$PM_{2.5}$ SIP

Appendix A

Meteorological Analyses

A-1: Investigation of Extended, Consecutive High $PM_{2.5}$ Days

A-2: Sullivan, 2007, Excerpt of Liberty-Clairton Area Meteorological Evaluation

A-3: Sullivan, 1996, Excerpt of Liberty-Clairton Area Meteorological Evaluation

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A-1: Investigation of Extended, Consecutive High $PM_{2.5}$ Days

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ANALYSIS OF METEOROLOGY ON DAYS IN 2005-2009 WHEN $PM_{2.5}$ WAS AT LEAST 35.5 $\mu g/m^3$ WITH A FOCUS ON EXTENDED, CONTINUOUS EXCEEDANCE DAYS

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November 2012 (Rev. Dec. 2012)

Overview: To better prepare for demonstrating compliance with the new federal 24-hour $PM_{2.5}$ ambient air quality standard of 35 $\mu g/m^3$, an analysis of weather conditions was performed on days in 2005 through 2009 when FRM values in Allegheny County reached or exceeded a $PM_{2.5}$ level of 35.5 $\mu g/m^3$ (the level at which an exceedance of the new standard may be registered). A summary of these days along with the FRM monitors registering the high values is given in Table 1.

Year	Monitor*	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2005	LB		4	1	7	3	7	2	7	8	4	9	4	**56**
	LV						4		3	4	2			**13**
	Others				1		3	1		2				**7**
2006	LB	2	1	3	2	5	2	9	2	2	2	7	6	**43**
	LV					3	1	4	3					**11**
	Others					1		2	1	1		1		**6**
2007	LB	2	1	2	2	5	5	5	10	7	7			**46**
	LV						2	2	6	2				**12**
	Others						3		2	2				**7**
2008	LB	1	2		3	4	1	8	1	4	4	3		**31**
	LV							1						**1**
	Others		1					2				1		**4**
2009	LB		2	1					1		1	7		**12**
	LV													**0**
	Others										1			**1**
	Totals													
	LB	**5**	**10**	**7**	**14**	**17**	**15**	**24**	**21**	**21**	**18**	**26**	**10**	**188**
	LV					**3**	**7**	**7**	**12**	**6**	**2**			**37**
	Others		**1**		**1**	**1**	**6**	**5**	**3**	**5**	**1**	**2**		**25**
	Total	**5**	**11**	**7**	**15**	**21**	**28**	**36**	**36**	**32**	**21**	**28**	**10**	**250**

***Note**: LB = Liberty Borough; LV = Lawrenceville; Others includes Clairton, Harrison, Moon, North Braddock, North Park, and South Fayette FRM monitors ("Previous FRM" monitors were not part of count for 2005).

Table 1. FRM monitors and number of days in 2005 - 2009 with $PM_{2.5}$ greater than or equal to 35.5 $\mu g/m^3$.

As indicated by the table totals, $PM_{2.5}$ daily exceedances are usually most frequent during the months of May through November with the maximum amount of exceedances reached in July and August. The Liberty Borough (LB) monitor, which operates daily, by far has the most exceedances, while the Lawrenceville (LV) monitor, which also operates daily and is considered to be an approximate measure of background concentrations, has much lower amounts of exceedances. Therefore, subtracting the LV totals from the LB totals will give a rough measure of LB exceedances attributable to the impact of local sources, more-distant upwind major point sources (i.e., sources approximately to the southwest), and meteorological conditions in the Liberty Borough-Clairton area. Finally, note that overall, on an annual basis, the total number of exceedances has generally been decreasing from 2005 through 2009, although 2009 was a year of generally low industrial production.

Meteorological Conditions that Typically Produce Exceedances: An investigation of the weather conditions that typically produce $PM_{2.5}$ levels of at least 35.5 $\mu g/m^3$, was conducted by focusing on time periods with extended, consecutive number of exceedance days. To be considered an extended period, daily $PM_{2.5}$ concentrations needed to be at least 35.5 $\mu g/m^3$ for a minimum of four consecutive days. Table 2 displays nine such periods meeting these concentration and duration criteria.

Year		May	Jun	Jul	Aug	Sep	Oct	Nov
2005	Days		24 - 27			12 - 15		
	LB		**77.8**			**84.9**		
2006	Days	28 - 31						24 - 28
	LB	**60.1**						**100.7**
2007	Days			7 - 10	1 - 4	3 - 7		
	LB			**61.7**	**53.8**	**56.2**		
2008	Days			16 - 20				
	LB			**50.0**				
2009	Days							7 - 10
	LB							**92.1**

Note: LB = Liberty Borough; Bold value under days of month represents maximum concentration in $\mu g/m^3$ during the duration ("Previous FRM" monitors were not part of evaluation for 2005).

Table 2. Days in 2005 - 2009 with $PM_{2.5}$ greater than or equal to 35.5 $\mu g/m^3$ for at least four consecutive days. Note that the maximum concentration during the period (given in bold) was always recorded at the Liberty Borough monitor.

Table 3 shows the typical meteorological conditions collected by the National Weather Service, Pittsburgh, PA (PIT NWS) associated with each of the prolonged high-concentration days from Table 2. Specific conditions evaluated included synoptic surface and 500-mb (about 3.4 mile altitude) features, precipitation amounts, maximum daily temperatures, temperature departures from normal, and morning radiosonde measurements (for inversion conditions).

Meteorological Variable/Event	**June 24-27, 2005**	**Sept. 12-15, 2005**	**May 28-31, 2006**	**Nov. 24-28, 2006**	**July 7-10, 2007**	**Aug. 1-4, 2007**	**Sept. 3-7, 2007**	**July 16-20, 2008**	**Nov. 7-10, 2009**	**Avg. or Typical Value**
Typical Surface Feature(s)	Varied	High P incl. T.S.	High Pres.	High Pres.	High Pres.	High Pres.	Varied	High P, incl. T.S.	High P, incl. T.S.	**High Pres.**
Typical 500 mb Feature(s)	Ridge to SW flow	High Pres.	High Pres.	Deep^{ng} Trough in W	Varied	Varied	NW to SW flow	Zonal flow	Varied	**Varied**
Max./Avg. Max. Temperature	91*/ 90	85*/ 84	91*/ 88	66/ 63	90*/ 88	91/ 91	91*/ 87	88*/ 87	71*/ 66	**85/ 83**
Average Temp. Departure	6	8	10	10	4	6	8	3	10	**7**
Avg. Resultant W. D. (^{o})	170	270	200	210	240	280	220	230	250	**230**
Avg. Resultant W. S. (mph)	2.5	2.6	1.0	2.2	4.3	2.9	2.7	3.7	4.0	**2.9**
Avg. Mean W.S. (mph)	3.4	3.6	2.6	2.7	4.9	3.8	3.6	4.5	4.5	**3.7**
Avg. Relative Humidity (%)	65	71	64	61	59	59	64	66	56	**63**
Avg. Precip. (inches)	0	0	0	0	0	0.01	0	0.01	0	**0**
Avg. Inversion: Strgth.,^{o}C/hgt.,m	4.0 / 169	4.4 / 175	4.5 / 235	6.4 / 192	4.2 / 187	4.3 / 163	5.4 / 258	4.1 / 163	4.9 / 260	**4.7 / 200**

Notes: Values derived from PIT NWS and University of Wyoming (for PIT NWS upper-air data) records. T.S. indicates that a tropical storm was off the East Coast. * Asterisk at Max. Temperature means value is maximum temperature for the month; the November 2006 and August 2007 Max. Temperatures were both one degree off the highest for the month. Average inversion strength and height data are from the daily 12Z (morning) sounding.

Table 3. Meteorology on days in 2005 - 2009 with $PM_{2.5}$ greater than or equal to 35.5 $\mu g/m^3$ for at least four consecutive days.

Along with meteorological conditions on the days given in Table 3, weather two days before and after these days was also examined. Specific conditions evaluated included those listed for the actual extended high-concentration days in Table 3. Again, weather conditions are based on data collected by PIT NWS.

Analysis of pre- and post-event weather produced an overview, given in Table 4, of the typical circumstances that set-up, sustain, and dissipate extended periods of exceedance days.

Meteorological Variable/Event	**Typical conditions associated with consecutive high $PM_{2.5}$ days**
Months	May through November
Surface Feature(s)	Complex, but generally high pressure [Note: Tropical storms off the coast of the Carolinas on two occasions (Sept. 2005, "Ophelia"; July 2008, "Cristobal") and Nov. 2009, Hurricane Ida in Gulf of Mexico] and events associated with fronts after
500 mb Feature(s)	Complex, but generally flow backing from NW to W or SW throughout event
Max Temperature	Max for month and highs >= mid 80s
Temp. Departure	+7 ^{o}F, with 2 days before +0.5 ^{o}F and 2 days after +11 ^{o}F
Resultant WD	SW, with winds prior outside of 180°–270° and after within 180°–270°
Resultant WS	3 mph, with winds 4.3 mph prior and 4.7 mph after
Avg. Mean WS	< 4 mph, with winds > 5 mph prior and > 5.5 mph after
Relative Humidity	Low 60s percent, with mid 60s before and mid 70s after
Precipitation	Little or no collection 36–48 hrs. prior and substantial amount to end high days
Stability	Morning surface inversions 4.7 ^{o}C strength, 200 m depth, and 83% frequency, with 2.8 ^{o}C, 150 m, and 61 % before and 1.5 ^{o}C, 140 m, and 56% after

Table 4. Typical conditions before, during, and after days in 2005 - 2009 with $PM_{2.5}$ greater than or equal to 35.5 $\mu g/m^3$ for at least four consecutive days.

As the table suggests, extended periods of days with $PM_{2.5}$ of at least 35.5 $\mu g/m^3$ are most likely to occur from May through November. The synoptic weather map features are rather complicated, but generally indicate the influence of a high pressure system in the NE U.S. with airflow backing from NW to W or SW at the 500 mb level. Typically, events associated with

frontal activity, especially precipitation, appear to dissipate the elevated $PM_{2.5}$. It is interesting to note that on two occasions (September 2005 and July 2008), a tropical storm was off the coast of the Carolinas, while another time (November 2009) Hurricane Ida was present in the Gulf of Mexico, eventually dropping to tropical-storm status as it made its way into the Florida panhandle, then transitioning into a Low in the SE that made its way up the eastern seaboard.

The maximum temperature for the month is usually reached during the extended $PM_{2.5}$ periods. In fact, as reported in Table 3, seven of the nine extended periods contained the monthly maximum temperature with the remaining two events reporting temperatures just one degree below the monthly high. Temperature *departures* averaged 7 ^{o}F above normal and even more within two days after $PM_{2.5}$ concentrations dropped below 35.5 $\mu g/m^3$.

Resultant wind directions were around SW and speeds were light—typically 3 mph for resultant velocity and 4 mph for mean speed—during the high $PM_{2.5}$ days. Wind directions were generally outside the S through W quarter and a bit faster for two days prior to the high days, while the directions tended to be within the S through W quadrant but still faster for two days after.

Relative humidity averaged at the low 60 percent level. Levels prior to the elevated $PM_{2.5}$ event averaged a little higher, while levels after averaged more than ten percentage points higher, which makes sense, since precipitation often occurred to help end the pollution event. Prior to the event little to no precipitation was measured; however, the reported substantial amounts associated with the end of the event apparently were sufficient to independently dampen the $PM_{2.5}$ levels or at least to assist with the event's abridgement.

Finally, atmospheric stability conditions, as indicated by the presence of a significant (i.e., at least 1 ^{o}C in strength) morning ground temperature inversion, were evaluated. During the extended $PM_{2.5}$ events, morning inversions were generally moderate to strong, averaging 4.7 ^{o}C in strength and topping out at a mean of 200 m. The frequency was relatively high at 83% of mornings. By comparison, such inversions averaged only 2.8 ^{o}C at a height of 150 m and a frequency of 61% before the event and 1.5 ^{o}C at 140 m and 56% after.

<u>Background</u>: Conclusions given above can be compared with published research findings. Based on two recent studies, Table 5 lists conditions that affect general and specific fine particulate matter concentrations. This table reveals that elevated $PM_{2.5}$ levels and specific component concentrations are generally associated with warm temperatures, slow wind speeds (typically < 5 mph), and stagnant air. High relative humidity (> 60%) tends to increase sulfate and nitrate concentrations while decreasing carbon concentrations. Precipitation yields a strong negative

correlation with all $PM_{2.5}$ components. Except for speciation associations, which were not part of this analysis, these research study results are largely substantiated by the findings in this paper.

Meteorological Variable	$PM_{2.5}$	Sulfates	Nitrates	Organic Carbon	Elemental Carbon
Temperature	+ (especially in summer)	+	+ in OH, CA; Great Plains; - in S.E. US	+	+
Wind < 5 mph	+	+	+	+	
Relative Humidity		+	+	-	-
Precipitation	-	-	-	-	-
Stability	+				

Note: A **+** symbol indicates the meteorological variable is positively associated with high PM2.5 levels, while a **–** symbol indicates a negative association. (Based on Tai, et al., 2010 and Varadarajan, 2007.)

Table 5. Association of meteorology with $PM_{2.5}$ general and component concentrations.

References:

Tai, A.P.K., Mickley, L.J., & Jacob, D.J. (2010). Correlations between fine particulate matter ($PM_{2.5}$) and meteorological variables in the United States: Implications for the sensitivity of $PM_{2.5}$ to climate change. *Atmospheric Environment*, *44*(32), 3976-3984.

Varadarajan, C. (2007). Development of a source-meteorology-receptor (SMR) approach using fine particulate intermittent monitored concentration data for urban areas in Ohio (Doctoral dissertation, University of Toledo, 2007). *Dissertation Abstracts International*, *69*, 01.

A-2: Sullivan, 2007, Excerpt of Liberty-Clairton Area Meteorological Evaluation

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The Processing of CALMET Files for Allegheny County's PM2.5 SIP Analysis

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Contract #5404-07

November 9, 2007

6.0 Potential for Low-Level Convergence During Stable Nocturnal Conditions

Two sources of information were reviewed to evaluate the potential for low-level convergence caused by the rising heat plumes, which would be expected to be most evident during light wind speed, nocturnal conditions: (1) the special meteorological study of 1996; and (2) data from the USX site for the period of 1995 through 1996.

Special Meteorological Study of 1996 – Appendix B contains this study report. Although a very short-term study and based on visual evidence rather than an intensive array of meteorological sensors, some useful information can be obtained by reviewing these historical records. Review of limited streamlines (see Figures 16 and 17 as examples) shows the potential for up-valley flow towards the heat sources at the coke facility. Down-valley flow would be towards the northwest at the Clairton Works. Note that the most westerly flow vector is located at the approximate location of the USX Clairton meteorological monitoring site. The limited data showed intermittent periods with flow up-river towards the heat sources. The SODAR data that were available concurrent to this study showed that any convergence was below the 50m level.

Figure 18 represents visual observations taken during the early morning hours of March 26, 1996. During this stable period strong down-valley flow was observed at the Youghiogheny River but weak up-valley flow down river from the USX Clairton facility. It has been hypothesized that blocking flow by the Youghiogheny River possibly coupled with low-level convergence near the plant (likely caused by the rising heat plumes) is creating the complex low-level flow during nocturnal conditions. Site-specific meteorological monitoring with low threshold wind systems would be needed to refine the available data-base, with coverage within both the Youghiogheny and Monongahela valley floors.

Figure 16: Flow Vectors (12/5/1995 0530)

Figure 4: Streamlines for December 5, 1995 (0530)

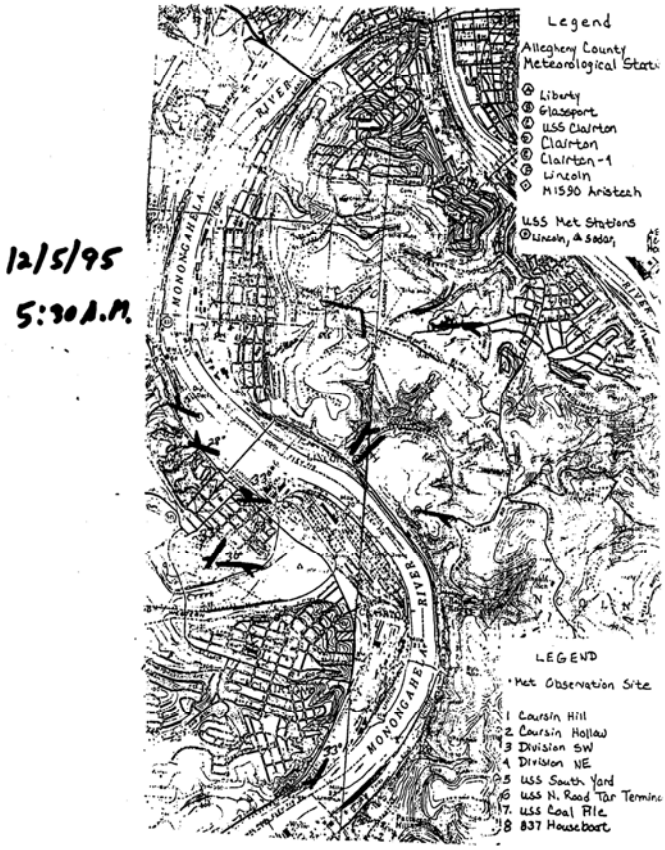


Figure 17: Flow Vectors 12/8/1995 0100

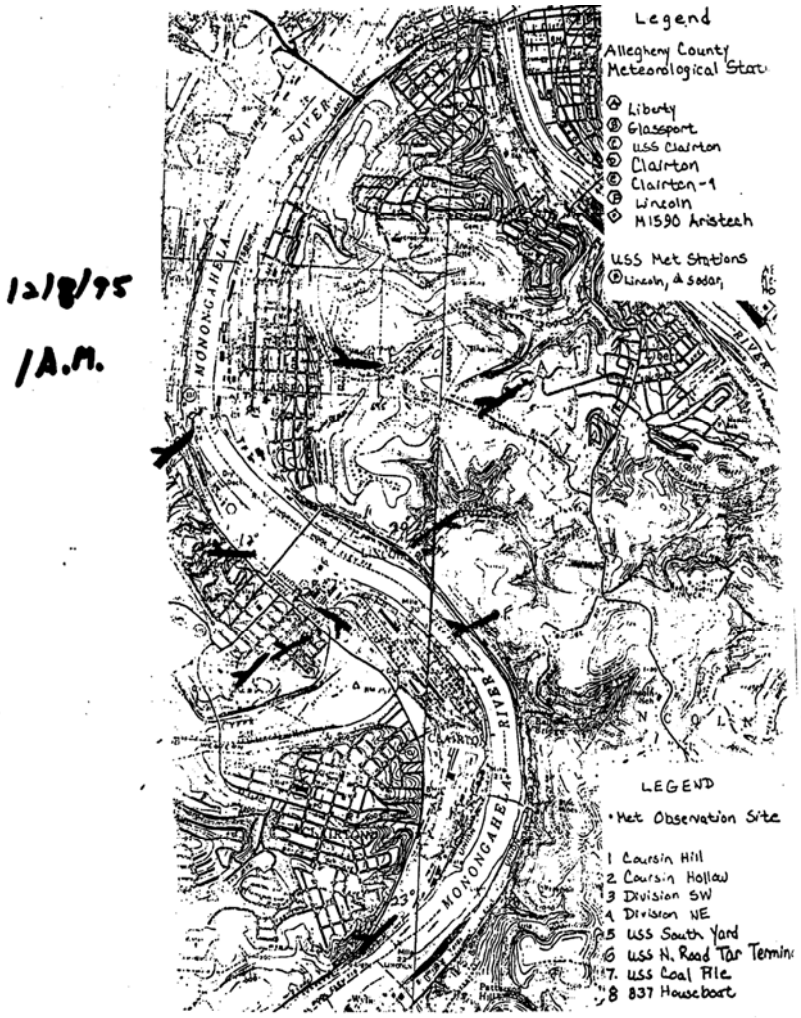
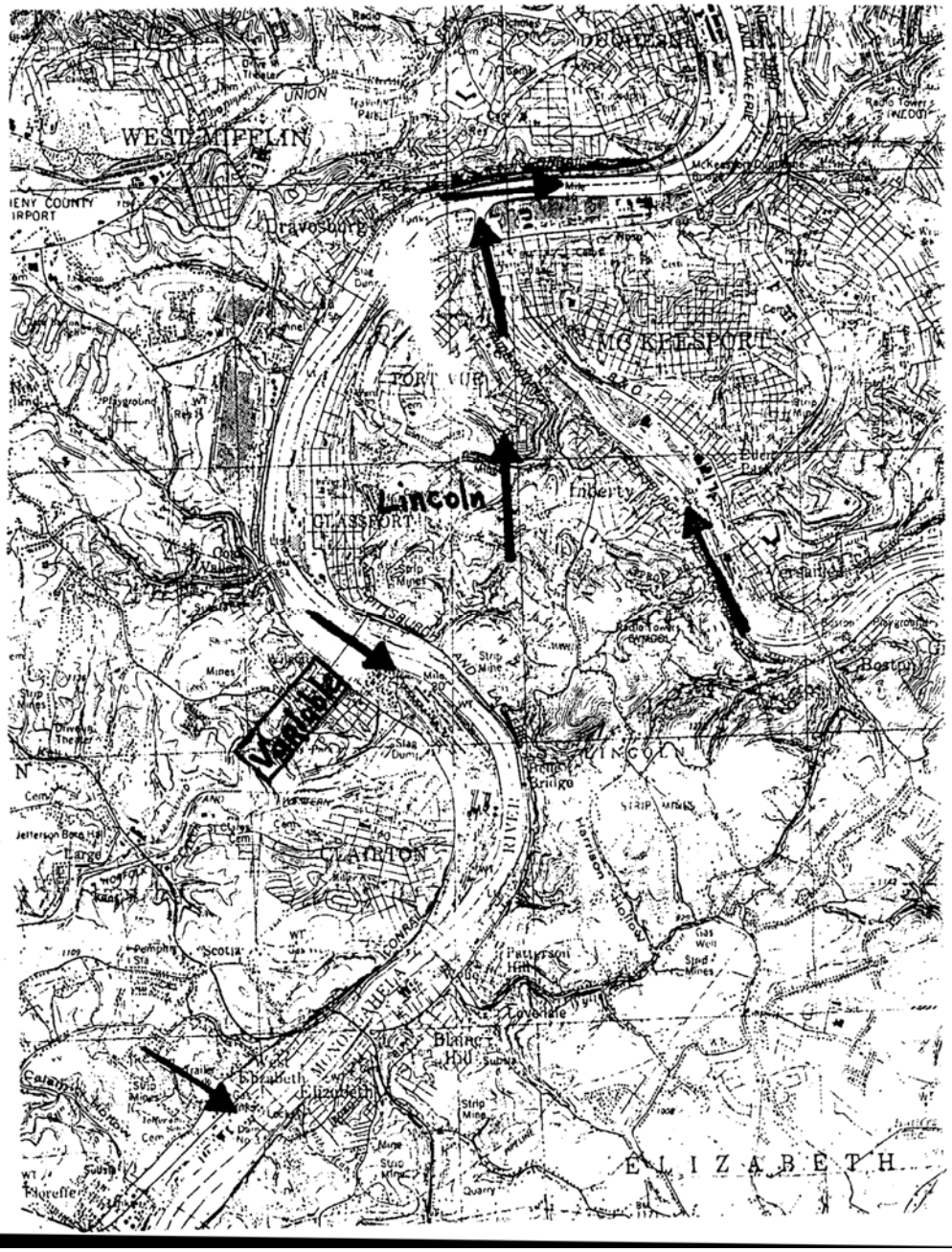


Figure 18: Observed Flow Vectors March 26, 1996



Long-Term Meteorological Monitoring At USX Clairton Works - Meteorological data were collected from 1995 through 2001 just downriver from the northwest extreme of the Clairton Works coal pile. These data were reviewed to display the most common wind directions associated with light flow periods during nighttime periods with non-overcast conditions. Figures 19 through 21 provide frequency plots for such periods with wind speeds less than 6, 3, and 1 mph respectively. As the wind speeds decrease, peak frequencies become more tightly clustered within the range of 240 through 260 degrees. Minimal flow is shown from 315 degrees; however, which would approximately up-river flow towards the heat sources. Figure 22 provides a general perspective on the river valley orientations in the vicinity of the Clairton Works.

Figure 19: Wind Direction Frequencies during Nocturnal Non-Overcast Conditions with Wind Speeds < 6 mph

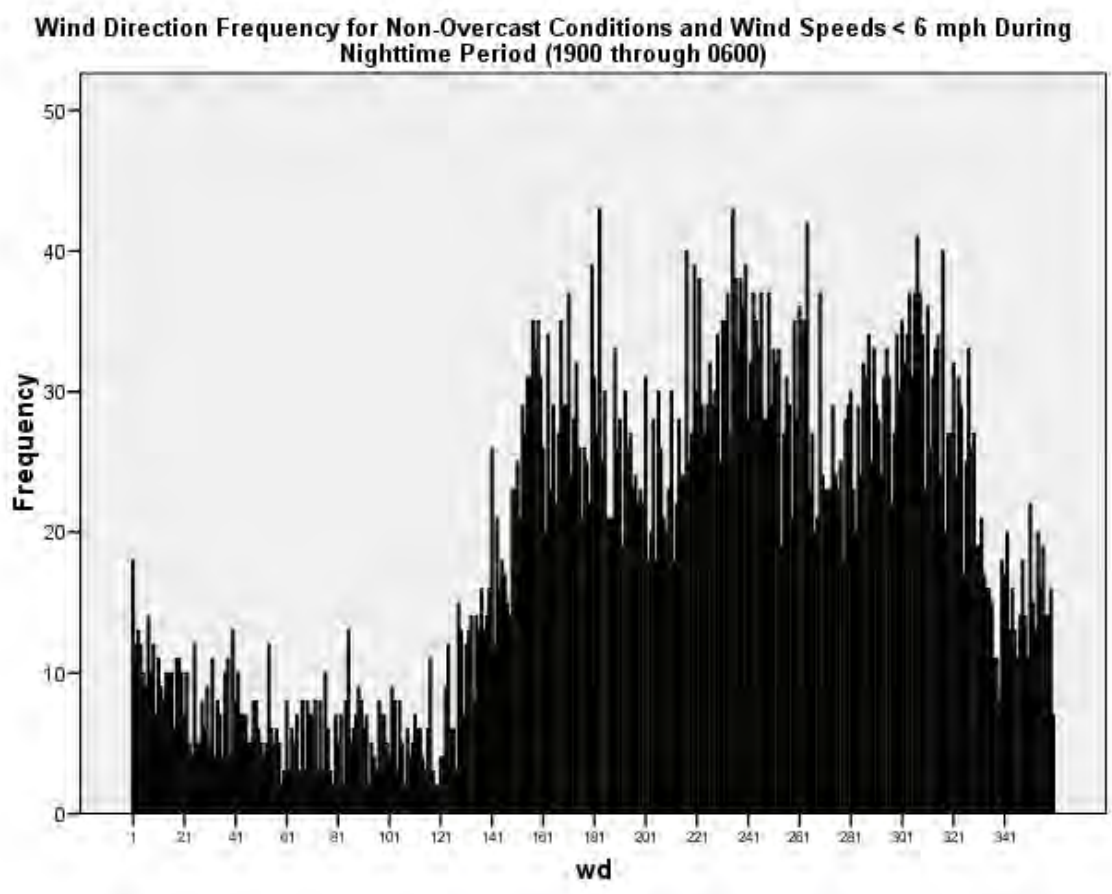


Figure 20: Wind Direction Frequencies during Nocturnal Non-Overcast Conditions with Wind Speeds < 3 mph

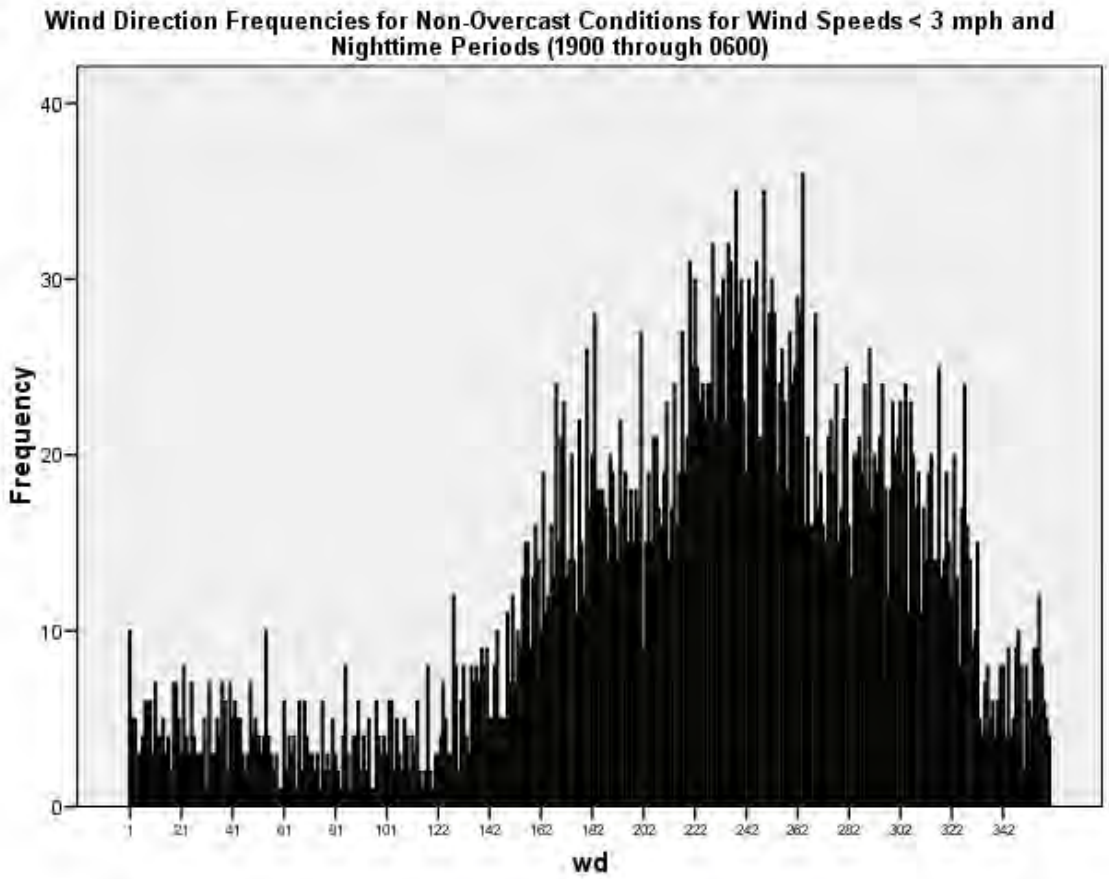


Figure 21: Wind Direction Frequencies during Nocturnal Non-Overcast Conditions with Wind Speeds < 1 mph

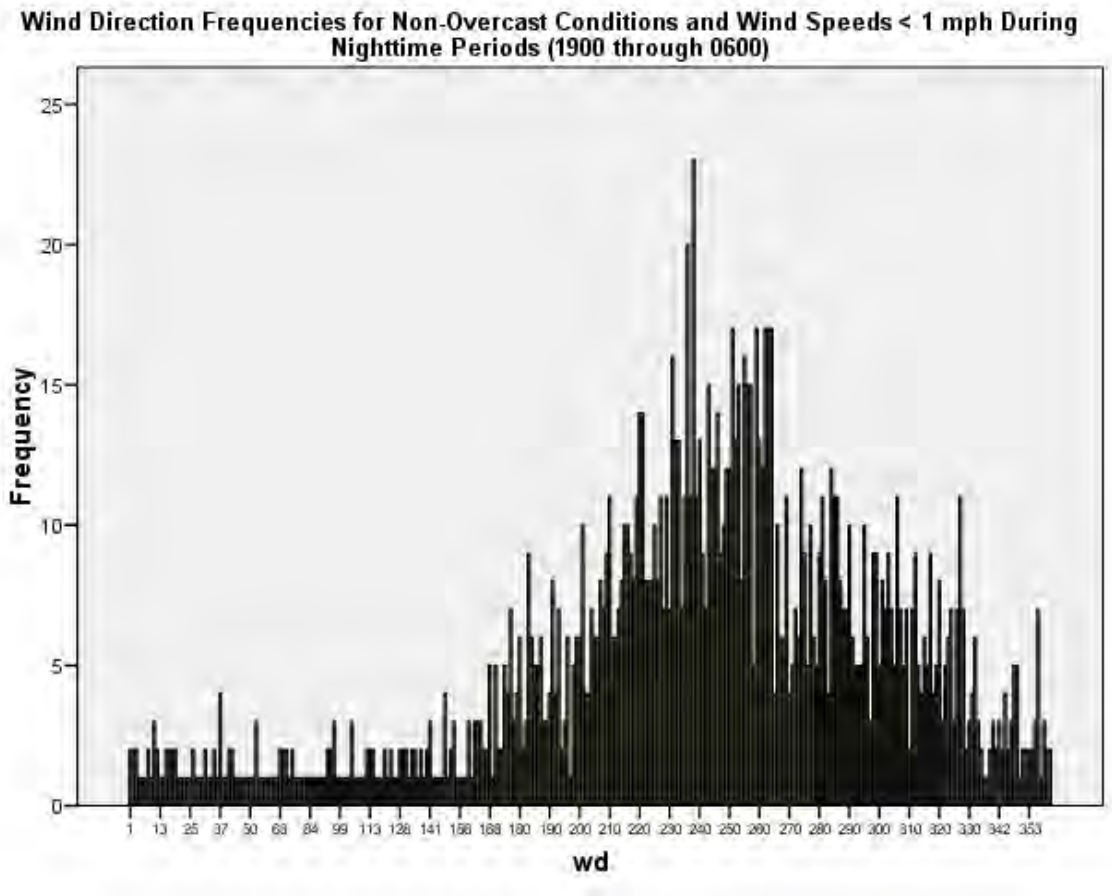
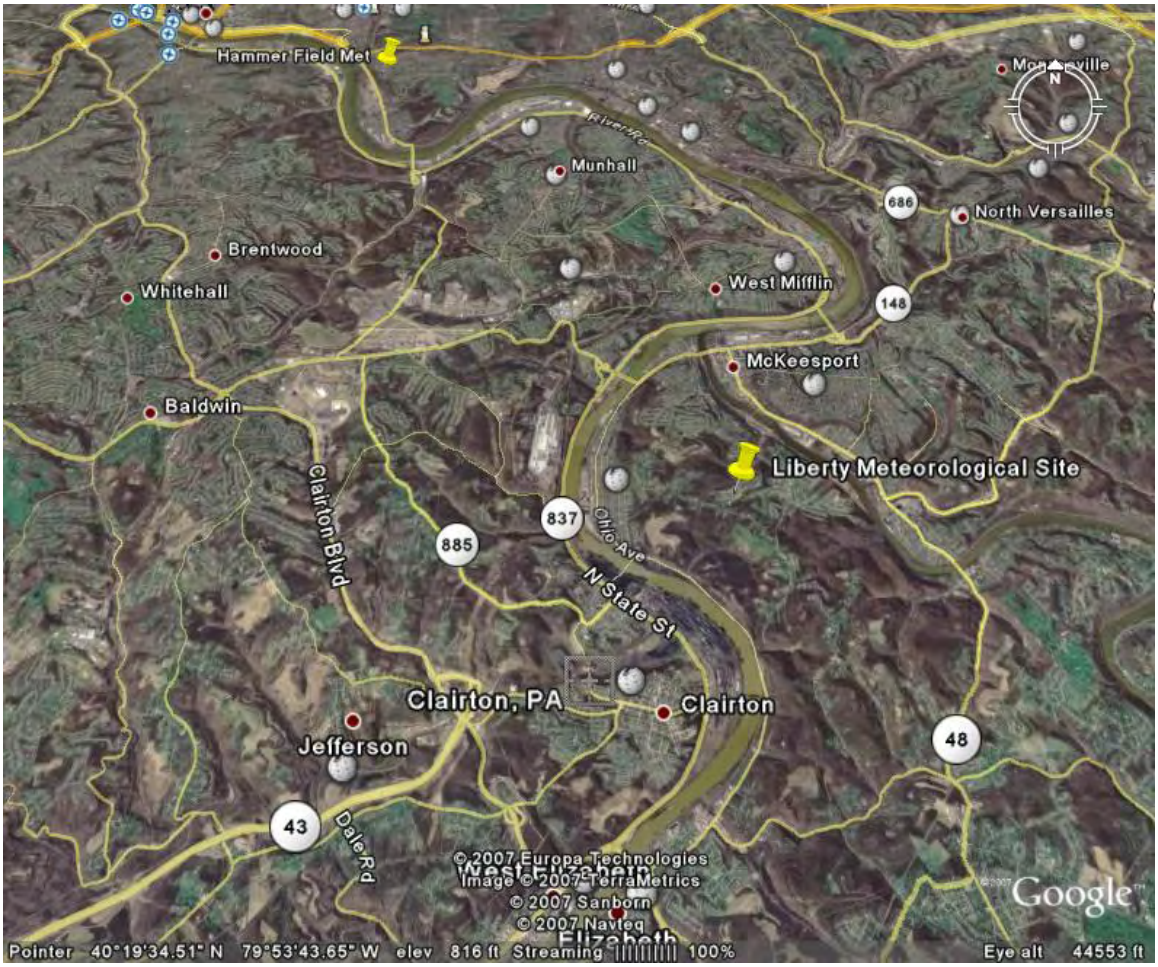


Figure 22: General Domain within Study Area



Although it is likely that at least on an intermittent basis there is up-valley flow towards the rising heat plums near the coke ovens and quench towers, there is insufficient available data to quantitatively incorporate this feature into the CALMET analysis, beyond accounting for heat flux-induced convergence near the Clairton Works. Our recommendation is to evaluate model performance in the CALPUFF modeling to be subsequently done with and without consideration for treating low-level fugitives near the heat sources by testing varying degrees of heat assigned to the buoyant area sources.

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A-3: Sullivan, 1996, Excerpt of Liberty-Clairton Area Meteorological Evaluation

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Review of Meteorology at the Clairton Area:
Strengthening Dispersion Modeling for State Implementation Plans

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March 1996

5.0 Interpretation of Available Measured Air Quality Data (PM_{10}, H2S, and Benzene)

Peak PM_{10} concentrations generally occur in the fall / winter months, during periods with nocturnal inversions. The likelihood of nocturnal inversions is much greater, however, in the summertime, when there are fewer storm systems (and less clouds) and lighter wind speeds. How do cold temperatures and inversion lead to exceedances? Is the strength of the inversions the key contributing factor? Could the drier conditions in winter lead to more intense and deeper inversions? Is greater formation of near-field, secondary particulates an issue? Are peak concentrations related to the longer nights in winter and longer periods for inversion conditions? Could some of the high PM_{10} concentrations in the winter relate to snow cover, which has been shown to produce valley drainage flows with increased vertical stability (Gudiksen et al., 1992)? Snow cover also could delay the breakup of the inversion in the morning; could this be a contributing factor to the observed peak 24-hour concentrations?

The best way to search for answers to the preceding questions, and others that could be posed, is to see what the measured air quality data set in Clairton shows in terms of peak PM_{10} concentrations versus specific meteorological conditions. Calendar years 1990 through 1994 were evaluated using FoxPro 2.6 queries to help isolate the key parameters.

We evaluated measured PM_{10}, H_2S, SO_2, and benzene concentrations as a function of temperature, relative humidity, wind speed, mixing height, stability, wind direction, length of inversion conditions, snow cover / no snow cover, and combinations of the

preceding parameters. The goal was to identify the combinations of conditions that most frequently lead to peak PM_{10} concentrations. Data were compiled into a database file to cover the preceding parameters. FoxPro queries and STATPLAN were used to interpret the data set. [2]

A FoxPro 2.6 database was established and installed on a County computer, which includes all available meteorological and air quality measurements for the Clairton area for the period of 1990 through 1994. The data base was resolved at the hourly level. Air quality data include PM_{10}, SO_2 H_2S, and benzene. Meteorological parameters include: wind speed, wind direction, mixing height, relative humidity, temperature, and snow cover. Queries were run to evaluate relationships among the parameters to support the development of future modeling strategies. The following was observed:

1. **H_2S is the best tracer for PM_{10}** impacts from USX. On this basis, H_2S would provide the most useful means to strengthen model performance, and to select sites for new air quality monitors. Refer to Table 1 for the correlation matrix for PM_{10}, H_2S, and benzene. In addition, Figures 9 through 11 display scatter plots of PM_{10} versus SO_2, H_2S, and benzene for peak concentrations when Liberty PM_{10} concentrations were greater than 100 $\mu g/m^3$. *This finding is important because H_2S can serve as a superior tracer of USX coke oven impacts, compared to PM_{10}, which is significantly affected by many other sources.*

2. **Peak PM_{10} concentrations at Liberty occur within a relatively narrow wind direction band** centered on a wind direction flow from 215 to 220 degrees, as shown in Figure 12. Lincoln, on the other hand, has peak concentrations for a somewhat broader range of degree wind directions,

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[2] STATPLAN is now nonproprietary software, which also was installed on a County computer along with the FoxPro database file.

although still generally concentrated in the same directions. Lincoln may be substantially complicated by proximity to USX, intermittent short-term flows that are different than regional conditions, valley fill / drift which may contribute to a broader range of wind direction impacts, and greater terrain complications. The observed PM_{10} data, therefore, suggest that the likelihood of accurately predicting the air quality benefits of control measures for USX sources is higher at Liberty than Lincoln. This is mostly because peak impacts occur within a well-defined and more narrow range of wind directions, showing transport from USX towards the site. *If Liberty could be accurately modeled for current conditions, based on the best performing model and input data, then there could be greater confidence that the air quality benefits could be effectively projected for that location. Once control benefits for Liberty could be predicted reasonably well, the empirical relationship of measured peak concentrations at Liberty relative to Lincoln could be applied to establish emission reduction goals to bring the ridge area near Lincoln into attainment.*

3. **October and especially November would be the preferred months to conduct follow-up activities** . Refer to Figure 13 which shows PM_{10} concentrations as a function of month for Liberty and Lincoln. Both sites show November to be a prime month for follow-up field activities. *Field studies should be focused during periods with the peak exposure problems that need to be addressed. The FoxPro queries clearly guide the selection of a preferred period for future field programs.*

4. **The available measured air quality data do not suggest that the valley fills and ultimately releases towards Liberty**. Rather, shortly after the inversions set up, concentrations at Liberty and Lincoln quickly peak and maintain at reasonably constant levels during the evening. Refer to seasonal displays of PM_{10} as a function of hour for both sites as shown in Figure 14. It is interesting to note that between 12 noon and 6 P.M. that Lincoln still can have relatively high concentrations of PM_{10} , while Liberty essentially has a gap in high concentrations during these hours. *This query was run to test the hypothesis that Coursin Hollow may be a relief point for the filling valley. The data do not appear to support this hypothesis.*

5 **Snow affects the Radiational Balance**. Snow cover conceivably could contribute to peak PM_{10} concentrations because of its influence on stability. Figure 15 shows concentrations as a function of snow depth for Liberty. Although the highest hourly concentrations occurred with snow cover present, there was no clear pattern to suggest that snow cover is a significant factor that contributes to peak PM_{10} concentrations.

6. **The influence of other meteorological variables**. Figures 16 and 17 show that there is no strong relationship at this location between peak PM_{10} concentrations and relative humidity or mixing height. Figure 18 clearly shows, however, that the vast majority of peak PM_{10} concentrations occur with stable conditions.

Based on all available information and the preceding data interpretation, it appears that the strength of inversion conditions is the most important contributing factor to peak PM_{10} concentrations in the Clairton area.

Table 1: Correlation Matrix for Liberty (for PM_{10} concentrations greater than 100 $\mu g/m^3$)

Variable	LB_PM1	LB_H2S	LB_SO2	LB_Ben
LB_PM10		0.590	0.426	0.496
Probability=		1.000	1.000	1.000
Number =		564	564	564
LB_H2S			0.533	0.734
Probability=			1.000	1.000
Number =			564	564
LB_SO2				0.259
Probability=				1.000
Number =				564
LB_Benzene				
Probability=				
Number =				

Figure 9: Scatter Plot of Hourly PM_{10} and SO_2 Concentrations in $\mu g/m^3$ for PM_{10} Greater than 100 $\mu g/m^3$.

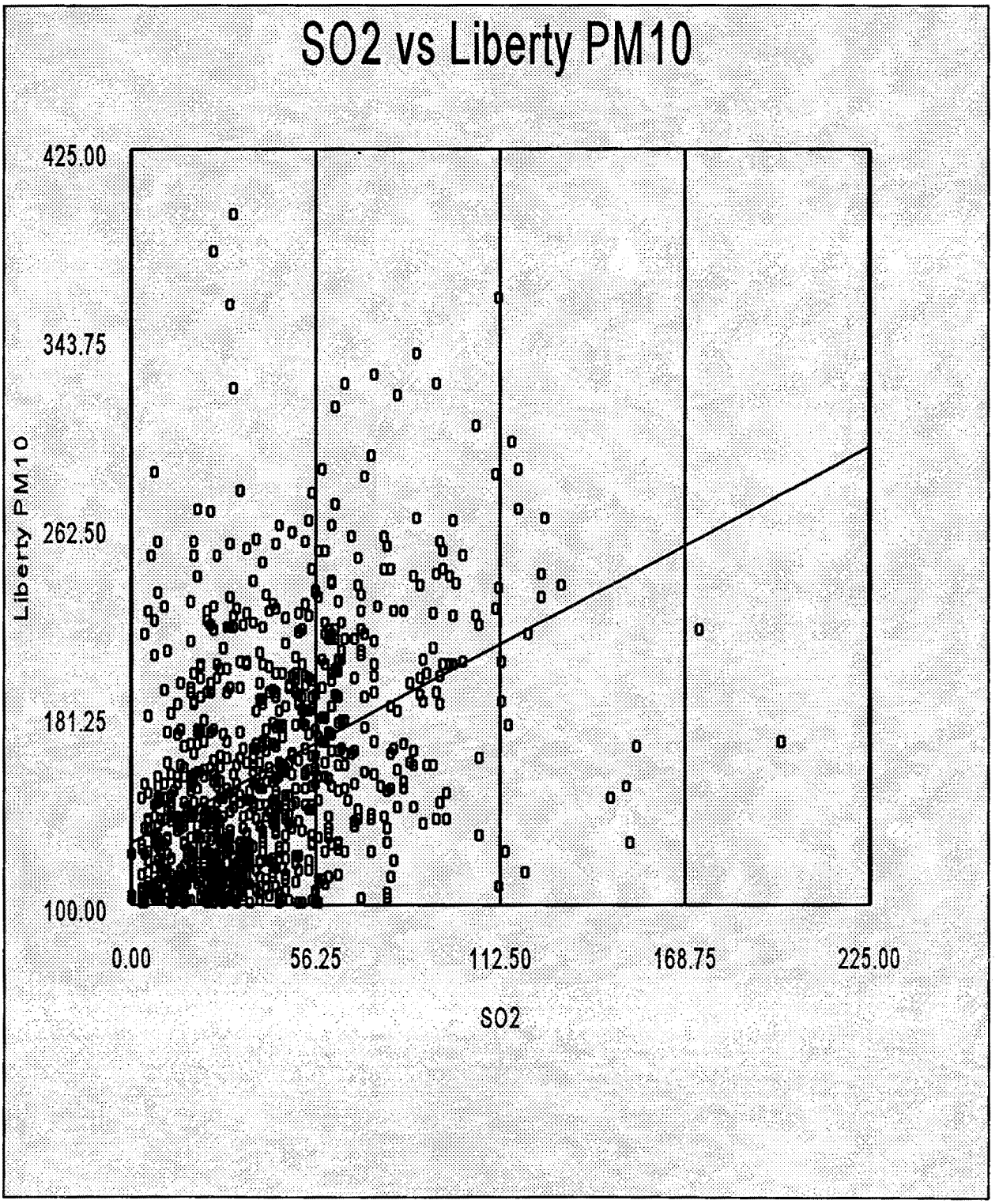


Figure 10: Scatter Plot of Hourly PM_{10} and H_2S Concentrations in $\mu g/m^3$ for PM_{10} Greater than 100 $\mu g/m^3$.

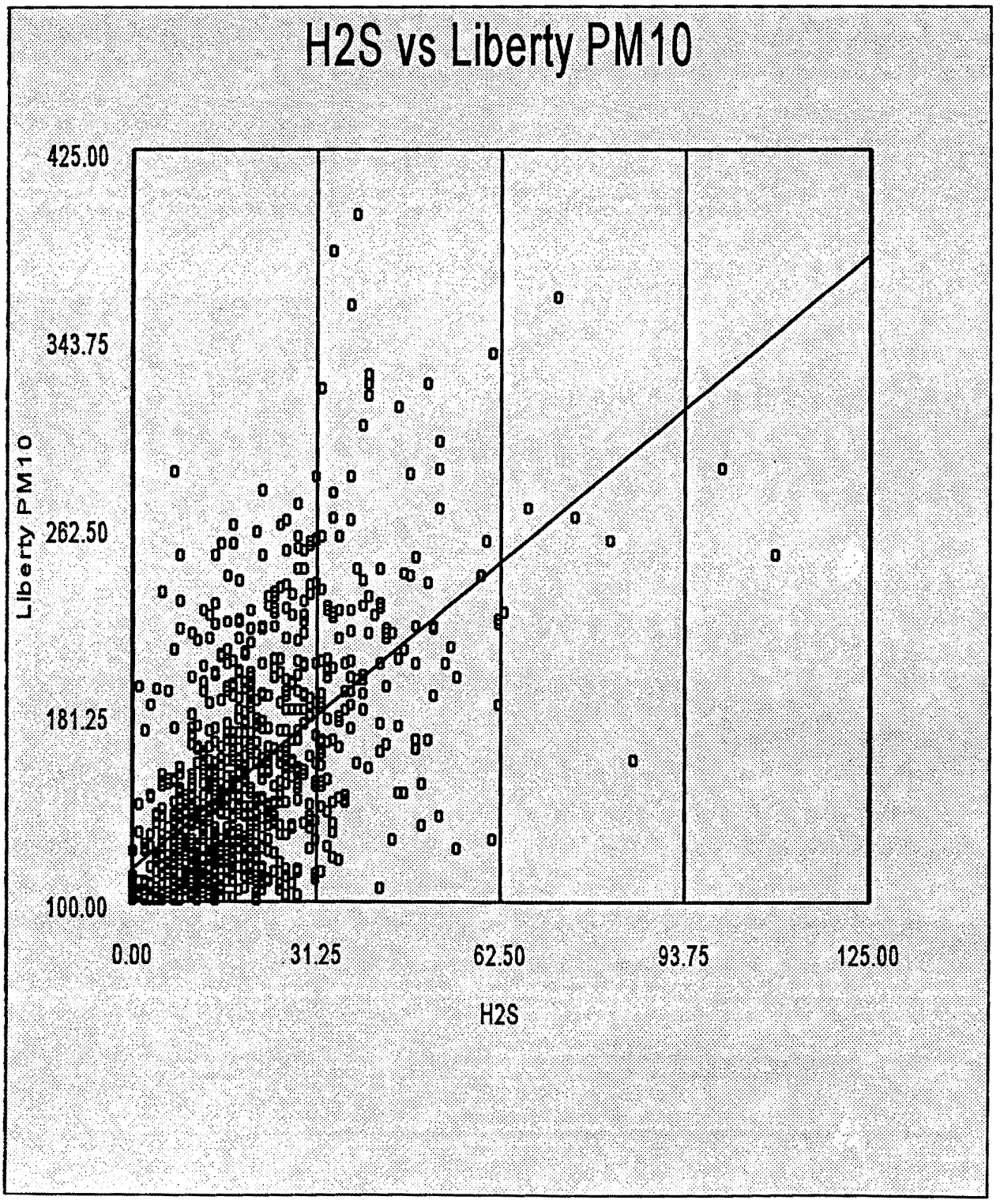


Figure 11: Scatter Plot of Hourly PM_{10} & Benzene in $\mu g/m^3$ for PM_{10} Greater than 100.

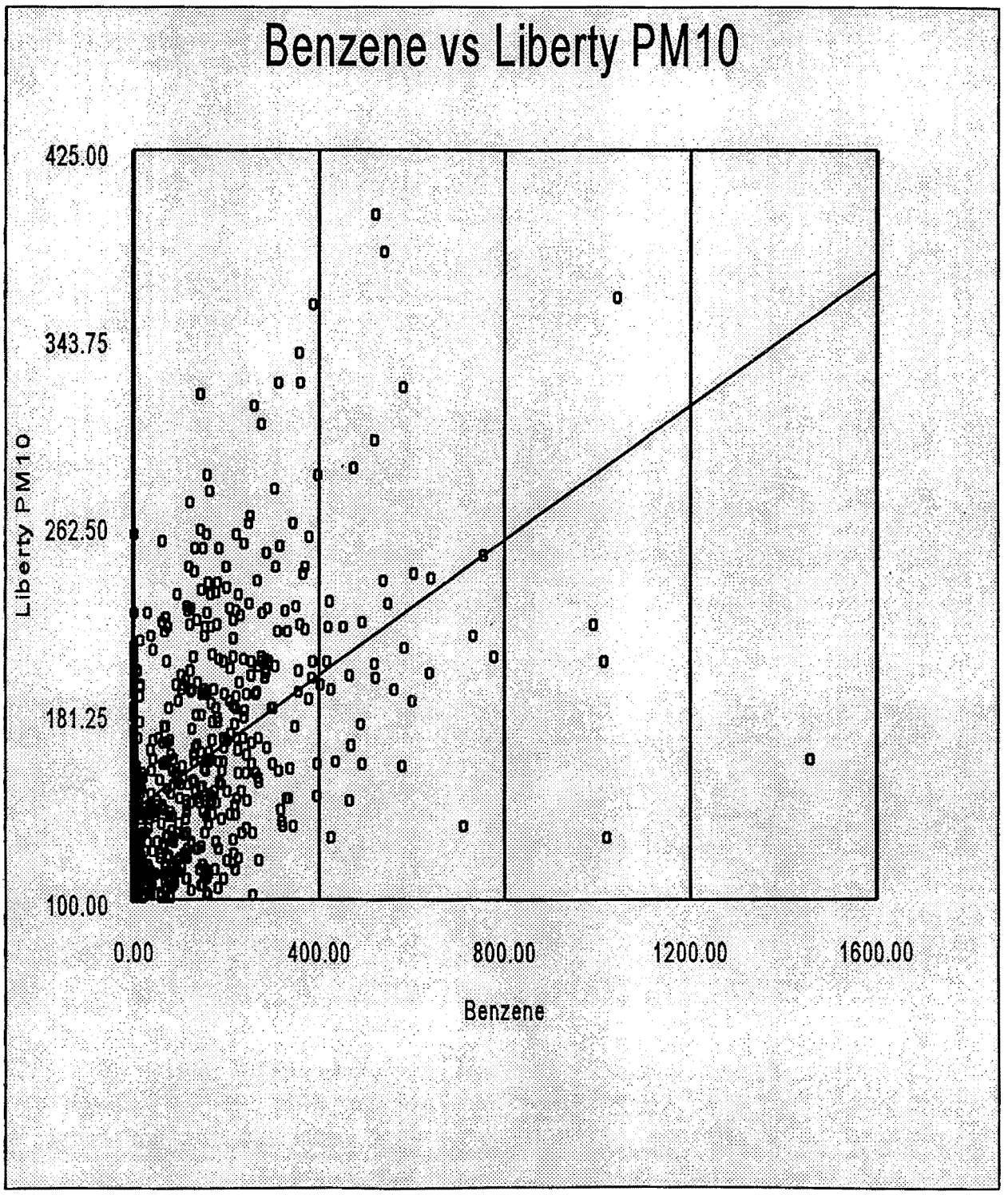
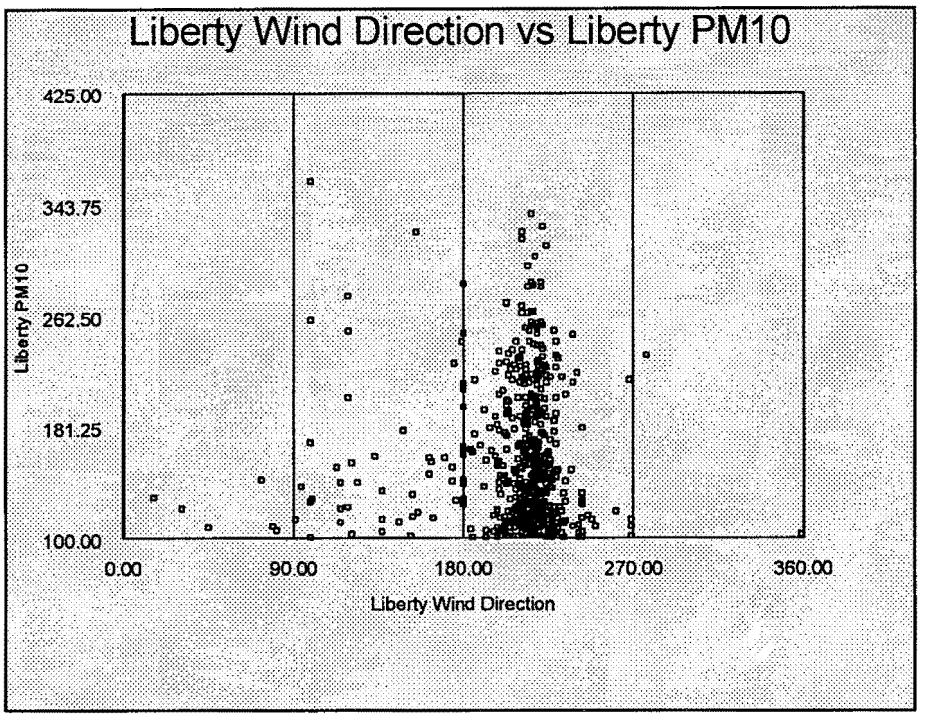


Figure 12: Hourly PM_{10} Concentrations, in $\mu g/m^3$, at Liberty and Lincoln as a Function of Wind Direction in Degrees for PM_{10} Concentrations greater than 100 $\mu g/m^3$.



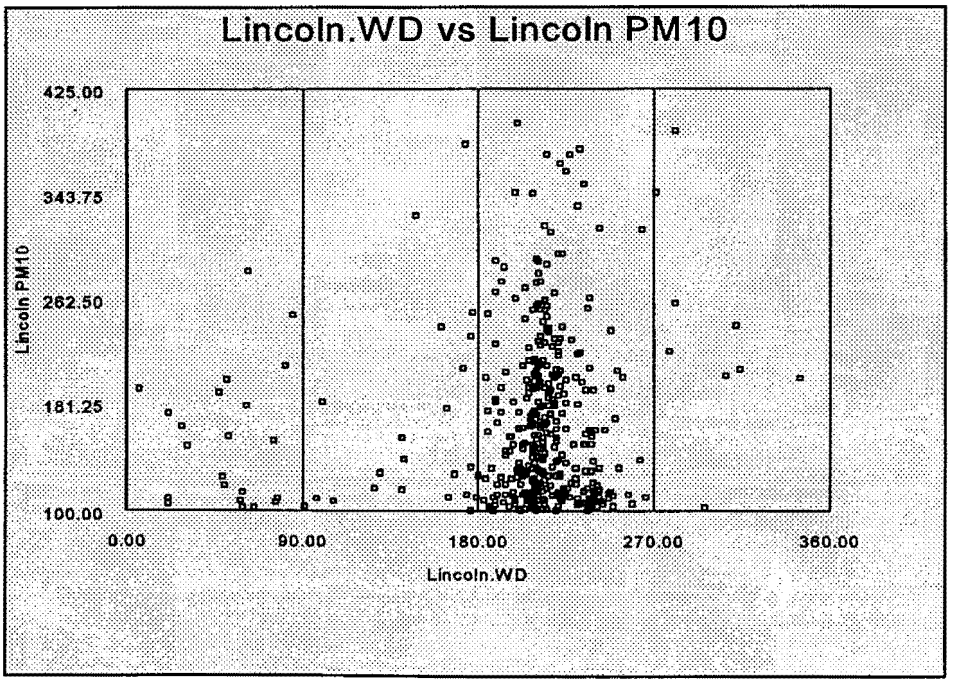
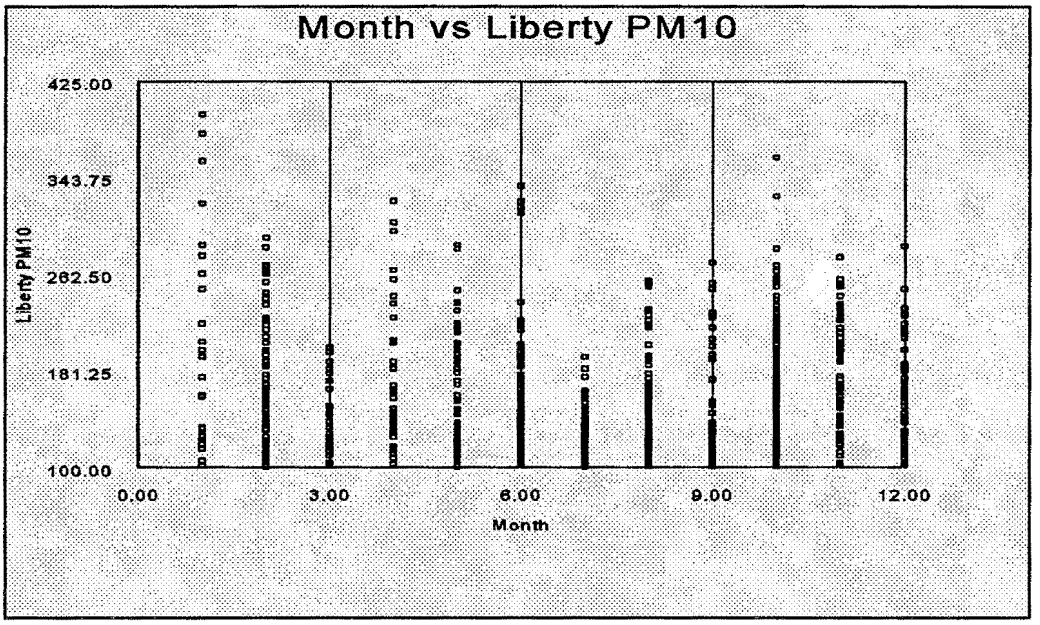


Figure 13: Hourly PM_{10} Concentrations in $\mu g/m^3$ at Liberty and Lincoln as a Function of Month of the Year.



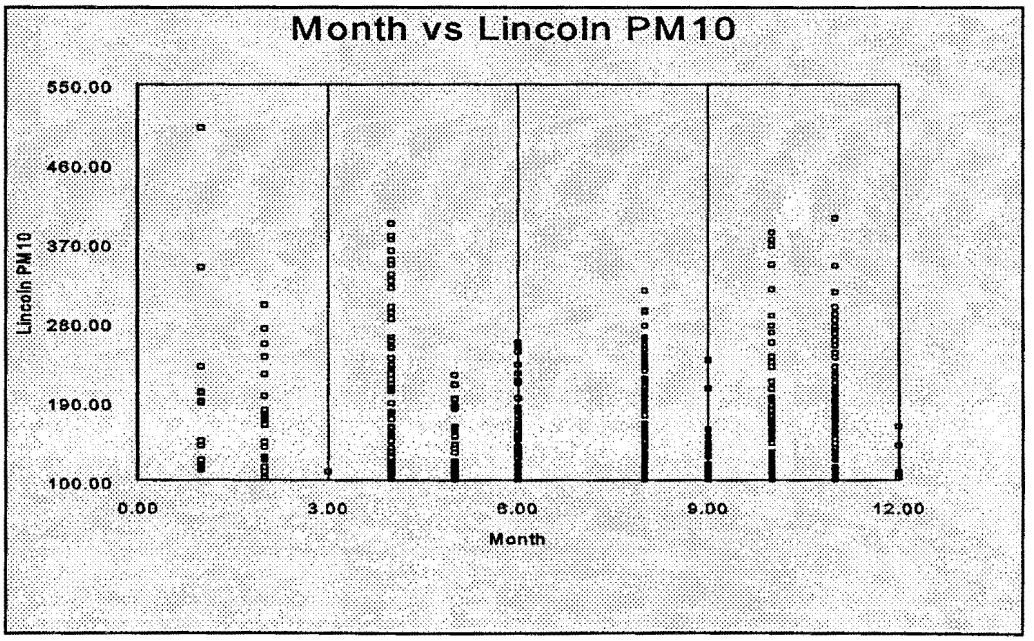
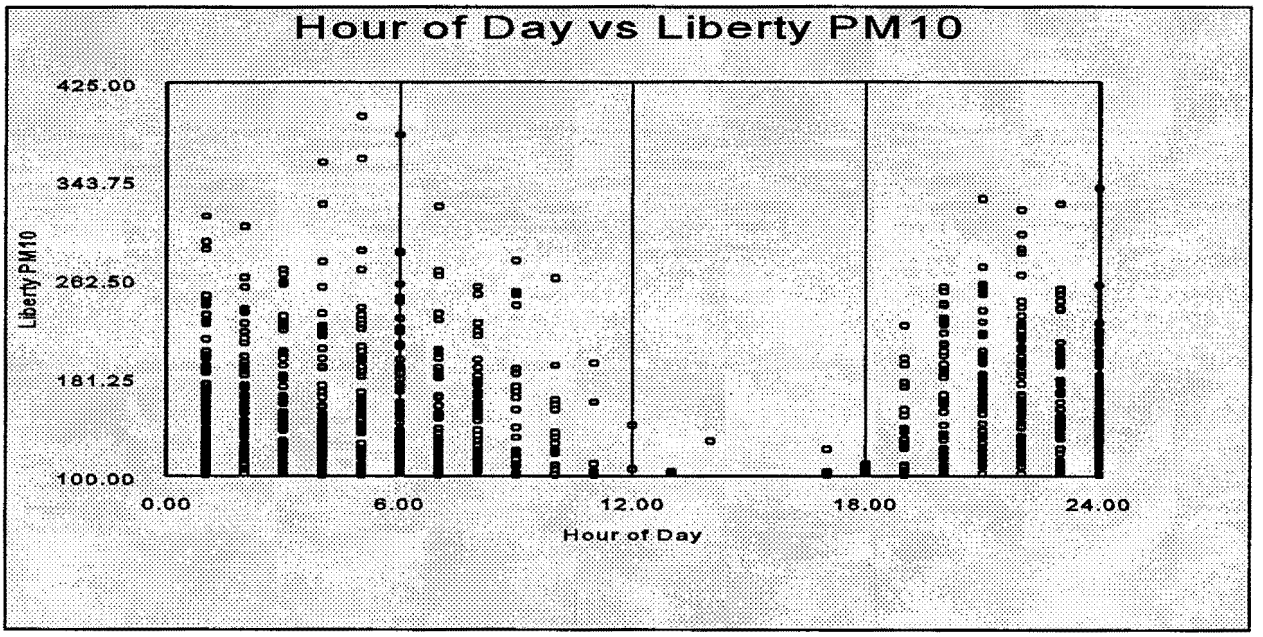


Figure 14: Hourly PM_{10} Concentrations in $\mu g/m^3$ at Liberty and Lincoln as a Function of Hour of the Day.



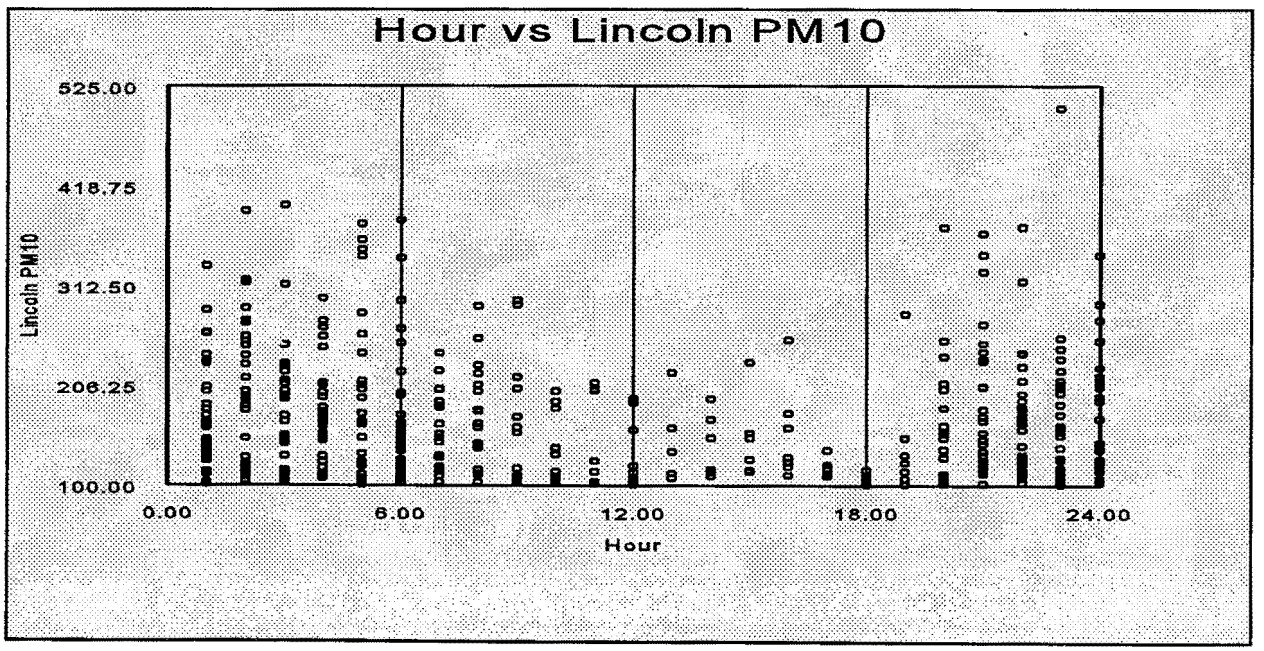


Figure 15: Hourly PM_{10} in $\mu g/m^3$ at Liberty as a Function of Snow Cover in Inches.

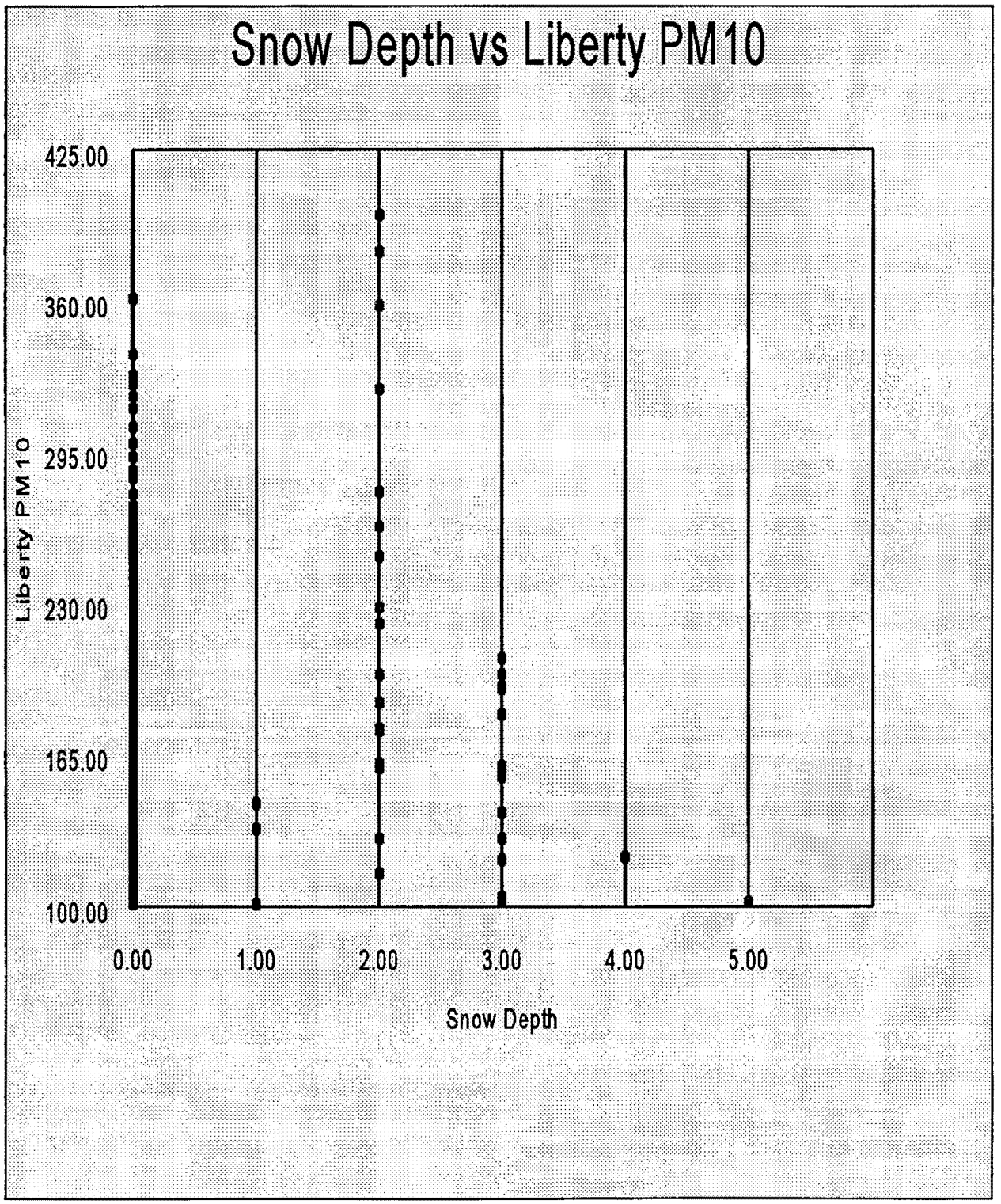


Figure 16: Hourly PM_{10} Concentrations in $\mu g/m^3$ at Liberty as a Function of Percent Relative Humidity.

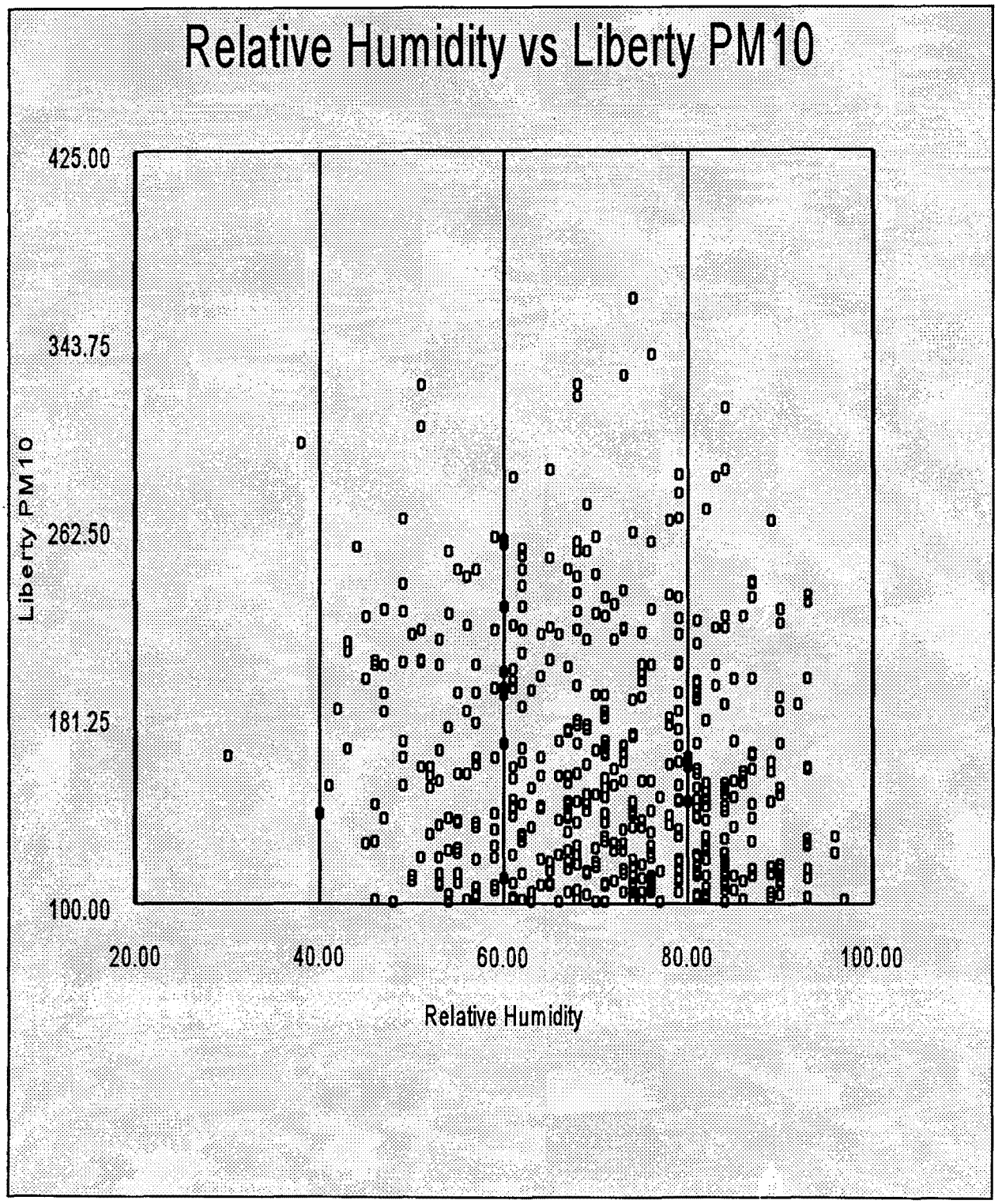


Figure 17: Hourly PM_{10} in $\mu g/m^3$ at Liberty as a Function of Mixing Height in Meters.

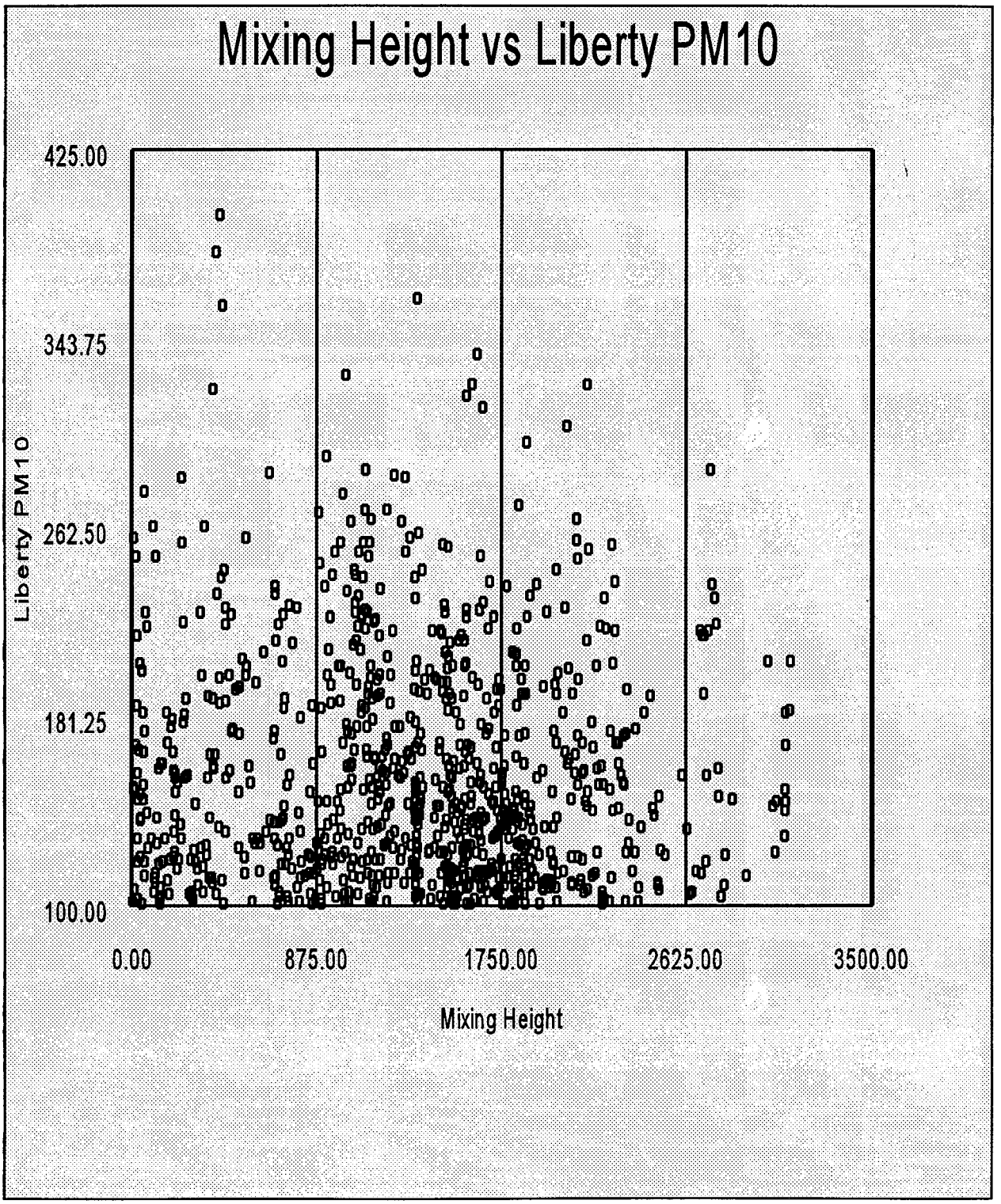
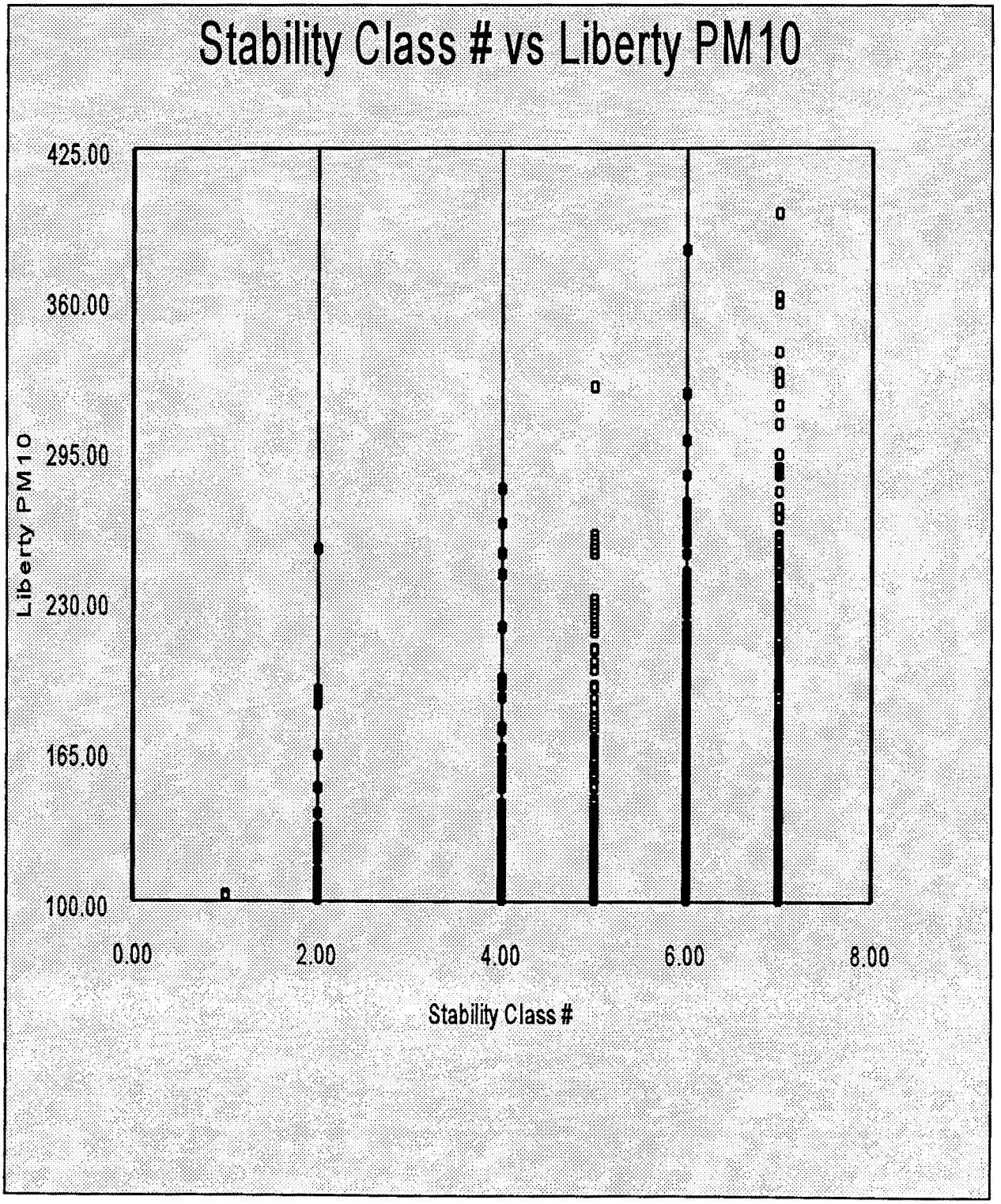


Figure 18: Hourly PM_{10} Concentrations in $\mu g/m^3$ at Liberty as a Function of Stability Class Number.



$PM_{2.5}$ SIP

Appendix B

Monitored Data

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Summary

This appendix provides the official Liberty and Clairton FRM data, along with Liberty CSN data, over the 2005-2009 timeframe as used in the attainment tests for this SIP. Appendix H contains the calculated attainment test data.

Values given in this appendix were supplied with the MATS version 2.5.1 software. These values also available from EPA's AirData web site, Air Quality System (AQS), and other databases.

AQS Quicklook and Design Value reports for all Allegheny County FRM/FEM sites over the timeframe 1999-2011 are also provided. All sites are showing attainment of the annual standard of 15.0 µg/m³. Liberty is the only site through 2011 showing nonattainment of the 24-hour standard of 35 µg/m³.

The official $PM_{2.5}$ Design Values downloaded from the EPA Air Trends web site (http://www.epa.gov/airtrends/values.html) are also included for 2000-2011. The design values include substitution tests for incomplete 3-year periods during which sites recorded one or more quarters of low data recovery (less than 75% data capture).

Liberty FRM operates on a 1-in-1 day basis, while Clairton FRM and Liberty CSN are 1-in-6 monitors.

All monitored data shown here has been collected and reported by ACHD and certified by EPA.

Liberty AQS code: 42|003|0064

Clairton AQS code: 42|003|3007

Liberty Quarterly FRM Data

ID	TYPE	LAT	LONG	DATE	PM25	NDAYS	COMP_CODE	STATE	COUNTY
420030064	FRM	40.32374	-79.8681	20050101	16.284	88	1	Pennsylvania	Allegheny
420030064	FRM	40.32374	-79.8681	20050401	22.264	90	1	Pennsylvania	Allegheny
420030064	FRM	40.32374	-79.8681	20050701	25.941	92	1	Pennsylvania	Allegheny
420030064	FRM	40.32374	-79.8681	20051001	21.101	86	1	Pennsylvania	Allegheny
420030064	FRM	40.32374	-79.8681	20060101	14.864	85	1	Pennsylvania	Allegheny
420030064	FRM	40.32374	-79.8681	20060401	17.893	90	1	Pennsylvania	Allegheny
420030064	FRM	40.32374	-79.8681	20060701	22.783	87	1	Pennsylvania	Allegheny
420030064	FRM	40.32374	-79.8681	20061001	20.967	89	1	Pennsylvania	Allegheny
420030064	FRM	40.32374	-79.8681	20070101	14.158	88	1	Pennsylvania	Allegheny
420030064	FRM	40.32374	-79.8681	20070401	18.637	90	1	Pennsylvania	Allegheny
420030064	FRM	40.32374	-79.8681	20070701	25.158	91	1	Pennsylvania	Allegheny
420030064	FRM	40.32374	-79.8681	20071001	17.571	90	1	Pennsylvania	Allegheny
420030064	FRM	40.32374	-79.8681	20080101	14.163	90	1	Pennsylvania	Allegheny
420030064	FRM	40.32374	-79.8681	20080401	17.379	90	1	Pennsylvania	Allegheny
420030064	FRM	40.32374	-79.8681	20080701	20.682	89	1	Pennsylvania	Allegheny
420030064	FRM	40.32374	-79.8681	20081001	15.772	89	1	Pennsylvania	Allegheny
420030064	FRM	40.32374	-79.8681	20090101	14.924	83	1	Pennsylvania	Allegheny
420030064	FRM	40.32374	-79.8681	20090401	13.740	90	1	Pennsylvania	Allegheny
420030064	FRM	40.32374	-79.8681	20090701	15.051	92	1	Pennsylvania	Allegheny
420030064	FRM	40.32374	-79.8681	20091001	16.377	81	1	Pennsylvania	Allegheny

Clairton Quarterly FRM Data

ID	TYPE	LAT	LONG	DATE	PM25	NDAYS	COMP_CODE	STATE	COUNTY
420033007	FRM	40.29409	-79.8848	20050101	14.133	15	1	Pennsylvania	Allegheny
420033007	FRM	40.29409	-79.8848	20050401	14.246	13	1	Pennsylvania	Allegheny
420033007	FRM	40.29409	-79.8848	20050701	24.357	14	1	Pennsylvania	Allegheny
420033007	FRM	40.29409	-79.8848	20051001	12.713	15	1	Pennsylvania	Allegheny
420033007	FRM	40.29409	-79.8848	20060101	12.927	15	2	Pennsylvania	Allegheny
420033007	FRM	40.29409	-79.8848	20060401	13.507	15	2	Pennsylvania	Allegheny
420033007	FRM	40.29409	-79.8848	20060701	19.157	14	2	Pennsylvania	Allegheny
420033007	FRM	40.29409	-79.8848	20061001	12.360	15	2	Pennsylvania	Allegheny
420033007	FRM	40.29409	-79.8848	20070101	12.364	14	1	Pennsylvania	Allegheny
420033007	FRM	40.29409	-79.8848	20070401	13.029	14	1	Pennsylvania	Allegheny
420033007	FRM	40.29409	-79.8848	20070701	21.186	14	1	Pennsylvania	Allegheny
420033007	FRM	40.29409	-79.8848	20071001	13.846	13	1	Pennsylvania	Allegheny
420033007	FRM	40.29409	-79.8848	20080101	12.636	14	2	Pennsylvania	Allegheny
420033007	FRM	40.29409	-79.8848	20080401	11.707	14	2	Pennsylvania	Allegheny
420033007	FRM	40.29409	-79.8848	20080701	18.567	15	2	Pennsylvania	Allegheny
420033007	FRM	40.29409	-79.8848	20081001	10.387	15	2	Pennsylvania	Allegheny
420033007	FRM	40.29409	-79.8848	20090101	10.050	12	2	Pennsylvania	Allegheny
420033007	FRM	40.29409	-79.8848	20090401	11.415	13	2	Pennsylvania	Allegheny
420033007	FRM	40.29409	-79.8848	20090701	12.980	15	2	Pennsylvania	Allegheny
420033007	FRM	40.29409	-79.8848	20091001	10.600	13	2	Pennsylvania	Allegheny

Liberty 24-Hour FRM Data

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20050101	12.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050102	17.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050103	19.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050104	7.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050105	3.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050106	8.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050107	7.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050108	10.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050109	18.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050110	15.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050112	19.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050113	15.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050114	6.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050115	12.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050116	10.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050117	9.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050118	13.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050119	15.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050120	10.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050121	10	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050122	12.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050123	6.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050124	25	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050125	20.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050126	17.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050127	7.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050128	9.6	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20050129	13.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050130	13.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050131	17.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050201	33.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050202	26.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050203	22.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050204	41.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050205	52.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050206	22.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050207	44.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050208	37.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050209	14.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050210	7.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050211	11.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050212	16.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050213	27.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050214	9.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050215	21	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050216	26.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050217	9.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050218	7.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050219	12.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050220	13.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050221	17.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050222	12.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050224	11.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050225	15.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050226	12.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050227	6.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050228	11.6	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20050301	8.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050302	4.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050303	6.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050304	37.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050305	16.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050306	18.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050307	20.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050308	4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050309	6.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050310	9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050311	20.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050312	17.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050313	10.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050314	9.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050315	31	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050316	29	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050317	26	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050318	31.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050319	23.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050320	23.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050321	14.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050322	19.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050323	11.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050324	13	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050325	18.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050326	12.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050327	10.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050328	3.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050329	15	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050330	14.5	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20050331	12.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050401	7.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050402	4.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050403	3.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050404	14.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050405	42	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050406	58.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050407	54	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050408	8.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050409	8.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050410	14.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050411	6.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050412	4.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050413	5.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050414	5.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050415	5.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050416	13	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050417	60.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050418	73.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050419	69.6	1	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050420	59	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050421	14.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050422	14.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050423	5.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050424	1.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050425	7.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050426	17.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050427	6.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050428	8.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050429	13.8	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20050430	16.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050501	15.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050502	6.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050503	7.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050504	15.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050505	17.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050506	21.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050507	51.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050508	25.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050509	37.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050510	43.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050511	30.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050512	6.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050513	8.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050514	19.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050515	8.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050516	6.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050517	9.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050518	10.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050519	11.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050520	9.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050521	32.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050522	26.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050523	14.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050524	4.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050525	5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050526	16.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050527	26	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050528	14.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050529	20.6	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20050530	30.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050531	21.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050601	13.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050602	10.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050603	4.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050604	16.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050605	44.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050606	39.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050607	39.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050608	53.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050609	21.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050610	23.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050611	27.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050612	23.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050613	21.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050615	9.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050616	8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050617	6.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050618	11	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050619	9.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050620	12.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050621	34.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050622	21.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050623	25.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050624	62.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050625	77.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050626	67	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050627	34.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050628	26.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050629	29.5	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20050630	25.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050701	19.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050702	8.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050703	27.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050704	31.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050705	21.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050706	18.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050707	15.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050708	19.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050709	14.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050710	28	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050711	35.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050712	34.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050713	21.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050714	13.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050715	19.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050716	27.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050717	27.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050718	30.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050719	17.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050720	35.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050721	42.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050722	24.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050723	11.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050724	33.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050725	37.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050726	21.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050727	16.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050728	16.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050729	19	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20050730	23.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050731	31.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050801	43.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050802	33.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050803	43.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050804	62.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050805	25.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050806	16.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050807	33.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050808	17.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050809	13	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050810	23.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050811	35.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050812	50	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050813	47.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050814	24	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050815	9.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050816	21	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050817	18.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050818	17.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050819	25.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050820	20.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050821	12	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050822	8.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050823	8.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050824	12.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050825	14.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050826	25.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050827	17.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050828	37.5	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20050829	27.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050830	15.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050831	13.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050901	28.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050902	25.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050903	15.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050904	18.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050905	12	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050906	11.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050907	34	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050908	58.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050909	37.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050910	16.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050911	20.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050912	61.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050913	84.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050914	70.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050915	58.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050916	25.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050917	21.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050918	20.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050919	43	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050920	16.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050921	25.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050922	35.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050923	14.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050924	9.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050925	27.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050926	18.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050927	4.2	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20050928	15.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050929	15.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20050930	17.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051001	34.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051002	46.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051003	51.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051004	22.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051005	14.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051006	6.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051007	4.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051008	3.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051009	10.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051010	8.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051011	11	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051012	8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051013	13.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051014	24.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051015	16	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051016	4.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051017	8.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051018	18.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051019	32.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051020	6.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051021	6.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051022	4.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051023	11.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051024	8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051025	2.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051026	4.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051027	8.7	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20051028	8.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051029	15.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051030	68.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051031	83.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051101	34.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051102	22.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051103	36.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051104	43.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051105	37.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051106	27.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051107	11.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051108	47.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051109	15.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051110	5.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051111	19.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051112	48.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051113	48.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051114	6.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051115	14.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051119	48	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051120	100.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051121	73.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051122	5.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051123	6.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051124	4.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051125	5.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051126	24.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051127	11.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051128	4.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051129	6.5	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20051130	7.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051202	9.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051203	9.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051204	13.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051205	15.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051206	14.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051207	17.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051209	14.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051210	20.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051211	9.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051212	7.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051214	16.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051215	11.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051216	9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051217	21.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051218	44.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051219	10.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051220	13.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051221	14.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051222	20.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051223	36.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051224	61.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051225	33.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051226	8.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051227	14.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051228	47	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051229	7.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051230	12.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20051231	13.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060101	9.2	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20060102	10.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060103	4.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060104	11.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060105	4.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060106	3.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060107	18.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060108	15.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060109	13.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060110	12.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060111	14.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060113	47.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060114	2.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060115	4.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060116	15.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060117	10.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060118	5.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060119	18.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060120	11.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060121	12.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060122	8.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060123	15.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060124	33.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060128	60.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060129	26.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060131	8.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060201	18.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060202	20.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060203	15.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060204	10.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060205	5	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20060206	6.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060207	7.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060208	11.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060209	7.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060210	13.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060211	16.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060212	14	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060213	12.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060214	16.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060215	27.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060216	25.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060217	7.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060218	6.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060219	8.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060220	10.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060221	19.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060222	44.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060223	13.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060224	6.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060225	12.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060226	4.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060227	11.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060228	8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060301	11.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060302	15.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060303	5.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060304	8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060305	8.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060306	6.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060307	6.8	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20060308	25.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060309	20.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060310	9.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060311	36.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060312	26.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060313	17.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060314	5.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060315	6.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060316	7.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060317	5.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060318	5.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060319	9.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060320	6.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060321	6.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060322	6.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060323	10.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060324	16.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060325	13.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060326	12.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060327	27.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060328	23.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060329	40.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060330	27.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060331	51.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060401	10.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060402	13.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060403	10.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060405	4.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060406	24	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060407	21.5	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20060408	6.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060409	10.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060410	38.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060411	34.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060412	28	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060413	14	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060414	22.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060415	9.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060416	10.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060417	6.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060418	5.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060419	5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060420	10.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060421	19.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060422	10.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060423	9.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060424	14.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060425	31.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060426	16.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060427	38.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060428	10	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060429	10.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060430	7.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060501	9.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060502	25.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060503	16.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060504	36.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060505	12.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060506	8.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060507	7.4	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20060508	7.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060509	7.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060510	23.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060511	14.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060512	10.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060513	11.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060514	12.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060515	8.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060516	15	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060517	12.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060518	7.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060519	6.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060520	11.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060521	12.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060522	6.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060523	6.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060524	35.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060525	28.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060526	14.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060527	18.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060528	35.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060529	54.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060530	60.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060531	41.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060601	29.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060602	12.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060603	7.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060604	7.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060605	5.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060606	30.5	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20060607	25.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060608	24.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060609	15.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060610	6.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060611	9.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060612	9.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060613	13.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060614	12.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060615	10.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060616	34.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060617	45.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060618	58.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060619	30.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060620	10.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060621	22.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060622	18.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060623	13.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060624	14	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060625	14.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060626	11.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060627	7.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060628	22.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060629	22.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060630	30.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060701	42.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060702	31.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060703	29.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060704	26.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060705	13	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060706	4.7	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20060707	18.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060708	24.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060709	37.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060710	45.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060711	36.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060712	32.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060713	23.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060714	30.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060715	17.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060716	32.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060717	54.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060718	43.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060719	22.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060720	47.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060721	33.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060722	13.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060723	13.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060724	26.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060725	42.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060726	50.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060727	33	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060728	20.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060729	28	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060730	30.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060731	35.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060802	38.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060803	25.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060804	8.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060805	11	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060806	20.2	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20060807	31.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060808	10.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060809	25.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060810	30.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060811	11.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060812	7.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060813	20.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060814	45.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060815	15.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060816	19.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060817	15.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060818	26.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060821	10.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060822	28	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060825	41.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060826	49.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060827	28.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060828	25.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060829	18.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060830	10.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060831	10	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060901	5.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060902	2.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060903	4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060904	15.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060905	16.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060906	18.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060907	24.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060908	44.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060909	35.9	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20060910	20.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060911	16.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060912	13	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060913	9.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060914	13	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060915	9.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060916	17.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060917	28.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060918	30.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060919	8.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060920	4.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060921	10.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060922	14.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060923	14.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060924	5.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060925	5.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060926	18.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060927	19.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060928	13	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060929	5.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20060930	8.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061001	14.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061002	23.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061003	31.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061004	32.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061005	4.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061006	5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061007	6.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061008	22.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061009	43.5	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20061010	29.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061011	21.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061012	6.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061013	10.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061014	12.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061015	29.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061016	17.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061017	7.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061018	11.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061019	15.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061020	3.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061021	9.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061022	10.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061023	7.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061024	6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061025	4.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061026	7.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061027	8.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061028	3.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061029	10.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061030	43.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061031	19.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061101	15	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061102	9.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061103	11.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061104	23.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061105	27.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061106	31.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061107	11	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061108	9.4	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20061109	19.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061110	55.7	1	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061111	44.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061112	3.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061113	11.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061115	12.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061116	8.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061117	5.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061118	16.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061119	12.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061120	5.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061121	9.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061122	8.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061123	25.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061124	68	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061125	50.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061126	100.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061127	82.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061128	50.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061129	16.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061130	17.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061201	6.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061202	13.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061203	25.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061204	8.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061205	17.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061206	18	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061207	8.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061208	9.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061209	17.9	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20061210	29.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061211	48.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061212	23.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061213	23.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061214	36.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061215	10.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061216	18.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061219	19.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061220	58.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061221	44.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061222	10.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061223	5.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061224	15.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061225	9.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061226	7.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061227	7.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061228	19.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061229	42.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061230	47.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20061231	18.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070101	5.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070102	15.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070103	48.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070104	46.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070105	24.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070106	6.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070107	15.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070108	3.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070109	6.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070110	6.8	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20070111	16.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070112	19.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070113	11	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070114	16.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070115	15.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070116	3.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070117	8.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070118	19.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070119	10.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070120	5.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070121	12.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070122	12.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070123	10.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070124	13.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070125	10.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070126	11.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070127	13	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070128	9.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070129	8.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070130	12.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070131	12.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070201	18	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070202	17.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070203	9.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070204	6.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070205	8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070206	10.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070207	10.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070208	10.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070209	11.6	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20070210	15.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070211	20.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070212	16.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070214	6.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070215	7.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070216	14.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070217	54.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070218	9.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070219	16.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070220	10.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070221	20.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070222	30.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070223	4.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070224	12.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070225	8.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070226	9.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070227	14.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070228	12.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070301	13.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070302	6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070303	7.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070304	5.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070305	8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070306	4.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070307	9.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070308	15.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070309	15.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070310	47	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070311	8.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070312	26.1	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20070313	25.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070314	46.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070315	5.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070316	5.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070317	5.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070318	5.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070319	28	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070320	10.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070322	23.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070323	11.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070324	12.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070325	8.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070326	22.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070327	10.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070328	10.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070329	3.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070330	9.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070331	14.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070401	13.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070402	9.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070403	32.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070404	9.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070405	4.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070406	6.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070407	5.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070408	8.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070409	11.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070410	17.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070411	14.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070412	7.5	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20070413	8.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070414	25.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070415	5.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070416	5.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070417	4.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070418	10.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070420	7.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070421	24.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070422	56.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070423	49.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070424	9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070425	8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070426	11.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070427	10.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070428	13.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070429	17.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070430	16.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070501	8.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070502	6.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070503	5.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070504	7.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070505	11.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070506	3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070507	5.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070508	20.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070509	30	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070510	20.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070511	33.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070512	14.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070513	5.9	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20070514	30.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070515	44.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070516	14.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070517	9.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070518	5.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070519	16.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070520	15.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070521	13.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070522	26.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070523	27	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070524	31.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070525	44.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070526	43	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070527	35.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070528	18.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070529	11.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070530	23.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070531	54.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070601	46.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070602	54.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070603	25.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070604	13.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070605	8.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070606	10.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070607	20.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070608	29.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070609	5.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070610	7.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070611	12.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070612	12.3	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20070613	12	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070614	10	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070615	10.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070616	20.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070617	40	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070618	28.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070619	31.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070620	8.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070621	22.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070622	5.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070623	10.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070624	18.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070625	26.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070626	40.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070627	40.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070628	18.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070629	9.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070630	11.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070701	7.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070702	7.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070703	17.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070704	44.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070705	13.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070706	15.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070707	38	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070708	36.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070709	56.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070710	61.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070711	14.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070712	12.2	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20070713	13.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070714	23.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070715	23.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070716	13.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070717	31.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070718	20.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070719	14.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070720	7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070721	7.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070722	9.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070723	12.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070724	11.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070725	19.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070726	20.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070727	17.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070728	33.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070729	29.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070730	24.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070731	20.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070801	36.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070802	54.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070803	53.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070804	39.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070805	20.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070806	35.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070807	41.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070808	22.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070809	10.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070810	11	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070811	27.1	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20070812	54.7	1	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070813	24.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070814	18.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070815	34.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070816	26.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070817	16.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070818	5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070819	11.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070820	11.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070821	13.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070822	27.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070823	25.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070824	37	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070825	29.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070826	9.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070827	20.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070828	47.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070829	58.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070830	50.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070831	9.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070901	8.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070902	24.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070903	36.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070904	40.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070905	56.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070906	47.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070907	46.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070908	27.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070909	26.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070911	13.5	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20070912	5.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070913	14.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070914	31.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070915	3.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070916	12.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070917	9.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070918	13.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070919	24.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070920	49.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070921	27.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070922	22.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070923	14.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070924	35	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070925	51	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070926	25.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070927	12.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070928	6.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070929	15	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20070930	16	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071001	12.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071002	12.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071003	21.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071004	27.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071005	15.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071006	32	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071007	40.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071008	41.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071009	35.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071010	14.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071011	5.1	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20071012	4.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071013	14.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071014	26.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071015	14.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071016	25.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071017	24.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071018	16.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071019	13.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071020	10.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071021	40.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071022	58.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071023	12.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071024	6.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071025	7.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071026	2.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071027	6.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071028	7.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071029	39.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071030	58	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071031	45.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071101	10.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071102	8.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071103	21.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071104	19	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071105	28.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071106	5.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071107	9.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071108	15.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071109	13	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071110	19.8	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20071111	25	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071112	26.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071113	21.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071114	27.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071115	5.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071116	4.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071117	15.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071118	15.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071119	17	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071120	23.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071121	18.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071122	9.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071123	4.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071124	30.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071125	32.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071126	16.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071128	10.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071130	8.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071201	7.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071202	15.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071203	5.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071204	3.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071205	8.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071206	29.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071207	24.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071208	23.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071209	23.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071210	16.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071211	23.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071212	7.6	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20071213	6.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071214	9.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071215	10.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071216	3.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071217	7.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071218	19.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071219	21.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071220	16.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071221	16.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071222	9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071223	3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071224	4.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071225	17.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071226	20.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071227	21.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071228	11.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071229	5.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071230	15.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20071231	14.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080101	11.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080102	8.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080103	12.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080104	22.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080105	35.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080106	24.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080107	14.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080108	17.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080109	5.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080110	13.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080111	6.6	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20080112	12.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080113	17.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080114	8.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080115	10.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080116	14.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080117	14.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080118	8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080119	15.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080120	8.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080121	10	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080122	26.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080123	11.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080124	15.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080125	13.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080126	18.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080127	19.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080128	30.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080129	14.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080131	8.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080201	7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080202	18	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080203	47.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080204	28.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080205	12.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080206	7.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080207	5.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080208	12.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080209	10.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080210	6.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080211	7.4	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20080212	15.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080213	15.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080214	17.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080215	16.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080216	17.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080217	18.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080218	7.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080219	6.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080220	9.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080221	13.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080222	16.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080223	18.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080224	35.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080225	23.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080226	15.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080227	4.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080228	7.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080229	16.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080301	8.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080302	13.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080303	34.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080304	6.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080305	6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080306	12.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080307	19.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080308	6.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080309	10.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080310	29.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080311	29.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080312	17.5	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20080313	12.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080314	10.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080315	14.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080316	6.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080317	5.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080318	9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080319	12.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080320	6.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080321	6.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080322	4.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080323	6.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080324	12.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080325	21.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080326	7.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080327	20.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080328	11	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080329	5.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080330	7.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080331	8.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080401	8.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080402	5.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080404	4.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080405	10.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080406	9.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080407	7.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080408	6.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080409	11.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080410	8.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080411	14.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080412	4.7	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20080413	3.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080414	3.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080415	13.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080416	56.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080417	66.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080418	56	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080419	21.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080420	5.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080421	8.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080422	9.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080423	17.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080424	11.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080425	17.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080426	18.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080427	15.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080428	11.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080429	7.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080430	12.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080501	25.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080502	32.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080503	16.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080504	6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080505	27.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080506	35.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080507	38.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080508	12.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080509	18.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080510	8.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080511	7.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080512	4.2	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20080513	21.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080514	36.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080515	7.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080516	8.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080517	16.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080518	9.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080519	14.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080520	18.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080521	16.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080522	5.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080523	10.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080524	6.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080525	24.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080526	39.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080527	15.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080528	5.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080529	16.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080530	27.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080531	12.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080601	8.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080602	26.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080603	21.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080604	11.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080605	19.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080606	36.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080607	34	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080608	22.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080609	29.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080610	25.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080611	23.6	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20080612	15.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080613	23	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080614	13.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080615	20.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080616	14.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080617	10.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080618	6.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080619	14.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080620	20.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080621	22.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080622	10.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080623	10.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080624	21.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080625	29.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080626	19.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080627	20.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080628	18.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080629	12.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080630	9.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080701	12.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080702	25.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080703	20.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080704	23.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080705	28.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080706	17.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080707	25.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080708	22.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080709	11	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080710	20.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080711	31	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20080712	35.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080713	16.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080714	17	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080715	31	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080716	40.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080717	45.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080718	50	1	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080719	49.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080720	36	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080721	17.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080722	17.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080723	14	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080724	10.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080725	33.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080726	37.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080727	22.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080729	44.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080730	39.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080731	18.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080801	21.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080802	12.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080803	8.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080804	27	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080805	23.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080806	11.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080807	13.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080808	6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080809	15.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080810	9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080811	4.8	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20080812	11.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080813	15.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080814	13.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080815	14.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080816	18.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080817	31.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080818	38.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080819	25.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080820	7.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080821	19.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080822	15.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080823	10.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080824	19.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080825	8.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080826	5.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080827	8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080828	3.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080829	26.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080830	23.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080831	9.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080901	12.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080902	29.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080903	45	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080904	47.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080905	17	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080906	12.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080907	17.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080908	29.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080909	19.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080910	6.3	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20080911	12.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080912	10.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080913	19.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080916	15.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080917	38.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080918	18.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080919	9.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080920	27.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080921	43.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080922	27.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080923	13.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080924	10.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080925	9.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080926	4.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080927	4.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080928	7.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080929	19.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20080930	16.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081002	4.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081003	6.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081004	9.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081005	10.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081006	9.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081007	7.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081008	20.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081009	17.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081010	27.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081011	9.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081012	14.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081013	70.8	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20081014	40.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081015	21.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081016	15.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081017	8.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081018	4.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081019	18	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081020	62.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081021	11.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081022	4.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081023	4.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081024	5.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081025	8.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081026	17.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081027	3.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081028	2.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081029	5.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081030	19.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081031	55.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081101	35.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081102	20.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081103	23.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081104	25.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081105	10.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081106	37.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081107	63.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081108	6.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081109	10.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081111	16.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081112	15	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081113	12.5	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20081114	27.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081115	7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081116	4.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081117	7.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081118	4.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081119	8.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081120	8.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081121	3.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081122	12.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081123	39.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081124	26.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081125	9.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081126	8.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081127	33.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081128	16.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081129	34.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081130	7.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081201	7.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081202	6.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081203	15.8	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081204	7.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081205	9.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081206	18	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081207	5.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081208	10.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081209	22.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081210	10.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081212	10.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081213	15.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081214	21.8	0	0	1	Pennsylvania	Allegheny	8

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20081215	10.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081216	11.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081217	10.4	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081218	13.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081219	9.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081220	9.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081221	7.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081222	10	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081223	18.7	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081224	13.2	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081225	11.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081226	17.1	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081227	18.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081228	6.9	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081229	6.6	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081230	6.5	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20081231	8.3	0	0	1	Pennsylvania	Allegheny	8
420030064	FRM	40.323744	-79.868137	20090101	9.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090102	13.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090103	12.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090104	31.6	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090105	10.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090106	10	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090107	7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090108	12.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090109	14.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090110	16.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090111	10.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090112	13.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090113	14.4	0	0	1	Pennsylvania	Allegheny	7

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20090114	10.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090115	9.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090116	9.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090117	27.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090118	12.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090119	20	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090120	22.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090125	12.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090128	13.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090129	17.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090130	8.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090131	12.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090201	16.6	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090202	27.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090203	16.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090204	10.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090205	11.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090206	32.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090207	35.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090208	19.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090209	54.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090210	42.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090211	18	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090212	4.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090213	13.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090214	17.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090215	6.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090216	8.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090217	22.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090218	12.3	0	0	1	Pennsylvania	Allegheny	7

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20090219	6.6	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090220	8.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090221	25.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090222	10.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090223	5.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090224	10	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090225	16.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090226	25.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090227	12.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090228	10.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090301	7.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090302	4.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090303	6.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090304	25.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090305	26.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090306	21.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090307	16	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090308	10.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090309	6.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090310	9.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090311	7.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090312	8.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090313	12.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090314	16.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090315	13.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090316	13.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090318	33.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090319	5.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090320	10.6	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090321	20.7	0	0	1	Pennsylvania	Allegheny	7

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20090322	40.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090323	5.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090324	4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090325	8.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090326	10.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090327	14.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090328	5.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090329	3.6	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090330	7.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090331	9.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090401	11.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090402	9.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090403	4.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090404	4.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090405	15	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090406	6.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090407	5.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090408	7.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090409	35	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090410	21.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090411	7.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090412	5.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090413	6.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090414	8.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090415	5.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090416	8.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090417	30.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090418	33.6	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090419	28.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090420	4.3	0	0	1	Pennsylvania	Allegheny	7

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20090421	8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090422	3.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090423	7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090424	9.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090425	14.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090426	23	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090427	22.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090428	12.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090429	3.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090430	9.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090501	8.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090502	7.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090503	14.6	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090504	7.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090505	6.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090506	10.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090507	12.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090508	20.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090509	7.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090510	8.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090511	11.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090512	13.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090513	12.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090514	13.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090515	19.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090516	12.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090517	3.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090518	10.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090519	18.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090520	19.2	0	0	1	Pennsylvania	Allegheny	7

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20090521	24.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090522	23.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090523	25.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090524	26	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090525	18.6	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090526	7.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090527	5.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090528	9.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090529	11.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090530	11.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090531	12.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090601	12.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090602	11.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090603	9.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090604	9.6	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090605	10.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090606	22.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090607	29.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090608	33	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090609	21.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090610	27.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090611	16.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090612	11.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090613	8.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090614	10	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090615	17.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090616	14.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090617	6.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090618	11.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090619	21.2	0	0	1	Pennsylvania	Allegheny	7

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20090620	12.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090622	6.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090623	7.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090624	16.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090625	32.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090626	15.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090627	12.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090628	21.6	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090629	12.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090630	6.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090701	11.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090702	9.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090703	7.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090704	12.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090705	18.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090706	25	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090707	13.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090708	13.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090709	15	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090710	17.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090711	22.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090712	10.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090713	14.6	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090714	14.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090715	13.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090716	13.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090717	14.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090718	6.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090719	9.6	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090720	13	0	0	1	Pennsylvania	Allegheny	7

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20090721	14.6	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090722	14.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090723	9.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090724	17.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090725	21.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090726	13.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090727	13	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090728	25.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090729	15.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090730	15.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090731	10.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090801	20.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090802	17.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090803	20.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090804	22.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090805	11.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090806	6.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090807	18.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090808	20.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090809	26.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090810	17.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090811	14.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090812	17.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090813	33.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090814	25.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090815	27.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090816	41.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090817	28.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090818	16.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090819	15.3	0	0	1	Pennsylvania	Allegheny	7

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20090820	13	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090821	13.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090822	13.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090823	7.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090824	11.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090825	22.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090826	31.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090827	22.6	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090828	16	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090829	12.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090830	5.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090831	6.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090901	8.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090902	7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090903	10.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090904	28.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090905	24.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090906	17.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090907	20	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090908	9.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090909	10.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090910	8.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090911	6.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090912	5.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090913	11.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090914	31.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090915	26	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090916	7.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090917	5.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090918	13	0	0	1	Pennsylvania	Allegheny	7

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20090919	7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090920	9.6	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090921	13.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090922	10.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090923	16.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090924	14.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090925	6	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090926	3.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090927	6.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090928	9.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090929	3.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20090930	5.6	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091001	10.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091002	12.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091003	15.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091004	7.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091005	11.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091006	12.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091007	3.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091008	19.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091009	13.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091010	14	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091011	16.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091012	8.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091013	10.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091014	5.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091022	55.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091023	15.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091024	8.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091025	8.8	0	0	1	Pennsylvania	Allegheny	7

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20091026	8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091027	34.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091028	7.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091029	7.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091030	8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091031	9.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091101	11.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091102	21	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091103	21.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091104	35.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091105	17.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091106	13.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091107	46.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091108	59.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091109	92.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091110	49.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091111	2.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091112	2.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091113	4.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091114	27.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091115	45.3	1	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091116	11.6	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091117	4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091120	6.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091121	16.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091122	11.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091123	10.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091124	8.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091125	14.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091126	19.1	0	0	1	Pennsylvania	Allegheny	7

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20091127	3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091128	14.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091129	40.6	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091130	3.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091201	17.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091202	11	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091203	7.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091204	12.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091205	16.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091206	19.8	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091207	20.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091208	10.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091209	3.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091210	5.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091211	5.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091212	24.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091213	20.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091214	19.5	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091216	6.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091217	17	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091218	17.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091219	8.7	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091220	5.3	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091221	14.4	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091222	14.6	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091223	8.9	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091224	9.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091225	3.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091226	10.1	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091227	31.8	0	0	1	Pennsylvania	Allegheny	7

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420030064	FRM	40.323744	-79.868137	20091228	7.6	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091229	8.2	0	0	1	Pennsylvania	Allegheny	7
420030064	FRM	40.323744	-79.868137	20091230	29.6	0	0	1	Pennsylvania	Allegheny	7

Clairton 24-Hour FRM Data

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420033007	FRM	40.294092	-79.884824	20050104	9	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050110	11	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050116	14.4	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050122	12.3	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050128	13.9	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050203	21.4	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050209	14.9	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050215	6.5	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050221	13.5	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050227	10.8	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050305	16.1	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050311	14.4	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050317	21.1	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050323	19.9	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050330	12.8	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050410	18.8	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050416	8.6	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050422	12.5	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050428	7.9	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050504	13.7	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050510	23.5	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050516	6.5	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050522	14.5	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050528	7.4	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050603	3.7	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050615	9.8	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050621	27.4	0	0	1	Pennsylvania	Allegheny	2

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420033007	FRM	40.294092	-79.884824	20050627	30.9	1	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050703	27.6	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050715	19.1	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050721	29.1	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050727	13.1	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050802	20.9	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050808	16.9	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050814	23.2	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050820	17.2	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050826	25.7	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050901	17.1	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050907	20.8	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050913	57.3	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050919	27.5	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20050925	25.5	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20051001	17.9	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20051007	8	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20051013	14.6	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20051019	11	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20051025	2.9	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20051031	21.7	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20051106	10.9	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20051112	16.4	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20051124	4.2	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20051130	7.7	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20051206	14.9	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20051212	8.2	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20051218	20.7	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20051224	18.4	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20051230	13.2	0	0	1	Pennsylvania	Allegheny	2

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420033007	FRM	40.294092	-79.884824	20060105	4.3	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060111	13	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060117	13.2	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060123	13.9	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060129	17.2	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060204	14	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060210	12.2	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060216	12	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060222	18.5	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060228	8.4	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060306	8.1	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060312	11.2	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060318	5.4	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060324	18.9	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060330	23.6	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060405	4.5	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060411	18.7	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060417	10.5	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060423	8.3	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060429	9.7	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060505	14.2	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060511	13.4	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060517	11.5	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060523	5.9	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060529	38.7	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060604	5.6	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060610	5.3	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060616	23.2	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060622	15	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060628	18.1	0	0	1	Pennsylvania	Allegheny	2

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420033007	FRM	40.294092	-79.884824	20060704	29.1	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060710	35.8	1	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060716	18.4	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060728	20.2	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060803	24.2	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060809	21.1	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060815	15.7	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060821	11	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060827	27.7	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060902	5.2	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060908	28.4	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060914	12.8	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060920	5.2	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20060926	13.4	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20061002	13.3	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20061008	6.8	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20061014	6.7	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20061020	3.5	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20061026	7.7	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20061101	16.1	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20061107	12.3	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20061113	11.5	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20061119	14.1	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20061125	28.2	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20061201	4.3	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20061213	11.5	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20061219	14.2	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20061225	12.9	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20061231	22.3	0	0	1	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070106	4.2	0	0	2	Pennsylvania	Allegheny	2

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420033007	FRM	40.294092	-79.884824	20070112	8.7	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070118	15.2	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070130	11.2	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070205	8.7	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070211	15.2	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070217	16.5	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070223	4.5	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070301	21.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070307	12	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070313	14.6	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070319	12.3	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070325	13.6	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070331	15.3	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070406	7	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070412	6.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070418	13.5	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070424	8.7	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070430	6.8	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070506	7.4	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070518	5.5	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070524	29	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070530	27.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070605	7.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070611	13.9	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070617	30	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070623	10.6	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070629	9.7	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070705	13.2	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070711	12.5	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070717	25.7	0	0	2	Pennsylvania	Allegheny	2

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420033007	FRM	40.294092	-79.884824	20070723	15.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070729	31.8	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070804	35	1	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070810	12.4	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070816	24.2	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070822	25.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070828	40.4	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070903	19.7	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070909	26.9	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070915	4	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20070927	10.6	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20071009	18.9	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20071015	12.8	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20071021	10	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20071027	6	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20071102	8.5	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20071108	13	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20071120	15.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20071126	11.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20071202	8.9	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20071208	24.5	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20071214	10.4	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20071220	17.2	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20071226	23.6	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080101	13	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080107	8.4	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080113	17.5	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080119	12.4	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080125	14.8	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080131	12.6	0	0	2	Pennsylvania	Allegheny	2

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420033007	FRM	40.294092	-79.884824	20080206	3.6	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080218	6.7	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080224	29.3	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080301	10.2	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080307	20.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080313	12.4	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080319	10	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080331	5.9	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080406	11.8	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080412	5	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080418	23.5	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080424	12.3	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080430	13.9	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080506	16.2	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080518	5.8	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080524	6.3	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080530	18	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080605	14	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080611	12.4	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080617	6.7	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080623	9.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080629	8.9	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080705	27.5	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080711	18.3	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080717	34.6	1	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080723	12.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080729	40.6	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080804	16.6	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080810	10.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080816	11.6	0	0	2	Pennsylvania	Allegheny	2

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420033007	FRM	40.294092	-79.884824	20080822	16.8	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080828	5.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080903	30.7	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080909	13.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080915	5.2	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080921	26.7	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20080927	9.5	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20081003	6.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20081009	9.7	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20081015	17.7	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20081021	5.2	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20081027	4.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20081102	22	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20081108	6.6	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20081114	11.4	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20081120	7.8	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20081126	9.3	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20081202	6.9	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20081208	10.3	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20081214	12.7	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20081220	11.6	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20081226	14.4	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090107	6.4	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090125	13.9	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090131	10.7	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090206	13.3	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090212	4.5	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090218	10.4	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090224	10.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090302	5.4	0	0	2	Pennsylvania	Allegheny	2

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420033007	FRM	40.294092	-79.884824	20090308	8.6	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090314	19.3	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090320	10.5	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090326	7.5	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090401	10.6	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090407	4.8	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090413	8.6	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090419	20.4	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090425	11.2	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090501	7.6	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090513	14	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090519	9.2	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090525	20.3	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090531	8.5	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090606	15	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090612	12.5	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090630	5.7	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090706	14.2	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090712	10.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090718	6.3	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090724	13.6	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090730	16.3	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090805	14.9	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090811	11.8	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090817	21.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090823	7.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090829	10	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090904	25.9	1	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090910	8.8	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090916	16.8	0	0	2	Pennsylvania	Allegheny	2

ID	TYPE	LAT	LONG	DATE	PM25	98_%TILE	EPA_FLAG	COMP_CODE	STATE	COUNTY	RANK98
420033007	FRM	40.294092	-79.884824	20090922	12.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20090928	5.7	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20091004	5.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20091010	3.7	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20091022	14.9	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20091028	7.9	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20091109	28	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20091115	18.9	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20091121	16.5	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20091127	3.1	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20091203	5.8	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20091209	2.6	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20091215	6.4	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20091221	13.5	0	0	2	Pennsylvania	Allegheny	2
420033007	FRM	40.294092	-79.884824	20091227	11.4	0	0	2	Pennsylvania	Allegheny	2

Liberty 24-Hour CSN Data

ID	TYPE	DATE	SO4	NO3R	NH4	EC	OC	DON	H2O_AIM	NO3	CRUST	CRUST_ALT	FRM_MASS	MEAS_FM	EPA_FLAG
420030064	CSN	20050104	2.09	1.25	1.02	0.44	1.86	0.314	0.63	1.43	0.32	0.32	7.3	7.3	0
420030064	CSN	20050110	5.27	0.62	2.77	1.71	4.51	0.375	1.82	1.33	0.22	0.25	15.7	16.8	0
420030064	CSN	20050116	2.26	1.96	1.26	0.53	2.9	0.306	0.71	2.19	0.13	0.15	10.7	10.2	0
420030064	CSN	20050122	2.92	2	1.48	0.48	3.69	0.308	0.88	2.14	0.26	0.32	12.4	12.7	0
420030064	CSN	20050203	4.15	5.56	3.19	1.21	5.15	0.375	1.49	6.21	0.96	1.03	22.2	22.5	0
420030064	CSN	20050209	4.16	2.25	2.19	1.12	3.31	0.369	1.28	2.38	0.26	0.26	14.4	14.8	0
420030064	CSN	20050215	4.39	0	2.85	4.86	7.89	0.375	1.57	1.7	1.58	2.26	21	21.3	0
420030064	CSN	20050221	6.38	1.06	2.99	1.39	3.35	0.375	2.16	1.55	0.3	0.29	17.7	17.9	0
420030064	CSN	20050227	1.75	0.61	0.76	0.39	2.3	0.333	0.56	1.1	0.15	0.14	6.4	8	0
420030064	CSN	20050305	4.27	3.56	2.5	0.84	4.34	0.343	1.37	4.02	0.51	0.56	16.9	17.6	0
420030064	CSN	20050317	4.92	5.86	3.96	2.43	5.75	0.375	1.67	6.98	0.5	0.52	26	25	0
420030064	CSN	20050323	4.12	1.18	1.82	0.38	2.07	0.359	1.39	1.56	0.24	0.27	11.5	10.6	0
420030064	CSN	20050329	3.61	0	2.04	2.92	5.54	0.375	1.29	1.12	1.15	1.64	15	15.9	0
420030064	CSN	20050404	2.21	0	1.77	3.5	6.02	0.375	0.79	0.5	0.73	0.92	14.6	14.1	0
420030064	CSN	20050410	4.04	0	1.59	0.97	5.11	0.375	1.45	0.67	0.77	0.94	14.1	17.2	0
420030064	CSN	20050416	1.93	0	1.8	2.52	6.66	0.375	0.69	1.67	0.48	0.54	13	14.9	0
420030064	CSN	20050422	4.41	0	2.02	1.82	3.7	0.375	1.58	1.05	0.47	0.48	14.1	16.4	0
420030064	CSN	20050428	3.67	0	1.76	0.39	1.91	0.375	1.31	1.67	0.31	0.36	8.8	11	0
420030064	CSN	20050504	5.26	1.46	3.06	1.85	3.77	0.375	1.71	3.23	0.55	0.54	15.6	17.7	0
420030064	CSN	20050510	13.7	0	6.67	6.11	14.6	0.375	4.91	1.55	2.7	3.17	43.9	46.3	0
420030064	CSN	20050516	2.8	0	1.03	0.3	1.91	0.368	1.03	0.79	0.24	0.24	6.4	8.6	0
420030064	CSN	20050522	5.4	0	3.75	4.84	10.7	0.375	1.93	1.53	1.37	1.77	26.9	30.1	0
420030064	CSN	20050528	3.48	0.87	1.91	1.96	4.15	0.375	1.14	1.77	0.33	0.38	14.2	14.1	0
420030064	CSN	20050603	1.48	0	0.52	0.29	1.96	0.351	0.55	0.48	0.1	0.1	4.1	7.7	0
420030064	CSN	20050609	8.9	0	2.87	1.22	5.54	0.322	3.08	0.41	0.66	0.67	21.8	15.1	0
420030064	CSN	20050615	3.66	0	0.99	0.09	3.45	0.27	0.88	0.38	0.09	0.09	9.8	12	0
420030064	CSN	20050621	14.6	0	4.48	3.33	8.01	0.307	4.67	0.81	0.55	0.63	34.5	37.3	0

ID	TYPE	DATE	SO4	NO3R	NH4	EC	OC	DON	H2O_AIM	NO3	CRUST	CRUST_ALT	FRM_MASS	MEAS_FM	EPA_FLAG
420030064	CSN	20050627	9.86	0	3.21	2.03	8.79	0.326	3.46	0.68	0.96	0.96	34.7	37.7	0
420030064	CSN	20050703	10.1	0	3.01	1.26	5.45	0.298	3.05	0.77	0.14	0.14	27.7	28.8	0
420030064	CSN	20050709	4.92	0	1.51	1.31	4.62	0.307	1.58	0.98	0.24	0.24	14.4	16.6	0
420030064	CSN	20050715	7.8	0	2.48	1.1	4.74	0.318	2.65	0.47	0.52	0.56	19.8	22.5	0
420030064	CSN	20050721	14.7	0	6.18	5.3	10.9	0.375	5.27	1.5	1.51	1.79	42.7	45.1	0
420030064	CSN	20050727	4.41	0	1.69	1.98	4.96	0.375	1.58	0.71	0.49	0.59	16.2	18.6	0
420030064	CSN	20050802	8.37	0	2.89	6.34	10.9	0.345	3.09	0.8	0.89	1.03	33.4	35.5	0
420030064	CSN	20050808	7.7	0	2.93	1.16	3.55	0.375	2.76	0.92	0.25	0.25	17.8	20.1	0
420030064	CSN	20050814	10	0	3.13	0.89	4.26	0.313	3.31	0.84	1.36	1.7	24	27.4	0
420030064	CSN	20050820	8.57	0	2.85	1.48	4.01	0.333	3.07	0.72	0.97	0.62	20.2	21	0
420030064	CSN	20050826	9.35	0	3.02	0.83	4.67	0.323	3.24	0.31	0.53	0.58	25.5	27.1	0
420030064	CSN	20050901	7.62	0	4.42	5.96	6.89	0.375	2.73	2.28	1.58	2.21	28.9	32.1	0
420030064	CSN	20050913	29.3	0	10.6	11	17.8	0.362	10.84	2.1	0.58	0.58	84.9	88.1	0
420030064	CSN	20050919	16.6	0	6.82	7.83	8.39	0.375	5.95	1.25	0.93	1.19	43	44	0
420030064	CSN	20050925	14.1	0	4.19	1.01	3.73	0.297	4.24	0.37	1.87	1.88	27.4	32.5	0
420030064	CSN	20051001	7.95	0	4.56	5.51	10.8	0.375	2.85	1.28	0.9	1	34.3	38.3	0
420030064	CSN	20051007	1.72	0	0.49	0.5	1.87	0.285	0.46	0.39	0.33	0.34	4.7	6.2	0
420030064	CSN	20051013	8.06	0	1.09	0.52	1.28	0.135	4.07	0.11	0.26	0.26	13.8	15.7	0
420030064	CSN	20051019	5.66	0	3.97	7.82	8.52	0.375	2.03	0.96	3.17	4.17	32.7	32.2	0
420030064	CSN	20051026	0.62	0	0.17	0.21	1.38	0.274	0.15	0.3	0.19	0.15	4.7	4.1	0
420030064	CSN	20051031	13.3	0	10	16.7	27.7	0.375	4.77	1.37	2.56	3.53	83.1	82.7	0
420030064	CSN	20051106	6.28	0	3.17	7.23	6.66	0.375	2.25	0.71	0.95	1.32	27.5	27.2	0
420030064	CSN	20051112	5.02	0	4.6	12.6	13.3	0.375	1.8	1.44	1.49	2.02	48.8	43.7	0
420030064	CSN	20051118	4.14	2.31	2.36	0.93	3.03	0.375	1.25	2.75	0.68	0.76		12.9	0
420030064	CSN	20051124	1.17	0.5	0.59	0.49	1.49	0.375	0.36	0.8	0.09	0.09	4.1	3.8	0
420030064	CSN	20051130	3.56	0	1.19	0.29	1.93	0.334	1.28	0.43	0.34	0.23	7.5	6.6	0
420030064	CSN	20051206	4.62	3.03	2.24	0.37	3.19	0.294	1.34	3.3	0.25	0.27	14.7	13.6	0
420030064	CSN	20051212	1.96	1.44	1.09	0.41	2.9	0.343	0.62	1.74	0.3	0.35	7.3	7.3	0
420030064	CSN	20051230	6.78	0.11	2.02	0.42	2.51	0.293	1.97	0.6	0.22	0.22	12.9	15.6	0
420030064	CSN	20060105	1.64	0.2	0.73	0.56	1.22	0.375	0.57	0.59	0.18	0.24	4.7	6.4	0

ID	TYPE	DATE	SO4	NO3R	NH4	EC	OC	DON	H2O_AIM	NO3	CRUST	CRUST_ALT	FRM_MASS	MEAS_FM	EPA_FLAG
420030064	CSN	20060111	5.4	0	2.09	1.07	3.21	0.375	1.93	0.89	0.42	0.45	14.1	15.9	0
420030064	CSN	20060117	2.39	0	0.92	1.09	4.04	0.375	0.86	0.78	0.3	0.35	10.9	12	0
420030064	CSN	20060123	3.33	1.91	2.07	1.67	4.62	0.375	1	2.29	0.63	0.67	15.7	16.8	0
420030064	CSN	20060129	4.01	0	2.66	5.01	8.45	0.375	1.44	0.97	1.07	1.44	26.2	26.3	0
420030064	CSN	20060204	3.69	0.06	1.47	0.57	2.46	0.375	1.32	0.71	0.24	0.25	10.6	11.1	0
420030064	CSN	20060210	3.1	2.88	2.09	0.96	3.48	0.375	0.97	3.37	0.43	0.56	13.4	14.7	0
420030064	CSN	20060216	5.63	0	3.39	4.37	8.38	0.375	2.02	1.55	1.25	1.44	25.3	25.5	0
420030064	CSN	20060222	8.2	2.7	6.38	5.99	16.2	0.375	2.61	3.6	1.16	1.22	44.7	47.3	0
420030064	CSN	20060228	1.98	1.5	1.14	0.36	2.21	0.356	0.62	1.85	0.32	0.38	8	8.8	0
420030064	CSN	20060306	0.97	0.72	0.65	0.55	3.61	0.375	0.29	1.44	0.34	0.39	6.6	8.3	0
420030064	CSN	20060312	4.93	0.71	3.38	3.9	6.94	0.375	1.68	1.85	0.61	0.61	26.6	26.8	0
420030064	CSN	20060318	1.55	0.39	0.71	0.19	2.03	0.375	0.51	0.95	0.12	0.12	5.3	6.3	0
420030064	CSN	20060324	5.38	2.61	2.8	0.8	4.31	0.375	1.64	3.22	0.59	0.57	16.9	16.8	0
420030064	CSN	20060330	8.9	0	3.99	2.81	7.08	0.375	3.19	1.45	0.67	0.9	27.2	27.9	0
420030064	CSN	20060405	2.13	0	0.81	0.2	1.38	0.375	0.76	0.46	0.21	0.24	4.8	5.4	0
420030064	CSN	20060411	7.08	0	3.94	5.56	11.2	0.375	2.54	1.56	1.5	1.85	34.1	30.6	0
420030064	CSN	20060417	1.92	0	0.72	0.54	2.66	0.375	0.69	0.23	0.45	0.55	6.4	5.7	0
420030064	CSN	20060423	3.08	0	1.34	0.91	2.64	0.375	1.1	1.15	0.38	0.4	9.2	15.4	0
420030064	CSN	20060429	1.4	0	0.53	0.72	3.84	0.375	0.5	0.42	0.45	0.54	10.6	9	0
420030064	CSN	20060505	4.06	0	1.57	0.73	3.59	0.375	1.45	1.46	0.92	1.08	12.6	13.6	0
420030064	CSN	20060517	5.73	0	2.12	0.58	2.55	0.37	2.09	0.65	0.46	0.46	12.4	15.4	0
420030064	CSN	20060523	2	0	0.77	0.57	2.35	0.375	0.72	0.68	0.64	0.56	6.7	7.1	0
420030064	CSN	20060529	14.9	0	7.25	7.03	16.8	0.375	5.34	2.62	1.2	1.33	54.1	57.1	0
420030064	CSN	20060604	1.75	0	0.82	0.31	2.36	0.375	0.63	1.19	0.22	0.19	7.8	6.9	0
420030064	CSN	20060610	2.03	0	0.59	0.29	2.27	0.291	0.59	0.19	0.28	0.31	6.1	6.2	0
420030064	CSN	20060616	8.12	0	3.88	6.08	15	0.375	2.91	1.04	1.18	1.49	34.9	41.1	0
420030064	CSN	20060622	6.31	0	2.54	1.26	4.94	0.375	2.26	0.8	0.71	0.7	18.8	19.4	0
420030064	CSN	20060628	9.65	0	3.82	1.77	4.52	0.375	3.46	1.14	0.57	0.55	22.8	23.2	0
420030064	CSN	20060704	8.77	0	3.31	0.68	5.19	0.375	3.14	0.78	0.38	0.31	26.3	26.7	0
420030064	CSN	20060710	18.4	0	6.84	3.04	8.58	0.372	6.67	0.83	0.8	1.03	45.1	46.6	0

ID	TYPE	DATE	SO4	NO3R	NH4	EC	OC	DON	H2O_AIM	NO3	CRUST	CRUST_ALT	FRM_MASS	MEAS_FM	EPA_FLAG
420030064	CSN	20060716	7.07	0	3.12	5.01	11.6	0.375	2.53	0.95	1.85	2.2	32.4	34.3	0
420030064	CSN	20060728	6.58	0	1.91			0.29	1.88	0.46	5.15	5.18	20.3	22.8	1
420030064	CSN	20060803	11.3	0	3.27	1.19	4.36	0.289	3.2	0.82	0.88	1.07	25.2	31.4	0
420030064	CSN	20060809	10.3	0	2.63	2	7.41	0.255	2.1	0.45	0.71	0.93	25.4	28	0
420030064	CSN	20060815	6.62	0	1.89	0.68	3.52	0.285	1.82	0.92	0.58	0.51	15.3	16.9	0
420030064	CSN	20060821	3.86	0	1.25	0.69	3.35	0.324	1.34	0.53	0.34	0.35	10.7	11.9	0
420030064	CSN	20060827	11.5	0	4.37	0.86	5	0.375	4.12	0.61	0.59	0.56	28.2	27.7	0
420030064	CSN	20060902	0.94	0	0.24	0.15	1.53	0.255	0.19	0.17	0.25	0.17	2.9	4.4	0
420030064	CSN	20060908	16.9	0	7.74	5.47	12.9	0.375	6.06	1.65	2.62	3.21	44.4	51.8	0
420030064	CSN	20060914	6.85	0	3.13	0.65	2.21	0.375	2.45	1.01	0.3	0.3	13	14.1	0
420030064	CSN	20060920	1.9	0	0.74	0.33	1.79	0.375	0.68	0.32	0.16	0.16	4.9	4.5	0
420030064	CSN	20060926	5.76	0	3.91	2.52	5.38	0.375	2.06	1.56	1.01	1.05	18.3	22.6	0
420030064	CSN	20061002	7.07	0	3.72	3.79	7.36	0.375	2.53	1.15	0.87	0.81	23.1	27.9	0
420030064	CSN	20061008	3.62	0	2.61	5	8.44	0.375	1.3	0.57	1.28	1.67	22.7	26.5	0
420030064	CSN	20061014	2.6	0	1.74	2.79	5.45	0.375	0.93	0.65	0.55	0.66	12.5	17.6	0
420030064	CSN	20061020	1.38	0	0.43	0.45	1.68	0.312	0.46	0.2	0.29	0.33	3.6	6.1	0
420030064	CSN	20061026	2.45	0	1.03	0.69	3.23	0.375	0.88	0.79	0.47	0.5	7.9	9.1	0
420030064	CSN	20061101	3.15	2.67	2.31	0.14	4.18	0.375	0.96	4.14	0.82	0.78	15	17	0
420030064	CSN	20061107	2.24	0	0.91	1.09	4.74	0.375	0.8	0.75	0.52	0.56	11	12.8	0
420030064	CSN	20061113	5.03	0.28	1.94	1.2	2.58	0.37	1.8	0.78	0.26	0.29	11.7	11.6	0
420030064	CSN	20061119	3.48	1.88	1.79	0.63	3.43	0.358	1.1	2.48	0.15	0.14	12.3	13.2	0
420030064	CSN	20061125	6.79	0	5.82	9.61	17.6	0.375	2.43	1.48	1	0.92	50.7	49.6	0
420030064	CSN	20061201	2.33	0	0.74	0.78	2.04	0.318	0.79	0.27	0.15	0.12	6.2	6.6	0
420030064	CSN	20061207	1.92	1.4	1.15	0.36	1.86	0.375	0.58	2	0.3	0.35	8.3	8.8	0
420030064	CSN	20061213	5.05	0.09	3.49	3.52	8.06	0.375	1.8	2.24	1.16	1.37	23.2	27.2	0
420030064	CSN	20061219	3.08	3.17	2.49	1.81	5.77	0.375	0.99	3.79	0.91	1.03	19.4	19.7	0
420030064	CSN	20061225	2.33	0.59	1.01	0.93	2.79	0.36	0.79	1.28	0.1	0.13	9.9	10.5	0
420030064	CSN	20061231	4.62	0.7	2.37	1.78	5.24	0.375	1.57	2.13	0.41	0.4	18.5	20.2	0
420030064	CSN	20070106	1.94	0	0.88	0.59	1.57	0.375	0.7	0.68	0.22	0.24	6.1	6	0
420030064	CSN	20070112	4.17	0.13	3.06	2.63	4.66	0.375	1.48	1.57	1.02	1.16	19.9	22.1	0

ID	TYPE	DATE	SO4	NO3R	NH4	EC	OC	DON	H2O_AIM	NO3	CRUST	CRUST_ALT	FRM_MASS	MEAS_FM	EPA_FLAG
420030064	CSN	20070118	3.6	1.88	2.2	2.83	7.98	0.375	1.09	2.44	0.93	1.05	19.5	21.2	0
420030064	CSN	20070124	6.48	0.99	2.53	0.11	2.37	0.346	2.27	1.38	0.2	0.25	13.2	15.3	0
420030064	CSN	20070130	3.81	2.78	2.33	0.35	2.89	0.375	1.14	3.11	0.54	0.57	12.5	11.8	0
420030064	CSN	20070205	1.69	2.07	0.97	0.07	2.52	0.218	0.67	2.13	0.19	0.2	8	9	0
420030064	CSN	20070211	4.24	4.87	3.27	1.19	4.36	0.375	1.42	5.09	0.33	0.44	20.9	22	0
420030064	CSN	20070217	10.6	3.06	9.84	8.01	14.4	0.375	3.43	3.31	1.86	2.42	54.1	56.6	0
420030064	CSN	20070223	1.65	0.28	0.61	0.41	1.49	0.32	0.53	0.62	0.23	0.27	4.2	4.8	0
420030064	CSN	20070301	5.54	0.07	2.33	0.7	3.34	0.375	1.98	1.36	0.4	0.44	13.5	14.9	0
420030064	CSN	20070307	2.47	1.99	1.24	0.78	2.93	0.268	0.73	2.27	0.49	0.42	9.9	11	0
420030064	CSN	20070313	6.34	0	4.75	5.25	8.33	0.375	2.27	1.41	1.62	1.87	25.9	32.3	0
420030064	CSN	20070319	4.8	1.5	4.33	4.33	5.8	0.375	1.54	1.96	1.06	1.25	28	27.3	0
420030064	CSN	20070325	3.66	0	1.66	0.68	2.46	0.375	1.31	1.96	0.36	0.38	8.4	10.8	0
420030064	CSN	20070327	3.05	0	1.22	1.47	5.53	0.375	1.09	0.64	3.61	3.73	10.3	18.4	0
420030064	CSN	20070406	2.54	0.9	1.26	0.22	1.68	0.375	0.8	1.43	0.36	0.42	6.5	8.6	0
420030064	CSN	20070412	3.16	0	1.44	0.81	1.57	0.375	1.13	0.37	0.38	0.39	7.5	9	0
420030064	CSN	20070418	6.14	0	1.34	0.21	1.95	0.218	1.22	0.53	0.67	0.67	10.9	13.1	0
420030064	CSN	20070424	3.47	0	1.45	0.4	2.68	0.375	1.24	1.57	1.38	1.38	9	11	0
420030064	CSN	20070506	0.94	0	0.36	0.16	1.19	0.375	0.34	0.1	0.44	0.44	3	7.2	0
420030064	CSN	20070518	1.62	0	0.6	0.37	2.04	0.37	0.59	0.78	0.56	0.53	5.5	5.4	0
420030064	CSN	20070524	13.7	0	5.24	2.15	7.33	0.375	4.91	1.34	2.04	2.17	31.8	37.2	0
420030064	CSN	20070530	7.25	0	3.28	2.69	8.99	0.375	2.6	0.96	1.43	1.56	23.2	31.4	0
420030064	CSN	20070605	3.49	0	1.28	0.44	2.56	0.367	1.28	0.56	0.36	0.46	8.2	10	0
420030064	CSN	20070611	3.6	0	1.15	0.7	5.03	0.319	1.23	0.49	1.44	1.49	12.8	16.9	0
420030064	CSN	20070617	14.8	0	6.24	5.06	13.2	0.375	5.3	1.47	1.6	1.74	40	45.4	0
420030064	CSN	20070623	2.4	0	1.02	1.95	4.95	0.375	0.86	0.78	1.1	1.18	10.7	13.9	0
420030064	CSN	20070629	2.19	0	0.87	0.7	4.18	0.375	0.78	0.84	0.76	0.87	9.4	11.8	0
420030064	CSN	20070705	6.45	0	2.41	0.58	2.92	0.374	2.32	0.91	0.7	0.82	13.8	17.3	0
420030064	CSN	20070711	5.52	0	1.81			0.328	1.95	0.68	0.98	0.96	14.6	17.3	1
420030064	CSN	20070717	11.7	0	4.22	3.95		0.361	4.33	0.78	1.36	1.77	31.4	34.3	0
420030064	CSN	20070723	2.78	0	0.86	1.2		0.309	0.9	0.51	1.25	1.39	12.7	13.4	0

ID	TYPE	DATE	SO4	NO3R	NH4	EC	OC	DON	H2O_AIM	NO3	CRUST	CRUST_ALT	FRM_MASS	MEAS_FM	EPA_FLAG
420030064	CSN	20070729	16.8	0	5.13	0.99		0.305	5.33	0.49	0.78	0.7	29.8	33.3	0
420030064	CSN	20070804	16.9	0	5.57	2.71		0.33	6.01	1.4	1.23	1.57	39.7	44.1	0
420030064	CSN	20070810	5.36	0	1.74	0.5		0.325	1.87	0.75	0.34	0.41	11	19.3	0
420030064	CSN	20070816	9.86	0	3.66	1.26		0.371	3.58	1.07	1.12	1.11	26.8	30.5	0
420030064	CSN	20070822	13.8	0	4.99	1.73		0.362	5.11	1.2	1.61	2.04	27.7	31	0
420030064	CSN	20070828	23.6	0	7.45	3.3		0.316	7.93	1.03	1.12	1.08	47.3	49.8	0
420030064	CSN	20070903	11.2	0	5.24	9.35		0.375	4.01	1.07	1.34	1.44	36.4	43.9	0
420030064	CSN	20070909	9.42	0	3.83	1.38		0.375	3.38	1.79	0.61	0.75	26.2	29.3	0
420030064	CSN	20070915	1.37	0	0.45	0.34		0.328	0.49	0.2	0.34	0.36	3.6	6	0
420030064	CSN	20070921	13	0	5.63	2.34		0.375	4.66	1.67	1.47	1.64	27.4	33.1	0
420030064	CSN	20070927	4.43	0	2.14	0.91		0.375	1.59	1.6	2.54	2.65	12.7	22.1	0
420030064	CSN	20071003	5.05	0	2.67	3.66		0.375	1.81	1.47	1.75	2.07	21.5	25.7	0
420030064	CSN	20071009	10.2	0	6.1	7.91		0.375	3.65	1.87	3.77	4.44	35.2	42	0
420030064	CSN	20071015	4.26	0	1.94	2.05		0.375	1.53	1.21	1.29	1.45	14.8	17.6	0
420030064	CSN	20071021	6.55	0	5.15	10.5		0.375	2.35	1.05	2.75	3.51	40.3	48.5	0
420030064	CSN	20071027	3.09	0	1.18	0.58		0.375	1.11	0.34	0.11	0.13	6.3	8.7	0
420030064	CSN	20071102	1.99	0	0.97	1.18		0.375	0.71	1.05	0.54	0.6	8.7	9.2	0
420030064	CSN	20071108	3.8	1.3	2.34	2.07		0.375	1.21	2.37	1.04	1.29	15.8	19	0
420030064	CSN	20071114	7.3	0.1	4.41	4		0.375	2.6	2.79	0.78	0.91	27.1	28.8	0
420030064	CSN	20071120	7.73	0	4.11	3.31		0.375	2.77	1.81	0.96	1.04	23.4	26	0
420030064	CSN	20071126	4.11	1.08	2.68	2.64		0.375	1.34	1.99	0.58	0.62	16.6	24.3	0
420030064	CSN	20071202	3.64	0.88	2.6	2.36		0.375	1.2	1.83	0.74	0.87	15.9	15.5	0
420030064	CSN	20071208	6.24	4.81	3.98	1.45		0.375	1.88	5.47	0.59	0.7	23.2	28.4	0
420030064	CSN	20071214	4.47	1.31	2.19	0.29		0.375	1.44	2.14	0.22	0.26	9.6	11.6	0
420030064	CSN	20071220	5.33	3.85	3.72	0.66		0.375	1.6	4.54	0.48	0.58	16.1	18.1	0
420030064	CSN	20071226	3.47	1.68	1.99	2.18		0.375	1.06	2.44	0.88	0.95	20.1	23.3	0
420030064	CSN	20080101	4.25	2.13	2.53	0.92		0.375	1.29	2.84	0.2	0.25	11.8	28.2	0
420030064	CSN	20080107	5.63	0	2.83	3.15		0.375	2.02	1.35	0.61	0.71	14.8	20.2	0
420030064	CSN	20080113	6.01	2.05	3.02	1.57		0.375	1.91	2.78	0.53	0.65	17.3	23	0
420030064	CSN	20080119	5	4.04	3.56	1.31		0.375	1.52	4.39	1.06	1.02	15.6	20.4	0

ID	TYPE	DATE	SO4	NO3R	NH4	EC	OC	DON	H2O_AIM	NO3	CRUST	CRUST_ALT	FRM_MASS	MEAS_FM	EPA_FLAG
420030064	CSN	20080125	3.23	4.86	3.02	0.8		0.375	1.23	5.05	0.55	0.62	13.7	19	0
420030064	CSN	20080131	2.11	1.85	1.2	0.79		0.314	0.67	2.24	0.42	0.5	8.5	10.8	0
420030064	CSN	20080206	2.74	0	1.19	1.33		0.375	0.98	0.45	0.4	0.5	7.5	10.4	0
420030064	CSN	20080212	3.87	2.87	2.24	1.1		0.364	1.21	3.12	1.26	1.4	15.6	22.5	0
420030064	CSN	20080218	3.15	0	1.35	0.69		0.375	1.13	0.82	0.28	0.22	7.7	8.5	0
420030064	CSN	20080224	11.6	4.9	7.4	2.9		0.375	3.59	5.31	0.75	0.78	35.7	40.6	0
420030064	CSN	20080301	3.12	1.51	1.66	0.25		0.375	0.95	2.12	0.14	0.15	8.3	9.7	0
420030064	CSN	20080307	6.4	2.26	2.97	1.19		0.362	2.1	2.82	0.88	0.97	19.3	20.9	0
420030064	CSN	20080313	4.15	0	2.45	1.77		0.375	1.49	2.14	1.79	2.09	12.1	19.6	0
420030064	CSN	20080319	4.76	0.19	2.25	1.76		0.375	1.69	1.1	0.76	0.69	12.7	14.8	0
420030064	CSN	20080325	5.63	2.09	4.39	0.18		0.375	1.77	3.35	0.99	1.24	21.5	30.9	0
420030064	CSN	20080331	2.86	0	1.19	1.38		0.375	1.02	0.55	0.64	0.79	8.3	10.6	0
420030064	CSN	20080406	4.1	0	1.55	0.38		0.375	1.47	0.43	0.09	0.12	9.1	10.4	0
420030064	CSN	20080412	2.39	0	0.75	0.15		0.314	0.79	0.38	0.27	0.28	4.7	6.7	0
420030064	CSN	20080418	11.5	0	7.97	8.52		0.375	4.12	1.77	1.97	2.28	56	56.7	0
420030064	CSN	20080424	3.32	0	1.32	1.04		0.375	1.19	0.54	1.28	1.45	11.2	12	0
420030064	CSN	20080430	4.17	1.09	2.32	0.93		0.375	1.36	3.02	0.5	0.57	12.4	15.3	0
420030064	CSN	20080506	7.65	0	4.95	4.66		0.375	2.74	2.05	2.06	2.64	35.6	38.7	0
420030064	CSN	20080512	1.89	0	0.62	0.31		0.328	0.67	0.19	0.13	0.09	4.2	5.3	0
420030064	CSN	20080518	2.71	0	1.48	1.28		0.375	0.97	0.9	0.38	0.42	9.1	10.8	0
420030064	CSN	20080524	1.74	0	0.69	0.57		0.375	0.62	0.8	0.22	0.22	6.1	7.6	0
420030064	CSN	20080530	6.95	0	3.62	5.91		0.375	2.49	1.29	1.51	1.62	27.7	32.9	0
420030064	CSN	20080605	6.78	0	2.79	2.61		0.375	2.43	1.45	0.6	0.73	19.2	22.9	0
420030064	CSN	20080611	4.88	0	2.59	4.64		0.375	1.75	1.5	1.1	1.27	23.6	32.1	0
420030064	CSN	20080617	0	0	0	0.61				0.05	0.33		10.2	8.2	1
420030064	CSN	20080623	3.73	0	1.79	0.94		0.375	1.34	1.39	0.38	0.45	10.6	11.1	0
420030064	CSN	20080629	4.74	0	2.25	1.38		0.375	1.7	1.01	0.83	0.85	12.5	18.9	0
420030064	CSN	20080705	11.8	0	2.79	1.1		0.236	2.15	3.43	0.68	0.46	28.8	30.7	0
420030064	CSN	20080711	8.22	0	4.44	6.88		0.375	2.95	1.33	1.58	1.94	31	34.1	0
420030064	CSN	20080717	17.3	0	6.51	6.13		0.375	6.2	1.54	1.08	1.11	45.1	46.3	0

ID	TYPE	DATE	SO4	NO3R	NH4	EC	OC	DON	H2O_AIM	NO3	CRUST	CRUST_ALT	FRM_MASS	MEAS_FM	EPA_FLAG
420030064	CSN	20080723	5.54	0	1.93	1.06		0.348	2.05	0.74	0.49	0.53	14	15.1	0
420030064	CSN	20080729	13.8	0	5.6	5.2		0.375	4.94	1.7	0.92	1.02	44.4	53.5	0
420030064	CSN	20080804	7.49	0	3.76	5.65		0.375	2.68	0.76	1.99	2.55	27	31.3	0
420030064	CSN	20080810	0.02	0	0	0.34		0	0.02	0.03	0	0	9	0.4	2
420030064	CSN	20080816	5.02	0	2.76	3.67		0.375	1.8	0.68	1.29	1.83	18.7	22.6	0
420030064	CSN	20080822	5.93	0	1.78	0.59		0.3	1.82	0.25	0.32	0.35	15.8	16.6	0
420030064	CSN	20080828	1.01	0	0.34	0.42		0.337	0.36	0.33	0.11	0.11	3.9	4.2	0
420030064	CSN	20080903	15	0	6.59	8.26		0.375	5.37	2.14	1.73	2	45	51.5	0
420030064	CSN	20080909	5.45	0	2.55	2.87		0.375	1.95	0.91	0.43	0.53	19.2	20.6	0
420030064	CSN	20080915	1.79	0	0.53	0.31		0.296	0.53	0.13	0.19	0.18		5.7	0
420030064	CSN	20080921	15.2	0	7.84	5.98		0.375	5.45	2.19	2.14	2.92	43.8	50.7	0
420030064	CSN	20080927	1.34	0	0.43	0.4		0.321	0.46	0.51	0.14	0.16	4.3	5.8	0
420030064	CSN	20081003	2	0	0.8	0.81		0.375	0.72	0.45	0.33	0.39	6.3	7.7	0
420030064	CSN	20081009	5.09	0	3.34	3.37		0.375	1.82	1.32	1.5	1.76	17.1	25.1	0
420030064	CSN	20081015	7.76	0	3.66	2.64		0.375	2.78	1.58	1.51	1.58	21.5	27.5	0
420030064	CSN	20081021	2.41	0	1.39	1.28		0.375	0.86	0.64	0.74	0.95	11.2	10.1	0
420030064	CSN	20081027	1.49	0	0.54	0.14		0.362	0.55	0.39	0.19	0.25	3.7	3.5	0
420030064	CSN	20081102	5.88	0	2.92	1.13		0.375	2.11	1.88	1.66	1.79	20.1	24.2	0
420030064	CSN	20081108	1.89	0	0.85	0.37		0.375	0.68	0.92	0.18	0.23	6.9	8.8	0
420030064	CSN	20081114	6.63	0	4.99	3.12		0.375	2.38	1.76	2.1	2.77	27.1	37	0
420030064	CSN	20081120				0.46							8.7		1
420030064	CSN	20081126	6.38	4.6	5.46	0.41		0.375	1.92	5.16	0.3	0.31	8.3	44	3
420030064	CSN	20081202	4.43	0.51	0	0.17		0	4.47	1.09	0.38	0.33	6.9	10.3	0
420030064	CSN	20081208	4.68	3.55	3.06	0.97		0.375	1.41	4.07	0.91	0.93	10.9	23.3	0
420030064	CSN	20081214	5.57	2.52	4.13	2.99		0.375	1.71	3.78	0.56	0.5	21.8	30.3	0
420030064	CSN	20081220	5.25	2.35	2.1	0.48		0.27	1.33	2.78	0.39	0.39	9.6	17.7	0
420030064	CSN	20081226	6.83	4.58	4.39	1.7		0.375	2.04	5.25	1.29	1.41	17.1	36.7	0
420030064	CSN	20090101	3.97	2.08	2.01	0.68		0.354	1.26	2.4	0.23	0.22	9.4	15	0
420030064	CSN	20090107	3.62	2.51	2.11	0.64		0.375	1.08	2.85	0.41	0.48	7	15.8	0
420030064	CSN	20090113	23.8	15.29	15.4	1.21		0.375	7.12	15.7	2.72	2.75	14.4	98.1	5

ID	TYPE	DATE	SO4	NO3R	NH4	EC	OC	DON	H2O_AIM	NO3	CRUST	CRUST_ALT	FRM_MASS	MEAS_FM	EPA_FLAG
420030064	CSN	20090125	7.16	5.62	5.14	0.78		0.375	2.17	5.79	1.27	1.26	12.8	35.4	3
420030064	CSN	20090131	12.1	12.13	8.4	0.78		0.375	3.85	12.4	0.92	0.91	12.9	48.3	3
420030064	CSN	20090206	7.67	4.36	6.91	4.87		0.375	2.3	4.89	1.01	0.91	32.5	46.8	0
420030064	CSN	20090212	2.11	0	0.9	0.1		0.375	0.76	0.62	0.28	0.28	4.4	4.5	0
420030064	CSN	20090218	5.06	2.26	3.36	1.19		0.375	1.55	3.1	0.59	0.7	12.3	24.2	0
420030064	CSN	20090224	7.98	5.49	4.88	0.65		0.375	2.39	5.77	0.83	0.94	10	32.6	3
420030064	CSN	20090302				0							4.9		1
420030064	CSN	20090308	3.07	0	1.1	0.71		0.358	1.14	0.92	0.51	0.56	10.3	11.5	0
420030064	CSN	20090314	5.35	1.07	2.43			0.375	1.79	2.58	0.69	0.81	16.4	18.8	1
420030064	CSN	20090320	3.81	1.47	2.3	1.08		0.375	1.19	2.17	0.45	0.52	10.6	18	0
420030064	CSN	20090326	2.2	0.41	1.5	0.89		0.375	0.74	1.78	0.31	0.37	10.2	10.6	0
420030064	CSN	20090401	3.64	0	1.65	0.89		0.375	1.3	0.77	0.63	0.73	11.5	12.7	0
420030064	CSN	20090407	2.15	0	0.82	0.16		0.375	0.77	0.36	0.12	0.12	5.2	5	0
420030064	CSN	20090413	1.84	0	0.74	0.39		0.375	0.66	0.42	0.47	0.46	6.5	7.1	0
420030064	CSN	20090419	8.34	0	4.47	4.27		0.375	2.99	1.56	0.32	0.38	28.8	25	0
420030064	CSN	20090425	3.34	0	1.65	3		0.375	1.2	0.71	0.65	0.72	14.8	19.4	0
420030064	CSN	20090501	2.65	0	1.06	0.55		0.375	0.95	0.6	0.94	0.99	8.5	11.6	0
420030064	CSN	20090507	5.08	0	2	0.86		0.375	1.82	0.5	1.09	1.03	12.9	14.2	0
420030064	CSN	20090513	4.6	0	1.68	0.67		0.365	1.69	0.63	1.26	1.43	12.5	13.6	0
420030064	CSN	20090519	3.42	0	2.39	3.09		0.375	1.23	1.22	2.1	2.39	18.3	23.2	0
420030064	CSN	20090525	6.79	0	2.68	0.9		0.375	2.43	1.21	1.81	2.08	18.6	23.5	0
420030064	CSN	20090531	2.38	0	1.33	2.6		0.375	0.85	0.77	0.79	0.86	12.2	16.5	0
420030064	CSN	20090606	7.22	0	3.41	2.74		0.375	2.59	1.51	1.25	1.23	22.1	27.6	0
420030064	CSN	20090612	4.36	0	2.06	0.77		0.375	1.56	1.84	0.41	0.49	11.8	15.5	0
420030064	CSN	20090618	4.89	0	1.97	0.5		0.375	1.75	1.11	0.74	0.76	11.7	13.4	0
420030064	CSN	20090624	3.02	0	1.3	2.5		0.375	1.08	0.84	2.23	2.34	16.3	22.3	0
420030064	CSN	20090630	2.07	0	0.71	0.45		0.343	0.76	0.42	0.51	0.55	6.5	9.6	0
420030064	CSN	20090706	5.48	0	2.81	4		0.375	1.96	1.12	1.26	1.32	25	33.7	0
420030064	CSN	20090712	3.35	0	1.14	0.51		0.34	1.22	0.32	0.96	1	10.2	12.9	0
420030064	CSN	20090718	1.84	0	0.86	0.73		0.375	0.66	0.71	0.13	0.16	6.8	8	0

ID	TYPE	DATE	SO4	NO3R	NH4	EC	OC	DON	H2O_AIM	NO3	CRUST	CRUST_ALT	FRM_MASS	MEAS_FM	EPA_FLAG
420030064	CSN	20090724	6.88	0	3.11	1.73		0.375	2.47	0.75	0.24	0.25	17.3	18.7	0
420030064	CSN	20090730	7	0	2.9	0.8		0.375	2.51	0.91	0.31	0.34	15.8	18.3	0
420030064	CSN	20090805	4.04	0	1.35	0.71		0.334	1.46	0.48	0.38	0.46	11.7	13.2	0
420030064	CSN	20090811	5.52	0	3.31	1.52		0.375	1.98	0.9	0.52	0.56	14.5	16.5	0
420030064	CSN	20090817	9.4	0	3.78	2.66		0.375	3.37	0.86	0.64	0.75	28.4	31.8	0
420030064	CSN	20090823	2.85	0	0.97	0.53		0.34	1.04	0.37	0.31	0.33	7.7	8.9	0
420030064	CSN	20090829	3.46	0	1.42	1.21		0.375	1.24	0.45	1.47	1.5	12.2	14	0
420030064	CSN	20090904	13	0	4.02	2.01		0.309	4.22	1.02	1.13	1.17	28.4	32	0
420030064	CSN	20090910	1.78	0	0.59	0.54		0.331	0.64	0.33	0.34	0.33	8.1	8.6	0
420030064	CSN	20090916	1.8	0	0.5	0.42		0.278	0.47	0.18	0.33	0.37	7.1	6.7	0
420030064	CSN	20090922	4.39	0	1.54	0.68		0.351	1.63	0.48	0.26	0.31	10.5	13.1	0
420030064	CSN	20090928	4.62	0	1.66	0.82		0.359	1.71	0.36	0.36	0.38	9.8	11.9	0
420030064	CSN	20091004	1.71	0	0.68	1.05		0.375	0.61	0.27	0.13	0.15	7.9	7.2	0
420030064	CSN	20091010	3.29	0	1.79			0.375	1.18	0.36	0.19	0.15	14	15	1
420030064	CSN	20091016	0.88	0.01	0.42			0.375	0.31	0.57	0.14	0.13		4.5	1
420030064	CSN	20091022	15.1	0	9.96			0.375	5.41	1.08	2.36	2.74	55.7	56.9	1
420030064	CSN	20091028	3.01	0	1.17			0.375	1.08	0.39	0.17	0.19	7.5	8.1	1
420030064	CSN	20091103	6.05	0.38	3.71			0.375	2.13	2.14	0.63	0.62	21.4	24.4	1
420030064	CSN	20091109	21.9	0	15.9			0.375	7.85	2.31	2.05	1.9	92.1	91	1
420030064	CSN	20091115	10.5	0	6.79			0.375	3.76	2.2	0.68	0.55	45.3	47.8	1
420030064	CSN	20091121	4.33	2.69	3.25			0.375	1.3	4.88	0.35	0.36	16.1	18.3	1
420030064	CSN	20091127	1.27	0	0.46			0.362	0.47	0.37	0.03	0.04	3	3.8	1
420030064	CSN	20091203	2.5	0.1	1.35			0.375	0.89	1.5	0.12	0.07	7.2	7.6	1
420030064	CSN	20091209	4.99	2.4	2.66			0.375	1.52	3.74	0.41	0.41	3.5	16.6	1
420030064	CSN	20091215	6.42	3.66	3.69			0.375	1.93	4.58	0.68	0.64		23.2	1
420030064	CSN	20091221	5.76	3.99	3.12	0.45		0.341	1.81	4.43	0.31	0.33	14.4	19.5	0
420030064	CSN	20091227	10.4	1.87	7.06			0.375	3.51	2.69	0.63	0.66	31.8	43.6	1

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

User ID: VSA

QUICKLOOK CRITERIA PARAMETERS

Report Request ID: 1035822 Report Code: AMP450 Nov. 15, 2012

GEOGRAPHIC SELECTIONS

Tribal Code	State	County	Site	Parameter	POC	City	AQCR	UAR	CBSA	CSA	EPA Region	Method	Duration	Begin Date	End Date
	42	003		88101											

SELECTED OPTIONS

Option Type	Option Value
MERGE PDF FILES	YES
WORKFILE DELIMITER	,
EVENTS PROCESSING	EXCLUDE REGIONALLY CONCURRED EVENTS

SORT ORDER

Order	Column
1	PARAMETER_CODE
2	STATE_CODE
3	COUNTY_CODE
4	SITE_ID
5	POC
6	DATES
7	EDT_ID

SCR GROUP SELECTIONS

Allegheny Co, PA

GLOBAL DATES

Start Date	End Date
1999	2011

APPLICABLE STANDARDS

Standard Description
PM25 24-hour 2006
PM25 Annual 2006

Nov. 15, 2012

EXCEPTIONAL DATA TYPES

EDT	DESCRIPTION
0	NO EVENTS
1	EVENTS EXCLUDED
2	EVENTS INCLUDED
5	EVENTS WITH CONCURRENCE EXCLUDED

Note: The * indicates that the mean does not satisfy summary criteria.

Nov. 15, 2012

PM2.5 - Local Conditions (88101) Pennsylvania Micrograms/cubic meter (LC) (105)

24-HOUR

SITE ID	POC	PQAO	CITY	COUNTY	ADDRESS	YEAR	METH	NUM CRED DAYS	1ST MAX	2ND MAX	3RD MAX	4TH MAX	98TH PERCENTILE VALUE	WTD ARITH MEAN	CERT	EDT
42-003-0002	1	0021	Avalon	Allegheny	520 ORCHARD AVE, AVALON	2011	118	62	35.6	33.1	29.8	28.6	33.1	13.67*		0
42-003-0002	3	0021	Avalon	Allegheny	520 ORCHARD AVE, AVALON	2010	170	358	49.5	45.1	41.6	40.8	37.7	16.34		0
42-003-0002	3	0021	Avalon	Allegheny	520 ORCHARD AVE, AVALON	2011	170	143	38.0	29.9	27.4	26.9	27.4	13.71*		0
42-003-0008	1	0021	Pittsburgh	Allegheny	301 39TH ST, BLDG #7, LAWRENCEVILLE	1999	118	61	62.2	31.7	31.5	30.2	31.7	16.23*		0
42-003-0008	1	0021	Pittsburgh	Allegheny	301 39TH ST, BLDG #7, LAWRENCEVILLE	2000	118	255	37.1	35.5	35.3	35.1	34.1	15.63*		0
42-003-0008	1	0021	Pittsburgh	Allegheny	301 39TH ST, BLDG #7, LAWRENCEVILLE	2001	118	341	54.2	49.4	47.7	46.0	41.7	16.58		0
42-003-0008	1	0021	Pittsburgh	Allegheny	301 39TH ST, BLDG #7, LAWRENCEVILLE	2002	118	347	54.4	51.7	48.4	45.1	41.4	15.33	Y	0
42-003-0008	1	0021	Pittsburgh	Allegheny	301 39TH ST, BLDG #7, LAWRENCEVILLE	2003	118	352	63.9	59.2	41.0	39.5	35.9	15.20	Y	0
42-003-0008	1	0021	Pittsburgh	Allegheny	301 39TH ST, BLDG #7, LAWRENCEVILLE	2004	118	348	52.1	47.4	44.1	43.9	38.3	15.46	Y	0
42-003-0008	1	0021	Pittsburgh	Allegheny	301 39TH ST, BLDG #7, LAWRENCEVILLE	2005	118	358	60.5	60.4	53.8	48.1	42.5	15.82	Y	0
42-003-0008	1	0021	Pittsburgh	Allegheny	301 39TH ST, BLDG #7, LAWRENCEVILLE	2006	118	357	55.1	51.5	49.3	43.1	37.6	14.40	Y	0
42-003-0008	1	0021	Pittsburgh	Allegheny	301 39TH ST, BLDG #7,	2007	118	341	50.7	47.7	45.9	45.7	39.8	14.89		0

Note: The * indicates that the mean does not satisfy summary criteria.

Nov. 15, 2012

PM2.5 - Local Conditions (88101) Pennsylvania Micrograms/cubic meter (LC) (105)

24-HOUR

SITE ID	POC	PQAO	CITY	COUNTY	ADDRESS	YEAR	METH	NUM CRED DAYS	1ST MAX	2ND MAX	3RD MAX	4TH MAX	98TH PERCENTILE VALUE	WTD ARITH MEAN	CERT	EDT
					LAWRENCEVILLE											
42-003-0008	1	0021	Pittsburgh	Allegheny	301 39TH ST, BLDG #7, LAWRENCEVILLE	2008	118	352	39.7	38.3	35.2	34.6	30.3	12.87		5
42-003-0008	1	0021	Pittsburgh	Allegheny	301 39TH ST, BLDG #7, LAWRENCEVILLE	2009	118	343	33.3	27.6	26.8	26.3	24.7	11.62		0
42-003-0008	1	0021	Pittsburgh	Allegheny	301 39TH ST, BLDG #7, LAWRENCEVILLE	2010	118	342	41.5	40.0	35.2	34.8	29.7	12.17		0
42-003-0008	1	0021	Pittsburgh	Allegheny	301 39TH ST, BLDG #7, LAWRENCEVILLE	2011	118	346	32.1	31.1	30.9	28.1	27.3	11.14		0
42-003-0008	2	0021	Pittsburgh	Allegheny	301 39TH ST, BLDG #7, LAWRENCEVILLE	2005	118	57	58.2	38.3	27.8	27.7	38.3	16.21	Y	0
42-003-0008	2	0021	Pittsburgh	Allegheny	301 39TH ST, BLDG #7, LAWRENCEVILLE	2006	118	59	36.8	35.7	28.6	27.7	35.7	13.82	Y	0
42-003-0008	2	0021	Pittsburgh	Allegheny	301 39TH ST, BLDG #7, LAWRENCEVILLE	2007	118	55	39.1	33.2	31.6	31.0	33.2	15.47		0
42-003-0008	2	0021	Pittsburgh	Allegheny	301 39TH ST, BLDG #7, LAWRENCEVILLE	2008	118	58	37.5	35.0	32.0	29.4	35.0	13.03		5
42-003-0008	2	0021	Pittsburgh	Allegheny	301 39TH ST, BLDG #7, LAWRENCEVILLE	2009	118	30	26.8	22.7	20.7	19.3	26.8	10.87		0
42-003-0008	2	0021	Pittsburgh	Allegheny	301 39TH ST, BLDG #7, LAWRENCEVILLE	2010	118	30	32.5	29.4	24.7	20.9	32.5	12.13		0
42-003-0008	2	0021	Pittsburgh	Allegheny	301 39TH ST,	2011	118	30	28.0	27.3	23.3	20.4	28.0	10.77		0

Note: The * indicates that the mean does not satisfy summary criteria.

Nov. 15, 2012

PM2.5 - Local Conditions (88101) Pennsylvania Micrograms/cubic meter (LC) (105)

24-HOUR

SITE ID	POC	PQAO	CITY	COUNTY	ADDRESS	YEAR	METH	NUM CRED DAYS	1ST MAX	2ND MAX	3RD MAX	4TH MAX	98TH PERCENTILE VALUE	WTD ARITH MEAN	CERT	EDT
					BLDG #7, LAWRENCEVILLE											
42-003-0021	1	0021	Pittsburgh	Allegheny	GLADSTONE HIGH SCHOOL	1999	118	79	64.3	39.1	38.8	35.2	39.1	16.57*		0
42-003-0021	1	0021	Pittsburgh	Allegheny	GLADSTONE HIGH SCHOOL	2000	118	92	35.0	33.7	33.1	32.9	33.7	14.85*		0
42-003-0021	1	0021	Pittsburgh	Allegheny	GLADSTONE HIGH SCHOOL	2001	118	97	57.0	56.3	40.7	40.7	56.3	15.81*		0
42-003-0021	1	0021	Pittsburgh	Allegheny	GLADSTONE HIGH SCHOOL	2002	118	105	49.0	43.3	40.2	36.2	40.2	14.55	Y	0
42-003-0021	1	0021	Pittsburgh	Allegheny	GLADSTONE HIGH SCHOOL	2003	118	104	54.9	40.0	30.7	28.1	30.7	14.56	Y	0
42-003-0021	1	0021	Pittsburgh	Allegheny	GLADSTONE HIGH SCHOOL	2004	118	102	53.8	44.6	39.7	36.4	39.7	14.10	Y	0
42-003-0021	1	0021	Pittsburgh	Allegheny	GLADSTONE HIGH SCHOOL	2005	118	112	57.7	38.3	35.1	34.7	35.1	15.35	Y	0
42-003-0064	1	0021	Liberty	Allegheny	2743 WASHINGTON BLVD, LIBERTY	1999	118	190	60.5	58.4	58.0	49.3	49.3	18.80*		0
42-003-0064	1	0021	Liberty	Allegheny	2743 WASHINGTON BLVD, LIBERTY	2000	118	328	78.5	71.1	70.2	68.6	64.2	20.92		0
42-003-0064	1	0021	Liberty	Allegheny	2743 WASHINGTON BLVD, LIBERTY	2001	118	337	98.6	90.2	81.0	71.9	63.9	23.05		0
42-003-0064	1	0021	Liberty	Allegheny	2743 WASHINGTON BLVD, LIBERTY	2002	118	355	69.6	63.4	62.6	61.9	59.9	20.30	Y	0
42-003-0064	1	0021	Liberty	Allegheny	2743 WASHINGTON BLVD, LIBERTY	2003	118	359	101.7	85.2	80.4	76.1	66.6	20.21	Y	0
42-003-0064	1	0021	Liberty	Allegheny	2743	2004	118	350	94.0	82.2	71.5	71.3	68.5	20.66	Y	0

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Nov. 15, 2012

PM2.5 - Local Conditions (88101) Pennsylvania Micrograms/cubic meter (LC) (105)

24-HOUR

SITE ID	POC	PQAO	CITY	COUNTY	ADDRESS	YEAR	METH	NUM CRED DAYS	1ST MAX	2ND MAX	3RD MAX	4TH MAX	98TH PERCENTILE VALUE	WTD ARITH MEAN	CERT	EDT
					WASHINGTON BLVD, LIBERTY											
42-003-0064	1	0021	Liberty	Allegheny	2743 WASHINGTON BLVD, LIBERTY	2005	118	355	100.3	84.9	83.1	77.8	69.6	21.41	Y	0
42-003-0064	1	0021	Liberty	Allegheny	2743 WASHINGTON BLVD, LIBERTY	2006	118	345	100.7	82.1	68.0	60.6	58.4	19.03	Y	0
42-003-0064	1	0021	Liberty	Allegheny	2743 WASHINGTON BLVD, LIBERTY	2007	118	359	61.7	58.7	58.7	58.0	54.7	18.88		0
42-003-0064	1	0021	Liberty	Allegheny	2743 WASHINGTON BLVD, LIBERTY	2008	118	358	70.8	66.9	63.2	62.7	50.0	17.00		0
42-003-0064	1	0021	Liberty	Allegheny	2743 WASHINGTON BLVD, LIBERTY	2009	118	342	92.1	59.2	55.7	54.8	45.3	15.04		0
42-003-0064	1	0021	Liberty	Allegheny	2743 WASHINGTON BLVD, LIBERTY	2010	118	340	69.9	59.8	58.4	51.7	48.8	16.06		0
42-003-0064	1	0021	Liberty	Allegheny	2743 WASHINGTON BLVD, LIBERTY	2011	118	339	59.0	57.0	48.1	46.7	38.0	14.00		0
42-003-0064	2	0021	Liberty	Allegheny	2743 WASHINGTON BLVD, LIBERTY	2005	118	54	85.6	84.2	63.7	48.2	84.2	23.18*	Y	0
42-003-0064	2	0021	Liberty	Allegheny	2743 WASHINGTON BLVD, LIBERTY	2006	118	56	52.3	49.9	48.6	48.5	49.9	17.73	Y	0
42-003-0064	2	0021	Liberty	Allegheny	2743 WASHINGTON BLVD, LIBERTY	2007	118	57	56.9	49.3	42.7	41.0	49.3	19.60		0

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Nov. 15, 2012

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24-HOUR

SITE ID	POC	PQAO	CITY	COUNTY	ADDRESS	YEAR	METH	NUM CRED DAYS	1ST MAX	2ND MAX	3RD MAX	4TH MAX	98TH PERCENTILE VALUE	WTD ARITH MEAN	CERT	EDT
42-003-0064	2	0021	Liberty	Allegheny	2743 WASHINGTON BLVD, LIBERTY	2008	118	55	59.2	47.7	46.5	46.2	47.7	17.98		0
42-003-0064	2	0021	Liberty	Allegheny	2743 WASHINGTON BLVD, LIBERTY	2009	118	29	90.9	53.9	46.9	34.0	90.9	16.91		0
42-003-0064	2	0021	Liberty	Allegheny	2743 WASHINGTON BLVD, LIBERTY	2010	118	30	48.7	42.3	42.0	37.8	48.7	16.06		0
42-003-0064	2	0021	Liberty	Allegheny	2743 WASHINGTON BLVD, LIBERTY	2011	118	30	35.9	34.3	33.3	28.9	35.9	12.30		0
42-003-0067	1	0021	Not in a city	Allegheny	3640 OLD OAKDALE RD, SOUTH FAYETTE	1999	118	70	56.4	37.0	28.6	28.0	37.0	14.98*		0
42-003-0067	1	0021	Not in a city	Allegheny	3640 OLD OAKDALE RD, SOUTH FAYETTE	2000	118	77	34.2	32.0	32.0	30.7	32.0	14.09*		0
42-003-0067	1	0021	Not in a city	Allegheny	3640 OLD OAKDALE RD, SOUTH FAYETTE	2001	118	90	50.5	37.0	32.6	32.4	37.0	14.04*		0
42-003-0067	1	0021	Not in a city	Allegheny	3640 OLD OAKDALE RD, SOUTH FAYETTE	2002	118	97	49.7	47.6	37.0	31.6	47.6	12.31*	Y	0
42-003-0067	1	0021	Not in a city	Allegheny	3640 OLD OAKDALE RD, SOUTH FAYETTE	2003	118	98	52.0	42.1	37.7	29.9	42.1	13.23*	Y	0
42-003-0067	1	0021	Not in a city	Allegheny	3640 OLD OAKDALE RD, SOUTH FAYETTE	2004	118	95	47.2	42.2	35.6	30.3	42.2	13.00*	Y	0
42-003-0067	1	0021	Not in a city	Allegheny	3640 OLD OAKDALE RD, SOUTH FAYETTE	2005	118	109	48.9	37.0	34.1	32.8	34.1	14.22	Y	0

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Nov. 15, 2012

PM2.5 - Local Conditions (88101) Pennsylvania Micrograms/cubic meter (LC) (105)

24-HOUR

SITE ID	POC	PQAO	CITY	COUNTY	ADDRESS	YEAR	METH	NUM CRED DAYS	1ST MAX	2ND MAX	3RD MAX	4TH MAX	98TH PERCENTILE VALUE	WTD ARITH MEAN	CERT	EDT
42-003-0067	1	0021	Not in a city	Allegheny	3640 OLD OAKDALE RD, SOUTH FAYETTE	2006	118	97	29.3	28.6	28.0	27.8	28.6	11.14*	Y	0
42-003-0067	1	0021	Not in a city	Allegheny	3640 OLD OAKDALE RD, SOUTH FAYETTE	2007	118	97	43.6	42.4	40.7	37.6	42.4	13.47*		0
42-003-0067	1	0021	Not in a city	Allegheny	3640 OLD OAKDALE RD, SOUTH FAYETTE	2008	118	108	30.8	30.5	25.5	24.7	25.5	10.77		0
42-003-0067	1	0021	Not in a city	Allegheny	3640 OLD OAKDALE RD, SOUTH FAYETTE	2009	118	104	24.6	23.6	22.5	21.4	22.5	10.76		0
42-003-0067	1	0021	Not in a city	Allegheny	3640 OLD OAKDALE RD, SOUTH FAYETTE	2010	118	111	32.6	30.5	28.5	27.0	28.5	11.67		0
42-003-0067	1	0021	Not in a city	Allegheny	3640 OLD OAKDALE RD, SOUTH FAYETTE	2011	118	107	32.4	30.7	30.6	24.7	30.6	10.59		0
42-003-0093	1	0021	McCandless Township	Allegheny	KUMMER RD, GOLF CLUBHOUSE, NORTH PARK	1999	118	16	26.3	22.4	20.8	20.5	26.3	11.99*		0
42-003-0093	1	0021	McCandless Township	Allegheny	KUMMER RD, GOLF CLUBHOUSE, NORTH PARK	2000	118	43	33.9	32.8	31.7	29.7	33.9	14.49*		0
42-003-0093	1	0021	McCandless Township	Allegheny	KUMMER RD, GOLF CLUBHOUSE, NORTH PARK	2001	118	48	37.9	36.0	35.0	33.4	37.9	14.87*		0
42-003-0093	1	0021	McCandless Township	Allegheny	KUMMER RD, GOLF CLUBHOUSE,	2002	118	55	57.9	52.5	29.4	25.4	52.5	13.63	Y	0

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Nov. 15, 2012

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24-HOUR

SITE ID	POC	PQAO	CITY	COUNTY	ADDRESS	YEAR	METH	NUM CRED DAYS	1ST MAX	2ND MAX	3RD MAX	4TH MAX	98TH PERCENTILE VALUE	WTD ARITH MEAN	CERT	EDT
					NORTH PARK											
42-003-0093	1	0021	McCandless Township	Allegheny	KUMMER RD, GOLF CLUBHOUSE, NORTH PARK	2003	118	50	56.6	30.5	26.6	26.1	56.6	13.96*	Y	0
42-003-0093	1	0021	McCandless Township	Allegheny	KUMMER RD, GOLF CLUBHOUSE, NORTH PARK	2004	118	48	47.2	43.6	32.7	31.7	47.2	12.28*	Y	0
42-003-0093	1	0021	McCandless Township	Allegheny	KUMMER RD, GOLF CLUBHOUSE, NORTH PARK	2005	118	49	50.7	41.3	27.8	25.4	50.7	14.44*	Y	0
42-003-0093	1	0021	McCandless Township	Allegheny	KUMMER RD, GOLF CLUBHOUSE, NORTH PARK	2006	118	46	37.2	28.6	27.2	20.0	37.2	11.50*	Y	0
42-003-0093	1	0021	McCandless Township	Allegheny	KUMMER RD, GOLF CLUBHOUSE, NORTH PARK	2007	118	55	39.6	32.9	28.7	27.5	32.9	13.02		0
42-003-0093	1	0021	McCandless Township	Allegheny	KUMMER RD, GOLF CLUBHOUSE, NORTH PARK	2009	118	52	26.0	23.1	20.7	20.2	23.1	9.61*		0
42-003-0093	1	0021	McCandless Township	Allegheny	KUMMER RD, GOLF CLUBHOUSE, NORTH PARK	2010	118	52	28.4	26.5	20.6	20.1	26.5	10.51*		0
42-003-0093	1	0021	McCandless Township	Allegheny	KUMMER RD, GOLF CLUBHOUSE, NORTH PARK	2011	118	50	25.6	25.0	19.7	19.6	25.6	9.04*		0

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Nov. 15, 2012

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24-HOUR

SITE ID	POC	PQAO	CITY	COUNTY	ADDRESS	YEAR	METH	NUM CRED DAYS	1ST MAX	2ND MAX	3RD MAX	4TH MAX	98TH PERCENTILE VALUE	WTD ARITH MEAN	CERT	EDT
42-003-0095	1	0021	Coraopolis	Allegheny	1000 BEAVER GRADE RD CORAOPOLIS PA	1999	118	27	54.2	30.3	29.0	25.9	54.2	15.63*		0
42-003-0095	1	0021	Coraopolis	Allegheny	1000 BEAVER GRADE RD CORAOPOLIS PA	2000	118	35	31.1	27.5	25.5	22.4	31.1	13.38*		0
42-003-0095	1	0021	Coraopolis	Allegheny	1000 BEAVER GRADE RD CORAOPOLIS PA	2001	118	44	38.4	31.7	30.2	30.1	38.4	15.33*		0
42-003-0095	1	0021	Coraopolis	Allegheny	1000 BEAVER GRADE RD CORAOPOLIS PA	2002	118	55	50.0	46.2	30.2	29.3	46.2	13.63*	Y	0
42-003-0095	1	0021	Coraopolis	Allegheny	1000 BEAVER GRADE RD CORAOPOLIS PA	2003	118	53	53.7	38.6	30.2	28.3	38.6	15.71	Y	0
42-003-0095	1	0021	Coraopolis	Allegheny	1000 BEAVER GRADE RD CORAOPOLIS PA	2004	118	52	46.7	46.6	31.0	30.2	46.6	13.26	Y	0
42-003-0095	1	0021	Coraopolis	Allegheny	1000 BEAVER GRADE RD CORAOPOLIS PA	2005	118	56	45.2	37.0	27.9	27.7	37.0	14.67	Y	0
42-003-0095	1	0021	Coraopolis	Allegheny	1000 BEAVER GRADE RD CORAOPOLIS PA	2006	118	53	47.2	36.7	36.6	29.3	36.7	12.38	Y	0
42-003-0095	1	0021	Coraopolis	Allegheny	1000 BEAVER GRADE RD CORAOPOLIS PA	2007	118	56	40.7	32.8	28.8	28.2	32.8	13.64		0
42-003-0095	1	0021	Coraopolis	Allegheny	1000 BEAVER GRADE RD CORAOPOLIS PA	2009	118	51	19.6	19.6	18.6	17.5	19.6	9.43*		0
42-003-0095	1	0021	Coraopolis	Allegheny	1000 BEAVER GRADE RD CORAOPOLIS PA	2010	118	53	27.0	26.4	26.4	22.0	26.4	11.50*		0

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Nov. 15, 2012

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24-HOUR

SITE ID	POC	PQAO	CITY	COUNTY	ADDRESS	YEAR	METH	NUM CRED DAYS	1ST MAX	2ND MAX	3RD MAX	4TH MAX	98TH PERCENTILE VALUE	WTD ARITH MEAN	CERT	EDT
42-003-0097	1	0021	Not in a city	Allegheny	BEAVER ROAD LEETSDALE	1999	118	18	46.8	25.9	25.2	24.5	46.8	21.20*		0
42-003-0097	1	0021	Not in a city	Allegheny	BEAVER ROAD LEETSDALE	2000	118	38	39.3	32.2	27.3	27.0	39.3	15.22*		0
42-003-0116	1	0021	Stowe (Township of)	Allegheny	405 WHEELER AVE, MCKEES ROCKS, PA 15132	1999	118	83	60.1	50.0	34.2	32.8	50.0	16.99*		0
42-003-0116	1	0021	Stowe (Township of)	Allegheny	405 WHEELER AVE, MCKEES ROCKS, PA 15132	2000	118	87	35.7	33.2	32.0	31.3	33.2	15.39*		0
42-003-0116	1	0021	Stowe (Township of)	Allegheny	405 WHEELER AVE, MCKEES ROCKS, PA 15132	2001	118	98	53.2	51.7	44.5	37.6	51.7	15.59*		0
42-003-0116	1	0021	Stowe (Township of)	Allegheny	405 WHEELER AVE, MCKEES ROCKS, PA 15132	2002	118	100	40.5	38.4	36.4	33.1	38.4	14.20	Y	0
42-003-0116	1	0021	Stowe (Township of)	Allegheny	405 WHEELER AVE, MCKEES ROCKS, PA 15132	2003	118	104	59.9	45.9	42.9	37.8	42.9	15.28	Y	0
42-003-0116	1	0021	Stowe (Township of)	Allegheny	405 WHEELER AVE, MCKEES ROCKS, PA 15132	2004	118	106	57.6	47.9	45.5	40.4	45.5	14.68*	Y	0
42-003-0116	1	0021	Stowe (Township of)	Allegheny	405 WHEELER AVE, MCKEES ROCKS, PA 15132	2005	118	106	54.8	44.1	39.3	33.5	39.3	16.15	Y	0

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Nov. 15, 2012

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24-HOUR

SITE ID	POC	PQAO	CITY	COUNTY	ADDRESS	YEAR	METH	NUM CRED DAYS	1ST MAX	2ND MAX	3RD MAX	4TH MAX	98TH PERCENTILE VALUE	WTD ARITH MEAN	CERT	EDT
42-003-0131	1	0021	Not in a city	Allegheny	WAVE POOL,SOUTH PARK, SOUTH PARK TWP, PA	1999	118	24	67.4	36.0	33.4	31.4	67.4	17.93*		0
42-003-0131	1	0021	Not in a city	Allegheny	WAVE POOL,SOUTH PARK, SOUTH PARK TWP, PA	2000	118	48	36.4	33.2	32.7	31.7	36.4	14.48*		0
42-003-0131	1	0021	Not in a city	Allegheny	WAVE POOL,SOUTH PARK, SOUTH PARK TWP, PA	2001	118	50	40.6	35.3	33.3	32.2	40.6	14.85*		0
42-003-0131	1	0021	Not in a city	Allegheny	WAVE POOL,SOUTH PARK, SOUTH PARK TWP, PA	2002	118	51	48.6	33.0	27.3	25.5	33.0	13.51	Y	0
42-003-0131	1	0021	Not in a city	Allegheny	WAVE POOL,SOUTH PARK, SOUTH PARK TWP, PA	2003	118	6	16.2	12.1	11.4	10.7	16.2	9.98*	Y	0
42-003-0133	1	0021	Elizabeth	Allegheny	5118 DORRIS DRIVE, ELIZABETH	2003	118	49	53.9	35.6	29.9	28.9	53.9	14.44*	Y	0
42-003-0133	1	0021	Elizabeth	Allegheny	5118 DORRIS DRIVE, ELIZABETH	2004	118	58	61.1	36.1	35.6	33.5	36.1	13.52	Y	0
42-003-0133	1	0021	Elizabeth	Allegheny	5118 DORRIS DRIVE, ELIZABETH	2005	118	49	27.7	27.3	25.6	25.1	27.7	14.04*	Y	0
42-003-1008	1	0021	Harrison Township	Allegheny	PACIFIC & IDAHO AVE, HARRISON	1999	118	79	70.8	40.3	40.3	39.6	40.3	17.45*		0

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Nov. 15, 2012

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24-HOUR

SITE ID	POC	PQAO	CITY	COUNTY	ADDRESS	YEAR	METH	NUM CRED DAYS	1ST MAX	2ND MAX	3RD MAX	4TH MAX	98TH PERCENTILE VALUE	WTD ARITH MEAN	CERT	EDT
42-003-1008	1	0021	Harrison Township	Allegheny	PACIFIC & IDAHO AVE, HARRISON	2000	118	94	42.4	41.6	38.4	37.1	41.6	16.09*		0
42-003-1008	1	0021	Harrison Township	Allegheny	PACIFIC & IDAHO AVE, HARRISON	2001	118	90	60.2	48.1	39.9	38.9	48.1	16.11*		0
42-003-1008	1	0021	Harrison Township	Allegheny	PACIFIC & IDAHO AVE, HARRISON	2002	118	110	57.0	53.3	46.2	41.9	46.2	16.09	Y	0
42-003-1008	1	0021	Harrison Township	Allegheny	PACIFIC & IDAHO AVE, HARRISON	2003	118	106	55.9	44.5	41.9	36.5	41.9	15.50	Y	0
42-003-1008	1	0021	Harrison Township	Allegheny	PACIFIC & IDAHO AVE, HARRISON	2004	118	79	49.4	45.4	38.5	36.9	45.4	15.02*	Y	0
42-003-1008	1	0021	Harrison Township	Allegheny	PACIFIC & IDAHO AVE, HARRISON	2005	118	118	50.8	41.5	41.3	37.8	41.3	15.95	Y	0
42-003-1008	1	0021	Harrison Township	Allegheny	PACIFIC & IDAHO AVE, HARRISON	2006	118	103	44.4	38.9	37.8	31.3	37.8	14.03	Y	0
42-003-1008	1	0021	Harrison Township	Allegheny	PACIFIC & IDAHO AVE, HARRISON	2007	118	110	51.8	43.9	39.9	38.4	39.9	15.06		0
42-003-1008	1	0021	Harrison Township	Allegheny	PACIFIC & IDAHO AVE, HARRISON	2008	118	107	41.3	39.2	32.1	31.4	32.1	13.39		0
42-003-1008	1	0021	Harrison Township	Allegheny	PACIFIC & IDAHO AVE, HARRISON	2009	118	101	43.5	28.9	25.9	25.7	25.9	12.68*		0
42-003-1008	1	0021	Harrison Township	Allegheny	PACIFIC & IDAHO AVE, HARRISON	2010	118	111	39.7	35.8	34.0	30.0	34.0	13.01		0

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Nov. 15, 2012

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24-HOUR

SITE ID	POC	PQAO	CITY	COUNTY	ADDRESS	YEAR	METH	NUM CRED DAYS	1ST MAX	2ND MAX	3RD MAX	4TH MAX	98TH PERCENTILE VALUE	WTD ARITH MEAN	CERT	EDT
42-003-1008	1	0021	Harrison Township	Allegheny	PACIFIC & IDAHO AVE, HARRISON	2011	118	104	32.5	29.9	29.8	24.8	29.8	11.57*		0
42-003-1301	1	0021	North Braddock	Allegheny	600 ANDERSON ST, NORTH BRADDOCK	1999	118	77	68.9	39.7	38.8	36.1	39.7	17.69*		0
42-003-1301	1	0021	North Braddock	Allegheny	600 ANDERSON ST, NORTH BRADDOCK	2000	118	84	40.8	39.7	36.9	36.5	39.7	16.45*		0
42-003-1301	1	0021	North Braddock	Allegheny	600 ANDERSON ST, NORTH BRADDOCK	2001	118	97	57.2	51.7	44.7	41.7	51.7	17.09*		0
42-003-1301	1	0021	North Braddock	Allegheny	600 ANDERSON ST, NORTH BRADDOCK	2002	118	105	59.3	42.2	41.9	41.3	41.9	16.92	Y	0
42-003-1301	1	0021	North Braddock	Allegheny	600 ANDERSON ST, NORTH BRADDOCK	2003	118	100	65.3	50.4	38.3	36.0	50.4	16.80*	Y	0
42-003-1301	1	0021	North Braddock	Allegheny	600 ANDERSON ST, NORTH BRADDOCK	2004	118	102	54.8	44.2	38.3	37.0	38.3	15.79	Y	0
42-003-1301	1	0021	North Braddock	Allegheny	600 ANDERSON ST, NORTH BRADDOCK	2005	118	111	60.9	39.6	38.6	37.0	38.6	17.16	Y	0
42-003-1301	1	0021	North Braddock	Allegheny	600 ANDERSON ST, NORTH BRADDOCK	2006	118	104	41.5	40.0	38.1	36.4	38.1	15.03	Y	0
42-003-1301	1	0021	North Braddock	Allegheny	600 ANDERSON ST, NORTH BRADDOCK	2007	118	110	50.0	47.0	43.7	43.1	43.7	16.38		0
42-003-1301	1	0021	North Braddock	Allegheny	600 ANDERSON ST, NORTH BRADDOCK	2008	118	105	38.4	37.3	36.3	36.2	36.3	14.15		0

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Nov. 15, 2012

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24-HOUR

SITE ID	POC	PQAO	CITY	COUNTY	ADDRESS	YEAR	METH	NUM CRED DAYS	1ST MAX	2ND MAX	3RD MAX	4TH MAX	98TH PERCENTILE VALUE	WTD ARITH MEAN	CERT	EDT
42-003-1301	1	0021	North Braddock	Allegheny	600 ANDERSON ST, NORTH BRADDOCK	2009	118	108	32.0	31.7	30.7	27.3	30.7	12.12		0
42-003-1301	1	0021	North Braddock	Allegheny	600 ANDERSON ST, NORTH BRADDOCK	2010	118	106	40.6	39.1	37.2	30.0	37.2	13.71		0
42-003-1301	1	0021	North Braddock	Allegheny	600 ANDERSON ST, NORTH BRADDOCK	2011	118	100	35.5	33.7	33.2	29.2	33.7	12.27*		0
42-003-1301	2	0021	North Braddock	Allegheny	600 ANDERSON ST, NORTH BRADDOCK	2005	118	50	61.5	37.5	36.0	32.5	61.5	18.24*	Y	0
42-003-1301	2	0021	North Braddock	Allegheny	600 ANDERSON ST, NORTH BRADDOCK	2006	118	56	41.7	39.5	37.8	30.2	39.5	15.45	Y	0
42-003-1301	2	0021	North Braddock	Allegheny	600 ANDERSON ST, NORTH BRADDOCK	2007	118	53	42.5	35.4	33.5	31.5	35.4	16.73		0
42-003-1301	2	0021	North Braddock	Allegheny	600 ANDERSON ST, NORTH BRADDOCK	2008	118	56	38.5	37.7	36.3	30.9	37.7	14.21		0
42-003-3007	1	0021	Clairton	Allegheny	501 WADDELL AVE, CLAIRTON	2001	118	54	47.2	44.5	37.9	36.5	44.5	18.65*		0
42-003-3007	1	0021	Clairton	Allegheny	501 WADDELL AVE, CLAIRTON	2002	118	56	51.6	50.4	39.8	37.5	50.4	16.00	Y	0
42-003-3007	1	0021	Clairton	Allegheny	501 WADDELL AVE, CLAIRTON	2003	118	60	59.3	58.8	37.0	30.7	58.8	17.02	Y	0
42-003-3007	1	0021	Clairton	Allegheny	501 WADDELL AVE, CLAIRTON	2004	118	55	43.2	39.8	36.2	33.1	39.8	13.80	Y	0
42-003-3007	1	0021	Clairton	Allegheny	501 WADDELL AVE, CLAIRTON	2005	118	57	57.3	30.9	29.1	27.6	30.9	16.36	Y	0
42-003-3007	1	0021	Clairton	Allegheny	501 WADDELL	2006	118	59	38.7	35.8	29.1	28.4	35.8	14.49	Y	0

Note: The * indicates that the mean does not satisfy summary criteria.

Nov. 15, 2012

PM2.5 - Local Conditions (88101) Pennsylvania Micrograms/cubic meter (LC) (105)

24-HOUR

SITE ID	POC	PQAO	CITY	COUNTY	ADDRESS	YEAR	METH	NUM CRED DAYS	1ST MAX	2ND MAX	3RD MAX	4TH MAX	98TH PERCENTILE VALUE	WTD ARITH MEAN	CERT	EDT
					AVE, CLAIRTON											
42-003-3007	1	0021	Clairton	Allegheny	501 WADDELL AVE, CLAIRTON	2007	118	55	40.4	35.0	31.8	30.0	35.0	15.11		0
42-003-3007	1	0021	Clairton	Allegheny	501 WADDELL AVE, CLAIRTON	2008	118	58	40.6	34.6	30.7	29.3	34.6	13.32		0
42-003-3007	1	0021	Clairton	Allegheny	501 WADDELL AVE, CLAIRTON	2009	118	53	28.0	25.9	21.1	20.4	25.9	11.26		0
42-003-3007	1	0021	Clairton	Allegheny	501 WADDELL AVE, CLAIRTON	2010	118	55	37.0	28.2	25.7	23.2	28.2	12.47		0
42-003-3007	1	0021	Clairton	Allegheny	501 WADDELL AVE, CLAIRTON	2011	118	49	30.3	24.6	23.1	20.4	30.3	10.72*		0
42-003-9002	1	0021	Springdale	Allegheny	SPRINGDALE JR HIGH, COLFAX & BUTLER	1999	118	43	72.8	38.0	34.2	31.5	72.8	16.48*		0
42-003-9002	1	0021	Springdale	Allegheny	SPRINGDALE JR HIGH, COLFAX & BUTLER	2000	118	50	33.4	32.8	32.6	32.0	33.4	14.76		0
42-003-9002	1	0021	Springdale	Allegheny	SPRINGDALE JR HIGH, COLFAX & BUTLER	2001	118	50	41.9	33.4	32.7	32.6	41.9	14.84*		0
42-003-9002	1	0021	Springdale	Allegheny	SPRINGDALE JR HIGH, COLFAX & BUTLER	2002	118	55	56.7	52.8	34.3	28.8	52.8	13.92*	Y	0
42-003-9002	1	0021	Springdale	Allegheny	SPRINGDALE JR HIGH, COLFAX & BUTLER	2003	118	57	58.6	33.4	31.0	29.1	33.4	15.95	Y	0
42-003-9002	1	0021	Springdale	Allegheny	SPRINGDALE JR HIGH, COLFAX & BUTLER	2004	118	57	45.6	41.4	32.3	32.2	41.4	12.49	Y	0
42-003-9002	1	0021	Springdale	Allegheny	SPRINGDALE JR HIGH, COLFAX & BUTLER	2005	118	55	50.6	38.8	27.9	26.1	38.8	14.88	Y	0

Note: The * indicates that the mean does not satisfy summary criteria.

Nov. 15, 2012

METHODS USED IN THIS REPORT

PARAMETER	METHOD CODE	COLLECTION METHOD	ANALYSIS METHOD
88101	118	R & P Model 2025 PM2.5 Sequential w/WINS	GRAVIMETRIC
88101	170	Met One BAM-1020 Mass Monitor w/VSCC	Beta Attenuation

Note: The * indicates that the mean does not satisfy summary criteria.

Nov. 15, 2012

PQAOS USED IN THIS REPORT

PQAO	AGENCY DESCRIPTION
0021	Allegheny County,PA Health Department

Note: The * indicates that the mean does not satisfy summary criteria.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

User ID: IYY

DESIGN VALUE REPORT

Report Request ID: 1040947 Report Code: AMP480 Dec. 6, 2012

GEOGRAPHIC SELECTIONS

Tribal Code	State	County	Site	Parameter	POC	City	AQCR	UAR	CBSA	CSA	EPA Region	Method	Duration	Begin Date	End Date
	42	003		88101											

SELECTED OPTIONS

Option Type	Option Value
USER SITE METADATA	STREET ADDRESS
MERGE PDF FILES	YES
QUARTERLY DATA IN WORKFILE	NO
WORKFILE DELIMITER	,
SINGLE EVENT PROCESSING	EXCLUDE REGIONALLY CONCURRED EVENTS

GLOBAL DATES

Start Date	End Date
1999	2011

APPLICABLE STANDARDS

Standard Description
PM25 24-hour 2006
PM25 Annual 2006

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Dec. 6, 2012

Pollutant: Site-LevelPM2.5 - Local Conditions(88101)
Standard Units: Micrograms/cubic meter (LC)(105)
NAAQS Standard: PM25 24-hour 2006 / PM25 Annual 2006
Statistic: Annual Weighted Mean **Level:** 15
Statistic: Annual 98th Percentile **Level:** 35

Design Value Year: 1999

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

Site_ID / STREET ADDRESS	1999 Cred. Days	1999 Comp. Qrtrs	1999 98th Perctil	1999 Wtd. Mean	1999 Cert.	1998 Cred. Days	1998 Comp. Qrtrs	1998 98th Perctil	1998 Wtd. Mean	1998 Cert.	1997 Cred. Days	1997 Comp. Qrtrs	1997 98th Perctil	1997 Wtd. Mean	1997 Cert.	24-Hour Design Value	24-Hour Valid Ind.	Annual Design Value	Annual Valid Ind.
42-003-0008	61	1	31.7*	16.2	N				*					*		32	N	16.2	N
301 39TH ST, BLDG #7, LAWRENCEVILLE																			
42-003-0021	79	2	39.1	16.6	N				*					*		39	N	16.6	N
GLADSTONE HIGH SCHOOL																			
42-003-0064	190	0	49.3	18.8	N				*					*		49	N	18.8	N
2743 WASHINGTON BLVD, LIBERTY																			
42-003-0067	70	3	37.0	15.0*	N				*					*		37	N	15.0	N
3640 OLD OAKDALE RD, SOUTH FAYETTE																			
42-003-0093	16	0	26.3*	12.0*	N				*					*		26	N	12.0	N
KUMMER RD, GOLF CLUBHOUSE, NORTH PARK																			
42-003-0095	27	0	54.2	15.6*	N				*					*		54	N	15.6	N
1000 BEAVER GRADE RD CORAOPOLIS PA																			
42-003-0097	17	0	46.8	21.2*	N				*					*		47	N	21.2	N
BEAVER ROAD LEETSDALE																			
42-003-0116	83	2	50.0	17.0	N				*					*		50	N	17.0	N
405 WHEELER AVE, MCKEES ROCKS, PA 15132																			
42-003-0131	23	0	67.4	17.9*	N				*					*		67	N	17.9	N
WAVE POOL,SOUTH PARK, SOUTH PARK TWP, PA																			
42-003-1008	78	3	40.3	17.5	N				*					*		40	N	17.5	N
PACIFIC & IDAHO AVE, HARRISON																			
42-003-1301	77	2	39.7	17.7	N				*					*		40	N	17.7	N
600 ANDERSON ST, NORTH BRADDOCK																			
42-003-9002	43	1	72.8	16.5	N				*					*		73	N	16.5	N
SPRINGDALE JR HIGH, COLFAX & BUTLER																			

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Pollutant: Site-LevelPM2.5 - Local Conditions(88101)
Standard Units: Micrograms/cubic meter (LC)(105)
NAAQS Standard: PM25 24-hour 2006 / PM25 Annual 2006
Statistic: Annual Weighted Mean **Level:** 15
Statistic: Annual 98th Percentile **Level:** 35

Design Value Year: 2000

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

Site_ID / STREET ADDRESS	2000 Cred. Days	2000 Comp. Qrtrs	2000 98th Perctil	2000 Wtd. Mean	2000 Cert.	1999 Cred. Days	1999 Comp. Qrtrs	1999 98th Perctil	1999 Wtd. Mean	1999 Cert.	1998 Cred. Days	1998 Comp. Qrtrs	1998 98th Perctil	1998 Wtd. Mean	1998 Cert.	24-Hour Design Value	24-Hour Valid Ind.	Annual Design Value	Annual Valid Ind.
42-003-0008	255	3	34.1*	15.6	N	61	1	31.7*	16.2*	N				*		33	N	15.9	N
301 39TH ST, BLDG #7, LAWRENCEVILLE																			
42-003-0021	92	2	33.7*	14.8*	N	79	2	39.1	16.6	N				*		36	N	15.7	N
GLADSTONE HIGH SCHOOL																			
42-003-0064	328	4	64.2	20.9	N	190	0	49.3	18.8	N				*		57	N	19.9	N
2743 WASHINGTON BLVD, LIBERTY																			
42-003-0067	77	1	32.0*	14.1*	N	70	3	37.0	15.0*	N				*		35	N	14.5	N
3640 OLD OAKDALE RD, SOUTH FAYETTE																			
42-003-0093	43	2	33.9*	14.5*	N	16	0	26.3*	12.0*	N				*		30	N	13.2	N
KUMMER RD, GOLF CLUBHOUSE, NORTH PARK																			
42-003-0095	35	0	31.1*	13.4*	N	27	0	54.2	15.6*	N				*		43	N	14.5	N
1000 BEAVER GRADE RD CORAOPOLIS PA																			
42-003-0097	38	1	39.3	15.2*	N	17	0	46.8	21.2*	N				*		43	N	18.2	N
BEAVER ROAD LEETSDALE																			
42-003-0116	87	2	33.2*	15.4	N	83	2	50.0	17.0	N				*		42	N	16.2	N
405 WHEELER AVE, MCKEES ROCKS, PA 15132																			
42-003-0131	48	2	36.4	14.5*	N	23	0	67.4	17.9*	N				*		52	N	16.2	N
WAVE POOL,SOUTH PARK, SOUTH PARK TWP, PA																			
42-003-1008	94	2	41.6	16.1	N	78	3	40.3	17.5	N				*		41	N	16.8	N
PACIFIC & IDAHO AVE, HARRISON																			
42-003-1301	84	2	39.7	16.4	N	77	2	39.7	17.7	N				*		40	N	17.1	N
600 ANDERSON ST, NORTH BRADDOCK																			
42-003-9002	50	4	33.4	14.8	N	43	1	72.8	16.5	N				*		53	N	15.6	N
SPRINGDALE JR HIGH, COLFAX & BUTLER																			

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Pollutant: Site-LevelPM2.5 - Local Conditions(88101)
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Statistic: Annual Weighted Mean **Level:** 15
Statistic: Annual 98th Percentile **Level:** 35

Design Value Year: 2001

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

Site_ID / STREET ADDRESS	2001 Cred. Days	2001 Comp. Qrtrs	2001 98th Perctil	2001 Wtd. Mean	2001 Cert.	2000 Cred. Days	2000 Comp. Qrtrs	2000 98th Perctil	2000 Wtd. Mean	2000 Cert.	1999 Cred. Days	1999 Comp. Qrtrs	1999 98th Perctil	1999 Wtd. Mean	1999 Cert.	24-Hour Design Value	24-Hour Valid Ind.	Annual Design Value	Annual Valid Ind.
42-003-0008	341	4	41.7	16.6	N	255	3	34.1*	15.6	N	61	1	31.7*	16.2*	N	36	Y	16.1	N
301 39TH ST, BLDG #7, LAWRENCEVILLE																			
42-003-0021	97	2	56.3	15.8	N	92	2	33.7*	14.8*	N	79	2	39.1	16.6	N	43	Y	15.7	Y
GLADSTONE HIGH SCHOOL																			
42-003-0064	337	4	63.9	23.1	N	328	4	64.2	20.9	N	190	0	49.3	18.8	N	59	Y	20.9	Y
2743 WASHINGTON BLVD, LIBERTY																			
42-003-0067	90	2	37.0	14.0*	N	77	1	32.0*	14.1*	N	70	3	37.0	15.0*	N	35	N	14.4	N
3640 OLD OAKDALE RD, SOUTH FAYETTE																			
42-003-0093	48	2	37.9	14.9*	N	43	2	33.9*	14.5*	N	16	0	26.3*	12.0*	N	33	N	13.8	N
KUMMER RD, GOLF CLUBHOUSE, NORTH PARK																			
42-003-0095	44	2	38.4	15.3*	N	35	0	31.1*	13.4*	N	27	0	54.2	15.6*	N	41	Y	14.8	N
1000 BEAVER GRADE RD CORAOPOLIS PA																			
42-003-0097				*		38	1	39.3	15.2*	N	17	0	46.8	21.2*	N	43	N	18.2	N
BEAVER ROAD LEETSDALE																			
42-003-0116	98	3	51.7	15.6	N	87	2	33.2*	15.4	N	83	2	50.0	17.0	N	45	Y	16.0	Y
405 WHEELER AVE, MCKEES ROCKS, PA 15132																			
42-003-0131	50	2	40.6	14.8*	N	48	2	36.4	14.5*	N	23	0	67.4	17.9*	N	48	Y	15.8	N
WAVE POOL,SOUTH PARK, SOUTH PARK TWP, PA																			
42-003-1008	90	1	48.1	16.1	N	94	2	41.6	16.1	N	78	3	40.3	17.5	N	43	Y	16.6	Y
PACIFIC & IDAHO AVE, HARRISON																			
42-003-1301	97	2	51.7	17.1	N	84	2	39.7	16.4	N	77	2	39.7	17.7	N	44	Y	17.1	Y
600 ANDERSON ST, NORTH BRADDOCK																			
42-003-3007	54	3	44.5	18.7	N				*					*		45	N	18.7	N
501 WADDELL AVE, CLAIRTON																			

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Dec. 6, 2012

Pollutant: Site-LevelPM2.5 - Local Conditions(88101)
Standard Units: Micrograms/cubic meter (LC)(105)
NAAQS Standard: PM25 24-hour 2006 / PM25 Annual 2006
Statistic: Annual Weighted Mean **Level:** 15
Statistic: Annual 98th Percentile **Level:** 35

Design Value Year: 2001

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

Site_ID / STREET ADDRESS	2001 Cred. Days	2001 Comp. Qrtrs	2001 98th Perctil	2001 Wtd. Mean	2001 Cert.	2000 Cred. Days	2000 Comp. Qrtrs	2000 98th Perctil	2000 Wtd. Mean	2000 Cert.	1999 Cred. Days	1999 Comp. Qrtrs	1999 98th Perctil	1999 Wtd. Mean	1999 Cert.	24-Hour Design Value	24-Hour Valid Ind.	Annual Design Value	Annual Valid Ind.
42-003-9002	50	3	41.9	14.8*	N	50	4	33.4	14.8	N	43	1	72.8	16.5	N	49	Y	15.4	N
SPRINGDALE JR HIGH, COLFAX & BUTLER																			

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Pollutant: Site-LevelPM2.5 - Local Conditions(88101)
Standard Units: Micrograms/cubic meter (LC)(105)
NAAQS Standard: PM25 24-hour 2006 / PM25 Annual 2006
Statistic: Annual Weighted Mean **Level:** 15
Statistic: Annual 98th Percentile **Level:** 35

Design Value Year: 2002

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

Site_ID / STREET ADDRESS	2002 Cred. Days	2002 Comp. Qrtrs	2002 98th Perctil	2002 Wtd. Mean	2002 Cert.	2001 Cred. Days	2001 Comp. Qrtrs	2001 98th Perctil	2001 Wtd. Mean	2001 Cert.	2000 Cred. Days	2000 Comp. Qrtrs	2000 98th Perctil	2000 Wtd. Mean	2000 Cert.	24-Hour Design Value	24-Hour Valid Ind.	Annual Design Value	Annual Valid Ind.
42-003-0008	347	4	41.4	15.3	Y	341	4	41.7	16.6	N	255	3	34.1*	15.6	N	39	Y	15.8	Y
301 39TH ST, BLDG #7, LAWRENCEVILLE																			
42-003-0021	105	4	40.2	14.5	Y	97	2	56.3	15.8	N	92	2	33.7*	14.8*	N	43	Y	15.1	Y
GLADSTONE HIGH SCHOOL																			
42-003-0064	355	4	59.9	20.3	Y	337	4	63.9	23.1	N	328	4	64.2	20.9	N	63	Y	21.4	Y
2743 WASHINGTON BLVD, LIBERTY																			
42-003-0067	97	3	47.6	12.3*	Y	90	2	37.0	14.0*	N	77	1	32.0*	14.1*	N	39	Y	13.5	N
3640 OLD OAKDALE RD, SOUTH FAYETTE																			
42-003-0093	55	4	52.5	13.6	Y	48	2	37.9	14.9*	N	43	2	33.9*	14.5*	N	41	Y	14.3	N
KUMMER RD, GOLF CLUBHOUSE, NORTH PARK																			
42-003-0095	55	3	46.2	13.6*	Y	44	2	38.4	15.3*	N	35	0	31.1*	13.4*	N	39	Y	14.1	N
1000 BEAVER GRADE RD CORAOPOLIS PA																			
42-003-0097				*					*		38	1	39.3	15.2*	N	39	N	15.2	N
BEAVER ROAD LEETSDALE																			
42-003-0116	100	4	38.4	14.2	Y	98	3	51.7	15.6	N	87	2	33.2*	15.4	N	41	Y	15.1	Y
405 WHEELER AVE, MCKEES ROCKS, PA 15132																			
42-003-0131	51	4	33.0	13.5	Y	50	2	40.6	14.8*	N	48	2	36.4	14.5*	N	37	Y	14.3	N
WAVE POOL,SOUTH PARK, SOUTH PARK TWP, PA																			
42-003-1008	110	4	46.2	16.1	Y	90	1	48.1	16.1	N	94	2	41.6	16.1	N	45	Y	16.1	Y
PACIFIC & IDAHO AVE, HARRISON																			
42-003-1301	105	4	41.9	16.9	Y	97	2	51.7	17.1	N	84	2	39.7	16.4	N	44	Y	16.8	Y
600 ANDERSON ST, NORTH BRADDOCK																			
42-003-3007	56	4	50.4	16.0	Y	54	3	44.5	18.7	N				*		47	N	17.3	N
501 WADDELL AVE, CLAIRTON																			

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Dec. 6, 2012

Pollutant: Site-LevelPM2.5 - Local Conditions(88101)
Standard Units: Micrograms/cubic meter (LC)(105)
NAAQS Standard: PM25 24-hour 2006 / PM25 Annual 2006
Statistic: Annual Weighted Mean **Level:** 15
Statistic: Annual 98th Percentile **Level:** 35

Design Value Year: 2002

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

Site_ID / STREET ADDRESS	2002 Cred. Days	2002 Comp. Qrtrs	2002 98th Perctil	2002 Wtd. Mean	2002 Cert.	2001 Cred. Days	2001 Comp. Qrtrs	2001 98th Perctil	2001 Wtd. Mean	2001 Cert.	2000 Cred. Days	2000 Comp. Qrtrs	2000 98th Perctil	2000 Wtd. Mean	2000 Cert.	24-Hour Design Value	24-Hour Valid Ind.	Annual Design Value	Annual Valid Ind.
42-003-9002	55	3	52.8	13.9*	Y	50	3	41.9	14.8*	N	50	4	33.4	14.8	N	43	Y	14.5	N
SPRINGDALE JR HIGH, COLFAX & BUTLER																			

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
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3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Site-LevelPM2.5 - Local Conditions(88101)
Standard Units: Micrograms/cubic meter (LC)(105)
NAAQS Standard: PM25 24-hour 2006 / PM25 Annual 2006
Statistic: Annual Weighted Mean **Level:** 15
Statistic: Annual 98th Percentile **Level:** 35

Design Value Year: 2003

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

Site_ID / STREET ADDRESS	2003 Cred. Days	2003 Comp. Qrtrs	2003 98th Perctil	2003 Wtd. Mean	2003 Cert.	2002 Cred. Days	2002 Comp. Qrtrs	2002 98th Perctil	2002 Wtd. Mean	2002 Cert.	2001 Cred. Days	2001 Comp. Qrtrs	2001 98th Perctil	2001 Wtd. Mean	2001 Cert.	24-Hour Design Value	24-Hour Valid Ind.	Annual Design Value	Annual Valid Ind.
42-003-0008	352	4	35.9	15.2	Y	347	4	41.4	15.3	Y	341	4	41.7	16.6	N	40	Y	15.7	Y
301 39TH ST, BLDG #7, LAWRENCEVILLE																			
42-003-0021	104	4	30.7	14.6	Y	105	4	40.2	14.5	Y	97	2	56.3	15.8	N	42	Y	15.0	Y
GLADSTONE HIGH SCHOOL																			
42-003-0064	359	4	66.6	20.2	Y	355	4	59.9	20.3	Y	337	4	63.9	23.1	N	63	Y	21.2	Y
2743 WASHINGTON BLVD, LIBERTY																			
42-003-0067	98	3	42.1	13.2*	Y	97	3	47.6	12.3*	Y	90	2	37.0	14.0*	N	42	Y	13.2	N
3640 OLD OAKDALE RD, SOUTH FAYETTE																			
42-003-0093	50	3	56.6	14.0*	Y	55	4	52.5	13.6	Y	48	2	37.9	14.9*	N	49	Y	14.2	N
KUMMER RD, GOLF CLUBHOUSE, NORTH PARK																			
42-003-0095	53	4	38.6	15.7	Y	55	3	46.2	13.6*	Y	44	2	38.4	15.3*	N	41	Y	14.9	N
1000 BEAVER GRADE RD CORAOPOLIS PA																			
42-003-0116	104	4	42.9	15.3	Y	100	4	38.4	14.2	Y	98	3	51.7	15.6	N	44	Y	15.0	Y
405 WHEELER AVE, MCKEES ROCKS, PA 15132																			
42-003-0131	6	1	16.2*	10.0*	Y	51	4	33.0	13.5	Y	50	2	40.6	14.8*	N	30	N	12.8	N
WAVE POOL,SOUTH PARK, SOUTH PARK TWP, PA																			
42-003-0133	49	4	53.9	14.4	Y				*					*		54	N	14.4	N
5118 DORRIS DRIVE, ELIZABETH																			
42-003-1008	106	4	41.9	15.5	Y	110	4	46.2	16.1	Y	90	1	48.1	16.1	N	45	Y	15.9	Y
PACIFIC & IDAHO AVE, HARRISON																			
42-003-1301	100	3	50.4	16.8	Y	105	4	41.9	16.9	Y	97	2	51.7	17.1	N	48	Y	16.9	Y
600 ANDERSON ST, NORTH BRADDOCK																			
42-003-3007	60	4	58.8	17.0	Y	56	4	50.4	16.0	Y	54	3	44.5	18.7	N	51	Y	17.2	Y
501 WADDELL AVE, CLAIRTON																			

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Dec. 6, 2012

Pollutant: Site-LevelPM2.5 - Local Conditions(88101)
Standard Units: Micrograms/cubic meter (LC)(105)
NAAQS Standard: PM25 24-hour 2006 / PM25 Annual 2006
Statistic: Annual Weighted Mean **Level:** 15
Statistic: Annual 98th Percentile **Level:** 35

Design Value Year: 2003

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

Site_ID / STREET ADDRESS	2003 Cred. Days	2003 Comp. Qrtrs	2003 98th Perctil	2003 Wtd. Mean	2003 Cert.	2002 Cred. Days	2002 Comp. Qrtrs	2002 98th Perctil	2002 Wtd. Mean	2002 Cert.	2001 Cred. Days	2001 Comp. Qrtrs	2001 98th Perctil	2001 Wtd. Mean	2001 Cert.	24-Hour Design Value	24-Hour Valid Ind.	Annual Design Value	Annual Valid Ind.
42-003-9002	57	4	33.4	16.0	Y	55	3	52.8	13.9*	Y	50	3	41.9	14.8*	N	43	Y	14.9	N
SPRINGDALE JR HIGH, COLFAX & BUTLER																			

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
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Pollutant: Site-LevelPM2.5 - Local Conditions(88101)
Standard Units: Micrograms/cubic meter (LC)(105)
NAAQS Standard: PM25 24-hour 2006 / PM25 Annual 2006
Statistic: Annual Weighted Mean **Level:** 15
Statistic: Annual 98th Percentile **Level:** 35

Design Value Year: 2004

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

Site_ID / STREET ADDRESS	2004 Cred. Days	2004 Comp. Qrtrs	2004 98th Perctil	2004 Wtd. Mean	2004 Cert.	2003 Cred. Days	2003 Comp. Qrtrs	2003 98th Perctil	2003 Wtd. Mean	2003 Cert.	2002 Cred. Days	2002 Comp. Qrtrs	2002 98th Perctil	2002 Wtd. Mean	2002 Cert.	24-Hour Design Value	24-Hour Valid Ind.	Annual Design Value	Annual Valid Ind.
42-003-0008	348	4	38.3	15.5	Y	352	4	35.9	15.2	Y	347	4	41.4	15.3	Y	39	Y	15.3	Y
301 39TH ST, BLDG #7, LAWRENCEVILLE																			
42-003-0021	102	4	39.7	14.1	Y	104	4	30.7	14.6	Y	105	4	40.2	14.5	Y	37	Y	14.4	Y
GLADSTONE HIGH SCHOOL																			
42-003-0064	350	4	68.5	20.7	Y	359	4	66.6	20.2	Y	355	4	59.9	20.3	Y	65	Y	20.4	Y
2743 WASHINGTON BLVD, LIBERTY																			
42-003-0067	95	2	42.2	13.0*	Y	98	3	42.1	13.2*	Y	97	3	47.6	12.3*	Y	44	Y	12.8	N
3640 OLD OAKDALE RD, SOUTH FAYETTE																			
42-003-0093	48	2	47.2	12.3*	Y	50	3	56.6	14.0*	Y	55	4	52.5	13.6	Y	52	Y	13.3	N
KUMMER RD, GOLF CLUBHOUSE, NORTH PARK																			
42-003-0095	52	4	46.6	13.3	Y	53	4	38.6	15.7	Y	55	3	46.2	13.6*	Y	44	Y	14.2	N
1000 BEAVER GRADE RD CORAOPOLIS PA																			
42-003-0116	106	3	45.5	14.7*	Y	104	4	42.9	15.3	Y	100	4	38.4	14.2	Y	42	Y	14.7	N
405 WHEELER AVE, MCKEES ROCKS, PA 15132																			
42-003-0131				*		6	1	16.2*	10.0*	Y	51	4	33.0	13.5	Y	25	N	11.7	N
WAVE POOL,SOUTH PARK, SOUTH PARK TWP, PA																			
42-003-0133	58	4	36.1	13.5	Y	49	4	53.9	14.4	Y				*		45	N	14.0	N
5118 DORRIS DRIVE, ELIZABETH																			
42-003-1008	79	1	45.4	15.0*	Y	106	4	41.9	15.5	Y	110	4	46.2	16.1	Y	45	Y	15.5	Y
PACIFIC & IDAHO AVE, HARRISON																			
42-003-1301	102	4	38.3	15.8	Y	100	3	50.4	16.8	Y	105	4	41.9	16.9	Y	44	Y	16.5	Y
600 ANDERSON ST, NORTH BRADDOCK																			
42-003-3007	55	4	39.8	13.8	Y	60	4	58.8	17.0	Y	56	4	50.4	16.0	Y	50	Y	15.6	Y
501 WADDELL AVE, CLAIRTON																			

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Dec. 6, 2012

Pollutant: Site-LevelPM2.5 - Local Conditions(88101)
Standard Units: Micrograms/cubic meter (LC)(105)
NAAQS Standard: PM25 24-hour 2006 / PM25 Annual 2006
Statistic: Annual Weighted Mean **Level:** 15
Statistic: Annual 98th Percentile **Level:** 35

Design Value Year: 2004

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

Site_ID / STREET ADDRESS	2004 Cred. Days	2004 Comp. Qrtrs	2004 98th Perctil	2004 Wtd. Mean	2004 Cert.	2003 Cred. Days	2003 Comp. Qrtrs	2003 98th Perctil	2003 Wtd. Mean	2003 Cert.	2002 Cred. Days	2002 Comp. Qrtrs	2002 98th Perctil	2002 Wtd. Mean	2002 Cert.	24-Hour Design Value	24-Hour Valid Ind.	Annual Design Value	Annual Valid Ind.
42-003-9002	57	4	41.4	12.5	Y	57	4	33.4	16.0	Y	55	3	52.8	13.9*	Y	43	Y	14.1	N
SPRINGDALE JR HIGH, COLFAX & BUTLER																			

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Site-LevelPM2.5 - Local Conditions(88101)
Standard Units: Micrograms/cubic meter (LC)(105)
NAAQS Standard: PM25 24-hour 2006 / PM25 Annual 2006
Statistic: Annual Weighted Mean **Level:** 15
Statistic: Annual 98th Percentile **Level:** 35

Design Value Year: 2005

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

Site_ID / STREET ADDRESS	2005 Cred. Days	2005 Comp. Qrtrs	2005 98th Perctil	2005 Wtd. Mean	2005 Cert.	2004 Cred. Days	2004 Comp. Qrtrs	2004 98th Perctil	2004 Wtd. Mean	2004 Cert.	2003 Cred. Days	2003 Comp. Qrtrs	2003 98th Perctil	2003 Wtd. Mean	2003 Cert.	24-Hour Design Value	24-Hour Valid Ind.	Annual Design Value	Annual Valid Ind.
42-003-0008	360	4	42.5	15.8	Y	348	4	38.3	15.5	Y	352	4	35.9	15.2	Y	39	Y	15.5	Y
301 39TH ST, BLDG #7, LAWRENCEVILLE																			
42-003-0021	112	4	35.1	15.3	Y	102	4	39.7	14.1	Y	104	4	30.7	14.6	Y	35	Y	14.7	Y
GLADSTONE HIGH SCHOOL																			
42-003-0064	356	4	69.6	21.4	Y	350	4	68.5	20.7	Y	359	4	66.6	20.2	Y	68	Y	20.8	Y
2743 WASHINGTON BLVD, LIBERTY																			
42-003-0067	109	4	34.1	14.2	Y	95	2	42.2	13.0*	Y	98	3	42.1	13.2*	Y	39	Y	13.5	N
3640 OLD OAKDALE RD, SOUTH FAYETTE																			
42-003-0093	49	3	50.7	14.4*	Y	48	2	47.2	12.3*	Y	50	3	56.6	14.0*	Y	52	Y	13.6	N
KUMMER RD, GOLF CLUBHOUSE, NORTH PARK																			
42-003-0095	56	4	37.0	14.7	Y	52	4	46.6	13.3	Y	53	4	38.6	15.7	Y	41	Y	14.5	Y
1000 BEAVER GRADE RD CORAOPOLIS PA																			
42-003-0116	106	4	39.3	16.1	Y	106	3	45.5	14.7*	Y	104	4	42.9	15.3	Y	43	Y	15.4	Y
405 WHEELER AVE, MCKEES ROCKS, PA 15132																			
42-003-0131				*					*		6	1	16.2*	10.0*	Y	16	N	10.0	N
WAVE POOL,SOUTH PARK, SOUTH PARK TWP, PA																			
42-003-0133	49	4	27.7	14.0	Y	58	4	36.1	13.5	Y	49	4	53.9	14.4	Y	39	Y	14.0	Y
5118 DORRIS DRIVE, ELIZABETH																			
42-003-1008	118	4	41.3	16.0	Y	79	1	45.4	15.0*	Y	106	4	41.9	15.5	Y	43	Y	15.5	Y
PACIFIC & IDAHO AVE, HARRISON																			
42-003-1301	113	4	38.6	17.1	Y	102	4	38.3	15.8	Y	100	3	50.4	16.8	Y	42	Y	16.6	Y
600 ANDERSON ST, NORTH BRADDOCK																			
42-003-3007	57	4	30.9	16.4	Y	55	4	39.8	13.8	Y	60	4	58.8	17.0	Y	43	Y	15.7	Y
501 WADDELL AVE, CLAIRTON																			

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Dec. 6, 2012

Pollutant: Site-LevelPM2.5 - Local Conditions(88101)
Standard Units: Micrograms/cubic meter (LC)(105)
NAAQS Standard: PM25 24-hour 2006 / PM25 Annual 2006
Statistic: Annual Weighted Mean **Level:** 15
Statistic: Annual 98th Percentile **Level:** 35

Design Value Year: 2005

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

Site_ID / STREET ADDRESS	2005 Cred. Days	2005 Comp. Qrtrs	2005 98th Perctil	2005 Wtd. Mean	2005 Cert.	2004 Cred. Days	2004 Comp. Qrtrs	2004 98th Perctil	2004 Wtd. Mean	2004 Cert.	2003 Cred. Days	2003 Comp. Qrtrs	2003 98th Perctil	2003 Wtd. Mean	2003 Cert.	24-Hour Design Value	24-Hour Valid Ind.	Annual Design Value	Annual Valid Ind.
42-003-9002	55	4	38.8	14.9	Y	57	4	41.4	12.5	Y	57	4	33.4	16.0	Y	38	Y	14.4	Y
SPRINGDALE JR HIGH, COLFAX & BUTLER																			

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Site-LevelPM2.5 - Local Conditions(88101)
Standard Units: Micrograms/cubic meter (LC)(105)
NAAQS Standard: PM25 24-hour 2006 / PM25 Annual 2006
Statistic: Annual Weighted Mean **Level:** 15
Statistic: Annual 98th Percentile **Level:** 35

Design Value Year: 2006

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

Site_ID / STREET ADDRESS	2006 Cred. Days	2006 Comp. Qrtrs	2006 98th Perctil	2006 Wtd. Mean	2006 Cert.	2005 Cred. Days	2005 Comp. Qrtrs	2005 98th Perctil	2005 Wtd. Mean	2005 Cert.	2004 Cred. Days	2004 Comp. Qrtrs	2004 98th Perctil	2004 Wtd. Mean	2004 Cert.	24-Hour Design Value	24-Hour Valid Ind.	Annual Design Value	Annual Valid Ind.
42-003-0008	357	4	37.6	14.4	Y	360	4	42.5	15.8	Y	348	4	38.3	15.5	Y	39	Y	15.2	Y
301 39TH ST, BLDG #7, LAWRENCEVILLE																			
42-003-0021				*		112	4	35.1	15.3	Y	102	4	39.7	14.1	Y	37	N	14.7	N
GLADSTONE HIGH SCHOOL																			
42-003-0064	351	4	55.7	19.1	Y	356	4	69.6	21.4	Y	350	4	68.5	20.7	Y	65	Y	20.4	Y
2743 WASHINGTON BLVD, LIBERTY																			
42-003-0067	97	3	28.6*	11.1*	Y	109	4	34.1	14.2	Y	95	2	42.2	13.0*	Y	35	N	12.8	N
3640 OLD OAKDALE RD, SOUTH FAYETTE																			
42-003-0093	46	3	37.2	11.5*	Y	49	3	50.7	14.4*	Y	48	2	47.2	12.3*	Y	45	Y	12.7	N
KUMMER RD, GOLF CLUBHOUSE, NORTH PARK																			
42-003-0095	53	4	36.7	12.4	Y	56	4	37.0	14.7	Y	52	4	46.6	13.3	Y	40	Y	13.4	Y
1000 BEAVER GRADE RD CORAOPOLIS PA																			
42-003-0116				*		106	4	39.3	16.1	Y	106	3	45.5	14.7*	Y	42	N	15.4	N
405 WHEELER AVE, MCKEES ROCKS, PA 15132																			
42-003-0133				*		49	4	27.7	14.0	Y	58	4	36.1	13.5	Y	32	N	13.8	N
5118 DORRIS DRIVE, ELIZABETH																			
42-003-1008	103	4	37.8	14.0	Y	118	4	41.3	16.0	Y	79	1	45.4	15.0*	Y	42	Y	15.0	N
PACIFIC & IDAHO AVE, HARRISON																			
42-003-1301	112	4	38.1	15.0	Y	113	4	38.6	17.1	Y	102	4	38.3	15.8	Y	38	Y	16.0	Y
600 ANDERSON ST, NORTH BRADDOCK																			
42-003-3007	59	4	35.8	14.5	Y	57	4	30.9	16.4	Y	55	4	39.8	13.8	Y	36	Y	14.9	Y
501 WADDELL AVE, CLAIRTON																			
42-003-9002				*		55	4	38.8	14.9	Y	57	4	41.4	12.5	Y	40	N	13.7	N
SPRINGDALE JR HIGH, COLFAX & BUTLER																			

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Site-LevelPM2.5 - Local Conditions(88101)
Standard Units: Micrograms/cubic meter (LC)(105)
NAAQS Standard: PM25 24-hour 2006 / PM25 Annual 2006
Statistic: Annual Weighted Mean **Level:** 15
Statistic: Annual 98th Percentile **Level:** 35

Design Value Year: 2007

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

Site_ID / STREET ADDRESS	2007 Cred. Days	2007 Comp. Qrtrs	2007 98th Perctil	2007 Wtd. Mean	2007 Cert.	2006 Cred. Days	2006 Comp. Qrtrs	2006 98th Perctil	2006 Wtd. Mean	2006 Cert.	2005 Cred. Days	2005 Comp. Qrtrs	2005 98th Perctil	2005 Wtd. Mean	2005 Cert.	24-Hour Design Value	24-Hour Valid Ind.	Annual Design Value	Annual Valid Ind.
42-003-0008	346	4	39.8	14.9	N	357	4	37.6	14.4	Y	360	4	42.5	15.8	Y	40	Y	15.0	Y
301 39TH ST, BLDG #7, LAWRENCEVILLE																			
42-003-0021				*					*		112	4	35.1	15.3	Y	35	N	15.3	N
GLADSTONE HIGH SCHOOL																			
42-003-0064	359	4	54.7	18.9	N	351	4	55.7	19.1	Y	356	4	69.6	21.4	Y	60	Y	19.8	Y
2743 WASHINGTON BLVD, LIBERTY																			
42-003-0067	97	3	42.4	13.5*	N	97	3	28.6*	11.1*	Y	109	4	34.1	14.2	Y	35	N	12.9	N
3640 OLD OAKDALE RD, SOUTH FAYETTE																			
42-003-0093	55	4	32.9	13.0	N	46	3	37.2	11.5*	Y	49	3	50.7	14.4*	Y	40	Y	13.0	N
KUMMER RD, GOLF CLUBHOUSE, NORTH PARK																			
42-003-0095	56	4	32.8	13.6	N	53	4	36.7	12.4	Y	56	4	37.0	14.7	Y	36	Y	13.6	Y
1000 BEAVER GRADE RD CORAOPOLIS PA																			
42-003-0116				*					*		106	4	39.3	16.1	Y	39	N	16.1	N
405 WHEELER AVE, MCKEES ROCKS, PA 15132																			
42-003-0133				*					*		49	4	27.7	14.0	Y	28	N	14.0	N
5118 DORRIS DRIVE, ELIZABETH																			
42-003-1008	110	4	39.9	15.1	N	103	4	37.8	14.0	Y	118	4	41.3	16.0	Y	40	Y	15.0	Y
PACIFIC & IDAHO AVE, HARRISON																			
42-003-1301	112	4	43.7	16.6	N	112	4	38.1	15.0	Y	113	4	38.6	17.1	Y	40	Y	16.2	Y
600 ANDERSON ST, NORTH BRADDOCK																			
42-003-3007	55	4	35.0	15.1	N	59	4	35.8	14.5	Y	57	4	30.9	16.4	Y	34	Y	15.3	Y
501 WADDELL AVE, CLAIRTON																			
42-003-9002				*					*		55	4	38.8	14.9	Y	39	N	14.9	N
SPRINGDALE JR HIGH, COLFAX & BUTLER																			

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Site-LevelPM2.5 - Local Conditions(88101)
Standard Units: Micrograms/cubic meter (LC)(105)
NAAQS Standard: PM25 24-hour 2006 / PM25 Annual 2006
Statistic: Annual Weighted Mean **Level:** 15
Statistic: Annual 98th Percentile **Level:** 35

Design Value Year: 2008

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

Site_ID / STREET ADDRESS	2008 Cred. Days	2008 Comp. Qrtrs	2008 98th Perctil	2008 Wtd. Mean	2008 Cert.	2007 Cred. Days	2007 Comp. Qrtrs	2007 98th Perctil	2007 Wtd. Mean	2007 Cert.	2006 Cred. Days	2006 Comp. Qrtrs	2006 98th Perctil	2006 Wtd. Mean	2006 Cert.	24-Hour Design Value	24-Hour Valid Ind.	Annual Design Value	Annual Valid Ind.
42-003-0008	353	4	30.3	12.9	N	346	4	39.8	14.9	N	357	4	37.6	14.4	Y	36	Y	14.0	Y
301 39TH ST, BLDG #7, LAWRENCEVILLE																			
42-003-0064	358	4	50.0	17.0	N	359	4	54.7	18.9	N	351	4	55.7	19.1	Y	53	Y	18.3	Y
2743 WASHINGTON BLVD, LIBERTY																			
42-003-0067	108	4	25.5	10.8	N	97	3	42.4	13.5*	N	97	3	28.6*	11.1*	Y	32	N	11.8	N
3640 OLD OAKDALE RD, SOUTH FAYETTE																			
42-003-0093				*		55	4	32.9	13.0	N	46	3	37.2	11.5*	Y	35	N	12.3	N
KUMMER RD, GOLF CLUBHOUSE, NORTH PARK																			
42-003-0095				*		56	4	32.8	13.6	N	53	4	36.7	12.4	Y	35	N	13.0	N
1000 BEAVER GRADE RD CORAOPOLIS PA																			
42-003-1008	107	4	32.1	13.4	N	110	4	39.9	15.1	N	103	4	37.8	14.0	Y	37	Y	14.2	Y
PACIFIC & IDAHO AVE, HARRISON																			
42-003-1301	109	4	36.3	14.1	N	112	4	43.7	16.6	N	112	4	38.1	15.0	Y	39	Y	15.2	Y
600 ANDERSON ST, NORTH BRADDOCK																			
42-003-3007	58	4	34.6	13.3	N	55	4	35.0	15.1	N	59	4	35.8	14.5	Y	35	Y	14.3	Y
501 WADDELL AVE, CLAIRTON																			

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Site-LevelPM2.5 - Local Conditions(88101)
Standard Units: Micrograms/cubic meter (LC)(105)
NAAQS Standard: PM25 24-hour 2006 / PM25 Annual 2006
Statistic: Annual Weighted Mean **Level:** 15
Statistic: Annual 98th Percentile **Level:** 35

Design Value Year: 2009

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

Site_ID / STREET ADDRESS	2009 Cred. Days	2009 Comp. Qrtrs	2009 98th Perctil	2009 Wtd. Mean	2009 Cert.	2008 Cred. Days	2008 Comp. Qrtrs	2008 98th Perctil	2008 Wtd. Mean	2008 Cert.	2007 Cred. Days	2007 Comp. Qrtrs	2007 98th Perctil	2007 Wtd. Mean	2007 Cert.	24-Hour Design Value	24-Hour Valid Ind.	Annual Design Value	Annual Valid Ind.
42-003-0008	346	4	24.7	11.6	N	353	4	30.3	12.9	N	346	4	39.8	14.9	N	32	Y	13.1	Y
301 39TH ST, BLDG #7, LAWRENCEVILLE																			
42-003-0064	346	4	45.3	15.0	N	358	4	50.0	17.0	N	359	4	54.7	18.9	N	50	Y	17.0	Y
2743 WASHINGTON BLVD, LIBERTY																			
42-003-0067	104	4	22.5	10.8	N	108	4	25.5	10.8	N	97	3	42.4	13.5*	N	30	Y	11.7	N
3640 OLD OAKDALE RD, SOUTH FAYETTE																			
42-003-0093	52	4	23.1	9.6	N				*		55	4	32.9	13.0	N	28	N	11.3	N
KUMMER RD, GOLF CLUBHOUSE, NORTH PARK																			
42-003-0095	51	4	19.6	9.4	N				*		56	4	32.8	13.6	N	26	N	11.5	N
1000 BEAVER GRADE RD CORAOPOLIS PA																			
42-003-1008	101	3	25.9*	12.7*	N	107	4	32.1	13.4	N	110	4	39.9	15.1	N	33	N	13.7	N
PACIFIC & IDAHO AVE, HARRISON																			
42-003-1301	108	4	30.7	12.1	N	109	4	36.3	14.1	N	112	4	43.7	16.6	N	37	Y	14.3	Y
600 ANDERSON ST, NORTH BRADDOCK																			
42-003-3007	53	4	25.9	11.3	N	58	4	34.6	13.3	N	55	4	35.0	15.1	N	32	Y	13.2	Y
501 WADDELL AVE, CLAIRTON																			

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
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3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: Dec. 6, 2012

Pollutant: Site-LevelPM2.5 - Local Conditions(88101)
Standard Units: Micrograms/cubic meter (LC)(105)
NAAQS Standard: PM25 24-hour 2006 / PM25 Annual 2006
Statistic: Annual Weighted Mean **Level:** 15
Statistic: Annual 98th Percentile **Level:** 35

Design Value Year: 2010

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

Site_ID / STREET ADDRESS	2010 Cred. Days	2010 Comp. Qrtrs	2010 98th Perctil	2010 Wtd. Mean	2010 Cert.	2009 Cred. Days	2009 Comp. Qrtrs	2009 98th Perctil	2009 Wtd. Mean	2009 Cert.	2008 Cred. Days	2008 Comp. Qrtrs	2008 98th Perctil	2008 Wtd. Mean	2008 Cert.	24-Hour Design Value	24-Hour Valid Ind.	Annual Design Value	Annual Valid Ind.
42-003-0002	358	4	37.7	16.3	N				*					*		38	N	16.3	N
520 ORCHARD AVE, AVALON																			
42-003-0008	346	4	29.7	12.2	N	346	4	24.7	11.6	N	353	4	30.3	12.9	N	28	Y	12.2	Y
301 39TH ST, BLDG #7, LAWRENCEVILLE																			
42-003-0064	342	4	48.8	16.0	N	346	4	45.3	15.0	N	358	4	50.0	17.0	N	48	Y	16.0	Y
2743 WASHINGTON BLVD, LIBERTY																			
42-003-0067	111	4	28.5	11.7	N	104	4	22.5	10.8	N	108	4	25.5	10.8	N	26	Y	11.1	Y
3640 OLD OAKDALE RD, SOUTH FAYETTE																			
42-003-0093	52	3	26.5*	10.5*	N	52	4	23.1	9.6	N				*		25	N	10.1	N
KUMMER RD, GOLF CLUBHOUSE, NORTH PARK																			
42-003-0095	53	3	26.4*	11.5*	N	51	4	19.6	9.4	N				*		23	N	10.5	N
1000 BEAVER GRADE RD CORAOPOLIS PA																			
42-003-1008	111	4	34.0	13.0	N	101	3	25.9*	12.7*	N	107	4	32.1	13.4	N	31	N	13.0	N
PACIFIC & IDAHO AVE, HARRISON																			
42-003-1301	106	4	37.2	13.7	N	108	4	30.7	12.1	N	109	4	36.3	14.1	N	35	Y	13.3	Y
600 ANDERSON ST, NORTH BRADDOCK																			
42-003-3007	55	4	28.2	12.5	N	53	4	25.9	11.3	N	58	4	34.6	13.3	N	30	Y	12.4	Y
501 WADDELL AVE, CLAIRTON																			

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
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3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Site-LevelPM2.5 - Local Conditions(88101)
Standard Units: Micrograms/cubic meter (LC)(105)
NAAQS Standard: PM25 24-hour 2006 / PM25 Annual 2006
Statistic: Annual Weighted Mean **Level:** 15
Statistic: Annual 98th Percentile **Level:** 35

Design Value Year: 2011

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State Name: Pennsylvania

Site_ID / STREET ADDRESS	2011 Cred. Days	2011 Comp. Qrtrs	2011 98th Perctil	2011 Wtd. Mean	2011 Cert.	2010 Cred. Days	2010 Comp. Qrtrs	2010 98th Perctil	2010 Wtd. Mean	2010 Cert.	2009 Cred. Days	2009 Comp. Qrtrs	2009 98th Perctil	2009 Wtd. Mean	2009 Cert.	24-Hour Design Value	24-Hour Valid Ind.	Annual Design Value	Annual Valid Ind.
42-003-0002	205	4	29.8	13.1	N	358	4	37.7	16.3	N				*		34	N	14.7	N
520 ORCHARD AVE, AVALON																			
42-003-0008	347	4	27.3	11.1	N	346	4	29.7	12.2	N	346	4	24.7	11.6	N	27	Y	11.6	Y
301 39TH ST, BLDG #7, LAWRENCEVILLE																			
42-003-0064	339	4	38.0	14.0	N	342	4	48.8	16.0	N	346	4	45.3	15.0	N	44	Y	15.0	Y
2743 WASHINGTON BLVD, LIBERTY																			
42-003-0067	107	4	30.6	10.6	N	111	4	28.5	11.7	N	104	4	22.5	10.8	N	27	Y	11.0	Y
3640 OLD OAKDALE RD, SOUTH FAYETTE																			
42-003-0093	50	3	25.6*	9.0*	N	52	3	26.5*	10.5*	N	52	4	23.1	9.6	N	25	N	9.7	N
KUMMER RD, GOLF CLUBHOUSE, NORTH PARK																			
42-003-0095				*		53	3	26.4*	11.5*	N	51	4	19.6	9.4	N	23	N	10.5	N
1000 BEAVER GRADE RD CORAOPOLIS PA																			
42-003-1008	104	3	29.8*	11.6*	N	111	4	34.0	13.0	N	101	3	25.9*	12.7*	N	30	N	12.4	N
PACIFIC & IDAHO AVE, HARRISON																			
42-003-1301	100	3	33.7*	12.3*	N	106	4	37.2	13.7	N	108	4	30.7	12.1	N	34	N	12.7	N
600 ANDERSON ST, NORTH BRADDOCK																			
42-003-3007	49	3	30.3*	10.7*	N	55	4	28.2	12.5	N	53	4	25.9	11.3	N	28	N	11.5	N
501 WADDELL AVE, CLAIRTON																			

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3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Monitoring Site Design Values History for PM2.5, 2000-2002 through 2009-2011

AQS Data Query: 07/26/2012

state_name	naa_name	site	code	Annual Design Values(µg/m3)																	
				2000-2002		2001-2003		2002-2004		2003-2005		2004-2006		2005-2007		2006-2008		2007-2009		2008-2010		2009-2011	
Pennsylvania	Pittsburgh-Beaver Valley, PA	Lawrenceville	420030008	15.8	NA	15.7	NA	15.3	NA	15.5	NA	15.2	NA	15.0	A	14.0	A	13.1	A	12.2	A	11.6	A
Pennsylvania	Liberty-Clairton, PA	Liberty	420030064	21.4	NA	21.2	NA	20.4	NA	20.8	NA	20.4	NA	19.8	NA	18.3	NA	17.0	NA	16.0	NA	15.0	A
Pennsylvania	Pittsburgh-Beaver Valley, PA	South Fayette	420030067	13.5	inc-a	13.2	inc-a	12.8	A	13.5	A	12.8	A	12.9	A	11.8	A	11.7	A	11.1	A	11.0	A
Pennsylvania	Pittsburgh-Beaver Valley, PA	North Park	420030093	14.3	inc-a	14.2	inc-a	13.3	inc-a	13.6	inc-a	12.7	inc-a	13.0	inc-a	12.3	inc-a	11.3	inc-a	10.1	inc-a	9.7	A
Pennsylvania	Pittsburgh-Beaver Valley, PA	Moon	420030095	14.1	inc-a	14.9	inc-a	14.2	A	14.5	A	13.4	A	13.6	A	13.0	inc-a	11.5	inc-a	10.5	inc-a	10.5	inc-a
Pennsylvania	Pittsburgh-Beaver Valley, PA	Harrison	420031008	16.1	NA	15.9	NA	15.5	NA	15.5	NA	15.0	inc-a	15.0	A	14.2	A	13.7	A	13.0	A	12.4	A
Pennsylvania	Pittsburgh-Beaver Valley, PA	North Braddock	420031301	16.8	NA	16.9	NA	16.5	NA	16.6	NA	16.0	NA	16.2	NA	15.2	NA	14.3	A	13.3	A	12.7	A
Pennsylvania	Liberty-Clairton, PA	Clairton	420033007	17.3	inc-na	17.2	NA	15.6	NA	15.7	NA	14.9	A	15.3	NA	14.3	A	13.2	A	12.4	A	11.5	inc-a
Pennsylvania	Pittsburgh-Beaver Valley, PA	Avalon	420030002																	16.3	inc-na	14.7	inc-a

state_name	naa_name	site	code	24-hour Design Values (µg/m3)																	
				2000-2002		2001-2003		2002-2004		2003-2005		2004-2006		2005-2007		2006-2008		2007-2009		2008-2010		2009-2011	
Pennsylvania	Pittsburgh-Beaver Valley, PA	Lawrenceville	420030008	39	NA	40	NA	39	NA	39	NA	39	NA	40	NA	36	NA	32	A	28	A	27	A
Pennsylvania	Liberty-Clairton, PA	Liberty	420030064	63	NA	63	NA	65	NA	68	NA	65	NA	60	NA	53	NA	50	NA	48	NA	44	NA
Pennsylvania	Pittsburgh-Beaver Valley, PA	South Fayette	420030067	39	NA	42	NA	44	NA	39	NA	35	A	35	A	32	A	30	A	26	A	27	A
Pennsylvania	Pittsburgh-Beaver Valley, PA	North Park	420030093	41	NA	49	NA	52	NA	52	NA	45	NA	40	NA	35	inc-a	28	inc-a	25	inc-a	25	A
Pennsylvania	Pittsburgh-Beaver Valley, PA	Moon	420030095	39	NA	41	NA	44	NA	41	NA	40	NA	36	NA	35	inc-a	26	inc-a	23	inc-a	23	inc-a
Pennsylvania	Pittsburgh-Beaver Valley, PA	Harrison	420031008	45	NA	45	NA	45	NA	43	NA	42	NA	40	NA	37	NA	33	inc-a	31	inc-a	30	inc-a
Pennsylvania	Pittsburgh-Beaver Valley, PA	North Braddock	420031301	44	NA	48	NA	44	NA	42	NA	38	NA	40	NA	39	NA	37	NA	35	A	34	A
Pennsylvania	Liberty-Clairton, PA	Clairton	420033007	47	inc-na	51	NA	50	NA	43	NA	36	NA	34	A	35	A	32	A	30	A	28	inc-a
Pennsylvania	Pittsburgh-Beaver Valley, PA	Avalon	420030002																	38	inc-na	34	inc-a

A = attainment
NA = nonattainment
inc-a = incomplete attainment
inc-na = incomplete nonattainment

$PM_{2.5}$ SIP

Appendix C

Speciation and Source Apportionment Analyses

C-1: $PM_{2.5}$ Speciation Data Analysis

C-2: Positive Matrix Factorization (PMF) Analysis

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C-1: $PM_{2.5}$ Speciation Data Analysis

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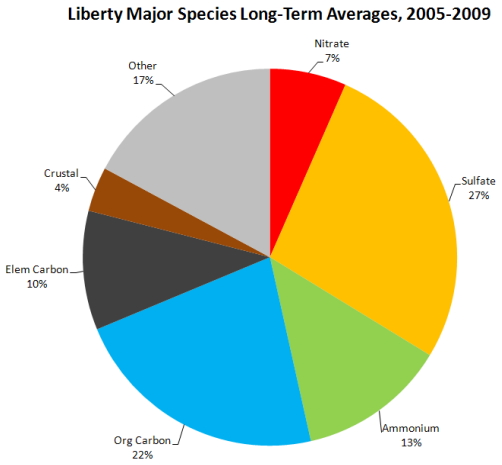
Allegheny County Health Department
Air Quality Program
301 39th St., Bldg. # 7
Pittsburgh, PA 15201

$PM_{2.5}$ Chemical Speciation Analysis for the Liberty-Clairton Area, 2005-2009



December 2012

TABLE OF CONTENTS

1 Introduction 1

2 Sites 2

3 Major Species Trends, Tri-State Sites 4

3.1 Long-Term Averages 6

3.2 Yearly Trends by Species 8

4 Major Species SANDWICH Data, SWPA Sites 14

4.1 SANDWICH, Quarterly Averages 14

4.2 SANDWICH, High Day Averages 18

5 Liberty Species Comparisons 23

5.1 Major Species 23

5.2 Trace Elements 24

5.3 Species Correlations 25

6 Liberty Temporal Trends 34

7 Additional Information 37

TABLE OF FIGURES

Figure 1-1. SWPA Nonattainment Areas 1
Figure 2-1. Tri-State Sites Examined for Speciation Trends 3
Figure 3-1. General $PM_{2.5}$ Behavior in the Tri-State Area 4
Figure 3-2. FRM Design Value Trends by U.S. Region, 2001-2010 5
Figure 3-3. Long-Term Averages of Major Species, Tri-State Area 6
Figure 3-4. Liberty Excess Species Compared to Other MSA sites 7
Figure 3-5. Sulfate Yearly Averages, Tri-State Sites 8
Figure 3-6. Nitrate Yearly Averages, Tri-State Sites 9
Figure 3-7. Organic Carbon Yearly Averages, Tri-State Sites 10
Figure 3-8. Elemental Carbon Yearly Averages, Tri-State Sites 11
Figure 3-9. Crustal Component Yearly Averages, Tri-State Sites 12
Figure 3-10. Ammonium Yearly Averages, Tri-State Sites 13
Figure 4-1. Major Species SANDWICH Averages, SWPA Sites, 2005-2009 14
Figure 4-2. Liberty Excess by SANDWICH, 2005-2009 15
Figure 4-3. Liberty Local and Regional Year-Round SANDWICH Quarterly Averages 16
Figure 4-4. Liberty Local and Regional SANDWICH Averages by Quarter 17
Figure 4-5. Major Species High Day SANDWICH Averages, SWPA Sites, 2005-2009 18
Figure 4-6. Liberty High Day Excess SANDWICH, 2005-2009 19
Figure 4-7. Liberty Local and Regional Year-Round SANDWICH High Day Averages 20
Figure 4-8. Liberty Local and Regional SANDWICH High Day Averages by Quarter 21
Figure 4-9. Degree of Neutralization of Sulfate, SWPA Sites, Long-Term 2005-2009 Avgs 22
Figure 5-1. Major Species Averages, Long-Term 2005-2009 Avgs, SWPA Sites 23
Figure 5-2. Liberty-Dominant Trace Elements, Long-Term 2005-2009 Avgs, SWPA Sites 24
Figure 5-3. Sulfate vs. Ammonium, Year-Round 25
Figure 5-4. Sulfate vs. Ammonium, June-Sept. 26
Figure 5-5. Sulfate vs. Sulfur, Year-Round 27
Figure 5-6. Nitrate vs. Ammonium, Winter Months 28
Figure 5-7. Organic Carbon vs. Elemental Carbon, Year-Round 29
Figure 5-8. Organic Carbon vs. Lead, Year-Round 30
Figure 5-9. Organic Carbon vs. Arsenic, Year-Round 31
Figure 5-10. Bromine vs. Lead, Year-Round 32
Figure 5-11. Chlorine vs. Bromine, Cool Months 33
Figure 6-1. Liberty Species by Day of the Week, 2005-2009 34
Figure 6-2. Liberty Species by Month, 2005-2009 35
Figure 6-3. Liberty Species by Quarter, 2005-2009 36

1 Introduction

This report focuses on Chemical Speciation Network (CSN) analysis for the Liberty-Clairton area over the timeframe 2005-2009. Specifically, this speciation analysis serves as supporting and underlying data for the attainment demonstration used in the $PM_{2.5}$ 2006 NAAQS State Implementation Plan (SIP).

Allegheny County Health Department (ACHD) collects $PM_{2.5}$ speciation data at the Liberty site at South Allegheny High School. Additional sites in the Pittsburgh MSA and surrounding tri-state area have also been used in this analysis to determine regional and local trends.

Most of the Pittsburgh MSA was designated nonattainment for $PM_{2.5}$ as part of the Pittsburgh-Beaver Valley area in December 2009. At the same time, the Liberty Borough-Clairton area was designated a separate nonattainment area within Allegheny County.

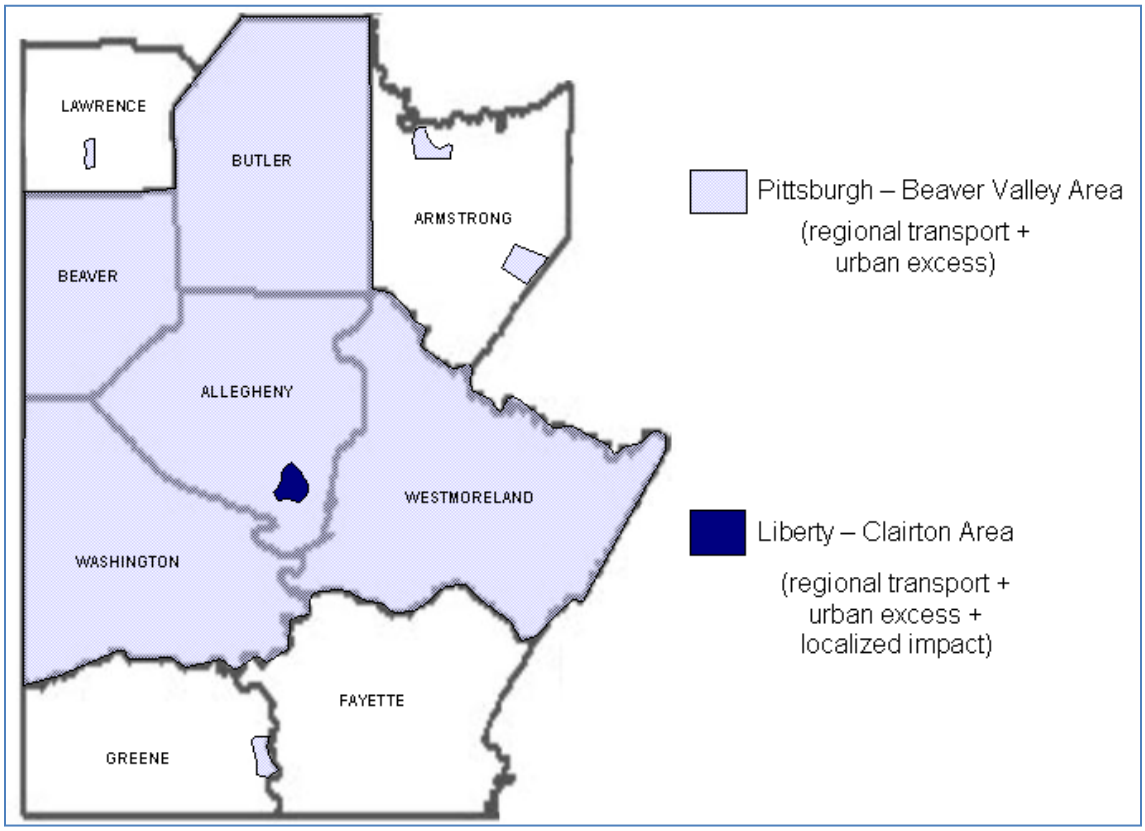


Figure 1-1. SWPA Nonattainment Areas

Major species concentrations in the Pittsburgh-Beaver Valley area generally parallel one another, as well as other sites in Mid-Atlantic and Northeastern U.S. metropolitan areas. Concentrations in the Liberty-Clairton area are unique within SWPA and are not representative of other sites. The differences in concentrations of many elements provide clues to the regional transport, urban excess, and localized river valley components of $PM_{2.5}$ in Liberty-Clairton.

2 Sites

The Lawrenceville monitor site is an urban residential site, downwind from the Pittsburgh Central Business District (Downtown). Lawrenceville is a NCore site and includes several other monitors, including a daily Federal Reference Method (FRM) $PM_{2.5}$ monitor.[1] Sampling frequency for the CSN speciation monitor is 1-in-3 days.

The Liberty monitor site is a 1-in-6 CSN frequency site located in the Monongahela Valley, which contains a mix of urban residential, heavy industrial and rural areas. Winds are predominantly from the southwest at Liberty. Like Lawrenceville, Liberty also has a 1-in-1 FRM monitor along with other pollutant monitors.

Average temperature and pressure are lower at Liberty, coinciding with higher elevation. Elevation alone does not appear to play a role in $PM_{2.5}$ concentrations at Liberty, as other sites such as South Fayette measure lower concentrations at higher elevations than Liberty.

Additional sites have been examined for regional species trends in the tri-state area. These sites include Florence (Washington Co.) and Greensburg (Westmoreland Co.) within the Pittsburgh MSA and Pittsburgh-Beaver Valley nonattainment area.[2] These sites are 1-in-6 sites, operated by the PA DEP.

Rural sites that were examined include Quaker City, OH and Dolly Sods, WV. Quaker City is a 1-in-3 CASTNET site[3] operated by EPA, and Dolly Sods is a 1-in-3 IMPROVE site[4] operated by the US Forest Service. The Quaker City and Dolly Sods sites have been used by EPA as background speciation sites for the Pittsburgh area.

For sites with higher sampling frequencies (1-in-3), long-term averages represent a larger array of values. Figure 2-1 on the following page shows the locations of the sites examined in this report.

[1] FRM monitors are used for the official designations for areas.

[2] Pittsburgh-Beaver Valley is showing attainment of the 2006 standards, based on 2009-2011 data.

[3] Additional Western PA CASTNET (Clean Air Status and Trends Network) sites with full/partial speciated data are M.K. Goddard and Laurel Hill. These sites have not been used in this analysis. For CASTNET information, go to: http://epa.gov/castnet/javaweb/index.html

[4] For IMPROVE (Interagency Monitoring of Protected Visual Environments) information, visit: http://vista.cira.colostate.edu/improve/

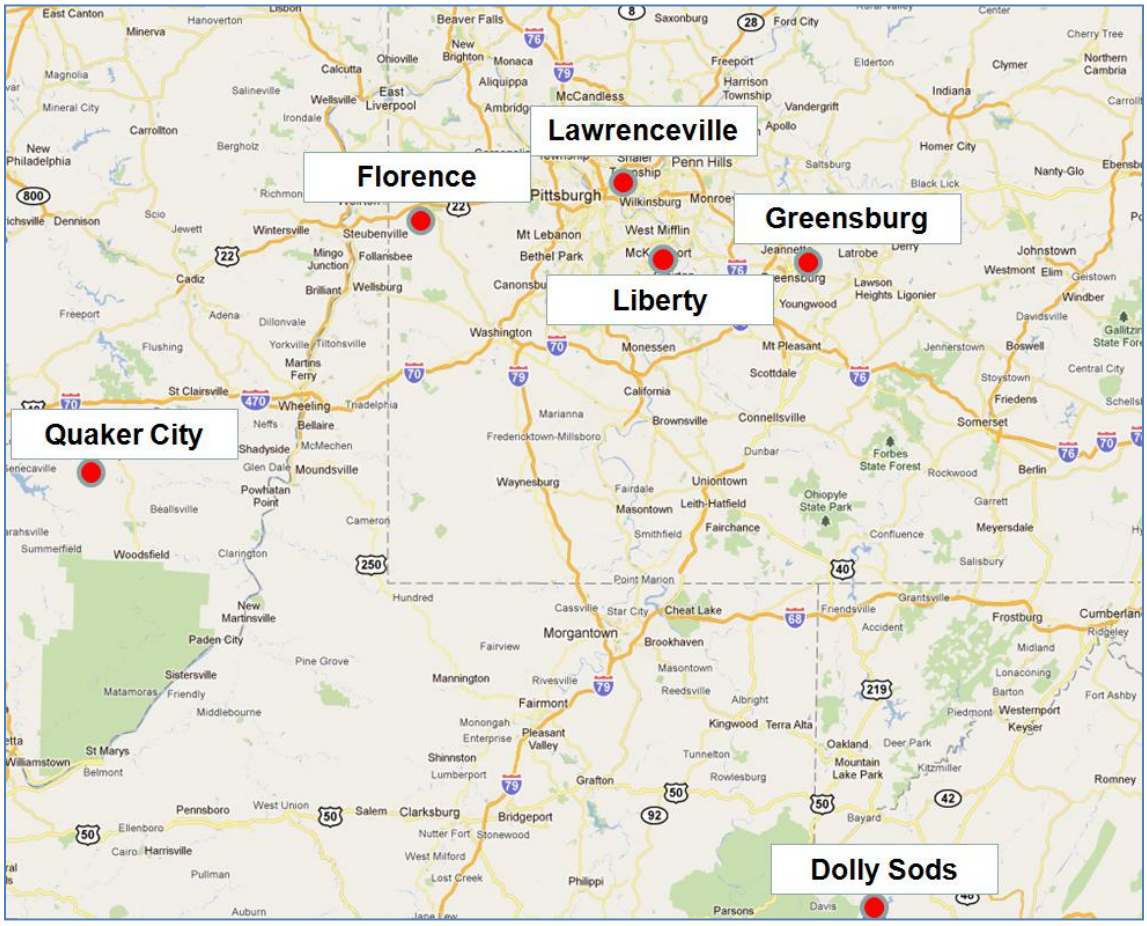


Figure 2-1. Tri-State Sites Examined for Speciation Trends

Florence, Lawrenceville, Liberty, and Greensburg are urban sites as part of the Pittsburgh MSA. Quaker City and Dolly Sods are considered to be rural sites.

3 Major Species Trends, Tri-State Sites

To focus on the regional and local nature of $PM_{2.5}$ that affects Liberty-Clairton, concentration averages were examined for the tri-state sites. Figure 3-1 below shows the conceptual model of the behavior of $PM_{2.5}$ throughout the tri-state area.

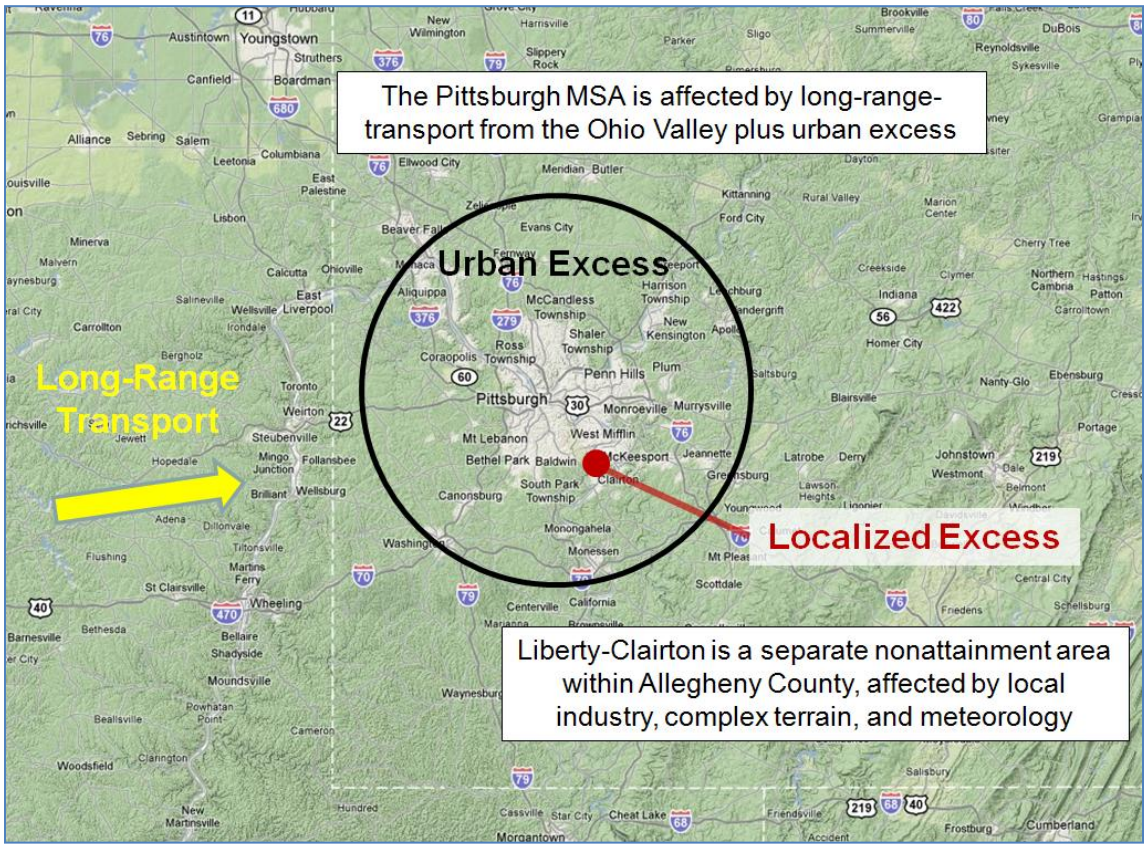


Figure 3-1. General $PM_{2.5}$ Behavior in the Tri-State Area

SWPA is affected by long-range transport of $PM_{2.5}$ and precursors, along with urban excess present in the Pittsburgh MSA from anthropogenic activity. Liberty-Clairton is affected by transport, urban excess, and localized excess.

To illustrate the localized nature in comparison to the rest of the U.S., Figure 3-2 below shows FRM long-term design value trends for nonattainment areas throughout the U.S. regions.

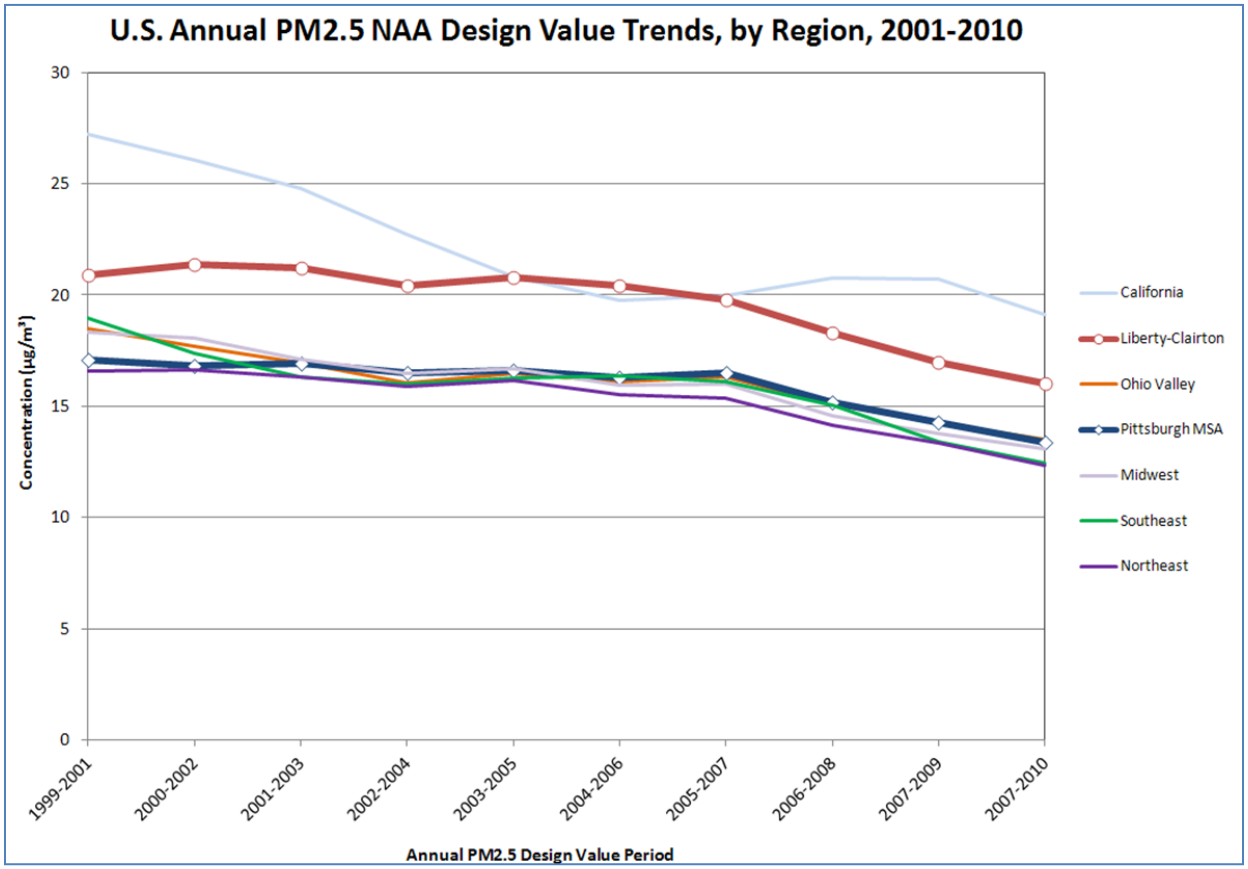


Figure 3-2. FRM Design Value Trends by U.S. Region, 2001-2010

The Liberty-Clairton area shows FRM concentrations that are above other regions of the U.S., including the Pittsburgh MSA and the upwind Ohio Valley.

3.1 Long-Term Averages

Figure 3-3 below shows the long-term averages of the tri-state sites by major species for 2005-2009 (the weighted timeframe for the $PM_{2.5}$ attainment demonstration). Major species are defined as the largest components of $PM_{2.5}$. "Other" is a representation of the total mass minus the major species, and can be due to particle-bound water, unknown matter, or differences in analytical methods used by the CSN monitors for specific types of species (e.g., sulfate is analyzed using a different method than carbons).

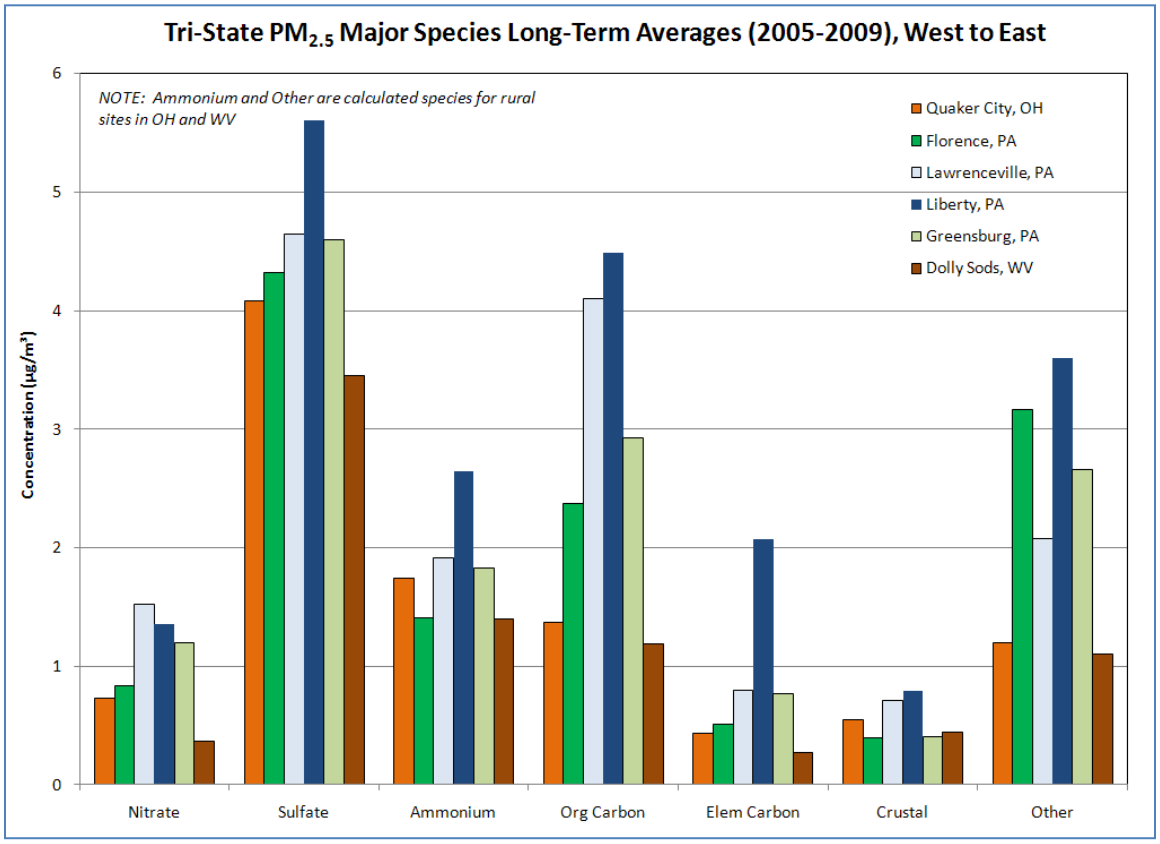


Figure 3-3. Long-Term Averages of Major Species, Tri-State Area

Increased concentrations for certain species are evident in the Pittsburgh MSA compared to rural sites. In addition, Liberty shows spikes of specific compounds that are higher than the surrounding MSA.

Figure 3-4 below shows Liberty "excess" species compared to sites in the Pittsburgh MSA. Liberty "excess" is defined as the $PM_{2.5}$ that is not consistent with the surrounding area.

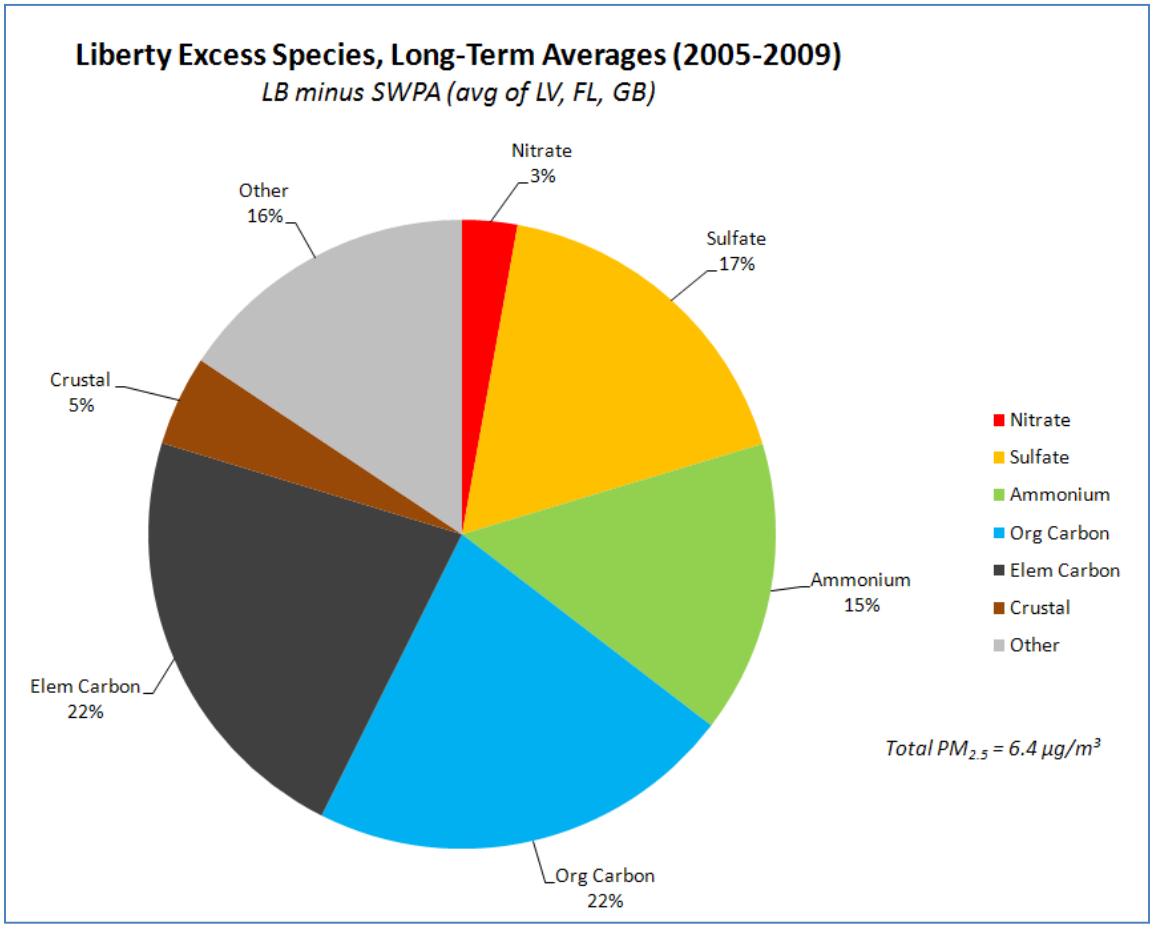


Figure 3-4. Liberty Excess Species Compared to Other MSA sites

The excess species at Liberty are the focus of the attainment demonstration for the SIP. The Source Apportionment report provides clues as to specific source factors that contribute to the localized excess. Additionally, the EPA SANDWICH technique[5] used for attainment tests adjusts these species to better represent FRM concentrations (shown later in this report).

[5] SANDWICH: sulfate, adjusted nitrate, derived water, inferred carbonaceous material balance approach

3.2 Yearly Trends by Species

Figures 3-5 through 3-10 show time-series of yearly averages of individual major species for tri-state sites over the timeframe 2005-2009. "Other" component has been excluded from these charts.

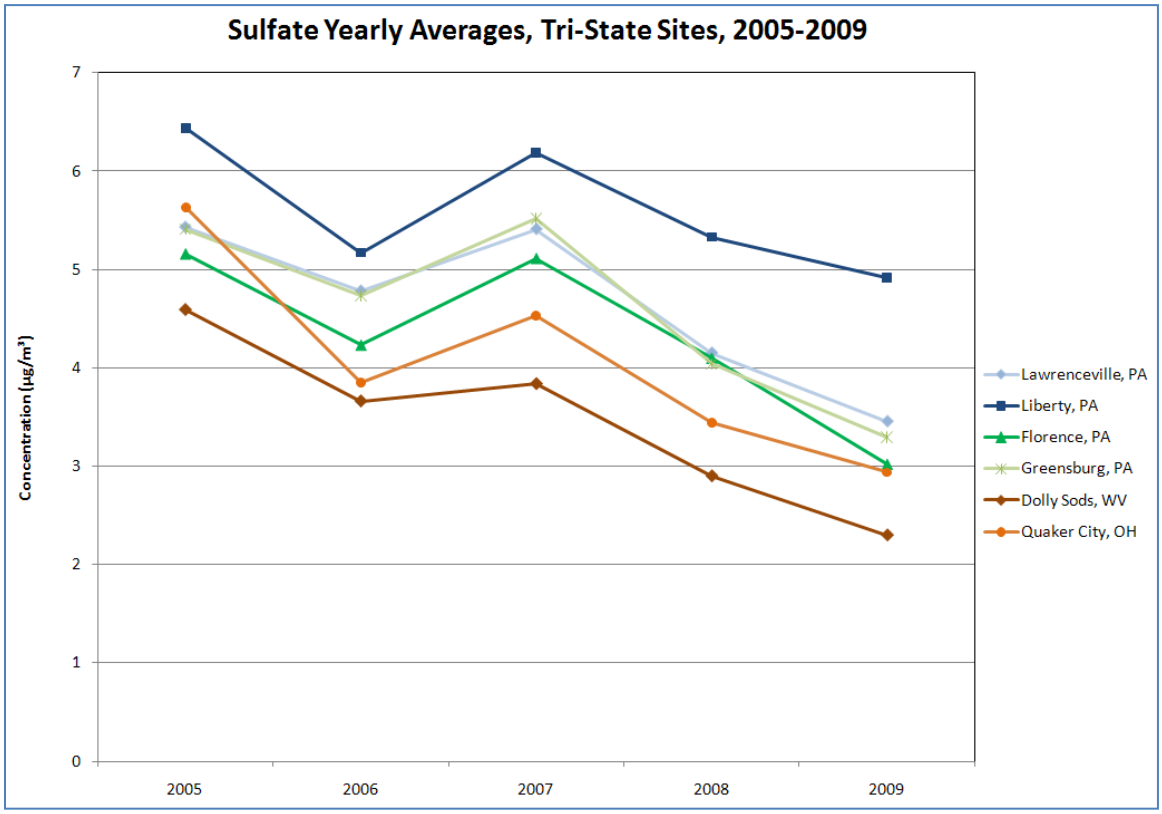


Figure 3-5. Sulfate Yearly Averages, Tri-State Sites

Sulfate shows highest overall averages at Liberty, with an increased difference from the MSA and rural sites in later years. Sulfate is generally regional in nature, formed secondarily from SO_2 and NH_4. The higher averages at Liberty are indicative of a consistent localized primary sulfate or SO_2 source. Sulfate averages are decreasing overall throughout the tri-state area presumably due to controls at coal-fired power plants.

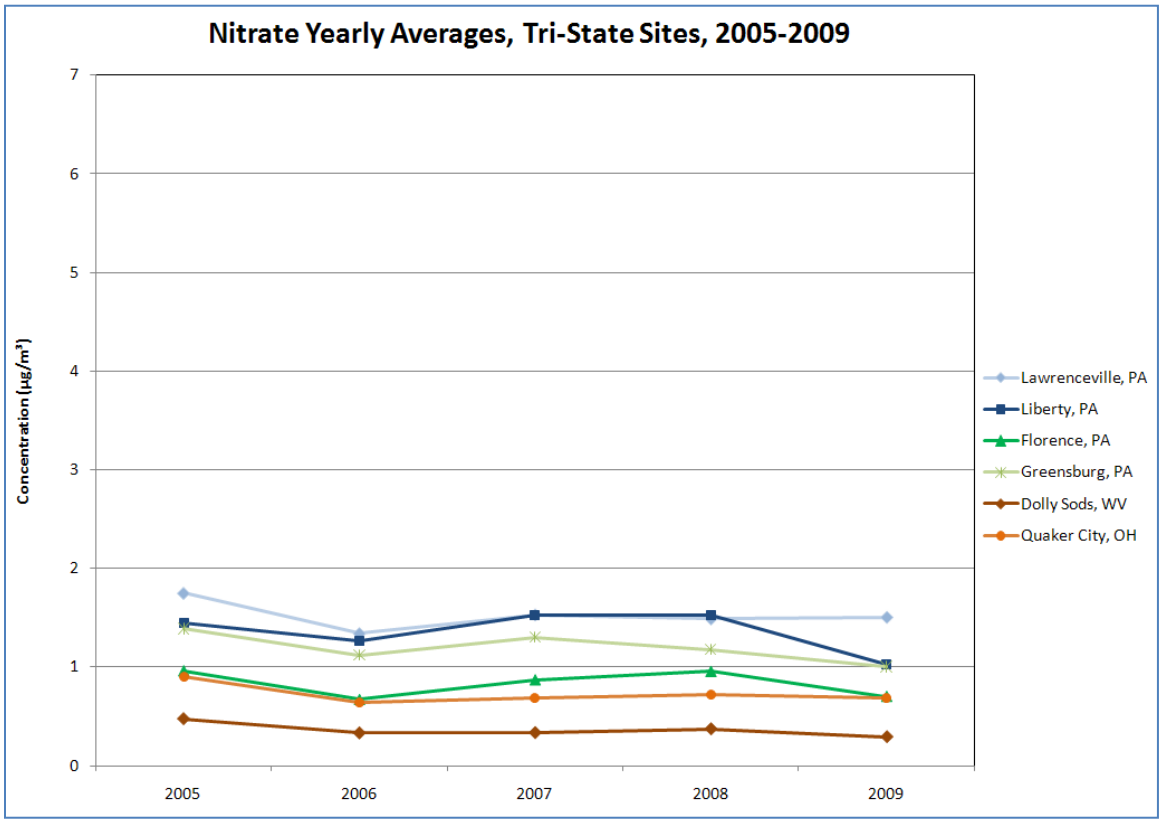


Figure 3-6. Nitrate Yearly Averages, Tri-State Sites

Nitrate shows fairly consistent averages from year to year, with the urban sites and Liberty showing the highest averages. Liberty averages show divergences from Lawrenceville averages in 2005 and in 2009.

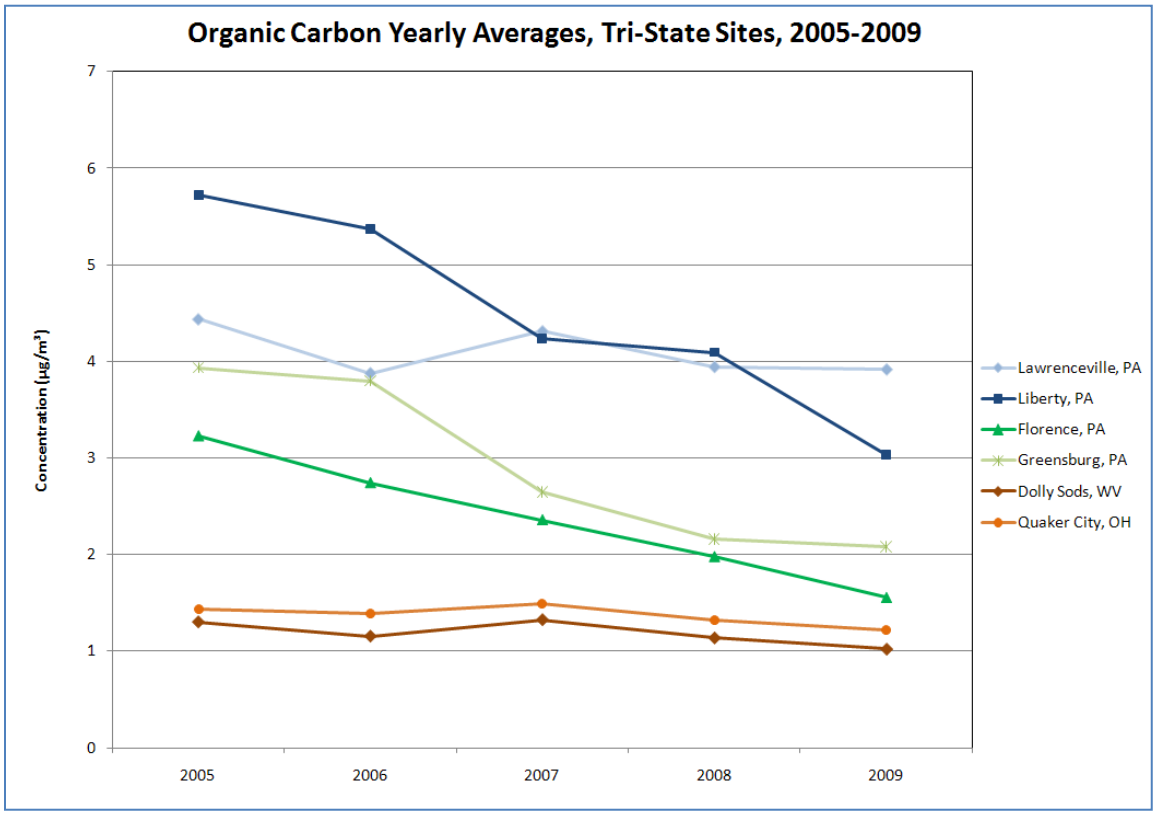


Figure 3-7. Organic Carbon Yearly Averages, Tri-State Sites

Organic carbon shows unique patterns for the tri-state sites. While Liberty shows the highest averages in early years, values for 2009 are lower than Lawrenceville, possibly due to low production at industrial facilities (see Source Apportionment report[6]). Lawrenceville shows fairly even averages from year to year, likely due to unchanged traffic patterns surrounding the site. Florence and Greensburg show some decreasing trends for organic carbon. The rural sites show the lowest averages, changing little from year to year.

[6] *Allegheny County $PM_{2.5}$ Source Apportionment Results using the Positive Matrix Factorization Model (PMF Version 3.0) and Conditional Probability Function (CPF),* ACHD, Dec. 2011.

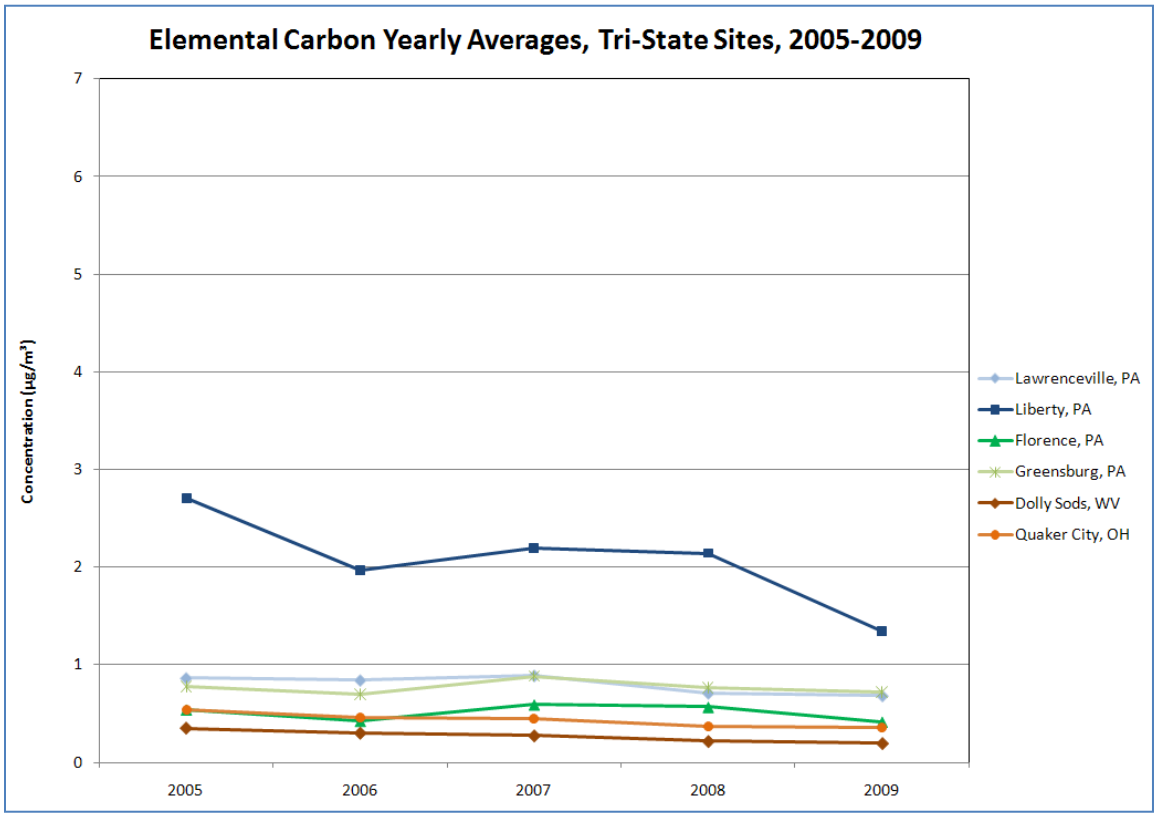


Figure 3-8. Elemental Carbon Yearly Averages, Tri-State Sites

Elemental carbon shows a distinct higher presence at Liberty compared to the other sites. It is also lower in 2009, similar to organic carbon at Liberty. The other sites show an even presence of elemental carbon with the highest averages at urban sites, likely due to heavy duty vehicle traffic.

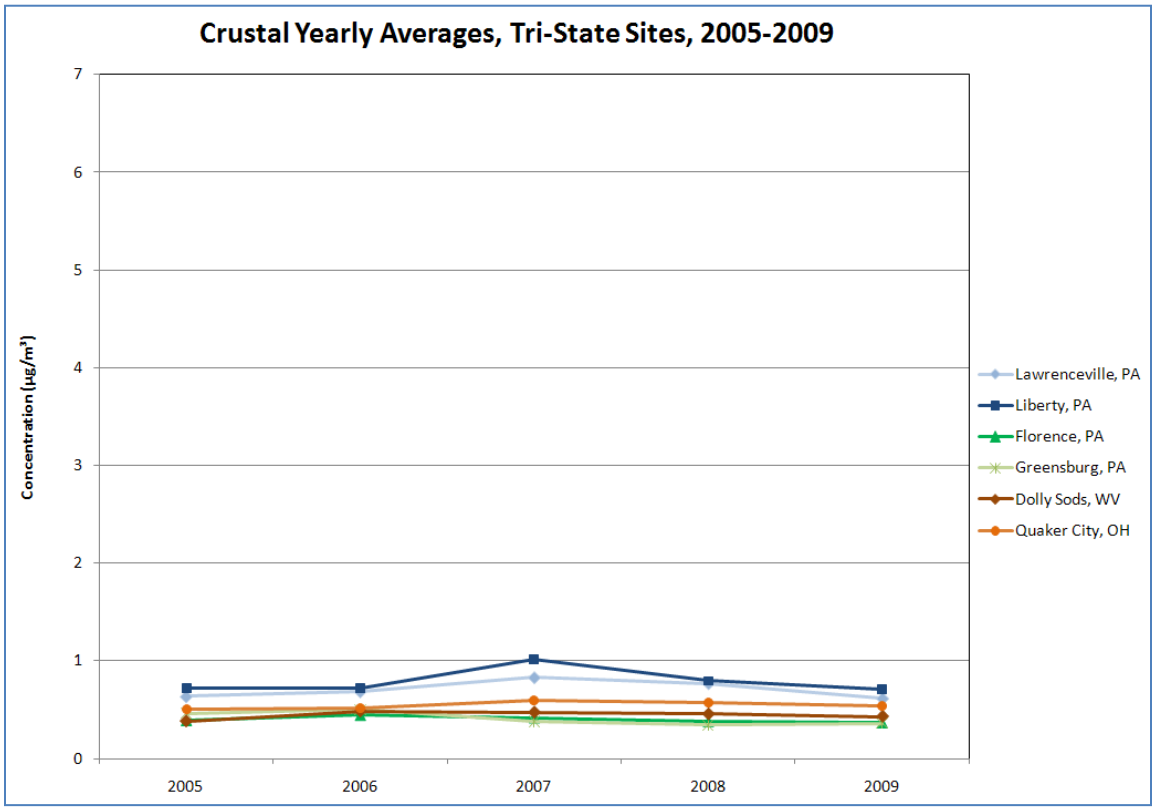


Figure 3-9. Crustal Component Yearly Averages, Tri-State Sites

Crustal component shows the lowest averages overall, with fairly even averages from year to year for each site.

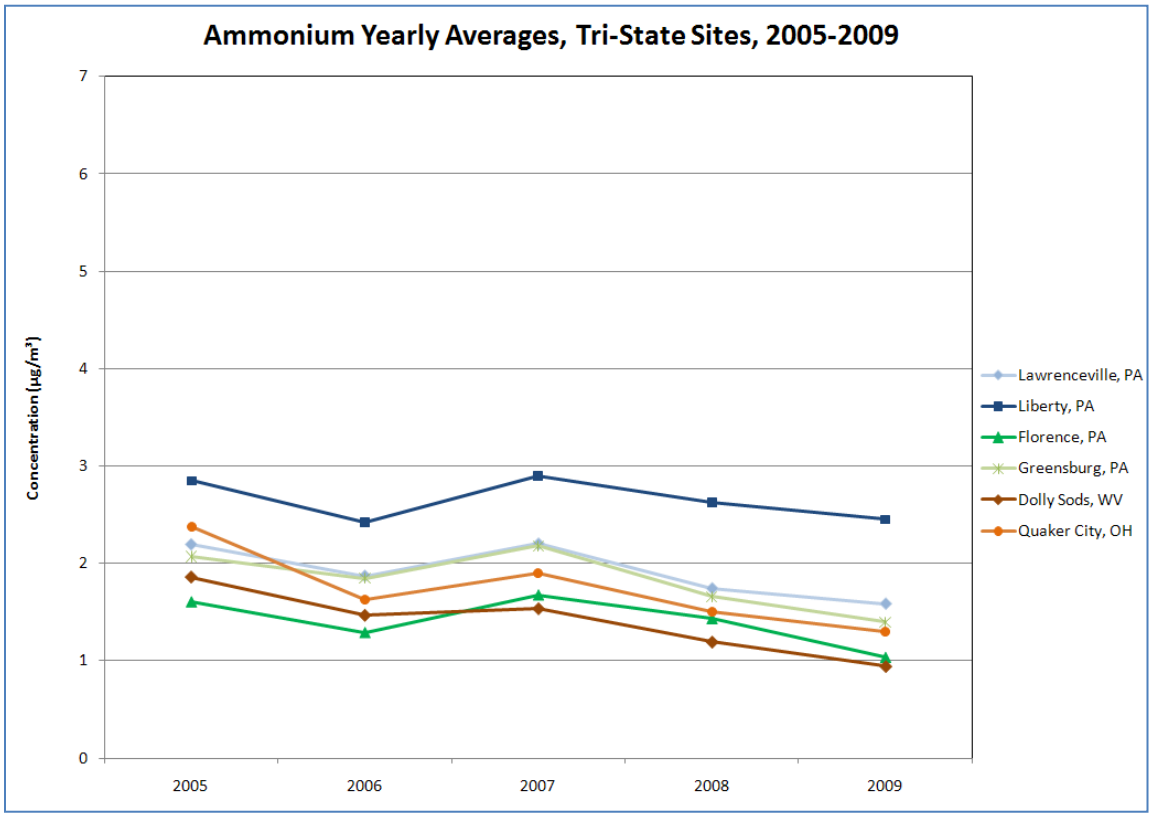


Figure 3-10. Ammonium Yearly Averages, Tri-State Sites

Ammonium shows the highest averages at Liberty, with a fairly steady pattern from year to year. Other sites show decreasing trends for ammonium. Ammonium is generally associated with sulfate in summer and with nitrate in winter.

4 Major Species SANDWICH Data, SWPA Sites

EPA's SANDWICH technique adjusts speciation data to fit FRM data for use in attainment tests for the SIP. SANDWICH uses calculated values for retained nitrate, indirect ammonium, particle-bound water, and organic carbon by mass balance. SANDWICH also adjusts species overall if the calculated species lead to mass balance inconsistencies with concurrent FRM values. Raw data values are adjusted as follows:

- Nitrate is lowered overall, with negligible concentrations in 2nd and 3rd quarters
- Ammonium is based on sulfate, nitrate, and degree of neutralization of sulfate (DON)
- Water replaces most of the "other" component
- Additional material by mass balance becomes lumped with organic carbon
- Measured species are adjusted due to mass balance error with FRM

4.1 SANDWICH, Quarterly Averages

Figure 4-1 below shows the long-term SANDWICH averages for surrounding SWPA sites (Lawrenceville, Florence, and Greensburg) and Liberty. Rural sites were not included in the SANDWICH analysis since the SIP modeling methodology is focused on local sources contributing to the excess at Liberty and not the urban excess for the Pittsburgh MSA.

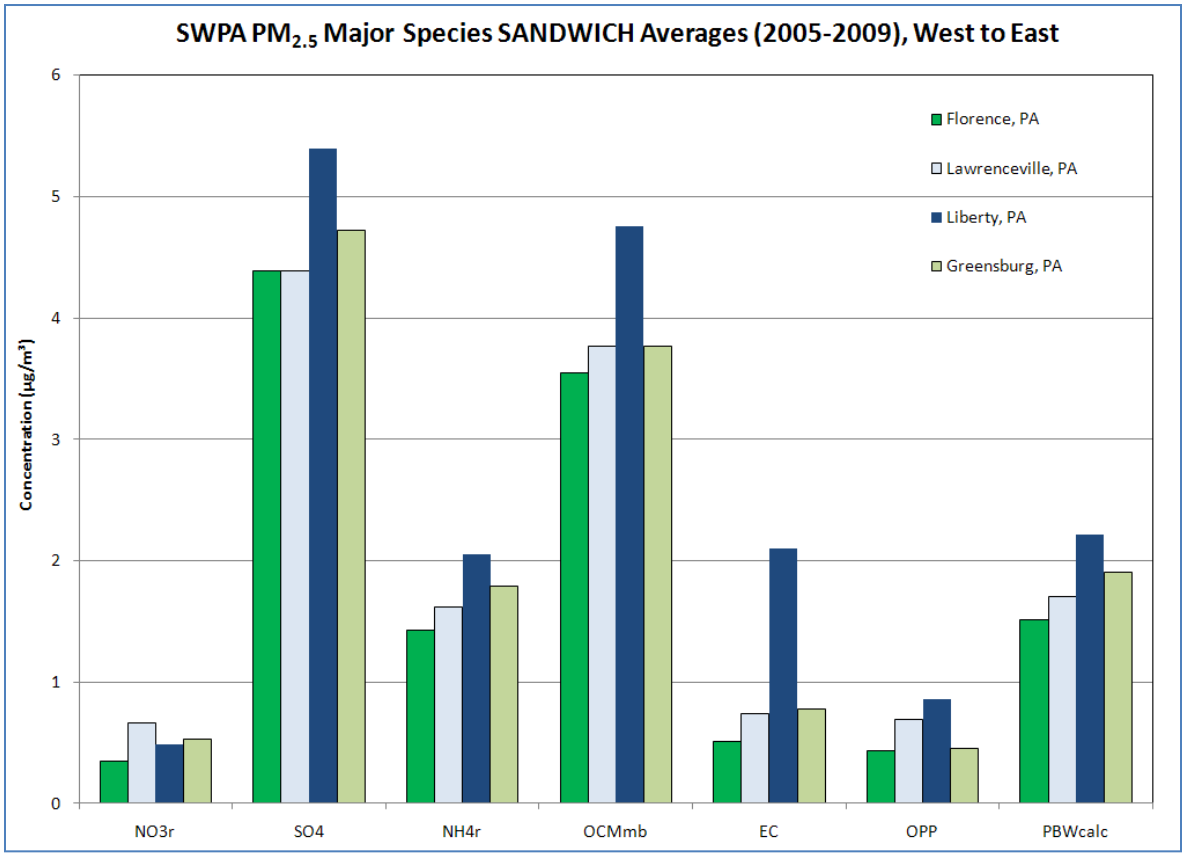


Figure 4-1. Major Species SANDWICH Averages, SWPA Sites, 2005-2009

Terms given in Figure 4-1 for SANDWICH species are as follows:

SO4	Sulfate
NO3r	Retained Nitrate, calculated by EPA using PIT temp and relative humidity
NH4r	Retained (Indirect) Ammonium, calculated as (DON*SO4)+(0.29*NO3r)
OCMmb	Organic Carbon Mass by mass balance (FRM minus other species)
EC	Elemental Carbon
OPP	Other Primary PM2.5 (analogous to crustal component)
PBWcalc	Particle Bound Water, calculated by polynomial fitted to the Aerosol Inorganic Model (AIM)

Adjustments to species using the SANDWICH technique can be seen in Figure 4-1 in comparison to Figure 3-3 (based on raw data). SANDWICH has also normalized the surrounding SWPA site data, minimizing differences between the sites and emphasizing the Liberty excess components.

Subtracting the average of the other SWPA sites from Liberty, the Liberty SANDWICH excess can then be calculated for 2005-2009 as shown in Figure 4-2 below.

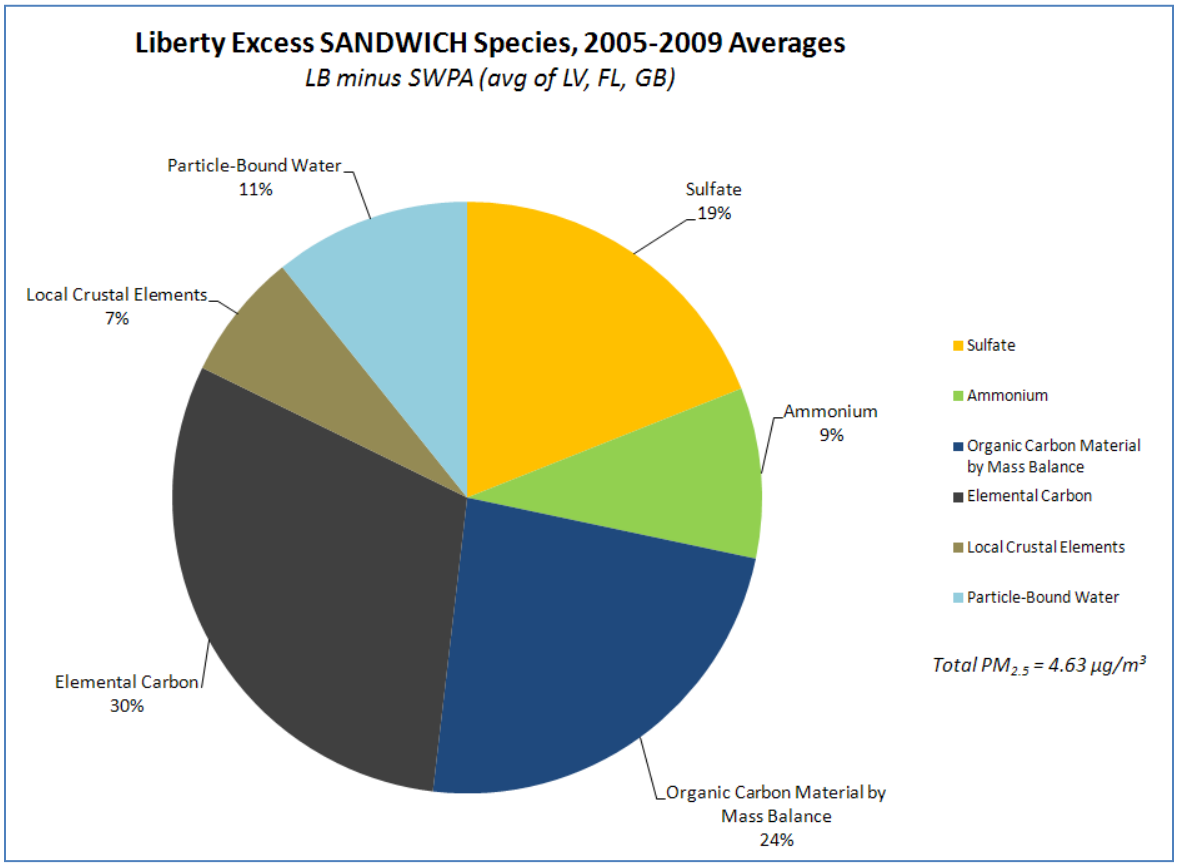


Figure 4-2. Liberty Excess by SANDWICH, 2005-2009

The average SANDWICH data indicates that sulfate (and associated ammonium and water), carbons, and local crustal elements make up the adjusted excess data.

To examine both the local excess and regional components at Liberty, the SANDWICH data can be viewed in stacked column format for the Liberty excess and surrounding SWPA regional portions of each species. Figure 4-3 shows the SANDWICH species averages as sums of local and regional components (local shown in darker shade).

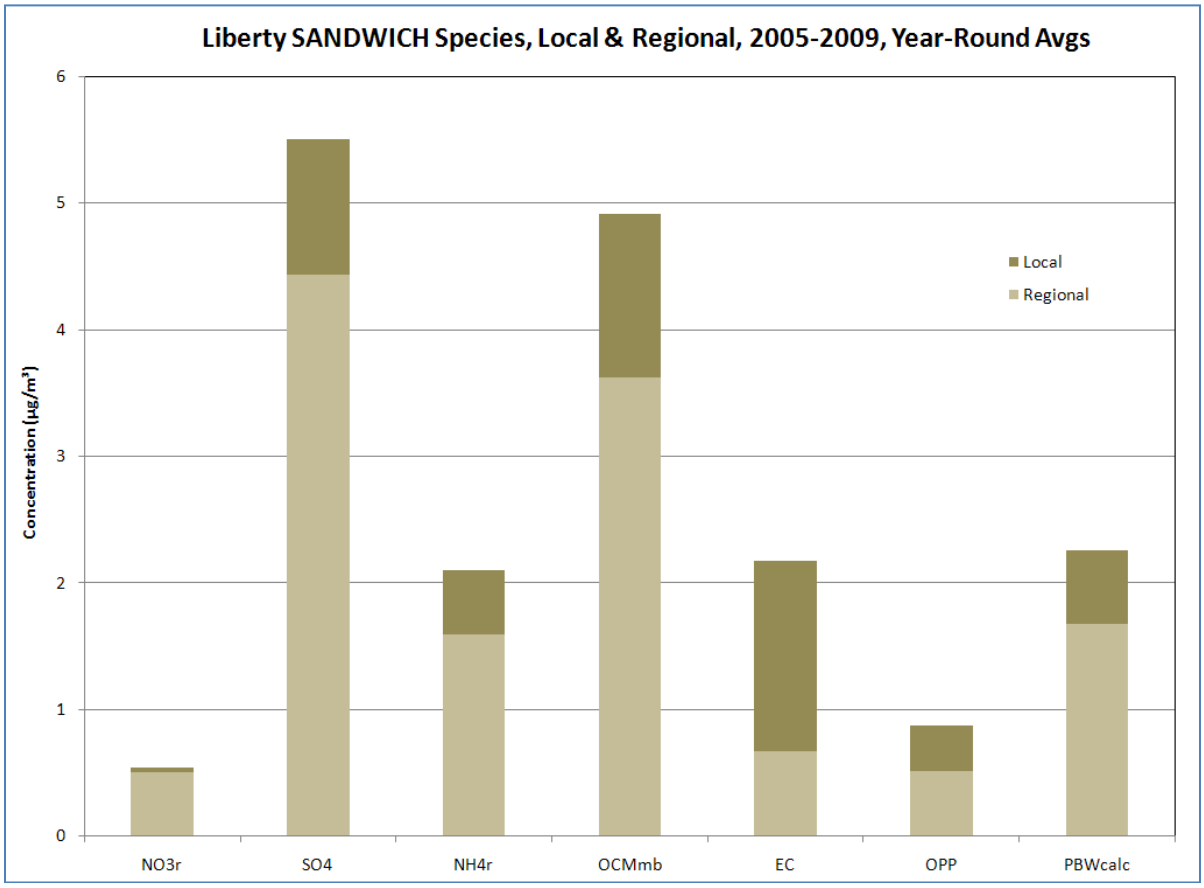


Figure 4-3. Liberty Local and Regional Year-Round SANDWICH Quarterly Averages

On a year-round SANDWICH quarterly average basis, elemental carbon is showing a higher local contribution than regional. All other species are showing larger regional contributions.

This data can also be examined on a quarterly average basis. Figure 4-4 shows the SANDWICH quarterly average data for local and regional $PM_{2.5}$. Note: the SANDWICH technique adjusts some quarterly species to zero (e.g., 3rd quarter nitrate).

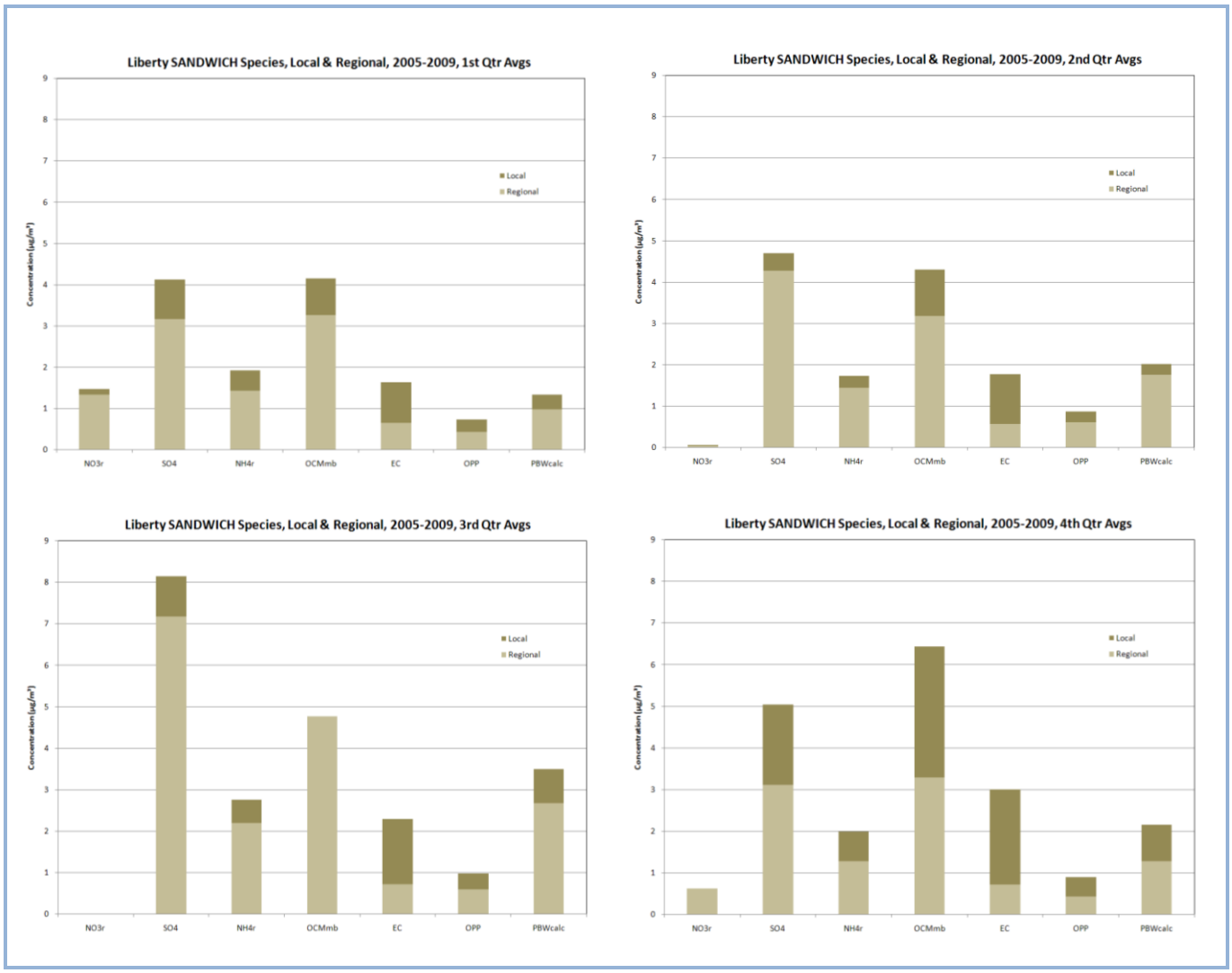


Figure 4-4. Liberty Local and Regional SANDWICH Averages by Quarter

On a quarterly average basis at Liberty, local impacts are highest in 4th quarter, likely due to meteorological conditions. Regional impacts are the highest in 3rd quarter when transported ammonium sulfate is the dominant species.

4.2 SANDWICH, High Day Averages

SANDWICH data is also used for high day calculations for use in the 24-hour attainment tests. For this data, species compositions are calculated only for high days per quarter. For Liberty, this is based on the top 3 days per quarter over the 2005-2009 timeframe. For the other SWPA sites, species compositions were calculated on the concurrent Liberty high days. Figure 4-5 shows the high day averages for the SWPA sites for 2005-2009.

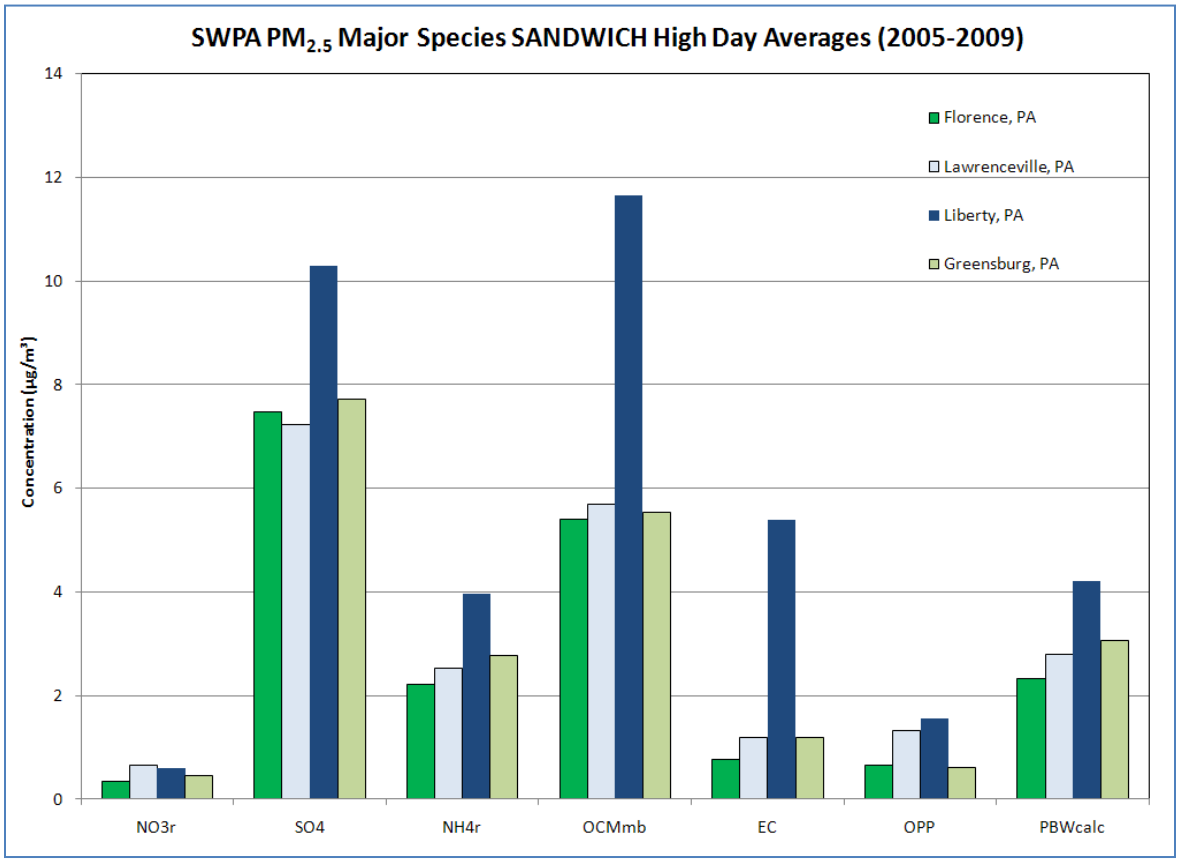


Figure 4-5. Major Species High Day SANDWICH Averages, SWPA Sites, 2005-2009

On a high day basis, organic and elemental carbon shows larger discrepancies from SWPA sites than the long-term average data shown in Figure 4-1. This indicates the importance of these species in relation to short-term impacts in the Liberty-Clairton area.

For Liberty high day excess, the average of other SWPA sites (on concurrent Liberty high days) was subtracted from Liberty high days. Figure 4-6 below shows the Liberty high day excess in pie chart format.

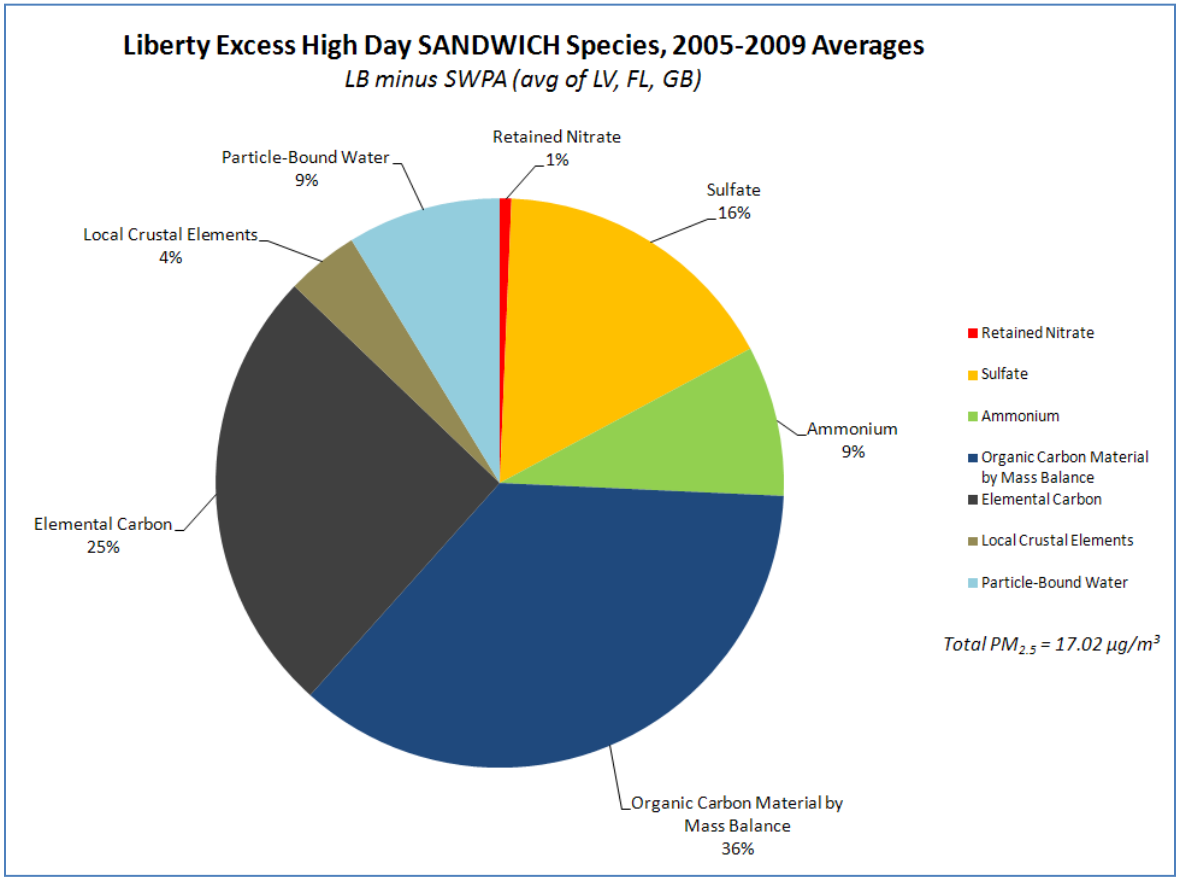


Figure 4-6. Liberty High Day Excess SANDWICH, 2005-2009

The Liberty high day excess chart shows a larger percentage of organic carbons than the long-term average excess shown in Figure 4-2, along with slightly less percentages of other species. Unlike the long-term average excess, retained nitrate shows a small percentage of the excess on a high day basis.

Figure 4-7 shows the SANDWICH species high day averages at Liberty as sums of local and regional components (local shown in darker shade).

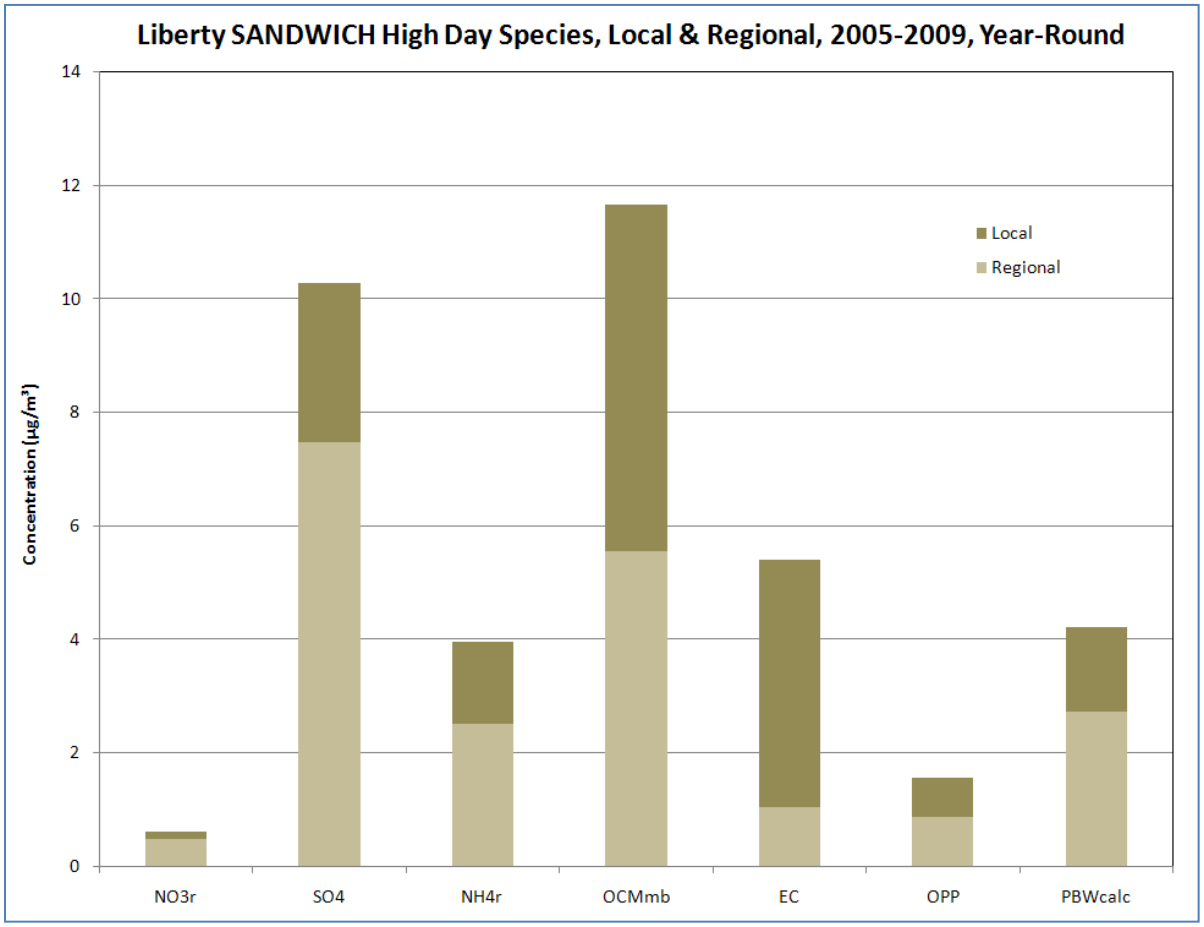


Figure 4-7. Liberty Local and Regional Year-Round SANDWICH High Day Averages

On a year-round SANDWICH high day basis, carbons are showing higher local contributions than regional contributions. Sulfate and nitrate (and associated ammonium and water) along with OPP (crustal) are showing larger regional contributions.

This data can also be examined on a quarterly high day average basis. Figure 4-8 shows the SANDWICH high day data by quarterly average for Liberty and other SWPA sites. Note: the SANDWICH technique adjusts some quarterly species to zero (e.g., 3rd quarter nitrate).

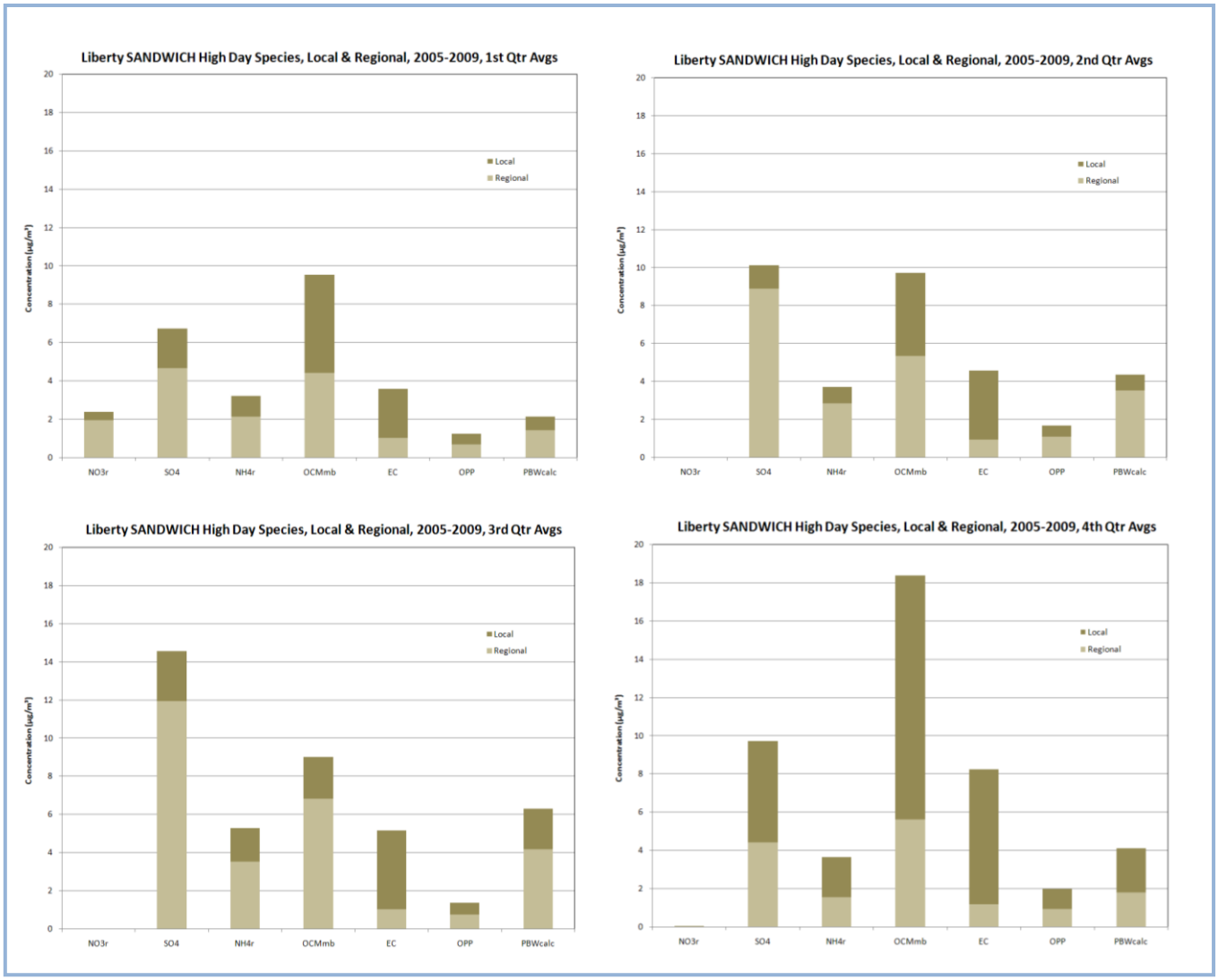


Figure 4-8. Liberty Local and Regional SANDWICH High Day Averages by Quarter

On a quarterly high day basis at Liberty, local impacts are highest in 4th quarter, likely due to meteorological conditions. Regional impacts are the highest in 3rd quarter when ammonium sulfate is the dominant species.

An additional parameter used by the SANDWICH technique is the degree of neutralization of sulfate (DON). The DON is a measure of the amount of ammonium associated with sulfate, up to 0.375 (complete neutralization to $(NH_4)_2SO_4$ based on molar ratios). DON ratios are given in Figure 4-9 for SWPA sites for 2005-2009.

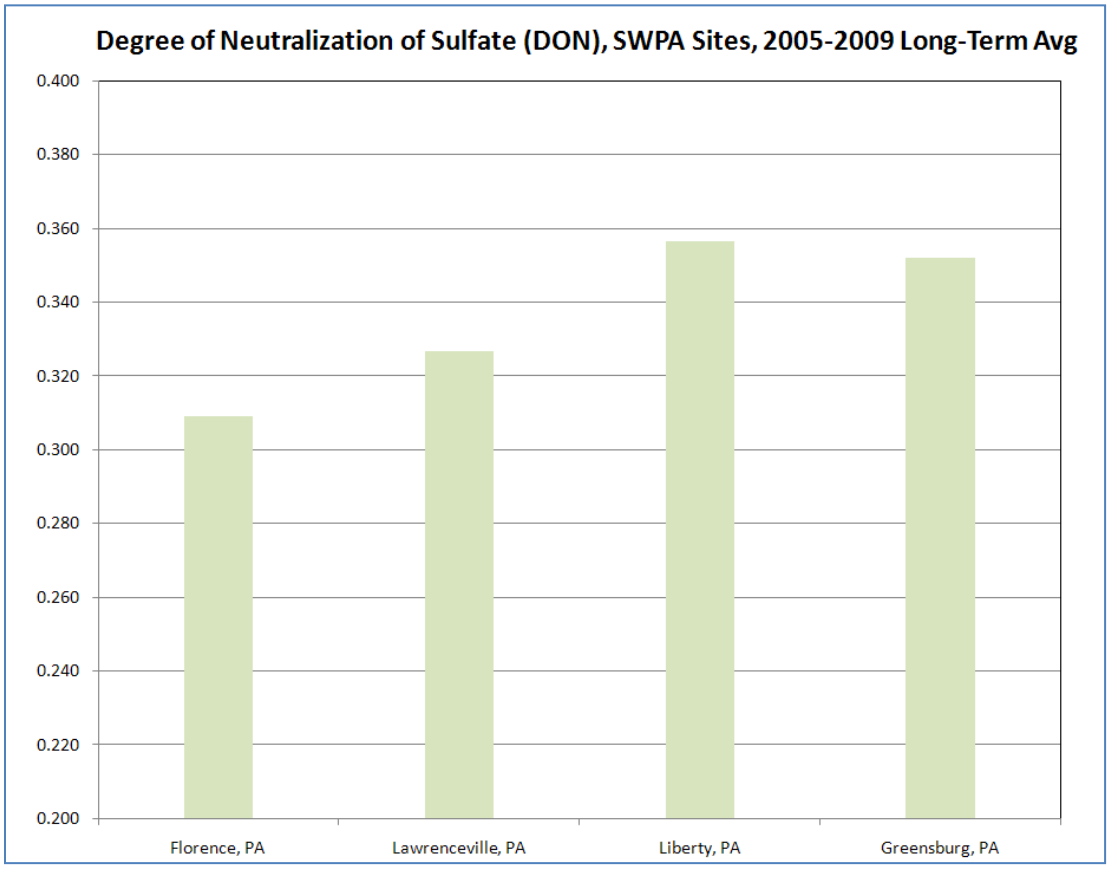


Figure 4-9. Degree of Neutralization of Sulfate, SWPA Sites, Long-Term 2005-2009 Avgs

The increasing DON ratios from west to east indicate that more acidic conditions are present with incoming air in the Pittsburgh region. Transported sulfuric acid (H_2SO_4) may be fresher or limited by NH_3, partially neutralizing to ammonium bisulfate (NH_4HSO_4). Excess ammonium at Liberty leads to the highest DON values for SWPA based on the SANDWICH technique.

5 Liberty Species Comparisons

This section focuses on individual species at Liberty in comparison to other sites and to other Liberty species.

5.1 Major Species

Figure 5-1 shows the major species long-term averages for Liberty and the other SWPA sites (averaged).

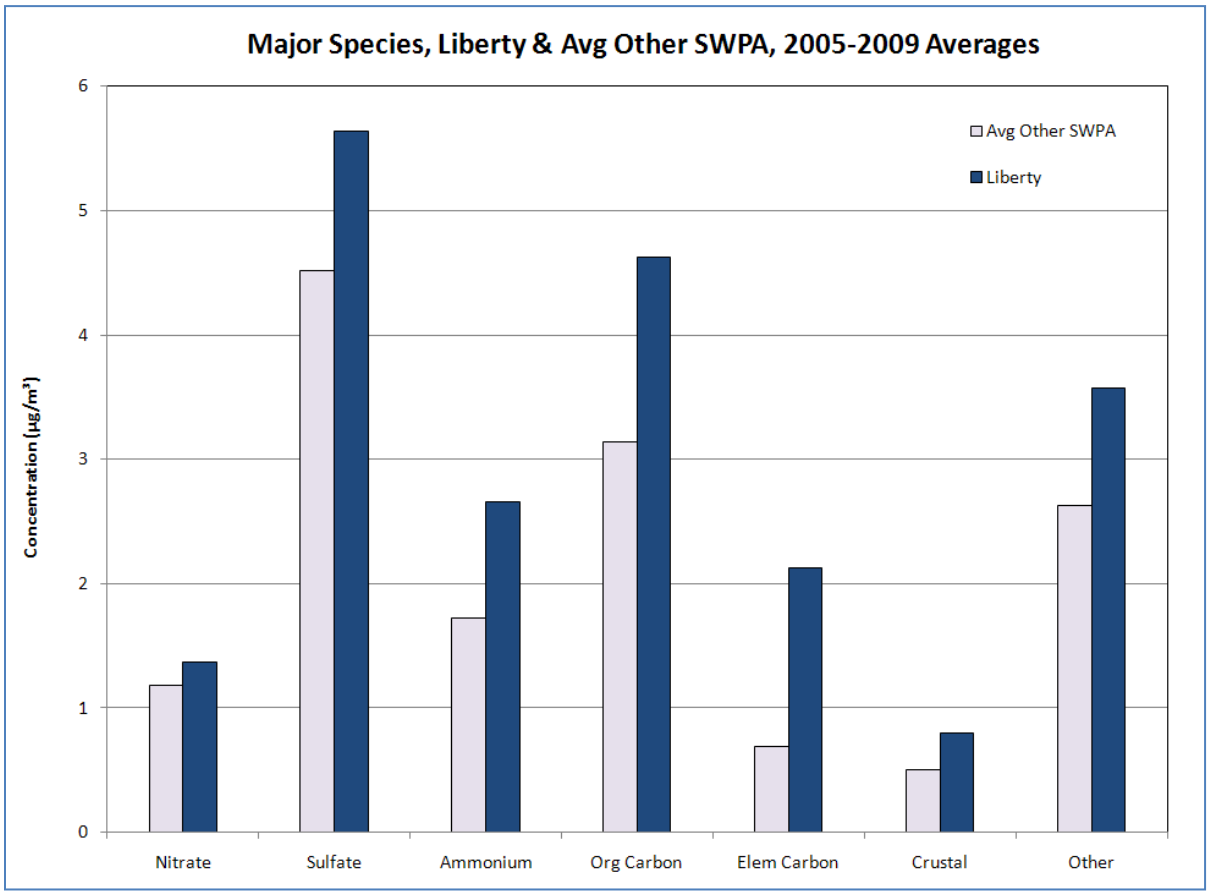


Figure 5-1. Major Species Averages, Long-Term 2005-2009 Avgs, SWPA Sites

Sulfate, ammonium, and carbons show the largest amounts of excess major species at Liberty. “Other” component replaced with particle-bound water and organic carbon material by mass balance using the SANDWICH technique, but “other” can also include trace elements measured in the raw data.

Trace elements were examined for excess at Liberty similarly to the major species. Many trace elements show negligible concentrations, while some show dominance at the Liberty site and can be used as tracers for source factor apportionment.

5.2 Trace Elements

Figure 5-2 shows Liberty-dominant trace elements for Liberty and other SWPA sites (averaged) based on the raw data measurements. Sulfur is also measured as a trace element but is much larger in scale than the other trace element concentrations and has been excluded in Figure 5-2.

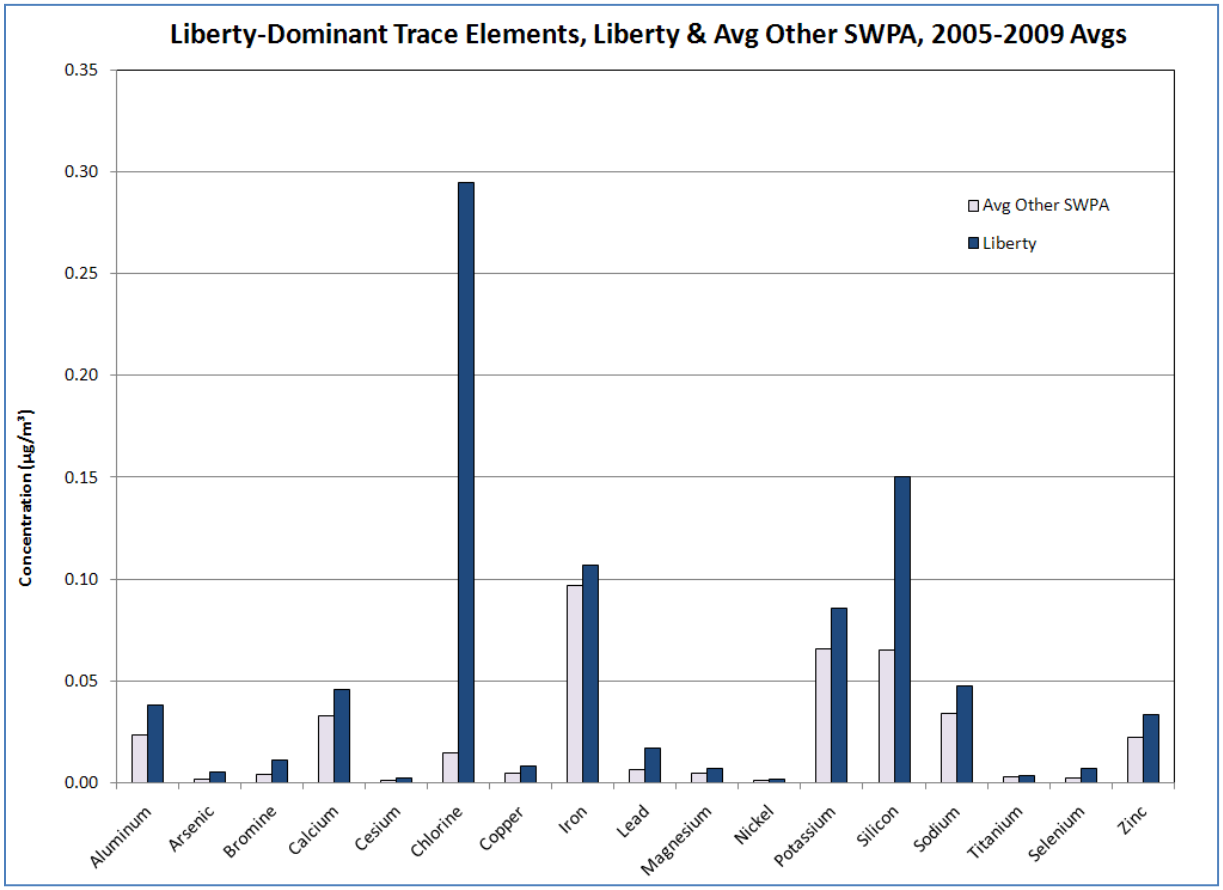


Figure 5-2. Liberty-Dominant Trace Elements, Long-Term 2005-2009 Avgs, SWPA Sites

Chlorine is the most evident Liberty-dominant trace element compared to other SWPA sites. Crustal elements[7] are also higher at Liberty, along with trace elements that can be indicators of specific source factors. For example, potassium can be an indicator of biomass burning, and zinc can be an indicator of galvanizing processes, tire wear, or incinerators.

Rock salt may be present as $PM_{2.5}$ at Liberty, but only a small portion of the total chlorine concentrations can be attributed to salt. The cations associated with deicing rock salt (Na, Ca, Mg) are much lower in molar ratio than chlorine, and chlorine is present on days without wintry conditions (either occurring or forecasted). Therefore, the source of chlorine is not entirely from rock salt at Liberty.

[7] Crustal elements (fine soil): Al, Ca, Fe, Si, Ti

5.3 Species Correlations

This subsection examines time-paired species correlations based on long-term averages at the Liberty site over the timeframe 2005-2009.

Figure 5-3 shows sulfate vs. ammonium on a year-round basis. Ammonium sulfate makes up the largest overall component of $PM_{2.5}$ at Liberty.

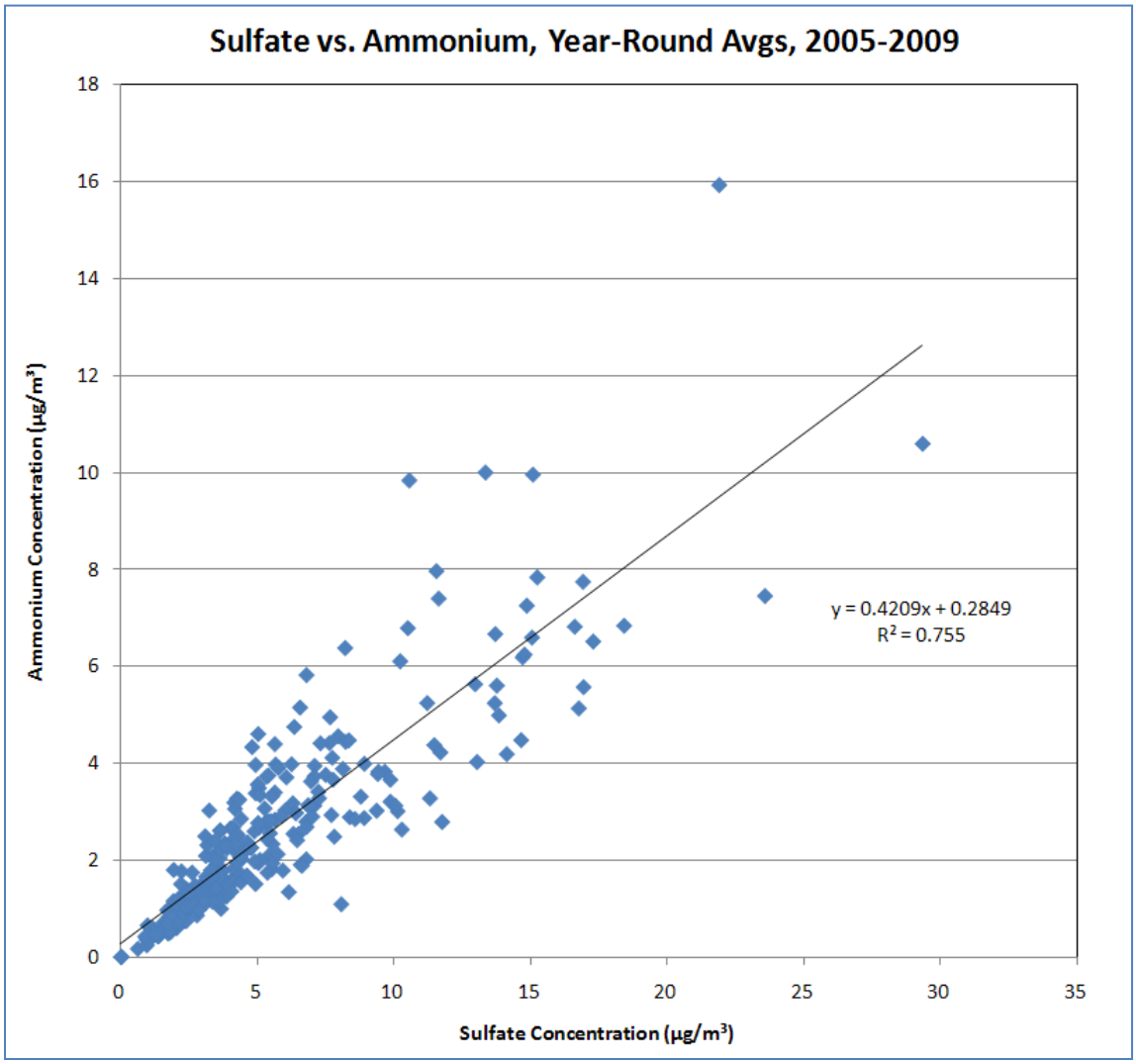


Figure 5-3. Sulfate vs. Ammonium, Year-Round

Sulfate and ammonium show moderate correlation on a year-round basis, but ammonium sulfate is most prevalent in warm months.

Sulfate and ammonium are shown in Figure 5-4 for June-Sept. data only, when sulfate is highest.

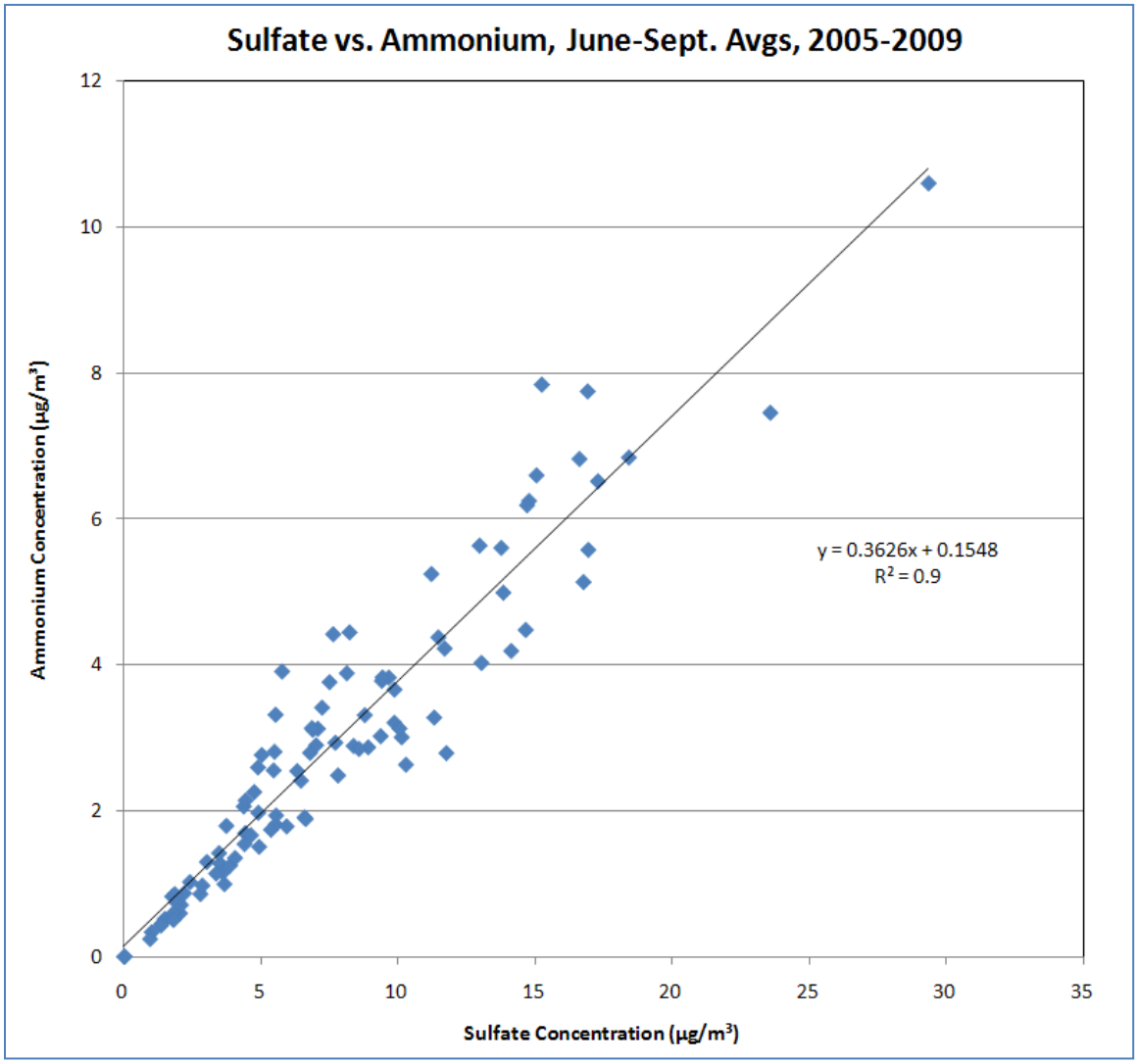


Figure 5-4. Sulfate vs. Ammonium, June-Sept.

Sulfate and ammonium show good correlation during June-Sept. months, with a slope indicating a DON of 0.362. Nearly all of the ammonium and sulfate is present as fully neutralized ammonium sulfate during warm months at Liberty.

Figure 5-5 below shows sulfate vs. sulfur to examine if sulfur is present in any forms other than sulfate at Liberty.

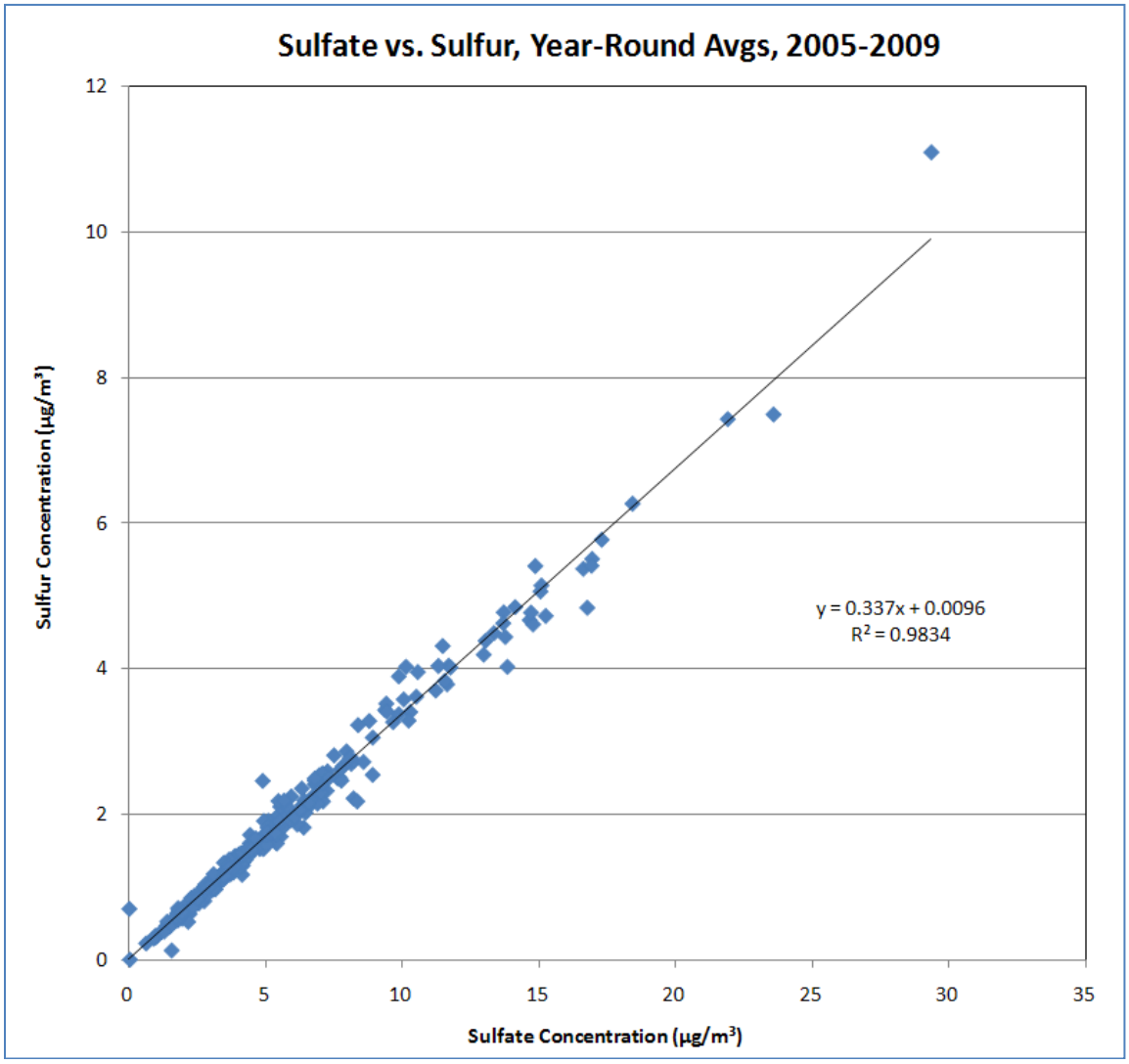


Figure 5-5. Sulfate vs. Sulfur, Year-Round

Sulfate and sulfur show excellent correlation year-round, indicating that sulfur measured as a trace element is representative of sulfur molecules measured as the sulfate ion.[8] Therefore, sulfur is not likely present in any particulate form other than sulfate.

[8] The CSN monitor measures species on three different channels: 1) trace and total mass, 2) ions, and 3) carbons.

Figure 5-6 shows nitrate vs. ammonium during winter months (Dec.-Feb.), when ammonium nitrate is most prevalent.

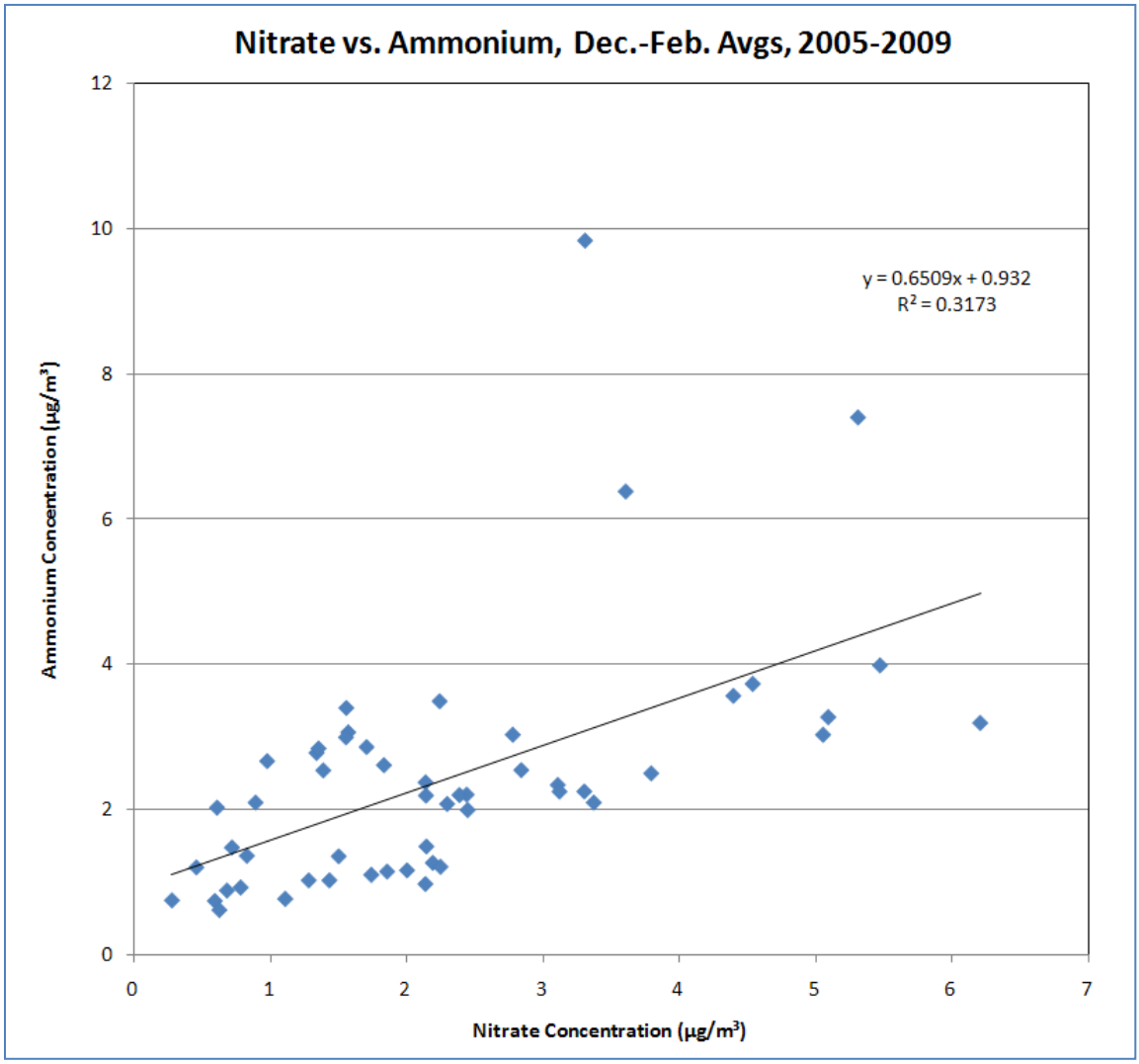


Figure 5-6. Nitrate vs. Ammonium, Winter Months

Although ammonium nitrate is most prevalent during winter months, the nitrate and ammonium correlation is poor during the winter months. This may be due to volatilization of nitrate during sampling/analysis or to the presence of excess ammonium that is not associated with nitrate.

Figure 5-7 shows the year-round organic and elemental carbon correlation. Carbons make up the largest component of the Liberty excess $PM_{2.5}$, on both long-term and high day bases.

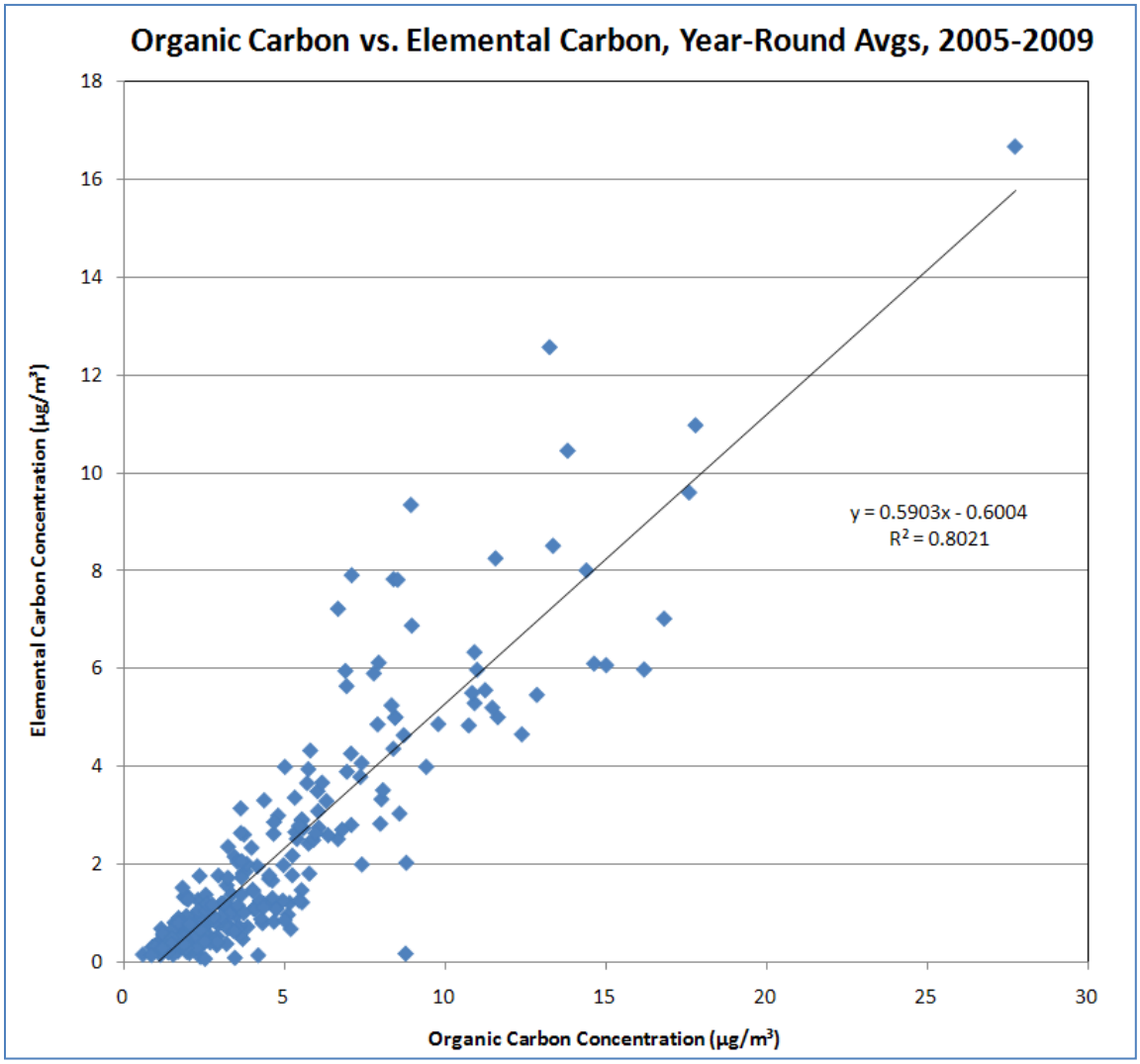


Figure 5-7. Organic Carbon vs. Elemental Carbon, Year-Round

Organic and elemental carbon show good correlation year-round. Source apportionment results suggested that the largest carbon source factors were attributed to similar sources in the Liberty and surrounding area (see the Source Apportionment report).

Organic carbon also shows correlation with some trace elements on a year-round basis. Figure 5-8 shows the correlation between organic carbon and lead.

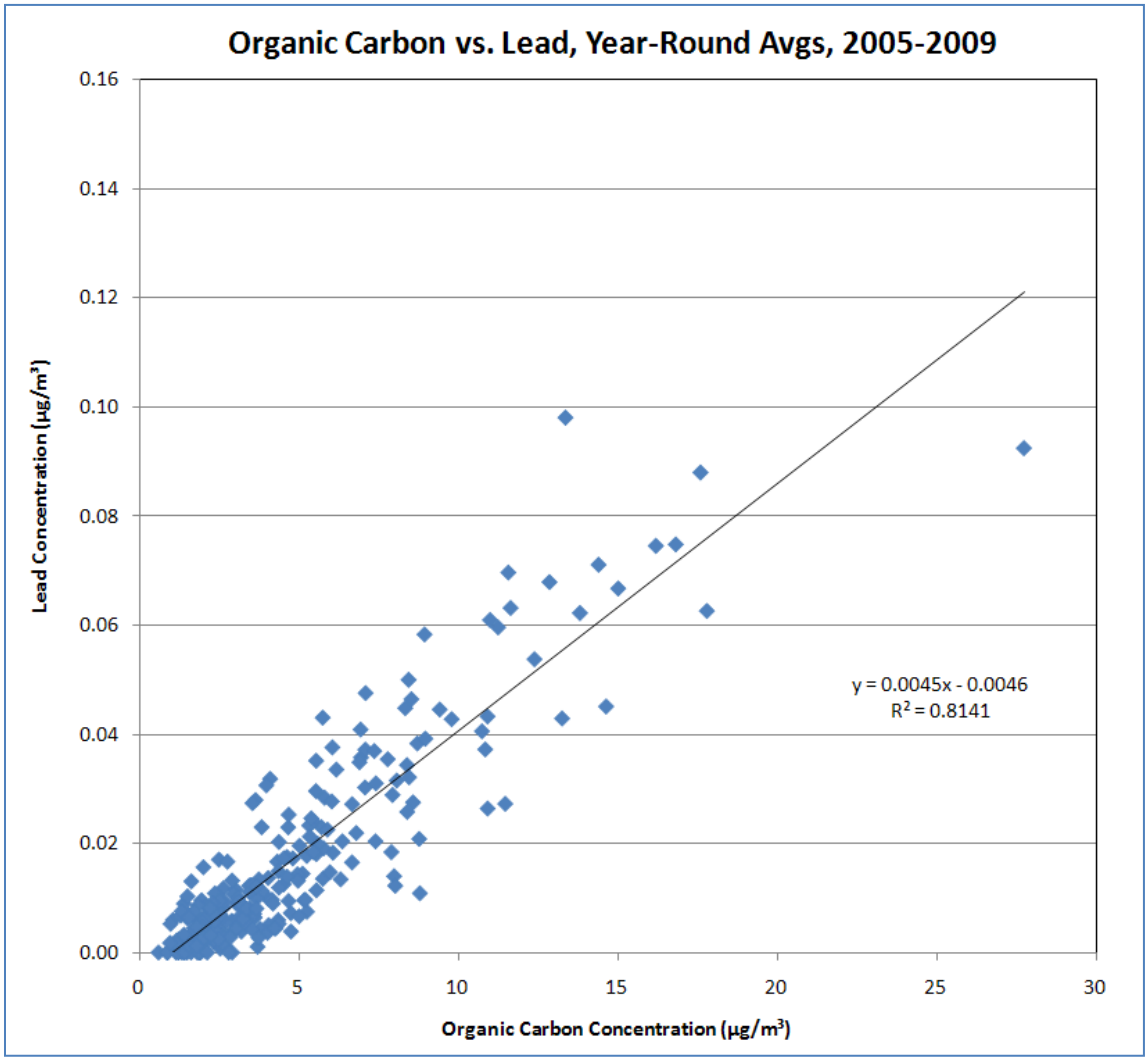


Figure 5-8. Organic Carbon vs. Lead, Year-Round

Organic carbon and lead show good correlation year-round, indicating possible similar sources of origination.

Figure 5-9 shows the year-round correlation between organic carbon and arsenic.

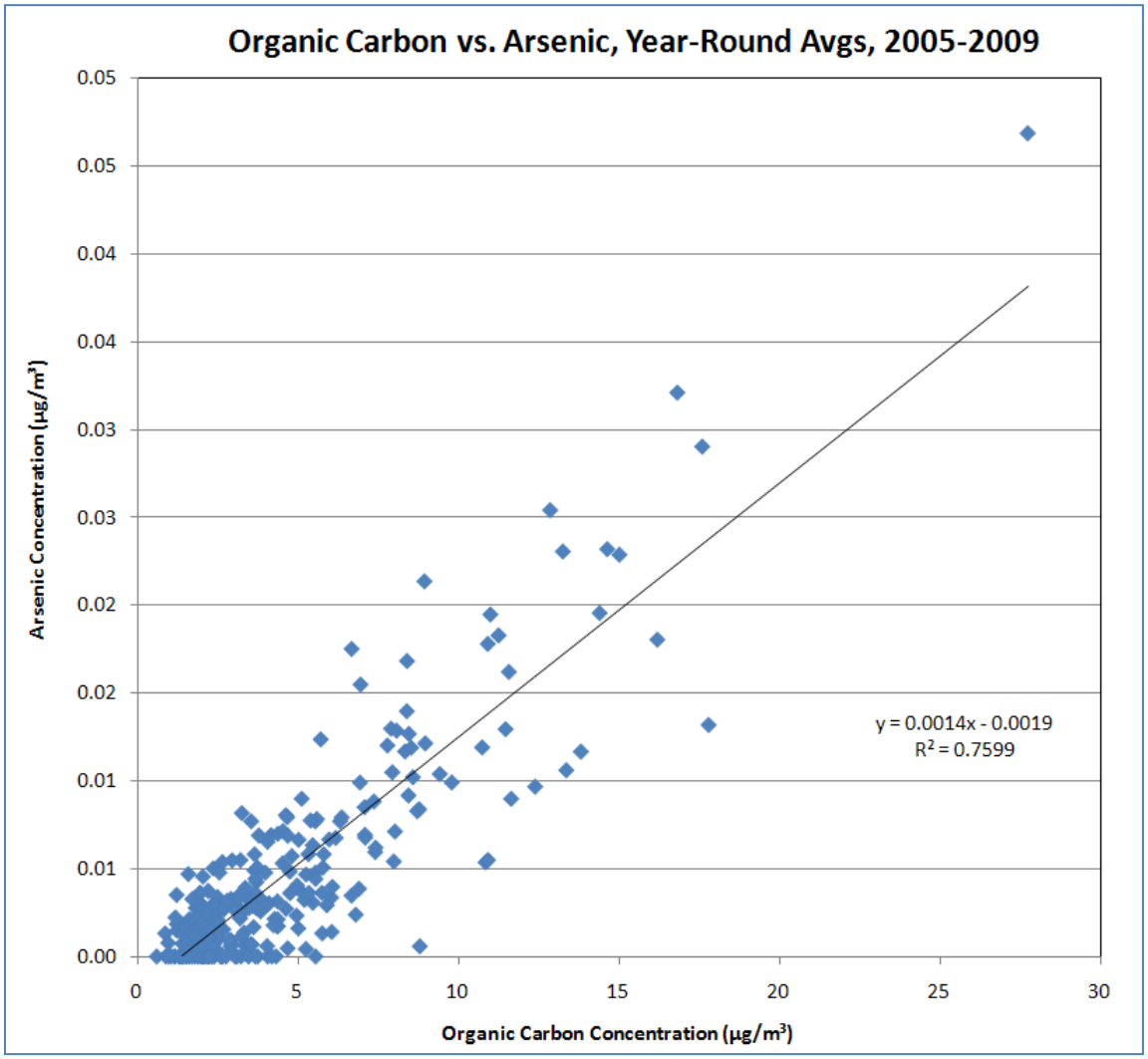


Figure 5-9. Organic Carbon vs. Arsenic, Year-Round

Organic carbon and arsenic show moderate correlation year-round, indicating possible similar sources of origination.

Some Liberty trace elements show correlation with one another. Figure 5-10 shows the correlation between bromine and lead.

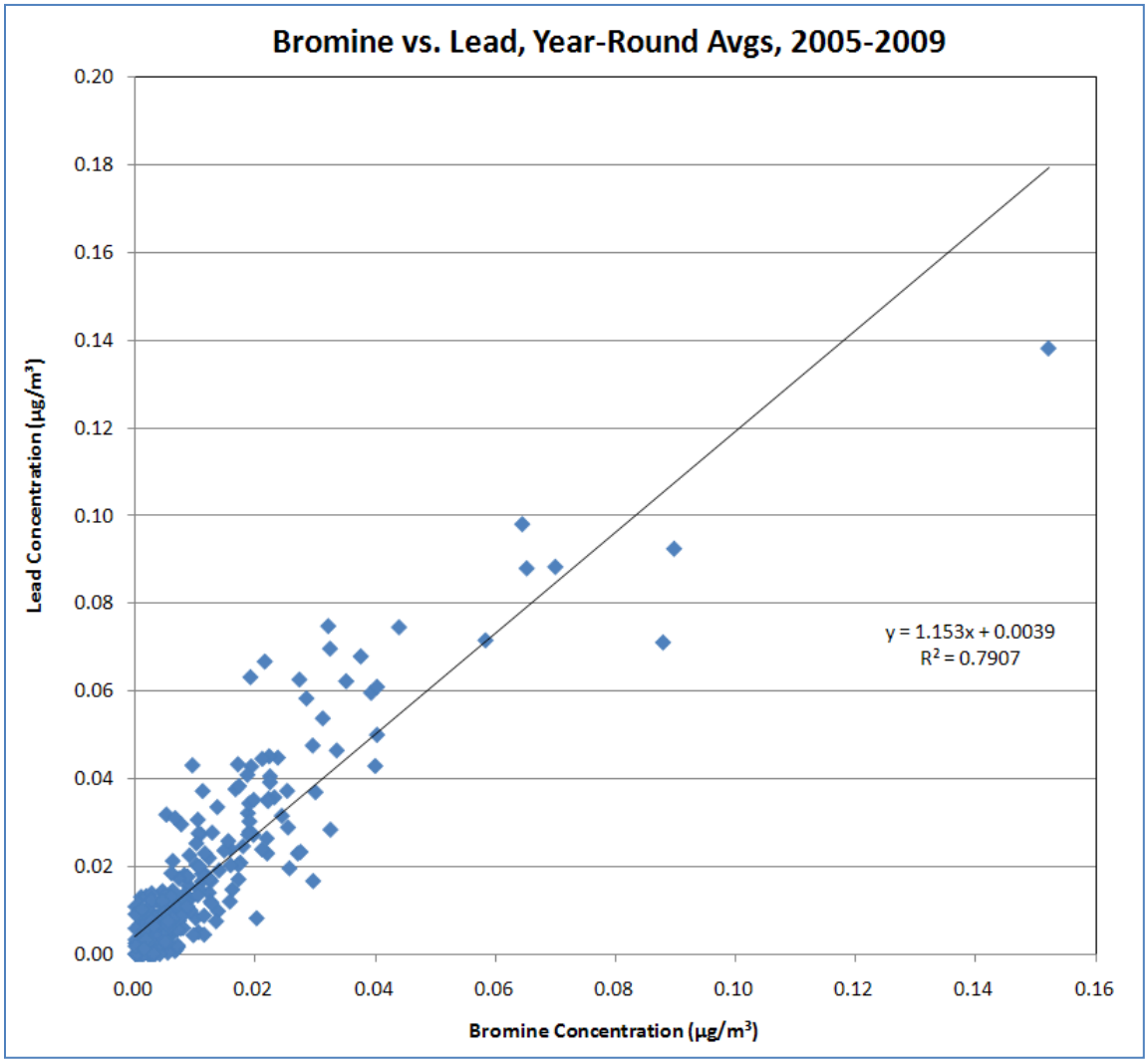


Figure 5-10. Bromine vs. Lead, Year-Round

Bromine shows good correlation with lead on a year-round basis. Bromine and lead also show some correlation with arsenic (plots not shown), suggesting similar sources of origin for these elements.

Figure 5-11 shows chlorine and bromine on a cool-month basis (Oct.-May). Both chlorine and bromine are most prevalent during cool months.

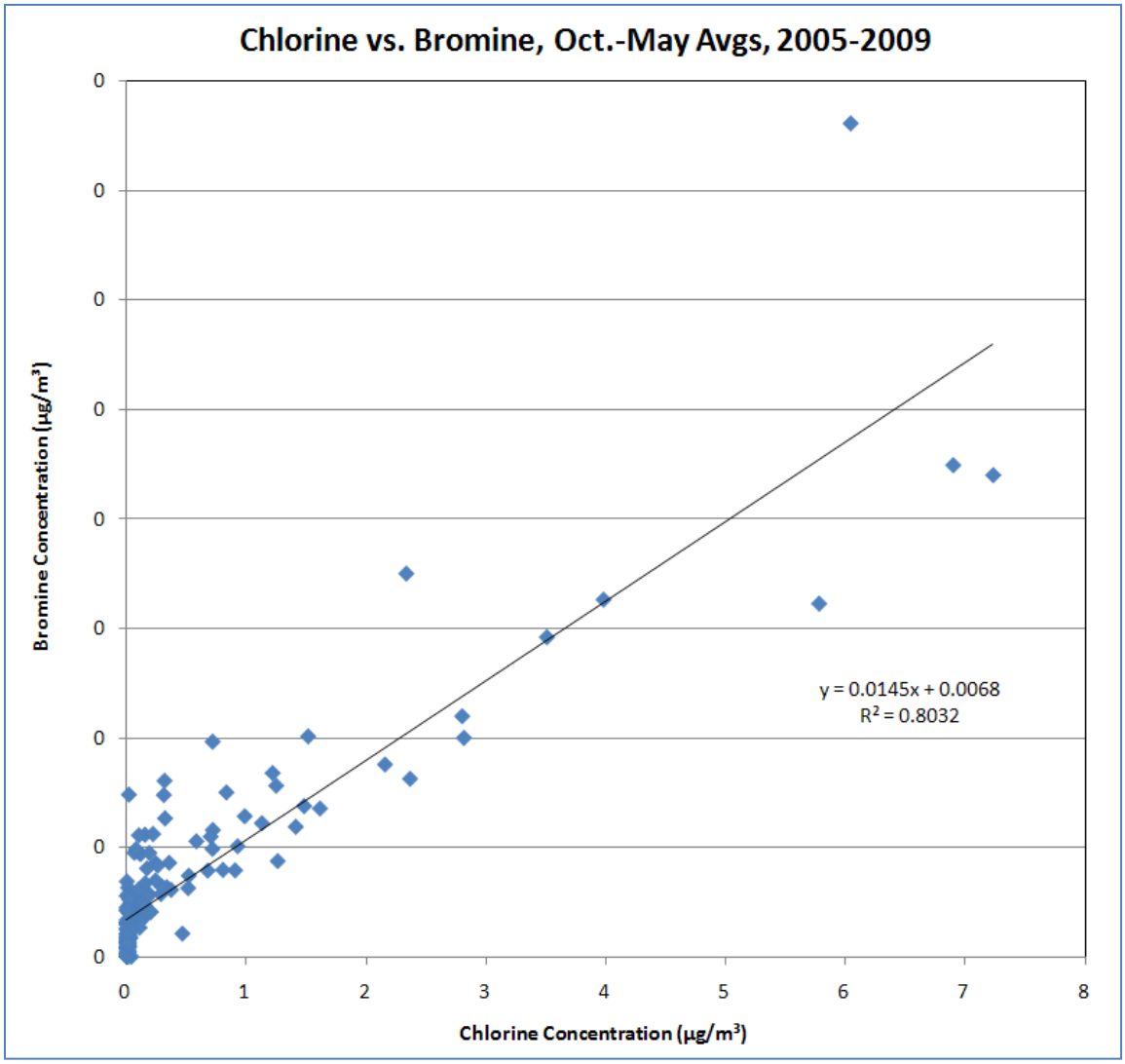


Figure 5-11. Chlorine vs. Bromine, Cool Months

Chlorine and bromine show good correlation in cool months, when their concentrations are highest. These species are likely originating from the same source and under similar meteorological conditions.

6 Liberty Temporal Trends

This section provides Liberty data on the following temporal bases: day, month, and quarter. Chlorine has been included as a separate component, separated from “other” component.

Figure 6-1 below shows Liberty species averages by day of the week over the period 2005-2009.

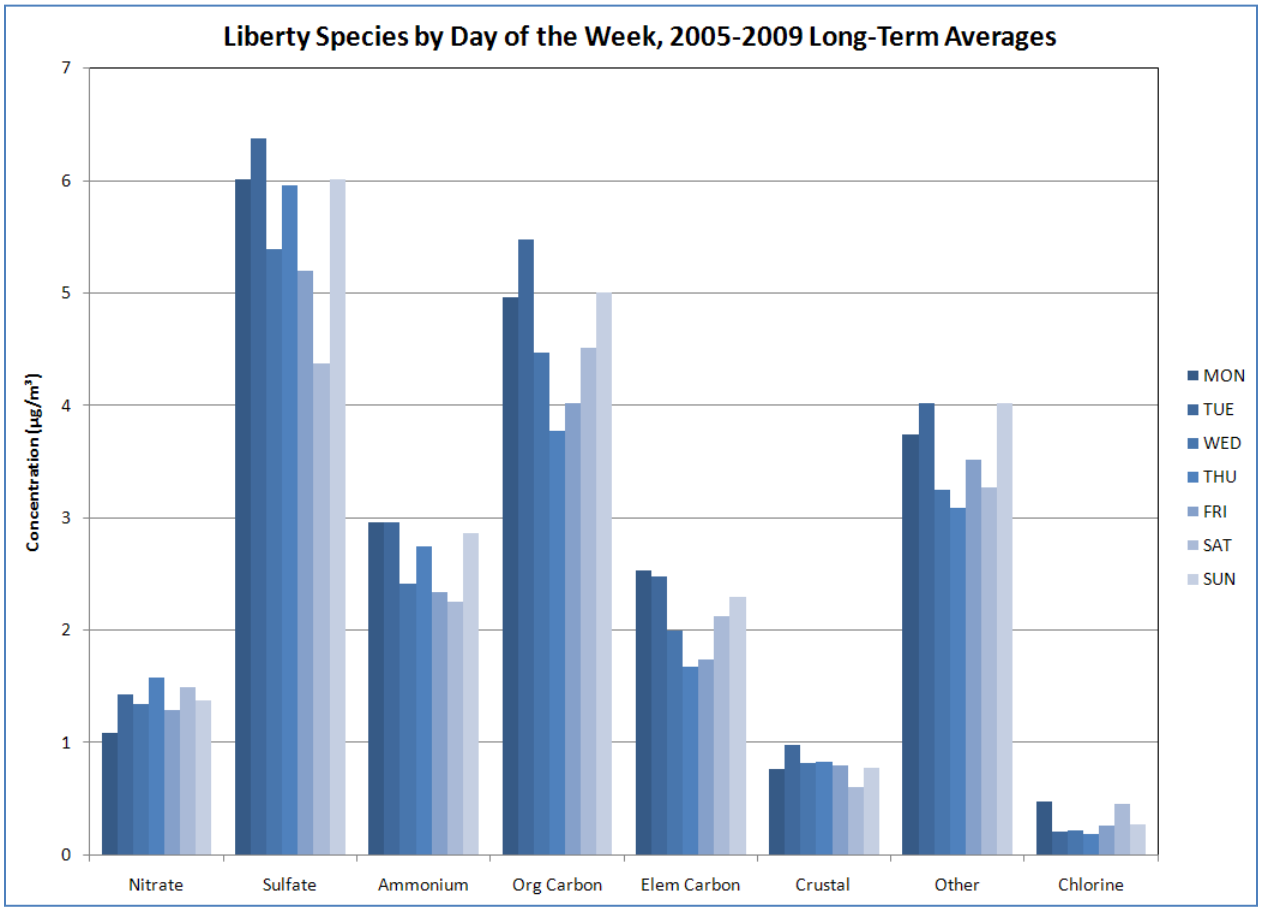


Figure 6-1. Liberty Species by Day of the Week, 2005-2009

Liberty species show some variation during the week, with higher concentrations during the early business week (Mon.-Tues.) and on weekends. This may be attributable to larger production and traffic volumes during the beginning of the week, or possibly lower activity during the middle/end of the business week (Wed.-Fri.). Weekend concentrations may be due to increased recreational sources of $PM_{2.5}$ (wood-burning, off-road vehicles/equipment, fireworks, etc.).

Site investigation at Liberty by ACHD staff indicates that school buses likely have little effect on $PM_{2.5}$ concentrations. Buses do not idle upon arrival at South Allegheny High School and promptly depart on staggered schedules for the middle/high school students.

Figure 6-2 shows Liberty species by month of the year for the timeframe 2005-2009.

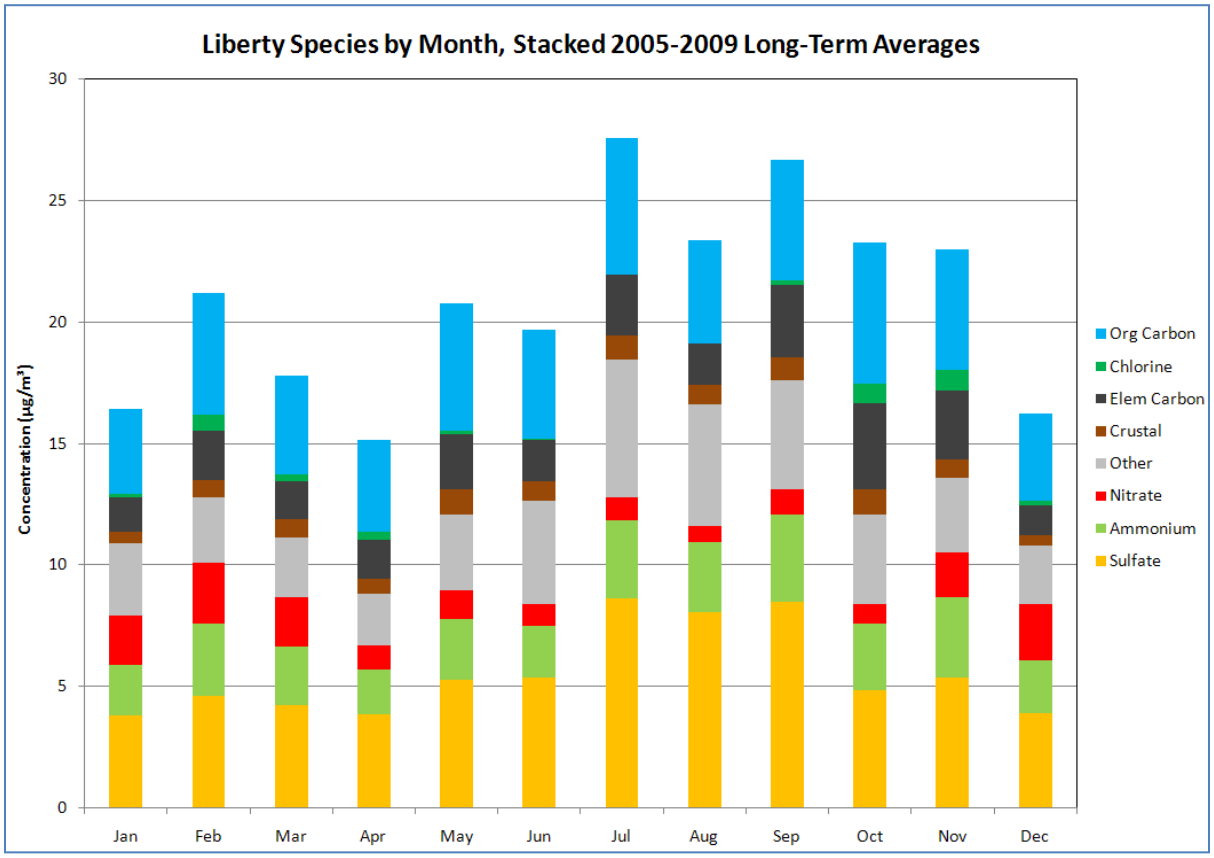


Figure 6-2. Liberty Species by Month, 2005-2009

Liberty species by month show persistent concentrations of several species such as carbons and sulfate. Sulfate is highest in summer months, when conditions are favorable for the formation of sulfate and hygroscopic growth ("other" component is also higher, likely representative of particle-bound water). Chlorine is present only in cool-weather conditions.

Figure 6-3 shows Liberty species by quarter of the year for 2005-2009.

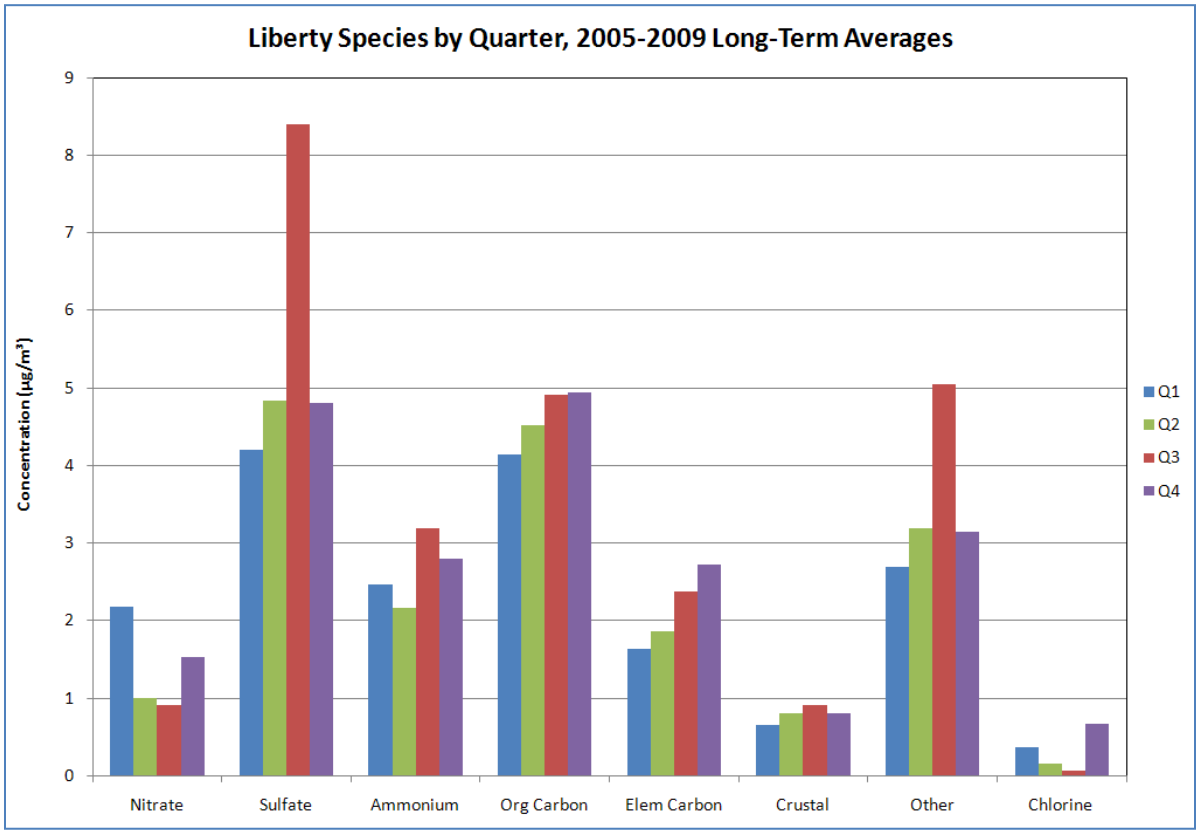


Figure 6-3. Liberty Species by Quarter, 2005-2009

Liberty species by quarter show peaks for sulfate and "other" in the 3rd quarter, which is consistent with summer data. Likewise, nitrate is highest in 1st and 4th quarters. Carbons show slightly increasing concentrations from 1st to 4th quarters, perhaps due to the prevalence of strong inversions in later months of the year.[9]

[9] Based on ACHD meteorological analyses.

7 Additional Information

For more information concerning Allegheny County speciation monitoring and analysis, contact Jason Maranche or Shaun Vozar at the ACHD Air Quality Program.

Jason Maranche can be contacted at 412-578-8104 or jmaranche@achd.net. Shaun Vozar can be contacted at 412-578-8145 or svozar@achd.net.

For general information about $PM_{2.5}$ and air quality, visit EPA's web site: www.epa.gov.

For EPA monitored data, visit: http://www.epa.gov/airdata/

For detailed EPA data available from the AQS Data Mart, visit:
http://www.epa.gov/ttn/airs/airsaqs/detaildata/downloadaqsdata.htm

For information concerning PA DEP Air Quality, visit:
http://www.dep.state.pa.us/dep/deputate/airwaste/aq/default.htm.

For information about $PM_{2.5}$ speciation collection and analysis methods, visit RTI's web site:
www.rti.org.

C-2: Positive Matrix Factorization (PMF) Analysis

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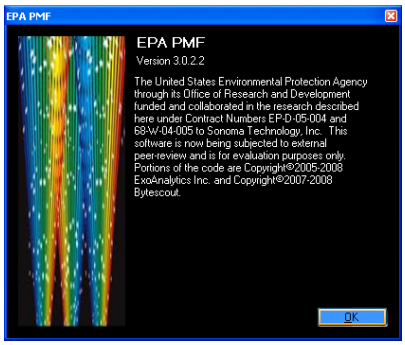
Allegheny County Health Department
Air Quality Program
301 39th St., Bldg. # 7
Pittsburgh, PA 15201

Allegheny County $PM_{2.5}$ Source Apportionment Results using the Positive Matrix Factorization Model (PMF Version 3.0) and Conditional Probability Function (CPF)



Model Timeframe: January 2005 through December 2010

December 13, 2011

TABLE OF CONTENTS

1. Executive Summary 1

2. Sites 4

3. Methodology 5

4. Modeled Results: Lawrenceville 8

Lawrenceville Source Factor 1: Secondary Ammonium Nitrate 12
Lawrenceville Source Factor 2: Diesel Vehicles + Metals Processing 15
Lawrenceville Source Factor 3: Road Salt/Dust 18
Lawrenceville Source Factor 4: Crustal Component 21
Lawrenceville Source Factor 5: Gasoline Vehicles + Tire Wear/Incinerators 24
Lawrenceville Source Factor 6: Metals Processing 27
Lawrenceville Source Factor 7: Coal Combustion or Glass Manufacturing 30
Lawrenceville Source Factor 8: Steel Manufacturing/Processing 33
Lawrenceville Source Factor 9: Burning/Cooking 36
Lawrenceville Source Factor 10: Secondary Ammonium Sulfates + Gasoline Vehicles 39

5. Modeled Results: Liberty 43

Liberty Source Factor 1: Metals Processing 47
Liberty Source Factor 2: Organic Industrial Carbons 50
Liberty Source Factor 3: Coal Combustion or Glass Manufacturing 53
Liberty Source Factor 4: Gasoline Vehicles + Metals Processing 56
Liberty Source Factor 5: Secondary Ammonium Nitrate 59
Liberty Source Factor 6: Elemental Industrial Carbons + Localized Sulfates 62
Liberty Source Factor 7: Secondary Ammonium Sulfates + Gasoline Vehicles 65
Liberty Source Factor 8: Coal/Coke Dust 68
Liberty Source Factor 9: Burning/Cooking 71
Liberty Source Factor 10: Chlorine 74
Liberty Source Factor 11: Steel Manufacturing/Processing 77
Liberty Source Factor 12: Crustal Component 80

6. Model Diagnostics.....85

7. References.....96

1. Executive Summary

The Positive Matrix Factorization Model (PMF Version 3.0) is a Windows-base software tool developed by EPA as a method to estimate source contributions based on actual monitored results. PMF performs a least-squares fit over an array of species measured simultaneously at a monitoring site.

The Allegheny County Health Department operates $PM_{2.5}$ Chemical Speciation Network (CSN) speciation monitors at Lawrenceville, in the City of Pittsburgh, and at Liberty Borough, near the southeastern tip of Allegheny County. Each speciation monitor measures 38 different component species of $PM_{2.5}$, along with total mass concentration. [Note: 53 species were measured until early 2009.]

Sample concentrations were entered into PMF along with concurrent uncertainties for each species. Source factors were then calculated by the model as a result of iterative method that converges on possible solutions to the array of variables. Modeled source factors were then matched to possible actual source types according to known species profiles, previous source apportionment studies, wind probability, and a conceptual model of Pittsburgh and the Monongahela Valley. A conceptual model is a fundamental understanding of how pollutants behave based on emissions inventory, monitored results, meteorological conditions, and transport phenomena.

This report is based on results using PMF Version 3.0. The species and pollutant comparisons between Lawrenceville and Liberty are over the timeframe of January 2005 through December 2010. All figures and tables represent the six-year period unless otherwise noted.

Wind direction data were also available at Liberty during the same timeframe, along with Lawrenceville since mid-2009. Wind directions were used to apply Conditional Probability Function (CPF) to the factor contributions. CPF reveals the frequency of wind directions for each modeled source factor during highest contributions.

PMF modeling resulted in the following 10 source factors for Lawrenceville:

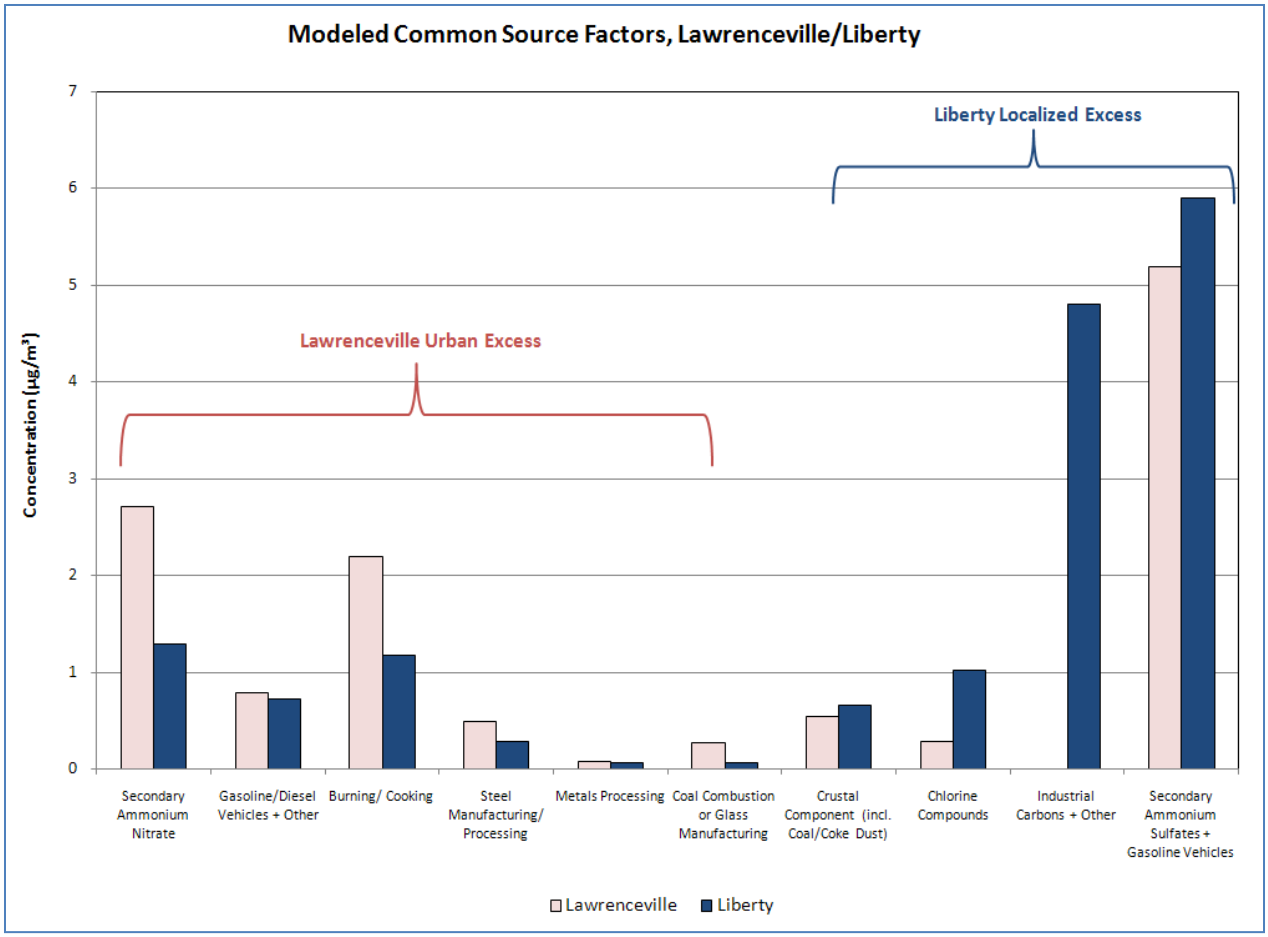
Key Species/Tracers	Nitrate	Carbons, Cu, Fe	Cl	Al, Ca, Fe, Si, Ti	Carbons, Pb, Zn	Cr, Ni	Se	Mn	Carbons, As, K, V	Sulfate, Carbons
Possible Source(s)	Secondary Ammonium Nitrate	Diesel Vehicles + Metals Processing	Road Salt/Dust	Crustal Component	Gasoline Vehicles + Tire Wear/ Incinerators	Metals Processing	Coal Combustion or Glass Manufacturing	Steel Manufacturing/ Processing	Burning/Cooking	Secondary Ammonium Sulfates + Gasoline Vehicles
Sum Conc. (µg/m³)	2.70851	0.34454	0.28995	0.54494	0.45208	0.08650	0.27532	0.49470	2.19307	5.18959

PMF modeling resulted in the following 12 source factors for Liberty:

Key Species/Tracers	Cr, Ni	Carbons, As	Se	Carbons, Cu	Nitrate	Carbons, Sulfate	Sulfate, Carbons	Elemental Carbon, Si	Carbons, K	Cl, Br	Fe, Mn, Zn	Al, Ca, Fe, Ti
Possible Source(s)	Metals Processing	Organic Industrial Carbons	Coal Combustion or Glass Manufacturing	Gasoline Vehicles + Metals Processing	Secondary Ammonium Nitrate	Elemental Industrial Carbons + Localized Sulfates	Secondary Ammonium Sulfates + Gasoline Vehicles	Coal/Coke Dust	Burning/ Cooking	Chlorine	Steel Manufacturing/ Processing	Crustal Component
Sum Conc. (µg/m³)	0.07132	1.93877	0.07281	0.73231	1.29450	2.87059	5.90173	0.56702	1.17206	1.02878	0.28750	0.09344

The values shown above are summed concentrations for each factor in units of µg/m^3. Detailed results for Lawrenceville and Liberty are given in Section 4 and Section 5, respectively.

The modeled results reveal that Lawrenceville and Liberty share several similar source factors. Comparing the common factors and combining some results, a generalized view of the urban and localized nature of each site can be examined. A column chart of the common grouped source factors for both sites is given on the following page.



Lawrenceville shows larger amounts of urban components of $PM_{2.5}$, such as mobile sources, commercial/residential cooking, and light industry. Liberty shows a localized excess due to heavy industry specific to the area, strongly influenced by meteorological conditions.

2. Sites

The Lawrenceville monitor site is an urban residential site, downwind from the Pittsburgh Central Business District (Downtown). Elevation is 847 feet above mean sea level (MSL), 135 feet above the Allegheny River valley. The Monitored data shows that Lawrenceville is affected by both regional flow and urban excess for $PM_{2.5}$. The regional flow is presumably due to upwind power plant emissions, but may also include $PM_{2.5}$ from biogenic sources. The urban excess sources are anthropogenic sources such as light or heavy industry, mobile source emissions, and residential and commercial cooking/heating.

The Liberty Borough monitor site is located in the Monongahela Valley, which contains a mix of urban residential, heavy industrial and rural areas. The elevation is 1066 feet MSL, 340 feet above the Monongahela River valley. Monitored speciation data suggests that some $PM_{2.5}$ species are consistent with other sites in SW PA, while other species are more localized to the Liberty area. It is assumed that species that do not follow regional flow may be originating at sources resident to the area, both stationary and mobile.

Data used in this PMF modeling spans the dates January 2005 through December 2010 as uploaded to EPA's Air Quality System (AQS) by RTI International, which processes the CSN data for Allegheny County.

Over this timeframe, 564 samples were modeled for the Lawrenceville site. Lawrenceville has a (1-in-3) speciation sampling frequency.

Liberty has a (1-in-6) speciation sampling frequency, and 287 samples were modeled for the Liberty site. Samples for the periods 11/14/2008-2/24/2009, 12/21/2009-3/9/10, and 12/4/10-12/22/10 were removed from the Liberty modeling input, due to unknown errors with the samples. The speciation results showed poor correlation with the filter-based (FRM) and continuous (TEOM) monitors at the Liberty site. These samples have been indicated as outliers in AQS with a code of "5," for unknown outlier.

Dates on or near the Fourth-of-July were removed due to outliers in the concentrations of firework ingredients. Potassium nitrate and other ingredients can lead to abnormal concentration levels of trace elements, some of which rarely exceed the method detection limits (MDL) on average days.

Additional outlier samples removed from the model for a better modeled solution are given in the model Diagnostics section.

3. Methodology

Model operation was followed according the PMF 3.0 user's guide. The PMF model was tested under different species and factor combinations. Species are excluded if they exhibit low signal-to-noise ratios, are frequently below the method detection limit (MDL), or do not easily fit into a least-squares solution. Any samples with missing data for one or more species are not modeled.

The major species measures from the speciation monitors show the highest concentrations and strongest signal-to-noise ratios. These species can strongly affect the model convergence and are usually a sign of specific sources. These species include:

Sulfate	Organic Carbon
Nitrate	Elemental Carbon
Ammonium	Total $PM_{2.5}$

Many trace element species also have significant concentrations and strong or moderate signal-to-noise ratios. They may also be important tracer elements, associated with specific sources. These species include:

Aluminum	Copper	Selenium
Arsenic	Iron	Silicon
Bromine	Lead	Sodium
Calcium	Manganese	Titanium
Chlorine	Nickel	Vanadium
Chromium	Potassium	Zinc

Trace element species with frequent concentrations less than the MDL were excluded from the modeling. These elements provide little weight in the fit of a solution. These species include:

Antimony	Cesium	Rubidium
Barium	Indium	Tin
Cadmium	Magnesium	Silver
Cobalt	Phosphorus	Zirconium
Cerium	Strontium	

Additionally, several trace elements were removed from the RTI lab analysis in early 2009. These species include:

Europium	Lanthanum	Scandium
Gallium	Mercury	Tantalum
Gold	Molybdenum	Terbium
Hafnium	Niobium	Tungsten
Iridium	Samarium	Yttrium

Sulfur as a trace element has also been excluded from the model, since nearly all sulfur as a component of $PM_{2.5}$ in the Pittsburgh region is accounted for by sulfate. Additionally, potassium and sodium are measured by both ion chromatography and x-ray fluorescence. The x-ray fluorescence samples were used due to higher signal-to-noise ratios.

PMF uses a strength indicator for each factor. Total $PM_{2.5}$ was down-weighted in order to lower its influence on the fit of the model. Total $PM_{2.5}$ is used only as an indicator for overall size of factor concentration. Down-weighting increases the uncertainty by a factor of 3.

Trace element species with low signal-to-noise ratios (less than 3.5) were down-weighted. Low signal-to-noise ratios mean that a species' concentration and uncertainties are nearly equal. Trace element species that fit less perfectly than other species into a convergent solution were also down-weighted. A poor fit is reflected by poor diagnostics from regression, standard deviation and residual statistics. Based on EPA recommendation, an additional 5% uncertainty was applied to the entire model for all samples in the CSN network.

The number of source factors in the model is increased or decreased based on the performance of the model and the rationality of the results. A source factor does not necessarily represent a single source but rather a source type or scenario, or combination thereof, that leads to contributions at the monitor site. Too few source factors indicate a lack of uncertainty and create profiles with species that are clustered. Too many source factors indicate too much uncertainty and leads to profiles that cannot be characterized or are too small in overall concentration to have significance. Profile results were also compared to previously compiled source profiles (see the References section of this document).

Some factors may be associated with similar source types but are separated into more specific source factors by the model. For example, a source type that is representative of vehicle emissions may comprise one source factor based on year-round contributions and another factor based on specific traffic conditions.

There may also be overlap of some source types. For example, a factor dominated by ammonium sulfate may also include carbons and trace elements that may or may not be originating from the sulfate sources but are peaking simultaneously in the monitor data.

Conditional Probability Function (CPF) analysis was used to determine the high-day wind directions of each modeled factor. For this analysis, the hourly wind directions were first separated into 30-degree sectors for each 24-hour sample. All hourly directions from 16-45 degrees are assigned to the 30 degree sector, 46-75 degrees to the 60 degree sector, and so on. The total hourly count for each sector is used for the dominator in the CPF equation (shown below).

Conditional Probability Function (CPF)

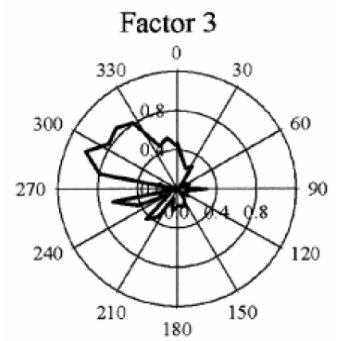
CPF uses wind direction rather than trajectories to determine likely direction of sources. CPF compares these highest concentration days to the average transport pattern (i.e., the climatology)

$$CPF = \frac{m_{\Delta\Theta}}{n_{\Delta\Theta}}$$

$n_{\Delta\Theta}$= number of times wind direction is from sector $\Delta\Theta$.

$m_{\Delta\Theta}$= number of times source contributions are high while wind direction was from sector $\Delta\Theta$.

CPF close to 1.0 for a given sector $\Delta\Theta$ indicates a high probability that a source is located in that direction.



Example CPF plot for the highest 25% contribution from a PMF factor pointing the northwest of the site as a possible source region.

(Source: Kim et al., 2004)

For each modeled factor, the top 25% days based on daily contributions were assigned as high days. The hourly count of wind sectors on these days was then used for the numerator in the CPF equation.

The result of the equation provides a frequency for which the number of times the factor showed a high contribution in each wind sector. Each sector is then plotted on a radar chart, representing the predominant direction of the high days of the modeled source factor.

Upper air soundings[1] were also examined for the occurrences of 12Z temperature inversions on high contribution days for each factor. Temperature inversions frequently occur in SW PA and can greatly affect the dispersion characteristics in river valleys. Both gaseous and particulate pollutants can show elevated levels during nighttime inversion periods.

Potential Source Contribution Function (PSCF) is an additional analysis that can be used for source apportionment, based on long-range back-trajectories generated by the HYPLIT model. PSCF was not performed for this report due to the smaller-scale conceptual model of $PM_{2.5}$ in Allegheny County, specifically in the Liberty area.

[1] Upper air soundings were taken from the University of Wyoming, College of Engineering, Department of Atmospheric Science web site: http://weather.uwyo.edu/upperair/sounding.html

4. Modeled Results: Lawrenceville

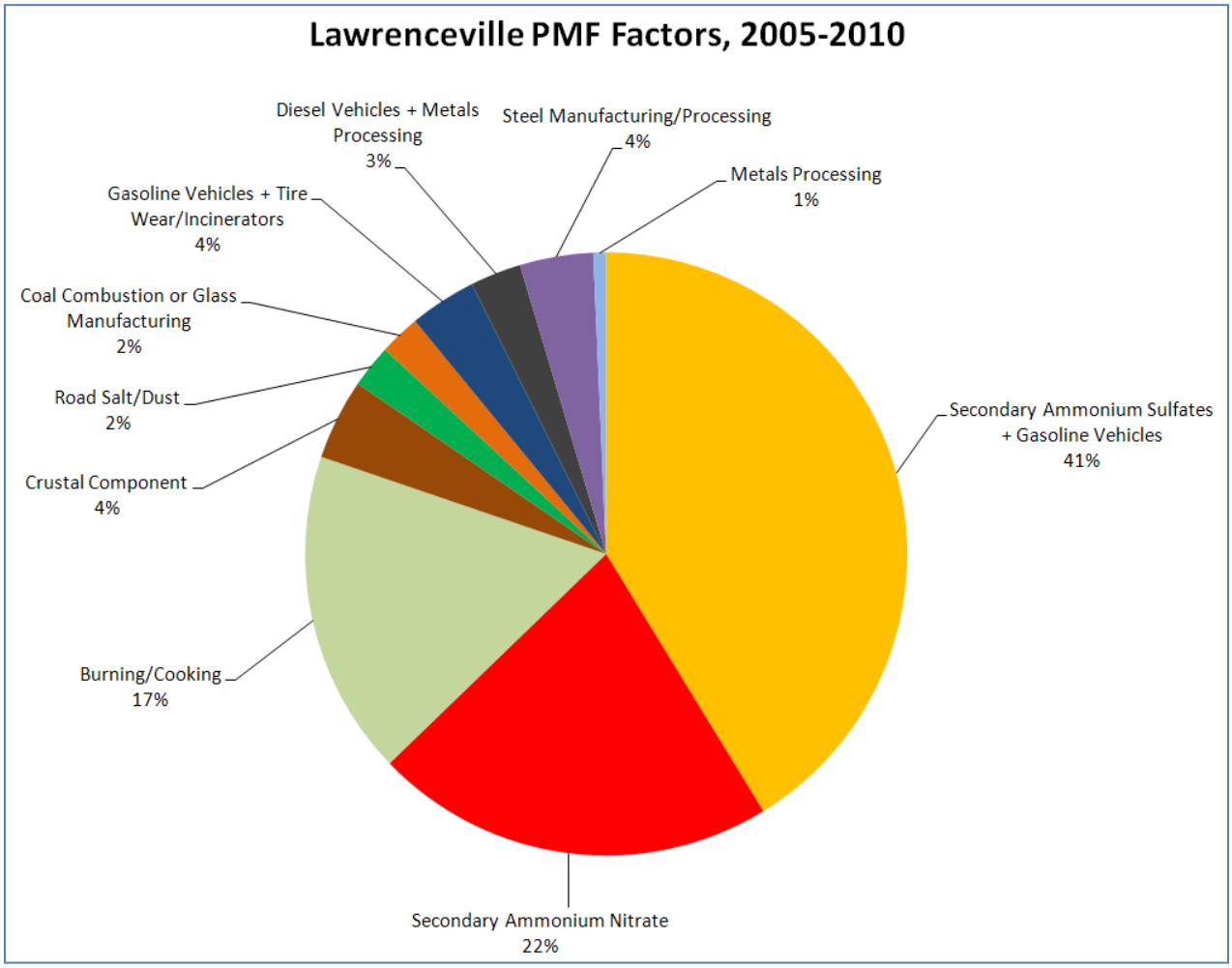
The best-fit model runs for Lawrenceville were able to resolve 10 source factors. The following species were down-weighted in the model runs: Elemental Carbon, Al, As, Na, Ti, V, and Total $PM_{2.5}$. Federal Reference Method (FRM) values were used for missing Total PM2.5 for two dates: 11/13/06 and 6/23/07.

Lawrenceville results exhibited source factors that are common to urban areas. Lawrenceville source factor profiles and associated source types are given in the table below. Species average concentrations that were considered to be indicators of the specific source types are shown in bold.

Factor	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Key Species/Tracers	Nitrate	Carbons, Cu, Fe	Cl	Al, Ca, Fe, Si, Ti	Carbons, Pb, Zn	Cr, Ni	Se	Mn	Carbons, As, K, V	Sulfate, Carbons
Possible Source(s)	Secondary Ammonium Nitrate	Diesel Vehicles + Metals Processing	Road Salt/Dust	Crustal Component	Gasoline Vehicles + Tire Wear/ Incinerators	Metals Processing	Coal Combustion or Glass Manufacturing	Steel Manufacturing/ Processing	Burning/Cooking	Secondary Ammonium Sulfates + Gasoline Vehicles
Ammonium	**0.53361**	0.03588	0.07164	0.03502	0.02694	0	0.04244	0.01889	0.04900	**1.02000**
Nitrate	**1.24560**	0.03980	0.10552	0.03270	0.01385	0.01832	0.04364	0.07586	0	0
Sulfate	0.49256	0.04470	0.03314	0.13432	0.10375	0.01300	0.12948	0.03154	0.27690	**3.14470**
Org_Carbon	0.34376	**0.08715**	0.02019	0.14004	**0.20581**	0.03034	0	0.26879	**1.58250**	**0.87877**
Elem_Carbon	0.07234	**0.06668**	0.01724	0.06603	**0.05431**	0.00704	0.03885	0.06017	**0.23596**	**0.12085**
Al	0.00180	0.00074	0.00060	**0.01382**	0	0.00205	0	0	0.00010	0.00187
As	0	0.00013	0.00006	0	0.00010	0.00003	0.00005	0.00021	**0.00084**	0.00026
Br	0.00090	0.00013	0.00037	0.00006	0	0.00004	0.00032	0.00019	0.00142	0.00055
Ca	0.00241	0	0.00181	**0.02736**	0.00062	0	0.00183	0.00394	0.00061	0
Cl	0	0	**0.02286**	0	0.00049	0	0	0	0	0
Cr	0	0	0	0.00028	0.00009	**0.00299**	0.00003	0	0	0
Cu	0.00017	**0.00201**	0.00026	0.00021	0.00037	0.00043	0.00018	0.00031	0.00086	0.00038
Fe	0	**0.06487**	0.00374	**0.02925**	0.00966	0.01020	0.00327	0.02044	0	0.00686
Pb	0.00034	0.00101	0	0	**0.00289**	0	0.00218	0	0.00205	0
Mn	0.00014	0.00043	0.00007	0.00021	0	0.00004	0.00006	**0.00500**	0.00002	0
Ni	0.00012	0.00028	0.00002	0	0	**0.00103**	0	0	0.00002	0.00011
K	0.00893	0	0.00192	0.00710	0.00139	0.00076	0.00384	0	**0.03357**	0.00583
Se	0	0	0.00017	0	0	0	**0.00303**	0	0	0.00027
Si	0	0.00015	0.00370	**0.05006**	0	0	0.00294	0.00277	0.00281	0.00426
Na	0.00536	0.00057	0.00416	0.00696	0.00815	0.00001	0.00254	0.00264	0.00616	0.00192
Ti	0.00035	0	0	**0.00153**	0.00008	0.00008	0.00025	0.00005	0	0.00061
V	0.00011	0	0	0	0.00002	0.00001	0.00002	0.00020	**0.00025**	0.00023
Zn	0	0	0.00249	0	**0.02356**	0.00014	0.00038	0.00370	0	0.00212
Sum Conc. (µg/m³)	2.70851	0.34454	0.28995	0.54494	0.45208	0.08650	0.27532	0.49470	2.19307	5.18959

Note: Factors and runs are generated randomly by PMF and are not ranked according to any one species.

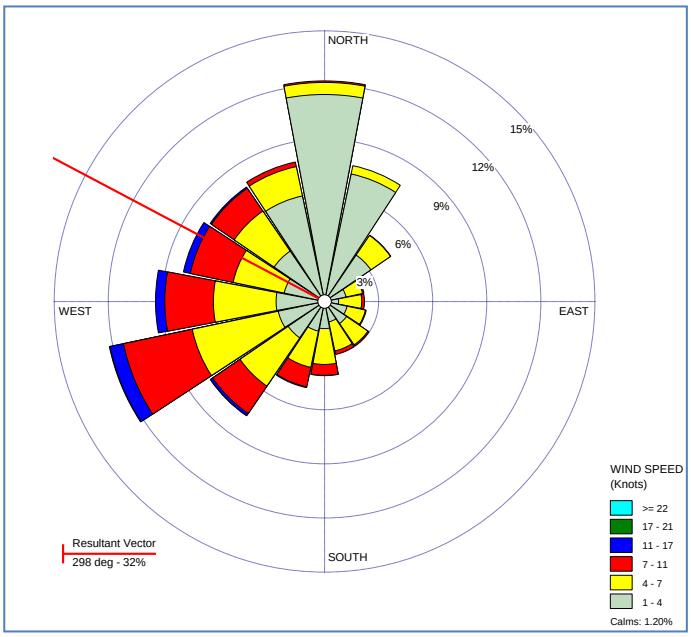
A pie chart of the best-guess source types, by percent of summed concentrations, is shown below.

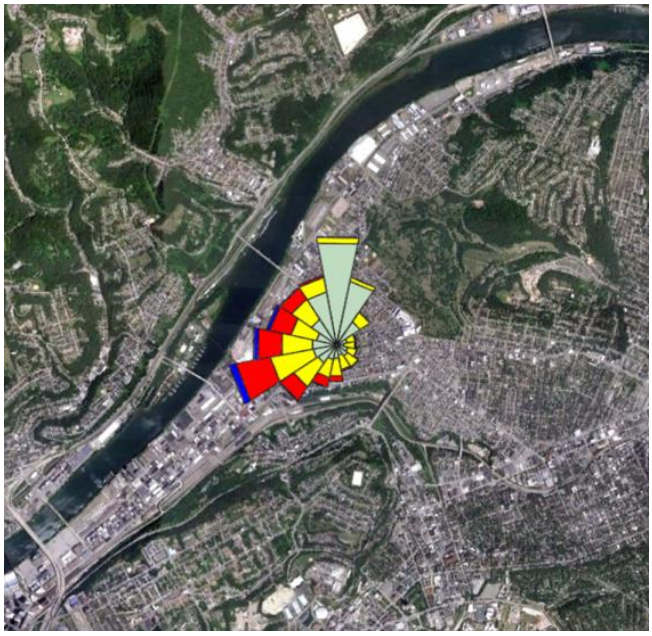


Analysis and graphical results for each factor are given on subsequent pages. Graphical results are copied directly from the model output and include the following for each factor:

- Concentration by value and percentage of total for each species
- Variable (bootstrapping) for each concentration and percentage
- Time series plot by overall factor concentration
- Contribution aggregates according to year, season, and day of week

Conditional Probability Functions (CPF) plots are also included for each factor for Lawrenceville. Below is the wind rose for Lawrenceville, showing wind direction frequencies plotted in vector grid form and also plotted in Google Earth.[2] Lawrenceville wind data were available only for July 2009 through Dec. 2010.



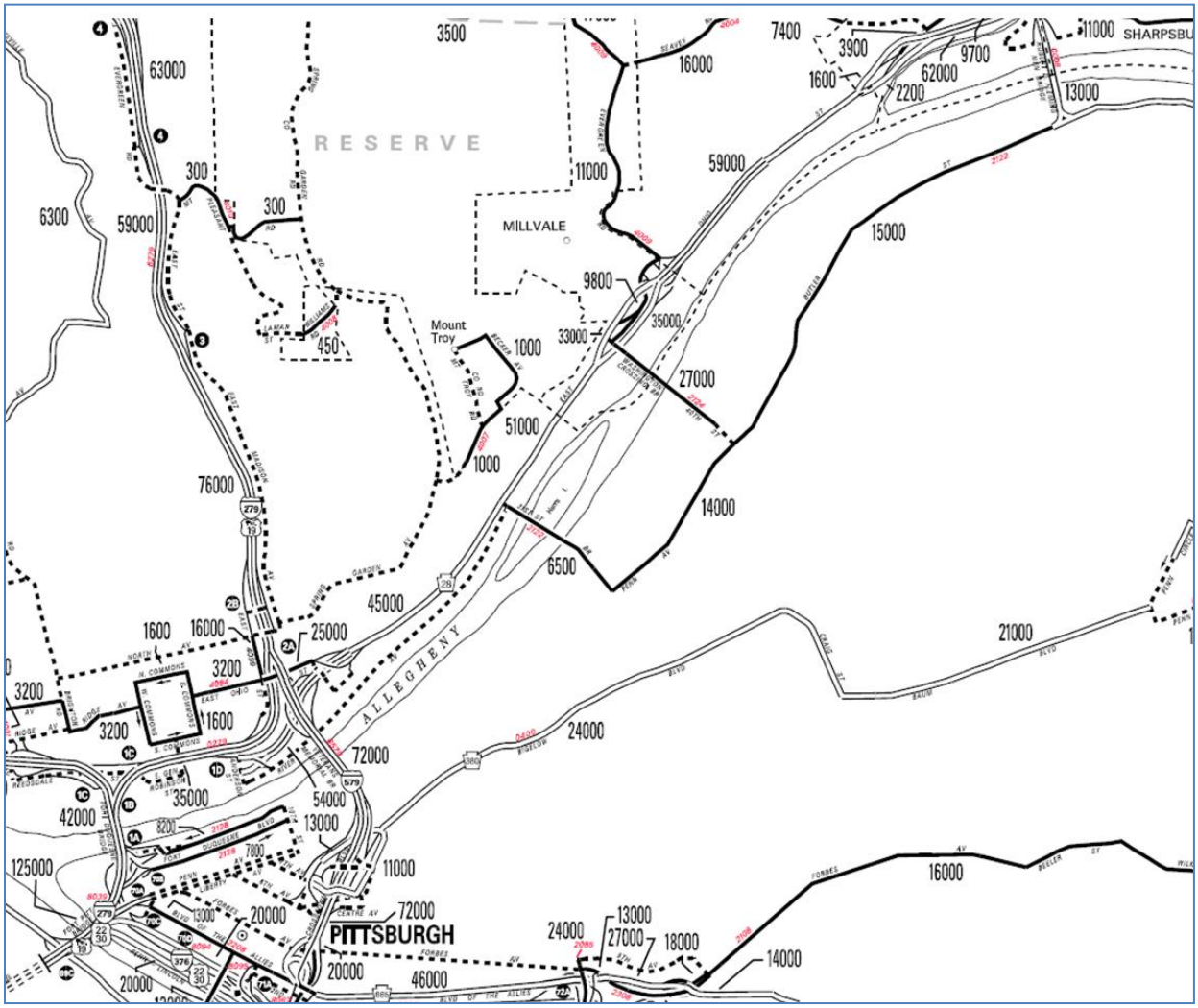


Average wind speed = 4.33 knots

Lawrenceville shows large frequencies of moderate wind speeds from the southwest and light wind speeds from the north. The light northerly winds generally occur at night, likely due to drainage from the Allegheny River valley.

[2] Wind rose generated by Lakes Environmental's WRPLOT View 7.0.0 software.

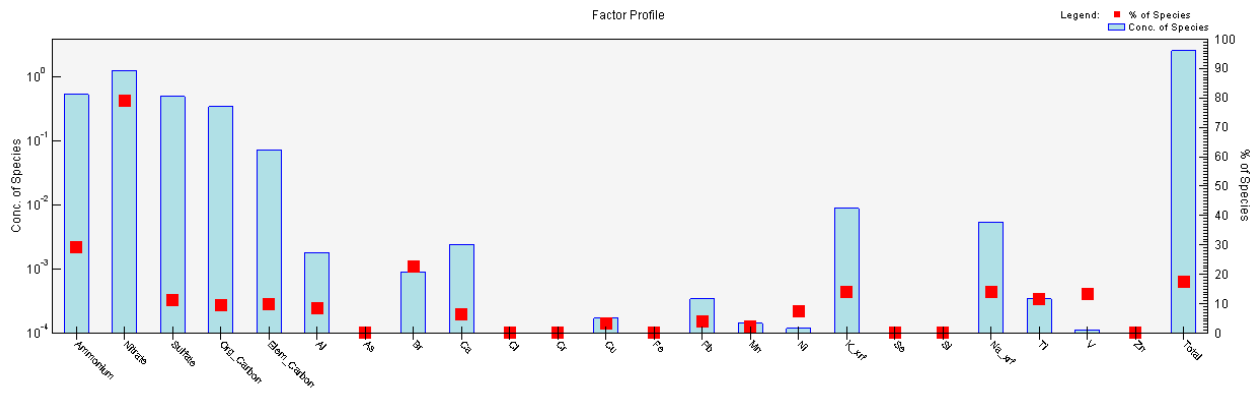
2008 annual average daily traffic volumes[3] for the Lawrenceville vicinity are shown on the map below. Penn Ave. (count: 14,000), Butler St. (15,000), and 40th St. (27,000) are the roadways nearest the Lawrenceville site.

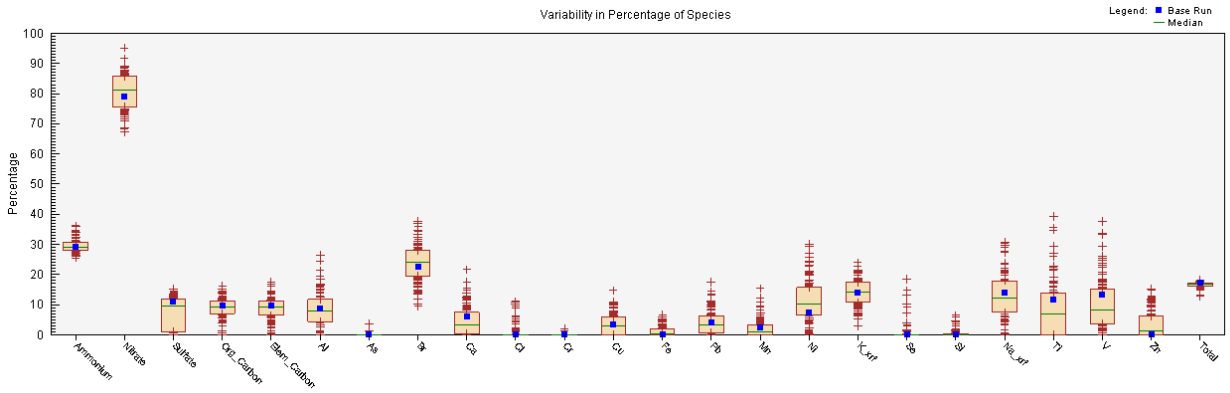


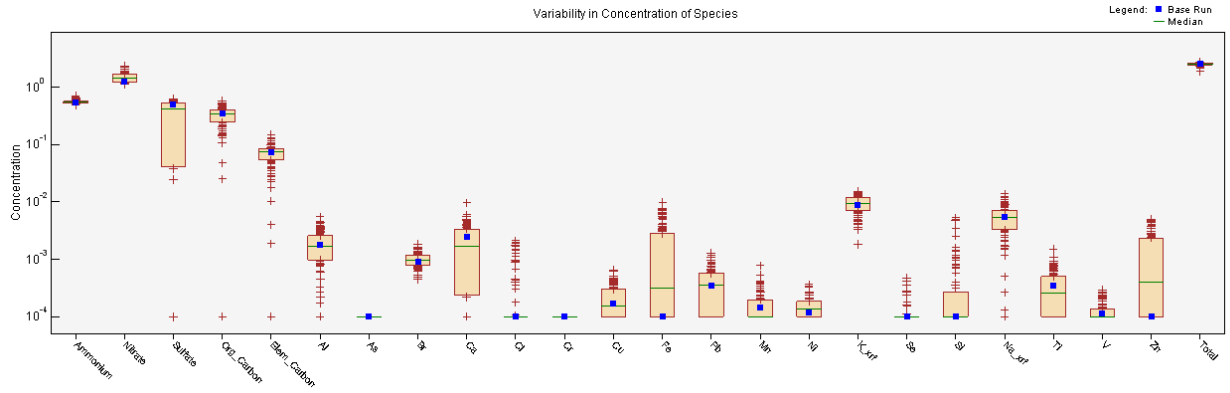
[3] 2008 Traffic Volumes, Pennsylvania Department of Transportation (PennDOT), Bureau of Planning and Research.

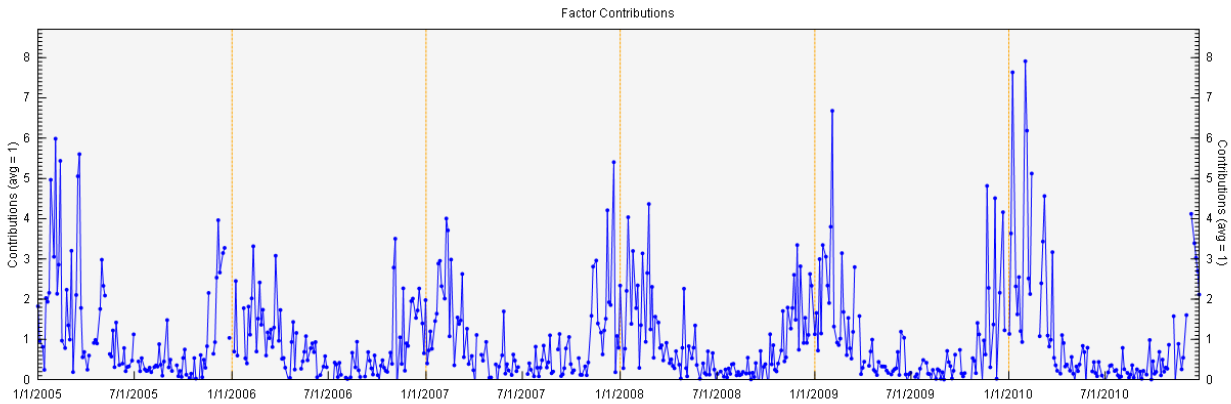
Lawrenceville Source Factor 1: Secondary Ammonium Nitrate

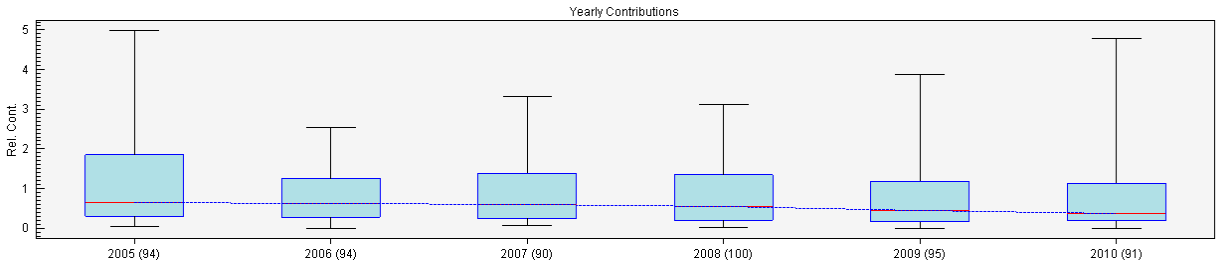
Factor 1 contains the majority of secondary ammonium nitrate at Lawrenceville, dominant in cold weather. Ammonium nitrate (NH_4NO_3) is a secondary species created from nitrogen oxide (NO_x) sources such as fossil fuel-fired boilers and motor vehicles. Factor 1 is a large component of $PM_{2.5}$ at Lawrenceville, representing 22% of the total concentration.

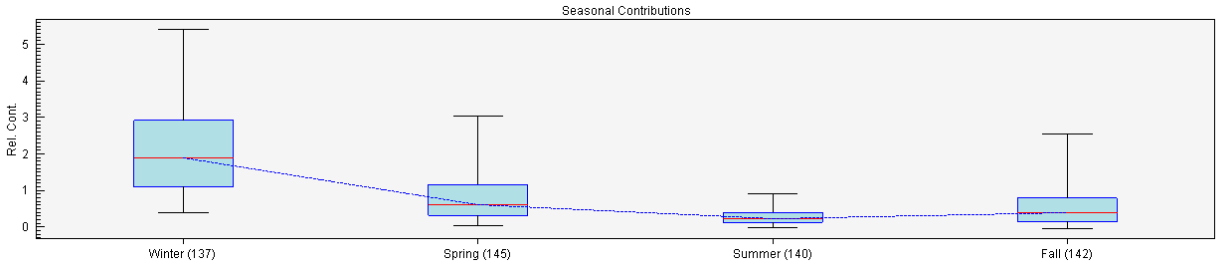


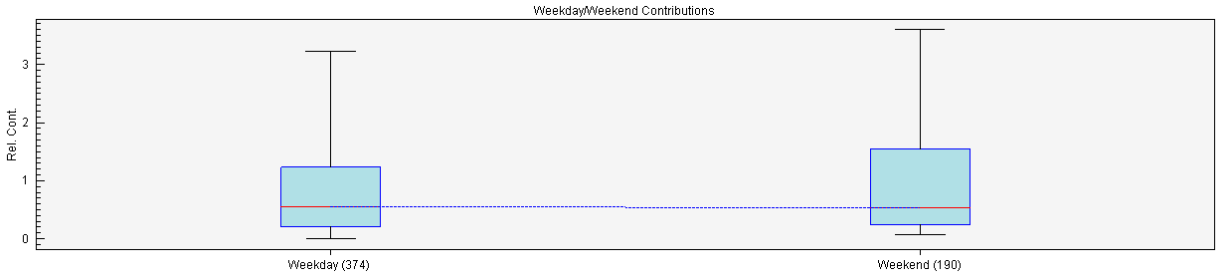




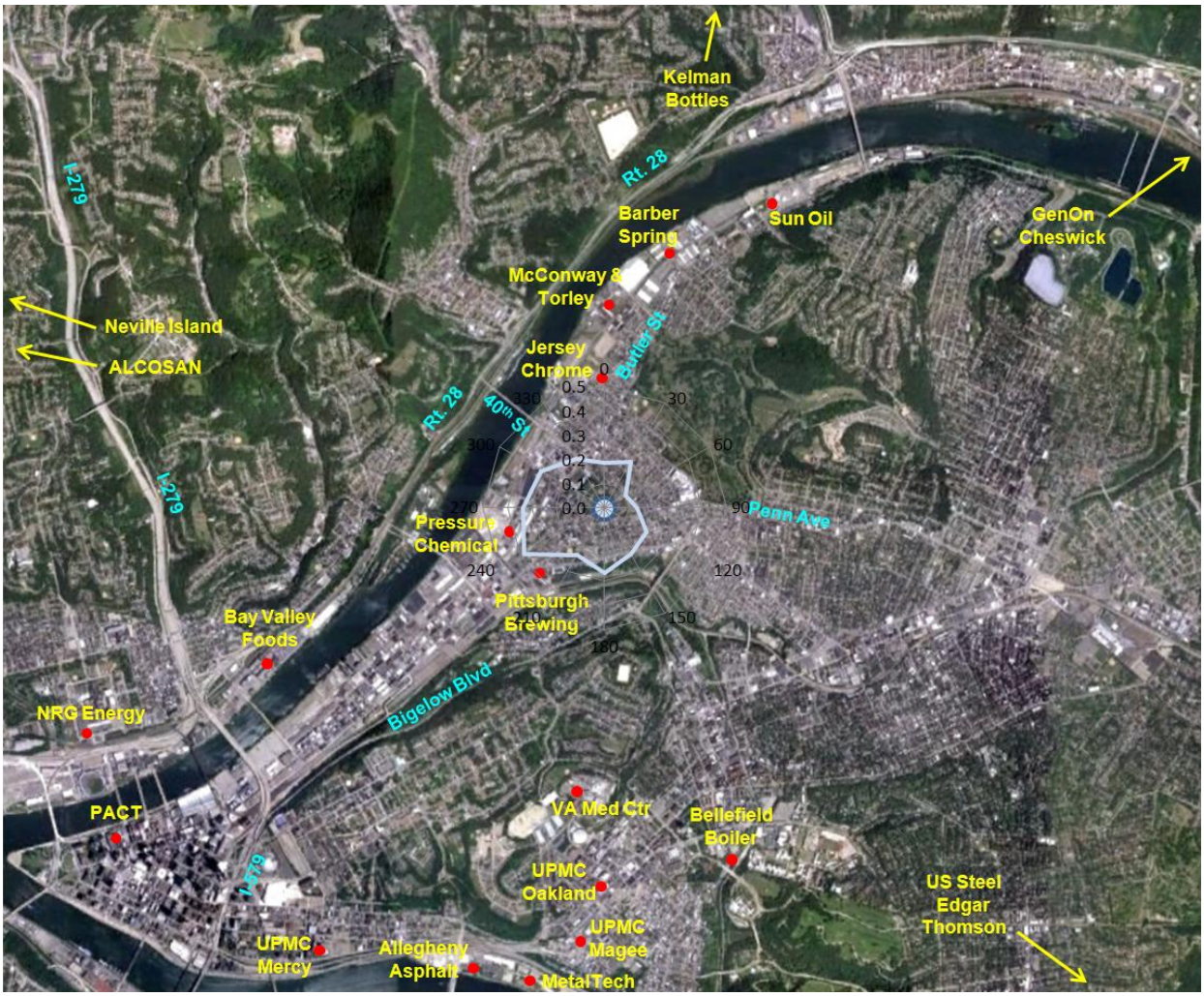

Factor Contributions
Contributions (avg = 1)
1/1/2005
7/1/2005
1/1/2006
7/1/2006
1/1/2007
7/1/2007
1/1/2008
7/1/2008
1/1/2009
7/1/2009
1/1/2010
7/1/2010


Yearly Contributions
Rel. Cont.
2005 (94)
2006 (94)
2007 (90)
2008 (100)
2009 (95)
2010 (91)


Seasonal Contributions
Rel. Cont.
Winter (137)
Spring (145)
Summer (140)
Fall (142)

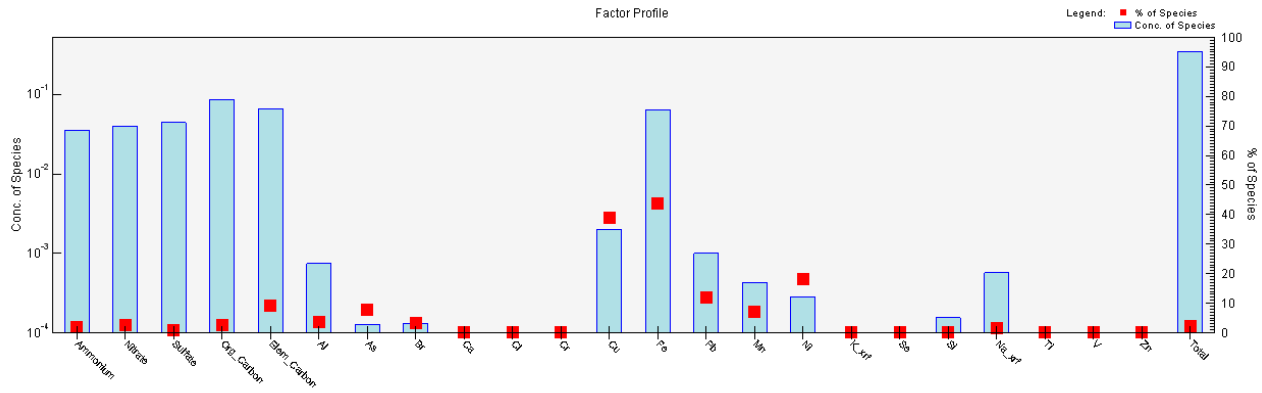

Weekday/Weekend Contributions
Rel. Cont.
Weekday (374)
Weekend (190)

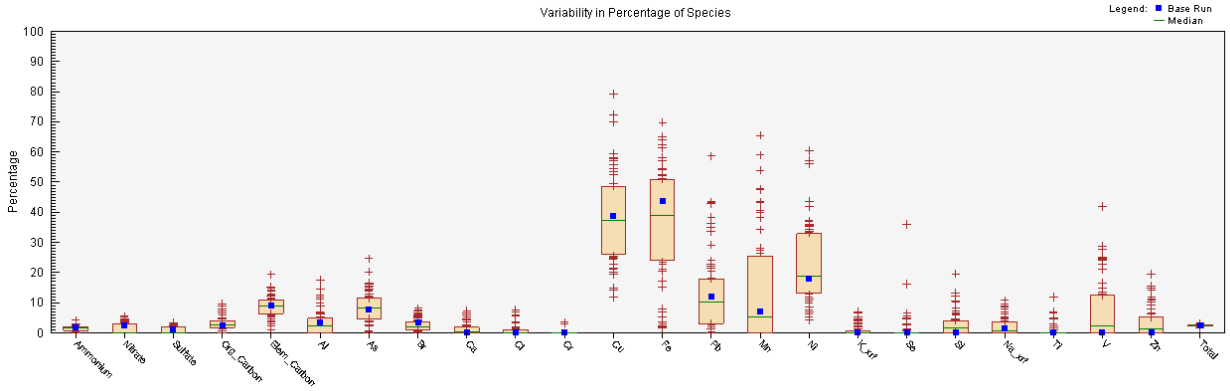
The CPF plot for Factor 1 is shown below. High days showed the highest frequencies from the west and south. This may indicate that upwind sources along with local vehicle traffic (Butler St., Penn Ave.) are the largest contributors of wintertime NO_x at Lawrenceville.

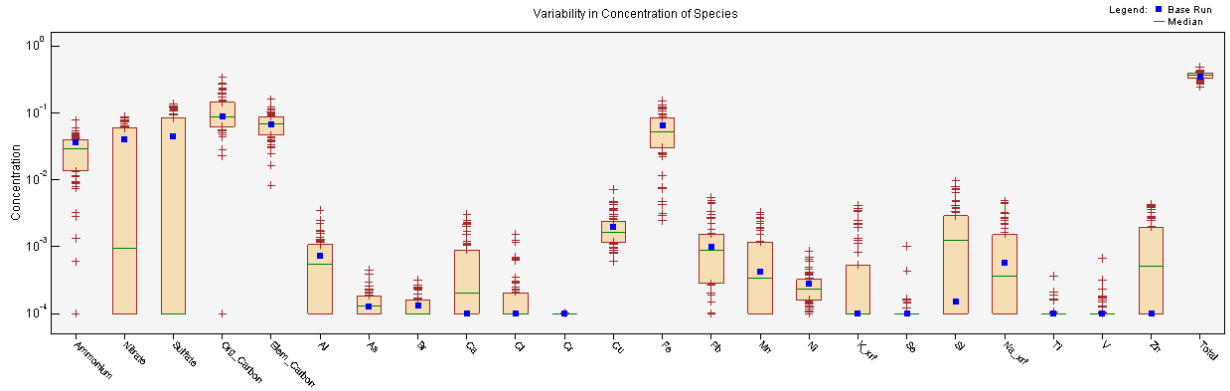


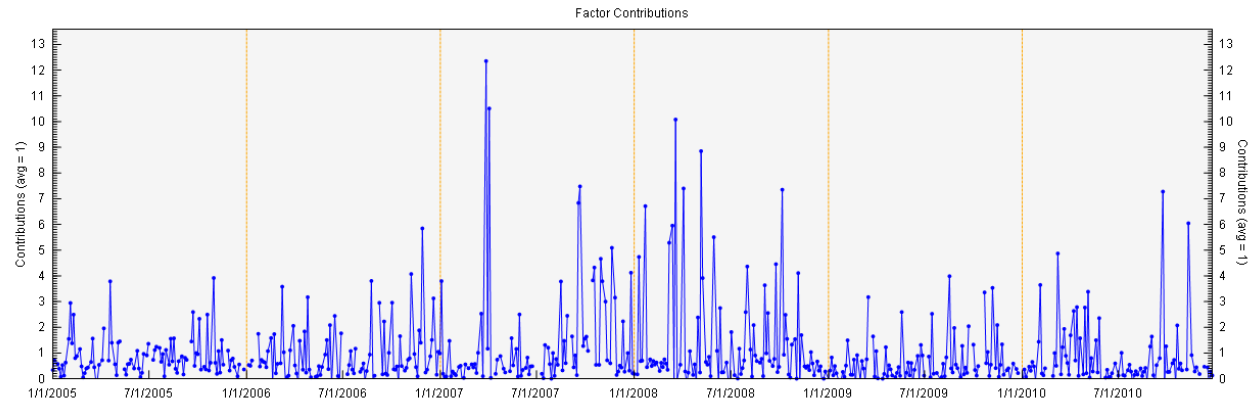
Lawrenceville Source Factor 2: Diesel Vehicles + Metals Processing

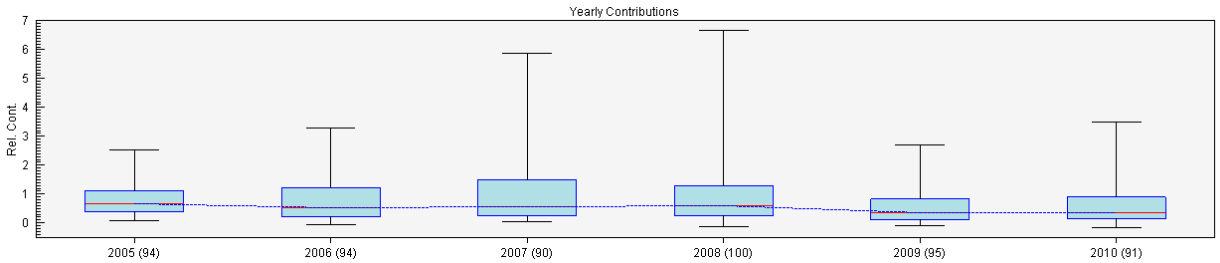
Factor 2 contains elemental carbon with high weekday contributions, indicative of diesel exhaust. High percentages of copper and iron are also present, which may indicate metals processing. Factor 2 is a small factor overall (3% of total) and shows peak contributions during inversions.

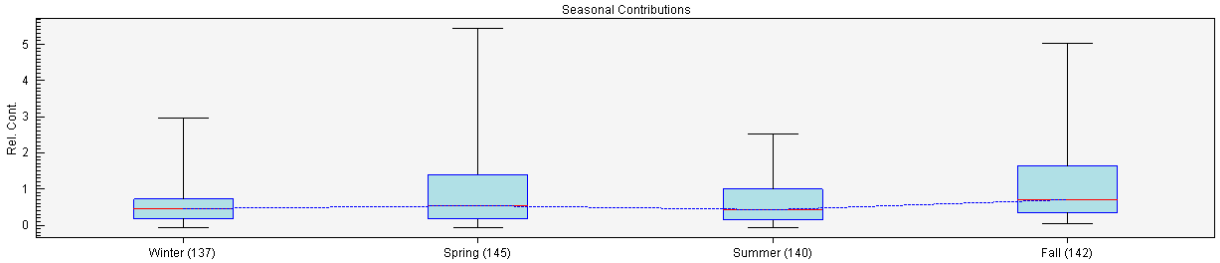


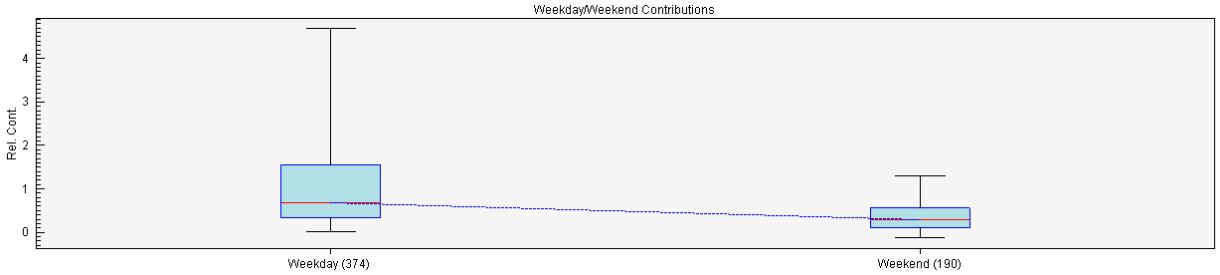




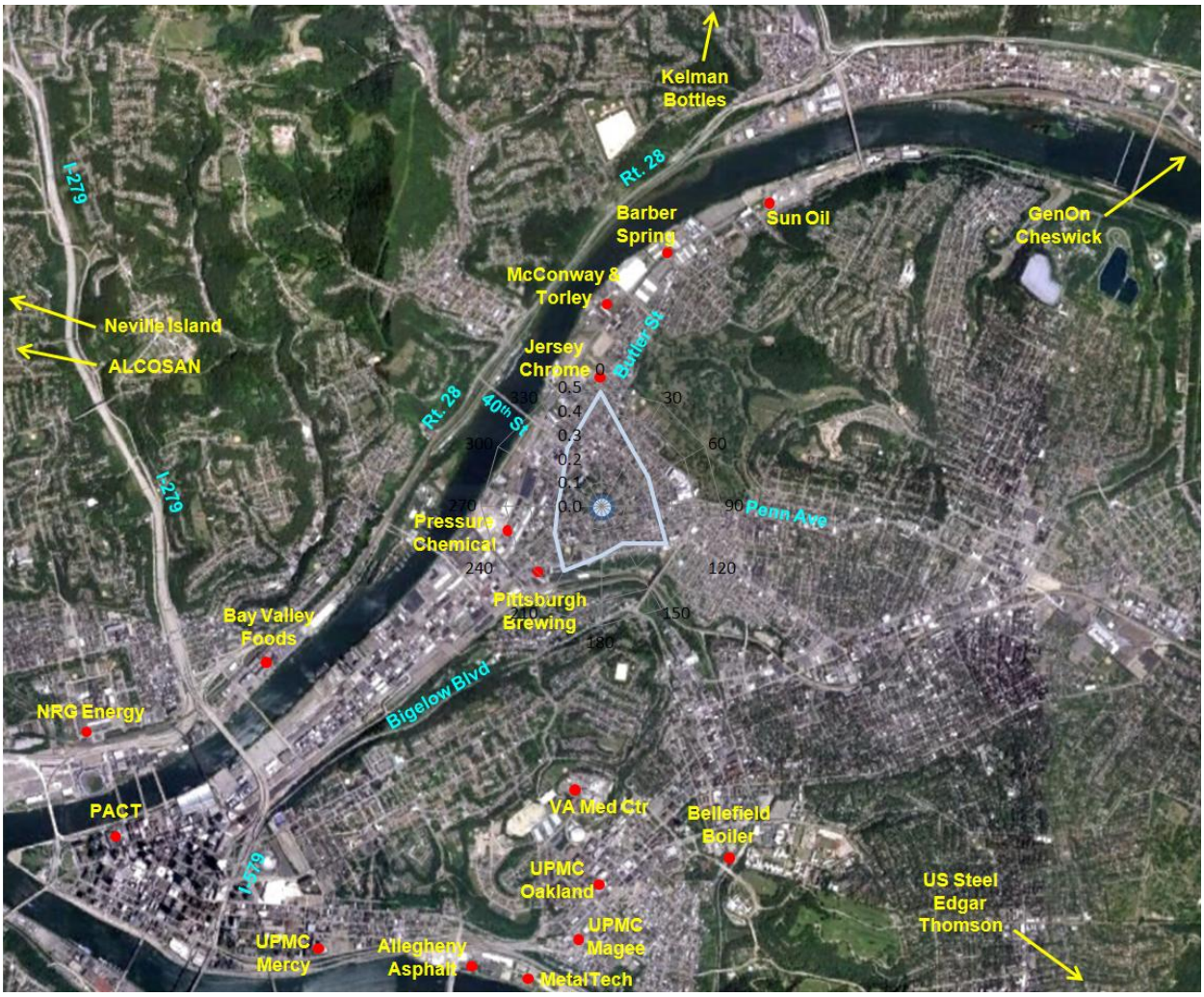

Factor Contributions
Contributions (avg = 1)
1/1/2005
7/1/2005
1/1/2006
7/1/2006
1/1/2007
7/1/2007
1/1/2008
7/1/2008
1/1/2009
7/1/2009
1/1/2010
7/1/2010


Yearly Contributions
Rel. Cont.
2005 (94)
2006 (94)
2007 (90)
2008 (100)
2009 (95)
2010 (91)


Seasonal Contributions
Rel. Cont.
Winter (137)
Spring (145)
Summer (140)
Fall (142)


Weekday/Weekend Contributions
Rel. Cont.
Weekday (374)
Weekend (190)

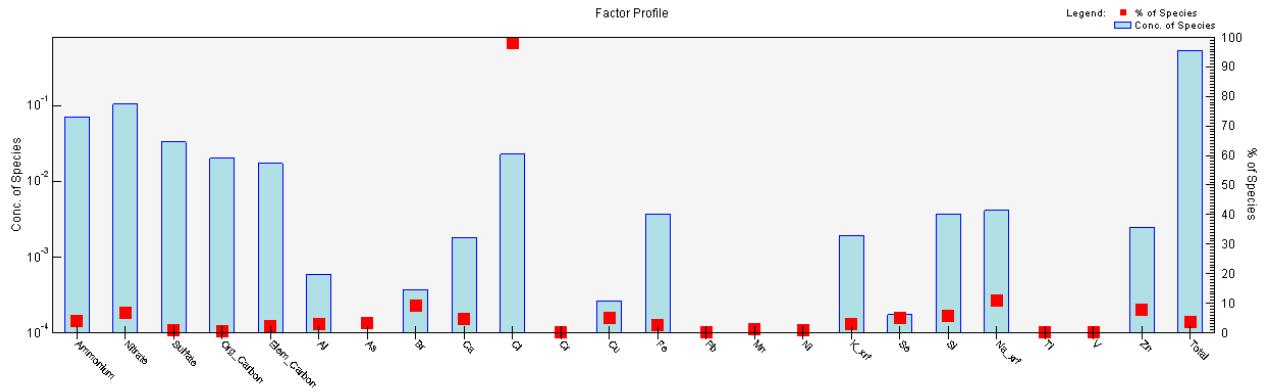
The CPF plot for Factor 2 is shown below. High days showed the highest frequencies from the north and, to a lesser extent, the southwest and southeast. This may be due to traffic on nearby roadways (40th St., Penn Ave., Butler St.), along with local metals processing sources.

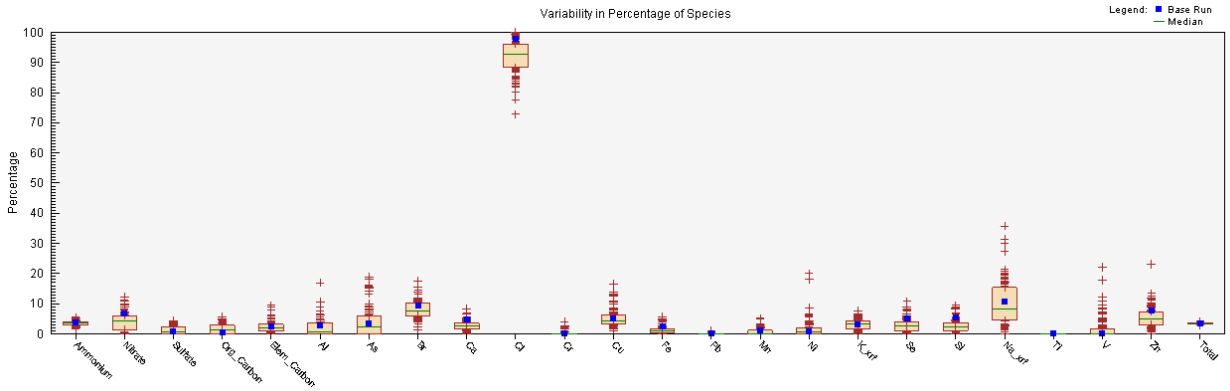


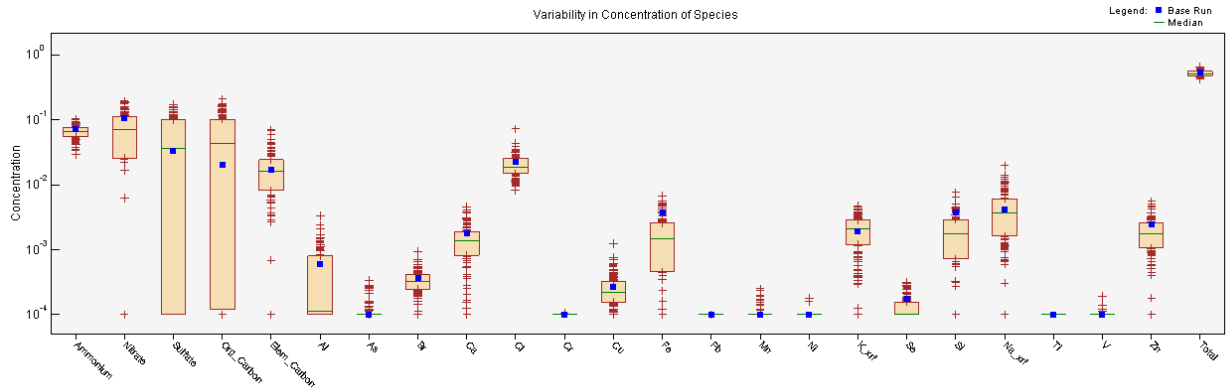
Lawrenceville Source Factor 3: Road Salt/Dust

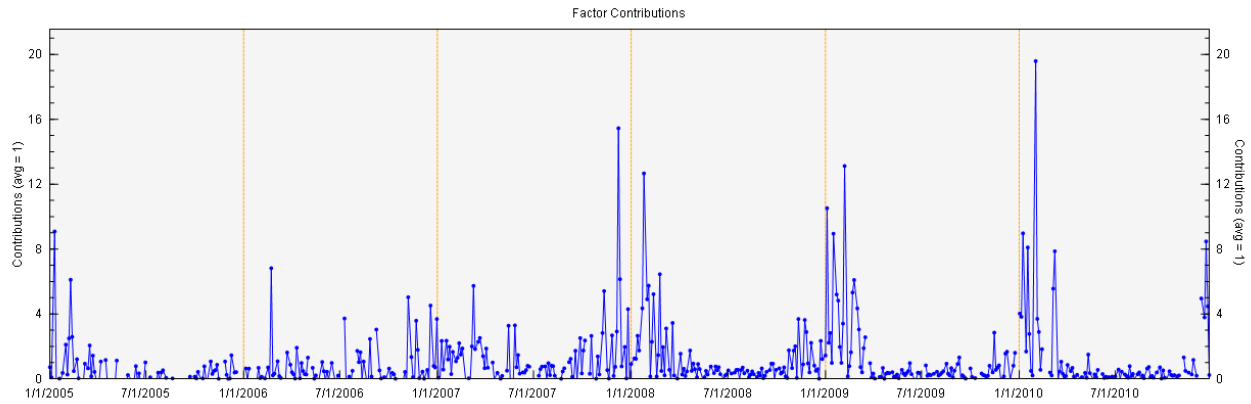
Factor 3 contributes nearly all of the chlorine at Lawrenceville. It shows high peaks on winter days and is likely due to airborne road salt along with other miscellaneous road dust compounds. Factor 3 has small overall contributions, representing 2% of total $PM_{2.5}$.

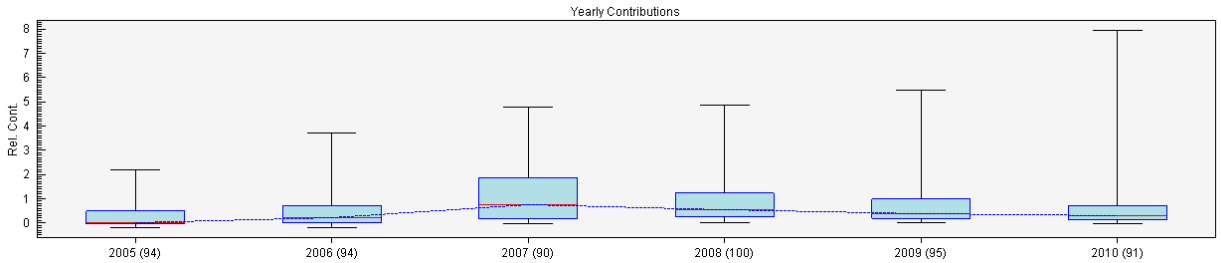
Both sodium chloride and calcium chloride are used on the grounds of the Lawrenceville site. The signal-to-noise ratio is very low for sodium, however, and it does not fit well in the model. Calcium is apportioned mostly with Factor 4 as crustal material.

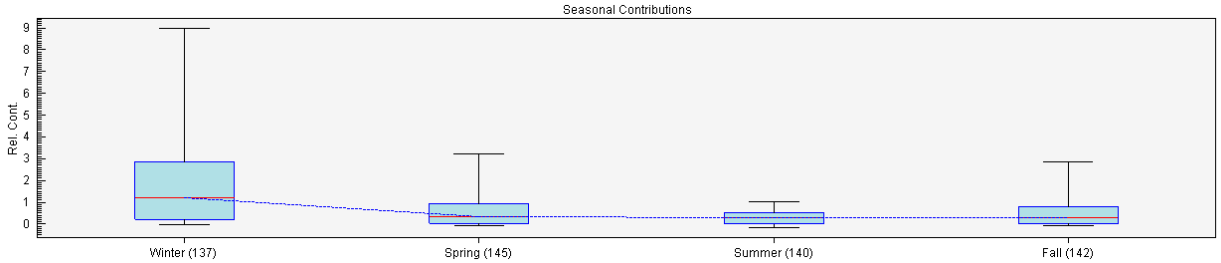


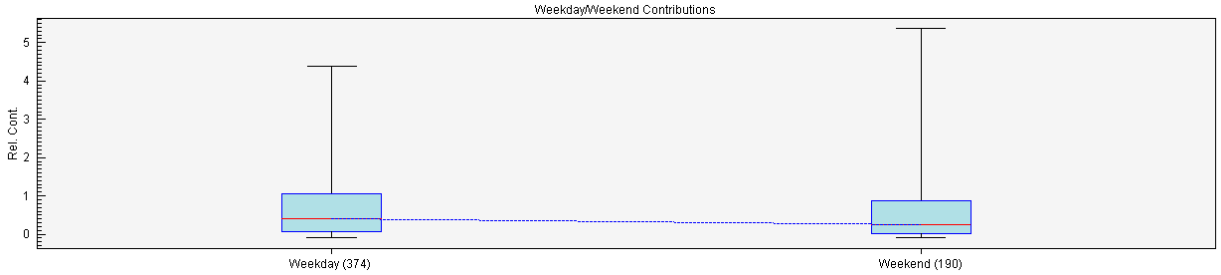




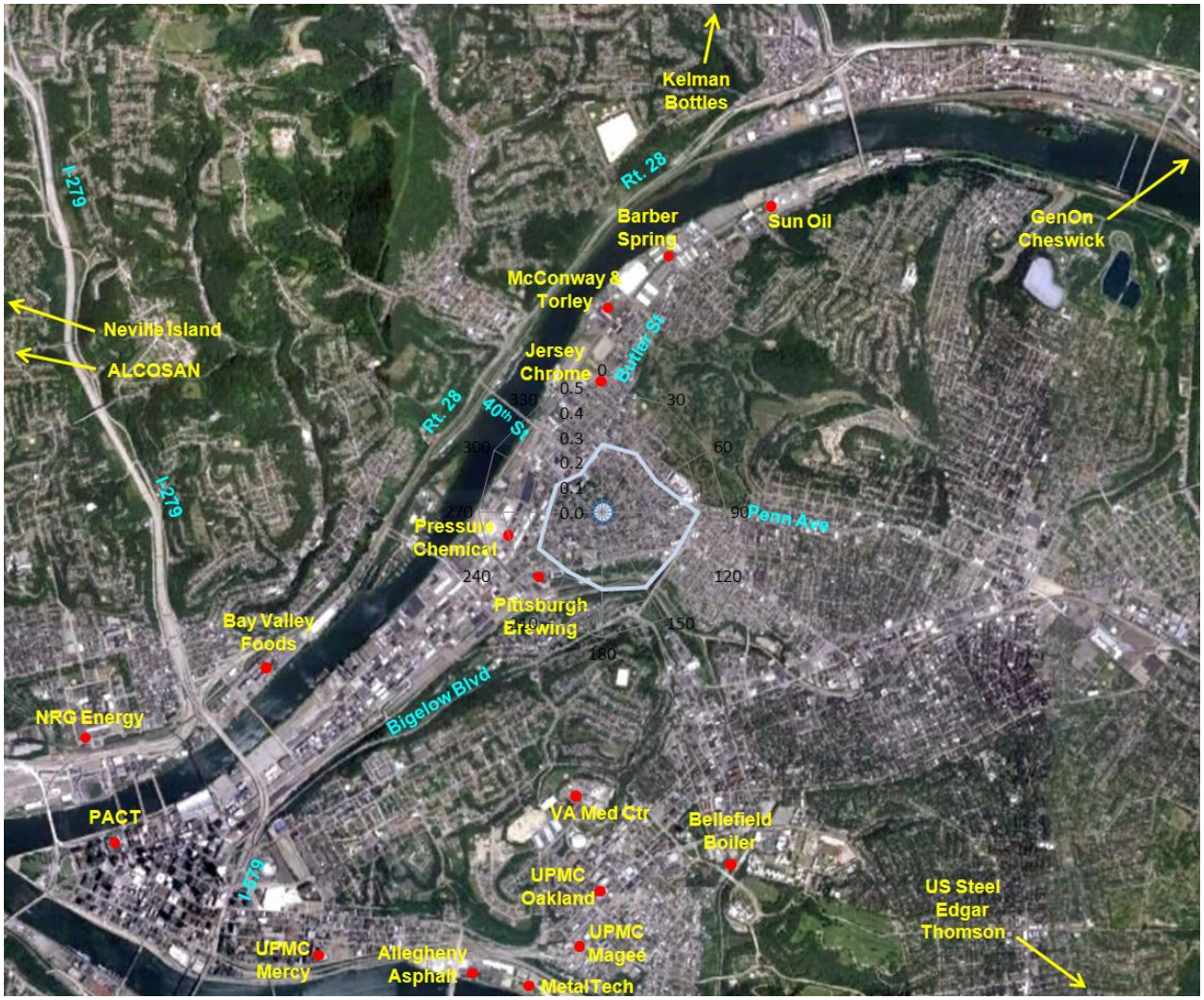

Factor Contributions
Contributions (avg = 1)
0
4
8
12
16
20
1/1/2005
7/1/2005
1/1/2006
7/1/2006
1/1/2007
7/1/2007
1/1/2008
7/1/2008
1/1/2009
7/1/2009
1/1/2010
7/1/2010


Yearly Contributions
Rel. Cont.
0
1
2
3
4
5
6
7
8
2005 (94)
2006 (94)
2007 (90)
2008 (100)
2009 (95)
2010 (91)


Seasonal Contributions
Rel. Cont.
0
1
2
3
4
5
6
7
8
9
Winter (137)
Spring (145)
Summer (140)
Fall (142)

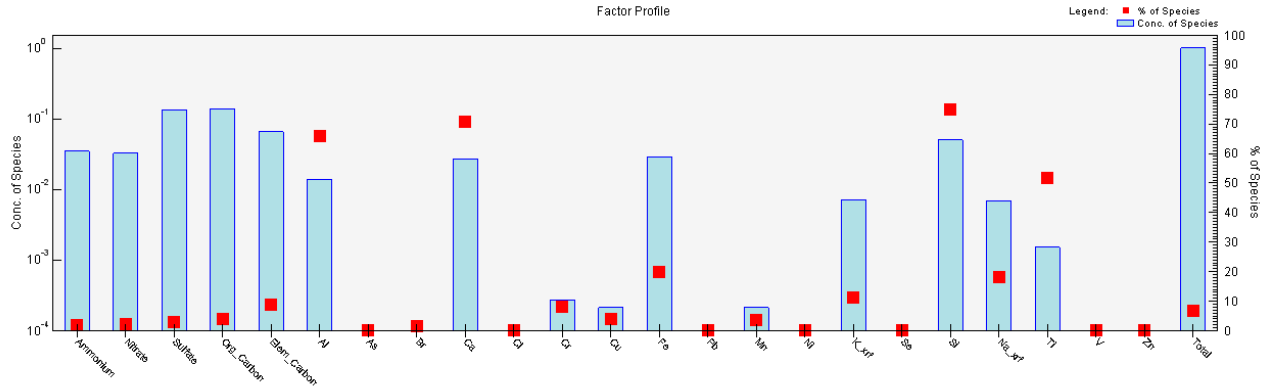

Weekday/Weekend Contributions
Rel. Cont.
0
1
2
3
4
5
Weekday (374)
Weekend (190)

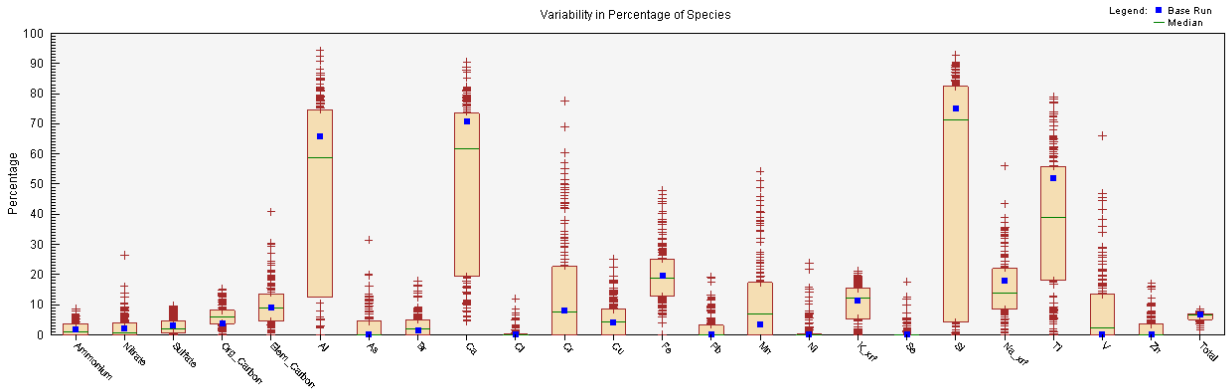
The CPF plot for Factor 3 is shown below. High day frequencies are distributed throughout all sectors, with the highest from the east and southeast. Traffic from 39th St., Penn Ave., and the ACHD Clack Center parking lot is likely contributing the salt dust along with other surrounding roadways.

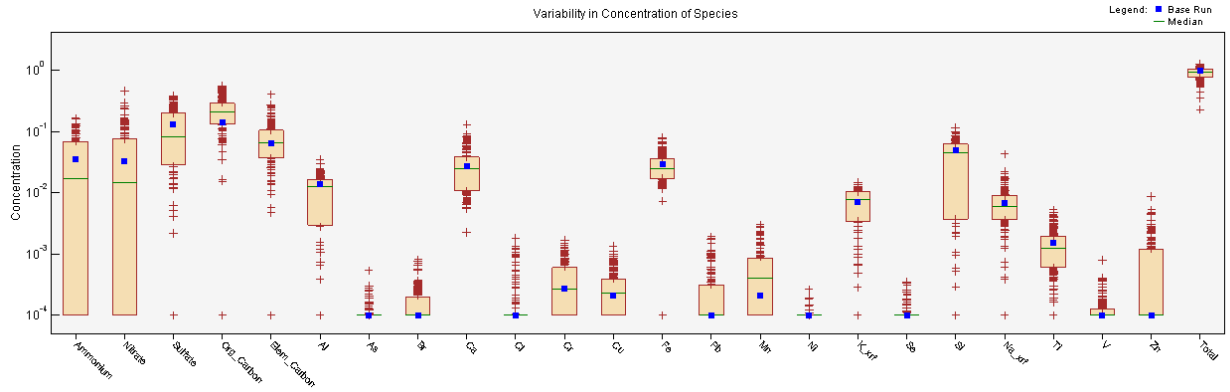


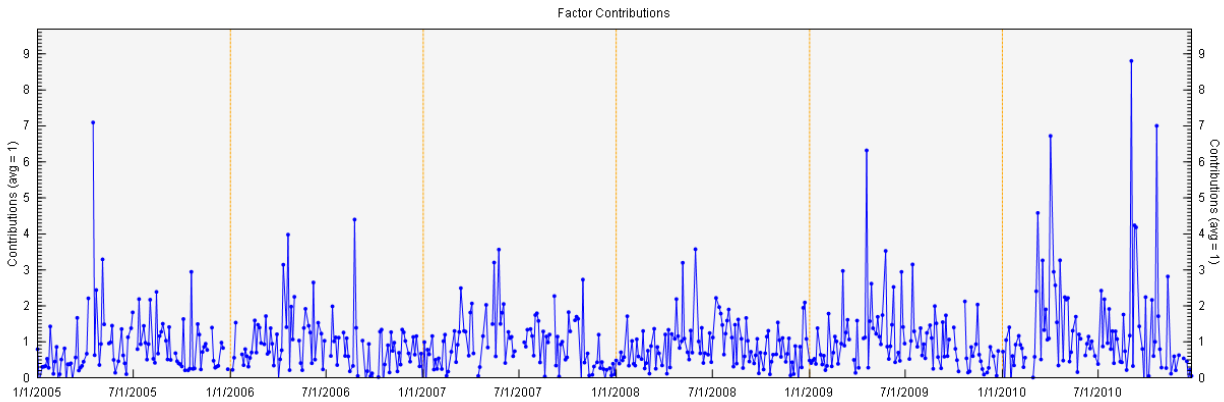
Lawrenceville Source Factor 4: Crustal Component

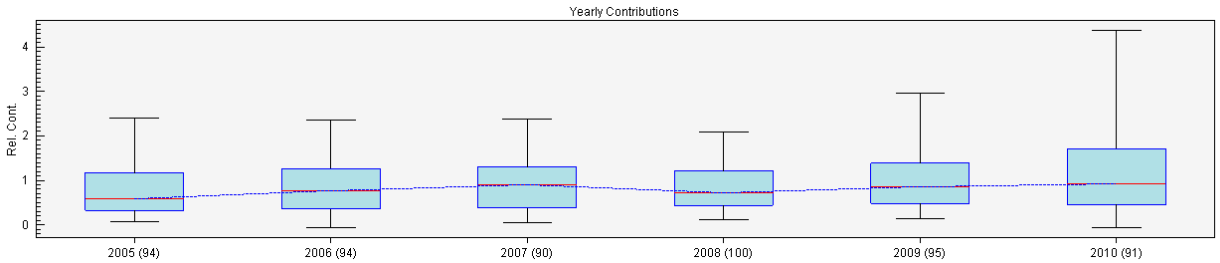
Factor 4 is composed primarily of crustal elements that make up airborne fine soil: aluminum, calcium, iron, silicon, and titanium. Other miscellaneous elements likely due to road dust are also grouped with this factor. Factor 4 is highest during weekday activity and in spring, when the ground is drier and not covered by leaves or snow. It also contains carbons, which indicates that some vehicle emissions are also included in this factor. Factor 4 represents 4% of the total $PM_{2.5}$.

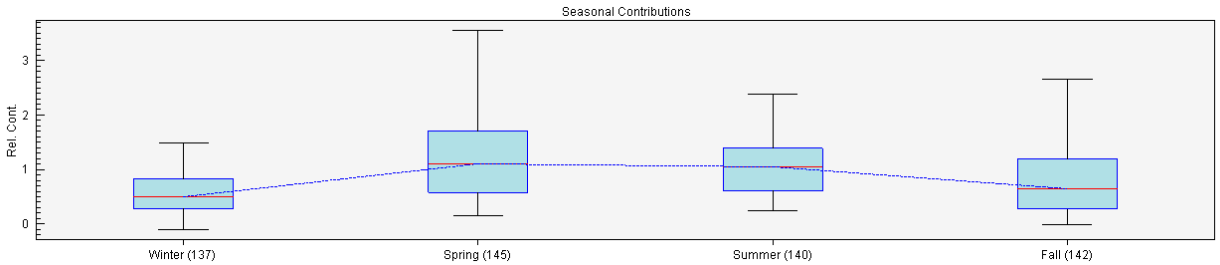


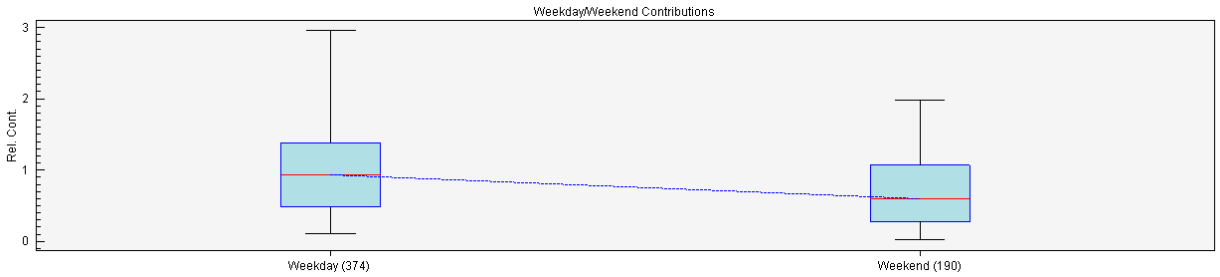




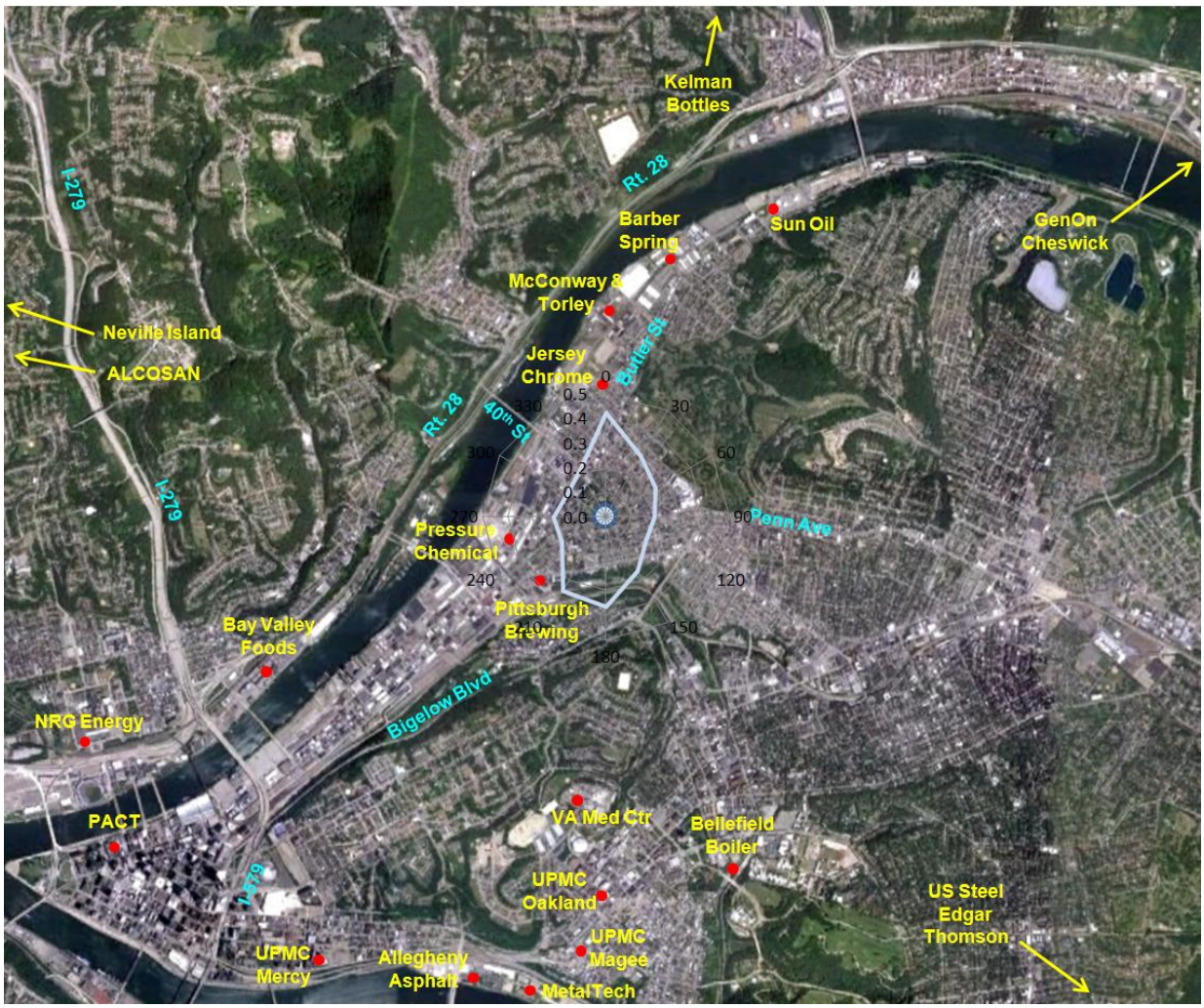

Factor Contributions
Contributions (avg = 1)
1/1/2005
7/1/2005
1/1/2006
7/1/2006
1/1/2007
7/1/2007
1/1/2008
7/1/2008
1/1/2009
7/1/2009
1/1/2010
7/1/2010


Yearly Contributions
Rel. Cont.
2005 (94)
2006 (94)
2007 (90)
2008 (100)
2009 (95)
2010 (91)


Seasonal Contributions
Rel. Cont.
Winter (137)
Spring (145)
Summer (140)
Fall (142)

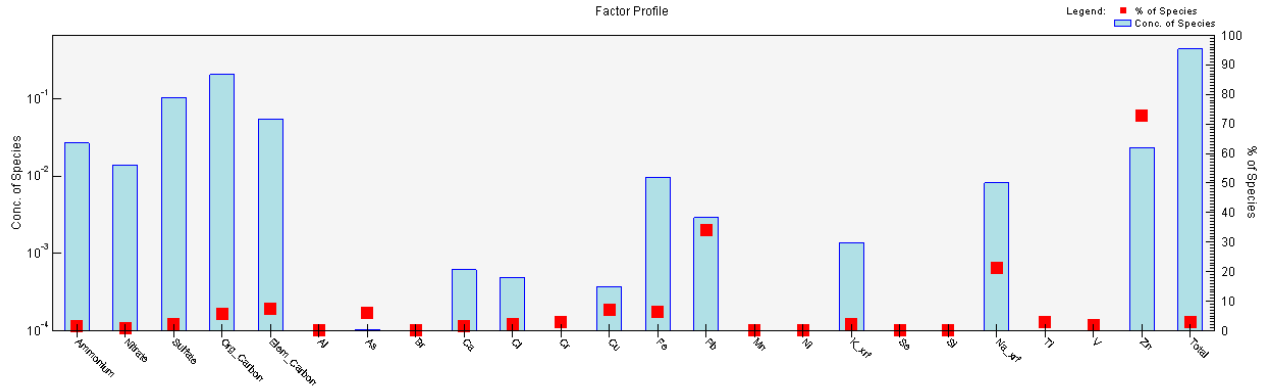

Weekday/Weekend Contributions
Rel. Cont.
Weekday (374)
Weekend (190)

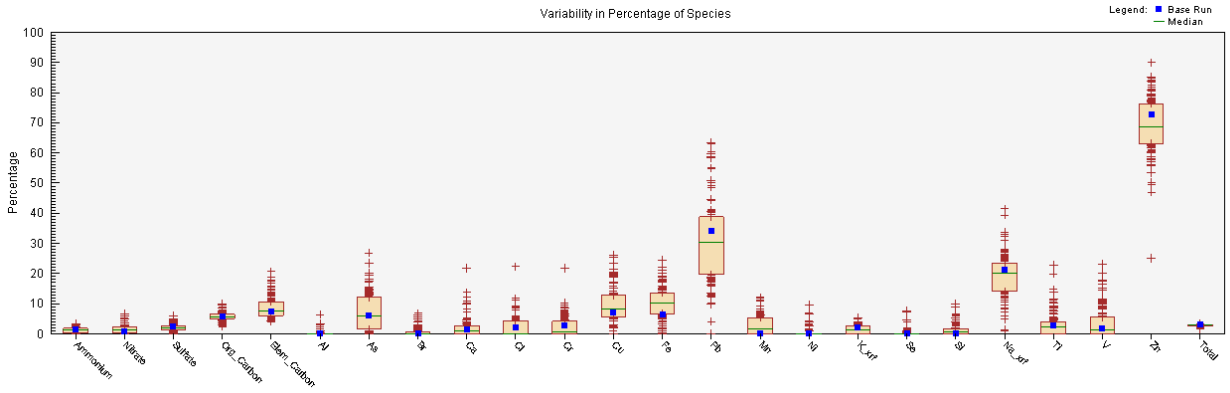
The CPF plot for Factor 4 is shown below. High days showed the highest frequencies from the north and from the south. Light winds from the north may be transporting crustal elements from Arsenal Park and roadways adjacent to the Lawrenceville site. Winds from the south may be transporting crustal elements from higher elevations to the south.

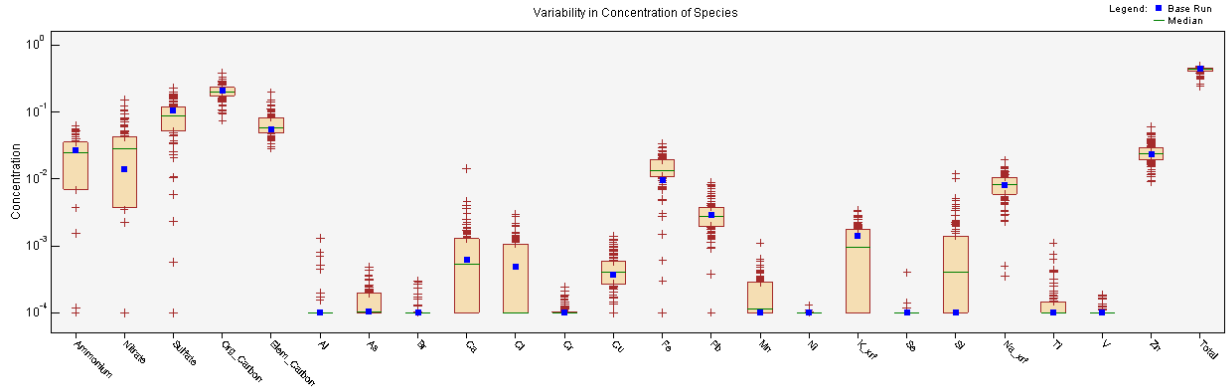


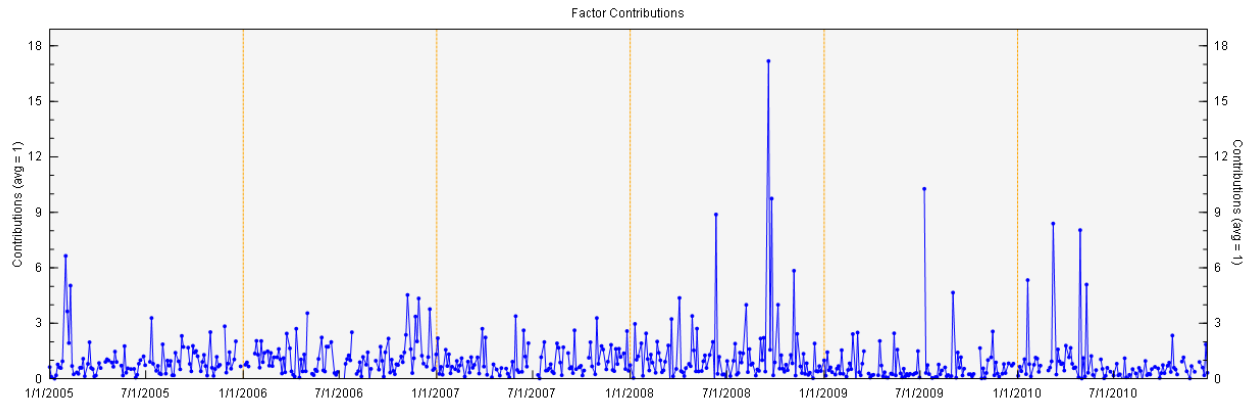
Lawrenceville Source Factor 5: Gasoline Vehicles + Tire Wear/Incinerators

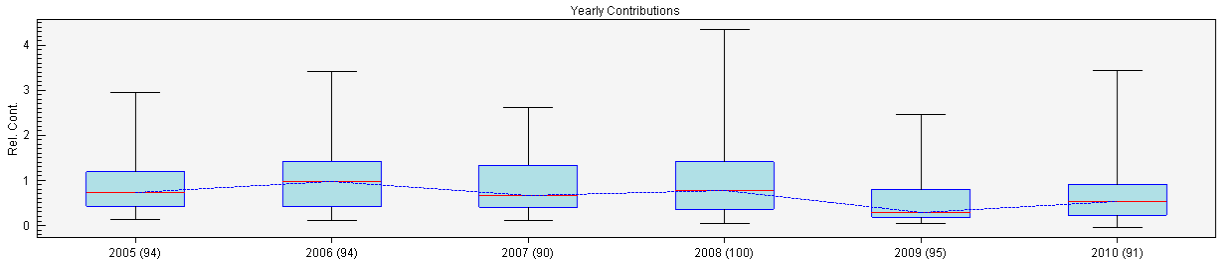
Factor 5 contains carbons with a bias toward weekday contributions, indicative of vehicle emissions. Elemental carbon is higher by percentage, but the ratio of organic carbon to elemental carbon by concentration most likely represents gasoline vehicle emissions. A high percentage of lead and zinc is also present, which can be an indicator of tire wear or incinerators. Factor 5 represents 4% of the total $PM_{2.5}$.

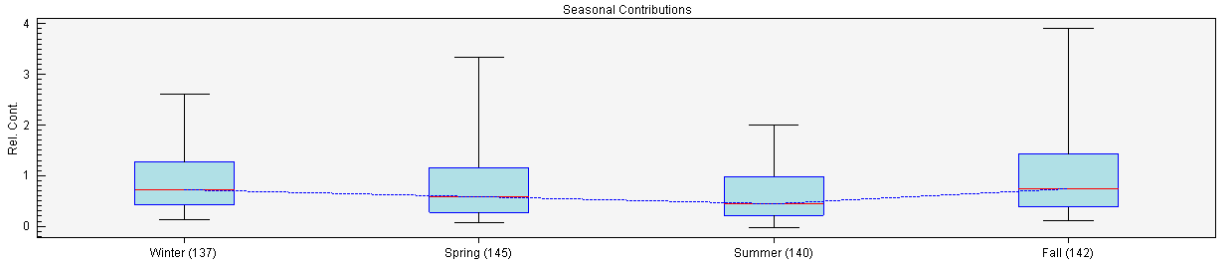


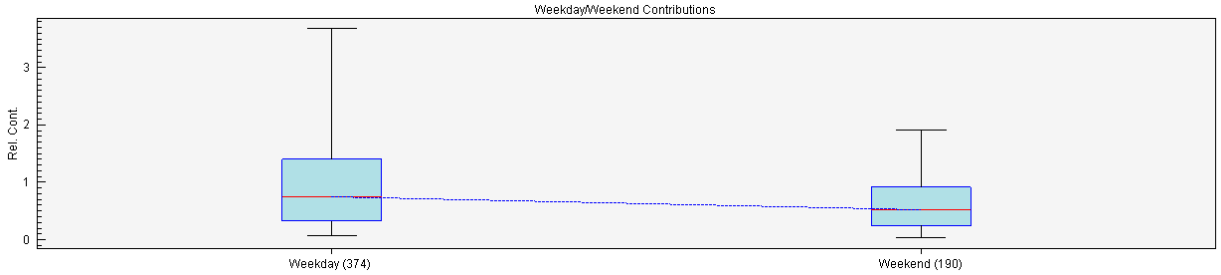




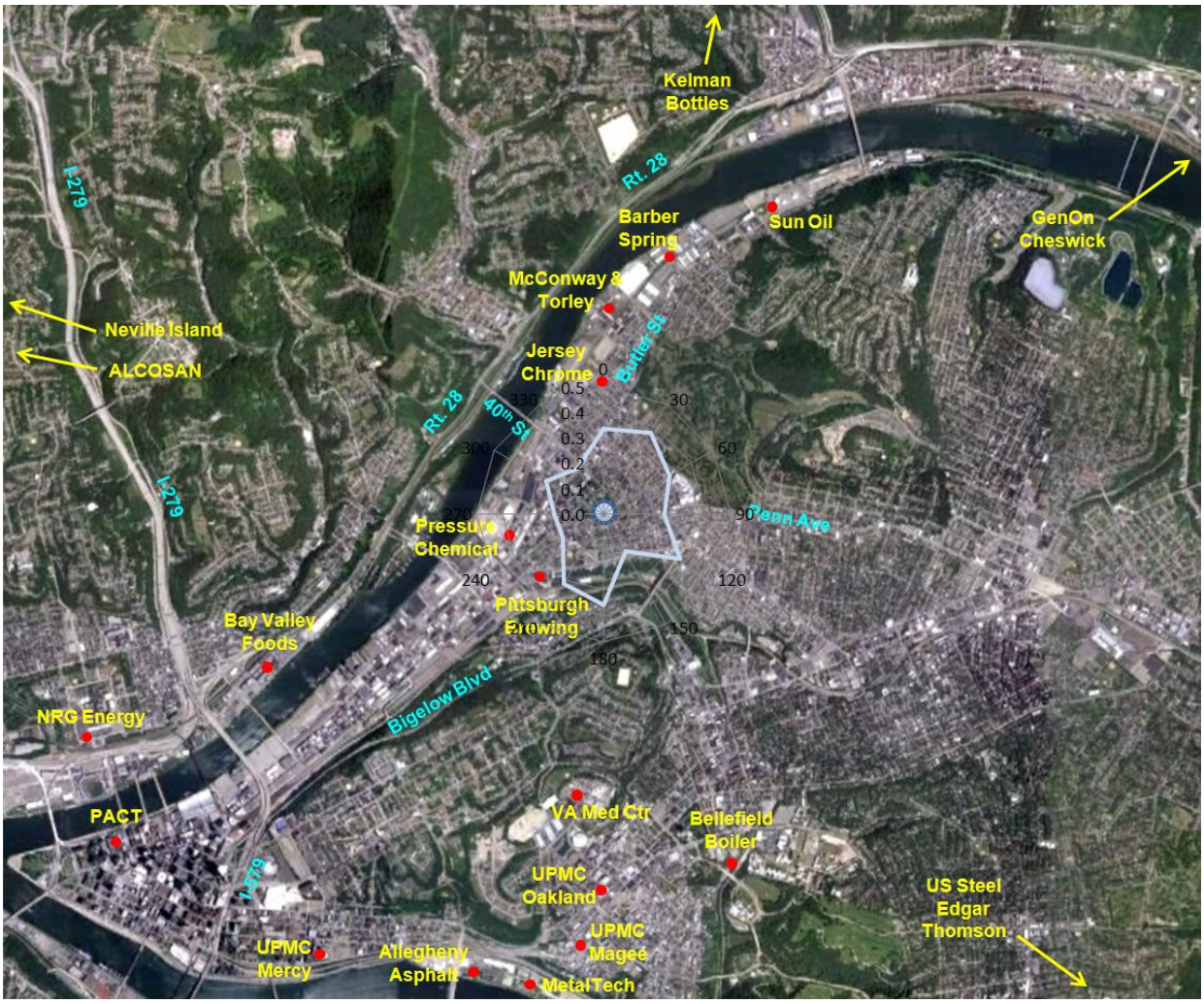

Factor Contributions
Contributions (avg = 1)
0
3
6
9
12
15
18
1/1/2005
7/1/2005
1/1/2006
7/1/2006
1/1/2007
7/1/2007
1/1/2008
7/1/2008
1/1/2009
7/1/2009
1/1/2010
7/1/2010


Yearly Contributions
Rel. Cont.
0
1
2
3
4
2005 (94)
2006 (94)
2007 (90)
2008 (100)
2009 (95)
2010 (91)


Seasonal Contributions
Rel. Cont.
0
1
2
3
4
Winter (137)
Spring (145)
Summer (140)
Fall (142)

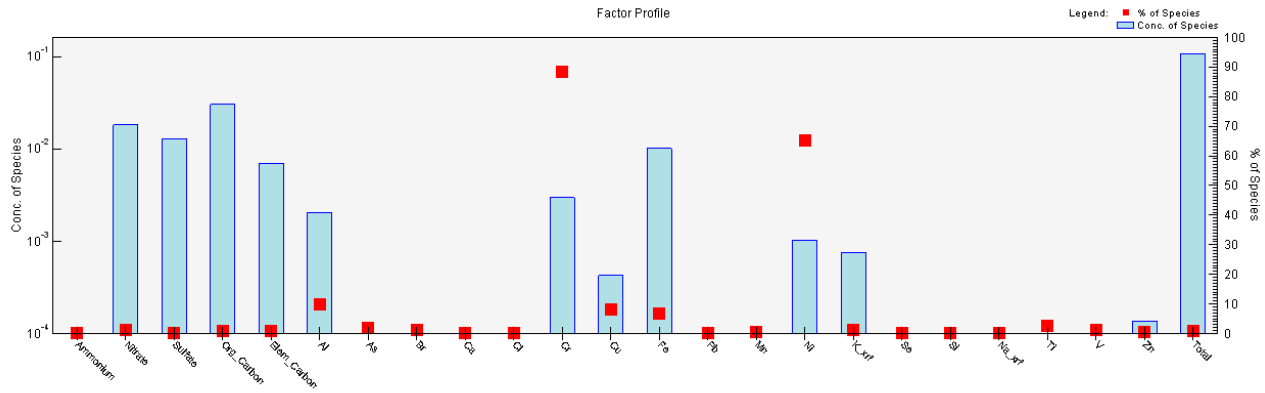

Weekday/Weekend Contributions
Rel. Cont.
0
1
2
3
Weekday (374)
Weekend (190)

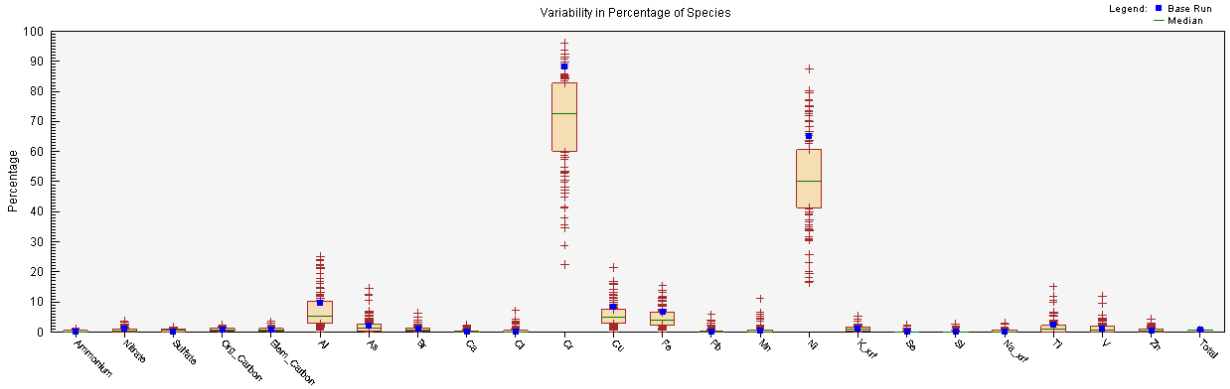
The CPF plot for Factor 5 is shown below. High day frequencies from the south, east, and north may be due to traffic on adjacent roadways (39th St., Penn Ave, 40th St.), specifically at intersections. Frequencies from the south may also be due to medical waste incinerators.

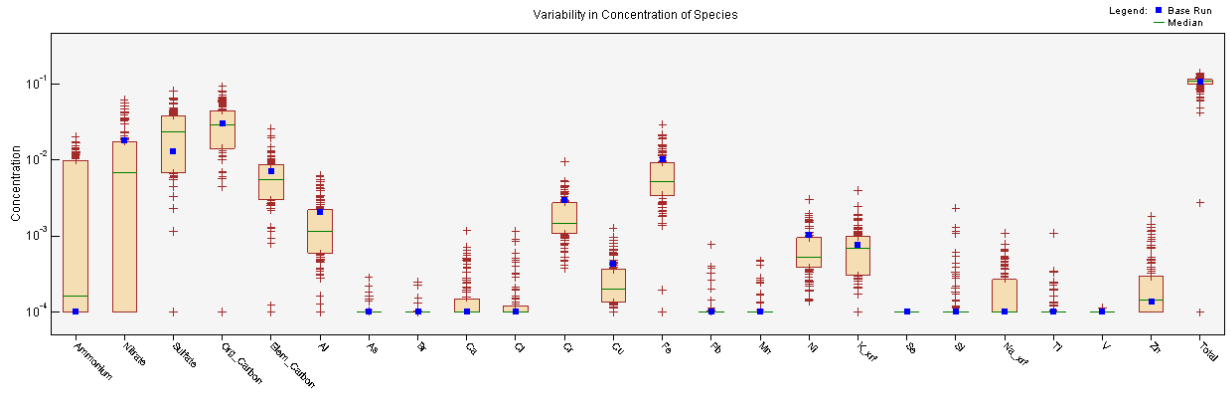


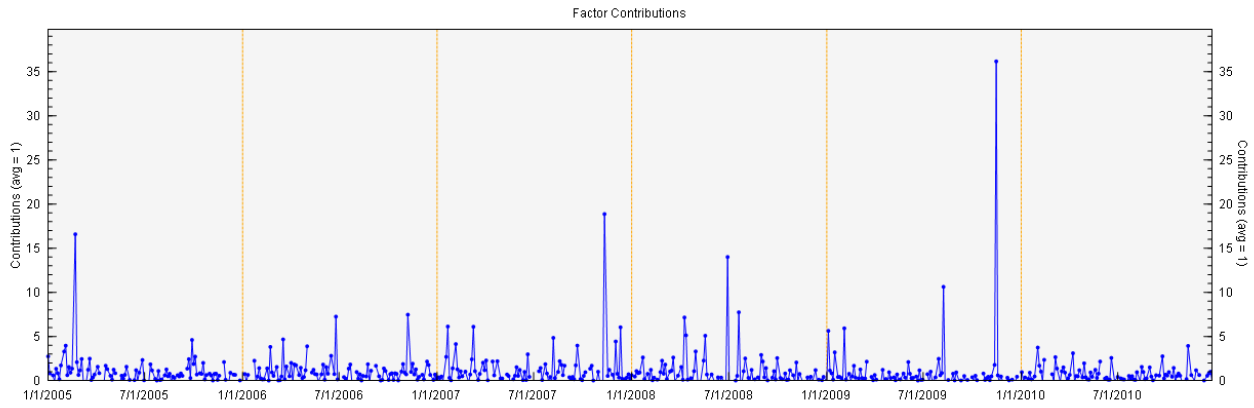
Lawrenceville Source Factor 6: Metals Processing

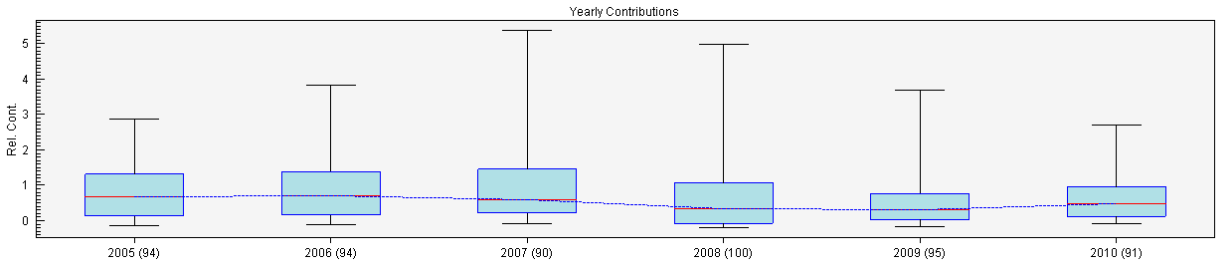
Factor 6 has a high percentage of chromium and nickel, which is associated with metals processing such as electroplating or scrap-cutting. This factor is small in overall contributions (1% of total) and contains few additional species. It shows the highest contributions during inversions.

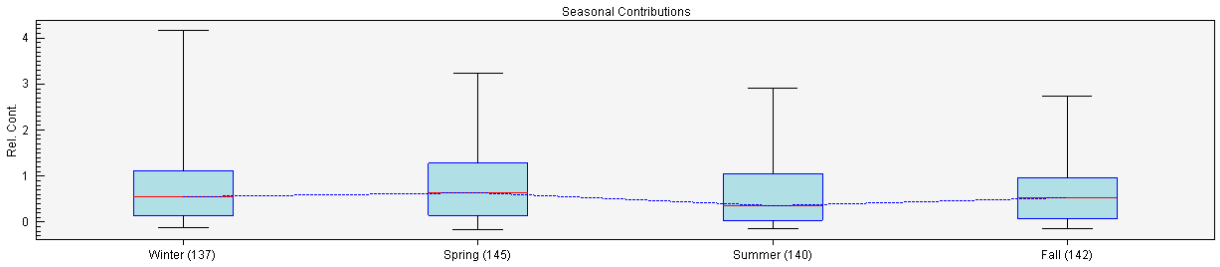


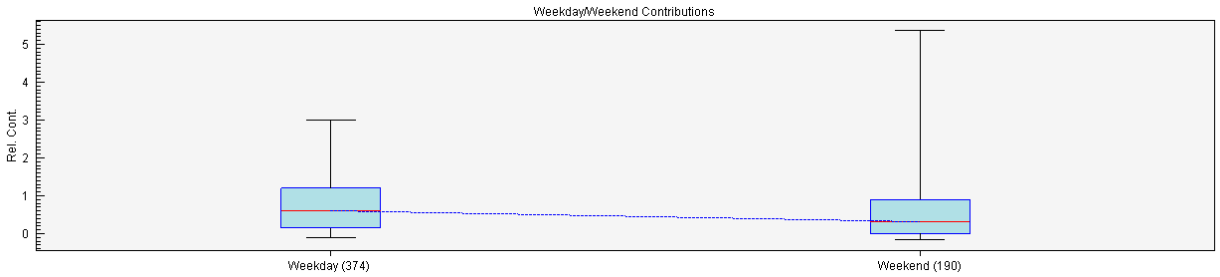




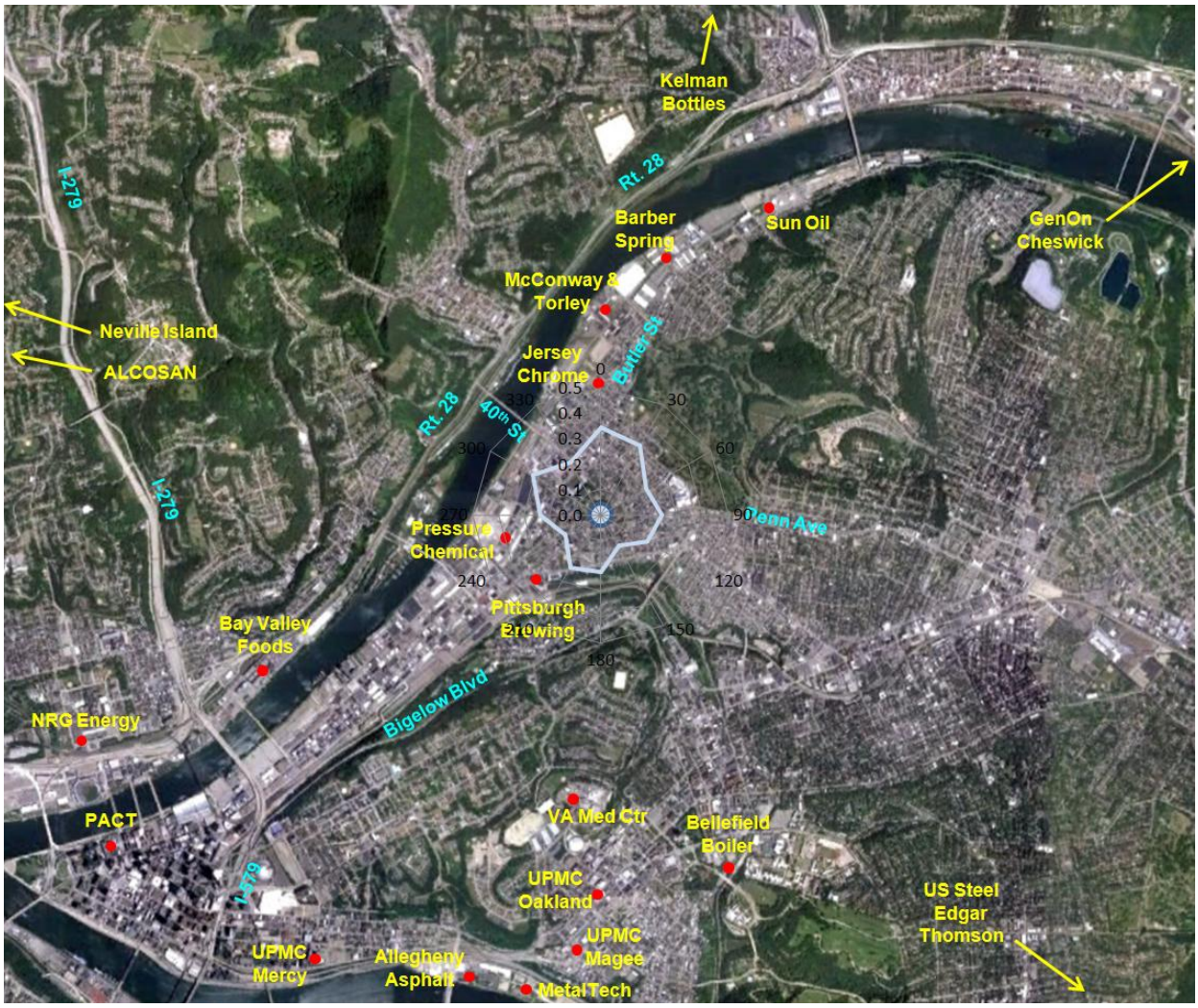

Factor Contributions
Contributions (avg = 1)
0
5
10
15
20
25
30
35
1/1/2005
7/1/2005
1/1/2006
7/1/2006
1/1/2007
7/1/2007
1/1/2008
7/1/2008
1/1/2009
7/1/2009
1/1/2010
7/1/2010


Yearly Contributions
Rel. Cont.
0
1
2
3
4
5
2005 (94)
2006 (94)
2007 (90)
2008 (100)
2009 (95)
2010 (91)


Seasonal Contributions
Rel. Cont.
0
1
2
3
4
Winter (137)
Spring (145)
Summer (140)
Fall (142)

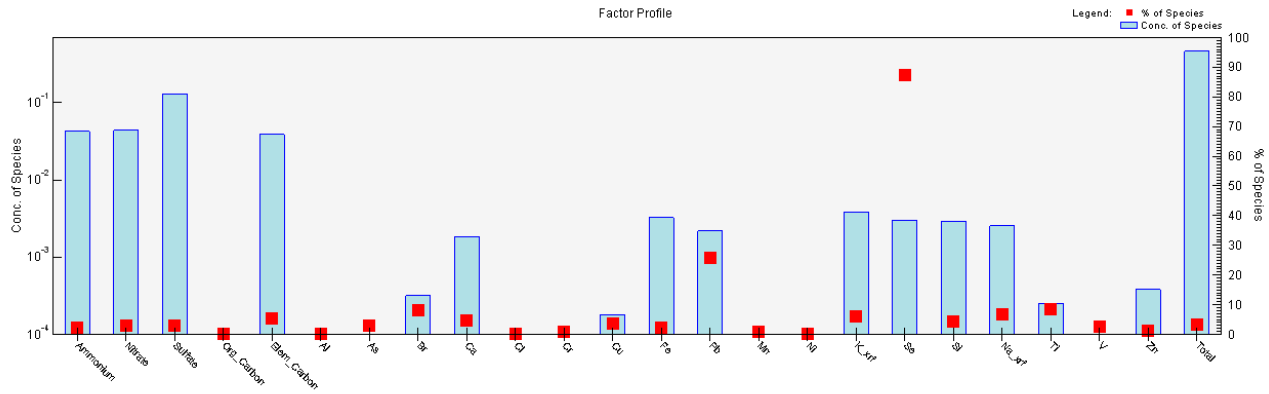

Weekday/Weekend Contributions
Rel. Cont.
0
1
2
3
4
5
Weekday (374)
Weekend (190)

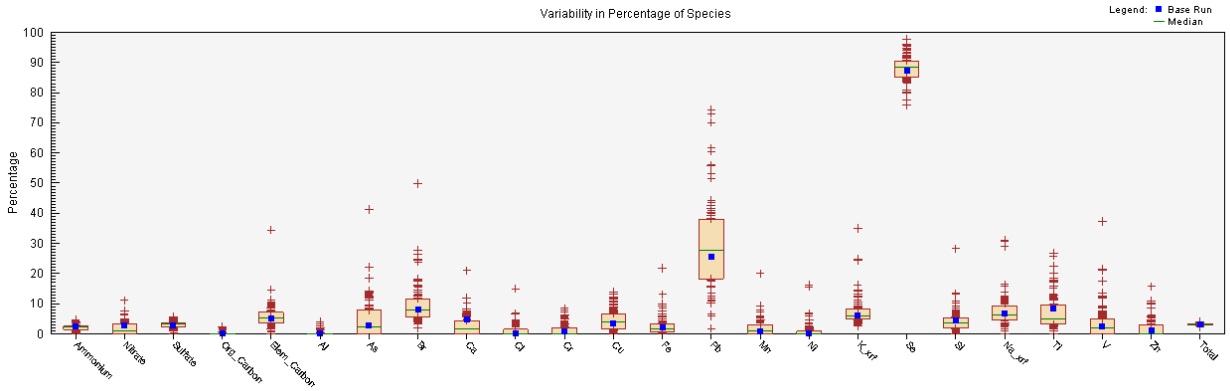
The CPF plot for Factor 6 is shown below. High day frequencies are high from the north, possibly due to local metals processing sources, but high days also occur in other sectors. This factor may be more affected by inversions than by wind directions.

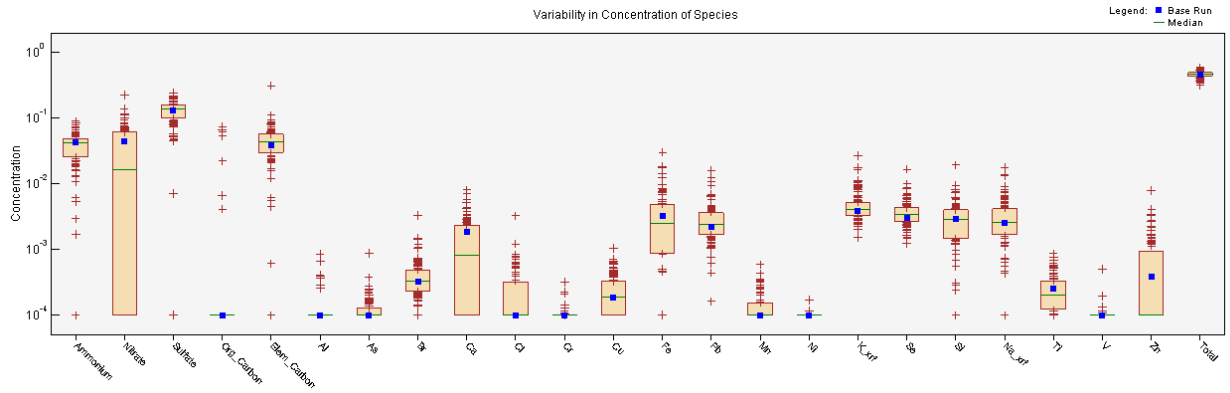


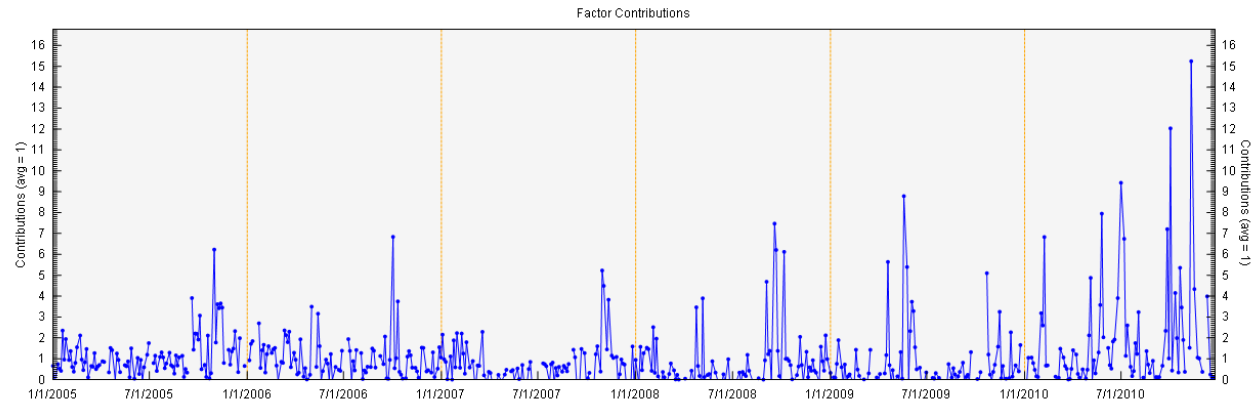
Lawrenceville Source Factor 7: Coal Combustion or Glass Manufacturing

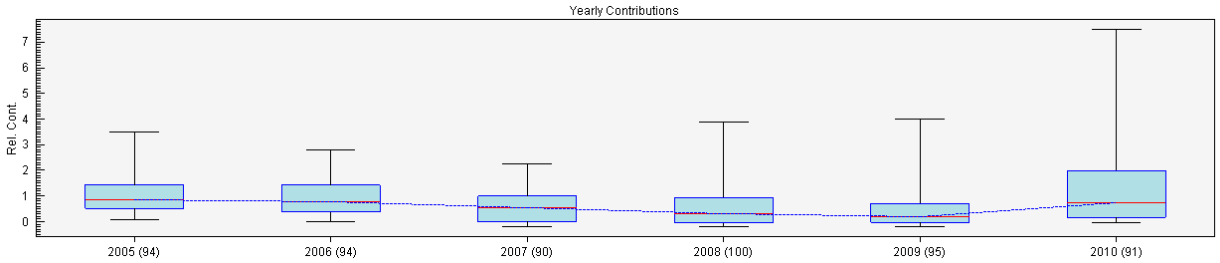
Factor 7 contributes nearly all of the selenium at Lawrenceville. Selenium is associated with primary coal-fired boilers and/or glass manufacturing. Some lead is also associated with this factor. Factor 7 is small overall (2% of total) and peaks during inversions.

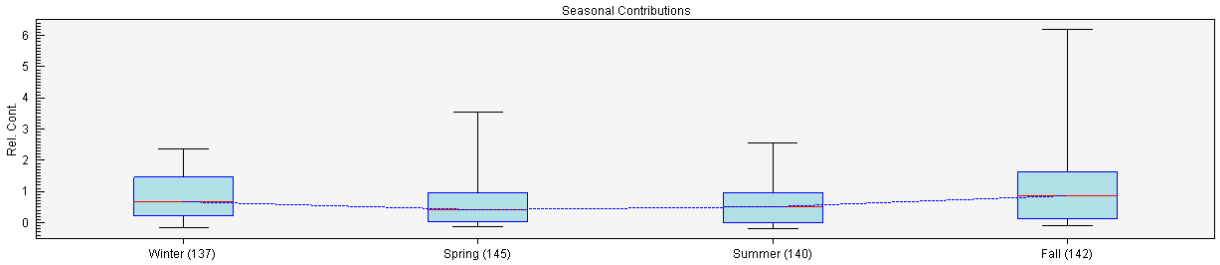


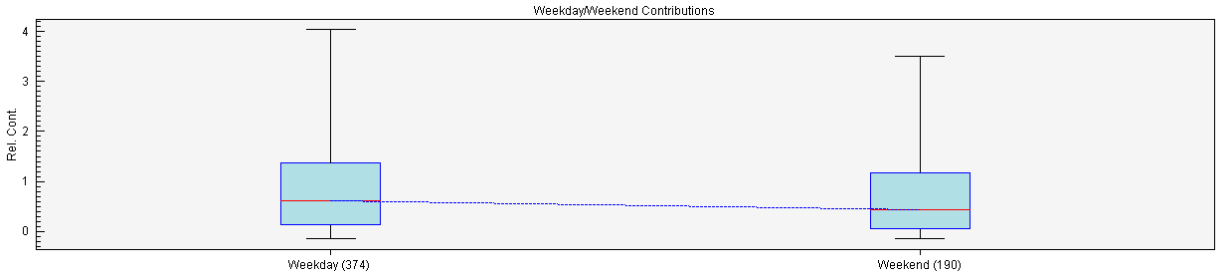




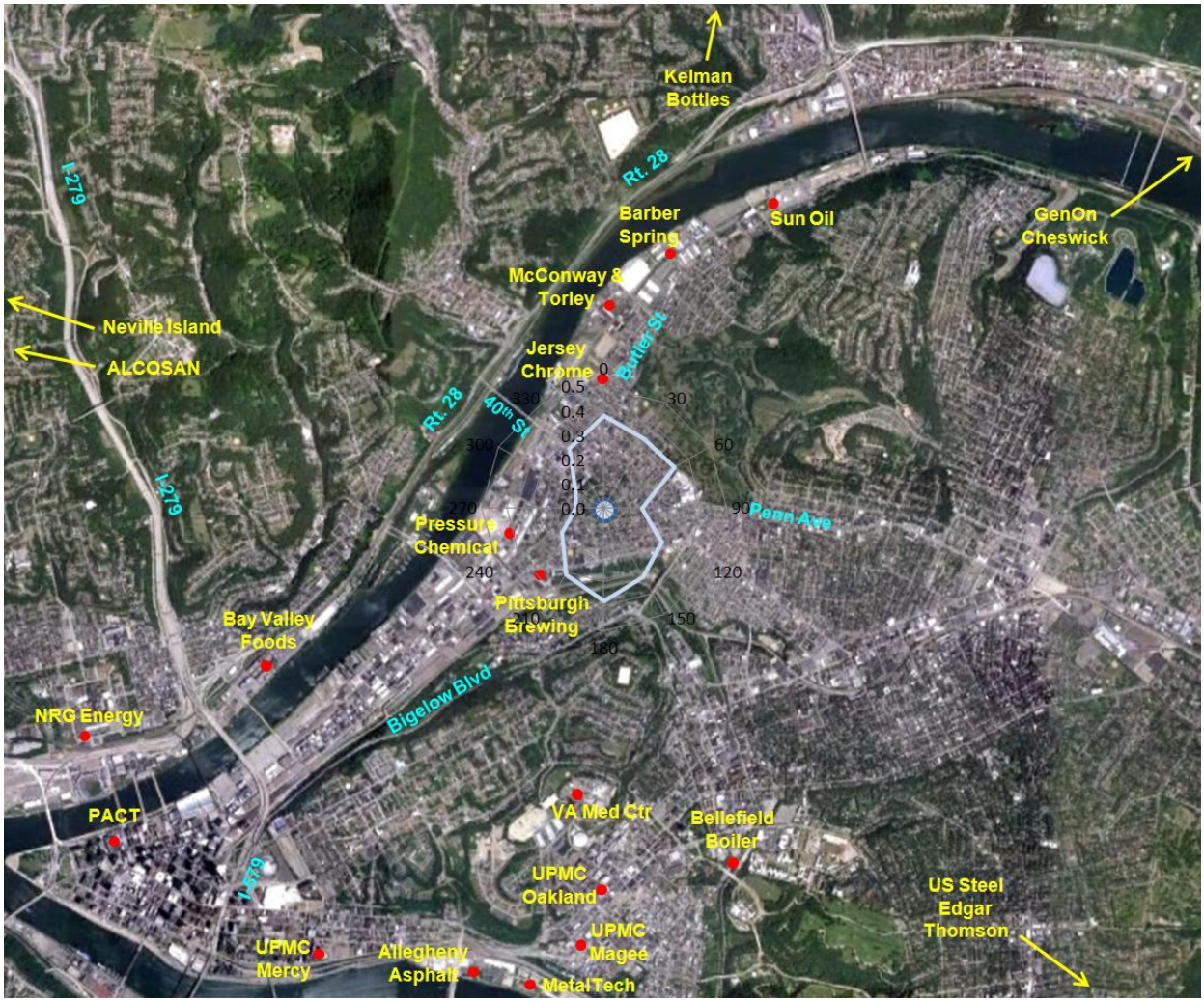

Factor Contributions
Contributions (avg = 1)
1/1/2005
7/1/2005
1/1/2006
7/1/2006
1/1/2007
7/1/2007
1/1/2008
7/1/2008
1/1/2009
7/1/2009
1/1/2010
7/1/2010


Yearly Contributions
Rel. Cont.
2005 (94)
2006 (94)
2007 (90)
2008 (100)
2009 (95)
2010 (91)


Seasonal Contributions
Rel. Cont.
Winter (137)
Spring (145)
Summer (140)
Fall (142)

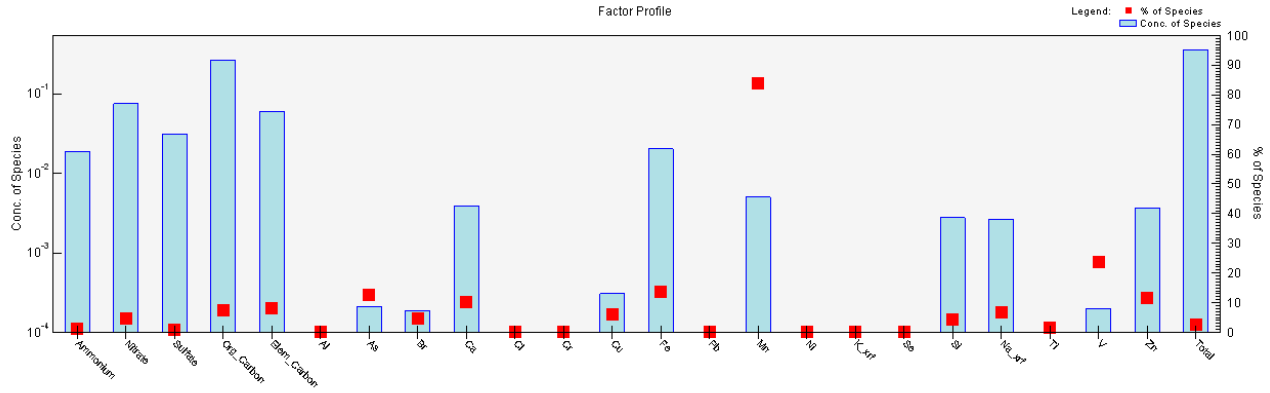

Weekday/Weekend Contributions
Rel. Cont.
Weekday (374)
Weekend (190)

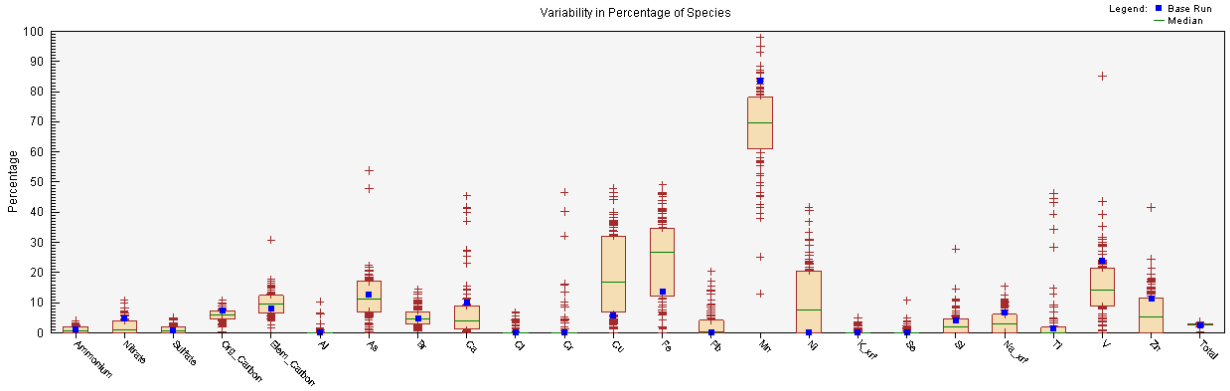
The CPF plot for Factor 7 is shown below. High days showed the highest frequencies from the north/northeast and from the south. This can be due to local and distant fossil fuel-combustion or glass facilities. [Not shown on the map: Gallery G Glass on Liberty Ave., a few blocks south of the Lawrenceville site, creates hand-blown art glass.]

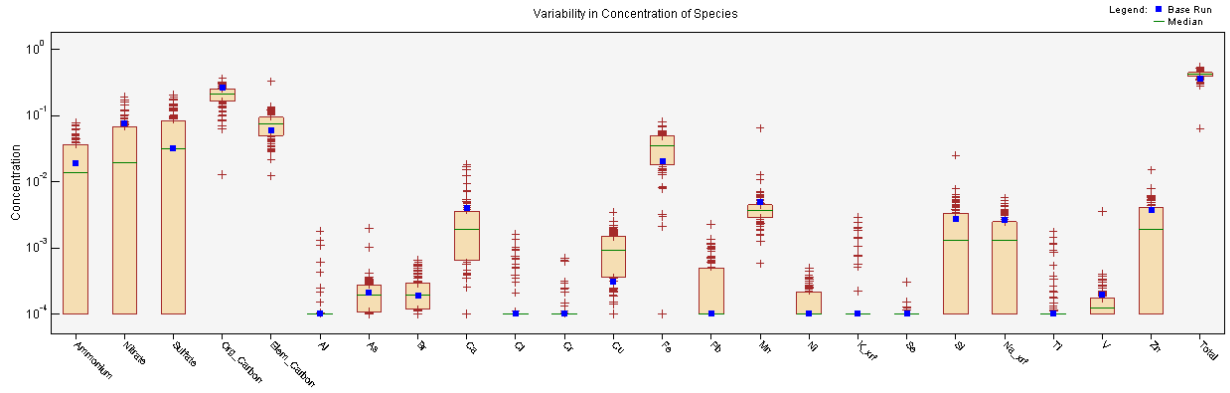


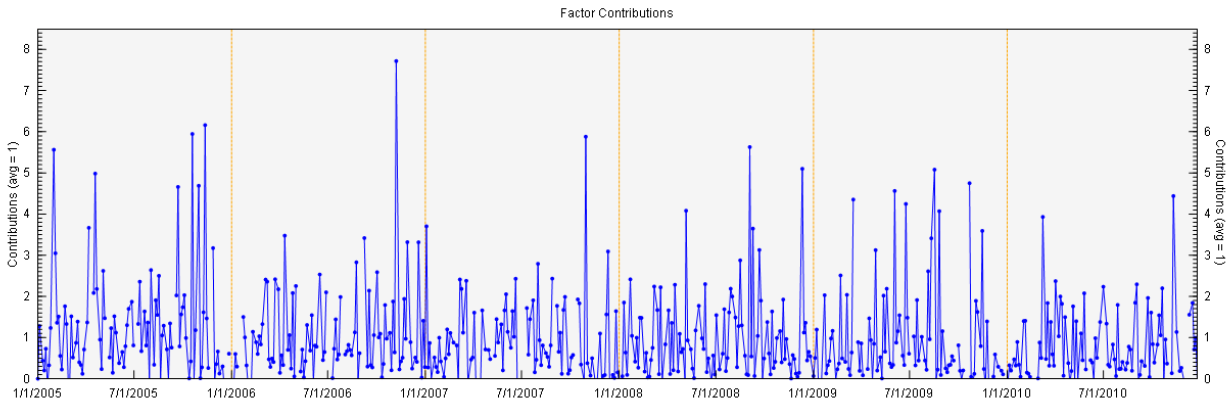
Lawrenceville Source Factor 8: Steel Manufacturing/Processing

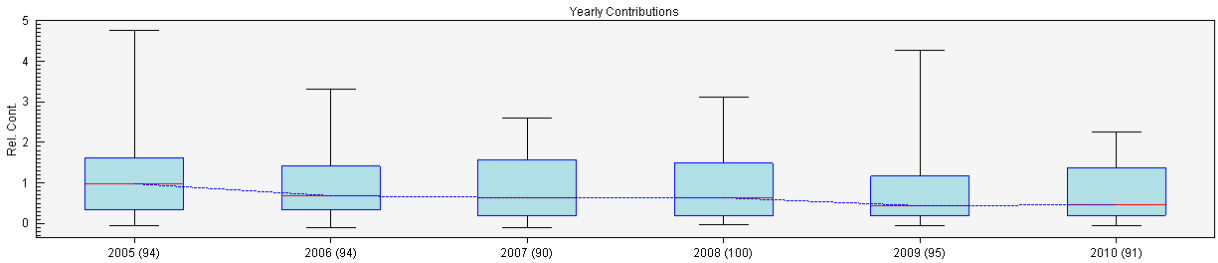
Factor 10 has a strong presence of manganese, which is related steel manufacturing or processing. There is a strong weekday contribution from this factor, indicating weekday-only production. Smaller amounts of other species are also grouped with this factor. Factor 10 is small overall (4% of total), and it peaks during inversions but shows fairly steady contributions overall on a time-series basis.

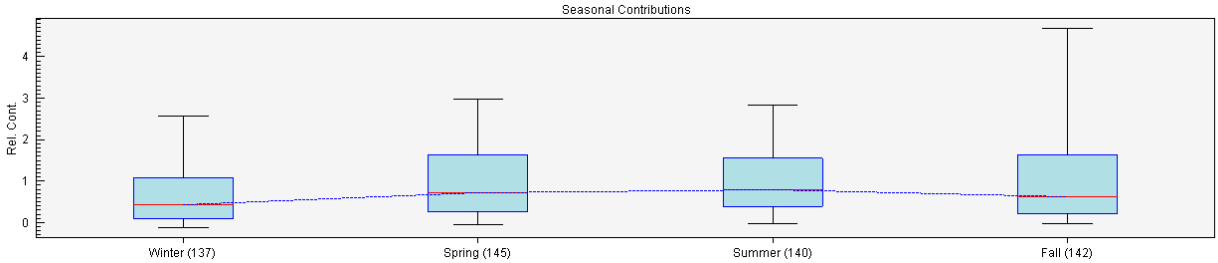


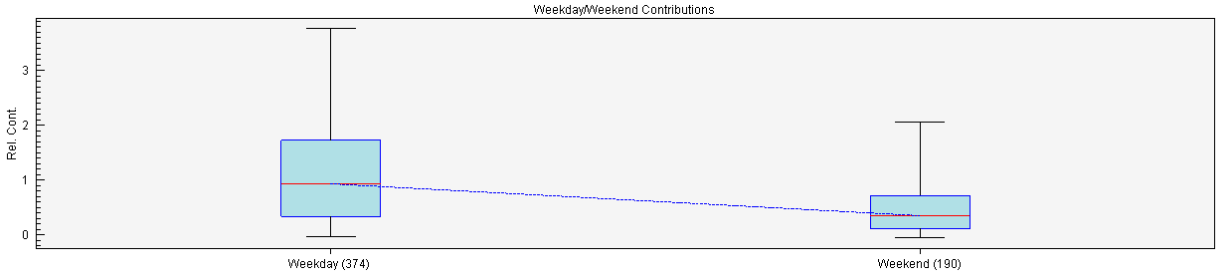




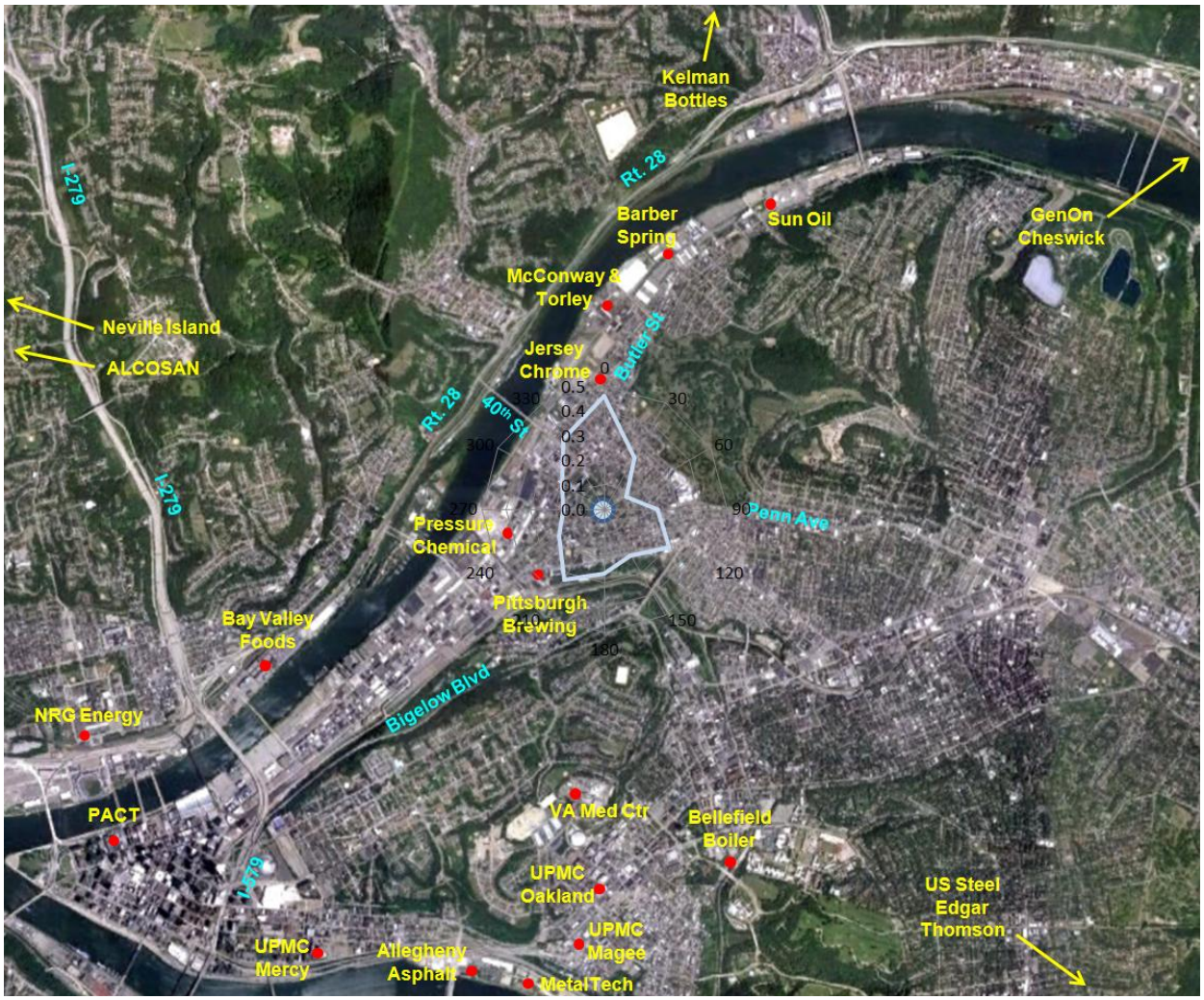

Factor Contributions
Contributions (avg = 1)
1/1/2005
7/1/2005
1/1/2006
7/1/2006
1/1/2007
7/1/2007
1/1/2008
7/1/2008
1/1/2009
7/1/2009
1/1/2010
7/1/2010


Yearly Contributions
Rel. Cont.
2005 (94)
2006 (94)
2007 (90)
2008 (100)
2009 (95)
2010 (91)


Seasonal Contributions
Rel. Cont.
Winter (137)
Spring (145)
Summer (140)
Fall (142)

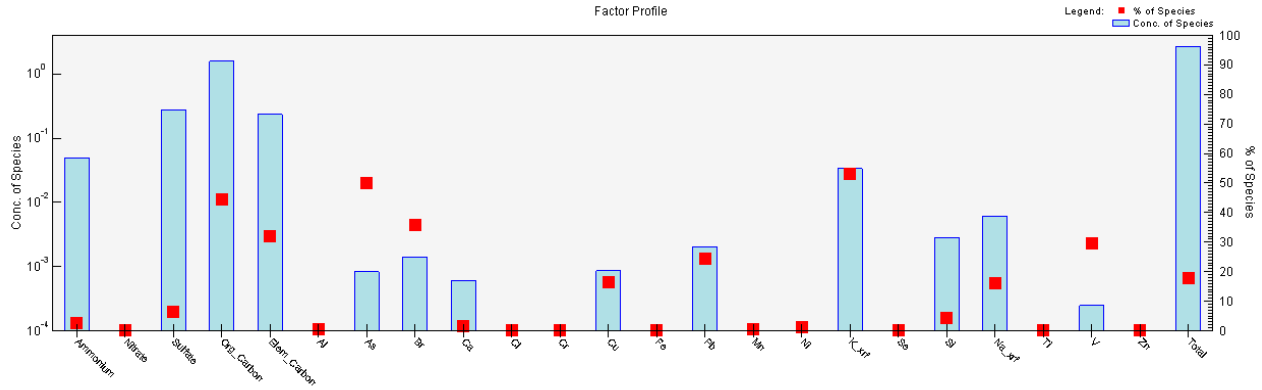

Weekday/Weekend Contributions
Rel. Cont.
Weekday (374)
Weekend (190)

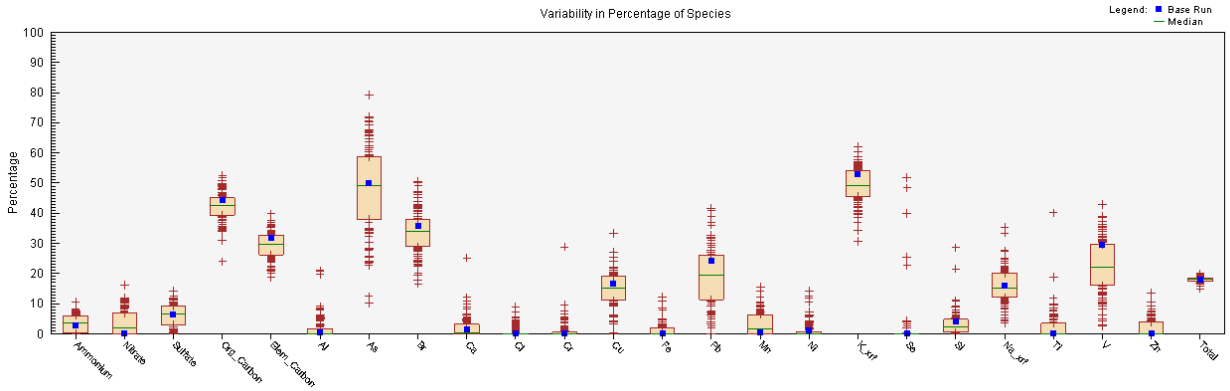
The CPF plot for Factor 8 is shown below. High-day frequencies from the north and southeast may be due to nearby steel facilities. Frequencies from the southwest may be due to lesser components that are grouped with this factor.

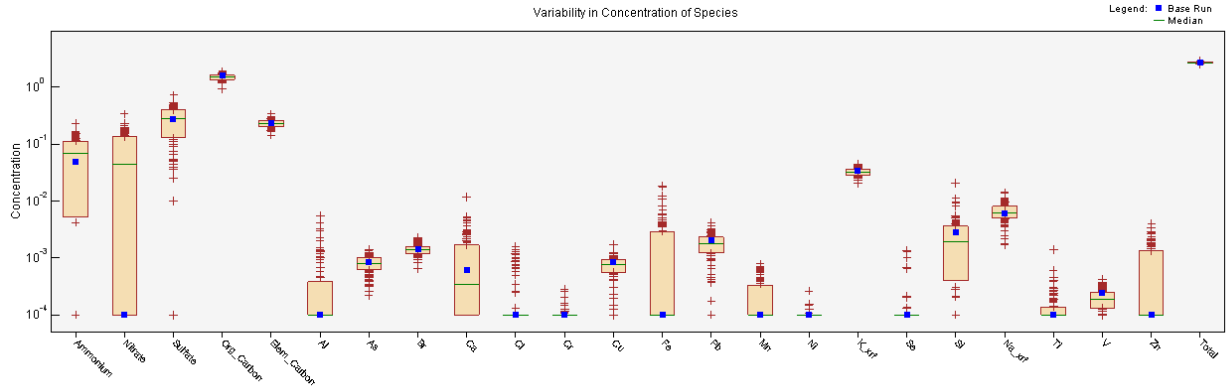


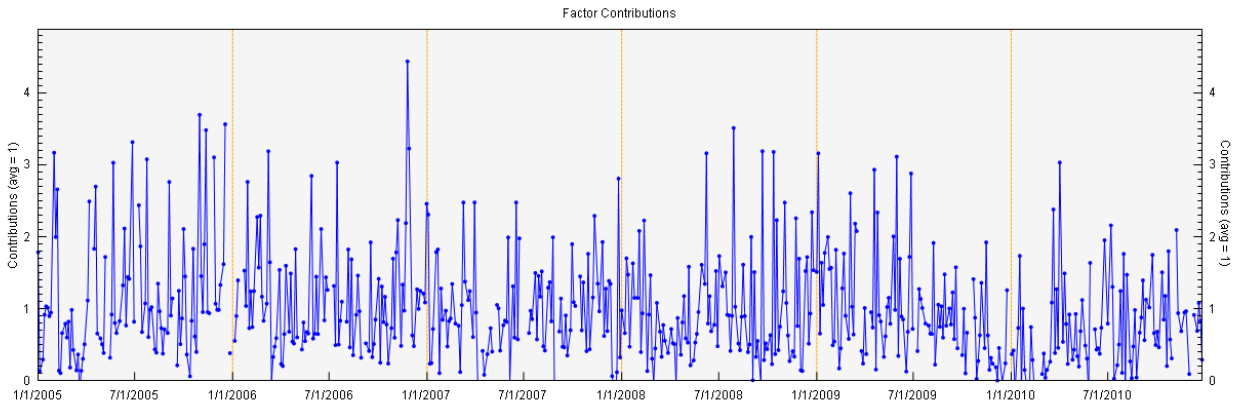
Lawrenceville Source Factor 9: Burning/Cooking

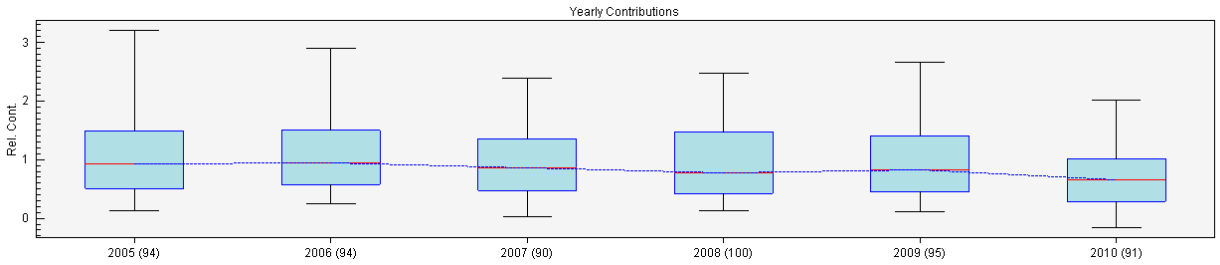
Factor 9 contains high amounts of carbons along with potassium, which are indicators of vegetative burning and cooking. This factor shows high weekend contributions and is lowest in spring, possibly due to recreational burning and cooking in summer and wood-burning in winter. Arsenic and vanadium also show high percentages with this factor, which can be associated with wood burning and oil combustion, respectively. Some vehicle emissions may also be present with this factor. Factor 9 represents a significant portion of total $PM_{2.5}$ (17%). It can peak during inversions but shows fairly steady contributions overall on a time-series basis.

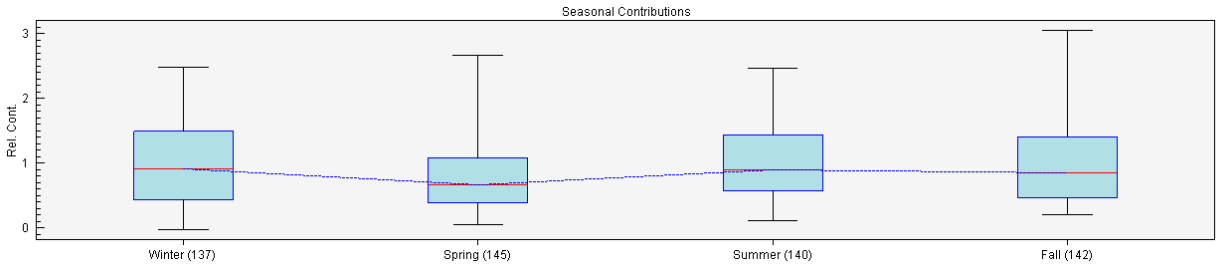


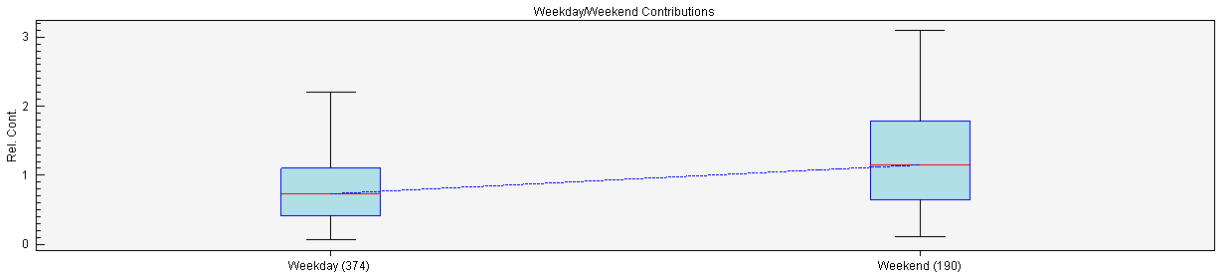




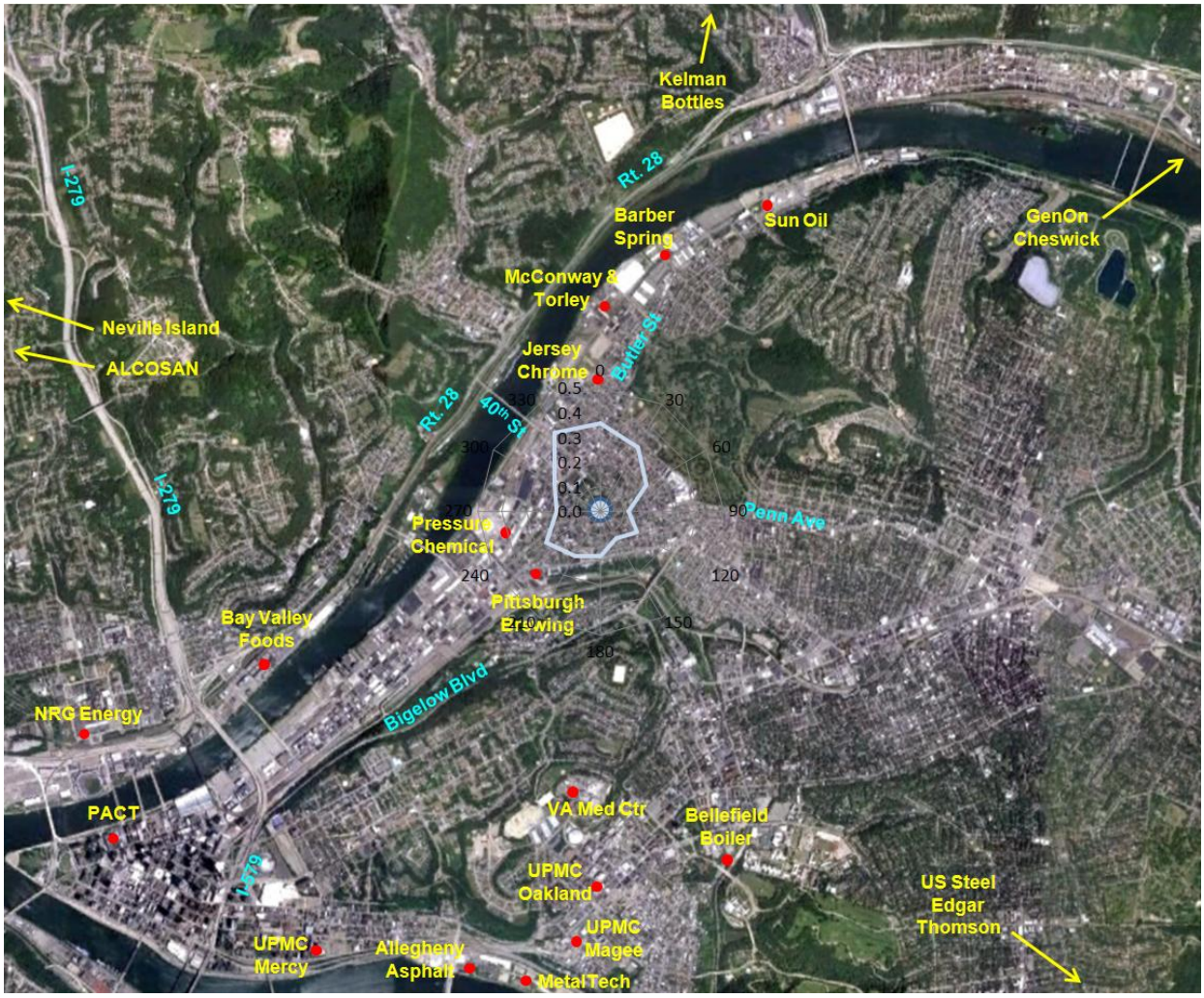

Factor Contributions
Contributions (avg = 1)
0
1
2
3
4
1/1/2005
7/1/2005
1/1/2006
7/1/2006
1/1/2007
7/1/2007
1/1/2008
7/1/2008
1/1/2009
7/1/2009
1/1/2010
7/1/2010


Yearly Contributions
Rel. Cont.
0
1
2
3
2005 (94)
2006 (94)
2007 (90)
2008 (100)
2009 (95)
2010 (91)


Seasonal Contributions
Rel. Cont.
0
1
2
3
Winter (137)
Spring (145)
Summer (140)
Fall (142)

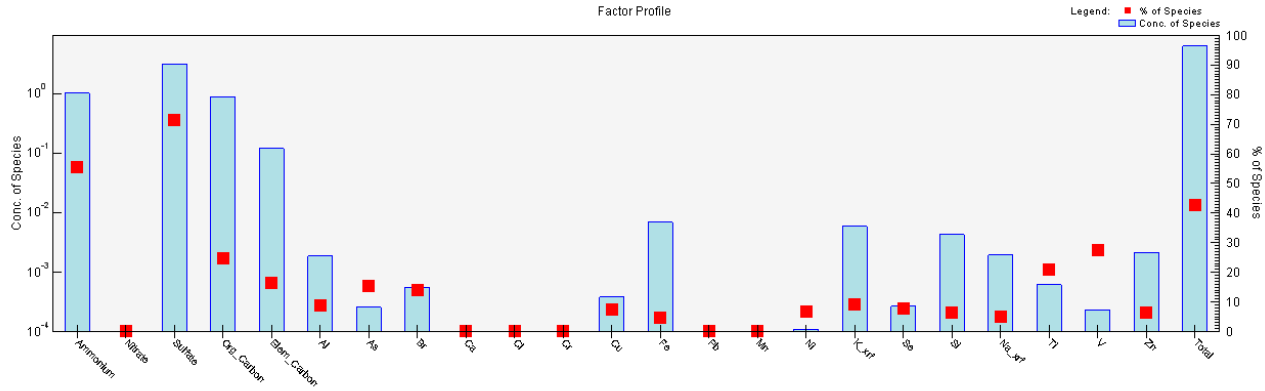

Weekday/Weekend Contributions
Rel. Cont.
0
1
2
3
Weekday (374)
Weekend (190)

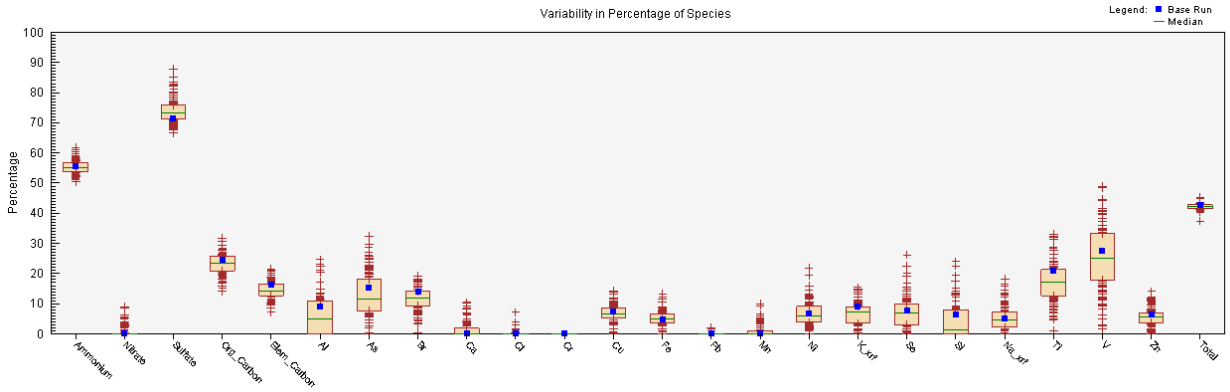
The CPF plot for Factor 9 is shown below. High days showed the highest frequencies from the north and southwest, likely due to cooking and wood-burning from surrounding community.

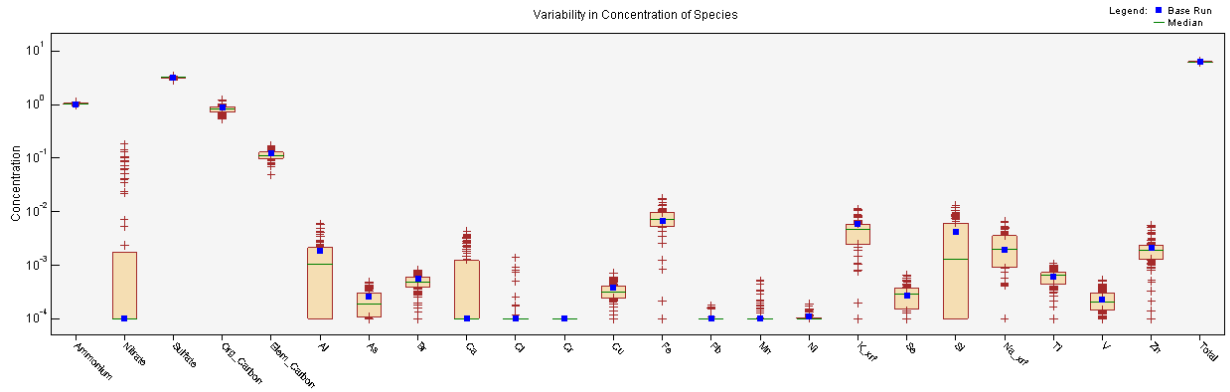


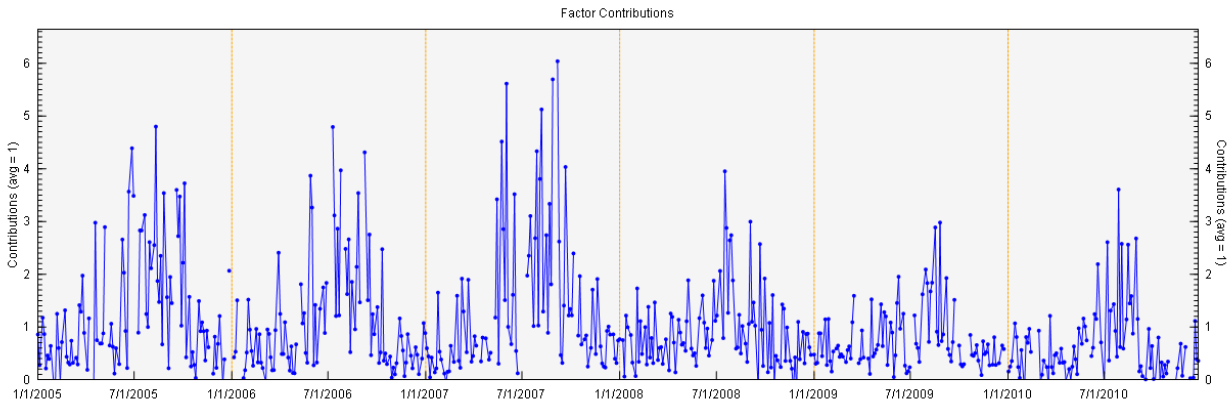
Lawrenceville Source Factor 10: Secondary Ammonium Sulfates + Gasoline Vehicles

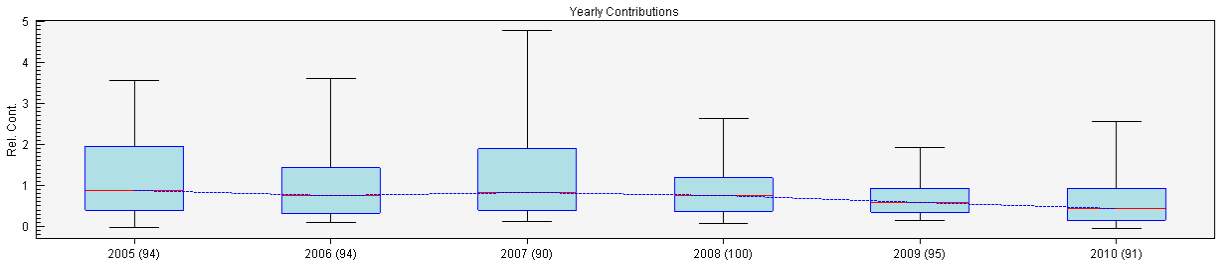
Factor 10 is the largest source factor and contributes nearly all of the ammonium sulfates (NH_4HSO_4 or $(NH_4)_2SO_4$) at Lawrenceville. Contributions are highest in the summer, when sulfates are most prevalent. Ammonium sulfates generally exist as secondary $PM_{2.5}$ in the Pittsburgh region, formed by upwind SO_2 from sources such as coal-fired power plants. Factor 10 also contains carbons that are peaking concurrently with sulfate, possibly from light-duty vehicle exhaust. Factor 10 is the largest component of $PM_{2.5}$ at Lawrenceville (41%).

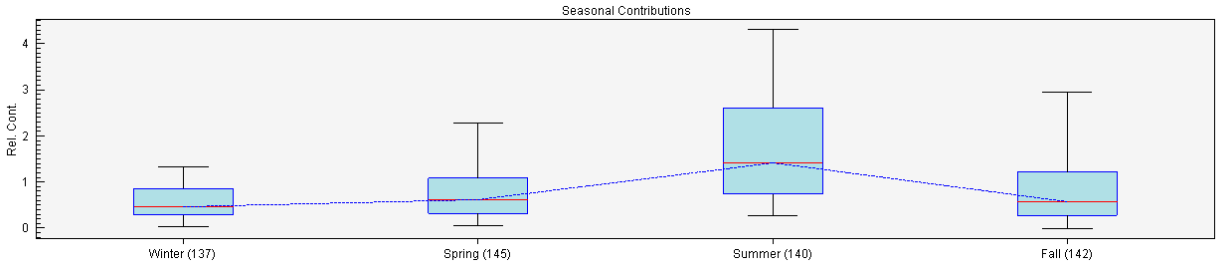


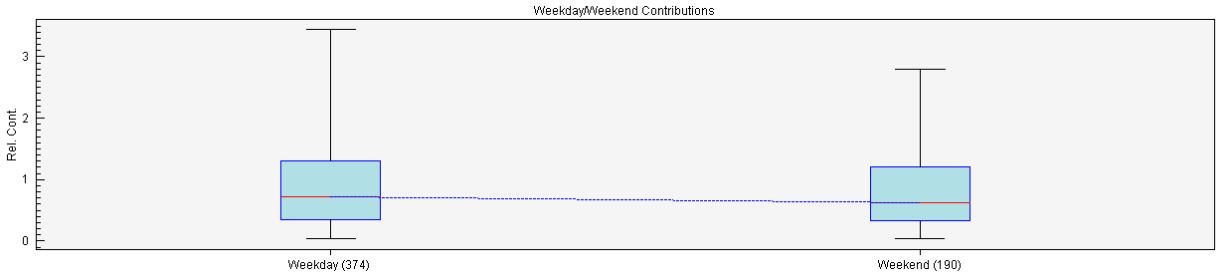




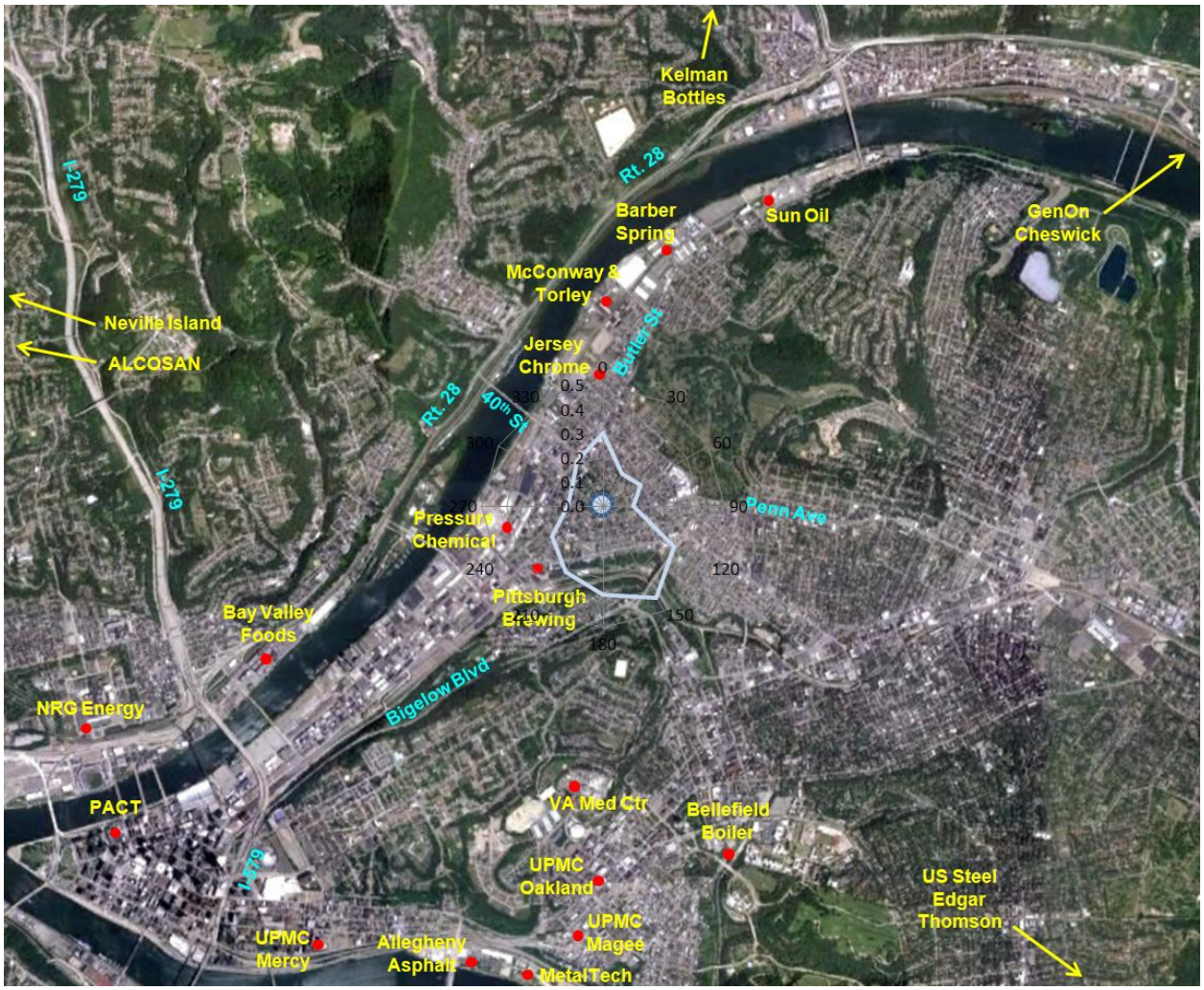

Factor Contributions
Contributions (avg = 1)
1/1/2005
7/1/2005
1/1/2006
7/1/2006
1/1/2007
7/1/2007
1/1/2008
7/1/2008
1/1/2009
7/1/2009
1/1/2010
7/1/2010


Yearly Contributions
Rel. Cont.
2005 (94)
2006 (94)
2007 (90)
2008 (100)
2009 (95)
2010 (91)


Seasonal Contributions
Rel. Cont.
Winter (137)
Spring (145)
Summer (140)
Fall (142)


Weekday/Weekend Contributions
Rel. Cont.
Weekday (374)
Weekend (190)

The CPF plot for Factor 10 is shown below. High days showed the highest frequencies from the south and southeast. This could be due to a combination of sulfates from distant upwind sources along with nearby sources to the south.



Lawrenceville Source Descriptions

Below are descriptions of the sources shown on the aerial maps of the Lawrenceville area.

McConway & Torley	Manufacturer of steel rail and mining castings including steel melting, casting, heat treating, and finishing.
Jersey Chrome	Manufacturer of chromium metal for deposition on metals.
Pressure Chemical	Fine chemical, polymer, and specialty material manufacturing.
Pittsburgh Brewing	Malt beverage brewing and packaging facility.
Barber Spring	Steel spring manufacturing.
Bay Valley Foods	Boilers for food production.
Sun Oil-Pittsburgh	Terminal that transfers gasoline and ethanol to/from tanks.
NRG Energy Center	Steam generation for district steam heating.
PACT	Pittsburgh Allegheny County Thermal. Steam generation for district steam heating.
Bellefield Boiler	Steam generation for district steam heating.
UPMC Facilities	Hospitals, medical laboratories, and incinerators.
VA Medical Center	Intermediate and long term health care facility.
Allegheny Asphalt	Now Lindy Paving. Processes coal and mineral aggregates.
MetalTech	Produces galvanized steel strips from untreated steel coils.
GenOn Cheswick	Coal-fired electric generation.
Kelman Bottles	Manufacturer of glass bottles.
ALCOSAN	Allegheny County Sanitary Authority. Domestic sewage treatment plant.
US Steel Edgar Thompson	Steel blast furnace and slab manufacturing using coke, iron-bearing materials, and fluxes.
Neville Island	Upwind/background industrial area. Includes Shenango, Calgon Carbon, Ashland, Neville Chemical, and other facilities.

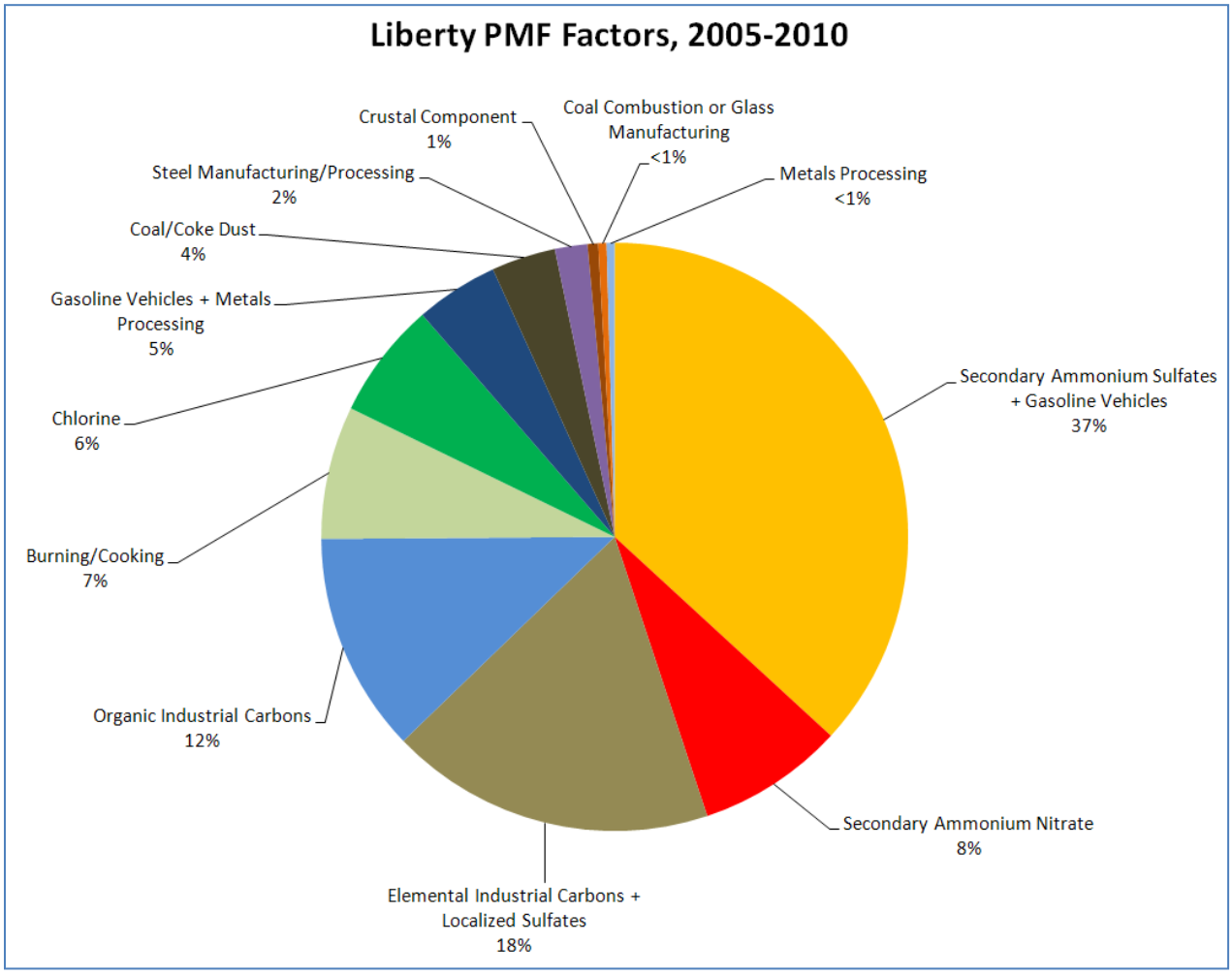
5. Modeled Results: Liberty

The best-fit model runs for Liberty were able to resolve 12 source factors. The following species were down-weighted in the model runs: Al, Na, Ti, V, and Total $PM_{2.5}$.

Liberty results revealed many of the same source factors that were evident at Lawrenceville, while also indicating additional sources specific to the Liberty area. Liberty source factor profiles and associated source types are given in the table below. Species average concentrations that were considered to be indicators of the specific source types are shown in bold.

Factor	1	2	3	4	5	6	7	8	9	10	11	12
Key Species/Tracers	Cr, Ni	Carbons, As	Se	Carbons, Cu	Nitrate	Carbons, Sulfate	Sulfate, Carbons	Elemental Carbon, Si	Carbons, K	Cl, Br	Fe, Mn, Zn	Al, Ca, Fe, Ti
Possible Source(s)	Metals Processing	Organic Industrial Carbons	Coal Combustion or Glass Manufacturing	Gasoline Vehicles + Metals Processing	Secondary Ammonium Nitrate	Elemental Industrial Carbons + Localized Sulfates	Secondary Ammonium Sulfates + Gasoline Vehicles	Coal/Coke Dust	Burning/ Cooking	Chlorine	Steel Manufacturing/ Processing	Crustal Component
Ammonium	0	0	0.01388	0	**0.30660**	**0.49492**	**1.27130**	0.11616	0	0.20768	0	0.01033
Nitrate	0.02778	0.11853	0	0.07862	**0.86571**	0	0	0	0.14222	0	0.04303	0
Sulfate	0	0.00104	0.04091	0.16674	0	**0.70900**	**3.91310**	0	0.25534	0.14854	0.03032	0
Org_Carbon	0.01208	**1.35170**	0	**0.38930**	0.11800	**0.72348**	**0.55460**	0.10176	**0.67784**	0.23764	0.11525	0
Elem_Carbon	0.01137	**0.42962**	0.00828	**0.05282**	0	**0.89370**	**0.15473**	**0.22997**	**0.03921**	0.19885	0.02511	0
Al	0.00060	0	0	0.00222	0	0.00186	0	0.00209	0.00364	0.00066	0	**0.01518**
As	0	**0.00314**	0.00006	0	0	0.00062	0	0.00015	0	0.00040	0	0.00005
Br	0.00013	0.00021	0.00015	0	0.00045	0.00478	0.00008	0.00020	0.00134	**0.00246**	0	0.00060
Ca	0	0.00737	0.00056	0	0.00102	0.00494	0	0	0	0	0.00217	**0.02762**
Cl	0.00293	0.00039	0	0.01200	0	0	0	0.00000	0.00340	**0.22105**	0.00758	0
Cr	**0.00146**	0	0	0	0	0.00008	0.00009	0	0	0	0	0.00014
Cu	0	0	0	**0.00552**	0.00097	0.00014	0	0	0	0	0	0.00048
Fe	0.01323	0.00604	0.00005	0.01415	0	0	0.00695	0.00186	0	0.00028	**0.03176**	**0.02123**
Pb	0	0	0	0.00093	0	0.01048	0.00002	0.00077	0.00071	0.00208	0.00045	0.00062
Mn	0.00020	0	0	0	0.00005	0.00006	0	0	0.00018	0	**0.00179**	0.00046
Ni	**0.00142**	0	0	0.00001	0	0.00003	0	0.00003	0	0.00002	0.00001	0
K_xrf	0	0.01188	0	0.00679	0	0	0	0	**0.03436**	0.00058	0.00426	0.00736
Se	0.00000	0	**0.00861**	0.00070	0	0	0.00001	0.00019	0.00029	0.00000	0.00008	0
Si	0	0.00062	0	0	0.00092	0	0	**0.11349**	0.00580	0.00605	0.00945	0.00169
Na_xrf	0	0.00398	0.00007	0.00019	0	0.01637	0.00022	0	0.00767	0	0.00341	0.00624
Ti	0.00011	0.00053	0	0	0.00007	0	0.00036	0.00034	0	0	0	**0.00144**
V	0	0.00021	0.00002	0.00006	0.00019	0	0.00028	0	0.00006	0	0.00016	0
Zn	0	0.00352	0.00022	0.00226	0.00052	0.01014	0	0	0	0.00248	**0.01267**	0
Sum Conc. (µg/m³)	0.07132	1.93877	0.07281	0.73231	1.29450	2.87059	5.90173	0.56702	1.17206	1.02878	0.28750	0.09344

A pie chart of the best-guess Liberty source types, by percent of summed concentrations, is shown below.

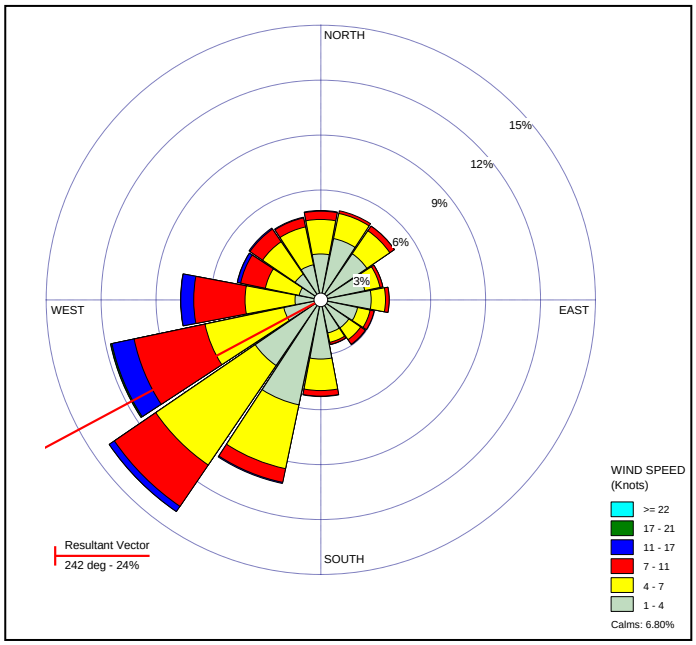


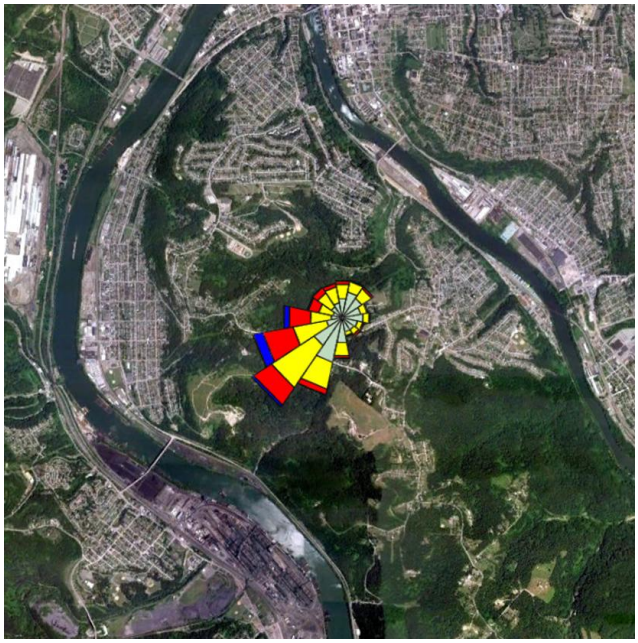
Analysis and graphical results for each factor are given on subsequent pages. Graphical results are copied directly from the model output and include the following for each factor:

- Concentration by value and percentage of total for each species
- Variable (bootstrapping) for each concentration and percentage
- Time series plot by overall factor concentration
- Contribution aggregates according to year, season, and day of week

Note: Factors and runs are generated randomly by PMF and are not ranked according to any one species.

Conditional Probability Functions (CPF) plots are also included for each factor for Liberty. Below is the wind rose for Liberty, showing wind direction frequencies plotted in vector grid form and also plotted in Google Earth. Liberty wind data were available for the full modeled timeframe (Jan. 2005 through Dec. 2010).

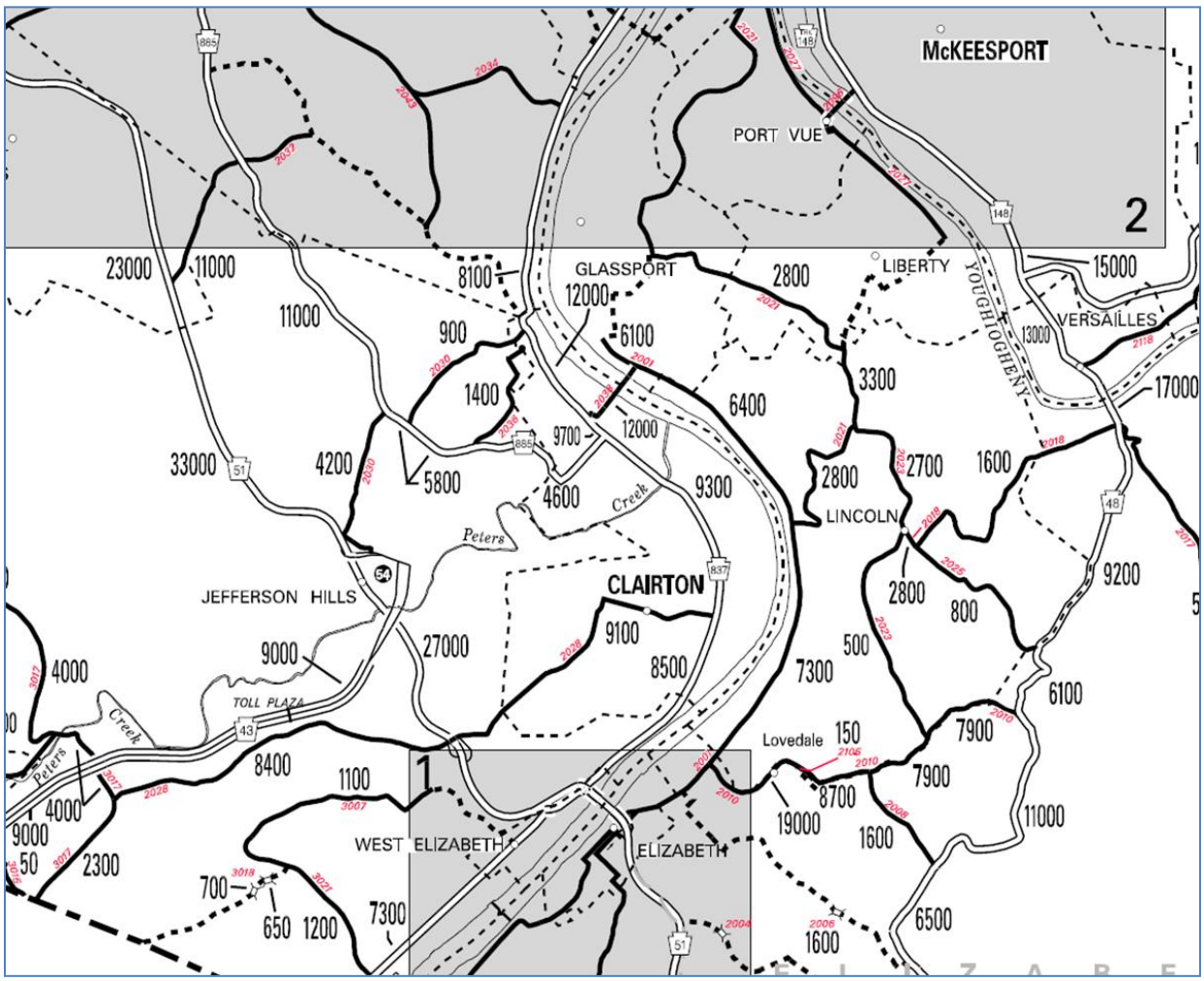




Average wind speed = 4.45 knots

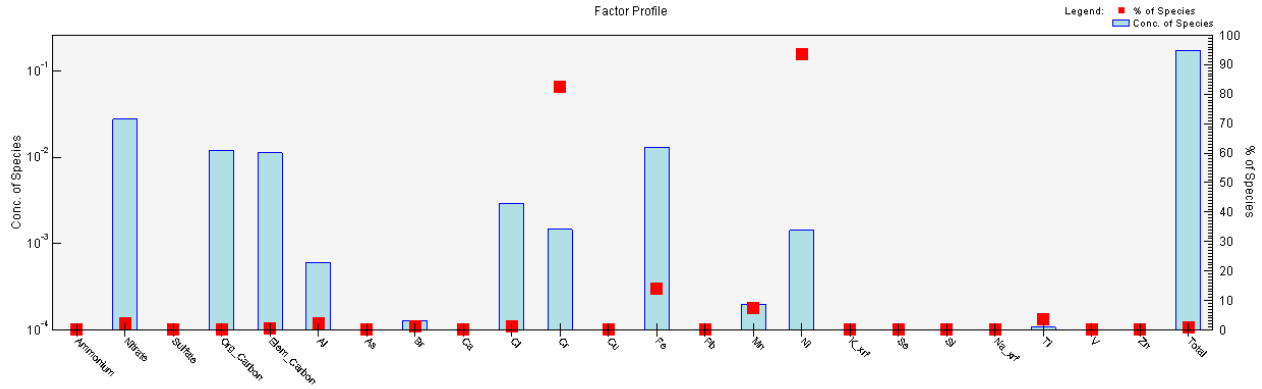
Liberty shows the largest frequencies of wind directions from the southwest. The strongest winds are from the west and west-southwest

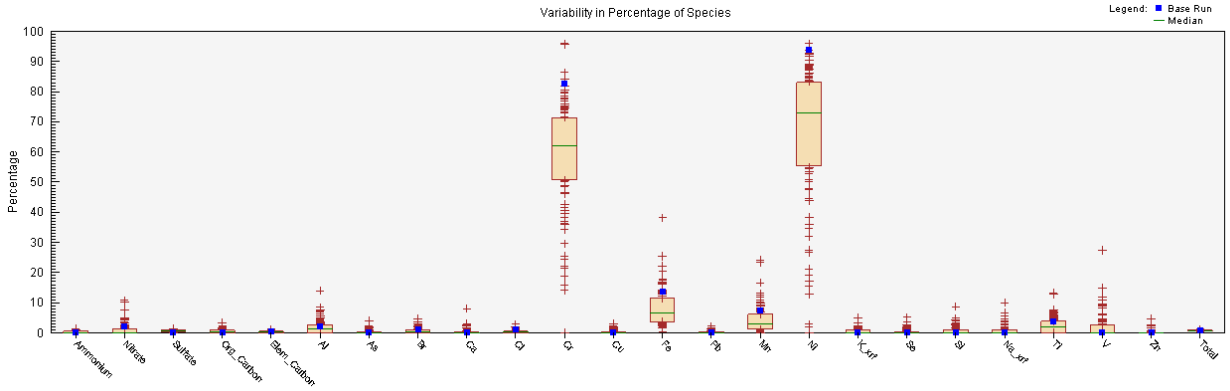
2008 annual average daily traffic volumes for the Liberty vicinity are shown on the map below. Washington Blvd. (count: 2,800) and Liberty Way (3,300) are the roadways nearest the Liberty site. Larger roadways at lower elevations to the southwest (the predominant wind direction) may also be significant to the Liberty site.

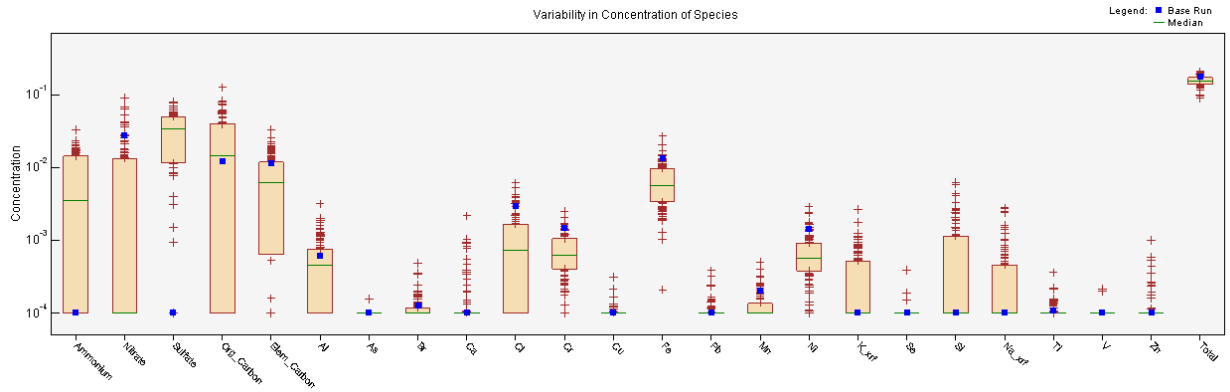


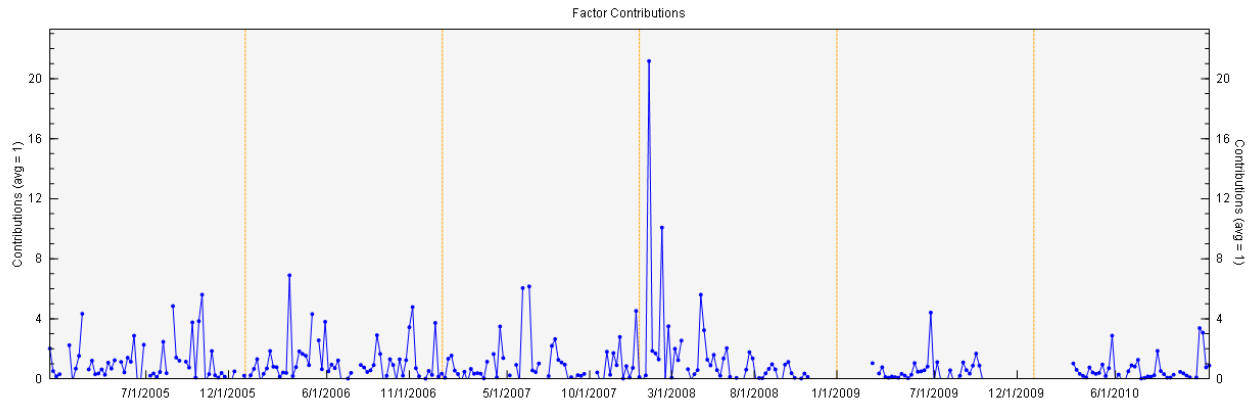
Liberty Source Factor 1: Metals Processing

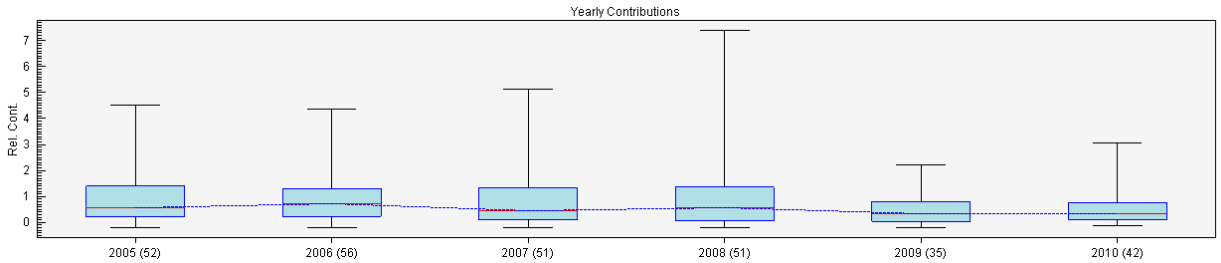
Factor 1 has a high percentage of chromium and nickel, which can be associated with metals processing such as electroplating or scrap-cutting. Weekday contributions are slightly higher than weekend, which may indicate weekday production schedules at local facilities. Factor 1 is small overall (less than 1% of total $PM_{2.5}$) and shows the highest contributions on days with no inversions.

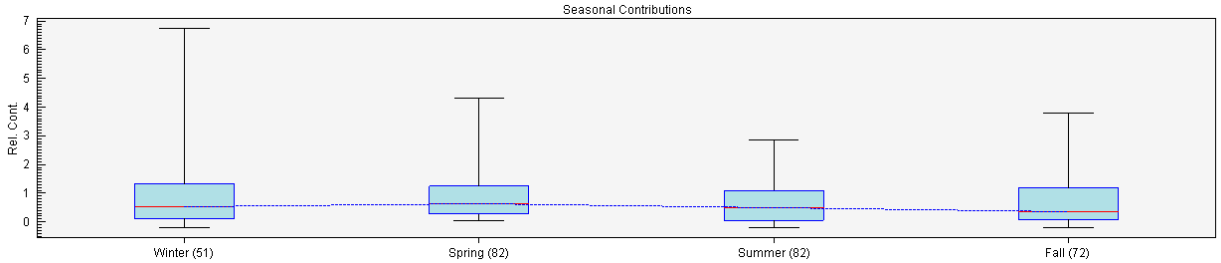


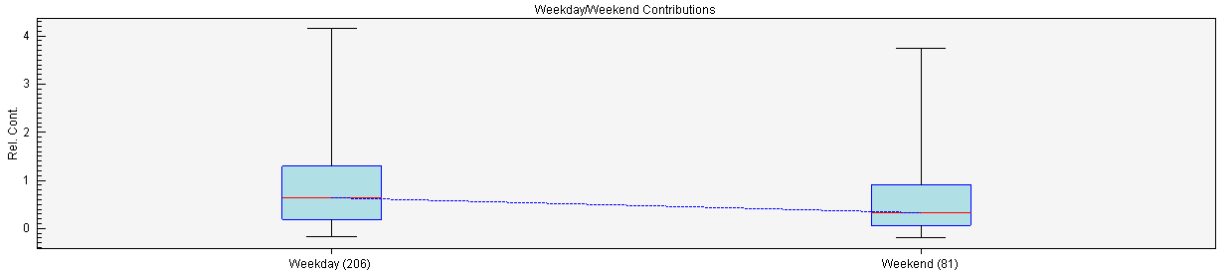




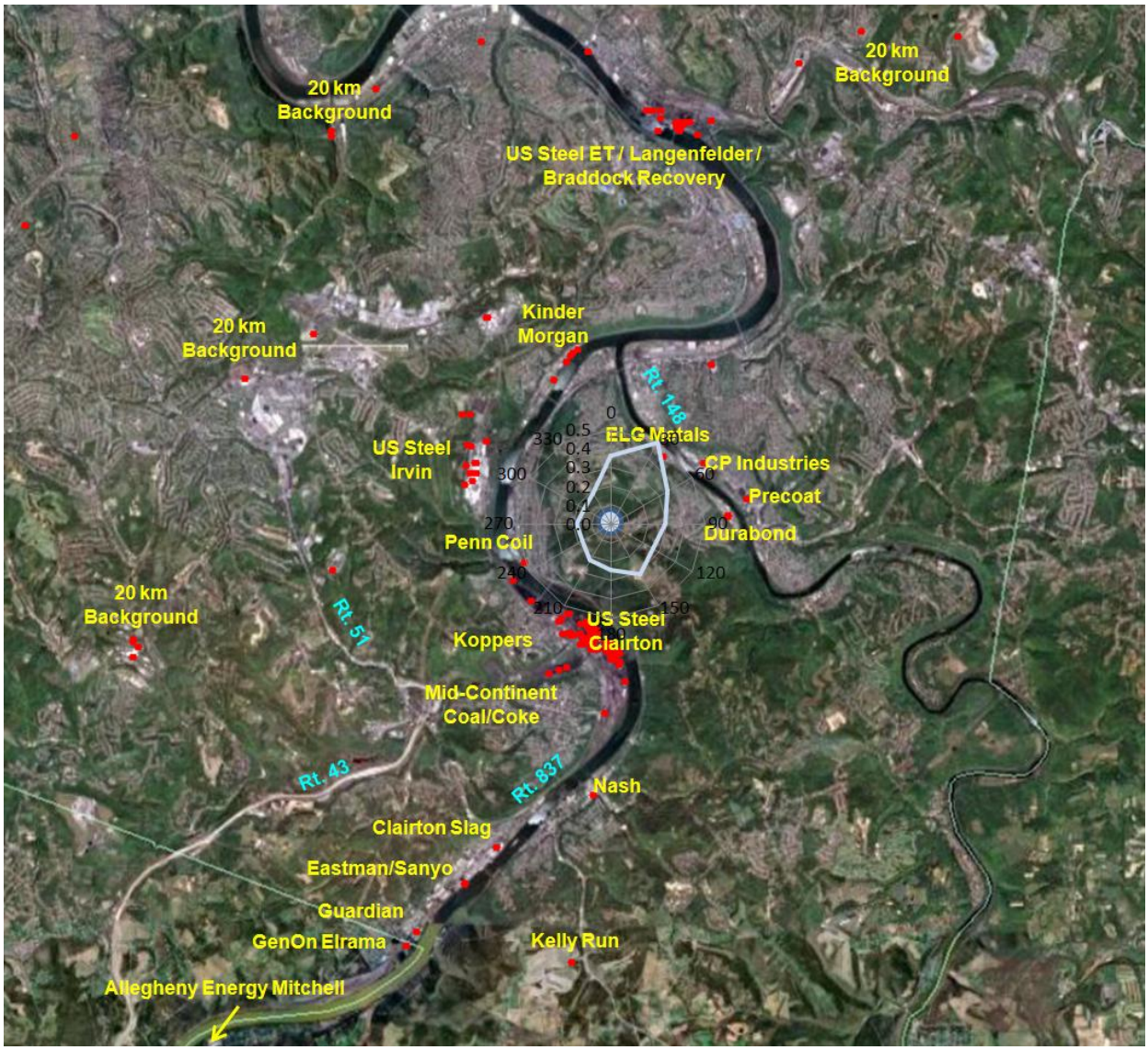

Factor Contributions
Contributions (avg = 1)
0
4
8
12
16
20
7/1/2005
12/1/2005
6/1/2006
11/1/2006
5/1/2007
10/1/2007
3/1/2008
8/1/2008
1/1/2009
7/1/2009
12/1/2009
6/1/2010


Yearly Contributions
Rel. Cont.
0
1
2
3
4
5
6
7
2005 (52)
2006 (56)
2007 (51)
2008 (51)
2009 (35)
2010 (42)


Seasonal Contributions
Rel. Cont.
0
1
2
3
4
5
6
7
Winter (51)
Spring (82)
Summer (82)
Fall (72)

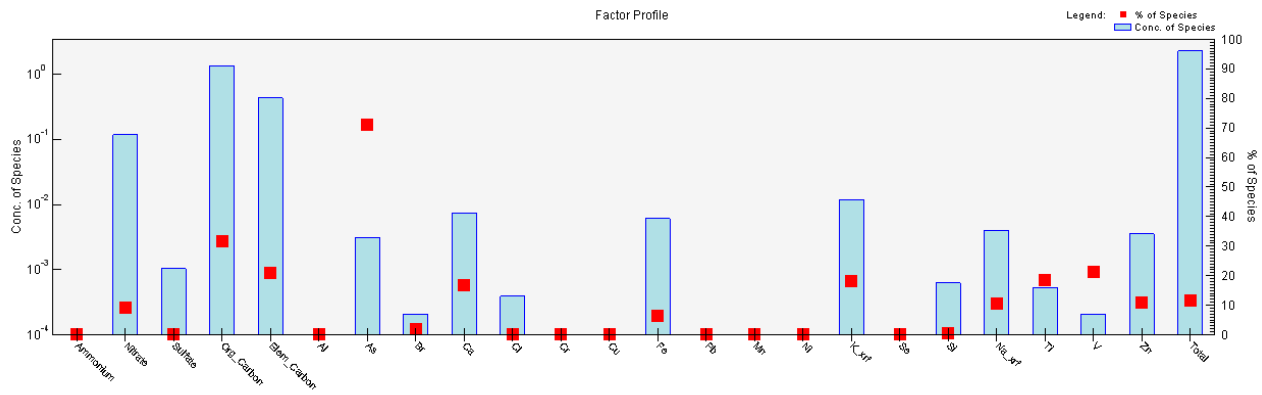

Weekday/Weekend Contributions
Rel. Cont.
0
1
2
3
4
Weekday (206)
Weekend (81)

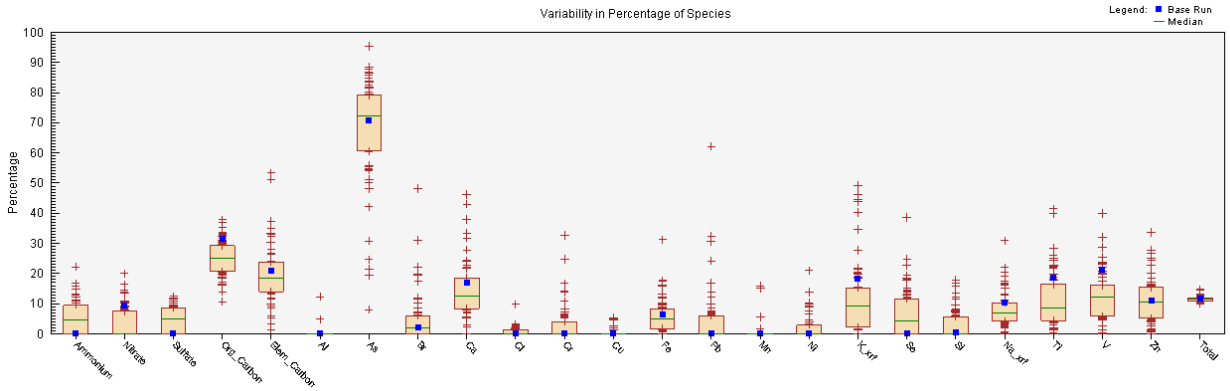
The CPF plot for Factor 1 is shown below. High days showed the highest frequencies from the northeast.

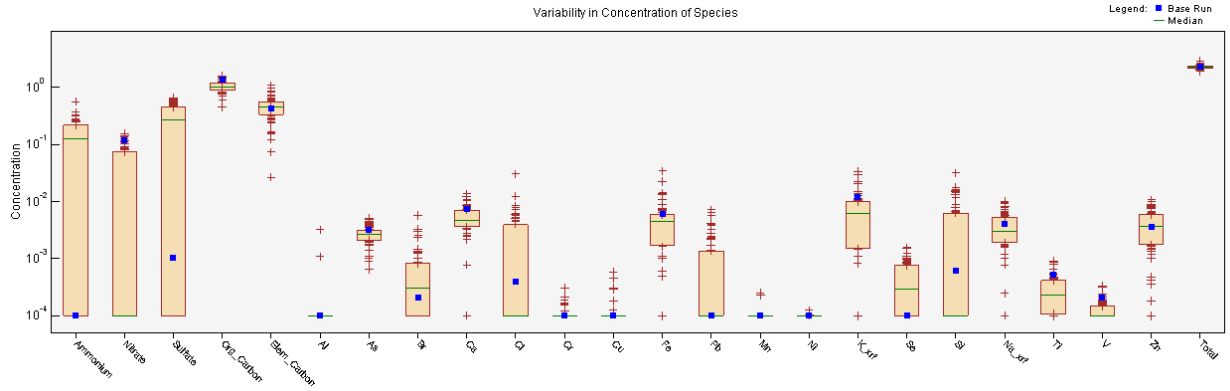


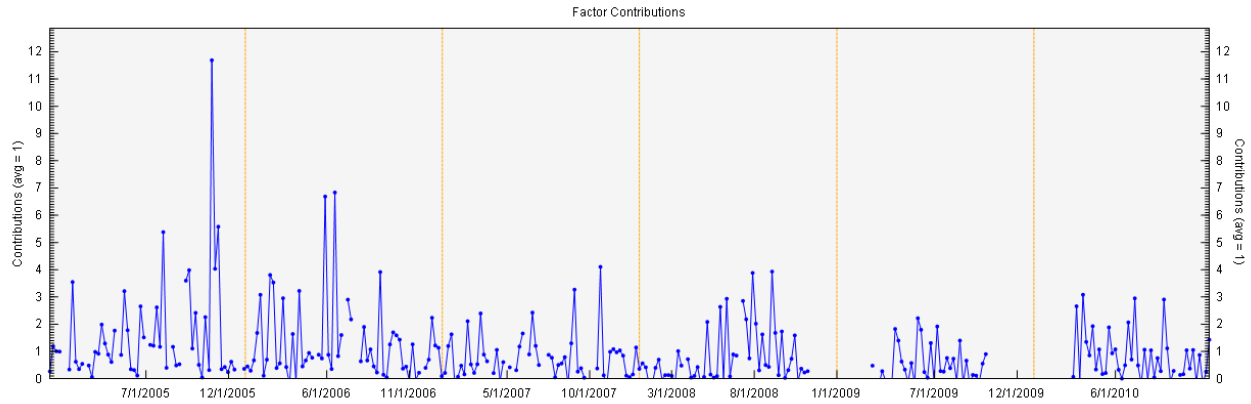
Liberty Source Factor 2: Organic Industrial Carbons

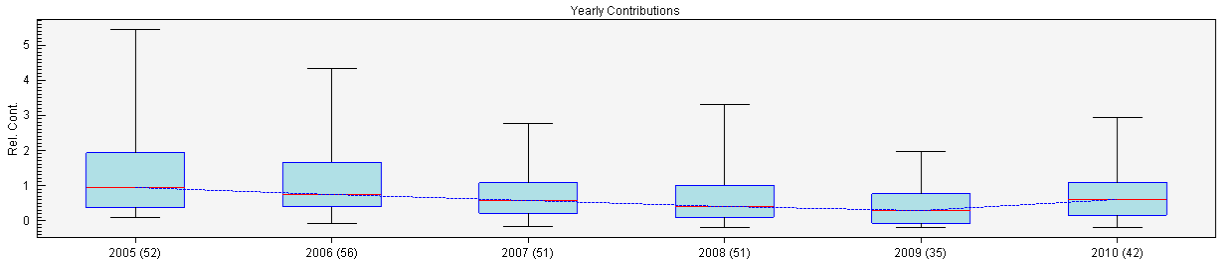
Factor 2 is largely composed of organic and elemental carbons, along with the majority of arsenic at Liberty. Weekday/weekend contributions are similar, indicating continuous activity. Yearly contributions are the lowest in 2009, with an increase in 2010, which may be attributed to industrial facilities with low production levels in 2009. Factor 2 is a significant factor (12% of total) and is strongly affected by inversions. Organic carbons may be primary or secondary in nature, possibly from coke production, chemical processing, and/or other sources. Arsenic may be attributed to coal combustion, coking, or wood burning. Smaller concentrations of other species are also grouped with this factor.

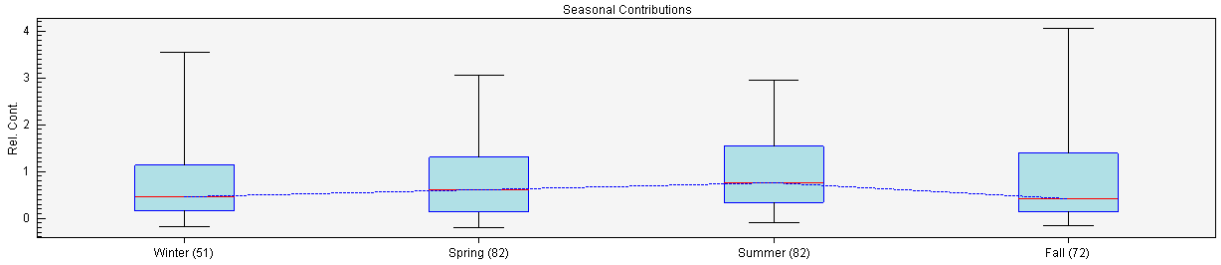


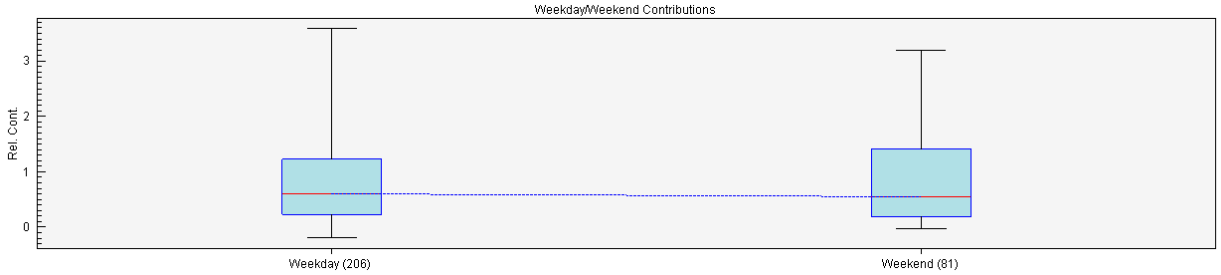




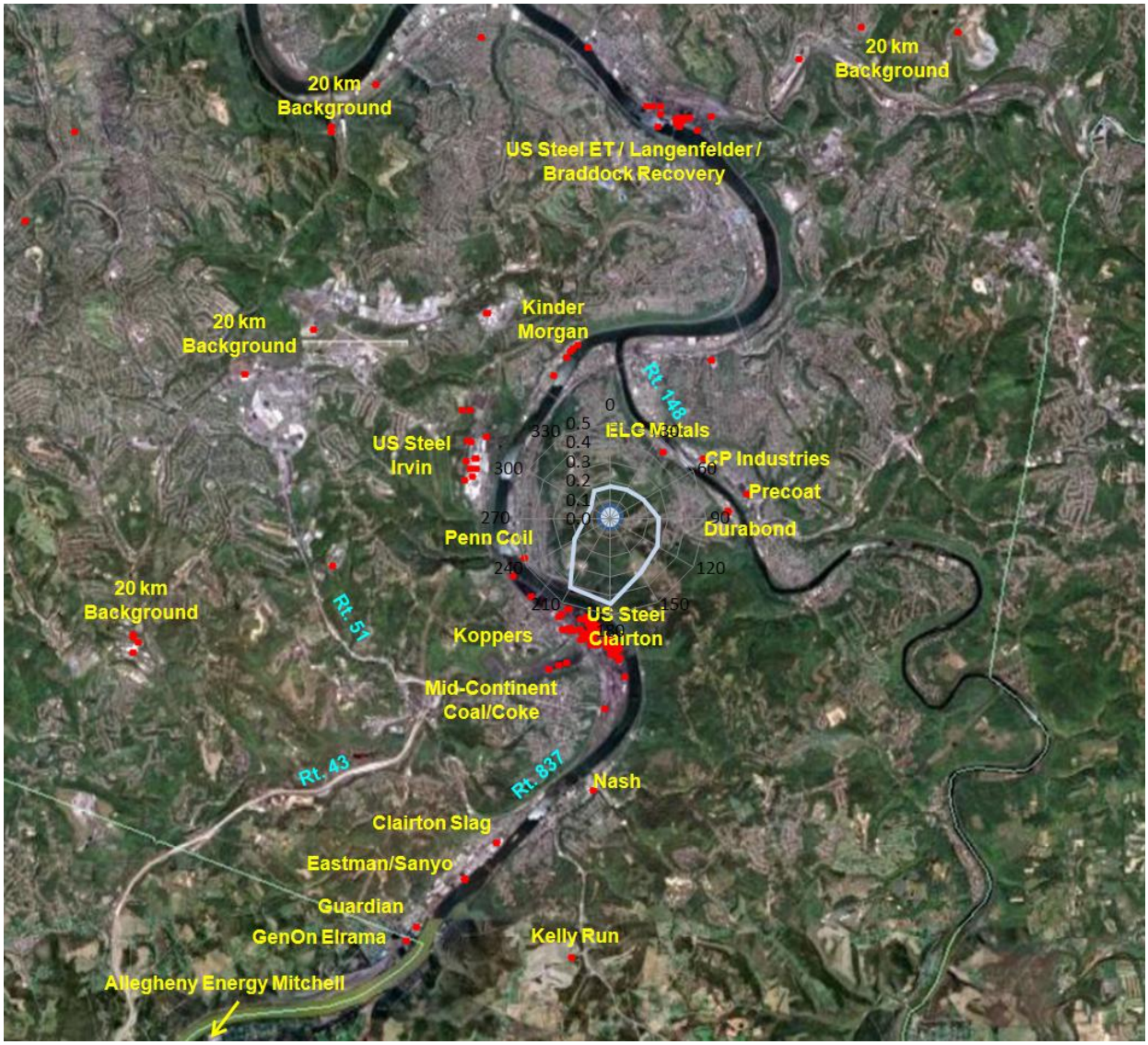

Factor Contributions
Contributions (avg = 1)
7/1/2005
12/1/2005
6/1/2006
11/1/2006
5/1/2007
10/1/2007
3/1/2008
8/1/2008
1/1/2009
7/1/2009
12/1/2009
6/1/2010


Yearly Contributions
Rel. Cont.
2005 (52)
2006 (56)
2007 (51)
2008 (51)
2009 (35)
2010 (42)


Seasonal Contributions
Rel. Cont.
Winter (51)
Spring (82)
Summer (82)
Fall (72)

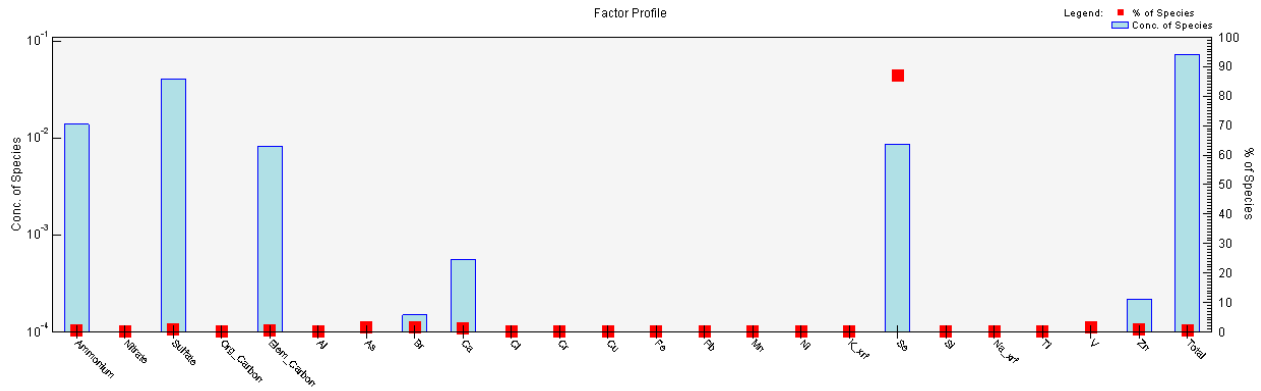

Weekday/Weekend Contributions
Rel. Cont.
Weekday (206)
Weekend (81)

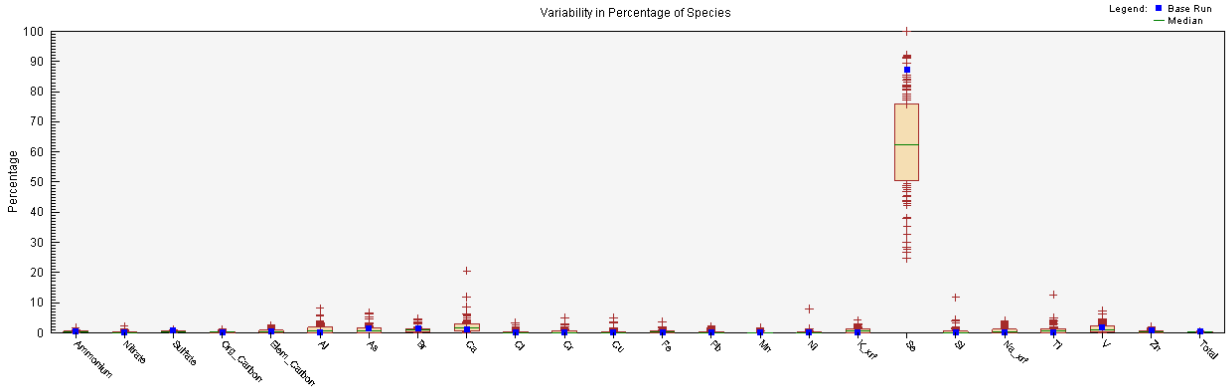
The CPF plot for Factor 2 is shown below. High days showed the highest frequencies from the southwest.

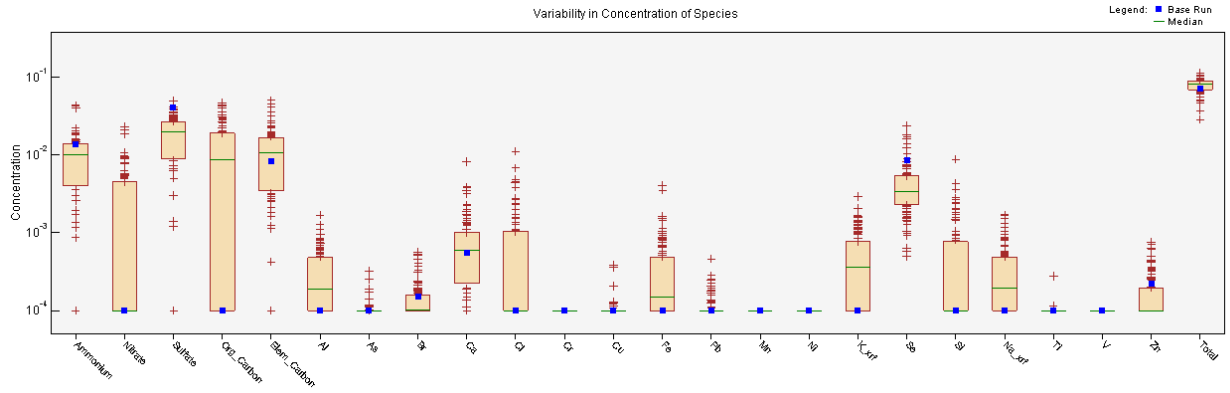


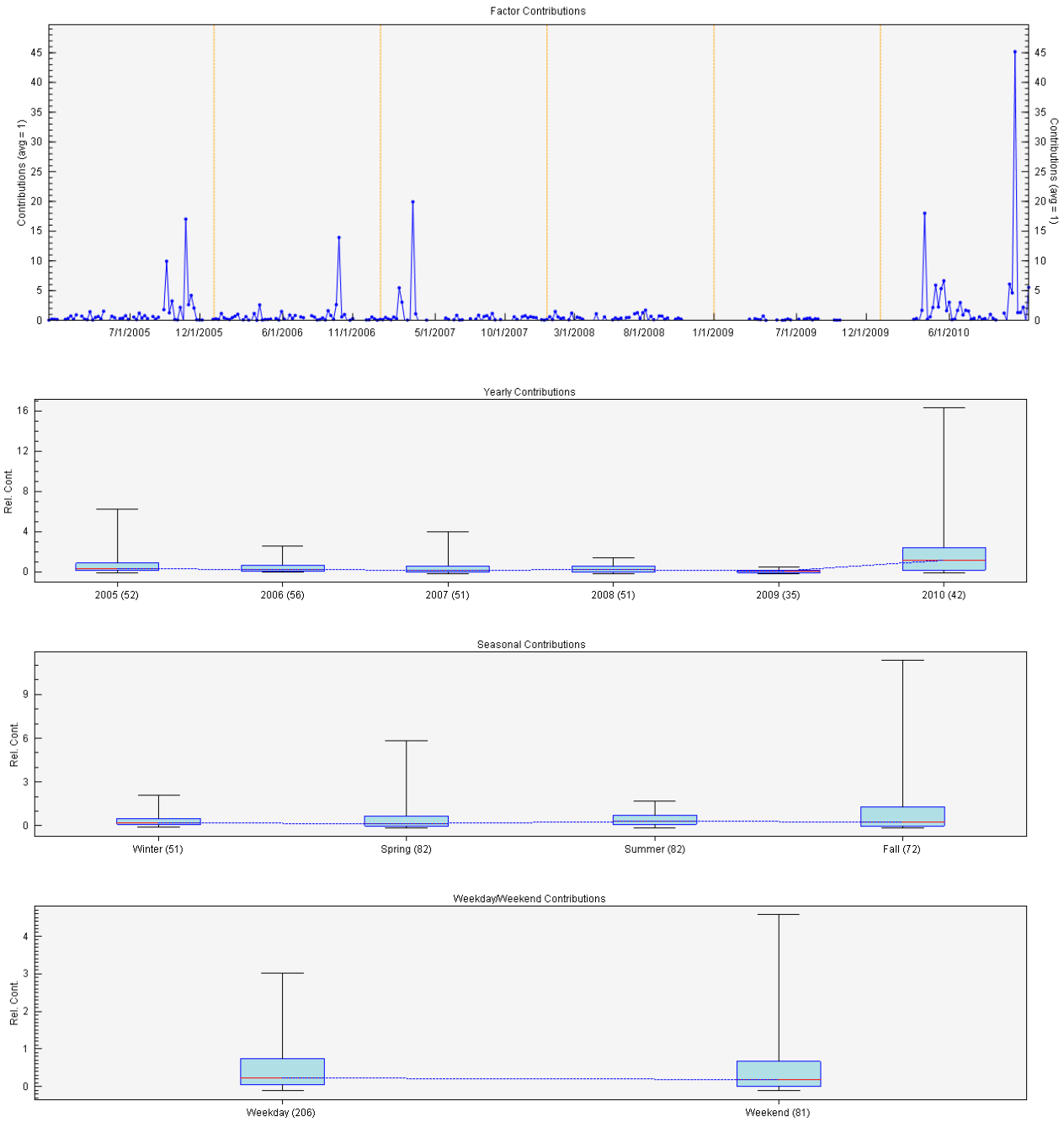
Liberty Source Factor 3: Coal Combustion or Glass Manufacturing

Factor 3 contains a high percentage of selenium, with nearly negligible percentages of all other species. High peaks occur during inversions, with the highest levels occurring in 2010. Selenium can be associated with coal-fired boilers or glass manufacturing operations. Factor 3 is a small factor overall (less than 1% of the total).

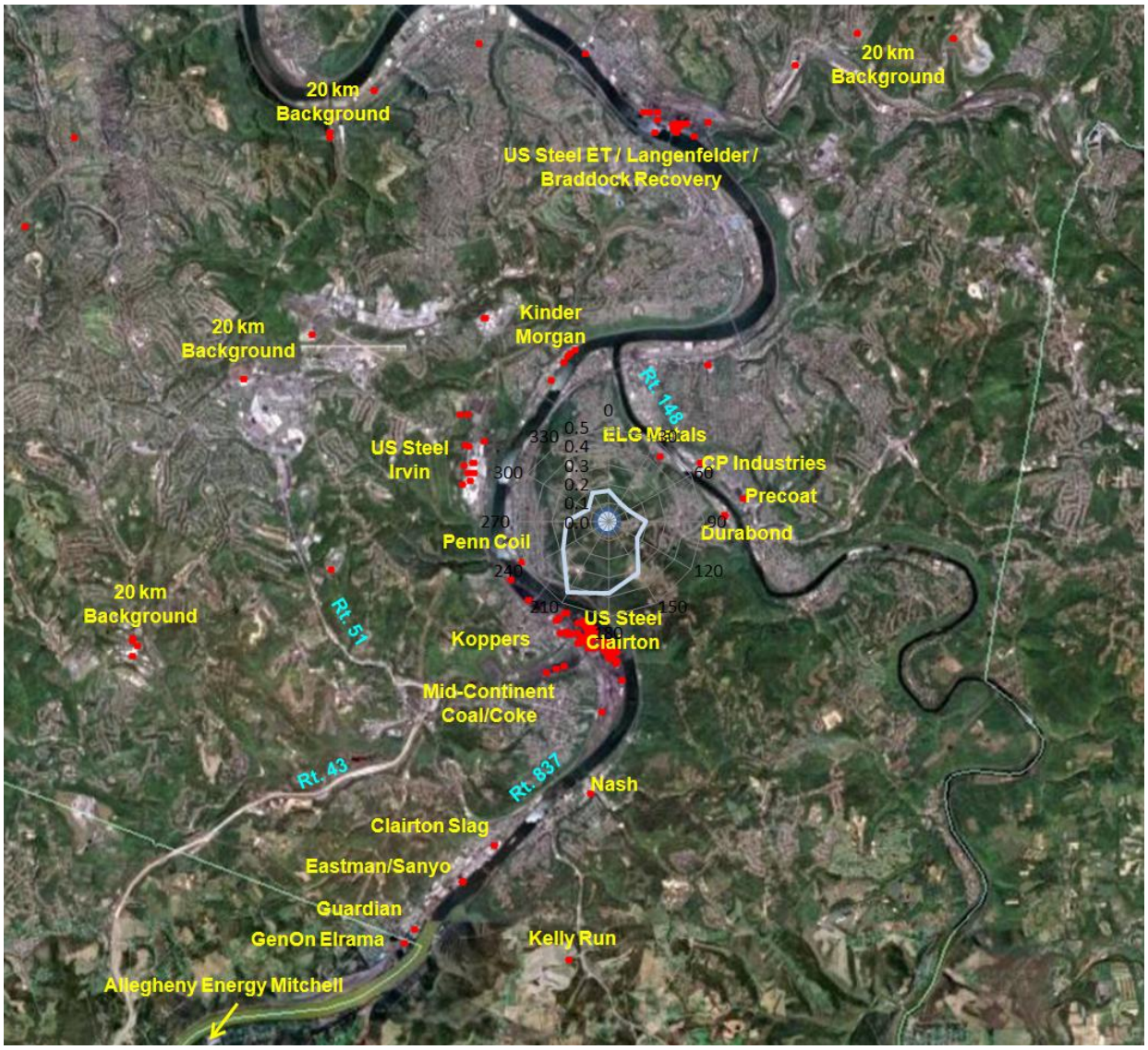






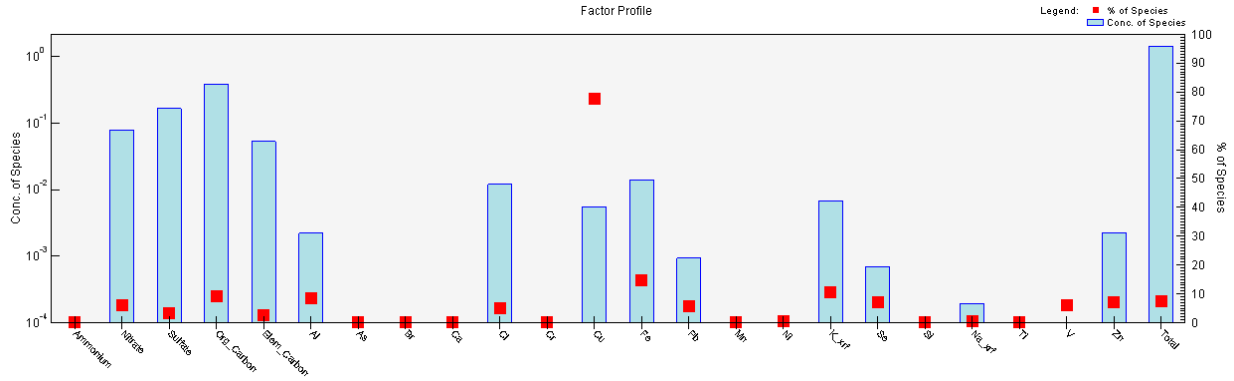

Factor Contributions
Contributions (avg = 1)
7/1/2005
12/1/2005
6/1/2006
11/1/2006
5/1/2007
10/1/2007
3/1/2008
8/1/2008
1/1/2009
7/1/2009
12/1/2009
6/1/2010
Yearly Contributions
Rel. Cont.
2005 (52)
2006 (56)
2007 (51)
2008 (51)
2009 (35)
2010 (42)
Seasonal Contributions
Rel. Cont.
Winter (51)
Spring (82)
Summer (82)
Fall (72)
Weekday/Weekend Contributions
Rel. Cont.
Weekday (206)
Weekend (81)

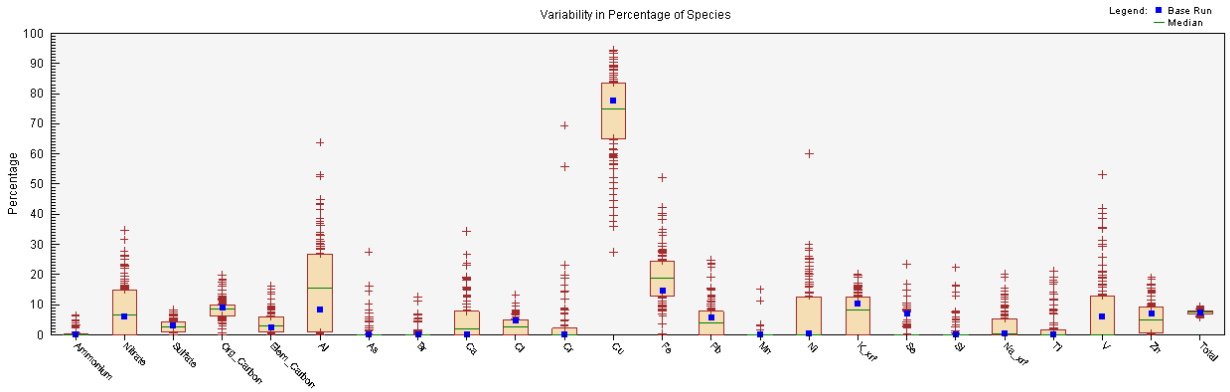
The CPF plot for Factor 3 is shown below. High days showed the highest frequencies from the southwest.

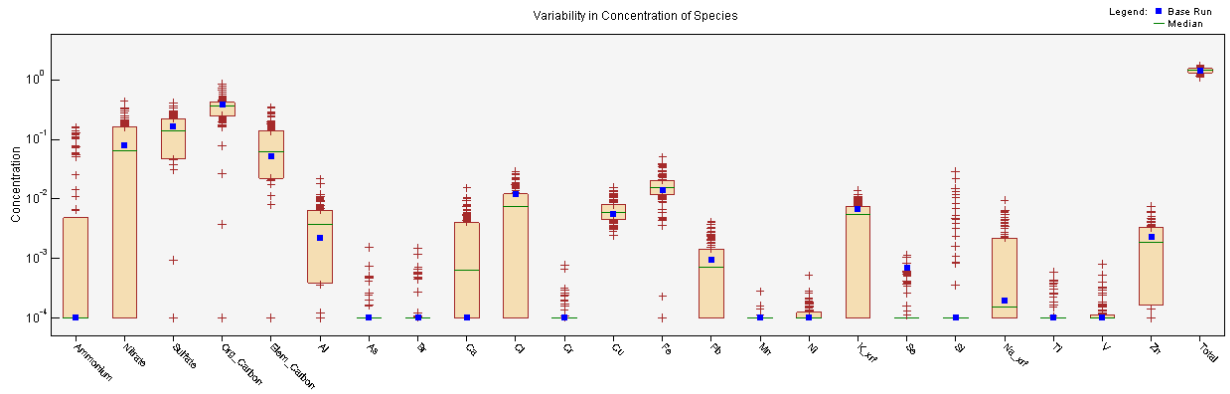


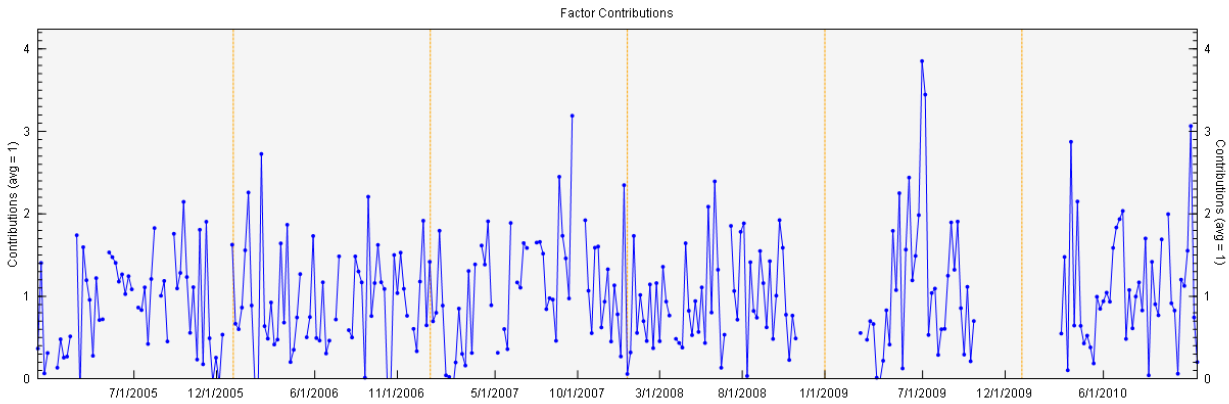
Liberty Source Factor 4: Gasoline Vehicles + Metals Processing

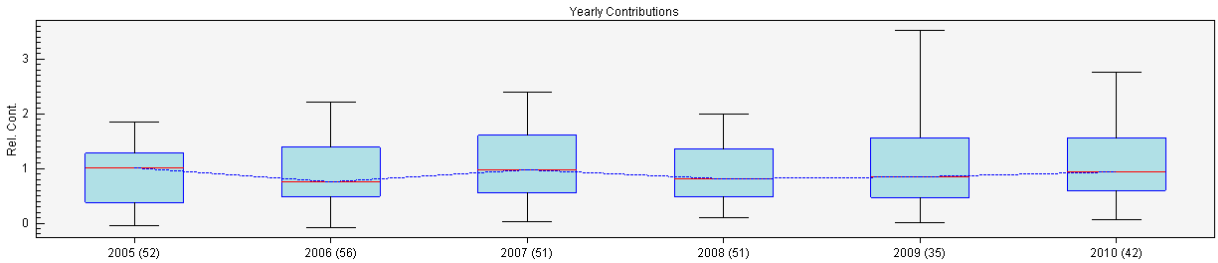
Factor 4 is high in weekday organic carbon, indicating light-duty gasoline vehicle emissions. Copper also shows a high percentage for this factor, possibly indicating metals processing near the Liberty site. Factor 4 represents about 5% of total $PM_{2.5}$.

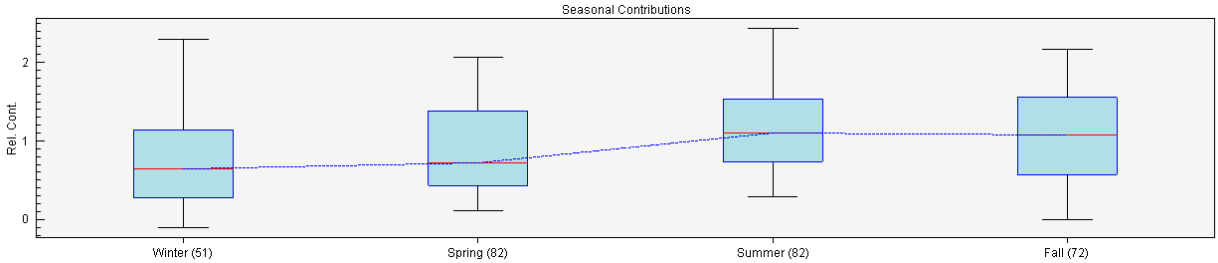


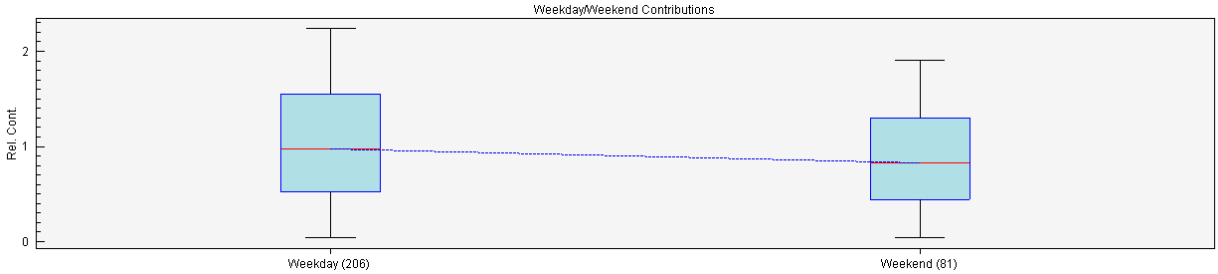




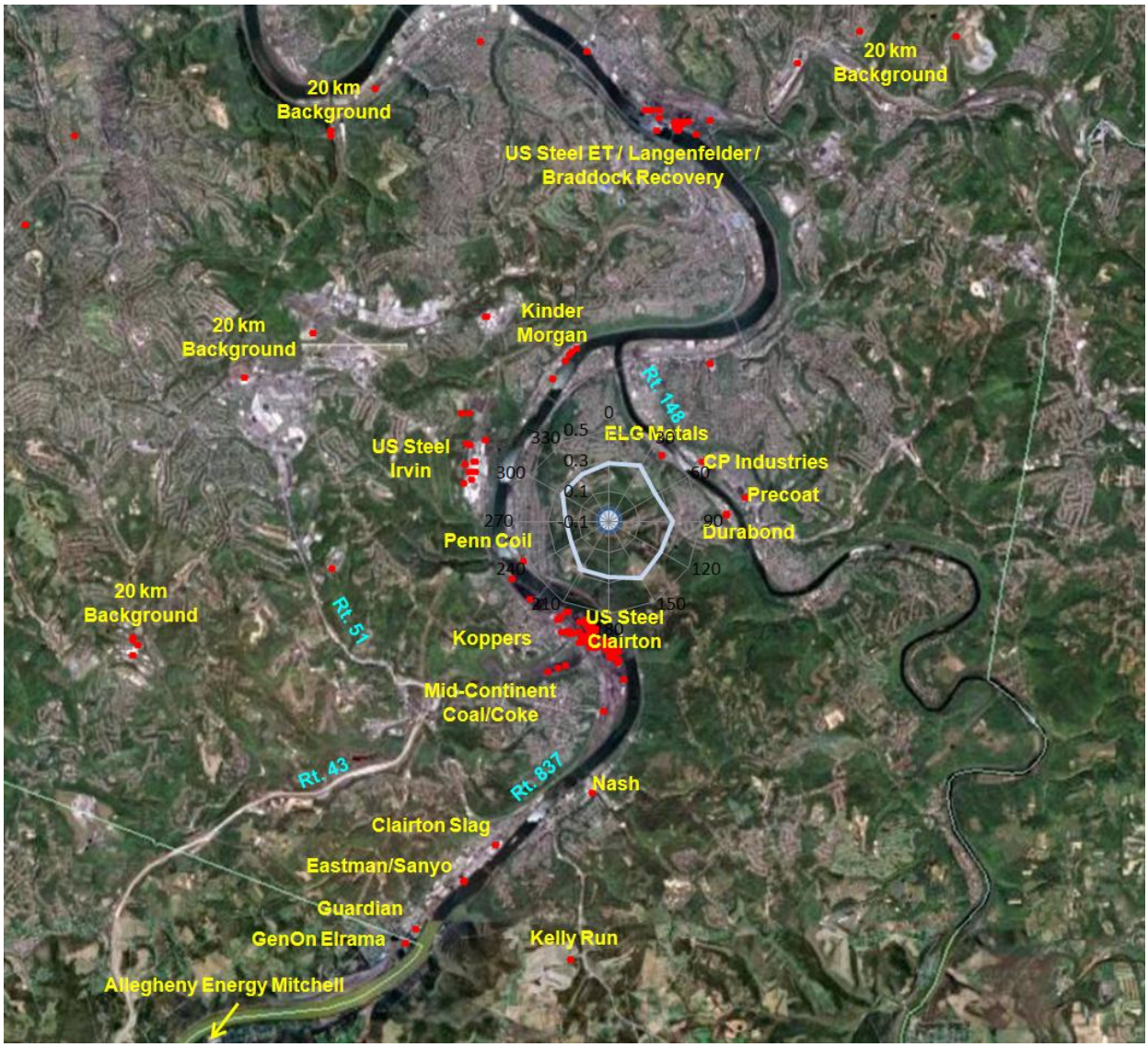

Factor Contributions
Contributions (avg = 1)
0
1
2
3
4
7/1/2005
12/1/2005
6/1/2006
11/1/2006
5/1/2007
10/1/2007
3/1/2008
8/1/2008
1/1/2009
7/1/2009
12/1/2009
6/1/2010


Yearly Contributions
Rel. Cont.
0
1
2
3
2005 (52)
2006 (56)
2007 (51)
2008 (51)
2009 (35)
2010 (42)


Seasonal Contributions
Rel. Cont.
0
1
2
Winter (51)
Spring (82)
Summer (82)
Fall (72)

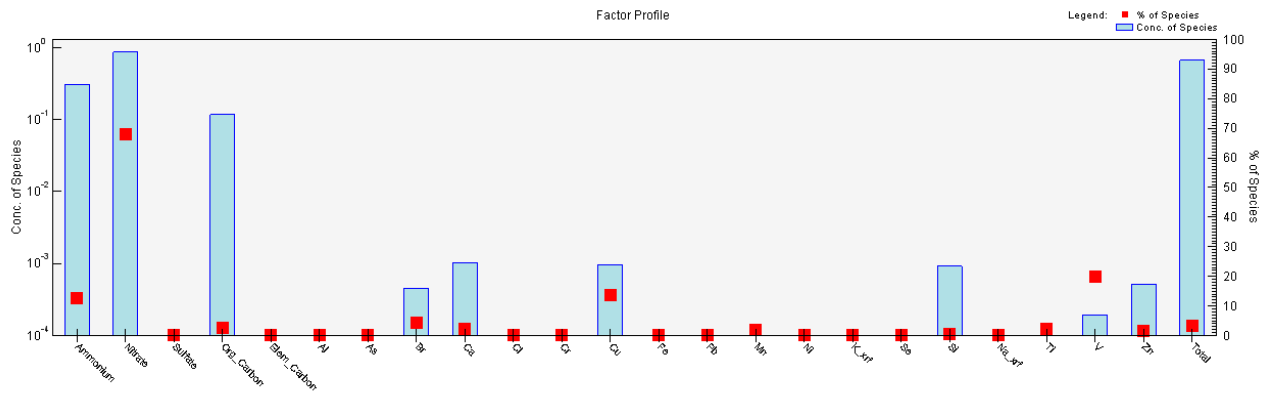

Weekday/Weekend Contributions
Rel. Cont.
0
1
2
Weekday (206)
Weekend (81)

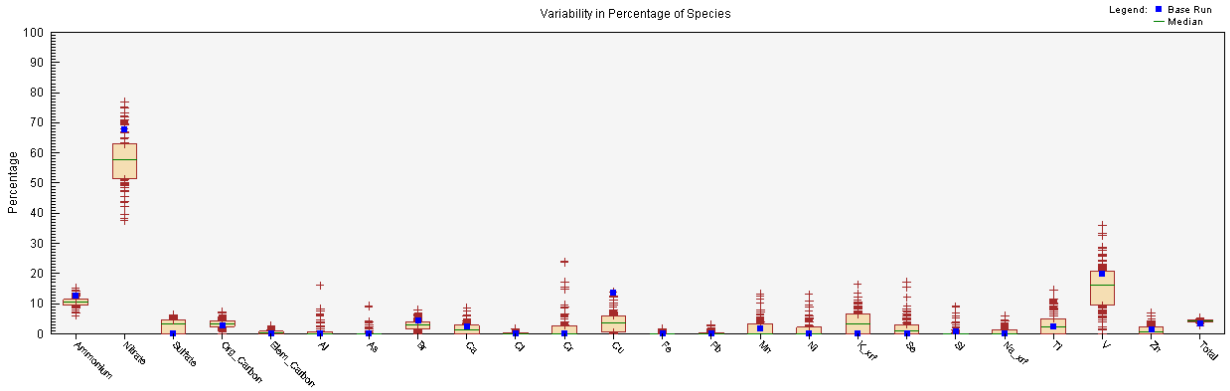
The CPF plot for Factor 4 is shown below. High days showed nearly identical frequencies from all sectors. This may be indicative of light-duty vehicle emissions from all directions around the Liberty site.

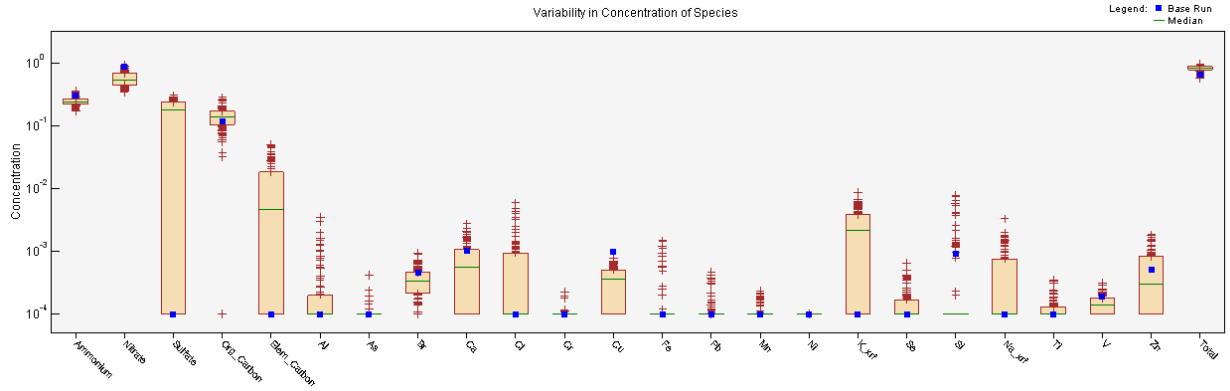


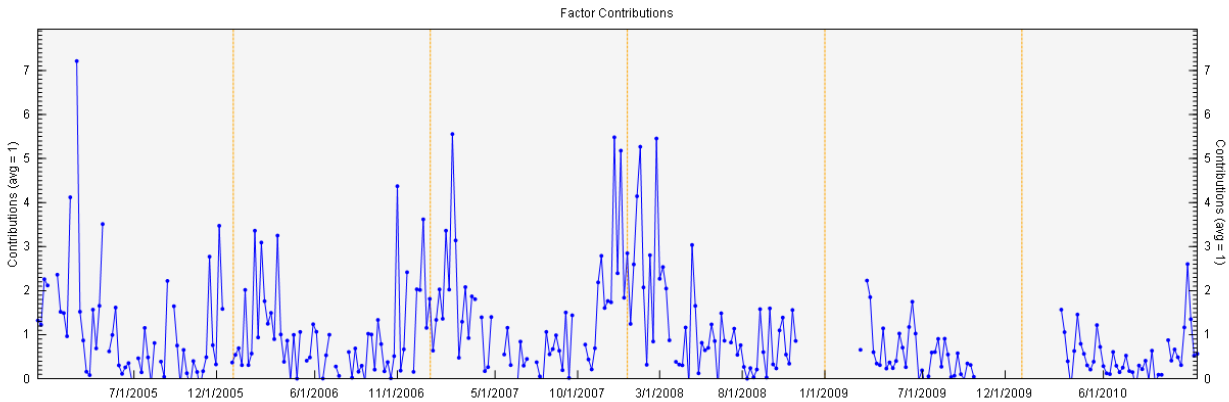
Liberty Source Factor 5: Secondary Ammonium Nitrate

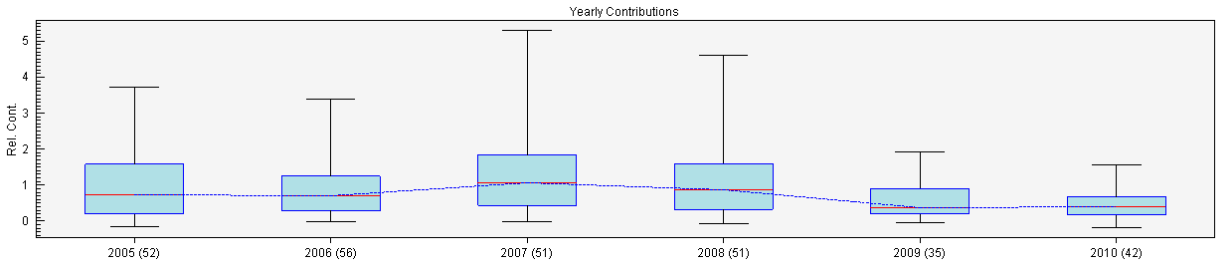
Factor 5 is the majority of secondary ammonium nitrate at Liberty, dominant in cold weather. Ammonium nitrate is a secondary species created by upwind NO_x sources such as fossil fuel-fired boilers and nearby vehicle emissions. Factor 5 represents 8% of the total $PM_{2.5}$.

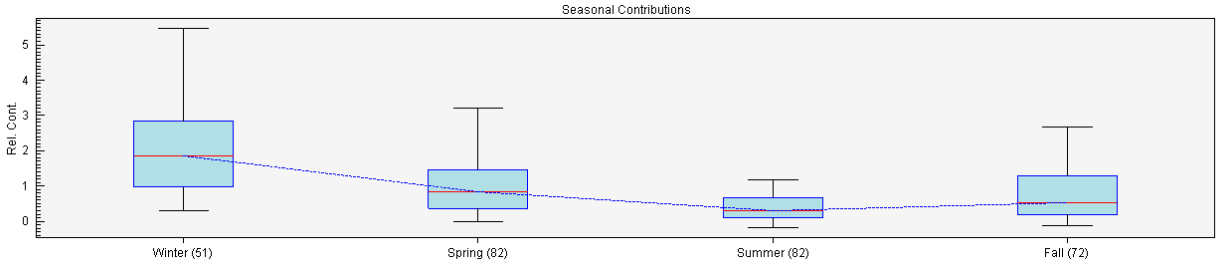


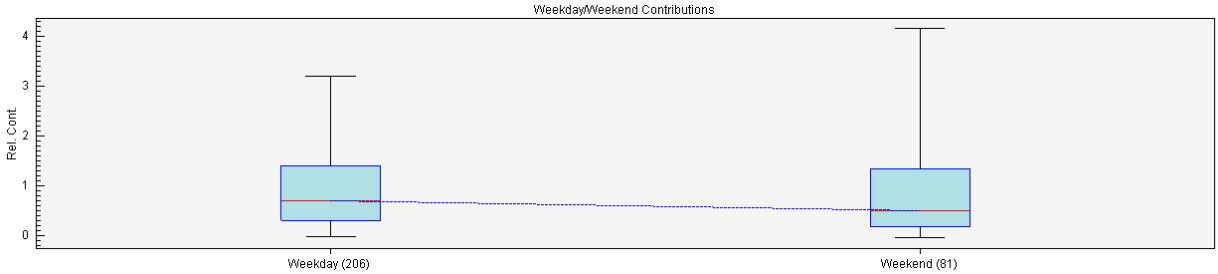




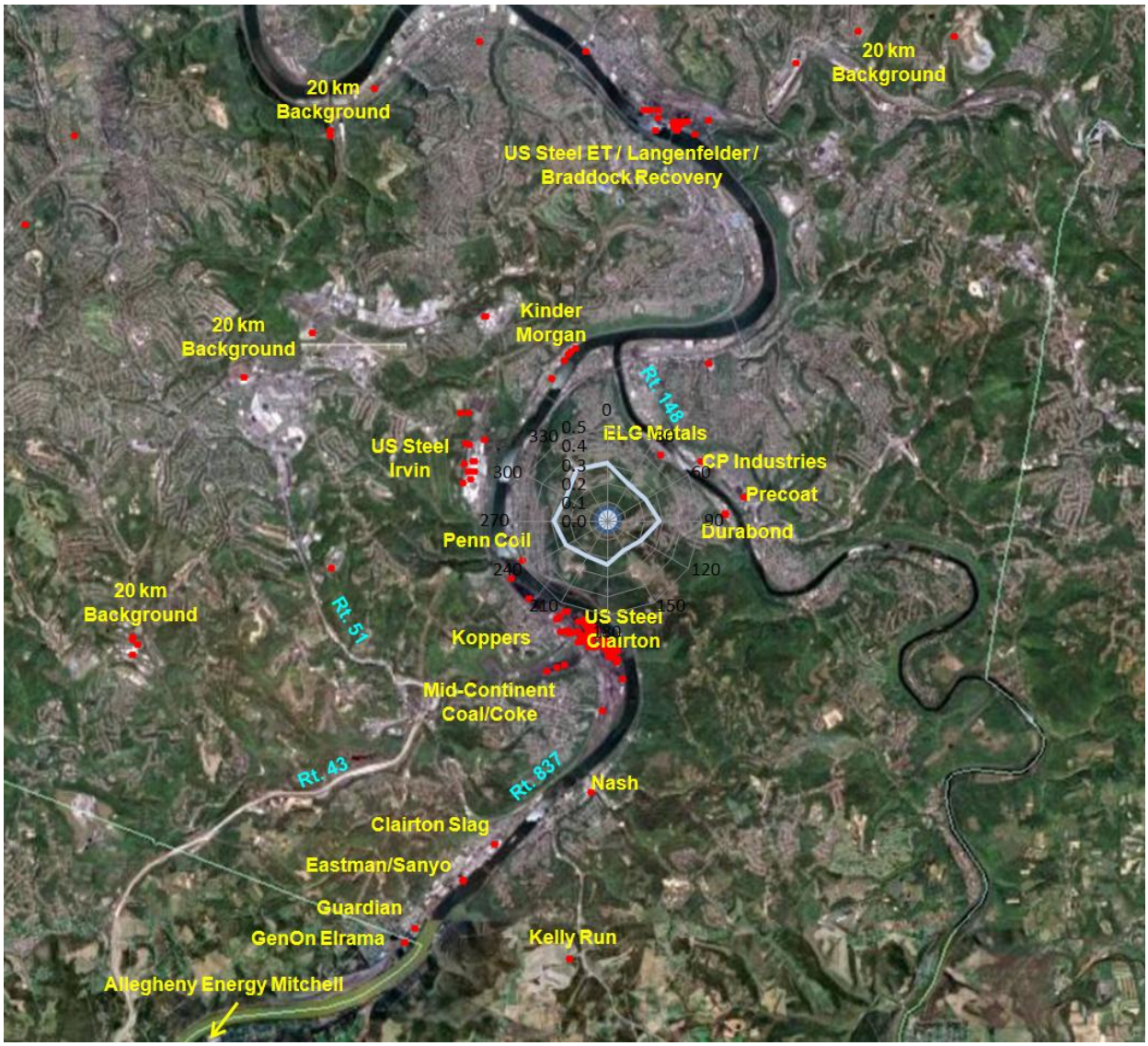

Factor Contributions
Contributions (avg = 1)
7/1/2005
12/1/2005
6/1/2006
11/1/2006
5/1/2007
10/1/2007
3/1/2008
8/1/2008
1/1/2009
7/1/2009
12/1/2009
6/1/2010


Yearly Contributions
Rel. Cont.
2005 (52)
2006 (56)
2007 (51)
2008 (51)
2009 (35)
2010 (42)


Seasonal Contributions
Rel. Cont.
Winter (51)
Spring (82)
Summer (82)
Fall (72)

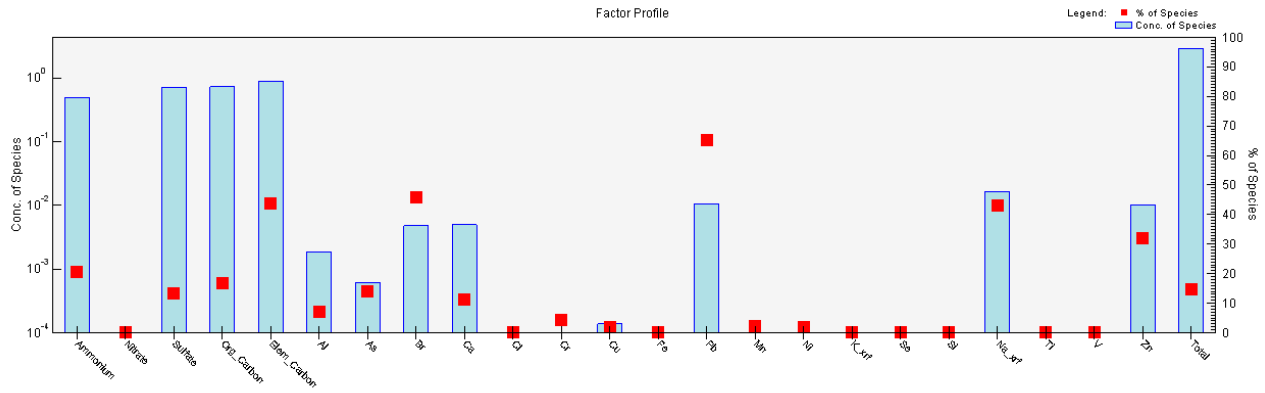

Weekday/Weekend Contributions
Rel. Cont.
Weekday (206)
Weekend (81)

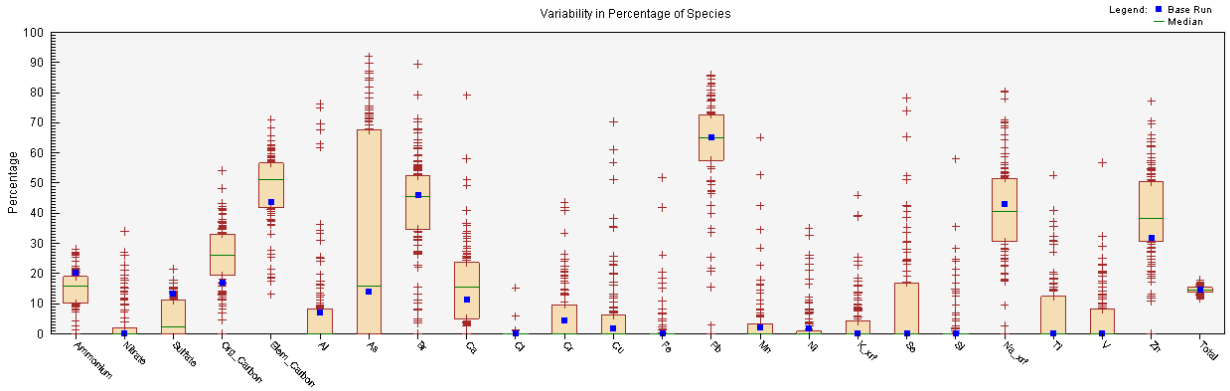
The CPF plot for Factor 5 is shown below. High day frequencies are distributed throughout all sectors, indicating contributions from distant and nearby NO_x sources in all directions.

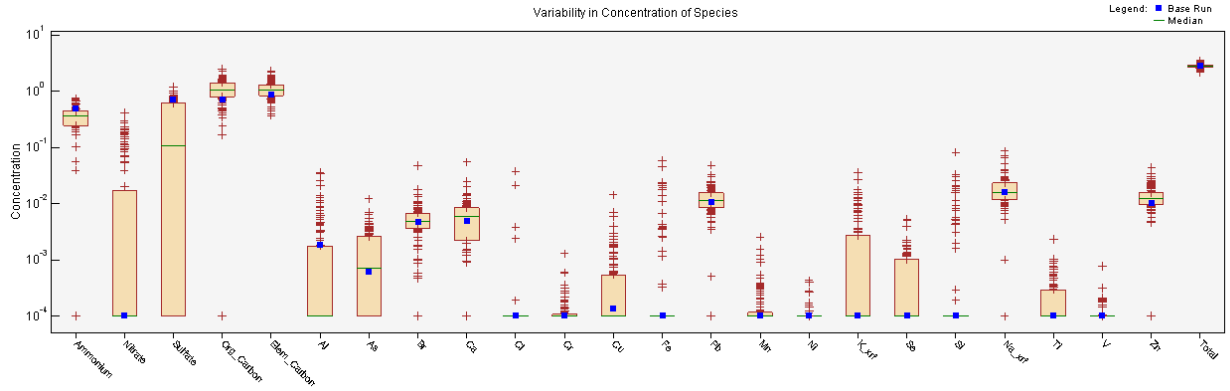


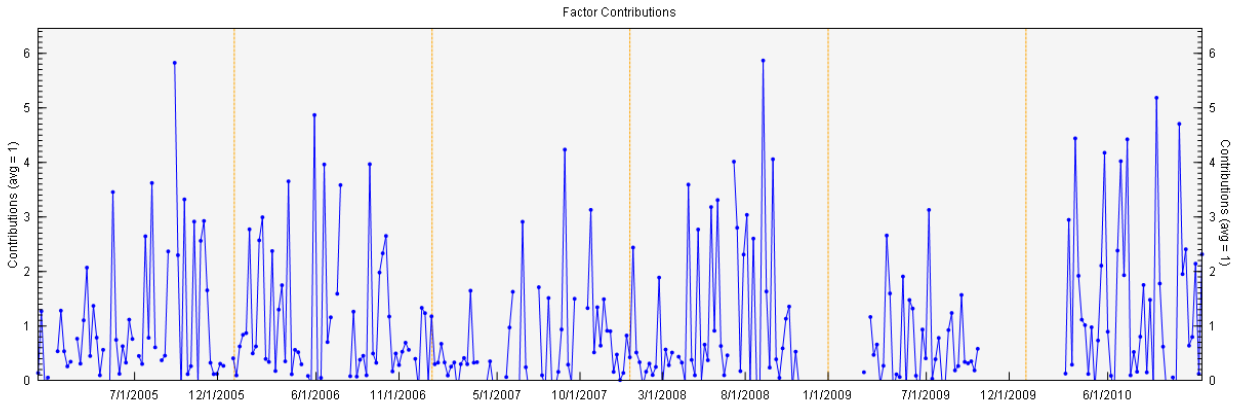
Liberty Source Factor 6: Elemental Industrial Carbons + Localized Sulfates

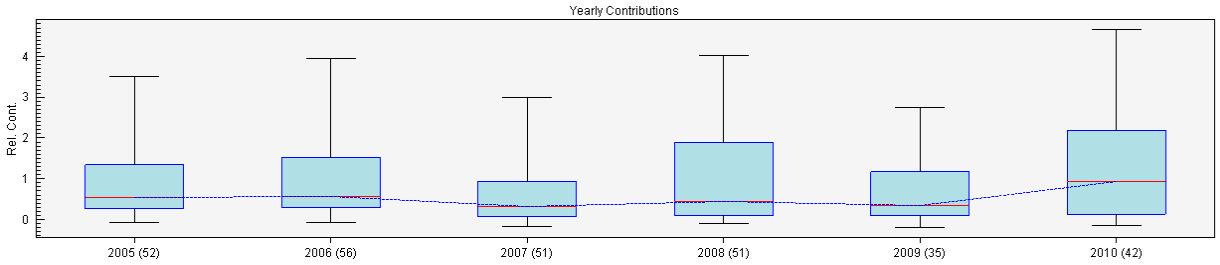
Factor 6 shows high amounts of elemental carbon, organic carbon, and ammonium sulfates (primary or secondary), along with several trace elements. The factor is continuous with little day of the week differences and is best attributed to a "mix" of continuous industrial activity in the Monongahela River valley. This may include coke production, mobile diesel use (trucks, railroads, tug boats), and/or electric power generation. This factor makes up 18% of the total $PM_{2.5}$ and, along with Factor 2, represents the majority of the excess $PM_{2.5}$ at Liberty in comparison to other SW PA sites. Factor 6 shows the highest levels during inversions, although at lesser extremes in contributions than other factors. High percentages of lead and zinc are also present, which can be due to tire wear or incinerators.

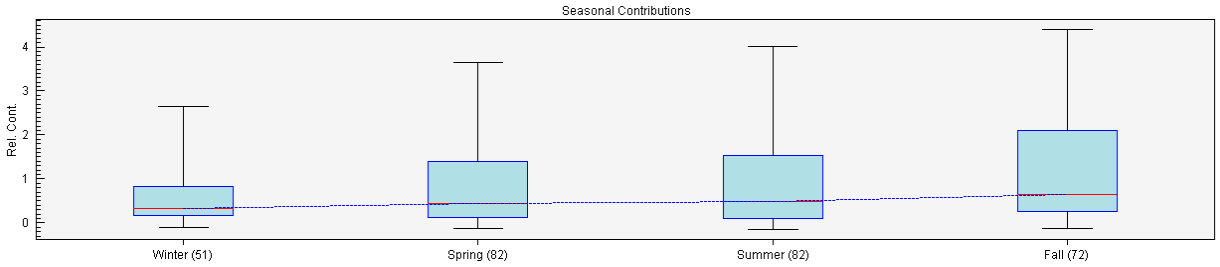


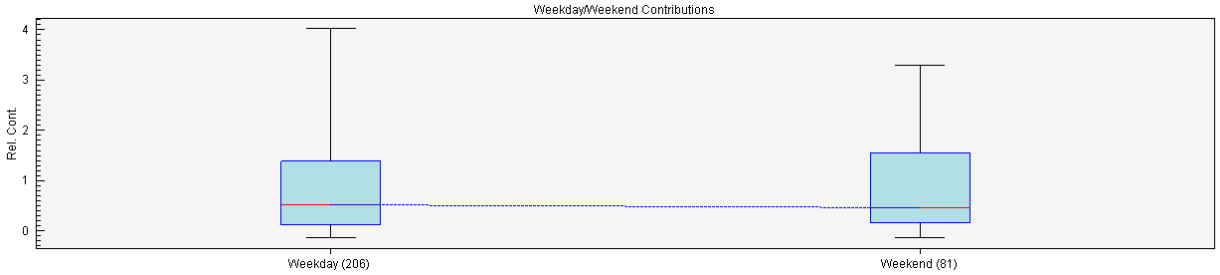





Factor Contributions
Contributions (avg = 1)
0
1
2
3
4
5
6
7/1/2005
12/1/2005
6/1/2006
11/1/2006
5/1/2007
10/1/2007
3/1/2008
8/1/2008
1/1/2009
7/1/2009
12/1/2009
6/1/2010

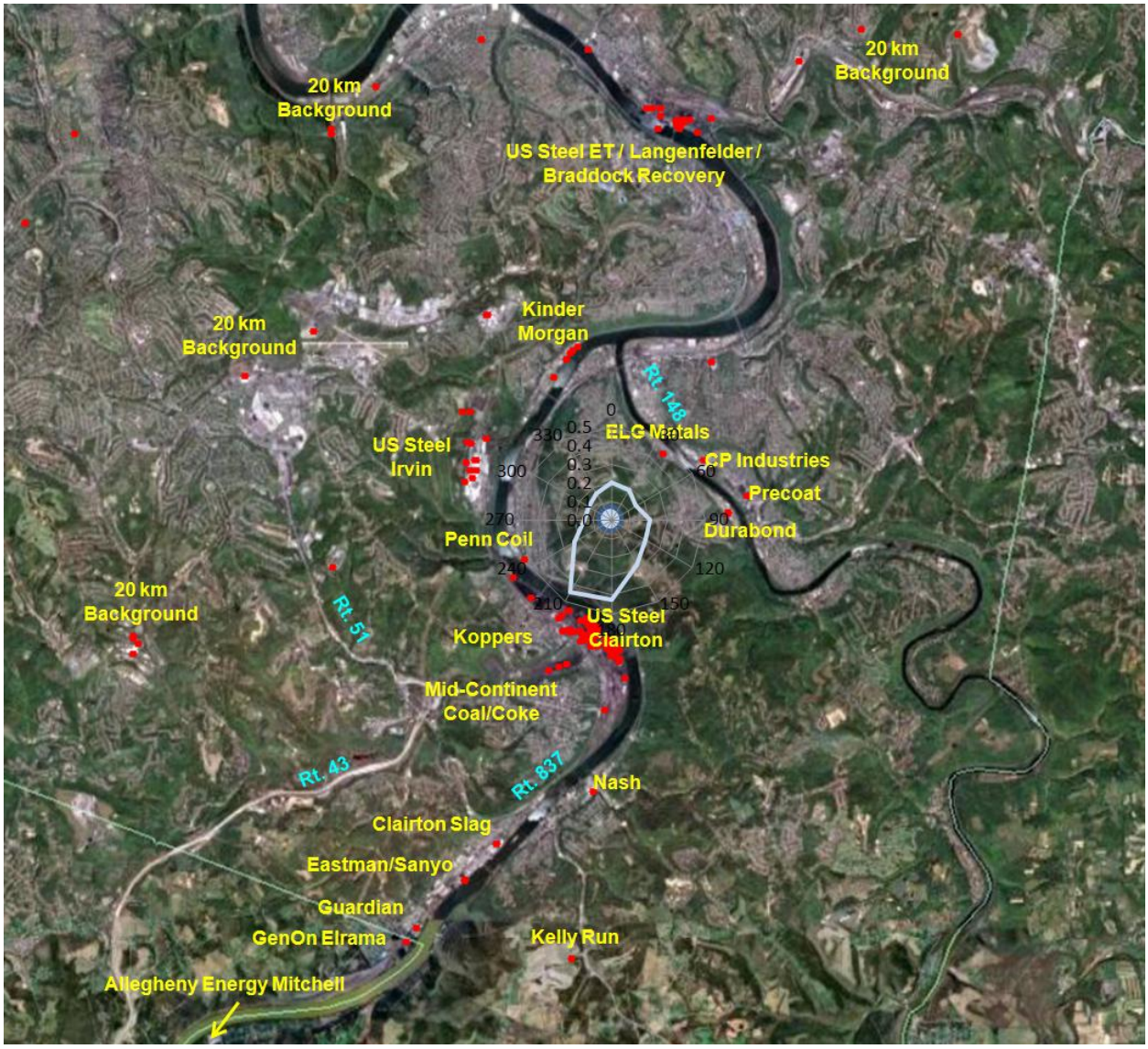

Yearly Contributions
Rel. Cont.
0
1
2
3
4
2005 (52)
2006 (56)
2007 (51)
2008 (51)
2009 (35)
2010 (42)


Seasonal Contributions
Rel. Cont.
0
1
2
3
4
Winter (51)
Spring (82)
Summer (82)
Fall (72)


Weekday/Weekend Contributions
Rel. Cont.
0
1
2
3
4
Weekday (206)
Weekend (81)

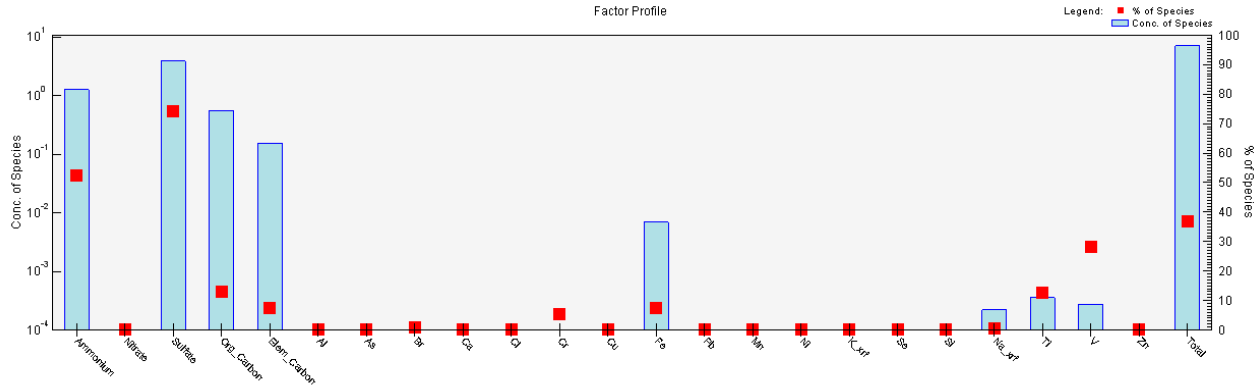
.

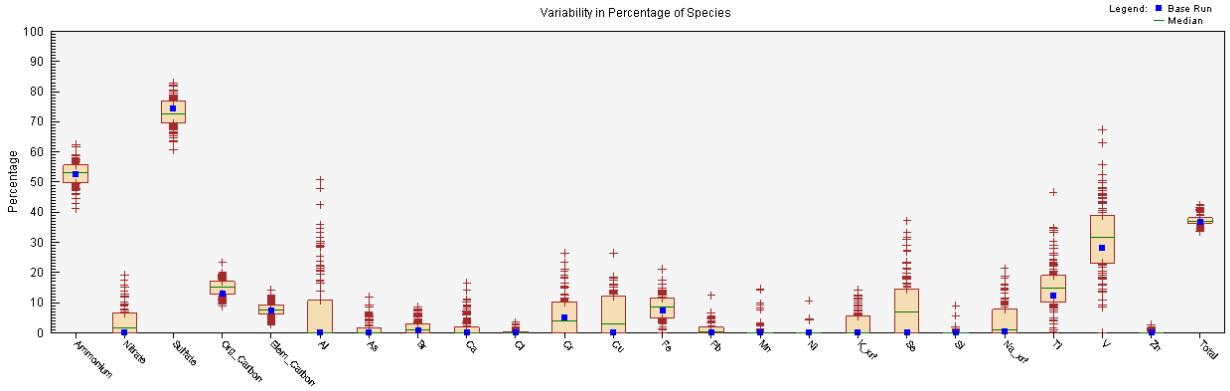
The CPF plot for Factor 6 is shown below. High days showed the highest frequencies from the south and southwest. Diesel emissions from school buses may contribute a small portion of elemental carbon at Liberty, but only for a few minutes during school days.

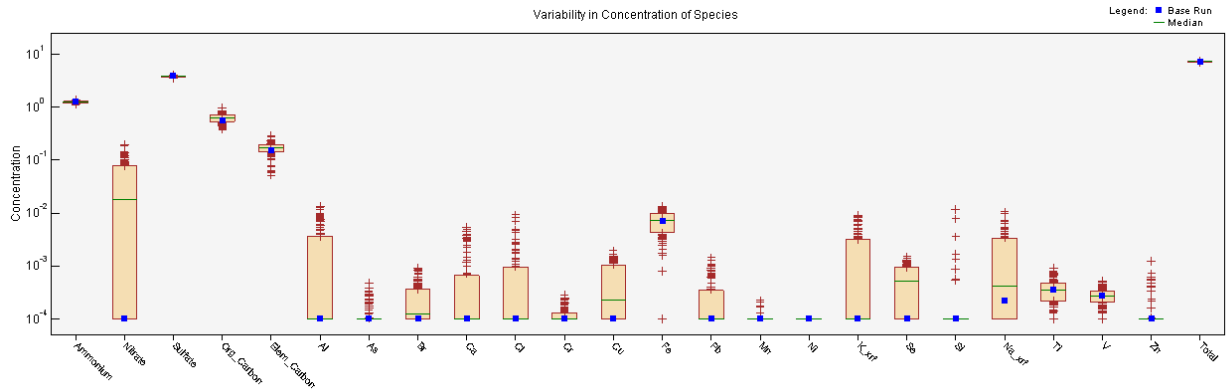


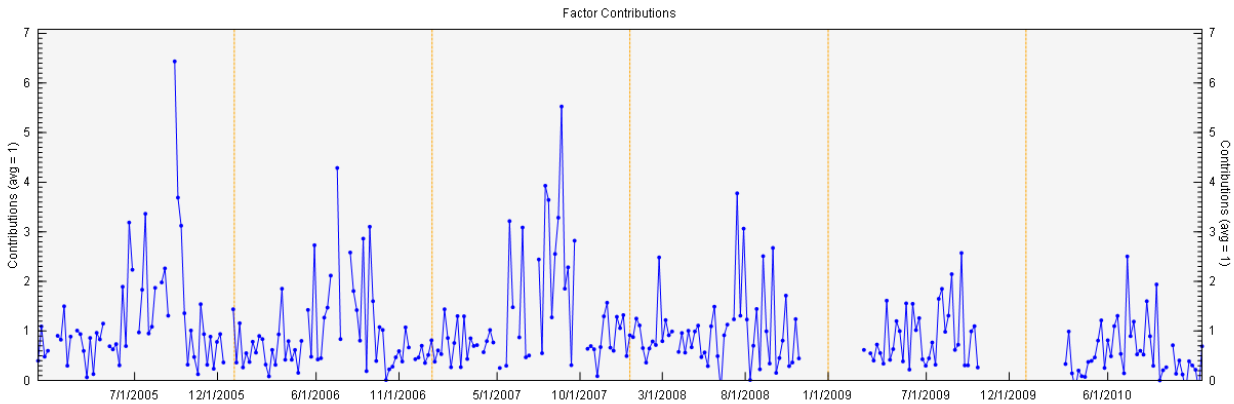
Liberty Source Factor 7: Secondary Ammonium Sulfates + Gasoline Vehicles

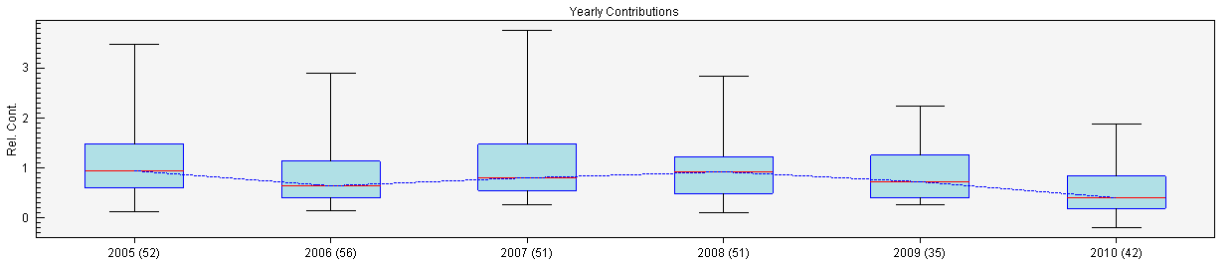
Factor 7 comprises the majority of secondary ammonium sulfates at Liberty. Contributions are highest in summer, when sulfates are most prevalent. Sulfates exist as secondary $PM_{2.5}$ throughout SW PA, formed by upwind SO_2 from sources such as coal-fired power plants. This factor also contains carbons that are peaking concurrently with sulfate, possibly from light-duty vehicle exhaust. Factor 7 is the largest factor by percentage of total (37%).

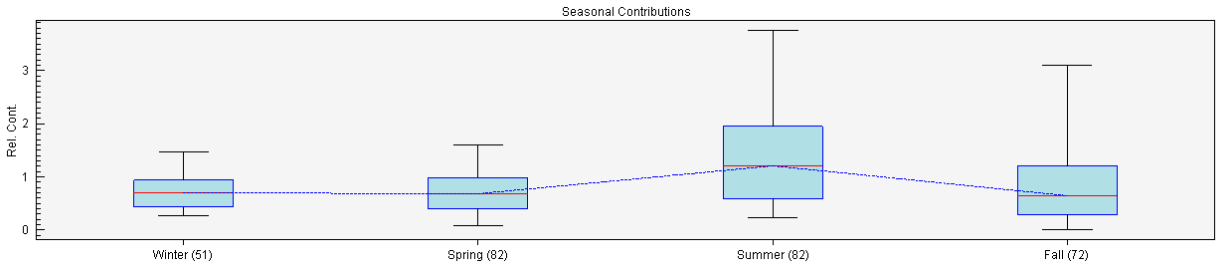


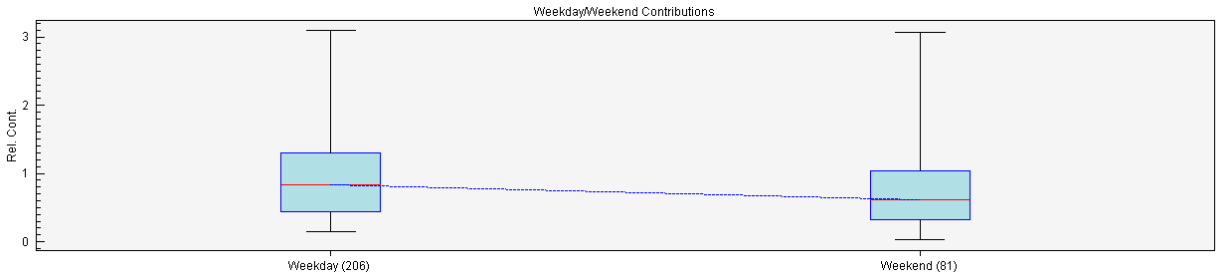




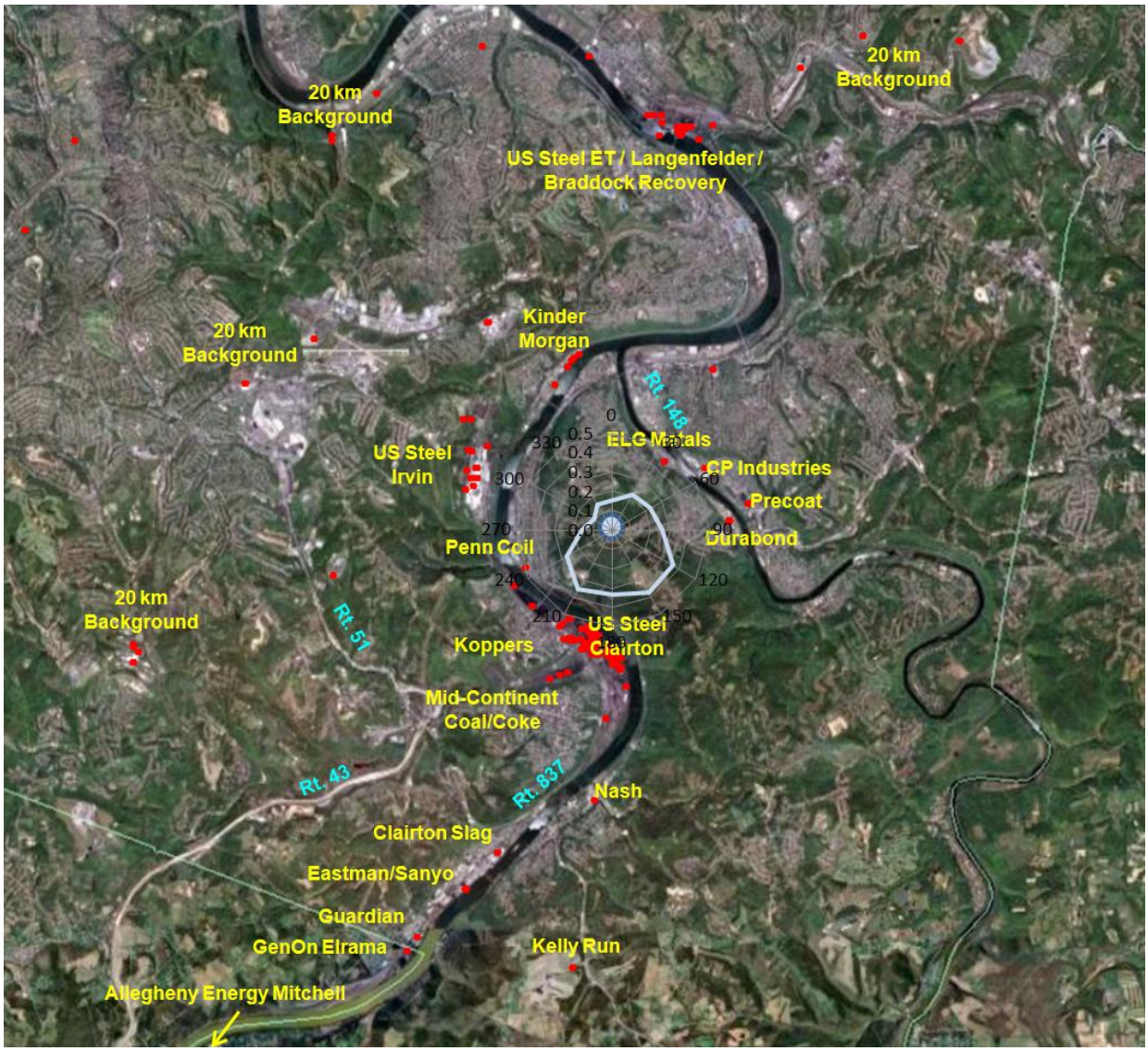

Factor Contributions
Contributions (avg = 1)
7/1/2005
12/1/2005
6/1/2006
11/1/2006
5/1/2007
10/1/2007
3/1/2008
8/1/2008
1/1/2009
7/1/2009
12/1/2009
6/1/2010


Yearly Contributions
Rel. Cont.
2005 (52)
2006 (56)
2007 (51)
2008 (51)
2009 (35)
2010 (42)


Seasonal Contributions
Rel. Cont.
Winter (51)
Spring (82)
Summer (82)
Fall (72)

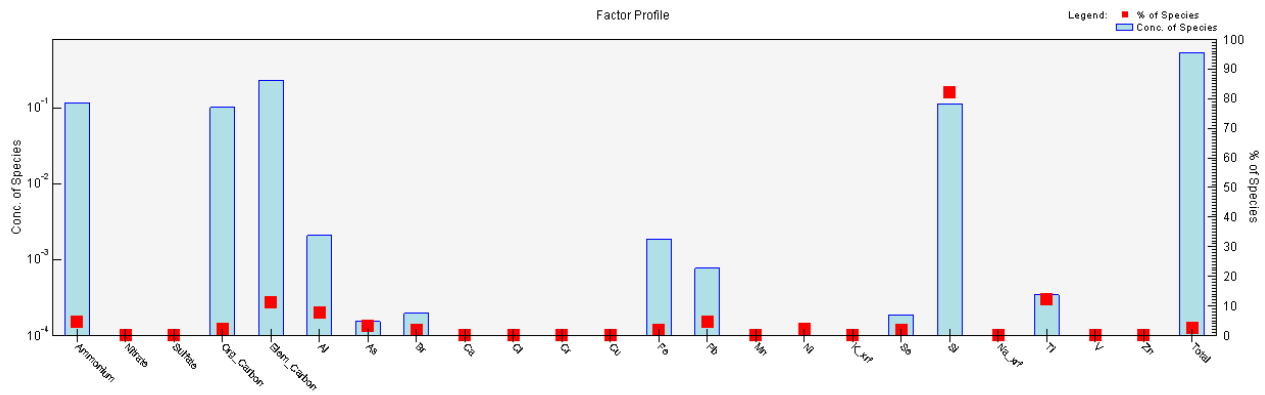

Weekday/Weekend Contributions
Rel. Cont.
Weekday (206)
Weekend (81)

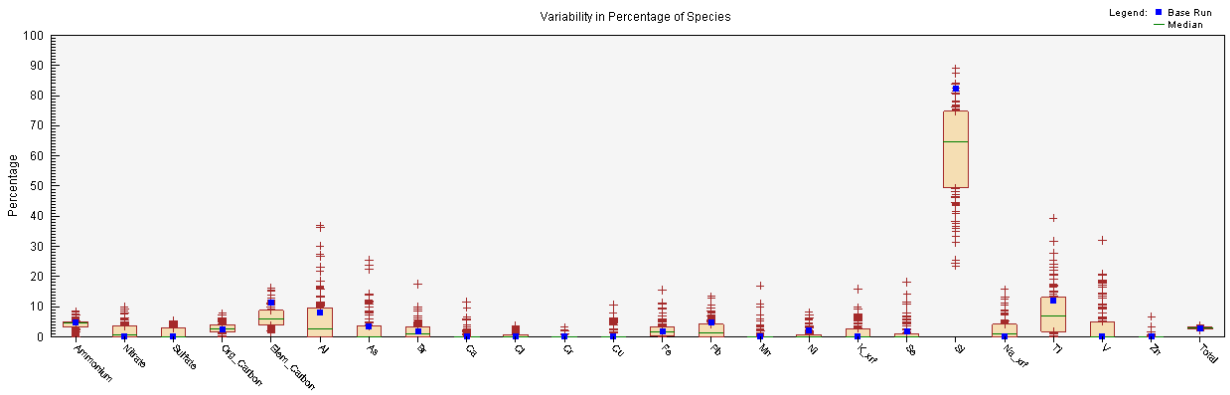
The CPF plot for Factor 7 is shown below. High days showed the highest frequencies from the southwest, south, and southeast.

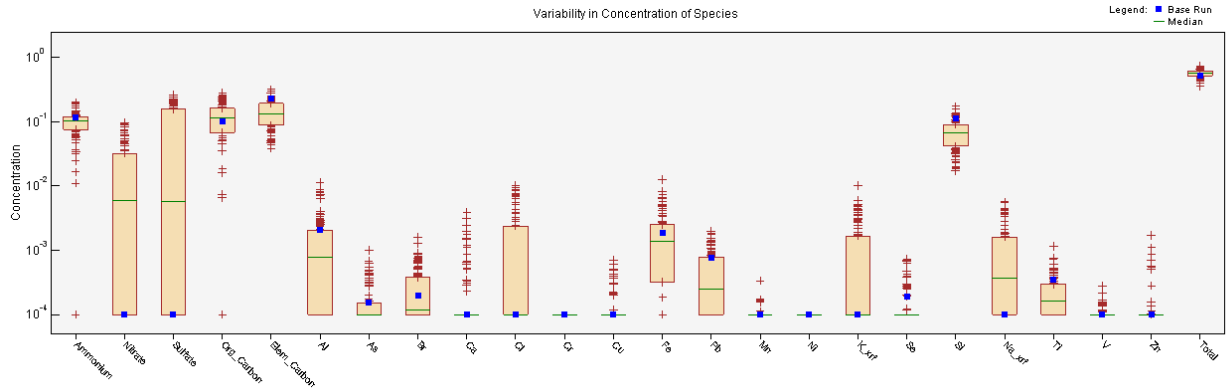


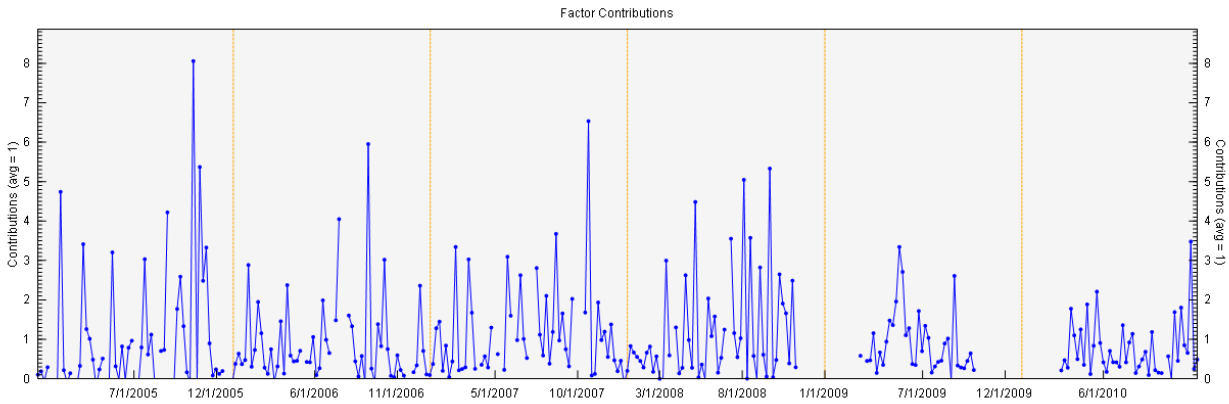
Liberty Source Factor 8: Coal/Coke Dust

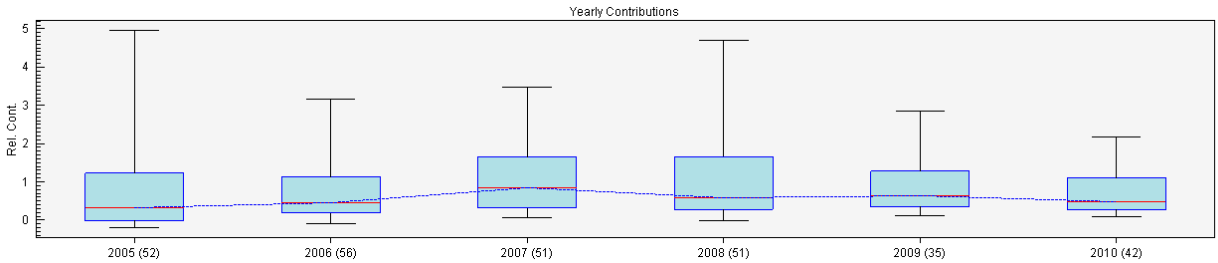
Factor 8 shows a high amount of silicon and elemental carbon, which can be associated with coal and coke dust. It is a small factor overall (4% of total) and shows the highest contributions during inversions.

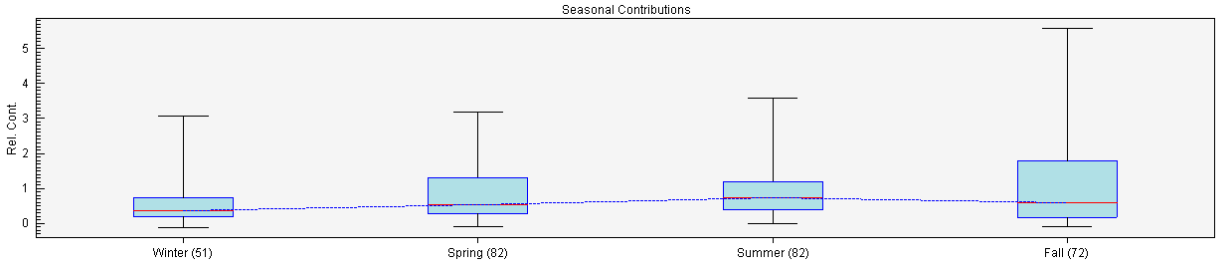


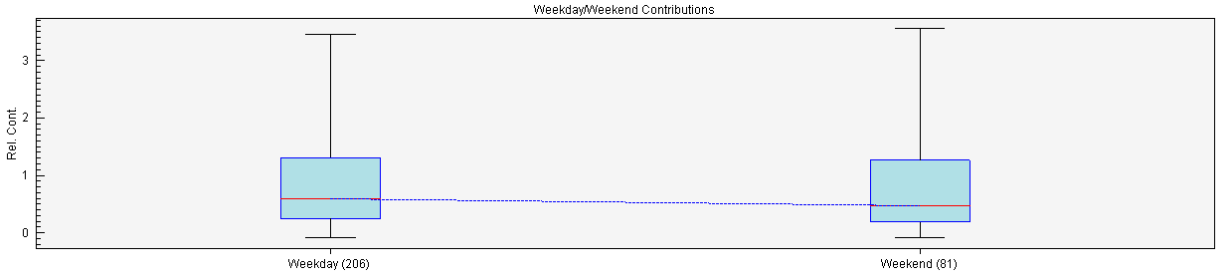




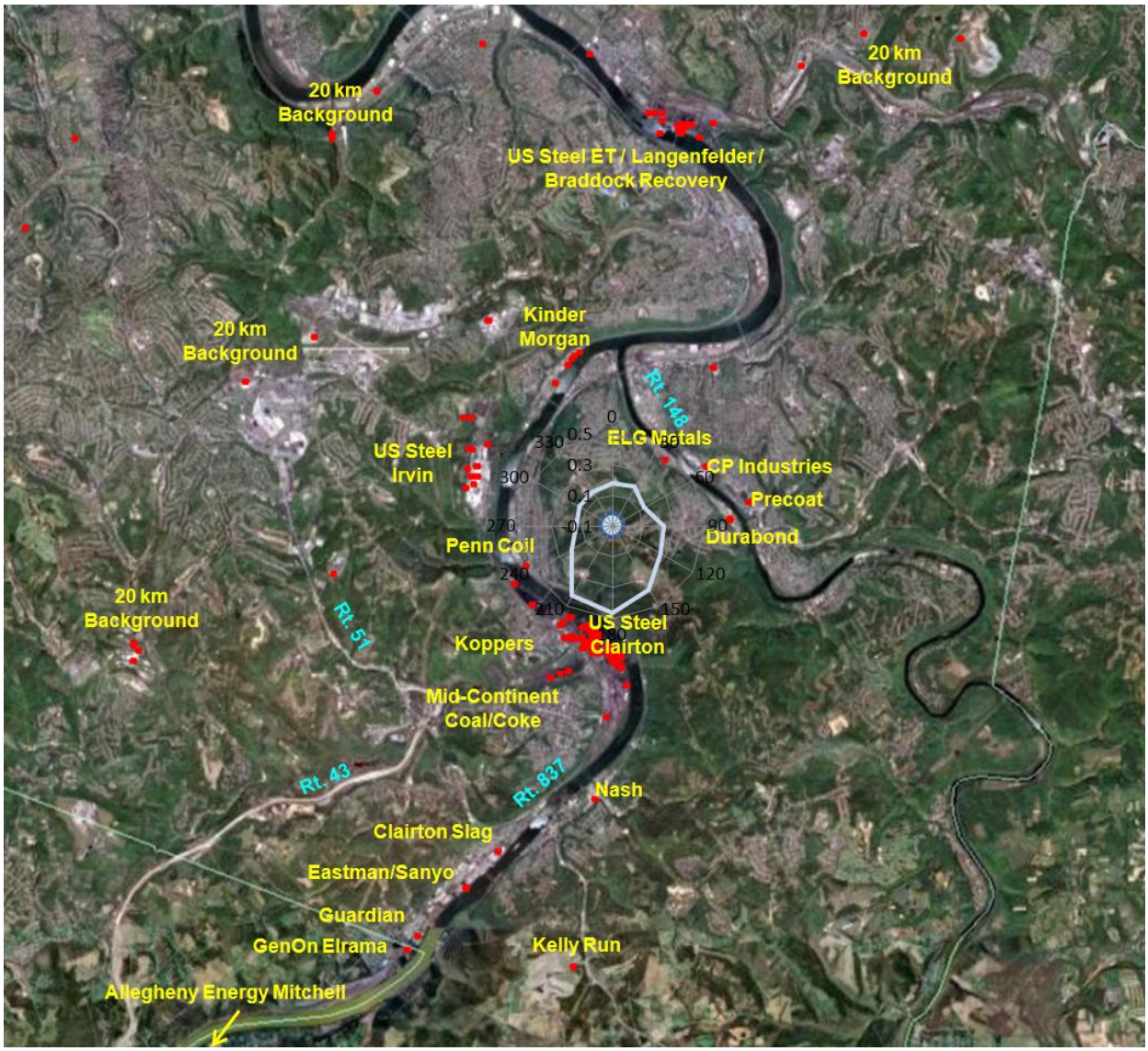

Factor Contributions
Contributions (avg = 1)
7/1/2005
12/1/2005
6/1/2006
11/1/2006
5/1/2007
10/1/2007
3/1/2008
8/1/2008
1/1/2009
7/1/2009
12/1/2009
6/1/2010


Yearly Contributions
Rel. Cont.
2005 (52)
2006 (56)
2007 (51)
2008 (51)
2009 (35)
2010 (42)


Seasonal Contributions
Rel. Cont.
Winter (51)
Spring (82)
Summer (82)
Fall (72)

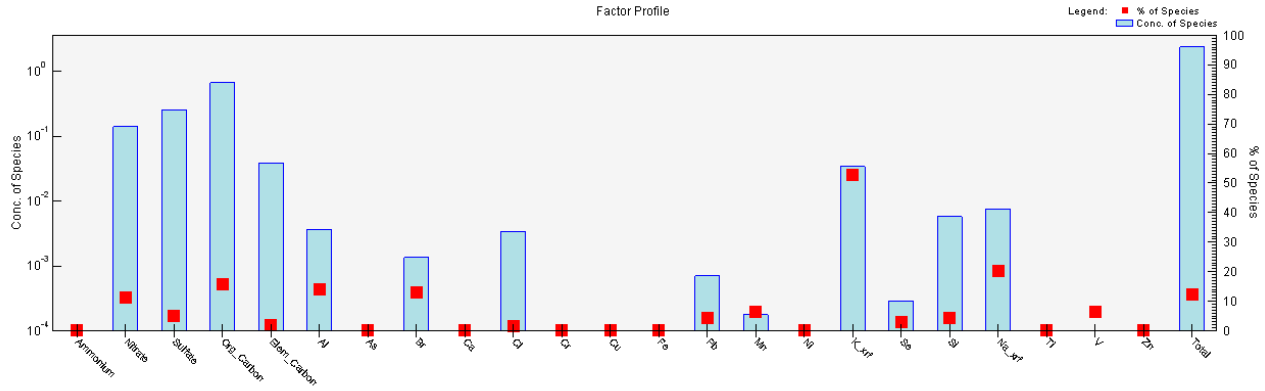

Weekday/Weekend Contributions
Rel. Cont.
Weekday (206)
Weekend (81)

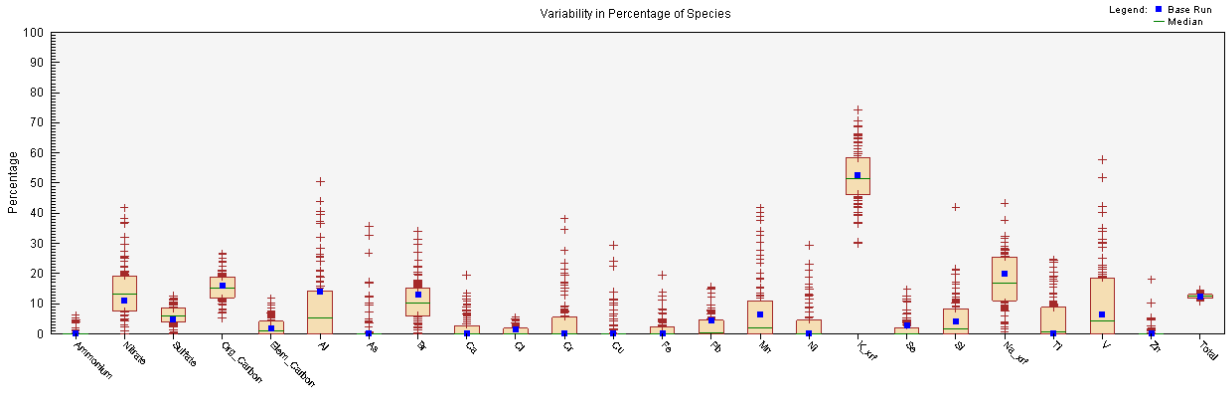
The CPF plot for Factor 8 is shown below. High days showed the highest frequencies from the south and southwest.

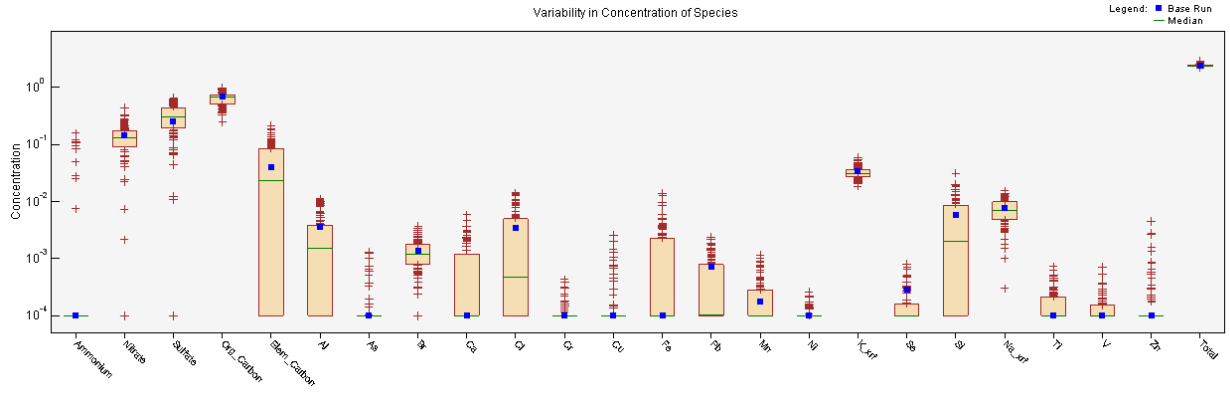


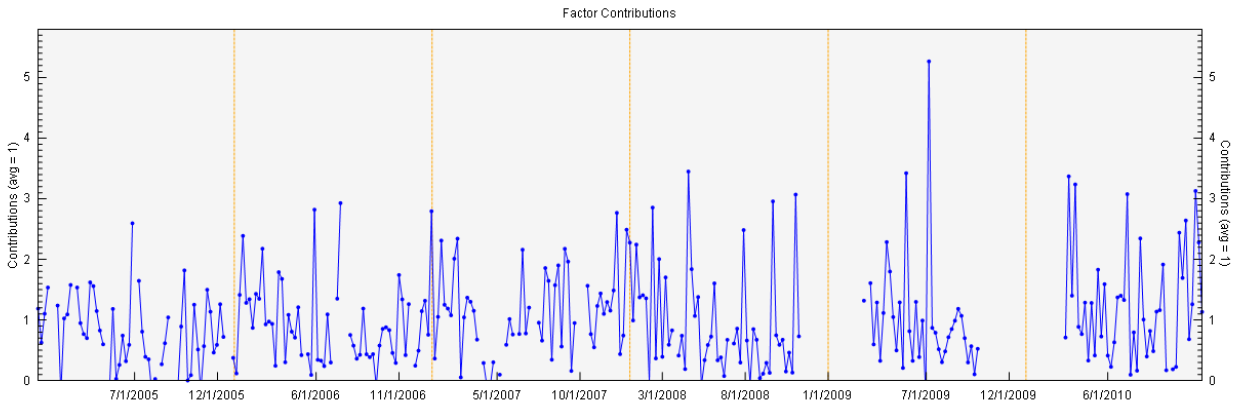
Liberty Source Factor 9: Burning/Cooking

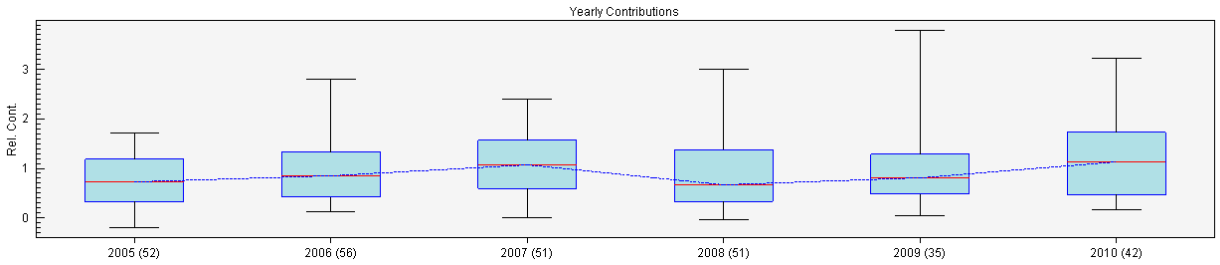
Factor 9 contains high percentages of organic carbon and potassium and is highest in winter and on weekends. This is indicative of vegetative burning and cooking, most likely for winter heating and for summer recreational burning/cooking in the Liberty area. Cooking at the school cafeteria at the Liberty site may also be contributing a small portion to this factor. Factor 9 represents 7% of the total $PM_{2.5}$ and shows the highest contributions during inversions.

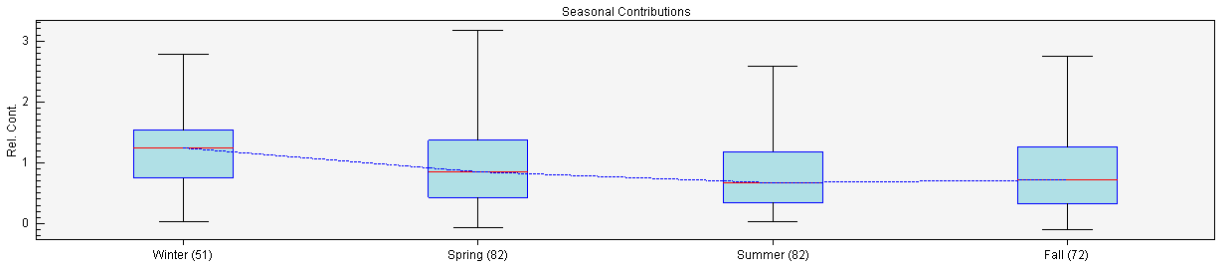


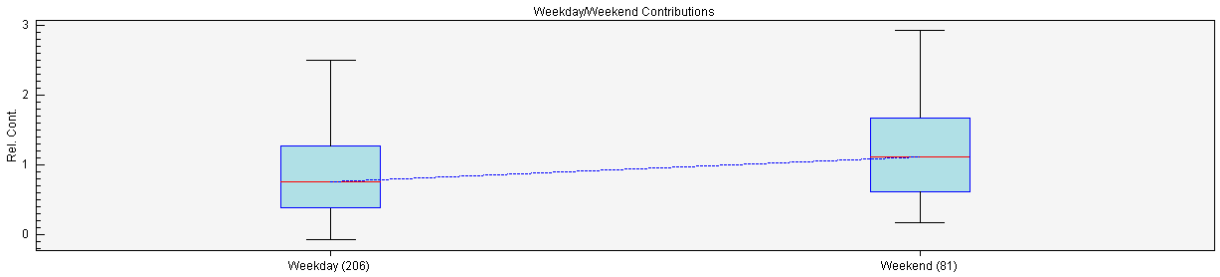




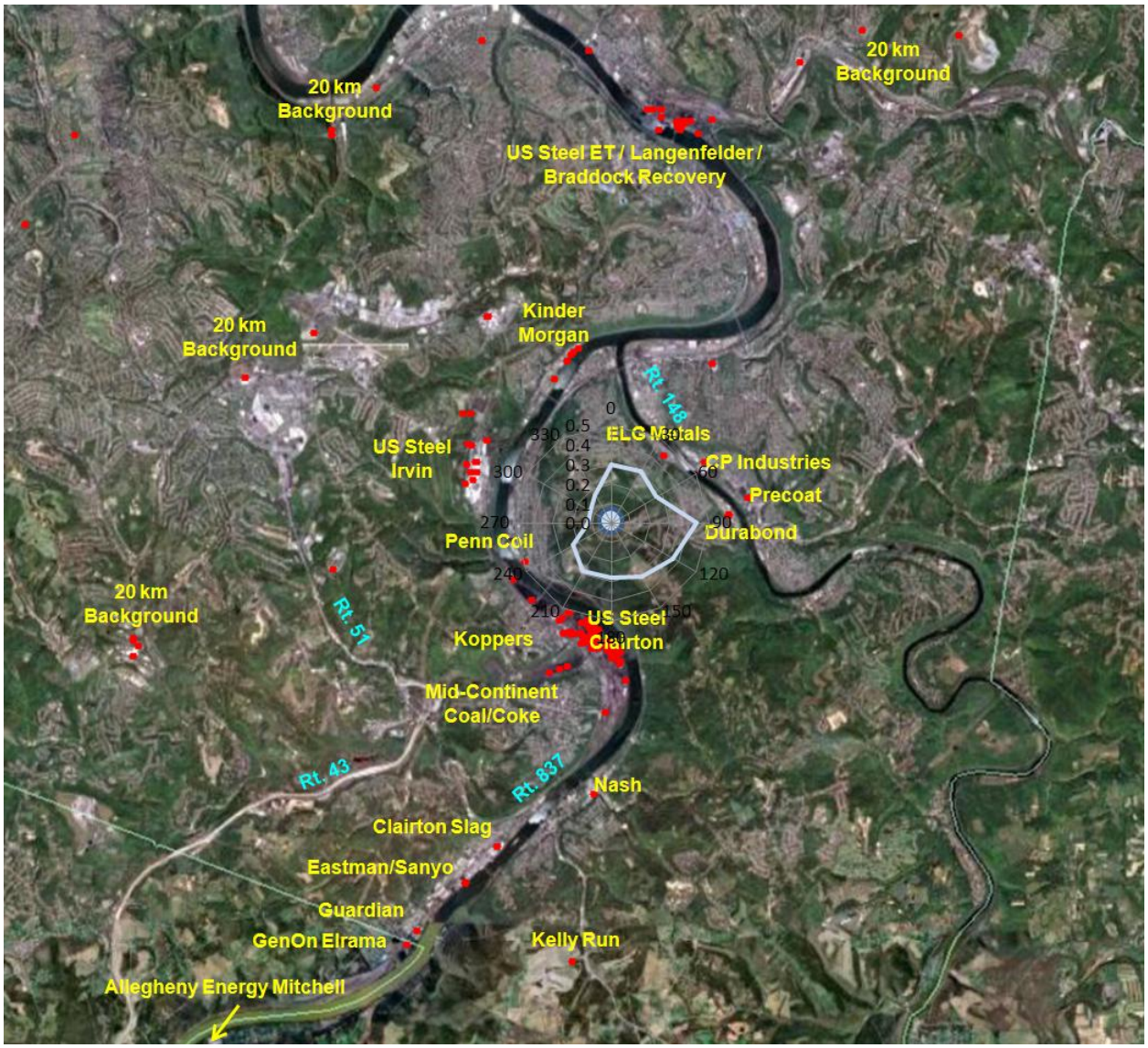

Factor Contributions
Contributions (avg = 1)
0
1
2
3
4
5
7/1/2005
12/1/2005
6/1/2006
11/1/2006
5/1/2007
10/1/2007
3/1/2008
8/1/2008
1/1/2009
7/1/2009
12/1/2009
6/1/2010


Yearly Contributions
Rel. Cont.
0
1
2
3
2005 (52)
2006 (56)
2007 (51)
2008 (51)
2009 (35)
2010 (42)


Seasonal Contributions
Rel. Cont.
0
1
2
3
Winter (51)
Spring (82)
Summer (82)
Fall (72)

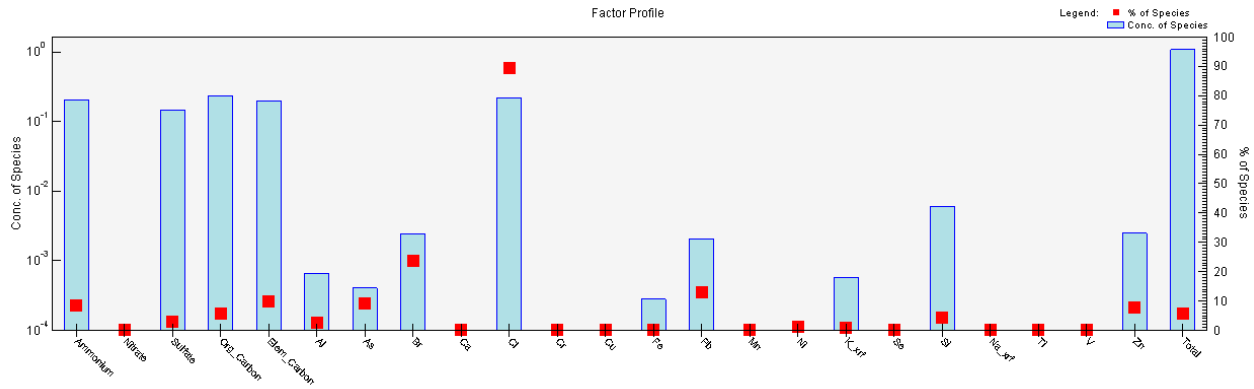

Weekday/Weekend Contributions
Rel. Cont.
0
1
2
3
Weekday (206)
Weekend (81)

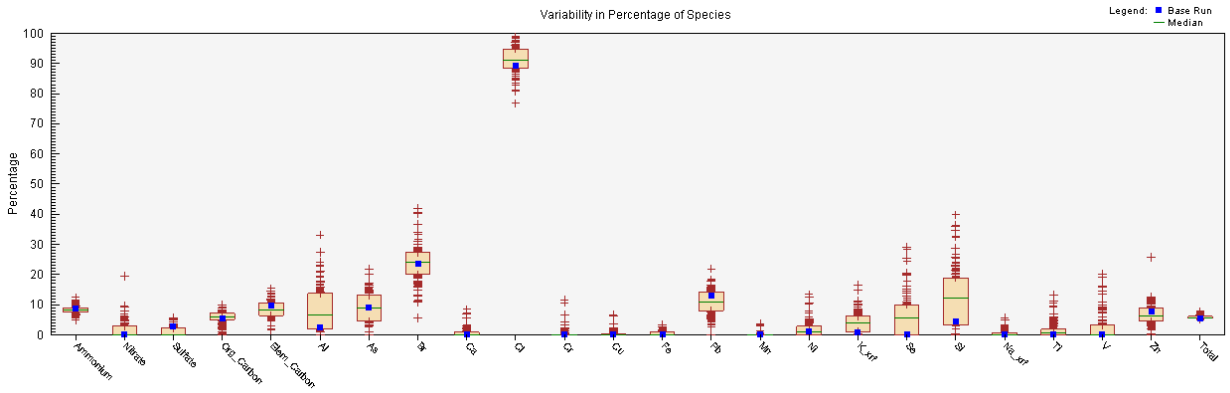
The CPF plot for Factor 9 is shown below. High days showed the highest frequencies from the east, likely due to residential burning and cooking in the Liberty area.

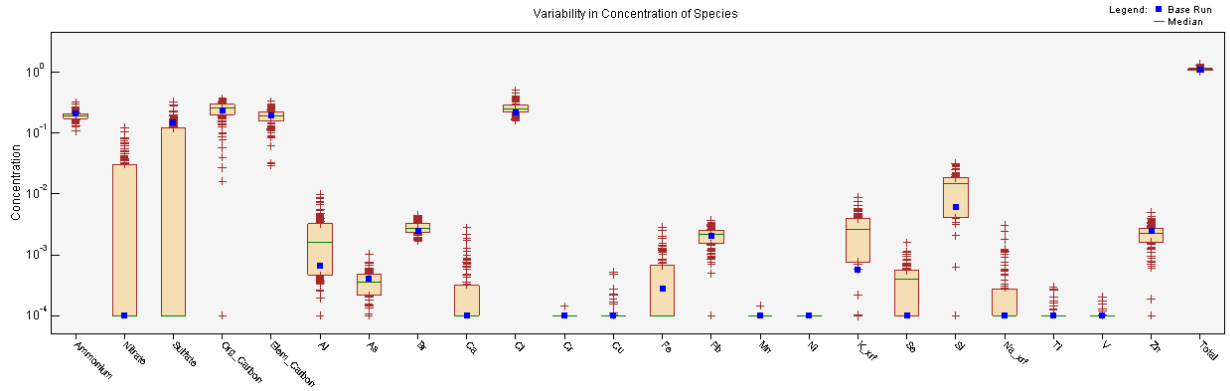


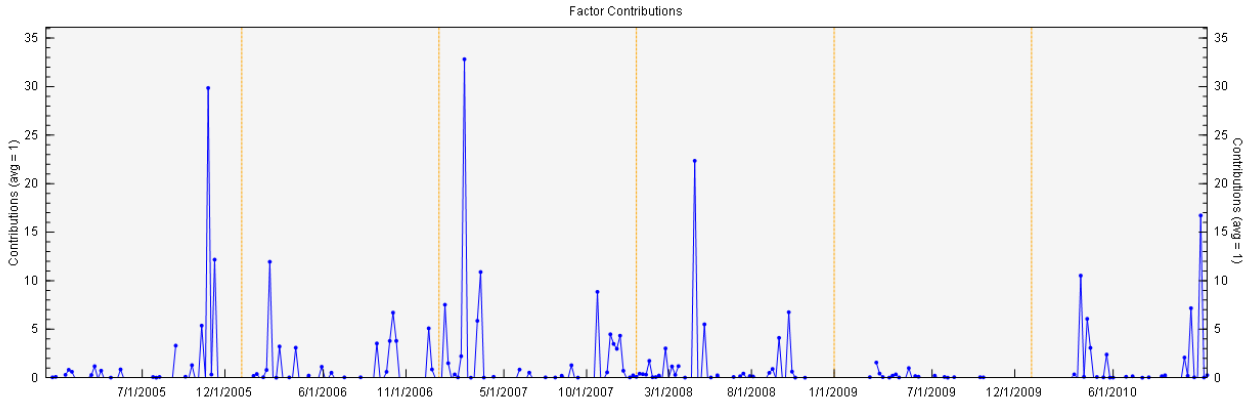
Liberty Source Factor 10: Chlorine

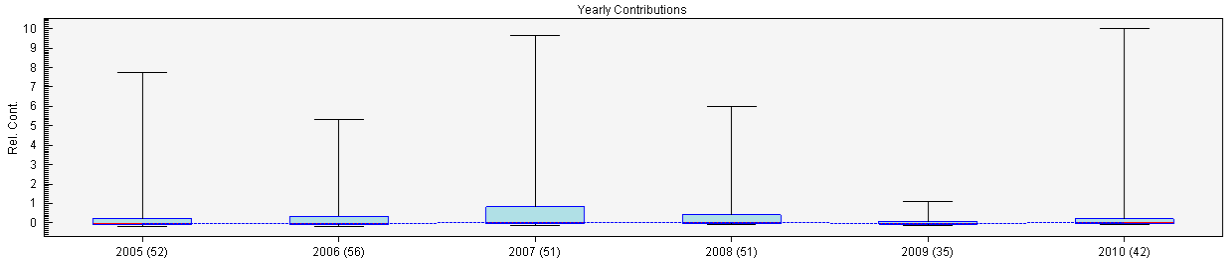
Factor 10 contains high percentages of chlorine, existing possibly as inorganic chlorides or as chlorinated organic compounds. Bromine and elemental carbon are also present with this factor. Contributions from this factor are specific, usually appearing as very large peaks during cool-weather inversions. Unlike the road salt factor for Lawrenceville, this factor is present in fall and spring and at much higher concentrations than road salt. Although road salt may be contributing a portion of the chlorine on winter days, the majority of this factor likely due to industrial activity that is emitting or utilizing chlorine. Sodium chloride and magnesium chloride are used for de-icing at the Liberty site, but no sodium is present with the factor (magnesium was not modeled due to low signal strength). Factor 10 makes up 6% of the total $PM_{2.5}$.

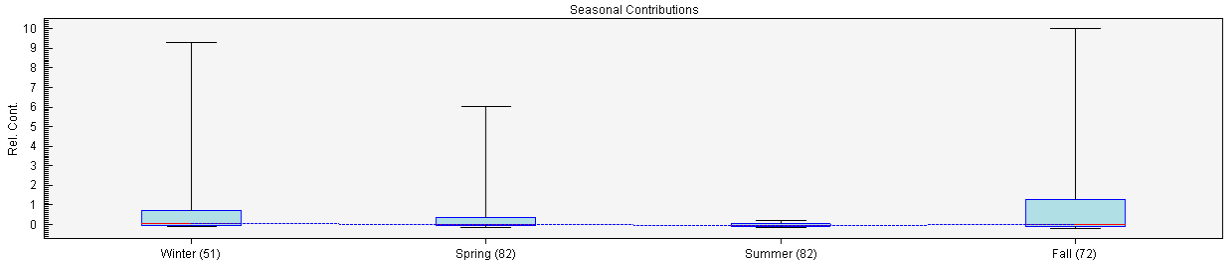


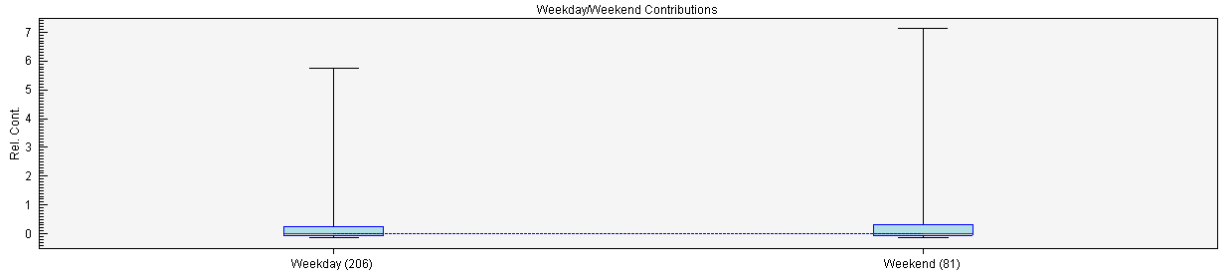




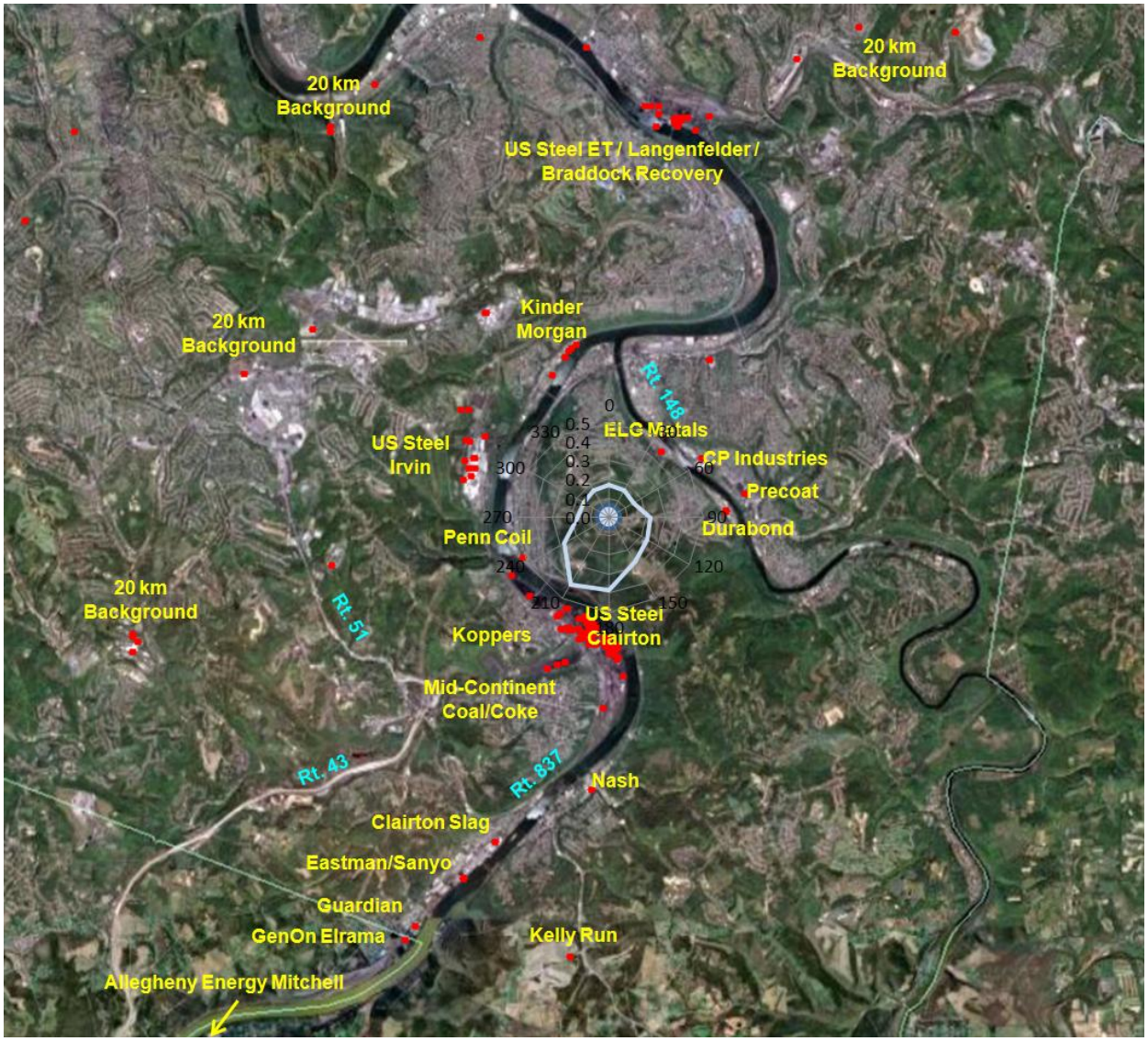

Factor Contributions
Contributions (avg = 1)
7/1/2005
12/1/2005
6/1/2006
11/1/2006
5/1/2007
10/1/2007
3/1/2008
8/1/2008
1/1/2009
7/1/2009
12/1/2009
6/1/2010


Yearly Contributions
Rel. Cont.
2005 (52)
2006 (56)
2007 (51)
2008 (51)
2009 (35)
2010 (42)


Seasonal Contributions
Rel. Cont.
Winter (51)
Spring (82)
Summer (82)
Fall (72)

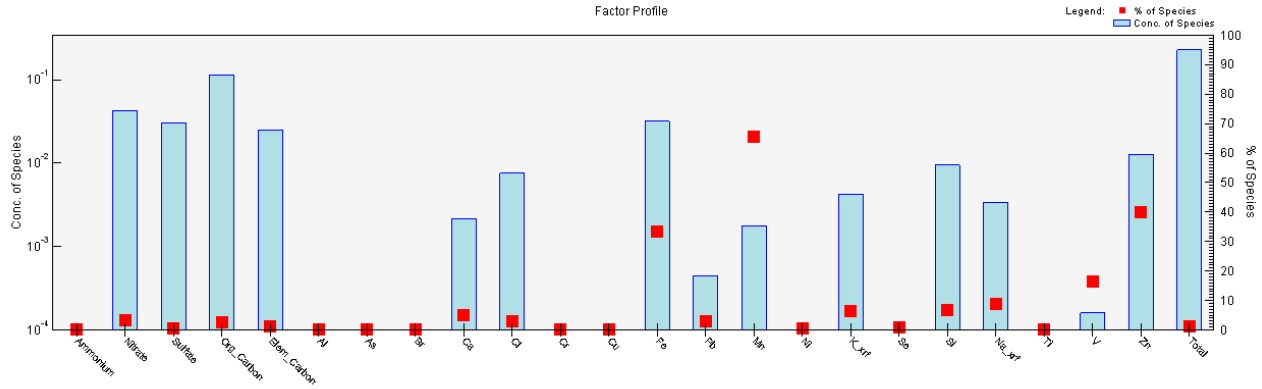

Weekday/Weekend Contributions
Rel. Cont.
Weekday (206)
Weekend (81)

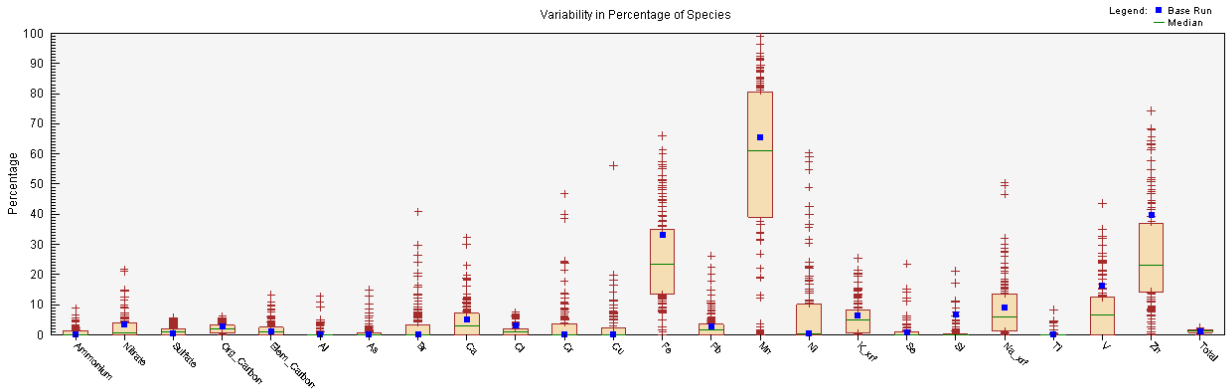
The CPF plot for Factor 10 is shown below. High days showed the highest frequencies from the southwest.

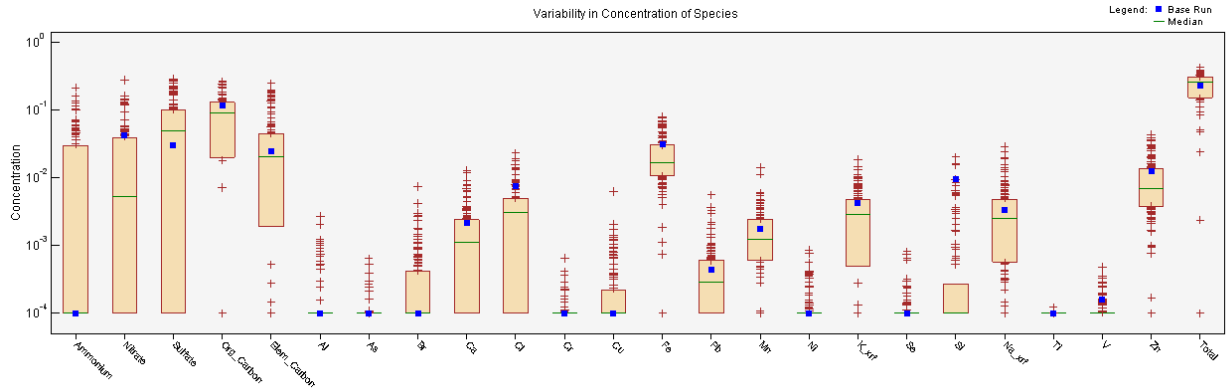


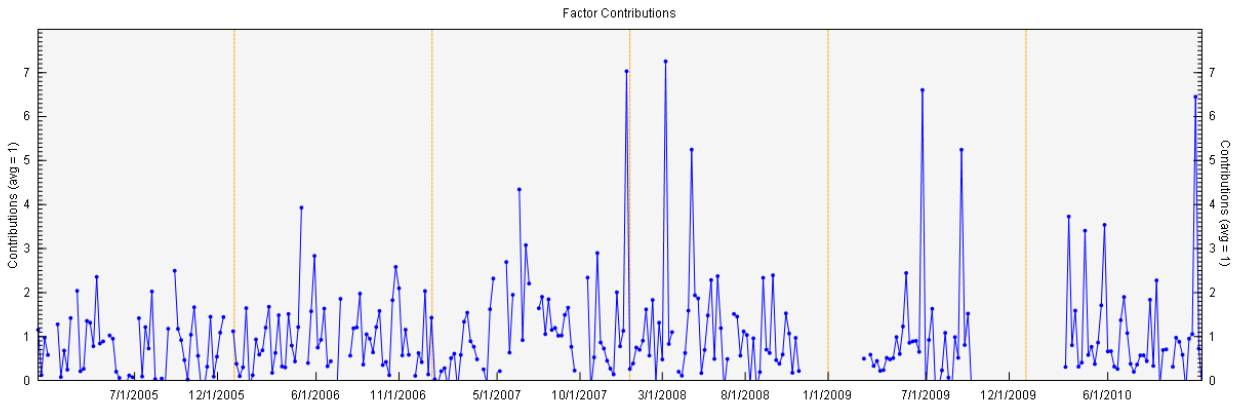
Liberty Source Factor 11: Steel Manufacturing/Processing

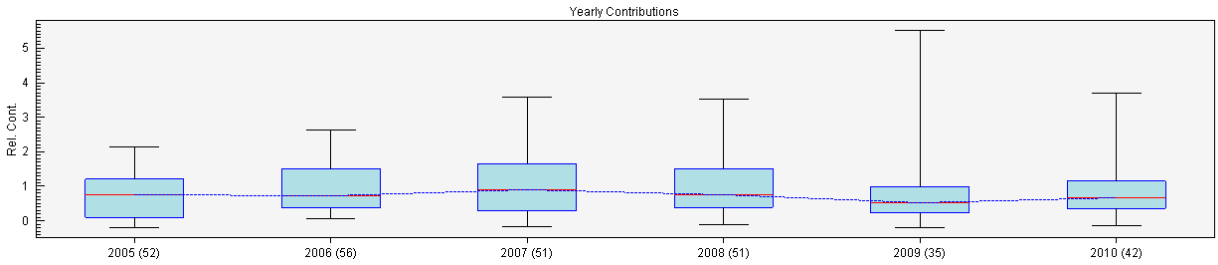
Factor 11 shows high amounts of iron, manganese, and zinc. The presence of iron and manganese is likely associated with steel manufacturing, while zinc may be due to galvanizing activities from similar wind directions. This factor shows higher weekday contributions, possibly pointing to weekday production schedules or a presence of some vehicle emissions. Factor 11 is a minor factor (2% of total) and usually peaks during inversions.

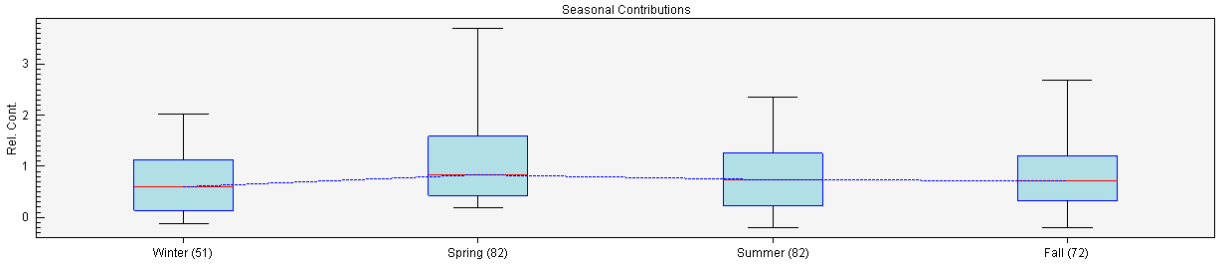


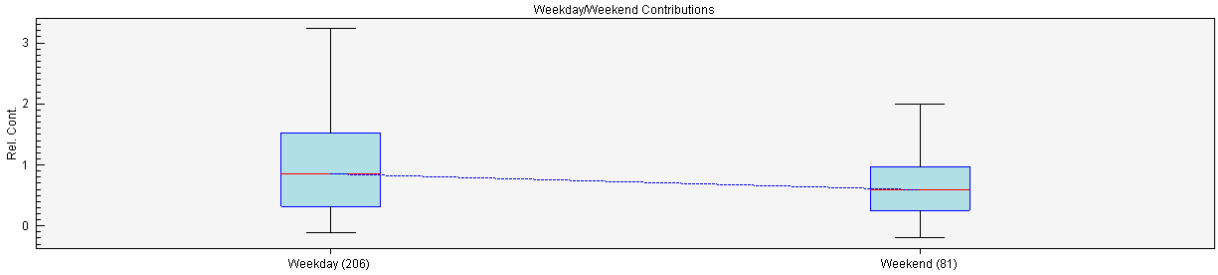




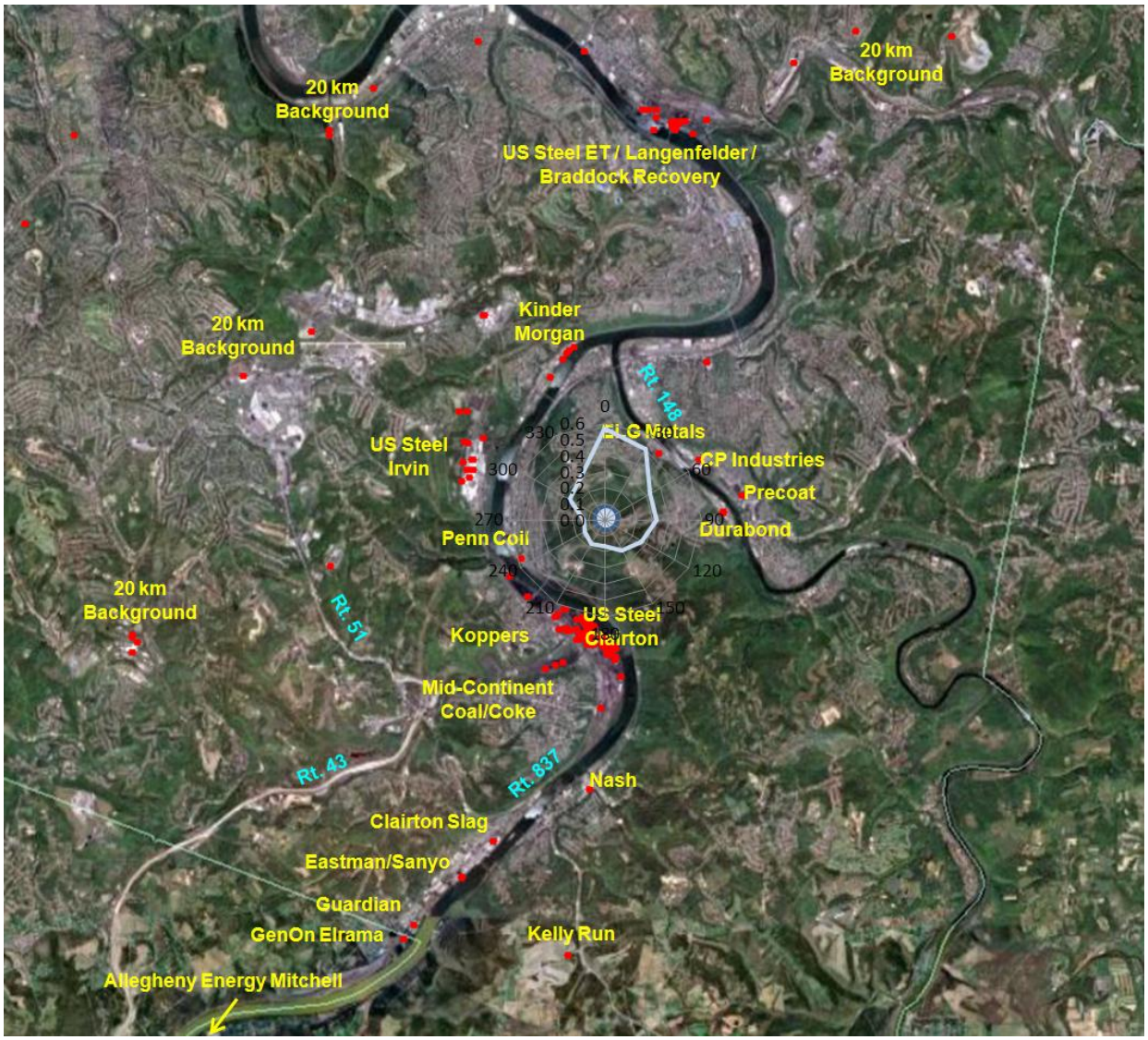

Factor Contributions
Contributions (avg = 1)
7/1/2005
12/1/2005
6/1/2006
11/1/2006
5/1/2007
10/1/2007
3/1/2008
8/1/2008
1/1/2009
7/1/2009
12/1/2009
6/1/2010


Yearly Contributions
Rel. Cont.
2005 (52)
2006 (56)
2007 (51)
2008 (51)
2009 (35)
2010 (42)


Seasonal Contributions
Rel. Cont.
Winter (51)
Spring (82)
Summer (82)
Fall (72)

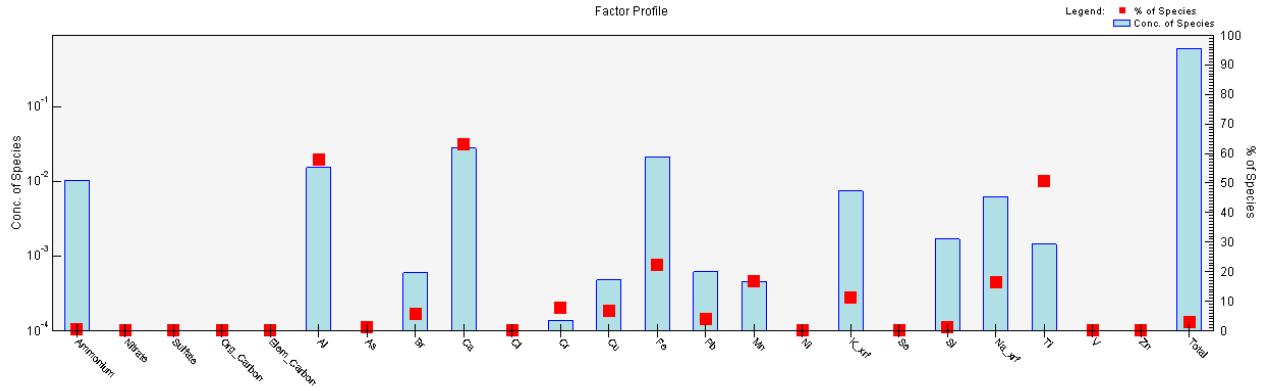

Weekday/Weekend Contributions
Rel. Cont.
Weekday (206)
Weekend (81)

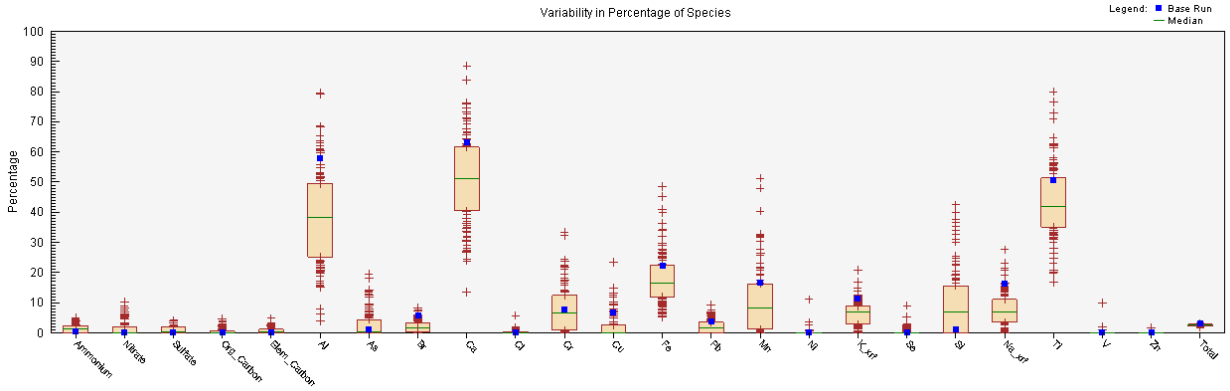
The CPF plot for Factor 11 is shown below. High days showed the highest frequencies from the north and northeast.

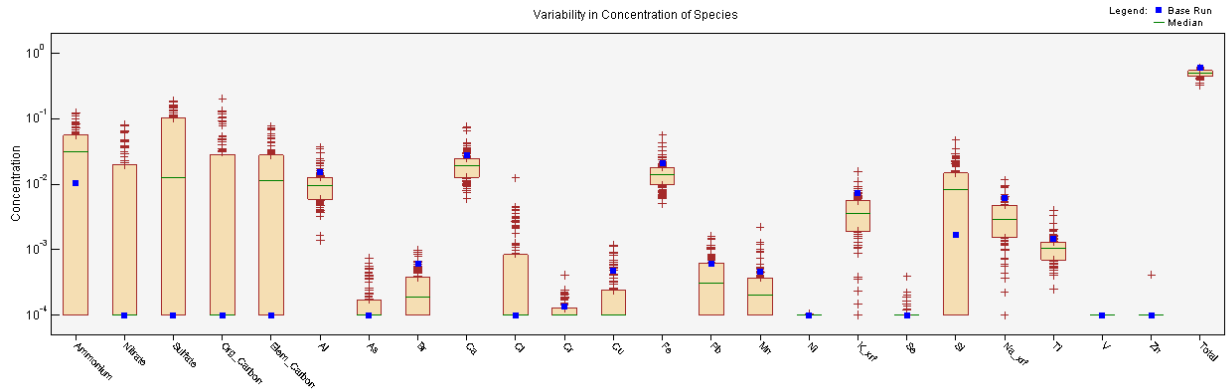


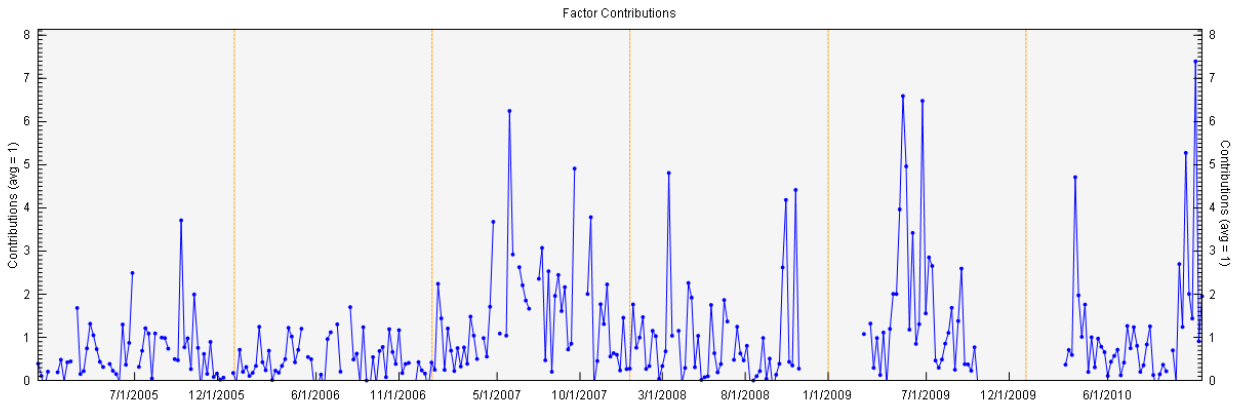
Liberty Source Factor 12: Crustal Component

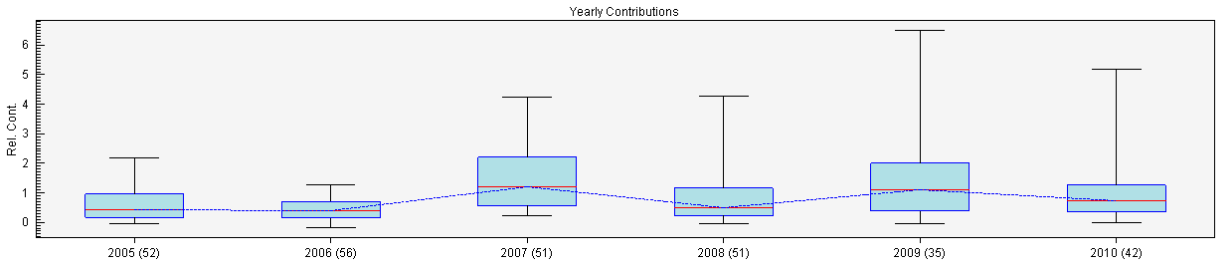
Factor 12 is composed primarily of crustal elements that make up airborne fine soil: aluminum, calcium, iron, and titanium. The silicon portion of crustal component is low, since the majority of silicon is included in Factor 8 (Coal/Coke Dust). Factor 12 is highest during weekday activity and in spring/summer. It is a small factor overall (1% of total) and often peaks during inversions.

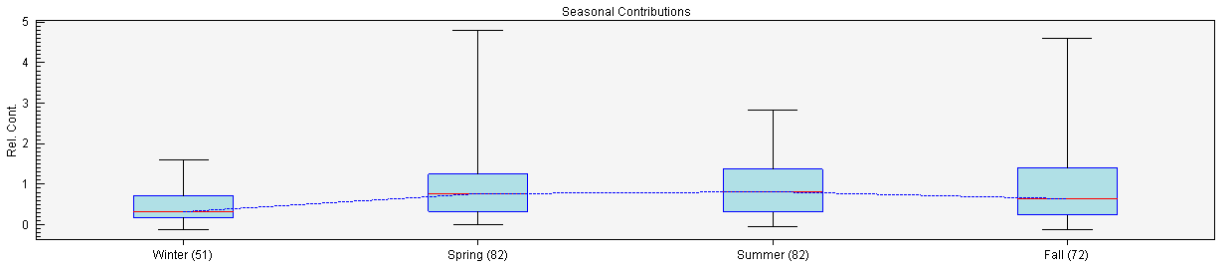


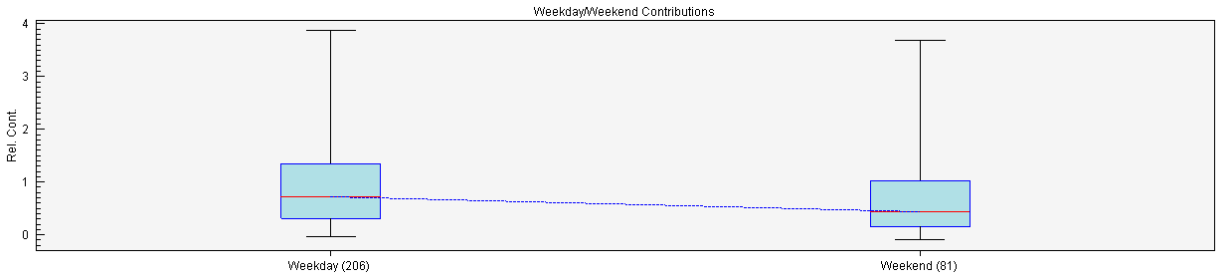




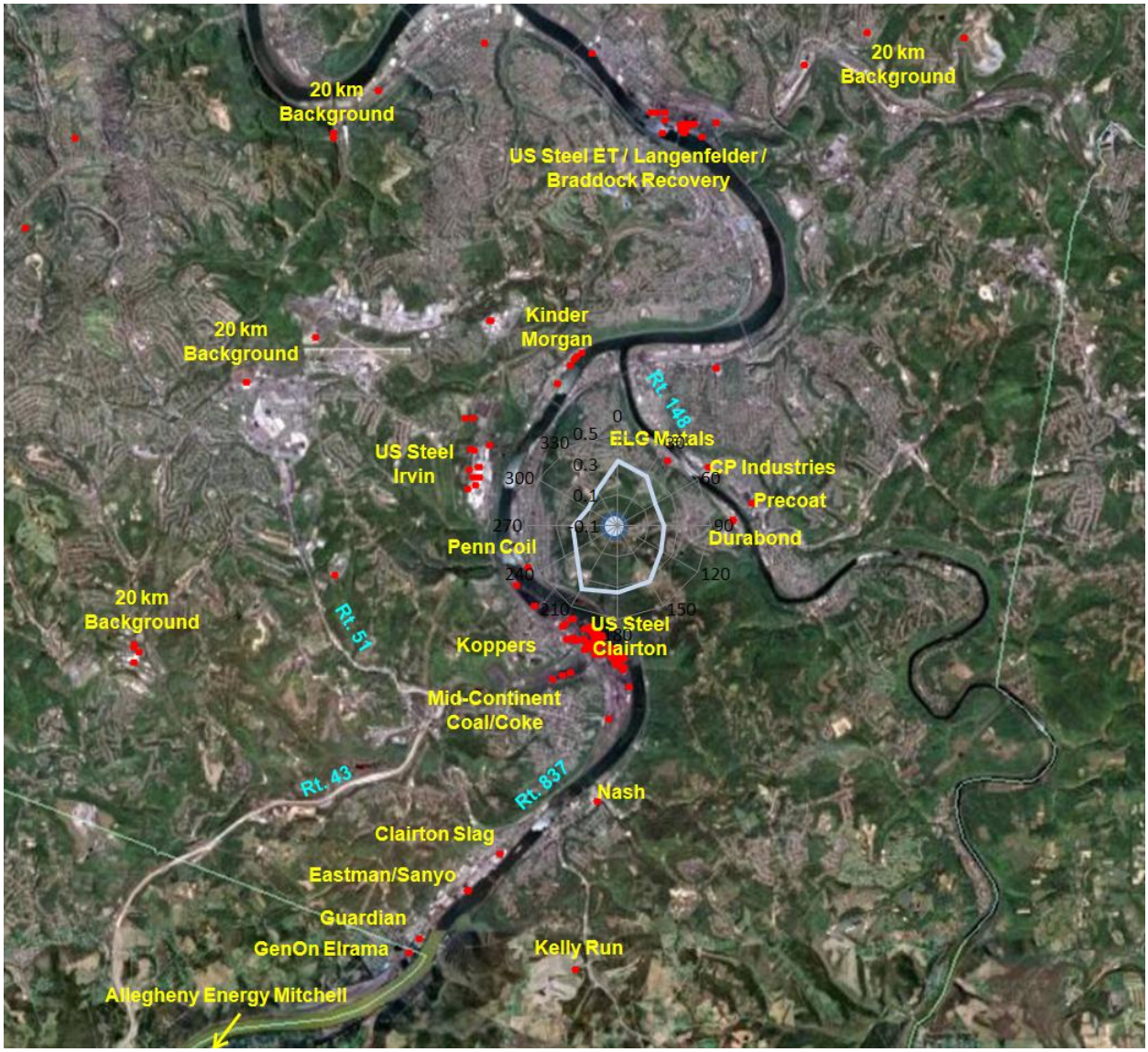

Factor Contributions
Contributions (avg = 1)
7/1/2005
12/1/2005
6/1/2006
11/1/2006
5/1/2007
10/1/2007
3/1/2008
8/1/2008
1/1/2009
7/1/2009
12/1/2009
6/1/2010


Yearly Contributions
Rel. Cont.
2005 (52)
2006 (56)
2007 (51)
2008 (51)
2009 (35)
2010 (42)


Seasonal Contributions
Rel. Cont.
Winter (51)
Spring (82)
Summer (82)
Fall (72)


Weekday/Weekend Contributions
Rel. Cont.
Weekday (206)
Weekend (81)

The CPF plot for Factor 12 is shown below. High day frequencies are distributed throughout all sectors, with the highest frequencies from the south.



Liberty Source Descriptions

Below are descriptions of the sources shown on the aerial maps of the Liberty area.

US Steel Clairton	Manufacturing of metallurgical coke for use in steel-making. Includes recovery and other processes.
US Steel Edgar Thomson	Steel blast furnace and slab manufacturing using coke, iron-bearing materials, and fluxes.
US Steel Irvin	Performs finishing processes to steel slabs, including hot and cold rolling, continuous pickling, annealing, galvanizing, and terne coating.
Tube City IMS	Formerly CJ Langenfelder and Son. Iron and steel furnace slag handling and processing at US Steel Edgar Thomson.
Braddock Recovery	Uses mill scale, flue dust, coke breeze, and sludge to produce briquettes for use in the BOP shop and blast furnace at US Steel Edgar Thomson.
Koppers	Distillation of crude tar into pitch, oils, and various other products.
Mid-Continent Coal & Coke	Metallurgical coke breeze screening.
Clairton Slag	Manufacturing of bituminous concrete mixes from raw materials for supply to asphalt paving companies and municipalities.
Kinder Morgan	Storage and handling of petroleum and chemical products.
Pennsylvania Electric Coil	Manufacturing and repair of high voltage and specialty coils.
Gardner Denver Nash	Manufactures and designs engineered vacuum and compressor systems.
Eastman	Manufactures polymer resins and pure monomers derived from cracked petroleum distillates.
Sanyo	Processes aromatic monomers into resins using batch suspension and solution polymerization.
Guardian	Manufacturing of float glass.
Kelly Run	Municipal landfill with a landfill gas (LFG) collection system.
ELG Metals	Scrap cutting, shearing, and bundling, burning and cutting of stainless and alloy steel with burning bars.

CP Industries	Manufacturing of seamless high pressure vessels.
Dura-Bond	Cleaning and applying protective coating to steel pipes.
Precoat Metals	Pretreatment, painting, curing and quenching of galvanized and cold-rolled steel materials. Closed 3/31/09.
GenOn Elrama	Coal-fired electric generation.
Allegheny Energy Mitchell	Coal-fired electric generation.
20 km Background	Background sources within a 20 km (near-field) domain around the Liberty site. Includes Tube City IMS-West Mifflin, WHEMCO, Jefferson and McKeesport Hospitals, National Energy Technology Laboratory, Bettis Atomic Laboratory, and others.

6. Model Diagnostics

Lawrenceville Diagnostics

Factors = 10
Random Run # 9

Valid samples not used in model due to outliers:

4/10/05 – crustal outliers
5/5/06 – Na, Zn outliers
7/28/06 – Al, Si outliers
12/10/06 – Pb outlier
4/21/07 – mass balance outliers
5/6/07 – Cr, Ni outliers
5/9/07 – Cr, Ni outliers
10/24/07 – major species outliers
11/14/07 – Ca outlier
7/5/08 – K outlier
7/6/09 – K outlier
7/4/10 – K outlier

Input Data Statistics:

Species	Category	S/N	Min	25th	Median	75th	Max
Ammonium	Strong	13.096	0.119	0.953	1.620	2.440	7.210
Nitrate	Strong	12.590	0.105	0.538	0.972	1.952	12.431
Sulfate	Strong	12.869	0.565	2.256	3.518	5.328	21.700
Org_Carbon	Strong	7.623	0.558	2.360	3.476	4.920	11.300
Elem_Carbon	Weak	2.368	0	0.469	0.721	1.027	4.000
Al	Weak	2.905	0	0	0.019	0.040	0.233
As	Weak	1.483	0	0	0.001	0.003	0.013
Br	Strong	4.024	0	0.002	0.004	0.006	0.016
Ca	Strong	11.326	0	0.020	0.033	0.050	0.275
Cl	Strong	7.821	0	0	0.009	0.024	0.484
Cr	Strong	6.542	0	0	0.002	0.004	0.111
Cu	Strong	6.223	0	0.002	0.004	0.007	0.033
Fe	Strong	13.106	0.015	0.065	0.102	0.185	1.640
Pb	Strong	4.578	0	0.003	0.007	0.013	0.087
Mn	Strong	6.977	0	0.002	0.004	0.009	0.040
Ni	Strong	6.124	0	0	0.001	0.002	0.055
K_xrf	Strong	11.936	0.008	0.039	0.057	0.084	0.285
Se	Strong	4.662	0	0.001	0.002	0.004	0.053
Si	Strong	8.188	0	0.032	0.059	0.092	0.431
Na_xrf	Weak	1.978	0	0	0.028	0.073	0.381
Ti	Weak	3.116	0	0	0.001	0.005	0.102
V	Weak	1.272	0	0	0	0.001	0.011
Zn	Strong	12.515	0	0.013	0.024	0.040	0.478
Total	Weak	17.903	1.700	9.400	13.600	19.650	48.300

Base Run Summary:

Run #	Q(Robust)	Q(True)	Converged	# Steps
9	9978.47	10345.10	Yes	1034

Regression Diagnostics:

Species	Intrcpt	Slope	SE	r^2	KS Test Stat	KS Test P Value
Ammonium	0.066	0.945	0.181	0.975	0.066	0.014
Nitrate	0.000	1.001	0.109	0.995	0.155	0.000
Sulfate	0.169	0.954	0.412	0.983	0.108	0.000
Org_Carbon	0.421	0.827	0.931	0.727	0.037	0.420
Elem_Carbon	0.291	0.563	0.261	0.516	0.075	0.004
Al	0.014	0.242	0.012	0.308	0.065	0.018
As	0.001	0.239	0.001	0.262	0.055	0.070
Br	0.001	0.575	0.001	0.602	0.036	0.440
Ca	0.006	0.804	0.010	0.877	0.068	0.010
Cl	0.000	0.970	0.002	0.997	0.121	0.000
Cr	0.000	0.957	0.001	0.982	0.043	0.240
Cu	0.001	0.787	0.002	0.803	0.048	0.145
Fe	0.029	0.763	0.052	0.849	0.123	0.000
Pb	0.004	0.418	0.005	0.511	0.058	0.047
Mn	0.000	0.991	0.000	0.995	0.032	0.610
Ni	0.001	0.430	0.002	0.481	0.073	0.005
K_xrf	0.012	0.783	0.013	0.848	0.100	0.000
Se	0.000	0.924	0.001	0.959	0.060	0.032
Si	0.011	0.786	0.024	0.798	0.051	0.110
Na_xrf	0.030	0.183	0.020	0.241	0.079	0.002
Ti	0.003	0.125	0.002	0.169	0.119	0.000
V	0.001	0.085	0.000	0.093	0.178	0.000
Zn	0.003	0.906	0.005	0.978	0.148	0.000
Total	0.356	0.957	1.840	0.943	0.044	0.220

Scaled Residuals Beyond 3 Standard Deviations:

Species	Dates	Residuals
Ammonium	12/1/2010	5.673
Nitrate	10/5/2010	3.468
Sulfate	10/5/2010	3.576
Org_Carbon	2/27/2005	3.029
Org_Carbon	5/28/2005	3.204
Org_Carbon	6/18/2005	3.536
Org_Carbon	10/13/2005	3.126
Org_Carbon	10/22/2005	3.344
Org_Carbon	4/15/2007	4.380
Org_Carbon	9/12/2007	3.871
Org_Carbon	11/2/2007	4.742
Org_Carbon	8/25/2008	3.044
Org_Carbon	8/28/2008	5.087
Org_Carbon	1/13/2009	3.032
Org_Carbon	2/15/2009	5.394
Org_Carbon	5/1/2009	5.043
Org_Carbon	9/10/2009	5.176
Br	1/4/2005	-3.863
Br	3/26/2005	3.054
Br	6/18/2005	-3.270
Br	6/30/2005	-3.339
Br	7/9/2005	-4.171
Br	11/12/2005	3.454
Br	2/19/2006	3.644
Br	3/12/2006	3.533
Br	3/21/2006	3.763
Br	5/17/2006	-3.025
Br	5/29/2006	-3.351
Br	6/16/2006	3.617
Br	6/25/2006	-3.920
Br	7/10/2006	-3.518
Br	11/13/2006	3.169
Br	1/12/2007	3.795
Br	2/17/2007	3.072
Br	3/31/2007	3.035
Br	5/27/2007	-4.273
Br	6/20/2007	-3.761
Br	6/23/2007	-5.992
Ca	1/25/2005	3.030
Ca	1/31/2005	3.766
Ca	2/3/2005	4.298
Ca	4/4/2005	3.357
Ca	4/19/2005	6.556
Ca	5/4/2005	3.054
Ca	6/21/2005	3.105
Ca	8/11/2005	6.022

Species	Dates	Residuals
Ca	9/19/2005	3.247
Ca	9/22/2005	3.847
Ca	5/20/2006	5.131
Ca	9/8/2006	6.027
Ca	2/21/2008	3.405
Ca	7/14/2008	3.601
Ca	3/2/2009	4.646
Ca	10/25/2009	3.191
Ca	7/10/2010	3.728
Cu	5/19/2005	-3.085
Cu	7/9/2005	4.283
Cu	11/27/2005	4.342
Cu	12/6/2005	3.817
Cu	1/26/2006	5.191
Cu	1/29/2006	4.056
Cu	2/4/2006	4.162
Cu	2/10/2006	4.410
Cu	6/7/2006	3.572
Cu	9/26/2006	3.846
Cu	10/26/2006	-3.232
Cu	12/16/2006	4.270
Cu	1/27/2007	4.604
Cu	1/30/2007	6.136
Cu	3/4/2007	3.017
Cu	11/29/2007	3.021
Cu	12/8/2007	4.398
Cu	1/1/2008	5.076
Cu	12/24/2009	-3.359
Cu	1/20/2010	-3.189
Cu	6/19/2010	-3.307
Cu	9/17/2010	3.090
Cu	10/14/2010	3.462
Fe	11/2/2007	3.678
Fe	11/8/2007	6.306
Fe	1/22/2008	3.397
Fe	3/7/2008	3.046
Fe	10/6/2008	5.263
Fe	1/20/2010	3.691
Pb	2/6/2005	3.135
Pb	2/9/2005	3.915
Pb	5/22/2005	3.678
Pb	7/30/2005	6.792
Pb	11/12/2005	-3.211
Pb	4/5/2006	5.060
Pb	8/9/2006	3.148
Pb	9/26/2006	3.536
Pb	10/2/2006	4.654
Pb	11/4/2006	4.075
Pb	12/16/2006	3.806

Species	Dates	Residuals
Pb	1/24/2007	4.026
Pb	1/30/2007	5.775
Pb	6/17/2007	6.458
Pb	7/29/2007	4.645
Pb	11/8/2007	-3.416
Pb	3/19/2008	-3.136
Pb	5/6/2008	3.526
Pb	5/24/2008	3.070
Pb	8/7/2008	-3.631
Pb	8/31/2008	4.405
Pb	9/3/2008	3.256
Pb	9/21/2008	3.952
Pb	10/12/2008	3.422
Pb	10/24/2008	3.314
Pb	11/5/2008	3.082
Pb	3/17/2009	3.486
Pb	5/19/2009	4.690
Pb	11/15/2009	3.206
Pb	1/20/2010	-3.072
Pb	2/1/2010	5.876
Pb	4/14/2010	5.575
Pb	9/17/2010	3.435
Pb	9/23/2010	-3.762
Ni	1/25/2005	3.358
Ni	9/7/2005	3.559
Ni	12/15/2005	3.019
Ni	7/13/2006	3.449
Ni	11/28/2006	4.007
Ni	1/3/2007	4.145
Ni	12/11/2007	4.650
Ni	4/30/2008	6.386
Ni	3/17/2009	-3.097
Ni	3/21/2010	6.172
Ni	4/8/2010	7.151
Ni	9/23/2010	7.346
K_xrf	1/1/2005	4.441
K_xrf	7/9/2005	3.144
K_xrf	5/29/2006	3.474
K_xrf	8/12/2006	3.441
K_xrf	1/1/2008	6.322
K_xrf	11/6/2009	4.015
K_xrf	4/11/2010	3.118
Si	3/26/2005	4.118
Si	5/7/2005	3.396
Si	5/19/2005	-3.216
Si	6/21/2005	-5.436
Si	7/15/2005	-4.220
Si	8/8/2005	-3.117
Si	8/11/2005	-3.095

Species	Dates	Residuals
Si	8/14/2005	3.776
Si	9/10/2005	-3.126
Si	9/19/2005	-4.474
Si	9/22/2005	-3.756
Si	9/25/2005	-3.004
Si	9/28/2005	-3.018
Si	10/1/2005	-3.263
Si	12/9/2005	3.650
Si	5/2/2006	3.097
Si	7/13/2006	4.999
Si	10/17/2006	3.211
Si	2/9/2008	3.560
Si	7/8/2008	4.108
Si	8/29/2009	5.092
Si	5/2/2010	4.508
Si	7/25/2010	4.647
Ti	11/15/2009	3.169

Liberty Diagnostics

Factors = 12
Random Run # 2

Valid samples not used in model due to outliers:

2/3/05 – crustal outliers
5/10/05 – crustal outliers
8/14/05 – Ti outlier
11/25/06 – K outlier
6/5/07 – Ca outlier
9/27/07 – Fe outlier
10/3/07 – Ca outlier
10/9/07 – Ca outlier
7/5/08 – K outlier
3/25/08 – elemental carbon outlier

Input Data Statistics:

Species	Category	S/N	Min	25th	Median	75th	Max
Ammonium	Strong	13.108	0	1.140	2.017	3.280	10.600
Nitrate	Strong	12.246	0.032	0.601	0.972	1.650	6.975
Sulfate	Strong	12.872	0	2.450	4.170	6.586	29.300
Org_Carbon	Strong	8.912	0.586	1.994	3.354	5.582	27.700
Elem_Carbon	Strong	7.024	0.069	0.583	1.160	2.830	16.700
Al	Weak	3.273	0	0	0.020	0.054	0.206
As	Strong	3.707	0	0.001	0.003	0.007	0.047
Br	Strong	9.489	0	0.003	0.006	0.014	0.133
Ca	Strong	11.398	0.001	0.018	0.033	0.059	0.236
Cl	Strong	13.042	0	0.002	0.020	0.096	7.230
Cr	Strong	4.041	0	0	0.001	0.003	0.041
Cu	Strong	7.009	0	0.004	0.006	0.010	0.029
Fe	Strong	11.838	0	0.049	0.081	0.129	0.518
Pb	Strong	6.508	0	0.004	0.009	0.023	0.098
Mn	Strong	4.197	0	0.001	0.002	0.004	0.024
Ni	Strong	3.827	0	0	0.001	0.002	0.020
K_xrf	Strong	11.806	0	0.033	0.060	0.085	0.325
Se	Strong	11.455	0	0.001	0.003	0.007	0.377
Si	Strong	10.005	0	0.042	0.083	0.177	0.986
Na_xrf	Weak	1.843	0	0	0.026	0.065	0.514
Ti	Weak	1.870	0	0	0.002	0.004	0.015
V	Weak	1.225	0	0	0	0.002	0.008
Zn	Strong	12.131	0	0.013	0.024	0.042	0.185
Total	Weak	18.557	0.400	10.600	16.300	27.100	88.100

Base Run Summary:

Run #	Q(Robust)	Q(True)	Converged	# Steps
2	3870.23	3965.98	Yes	2825

Regression Diagnostics:

Species	Intrcpt	Slope	SE	r^2	KS Test Stat	KS Test P Value
Ammonium	-0.007	0.991	0.212	0.987	0.050	0.465
Nitrate	-0.001	1.002	0.054	0.997	0.186	0.000
Sulfate	0.053	0.982	0.440	0.988	0.174	0.000
Org_Carbon	0.120	0.935	0.811	0.943	0.033	0.922
Elem_Carbon	0.161	0.875	0.599	0.922	0.033	0.909
Al	0.013	0.371	0.017	0.449	0.063	0.199
As	0.000	0.898	0.002	0.892	0.076	0.071
Br	0.001	0.835	0.004	0.887	0.041	0.707
Ca	0.000	0.987	0.004	0.988	0.068	0.143
Cl	0.004	0.970	0.050	0.996	0.248	0.000
Cr	0.001	0.575	0.001	0.734	0.108	0.002
Cu	0.000	0.954	0.001	0.979	0.071	0.113
Fe	0.005	0.912	0.020	0.912	0.076	0.072
Pb	0.001	0.913	0.004	0.946	0.056	0.337
Mn	0.001	0.631	0.001	0.778	0.052	0.419
Ni	0.000	0.899	0.001	0.821	0.084	0.034
K_xrf	0.003	0.938	0.006	0.981	0.083	0.039
Se	0.000	1.017	0.001	0.999	0.171	0.000
Si	0.001	0.995	0.004	0.999	0.101	0.006
Na_xrf	0.028	0.212	0.026	0.227	0.086	0.029
Ti	0.002	0.444	0.002	0.454	0.108	0.003
V	0.001	0.100	0.001	0.082	0.168	0.000
Zn	0.003	0.867	0.009	0.901	0.100	0.007
Total	0.183	0.973	2.194	0.972	0.068	0.140

Scaled Residuals Beyond 3 Standard Deviations:

Species	Dates	Residuals
Nitrate	11/16/2010	3.015
Sulfate	10/13/2005	3.710
Sulfate	11/16/2010	8.181
Org_Carbon	6/15/2005	3.302
Elem_Carbon	11/12/2005	3.057
Br	11/2/2007	5.051
Br	1/25/2008	-3.482
Br	11/10/2010	4.263
Br	11/16/2010	3.307
Cr	3/5/2005	-6.504
Cr	5/16/2005	3.372
Cr	6/9/2005	3.481
Cr	8/20/2005	4.795
Cr	2/16/2006	-3.409
Cr	5/17/2006	4.889
Cr	5/29/2006	4.865
Cr	11/7/2006	-3.166
Cr	7/29/2007	4.435
Cr	5/8/2010	3.018
Cr	5/20/2010	3.271
Cr	11/4/2010	3.175
Fe	10/13/2005	-3.037
Fe	2/16/2006	3.166
Fe	6/18/2009	4.858
Pb	12/12/2005	3.626
Pb	5/23/2006	3.463
Pb	6/10/2006	3.124
Pb	8/9/2006	3.073
Mn	4/22/2005	4.822
Mn	1/23/2006	3.073
Mn	12/1/2006	3.167
Mn	12/13/2006	3.061
Mn	2/11/2007	5.368
Mn	8/16/2007	-3.247
Mn	8/12/2010	3.261
Mn	10/11/2010	3.078
Ni	3/5/2005	3.780
Ni	9/25/2005	3.899
Ni	10/13/2005	3.506
Zn	5/5/2006	5.639
Zn	5/18/2007	3.855

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Additional Information

For more information concerning this report or Allegheny County $PM_{2.5}$ data analysis, contact Jason Maranche at the ACHD Air Quality Program at 412-578-8104 or jmaranche@achd.net, or Shaun Vozar at the ACHD Air Quality Program at 412-578-8145 or svozar@achd.net.

The EPA disclaimer for the PMF 3.0 Model is reproduced below:

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This User Guide is for the EPA PMF 3.0 program and the disclaimer for the software is shown below.

The United States Environmental Protection Agency through its Office of Research and Development funded and collaborated in the research described here under Contract Numbers EP-D-05-004 and 68-W-04-005 to Sonoma Technology, Inc. This software is now being subjected to external peer-review and is for evaluation purposes only. Portions of the code are Copyright©2005-2008 ExoAnalytics Inc. and Copyright©2007-2008 Bytescout.

$PM_{2.5}$ SIP

Appendix D

Liberty-Clairton Emissions Inventories

D-1: Stationary Point Sources

D-2: Area Sources

D-3: Nonroad Sources

D-4: Mobile Sources

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D-1: Stationary Point Sources

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Liberty-Clairton Point Source Summary

- Emissions given in tons/year for actuals (not permitted or allowables)

- Data based on MANE-VU 2007, with local revisions performed by ACHD

- Point source revisions/corrections based on:
    - Updated stack tests
    - More accurate stack parameters/locations
    - Projected inventories

- Minor sources not included in MANE-VU were added to Liberty-Clairton

- Non-inventoried minors were based on minor source permit calculations

- Fugitives sources listed as stacks, using the following general methodology:
    - Height = release height (default=10 ft)
    - Temp = release temp (default=72°F)
    - Diameter = 0 ft (unless estimated)
    - Velocity = 0 ft/s (unless estimated)

- Buoyant fugitives assigned a height of 126 ft

- ACHD point source inventory reporting instructions are given in this appendix

- Details of Liberty-Clairton point source revisions given in Appendix F

TOTALS

2007

FACILITY	SO2	NOx	VOC	NH3	PM10	PM2.5
AKJ Industries	0.000	0.000	0.030	0.000	0.030	0.030
Bekavac Funeral Home	0.004	0.007	0.000	0.000	0.006	0.006
Dura-Bond Industries	0.689	12.366	1.077	0.000	4.596	3.600
ELG Metals	0.000	0.481	0.002	0.000	1.931	1.931
KOPPERS INC. CLAIRTON PLANT	0.325	13.580	15.229	0.000	7.371	5.961
Mid-Continent Coal & Coke	0.376	5.722	0.454	0.000	3.983	1.794
Mon Valley Transportation	0.000	0.000	0.000	0.000	8.120	3.758
Pennsylvania Electric Coil	0.003	0.340	2.040	0.000	0.026	0.026
Tech Met	0.000	2.030	1.140	0.000	0.000	0.000
Tube City IMS Clairton	0.000	0.001	0.000	0.000	0.310	0.310
US STEEL CORP - CLAIRTON PLANT	1739.948	4807.357	570.576	18.419	1110.587	929.175
TOTAL	**1741.345**	**4841.884**	**590.548**	**18.419**	**1136.960**	**946.591**

2014

FACILITY	SO2	NOX	VOC	NH3	PM10	PM2.5
AKJ Industries	0.000	0.000	0.030	0.000	0.030	0.030
Bekavac Funeral Home	0.004	0.007	0.000	0.000	0.006	0.006
Dura-Bond Industries	0.689	12.366	1.077	0.000	4.596	3.600
ELG Metals	0.000	0.481	0.002	0.000	1.931	1.931
KOPPERS INC. CLAIRTON PLANT	1.831	15.599	11.769	0.000	7.505	6.095
Mid-Continent Coal & Coke	0.376	5.722	0.454	0.000	3.983	1.794
Mon Valley Transportation	0.000	0.000	0.000	0.000	8.120	3.758
Pennsylvania Electric Coil	0.003	0.340	2.040	0.000	0.026	0.026
Tech Met	0.000	2.030	1.140	0.000	0.000	0.000
Tube City IMS Clairton	0.000	0.001	0.000	0.000	0.310	0.310
US STEEL CORP - CLAIRTON PLANT	1717.620	4312.803	443.540	17.554	827.180	645.103
TOTAL	**1720.523**	**4349.349**	**460.052**	**17.554**	**853.687**	**662.653**

Point Source Inventory Column Definitions

Field	Definition
FACNAME	Name of the facility
PTID	ID number used by a state/local agency to identify an emission unit
STKID	ID number used by a state/local agency to identify an emission release point
SEGID	ID number used by a state/local agency to identify an emission process/segment
SCC	8-digit EPA source classification code
UNIT DESCRIPTION	Description of the emission unit
PROCESS DESCRIPTION	Description of the emission process
SO2	Annual 2007 SO2 emissions
NOx	Annual 2007 NOx emissions
VOC	Annual 2007 VOC emissions
NH3	Annual 2007 Ammonia emissions
PM10	Annual 2007 PM10 primary emissions
PM2.5	Annual 2007 PM2.5 primary emissions
HGHT	The height (in feet) of a stack
DIAM	The diameter (in feet) of a stack
TEMP	The temperature of an exit gas stream (degree Fahrenheit)
VEL	Numeric value of stach exit velocity in feet per second
XCOORD	Longitude measure in decimal degrees of the angular distance on a meridian east or west of the prime meridian
YCOORD	Latitude measure in decimal degrees of the angular distance on a meridian north or south of the equator

FACNAME	PTID	STKID	SEGID	SCC	UNIT DESCRIPTION	PROCESS DESCRIPTION	SO2	NOx	VOC	NH3	PM10	PM2.5	HGHT	DIAM	TEMP	VEL	XCOORD	YCOORD
KOPPERS INC. CLAIRTON PLANT	001	1	1	30184001	TAR REFINING	TAR REFINING PROCESS	0.000	0.000	0.000	0.000	0.000	0.000	105.00	6.75	1200	27.00	-79.881559	40.306178
KOPPERS INC. CLAIRTON PLANT	001	1	2	30180001	TAR REFINING	TAR REFINING FUGITIVES	0.000	0.000	0.040	0.000	0.000	0.000	105.00	6.75	1200	27.00	-79.881559	40.306178
KOPPERS INC. CLAIRTON PLANT	002	3	1	30199999	ROD PITCH MANUFACTURING	ROD PITCH MANUFACTURING	0.000	0.000	0.180	0.000	0.190	0.190	50.00	1.00	125	10.00	-79.880836	40.305775
KOPPERS INC. CLAIRTON PLANT	002	5	2	30199999	ROD PITCH MANUFACTURING	ROD PITCH FUGITIVES	0.000	0.000	0.460	0.000	0.500	0.500	10.00	0.00	72	0.00	-79.880836	40.305775
KOPPERS INC. CLAIRTON PLANT	003	1	1	10200603	1T2 HEATER	1T2 HEATER	0.000	0.000	0.000	0.000	0.000	0.000	105.00	6.75	1200	27.00	-79.881559	40.306178
KOPPERS INC. CLAIRTON PLANT	004	1	1	10200603	2T2 HEATER	2T2 HEATER	0.005	0.770	0.040	0.000	0.050	0.050	105.00	6.75	1200	27.00	-79.881559	40.306178
KOPPERS INC. CLAIRTON PLANT	005	1	1	10200603	PRIMARY FLASH HEATER	PRIMARY FLASH HEATER	0.020	3.620	0.190	0.000	0.260	0.260	105.00	6.75	1200	27.00	-79.881559	40.306178
KOPPERS INC. CLAIRTON PLANT	006	2	1	39990003	PRILL HOT OIL HEATER	HOT OIL HEATER	0.007	1.190	0.060	0.000	0.080	0.080	40.00	2.00	1200	4.10	-79.881248	40.305770
KOPPERS INC. CLAIRTON PLANT	007	1	1	10200603	1T4 HOT OIL HEATER	1T4 HOT OIL HEATER	0.001	0.220	0.010	0.000	0.014	0.014	105.00	6.75	1200	27.00	-79.881559	40.306178
KOPPERS INC. CLAIRTON PLANT	008	1	1	10100602	SECONDARY FLASH HEATER	SECONDARY FLASH HEATER	0.010	2.650	0.140	0.000	0.200	0.200	105.00	6.75	1200	27.00	-79.881559	40.306178
KOPPERS INC. CLAIRTON PLANT	009	5	1	20300301	TRANSPORTATION	GASOLINE VEHICLES	0.007	0.130	0.250	0.000	0.017	0.017	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	009	5	3	39999991	TRANSPORTATION	PAVED ROADS	0.000	0.000	0.000	0.000	0.600	0.080	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	009	5	4	39999991	TRANSPORTATION	UNPAVED ROADS	0.000	0.000	0.000	0.000	0.990	0.100	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	009	5	5	20300101	TRANSPORTATION	DIESEL VEHICLES	0.270	4.240	0.340	0.000	0.590	0.590	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	011	5	1	40899999	LOADING	LIQUID LOADING	0.000	0.000	4.890	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	011	5	2	30183001	LOADING	ROD PITCH LOADING	0.000	0.000	0.540	0.000	3.100	3.100	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	012	5	1	40703698	CARBON PITCH TANKS	CARBON PITCH TANKS	0.000	0.000	0.620	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	013	5	1	40703698	PETROLEUM PITCH TANKS	PET PITCH TANKS	0.000	0.000	0.010	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	014	5	1	40703698	TYPE A PITCH TANKS	TYPE A PITCH TANKS	0.000	0.000	1.130	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	015	5	1	40703698	RCO TANKS	RCO REGULAR TANKS	0.000	0.000	3.390	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	015	5	2	40703698	RCO TANKS	RCO CO-DISTILLED TANKS	0.000	0.000	0.200	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	016	5	1	40703698	PETRO TAR TANKS	PETRO TAR TANKS	0.000	0.000	0.060	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	017	5	1	40703698	CARBON BLACK OIL TANKS	CBO REGULAR TANKS	0.000	0.000	0.100	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	017	5	2	40703698	CARBON BLACK OIL TANKS	CBO CO-DISTILLED TANKS	0.000	0.000	0.040	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	018	5	1	40703698	CREOSOTE PROCESSING	P2 CREOSOTE TANK	0.000	0.000	0.002	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	018	5	3	40703698	CREOSOTE PROCESSING	P2 PETROLEUM CREOSOTE	0.000	0.000	0.002	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	020	5	1	40703698	NSR TANKS	NSR TANKS	0.000	0.000	0.100	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	021	5	1	40703698	CO-DISTILL MATERIAL TANKS	CO-DISTILL MATERIAL TANKS	0.000	0.000	0.270	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	022	5	1	40703698	WASTEWATER STORAGE TANKS	WW TANKS UNCONTROLLED	0.000	0.000	0.005	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	024	5	1	40703698	DEBENZOL. COAL TAR TANKS	DEBENZ COAL TAR	0.000	0.000	2.000	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	027	5	1	50400201	SOIL/VAPOR RECOVERY	SOIL/VAPOR RECOVERY	0.000	0.000	0.000	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	028	5	1	38500102	COOLING TOWER	COOLING TOWER	0.000	0.000	0.000	0.000	0.730	0.730	57.00	14.90	72	34.61	-79.881218	40.306175
KOPPERS INC. CLAIRTON PLANT	029	5	1	30199998	CENTRIFUGE OPERATION	CENTRIFUGE OPERATION	0.000	0.000	0.030	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	032	5	1	40899999	PET PITCH PURGING/DEPRESS	PET PITCH CARS AND TRUCKS	0.000	0.000	0.000	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	033	5	1	40703698	NEEDLE COKER GAS OIL TANK	NEEDLE COKER GAS OIL TK	0.000	0.000	0.090	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	034	4	1	10200603	THERMAL OXIDIZER	THERMAL OXIDIZER	0.005	0.760	0.040	0.000	0.050	0.050	50.00	6.00	1120	19.00	-79.882925	40.306110
US STEEL CORP - CLAIRTON PLANT	001	2011	1	30300302	BATTERY 1 FUGITIVES	BATTERY 1 CHARGING	0.000	0.000	0.140	0.009	0.110	0.100	126.00	0.00	72	0.00	-79.871506	40.301084
US STEEL CORP - CLAIRTON PLANT	001	2011	2	30300308	BATTERY 1 FUGITIVES	BATTERY #1, DOOR LEAKS	0.000	0.000	2.180	0.150	1.730	1.560	126.00	0.00	72	0.00	-79.871506	40.301084
US STEEL CORP - CLAIRTON PLANT	001	2011	4	30300314	BATTERY 1 FUGITIVES	BATTERY #1, TOPSIDE LEAKS	0.000	0.000	0.083	0.006	0.066	0.059	126.00	0.00	72	0.00	-79.871506	40.301084
US STEEL CORP - CLAIRTON PLANT	001	2011	5	30300303	BATTERY 1 FUGITIVES	BATTERY #1, SOAKING	9.988	0.282	0.187	0.000	0.539	0.539	126.00	0.00	72	0.00	-79.871506	40.301084
US STEEL CORP - CLAIRTON PLANT	001	2011	6	30300303	BATTERY 1 FUGITIVES	BATTERY #1, DECARBONIZING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.871506	40.301084
US STEEL CORP - CLAIRTON PLANT	002	2012	1	30300302	BATTERY 2 FUGITIVES	BATTERY 2 CHARGING	0.000	0.000	0.140	0.010	0.107	0.097	126.00	0.00	72	0.00	-79.872513	40.301966
US STEEL CORP - CLAIRTON PLANT	002	2012	2	30300308	BATTERY 2 FUGITIVES	BATTERY 2, DOOR LEAKS	0.000	0.000	2.270	0.150	1.800	1.630	126.00	0.00	72	0.00	-79.872513	40.301966
US STEEL CORP - CLAIRTON PLANT	002	2012	4	30300314	BATTERY 2 FUGITIVES	BATTERY #2, TOPSIDE LEAKS	0.000	0.000	0.081	0.005	0.065	0.059	126.00	0.00	72	0.00	-79.872513	40.301966
US STEEL CORP - CLAIRTON PLANT	002	2012	5	30300303	BATTERY 2 FUGITIVES	BATTERY #2, SOAKING	9.988	0.282	0.187	0.000	0.539	0.539	126.00	0.00	72	0.00	-79.872513	40.301966
US STEEL CORP - CLAIRTON PLANT	002	2012	6	30300303	BATTERY 2 FUGITIVES	BATTERY 2, DECARBONIZING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.872513	40.301966
US STEEL CORP - CLAIRTON PLANT	003	2013	1	30300302	BATTERY 3 FUGITIVES	BATTERY 3, CHARGING	0.000	0.000	0.140	0.010	0.110	0.100	126.00	0.00	72	0.00	-79.873164	40.302548
US STEEL CORP - CLAIRTON PLANT	003	2013	2	30300308	BATTERY 3 FUGITIVES	BATTERY 3, DOOR LEAKS	0.000	0.000	2.640	0.180	2.076	1.876	126.00	0.00	72	0.00	-79.873164	40.302548
US STEEL CORP - CLAIRTON PLANT	003	2013	4	30300314	BATTERY 3 FUGITIVES	BATTERY #3 TOPSIDE LEAKS	0.000	0.000	0.081	0.006	0.064	0.058	126.00	0.00	72	0.00	-79.873164	40.302548
US STEEL CORP - CLAIRTON PLANT	003	2013	5	30300303	BATTERY 3 FUGITIVES	BATTERY #3, SOAKING	9.988	0.282	0.187	0.000	0.539	0.539	126.00	0.00	72	0.00	-79.873164	40.302548
US STEEL CORP - CLAIRTON PLANT	003	2013	6	30300303	BATTERY 3 FUGITIVES	BATTERY 3, DECARBONIZING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.873164	40.302548
US STEEL CORP - CLAIRTON PLANT	004	2014	1	30300302	BATTERY 7 FUGITIVES	BATTERY 7, CHARGING	0.000	0.000	0.140	0.010	0.110	0.100	126.00	0.00	72	0.00	-79.870853	40.301542
US STEEL CORP - CLAIRTON PLANT	004	2014	2	30300308	BATTERY 7 FUGITIVES	BATTERY 7, DOOR LEAKS	0.000	0.000	2.080	0.140	1.662	1.502	126.00	0.00	72	0.00	-79.870853	40.301542
US STEEL CORP - CLAIRTON PLANT	004	2014	4	30300314	BATTERY 7 FUGITIVES	BATTERY #7, TOPSIDE LEAKS	0.000	0.000	0.072	0.005	0.064	0.059	126.00	0.00	72	0.00	-79.870853	40.301542
US STEEL CORP - CLAIRTON PLANT	004	2014	5	30300303	BATTERY 7 FUGITIVES	BATTERY 7, SOAKING	3.762	0.295	0.191	0.000	0.563	0.563	126.00	0.00	72	0.00	-79.870853	40.301542
US STEEL CORP - CLAIRTON PLANT	004	2014	6	30300303	BATTERY 7 FUGITIVES	BATTERY 7, DECARBONIZING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.870853	40.301542
US STEEL CORP - CLAIRTON PLANT	005	2015	1	30300302	BATTERY 8 FUGITIVES	BATTERY 8, CHARGING	0.000	0.000	0.140	0.010	0.107	0.100	126.00	0.00	72	0.00	-79.871828	40.302406
US STEEL CORP - CLAIRTON PLANT	005	2015	2	30300308	BATTERY 8 FUGITIVES	BATTERY 8, DOOR LEAKS	0.000	0.000	2.168	0.150	1.727	1.557	126.00	0.00	72	0.00	-79.871828	40.302406
US STEEL CORP - CLAIRTON PLANT	005	2015	4	30300314	BATTERY 8 FUGITIVES	BATTERY #8, TOPSIDE LEAKS	0.000	0.000	0.070	0.005	0.064	0.058	126.00	0.00	72	0.00	-79.871828	40.302406
US STEEL CORP - CLAIRTON PLANT	005	2015	5	30300303	BATTERY 8 FUGITIVES	BATTERY #8, SOAKING	3.762	0.295	0.191	0.000	0.563	0.563	126.00	0.00	72	0.00	-79.871828	40.302406

FACNAME	PTID	STKID	SEGID	SCC	UNIT DESCRIPTION	PROCESS DESCRIPTION	SO2	NOx	VOC	NH3	PM10	PM2.5	HGHT	DIAM	TEMP	VEL	XCOORD	YCOORD
US STEEL CORP - CLAIRTON PLANT	005	2015	6	30300303	BATTERY 8 FUGITIVES	BATTERY 8, DECARBONIZING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.871828	40.302406
US STEEL CORP - CLAIRTON PLANT	006	2016	1	30300302	BATTERY 9 FUGITIVES	BATTERY 9, CHARGING	0.000	0.000	0.140	0.010	0.110	0.100	126.00	0.00	72	0.00	-79.872507	40.303016
US STEEL CORP - CLAIRTON PLANT	006	2016	2	30300308	BATTERY 9 FUGITIVES	BATTERY 9, DOOR LEAKS	0.000	0.000	2.480	0.170	1.951	1.761	126.00	0.00	72	0.00	-79.872507	40.303016
US STEEL CORP - CLAIRTON PLANT	006	2016	4	30300314	BATTERY 9 FUGITIVES	BATTERY #9, TOPSIDE LEAKS	0.000	0.000	0.093	0.006	0.064	0.058	126.00	0.00	72	0.00	-79.872507	40.303016
US STEEL CORP - CLAIRTON PLANT	006	2016	5	30300303	BATTERY 9 FUGITIVES	BATTERY #9, SOAKING	3.762	0.295	0.191	0.000	0.563	0.563	126.00	0.00	72	0.00	-79.872507	40.303016
US STEEL CORP - CLAIRTON PLANT	006	2016	6	30300303	BATTERY 9 FUGITIVES	BATTERY 9, DECARBONIZING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.872507	40.303016
US STEEL CORP - CLAIRTON PLANT	007	2017	1	30300302	BATTERY 13 FUGITIVES	BATTERY 13, CHARGING	0.000	0.000	0.140	0.010	0.110	0.099	126.00	0.00	72	0.00	-79.876974	40.304339
US STEEL CORP - CLAIRTON PLANT	007	2017	2	30300308	BATTERY 13 FUGITIVES	BATTERY 13, DOOR LEAKS	0.000	0.000	2.160	0.150	1.701	1.531	126.00	0.00	72	0.00	-79.876974	40.304339
US STEEL CORP - CLAIRTON PLANT	007	2017	4	30300314	BATTERY 13 FUGITIVES	BATTERY #13 TOPSIDE LEAKS	0.000	0.000	0.086	0.006	0.064	0.058	126.00	0.00	72	0.00	-79.876974	40.304339
US STEEL CORP - CLAIRTON PLANT	007	2017	5	30300303	BATTERY 13 FUGITIVES	BATTERY #13, SOAKING	0.633	0.363	0.151	0.000	0.100	0.100	126.00	0.00	72	0.00	-79.876974	40.304339
US STEEL CORP - CLAIRTON PLANT	007	2017	6	30300303	BATTERY 13 FUGITIVES	BATTERY 13, DECARBONIZING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.876974	40.304339
US STEEL CORP - CLAIRTON PLANT	008	2018	1	30300302	BATTERY 14 FUGITIVES	BATTERY 14, CHARGING	0.000	0.000	0.140	0.010	0.110	0.100	126.00	0.00	72	0.00	-79.877701	40.304977
US STEEL CORP - CLAIRTON PLANT	008	2018	2	30300308	BATTERY 14 FUGITIVES	BATTERY 14, DOOR LEAKS	0.000	0.000	2.080	0.140	1.637	1.477	126.00	0.00	72	0.00	-79.877701	40.304977
US STEEL CORP - CLAIRTON PLANT	008	2018	4	30300314	BATTERY 14 FUGITIVES	BATTERY #14 TOPSIDE LEAKS	0.000	0.000	0.093	0.006	0.064	0.058	126.00	0.00	72	0.00	-79.877701	40.304977
US STEEL CORP - CLAIRTON PLANT	008	2018	5	30300303	BATTERY 14 FUGITIVES	BATTERY #14, SOAKING	0.633	0.363	0.151	0.000	0.100	0.100	126.00	0.00	72	0.00	-79.877701	40.304977
US STEEL CORP - CLAIRTON PLANT	008	2018	6	30300303	BATTERY 14 FUGITIVES	BATTERY 14, DECARBONIZING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.877701	40.304977
US STEEL CORP - CLAIRTON PLANT	009	2019	1	30300302	BATTERY 15 FUGITIVES	BATTERY 15, CHARGING	0.000	0.000	0.140	0.010	0.113	0.103	126.00	0.00	72	0.00	-79.878537	40.305725
US STEEL CORP - CLAIRTON PLANT	009	2019	2	30300308	BATTERY 15 FUGITIVES	BATTERY 15, DOOR LEAKS	0.000	0.000	2.000	0.130	1.578	1.418	126.00	0.00	72	0.00	-79.878537	40.305725
US STEEL CORP - CLAIRTON PLANT	009	2019	4	30300314	BATTERY 15 FUGITIVES	BATTERY #15 TOPSIDE LEAKS	0.000	0.000	0.064	0.004	0.064	0.058	126.00	0.00	72	0.00	-79.878537	40.305725
US STEEL CORP - CLAIRTON PLANT	009	2019	5	30300303	BATTERY 15 FUGITIVES	BATTERY #15, SOAKING	0.633	0.363	0.151	0.000	0.100	0.100	126.00	0.00	72	0.00	-79.878537	40.305725
US STEEL CORP - CLAIRTON PLANT	009	2019	6	30300303	BATTERY 15 FUGITIVES	BATTERY 15, DECARBONIZING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.878537	40.305725
US STEEL CORP - CLAIRTON PLANT	010	2020	1	30300302	BATTERY 19 FUGITIVES	BATTERY 19, CHARGING	0.000	0.000	0.180	0.012	0.140	0.124	126.00	0.00	72	0.00	-79.877862	40.304047
US STEEL CORP - CLAIRTON PLANT	010	2020	2	30300308	BATTERY 19 FUGITIVES	BATTERY 19, DOOR LEAKS	0.000	0.000	2.760	0.190	2.175	1.965	126.00	0.00	72	0.00	-79.877862	40.304047
US STEEL CORP - CLAIRTON PLANT	010	2020	4	30300314	BATTERY 19 FUGITIVES	BATTERY #19 TOPSIDE LEAKS	0.000	0.000	0.060	0.004	0.050	0.047	126.00	0.00	72	0.00	-79.877862	40.304047
US STEEL CORP - CLAIRTON PLANT	010	2020	5	30300303	BATTERY 19 FUGITIVES	BATTERY #19, SOAKING	3.212	0.555	0.222	0.000	1.766	1.766	126.00	0.00	72	0.00	-79.877862	40.304047
US STEEL CORP - CLAIRTON PLANT	010	2020	6	30300303	BATTERY 19 FUGITIVES	BATTERY 19, DECARBONIZING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.877862	40.304047
US STEEL CORP - CLAIRTON PLANT	011	2021	1	30300302	BATTERY 20 FUGITIVES	BATTERY 20, CHARGING	0.000	0.000	0.170	0.012	0.140	0.124	126.00	0.00	72	0.00	-79.878922	40.304975
US STEEL CORP - CLAIRTON PLANT	011	2021	2	30300308	BATTERY 20 FUGITIVES	BATTERY 20, DOOR LEAKS	0.000	0.000	3.051	0.210	2.428	2.188	126.00	0.00	72	0.00	-79.878922	40.304975
US STEEL CORP - CLAIRTON PLANT	011	2021	4	30300314	BATTERY 20 FUGITIVES	BATTERY 20, TOPSIDE LEAKS	0.000	0.000	0.054	0.004	0.045	0.042	126.00	0.00	72	0.00	-79.878922	40.304975
US STEEL CORP - CLAIRTON PLANT	011	2021	5	30300303	BATTERY 20 FUGITIVES	BATTERY #20, SOAKING	3.212	0.555	0.222	0.000	1.766	1.766	126.00	0.00	72	0.00	-79.878922	40.304975
US STEEL CORP - CLAIRTON PLANT	011	2021	6	30300303	BATTERY 20 FUGITIVES	BATTERY 20, DECARBONIZING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.878922	40.304975
US STEEL CORP - CLAIRTON PLANT	012	2022	1	30300302	BATTERY B FUGITIVES	BATTERY B CHARGING	0.000	0.000	0.170	0.012	0.140	0.130	126.00	0.00	72	0.00	-79.875556	40.305705
US STEEL CORP - CLAIRTON PLANT	012	2022	2	30300308	BATTERY B FUGITIVES	BATTERY B, DOOR LEAKS	0.000	0.000	3.620	0.250	1.980	1.880	126.00	0.00	72	0.00	-79.875556	40.305705
US STEEL CORP - CLAIRTON PLANT	012	2022	4	30300314	BATTERY B FUGITIVES	BATTERY B, TOPSIDE LEAKS	0.000	0.000	0.035	0.002	0.026	0.025	126.00	0.00	72	0.00	-79.875556	40.305705
US STEEL CORP - CLAIRTON PLANT	012	2022	5	30300303	BATTERY B FUGITIVES	BATTERY #B, SOAKING	3.174	0.699	0.278	0.000	2.218	2.218	126.00	0.00	72	0.00	-79.875556	40.305705
US STEEL CORP - CLAIRTON PLANT	012	2022	6	30300303	BATTERY B FUGITIVES	BATTERY B, DECARBONIZING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.875556	40.305705
US STEEL CORP - CLAIRTON PLANT	013	13	1	30300306	BATTERY 1 UNDERFIRING	BATTERY 1, UNDERFIRING	37.898	226.061	1.841	0.014	9.736	9.321	225.00	8.00	488	24.90	-79.871963	40.301580
US STEEL CORP - CLAIRTON PLANT	014	14	1	30300306	BATTERY 2 UNDERFIRING	BATTERY 2, UNDERFIRING	32.126	259.398	0.464	0.014	11.146	10.631	225.00	8.00	502	25.30	-79.872044	40.301653
US STEEL CORP - CLAIRTON PLANT	015	15	1	30300306	BATTERY 3, UNDERFIRING	BATTERY 3, UNDERFIRING	34.830	305.672	4.893	0.014	10.416	10.034	226.00	8.00	511	24.20	-79.873388	40.302928
US STEEL CORP - CLAIRTON PLANT	016	16	1	30300306	BATTERY 7, UNDERFIRING	BATTERY 7, UNDERFIRING	32.209	372.857	13.809	0.014	11.712	11.314	225.00	9.50	505	19.90	-79.871558	40.301847
US STEEL CORP - CLAIRTON PLANT	017	17	1	30300306	BATTERY 8, UNDERFIRING	BATTERY 8, UNDERFIRING	30.979	238.060	1.282	0.014	8.230	7.831	225.00	9.50	552	17.80	-79.871640	40.301911
US STEEL CORP - CLAIRTON PLANT	018	18	1	30300306	BATTERY 9, UNDERFIRING	BATTERY 9, UNDERFIRING	31.949	347.214	1.767	0.014	6.896	6.567	225.00	9.50	493	22.40	-79.872995	40.303194
US STEEL CORP - CLAIRTON PLANT	019	19	1	30300306	BATTERY 13, UNDERFIRING	BATTERY 13, UNDERFIRING	30.487	168.279	2.548	0.095	7.386	6.423	225.00	10.00	441	14.70	-79.877480	40.304526
US STEEL CORP - CLAIRTON PLANT	020	20	1	30300306	BATTERY 14, UNDERFIRING	BATTERY 14, UNDERFIRING	24.899	140.018	1.884	0.357	8.671	7.836	225.00	10.00	440	14.10	-79.877549	40.304626
US STEEL CORP - CLAIRTON PLANT	021	21	1	30300306	BATTERY 15, UNDERFIRING	BATTERY 15, UNDERFIRING	47.379	201.892	0.214	0.227	15.394	13.831	225.00	10.00	441	14.70	-79.878975	40.305919
US STEEL CORP - CLAIRTON PLANT	022	22	1	30300306	BATTERY 19, UNDERFIRING	BATTERY 19, UNDERFIRING	81.915	452.178	99.283	0.163	20.013	19.001	250.00	15.50	475	12.20	-79.878887	40.304134
US STEEL CORP - CLAIRTON PLANT	023	23	1	30300306	BATTERY 20, UNDERFIRING	BATTERY 20, UNDERFIRING	57.396	819.145	136.763	0.503	21.646	21.058	250.00	15.50	516	14.00	-79.879060	40.304289
US STEEL CORP - CLAIRTON PLANT	024	24	1	30300306	BATTERY B, UNDERFIRING	BATTERY B, UNDERFIRING	80.984	388.525	5.984	0.029	35.287	33.730	315.00	16.25	468	16.60	-79.876467	40.306705
US STEEL CORP - CLAIRTON PLANT	025	25	1	30300303	PEC SYSTEM, BATTERIES 1-3	PEC BAGHOUSE STACK	42.710	8.294	0.735	0.099	4.177	3.859	82.00	4.00	125	29.00	-79.872159	40.301844
US STEEL CORP - CLAIRTON PLANT	025	930	2	30300303	PEC SYSTEM, BATTERIES 1-3	TRAVELING HOT CAR	34.332	9.205	0.074	0.010	7.409	2.732	126.00	0.00	72	0.00	-79.872513	40.301966
US STEEL CORP - CLAIRTON PLANT	025	935	3	30300303	PEC SYSTEM, BATTERIES 1-3	PEC FUGITIVES	5.811	1.142	0.100	0.013	32.668	12.853	126.00	0.00	72	0.00	-79.872513	40.301966
US STEEL CORP - CLAIRTON PLANT	025	935	6	30300303	PEC SYSTEM, BATTERIES 1-3	PRE PUSH	0.498	0.144	0.090	0.000	4.712	4.637	126.00	0.00	72	0.00	-79.872513	40.301966
US STEEL CORP - CLAIRTON PLANT	025	940	4	30300303	PEC SYSTEM, BATTERIES 1-3	UNCONTROLLED PUSHING	0.092	0.018	0.002	0.000	0.503	0.184	126.00	0.00	72	0.00	-79.872513	40.301966
US STEEL CORP - CLAIRTON PLANT	025	2023	5	30300303	PEC SYSTEM, BATTERIES 1-3	BALL MILL	0.000	0.000	0.000	0.000	0.004	0.004	50.00	0.00	72	0.00	-79.872258	40.301529
US STEEL CORP - CLAIRTON PLANT	026	26	1	30300303	PEC SYSTEM, BATTERIES 7-9	PEC BAGHOUSE STACK	44.472	8.636	0.791	0.103	3.946	3.648	82.00	4.00	125	28.40	-79.872063	40.301924
US STEEL CORP - CLAIRTON PLANT	026	931	2	30300303	PEC SYSTEM, BATTERIES 7-9	TRAVELING HOT CAR	35.865	9.616	0.077	0.010	7.740	2.854	126.00	0.00	72	0.00	-79.871828	40.302406
US STEEL CORP - CLAIRTON PLANT	026	936	3	30300303	PEC SYSTEM, BATTERIES 7-9	PEC FUGITIVES	6.050	1.189	0.109	0.014	33.670	13.037	126.00	0.00	72	0.00	-79.871828	40.302406
US STEEL CORP - CLAIRTON PLANT	026	936	6	30300303	PEC SYSTEM, BATTERIES 7-9	PRE PUSH	0.520	0.151	0.094	0.000	4.922	4.844	126.00	0.00	72	0.00	-79.871828	40.302406
US STEEL CORP - CLAIRTON PLANT	026	941	4	30300303	PEC SYSTEM, BATTERIES 7-9	UNCONTROLLED PUSHING	0.261	0.051	0.004	0.001	1.425	0.521	126.00	0.00	72	0.00	-79.871828	40.302406
US STEEL CORP - CLAIRTON PLANT	026	2024	5	30300303	PEC SYSTEM, BATTERIES 7-9	BALL MILL	0.000	0.000	0.000	0.000	0.004	0.004	50.00	0.00	72	0.00	-79.871581	40.301901

FACNAME	PTID	STKID	SEGID	SCC	UNIT DESCRIPTION	PROCESS DESCRIPTION	SO2	NOx	VOC	NH3	PM10	PM2.5	HGHT	DIAM	TEMP	VEL	XCOORD	YCOORD
US STEEL CORP - CLAIRTON PLANT	027	27	1	30300303	PEC SYSTEM, BATT. 13-15	PEC BAGHOUSE STACK	54.207	10.526	1.034	0.126	3.076	2.803	82.00	3.00	125	55.60	-79.878565	40.305086
US STEEL CORP - CLAIRTON PLANT	027	932	2	30300303	PEC SYSTEM, BATT. 13-15	TRAVELING HOT CAR	44.318	11.882	0.105	0.013	9.564	3.526	126.00	0.00	72	0.00	-79.877701	40.304977
US STEEL CORP - CLAIRTON PLANT	027	937	3	30300303	PEC SYSTEM, BATT. 13-15	PEC FUGITIVES	7.375	1.450	0.141	0.017	39.344	15.329	126.00	0.00	72	0.00	-79.877701	40.304977
US STEEL CORP - CLAIRTON PLANT	027	937	6	30300303	PEC SYSTEM, BATT. 13-15	PRE PUSH	0.642	0.186	0.116	0.000	6.082	5.986	126.00	0.00	72	0.00	-79.877701	40.304977
US STEEL CORP - CLAIRTON PLANT	027	942	4	30300303	PEC SYSTEM, BATT. 13-15	UNCONTROLLED PUSHING	1.174	0.228	0.018	0.002	6.388	2.317	126.00	0.00	72	0.00	-79.877701	40.304977
US STEEL CORP - CLAIRTON PLANT	027	2025	5	30300303	PEC SYSTEM, BATT. 13-15	BALL MILL	0.000	0.000	0.000	0.000	0.005	0.005	50.00	0.00	72	0.00	-79.878091	40.305280
US STEEL CORP - CLAIRTON PLANT	028	28	1	30300303	PEC SYSTEM, BATT. 19-20	PEC BAGHOUSE STACK	55.309	10.740	0.875	0.129	2.751	2.518	82.00	3.00	89	51.20	-79.878624	40.305042
US STEEL CORP - CLAIRTON PLANT	028	933	2	30300303	PEC SYSTEM, BATT. 19-20	TRAVELING HOT CAR	45.055	12.080	0.089	0.013	9.723	3.585	126.00	0.00	72	0.00	-79.878380	40.304512
US STEEL CORP - CLAIRTON PLANT	028	938	3	30300303	PEC SYSTEM, BATT. 19-20	PEC FUGITIVES	7.525	1.479	0.119	0.017	40.498	15.802	126.00	0.00	72	0.00	-79.878380	40.304512
US STEEL CORP - CLAIRTON PLANT	028	938	6	30300303	PEC SYSTEM, BATT. 19-20	PRE PUSH	0.653	0.189	0.117	0.000	6.184	6.086	126.00	0.00	72	0.00	-79.878380	40.304512
US STEEL CORP - CLAIRTON PLANT	028	943	4	30300303	PEC SYSTEM, BATT. 19-20	UNCONTROLLED PUSHING	0.964	0.187	0.015	0.002	5.244	1.899	126.00	0.00	72	0.00	-79.878380	40.304512
US STEEL CORP - CLAIRTON PLANT	028	2026	5	30300303	PEC SYSTEM, BATT. 19-20	BALL MILL	0.000	0.000	0.000	0.000	0.017	0.010	50.00	0.00	72	0.00	-79.878291	40.304561
US STEEL CORP - CLAIRTON PLANT	029	29	1	30300303	PEC SYSTEM, BATTERY B	PEC BAGHOUSE STACK	38.115	7.418	0.971	0.082	45.805	42.208	51.00	4.00	125	45.20	-79.877296	40.307092
US STEEL CORP - CLAIRTON PLANT	029	934	2	30300303	PEC SYSTEM, BATTERY B	TRAVELING HOT CAR	21.311	5.697	0.039	0.003	0.641	0.395	126.00	0.00	72	0.00	-79.875556	40.305705
US STEEL CORP - CLAIRTON PLANT	029	939	3	30300303	PEC SYSTEM, BATTERY B	PEC FUGITIVES	2.004	0.389	0.051	0.004	10.734	5.119	126.00	0.00	72	0.00	-79.875556	40.305705
US STEEL CORP - CLAIRTON PLANT	029	939	6	30300303	PEC SYSTEM, BATTERY B	PRE PUSH	0.271	0.078	0.049	0.000	2.512	2.505	126.00	0.00	72	0.00	-79.875556	40.305705
US STEEL CORP - CLAIRTON PLANT	029	944	4	30300303	PEC SYSTEM, BATTERY B	UNCONTROLLED PUSHING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.875556	40.305705
US STEEL CORP - CLAIRTON PLANT	029	2027	5	30300303	PEC SYSTEM, BATTERY B	BALL MILL	0.000	0.000	0.000	0.000	0.003	0.003	50.00	0.00	72	0.00	-79.875258	40.305117
US STEEL CORP - CLAIRTON PLANT	030	945	1	30300304	QUENCH TOWER #1	QUENCH TOWER #1	8.707	0.000	29.854	0.105	112.112	112.112	100.00	22.30	186	11.60	-79.870908	40.300642
US STEEL CORP - CLAIRTON PLANT	031	946	1	30300304	QUENCH TOWER #3	QUENCH TOWER #3	9.096	0.000	31.187	0.109	114.564	114.564	100.00	22.30	186	11.60	-79.870490	40.300989
US STEEL CORP - CLAIRTON PLANT	032	947	1	30300304	QUENCH TOWER #5	QUENCH TOWER #5	11.240	0.000	38.537	0.135	27.368	27.368	100.00	23.30	186	11.60	-79.876293	40.303695
US STEEL CORP - CLAIRTON PLANT	033	948	1	30300304	QUENCH TOWER #7	QUENCH TOWER #7	11.427	0.000	39.178	0.137	97.887	97.887	122.00	28.90	193	9.80	-79.876839	40.303421
US STEEL CORP - CLAIRTON PLANT	034	949	1	30300304	QUENCH TOWER #B	QUENCH TOWER #B	7.172	0.000	24.590	0.086	66.675	66.675	135.00	31.20	204	14.10	-79.876742	40.306420
US STEEL CORP - CLAIRTON PLANT	035	50	1	10200707	BOILER #1, STCK S31	BOILER #1, COG, STACK S31	274.327	260.668	2.321	0.409	20.041	17.061	190.00	8.75	364	97.00	-79.881586	40.309566
US STEEL CORP - CLAIRTON PLANT	035	50	2	10200601	BOILER #1, STCK S31	BOILER #1, NG, STACK S31	0.217	79.709	1.986	0.000	2.744	2.744	190.00	8.75	364	97.00	-79.881586	40.309566
US STEEL CORP - CLAIRTON PLANT	038	53	1	10200707	BOILER #2, STCK S32	BOILER #2, COG, STACK S32	167.426	212.711	1.900	0.335	16.412	13.972	190.00	7.00	303	72.00	-79.881762	40.309595
US STEEL CORP - CLAIRTON PLANT	038	53	2	10200601	BOILER #2, STCK S32	BOILER #2, NG, STACK S32	0.159	54.090	1.455	0.000	2.010	2.010	190.00	7.00	303	72.00	-79.881762	40.309595
US STEEL CORP - CLAIRTON PLANT	047	59	1	10200707	BOILER R1, STACK S36	BOILER R1, COG, STACK S36	26.730	27.350	0.548	0.056	2.725	2.320	165.00	8.50	433	24.50	-79.883179	40.308581
US STEEL CORP - CLAIRTON PLANT	049	59	1	10200707	BOILER R2, STACK S36	BOILER R2, COG, STACK S36	10.898	13.253	0.266	0.026	1.269	1.081	165.00	8.50	433	24.50	-79.883179	40.308581
US STEEL CORP - CLAIRTON PLANT	051	62	1	10200707	BOILER T1, STACK S38	BOILER T1, COG, STACK S38	13.520	13.854	0.057	0.032	1.558	1.326	87.00	4.80	433	29.70	-79.883739	40.308181
US STEEL CORP - CLAIRTON PLANT	053	63	1	10200707	BOILER T2, STACK S39	BOILER T2, COG, STACK S39	12.413	11.336	0.027	0.032	1.558	1.326	87.00	4.80	433	29.70	-79.883855	40.308254
US STEEL CORP - CLAIRTON PLANT	055	2028	1	30300331	TAR/FL DECANTERS	TAR/FL DECANTERS	0.000	0.000	0.320	0.020	0.000	0.000	10.00	0.00	72	0.00	-79.877269	40.305247
US STEEL CORP - CLAIRTON PLANT	056	2028	1	30300333	FL CIRC./SURGE TANKS	FL CIRC./SURGE TANKS	0.000	0.000	0.290	0.020	0.000	0.000	10.00	0.00	72	0.00	-79.877269	40.305247
US STEEL CORP - CLAIRTON PLANT	057	2028	1	30300336	TAR STORAGE/SEP TANKS	TAR STORAGE/SEP TANKS	0.000	0.000	0.120	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.877269	40.305247
US STEEL CORP - CLAIRTON PLANT	058	2028	1	30300335	WEIR TANK/INTERCEPT SUMP	WEIR TANK/INTERCEPT SUMP	0.000	0.000	0.000	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.877269	40.305247
US STEEL CORP - CLAIRTON PLANT	059	2028	1	30300341	FINAL COOLER SUMP	FINAL COOLER SUMP	0.000	0.000	1.695	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.877269	40.305247
US STEEL CORP - CLAIRTON PLANT	060	2028	1	30300333	FL PUMPHOUSE SUMPS	FL PUMPHOUSE SUMPS	0.000	0.000	0.140	0.020	0.000	0.000	10.00	0.00	72	0.00	-79.877269	40.305247
US STEEL CORP - CLAIRTON PLANT	061	2028	1	30300331	EQUIPMENT LEAKS/SAMP CONN	EQUIPMENT LEAKS/SAMP CONN	0.000	0.000	1.220	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.877269	40.305247
US STEEL CORP - CLAIRTON PLANT	062	2028	1	30300331	TAR COLLECTING TANKS	TAR COLLECTING TANKS	0.000	0.000	0.003	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.877269	40.305247
US STEEL CORP - CLAIRTON PLANT	063	975	1	30300305	CONTINUOUS COAL UNLOADERS	COAL UNLOADER #1	0.000	0.000	0.000	0.000	0.186	0.057	50.00	0.00	72	0.00	-79.872876	40.304397
US STEEL CORP - CLAIRTON PLANT	063	975	2	30300305	CONTINUOUS COAL UNLOADERS	COAL UNLOADER #2	0.000	0.000	0.000	0.000	0.168	0.052	50.00	0.00	72	0.00	-79.872876	40.304397
US STEEL CORP - CLAIRTON PLANT	064	973	1	30300305	PEDESTAL CRANE UNLOADER	PEDESTAL CRANE UNLOADER	0.000	0.000	0.000	0.000	0.009	0.003	50.00	0.00	72	0.00	-79.872876	40.304397
US STEEL CORP - CLAIRTON PLANT	065	974	1	30300305	CLAM SHELL UNLOADER	CLAM SHELL UNLOADER	0.000	0.000	0.000	0.000	0.023	0.007	50.00	0.00	72	0.00	-79.872876	40.304397
US STEEL CORP - CLAIRTON PLANT	066	975	1	30300305	COAL TRANSFER	COAL TRANSFER	0.000	0.000	0.000	0.000	0.354	0.109	50.00	0.00	72	0.00	-79.872876	40.304397
US STEEL CORP - CLAIRTON PLANT	067	975	1	30300310	#1 PULVERIZERS	#1 PULVERIZER, PRIMARY	0.000	0.000	0.000	0.000	0.033	0.008	50.00	0.00	72	0.00	-79.871291	40.303069
US STEEL CORP - CLAIRTON PLANT	067	975	2	30300310	#1 PULVERIZERS	#1 PULVERIZER, SECONDARY	0.000	0.000	0.000	0.000	0.000	0.000	50.00	0.00	72	0.00	-79.875505	40.306543
US STEEL CORP - CLAIRTON PLANT	068	975	1	30300310	#2 PULVERIZERS	#2 PULVERIZER, PRIMARY	0.000	0.000	0.000	0.000	0.004	0.001	50.00	0.00	72	0.00	-79.871186	40.302987
US STEEL CORP - CLAIRTON PLANT	068	975	2	30300310	#2 PULVERIZERS	#2 PULVERIZER, SECONDARY	0.000	0.000	0.000	0.000	0.000	0.000	50.00	0.00	72	0.00	-79.875400	40.306461
US STEEL CORP - CLAIRTON PLANT	069	978	1	30300316	COAL STORAGE-BINS/BUNKERS	COAL STORAGE-BINS/BUNKERS	0.000	0.000	0.000	0.000	0.011	0.003	45.00	0.00	72	0.00	-79.889072	40.309480
US STEEL CORP - CLAIRTON PLANT	070	979	1	30300316	COAL STORAGE PILE EROSION	COAL STORAGE PILE EROSION	0.000	0.000	0.000	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.889072	40.309480
US STEEL CORP - CLAIRTON PLANT	071	980	1	30300309	COKE TRANSFER 1-3, 7-9, B	COKE TRANSFER 1-3, 7-9, B	0.000	0.000	0.000	0.000	1.841	0.585	7.00	3.00	150	5.00	-79.873221	40.303143
US STEEL CORP - CLAIRTON PLANT	072	981	1	30300309	COKE TRANSFER 13-15/19-20	COKE TRANSFER 13-15/19-20	0.000	0.000	0.000	0.000	1.589	0.505	7.00	3.00	150	3.80	-79.876624	40.303516
US STEEL CORP - CLAIRTON PLANT	073	982	1	30300312	COKE PILE, LOAD/UNLOAD	COKE PILE, LOAD/UNLOAD	0.000	0.000	0.000	0.000	0.097	0.031	50.00	6.40	72	1.00	-79.881614	40.300327
US STEEL CORP - CLAIRTON PLANT	074	983	1	30300312	SCREEN STATION 1-3, 7-9	SCREEN STATION 1-3, 7-9	0.000	0.000	0.000	0.000	0.288	0.020	85.00	37.70	72	2.00	-79.873106	40.302862
US STEEL CORP - CLAIRTON PLANT	074	983	2	30300312	SCREEN STATION 1-3, 7-9	SCR. STN 1-3/7-9 LOADOUT	0.000	0.000	0.000	0.000	0.662	0.210	85.00	37.70	72	2.00	-79.873106	40.302862
US STEEL CORP - CLAIRTON PLANT	075	984	1	30300312	SCREEN STN 13-15, 19-20	SCREEN STN 13-15, 19-20	0.000	0.000	0.000	0.000	0.346	0.023	85.00	37.70	72	2.00	-79.879317	40.305886
US STEEL CORP - CLAIRTON PLANT	075	984	2	30300312	SCREEN STN 13-15, 19-20	SCRN 13-15/19-20 LOADOUT	0.000	0.000	0.000	0.000	0.795	0.252	85.00	37.70	72	2.00	-79.879317	40.305886
US STEEL CORP - CLAIRTON PLANT	076	985	1	30300312	SCREENING STATION B	SCREENING STATION B BAGHS	0.000	0.000	0.000	0.000	1.979	0.134	50.00	2.50	72	2.00	-79.873323	40.303432
US STEEL CORP - CLAIRTON PLANT	076	985	2	30300312	SCREENING STATION B	SCREEN STATION B LOADOUT	0.000	0.000	0.000	0.000	0.258	0.082	50.00	2.50	72	2.00	-79.873323	40.303432
US STEEL CORP - CLAIRTON PLANT	076	985	3	30300312	SCREENING STATION B	SCREENING FUGITIVES - B	0.000	0.000	0.000	0.000	0.198	0.014	50.00	2.50	72	2.00	-79.873323	40.303432

FACNAME	PTID	STKID	SEGID	SCC	UNIT DESCRIPTION	PROCESS DESCRIPTION	SO2	NOx	VOC	NH3	PM10	PM2.5	HGHT	DIAM	TEMP	VEL	XCOORD	YCOORD
US STEEL CORP - CLAIRTON PLANT	077	988	1	30300316	COKE STORAGE PILE EROSION	COKE PILE EROSION	0.000	0.000	0.000	0.000	1.025	0.410	56.00	99.90	72	2.00	-79.882326	40.300375
US STEEL CORP - CLAIRTON PLANT	078	990	1	30399999	BLASTING - BLACK BEAUTY	BLASTING - BLACK BEAUTY	0.000	0.000	0.000	0.000	0.516	0.052	56.20	2.69	72	26.31	-79.876349	40.304578
US STEEL CORP - CLAIRTON PLANT	079	2029	1	30399999	PLANT ROADS	PAVED ROADS	0.000	0.000	0.000	0.000	2.981	0.447	10.00	0.00	72	0.00	-79.872340	40.299831
US STEEL CORP - CLAIRTON PLANT	079	2029	2	30399999	PLANT ROADS	UNPAVED ROADS	0.000	0.000	0.000	0.000	2.838	0.294	10.00	0.00	72	0.00	-79.872340	40.299831
US STEEL CORP - CLAIRTON PLANT	080	2029	1	20300101	MOTOR VEHICLE EXHAUST	HEAVY-DUTY VEHICLES	2.822	42.909	3.503	0.000	6.033	6.033	10.00	0.00	72	0.00	-79.872340	40.299831
US STEEL CORP - CLAIRTON PLANT	081	2029	1	20300101	TUG BOAT EXHAUST	TUG BOAT EXHAUST	1.665	25.313	2.066	0.000	3.559	3.559	10.00	0.00	72	0.00	-79.890486	40.313629
US STEEL CORP - CLAIRTON PLANT	082	2029	1	30399999	FACILITY MAINTENANCE	SAFETY-KLEEN PARTS WASHER	0.000	0.000	1.200	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.872340	40.299831
US STEEL CORP - CLAIRTON PLANT	082	2029	2	30399999	FACILITY MAINTENANCE	PAINTS AND THINNERS	0.000	0.000	36.330	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.872340	40.299831
US STEEL CORP - CLAIRTON PLANT	083	83	1	30399999	SCOT HYDROGENATION UNIT	SCOT STACK	151.790	2.190	24.970	0.000	6.420	6.350	150.00	3.83	689	57.20	-79.875393	40.303353
US STEEL CORP - CLAIRTON PLANT	084	99	1	30399999	COOLING TOWER	COOLING TOWER	0.000	0.000	0.000	0.000	121.220	101.010	72.50	32.00	83	21.39	-79.876653	40.306015
US STEEL CORP - CLAIRTON PLANT	085	2029	1	30399999	FLARING	FLARING	4.712	0.250	0.190	0.021	0.000	0.000	10.00	0.00	72	0.00	-79.875283	40.302873
US STEEL CORP - CLAIRTON PLANT	086	2029	1	30399999	AERATION BASINS - WWTP	AERATION BASINS - WWTP	0.000	0.000	0.000	6.853	0.000	0.000	10.00	0.00	72	0.00	-79.880121	40.307867
US STEEL CORP - CLAIRTON PLANT	087	2029	1	30399999	METHANOL USAGE	AIR LINES	0.000	0.000	7.747	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.875213	40.303134
US STEEL CORP - CLAIRTON PLANT	087	2029	2	30399999	METHANOL USAGE	WINTER LID SLURRY	0.000	0.000	7.180	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.875213	40.303134
US STEEL CORP - CLAIRTON PLANT	087	2029	3	30399999	METHANOL USAGE	STORAGE TANKS	0.000	0.000	0.000	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.875213	40.303134
US STEEL CORP - CLAIRTON PLANT	088	2010	1	39990024	WWT SURGE TANK NH3 FLARE	WWT SURGE TANK NH3 FLARE	0.169	1.681	0.002	0.001	0.000	0.000	27.00	3.50	1925	33.20	-79.879197	40.307074
US STEEL CORP - CLAIRTON PLANT	089	2010	1	39999993	NH3 TANKER LOADING FLARE	NH3 TANKER LOADING FLARE	0.126	37.140	0.022	5.712	0.000	0.000	27.00	3.50	1925	33.20	-79.879197	40.307074
US STEEL CORP - CLAIRTON PLANT	090	2029	1	31000299	COG VENTING	ACCIDENTAL VENT	0.000	0.000	0.000	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.875451	40.303837
US STEEL CORP - CLAIRTON PLANT	091	2030	1	39999996	L.O. COLLECTING TANKS	LO COLLECTING TANKS	0.000	0.000	0.450	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.884258	40.308299
US STEEL CORP - CLAIRTON PLANT	092	2030	1	39999996	L.O. BARGE LOADING	LO BARGE LOADING	0.000	0.000	0.165	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.884258	40.308299
US STEEL CORP - CLAIRTON PLANT	093	2030	1	39999996	L.O. DECANTERS	LO DECANTERS	0.000	0.000	0.060	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.884258	40.308299
US STEEL CORP - CLAIRTON PLANT	65A	974	1	30300305	BOOM CONVEYOR	FRONT END LOADER TO TRUCK	0.000	0.000	0.000	0.000	0.011	0.003	50.00	0.00	72	0.00	-79.891066	40.312828
US STEEL CORP - CLAIRTON PLANT	65A	974	2	30300305	BOOM CONVEYOR	TRUCK TO HOPPER	0.000	0.000	0.000	0.000	0.011	0.003	50.00	0.00	72	0.00	-79.891066	40.312828
US STEEL CORP - CLAIRTON PLANT	65A	974	3	30300305	BOOM CONVEYOR	HOPPER TO CONVEYOR	0.000	0.000	0.000	0.000	0.006	0.002	50.00	0.00	72	0.00	-79.891066	40.312828
US STEEL CORP - CLAIRTON PLANT	65A	974	4	30300305	BOOM CONVEYOR	CONVEYOR TO BARGE	0.000	0.000	0.000	0.000	0.011	0.003	50.00	0.00	72	0.00	-79.891066	40.312828
AKJ Industries	001	1	1	30601001	Sludge Processing	Sludge Processing 1	0.000	0.000	0.015	0.000	0.015	0.015	21.00	0.33	140	4.50	-79.876258	40.307226
AKJ Industries	002	1	1	30601001	Sludge Processing	Sludge Processing 2	0.000	0.000	0.015	0.000	0.015	0.015	21.00	0.33	140	4.50	-79.870488	40.302530
Bekavac Funeral Home	001	1	1	31502101	INCINERATOR	EURICH INCINERATOR	0.004	0.007	0.000	0.000	0.006	0.006	20.00	0.67	200	3.80	-79.885610	40.293582
Dura-Bond Industries	1	4	9	30900207	FUSION BOND PROCESS	FUSION BOND AIR WASH	0.000	0.000	0.000	0.000	1.639	1.639	16.00	1.20	70	70.50	-79.846510	40.326000
Dura-Bond Industries	2	8	2	30900207	EXTRUSION PROCESS(X-TEC)	XTEC WB BH STACK	0.000	0.000	0.000	0.000	0.324	0.324	21.00	1.20	68	70.50	-79.846510	40.326000
Dura-Bond Industries	2	9	1	10300602	EXTRUSION PROCESS(X-TEC)	X-TEC OIL HEATER	0.001	0.127	0.007	0.000	0.010	0.010	7.00	0.50	350	0.10	-79.846390	40.325820
Dura-Bond Industries	2	9999	3	30901699	FUSION BOND PROCESS	FUSION BOND AIR WASH	0.000	0.000	0.000	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.846510	40.326000
Dura-Bond Industries	3	10	1	30300834	ROAD EMISSIONS	ROAD DUST (Haul Trucks)	0.000	0.000	0.000	0.000	0.621	0.061	10.00	0.00	72	0.00	-79.846390	40.326110
Dura-Bond Industries	3	10	2	27000320	ROAD EMISSIONS	FORKLIFT EMISSIONS (Diesel)	0.677	10.293	0.840	0.000	0.724	0.724	10.00	0.00	72	0.00	-79.846390	40.326110
Dura-Bond Industries	3	10	3	30300834	ROAD EMISSIONS	ROAD DUST (Forklifts)	0.000	0.000	0.000	0.000	0.484	0.048	10.00	0.00	72	0.00	-79.846390	40.326110
Dura-Bond Industries	4	5	1	10300603	FUSION BOND OVEN 1	FUSION BOND OVEN 1	0.002	0.389	0.021	0.000	0.030	0.030	32.00	1.70	1200	8.80	-79.846510	40.326000
Dura-Bond Industries	5	6	1	10300603	FUSION BOND OVEN 2	FUSION BOND OVEN 2	0.002	0.389	0.021	0.000	0.030	0.030	32.00	1.70	1200	8.80	-79.846510	40.326000
Dura-Bond Industries	6	7	1	10300603	FUSION BOND OVEN 3	FUSION BOND OVEN 3	0.002	0.389	0.021	0.000	0.030	0.030	32.00	1.70	1200	8.80	-79.846510	40.326000
Dura-Bond Industries	7	2	1	30900207	FUSION BOND WB-1 BH STACK	FUSION BOND WB-1 BH STACK	0.000	0.000	0.000	0.000	0.324	0.324	16.00	1.20	90	70.50	-79.846390	40.326110
Dura-Bond Industries	8	3	1	30900207	FUSION BOND WB-2 BH STACK	FUSION BOND WB-2 BH STACK	0.000	0.000	0.000	0.000	0.324	0.324	16.00	1.20	70	70.50	-79.846390	40.326090
Dura-Bond Industries	9	1	1	10300603	FUSION BOND DRYING OVEN	FUSION BOND DRYING OVEN	0.005	0.779	0.043	0.000	0.059	0.059	32.00	1.70	1200	14.00	-79.846510	40.326000
Dura-Bond Industries	12	10	1	40400107	GASOLINE STORAGE TANK	GASOLINE STORAGE TANK	0.000	0.000	0.122	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.846390	40.326110
Dura-Bond Industries	13	10	1	40400109	DIESEL STORAGE TANK	DIESEL STORAGE TANK	0.000	0.000	0.001	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.846390	40.326110
ELG Metals	P01	1	1	30402201	Scrap Burning	Scrap Burning	0.000	0.420	0.000	0.000	0.960	0.960	13.00	3.35	80	33.00	-79.860344	40.336205
ELG Metals	P02	1	1	20200202	Emergency Generator	Emergency Generator	0.000	0.061	0.002	0.000	0.001	0.001	10.00	0.00	70	0.00	-79.860344	40.336205
ELG Metals	P03	1	1	30499999	Roads	Vehicles	0.000	0.000	0.000	0.000	0.970	0.970	10.00	0.00	70	0.00	-79.860344	40.336205
Mid-Continent Coal & Coke	001	1	1	30300312	SCREENS	SCREENS	0.000	0.000	0.000	0.000	1.194	1.103	70.00	0.00	70	0.00	-79.881296	40.300013
Mid-Continent Coal & Coke	001	1	2	30588801	STORAGE PILES	STORAGE PILES	0.000	0.000	0.000	0.000	0.056	0.056	30.00	0.00	70	0.00	-79.881296	40.300013
Mid-Continent Coal & Coke	001	1	3	30300833	ROAD EMISSIONS	ROAD EMISSIONS	0.000	0.000	0.000	0.000	2.331	0.233	10.00	0.00	70	0.00	-79.881296	40.300013
Mid-Continent Coal & Coke	001	1	4	10201403	EQUIPMENT FUEL USAGE	EQUIPMENT FUEL USAGE	0.376	5.722	0.454	0.000	0.402	0.402	35.00	0.00	70	0.00	-79.881296	40.300013
Mon Valley Transportation	P01	1	1	30510504	DOCK 2	DOCK 2 LOADING	0.000	0.000	0.000	0.000	3.480	1.593	9.00	0.00	70	0.00	-79.885197	40.313258
Mon Valley Transportation	P02	1	1	30510404	RAILCAR	RAILCAR UNLOADING	0.000	0.000	0.000	0.000	0.350	0.350	7.50	0.00	70	0.00	-79.884739	40.313182
Mon Valley Transportation	P03	1	1	30510404	DOCK 3	DOCK 3 UNLOADING	0.000	0.000	0.000	0.000	1.680	0.236	14.00	0.00	70	0.00	-79.883839	40.312795
Mon Valley Transportation	P05	1	1	30510404	DOCK 1	DOCK 1 UNLOADING	0.000	0.000	0.000	0.000	1.200	0.169	11.50	0.00	70	0.00	-79.889735	40.315680
Mon Valley Transportation	R01	1	1	30531090	VEHICLES	TRUCK EMISSIONS	0.000	0.000	0.000	0.000	1.200	1.200	7.50	0.00	70	0.00	-79.882648	40.312945
Mon Valley Transportation	S01	1	1	30510304	STORAGE PILES	EROSION	0.000	0.000	0.000	0.000	0.210	0.210	20.00	0.00	70	0.00	-79.881295	40.312212
Pennsylvania Electric Coil	A03	3	1	39000699	Large Bake Oven	Natural Gas Combustion	0.000	0.075	0.004	0.000	0.006	0.006	39.40	1.20	290	106.10	-79.894687	40.321413
Pennsylvania Electric Coil	A03	3	4	40200803	Large Bake Oven	Coating Evaporation	0.000	0.000	0.010	0.000	0.000	0.000	39.40	1.20	290	106.10	-79.894687	40.321413
Pennsylvania Electric Coil	A04	4	1	39000699	Small Bake Oven	Natural Gas Combustion	0.000	0.078	0.004	0.000	0.006	0.006	41.00	0.70	275	5.00	-79.894687	40.321413
Pennsylvania Electric Coil	A04	4	2	40200803	Small Bake Oven	Coating Evaporation	0.000	0.000	0.115	0.000	0.000	0.000	41.00	0.70	275	5.00	-79.894687	40.321413

FACNAME	PTID	STKID	SEGID	SCC	UNIT DESCRIPTION	PROCESS DESCRIPTION	SO2	NOx	VOC	NH3	PM10	PM2.5	HGHT	DIAM	TEMP	VEL	XCOORD	YCOORD
Pennsylvania Electric Coil	A10	2	1	40201806	Paint Spray Booth	Paint Spray Booth	0.000	0.000	0.540	0.000	0.000	0.000	32.00	2.90	75	15.60	-79.894687	40.321413
Pennsylvania Electric Coil	A14	7	1	39000699	Coil Manufacturing, Oven	Natural Gas Combustion	0.000	0.058	0.003	0.000	0.004	0.004	36.00	0.60	500	0.10	-79.894687	40.321413
Pennsylvania Electric Coil	A14	7	2	40200803	Coil Manufacturing, Oven	Coating Evaporation	0.000	0.000	0.250	0.000	0.000	0.000	36.00	0.60	500	0.10	-79.894687	40.321413
Pennsylvania Electric Coil	A15	9	1	30904030	Skin/Tin Area	Tinning Process	0.000	0.000	0.000	0.000	0.000	0.000	36.00	0.60	70	0.10	-79.894687	40.321413
Pennsylvania Electric Coil	A15	9	2	39000699	Skin/Tin Area	Natural Gas Combustion	0.000	0.006	0.000	0.000	0.000	0.000	36.00	0.60	70	0.10	-79.894687	40.321413
Pennsylvania Electric Coil	A16	10	1	39000699	Gas Insulator	Gas Insulator	0.000	0.003	0.000	0.000	0.000	0.000	36.00	0.60	70	0.10	-79.894687	40.321413
Pennsylvania Electric Coil	A17	1	1	39000699	Coil Pressing Area	Coil Pressing Area	0.000	0.019	0.001	0.000	0.001	0.001	10.00	0.00	72	0.00	-79.894687	40.321413
Pennsylvania Electric Coil	A18	1	1	39000699	Cleaning of Motor Parts	Cleaning of Motor Parts	0.000	0.017	0.001	0.000	0.001	0.001	10.00	0.00	72	0.00	-79.894687	40.321413
Pennsylvania Electric Coil	D03	1	1	40714698	U-372 Storage Area	U-372 Storage Area	0.000	0.000	0.030	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.894687	40.321413
Pennsylvania Electric Coil	D04	1	1	40714698	U-475 Storage Area	U-475 Storage Area	0.000	0.000	0.040	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.894687	40.321413
Pennsylvania Electric Coil	D05	1	1	40714698	TSR-601 Varnish Tank	TSR-601 Varnish Tank	0.000	0.000	0.220	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.894687	40.321413
Pennsylvania Electric Coil	G08	1	1	40202599	Miscellaneous Fugitives	Miscellaneous Fugitives	0.000	0.000	0.750	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.894687	40.321413
Pennsylvania Electric Coil	I02	8	1	10200602	Boiler	Boiler	0.000	0.040	0.002	0.000	0.003	0.003	36.00	0.60	500	0.10	-79.894687	40.321413
Pennsylvania Electric Coil	I03	1	1	10500106	Gas Radient Space Heaters	Gas Radient Space Heaters	0.000	0.020	0.001	0.000	0.001	0.001	10.00	0.00	72	0.00	-79.894687	40.321413
Pennsylvania Electric Coil	P01	5	1	31307002	Small Burnoff Oven	Coating Evaporation	0.000	0.001	0.019	0.000	0.000	0.000	50.00	0.60	1400	15.60	-79.894687	40.321413
Pennsylvania Electric Coil	P01	5	2	39000699	Small Burnoff Oven	Natural Gas Combustion	0.000	0.003	0.000	0.000	0.000	0.000	50.00	0.60	1400	15.60	-79.894687	40.321413
Pennsylvania Electric Coil	P02	6	1	31307002	Large Burnoff Oven	Coating Evaporation	0.001	0.001	0.048	0.000	0.000	0.000	40.00	1.50	1400	21.00	-79.894687	40.321413
Pennsylvania Electric Coil	P02	6	2	39000699	Large Burnoff Oven	Natural Gas Combustion	0.000	0.021	0.001	0.000	0.002	0.002	40.00	1.50	1400	21.00	-79.894687	40.321413
Tech Met	001	1	1	30901501	ETCH LINE 1	MEDIUM TANK ETCH LINE P001	0.000	0.730	0.000	0.000	0.000	0.000	22.00	2.00	70	50.00	-79.893935	40.319889
Tech Met	002	2	2	30901501	ETCH LINE 2	LARGE TANK ETCH LINE P002	0.000	1.000	0.000	0.000	0.000	0.000	22.00	3.00	70	71.00	-79.893935	40.319889
Tech Met	003	3	3	30901501	ETCH LINE 3	CHEMTEX ETCH LINE P003	0.000	0.300	0.000	0.000	0.000	0.000	18.00	2.00	70	25.00	-79.893935	40.319889
Tech Met	004	4	4	30988801	MISCELLANEOUS SOLVENT USAGE	MISCELLANEOUS SOLVENT USAGE	0.000	0.000	1.140	0.000	0.000	0.000	10.00	0.00	70	0.00	-79.893935	40.319889
Tube City IMS Clairton	001	1	1	30400768	Steel Scrap	Steel Scrap Cutting	0.000	0.001	0.000	0.000	0.310	0.310	10.00	0.00	70	0.00	-79.871073	40.298787

FACNAME	UNIT/PROCESS DESCRIPTION	SCC	SCC Description
KOPPERS INC. CLAIRTON PLANT	TAR REFINING, TAR REFINING PROCESS	30184001	Chem Manuf /General Processes /Distillation Units
KOPPERS INC. CLAIRTON PLANT	TAR REFINING, TAR REFINING FUGITIVES	30180001	Chem Manuf /General Processes /Fugitive Leaks
KOPPERS INC. CLAIRTON PLANT	ROD PITCH MANUFACTURING	30199999	Chem Manuf /Other Not Classified /Specify in Comments Field
KOPPERS INC. CLAIRTON PLANT	ROD PITCH MANUFACTURING, ROD PITCH FUGITIVES	30199999	Chem Manuf /Other Not Classified /Specify in Comments Field
KOPPERS INC. CLAIRTON PLANT	1T2 HEATER	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr
KOPPERS INC. CLAIRTON PLANT	2T2 HEATER	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr
KOPPERS INC. CLAIRTON PLANT	PRIMARY FLASH HEATER	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr
KOPPERS INC. CLAIRTON PLANT	PRILL HOT OIL HEATER	39990003	Misc Manuf Indus /Natural Gas: Process Heaters
KOPPERS INC. CLAIRTON PLANT	1T4 HOT OIL HEATER	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr
KOPPERS INC. CLAIRTON PLANT	SECONDARY FLASH HEATER	10100602	Ext Comb /Electric Gen /Natural Gas /Boilers < 100 Million Btu/hr except Tangential
KOPPERS INC. CLAIRTON PLANT	TRANSPORTATION, GASOLINE VEHICLES	20300301	Int Comb /Comm-Inst /Gasoline /Reciprocating
KOPPERS INC. CLAIRTON PLANT	TRANSPORTATION, PAVED ROADS	39999991	Misc Manuf / Indus Processes /Other Not Classified
KOPPERS INC. CLAIRTON PLANT	TRANSPORTATION, UNPAVED ROADS	39999991	Misc Manuf / Indus Processes /Other Not Classified
KOPPERS INC. CLAIRTON PLANT	TRANSPORTATION, DIESEL VEHICLES	20300101	Int Comb /Comm-Inst /Distillate Oil (Diesel) /Reciprocating
KOPPERS INC. CLAIRTON PLANT	LOADING, LIQUID LOADING	40899999	Organic Chem Transport /Specific Liquid /Loading Rack
KOPPERS INC. CLAIRTON PLANT	LOADING, ROD PITCH LOADING	30183001	Chem Manuf /General Processes /Storage/Transfer
KOPPERS INC. CLAIRTON PLANT	CARBON PITCH TANKS	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	PETROLEUM PITCH TANKS	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	TYPE A PITCH TANKS	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	RCO TANKS, RCO REGULAR TANKS	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	RCO TANKS, RCO CO-DISTILLED TANKS	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	PETRO TAR TANKS	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	CARBON BLACK OIL TANKS, CBO REGULAR TANKS	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	CARBON BLACK OIL TANKS, CBO CO-DISTILLED TANKS	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	CREOSOTE PROCESSING, P2 CREOSOTE TANK	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	CREOSOTE PROCESSING, P2 PETROLEUM CREOSOTE	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	NSR TANKS	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	CO-DISTILL MATERIAL TANKS	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	WASTEWATER STORAGE TANKS, WW TANKS UNCONTROLLED	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	DEBENZOL. COAL TAR TANKS	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	SOIL/VAPOR RECOVERY	50400201	Waste Disp /Site Remed /General Processes /Miscellaneous
KOPPERS INC. CLAIRTON PLANT	COOLING TOWER	38500102	Industrial Process Cooling Tower /Natural Draft
KOPPERS INC. CLAIRTON PLANT	CENTRIFUGE OPERATION	30199998	Chem Manuf /Other Not Classified /Specify in Comments Field
KOPPERS INC. CLAIRTON PLANT	PET PITCH PURGING/DEPRESS, PET PITCH CARS AND TRUCKS	40899999	Organic Chem Transport /Specific Liquid /Loading Rack
KOPPERS INC. CLAIRTON PLANT	NEEDLE COKER GAS OIL TANK	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	THERMAL OXIDIZER	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr
US STEEL CORP - CLAIRTON PLANT	BATTERY 1 FUGITIVES, BATTERY 1 CHARGING	30300302	By-product Coke Manuf /Oven Charging
US STEEL CORP - CLAIRTON PLANT	BATTERY 1 FUGITIVES, BATTERY #1, DOOR LEAKS	30300308	By-product Coke Manuf /Oven/Door Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 1 FUGITIVES, BATTERY #1, TOPSIDE LEAKS	30300314	By-product Coke Manuf /Topside Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 1 FUGITIVES, BATTERY #1, SOAKING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 1 FUGITIVES, BATTERY #1, DECARBONIZING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 2 FUGITIVES, BATTERY 2 CHARGING	30300302	By-product Coke Manuf /Oven Charging
US STEEL CORP - CLAIRTON PLANT	BATTERY 2 FUGITIVES, BATTERY 2, DOOR LEAKS	30300308	By-product Coke Manuf /Oven/Door Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 2 FUGITIVES, BATTERY #2, TOPSIDE LEAKS	30300314	By-product Coke Manuf /Topside Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 2 FUGITIVES, BATTERY #2, SOAKING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 2 FUGITIVES, BATTERY 2, DECARBONIZING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 3 FUGITIVES, BATTERY 3, CHARGING	30300302	By-product Coke Manuf /Oven Charging
US STEEL CORP - CLAIRTON PLANT	BATTERY 3 FUGITIVES, BATTERY 3, DOOR LEAKS	30300308	By-product Coke Manuf /Oven/Door Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 3 FUGITIVES, BATTERY #3 TOPSIDE LEAKS	30300314	By-product Coke Manuf /Topside Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 3 FUGITIVES, BATTERY #3, SOAKING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 3 FUGITIVES, BATTERY 3, DECARBONIZING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 7 FUGITIVES, BATTERY 7, CHARGING	30300302	By-product Coke Manuf /Oven Charging
US STEEL CORP - CLAIRTON PLANT	BATTERY 7 FUGITIVES, BATTERY 7, DOOR LEAKS	30300308	By-product Coke Manuf /Oven/Door Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 7 FUGITIVES, BATTERY #7, TOPSIDE LEAKS	30300314	By-product Coke Manuf /Topside Leaks

FACNAME	UNIT/PROCESS DESCRIPTION	SCC	SCC Description
US STEEL CORP - CLAIRTON PLANT	BATTERY 7 FUGITIVES, BATTERY 7, SOAKING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 7 FUGITIVES, BATTERY 7, DECARBONIZING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 8 FUGITIVES, BATTERY 8, CHARGING	30300302	By-product Coke Manuf /Oven Charging
US STEEL CORP - CLAIRTON PLANT	BATTERY 8 FUGITIVES, BATTERY 8, DOOR LEAKS	30300308	By-product Coke Manuf /Oven/Door Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 8 FUGITIVES, BATTERY #8, TOPSIDE LEAKS	30300314	By-product Coke Manuf /Topside Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 8 FUGITIVES, BATTERY #8, SOAKING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 8 FUGITIVES, BATTERY 8, DECARBONIZING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 9 FUGITIVES, BATTERY 9, CHARGING	30300302	By-product Coke Manuf /Oven Charging
US STEEL CORP - CLAIRTON PLANT	BATTERY 9 FUGITIVES, BATTERY 9, DOOR LEAKS	30300308	By-product Coke Manuf /Oven/Door Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 9 FUGITIVES, BATTERY #9, TOPSIDE LEAKS	30300314	By-product Coke Manuf /Topside Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 9 FUGITIVES, BATTERY #9, SOAKING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 9 FUGITIVES, BATTERY 9, DECARBONIZING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 13 FUGITIVES, BATTERY 13, CHARGING	30300302	By-product Coke Manuf /Oven Charging
US STEEL CORP - CLAIRTON PLANT	BATTERY 13 FUGITIVES, BATTERY 13, DOOR LEAKS	30300308	By-product Coke Manuf /Oven/Door Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 13 FUGITIVES, BATTERY #13 TOPSIDE LEAKS	30300314	By-product Coke Manuf /Topside Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 13 FUGITIVES, BATTERY #13, SOAKING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 13 FUGITIVES, BATTERY 13, DECARBONIZING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 14 FUGITIVES, BATTERY 14, CHARGING	30300302	By-product Coke Manuf /Oven Charging
US STEEL CORP - CLAIRTON PLANT	BATTERY 14 FUGITIVES, BATTERY 14, DOOR LEAKS	30300308	By-product Coke Manuf /Oven/Door Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 14 FUGITIVES, BATTERY #14 TOPSIDE LEAKS	30300314	By-product Coke Manuf /Topside Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 14 FUGITIVES, BATTERY #14, SOAKING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 14 FUGITIVES, BATTERY 14, DECARBONIZING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 15 FUGITIVES, BATTERY 15, CHARGING	30300302	By-product Coke Manuf /Oven Charging
US STEEL CORP - CLAIRTON PLANT	BATTERY 15 FUGITIVES, BATTERY 15, DOOR LEAKS	30300308	By-product Coke Manuf /Oven/Door Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 15 FUGITIVES, BATTERY #15 TOPSIDE LEAKS	30300314	By-product Coke Manuf /Topside Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 15 FUGITIVES, BATTERY #15, SOAKING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 15 FUGITIVES, BATTERY 15, DECARBONIZING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 19 FUGITIVES, BATTERY 19, CHARGING	30300302	By-product Coke Manuf /Oven Charging
US STEEL CORP - CLAIRTON PLANT	BATTERY 19 FUGITIVES, BATTERY 19, DOOR LEAKS	30300308	By-product Coke Manuf /Oven/Door Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 19 FUGITIVES, BATTERY #19 TOPSIDE LEAKS	30300314	By-product Coke Manuf /Topside Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 19 FUGITIVES, BATTERY #19, SOAKING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 19 FUGITIVES, BATTERY 19, DECARBONIZING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 20 FUGITIVES, BATTERY 20, CHARGING	30300302	By-product Coke Manuf /Oven Charging
US STEEL CORP - CLAIRTON PLANT	BATTERY 20 FUGITIVES, BATTERY 20, DOOR LEAKS	30300308	By-product Coke Manuf /Oven/Door Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 20 FUGITIVES, BATTERY 20, TOPSIDE LEAKS	30300314	By-product Coke Manuf /Topside Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 20 FUGITIVES, BATTERY #20, SOAKING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 20 FUGITIVES, BATTERY 20, DECARBONIZING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY B FUGITIVES, BATTERY B CHARGING	30300302	By-product Coke Manuf /Oven Charging
US STEEL CORP - CLAIRTON PLANT	BATTERY B FUGITIVES, BATTERY B, DOOR LEAKS	30300308	By-product Coke Manuf /Oven/Door Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY B FUGITIVES, BATTERY B, TOPSIDE LEAKS	30300314	By-product Coke Manuf /Topside Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY B FUGITIVES, BATTERY #B, SOAKING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY B FUGITIVES, BATTERY B, DECARBONIZING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 1 UNDERFIRING, BATTERY 1, UNDERFIRING	30300306	By-product Coke Manuf /Oven Underfiring
US STEEL CORP - CLAIRTON PLANT	BATTERY 2 UNDERFIRING, BATTERY 2, UNDERFIRING	30300306	By-product Coke Manuf /Oven Underfiring
US STEEL CORP - CLAIRTON PLANT	BATTERY 3, UNDERFIRING, BATTERY 3, UNDERFIRING	30300306	By-product Coke Manuf /Oven Underfiring
US STEEL CORP - CLAIRTON PLANT	BATTERY 7, UNDERFIRING, BATTERY 7, UNDERFIRING	30300306	By-product Coke Manuf /Oven Underfiring
US STEEL CORP - CLAIRTON PLANT	BATTERY 8, UNDERFIRING, BATTERY 8, UNDERFIRING	30300306	By-product Coke Manuf /Oven Underfiring
US STEEL CORP - CLAIRTON PLANT	BATTERY 9, UNDERFIRING, BATTERY 9, UNDERFIRING	30300306	By-product Coke Manuf /Oven Underfiring
US STEEL CORP - CLAIRTON PLANT	BATTERY 13, UNDERFIRING, BATTERY 13, UNDERFIRING	30300306	By-product Coke Manuf /Oven Underfiring
US STEEL CORP - CLAIRTON PLANT	BATTERY 14, UNDERFIRING, BATTERY 14, UNDERFIRING	30300306	By-product Coke Manuf /Oven Underfiring
US STEEL CORP - CLAIRTON PLANT	BATTERY 15, UNDERFIRING, BATTERY 15, UNDERFIRING	30300306	By-product Coke Manuf /Oven Underfiring
US STEEL CORP - CLAIRTON PLANT	BATTERY 19, UNDERFIRING, BATTERY 19, UNDERFIRING	30300306	By-product Coke Manuf /Oven Underfiring
US STEEL CORP - CLAIRTON PLANT	BATTERY 20, UNDERFIRING, BATTERY 20, UNDERFIRING	30300306	By-product Coke Manuf /Oven Underfiring
US STEEL CORP - CLAIRTON PLANT	BATTERY B, UNDERFIRING, BATTERY B, UNDERFIRING	30300306	By-product Coke Manuf /Oven Underfiring

FACNAME	UNIT/PROCESS DESCRIPTION	SCC	SCC Description
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERIES 1-3, PEC BAGHOUSE STACK	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERIES 1-3, TRAVELING HOT CAR	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERIES 1-3, PEC FUGITIVES	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERIES 1-3, PRE PUSH	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERIES 1-3, UNCONTROLLED PUSHING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERIES 1-3, BALL MILL	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERIES 7-9, PEC BAGHOUSE STACK	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERIES 7-9, TRAVELING HOT CAR	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERIES 7-9, PEC FUGITIVES	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERIES 7-9, PRE PUSH	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERIES 7-9, UNCONTROLLED PUSHING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERIES 7-9, BALL MILL	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 13-15, PEC BAGHOUSE STACK	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 13-15, TRAVELING HOT CAR	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 13-15, PEC FUGITIVES	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 13-15, PRE PUSH	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 13-15, UNCONTROLLED PUSHING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 13-15, BALL MILL	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 19-20, PEC BAGHOUSE STACK	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 19-20, TRAVELING HOT CAR	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 19-20, PEC FUGITIVES	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 19-20, PRE PUSH	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 19-20, UNCONTROLLED PUSHING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 19-20, BALL MILL	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERY B, PEC BAGHOUSE STACK	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERY B, TRAVELING HOT CAR	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERY B, PEC FUGITIVES	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERY B, PRE PUSH	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERY B, UNCONTROLLED PUSHING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERY B, BALL MILL	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	QUENCH TOWER #1	30300304	By-product Coke Manuf /Quenching
US STEEL CORP - CLAIRTON PLANT	QUENCH TOWER #3	30300304	By-product Coke Manuf /Quenching
US STEEL CORP - CLAIRTON PLANT	QUENCH TOWER #5	30300304	By-product Coke Manuf /Quenching
US STEEL CORP - CLAIRTON PLANT	QUENCH TOWER #7	30300304	By-product Coke Manuf /Quenching
US STEEL CORP - CLAIRTON PLANT	QUENCH TOWER #B	30300304	By-product Coke Manuf /Quenching
US STEEL CORP - CLAIRTON PLANT	BOILER #1, STCK S31, BOILER #1, COG	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas
US STEEL CORP - CLAIRTON PLANT	BOILER #1, STCK S31, BOILER #1, NG	10200601	Ext Comb /Industrial /Natural Gas /> 100 Million Btu/hr
US STEEL CORP - CLAIRTON PLANT	BOILER #2, STCK S32, BOILER #2, COG	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas
US STEEL CORP - CLAIRTON PLANT	BOILER #2, STCK S32, BOILER #2, NG	10200601	Ext Comb /Industrial /Natural Gas /> 100 Million Btu/hr
US STEEL CORP - CLAIRTON PLANT	BOILER R1, STACK S36, BOILER R1, COG	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas
US STEEL CORP - CLAIRTON PLANT	BOILER R2, STACK S36, BOILER R2, COG	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas
US STEEL CORP - CLAIRTON PLANT	BOILER T1, STACK S38, BOILER T1, COG	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas
US STEEL CORP - CLAIRTON PLANT	BOILER T2, STACK S39, BOILER T2, COG	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas
US STEEL CORP - CLAIRTON PLANT	TAR/FL DECANTERS	30300331	By-product Coke Manuf /By-product Coke Manufacturing
US STEEL CORP - CLAIRTON PLANT	FL CIRC./SURGE TANKS	30300333	By-product Coke Manuf /Excess-ammonia Liquor Tank
US STEEL CORP - CLAIRTON PLANT	TAR STORAGE/SEP TANKS	30300336	By-product Coke Manuf /Tar Storage
US STEEL CORP - CLAIRTON PLANT	WEIR TANK/INTERCEPT SUMP	30300335	By-product Coke Manuf /Tar Interceding Sump
US STEEL CORP - CLAIRTON PLANT	FINAL COOLER SUMP	30300341	By-product Coke Manuf /Light Oil Sump
US STEEL CORP - CLAIRTON PLANT	FL PUMPHOUSE SUMPS	30300333	By-product Coke Manuf /Excess-ammonia Liquor Tank
US STEEL CORP - CLAIRTON PLANT	EQUIPMENT LEAKS/SAMP CONN	30300331	By-product Coke Manuf /By-product Coke Manufacturing
US STEEL CORP - CLAIRTON PLANT	TAR COLLECTING TANKS	30300331	By-product Coke Manuf /By-product Coke Manufacturing
US STEEL CORP - CLAIRTON PLANT	CONTINUOUS COAL UNLOADERS, COAL UNLOADER #1	30300305	By-product Coke Manuf /Coal Unloading
US STEEL CORP - CLAIRTON PLANT	CONTINUOUS COAL UNLOADERS, COAL UNLOADER #2	30300305	By-product Coke Manuf /Coal Unloading
US STEEL CORP - CLAIRTON PLANT	PEDESTAL CRANE UNLOADER	30300305	By-product Coke Manuf /Coal Unloading

FACNAME	UNIT/PROCESS DESCRIPTION	SCC	SCC Description
US STEEL CORP - CLAIRTON PLANT	CLAM SHELL UNLOADER	30300305	By-product Coke Manuf /Coal Unloading
US STEEL CORP - CLAIRTON PLANT	COAL TRANSFER	30300305	By-product Coke Manuf /Coal Unloading
US STEEL CORP - CLAIRTON PLANT	#1 PULVERIZERS, #1 PULVERIZER, PRIMARY	30300310	By-product Coke Manuf /Coal Crushing
US STEEL CORP - CLAIRTON PLANT	#1 PULVERIZERS, #1 PULVERIZER, SECONDARY	30300310	By-product Coke Manuf /Coal Crushing
US STEEL CORP - CLAIRTON PLANT	#2 PULVERIZERS, #2 PULVERIZER, PRIMARY	30300310	By-product Coke Manuf /Coal Crushing
US STEEL CORP - CLAIRTON PLANT	#2 PULVERIZERS, #2 PULVERIZER, SECONDARY	30300310	By-product Coke Manuf /Coal Crushing
US STEEL CORP - CLAIRTON PLANT	COAL STORAGE-BINS/BUNKERS	30300316	By-product Coke Manuf /Coal Storage Pile
US STEEL CORP - CLAIRTON PLANT	COAL STORAGE PILE EROSION	30300316	By-product Coke Manuf /Coal Storage Pile
US STEEL CORP - CLAIRTON PLANT	COKE TRANSFER 1-3, 7-9, B	30300309	By-product Coke Manuf /Coal Conveying
US STEEL CORP - CLAIRTON PLANT	COKE TRANSFER 13-15/19-20	30300309	By-product Coke Manuf /Coal Conveying
US STEEL CORP - CLAIRTON PLANT	COKE PILE, LOAD/UNLOAD	30300312	By-product Coke Manuf /Coke: Crushing/Screening/Handling
US STEEL CORP - CLAIRTON PLANT	SCREEN STATION 1-3, 7-9	30300312	By-product Coke Manuf /Coke: Crushing/Screening/Handling
US STEEL CORP - CLAIRTON PLANT	SCREEN STATION 1-3, 7-9, SCR. STN 1-3/7-9 LOADOUT	30300312	By-product Coke Manuf /Coke: Crushing/Screening/Handling
US STEEL CORP - CLAIRTON PLANT	SCREEN STN 13-15, 19-20	30300312	By-product Coke Manuf /Coke: Crushing/Screening/Handling
US STEEL CORP - CLAIRTON PLANT	SCREEN STN 13-15, 19-20, SCRN 13-15/19-20 LOADOUT	30300312	By-product Coke Manuf /Coke: Crushing/Screening/Handling
US STEEL CORP - CLAIRTON PLANT	SCREENING STATION B, SCREENING STATION B BAGHS	30300312	By-product Coke Manuf /Coke: Crushing/Screening/Handling
US STEEL CORP - CLAIRTON PLANT	SCREENING STATION B, SCREEN STATION B LOADOUT	30300312	By-product Coke Manuf /Coke: Crushing/Screening/Handling
US STEEL CORP - CLAIRTON PLANT	SCREENING STATION B, SCREENING FUGITIVES - B	30300312	By-product Coke Manuf /Coke: Crushing/Screening/Handling
US STEEL CORP - CLAIRTON PLANT	COKE STORAGE PILE EROSION, COKE PILE EROSION	30300316	By-product Coke Manuf /Coal Storage Pile
US STEEL CORP - CLAIRTON PLANT	BLASTING - BLACK BEAUTY	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	PLANT ROADS, PAVED ROADS	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	PLANT ROADS, UNPAVED ROADS	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	MOTOR VEHICLE EXHAUST, HEAVY-DUTY VEHICLES	20300101	Int Comb /Comm-Inst /Distillate Oil (Diesel) /Reciprocating
US STEEL CORP - CLAIRTON PLANT	TUG BOAT EXHAUST	20300101	Int Comb /Comm-Inst /Distillate Oil (Diesel) /Reciprocating
US STEEL CORP - CLAIRTON PLANT	FACILITY MAINTENANCE, SAFETY-KLEEN PARTS WASHER	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	FACILITY MAINTENANCE, PAINTS AND THINNERS	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	SCOT HYDROGENATION UNIT, SCOT STACK	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	COOLING TOWER	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	FLARING	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	AERATION BASINS - WWTP, AERATION BASINS - WWTP	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	METHANOL USAGE, AIR LINES	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	METHANOL USAGE, WINTER LID SLURRY	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	METHANOL USAGE, STORAGE TANKS	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	WWT SURGE TANK NH3 FLARE	39990024	Misc Manuf Indus /Process Gas: Flares
US STEEL CORP - CLAIRTON PLANT	NH3 TANKER LOADING FLARE	39999993	Misc Manuf / Indus Processes /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	COG VENTING, ACCIDENTAL VENT	31000299	Natural Gas Production /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	L.O. COLLECTING TANKS	39999996	Misc Manuf / Indus Processes /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	L.O. BARGE LOADING	39999996	Misc Manuf / Indus Processes /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	L.O. DECANTERS	39999996	Misc Manuf / Indus Processes /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	BOOM CONVEYOR, FRONT END LOADER TO TRUCK	30300305	By-product Coke Manuf /Coal Unloading
US STEEL CORP - CLAIRTON PLANT	BOOM CONVEYOR, TRUCK TO HOPPER	30300305	By-product Coke Manuf /Coal Unloading
US STEEL CORP - CLAIRTON PLANT	BOOM CONVEYOR, HOPPER TO CONVEYOR	30300305	By-product Coke Manuf /Coal Unloading
US STEEL CORP - CLAIRTON PLANT	BOOM CONVEYOR, CONVEYOR TO BARGE	30300305	By-product Coke Manuf /Coal Unloading
AKJ Industries	Sludge Processing, Sludge Processing 1	30601001	Petrol Indus /Sludge Converter /General
AKJ Industries	Sludge Processing, Sludge Processing 2	30601001	Petrol Indus /Sludge Converter /General
Bekavac Funeral Home	INCINERATOR, EURICH INCINERATOR	31502101	Health Care - Crematoriums /Crematory Stack
Dura-Bond Industries	FUSION BOND PROCESS, FUSION BOND AIR WASH	30900207	Fabricated Metal /Abrasive Blasting of Metal Parts /Shotblast with Air
Dura-Bond Industries	EXTRUSION PROCESS(X-TEC), XTEC WB BH STACK	30900207	Fabricated Metal /Abrasive Blasting of Metal Parts /Shotblast with Air
Dura-Bond Industries	EXTRUSION PROCESS(X-TEC), X-TEC OIL HEATER	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr
Dura-Bond Industries	FUSION BOND PROCESS, FUSION BOND AIR WASH	30901699	Fabricated Metal /Metal Pipe Coating of Metal Parts /Other Not Classified
Dura-Bond Industries	ROAD EMISSIONS, ROAD DUST (Haul Trucks)	30300834	Iron Production /Paved Roads: All Vehicle Types
Dura-Bond Industries	ROAD EMISSIONS, FORKLIFT EMISSIONS (Diesel)	27000320	Int Comb /Engine Testing /Wastewater, Pts of Generation /Specify Point of Generation
Dura-Bond Industries	ROAD EMISSIONS, ROAD DUST (Forklifts)	30300834	Iron Production /Paved Roads: All Vehicle Types
Dura-Bond Industries	FUSION BOND OVEN 1	10300603	Ext Comb /Comm-Inst /Natural Gas /< 10 Million Btu/hr

FACNAME	UNIT/PROCESS DESCRIPTION	SCC	SCC Description
Dura-Bond Industries	FUSION BOND OVEN 2	10300603	Ext Comb /Comm-Inst /Natural Gas /< 10 Million Btu/hr
Dura-Bond Industries	FUSION BOND OVEN 3	10300603	Ext Comb /Comm-Inst /Natural Gas /< 10 Million Btu/hr
Dura-Bond Industries	FUSION BOND WB-1 BH STACK	30900207	Fabricated Metal /Abrasive Blasting of Metal Parts /Shotblast with Air
Dura-Bond Industries	FUSION BOND WB-2 BH STACK	30900207	Fabricated Metal /Abrasive Blasting of Metal Parts /Shotblast with Air
Dura-Bond Industries	FUSION BOND DRYING OVEN	10300603	Ext Comb /Comm-Inst /Natural Gas /< 10 Million Btu/hr
Dura-Bond Industries	GASOLINE STORAGE TANK	40400107	Petrol Prod Stor-Bulk Terminals /Gasoline RVP 13: Working Loss (Diam Independent) - Fixed Roof Tank
Dura-Bond Industries	DIESEL STORAGE TANK	40400109	Petrol Prod Stor-Bulk Terminals /Gasoline RVP 7: Working Loss (Diam Independent) - Fixed Roof Tank
ELG Metals	Scrap Burning	30402201	Secondary Metals /Metal Heat Treating /Furnace: General
ELG Metals	Emergency Generator	20200202	Int Comb /Industrial /Natural Gas /Reciprocating
ELG Metals	Roads, Vehicles	30499999	Secondary Metals /Other Not Classified /Specify in Comments Field
Mid-Continent Coal & Coke	SCREENS	30300312	By-product Coke Manuf /Coke: Crushing/Screening/Handling
Mid-Continent Coal & Coke	STORAGE PILES	30588801	Mineral Prods /Fugitive Emissions /Specify in Comments Field
Mid-Continent Coal & Coke	ROAD EMISSIONS	30300833	Iron Production /Unpaved Roads: Heavy Duty Vehicles
Mid-Continent Coal & Coke	EQUIPMENT FUEL USAGE	10201403	Ext Comb /Industrial /CO Boiler /Distillate Oil
Mon Valley Transportation	DOCK 2, DOCK 2 LOADING	30510504	Mineral Prods /Bulk Materials Loading /Coke
Mon Valley Transportation	RAILCAR, RAILCAR UNLOADING	30510404	Mineral Prods /Bulk Materials Unloading Op /Coke
Mon Valley Transportation	DOCK 3, DOCK 3 UNLOADING	30510404	Mineral Prods /Bulk Materials Unloading Op /Coke
Mon Valley Transportation	DOCK 1, DOCK 1 UNLOADING	30510404	Mineral Prods /Bulk Materials Unloading Op /Coke
Mon Valley Transportation	VEHICLES, TRUCK EMISSIONS	30531090	Coal Mining, Cleaning & Material Handling /Haul Roads: General
Mon Valley Transportation	STORAGE PILES, EROSION	30510304	Mineral Prods /Bulk Materials Open Stockpiles /Coke
Pennsylvania Electric Coil	Large Bake Oven, Natural Gas Combustion	39000699	In-Process Fuel Use /Natural Gas /General
Pennsylvania Electric Coil	Large Bake Oven, Coating Evaporation	40200803	Surface Coating Oven - General /Baked : 175F **
Pennsylvania Electric Coil	Small Bake Oven, Natural Gas Combustion	39000699	In-Process Fuel Use /Natural Gas /General
Pennsylvania Electric Coil	Small Bake Oven, Coating Evaporation	40200803	Surface Coating Oven - General /Baked : 175F **
Pennsylvania Electric Coil	Paint Spray Booth	40201806	Metal Coil Coating /Finish Coating
Pennsylvania Electric Coil	Coil Manufacturing, Oven, Natural Gas Combustion	39000699	In-Process Fuel Use /Natural Gas /General
Pennsylvania Electric Coil	Coil Manufacturing, Oven, Coating Evaporation	40200803	Surface Coating Oven - General /Baked : 175F **
Pennsylvania Electric Coil	Skin/Tin Area, Tinning Process	30904030	Fabricated Metal /Metal Deposition Processes /Tinning: Batch Process
Pennsylvania Electric Coil	Skin/Tin Area, Natural Gas Combustion	39000699	In-Process Fuel Use /Natural Gas /General
Pennsylvania Electric Coil	Gas Insulator	39000699	In-Process Fuel Use /Natural Gas /General
Pennsylvania Electric Coil	Coil Pressing Area	39000699	In-Process Fuel Use /Natural Gas /General
Pennsylvania Electric Coil	Cleaning of Motor Parts	39000699	In-Process Fuel Use /Natural Gas /General
Pennsylvania Electric Coil	U-372 Storage Area	40714698	Organic Chem Storage - Fixed Roof Tanks - Specify In Comments: Working Loss
Pennsylvania Electric Coil	U-475 Storage Area	40714698	Organic Chem Storage - Fixed Roof Tanks - Specify In Comments: Working Loss
Pennsylvania Electric Coil	TSR-601 Varnish Tank	40714698	Organic Chem Storage - Fixed Roof Tanks - Specify In Comments: Working Loss
Pennsylvania Electric Coil	Miscellaneous Fugitives	40202599	Surface Coating /Misc Metal Parts /Other Not Classified
Pennsylvania Electric Coil	Boiler	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr
Pennsylvania Electric Coil	Gas Radient Space Heaters	10500106	Ext Comb /Space Heater /Industrial /Natural Gas
Pennsylvania Electric Coil	Small Burnoff Oven, Coating Evaporation	31307002	Electrical Equip /Electrical Windings Reclamation /Multiple Chamber Incinerator/Oven
Pennsylvania Electric Coil	Small Burnoff Oven, Natural Gas Combustion	39000699	In-Process Fuel Use /Natural Gas /General
Pennsylvania Electric Coil	Large Burnoff Oven, Coating Evaporation	31307002	Electrical Equip /Electrical Windings Reclamation /Multiple Chamber Incinerator/Oven
Pennsylvania Electric Coil	Large Burnoff Oven, Natural Gas Combustion	39000699	In-Process Fuel Use /Natural Gas /General
Tech Met	ETCH LINE 1, MEDIUM TANK ETCH LINE P001	30901501	Fabricated Metal /Chemical Milling of Metal Products /Milling Tank
Tech Met	ETCH LINE 2, LARGE TANK ETCH LINE P002	30901501	Fabricated Metal /Chemical Milling of Metal Products /Milling Tank
Tech Met	ETCH LINE 3, CHEMTEX ETCH LINE P003	30901501	Fabricated Metal /Chemical Milling of Metal Products /Milling Tank
Tech Met	MISCELLANEOUS SOLVENT USAGE	30988801	Fabricated Metal /Fugitive Emissions /Specify in Comments Field
Tube City IMS Clairton	Steel Scrap, Steel Scrap Cutting	30400768	Secondary Metals /Steel Foundries /Scrap Handling

FACNAME	PTID	STKID	SEGID	SCC	UNIT DESCRIPTION	PROCESS DESCRIPTION	SO2	NOx	VOC	NH3	PM10	PM2.5	HGHT	DIAM	TEMP	VEL	XCOORD	YCOORD
KOPPERS INC. CLAIRTON PLANT	001	1	1	30184001	TAR REFINING	TAR REFINING PROCESS	0.000	0.000	0.000	0.000	0.000	0.000	105.00	6.75	1200	27.00	-79.881559	40.306178
KOPPERS INC. CLAIRTON PLANT	001	1	2	30180001	TAR REFINING	TAR REFINING FUGITIVES	0.000	0.000	1.034	0.000	0.000	0.000	105.00	6.75	1200	27.00	-79.881559	40.306178
KOPPERS INC. CLAIRTON PLANT	002	3	1	30199999	ROD PITCH MANUFACTURING	ROD PITCH MANUFACTURING	0.000	0.000	0.180	0.000	0.190	0.190	50.00	1.00	125	10.00	-79.880836	40.305775
KOPPERS INC. CLAIRTON PLANT	002	5	2	30199999	ROD PITCH MANUFACTURING	ROD PITCH FUGITIVES	0.000	0.000	0.460	0.000	0.500	0.500	10.00	0.00	72	0.00	-79.880836	40.305775
KOPPERS INC. CLAIRTON PLANT	003	1	1	10200603	1T2 HEATER	1T2 HEATER	0.000	0.000	0.000	0.000	0.000	0.000	105.00	6.75	1200	27.00	-79.881559	40.306178
KOPPERS INC. CLAIRTON PLANT	004	1	1	10200603	2T2 HEATER	2T2 HEATER	0.005	0.770	0.040	0.000	0.050	0.050	105.00	6.75	1200	27.00	-79.881559	40.306178
KOPPERS INC. CLAIRTON PLANT	005	1	1	10200603	PRIMARY FLASH HEATER	PRIMARY FLASH HEATER	0.020	3.620	0.190	0.000	0.260	0.260	105.00	6.75	1200	27.00	-79.881559	40.306178
KOPPERS INC. CLAIRTON PLANT	006	2	1	39990003	PRILL HOT OIL HEATER	HOT OIL HEATER	0.007	1.190	0.060	0.000	0.080	0.080	40.00	2.00	1200	4.10	-79.881248	40.305770
KOPPERS INC. CLAIRTON PLANT	007	1	1	10200603	1T4 HOT OIL HEATER	1T4 HOT OIL HEATER	0.001	0.220	0.010	0.000	0.014	0.014	105.00	6.75	1200	27.00	-79.881559	40.306178
KOPPERS INC. CLAIRTON PLANT	008	1	1	10100602	SECONDARY FLASH HEATER	SECONDARY FLASH HEATER	0.010	2.650	0.140	0.000	0.200	0.200	105.00	6.75	1200	27.00	-79.881559	40.306178
KOPPERS INC. CLAIRTON PLANT	009	5	1	20300301	TRANSPORTATION	GASOLINE VEHICLES	0.007	0.130	0.250	0.000	0.017	0.017	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	009	5	3	39999991	TRANSPORTATION	PAVED ROADS	0.000	0.000	0.000	0.000	0.600	0.080	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	009	5	4	39999991	TRANSPORTATION	UNPAVED ROADS	0.000	0.000	0.000	0.000	0.990	0.100	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	009	5	5	20300101	TRANSPORTATION	DIESEL VEHICLES	0.270	4.240	0.340	0.000	0.590	0.590	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	011	5	1	40899999	LOADING	LIQUID LOADING	0.000	0.000	1.095	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	011	5	2	30183001	LOADING	ROD PITCH LOADING	0.000	0.000	0.540	0.000	3.100	3.100	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	012	5	1	40703698	CARBON PITCH TANKS	CARBON PITCH TANKS	0.000	0.000	0.620	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	013	5	1	40703698	PETROLEUM PITCH TANKS	PET PITCH TANKS	0.000	0.000	0.010	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	014	5	1	40703698	TYPE A PITCH TANKS	TYPE A PITCH TANKS	0.000	0.000	0.020	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	015	5	1	40703698	RCO TANKS	RCO REGULAR TANKS	0.000	0.000	3.740	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	015	5	2	40703698	RCO TANKS	RCO CO-DISTILLED TANKS	0.000	0.000	0.200	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	016	5	1	40703698	PETRO TAR TANKS	PETRO TAR TANKS	0.000	0.000	0.060	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	017	5	1	40703698	CARBON BLACK OIL TANKS	CBO REGULAR TANKS	0.000	0.000	0.100	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	017	5	2	40703698	CARBON BLACK OIL TANKS	CBO CO-DISTILLED TANKS	0.000	0.000	0.040	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	018	5	1	40703698	CREOSOTE PROCESSING	P2 CREOSOTE TANK	0.000	0.000	0.002	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	018	5	3	40703698	CREOSOTE PROCESSING	P2 PETROLEUM CREOSOTE	0.000	0.000	0.002	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	020	5	1	40703698	NSR TANKS	NSR TANKS	0.000	0.000	0.100	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	021	5	1	40703698	CO-DISTILL MATERIAL TANKS	CO-DISTILL MATERIAL TANKS	0.000	0.000	0.270	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	022	5	1	40703698	WASTEWATER STORAGE TANKS	WW TANKS UNCONTROLLED	0.000	0.000	0.005	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	024	5	1	40703698	DEBENZOL. COAL TAR TANKS	DEBENZ COAL TAR	0.000	0.000	2.000	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	027	5	1	50400201	SOIL/VAPOR RECOVERY	SOIL/VAPOR RECOVERY	0.000	0.000	0.000	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	028	5	1	38500102	COOLING TOWER	COOLING TOWER	0.000	0.000	0.000	0.000	0.730	0.730	57.00	14.90	72	34.61	-79.881218	40.306175
KOPPERS INC. CLAIRTON PLANT	029	5	1	30199998	CENTRIFUGE OPERATION	CENTRIFUGE OPERATION	0.000	0.000	0.030	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	032	5	1	40899999	PET PITCH PURGING/DEPRESS	PET PITCH CARS AND TRUCKS	0.000	0.000	0.000	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	033	5	1	40703698	NEEDLE COKER GAS OIL TANK	NEEDLE COKER GAS OIL TK	0.000	0.000	0.090	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	034	4	1	10200603	THERMAL OXIDIZER	THERMAL OXIDIZER	0.005	0.760	0.040	0.000	0.050	0.050	50.00	6.00	1120	19.00	-79.882925	40.306110
KOPPERS INC. CLAIRTON PLANT	035	6	1	10200603	THERMAL OXIDIZER	4.5 MMBTU/HR DIRECT-FIRED TO	1.506	2.019	0.101	0.000	0.134	0.134	50.00	2.00	800	11.51	-79.875000	40.291667
US STEEL CORP - CLAIRTON PLANT	001	2011	1	30300302	BATTERY 1 FUGITIVES	BATTERY 1 CHARGING	0.000	0.000	0.140	0.009	0.110	0.100	126.00	0.00	72	0.00	-79.871506	40.301084
US STEEL CORP - CLAIRTON PLANT	001	2011	2	30300308	BATTERY 1 FUGITIVES	BATTERY 1 DOOR LEAKS	0.000	0.000	2.180	0.150	1.730	1.560	126.00	0.00	72	0.00	-79.871506	40.301084
US STEEL CORP - CLAIRTON PLANT	001	2011	4	30300314	BATTERY 1 FUGITIVES	BATTERY 1 TOPSIDE LEAKS	0.000	0.000	0.083	0.006	0.066	0.059	126.00	0.00	72	0.00	-79.871506	40.301084
US STEEL CORP - CLAIRTON PLANT	001	2011	5	30300303	BATTERY 1 FUGITIVES	BATTERY 1 SOAKING	9.988	0.282	0.187	0.000	0.539	0.539	126.00	0.00	72	0.00	-79.871506	40.301084
US STEEL CORP - CLAIRTON PLANT	001	2011	6	30300303	BATTERY 1 FUGITIVES	BATTERY 1 DECARBONIZING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.871506	40.301084
US STEEL CORP - CLAIRTON PLANT	002	2012	1	30300302	BATTERY 2 FUGITIVES	BATTERY 2 CHARGING	0.000	0.000	0.140	0.010	0.107	0.097	126.00	0.00	72	0.00	-79.872513	40.301966
US STEEL CORP - CLAIRTON PLANT	002	2012	2	30300308	BATTERY 2 FUGITIVES	BATTERY 2 DOOR LEAKS	0.000	0.000	2.270	0.150	1.800	1.630	126.00	0.00	72	0.00	-79.872513	40.301966
US STEEL CORP - CLAIRTON PLANT	002	2012	4	30300314	BATTERY 2 FUGITIVES	BATTERY 2 TOPSIDE LEAKS	0.000	0.000	0.081	0.005	0.065	0.059	126.00	0.00	72	0.00	-79.872513	40.301966
US STEEL CORP - CLAIRTON PLANT	002	2012	5	30300303	BATTERY 2 FUGITIVES	BATTERY 2 SOAKING	9.988	0.282	0.187	0.000	0.539	0.539	126.00	0.00	72	0.00	-79.872513	40.301966
US STEEL CORP - CLAIRTON PLANT	002	2012	6	30300303	BATTERY 2 FUGITIVES	BATTERY 2 DECARBONIZING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.872513	40.301966
US STEEL CORP - CLAIRTON PLANT	003	2013	1	30300302	BATTERY 3 FUGITIVES	BATTERY 3 CHARGING	0.000	0.000	0.140	0.010	0.110	0.100	126.00	0.00	72	0.00	-79.873164	40.302548
US STEEL CORP - CLAIRTON PLANT	003	2013	2	30300308	BATTERY 3 FUGITIVES	BATTERY 3 DOOR LEAKS	0.000	0.000	2.640	0.180	2.076	1.876	126.00	0.00	72	0.00	-79.873164	40.302548
US STEEL CORP - CLAIRTON PLANT	003	2013	4	30300314	BATTERY 3 FUGITIVES	BATTERY 3 TOPSIDE LEAKS	0.000	0.000	0.081	0.006	0.064	0.058	126.00	0.00	72	0.00	-79.873164	40.302548
US STEEL CORP - CLAIRTON PLANT	003	2013	5	30300303	BATTERY 3 FUGITIVES	BATTERY 3 SOAKING	9.988	0.282	0.187	0.000	0.539	0.539	126.00	0.00	72	0.00	-79.873164	40.302548
US STEEL CORP - CLAIRTON PLANT	003	2013	6	30300303	BATTERY 3 FUGITIVES	BATTERY 3 DECARBONIZING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.873164	40.302548
US STEEL CORP - CLAIRTON PLANT	007	2017	1	30300302	BATTERY 13 FUGITIVES	BATTERY 13 CHARGING	0.000	0.000	0.140	0.010	0.110	0.099	126.00	0.00	72	0.00	-79.876974	40.304339
US STEEL CORP - CLAIRTON PLANT	007	2017	2	30300308	BATTERY 13 FUGITIVES	BATTERY 13 DOOR LEAKS	0.000	0.000	2.160	0.150	1.701	1.531	126.00	0.00	72	0.00	-79.876974	40.304339
US STEEL CORP - CLAIRTON PLANT	007	2017	4	30300314	BATTERY 13 FUGITIVES	BATTERY 13 TOPSIDE LEAKS	0.000	0.000	0.086	0.006	0.064	0.058	126.00	0.00	72	0.00	-79.876974	40.304339
US STEEL CORP - CLAIRTON PLANT	007	2017	5	30300303	BATTERY 13 FUGITIVES	BATTERY 13 SOAKING	0.633	0.363	0.151	0.000	0.100	0.100	126.00	0.00	72	0.00	-79.876974	40.304339
US STEEL CORP - CLAIRTON PLANT	007	2017	6	30300303	BATTERY 13 FUGITIVES	BATTERY 13 DECARBONIZING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.876974	40.304339
US STEEL CORP - CLAIRTON PLANT	008	2018	1	30300302	BATTERY 14 FUGITIVES	BATTERY 14 CHARGING	0.000	0.000	0.140	0.010	0.110	0.100	126.00	0.00	72	0.00	-79.877701	40.304977
US STEEL CORP - CLAIRTON PLANT	008	2018	2	30300308	BATTERY 14 FUGITIVES	BATTERY 14 DOOR LEAKS	0.000	0.000	2.080	0.140	1.637	1.477	126.00	0.00	72	0.00	-79.877701	40.304977
US STEEL CORP - CLAIRTON PLANT	008	2018	4	30300314	BATTERY 14 FUGITIVES	BATTERY 14 TOPSIDE LEAKS	0.000	0.000	0.093	0.006	0.064	0.058	126.00	0.00	72	0.00	-79.877701	40.304977

FACNAME	PTID	STKID	SEGID	SCC	UNIT DESCRIPTION	PROCESS DESCRIPTION	SO2	NOx	VOC	NH3	PM10	PM2.5	HGHT	DIAM	TEMP	VEL	XCOORD	YCOORD
US STEEL CORP - CLAIRTON PLANT	008	2018	5	30300303	BATTERY 14 FUGITIVES	BATTERY 14 SOAKING	0.633	0.363	0.151	0.000	0.100	0.100	126.00	0.00	72	0.00	-79.877701	40.304977
US STEEL CORP - CLAIRTON PLANT	008	2018	6	30300303	BATTERY 14 FUGITIVES	BATTERY 14 DECARBONIZING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.877701	40.304977
US STEEL CORP - CLAIRTON PLANT	009	2019	1	30300302	BATTERY 15 FUGITIVES	BATTERY 15 CHARGING	0.000	0.000	0.140	0.010	0.113	0.103	126.00	0.00	72	0.00	-79.878537	40.305725
US STEEL CORP - CLAIRTON PLANT	009	2019	2	30300308	BATTERY 15 FUGITIVES	BATTERY 15 DOOR LEAKS	0.000	0.000	2.000	0.130	1.578	1.418	126.00	0.00	72	0.00	-79.878537	40.305725
US STEEL CORP - CLAIRTON PLANT	009	2019	4	30300314	BATTERY 15 FUGITIVES	BATTERY 15 TOPSIDE LEAKS	0.000	0.000	0.064	0.004	0.064	0.058	126.00	0.00	72	0.00	-79.878537	40.305725
US STEEL CORP - CLAIRTON PLANT	009	2019	5	30300303	BATTERY 15 FUGITIVES	BATTERY 15 SOAKING	0.633	0.363	0.151	0.000	0.100	0.100	126.00	0.00	72	0.00	-79.878537	40.305725
US STEEL CORP - CLAIRTON PLANT	009	2019	6	30300303	BATTERY 15 FUGITIVES	BATTERY 15 DECARBONIZING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.878537	40.305725
US STEEL CORP - CLAIRTON PLANT	010	2020	1	30300302	BATTERY 19 FUGITIVES	BATTERY 19 CHARGING	0.000	0.000	0.180	0.012	0.140	0.124	126.00	0.00	72	0.00	-79.877862	40.304047
US STEEL CORP - CLAIRTON PLANT	010	2020	2	30300308	BATTERY 19 FUGITIVES	BATTERY 19 DOOR LEAKS	0.000	0.000	2.760	0.190	1.168	1.055	126.00	0.00	72	0.00	-79.877862	40.304047
US STEEL CORP - CLAIRTON PLANT	010	2020	4	30300314	BATTERY 19 FUGITIVES	BATTERY 19 TOPSIDE LEAKS	0.000	0.000	0.060	0.004	0.050	0.047	126.00	0.00	72	0.00	-79.877862	40.304047
US STEEL CORP - CLAIRTON PLANT	010	2020	5	30300303	BATTERY 19 FUGITIVES	BATTERY 19 SOAKING	3.212	0.555	0.222	0.000	1.766	1.766	126.00	0.00	72	0.00	-79.877862	40.304047
US STEEL CORP - CLAIRTON PLANT	010	2020	6	30300303	BATTERY 19 FUGITIVES	BATTERY 19 DECARBONIZING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.877862	40.304047
US STEEL CORP - CLAIRTON PLANT	011	2021	1	30300302	BATTERY 20 FUGITIVES	BATTERY 20 CHARGING	0.000	0.000	0.170	0.012	0.140	0.124	126.00	0.00	72	0.00	-79.878922	40.304975
US STEEL CORP - CLAIRTON PLANT	011	2021	2	30300308	BATTERY 20 FUGITIVES	BATTERY 20 DOOR LEAKS	0.000	0.000	3.051	0.210	2.428	2.188	126.00	0.00	72	0.00	-79.878922	40.304975
US STEEL CORP - CLAIRTON PLANT	011	2021	4	30300314	BATTERY 20 FUGITIVES	BATTERY 20 TOPSIDE LEAKS	0.000	0.000	0.054	0.004	0.045	0.042	126.00	0.00	72	0.00	-79.878922	40.304975
US STEEL CORP - CLAIRTON PLANT	011	2021	5	30300303	BATTERY 20 FUGITIVES	BATTERY 20 SOAKING	3.212	0.555	0.222	0.000	1.766	1.766	126.00	0.00	72	0.00	-79.878922	40.304975
US STEEL CORP - CLAIRTON PLANT	011	2021	6	30300303	BATTERY 20 FUGITIVES	BATTERY 20 DECARBONIZING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.878922	40.304975
US STEEL CORP - CLAIRTON PLANT	012	2022	1	30300302	BATTERY B FUGITIVES	BATTERY B CHARGING	0.000	0.000	0.170	0.012	0.140	0.130	126.00	0.00	72	0.00	-79.875556	40.305705
US STEEL CORP - CLAIRTON PLANT	012	2022	2	30300308	BATTERY B FUGITIVES	BATTERY B DOOR LEAKS	0.000	0.000	3.620	0.250	1.063	1.009	126.00	0.00	72	0.00	-79.875556	40.305705
US STEEL CORP - CLAIRTON PLANT	012	2022	4	30300314	BATTERY B FUGITIVES	BATTERY B TOPSIDE LEAKS	0.000	0.000	0.035	0.002	0.026	0.025	126.00	0.00	72	0.00	-79.875556	40.305705
US STEEL CORP - CLAIRTON PLANT	012	2022	5	30300303	BATTERY B FUGITIVES	BATTERY B SOAKING	3.174	0.699	0.278	0.000	2.218	2.218	126.00	0.00	72	0.00	-79.875556	40.305705
US STEEL CORP - CLAIRTON PLANT	012	2022	6	30300303	BATTERY B FUGITIVES	BATTERY B DECARBONIZING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.875556	40.305705
US STEEL CORP - CLAIRTON PLANT	100	2025	1	30300302	BATTERY C FUGITIVES	BATTERY C CHARGING	0.000	0.000	0.500	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.873979	40.304287
US STEEL CORP - CLAIRTON PLANT	100	2025	2	30300308	BATTERY C FUGITIVES	BATTERY C DOOR LEAKS	0.000	0.000	2.636	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.873979	40.304287
US STEEL CORP - CLAIRTON PLANT	100	2025	4	30300314	BATTERY C FUGITIVES	BATTERY C OFFTAKES, LIDS	0.000	0.000	0.218	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.873979	40.304287
US STEEL CORP - CLAIRTON PLANT	100	2025	5	30300303	BATTERY C FUGITIVES	BATTERY C SOAKING	32.425	0.328	1.965	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.873979	40.304287
US STEEL CORP - CLAIRTON PLANT	100	2025	6	30300303	BATTERY C FUGITIVES	BATTERY C DECARBONIZING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.873979	40.304287
US STEEL CORP - CLAIRTON PLANT	013	13	1	30300306	BATTERY 1 UNDERFIRING	BATTERY 1 UNDERFIRING	37.898	226.061	1.841	0.014	9.736	9.321	225.00	8.00	488	24.90	-79.871963	40.301580
US STEEL CORP - CLAIRTON PLANT	014	14	1	30300306	BATTERY 2 UNDERFIRING	BATTERY 2 UNDERFIRING	32.126	259.398	0.464	0.014	11.146	10.631	225.00	8.00	502	25.30	-79.872044	40.301653
US STEEL CORP - CLAIRTON PLANT	015	15	1	30300306	BATTERY 3 UNDERFIRING	BATTERY 3 UNDERFIRING	34.830	305.672	4.893	0.014	10.416	10.034	226.00	8.00	511	24.20	-79.873388	40.302928
US STEEL CORP - CLAIRTON PLANT	019	19	1	30300306	BATTERY 13 UNDERFIRING	BATTERY 13 UNDERFIRING	30.487	168.279	2.548	0.095	7.386	6.423	225.00	10.00	441	14.70	-79.877480	40.304526
US STEEL CORP - CLAIRTON PLANT	020	20	1	30300306	BATTERY 14 UNDERFIRING	BATTERY 14 UNDERFIRING	24.899	140.018	1.884	0.357	8.671	7.836	225.00	10.00	440	14.10	-79.877549	40.304626
US STEEL CORP - CLAIRTON PLANT	021	21	1	30300306	BATTERY 15 UNDERFIRING	BATTERY 15 UNDERFIRING	47.379	201.892	0.214	0.227	15.394	13.831	225.00	10.00	441	14.70	-79.878975	40.305919
US STEEL CORP - CLAIRTON PLANT	022	22	1	30300306	BATTERY 19 UNDERFIRING	BATTERY 19 UNDERFIRING	81.915	452.178	99.283	0.163	10.746	10.204	250.00	15.50	475	12.20	-79.878887	40.304134
US STEEL CORP - CLAIRTON PLANT	023	23	1	30300306	BATTERY 20 UNDERFIRING	BATTERY 20 UNDERFIRING	57.396	819.145	136.763	0.503	21.646	21.058	250.00	15.50	516	14.00	-79.879060	40.304289
US STEEL CORP - CLAIRTON PLANT	024	24	1	30300306	BATTERY B UNDERFIRING	BATTERY B UNDERFIRING	80.984	388.525	5.984	0.029	18.949	18.113	315.00	16.25	468	16.60	-79.876467	40.306705
US STEEL CORP - CLAIRTON PLANT	100	25	1	30300306	BATTERY C UNDERFIRING	BATTERY C UNDERFIRING	91.898	461.182	5.029	0.000	27.445	27.103	322.00	12.00	446	19.06	-79.873789	40.304705
US STEEL CORP - CLAIRTON PLANT	025	25	1	30300303	PEC SYSTEM, BATTERIES 1-3	PEC BAGHOUSE STACK	42.710	8.294	0.735	0.099	4.177	3.859	82.00	4.00	125	29.00	-79.872159	40.301844
US STEEL CORP - CLAIRTON PLANT	025	930	2	30300303	PEC SYSTEM, BATTERIES 1-3	TRAVELING HOT CAR	34.332	9.205	0.074	0.010	7.409	2.732	126.00	0.00	72	0.00	-79.872513	40.301966
US STEEL CORP - CLAIRTON PLANT	025	935	3	30300303	PEC SYSTEM, BATTERIES 1-3	PEC FUGITIVES	5.811	1.142	0.100	0.013	32.668	12.853	126.00	0.00	72	0.00	-79.872513	40.301966
US STEEL CORP - CLAIRTON PLANT	025	935	6	30300303	PEC SYSTEM, BATTERIES 1-3	PRE PUSH	0.498	0.144	0.090	0.000	4.712	4.637	126.00	0.00	72	0.00	-79.872513	40.301966
US STEEL CORP - CLAIRTON PLANT	025	940	4	30300303	PEC SYSTEM, BATTERIES 1-3	UNCONTROLLED PUSHING	0.092	0.018	0.002	0.000	0.503	0.184	126.00	0.00	72	0.00	-79.872513	40.301966
US STEEL CORP - CLAIRTON PLANT	025	2023	5	30300303	PEC SYSTEM, BATTERIES 1-3	BALL MILL	0.000	0.000	0.000	0.000	0.004	0.004	50.00	0.00	72	0.00	-79.872258	40.301529
US STEEL CORP - CLAIRTON PLANT	027	27	1	30300303	PEC SYSTEM, BATT. 13-15	PEC BAGHOUSE STACK	54.207	10.526	1.034	0.126	3.076	2.803	82.00	3.00	125	55.60	-79.878565	40.305086
US STEEL CORP - CLAIRTON PLANT	027	932	2	30300303	PEC SYSTEM, BATT. 13-15	TRAVELING HOT CAR	44.318	11.882	0.105	0.013	9.564	3.526	126.00	0.00	72	0.00	-79.877701	40.304977
US STEEL CORP - CLAIRTON PLANT	027	937	3	30300303	PEC SYSTEM, BATT. 13-15	PEC FUGITIVES	7.375	1.450	0.141	0.017	39.344	15.329	126.00	0.00	72	0.00	-79.877701	40.304977
US STEEL CORP - CLAIRTON PLANT	027	937	6	30300303	PEC SYSTEM, BATT. 13-15	PRE PUSH	0.642	0.186	0.116	0.000	6.082	5.986	126.00	0.00	72	0.00	-79.877701	40.304977
US STEEL CORP - CLAIRTON PLANT	027	942	4	30300303	PEC SYSTEM, BATT. 13-15	UNCONTROLLED PUSHING	1.174	0.228	0.018	0.002	6.388	2.317	126.00	0.00	72	0.00	-79.877701	40.304977
US STEEL CORP - CLAIRTON PLANT	027	2025	5	30300303	PEC SYSTEM, BATT. 13-15	BALL MILL	0.000	0.000	0.000	0.000	0.005	0.005	50.00	0.00	72	0.00	-79.878091	40.305280
US STEEL CORP - CLAIRTON PLANT	028	28	1	30300303	PEC SYSTEM, BATT. 19-20	PEC BAGHOUSE STACK	55.309	10.740	0.875	0.129	2.751	2.518	82.00	3.00	89	51.20	-79.878624	40.305042
US STEEL CORP - CLAIRTON PLANT	028	933	2	30300303	PEC SYSTEM, BATT. 19-20	TRAVELING HOT CAR	45.055	12.080	0.089	0.013	9.723	3.585	126.00	0.00	72	0.00	-79.878380	40.304512
US STEEL CORP - CLAIRTON PLANT	028	938	3	30300303	PEC SYSTEM, BATT. 19-20	PEC FUGITIVES	7.525	1.479	0.119	0.017	40.498	15.802	126.00	0.00	72	0.00	-79.878380	40.304512
US STEEL CORP - CLAIRTON PLANT	028	938	6	30300303	PEC SYSTEM, BATT. 19-20	PRE PUSH	0.653	0.189	0.117	0.000	6.184	6.086	126.00	0.00	72	0.00	-79.878380	40.304512
US STEEL CORP - CLAIRTON PLANT	028	943	4	30300303	PEC SYSTEM, BATT. 19-20	UNCONTROLLED PUSHING	0.964	0.187	0.015	0.002	5.244	1.899	126.00	0.00	72	0.00	-79.878380	40.304512
US STEEL CORP - CLAIRTON PLANT	028	2026	5	30300303	PEC SYSTEM, BATT. 19-20	BALL MILL	0.000	0.000	0.000	0.000	0.017	0.010	50.00	0.00	72	0.00	-79.878291	40.304561
US STEEL CORP - CLAIRTON PLANT	029	29	1	30300303	PEC SYSTEM, BATTERY B	PEC BAGHOUSE STACK	38.115	7.418	0.971	0.082	28.445	26.211	51.00	4.00	125	45.20	-79.877296	40.307092
US STEEL CORP - CLAIRTON PLANT	029	934	2	30300303	PEC SYSTEM, BATTERY B	TRAVELING HOT CAR	21.311	5.697	0.039	0.003	0.641	0.395	126.00	0.00	72	0.00	-79.875556	40.305705
US STEEL CORP - CLAIRTON PLANT	029	939	3	30300303	PEC SYSTEM, BATTERY B	PEC FUGITIVES	2.004	0.389	0.051	0.004	6.665	3.179	126.00	0.00	72	0.00	-79.875556	40.305705
US STEEL CORP - CLAIRTON PLANT	029	939	6	30300303	PEC SYSTEM, BATTERY B	PRE PUSH	0.271	0.078	0.049	0.000	2.512	2.505	126.00	0.00	72	0.00	-79.875556	40.305705
US STEEL CORP - CLAIRTON PLANT	029	944	4	30300303	PEC SYSTEM, BATTERY B	UNCONTROLLED PUSHING	0.000	0.000	0.000	0.000	0.000	0.000	126.00	0.00	72	0.00	-79.875556	40.305705

FACNAME	PTID	STKID	SEGID	SCC	UNIT DESCRIPTION	PROCESS DESCRIPTION	SO2	NOx	VOC	NH3	PM10	PM2.5	HGHT	DIAM	TEMP	VEL	XCOORD	YCOORD
US STEEL CORP - CLAIRTON PLANT	029	2027	5	30300303	PEC SYSTEM, BATTERY B	BALL MILL	0.000	0.000	0.000	0.000	0.003	0.003	50.00	0.00	72	0.00	-79.875258	40.305117
US STEEL CORP - CLAIRTON PLANT	100	900	1	30300303	PEC SYSTEM, BATTERY C	PEC BAGHOUSE STACK	56.490	15.136	1.120	0.138	14.854	6.106	98.43	8.17	131	49.54	-79.874461	40.304090
US STEEL CORP - CLAIRTON PLANT	100	901	2	30300303	PEC SYSTEM, BATTERY C	TRAVELING HOT CAR	24.080	6.450	0.000	0.008	5.194	1.926	126.00	0.00	72	0.00	-79.873979	40.304287
US STEEL CORP - CLAIRTON PLANT	100	902	3	30300303	PEC SYSTEM, BATTERY C	PEC FUGITIVES	3.206	0.859	19.416	0.019	62.491	38.670	126.00	0.00	72	0.00	-79.873979	40.304287
US STEEL CORP - CLAIRTON PLANT	100	903	4	30300303	PEC SYSTEM, BATTERY C	PRE PUSH	0.022	0.006	0.001	0.000	6.317	5.909	126.00	0.00	72	0.00	-79.873979	40.304287
US STEEL CORP - CLAIRTON PLANT	100	904	5	30300303	PEC SYSTEM, BATTERY C	UNCONTROLLED PUSHING	0.744	0.144	0.584	0.000	1.896	1.169	126.00	0.00	72	0.00	-79.873979	40.304287
US STEEL CORP - CLAIRTON PLANT	100	905	6	30300303	PEC SYSTEM, BATTERY C	BALL MILL	0.000	0.000	0.000	0.000	0.017	0.017	51.00	0.00	72	0.00	-79.873388	40.303630
US STEEL CORP - CLAIRTON PLANT	030	945	1	30300304	QUENCH TOWER 1	QUENCH TOWER 1	1.700	0.000	5.300	0.105	65.464	65.464	100.00	22.30	186	11.60	-79.870908	40.300642
US STEEL CORP - CLAIRTON PLANT	032	947	1	30300304	QUENCH TOWER 5A	QUENCH TOWER 5A	1.040	0.000	2.630	0.009	8.750	8.750	163.98	41.57	221	12.00	-79.879183	40.306119
US STEEL CORP - CLAIRTON PLANT	033	948	1	30300304	QUENCH TOWER 7A	QUENCH TOWER 7A	2.400	0.000	10.800	0.009	38.000	38.000	163.98	41.57	221	12.00	-79.879564	40.305862
US STEEL CORP - CLAIRTON PLANT	034	949	1	30300304	QUENCH TOWER B	QUENCH TOWER B	3.800	0.000	9.200	0.086	33.338	33.338	135.00	31.20	204	14.10	-79.876742	40.306420
US STEEL CORP - CLAIRTON PLANT	100	906	1	30300304	QUENCH TOWER C	QUENCH TOWER C	1.100	0.000	2.800	0.009	9.000	9.000	163.98	41.57	221	12.00	-79.875049	40.305347
US STEEL CORP - CLAIRTON PLANT	035	50	1	10200707	BOILER 1, STCK S31	BOILER 1, COG, STACK S31	274.327	260.668	2.321	0.409	20.041	17.061	190.00	8.75	364	97.00	-79.881586	40.309566
US STEEL CORP - CLAIRTON PLANT	035	50	2	10200601	BOILER 1, STCK S31	BOILER 1, NG, STACK S31	0.217	79.709	1.986	0.000	2.744	2.744	190.00	8.75	364	97.00	-79.881586	40.309566
US STEEL CORP - CLAIRTON PLANT	038	53	1	10200707	BOILER 2, STCK S32	BOILER 2, COG, STACK S32	167.426	212.711	1.900	0.335	16.412	13.972	190.00	7.00	303	72.00	-79.881762	40.309595
US STEEL CORP - CLAIRTON PLANT	038	53	2	10200601	BOILER 2, STCK S32	BOILER 2, NG, STACK S32	0.159	54.090	1.455	0.000	2.010	2.010	190.00	7.00	303	72.00	-79.881762	40.309595
US STEEL CORP - CLAIRTON PLANT	047	59	1	10200707	BOILER R1, STACK S36	BOILER R1, COG, STACK S36	26.730	27.350	0.548	0.056	2.725	2.320	165.00	8.50	433	24.50	-79.883179	40.308581
US STEEL CORP - CLAIRTON PLANT	049	59	1	10200707	BOILER R2, STACK S36	BOILER R2, COG, STACK S36	10.898	13.253	0.266	0.026	1.269	1.081	165.00	8.50	433	24.50	-79.883179	40.308581
US STEEL CORP - CLAIRTON PLANT	051	62	1	10200707	BOILER T1, STACK S38	BOILER T1, COG, STACK S38	13.520	13.854	0.057	0.032	1.558	1.326	87.00	4.80	433	29.70	-79.883739	40.308181
US STEEL CORP - CLAIRTON PLANT	053	63	1	10200707	BOILER T2, STACK S39	BOILER T2, COG, STACK S39	12.413	11.336	0.027	0.032	1.558	1.326	87.00	4.80	433	29.70	-79.883855	40.308254
US STEEL CORP - CLAIRTON PLANT	055	2028	1	30300331	TAR/FL DECANTERS	TAR/FL DECANTERS	0.000	0.000	0.320	0.020	0.000	0.000	10.00	0.00	72	0.00	-79.877269	40.305247
US STEEL CORP - CLAIRTON PLANT	056	2028	1	30300333	FL CIRC./SURGE TANKS	FL CIRC./SURGE TANKS	0.000	0.000	0.290	0.020	0.000	0.000	10.00	0.00	72	0.00	-79.877269	40.305247
US STEEL CORP - CLAIRTON PLANT	057	2028	1	30300336	TAR STORAGE/SEP TANKS	TAR STORAGE/SEP TANKS	0.000	0.000	0.120	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.877269	40.305247
US STEEL CORP - CLAIRTON PLANT	058	2028	1	30300335	WEIR TANK/INTERCEPT SUMP	WEIR TANK/INTERCEPT SUMP	0.000	0.000	0.000	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.877269	40.305247
US STEEL CORP - CLAIRTON PLANT	059	2028	1	30300341	FINAL COOLER SUMP	FINAL COOLER SUMP	0.000	0.000	1.695	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.877269	40.305247
US STEEL CORP - CLAIRTON PLANT	060	2028	1	30300333	FL PUMPHOUSE SUMPS	FL PUMPHOUSE SUMPS	0.000	0.000	0.140	0.020	0.000	0.000	10.00	0.00	72	0.00	-79.877269	40.305247
US STEEL CORP - CLAIRTON PLANT	061	2028	1	30300331	EQUIPMENT LEAKS/SAMP CONN	EQUIPMENT LEAKS/SAMP CONN	0.000	0.000	1.220	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.877269	40.305247
US STEEL CORP - CLAIRTON PLANT	062	2028	1	30300331	TAR COLLECTING TANKS	TAR COLLECTING TANKS	0.000	0.000	0.003	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.877269	40.305247
US STEEL CORP - CLAIRTON PLANT	063	975	1	30300305	CONTINUOUS COAL UNLOADERS	COAL UNLOADER #1	0.000	0.000	0.000	0.000	0.194	0.067	50.00	0.00	72	0.00	-79.872876	40.304397
US STEEL CORP - CLAIRTON PLANT	063	975	2	30300305	CONTINUOUS COAL UNLOADERS	COAL UNLOADER #2	0.000	0.000	0.000	0.000	0.168	0.052	50.00	0.00	72	0.00	-79.872876	40.304397
US STEEL CORP - CLAIRTON PLANT	064	973	1	30300305	PEDESTAL CRANE UNLOADER	PEDESTAL CRANE UNLOADER	0.000	0.000	0.000	0.000	0.009	0.003	50.00	0.00	72	0.00	-79.872876	40.304397
US STEEL CORP - CLAIRTON PLANT	065	974	1	30300305	CLAM SHELL UNLOADER	CLAM SHELL UNLOADER	0.000	0.000	0.000	0.000	0.026	0.017	50.00	0.00	72	0.00	-79.872876	40.304397
US STEEL CORP - CLAIRTON PLANT	066	975	1	30300305	COAL TRANSFER	COAL TRANSFER	0.000	0.000	0.000	0.000	0.377	0.119	50.00	0.00	72	0.00	-79.872876	40.304397
US STEEL CORP - CLAIRTON PLANT	067	975	1	30300310	#1 PULVERIZERS	#1 PULVERIZER, PRIMARY	0.000	0.000	0.000	0.000	0.043	0.018	50.00	0.00	72	0.00	-79.871291	40.303069
US STEEL CORP - CLAIRTON PLANT	067	975	2	30300310	#1 PULVERIZERS	#1 PULVERIZER, SECONDARY	0.000	0.000	0.000	0.000	0.000	0.000	50.00	0.00	72	0.00	-79.875505	40.306543
US STEEL CORP - CLAIRTON PLANT	068	975	1	30300310	#2 PULVERIZERS	#2 PULVERIZER, PRIMARY	0.000	0.000	0.000	0.000	0.004	0.001	50.00	0.00	72	0.00	-79.871186	40.302987
US STEEL CORP - CLAIRTON PLANT	068	975	2	30300310	#2 PULVERIZERS	#2 PULVERIZER, SECONDARY	0.000	0.000	0.000	0.000	0.000	0.000	50.00	0.00	72	0.00	-79.875400	40.306461
US STEEL CORP - CLAIRTON PLANT	069	978	1	30300316	COAL STORAGE-BINS/BUNKERS	COAL STORAGE-BINS/BUNKERS	0.000	0.000	0.000	0.000	0.011	0.003	45.00	0.00	72	0.00	-79.889072	40.309480
US STEEL CORP - CLAIRTON PLANT	070	979	1	30300316	COAL STORAGE PILE EROSION	COAL STORAGE PILE EROSION	0.000	0.000	0.000	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.889072	40.309480
US STEEL CORP - CLAIRTON PLANT	071	980	1	30300309	COKE TRANSFER 1-3, B, C	COKE TRANSFER 1-3, B, C	0.000	0.000	0.000	0.000	1.841	0.898	7.00	3.00	150	5.00	-79.873221	40.303143
US STEEL CORP - CLAIRTON PLANT	072	981	1	30300309	COKE TRANSFER 13-15, 19-20	COKE TRANSFER 13-15, 19-20	0.000	0.000	0.000	0.000	1.589	0.505	7.00	3.00	150	3.80	-79.876624	40.303516
US STEEL CORP - CLAIRTON PLANT	073	982	1	30300312	COKE PILE, LOAD/UNLOAD	COKE PILE, LOAD/UNLOAD	0.000	0.000	0.000	0.000	0.097	0.031	50.00	6.40	72	1.00	-79.881614	40.300327
US STEEL CORP - CLAIRTON PLANT	074	983	1	30300312	SCREEN STATION 1-3	SCREEN STATION 1-3	0.000	0.000	0.000	0.000	0.144	0.010	85.00	37.70	72	2.00	-79.873106	40.302862
US STEEL CORP - CLAIRTON PLANT	074	983	2	30300312	SCREEN STATION 1-3	SCR. STN 1-3, LOADOUT	0.000	0.000	0.000	0.000	0.331	0.105	85.00	37.70	72	2.00	-79.873106	40.302862
US STEEL CORP - CLAIRTON PLANT	075	984	1	30300312	SCREEN STN 13-15, 19-20	SCREEN STN 13-15, 19-20	0.000	0.000	0.000	0.000	0.346	0.023	85.00	37.70	72	2.00	-79.879317	40.305886
US STEEL CORP - CLAIRTON PLANT	075	984	2	30300312	SCREEN STN 13-15, 19-20	SCRN 13-15, 19-20 LOADOUT	0.000	0.000	0.000	0.000	0.795	0.252	85.00	37.70	72	2.00	-79.879317	40.305886
US STEEL CORP - CLAIRTON PLANT	077	988	1	30300316	COKE STORAGE PILE EROSION	COKE PILE EROSION	0.000	0.000	0.000	0.000	1.115	0.960	56.00	99.90	72	2.00	-79.882326	40.300375
US STEEL CORP - CLAIRTON PLANT	100	989	1	30300312	SCREEN STN 4 (B, C)	SCREEN STN 4 (B, C)	0.000	0.000	0.000	0.000	0.260	0.260	40.00	2.50	72	2.00	-79.873778	40.303508
US STEEL CORP - CLAIRTON PLANT	078	990	1	30399999	BLASTING - BLACK BEAUTY	BLASTING - BLACK BEAUTY	0.000	0.000	0.000	0.000	0.516	0.052	56.20	2.69	72	26.31	-79.876349	40.304578
US STEEL CORP - CLAIRTON PLANT	079	2029	1	30399999	PLANT ROADS	PAVED ROADS	0.000	0.000	0.000	0.000	2.981	0.447	10.00	0.00	72	0.00	-79.872340	40.299831
US STEEL CORP - CLAIRTON PLANT	079	2029	2	30399999	PLANT ROADS	UNPAVED ROADS	0.000	0.000	0.000	0.000	2.838	0.294	10.00	0.00	72	0.00	-79.872340	40.299831
US STEEL CORP - CLAIRTON PLANT	080	2029	1	20300101	MOTOR VEHICLE EXHAUST	HEAVY-DUTY VEHICLES	2.822	42.909	3.503	0.000	6.033	6.033	10.00	0.00	72	0.00	-79.872340	40.299831
US STEEL CORP - CLAIRTON PLANT	081	2029	1	20300101	TUG BOAT EXHAUST	TUG BOAT EXHAUST	1.665	25.313	2.066	0.000	3.559	3.559	10.00	0.00	72	0.00	-79.890486	40.313629
US STEEL CORP - CLAIRTON PLANT	082	2029	1	30399999	FACILITY MAINTENANCE	SAFETY-KLEEN PARTS WASHER	0.000	0.000	1.200	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.872340	40.299831
US STEEL CORP - CLAIRTON PLANT	082	2029	2	30399999	FACILITY MAINTENANCE	PAINTS AND THINNERS	0.000	0.000	36.330	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.872340	40.299831
US STEEL CORP - CLAIRTON PLANT	083	83	1	30399999	SCOT HYDROGENATION UNIT	SCOT STACK	151.790	2.190	24.970	0.000	6.420	6.350	150.00	3.83	689	57.20	-79.875393	40.303353
US STEEL CORP - CLAIRTON PLANT	084	99	1	30399999	COOLING TOWER	COOLING TOWER	0.000	0.000	0.000	0.000	121.220	101.010	72.50	32.00	83	21.39	-79.876653	40.306015
US STEEL CORP - CLAIRTON PLANT	085	2029	1	30399999	FLARING	FLARING	4.712	0.250	0.190	0.021	0.000	0.000	10.00	0.00	72	0.00	-79.875283	40.302873
US STEEL CORP - CLAIRTON PLANT	086	2029	1	30399999	AERATION BASINS - WWTP	AERATION BASINS - WWTP	0.000	0.000	0.000	6.853	0.000	0.000	10.00	0.00	72	0.00	-79.880121	40.307867
US STEEL CORP - CLAIRTON PLANT	087	2029	1	30399999	METHANOL USAGE	AIR LINES	0.000	0.000	7.747	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.875213	40.303134

FACNAME	PTID	STKID	SEGID	SCC	UNIT DESCRIPTION	PROCESS DESCRIPTION	SO2	NOx	VOC	NH3	PM10	PM2.5	HGHT	DIAM	TEMP	VEL	XCOORD	YCOORD
US STEEL CORP - CLAIRTON PLANT	087	2029	2	30399999	METHANOL USAGE	WINTER LID SLURRY	0.000	0.000	7.180	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.875213	40.303134
US STEEL CORP - CLAIRTON PLANT	087	2029	3	30399999	METHANOL USAGE	STORAGE TANKS	0.000	0.000	0.000	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.875213	40.303134
US STEEL CORP - CLAIRTON PLANT	088	2010	1	39990024	WWT SURGE TANK NH3 FLARE	WWT SURGE TANK NH3 FLARE	0.169	1.681	0.002	0.001	0.000	0.000	27.00	3.50	1925	33.20	-79.879197	40.307074
US STEEL CORP - CLAIRTON PLANT	089	2010	1	39999993	NH3 TANKER LOADING FLARE	NH3 TANKER LOADING FLARE	0.126	37.140	0.022	5.712	0.000	0.000	27.00	3.50	1925	33.20	-79.879197	40.307074
US STEEL CORP - CLAIRTON PLANT	090	2029	1	31000299	COG VENTING	ACCIDENTAL VENT	0.000	0.000	0.000	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.875451	40.303837
US STEEL CORP - CLAIRTON PLANT	091	2030	1	39999996	L.O. COLLECTING TANKS	L.O. COLLECTING TANKS	0.000	0.000	0.450	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.884258	40.308299
US STEEL CORP - CLAIRTON PLANT	092	2030	1	39999996	L.O. BARGE LOADING	L.O. BARGE LOADING	0.000	0.000	0.165	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.884258	40.308299
US STEEL CORP - CLAIRTON PLANT	093	2030	1	39999996	L.O. DECANTERS	L.O. DECANTERS	0.000	0.000	0.060	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.884258	40.308299
US STEEL CORP - CLAIRTON PLANT	65A	974	1	30300305	BOOM CONVEYOR	FRONT END LOADER TO TRUCK	0.000	0.000	0.000	0.000	0.011	0.003	50.00	0.00	72	0.00	-79.891066	40.312828
US STEEL CORP - CLAIRTON PLANT	65A	974	2	30300305	BOOM CONVEYOR	TRUCK TO HOPPER	0.000	0.000	0.000	0.000	0.011	0.003	50.00	0.00	72	0.00	-79.891066	40.312828
US STEEL CORP - CLAIRTON PLANT	65A	974	3	30300305	BOOM CONVEYOR	HOPPER TO CONVEYOR	0.000	0.000	0.000	0.000	0.006	0.002	50.00	0.00	72	0.00	-79.891066	40.312828
US STEEL CORP - CLAIRTON PLANT	65A	974	4	30300305	BOOM CONVEYOR	CONVEYOR TO BARGE	0.000	0.000	0.000	0.000	0.011	0.003	50.00	0.00	72	0.00	-79.891066	40.312828
AKJ Industries	001	1	1	30601001	Sludge Processing	Sludge Processing 1	0.000	0.000	0.015	0.000	0.000	0.015	21.00	0.33	140	4.50	-79.876258	40.307226
AKJ Industries	002	1	1	30601001	Sludge Processing	Sludge Processing 2	0.000	0.000	0.015	0.000	0.000	0.015	21.00	0.33	140	4.50	-79.870488	40.302530
Bekavac Funeral Home	001	1	1	31502101	INCINERATOR	EURICH INCINERATOR	0.004	0.007	0.000	0.000	0.006	0.006	20.00	0.67	200	3.80	-79.885610	40.293582
Dura-Bond Industries	1	4	9	30900207	FUSION BOND PROCESS	FUSION BOND AIR WASH	0.000	0.000	0.000	0.000	1.639	1.639	16.00	1.20	70	70.50	-79.846510	40.326000
Dura-Bond Industries	2	8	2	30900207	EXTRUSION PROCESS(X-TEC)	XTEC WB BH STACK	0.000	0.000	0.000	0.000	0.324	0.324	21.00	1.20	68	70.50	-79.846510	40.326000
Dura-Bond Industries	2	9	1	10300602	EXTRUSION PROCESS(X-TEC)	X-TEC OIL HEATER	0.001	0.127	0.007	0.000	0.010	0.010	7.00	0.50	350	0.10	-79.846390	40.325820
Dura-Bond Industries	2	9999	3	30901699	FUSION BOND PROCESS	FUSION BOND AIR WASH	0.000	0.000	0.000	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.846510	40.326000
Dura-Bond Industries	3	10	1	30300834	ROAD EMISSIONS	ROAD DUST (Haul Trucks)	0.000	0.000	0.000	0.000	0.621	0.061	10.00	0.00	72	0.00	-79.846390	40.326110
Dura-Bond Industries	3	10	2	27000320	ROAD EMISSIONS	FORKLIFT EMISSIONS (Diesel)	0.677	10.293	0.840	0.000	0.724	0.724	10.00	0.00	72	0.00	-79.846390	40.326110
Dura-Bond Industries	3	10	3	30300834	ROAD EMISSIONS	ROAD DUST (Forklifts)	0.000	0.000	0.000	0.000	0.484	0.048	10.00	0.00	72	0.00	-79.846390	40.326110
Dura-Bond Industries	4	5	1	10300603	FUSION BOND OVEN 1	FUSION BOND OVEN 1	0.002	0.389	0.021	0.000	0.030	0.030	32.00	1.70	1200	8.80	-79.846510	40.326000
Dura-Bond Industries	5	6	1	10300603	FUSION BOND OVEN 2	FUSION BOND OVEN 2	0.002	0.389	0.021	0.000	0.030	0.030	32.00	1.70	1200	8.80	-79.846510	40.326000
Dura-Bond Industries	6	7	1	10300603	FUSION BOND OVEN 3	FUSION BOND OVEN 3	0.002	0.389	0.021	0.000	0.030	0.030	32.00	1.70	1200	8.80	-79.846510	40.326000
Dura-Bond Industries	7	2	1	30900207	FUSION BOND WB-1 BH STACK	FUSION BOND WB-1 BH STACK	0.000	0.000	0.000	0.000	0.324	0.324	16.00	1.20	90	70.50	-79.846390	40.326110
Dura-Bond Industries	8	3	1	30900207	FUSION BOND WB-2 BH STACK	FUSION BOND WB-2 BH STACK	0.000	0.000	0.000	0.000	0.324	0.324	16.00	1.20	70	70.50	-79.846390	40.326090
Dura-Bond Industries	9	1	1	10300603	FUSION BOND DRYING OVEN	FUSION BOND DRYING OVEN	0.005	0.779	0.043	0.000	0.059	0.059	32.00	1.70	1200	14.00	-79.846510	40.326000
Dura-Bond Industries	12	10	1	40400107	GASOLINE STORAGE TANK	GASOLINE STORAGE TANK	0.000	0.000	0.122	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.846390	40.326110
Dura-Bond Industries	13	10	1	40400109	DIESEL STORAGE TANK	DIESEL STORAGE TANK	0.000	0.000	0.001	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.846390	40.326110
ELG Metals	P01	1	1	30402201	Scrap Burning	Scrap Burning	0.000	0.420	0.000	0.000	0.960	0.960	13.00	3.35	80	33.00	-79.860344	40.336205
ELG Metals	P02	1	1	20200202	Emergency Generator	Emergency Generator	0.000	0.061	0.002	0.000	0.001	0.001	10.00	0.00	70	0.00	-79.860344	40.336205
ELG Metals	P03	1	1	30499999	Roads	Vehicles	0.000	0.000	0.000	0.000	0.970	0.970	10.00	0.00	70	0.00	-79.860344	40.336205
Mid-Continent Coal & Coke	001	1	1	30300312	SCREENS	SCREENS	0.000	0.000	0.000	0.000	1.194	1.103	70.00	0.00	70	0.00	-79.881296	40.300013
Mid-Continent Coal & Coke	001	1	2	30588801	STORAGE PILES	STORAGE PILES	0.000	0.000	0.000	0.000	0.056	0.056	30.00	0.00	70	0.00	-79.881296	40.300013
Mid-Continent Coal & Coke	001	1	3	30300833	ROAD EMISSIONS	ROAD EMISSIONS	0.000	0.000	0.000	0.000	2.331	0.233	10.00	0.00	70	0.00	-79.881296	40.300013
Mid-Continent Coal & Coke	001	1	4	10201403	EQUIPMENT FUEL USAGE	EQUIPMENT FUEL USAGE	0.376	5.722	0.454	0.000	0.402	0.402	35.00	0.00	70	0.00	-79.881296	40.300013
Mon Valley Transportation	P01	1	1	30510504	DOCK 2	DOCK 2 LOADING	0.000	0.000	0.000	0.000	3.480	1.593	9.00	0.00	70	0.00	-79.885197	40.313258
Mon Valley Transportation	P02	1	1	30510404	RAILCAR	RAILCAR UNLOADING	0.000	0.000	0.000	0.000	0.350	0.350	7.50	0.00	70	0.00	-79.884739	40.313182
Mon Valley Transportation	P03	1	1	30510404	DOCK 3	DOCK 3 UNLOADING	0.000	0.000	0.000	0.000	1.680	0.236	14.00	0.00	70	0.00	-79.883839	40.312795
Mon Valley Transportation	P05	1	1	30510404	DOCK 1	DOCK 1 UNLOADING	0.000	0.000	0.000	0.000	1.200	0.169	11.50	0.00	70	0.00	-79.889735	40.315680
Mon Valley Transportation	R01	1	1	30531090	VEHICLES	TRUCK EMISSIONS	0.000	0.000	0.000	0.000	1.200	1.200	7.50	0.00	70	0.00	-79.882648	40.312945
Mon Valley Transportation	S01	1	1	30510304	STORAGE PILES	EROSION	0.000	0.000	0.000	0.000	0.210	0.210	20.00	0.00	70	0.00	-79.881295	40.312212
Pennsylvania Electric Coil	A03	3	1	39000699	Large Bake Oven	Natural Gas Combustion	0.000	0.075	0.004	0.000	0.006	0.006	39.40	1.20	290	106.10	-79.894687	40.321413
Pennsylvania Electric Coil	A03	3	4	40200803	Large Bake Oven	Coating Evaporation	0.000	0.000	0.010	0.000	0.000	0.000	39.40	1.20	290	106.10	-79.894687	40.321413
Pennsylvania Electric Coil	A04	4	1	39000699	Small Bake Oven	Natural Gas Combustion	0.000	0.078	0.004	0.000	0.006	0.006	41.00	0.70	275	5.00	-79.894687	40.321413
Pennsylvania Electric Coil	A04	4	2	40200803	Small Bake Oven	Coating Evaporation	0.000	0.000	0.115	0.000	0.000	0.000	41.00	0.70	275	5.00	-79.894687	40.321413
Pennsylvania Electric Coil	A10	2	1	40201806	Paint Spray Booth	Paint Spray Booth	0.000	0.000	0.540	0.000	0.000	0.000	32.00	2.90	75	15.60	-79.894687	40.321413
Pennsylvania Electric Coil	A14	7	1	39000699	Coil Manufacturing, Oven	Natural Gas Combustion	0.000	0.058	0.003	0.000	0.004	0.004	36.00	0.60	500	0.10	-79.894687	40.321413
Pennsylvania Electric Coil	A14	7	2	40200803	Coil Manufacturing, Oven	Coating Evaporation	0.000	0.000	0.250	0.000	0.000	0.000	36.00	0.60	500	0.10	-79.894687	40.321413
Pennsylvania Electric Coil	A15	9	1	30904030	Skin/Tin Area	Tinning Process	0.000	0.000	0.000	0.000	0.000	0.000	36.00	0.60	70	0.10	-79.894687	40.321413
Pennsylvania Electric Coil	A15	9	2	39000699	Skin/Tin Area	Natural Gas Combustion	0.000	0.006	0.000	0.000	0.000	0.000	36.00	0.60	70	0.10	-79.894687	40.321413
Pennsylvania Electric Coil	A16	10	1	39000699	Gas Insulator	Gas Insulator	0.000	0.003	0.000	0.000	0.000	0.000	36.00	0.60	70	0.10	-79.894687	40.321413
Pennsylvania Electric Coil	A17	1	1	39000699	Coil Pressing Area	Coil Pressing Area	0.000	0.019	0.001	0.000	0.001	0.001	10.00	0.00	72	0.00	-79.894687	40.321413
Pennsylvania Electric Coil	A18	1	1	39000699	Cleaning of Motor Parts	Cleaning of Motor Parts	0.000	0.017	0.001	0.000	0.001	0.001	10.00	0.00	72	0.00	-79.894687	40.321413
Pennsylvania Electric Coil	D03	1	1	40714698	U-372 Storage Area	U-372 Storage Area	0.000	0.000	0.030	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.894687	40.321413
Pennsylvania Electric Coil	D04	1	1	40714698	U-475 Storage Area	U-475 Storage Area	0.000	0.000	0.040	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.894687	40.321413
Pennsylvania Electric Coil	D05	1	1	40714698	TSR-601 Varnish Tank	TSR-601 Varnish Tank	0.000	0.000	0.220	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.894687	40.321413
Pennsylvania Electric Coil	G08	1	1	40202599	Miscellaneous Fugitives	Miscellaneous Fugitives	0.000	0.000	0.750	0.000	0.000	0.000	10.00	0.00	72	0.00	-79.894687	40.321413
Pennsylvania Electric Coil	I02	8	1	10200602	Boiler	Boiler	0.000	0.040	0.002	0.000	0.003	0.003	36.00	0.60	500	0.10	-79.894687	40.321413

FACNAME	PTID	STKID	SEGID	SCC	UNIT DESCRIPTION	PROCESS DESCRIPTION	SO2	NOx	VOC	NH3	PM10	PM2.5	HGHT	DIAM	TEMP	VEL	XCOORD	YCOORD
Pennsylvania Electric Coil	I03	1	1	10500106	Gas Radient Space Heaters	Gas Radient Space Heaters	0.000	0.020	0.001	0.000	0.001	0.001	10.00	0.00	72	0.00	-79.894687	40.321413
Pennsylvania Electric Coil	P01	5	1	31307002	Small Burnoff Oven	Coating Evaporation	0.000	0.001	0.019	0.000	0.000	0.000	50.00	0.60	1400	15.60	-79.894687	40.321413
Pennsylvania Electric Coil	P01	5	2	39000699	Small Burnoff Oven	Natural Gas Combustion	0.000	0.003	0.000	0.000	0.000	0.000	50.00	0.60	1400	15.60	-79.894687	40.321413
Pennsylvania Electric Coil	P02	6	1	31307002	Large Burnoff Oven	Coating Evaporation	0.001	0.001	0.048	0.000	0.000	0.000	40.00	1.50	1400	21.00	-79.894687	40.321413
Pennsylvania Electric Coil	P02	6	2	39000699	Large Burnoff Oven	Natural Gas Combustion	0.000	0.021	0.001	0.000	0.002	0.002	40.00	1.50	1400	21.00	-79.894687	40.321413
Tech Met	001	1	1	30901501	ETCH LINE 1	MEDIUM TANK ETCH LINE P001	0.000	0.730	0.000	0.000	0.000	0.000	22.00	2.00	70	50.00	-79.893935	40.319889
Tech Met	002	2	2	30901501	ETCH LINE 2	LARGE TANK ETCH LINE P002	0.000	1.000	0.000	0.000	0.000	0.000	22.00	3.00	70	71.00	-79.893935	40.319889
Tech Met	003	3	3	30901501	ETCH LINE 3	CHEMTEX ETCH LINE P003	0.000	0.300	0.000	0.000	0.000	0.000	18.00	2.00	70	25.00	-79.893935	40.319889
Tech Met	004	4	4	30988801	MISCELLANEOUS SOLVENT USAGE	MISCELLANEOUS SOLVENT USAGE	0.000	0.000	1.140	0.000	0.000	0.000	10.00	0.00	70	0.00	-79.893935	40.319889
Tube City IMS Clairton	001	1	1	30400768	Steel Scrap	Steel Scrap Cutting	0.000	0.001	0.000	0.000	0.310	0.310	10.00	0.00	70	0.00	-79.871073	40.298787

FACNAME	UNIT/PROCESS DESCRIPTION	SCC	SCC Description
KOPPERS INC. CLAIRTON PLANT	TAR REFINING, TAR REFINING PROCESS	30184001	Chem Manuf /General Processes /Distillation Units
KOPPERS INC. CLAIRTON PLANT	TAR REFINING, TAR REFINING FUGITIVES	30180001	Chem Manuf /General Processes /Fugitive Leaks
KOPPERS INC. CLAIRTON PLANT	ROD PITCH MANUFACTURING, ROD PITCH MANUFACTURING	30199999	Chem Manuf /Other Not Classified /Specify in Comments Field
KOPPERS INC. CLAIRTON PLANT	ROD PITCH MANUFACTURING, ROD PITCH FUGITIVES	30199999	Chem Manuf /Other Not Classified /Specify in Comments Field
KOPPERS INC. CLAIRTON PLANT	1T2 HEATER, 1T2 HEATER	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr
KOPPERS INC. CLAIRTON PLANT	2T2 HEATER, 2T2 HEATER	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr
KOPPERS INC. CLAIRTON PLANT	PRIMARY FLASH HEATER	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr
KOPPERS INC. CLAIRTON PLANT	PRILL HOT OIL HEATER	39990003	Misc Manuf Indus /Natural Gas: Process Heaters
KOPPERS INC. CLAIRTON PLANT	1T4 HOT OIL HEATER	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr
KOPPERS INC. CLAIRTON PLANT	SECONDARY FLASH HEATER	10100602	Ext Comb /Electric Gen /Natural Gas /Boilers < 100 Million Btu/hr except Tangential
KOPPERS INC. CLAIRTON PLANT	TRANSPORTATION, GASOLINE VEHICLES	20300301	Int Comb /Comm-Inst /Gasoline /Reciprocating
KOPPERS INC. CLAIRTON PLANT	TRANSPORTATION, PAVED ROADS	39999991	Misc Manuf / Indus Processes /Other Not Classified
KOPPERS INC. CLAIRTON PLANT	TRANSPORTATION, UNPAVED ROADS	39999991	Misc Manuf / Indus Processes /Other Not Classified
KOPPERS INC. CLAIRTON PLANT	TRANSPORTATION, DIESEL VEHICLES	20300101	Int Comb /Comm-Inst /Distillate Oil (Diesel) /Reciprocating
KOPPERS INC. CLAIRTON PLANT	LOADING, LIQUID LOADING	40899999	Organic Chem Transport /Specific Liquid /Loading Rack
KOPPERS INC. CLAIRTON PLANT	LOADING, ROD PITCH LOADING	30183001	Chem Manuf /General Processes /Storage/Transfer
KOPPERS INC. CLAIRTON PLANT	CARBON PITCH TANKS	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	PETROLEUM PITCH TANKS	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	TYPE A PITCH TANKS	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	RCO TANKS, RCO REGULAR TANKS	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	RCO TANKS, RCO CO-DISTILLED TANKS	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	PETRO TAR TANKS	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	CARBON BLACK OIL TANKS, CBO REGULAR TANKS	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	CARBON BLACK OIL TANKS, CBO CO-DISTILLED TANKS	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	CREOSOTE PROCESSING, P2 CREOSOTE TANK	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	CREOSOTE PROCESSING, P2 PETROLEUM CREOSOTE	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	NSR TANKS	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	CO-DISTILL MATERIAL TANKS	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	WASTEWATER STORAGE TANKS, WW TANKS UNCONTROLLED	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	DEBENZOL. COAL TAR TANKS	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	SOIL/VAPOR RECOVERY	50400201	Waste Disp /Site Remed /General Processes /Miscellaneous
KOPPERS INC. CLAIRTON PLANT	COOLING TOWER	38500102	Industrial Process Cooling Tower /Natural Draft
KOPPERS INC. CLAIRTON PLANT	CENTRIFUGE OPERATION	30199998	Chem Manuf /Other Not Classified /Specify in Comments Field
KOPPERS INC. CLAIRTON PLANT	PET PITCH PURGING/DEPRESS, PET PITCH CARS AND TRUCKS	40899999	Organic Chem Transport /Specific Liquid /Loading Rack
KOPPERS INC. CLAIRTON PLANT	NEEDLE COKER GAS OIL TANK	40703698	Organic Chem Storage - Fixed Roof Tanks - Specify Aromatic: Working Loss
KOPPERS INC. CLAIRTON PLANT	THERMAL OXIDIZER	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr
KOPPERS INC. CLAIRTON PLANT	THERMAL OXIDIZER, 4.5 MMBTU/HR DIRECT-FIRED TO	10200603	Ext Comb /Industrial /Natural Gas /< 10 Million Btu/hr
US STEEL CORP - CLAIRTON PLANT	BATTERY 1 FUGITIVES, BATTERY 1 CHARGING	30300302	By-product Coke Manuf /Oven Charging
US STEEL CORP - CLAIRTON PLANT	BATTERY 1 FUGITIVES, BATTERY 1 DOOR LEAKS	30300308	By-product Coke Manuf /Oven/Door Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 1 FUGITIVES, BATTERY 1 TOPSIDE LEAKS	30300314	By-product Coke Manuf /Topside Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 1 FUGITIVES, BATTERY 1 SOAKING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 1 FUGITIVES, BATTERY 1 DECARBONIZING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 2 FUGITIVES, BATTERY 2 CHARGING	30300302	By-product Coke Manuf /Oven Charging
US STEEL CORP - CLAIRTON PLANT	BATTERY 2 FUGITIVES, BATTERY 2 DOOR LEAKS	30300308	By-product Coke Manuf /Oven/Door Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 2 FUGITIVES, BATTERY 2 TOPSIDE LEAKS	30300314	By-product Coke Manuf /Topside Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 2 FUGITIVES, BATTERY 2 SOAKING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 2 FUGITIVES, BATTERY 2 DECARBONIZING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 3 FUGITIVES, BATTERY 3 CHARGING	30300302	By-product Coke Manuf /Oven Charging
US STEEL CORP - CLAIRTON PLANT	BATTERY 3 FUGITIVES, BATTERY 3 DOOR LEAKS	30300308	By-product Coke Manuf /Oven/Door Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 3 FUGITIVES, BATTERY 3 TOPSIDE LEAKS	30300314	By-product Coke Manuf /Topside Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 3 FUGITIVES, BATTERY 3 SOAKING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 3 FUGITIVES, BATTERY 3 DECARBONIZING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 13 FUGITIVES, BATTERY 13 CHARGING	30300302	By-product Coke Manuf /Oven Charging
US STEEL CORP - CLAIRTON PLANT	BATTERY 13 FUGITIVES, BATTERY 13 DOOR LEAKS	30300308	By-product Coke Manuf /Oven/Door Leaks

FACNAME	UNIT/PROCESS DESCRIPTION	SCC	SCC Description
US STEEL CORP - CLAIRTON PLANT	BATTERY 13 FUGITIVES, BATTERY 13 TOPSIDE LEAKS	30300314	By-product Coke Manuf /Topside Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 13 FUGITIVES, BATTERY 13 SOAKING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 13 FUGITIVES, BATTERY 13 DECARBONIZING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 14 FUGITIVES, BATTERY 14 CHARGING	30300302	By-product Coke Manuf /Oven Charging
US STEEL CORP - CLAIRTON PLANT	BATTERY 14 FUGITIVES, BATTERY 14 DOOR LEAKS	30300308	By-product Coke Manuf /Oven/Door Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 14 FUGITIVES, BATTERY 14 TOPSIDE LEAKS	30300314	By-product Coke Manuf /Topside Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 14 FUGITIVES, BATTERY 14 SOAKING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 14 FUGITIVES, BATTERY 14 DECARBONIZING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 15 FUGITIVES, BATTERY 15 CHARGING	30300302	By-product Coke Manuf /Oven Charging
US STEEL CORP - CLAIRTON PLANT	BATTERY 15 FUGITIVES, BATTERY 15 DOOR LEAKS	30300308	By-product Coke Manuf /Oven/Door Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 15 FUGITIVES, BATTERY 15 TOPSIDE LEAKS	30300314	By-product Coke Manuf /Topside Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 15 FUGITIVES, BATTERY 15 SOAKING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 15 FUGITIVES, BATTERY 15 DECARBONIZING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 19 FUGITIVES, BATTERY 19 CHARGING	30300302	By-product Coke Manuf /Oven Charging
US STEEL CORP - CLAIRTON PLANT	BATTERY 19 FUGITIVES, BATTERY 19 DOOR LEAKS	30300308	By-product Coke Manuf /Oven/Door Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 19 FUGITIVES, BATTERY 19 TOPSIDE LEAKS	30300314	By-product Coke Manuf /Topside Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 19 FUGITIVES, BATTERY 19 SOAKING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 19 FUGITIVES, BATTERY 19 DECARBONIZING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 20 FUGITIVES, BATTERY 20 CHARGING	30300302	By-product Coke Manuf /Oven Charging
US STEEL CORP - CLAIRTON PLANT	BATTERY 20 FUGITIVES, BATTERY 20 DOOR LEAKS	30300308	By-product Coke Manuf /Oven/Door Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 20 FUGITIVES, BATTERY 20 TOPSIDE LEAKS	30300314	By-product Coke Manuf /Topside Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY 20 FUGITIVES, BATTERY 20 SOAKING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 20 FUGITIVES, BATTERY 20 DECARBONIZING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY B FUGITIVES, BATTERY B CHARGING	30300302	By-product Coke Manuf /Oven Charging
US STEEL CORP - CLAIRTON PLANT	BATTERY B FUGITIVES, BATTERY B DOOR LEAKS	30300308	By-product Coke Manuf /Oven/Door Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY B FUGITIVES, BATTERY B TOPSIDE LEAKS	30300314	By-product Coke Manuf /Topside Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY B FUGITIVES, BATTERY B SOAKING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY B FUGITIVES, BATTERY B DECARBONIZING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY C FUGITIVES, BATTERY C CHARGING	30300302	By-product Coke Manuf /Oven Charging
US STEEL CORP - CLAIRTON PLANT	BATTERY C FUGITIVES, BATTERY C DOOR LEAKS	30300308	By-product Coke Manuf /Oven/Door Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY C FUGITIVES, BATTERY C OFFTAKES, LIDS	30300314	By-product Coke Manuf /Topside Leaks
US STEEL CORP - CLAIRTON PLANT	BATTERY C FUGITIVES, BATTERY C SOAKING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY C FUGITIVES, BATTERY C DECARBONIZING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	BATTERY 1 UNDERFIRING, BATTERY 1 UNDERFIRING	30300306	By-product Coke Manuf /Oven Underfiring
US STEEL CORP - CLAIRTON PLANT	BATTERY 2 UNDERFIRING, BATTERY 2 UNDERFIRING	30300306	By-product Coke Manuf /Oven Underfiring
US STEEL CORP - CLAIRTON PLANT	BATTERY 3 UNDERFIRING, BATTERY 3 UNDERFIRING	30300306	By-product Coke Manuf /Oven Underfiring
US STEEL CORP - CLAIRTON PLANT	BATTERY 13 UNDERFIRING, BATTERY 13 UNDERFIRING	30300306	By-product Coke Manuf /Oven Underfiring
US STEEL CORP - CLAIRTON PLANT	BATTERY 14 UNDERFIRING, BATTERY 14 UNDERFIRING	30300306	By-product Coke Manuf /Oven Underfiring
US STEEL CORP - CLAIRTON PLANT	BATTERY 15 UNDERFIRING, BATTERY 15 UNDERFIRING	30300306	By-product Coke Manuf /Oven Underfiring
US STEEL CORP - CLAIRTON PLANT	BATTERY 19 UNDERFIRING, BATTERY 19 UNDERFIRING	30300306	By-product Coke Manuf /Oven Underfiring
US STEEL CORP - CLAIRTON PLANT	BATTERY 20 UNDERFIRING, BATTERY 20 UNDERFIRING	30300306	By-product Coke Manuf /Oven Underfiring
US STEEL CORP - CLAIRTON PLANT	BATTERY B UNDERFIRING, BATTERY B UNDERFIRING	30300306	By-product Coke Manuf /Oven Underfiring
US STEEL CORP - CLAIRTON PLANT	BATTERY C UNDERFIRING, BATTERY C UNDERFIRING	30300306	By-product Coke Manuf /Oven Underfiring
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERIES 1-3, PEC BAGHOUSE STACK	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERIES 1-3, TRAVELING HOT CAR	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERIES 1-3, PEC FUGITIVES	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERIES 1-3, PRE PUSH	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERIES 1-3, UNCONTROLLED PUSHING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERIES 1-3, BALL MILL	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 13-15, PEC BAGHOUSE STACK	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 13-15, TRAVELING HOT CAR	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 13-15, PEC FUGITIVES	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 13-15, PRE PUSH	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 13-15, UNCONTROLLED PUSHING	30300303	By-product Coke Manuf /Oven Pushing

FACNAME	UNIT/PROCESS DESCRIPTION	SCC	SCC Description
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 13-15, BALL MILL	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 19-20, PEC BAGHOUSE STACK	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 19-20, TRAVELING HOT CAR	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 19-20, PEC FUGITIVES	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 19-20, PRE PUSH	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 19-20, UNCONTROLLED PUSHING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATT. 19-20, BALL MILL	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERY B, PEC BAGHOUSE STACK	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERY B, TRAVELING HOT CAR	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERY B, PEC FUGITIVES	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERY B, PRE PUSH	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERY B, UNCONTROLLED PUSHING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERY B, BALL MILL	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERY C, PEC BAGHOUSE STACK	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERY C, TRAVELING HOT CAR	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERY C, PEC FUGITIVES	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERY C, PRE PUSH	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERY C, UNCONTROLLED PUSHING	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	PEC SYSTEM, BATTERY C, BALL MILL	30300303	By-product Coke Manuf /Oven Pushing
US STEEL CORP - CLAIRTON PLANT	QUENCH TOWER 1	30300304	By-product Coke Manuf /Quenching
US STEEL CORP - CLAIRTON PLANT	QUENCH TOWER 5A	30300304	By-product Coke Manuf /Quenching
US STEEL CORP - CLAIRTON PLANT	QUENCH TOWER 7A	30300304	By-product Coke Manuf /Quenching
US STEEL CORP - CLAIRTON PLANT	QUENCH TOWER B	30300304	By-product Coke Manuf /Quenching
US STEEL CORP - CLAIRTON PLANT	QUENCH TOWER C	30300304	By-product Coke Manuf /Quenching
US STEEL CORP - CLAIRTON PLANT	BOILER 1, STCK S31, BOILER 1, COG	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas
US STEEL CORP - CLAIRTON PLANT	BOILER 1, STCK S31, BOILER 1, NG	10200601	Ext Comb /Industrial /Natural Gas /> 100 Million Btu/hr
US STEEL CORP - CLAIRTON PLANT	BOILER 2, STCK S32, BOILER 2, COG	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas
US STEEL CORP - CLAIRTON PLANT	BOILER 2, STCK S32, BOILER 2, NG	10200601	Ext Comb /Industrial /Natural Gas /> 100 Million Btu/hr
US STEEL CORP - CLAIRTON PLANT	BOILER R1, STACK S36, BOILER R1, COG	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas
US STEEL CORP - CLAIRTON PLANT	BOILER R2, STACK S36, BOILER R2, COG	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas
US STEEL CORP - CLAIRTON PLANT	BOILER T1, STACK S38, BOILER T1, COG	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas
US STEEL CORP - CLAIRTON PLANT	BOILER T2, STACK S39, BOILER T2, COG	10200707	Ext Comb /Industrial /Process Gas /Coke Oven Gas
US STEEL CORP - CLAIRTON PLANT	TAR/FL DECANTERS	30300331	By-product Coke Manuf /By-product Coke Manufacturing
US STEEL CORP - CLAIRTON PLANT	FL CIRC./SURGE TANKS	30300333	By-product Coke Manuf /Excess-ammonia Liquor Tank
US STEEL CORP - CLAIRTON PLANT	TAR STORAGE/SEP TANKS	30300336	By-product Coke Manuf /Tar Storage
US STEEL CORP - CLAIRTON PLANT	WEIR TANK/INTERCEPT SUMP	30300335	By-product Coke Manuf /Tar Interceding Sump
US STEEL CORP - CLAIRTON PLANT	FINAL COOLER SUMP	30300341	By-product Coke Manuf /Light Oil Sump
US STEEL CORP - CLAIRTON PLANT	FL PUMPHOUSE SUMPS	30300333	By-product Coke Manuf /Excess-ammonia Liquor Tank
US STEEL CORP - CLAIRTON PLANT	EQUIPMENT LEAKS/SAMP CONN	30300331	By-product Coke Manuf /By-product Coke Manufacturing
US STEEL CORP - CLAIRTON PLANT	TAR COLLECTING TANKS	30300331	By-product Coke Manuf /By-product Coke Manufacturing
US STEEL CORP - CLAIRTON PLANT	CONTINUOUS COAL UNLOADERS, COAL UNLOADER #1	30300305	By-product Coke Manuf /Coal Unloading
US STEEL CORP - CLAIRTON PLANT	CONTINUOUS COAL UNLOADERS, COAL UNLOADER #2	30300305	By-product Coke Manuf /Coal Unloading
US STEEL CORP - CLAIRTON PLANT	PEDESTAL CRANE UNLOADER	30300305	By-product Coke Manuf /Coal Unloading
US STEEL CORP - CLAIRTON PLANT	CLAM SHELL UNLOADER	30300305	By-product Coke Manuf /Coal Unloading
US STEEL CORP - CLAIRTON PLANT	COAL TRANSFER	30300305	By-product Coke Manuf /Coal Unloading
US STEEL CORP - CLAIRTON PLANT	#1 PULVERIZERS, #1 PULVERIZER, PRIMARY	30300310	By-product Coke Manuf /Coal Crushing
US STEEL CORP - CLAIRTON PLANT	#1 PULVERIZERS, #1 PULVERIZER, SECONDARY	30300310	By-product Coke Manuf /Coal Crushing
US STEEL CORP - CLAIRTON PLANT	#2 PULVERIZERS, #2 PULVERIZER, PRIMARY	30300310	By-product Coke Manuf /Coal Crushing
US STEEL CORP - CLAIRTON PLANT	#2 PULVERIZERS, #2 PULVERIZER, SECONDARY	30300310	By-product Coke Manuf /Coal Crushing
US STEEL CORP - CLAIRTON PLANT	COAL STORAGE-BINS/BUNKERS	30300316	By-product Coke Manuf /Coal Storage Pile
US STEEL CORP - CLAIRTON PLANT	COAL STORAGE PILE EROSION	30300316	By-product Coke Manuf /Coal Storage Pile
US STEEL CORP - CLAIRTON PLANT	COKE TRANSFER 1-3, B, C	30300309	By-product Coke Manuf /Coal Conveying
US STEEL CORP - CLAIRTON PLANT	COKE TRANSFER 13-15, 19-20	30300309	By-product Coke Manuf /Coal Conveying
US STEEL CORP - CLAIRTON PLANT	COKE PILE, LOAD/UNLOAD	30300312	By-product Coke Manuf /Coke: Crushing/Screening/Handling

FACNAME	UNIT/PROCESS DESCRIPTION	SCC	SCC Description
US STEEL CORP - CLAIRTON PLANT	SCREEN STATION 1-3	30300312	By-product Coke Manuf /Coke: Crushing/Screening/Handling
US STEEL CORP - CLAIRTON PLANT	SCREEN STATION 1-3, SCR. STN 1-3, LOADOUT	30300312	By-product Coke Manuf /Coke: Crushing/Screening/Handling
US STEEL CORP - CLAIRTON PLANT	SCREEN STN 13-15, 19-20	30300312	By-product Coke Manuf /Coke: Crushing/Screening/Handling
US STEEL CORP - CLAIRTON PLANT	SCREEN STN 13-15, 19-20, SCRN 13-15, 19-20 LOADOUT	30300312	By-product Coke Manuf /Coke: Crushing/Screening/Handling
US STEEL CORP - CLAIRTON PLANT	COKE STORAGE PILE EROSION, COKE PILE EROSION	30300316	By-product Coke Manuf /Coal Storage Pile
US STEEL CORP - CLAIRTON PLANT	SCREEN STN 4 (B, C)	30300312	By-product Coke Manuf /Coke: Crushing/Screening/Handling
US STEEL CORP - CLAIRTON PLANT	BLASTING - BLACK BEAUTY	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	PLANT ROADS, PAVED ROADS	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	PLANT ROADS, UNPAVED ROADS	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	MOTOR VEHICLE EXHAUST, HEAVY-DUTY VEHICLES	20300101	Int Comb /Comm-Inst /Distillate Oil (Diesel) /Reciprocating
US STEEL CORP - CLAIRTON PLANT	TUG BOAT EXHAUST	20300101	Int Comb /Comm-Inst /Distillate Oil (Diesel) /Reciprocating
US STEEL CORP - CLAIRTON PLANT	FACILITY MAINTENANCE, SAFETY-KLEEN PARTS WASHER	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	FACILITY MAINTENANCE, PAINTS AND THINNERS	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	SCOT HYDROGENATION UNIT, SCOT STACK	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	COOLING TOWER	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	FLARING	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	AERATION BASINS - WWTP	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	METHANOL USAGE, AIR LINES	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	METHANOL USAGE, WINTER LID SLURRY	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	METHANOL USAGE, STORAGE TANKS	30399999	Primary Metals /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	WWT SURGE TANK NH3 FLARE	39990024	Misc Manuf Indus /Process Gas: Flares
US STEEL CORP - CLAIRTON PLANT	NH3 TANKER LOADING FLARE	39999993	Misc Manuf / Indus Processes /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	COG VENTING, ACCIDENTAL VENT	31000299	Natural Gas Production /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	L.O. COLLECTING TANKS	39999996	Misc Manuf / Indus Processes /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	L.O. BARGE LOADING	39999996	Misc Manuf / Indus Processes /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	L.O. DECANTERS, L.O. DECANTERS	39999996	Misc Manuf / Indus Processes /Other Not Classified
US STEEL CORP - CLAIRTON PLANT	BOOM CONVEYOR, FRONT END LOADER TO TRUCK	30300305	By-product Coke Manuf /Coal Unloading
US STEEL CORP - CLAIRTON PLANT	BOOM CONVEYOR, TRUCK TO HOPPER	30300305	By-product Coke Manuf /Coal Unloading
US STEEL CORP - CLAIRTON PLANT	BOOM CONVEYOR, HOPPER TO CONVEYOR	30300305	By-product Coke Manuf /Coal Unloading
US STEEL CORP - CLAIRTON PLANT	BOOM CONVEYOR, CONVEYOR TO BARGE	30300305	By-product Coke Manuf /Coal Unloading
AKJ Industries	Sludge Processing, Sludge Processing 1	30601001	Petrol Indus /Sludge Converter /General
AKJ Industries	Sludge Processing, Sludge Processing 2	30601001	Petrol Indus /Sludge Converter /General
Bekavac Funeral Home	INCINERATOR, EURICH INCINERATOR	31502101	Health Care - Crematoriums /Crematory Stack
Dura-Bond Industries	FUSION BOND PROCESS, FUSION BOND AIR WASH	30900207	Fabricated Metal /Abrasive Blasting of Metal Parts /Shotblast with Air
Dura-Bond Industries	EXTRUSION PROCESS(X-TEC), XTEC WB BH STACK	30900207	Fabricated Metal /Abrasive Blasting of Metal Parts /Shotblast with Air
Dura-Bond Industries	EXTRUSION PROCESS(X-TEC), X-TEC OIL HEATER	10300602	Ext Comb /Comm-Inst /Natural Gas /10-100 Million Btu/hr
Dura-Bond Industries	FUSION BOND PROCESS, FUSION BOND AIR WASH	30901699	Fabricated Metal /Metal Pipe Coating of Metal Parts /Other Not Classified
Dura-Bond Industries	ROAD EMISSIONS, ROAD DUST (Haul Trucks)	30300834	Iron Production /Paved Roads: All Vehicle Types
Dura-Bond Industries	ROAD EMISSIONS, FORKLIFT EMISSIONS (Diesel)	27000320	Int Comb /Engine Testing /Wastewater, Pts of Generation /Specify Point of Generation
Dura-Bond Industries	ROAD EMISSIONS, ROAD DUST (Forklifts)	30300834	Iron Production /Paved Roads: All Vehicle Types
Dura-Bond Industries	FUSION BOND OVEN 1	10300603	Ext Comb /Comm-Inst /Natural Gas /< 10 Million Btu/hr
Dura-Bond Industries	FUSION BOND OVEN 2	10300603	Ext Comb /Comm-Inst /Natural Gas /< 10 Million Btu/hr
Dura-Bond Industries	FUSION BOND OVEN 3	10300603	Ext Comb /Comm-Inst /Natural Gas /< 10 Million Btu/hr
Dura-Bond Industries	FUSION BOND WB-1 BH STACK	30900207	Fabricated Metal /Abrasive Blasting of Metal Parts /Shotblast with Air
Dura-Bond Industries	FUSION BOND WB-2 BH STACK	30900207	Fabricated Metal /Abrasive Blasting of Metal Parts /Shotblast with Air
Dura-Bond Industries	FUSION BOND DRYING OVEN	10300603	Ext Comb /Comm-Inst /Natural Gas /< 10 Million Btu/hr
Dura-Bond Industries	GASOLINE STORAGE TANK	40400107	Petrol Prod Stor-Bulk Terminals /Gasoline RVP 13: Working Loss (Diam Independent) - Fixed Roof Tank
Dura-Bond Industries	DIESEL STORAGE TANK	40400109	Petrol Prod Stor-Bulk Terminals /Gasoline RVP 7: Working Loss (Diam Independent) - Fixed Roof Tank
ELG Metals	Scrap Burning	30402201	Secondary Metals /Metal Heat Treating /Furnace: General
ELG Metals	Emergency Generator	20200202	Int Comb /Industrial /Natural Gas /Reciprocating
ELG Metals	Roads, Vehicles	30499999	Secondary Metals /Other Not Classified /Specify in Comments Field
Mid-Continent Coal & Coke	SCREENS	30300312	By-product Coke Manuf /Coke: Crushing/Screening/Handling
Mid-Continent Coal & Coke	STORAGE PILES	30588801	Mineral Prods /Fugitive Emissions /Specify in Comments Field
Mid-Continent Coal & Coke	ROAD EMISSIONS	30300833	Iron Production /Unpaved Roads: Heavy Duty Vehicles

FACNAME	UNIT/PROCESS DESCRIPTION	SCC	SCC Description
Mid-Continent Coal & Coke	EQUIPMENT FUEL USAGE	10201403	Ext Comb /Industrial /CO Boiler /Distillate Oil
Mon Valley Transportation	DOCK 2, DOCK 2 LOADING	30510504	Mineral Prods /Bulk Materials Loading /Coke
Mon Valley Transportation	RAILCAR, RAILCAR UNLOADING	30510404	Mineral Prods /Bulk Materials Unloading Op /Coke
Mon Valley Transportation	DOCK 3, DOCK 3 UNLOADING	30510404	Mineral Prods /Bulk Materials Unloading Op /Coke
Mon Valley Transportation	DOCK 1, DOCK 1 UNLOADING	30510404	Mineral Prods /Bulk Materials Unloading Op /Coke
Mon Valley Transportation	VEHICLES, TRUCK EMISSIONS	30531090	Coal Mining, Cleaning & Material Handling /Haul Roads: General
Mon Valley Transportation	STORAGE PILES, EROSION	30510304	Mineral Prods /Bulk Materials Open Stockpiles /Coke
Pennsylvania Electric Coil	Large Bake Oven, Natural Gas Combustion	39000699	In-Process Fuel Use /Natural Gas /General
Pennsylvania Electric Coil	Large Bake Oven, Coating Evaporation	40200803	Surface Coating Oven - General /Baked : 175F **
Pennsylvania Electric Coil	Small Bake Oven, Natural Gas Combustion	39000699	In-Process Fuel Use /Natural Gas /General
Pennsylvania Electric Coil	Small Bake Oven, Coating Evaporation	40200803	Surface Coating Oven - General /Baked : 175F **
Pennsylvania Electric Coil	Paint Spray Booth	40201806	Metal Coil Coating /Finish Coating
Pennsylvania Electric Coil	Coil Manufacturing, Oven, Natural Gas Combustion	39000699	In-Process Fuel Use /Natural Gas /General
Pennsylvania Electric Coil	Coil Manufacturing, Oven, Coating Evaporation	40200803	Surface Coating Oven - General /Baked : 175F **
Pennsylvania Electric Coil	Skin/Tin Area, Tinning Process	30904030	Fabricated Metal /Metal Deposition Processes /Tinning: Batch Process
Pennsylvania Electric Coil	Skin/Tin Area, Natural Gas Combustion	39000699	In-Process Fuel Use /Natural Gas /General
Pennsylvania Electric Coil	Gas Insulator	39000699	In-Process Fuel Use /Natural Gas /General
Pennsylvania Electric Coil	Coil Pressing Area	39000699	In-Process Fuel Use /Natural Gas /General
Pennsylvania Electric Coil	Cleaning of Motor Part	39000699	In-Process Fuel Use /Natural Gas /General
Pennsylvania Electric Coil	U-372 Storage Area	40714698	Organic Chem Storage - Fixed Roof Tanks - Specify In Comments: Working Loss
Pennsylvania Electric Coil	U-475 Storage Area	40714698	Organic Chem Storage - Fixed Roof Tanks - Specify In Comments: Working Loss
Pennsylvania Electric Coil	TSR-601 Varnish Tank	40714698	Organic Chem Storage - Fixed Roof Tanks - Specify In Comments: Working Loss
Pennsylvania Electric Coil	Miscellaneous Fugitives	40202599	Surface Coating /Misc Metal Parts /Other Not Classified
Pennsylvania Electric Coil	Boiler	10200602	Ext Comb /Industrial /Natural Gas /10-100 Million Btu/hr
Pennsylvania Electric Coil	Gas Radient Space Heaters	10500106	Ext Comb /Space Heater /Industrial /Natural Gas
Pennsylvania Electric Coil	Small Burnoff Oven, Coating Evaporation	31307002	Electrical Equip /Electrical Windings Reclamation /Multiple Chamber Incinerator/Oven
Pennsylvania Electric Coil	Small Burnoff Oven, Natural Gas Combustion	39000699	In-Process Fuel Use /Natural Gas /General
Pennsylvania Electric Coil	Large Burnoff Oven, Coating Evaporation	31307002	Electrical Equip /Electrical Windings Reclamation /Multiple Chamber Incinerator/Oven
Pennsylvania Electric Coil	Large Burnoff Oven, Natural Gas Combustion	39000699	In-Process Fuel Use /Natural Gas /General
Tech Met	ETCH LINE 1, MEDIUM TANK ETCH LINE P001	30901501	Fabricated Metal /Chemical Milling of Metal Products /Milling Tank
Tech Met	ETCH LINE 2, LARGE TANK ETCH LINE P002	30901501	Fabricated Metal /Chemical Milling of Metal Products /Milling Tank
Tech Met	ETCH LINE 3, CHEMTEX ETCH LINE P003	30901501	Fabricated Metal /Chemical Milling of Metal Products /Milling Tank
Tech Met	MISCELLANEOUS SOLVENT USAGE	30988801	Fabricated Metal /Fugitive Emissions /Specify in Comments Field
Tube City IMS Clairton	Steel Scrap, Steel Scrap Cutting	30400768	Secondary Metals /Steel Foundries /Scrap Handling

ACHD Emissions Inventory Reporting Instructions (2012)
Stationary Point Sources

INTRODUCTION

Background

This inventory is intended to incorporate a number of emission reporting requirements within one package. The information gathered is used for compliance purposes, general information concerning air emissions in the County, and meeting legal requirements under County, State, and Federal law.

Submitted information is entered into an AES*Online web-based data system by the user. The County Health Department's Air Quality Program (AQP) reviews the submitted information and accepts it after all information is received as requested. This will be used in future years to simplify the reporting of the needed inventory information. The Department also prefers to have consistency between the inventory system and sources included in Title V and "Synthetic Minor" permits.

AES*Online emission information accepted by the County Health Department is transferred to the PA Department of Environmental Protection's Air Information Management System (AIMS).

Facilities Included in this Inventory

The facilities included in this inventory, at a minimum, are:

- Title V facilities;
- Synthetic Minor facilities; and
- Facilities that emit any criteria pollutant in amounts equal to or greater than 25 tons per year.

Facilities that receive this package must respond to the data request to comply with the requirements of the Clean Air Act. Annual emission inventories in Allegheny County must be submitted by March 15th easch year . If the fifteenth falls on a weekend then the emission invnetory is due on the first busineess day following the weekend.

Assistance Resources

The 1990 amendments to the Clean Air Act placed new requirements on smaller facilities. The PA Small Business Development Center's Environmental Management Assistance Program (EMAP) provides free and confidential environmental regulatory assistance to small businesses in Pennsylvania. The services include:

- **Toll-Free Hot Line 1-877-ASK-EMAP (1-800-275-3627);**
- **Email - questions@askemap.org;**
- **Website - http://www.askemap.org/;**
- Brochures and pamphlets;
- Site visits to help determine the regulations that might apply to your facility;
- Review of permit applications for completeness and accuracy; and

- Small Business Ombudsman to help locate sources of funding for compliance with air pollution regulations.

Emission Sources to Include in the Inventory

Please include all air emission sources at the facility. This includes air pollution sources, control equipment, and stack emission points. Sources that were included in earlier emission inventories and, if Title V requirements are applicable, emission components listed in the Title V application/permit should also be included in this inventory. Emission sources that are exempt from permitting requirements are still reportable in the annual emission inventory. If a process or piece of equipment has actual emissions of at least 0.1 tpy of hazardous air pollutant, it must be included in the annual emissions inventory. An example would be space heaters. In Allegheny County actual emissions of criteria emissions must be reported down to the lowest limit available in AES Online.

Fugitive emissions include both plant and vehicle fugitive emissions. Vehicle fugitive emissions originate from not only vehicles but also from roads on the premises. Vehicle emissions from facility dedicated vehicles that do not operate on public roads or exit plant property must be reported as point source emissions from the facility. This includes tailpipe emissions and emissions from travel over the firm's property by site dedicated vehicles. Emissions from non-dedicated vehicles must be reported as point source emissions from the facility for travel over unpaved roads and areas on the facility property. Supporting calculations should be included with supporting documentation (see steps 5.7 and 6.4).

Aggregation of sources:

Individual sources need to be identified. However, some small sources can be aggregated in the emissions system. The aggregating of sources should be consistent with that required for the permit requirements for Title V and synthetic minor sources. In some cases, an acceptable aggregation of sources may not be available until a Title V permit has been issued. Synthetic minor sources will need to be reported consistent with information provided in their synthetic minor application/permit. **An example of aggregation of sources would be tanks of the same design and size used to store the same materials.**

Accidental Releases

Unplanned unintentional releases of air emissions must be reported in this inventory. These releases can be reported as miscellaneous emissions (see Section 6.0).

Reporting Hazardous Air Pollutants (HAP) Emissions for the National Toxics Inventory

The EPA continues to demand a high level of detail for the reporting of HAPs in emissions inventories. Where state and local agencies are unable to supply HAP emission inventory data, the EPA will prepare default emissions inventory data for the National Toxics Inventory (NTI). Sources should report emissions not only of specific compounds categorized as HAPs but also for pollutants within compound groups such as glycol ethers, metal compounds, and polycyclic organic matter also categorized as HAPs. The EPA is making all emissions inventory data available on the internet. Therefore, the Air Quality Program believes it is in the best interest of every source to comply to the extent practicable with the instructions in this document. Furthermore, all firms should be aware that the Air Quality Program compares the data submitted in their emissions inventory to that submitted in the same firm's Toxic Release Inventory for consistency and accuracy.

The Emission Inventory Instructions are divided into the following sections:

1.0 **Accessing AES*Online**: This section provides information to access AES*Online and how to obtain account information for first-time users.

2.0 **General Facility/SubFacility Information**: This section provides details for completing General Facility and SubFacility information.

3.0 **SubFacility Fuel**: The section provides information on entering fuel details.

4.0 **SubFacility Operating Schedule**: This section provides information on entering operating schedules.

5.0 **SubFacility Emissions**: This section provides information on entering emissions.

6.0 **Miscellaneous Emissions**: This section provides information on entering miscellaneous emissions.

7.0 **Pollutant Summary**: This section provides information on completing the Pollutant Summary.

8.0 **Fuel Usage Summary**: This section provides information on completing the Fuel Usage Summary.

9.0 **Submission**: This section provides information on submitting the emissions inventory.

10.0 **Revision(s) and Resubmission(s)**: This section provides information on revising and resubmitting the emissions inventory.

11.0 **Acceptance**: This section provides information on the Department accepting emissions inventory submissions.

Tables and Appendices:

Appendix A	Hazardous Air Pollutant Reporting
Appendix B	Calculation of Tank Emissions below Roof Supports
Appendix C	Material Balance Explanation
Appendix D	ACHD Completion Checklist

Section 1.0

Accessing AES*Online

This section provides information on accessing AES*Online and obtaining account information for first-time users.

1.1 First-Time User: If accessing AES*Online for the first time, an AES*Online account will need to be created. To create an account electronically, access the DEP Greenport site (www.depgreenport.state.pa.us) and click the "Click here to self-register" button. Follow the subsequent steps. Once completed, an email with the username and password will be received. This is the information needed to log in to DEP Greenport. A copy of this email should be stored for future use.

Accounts can also be created by completing and submitting the "Request for Security Access/Portal Account" form provided on the Allegheny County Health Department's Air Quality Program website (http://www.achd.net/air/ind.html).

Be sure the certifying official (submitter of the emissions inventory) has the security role of "Submitter" in order to be able to view, edit, and submit the emissions inventory to the Department. Other users can have the role of "Reader" (only view the inventory but not edit) or "Editor" (can view/edit data). Each facility can only have one submitter and up to five readers/editors.

Questions regarding account access or obtaining forgotten passwords can be directed to: Robert Bihl (717-772-3950, rbihl@pa.gov) or Mike Rudawski (717-783-9241, mrudawski@pa.gov).

1.2 Existing Users: To access AES*Online, access the DEP Greenport site (www.depgreenport.state.pa.us). Enter the username and password and click the "Log into DEPGreenPort" button. Click the "AES" button on the following screen.

The subsequent screen will provide the Trading Partner Agreement. This screen appears each time the user logs into AES*Online. Read the agreement and click the "I agree" button. The Emission Inventory Production Report screen will appear listing the facility(-ies) the user has access to. Under the Option heading, click the "Edit" link to access the facility of interest.

Section 2.0

General Facility/SubFacility Information

This section provides details for completing AES*Online General Facility and SubFacilities details.

2.1 Facility: Click "Facility Details" on the left-hand navigation pane to access general facility details such as tax ID, PF ID, county, SIC, NAICS, contacts, and site location. If any of this information has changed, please add a note to AES*Online explaining the change(s). Notes can be added to AES*Online by clicking the "New Note" link in the upper right-hand corner, entering the appropriate information, and clicking the "OK" button.

The work done in AES*Online is not saved until the user saves the work. Be sure to save after each update.

2.2 SubFacility/SCCs: The SCC Codes (SCCs) are building blocks upon which the national depository of point source emissions data is structured. Each SCC represents a unique process or function within a source category logically associated with a group of air pollution emissions.

Any operation causing air pollution can be represented by one or more of these SCCs. SCC is a critical data element since, without an appropriate SCC, a process cannot be properly identified for data entry or data retrieval purposes, nor can emissions be properly calculated when using the associated emission factors.

It is advisable for your facility to compare its AES*Online SCCs with the EPA's WebFIRE database (http://cfpub.epa.gov/webfire/) to identify SCC differences. It is the facility's responsibility to contact the Department to request such changes.

To access the subfacility and SCC status for a facility, click "Sub Facility/SCC Status" on the left-hand navigation pane to access the SCC Status Change Request screen. If any SCC status is incorrect, click the change box for each subfacility SCC status to be changed. These changes will not take effect until the following day. The system requires 24 hours to refresh.

Notes can also be added by the user as needed. To add a note, click the "New Note" link in the upper right-hand corner of the screen. Enter the appropriate information in the pop-up window, and click the "OK" button.

Section 3.0

SubFacility Fuel

This section provides details for entering fuel tests.

3.1 Accessing the Fuel Test: Click "Sub Facilities" in the left-hand navigation pane. Click the subfacility of interest. In the Sub Facility Details screen, click the SCC of interest in the "SCCs Used" column. The following screen will be the SCC summary where the fuel test(s) can be added and entered. Fuel test information can be obtained from the supplier.

3.2 Date Collected: Enter the fuel test date.

3.3 Percent Ash: Enter the ash content associated with the fuel test date in step 3.2. **Reporting of ash content for coal and fuel oil is mandatory.** It is not necessary to provide this information for Natural Gas and Propane because the ash content of these fuels is negligible.

3.4 Percent Sulfur: Enter the sulfur content associated the fuel test date in step 3.2. **Reporting of sulfur content for coal and fuel oil is mandatory.** It is not necessary to provide this information for Natural Gas and Propane because the sulfur content of these fuels is negligible.

3.5 BTU (lb/gal/cu ft): Enter the heat content associated with the fuel test date in step 3.2. Click the "Save" button.

3.6 Additional fuel tests: Repeat steps 3.1 to 3.5 for each additional fuel test. **Again, it is mandatory to include the sulfur and ash contents for coal and fuel oil.** Be sure to save all work as needed.

Section 4.0

SubFacility Operating Schedule

This section provides details for entering operating schedules.

4.1 Accessing the Operating Schedule: Click "Sub Facilities" in the left-hand navigation pane. Click the subfacility of interest. In the Sub Facility Details screen, click the SCC of interest in the "SCCs Used" column. The following screen will be the SCC summary where the operating schedules can be added and entered.

4.2 Date Effective: Enter the subfacility start date for the reporting period.

4.3 Date End: Enter the subfacility end date for the reporting period.

4.4 Total Days: Enter the total days the subfacility operated during the reporting period.

4.5 Total Hours: Enter the total hours (not hours per week) the subfacility operated during the reporting period.

4.6 Days Per Week: Enter the days per week the subfacility operated during the reporting period. If not known, leave blank and AES*Online will calculate.

4.7 Throughput Units: Select the appropriate units from the drop-down menu using the button. If emissions factors are used to estimate emissions, the units for the above data elements must be consistent with the emission factor units.

4.8 Monthly Throughputs: Enter the monthly throughputs for the reporting period in the fields. If monthly throughputs are unknown, divide the annual throughput by 12, and enter this value in each monthly field. Remember to save all work.

4.9 Additional SubFacilities, SCCs, and/or Operating Schedules: Repeat steps 4.1 to 4.8 as needed.

Section 5.0

SubFacility Emissions

This section provides details for entering emissions. A separate entry for each criteria pollutant and each HAP is necessary whether the HAP is a VOC or not. Title V sources must provide information on emissions of HAPs at the process emission level. The cut-off for reporting of HAP emissions is at the facility wide level. Appendix A provides further information on hazardous air pollutant reporting

For any single pollutant, an amount equal to 0.1 ton or greater must be reported at the individual process level. However, some pollutants of special concern are to be reported as follows:

- Polychlorobiphenols (PCB) - 0.01 TPY
- Lead (Pb) - 0.01 TPY
- Polycyclic Organic Mater (POM) - 0.01 TPY
- Dioxins (submit Lbs/Yr only) - 0.02 Lbs/Yr
- Furans (submit Lbs/Yr only) - 0.02 Lbs/Yr
- Mercury (Hg) from coal fired electric generating units (EGU) - 0.0001 TPY
- Mercury (Hg) from Non-coal fired EGUs - 0.0005 TPY

- Mercury (Hg) from all other subfacilities - 0.01 TPY

5.1 Accessing the Manual Emissions: Click "Sub Facilities" in the left-hand navigation pane. Click the subfacility of interest. In the Sub Facility Details screen, click the "Manual Emissions" link under the "SCCs Used" column. The following screen will be the Manual Emissions summary where pollutants and emissions can be added and entered.

5.2 Criteria Pollutants: Emissions for each of these pollutants must be reported. See the following sections for further information.

5.2.1 NH3 Ammonia: Ammonia is a precursor for PM2.5. Emissions for this pollutant must be reported.

5.2.2 CO Carbon Monoxide: Carbon monoxide is usually the result of incomplete combustion for fuel burning equipment, such as boilers and process heaters, but can also be the result of some non-combustion processes.

5.2.3 Pb Lead: Lead is a commonly known pollutant that has emission factors associated with many SCCs.

5.2.4 NOx Nitrogen Oxides: Nitrogen oxides are usually produced by combustion. Atmospheric nitrogen and nitrogen compounds in fuels are oxidized. Some non-combustion processes may also produce nitrogen oxides.

5.2.5 PM10 Particulate Matter (< 10 microns in diameter, PM10): Report the total (collective) amount of particulate matter less than ten microns in aerodynamic diameter, other than water, emitted for each process at each point. AP-42 (and other references) may provide emissions factors for total particulates, condensables, and filterables. Be sure to use the correct emission factor. **Be sure to report only filterable particulate matter**. If facility-specific information is used (such as site testing), be sure the PM10 emission factor used is only for filterable.

5.2.5a Special Instructions for Coke Plants PM10: Report coke oven emissions and cyanide compounds separately and add these emissions to the PM10 to ensure that reported PM10 is greater than or equal to the sum of the reported PM10 HAPs. The Department will adjust the billing so that coke oven emissions and cyanide compounds are not double counted.

5.2.6 PM2.5 Particulate Matter (< 2.5 microns in diameter, PM2.5) Report the total (collective) filterable amount of particulate matter less than 2.5 microns in aerodynamic diameter, other than water, emitted for each process at each point. If no factor is available, use the PM10 emission factor for determining PM2.5 emissions.

5.2.6a Condensable Particulate:AES Online does not provide a filed for the reporting of condensable particulate. The DEP is considering upgrading the system do allow separate reporting of this form of particulate. Until they do report only filterable particulate in AES Online. Do not add pm condensable to filterable PM10 and report this total in AES as PM10.

5.2.7 SOx Sulfur Oxides: Sulfur dioxide is a commonly known pollutant that has emission factors associated with many SCCs. Some SOx emission factors are dependent on the sulfur content of the fuel so be sure sulfur content entered in AES*Online fuel test(s) is correct.

5.2.8 VOC Total Volatile Organic Compound: An organic compound that participates in atmospheric photochemical reactions; that is, an organic compound other than those which the Administrator of the EPA designates as having negligible photochemical reactivity.

5.3 Non-Criteria Pollutants: Other hazardous pollutants should be included with the submission. Hexane is such a pollutant. **Hexane is a product of natural gas combustion and is to be reported for all sources that burn natural gas.** Appendix A provides additional information and recommendations regarding how to report hazardous air pollutants. A list of hazardous air pollutants can be found at the link below:

http://www.achd.net/airqual/pubs/pdf/Art21_polctrl2010.pdf

If a pollutant is not shown on the Manual Emissions screen, it can be added using the drop-down menu at the bottom of the screen. Remember to add additional pollutants as needed to ensure all pollutants are reported in the current inventory that were reported in previous years as well as any pollutants that may be emitted for the first time due to new processes or raw material changes.

5.4 Greenhouse Gases and Miscellaneous Alkanes: Do **NOT** report greenhouse gases (carbon dioxide, methane, nitrous oxide, and various fluorinated gases) as well as miscellaneous alkanes except for hexane. Hexane must be reported since it is both a hap and product of natural gas combustion.

5.5 Emission Factors: Emission factors for some pollutants may be available in AES*Online. These factors should be used with caution as they are "standard" for SCCs. Facilities may have different emission factors depending on such items as stack testing, manufacturer specifications, etc. Others may be found in AP-42 or databases such as WebFIRE. WebFIRE and AP-42 can be found at the EPA Emission Factor Inventory site (http://www.epa.gov/ttn/chief/efpac/index.html).

To access the list of AES*Online emission factors for the subfacility of interest, click the "View Factors" link in the upper right-hand corner of the screen. This list can also be accessed by clicking the "View Factors" link in the left-hand navigation pane under the subfacility. Please be advised some DEP factors may be out of date Webfire and AP-42 should be checked to insure the DEP factor available in AES online is still current.

All tank emissions are to be calculated using the EPA TANKS Program Version 4.09D (except emissions from the emptying of internal/external floating roof tanks below roof supports). The EPA TANKS Program can be downloaded from: http://www.epa.gov/ttn/chief/software/tanks/index.html. Calculation of emissions from the emptying of internal/external floating roof tanks below roof supports is provided in Appendix B. **Both VOC and HAP emissions from tanks are entered into AES*Online.**

5.6 Calculation Method: Select the appropriate calculation method for each pollutant using the drop-down menu associated with that pollutant. If the "See Comment" method is selected, the user must add a comment to AES*Online explaining the basis for calculating emissions. Comments can be added by clicking the "New Note" link in the upper right-hand corner, entering the information in the pop-up window, and clicking "OK".

5.7 Emission Amount: Enter the emissions in **tons per year** for each pollutant in its respective field under the Emission Amount column. Repeat this step for each pollutant.

If the user prefers to have AES*Online calculate the emissions for a hazardous air pollutant, select the Calculation Method "Dep Factor Used by Dep" and click the "Use Factor" box under the "Use Factor" column. If using this method, the user should check if AP-42 or WebFIRE has updated emission factors for the DEP emission factors used. AES*Online emission factors may not be the most current version available.

5.7 Support Documentation: Complete documentation must accompany each emission estimate. **If stack test results are used, an emission factor must be calculated from the stack test results in pounds per unit of throughput. The emission factor must be provided in the supporting calculations with the date of the stack test.** If a stack test report giving the emission factors to be used in the inventory along with sample calculations has

been submitted to the Department, it is sufficient to reference the date of the test, the unit(s) tested, and the date of submittal of the test report. If additional calculations are required to modify, convert, or otherwise manipulate the stack test results, these should be provided in spreadsheet format. **If a test report has not previously been provided to the Department's Air Quality Program, such as for a diagnostic test, the following should be attached to the emission inventory:**

1) A full test report (in .pdf format);
2) Summary calculations in live spreadsheet format (Excel); and
3) Documentation showing the representativeness of test data to actual operation during the inventory year.

Acceptance of stack test data is at the discretion of the Department.

A stack test or measurement must be performed according to a method acceptable to EPA. If a material balance is used, you must show the calculations. See Appendix C for illustration. In addition, documentation for wind erosion emissions must also be provided, even if the facility is using the methodology presented in AP-42 Ch. 13.2.5.

Adobe (.pdf) copies of all TANKS results reports should be attached to the submission if storage tank emissions are calculated using TANKS. Submissions of tank database (.mdb) files will not be accepted in place of the Adobe files. If additional calculations were used to calculated tank emissions from emptying below roof supports, those files must be included as well.

All supporting documentation can be attached to the AES*Online submission using the Document Attachment feature of AES*Online. To attach documents, click the "Document Attachments" link on the left-hand navigation pane. Complete the fields in the new window and click "Attach File". Repeat for each additional file.

All documentation must be submitted electronically. Hardcopy submissions will not be accepted.

Section 6.0
Miscellaneous Emissions

This section provides information on entering miscellaneous emissions.

6.1 Accessing Miscellaneous Emissions: Click "Misc. Emissions" in the left-hand navigation pane.

6.2 Entering Emissions: In the Miscellaneous Emissions details screen, complete the fields for each pollutant available. Be sure to save the changes. If additional pollutants and/or miscellaneous emission entries need to be added, use the "Add a New Record" feature for each additional item.

6.3 Types of Miscellaneous Emissions: Users should check that the AES*Online subfacilities account for sources in the previous emissions inventory submittal, previous summary template, and/or air permit(s). If the user finds subfacilities not accounted for in AES*Online, he/she should inform the Department to add/activate those subfacilities. Types of subfacilities can include unpaved/paved road fugitives and tank emissions.

If any subfacilities shown in AES*Online are not in operation, it is the user's responsibility to inform the Department that the subfacility is not in operation and what date the source became inoperable. The Department will then have the option of deactivating the subfacility or contacting the user for further information.

If the Department changes subfacilities, AES*Online will show such changes the following day after the system's 24-hour refresh.

6.4 Support Documentation: **Supporting calculations in a live Excel spreadsheet are required for all subfacilities.** Be sure to include support calculations for miscellaneous emissions in a live Excel spreadsheet as was previously mentioned for other subfacilities in step 5.7. Revised spreadsheets and other pertinent files are required to be submitted with revised AES Online submittals. See step 5.7 for information on support documentation and Section 10.0 for information on revisions. Also check that calculations reflect current versions of guidances and software programs being used. For example, AP-42 Ch. 13.2.1 guidance for calculating paved road fugitive emissions was updated in January, 2011.

Section 7.0

Pollutant Summary

This section provides details on entering Pollutant Summary emissions.

7.1 Accessing Site Pollutant Summary: Click "Pollutant Summary" in the left-hand navigation pane.

7.2 Entering Emissions: Enter the emissions for each pollutant in the Facility Estimate fields. Be sure the facility estimate for each pollutant matches each pollutant sum (sub fac. total and misc. emissions). If emissions within AES*Online are changed, pollutant sums in the Pollutant Summary may change. In such cases, check that the facility estimate for each pollutant sum matches each revised pollutant sum and change the facility estimates if needed.

Section 8.0

Fuel Usage Summary

This section provides details on completing the Fuel Usage Summary.

8.1 Accessing Fuel Usage Summary: Click "Fuel Usage Summary" in the left-hand navigation pane.

8.2 Entering Fuel Usages: For each fuel listed, enter the usage and select the appropriate units of measure from the drop-down menu. To add new fuel usages, use the "Add New Fuel" feature at the bottom of the screen.

8.3 Manual Check: Click "SCC Fuel Usage" in the upper right-hand corner to access the usage summary screen. Check that the total usage for each fuel matches the manual usage totals entered by the user. If there are differences, revise the manual fuel usages so they match.

Section 9.0

Submission

This section provides details on submitting the emissions inventory. All submissions must be received electronically. Be sure all changes are saved prior to submitting the emissions inventory.

9.1 Submitting the Inventory: From the facility's emission inventory home page, click "Start Submission" on the left-hand navigation pane to being the submission process. Follow the subsequent steps to submit the inventory. Once the inventory is submitted, a notification window will appear informing the user the inventory has been submitted. **If the submitter does not have the role as the certifying official, the status of the submittal will be complete, and the certifying official will still need to submit the inventory. Once the certifying official submits the inventory, AES*Online will show the report status as submitted.**

9.2 Completion Checklist: During the submission process, a completion checklist window will appear. If the checklist is complete and the user has the AES*Online account authorization of "Submitter", a "Continue" button will appear at the bottom of the checklist. If the user only has "Reader" or "Editor" status, he/she will not see the "Continue" button.

The submitter clicks the "Continue" button to proceed with the submission. If the "Continue" button is not shown at the bottom of the checklist, review the checklist for incomplete items. Incomplete items will not have a green checkmark to the left of them. Once these items are addressed, restart the submission process. If all items have been addressed, the checklist should be completed, and the user should then have access to the "Continue" button.

A completion checklist is also provided in Appendix D to help the user check if items are addressed prior to submission. The checklist in Appendix D is not the same as the completion checklist AES*Online shows during the submission; however it does provide several important items to review before submitting.

Section 10.0

Revision(s) and Resubmission(s)

This section provides information on revising and resubmitting the emissions inventory. The revised inventory must be resubmitted within ten (10) business days of receiving the AES*Online e-mail indicating a submittal has been rejected. In cases where a facility does not cooperate with the Department until the submission is accepted, the inventory may be considered incomplete and regulatory action, such as penalties, may be enforced.

Be sure all changes are saved prior to submitting the revised emissions inventory.

10.1 What is a Revision: The Department may return the inventory to the submitter for revision for reasons such as inaccurate operating schedules, lack of support documentation, incorrect emissions, incorrect emission factors, and not including emissions from all subfacilities and miscellaneous emissions. If the inventory is returned for revision, an email will be sent to those with AES*Online accounts for the facility notifying them the inventory has been returned for revision.

10.2 Accessing the Revision: See step 1.2 for accessing the revision.

10.3 Addressing Revision Items: All items flagged by the Department for revision have the following icon: . Placing the cursor over this icon will allow the user to see if the Department has any comments regarding why a particular item was flagged. If the user changes a revision item, the icon will be changed to indicating the item in question was changed. If the user does not change a revision item, the user must click on the icon to change it to . This icon acknowledges the item was reviewed and the user read the Deparment's comment.

To address the revisions, the user must change all icons to or . In addition, any new notes added by the Department must be read before the user can resubmit the revision. To read any new notes, click on the "Notes" link in the left-hand navigation pane, and then click all notes in bold type to read the comments.

As mentioned in previous sections, be sure to check that the following items have been addressed prior to submitting revisions:

- Pollutant Summary – Be sure the facility estimate for each pollutant matches each pollutant sum (sub fac. total and misc. emissions). If the facility estimates do not, revise them to match their respective sums;
- Fuel Usage Summary – Check that the total usage for each fuel matches the manual usage totals entered by the user. If there are differences, revise the manual fuel usages so they match; and
- ACHD Completion Checklist (Appendix D) items have been addressed.

10.4 Submitting the Revision: As was done for previous submission(s), the certifying official will have to repeat the AES*Online submittal process for the Department to receive the revision(s). See Section 9.0 for further information.

10.5 Multiple Revisions: The Department can return the inventory for revision several times. To resubmit, follow steps 10.1 to 10.4 for each resubmission. The user must resubmit each time the emissions inventory has been returned for revision in accordance with Department requirements. Again, the revised inventory must be resubmitted within ten (10) business days of receiving the AES*Online e-mail indicating a submittal has been rejected. In cases where a facility does not cooperate with the Department until the submission is accepted, the inventory may be considered incomplete and regulatory action, such as penalties, may be enforced.

Section 11.0

Acceptance

This section provides details regarding the Department accepting emissions inventory submissions.

11.1 Notification: Once the Department accepts a submission or resubmission, AES*Online will send an email to users associated with the facility's inventory that the inventory has been accepted. The status of the emissions inventory in AES*Online will then show "Accepted".

11.2 Changes after Acceptance: Only the Department has access to make changes to accepted inventories. If a user finds an accepted emissions inventory may need to be revised, he/she will need to contact the Department.

11.3 Records Maintenance: AES*Online account, emissions inventory support, and submittal information as well as any information the user may need if the Department should further question their inventory should be retained. This information will also be helpful in preparing emissions inventories for future reporting years.

APPENDIX A

HAZARDOUS AIR POLLUTANT REPORTING

Hazardous Air Pollutant Reporting Levels

The ACHD Air Quality Program will use a base of 200 pounds per year or 0.1 ton for each pollutant at each point source facility for all hazardous air pollutants with the exception of those discussed below.

Any facility that emits any HAP in an amount equal to or greater than 0.1 ton at the process level must report the total emissions for each HAP. Title V and synthetic minor sources must also report the information at the process level.

To report much of the total risk from HAPs, several HAP compounds will be reported at lower rates. The following compounds will be reported down to de minimis levels on a process basis:

- Chromium Compounds
- Mercury Compounds
- Polycyclic Organic Matter Compounds.

For these compounds, manual methods will be used to report lesser values:

- Dioxin Compounds
- Furan Compounds

ACHD recommends all sources review their MSDS's to determine if any of these compounds are at their facilities. Review AP-42 to determine if any of your processes generate them. AP-42 and Factor Information Retrieval System (FIRE) do list factors for these compounds for many processes. Be sure you use the latest version of the WebFIRE. WebFIRE as well as AP-42 can be found at the EPA Emission Factor Inventory site (http://www.epa.gov/ttn/chief/efpac/index.html).

EPA Reporting Recommendations/Strategies in Order of Preference

For pollutant groups, only one reporting strategy per HAP group per source should be used. Use of more than one reporting strategy can result in the same emission being counted twice. An example would be reporting both individual chromium compounds and total chromium for the same source.

Metals and Cyanide Groups

1. Separate emissions of metals from those of metal compounds.

   Example: Arsenic - CAS# - amount emitted

   Lead Arsenate - CAS# - amount emitted

2. All individual compounds should be reported as mass of the total compounds not just the metal within the compound.

3. Report two forms of the toxic material of widely - varying toxicity. This alternative method is especially applicable to chromium, lead, mercury and nickel.

4. Report only the mass emissions of the metal not the entire metal compound

   Example: Trivalent Chromium- CAS# 16065831
   Hexavalent Chromium- CAS# 18540299

5. Separate lead compounds into organic and inorganic species.

6. Separate mercury compounds into organic (CAS# 22967926) and inorganic (CAS# 7439976)

7. Separate nickel compounds into nickel subsulfide (CAS# 12035722) and other nickel (CAS#7440020)

8. For all other metal and cyanide groups, report total emissions in terms of the mass of the metal or cyanide alone under the CAS# of the metal or cyanide.

Polycyclic Organic Matter Compounds

1. Identify and report as many individual POM compounds with associated CAS numbers as possible. It is especially important to differentiate the seven PAH compounds from POM. The seven PAH compounds are: benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a, h)anthracene, and indeno(1,2,3-cd)pyrene. The POM compounds (in addition to 7-PAH) for which ACHD has cancer assessments are: carbazole, dibenz[a,hjacridine, dibenz[aflacridine, 7H-dibenzo[cg]carbazole, dibenzo[a,e]pyrene, dibenzo[a,flpyrene, 7,12-dimethylbenz[a]anthracene, 1,6-dinitropyrene, 1,8-dinitropyrene, 3-methylcholanthrene, 5-methylchrysene, 5-nitroacenaphthene, 6-nitrochrysene, 2-nitrofluorene, 2-nitrofluorene, I–nitropyrene, and 4-nitropyrene. The 7-PAH compounds should be reported individually if at all possible as well as the POM compounds for which cancer assessments are available. Clearly identify what is being inventoried as POM.

2. If individual PAH's cannot be reported, then report 7-PAH as a subgroup.

3. Naphthalene is a HAP and should be reported individually rather than being reported in total POM. However, if it is a component of total POM and a source reports total POM, then naphthalene form the source of total POM does not need to be reported individually.

4. If it is not possible to report emissions of 7-PAH, then report emissions as total POM.

Dioxins/Furans

1. Report mass emissions and the associated CAS#'s of all individual congeners of chlorinated dibenzodioxins (CDDs) and chlorinated dibenzofurans (CDFs).

2. If it is not possible to identify individual congeners, then report dioxins and furans as 2,3,7,8-Tetrachlorodibenzodioxin (TCDD) toxic equivalents (TEQ) under the HAP name "dioxins/furans as TEQ". **Do not report dioxins/furans with POM emissions.**

3. Report emissions as total dioxins or total furans where it is not possible to report individual congeners.

Xylenes and Cresols

1. Report emissions for individual xylene and cresol isomers with their associated CAS #'s. Do not report any emissions for total xylenes or cresols.

2. If you cannot report individual emissions of isomers of xylene and cresol, then report total emissions of xylenes under CAS# 1330207 or the CAS# for cresols/cresylic acid**.**

Glycol Ethers

1. Report emissions for individual glycol ethers with their associated CAS#'s. Use the Toxic Release Inventory (TRI) guidance on glycol ethers to identify compounds that are actually glycol ethers**. This document also contains a table listing industrial products containing glycol ethers used by a variety of industries.** This guidance is available at the following URL:
2. http://www.epa.gov/tri/guide_docs/pdf/2000/glycol2000.pdf

3. It is acceptable, where impossible to report individual glycol ethers, to report total emissions of glycol ethers as a group under "glycol ethers".

APPENDIX B

CALCULATION OF TANK EMISSIONS BELOW ROOF SUPPORTS

Calculation of emissions from the emptying of internal/external floating roof tanks below roof supports is explained in this appendix. For more detail, please refer to Chapter 7 of AP-42.

Please note these emissions cannot be calculated using the EPA Tanks Program. They must be calculated, using the equations provided, in a spreadsheets adding these emissions to the breathing/working emissions calculated by the EPA Tanks Program**.**

The total loss from floating roof tanks during a roof landing is the sum of the standing idle losses and the filling losses.

$$L_{TL} = L_{SL} + L_{FL}$$

L_{TL}=total losses during roof landing, pounds per landing episode.

L_{SL}= standing idle losses during a roof landing, pounds per landing episode.

L_{FL}= filling losses during roof landing, pounds per landing episode.

Internal Floating Roof Tank with Liquid Heel:

Standing Idle Loss Equation:

$$L_{SL\,max} = \left(\frac{\pi}{4}\right) D^2 \; h_{le} \; W_l \; (7.48)$$

$$L_{SL\,max} = 5.9 \; D^2 \; h_{le} \; W_l$$

L_{SLmax} = limit on standing idle loss, lb per landing episode
7.48 = volume conversion factor, gal/ft^3
D = diameter of the tank, feet
h_{le} = effective height of the stock liquid, feet
W_l = density of the liquid inside the tank, lb/gal

Filling Loss Equation:

$$L_{FL} = \left(\frac{P\,V_V}{R\,T} \right) M_V\ S$$

L_{FL} = filling loss during roof landing, lb
P = true vapor pressure of the liquid within the tank, psia
V_V = volume of the vapor space, ft^3
R = ideal gas constant, 10.731 psia-ft^3/(lb-mole-°R)
T = average temperature of the vapor and liquid below the floating roof, °R
M_V = stock vapor molecular weight, lb/lb-mole
S = filling saturation factor, dimension less (0.60 for a full liquid heel; 0.50 for a partial liquid heel).

External Floating Roof Tanks:

Standing Idle Loss Equation:

$$L_{SL} = 0.57\ n_d\ D\ P^*\ M_V$$

$$L_{SL} \leq 5.9\ D^2\ h_{le}\ W_l$$

Filling Loss Equation:

$$L_{FL} = \left(\frac{P\,V_V}{R\,T} \right) M_V \left(C_{sf}\ S \right)$$

Filling Saturation Factor (S)	S = 0.60 for a full liquid heel S = 0.50 for a partial liquid heel	**(for both types of tanks)**

APPENDIX C

MATERIAL BALANCE EXPLANATION

If source test data is not available, the facility can, in some cases, use the material balance method to estimate emissions. For some sources, material balance is the only practical method to estimate VOC emissions accurately. VOC emissions from solvent evaporation sources are commonly determined by use of material balance.

The use of material balance involves the examination of a process to determine if emissions can be estimated solely based on knowledge of specific operating parameters and material composition. In estimating the VOC emissions, a material balance is generally used for solvent evaporation sources. The simplest method of material balance is to assume that all the solvent consumed by a source's process(es) will evaporate during the process(es). It is a reasonable assumption in a coating operation that all solvents in the coating evaporate to the atmosphere as part of the process.

For processes that employ a non-destructive control device such as a condenser or absorber, the solvent captured by the control device must be taken into account in the material balance. If the captured solvent is returned to the process, then the total amount of solvent entering the process equals the amount of captured solvent plus the amount of new solvent added to the process. The amount of new solvent added to the process is called "make-up-solvent" because it is added to replace the amount of solvent that evaporates during the process (assuming all solvent loss is due to evaporation). The emissions from this type of process are equal to the amount of make-up solvent added to the process, <u>not</u> the total amount of solvent entering the process as defined above. In addition to the use of condensers and absorbers, waste solvent reclamation by distillation is another example of a technique for which this type of material balance may apply.

In the above discussions, the material balance is simplified because the assumption is that all of the solvent used evaporated and is emitted to the atmosphere. Situations exist where this assumption is not always reasonable. For example, if a destructive control device such as an afterburner, incinerator, or catalytic oxidation unit is employed on a process exhaust, any VOC emissions will be either destroyed or so altered that one could not reasonably assume, without testing the exhaust stream of the device, the characteristics and quantities of any remaining VOC material. The capture efficiency of the exhaust system for the control device is an important consideration. In addition, degreasing emissions will not equal solvent consumption if the waste solvent is sent to a commercial re-processor. In such cases, emissions will be the difference between solvent consumed and solvent in the waste sent to the re-processor.

Material balance cannot be employed in some evaporation processes because the amount of material lost is too small to be determined accurately by conventional procedures. An example of this would be applying material balance to petroleum storage tanks, because breathing loss and working loss are too small relative to capacity and throughput. In this case, the use of the EPA Tanks Program is preferred.

<u>Example # 1: Material Balance Estimation of VOC Emissions and Overall Control Efficiency Process Data:</u>

450 tons solvent per year (toluene or other non-halogenated solvent) used.

90% Capture efficiency of process solvent emissions. This is the percent of solvent captured by the collection system and sent to the control device.

95% Primary control device removal efficiency

1. Solvent Captured = 450 tons per year x 0.9 = 405 tons captured (45 tons are fugitives)

2. Solvent Removed by Control Device = 405 x 0.95 = 384.75 tons solvent

3. Fugitives (Solvent not Captured) = 450 - 405 = 45 tons per year

4. Stack Emissions = 405 - 384.75 = 20.25 tons per year

5. Total Estimated = 20.25 + 45 tons = 65.25 tons toluene emission

6. Second way to calculate: Total Estimated = 450[1- (0.9x0.95)] = 65.25 tons toluene emissions

7. Overall Control Efficiency =(0.9)x(0.95) =0.855

<u>Example # 2: Calculation for Overall Control Efficiency for VOC's</u>

- Sources with fugitive emissions (for example, VOC emissions from a partially enclosed printing operation equipped with a catalytic incinerator and an afterburner):

  1. Capture Efficiency (enclosure) = 90%

  2. Primary Control Device Efficiency (incinerator) = 95%

  3. Secondary Control Device Efficiency (afterburner) = 50%

  4. Overall Control Efficiency including capture efficiency, primary control device, and secondary control device:

     0.90 x (1-[(1-0.95)x(1-0.50)])

     = (0.90) x (l-[(0.05) x (0.50)])

     = (0.90)x[1-(0.025)]

     = *(0.90) x (0.975) = 0.8775* or *87.75%* overall Control Efficiency

     Note in this case, 10% of the total emissions were released to the atmosphere without controls. Both controlled and uncontrolled emissions are reported.

- Sources with no fugitive emissions (for example, particulate emissions form a sewage sludge incinerator equipped with an electrostatic precipitator (ESP) and wet scrubber):

1. Primary Control (ESP) = 95%

2. Secondary Control Device (scrubber) = 50%

3. Overall Control Efficiency including primary and secondary control devices:

$$1- [(1-.95) \times (1-.50)] = 0.975 \text{ or } 97.5\% \text{ Overall Control Efficiency}$$

APPENDIX D

ACHD COMPLETION CHECKLIST

Were all items in these instructions reviewed?	Yes / No
All active subfacilities from previous permits, inventory submissions, and calculations template are included in current AES*Online inventory.	Yes / No
Fuel Test: Is date collected, percent ash (if needed), percent sulfur (if needed), and BTU content completed for all fuel tests?	Yes / No
Operating Schedule: Is this complete and accurate for all subfacilities? Are throughput units correct for each subfacility? It is best to use the same units as those associated with the selected SCC.	Yes / No
Manual Emission Amounts: Are all criteria pollutants (including ammonia) and non-criteria hazardous air pollutants (including hexane) reported for each subfacility?	Yes / No
PM10 and PM2.5: Both reported for all subfacilities. Only filterable PM10 and PM2.5 is reported.	Yes / No
Calculation Method: Correct for each pollutant in each subfacility.	Yes / No
Emission Factors: Are all emission factors correct? Is appropriate reference documentation attached (such as stack testing results)?	Yes / No
Tank Emissions: Was TANKS 4.09D used to calculate storage tank emissions? If applicable, was Appendix B calculation information used to calculate tank emissions from emptying floating roof tanks below roof supports? Is support documentation attached?	Yes / No
Miscellaneous Emissions: All fields complete and accurate.	Yes / No
Supporting Documentation: Live Excel spreadsheets, TANKS results in Adobe (.pdf) format (if applicable), and other information used for calculations included in AES*Online submission.	Yes / No
EACH pollutant in **Pollutant Summary:** facility estimate = sub. fac. estimate + misc. emissions	Yes / No
Fuel Usage Summary: Manual entries for each fuel match SCC Fuel Usage	Yes / No
Have all notes been read? All corrective actions addressed?	Yes / No
Is your emissions inventory submission completely documented with attachments, notes, spreadsheets, and 4.09D tank reports.	Yes / No

D-2: Area Sources

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Liberty-Clairton Area Source Summary

- Emissions given in tons/year

- Liberty-Clairton corrections given in TS|Pechan report (Appendix F)

- On-shore drilling was added by TS|Pechan for ACHD

- Point subtractions were done by ACHD for the following:

2102004000
2102006000
2102007000
2103002000
2103004000
2103006000
2103007000

- Liberty-Clairton subtractions were also done by ACHD for all Allegheny County SCC categories

- Fugitive dust transport factors (FDTF) applied to AC/LC by ACHD for the following:

2294000000
2296000000
2311010000
2311020000
2311030000
2801000003

FIPS code 42003 (L-C) is Allegheny County (Liberty-Clairton)

TOTALS

2007

CATEGORY	SO2	NOx	VOC	NH3	PM10	PM2.5
Agriculture	0.000	0.000	0.000	2.929	0.394	0.079
Commercial Cooking	0.000	0.000	2.183	0.000	4.438	4.104
Construction Dust	0.000	0.000	0.000	0.000	0.644	0.064
Fuel Combustion (Industrial/Comm)	47.954	2.601	0.031	0.098	6.019	0.598
Fuel Combustion (Residential)	1.792	33.713	1.952	0.201	2.234	2.192
Gas Drilling	0.000	0.000	0.000	0.000	0.000	0.000
Gasoline Stations	0.000	0.000	11.639	0.000	0.000	0.000
Mining	0.000	0.000	0.000	0.000	3.917	0.783
Open Burning (Waste/Debris)	0.001	0.384	0.888	0.000	1.322	1.023
Residential Wood Combustion	0.403	2.105	19.788	0.947	16.623	16.595
Roads	0.000	0.000	0.000	0.000	14.877	0.861
Solvents/Surface Coatings	0.000	0.000	215.042	0.000	0.000	0.000
Wastewater Treatment	0.000	0.000	4.410	0.075	0.000	0.000
TOTAL	**50.150**	**38.804**	**255.932**	**4.250**	**50.468**	**26.299**

2014

CATEGORY	SO2	NOX	VOC	NH3	PM10	PM2.5
Agriculture	0.000	0.000	0.000	2.899	0.390	0.078
Commercial Cooking	0.000	0.000	2.160	0.000	4.394	4.063
Construction Dust	0.000	0.000	0.000	0.000	0.649	0.065
Fuel Combustion (Industrial/Comm)	47.474	2.575	0.031	0.098	5.960	0.592
Fuel Combustion (Residential)	1.773	33.376	1.932	0.200	2.213	2.170
Gas Drilling	0.000	0.015	0.027	0.000	0.001	0.001
Gasoline Stations	0.000	0.000	11.522	0.000	0.000	0.000
Mining	0.000	0.000	0.000	0.000	3.878	0.776
Open Burning (Waste/Debris)	0.001	0.380	0.880	0.000	1.309	1.014
Residential Wood Combustion	0.398	2.114	18.168	0.913	15.990	15.962
Roads	0.000	0.000	0.000	0.000	14.729	0.853
Solvents/Surface Coatings	0.000	0.000	212.893	0.000	0.000	0.000
Wastewater Treatment	0.000	0.000	4.366	0.075	0.000	0.000
TOTAL	**49.646**	**38.460**	**251.979**	**4.185**	**49.512**	**25.574**

SCC	SCC Short Name
2102002000	Stationary Fuel Comb /Industrial /Bituminous/Subbituminous Coal /Total: All Boiler Types
2102004000	Stationary Fuel Comb /Industrial /Distillate Oil /Total: Boilers and IC Engines
2102005000	Stationary Fuel Comb /Industrial /Residual Oil /Total: All Boiler Types
2102006000	Stationary Fuel Comb /Industrial /Natural Gas /Total: Boilers and IC Engines
2102007000	Stationary Fuel Comb /Industrial /Liquified Petroleum Gas /Total: All Boiler Types
2102011000	Stationary Fuel Comb /Industrial /Kerosene /Total: All Boiler Types
2103002000	Stationary Fuel Comb /Commercial/Institutional /Bituminous/Subbituminous Coal /Total: All Boiler Types
2103004000	Stationary Fuel Comb /Commercial/Institutional /Distillate Oil /Total: Boilers and IC Engines
2103005000	Stationary Fuel Comb /Commercial/Institutional /Residual Oil /Total: All Boiler Types
2103006000	Stationary Fuel Comb /Commercial/Institutional /Natural Gas /Total: Boilers and IC Engines
2103007000	Stationary Fuel Comb /Commercial/Institutional /Liquified Petroleum Gas /Total: All Combustor Types
2103011000	Stationary Fuel Comb /Commercial/Institutional /Kerosene /Total: All Combustor Types
2104002000	Stationary Fuel Comb /Residential /Bituminous/Subbituminous Coal /Total: All Combustor Types
2104004000	Stationary Fuel Comb /Residential /Distillate Oil /Total: All Combustor Types
2104006000	Stationary Fuel Comb /Residential /Natural Gas /Total: All Combustor Types
2104007000	Stationary Fuel Comb /Residential /Liquified Petroleum Gas /Total: All Combustor Types
2104008100	Stationary Fuel Comb /Residential /Wood /Fireplace: general
2104008210	Stationary Fuel Comb /Residential /Wood /Woodstove: fireplace inserts; non-EPA certified
2104008220	Stationary Fuel Comb /Residential /Wood /Woodstove: fireplace inserts; EPA certified; non-catalytic
2104008230	Stationary Fuel Comb /Residential /Wood /Woodstove: fireplace inserts; EPA certified; catalytic
2104008310	Stationary Fuel Comb /Residential /Wood /Woodstove: freestanding, non-EPA certified
2104008320	Stationary Fuel Comb /Residential /Wood /Woodstove: freestanding, EPA certified, non-catalytic
2104008330	Stationary Fuel Comb /Residential /Wood /Woodstove: freestanding, EPA certified, catalytic
2104008400	Stationary Fuel Comb /Residential /Wood /Woodstove: pellet-fired, general (freestanding or FP insert)
2104008510	Stationary Fuel Comb /Residential /Wood /Furnace: Indoor, cordwood-fired, non-EPA certified
2104008610	Stationary Fuel Comb /Residential /Wood /Hydronic heater: outdoor
2104009000	Stationary Fuel Comb /Residential /Firelog /Total: All Combustor Types
2104011000	Stationary Fuel Comb /Residential /Kerosene /Total: All Heater Types
2294000000	Paved Roads /All Paved Roads /Total: Fugitives
2296000000	Unpaved Roads /All Unpaved Roads /Total: Fugitives
2302002100	Food & Kindred Products /Commercial Cooking - Charbroiling /Conveyorized Charbroiling
2302002200	Food & Kindred Products /Commercial Cooking - Charbroiling /Under-fired Charbroiling
2302003000	Food & Kindred Products /Commercial Cooking - Frying /Deep Fat Fying

SCC	SCC Short Name
2302003100	Food & Kindred Products /Commercial Cooking - Frying /Flat Griddle Frying
2302003200	Food & Kindred Products /Commercial Cooking - Frying /Clamshell Griddle Frying
2302050000	Food & Kindred Products /Bakery Products /Total
2310021000	Industrial Processes/Oil and Gas Production: SIC 13/Natural Gas : On-shore/
2311010000	Construction: SIC 15 - 17 /Residential /Total
2311020000	Construction: SIC 15 - 17 /Industrial/Commercial/Institutional /Total
2311030000	Construction: SIC 15 - 17 /Road Construction /Total
2325000000	Mining &Quarrying /All Processes /Total
2401001000	Surface Coating /Architectural Coatings /Total: All Solvent Types
2401005000	Surface Coating /Auto Refinishing /Total: All Solvent Types
2401008000	Surface Coating /Traffic Markings /Total: All Solvent Types
2401015000	Surface Coating /Factory Finished Wood /Total: All Solvent Types
2401020000	Surface Coating /Wood Furniture /Total: All Solvent Types
2401025000	Surface Coating /Metal Furniture /Total: All Solvent Types
2401030000	Surface Coating /Paper /Total: All Solvent Types
2401040000	Surface Coating /Metal Cans /Total: All Solvent Types
2401045000	Surface Coating /Metal Coils /Total: All Solvent Types
2401060000	Surface Coating /Large Appliances /Total: All Solvent Types
2401065000	Surface Coating /Electronic & Other Electrical /Total: All Solvent Types
2401080000	Surface Coating /Marine /Total: All Solvent Types
2401085000	Surface Coating /Railroad /Total: All Solvent Types
2401090000	Surface Coating /Misc Manufacturing /Total: All Solvent Types
2401100000	Surface Coating /Industrial Maintenance Coatings /Total: All Solvent Types
2401200000	Surface Coating /Other Special Purpose Coatings /Total: All Solvent Types
2415200000	Degreasing /All Industries: Conveyerized Degreasing /Total: All Solvent Types
2415230000	Degreasing /Electronic & Other Elec: Conveyerized Degreasing /Total: All Solvent Types
2415300000	Degreasing /All Industries: Cold Cleaning /Total: All Solvent Types
2415360000	Degreasing /Auto Repair Services: Cold Cleaning /Total: All Solvent Types
2420000000	Dry Cleaning /All Processes /Total: All Solvent Types
2425000000	Graphic Arts /All Processes /Total: All Solvent Types
2460100000	Misc Non-indus: Consumer & Comm /All Personal Care Products /Total: All Solvent Types
2460200000	Misc Non-indus: Consumer & Comm /All Household Products /Total: All Solvent Types
2460400000	Misc Non-indus: Consumer & Comm /All Auto Aftermarket Products /Total: All Solvent Types

SCC	SCC Short Name
2460500000	Misc Non-indus: Consumer & Comm /All Coatings & Related Products /Total: All Solvent Types
2460600000	Misc Non-indus: Consumer & Comm /All Adhesives & Sealants /Total: All Solvent Types
2460800000	Misc Non-indus: Consumer & Comm /All FIFRA Related Products /Total: All Solvent Types
2460900000	Misc Non-indus: Consumer & Comm /Misc Products (Not Otherwise Covered) /Total: All Solvent Types
2461021000	Misc Non-industrial: Commercial /Cutback Asphalt /Total: All Solvent Types
2461022000	Misc Non-industrial: Commercial /Emulsified Asphalt /Total: All Solvent Types
2501011011	Residential Portable Gas Cans /Permeation
2501011012	Residential Portable Gas Cans /Evaporation (includes Diurnal losses)
2501011013	Residential Portable Gas Cans /Spillage During Transport
2501011014	Residential Portable Gas Cans /Refilling at the Pump - Vapor Displacement
2501011015	Residential Portable Gas Cans /Refilling at the Pump - Spillage
2501012011	Commercial Portable Gas Cans /Permeation
2501012012	Commercial Portable Gas Cans /Evaporation (includes Diurnal losses)
2501012013	Commercial Portable Gas Cans /Spillage During Transport
2501012014	Commercial Portable Gas Cans /Refilling at the Pump - Vapor Displacement
2501012015	Commercial Portable Gas Cans /Refilling at the Pump - Spillage
2501060053	Gasoline Service Stations /Stage 1: Balanced Submerged Filling
2501060100	Gasoline Service Stations /Stage 2: Total
2501060201	Gasoline Service Stations /Underground Tank: Breathing and Emptying
2505030120	Petrol & Petrol Product Transport /Truck /Gasoline
2610000100	Open Burning /All Categories /Yard Waste - Leaf Species Unspecified
2610000400	Open Burning /All Categories /Yard Waste - Brush Species Unspecified
2610000500	Open Burning /All Categories /Land Clearing Debris (use 28-10-005-000 for Logging Debris Burning)
2610030000	Open Burning /Residential /Household Waste (use 26-10-000-xxx for Yard Wastes)
2630020000	Wastewater Treatment /Public Owned /Total Processed
2801000003	Agric - Crops /Tilling
2801700001	Agric - Crops /Fertilizer Application /Anhydrous Ammonia
2801700002	Agric - Crops /Fertilizer Application /Aqueous Ammonia
2801700003	Agric - Crops /Fertilizer Application /Nitrogen Solutions
2801700004	Agric - Crops /Fertilizer Application /Urea
2801700005	Agric - Crops /Fertilizer Application /Ammonium Nitrate
2801700006	Agric - Crops /Fertilizer Application /Ammonium Sulfate
2801700007	Agric - Crops /Fertilizer Application /Ammonium Thiosulfate

SCC	SCC Short Name
2801700010	Agric - Crops /Fertilizer Application /N-P-K (multi-grade nutrient fertilizers)
2801700011	Agric - Crops /Fertilizer Application /Calcium Ammonium Nitrate
2801700012	Agric - Crops /Fertilizer Application /Potassium Nitrate
2801700013	Agric - Crops /Fertilizer Application /Diammonium Phosphate
2801700014	Agric - Crops /Fertilizer Application /Monoammonium Phosphate
2801700015	Agric - Crops /Fertilizer Application /Liquid Ammonium Polyphosphate
2801700099	Agric - Crops /Fertilizer Application /Miscellaneous Fertilizers
2805001100	Agric - Livestock /Beef cattle - finishing operations on feedlots (drylots) /Confinement
2805001200	Agric - Livestock /Beef cattle - finishing operations on feedlots (drylots) /Manure handling & storage
2805001300	Agric - Livestock /Beef cattle - finishing operations on feedlots (drylots) /Land application of manure
2805002000	Agric - Livestock /Beef cattle production composite /Not Elsewhere Classified
2805003100	Agric - Livestock /Beef cattle - finishing operations on pasture/range /Confinement
2805007100	Agric - Livestock /Poultry production - layers with dry manure management systems /Confinement
2805007300	Agric - Livestock /Poultry production - layers with dry manure management systems /Land application of manure
2805008100	Agric - Livestock /Poultry production - layers with wet manure management systems /Confinement
2805008200	Agric - Livestock /Poultry production - layers with wet manure management systems /Manure handling & storage
2805008300	Agric - Livestock /Poultry production - layers with wet manure management systems /Land application of manure
2805009100	Agric - Livestock /Poultry production - broilers /Confinement
2805009200	Agric - Livestock /Poultry production - broilers /Manure handling and storage
2805009300	Agric - Livestock /Poultry production - broilers /Land application of manure
2805010100	Agric - Livestock /Poultry production - turkeys /Confinement
2805010200	Agric - Livestock /Poultry production - turkeys /Manure handling and storage
2805010300	Agric - Livestock /Poultry production - turkeys /Land application of manure
2805018000	Agric - Livestock /Dairy cattle composite /Not Elsewhere Classified
2805019100	Agric - Livestock /Dairy cattle - flush dairy /Confinement
2805019200	Agric - Livestock /Dairy cattle - flush dairy /Manure handling and storage
2805019300	Agric - Livestock /Dairy cattle - flush dairy /Land application of manure
2805021100	Agric - Livestock /Dairy cattle - scrape dairy /Confinement
2805021200	Agric - Livestock /Dairy cattle - scrape dairy /Manure handling and storage
2805021300	Agric - Livestock /Dairy cattle - scrape dairy /Land application of manure
2805022100	Agric - Livestock /Dairy cattle - deep pit dairy /Confinement
2805022200	Agric - Livestock /Dairy cattle - deep pit dairy /Manure handling and storage
2805022300	Agric - Livestock /Dairy cattle - deep pit dairy /Land application of manure

SCC	SCC Short Name
2805023100	Agric - Livestock /Dairy cattle - drylot/pasture dairy /Confinement
2805023200	Agric - Livestock /Dairy cattle - drylot/pasture dairy /Manure handling and storage
2805023300	Agric - Livestock /Dairy cattle - drylot/pasture dairy /Land application of manure
2805025000	Agric - Livestock /Swine production composite /Not Elsewhere Classified (see also 28-05-039, -047, -053)
2805030000	Agric - Livestock /Poultry Waste Emissions /Not Elsewhere Classified (see also 28-05-007, -008, -009)
2805030007	Agric - Livestock /Poultry Waste Emissions /Ducks
2805030008	Agric - Livestock /Poultry Waste Emissions /Geese
2805035000	Agric - Livestock /Horses & Ponies Waste Emissions /Not Elsewhere Classified
2805039100	Agric - Livestock /Swine production - operations with lagoons (unspecified animal age) /Confinement
2805039200	Agric - Livestock /Swine production - operations with lagoons (unspecified animal age) /Manure handling & storage
2805039300	Agric - Livestock /Swine production - operations with lagoons (unspecified animal age) /Land application of manure
2805040000	Agric - Livestock /Sheep & Lambs Waste Emissions /Total
2805045000	Agric - Livestock /Goats Waste Emissions /Not Elsewhere Classified
2805047100	Agric - Livestock /Swine production - deep-pit house operations (unspecified animal age) /Confinement
2805047300	Agric - Livestock /Swine production - deep-pit house operations (unspecified animal age) /Land application of manure
2805053100	Agric - Livestock /Swine production - outdoor operations (unspecified animal age) /Confinement

FIPS	SCC	SO2	NOX	VOC	NH3	PM10	PM2.5
42003 (L-C)	2102002000	31.419	0.000	0.000	0.040	5.065	0.000
42003 (L-C)	2102004000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2102005000	10.774	1.433	0.009	0.024	0.678	0.457
42003 (L-C)	2102006000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2102007000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2102011000	0.030	0.014	0.000	0.001	0.002	0.001
42003 (L-C)	2103002000	0.000	0.000	0.000	0.020	0.000	0.000
42003 (L-C)	2103004000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2103005000	4.898	0.763	0.016	0.011	0.228	0.098
42003 (L-C)	2103006000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2103007000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2103011000	0.834	0.391	0.007	0.002	0.046	0.042
42003 (L-C)	2104002000	0.055	0.007	0.007	0.000	0.005	0.003
42003 (L-C)	2104004000	1.527	0.645	0.025	0.029	0.085	0.076
42003 (L-C)	2104006000	0.206	32.298	1.890	0.168	2.137	2.106
42003 (L-C)	2104007000	0.003	0.728	0.028	0.003	0.003	0.002
42003 (L-C)	2104008100	0.048	0.312	2.271	0.216	2.835	2.835
42003 (L-C)	2104008210	0.049	0.341	6.455	0.207	3.727	3.727
42003 (L-C)	2104008220	0.016	0.090	0.473	0.035	0.773	0.773
42003 (L-C)	2104008230	0.005	0.027	0.201	0.012	0.273	0.273
42003 (L-C)	2104008310	0.056	0.393	7.435	0.238	4.293	4.293
42003 (L-C)	2104008320	0.018	0.103	0.543	0.041	0.887	0.887
42003 (L-C)	2104008330	0.006	0.031	0.231	0.014	0.314	0.314
42003 (L-C)	2104008400	0.036	0.423	0.005	0.033	0.341	0.341
42003 (L-C)	2104008510	0.078	0.071	0.453	0.069	1.059	1.059
42003 (L-C)	2104008610	0.091	0.082	0.528	0.081	1.236	1.236
42003 (L-C)	2104009000	0.000	0.232	1.194	0.000	0.885	0.857
42003 (L-C)	2104011000	0.001	0.035	0.001	0.002	0.005	0.004
42003 (L-C)	2294000000	0.000	0.000	0.000	0.000	12.221	0.597
42003 (L-C)	2296000000	0.000	0.000	0.000	0.000	2.656	0.264
42003 (L-C)	2302002100	0.000	0.000	0.104	0.000	0.431	0.418
42003 (L-C)	2302002200	0.000	0.000	0.359	0.000	3.054	2.956
42003 (L-C)	2302003000	0.000	0.000	0.109	0.000	0.000	0.000
42003 (L-C)	2302003100	0.000	0.000	0.051	0.000	0.893	0.678
42003 (L-C)	2302003200	0.000	0.000	0.002	0.000	0.061	0.051
42003 (L-C)	2302050000	0.000	0.000	1.557	0.000	0.000	0.000
42003 (L-C)	2310021000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2311010000	0.000	0.000	0.000	0.000	0.109	0.011
42003 (L-C)	2311020000	0.000	0.000	0.000	0.000	0.407	0.041
42003 (L-C)	2311030000	0.000	0.000	0.000	0.000	0.128	0.013
42003 (L-C)	2325000000	0.000	0.000	0.000	0.000	3.917	0.783
42003 (L-C)	2401001000	0.000	0.000	24.094	0.000	0.000	0.000
42003 (L-C)	2401005000	0.000	0.000	4.999	0.000	0.000	0.000
42003 (L-C)	2401008000	0.000	0.000	1.078	0.000	0.000	0.000
42003 (L-C)	2401015000	0.000	0.000	0.095	0.000	0.000	0.000
42003 (L-C)	2401020000	0.000	0.000	0.775	0.000	0.000	0.000

FIPS	SCC	SO2	NOX	VOC	NH3	PM10	PM2.5
42003 (L-C)	2401025000	0.000	0.000	0.643	0.000	0.000	0.000
42003 (L-C)	2401030000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2401040000	0.000	0.000	0.190	0.000	0.000	0.000
42003 (L-C)	2401045000	0.000	0.000	12.122	0.000	0.000	0.000
42003 (L-C)	2401060000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2401065000	0.000	0.000	0.012	0.000	0.000	0.000
42003 (L-C)	2401080000	0.000	0.000	0.008	0.000	0.000	0.000
42003 (L-C)	2401085000	0.000	0.000	3.136	0.000	0.000	0.000
42003 (L-C)	2401090000	0.000	0.000	5.999	0.000	0.000	0.000
42003 (L-C)	2401100000	0.000	0.000	1.500	0.000	0.000	0.000
42003 (L-C)	2401200000	0.000	0.000	0.070	0.000	0.000	0.000
42003 (L-C)	2415200000	0.000	0.000	2.430	0.000	0.000	0.000
42003 (L-C)	2415230000	0.000	0.000	1.041	0.000	0.000	0.000
42003 (L-C)	2415300000	0.000	0.000	5.191	0.000	0.000	0.000
42003 (L-C)	2415360000	0.000	0.000	11.797	0.000	0.000	0.000
42003 (L-C)	2420000000	0.000	0.000	7.666	0.000	0.000	0.000
42003 (L-C)	2425000000	0.000	0.000	43.989	0.000	0.000	0.000
42003 (L-C)	2460100000	0.000	0.000	21.829	0.000	0.000	0.000
42003 (L-C)	2460200000	0.000	0.000	7.478	0.000	0.000	0.000
42003 (L-C)	2460400000	0.000	0.000	13.004	0.000	0.000	0.000
42003 (L-C)	2460500000	0.000	0.000	9.498	0.000	0.000	0.000
42003 (L-C)	2460600000	0.000	0.000	5.469	0.000	0.000	0.000
42003 (L-C)	2460800000	0.000	0.000	16.066	0.000	0.000	0.000
42003 (L-C)	2460900000	0.000	0.000	0.700	0.000	0.000	0.000
42003 (L-C)	2461021000	0.000	0.000	11.141	0.000	0.000	0.000
42003 (L-C)	2461022000	0.000	0.000	3.023	0.000	0.000	0.000
42003 (L-C)	2501011011	0.000	0.000	1.492	0.000	0.000	0.000
42003 (L-C)	2501011012	0.000	0.000	2.912	0.000	0.000	0.000
42003 (L-C)	2501011013	0.000	0.000	0.797	0.000	0.000	0.000
42003 (L-C)	2501011014	0.000	0.000	0.272	0.000	0.000	0.000
42003 (L-C)	2501011015	0.000	0.000	0.025	0.000	0.000	0.000
42003 (L-C)	2501012011	0.000	0.000	0.048	0.000	0.000	0.000
42003 (L-C)	2501012012	0.000	0.000	0.093	0.000	0.000	0.000
42003 (L-C)	2501012013	0.000	0.000	1.087	0.000	0.000	0.000
42003 (L-C)	2501012014	0.000	0.000	0.524	0.000	0.000	0.000
42003 (L-C)	2501012015	0.000	0.000	0.048	0.000	0.000	0.000
42003 (L-C)	2501060053	0.000	0.000	3.641	0.000	0.000	0.000
42003 (L-C)	2501060100	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2501060201	0.000	0.000	0.586	0.000	0.000	0.000
42003 (L-C)	2505030120	0.000	0.000	0.114	0.000	0.000	0.000
42003 (L-C)	2610000100	0.000	0.000	0.001	0.000	0.001	0.001
42003 (L-C)	2610000400	0.000	0.000	0.001	0.000	0.001	0.001
42003 (L-C)	2610000500	0.000	0.379	0.880	0.000	1.289	0.994
42003 (L-C)	2610030000	0.001	0.005	0.007	0.000	0.031	0.029
42003 (L-C)	2630020000	0.000	0.000	4.410	0.075	0.000	0.000
42003 (L-C)	2801000003	0.000	0.000	0.000	0.000	0.394	0.079

FIPS	SCC	SO2	NOX	VOC	NH3	PM10	PM2.5
42003 (L-C)	2801700001	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2801700002	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2801700003	0.000	0.000	0.000	0.010	0.000	0.000
42003 (L-C)	2801700004	0.000	0.000	0.000	1.397	0.000	0.000
42003 (L-C)	2801700005	0.000	0.000	0.000	0.001	0.000	0.000
42003 (L-C)	2801700006	0.000	0.000	0.000	0.003	0.000	0.000
42003 (L-C)	2801700007	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2801700010	0.000	0.000	0.000	0.713	0.000	0.000
42003 (L-C)	2801700011	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2801700012	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2801700013	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2801700014	0.000	0.000	0.000	0.013	0.000	0.000
42003 (L-C)	2801700015	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2801700099	0.000	0.000	0.000	0.064	0.000	0.000
42003 (L-C)	2805001100	0.000	0.000	0.000	0.024	0.000	0.000
42003 (L-C)	2805001200	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805001300	0.000	0.000	0.000	0.019	0.000	0.000
42003 (L-C)	2805002000	0.000	0.000	0.000	0.071	0.000	0.000
42003 (L-C)	2805003100	0.000	0.000	0.000	0.064	0.000	0.000
42003 (L-C)	2805007100	0.000	0.000	0.000	0.018	0.000	0.000
42003 (L-C)	2805007300	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805008100	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805008200	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805008300	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805009100	0.000	0.000	0.000	0.001	0.000	0.000
42003 (L-C)	2805009200	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805009300	0.000	0.000	0.000	0.001	0.000	0.000
42003 (L-C)	2805010100	0.000	0.000	0.000	0.048	0.000	0.000
42003 (L-C)	2805010200	0.000	0.000	0.000	0.009	0.000	0.000
42003 (L-C)	2805010300	0.000	0.000	0.000	0.044	0.000	0.000
42003 (L-C)	2805018000	0.000	0.000	0.000	0.016	0.000	0.000
42003 (L-C)	2805019100	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805019200	0.000	0.000	0.000	0.001	0.000	0.000
42003 (L-C)	2805019300	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805021100	0.000	0.000	0.000	0.010	0.000	0.000
42003 (L-C)	2805021200	0.000	0.000	0.000	0.010	0.000	0.000
42003 (L-C)	2805021300	0.000	0.000	0.000	0.024	0.000	0.000
42003 (L-C)	2805022100	0.000	0.000	0.000	0.001	0.000	0.000
42003 (L-C)	2805022200	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805022300	0.000	0.000	0.000	0.001	0.000	0.000
42003 (L-C)	2805023100	0.000	0.000	0.000	0.009	0.000	0.000
42003 (L-C)	2805023200	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805023300	0.000	0.000	0.000	0.012	0.000	0.000
42003 (L-C)	2805025000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805030000	0.000	0.000	0.000	0.001	0.000	0.000
42003 (L-C)	2805030007	0.000	0.000	0.000	0.002	0.000	0.000

FIPS	SCC	SO2	NOX	VOC	NH3	PM10	PM2.5
42003 (L-C)	2805030008	0.000	0.000	0.000	0.001	0.000	0.000
42003 (L-C)	2805035000	0.000	0.000	0.000	0.265	0.000	0.000
42003 (L-C)	2805039100	0.000	0.000	0.000	0.002	0.000	0.000
42003 (L-C)	2805039200	0.000	0.000	0.000	0.004	0.000	0.000
42003 (L-C)	2805039300	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805040000	0.000	0.000	0.000	0.035	0.000	0.000
42003 (L-C)	2805045000	0.000	0.000	0.000	0.028	0.000	0.000
42003 (L-C)	2805047100	0.000	0.000	0.000	0.005	0.000	0.000
42003 (L-C)	2805047300	0.000	0.000	0.000	0.002	0.000	0.000
42003 (L-C)	2805053100	0.000	0.000	0.000	0.000	0.000	0.000

FIPS	SCC	SO2	NOX	VOC	NH3	PM10	PM2.5
42003 (L-C)	2102002000	31.105	0.000	0.000	0.040	5.015	0.000
42003 (L-C)	2102004000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2102005000	10.666	1.419	0.008	0.024	0.671	0.453
42003 (L-C)	2102006000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2102007000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2102011000	0.029	0.014	0.000	0.001	0.002	0.001
42003 (L-C)	2103002000	0.000	0.000	0.000	0.020	0.000	0.000
42003 (L-C)	2103004000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2103005000	4.849	0.755	0.016	0.011	0.226	0.097
42003 (L-C)	2103006000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2103007000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2103011000	0.825	0.387	0.007	0.002	0.046	0.041
42003 (L-C)	2104002000	0.054	0.007	0.007	0.000	0.005	0.003
42003 (L-C)	2104004000	1.511	0.639	0.025	0.028	0.084	0.076
42003 (L-C)	2104006000	0.204	31.975	1.871	0.167	2.116	2.085
42003 (L-C)	2104007000	0.003	0.721	0.028	0.003	0.003	0.002
42003 (L-C)	2104008100	0.051	0.334	2.430	0.231	3.034	3.034
42003 (L-C)	2104008210	0.042	0.293	5.552	0.178	3.205	3.205
42003 (L-C)	2104008220	0.018	0.103	0.540	0.040	0.881	0.881
42003 (L-C)	2104008230	0.006	0.031	0.229	0.014	0.311	0.311
42003 (L-C)	2104008310	0.048	0.338	6.394	0.205	3.692	3.692
42003 (L-C)	2104008320	0.021	0.118	0.619	0.046	1.011	1.011
42003 (L-C)	2104008330	0.007	0.035	0.263	0.016	0.358	0.358
42003 (L-C)	2104008400	0.041	0.483	0.005	0.038	0.389	0.389
42003 (L-C)	2104008510	0.067	0.061	0.389	0.059	0.911	0.911
42003 (L-C)	2104008610	0.097	0.088	0.565	0.086	1.322	1.322
42003 (L-C)	2104009000	0.000	0.230	1.182	0.000	0.876	0.848
42003 (L-C)	2104011000	0.001	0.034	0.001	0.002	0.005	0.004
42003 (L-C)	2294000000	0.000	0.000	0.000	0.000	12.099	0.592
42003 (L-C)	2296000000	0.000	0.000	0.000	0.000	2.629	0.261
42003 (L-C)	2302002100	0.000	0.000	0.103	0.000	0.427	0.414
42003 (L-C)	2302002200	0.000	0.000	0.355	0.000	3.023	2.927
42003 (L-C)	2302003000	0.000	0.000	0.108	0.000	0.000	0.000
42003 (L-C)	2302003100	0.000	0.000	0.051	0.000	0.884	0.671
42003 (L-C)	2302003200	0.000	0.000	0.002	0.000	0.060	0.051
42003 (L-C)	2302050000	0.000	0.000	1.541	0.000	0.000	0.000
42003 (L-C)	2310021000	0.000	0.015	0.027	0.000	0.001	0.001
42003 (L-C)	2311010000	0.000	0.000	0.000	0.000	0.110	0.011
42003 (L-C)	2311020000	0.000	0.000	0.000	0.000	0.409	0.041
42003 (L-C)	2311030000	0.000	0.000	0.000	0.000	0.129	0.013
42003 (L-C)	2325000000	0.000	0.000	0.000	0.000	3.878	0.776
42003 (L-C)	2401001000	0.000	0.000	23.853	0.000	0.000	0.000
42003 (L-C)	2401005000	0.000	0.000	4.949	0.000	0.000	0.000
42003 (L-C)	2401008000	0.000	0.000	1.068	0.000	0.000	0.000
42003 (L-C)	2401015000	0.000	0.000	0.094	0.000	0.000	0.000
42003 (L-C)	2401020000	0.000	0.000	0.767	0.000	0.000	0.000

FIPS	SCC	SO2	NOX	VOC	NH3	PM10	PM2.5
42003 (L-C)	2401025000	0.000	0.000	0.636	0.000	0.000	0.000
42003 (L-C)	2401030000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2401040000	0.000	0.000	0.189	0.000	0.000	0.000
42003 (L-C)	2401045000	0.000	0.000	12.001	0.000	0.000	0.000
42003 (L-C)	2401060000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2401065000	0.000	0.000	0.012	0.000	0.000	0.000
42003 (L-C)	2401080000	0.000	0.000	0.008	0.000	0.000	0.000
42003 (L-C)	2401085000	0.000	0.000	3.105	0.000	0.000	0.000
42003 (L-C)	2401090000	0.000	0.000	5.939	0.000	0.000	0.000
42003 (L-C)	2401100000	0.000	0.000	1.485	0.000	0.000	0.000
42003 (L-C)	2401200000	0.000	0.000	0.069	0.000	0.000	0.000
42003 (L-C)	2415200000	0.000	0.000	2.405	0.000	0.000	0.000
42003 (L-C)	2415230000	0.000	0.000	1.031	0.000	0.000	0.000
42003 (L-C)	2415300000	0.000	0.000	5.139	0.000	0.000	0.000
42003 (L-C)	2415360000	0.000	0.000	11.679	0.000	0.000	0.000
42003 (L-C)	2420000000	0.000	0.000	7.590	0.000	0.000	0.000
42003 (L-C)	2425000000	0.000	0.000	43.549	0.000	0.000	0.000
42003 (L-C)	2460100000	0.000	0.000	21.611	0.000	0.000	0.000
42003 (L-C)	2460200000	0.000	0.000	7.403	0.000	0.000	0.000
42003 (L-C)	2460400000	0.000	0.000	12.874	0.000	0.000	0.000
42003 (L-C)	2460500000	0.000	0.000	9.403	0.000	0.000	0.000
42003 (L-C)	2460600000	0.000	0.000	5.414	0.000	0.000	0.000
42003 (L-C)	2460800000	0.000	0.000	15.905	0.000	0.000	0.000
42003 (L-C)	2460900000	0.000	0.000	0.693	0.000	0.000	0.000
42003 (L-C)	2461021000	0.000	0.000	11.029	0.000	0.000	0.000
42003 (L-C)	2461022000	0.000	0.000	2.993	0.000	0.000	0.000
42003 (L-C)	2501011011	0.000	0.000	1.477	0.000	0.000	0.000
42003 (L-C)	2501011012	0.000	0.000	2.883	0.000	0.000	0.000
42003 (L-C)	2501011013	0.000	0.000	0.789	0.000	0.000	0.000
42003 (L-C)	2501011014	0.000	0.000	0.269	0.000	0.000	0.000
42003 (L-C)	2501011015	0.000	0.000	0.025	0.000	0.000	0.000
42003 (L-C)	2501012011	0.000	0.000	0.047	0.000	0.000	0.000
42003 (L-C)	2501012012	0.000	0.000	0.092	0.000	0.000	0.000
42003 (L-C)	2501012013	0.000	0.000	1.077	0.000	0.000	0.000
42003 (L-C)	2501012014	0.000	0.000	0.519	0.000	0.000	0.000
42003 (L-C)	2501012015	0.000	0.000	0.047	0.000	0.000	0.000
42003 (L-C)	2501060053	0.000	0.000	3.604	0.000	0.000	0.000
42003 (L-C)	2501060100	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2501060201	0.000	0.000	0.580	0.000	0.000	0.000
42003 (L-C)	2505030120	0.000	0.000	0.113	0.000	0.000	0.000
42003 (L-C)	2610000100	0.000	0.000	0.001	0.000	0.001	0.001
42003 (L-C)	2610000400	0.000	0.000	0.001	0.000	0.001	0.001
42003 (L-C)	2610000500	0.000	0.375	0.871	0.000	1.276	0.984
42003 (L-C)	2610030000	0.001	0.005	0.007	0.000	0.031	0.028
42003 (L-C)	2630020000	0.000	0.000	4.366	0.075	0.000	0.000
42003 (L-C)	2801000003	0.000	0.000	0.000	0.000	0.390	0.078

FIPS	SCC	SO2	NOX	VOC	NH3	PM10	PM2.5
42003 (L-C)	2801700001	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2801700002	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2801700003	0.000	0.000	0.000	0.010	0.000	0.000
42003 (L-C)	2801700004	0.000	0.000	0.000	1.383	0.000	0.000
42003 (L-C)	2801700005	0.000	0.000	0.000	0.001	0.000	0.000
42003 (L-C)	2801700006	0.000	0.000	0.000	0.003	0.000	0.000
42003 (L-C)	2801700007	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2801700010	0.000	0.000	0.000	0.706	0.000	0.000
42003 (L-C)	2801700011	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2801700012	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2801700013	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2801700014	0.000	0.000	0.000	0.012	0.000	0.000
42003 (L-C)	2801700015	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2801700099	0.000	0.000	0.000	0.063	0.000	0.000
42003 (L-C)	2805001100	0.000	0.000	0.000	0.024	0.000	0.000
42003 (L-C)	2805001200	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805001300	0.000	0.000	0.000	0.019	0.000	0.000
42003 (L-C)	2805002000	0.000	0.000	0.000	0.070	0.000	0.000
42003 (L-C)	2805003100	0.000	0.000	0.000	0.064	0.000	0.000
42003 (L-C)	2805007100	0.000	0.000	0.000	0.018	0.000	0.000
42003 (L-C)	2805007300	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805008100	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805008200	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805008300	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805009100	0.000	0.000	0.000	0.001	0.000	0.000
42003 (L-C)	2805009200	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805009300	0.000	0.000	0.000	0.001	0.000	0.000
42003 (L-C)	2805010100	0.000	0.000	0.000	0.048	0.000	0.000
42003 (L-C)	2805010200	0.000	0.000	0.000	0.009	0.000	0.000
42003 (L-C)	2805010300	0.000	0.000	0.000	0.043	0.000	0.000
42003 (L-C)	2805018000	0.000	0.000	0.000	0.016	0.000	0.000
42003 (L-C)	2805019100	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805019200	0.000	0.000	0.000	0.001	0.000	0.000
42003 (L-C)	2805019300	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805021100	0.000	0.000	0.000	0.010	0.000	0.000
42003 (L-C)	2805021200	0.000	0.000	0.000	0.010	0.000	0.000
42003 (L-C)	2805021300	0.000	0.000	0.000	0.024	0.000	0.000
42003 (L-C)	2805022100	0.000	0.000	0.000	0.001	0.000	0.000
42003 (L-C)	2805022200	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805022300	0.000	0.000	0.000	0.001	0.000	0.000
42003 (L-C)	2805023100	0.000	0.000	0.000	0.009	0.000	0.000
42003 (L-C)	2805023200	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805023300	0.000	0.000	0.000	0.011	0.000	0.000
42003 (L-C)	2805025000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805030000	0.000	0.000	0.000	0.001	0.000	0.000
42003 (L-C)	2805030007	0.000	0.000	0.000	0.002	0.000	0.000

FIPS	SCC	SO2	NOX	VOC	NH3	PM10	PM2.5
42003 (L-C)	2805030008	0.000	0.000	0.000	0.001	0.000	0.000
42003 (L-C)	2805035000	0.000	0.000	0.000	0.262	0.000	0.000
42003 (L-C)	2805039100	0.000	0.000	0.000	0.002	0.000	0.000
42003 (L-C)	2805039200	0.000	0.000	0.000	0.004	0.000	0.000
42003 (L-C)	2805039300	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2805040000	0.000	0.000	0.000	0.034	0.000	0.000
42003 (L-C)	2805045000	0.000	0.000	0.000	0.028	0.000	0.000
42003 (L-C)	2805047100	0.000	0.000	0.000	0.005	0.000	0.000
42003 (L-C)	2805047300	0.000	0.000	0.000	0.002	0.000	0.000
42003 (L-C)	2805053100	0.000	0.000	0.000	0.000	0.000	0.000

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D-3: Nonroad Sources

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Liberty-Clairton Nonroad Source Summary

- Emissions given in tons/year

- Liberty-Clairton corrections given in TS|Pechan report (Appendix F)

- 2285002010 added by TS|Pechan

- Liberty-Clairton subtractions were done by ACHD for all Allegheny County SCC categories except:
  2280002200

- Marine/Aircraft/Railway (MAR) categories included with nonroad:
  2265008005
  2267008005
  2268008005
  2270008005
  2275001000
  2275020000
  2275050011
  2275050012
  2275060011
  2275060012
  2275070000
  2280002100
  2280002200
  2285002006
  2285002007
  2285002008
  2285002010

FIPS code 42003 (L-C) is Allegheny County (Liberty-Clairton)

TOTALS

2007

CATEGORY	SO2	NOx	VOC	NH3	PM10	PM2.5
Aircraft	0.000	0.000	0.000	0.000	0.000	0.000
Marine	12.474	290.690	14.691	0.048	6.986	6.496
Off-Highway Equip (Diesel)	3.840	49.591	5.486	0.042	4.411	4.278
Off-Highway Equip (Gasoline)	0.084	9.474	59.252	0.033	1.787	1.644
Off-Highway Equip (Other)	0.020	12.528	3.170	0.000	0.095	0.095
Railroad	0.800	75.657	3.973	0.035	2.651	2.442
TOTAL	**17.217**	**437.940**	**86.573**	**0.159**	**15.929**	**14.955**

2014

CATEGORY	SO2	NOX	VOC	NH3	PM10	PM2.5
Aircraft	0.000	0.000	0.000	0.000	0.000	0.000
Marine	5.512	285.520	11.450	0.052	6.136	6.131
Off-Highway Equip (Diesel)	0.235	36.322	3.815	0.049	3.157	3.063
Off-Highway Equip (Gasoline)	0.096	5.984	39.889	0.036	1.964	1.807
Off-Highway Equip (Other)	0.021	4.021	0.836	0.000	0.113	0.113
Railroad	0.129	55.248	2.481	0.033	1.328	1.328
TOTAL	**5.993**	**387.096**	**58.472**	**0.171**	**12.699**	**12.441**

SCC	SCC Short Name
2260001010	Off-highway Gasoline, 2-Stroke /Recreational Equipt /Motorcycles: Off-road
2260001020	Off-highway Gasoline, 2-Stroke /Recreational Equipt /Snowmobiles
2260001030	Off-highway Gasoline, 2-Stroke /Recreational Equipt /All Terrain Vehicles
2260001060	Off-highway Gasoline, 2-Stroke /Recreational Equipt /Specialty Vehicles/Carts
2260002006	Off-highway Gasoline, 2-Stroke /Construction & Mining Equipt /Tampers/Rammers
2260002009	Off-highway Gasoline, 2-Stroke /Construction & Mining Equipt /Plate Compactors
2260002021	Off-highway Gasoline, 2-Stroke /Construction & Mining Equipt /Paving Equipt
2260002027	Off-highway Gasoline, 2-Stroke /Construction & Mining Equipt /Signal Boards/Light Plants
2260002039	Off-highway Gasoline, 2-Stroke /Construction & Mining Equipt /Concrete/Industrial Saws
2260002054	Off-highway Gasoline, 2-Stroke /Construction & Mining Equipt /Crushing/Processing Equipt
2260003030	Off-highway Gasoline, 2-Stroke /Industrial Equipt /Sweepers/Scrubbers
2260003040	Off-highway Gasoline, 2-Stroke /Industrial Equipt /Other General Industrial Equipt
2260004015	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Rotary Tillers < 6 HP (Residential)
2260004016	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Rotary Tillers < 6 HP (Commercial)
2260004020	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Chain Saws < 6 HP (Residential)
2260004021	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Chain Saws < 6 HP (Commercial)
2260004025	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Trimmers/Edgers/Brush Cutters (Residential)
2260004026	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Trimmers/Edgers/Brush Cutters (Commercial)
2260004030	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Leafblowers/Vacuums (Residential)
2260004031	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Leafblowers/Vacuums (Commercial)
2260004035	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Snowblowers (Residential)
2260004036	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Snowblowers (Commercial)
2260004071	Off-highway Gasoline, 2-Stroke /Lawn & Garden Equipt /Turf Equipt (Commercial)
2260005035	Off-highway Gasoline, 2-Stroke /Agricultural Equipt /Sprayers
2260006005	Off-highway Gasoline, 2-Stroke /Commercial Equipt /Generator Sets
2260006010	Off-highway Gasoline, 2-Stroke /Commercial Equipt /Pumps
2260006015	Off-highway Gasoline, 2-Stroke /Commercial Equipt /Air Compressors
2260006035	Off-highway Gasoline, 2-Stroke /Commercial Equipt /Hydro-power Units
2260007005	Off-highway Gasoline, 2-Stroke /Logging Equipt /Chain Saws : 6 HP
2265001010	Off-highway Gasoline, 4-Stroke /Recreational Equipt /Motorcycles: Off-road
2265001030	Off-highway Gasoline, 4-Stroke /Recreational Equipt /All Terrain Vehicles
2265001050	Off-highway Gasoline, 4-Stroke /Recreational Equipt /Golf Carts
2265001060	Off-highway Gasoline, 4-Stroke /Recreational Equipt /Specialty Vehicles/Carts

SCC	SCC Short Name
2265002003	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Pavers
2265002006	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Tampers/Rammers
2265002009	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Plate Compactors
2265002015	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Rollers
2265002021	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Paving Equipt
2265002024	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Surfacing Equipt
2265002027	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Signal Boards/Light Plants
2265002030	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Trenchers
2265002033	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Bore/Drill Rigs
2265002039	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Concrete/Industrial Saws
2265002042	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Cement & Mortar Mixers
2265002045	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Cranes
2265002054	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Crushing/Processing Equipt
2265002057	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Rough Terrain Forklifts
2265002060	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Rubber Tire Loaders
2265002066	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Tractors/Loaders/Backhoes
2265002072	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Skid Steer Loaders
2265002078	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Dumpers/Tenders
2265002081	Off-highway Gasoline, 4-Stroke /Construction & Mining Equipt /Other Construction Equipt
2265003010	Off-highway Gasoline, 4-Stroke /Industrial Equipt /Aerial Lifts
2265003020	Off-highway Gasoline, 4-Stroke /Industrial Equipt /Forklifts
2265003030	Off-highway Gasoline, 4-Stroke /Industrial Equipt /Sweepers/Scrubbers
2265003040	Off-highway Gasoline, 4-Stroke /Industrial Equipt /Other General Industrial Equipt
2265003050	Off-highway Gasoline, 4-Stroke /Industrial Equipt /Other Material H&ling Equipt
2265003060	Off-highway Gasoline, 4-Stroke /Industrial Equipt /AC\Refrigeration
2265003070	Off-highway Gasoline, 4-Stroke /Industrial Equipt /Terminal Tractors
2265004010	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Lawn Mowers (Residential)
2265004011	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Lawn Mowers (Commercial)
2265004015	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Rotary Tillers < 6 HP (Residential)
2265004016	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Rotary Tillers < 6 HP (Commercial)
2265004025	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Trimmers/Edgers/Brush Cutters (Residential)
2265004026	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Trimmers/Edgers/Brush Cutters (Commercial)
2265004030	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Leafblowers/Vacuums (Residential)

SCC	SCC Short Name
2265004031	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Leafblowers/Vacuums (Commercial)
2265004035	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Snowblowers (Residential)
2265004036	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Snowblowers (Commercial)
2265004040	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Rear Engine Riding Mowers (Residential)
2265004041	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Rear Engine Riding Mowers (Commercial)
2265004046	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Front Mowers (Commercial)
2265004051	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Shredders < 6 HP (Commercial)
2265004055	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Lawn & Garden Tractors (Residential)
2265004056	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Lawn & Garden Tractors (Commercial)
2265004066	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Chippers/Stump Grinders (Commercial)
2265004071	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Turf Equipt (Commercial)
2265004075	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Other Lawn & Garden Equipt (Residential)
2265004076	Off-highway Gasoline, 4-Stroke /Lawn & Garden Equipt /Other Lawn & Garden Equipt (Commercial)
2265005010	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /2-Wheel Tractors
2265005015	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Agricultural Tractors
2265005020	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Combines
2265005025	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Balers
2265005030	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Agricultural Mowers
2265005035	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Sprayers
2265005040	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Tillers : 6 HP
2265005045	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Swathers
2265005055	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Other Agricultural Equipt
2265005060	Off-highway Gasoline, 4-Stroke /Agricultural Equipt /Irrigation Sets
2265006005	Off-highway Gasoline, 4-Stroke /Commercial Equipt /Generator Sets
2265006010	Off-highway Gasoline, 4-Stroke /Commercial Equipt /Pumps
2265006015	Off-highway Gasoline, 4-Stroke /Commercial Equipt /Air Compressors
2265006025	Off-highway Gasoline, 4-Stroke /Commercial Equipt /Welders
2265006030	Off-highway Gasoline, 4-Stroke /Commercial Equipt /Pressure Washers
2265006035	Off-highway Gasoline, 4-Stroke /Commercial Equipt /Hydro-power Units
2265007010	Off-highway Gasoline, 4-Stroke /Logging Equipt /Shredders : 6 HP
2265007015	Off-highway Gasoline, 4-Stroke /Logging Equipt /Forest Equipt - Feller/Bunch/Skidder
2265010010	Off-highway Gasoline, 4-Stroke /Industrial Equipt /Other Oil Field Equipt
2267001060	Off-highway LPG /Recreational Equipt /Specialty Vehicles/Carts

SCC	SCC Short Name
2267002003	Off-highway LPG /Construction & Mining Equipt /Pavers
2267002015	Off-highway LPG /Construction & Mining Equipt /Rollers
2267002021	Off-highway LPG /Construction & Mining Equipt /Paving Equipt
2267002024	Off-highway LPG /Construction & Mining Equipt /Surfacing Equipt
2267002030	Off-highway LPG /Construction & Mining Equipt /Trenchers
2267002033	Off-highway LPG /Construction & Mining Equipt /Bore/Drill Rigs
2267002039	Off-highway LPG /Construction & Mining Equipt /Concrete/Industrial Saws
2267002045	Off-highway LPG /Construction & Mining Equipt /Cranes
2267002054	Off-highway LPG /Construction & Mining Equipt /Crushing/Processing Equipt
2267002057	Off-highway LPG /Construction & Mining Equipt /Rough Terrain Forklifts
2267002060	Off-highway LPG /Construction & Mining Equipt /Rubber Tire Loaders
2267002066	Off-highway LPG /Construction & Mining Equipt /Tractors/Loaders/Backhoes
2267002072	Off-highway LPG /Construction & Mining Equipt /Skid Steer Loaders
2267002081	Off-highway LPG /Construction & Mining Equipt /Other Construction Equipt
2267003010	Off-highway LPG /Industrial Equipt /Aerial Lifts
2267003020	Off-highway LPG /Industrial Equipt /Forklifts
2267003030	Off-highway LPG /Industrial Equipt /Sweepers/Scrubbers
2267003040	Off-highway LPG /Industrial Equipt /Other General Industrial Equipt
2267003050	Off-highway LPG /Industrial Equipt /Other Material H&ling Equipt
2267003070	Off-highway LPG /Industrial Equipt /Terminal Tractors
2267004066	Off-highway LPG /Lawn & Garden Equipt /Chippers/Stump Grinders (Commercial)
2267005055	Off-highway LPG /Agricultural Equipt /Other Agricultural Equipt
2267005060	Off-highway LPG /Agricultural Equipt /Irrigation Sets
2267006005	Off-highway LPG /Commercial Equipt /Generator Sets
2267006010	Off-highway LPG /Commercial Equipt /Pumps
2267006015	Off-highway LPG /Commercial Equipt /Air Compressors
2267006025	Off-highway LPG /Commercial Equipt /Welders
2267006030	Off-highway LPG /Commercial Equipt /Pressure Washers
2267006035	Off-highway LPG /Commercial Equipt /Hydro-power Units
2268002081	Off-highway CNG /Construction & Mining Equipt /Other Construction Equipt
2268003020	Off-highway CNG /Industrial Equipt /Forklifts
2268003030	Off-highway CNG /Industrial Equipt /Sweepers/Scrubbers
2268003040	Off-highway CNG /Industrial Equipt /Other General Industrial Equipt

SCC	SCC Short Name
2268003060	Off-highway CNG /Industrial Equipt /AC\Refrigeration
2268003070	Off-highway CNG /Industrial Equipt /Terminal Tractors
2268005055	Off-highway CNG /Agricultural Equipt /Other Agricultural Equipt
2268005060	Off-highway CNG /Agricultural Equipt /Irrigation Sets
2268006005	Off-highway CNG /Commercial Equipt /Generator Sets
2268006010	Off-highway CNG /Commercial Equipt /Pumps
2268006015	Off-highway CNG /Commercial Equipt /Air Compressors
2268006020	Off-highway CNG /Commercial Equipt /Gas Compressors
2268006035	Off-highway CNG /Commercial Equipt /Hydro-power Units
2268010010	Off-highway CNG /Industrial Equipt /Other Oil Field Equipt
2270001060	Off-highway Diesel /Recreational Equipt /Specialty Vehicles/Carts
2270002003	Off-highway Diesel /Construction & Mining Equipt /Pavers
2270002006	Off-highway Diesel /Construction & Mining Equipt /Tampers/Rammers
2270002009	Off-highway Diesel /Construction & Mining Equipt /Plate Compactors
2270002015	Off-highway Diesel /Construction & Mining Equipt /Rollers
2270002018	Off-highway Diesel /Construction & Mining Equipt /Scrapers
2270002021	Off-highway Diesel /Construction & Mining Equipt /Paving Equipt
2270002024	Off-highway Diesel /Construction & Mining Equipt /Surfacing Equipt
2270002027	Off-highway Diesel /Construction & Mining Equipt /Signal Boards/Light Plants
2270002030	Off-highway Diesel /Construction & Mining Equipt /Trenchers
2270002033	Off-highway Diesel /Construction & Mining Equipt /Bore/Drill Rigs
2270002036	Off-highway Diesel /Construction & Mining Equipt /Excavators
2270002039	Off-highway Diesel /Construction & Mining Equipt /Concrete/Industrial Saws
2270002042	Off-highway Diesel /Construction & Mining Equipt /Cement & Mortar Mixers
2270002045	Off-highway Diesel /Construction & Mining Equipt /Cranes
2270002048	Off-highway Diesel /Construction & Mining Equipt /Graders
2270002051	Off-highway Diesel /Construction & Mining Equipt /Off-highway Trucks
2270002054	Off-highway Diesel /Construction & Mining Equipt /Crushing/Processing Equipt
2270002057	Off-highway Diesel /Construction & Mining Equipt /Rough Terrain Forklifts
2270002060	Off-highway Diesel /Construction & Mining Equipt /Rubber Tire Loaders
2270002066	Off-highway Diesel /Construction & Mining Equipt /Tractors/Loaders/Backhoes
2270002069	Off-highway Diesel /Construction & Mining Equipt /Crawler Tractor/Dozers
2270002072	Off-highway Diesel /Construction & Mining Equipt /Skid Steer Loaders

SCC	SCC Short Name
2270002075	Off-highway Diesel /Construction & Mining Equipt /Off-highway Tractors
2270002078	Off-highway Diesel /Construction & Mining Equipt /Dumpers/Tenders
2270002081	Off-highway Diesel /Construction & Mining Equipt /Other Construction Equipt
2270003010	Off-highway Diesel /Industrial Equipt /Aerial Lifts
2270003020	Off-highway Diesel /Industrial Equipt /Forklifts
2270003030	Off-highway Diesel /Industrial Equipt /Sweepers/Scrubbers
2270003040	Off-highway Diesel /Industrial Equipt /Other General Industrial Equipt
2270003050	Off-highway Diesel /Industrial Equipt /Other Material H&ling Equipt
2270003060	Off-highway Diesel /Industrial Equipt /AC\Refrigeration
2270003070	Off-highway Diesel /Industrial Equipt /Terminal Tractors
2270004031	Off-highway Diesel /Lawn & Garden Equipt /Leafblowers/Vacuums (Commercial)
2270004036	Off-highway Diesel /Lawn & Garden Equipt /Snowblowers (Commercial)
2270004046	Off-highway Diesel /Lawn & Garden Equipt /Front Mowers (Commercial)
2270004056	Off-highway Diesel /Lawn & Garden Equipt /Lawn & Garden Tractors (Commercial)
2270004066	Off-highway Diesel /Lawn & Garden Equipt /Chippers/Stump Grinders (Commercial)
2270004071	Off-highway Diesel /Lawn & Garden Equipt /Turf Equipt (Commercial)
2270004076	Off-highway Diesel /Lawn & Garden Equipt /Other Lawn & Garden Equipt (Commercial)
2270005010	Off-highway Diesel /Agricultural Equipt /2-Wheel Tractors
2270005015	Off-highway Diesel /Agricultural Equipt /Agricultural Tractors
2270005020	Off-highway Diesel /Agricultural Equipt /Combines
2270005025	Off-highway Diesel /Agricultural Equipt /Balers
2270005030	Off-highway Diesel /Agricultural Equipt /Agricultural Mowers
2270005035	Off-highway Diesel /Agricultural Equipt /Sprayers
2270005040	Off-highway Diesel /Agricultural Equipt /Tillers : 6 HP
2270005045	Off-highway Diesel /Agricultural Equipt /Swathers
2270005055	Off-highway Diesel /Agricultural Equipt /Other Agricultural Equipt
2270005060	Off-highway Diesel /Agricultural Equipt /Irrigation Sets
2270006005	Off-highway Diesel /Commercial Equipt /Generator Sets
2270006010	Off-highway Diesel /Commercial Equipt /Pumps
2270006015	Off-highway Diesel /Commercial Equipt /Air Compressors
2270006020	Off-highway Diesel /Commercial Equipt /Gas Compressors
2270006025	Off-highway Diesel /Commercial Equipt /Welders
2270006030	Off-highway Diesel /Commercial Equipt /Pressure Washers

SCC	SCC Short Name
2270006035	Off-highway Diesel /Commercial Equipt /Hydro-power Units
2270007010	Off-highway Diesel /Logging Equipt /Shredders : 6 HP
2270007015	Off-highway Diesel /Logging Equipt /Forest Equipt - Feller/Bunch/Skidder
2270009010	Off-highway Diesel /Underground Mining Equipt /Other Underground Mining Equipt
2270010010	Off-highway Diesel /Industrial Equipt /Other Oil Field Equipt
2282005010	Pleasure Craft /Gasoline 2-Stroke /Outboard
2282005015	Pleasure Craft /Gasoline 2-Stroke /Personal Water Craft
2282010005	Pleasure Craft /Gasoline 4-Stroke /Inboard/Sterndrive
2282020005	Pleasure Craft /Diesel /Inboard/Sterndrive
2282020010	Pleasure Craft /Diesel /Outboard
2285002015	Railroad Equipt /Diesel /Railway Maintenance
2285004015	Railroad Equipt /Gasoline, 4-Stroke /Railway Maintenance
2285006015	Railroad Equipt /LPG /Railway Maintenance
2265008005	Airport Ground Support Equipment, 4-Stroke Gasoline
2267008005	Airport Ground Support Equipment, LPG
2268008005	Airport Ground Support Equipment, CNG
2270008005	Airport Ground Support Equipment, Diesel
2275001000	Aircraft /Military Aircraft /Total
2275020000	Aircraft /Commercial Aircraft /Total: All Types
2275050011	Aircraft /General Aviation /Piston
2275050012	Aircraft /General Aviation /Turbine
2275060011	Aircraft /Air Taxi /Piston
2275060012	Aircraft /Air Taxi /Turbine
2275070000	Aircraft /Aircraft Auxiliary Power Units /Total
2280002100	Marine Vessels, Commercial /Diesel /Port emissions
2280002200	Marine Vessels, Commercial /Diesel /Underway emissions
2285002006	Railroad Equipment /Diesel /Line Haul Locomotives: Class I Operations
2285002007	Railroad Equipment /Diesel /Line Haul Locomotives: Class II / III Operations
2285002008	Railroad Equipment /Diesel /Line Haul Locomotives: Passenger Trains (Amtrak)
2285002010	Railroad Equipment /Diesel /Yard Locomotives

FIPS	SCC	SO2	NOX	VOC	NH3	PM10	PM2.5
42003 (L-C)	2260001010	0.000	0.006	1.623	0.000	0.059	0.055
42003 (L-C)	2260001020	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2260001030	0.000	0.008	2.103	0.000	0.076	0.070
42003 (L-C)	2260001060	0.000	0.004	0.021	0.000	0.000	0.000
42003 (L-C)	2260002006	0.000	0.004	0.260	0.000	0.028	0.025
42003 (L-C)	2260002009	0.000	0.000	0.007	0.000	0.001	0.001
42003 (L-C)	2260002021	0.000	0.000	0.008	0.000	0.001	0.001
42003 (L-C)	2260002027	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2260002039	0.000	0.009	0.472	0.000	0.072	0.066
42003 (L-C)	2260002054	0.000	0.000	0.002	0.000	0.000	0.000
42003 (L-C)	2260003030	0.000	0.000	0.003	0.000	0.000	0.000
42003 (L-C)	2260003040	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2260004015	0.000	0.001	0.095	0.000	0.006	0.006
42003 (L-C)	2260004016	0.000	0.004	0.209	0.000	0.018	0.017
42003 (L-C)	2260004020	0.000	0.016	1.178	0.000	0.081	0.074
42003 (L-C)	2260004021	0.001	0.047	2.925	0.000	0.354	0.325
42003 (L-C)	2260004025	0.001	0.023	1.541	0.000	0.115	0.106
42003 (L-C)	2260004026	0.001	0.040	1.591	0.000	0.185	0.171
42003 (L-C)	2260004030	0.000	0.015	1.005	0.000	0.073	0.067
42003 (L-C)	2260004031	0.001	0.040	1.760	0.000	0.210	0.194
42003 (L-C)	2260004035	0.000	0.006	1.099	0.000	0.028	0.026
42003 (L-C)	2260004036	0.000	0.009	1.353	0.000	0.039	0.036
42003 (L-C)	2260004071	0.000	0.000	0.001	0.000	0.000	0.000
42003 (L-C)	2260005035	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2260006005	0.000	0.003	0.107	0.000	0.012	0.011
42003 (L-C)	2260006010	0.000	0.019	0.751	0.000	0.091	0.083
42003 (L-C)	2260006015	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2260006035	0.000	0.000	0.005	0.000	0.001	0.000
42003 (L-C)	2260007005	0.000	0.000	0.005	0.000	0.001	0.001
42003 (L-C)	2265001010	0.000	0.007	0.063	0.000	0.001	0.001
42003 (L-C)	2265001030	0.001	0.068	0.692	0.000	0.009	0.008
42003 (L-C)	2265001050	0.002	0.230	0.765	0.001	0.008	0.008
42003 (L-C)	2265001060	0.000	0.005	0.022	0.000	0.000	0.000
42003 (L-C)	2265002003	0.000	0.009	0.019	0.000	0.000	0.000
42003 (L-C)	2265002006	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265002009	0.000	0.013	0.089	0.000	0.001	0.001
42003 (L-C)	2265002015	0.000	0.015	0.030	0.000	0.000	0.000
42003 (L-C)	2265002021	0.000	0.026	0.109	0.000	0.001	0.001
42003 (L-C)	2265002024	0.000	0.011	0.041	0.000	0.000	0.000
42003 (L-C)	2265002027	0.000	0.001	0.003	0.000	0.000	0.000
42003 (L-C)	2265002030	0.000	0.029	0.079	0.000	0.001	0.001
42003 (L-C)	2265002033	0.000	0.011	0.054	0.000	0.000	0.000
42003 (L-C)	2265002039	0.000	0.048	0.113	0.000	0.001	0.001
42003 (L-C)	2265002042	0.000	0.024	0.119	0.000	0.001	0.001
42003 (L-C)	2265002045	0.000	0.005	0.004	0.000	0.000	0.000
42003 (L-C)	2265002054	0.000	0.003	0.010	0.000	0.000	0.000

FIPS	SCC	SO2	NOX	VOC	NH3	PM10	PM2.5
42003 (L-C)	2265002057	0.000	0.008	0.006	0.000	0.000	0.000
42003 (L-C)	2265002060	0.000	0.018	0.012	0.000	0.000	0.000
42003 (L-C)	2265002066	0.000	0.016	0.036	0.000	0.000	0.000
42003 (L-C)	2265002072	0.000	0.023	0.025	0.000	0.000	0.000
42003 (L-C)	2265002078	0.000	0.004	0.016	0.000	0.000	0.000
42003 (L-C)	2265002081	0.000	0.008	0.005	0.000	0.000	0.000
42003 (L-C)	2265003010	0.000	0.078	0.071	0.000	0.001	0.001
42003 (L-C)	2265003020	0.001	0.275	0.179	0.000	0.002	0.002
42003 (L-C)	2265003030	0.000	0.040	0.053	0.000	0.001	0.001
42003 (L-C)	2265003040	0.000	0.046	0.244	0.000	0.003	0.002
42003 (L-C)	2265003050	0.000	0.005	0.005	0.000	0.000	0.000
42003 (L-C)	2265003060	0.000	0.001	0.003	0.000	0.000	0.000
42003 (L-C)	2265003070	0.000	0.018	0.012	0.000	0.000	0.000
42003 (L-C)	2265004010	0.005	0.525	6.252	0.002	0.033	0.031
42003 (L-C)	2265004011	0.002	0.251	2.717	0.001	0.019	0.018
42003 (L-C)	2265004015	0.000	0.044	0.543	0.000	0.003	0.003
42003 (L-C)	2265004016	0.001	0.132	1.339	0.000	0.009	0.008
42003 (L-C)	2265004025	0.000	0.003	0.037	0.000	0.000	0.000
42003 (L-C)	2265004026	0.000	0.006	0.049	0.000	0.000	0.000
42003 (L-C)	2265004030	0.000	0.006	0.067	0.000	0.000	0.000
42003 (L-C)	2265004031	0.002	0.330	0.797	0.001	0.008	0.007
42003 (L-C)	2265004035	0.001	0.051	0.537	0.000	0.001	0.001
42003 (L-C)	2265004036	0.001	0.070	0.405	0.000	0.002	0.002
42003 (L-C)	2265004040	0.001	0.107	0.504	0.000	0.003	0.003
42003 (L-C)	2265004041	0.000	0.027	0.076	0.000	0.001	0.001
42003 (L-C)	2265004046	0.000	0.036	0.118	0.000	0.001	0.001
42003 (L-C)	2265004051	0.000	0.015	0.154	0.000	0.001	0.001
42003 (L-C)	2265004055	0.013	1.454	5.611	0.005	0.043	0.040
42003 (L-C)	2265004056	0.004	0.371	0.977	0.001	0.012	0.011
42003 (L-C)	2265004066	0.001	0.106	0.141	0.000	0.002	0.002
42003 (L-C)	2265004071	0.012	1.233	4.078	0.004	0.046	0.042
42003 (L-C)	2265004075	0.000	0.052	0.363	0.000	0.002	0.002
42003 (L-C)	2265004076	0.000	0.041	0.281	0.000	0.002	0.002
42003 (L-C)	2265005010	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265005015	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265005020	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265005025	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265005030	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265005035	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265005040	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265005045	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265005055	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265005060	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265006005	0.013	1.463	5.694	0.005	0.046	0.043
42003 (L-C)	2265006010	0.003	0.414	2.006	0.001	0.017	0.016
42003 (L-C)	2265006015	0.002	0.264	0.761	0.001	0.008	0.007

FIPS	SCC	SO2	NOX	VOC	NH3	PM10	PM2.5
42003 (L-C)	2265006025	0.004	0.483	1.088	0.001	0.012	0.011
42003 (L-C)	2265006030	0.005	0.619	3.449	0.002	0.028	0.026
42003 (L-C)	2265006035	0.000	0.029	0.108	0.000	0.001	0.001
42003 (L-C)	2265007010	0.000	0.000	0.002	0.000	0.000	0.000
42003 (L-C)	2265007015	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265010010	0.000	0.038	0.103	0.000	0.001	0.001
42003 (L-C)	2267001060	0.000	0.001	0.000	0.000	0.000	0.000
42003 (L-C)	2267002003	0.000	0.005	0.001	0.000	0.000	0.000
42003 (L-C)	2267002015	0.000	0.006	0.002	0.000	0.000	0.000
42003 (L-C)	2267002021	0.000	0.001	0.000	0.000	0.000	0.000
42003 (L-C)	2267002024	0.000	0.001	0.000	0.000	0.000	0.000
42003 (L-C)	2267002030	0.000	0.014	0.004	0.000	0.000	0.000
42003 (L-C)	2267002033	0.000	0.006	0.002	0.000	0.000	0.000
42003 (L-C)	2267002039	0.000	0.008	0.002	0.000	0.000	0.000
42003 (L-C)	2267002045	0.000	0.006	0.002	0.000	0.000	0.000
42003 (L-C)	2267002054	0.000	0.001	0.000	0.000	0.000	0.000
42003 (L-C)	2267002057	0.000	0.010	0.003	0.000	0.000	0.000
42003 (L-C)	2267002060	0.000	0.021	0.006	0.000	0.000	0.000
42003 (L-C)	2267002066	0.000	0.002	0.001	0.000	0.000	0.000
42003 (L-C)	2267002072	0.000	0.021	0.006	0.000	0.000	0.000
42003 (L-C)	2267002081	0.000	0.009	0.002	0.000	0.000	0.000
42003 (L-C)	2267003010	0.000	0.128	0.035	0.000	0.001	0.001
42003 (L-C)	2267003020	0.015	9.904	2.783	0.000	0.073	0.073
42003 (L-C)	2267003030	0.000	0.060	0.017	0.000	0.001	0.001
42003 (L-C)	2267003040	0.000	0.021	0.006	0.000	0.000	0.000
42003 (L-C)	2267003050	0.000	0.007	0.002	0.000	0.000	0.000
42003 (L-C)	2267003070	0.000	0.031	0.009	0.000	0.000	0.000
42003 (L-C)	2267004066	0.000	0.076	0.022	0.000	0.001	0.001
42003 (L-C)	2267005055	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2267005060	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2267006005	0.001	0.654	0.134	0.000	0.004	0.004
42003 (L-C)	2267006010	0.000	0.137	0.028	0.000	0.001	0.001
42003 (L-C)	2267006015	0.000	0.152	0.032	0.000	0.001	0.001
42003 (L-C)	2267006025	0.000	0.199	0.055	0.000	0.001	0.001
42003 (L-C)	2267006030	0.000	0.003	0.001	0.000	0.000	0.000
42003 (L-C)	2267006035	0.000	0.002	0.000	0.000	0.000	0.000
42003 (L-C)	2268002081	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2268003020	0.001	0.709	0.012	0.000	0.005	0.005
42003 (L-C)	2268003030	0.000	0.001	0.000	0.000	0.000	0.000
42003 (L-C)	2268003040	0.000	0.001	0.000	0.000	0.000	0.000
42003 (L-C)	2268003060	0.000	0.002	0.000	0.000	0.000	0.000
42003 (L-C)	2268003070	0.000	0.002	0.000	0.000	0.000	0.000
42003 (L-C)	2268005055	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2268005060	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2268006005	0.000	0.204	0.002	0.000	0.001	0.001
42003 (L-C)	2268006010	0.000	0.009	0.000	0.000	0.000	0.000

FIPS	SCC	SO2	NOX	VOC	NH3	PM10	PM2.5
42003 (L-C)	2268006015	0.000	0.012	0.000	0.000	0.000	0.000
42003 (L-C)	2268006020	0.001	0.061	0.001	0.000	0.003	0.003
42003 (L-C)	2268006035	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2268010010	0.000	0.041	0.001	0.000	0.001	0.001
42003 (L-C)	2270001060	0.001	0.016	0.005	0.000	0.003	0.002
42003 (L-C)	2270002003	0.037	0.441	0.038	0.000	0.036	0.035
42003 (L-C)	2270002006	0.000	0.001	0.000	0.000	0.000	0.000
42003 (L-C)	2270002009	0.001	0.015	0.003	0.000	0.002	0.002
42003 (L-C)	2270002015	0.093	1.124	0.103	0.001	0.102	0.099
42003 (L-C)	2270002018	0.101	1.261	0.075	0.001	0.078	0.076
42003 (L-C)	2270002021	0.006	0.072	0.007	0.000	0.007	0.006
42003 (L-C)	2270002024	0.003	0.050	0.005	0.000	0.005	0.004
42003 (L-C)	2270002027	0.010	0.140	0.022	0.000	0.014	0.014
42003 (L-C)	2270002030	0.044	0.557	0.061	0.000	0.062	0.060
42003 (L-C)	2270002033	0.038	0.659	0.057	0.000	0.045	0.044
42003 (L-C)	2270002036	0.378	4.260	0.321	0.004	0.303	0.294
42003 (L-C)	2270002039	0.003	0.038	0.005	0.000	0.005	0.005
42003 (L-C)	2270002042	0.001	0.025	0.003	0.000	0.002	0.002
42003 (L-C)	2270002045	0.086	1.187	0.082	0.001	0.062	0.061
42003 (L-C)	2270002048	0.094	1.070	0.080	0.001	0.073	0.071
42003 (L-C)	2270002051	0.323	4.122	0.234	0.004	0.211	0.205
42003 (L-C)	2270002054	0.015	0.216	0.017	0.000	0.013	0.013
42003 (L-C)	2270002057	0.121	1.512	0.158	0.001	0.157	0.153
42003 (L-C)	2270002060	0.411	5.451	0.402	0.004	0.378	0.367
42003 (L-C)	2270002066	0.249	3.570	0.783	0.003	0.539	0.523
42003 (L-C)	2270002069	0.376	4.707	0.331	0.004	0.312	0.302
42003 (L-C)	2270002072	0.171	2.408	0.730	0.002	0.468	0.454
42003 (L-C)	2270002075	0.041	0.596	0.043	0.000	0.039	0.038
42003 (L-C)	2270002078	0.001	0.008	0.002	0.000	0.001	0.001
42003 (L-C)	2270002081	0.039	0.571	0.043	0.000	0.042	0.041
42003 (L-C)	2270003010	0.010	0.148	0.042	0.000	0.025	0.024
42003 (L-C)	2270003020	0.140	1.481	0.135	0.002	0.135	0.131
42003 (L-C)	2270003030	0.061	0.749	0.062	0.001	0.050	0.049
42003 (L-C)	2270003040	0.062	0.853	0.072	0.001	0.056	0.054
42003 (L-C)	2270003050	0.002	0.042	0.008	0.000	0.005	0.005
42003 (L-C)	2270003060	0.234	2.798	0.273	0.003	0.245	0.238
42003 (L-C)	2270003070	0.088	0.934	0.076	0.001	0.070	0.068
42003 (L-C)	2270004031	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270004036	0.002	0.024	0.002	0.000	0.002	0.001
42003 (L-C)	2270004046	0.041	0.558	0.086	0.000	0.059	0.057
42003 (L-C)	2270004056	0.009	0.114	0.018	0.000	0.011	0.011
42003 (L-C)	2270004066	0.057	0.854	0.086	0.001	0.068	0.066
42003 (L-C)	2270004071	0.007	0.080	0.007	0.000	0.006	0.006
42003 (L-C)	2270004076	0.000	0.002	0.000	0.000	0.000	0.000
42003 (L-C)	2270005010	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270005015	0.003	0.045	0.005	0.000	0.005	0.004

FIPS	SCC	SO2	NOX	VOC	NH3	PM10	PM2.5
42003 (L-C)	2270005020	0.000	0.005	0.000	0.000	0.001	0.000
42003 (L-C)	2270005025	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270005030	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270005035	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270005040	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270005045	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270005055	0.000	0.001	0.000	0.000	0.000	0.000
42003 (L-C)	2270005060	0.000	0.001	0.000	0.000	0.000	0.000
42003 (L-C)	2270006005	0.197	2.951	0.393	0.002	0.283	0.274
42003 (L-C)	2270006010	0.046	0.702	0.088	0.001	0.069	0.067
42003 (L-C)	2270006015	0.129	1.717	0.179	0.001	0.149	0.145
42003 (L-C)	2270006020	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270006025	0.065	0.875	0.294	0.001	0.177	0.172
42003 (L-C)	2270006030	0.006	0.098	0.013	0.000	0.008	0.008
42003 (L-C)	2270006035	0.006	0.074	0.008	0.000	0.007	0.006
42003 (L-C)	2270007010	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270007015	0.001	0.015	0.001	0.000	0.001	0.001
42003 (L-C)	2270009010	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270010010	0.026	0.393	0.027	0.000	0.020	0.019
42003 (L-C)	2282005010	0.002	0.222	5.766	0.001	0.099	0.091
42003 (L-C)	2282005015	0.001	0.081	1.934	0.000	0.037	0.034
42003 (L-C)	2282010005	0.001	0.379	0.424	0.001	0.003	0.003
42003 (L-C)	2282020005	0.027	0.388	0.015	0.000	0.009	0.009
42003 (L-C)	2282020010	0.000	0.001	0.000	0.000	0.000	0.000
42003 (L-C)	2285002015	0.005	0.081	0.015	0.000	0.011	0.010
42003 (L-C)	2285004015	0.000	0.001	0.004	0.000	0.000	0.000
42003 (L-C)	2285006015	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265008005	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2267008005	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2268008005	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270008005	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2275001000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2275020000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2275050011	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2275050012	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2275060011	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2275060012	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2275070000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2280002100	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2280002200	12.442	289.619	6.551	0.046	6.838	6.359
42003 (L-C)	2285002006	0.764	71.132	3.781	0.034	2.534	2.331
42003 (L-C)	2285002007	0.020	2.936	0.114	0.001	0.072	0.066
42003 (L-C)	2285002008	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2285002010	0.010	1.506	0.059	0.000	0.034	0.034

FIPS	SCC	SO2	NOX	VOC	NH3	PM10	PM2.5
42003 (L-C)	2260001010	0.000	0.010	1.524	0.000	0.056	0.051
42003 (L-C)	2260001020	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2260001030	0.000	0.014	1.553	0.000	0.054	0.050
42003 (L-C)	2260001060	0.000	0.003	0.014	0.000	0.000	0.000
42003 (L-C)	2260002006	0.000	0.003	0.187	0.000	0.028	0.026
42003 (L-C)	2260002009	0.000	0.000	0.007	0.000	0.001	0.001
42003 (L-C)	2260002021	0.000	0.000	0.008	0.000	0.001	0.001
42003 (L-C)	2260002027	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2260002039	0.000	0.009	0.478	0.000	0.073	0.067
42003 (L-C)	2260002054	0.000	0.000	0.002	0.000	0.000	0.000
42003 (L-C)	2260003030	0.000	0.000	0.002	0.000	0.000	0.000
42003 (L-C)	2260003040	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2260004015	0.000	0.002	0.051	0.000	0.006	0.006
42003 (L-C)	2260004016	0.000	0.005	0.136	0.000	0.019	0.018
42003 (L-C)	2260004020	0.000	0.021	0.908	0.000	0.087	0.080
42003 (L-C)	2260004021	0.001	0.051	3.130	0.001	0.401	0.369
42003 (L-C)	2260004025	0.001	0.029	0.982	0.000	0.126	0.116
42003 (L-C)	2260004026	0.001	0.045	1.585	0.000	0.209	0.192
42003 (L-C)	2260004030	0.000	0.019	0.593	0.000	0.079	0.072
42003 (L-C)	2260004031	0.001	0.042	1.578	0.000	0.238	0.219
42003 (L-C)	2260004035	0.000	0.007	1.058	0.000	0.032	0.029
42003 (L-C)	2260004036	0.000	0.010	1.514	0.000	0.044	0.041
42003 (L-C)	2260004071	0.000	0.000	0.001	0.000	0.000	0.000
42003 (L-C)	2260005035	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2260006005	0.000	0.003	0.119	0.000	0.015	0.013
42003 (L-C)	2260006010	0.000	0.023	0.856	0.000	0.108	0.100
42003 (L-C)	2260006015	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2260006035	0.000	0.000	0.005	0.000	0.001	0.001
42003 (L-C)	2260007005	0.000	0.000	0.006	0.000	0.001	0.001
42003 (L-C)	2265001010	0.000	0.009	0.063	0.000	0.001	0.001
42003 (L-C)	2265001030	0.001	0.074	0.730	0.001	0.012	0.011
42003 (L-C)	2265001050	0.002	0.127	0.460	0.001	0.009	0.008
42003 (L-C)	2265001060	0.000	0.005	0.016	0.000	0.000	0.000
42003 (L-C)	2265002003	0.000	0.004	0.011	0.000	0.000	0.000
42003 (L-C)	2265002006	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265002009	0.000	0.007	0.029	0.000	0.001	0.001
42003 (L-C)	2265002015	0.000	0.006	0.018	0.000	0.000	0.000
42003 (L-C)	2265002021	0.000	0.015	0.050	0.000	0.001	0.001
42003 (L-C)	2265002024	0.000	0.005	0.018	0.000	0.000	0.000
42003 (L-C)	2265002027	0.000	0.000	0.001	0.000	0.000	0.000
42003 (L-C)	2265002030	0.000	0.013	0.034	0.000	0.001	0.001
42003 (L-C)	2265002033	0.000	0.007	0.017	0.000	0.000	0.000
42003 (L-C)	2265002039	0.000	0.023	0.072	0.000	0.002	0.001
42003 (L-C)	2265002042	0.000	0.016	0.066	0.000	0.001	0.001
42003 (L-C)	2265002045	0.000	0.003	0.002	0.000	0.000	0.000
42003 (L-C)	2265002054	0.000	0.002	0.005	0.000	0.000	0.000

FIPS	SCC	SO2	NOX	VOC	NH3	PM10	PM2.5
42003 (L-C)	2265002057	0.000	0.003	0.002	0.000	0.000	0.000
42003 (L-C)	2265002060	0.000	0.005	0.003	0.000	0.000	0.000
42003 (L-C)	2265002066	0.000	0.008	0.023	0.000	0.000	0.000
42003 (L-C)	2265002072	0.000	0.012	0.014	0.000	0.000	0.000
42003 (L-C)	2265002078	0.000	0.003	0.010	0.000	0.000	0.000
42003 (L-C)	2265002081	0.000	0.005	0.003	0.000	0.000	0.000
42003 (L-C)	2265003010	0.000	0.033	0.029	0.000	0.000	0.000
42003 (L-C)	2265003020	0.000	0.044	0.028	0.000	0.001	0.001
42003 (L-C)	2265003030	0.000	0.007	0.011	0.000	0.000	0.000
42003 (L-C)	2265003040	0.000	0.011	0.039	0.000	0.001	0.001
42003 (L-C)	2265003050	0.000	0.002	0.002	0.000	0.000	0.000
42003 (L-C)	2265003060	0.000	0.000	0.001	0.000	0.000	0.000
42003 (L-C)	2265003070	0.000	0.002	0.001	0.000	0.000	0.000
42003 (L-C)	2265004010	0.006	0.351	3.419	0.002	0.046	0.042
42003 (L-C)	2265004011	0.003	0.136	0.941	0.001	0.022	0.020
42003 (L-C)	2265004015	0.000	0.029	0.290	0.000	0.004	0.004
42003 (L-C)	2265004016	0.001	0.084	0.701	0.001	0.012	0.011
42003 (L-C)	2265004025	0.000	0.002	0.018	0.000	0.000	0.000
42003 (L-C)	2265004026	0.000	0.003	0.024	0.000	0.000	0.000
42003 (L-C)	2265004030	0.000	0.003	0.030	0.000	0.000	0.000
42003 (L-C)	2265004031	0.003	0.169	0.586	0.001	0.009	0.008
42003 (L-C)	2265004035	0.001	0.057	0.334	0.000	0.002	0.001
42003 (L-C)	2265004036	0.001	0.079	0.418	0.000	0.002	0.002
42003 (L-C)	2265004040	0.001	0.076	0.335	0.000	0.003	0.003
42003 (L-C)	2265004041	0.000	0.016	0.056	0.000	0.001	0.001
42003 (L-C)	2265004046	0.000	0.028	0.084	0.000	0.001	0.001
42003 (L-C)	2265004051	0.000	0.010	0.083	0.000	0.001	0.001
42003 (L-C)	2265004055	0.015	1.013	3.609	0.006	0.045	0.041
42003 (L-C)	2265004056	0.004	0.223	0.738	0.002	0.013	0.012
42003 (L-C)	2265004066	0.001	0.039	0.080	0.000	0.002	0.002
42003 (L-C)	2265004071	0.013	0.685	2.265	0.005	0.054	0.049
42003 (L-C)	2265004075	0.001	0.038	0.233	0.000	0.003	0.003
42003 (L-C)	2265004076	0.000	0.030	0.178	0.000	0.002	0.002
42003 (L-C)	2265005010	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265005015	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265005020	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265005025	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265005030	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265005035	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265005040	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265005045	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265005055	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265005060	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265006005	0.015	1.083	3.788	0.006	0.052	0.048
42003 (L-C)	2265006010	0.004	0.247	0.799	0.001	0.019	0.017
42003 (L-C)	2265006015	0.002	0.132	0.337	0.001	0.009	0.008

FIPS	SCC	SO2	NOX	VOC	NH3	PM10	PM2.5
42003 (L-C)	2265006025	0.004	0.262	0.747	0.002	0.014	0.013
42003 (L-C)	2265006030	0.007	0.402	1.615	0.002	0.032	0.030
42003 (L-C)	2265006035	0.000	0.017	0.056	0.000	0.001	0.001
42003 (L-C)	2265007010	0.000	0.000	0.001	0.000	0.000	0.000
42003 (L-C)	2265007015	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265010010	0.000	0.021	0.067	0.000	0.001	0.001
42003 (L-C)	2267001060	0.000	0.001	0.000	0.000	0.000	0.000
42003 (L-C)	2267002003	0.000	0.002	0.000	0.000	0.000	0.000
42003 (L-C)	2267002015	0.000	0.001	0.000	0.000	0.000	0.000
42003 (L-C)	2267002021	0.000	0.001	0.000	0.000	0.000	0.000
42003 (L-C)	2267002024	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2267002030	0.000	0.005	0.001	0.000	0.000	0.000
42003 (L-C)	2267002033	0.000	0.004	0.001	0.000	0.000	0.000
42003 (L-C)	2267002039	0.000	0.002	0.000	0.000	0.000	0.000
42003 (L-C)	2267002045	0.000	0.003	0.001	0.000	0.000	0.000
42003 (L-C)	2267002054	0.000	0.001	0.000	0.000	0.000	0.000
42003 (L-C)	2267002057	0.000	0.004	0.001	0.000	0.000	0.000
42003 (L-C)	2267002060	0.000	0.005	0.001	0.000	0.000	0.000
42003 (L-C)	2267002066	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2267002072	0.000	0.011	0.003	0.000	0.000	0.000
42003 (L-C)	2267002081	0.000	0.006	0.002	0.000	0.000	0.000
42003 (L-C)	2267003010	0.000	0.078	0.021	0.000	0.001	0.001
42003 (L-C)	2267003020	0.016	2.642	0.626	0.000	0.087	0.087
42003 (L-C)	2267003030	0.000	0.015	0.003	0.000	0.001	0.001
42003 (L-C)	2267003040	0.000	0.005	0.001	0.000	0.000	0.000
42003 (L-C)	2267003050	0.000	0.004	0.001	0.000	0.000	0.000
42003 (L-C)	2267003070	0.000	0.007	0.001	0.000	0.000	0.000
42003 (L-C)	2267004066	0.000	0.018	0.004	0.000	0.001	0.001
42003 (L-C)	2267005055	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2267005060	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2267006005	0.001	0.536	0.111	0.000	0.005	0.005
42003 (L-C)	2267006010	0.000	0.080	0.016	0.000	0.001	0.001
42003 (L-C)	2267006015	0.000	0.062	0.012	0.000	0.001	0.001
42003 (L-C)	2267006025	0.000	0.080	0.021	0.000	0.002	0.002
42003 (L-C)	2267006030	0.000	0.002	0.001	0.000	0.000	0.000
42003 (L-C)	2267006035	0.000	0.001	0.000	0.000	0.000	0.000
42003 (L-C)	2268002081	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2268003020	0.001	0.189	0.003	0.000	0.006	0.006
42003 (L-C)	2268003030	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2268003040	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2268003060	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2268003070	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2268005055	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2268005060	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2268006005	0.000	0.163	0.002	0.000	0.001	0.001
42003 (L-C)	2268006010	0.000	0.006	0.000	0.000	0.000	0.000

FIPS	SCC	SO2	NOX	VOC	NH3	PM10	PM2.5
42003 (L-C)	2268006015	0.000	0.005	0.000	0.000	0.000	0.000
42003 (L-C)	2268006020	0.001	0.066	0.001	0.000	0.004	0.004
42003 (L-C)	2268006035	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2268010010	0.000	0.014	0.000	0.000	0.001	0.001
42003 (L-C)	2270001060	0.000	0.015	0.003	0.000	0.002	0.002
42003 (L-C)	2270002003	0.002	0.294	0.025	0.000	0.024	0.024
42003 (L-C)	2270002006	0.000	0.001	0.000	0.000	0.000	0.000
42003 (L-C)	2270002009	0.000	0.013	0.002	0.000	0.001	0.001
42003 (L-C)	2270002015	0.006	0.803	0.067	0.001	0.070	0.068
42003 (L-C)	2270002018	0.006	0.817	0.056	0.001	0.051	0.050
42003 (L-C)	2270002021	0.000	0.053	0.005	0.000	0.005	0.004
42003 (L-C)	2270002024	0.000	0.041	0.003	0.000	0.003	0.003
42003 (L-C)	2270002027	0.001	0.128	0.014	0.000	0.010	0.010
42003 (L-C)	2270002030	0.003	0.458	0.038	0.001	0.040	0.039
42003 (L-C)	2270002033	0.002	0.539	0.044	0.000	0.032	0.031
42003 (L-C)	2270002036	0.022	2.529	0.213	0.005	0.206	0.200
42003 (L-C)	2270002039	0.000	0.033	0.003	0.000	0.003	0.003
42003 (L-C)	2270002042	0.000	0.022	0.002	0.000	0.002	0.002
42003 (L-C)	2270002045	0.005	0.786	0.057	0.001	0.040	0.039
42003 (L-C)	2270002048	0.006	0.629	0.054	0.001	0.049	0.047
42003 (L-C)	2270002051	0.018	2.619	0.208	0.004	0.138	0.134
42003 (L-C)	2270002054	0.001	0.154	0.011	0.000	0.009	0.008
42003 (L-C)	2270002057	0.007	1.107	0.099	0.002	0.113	0.109
42003 (L-C)	2270002060	0.025	3.778	0.283	0.005	0.256	0.248
42003 (L-C)	2270002066	0.016	2.900	0.556	0.003	0.444	0.430
42003 (L-C)	2270002069	0.022	3.048	0.231	0.005	0.213	0.207
42003 (L-C)	2270002072	0.011	2.135	0.493	0.002	0.366	0.355
42003 (L-C)	2270002075	0.002	0.432	0.029	0.001	0.024	0.023
42003 (L-C)	2270002078	0.000	0.007	0.002	0.000	0.001	0.001
42003 (L-C)	2270002081	0.002	0.425	0.030	0.000	0.028	0.027
42003 (L-C)	2270003010	0.001	0.131	0.033	0.000	0.021	0.020
42003 (L-C)	2270003020	0.008	0.865	0.068	0.002	0.077	0.075
42003 (L-C)	2270003030	0.004	0.486	0.040	0.001	0.033	0.032
42003 (L-C)	2270003040	0.004	0.592	0.049	0.001	0.039	0.038
42003 (L-C)	2270003050	0.000	0.034	0.006	0.000	0.004	0.004
42003 (L-C)	2270003060	0.015	2.330	0.166	0.003	0.148	0.143
42003 (L-C)	2270003070	0.005	0.519	0.047	0.001	0.044	0.042
42003 (L-C)	2270004031	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270004036	0.000	0.022	0.002	0.000	0.001	0.001
42003 (L-C)	2270004046	0.003	0.568	0.059	0.001	0.046	0.044
42003 (L-C)	2270004056	0.001	0.116	0.013	0.000	0.009	0.009
42003 (L-C)	2270004066	0.004	0.787	0.071	0.001	0.055	0.054
42003 (L-C)	2270004071	0.000	0.070	0.005	0.000	0.005	0.004
42003 (L-C)	2270004076	0.000	0.002	0.000	0.000	0.000	0.000
42003 (L-C)	2270005010	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270005015	0.000	0.035	0.003	0.000	0.003	0.003

FIPS	SCC	SO2	NOX	VOC	NH3	PM10	PM2.5
42003 (L-C)	2270005020	0.000	0.004	0.000	0.000	0.000	0.000
42003 (L-C)	2270005025	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270005030	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270005035	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270005040	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270005045	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270005055	0.000	0.001	0.000	0.000	0.000	0.000
42003 (L-C)	2270005060	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270006005	0.013	2.742	0.300	0.003	0.224	0.218
42003 (L-C)	2270006010	0.003	0.643	0.069	0.001	0.055	0.053
42003 (L-C)	2270006015	0.008	1.371	0.117	0.002	0.105	0.101
42003 (L-C)	2270006020	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270006025	0.004	0.842	0.204	0.001	0.138	0.134
42003 (L-C)	2270006030	0.000	0.092	0.010	0.000	0.006	0.006
42003 (L-C)	2270006035	0.000	0.061	0.005	0.000	0.005	0.005
42003 (L-C)	2270007010	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270007015	0.000	0.006	0.001	0.000	0.001	0.001
42003 (L-C)	2270009010	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270010010	0.001	0.237	0.016	0.000	0.011	0.010
42003 (L-C)	2282005010	0.002	0.299	3.570	0.001	0.052	0.048
42003 (L-C)	2282005015	0.001	0.127	0.795	0.000	0.013	0.012
42003 (L-C)	2282010005	0.001	0.346	0.370	0.001	0.003	0.003
42003 (L-C)	2282020005	0.004	0.392	0.019	0.000	0.010	0.009
42003 (L-C)	2282020010	0.000	0.001	0.000	0.000	0.000	0.000
42003 (L-C)	2285002015	0.000	0.068	0.011	0.000	0.008	0.008
42003 (L-C)	2285004015	0.000	0.001	0.002	0.000	0.000	0.000
42003 (L-C)	2285006015	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2265008005	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2267008005	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2268008005	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2270008005	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2275001000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2275020000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2275050011	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2275050012	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2275060011	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2275060012	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2275070000	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2280002100	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2280002200	5.504	284.355	6.697	0.050	6.058	6.058
42003 (L-C)	2285002006	0.123	51.214	2.315	0.032	1.243	1.243
42003 (L-C)	2285002007	0.003	2.740	0.107	0.001	0.053	0.053
42003 (L-C)	2285002008	0.000	0.000	0.000	0.000	0.000	0.000
42003 (L-C)	2285002010	0.002	1.225	0.046	0.000	0.024	0.024

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D-4: Mobile Sources

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Liberty-Clairton Onroad (Mobile) Source Summary

- Emissions given in tons/year

- Onroad methodology given in TS|Pechan report (Appendix F)

- Emissions estimated using the MOVES model

Pittsburgh Liberty-Clairton Area - Annual Emissions Summary (tons/year), 2007

	2007						
RoadType	**Annual Million VMT**	**Speed (mph)**	**PM2.5**	**VOC**	**NOX**	**SO2**	**NH3**
Off-Road	0	0.0	1.82	121.60	75.43	0.16	0.00
Rural Restricted	0	0.0	0.00	0.00	0.00	0.00	0.00
Rural UnRestricted	0	0.0	0.00	0.00	0.00	0.00	0.00
Urban Restricted	0	0.0	0.00	0.00	0.00	0.00	0.00
Urban UnRestricted	94.701	29.1	8.09	50.92	198.86	1.99	4.66
Area Total	***94.701***	***-***	***9.91***	***172.52***	***274.29***	***2.15***	***4.66***

Pittsburgh Liberty-Clairton Area - Annual Emissions Summary by Source Type (tons/year), 2007

	2007						
Source Type	**Annual Million VMT**	**Speed (mph)**	**PM2.5**	**VOC**	**NOX**	**SO2**	**NH3**
Motorcycle	0.500	29.1	0.03	3.09	0.47	0.01	0.01
Passenger Car	53.127	29.1	1.63	56.83	59.49	0.92	2.53
Passenger Truck	27.035	29.1	2.16	78.37	88.58	0.66	1.51
Light Commercial Truck	9.091	29.1	1.14	25.97	34.47	0.22	0.46
Intercity Bus	0.061	29.1	0.10	0.06	1.47	0.00	0.00
Transit Bus	0.210	29.1	0.19	0.21	3.55	0.01	0.00
School Bus	0.097	29.1	0.06	0.19	1.02	0.00	0.00
Refuse Truck	0.044	29.1	0.05	0.04	0.79	0.00	0.00
Single Unit Short-haul Truck	1.389	29.1	0.61	2.55	12.61	0.06	0.04
Single Unit Long-haul Truck	0.189	29.1	0.07	0.26	1.47	0.01	0.01
Motor Home	0.084	29.1	0.02	0.26	0.66	0.00	0.00
Combination Short-haul Truck	1.204	29.1	1.51	1.13	25.08	0.10	0.03
Combination Long-haul Truck	1.672	29.1	2.36	3.57	44.62	0.15	0.05
Area Total	***94.701***	***-***	***9.91***	***172.52***	***274.29***	***2.15***	***4.66***

Pittsburgh Liberty-Clairton Area - Annual Emissions Summary by Fuel Type (tons/year), 2007

	2007						
Fuel Type	**Annual Million VMT**	**Speed (mph)**	**PM2.5**	**VOC**	**NOX**	**SO2**	**NH3**
Gasoline	88.717	29.1	4.17	164.42	175.63	1.80	4.51
Diesel Fuel	5.985	29.1	5.74	8.10	98.66	0.35	0.15
Area Total	***94.701***	***-***	***9.91***	***172.52***	***274.29***	***2.15***	***4.66***

Note: for PM10 estimates, PM2.5 gasoline was scaled by 1.086, PM2.5 diesel by 1.031

Pittsburgh Liberty-Clairton Area - Annual Emissions Summary (tons/year), 2014

	2014						
RoadType	**Annual Million VMT**	**Speed (mph)**	**PM2.5**	**VOC**	**NOX**	**SO2**	**NH3**
Off-Road	0	0.0	1.16	72.74	51.72	0.07	0.00
Rural Restricted	0	0.0	0.00	0.00	0.00	0.00	0.00
Rural UnRestricted	0	0.0	0.00	0.00	0.00	0.00	0.00
Urban Restricted	0	0.0	0.00	0.00	0.00	0.00	0.00
Urban UnRestricted	107.171	29.1	5.02	22.32	99.31	0.84	3.36
Area Total	***107.171***	***-***	***6.18***	***95.06***	***151.03***	***0.90***	***3.36***

Pittsburgh Liberty-Clairton Area - Annual Emissions Summary by Source Type (tons/year), 2014

	2014						
Source Type	**Annual Million VMT**	**Speed (mph)**	**PM2.5**	**VOC**	**NOX**	**SO2**	**NH3**
Motorcycle	0.566	29.1	0.03	3.08	0.36	0.00	0.02
Passenger Car	60.114	29.1	1.38	27.77	25.30	0.42	1.65
Passenger Truck	30.596	29.1	1.60	44.21	51.53	0.29	1.15
Light Commercial Truck	10.282	29.1	0.76	14.89	22.09	0.09	0.37
Intercity Bus	0.088	29.1	0.08	0.06	1.24	0.00	0.00
Transit Bus	0.223	29.1	0.11	0.15	2.04	0.00	0.00
School Bus	0.107	29.1	0.04	0.11	0.72	0.00	0.00
Refuse Truck	0.048	29.1	0.02	0.02	0.35	0.00	0.00
Single Unit Short-haul Truck	1.576	29.1	0.30	1.54	7.09	0.02	0.05
Single Unit Long-haul Truck	0.213	29.1	0.04	0.18	0.89	0.00	0.01
Motor Home	0.096	29.1	0.02	0.18	0.51	0.00	0.00
Combination Short-haul Truck	1.391	29.1	0.68	0.58	11.57	0.03	0.04
Combination Long-haul Truck	1.871	29.1	1.13	2.29	27.34	0.04	0.05
Area Total	***107.171***	***-***	***6.18***	***95.06***	***151.03***	***0.90***	***3.36***

Pittsburgh Liberty-Clairton Area - Annual Emissions Summary by Fuel Type (tons/year), 2014

	2014						
Fuel Type	**Annual Million VMT**	**Speed (mph)**	**PM2.5**	**VOC**	**NOX**	**SO2**	**NH3**
Gasoline	100.203	29.1	3.34	89.91	93.23	0.81	3.18
Diesel Fuel	6.968	29.1	2.84	5.15	57.80	0.09	0.18
Area Total	***107.171***	***-***	***6.18***	***95.06***	***151.03***	***0.90***	***3.36***

Note: for PM10 estimates, PM2.5 gasoline was scaled by 1.086, PM2.5 diesel by 1.031

$PM_{2.5}$ SIP

Appendix E

Inventory Documentation

E-1: MANE-VU Emissions Inventory TSD 2007 Baseline Case

E-2: MANE-VU Emissions Inventory TSD 2017/2020 Projections

E-3: LADCO and SEMAP 2007 Summaries

E-4: National Emissions Inventory (NEI) 2008 Version 2 TSD

E-5: Transport Rule (CSAPR) Emissions Inventory TSD

E-6: Comparison of EGU Emissions

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E-1: MANE-VU Emissions Inventory TSD 2007 Baseline Case

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Technical Support Document for the Development of the 2007 Emission Inventory for Regional Air Quality Modeling in the Northeast / Mid-Atlantic Region

Version 3.3

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About MARAMA

The Mid-Atlantic Regional Air Management Association, Inc. is a voluntary, non-profit association of ten state and local air pollution control agencies. MARAMA's mission is to strengthen the skills and capabilities of member agencies and to help them work together to prevent and reduce air pollution in the Mid-Atlantic Region. MARAMA provides cost-effective approaches to regional collaboration by pooling resources to develop and analyze data, share ideas, and train staff to implement common requirements.

Table of Contents

1.0 INTRODUCTION 1

1.1 INVENTORY PURPOSE 1
1.2 POLLUTANTS 2
1.3 SOURCE CATEGORIES 2
1.4 DATA FORMATS 3
1.5 SUMMARY OF INVENTORY DEVELOPMENT PROCESS 4
1.6 REPORT ORGANIZATION 4

2.0 ANNUAL 2007 INVENTORY FOR POINT SOURCES 6

2.1 INITIAL DATA SOURCES AND QA REVIEW 6
2.1.1 Initial State NIF Submittals 6
2.1.2 EPA CAMD Hourly Emissions Data 7
2.2 PM AUGMENTATION 9
2.2.1 EGU PM Augmentation 12
2.2.1.1 EGU Condensable Emission Factors 12
2.2.1.2 EGU Heat Input 14
2.2.1.3 EGU PM Emission Calculations 14
2.2.2 NONEGU PM Augmentation 17
2.2.2.1 Initial QA and Remediation of PM Pollutants 17
2.2.2.2 Updating of PM Factor Ratios 17
2.2.2.3 NonEGU PM Emission Calculations 18
2.3 EMISSION RELEASE POINT QA CHECKS 20
2.3.1 QA Checks and Gap-Filling for Location Coordinates 20
2.3.2 QA Checks and Gap-Filling for Emission Release Parameters 21
2.4 IDENTIFICATION OF EGUs AND NONEGUs 26
2.5 VERSION 2 - STAKEHOLDER COMMENT AND RESPONSE 26
2.5.1 Connecticut Response to Stakeholder Comments 26
2.5.2 Maryland Response to Stakeholder Comments 27
2.5.3 Massachusetts Response to Stakeholder Comments 28
2.5.4 New Jersey Response to Stakeholder Comments 28
2.5.5 New York Response to Stakeholder Comments 30
2.5.6 Pennsylvania Response to Stakeholder Comments 30
2.5.7 Virginia Response to Stakeholder Comments 31
2.6 VERSION 2 - ADDITIONAL STATE-SPECIFIC UPDATES 32
2.6.1 Connecticut 32
2.6.2 Delaware 33
2.6.3 District of Columbia 33
2.6.4 Maine 33
2.6.5 Maryland 33

2.6.6 Massachusetts 33
2.6.7 Maine 34
2.6.8 New Hampshire 34
2.6.9 New Jersey 34
2.6.10 Pennsylvania – Allegheny County 34
2.6.11 Pennsylvania - Philadelphia 35
2.6.12 Rhode Island 35
2.6.13 Vermont 35
2.6.14 Virginia 35
2.7 VERSION 3 REVISIONS 36
2.7.1 Emission Offsets 36
2.8 ANNUAL 2007 POINT SOURCE EMISSION SUMMARY 36

3.0 HOURLY 2007 INVENTORY FOR LARGE POINT SOURCES 44

3.1 DATA SOURCES FOR HOURLY EMISSIONS 44
3.1.1 2007 Annual Emission Inventory 44
3.1.2 EPA CAMD Hourly Database 44
3.1.3 Virginia Hourly Data for Distributed Generation Units 45
3.1.4 Maryland Hourly Data for Six Month Reporters 45
3.2 METHODOLOGY FOR DEVELOPING HOURLY SMOKE FILES 46
3.2.1 Conversion of Annual NIF Inventory to SMOKE ORL Format for PTINV 46
3.2.2 PTHOUR Methodology for 12 Month Reporters 49
3.2.3 PTHOUR Methodology for 6 Month Reporters 50
3.2.4 PTHOUR Methodology for Maryland 6 Month Reporters 51
3.2.5 PTHOUR Methodology for Virginia Distributed Generation Units 52
3.2.6 QA of PTINV and PTHOUR Files 52
3.3 DEVELOPMENT OF HOURLY PROFILES FOR 6-MONTH REPORTING UNITS 53
3.3.1 Annual Profile Preparation 53
3.3.2 Non-Annual Profile Development 55
3.3.3 Issue for Consideration 56
3.4 VERSION 2 - STATE AND STAKEHOLDER REVIEW 56
3.4.1 Massachusetts 56
3.4.2 New York 56
3.4.3 Pennsylvania 57
3.4.4 Virginia 57
3.5 VERSION 3 REVISIONS 58
3.5.1 Massachusetts Stony Brook Energy Center NH3 Emissions 58

4.0 ANNUAL 2007 INVENTORY FOR AREA SOURCES 59

4.1 AREA SOURCE CATEGORIES 59
4.2 USEPA AREA SOURCE DATA 64

4.2.1 USEPA 2008 National Emission Inventory 65
4.2.2 EPA Residential Wood Combustion (RWC) Tool 65
4.2.3 EPA CMU Agricultural Ammonia Model 66
4.2.4 EPA SMARTFIRE Emissions Database 66
4.3 STATE-SPECIFIC DATA 67
4.4 VERSION 2: STATE AND STAKEHOLDER REVIEW AND COMMENT 72
4.4.1 National Park Service Comments 72
4.4.2 Checks for Missing Categories, Double Counting, Outliers, and Differences between 2002 and 2007 Inventories 72
4.5 VERSION 3 REVISIONS 73
4.5.1 Use of New USEPA Road Dust Equation 73
4.5.2 Use of MOVES Model to Estimate Stage II Emissions 74
4.5.3 Connecticut Changes for Fuel Combustion 75
4.5.4 Connecticut Revisions for AIM Coatings and Auto Refinishing 76
4.5.5 District of Columbia Residential Wood Combustion 77
4.5.6 Maryland Degreasing VOC Emisions 77
4.5.7 Massachusetts NH3 Emisions 77
4.5.8 New Jersey Bakeries and Auto Refinishing VOC Emisions 77
4.5.9 New York VOC Emisions from Residential Wood Combustion 77
4.5.10 Pennsylvania Industrial Coal Combustion 77
4.5.11 Pennsylvania Residential Distillate Oil Combustion 77
4.5.12 Virginia Industrial Coal Combustion 77
4.5.13 Multiple States Open Burning and Commercial Cooking 78
4.6 ANNUAL 2007 AREA SOURCE EMISSION SUMMARY 78

5.0 ANNUAL 2007 INVENTORY FOR NONROAD SOURCES INCLUDED IN THE NONROAD MODEL 87

5.1 NONROAD MODEL CATEGORIES 87
5.2 VERSION 2 INVENTORY DEVELOPMENT 87
5.2.1 State Review of NMIM Meteorology Data and Fuel Characteristics 87
5.2.2 Update of NMIM Allocation Files for Population and Housing 88
5.2.3 State-Specific Data Incorporated in NMIM 89
5.2.3.1 Connecticut 89
5.2.3.2 Delaware 89
5.2.3.3 Maryland 90
5.2.3.4 New Hampshire 90
5.2.4 New Jersey 90
5.2.4.1 New York 90
5.2.4.2 Pennsylvania 91
5.2.5 NMIM Run Specification 91
5.2.6 State and Stakeholder Review of Version 2 92

5.2.6.1 Connecticut 92
5.2.6.2 New Jersey 92
5.2.7 Removal of Airport Ground Support Equipment Emissions 92
5.3 CHANGES MADE FOR VERSION 3 92
5.4 SUMMARY OF NMIM MODELING RESULTS FOR 2007 92

6.0 ANNUAL 2007 INVENTORY FOR NONROAD SOURCES –MARINE VESSELS, AIRPORTS, AND RAIL 102

6.1 COMMERCIAL MARINE VESSELS 102
6.2 AIRPORTS (AIRCRAFT AND GROUND SUPPORT EQUIPMENT) 104
6.3 RAILROAD LOCOMOTIVES AND RAILYARDS 106
6.4 STAKEHOLDER REVIEW AND COMMENT 107
6.5 VERSION 3 REVISIONS 107
6.5.1 New Jersey MAR Revisions 107
6.5.2 Adjustment of Rail VOC Emissions 108
6.6 SUMMARY OF MAR INVENTORY FOR 2007 108

7.0 ANNUAL 2007 INVENTORY FOR ONROAD SOURCES 116

7.1 OVERALL PROCESS TO DEVELOP THE ONROAD INVENTORY 116
7.2 MOVES MODEL RUN SPECIFICATIONS AND DOCUMENTATION 116
7.3 SUMMARY OF ONROAD INVENTORY 116

8.0 PREPARATION OF SMOKE MODEL FILES 124

8.1 PREPARATION OF SMOKE EMISSION FILES 124
8.1.1 Point Source SMOKE Emission Files 124
8.1.2 Area Source SMOKE Emission Files 125
8.1.3 Nonroad NMIM SMOKE Emission Files 127
8.1.4 Nonroad MAR SMOKE Emission Files 127
8.1.5 Onroad SMOKE Emission Files 127
8.1.1 Biogenic SMOKE Emission Files 127
8.1.1 SMOKE Emission Files for Areas Outside of the MANE-VU+VA Region 127
8.2 REVIEW OF SMOKE AUXILIARY FILES 127
8.2.1 SMOKE Speciation Files 128
8.2.2 SMOKE Spatial Allocation Files 128
8.2.3 SMOKE Temporal Allocation Files 129

9.0 FINAL DELIVERABLES 131

10.0 REFERENCES 136

List of Appendices

Appendix A CAMD to NIF Crosswalk Aug12_2010.xls
Appendix B Technical Memorandum - EFs for CPM from EGUs.doc
Appendix C SCC_Control_Device_PM_Ratios.xls
Appendix D Stack_SCC_Defaults.xls
Appendix E VDEQ Conceptual Description for DG draft March 15, 2010.doc
Appendix F NESCAUM 2007 2020 MOVES modeling 20111209 PM.doc
Appendix G Stage_II_Controls.xlsx
Appendix H MANEVU_VA SMOKE QA Memo 17Dec2010.doc

List of Exhibits

Exhibit 2.1 – PM Compound Descriptions
Exhibit 2.2 – PM Compounds Reported in State Initial Submittals
Exhibit 2.3 - Emission Factors Used to Estimate EGU Condensable PM Emissions
Exhibit 2.4 – Cases and Steps Required to Augment EGU PM Emissions
Exhibit 2.5 – Cases and Steps Required to Augment nonEGU PM Emissions
Exhibit 2.6 - Stack Parameter Data Replacement Matrix
Exhibit 2.7 – 2002 and 2007 Point Source CO Emissions by State
Exhibit 2.8 – EGU and nonEGU 2007 Point Source CO Emissions by State
Exhibit 2.9 – 2002 and 2007 Point Source NH3 Emissions by State
Exhibit 2.10 – EGU and nonEGU 2007 Point Source NH3 Emissions by State
Exhibit 2.11 – 2002 and 2007 Point Source NOx Emissions by State
Exhibit 2.12 – EGU and nonEGU 2007 Point Source NOx Emissions by State
Exhibit 2.13 – 2002 and 2007 Point Source PM10-PRI Emissions by State
Exhibit 2.14 – EGU and nonEGU 2007 Point Source PM10-PRI Emissions by State
Exhibit 2.15 – 2002 and 2007 Point Source PM25-PRI Emissions by State
Exhibit 2.16 – EGU and nonEGU 2007 Point Source PM25-PRI Emissions by State
Exhibit 2.17 – 2002 and 2007 Point Source SO2 Emissions by State
Exhibit 2.18 – EGU and nonEGU 2007 Point Source SO2 Emissions by State
Exhibit 2.19 – 2002 and 2007 Point Source VOC Emissions by State

Exhibit 2.20 – EGU and nonEGU 2007 Point Source VOC Emissions by State

Exhibit 3.1 – SMOKE ORL Format for PTINV

Exhibit 3.2 – SMOKE EMS-95 Traditional Foramt for Individual Hour-Specific Files

Exhibit 3.3 – Example Application of Calculated Ratios for Actual 2007 by Month

Exhibit 3.4 - Example SMOKE Profile for Monthly Distribution of New York Annual Emissions Using Heat Input

Exhibit 3.5 - Example SMOKE profile for Adjusted Monthly Distribution of New York Seasonal Emissions Using Heat Input

Exhibit 4.1 – Area Source Category Definitions

Exhibit 4.2 – Values Contained in the DATA_SOURCE Field of the EM Table

Exhibit 4.3 – Data Sources Generally Used by Each State for Each Area Source Category

Exhibit 4.4 – Comparison of 2007 Paved Road Dust PM10 and PM2.5 Emission Estimates

Exhibit 4.5 – Comparison of 2007 Vehicle Refueling Emissions using NMIM and MOVES

Exhibit 4.6 – 2002 and 2007 Area Source CO Emissions by State

Exhibit 4.7 – 2007 Area Source CO Emissions by Category and State

Exhibit 4.8 – 2002 and 2007 Area Source NH3 Emissions by State

Exhibit 4.9 – 2007 Area Source NH3 Emissions by Category and State

Exhibit 4.10 – 2002 and 2007 Area Source NOx Emissions by State

Exhibit 4.11 – 2007 Area Source NOx Emissions by Category and State

Exhibit 4.12 – 2002 and 2007 Area Source PM10-PRI Emissions by State

Exhibit 4.13 – 2007 Area Source PM10-PRI Emissions by Category and State

Exhibit 4.14 – 2002 and 2007 Area Source PM25-PRI Emissions by State

Exhibit 4.15 – 2007 Area Source PM25-PRI Emissions by Category and State

Exhibit 4.16 – 2002 and 2007 Area Source SO2 Emissions by State

Exhibit 4.17 – 2007 Area Source SO2 Emissions by Category and State

Exhibit 4.18 – 2002 and 2007 Area Source VOC Emissions by State

Exhibit 4.19 – 2007 Area Source VOC Emissions by Category and State

Exhibit 5.1 – Gasoline Fuel Record Types Add to MySQL NCD Database

Exhibit 5.2 – Sources of Population and Housing Data

Exhibit 5.3 – 2002 and 2007 NMIM/NONROAD CO Emissions by State

Exhibit 5.4 – 2007 NMIM Source CO Emissions by Category and State

Exhibit 5.5 – 2002 and 2007 NMIM/NONROAD NH3 Emissions by State

Exhibit 5.6 – 2007 NMIM Source NH3Emissions by Category and State
Exhibit 5.7 – 2002 and 2007 NMIM/NONROAD NOx Emissions by State
Exhibit 5.8 – 2007 NMIM Source NOx Emissions by Category and State
Exhibit 5.9 – 2002 and 2007 NMIM/NONROAD PM10-PRI Emissions by State
Exhibit 5.10 – 2007 NMIM Source PM10-PRI Emissions by Category and State
Exhibit 5.11 – 2002 and 2007 NMIM/NONROAD PM25-PRI Emissions by State
Exhibit 5.12 – 2007 NMIM Source PM25-PRI Emissions by Category and State
Exhibit 5.13– 2002 and 2007 NMIM/NONROAD SO2 Emissions by State
Exhibit 5.14 – 2007 NMIM Source SO2 Emissions by Category and State
Exhibit 5.15 – 2002 and 2007 NMIM/NONROAD VOC Emissions by State
Exhibit 5.16 – 2007 NMIM Source VOC Emissions by Category and State

Exhibit 6.1 – Data Sources for Commercial Marine Vessel Inventory
Exhibit 6.2 – Data Sources for Airport Inventory
Exhibit 6.3 – Data Sources for Railroad Locomotive and Railyard Inventory
Exhibit 6.4 – 2002 and 2007 MAR CO Emissions by State
Exhibit 6.5 – 2002 and 2007 MAR NH3 Emissions by State
Exhibit 6.6 – 2002 and 2007 MAR NOx Emissions by State
Exhibit 6.7 – 2002 and 2007 MAR PM10-PRI Emissions by State
Exhibit 6.8 – 2002 and 2007 MAR PM25-PRI Emissions by State
Exhibit 6.9 – 2002 and 2007 MAR SO2 Emissions by State
Exhibit 6.10 – 2002 and 2007 MAR VOC Emissions by State

Exhibit 7.1 – MOVES Modeling Approach by State
Exhibit 7.2 – 2002 and 2007 Onroad CO Emissions by State
Exhibit 7.3 – 2002 and 2007 Onroad NH3 Emissions by State
Exhibit 7.4 – 2002 and 2007 Onroad NOx Emissions by State
Exhibit 7.5 – 2002 and 2007 Onroad PM10-PRI Emissions by State
Exhibit 7.6 – 2002 and 2007 Onroad PM25-PRI Emissions by State
Exhibit 7.7 – 2002 and 2007 Onroad SO2 Emissions by State
Exhibit 7.8 – 2002 and 2007 Onroad VOC Emissions by State

Exhibit 8.1 – Comparison of 2007 Area Source Emissions With and Without the Application of the Fugitive Dust Transport Factor

Exhibit 9.1 – NIF Data and Emission Summary Files for the 2007 MANE-VU+VA Emission Inventory

Exhibit 9.2 – SMOKE Files for the 2007 MANE-VU+VA Emission Inventory

Acronyms and Abbreviations

Acronym	Description
CAMD	Clean Air Markets Division (USEPA)
CAP	Criteria Air Pollutant
CEM	Continuous Emission Monitoring
CMV	Commercial Marine Vessel
CO	Carbon Monoxide
EGU	Electric Generating Unit
ERTAC	Eastern Regional Technical Advisory Committee
FIPS	Federal Information Processing Standard
GSE	Ground Support Equipment
MANE-VU	Mid-Atlantic/Northeast Visibility Union
MANE-VU+VA	MANE-VU States plus Virginia
MAR	Marine, Airport, Rail
MARAMA	Mid-Atlantic Regional Air Management Association
MOBILE6	USEPA model
MOVES	Motor Vehicle Emissions Simulator
NAICS	North American Industry Classification System code
NCD	National County Database
NEI	National Emission Inventory
NESCAUM	Northeast States for Coordinated Air Use Management
NH3	Ammonia
NIF3.0	National Emission Inventory Input Format Version 3.0
NMIM	National Mobile Input Model
NOF3.0	National Emission Inventory Output Format Version 3.0
NONROAD	USEPA model
NOx	Oxides of nitrogen
OAQPS	Office of Air Quality Planning and Standards (USEPA)
ORL	One-record-per-line (SMOKE Format)
OTAQ	Office of Transportation and Air Quality (USEPA)
PFC	Portable Fuel Container
PM-CON	Primary PM, Condensable portion only (all < 1 micron)
PM-FIL	Primary PM, Filterable portion only
PM-PRI	Primary PM, includes filterables and condensables PM-PRI= PM-FIL + PM-CON
PM10-FIL	Primary PM10, Filterable portion only
PM10-PRI	Primary PM10, includes filterables and condensables, PM10- PRI = PM0-FIL + PM-CON

Acronym	**Description**
PM25-FIL	Primary PM2.5, Filterable portion only
PM25-PRI	Primary PM2.5, includes filterables and condensables PM25-PRI= PM25-FIL + PM-CON
RWC	Residential Wood Combustion
SEMAP	Southeast Modeling, Analysis and Planning
SIC	Standard Industrial Classification code
SIP	State Implementation Plan
SCC	Source Classification Code
S/L	State/local
SMOKE	Sparse Matrix Operator Kernel Emissions
SO2	Sulfur Dioxide
USEPA	U.S Environmental Protection Agency
VISTAS	Visibility Improvement State and Tribal Association of the Southeast
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds

1.0 INTRODUCTION

This technical support document (TSD) explains the data sources, methods, and results for preparing the 2007 criteria air pollutant (CAP) and ammonia (NH3) emission inventory for the Northeast and Mid-Atlantic/Northeast region. The region includes the Mid-Atlantic / Northeast Visibility Union (MANE-VU) area plus Virginia. In this document, this region will be referred to as the MANE-VU+VA region. The MANE-VU+VA region includes Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia. Local air planning agencies include Philadelphia and Allegheny County, Pennsylvania.

1.1 INVENTORY PURPOSE

The MANE-VU+VA regional inventory will be used to concurrently address national ambient air quality standard (NAAQS) requirements for the new ozone and fine particle ambient standards and to evaluate progress towards long-term regional haze goals. Similar pollutant emissions and atmospheric processes control chemical formation and transport of ozone, fine particles, and regional haze. Therefore, similar technical analyses are necessary to evaluate air quality benefits of emissions controls. The emissions inventory will support a single integrated, one-atmosphere air quality modeling platform to support State air quality attainment demonstrations.

The U.S. Environmental Protection Agency (USEPA) has provided guidance on developing emission inventories to be used with models and other analyses for demonstrating attainment of air quality goals for ozone, fine particles, and regional haze (USEPA 2007a). According to the USEPA guidance, there are potentially two different base year emissions inventories. One is the base case inventory which represents the actual emissions for the meteorological period that is being modeled. This inventory is generally used for model performance evaluations. The second potential base year inventory is called the baseline inventory, which is generally used as the basis for projecting emissions to the future. The base case inventory may include day specific information (e.g. hourly continuous emission monitoring data for point sources) that USEPA considers inappropriate for using in future year projections. Therefore, the baseline inventory may need to replace the day specific emissions with average or “typical” emissions (for certain types of sources). For the 2007 MANE-VU+VA inventory, the base case and baseline inventories are one in the same.

1.2 POLLUTANTS

The inventory includes annual emissions for carbon monoxide (CO), ammonia (NH3), oxides of nitrogen (NOx), particulate matter (PM), sulfur dioxide (SO2), and volatile organic compounds (VOC). The PM species in the inventory are categorized as: filterable and condensable particles with an aerodynamic diameter less than or equal to a nominal 10 and 2.5 micrometers (i.e., PM10-PRI and PM25-PRI); filterable particles with an aerodynamic diameter less than or equal to a nominal 10 and 2.5 micrometers (i.e., PM10-FIL and PM25-FIL); and condensable particles (PM-CON). Note that PM10-PRI equals the sum of PM10-FIL and PM-CON, and PM25-PRI equals the sum of PM25-FIL and PM-CON.

1.3 SOURCE CATEGORIES

Emission inventory data from five general categories are needed to support air quality modeling: stationary point-sources, stationary area-sources, on-road mobile sources, nonroad mobile sources (including aircraft, railroad, and marine vessels), and biogenic/geogenic emissions. These sectors are described as follows:

- **Point Sources** are individual facilities and are further subdivided by stack, emission unit ("point"), and emission process ("segment"). The point source data include source-specific information on the location of sources (e.g., latitude/longitude coordinates); stack parameters (stack diameter and height, exit gas temperature and velocity); type of emission process (Source Classification Code {SCC}); and annual emissions. Point sources were classified as electric generating units (EGUs) and non-electric generating units (nonEGUs). Most point source emissions data is certified by the facility and reported to the State agency or USEPA.

- **Stationary Area Sources** include sources that in and of themselves are small, but in aggregate may comprise significant emissions. Examples include emissions from small industrial/commercial facilities, residential heating furnaces, VOCs volatizing from house painting or consumer products, gasoline service stations, and agricultural fertilizer/pesticide application. Emissions were calculated using emission factors and activity data on a county and source category basis.

- **On-road Mobile Source** emissions include sources of air pollution from internal combustion engines used to propel cars, trucks, buses, and other vehicles on public roadways. Emissions were calculated by the Northeast States for Coordinated Air

Use Management (NESCAUM) using the USEPA Motor Vehicle Emission Simulator (MOVES) model in concert with vehicle miles traveled (VMT) data.

- **Non-road Mobile Sources** include internal combustion engines used to propel marine vessels, airplanes, and locomotives, or to operate equipment such as forklifts, lawn and garden equipment, portable generators, etc. For activities other than marine vessels, airplanes, and locomotives, the inventory was developed using the most current version of USEPA's NONROAD model as embedded in the National Mobile Inventory Model (NMIM). Since the NONROAD model does not include emissions from marine vessels, airplanes, and locomotives, these emissions were estimated using the latest USEPA guidance or by groups such as the Eastern Regional Technical Advisory Committee (ERTAC).

- **Biogenic** emissions are emitted by natural sources, such as plants, trees, and soils. The sharp scent of pine needles, for instance, is caused by monoterpenes, which are VOCs. The USEPA developed estimates of biogenic emissions from vegetation for natural areas, crops, and urban vegetation. The USEPA estimates take into account the geographic variations in vegetation land cover and species composition, as well as seasonal variations in leaf cover.

For all sectors, emissions data were compiled on an annual basis to represent 2007 actual emissions and meteorology. For certain large EGUs and nonEGUs, actual hourly 2007 emissions data were adapted for use in the inventory. For sources with emissions estimated by NONROAD model, emissions were compiled as monthly total emissions. For sources included in the MOVES model, emissions will be compiled on an hourly basis.

1.4 DATA FORMATS

The annual mass emissions inventory files were prepared in the National Emissions Inventory (NEI) Output Format Version 3.0 (NOF 3.0). These annual emission inventories will be converted (through the emissions modeling process) from their original resolution (e.g., annual, county level) to input files for air quality models. These input files generally require emissions to be specified by model grid cell, hour, and model chemical species. The emission modelers in the MANE-VU+VA region are using the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system and data formats. Ancillary files (holding spatial, temporal, and speciation profile data) were prepared in SMOKE compatible format. Various spreadsheets summarizing emissions by county, sector, SCC, and pollutant were also prepared.

1.5 SUMMARY OF INVENTORY DEVELOPMENT PROCESS

Work on Version 1 of the 2007 MANE-VU+VA inventory began in April 2009. Preparation of the consolidated inventory for point, area, onroad, and nonroad sources started with the inventories submitted by State and local (S/L) as well as input files needed by the NONROAD and MOVES models. For certain area and nonroad source categories, the S/L submittals were supplemented 2008 NEI data. In addition, the Carnegie Mellon Ammonia model was exercised to calculate agricultural ammonia emissions. Work products developed by ERTAC were used including the USEPA wood smoke tool and the Area Source emission factor harmonization project.

The USEPA's format and content quality assurance (QA) programs (and other QA checks not included in USEPA's QA software) were run to identify format and/or data content issues (EPA, 2004). The Contractor worked with the S/L agencies and the staff of the Mid-Atlantic Regional Air Management Association (MARAMA) to resolve QA issues and augment the inventories to fill data gaps in accordance with the Quality Assurance Project Plan prepared for this project.

Work on Version 2 began with a stakeholder review process. Version 1 inventory and summary files were provided for stakeholder review between October 2009 and August 2010. Stakeholder comments were reviewed by the S/L agencies and revisions to the inventory files were made to incorporate stakeholder comments as approved by each S/L agency. Other corrections, revisions, or updates were supplied by the S/L agencies, which resulted in the publication of Version 2 of the 2007 inventory in February 2011 (MARAMA 2011).

Further revisions to the 2007 inventory were made in late 2011. The most significant changes were to use an improved emission estimation methodology for re-entrained road dust from paved roads, incorporate vehicle refueling emissions as calculated by MOVES, amd correct errors used in the NMIM modeling of nonroad emissions. Other revisions were made to correct minor errors or revisions to selected categories as identified by the S/L agencies. These revisons resulted in the publication of Version 3 of the 2007 inventory in December 2011.

1.6 REPORT ORGANIZATION

This report documents the development of Version 1 of the 2007 inventory, as well as the revisions made during the Version 2 and Version 3 update cycles. Sections 2 and 3 of this TSD present the general and State-specific methods and data sources used to develop the MANE-VU+VA 2007 annual inventory for point sources and hourly emissions for large

point sources, respectively. Sections 4 through 7 present the methods and data used to develop the inventory for area sources, nonroad marine vessel/airport/locomotive sources, nonroad sources included in the NONROAD model, and onroad sources included in the MOVES model. Section 8 documents the inventory, temporal allocation, speciation, and spatial allocation modeling input files used for the MANE-VU+VA 2007 inventory for all sectors. Section 9 identifies the file names for all final deliverable products. References for the TSD are provided in Section 10.

2.0 ANNUAL 2007 INVENTORY FOR POINT SOURCES

2.1 INITIAL DATA SOURCES AND QA REVIEW

The 2007 annual point source inventory was developed using the 2007 inventories that S/L agencies submitted to MARAMA and data from the USEPA's Clean Air Markets Division (CAMD) hourly emissions database.

2.1.1 Initial State NIF Submittals

State and local (S/L) agencies prepared and submitted emission inventory files in the National Emissions Inventory (NEI) Input Format Version 3.0 (NIF 3.0). The NIF format includes eight tables: Transmittal (TR), Site (SI), Emission Unit (EU), Emission Release Point (ER), Emission Process (EP), Emission Period (PE), Emission (EM), and Control Equipment (CE). States were requested to submitted 2007 data for those major sources that they would normally submit to USEPA during the 3-year requirements of the Consolidated Emission Reporting Rule. All 13 MANE-VU+VA agencies submitted point source inventories to MARAMA. In addition, Allegheny and Philadelphia Counties in Pennsylvania each submitted their own point source inventories.

Upon receipt of the NIF submittals, the Contractor performed an initial review of the S/L inventories with the following QA checks:

- EPA's Basic Format and Content Checker tool was used to verify format and check for referential integrity and duplicate record issues. Only very minor issues were identified and were resolved by the Contractor without the need for S/L assistance.

- Facility-level comparisons were made between the MANE-VU/VISTAS Best and Final 2002 inventories and the S/L 2007 submittals to identify facilities included in the 2002 inventory but not in the 2007 inventory. For four S/L agencies (NY, PA, Allegheny and Philadelphia Counties), the number of facilities included in the 2007 were far less than the number of facilities reported in 2002. These S/L agencies provided revised files with a lower facility emission cutoff level to ensure that all major sources were included in the 2007 inventory. S/L agencies were asked to review this list and confirmed that facilities not in the 2007 inventory were either closed or included in the area source inventory.

- Facility-level comparisons were made between the MANE-VU/VISTAS 2002 inventories and the S/L 2007 submittals to identify facilities included in the 2007 inventory but not in the 2002 inventory. S/L agencies verified the reasonableness of this list of sources.

- Facility-level comparisons were made between the MANE-VU/VISTAS 2002 inventories and the S/L 2007 submittals to identify facilities that were included in both the 2002 inventory and 2007 inventory. Facility-level emission changes were calculated, large differences between 2002 and 2007 emissions were flagged, and S/L agencies reviewed and confirmed the reasonableness of the emission changes between 2002 and 2007.

- Facility-level ammonia emissions were obtained from the USEPA 2007 Toxic Release Inventory (USEPA 2009a) and were compared to the ammonia emissions in the S/L agency submittal. S/L agencies reviewed the TRI data to ensure that large (> 100 tons per year) ammonia sources were included in the 2007 MANE-VU+VA inventory.

Following this initial QA review, these individual inventory files were consolidated into a single NIF database. S/L responses and updates to the inventory files resulting from the initial QA review are discussed later in this document.

2.1.2 EPA CAMD Hourly Emissions Data

The second source of data was the hourly emissions data reported to USEPA by facilities to comply with various provisions of the Clean Air Act. MARAMA downloaded the 2007 CAMD annual inventory containing NOx and SO2 emissions, heat input data and other information from the CAMD web site in May 2009.

MARAMA prepared an initial crosswalk file to match facilities and units in the CAMD inventory to facilities and units in the 2002 MANE-VU Version 3 inventory. In the CAMD inventory, the Office of Regulatory Information Systems (ORIS) identification (ID) code identifies unique facilities and the unit ID identifies unique boilers and internal combustion engines (i.e., turbines and reciprocating engines). MARAMA sent an Excel Workbook to each S/L agencies that contained an initial crosswalk with the ORIS ID and unit ID in the CAMD inventory matched to the state and county FIPS, state facility ID, and EU ID in the 2002 MANE-VU Version 3 inventory. The crosswalk contained the annual 2007 NOx, SO2, and heat input (except for those units that are required to report for only 6 months, wherein the data were for the 6 month period). The crosswalk also included other information from the 2002 MANVEU inventory, including stack and location coordinates.

Agencies reviewed and confirmed/corrected/supplemented the information in the crosswalk, provided annual 2007 emissions for the 6-month CAMD reporting units, and provided 2007 annual emissions for other CAPs and NH3.

The crosswalk was provided to the Contractor who updated the crosswalk as follows:

- In most of the S/L inventories, the state and county FIPS and state facility ID together identify unique facilities and the EU ID identifies unique boilers or internal combustion engines. However, in some of the S/L inventories, the emissions for multiple EUs were summed and reported under the same EU ID. To provide a better linkage between the CAMD data and the S/L inventories, the Contractor worked with States to establish the crosswalk at the EU ID / EP ID / ER ID. This effort resulted in a much better linkage between the CAMD and S/L inventories.

- In several cases, the EU ID / EP ID / ER ID identifiers in the 2002 MANVU inventory were changed in the 2007 S/L agency submittals. The Contractor worked with the S/L agencies to correct these broken linkages by updating the EU ID / EP ID /ER ID identifies as necessary.

- The Contractor downloaded the 2007 CAMD hourly inventory containing hourly NOx and SO2 emissions and heat input data from the CAMD website (USEPA 2009b). The Contractor summed the hourly emissions to the annual level (or 6-month level for 6-month reporting units) by emission unit. The summed hourly data was compared to the annual summary data, which matched in virtually all cases. This check was made because MARAMA is considering using the actual 2007 hourly data rather than average temporal profiles in the next round of regional air quality modeling.

- As another QA check, the Contractor compiled a list of sources with EGU SCCs of 1-01-xxx-xx and 2-01-xxx-xx in the State NIF tables that could not be linked to the CAMD table. States reviewed this list and verified that there are no large EGUs missing from the CAMD to NIF crosswalk.

The Contractor prepared a CAMD-to-NIF crosswalk spreadsheet for each State. Aagencies were asked to review this list and verify that (1) the linkages are correct, (2) there are no large sources missing from the CAMD-to-NIF crosswalk, and (3) there are not discrepancies between the emissions reported to CAMD and the emissions reported in the SEMAP database.

There are three types of possible linkages:

- CAMD facility has no match in NIF SI facility table. The emissions from these facilities reported to CAMD are small, and initially accounted for about 0.5% of the NOx and 0.07% of the SO2 emissions in the CAMD database.

- CAMD unit could not be matched in NIF. The emissions from these facilities reported to CAMD were small, accounting for about 0.9% of the NOx and 0.007% of the SO2 emissions in the CAMD database. Most of the units that could not be matched at the unit level are either peaking units or industrial sources such as paper mills or chemical plants. In addition, there were several instances where multiple CAMD units match to a single NIF record (i.e., units are grouped in the NIF tables but reported individually in the CAMD database).

- CAMD unit matches with a single NIF record or CAMD unit matches with multiple NIF records (in many cases, the NIF tables include multiple records for different fuel types). The emissions from these units reported to CAMD account for about 98.6% of the NOx and 99.9% of the SO2 emissions in the CAMD database. In most cases the sum of the emissions from the matching NIF records are generally very close to the CAMD unit level emissions; and S/L agencies verified that linkages were correct.

As another QA check, the Contractor compiled a list of sources with EGU SCCs of 1-01-xxx-xx and 2-01-xxx-xx in the S/L agency NIF tables that could not be linked to the CAMD CEM table to help resolve some of the linkage issues noted above. S/L agencies made significant efforts to improve the crosswalk between the CAMD identifiers and the S/L agency identifiers. Appendix A contains the current version of the crosswalk.

2.2 PM AUGMENTATION

PM compounds may be reported in several forms, as identified in Exhibit 2.1. Exhibit 2.2 provides a count of the number of annual NIF EM table records in each agency's NIF Submittal by type of PM compound. The PM augmentations process was necessary to gap-fill missing PM pollutant complements. For example, if a S/L agency provided only PM10-PRI emissions, the PM augmentation process filled in the PM25-PRI emissions.

A second aspect of the PM augmentation process was to utilize improved condensable emission factors for EGUs. Condensable emissions were not calculated uniformly across all states in the MANE-VU region in the 2002 emissions inventory. Because of the need to model the effect of condensable emissions on regional haze and fine particles, MARAMA instructed the Contractor to use recently updated emission factors for condensable emissions from EGUs.

Exhibit 2.1 – PM Compound Descriptions

Pollutant Code	Pollutant	Pollutant Description
PM-CON	Primary PM Condensable portion only (all < 1 micron)	Material that is vapor phase at stack conditions, but which condenses and/or reacts upon cooling and dilution in the ambient air to form solid or liquid PM immediately after discharge from the stack.
PM-FIL	Primary PM, Filterable portion only	Particles that are directly emitted by a source as a solid or liquid at stack or release conditions and captured on the filter of a stack test train.
PM-PRI	Primary PM, includes filterables and condensables PM-PRI= PM-FIL + PM-CON	Particles that enter the atmosphere as a direct emission from a stack or an open source. It is comprised of two components: Filterable PM and Condensable PM.
PM10-FIL	Primary PM10, Filterable portion only	Particles with an aerodynamic diameter equal to or less than 10 micrometers that are directly emitted by a source as a solid or liquid at stack or release conditions and captured on the filter of a stack test train.
PM10-PRI	Primary PM10, includes filterables and condensables, PM10- PRI = PM0-FIL + PM-CON	Particles with an aerodynamic diameter equal to or less than 10 micrometers that enter the atmosphere as a direct emission from a stack or an open source. It is comprised of two components: Filterable PM and Condensable PM. (As specified in § 51.15 (a)(2), These two PM components are the components measured by a stack sampling train such as USEPA Method 5.)
PM25-FIL	Primary PM2.5, Filterable portion only	Particles with an aerodynamic diameter equal to or less than 2.5 micrometers that are directly emitted by a source as a solid or liquid at stack or release conditions and captured on the filter of a stack test train.
PM25-PRI	Primary PM2.5, includes filterables and condensables PM25-PRI= PM25-FIL + PM-CON	Particles with an aerodynamic diameter equal to or less than 2.5 micrometers that enter the atmosphere as a direct emission from a stack or an open source. It is comprised of two components: Filterable PM and Condensable PM. (As specified in § 51.15 (a)(2), These two PM components are the components measured by a stack sampling train such as USEPA Method 5.)

Exhibit 2.2 – PM Compounds Reported in State Initial Submittals

	Number of Annual EM Records in Agency's Initial NIF Submittal						
Agency	**PM-CON**	**PM-FIL**	**PM-PRI**	**PM10-FIL**	**PM10-PRI**	**PM25-FIL**	**PM25-PRI**
CT[1]	---	---	---	122	1,300	---	5
DE	449	---	---	886	756	734	699
DC	70	---	---	70	70	70	70
ME	---	9	---	1,150	---	1,053	---
MD	1,265	---	---	3,543	3,750	3,040	2,477
MA	---	---	6	6,614	---	5,930	---
NH	---	463	---	464	---	461	---
NJ	---	---	5,966	---	5,848	---	---
NY	---	---	1,220	---	1,201	---	---
PA	---	---	---	---	5,738	---	3,949
Allegheny[2]	434	881	---	881	---	836	---
Philadelphia	---	---	---	1,178	27	351	21
RI	12	12	105	12	46	12	48
VT	---	64	---	---	---	---	---
VA[3]	---	---	---	5,204	---	3,302	---

After reviewing the initial draft inventory that was posted in October, 2009, three agencies provided the following changes to their initial submittals. These changes are reflected in the record counts in the above table. The PM augmentation routine was re-executed to account for these changes.

1) Connecticut indicated that the PM records in their original submittal for oil and coal-fired boilers should have been submitted as PM10-FIL and not PM10-PRI. All natural gas-fired units and oil-fired turbines were correctly reported as PM10-PRI.
2) Allegheny County provided information on 31 additional facilities that were not included in their original submittal.
3) Virginia indicated that all of the PM records in their original submittal used incorrect pollutant codes. Records in the original submittal designated as PM10-PRI should have been submitted as PM10-FIL, and PM25-PRI should have been PM25-FIL.

The PM augmentation process was divided into two components – the first applying to EGUs and the second to all other point sources. EGUs were identified as those units that supplied hourly data to USEPA's CAMD database. Because of the differences in the augmentation process for EGUs and nonEGUs, each process is discussed separately in the following sections. The EGU process uses the updated condensable emission factors, while the nonEGU process is essentially the same process used in developing the 2002 MANE-VU Version 3 inventory.

2.2.1 EGU PM Augmentation

The EGU PM augmentation process utilized the recently updated condensable emission factors for EGUs developed for MARAMA in 2008. Appendix B contains the technical memorandum describing how the emission factors were developed. The general process is to use the emission factors and heat input to calculate the PM-CON emissions, and then to perform the gap filling for compounds missing from the S/L submittal.

2.2.1.1 EGU Condensable Emission Factors

As described in Appendix B, two sets of emission factors were developed by 6-digit SCC corresponding to equipment type (boiler or IC engine) and fuel type. The first set is based on all available source tests, while the second set includes only source tests where nitrogen purging occurred. As described in more detail in Appendix B, in measuring condensable PM from combustion of fuels containing sulfur, it has been shown by USEPA that SO2 collected in the impingers can be oxidized to sulfate and produce a variable sulfate artifact that results in overestimation of condensable emissions. In this example, if impingers are not purged with nitrogen, errors associated with the sulfate artifact may be inflated resulting in an overestimation of condensable PM emissions.

Exhibit 2.3 shows the emission factors considered for use in estimating EGU condensable PM emissions. It shows the new emission factors developed using all available test data as well as the emission factors based only on those tests that utilized a nitrogen purge. In addition, emission factors are available from USEPA's AP-42 emission factor document. The emission factors actually used in the augmentation process are **highlighted in bold** in Exhibit 2.3. Emission factors based on purged test were used where available; otherwise the emission factors based on all tests were used. Since Appendix B did not provide a condensable PM emission factors for residual oil, we used the AP-42 condensable PM emission factor for residual oil.

Exhibit 2.3 - Emission Factors Used to Estimate EGU Condensable PM Emissions

		Emission Factor (lbs/mmBtu)		
SCC (6-digit)	**SCC (6-digit) Description**	**MARAMA[1] All Tests**	**MARAMA[1] Purged Tests Only**	**AP-42[2]**
1-01-001 *1-02-001*	Boiler / EGU / Anthracite Coal *Boiler / Industrial / Anthracite Coal*	**0.0084**	---	---
1-01-002 *1-02-002* *1-03-002*	Boiler / EGU / Bituminous/Sub-butuminous Coal *Boiler / Industrial / Bituminous/Subbit. Coal* *Boiler / Commercial / Bituminous/Subbit. Coal*	0.022	**0.013**	0.04 to 0.37[3] depending on sulfur content
1-01-003 *1-02-003*	Boiler / EGU / Lignite *Boiler / Industrial / Lignite*	**0.039**	---	0.014
1-01-004 *1-02-004*	Boiler / EGU / #6 Fuel Oil *Boiler / Industrial / #6 Fuel Oil*	---	---	**0.01**
1-01-005 *1-02-005* *1-03-005*	Boiler / Industrial / #2 Fuel Oil *Boiler / Commercial / #2 Fuel Oil* *Boiler / EGU / #2 Fuel Oil*	**0.014**	---	0.00928
1-01-006 *1-02-006* *1-03-006*	Boiler / EGU / Natural Gas *Boiler / Industrial / Natural Gas* *Boiler / Commercial / Natural Gas*	**0.00249**	---	0.00559
1-01-008	Boiler / EGU / Petroleum Coke	**0.05**	---	---
2-01-001 *2-01-009* *2-02-009*	IC Engine / EGU/ Fuel Oil *IC Engine / EGU/ Kerosene* *IC Engine / Industrial / Kerosene*	0.013	**0.01**	0.0072
2-01-002 *2-02-002* *2-03-002*	IC Engine / EGU / Natural Gas *IC Engine / Industrial/ Natural Gas* *IC Engine / Commercial / Natural Gas*	0.005	**0.0015**	0.0047

1) Source: *Emissions Factors for Condensable Particulate Matter Emissions from Electric Generating Units* ; memo dated August 20, 2008, from Arthur Werner (MACTEC) to Julie McDill (MARAMA). In accordance with USEPA guidance, CPM emissions determined from Method 202 tests that apply nitrogen purging are more reliable than results from tests where purging was not used.
2) Source: *AP 42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources*.
3) Based on typical bituminous sulfur content range of 0.7 to 4.0 % by weight.
4) Based on typical lignite sulfur content of 0.4 % by weight.
5) **Bolded** numbers are the emission factors actually used to calculated condensable emissions.

SCCs associated with CAMD units for which condensable emission factors were not available in the MARAMA report:

1-01-009 Boiler / EGU / Wood or Bark Waste
1-01-010 Boiler / EGU / LPG
1-01-012 Boiler / EGU / Solid Waste
1-01-013 Boiler / EGU / Liquid Waste
1-02-009 Boiler / Industrial / Wood or Bark Waste
1-02-010 Boiler / Industrial / LPG
1-02-014 Boiler / CO Boiler / Natural or Process Gas
3-05-007 Cement Manufacturing / Kilns
3-06-002 Petroleum Refining / Catalytic Cracking Units
3-06-012 Petroleum Refining / Fluid Coking Units
3-90-001 In-process Fuel / Anthracite Coal
3-90-012 In-process Fuel / Solid Waste
3-99-999 Misc. Industrial Processes

While Appendix B only provides emission factors for electric generation SCCs (e.g., 1-01-xxx-xx or 2-01-xxx-xx), a review of the S/L agency NIF submittals showed that several other SCCs were used by EGUs. These additional SCCs are *highlighted in italics* in Exhibit 3. Since these SCCs were associated with EGUs, it was assumed that emission factors would apply to these SCCs also.

Note also that there were several other SCCs associated with EGUs for which condensable PM emission factors were not available. These SCCs are listed at the bottom of Exhibit 2.3. No special effort was made to evaluate condensable emissions for these SCCs; rather, the State-supplied PM condensable emissions were used where available.

2.2.1.2 EGU Heat Input

In addition to the emission factors, the annual heat input in mmBtu/year by unit and fuel type is also needed to calculate condensable PM emissions. Heat input was available from two sources. The CAMD hourly database provides heat input, but there are two limitations for each use in this analysis. First, the heat input is reported at the unit level and does not provide a breakout of heat input for units using multiple fuels. Second, only a 6-month heat input value is provided for those units only required to report for six months.

As an alternative to the CAMD heat input, the S/L NIF tables usually provide a fuel process annual throughput which can be used to calculate the heat input using the heating value of the fuel. By calculating the heat input using the NIF annual throughput, the annual heat input is available by fuel type for both 6-month and 12-month reporting units. Where NIF annual throughput was available, it was used to calculate the annual heat input which was then used to calculate condensable PM emissions. In cases where the S/L NIF tables do not provide an annual throughput, the CAMD heat input was assigned to the primary fuel type and used in the condensable PM emission calculations.

2.2.1.3 EGU PM Emission Calculations

In addition to calculating the condensable PM emissions, the EGU PM augmentation also gap-fills missing PM compounds. The gap-filling requires that the data be analyzed and separated into cases. The cases determine which math steps and ratios of PM terms will be applied. Exhibit 2.4 shows the various cases and the augmentation method that was applied.

Exhibit 2.4 – Cases and Required Steps to Augment EGU PM Emissions

Case	PM Reported	Augmentation Methodology
1	---	None required; all PM compounds = 0
2	PM25-PRI	PM-CON = HEAT_USED * EMIS_FACT PM25-PRI = PM-CON (only if PM-CON > PM25-PRI) PM25-FIL = PM25-PRI - PM-CON PM10-FIL = PM25-FIL * F10_F25 ratio PM10-PRI = PM-CON + PM10-FIL
3	PM10-PRI	PM-CON = HEAT_USED * EMIS_FACT PM10-PRI = PM-CON (only if PM-CON > PM10-PRI) PM10-FIL = PM10-PRI - PM-CON PM25-FIL = PM10-FIL / F10_F25 ratio PM25-PRI = PM-CON + PM25-FIL
4	PM25-PRI PM10-PRI	PM-CON = HEAT_USED * EMIS_FACT PM10-PRI = PM-CON (only if PM-CON > PM10-PRI) PM25-PRI = PM-CON (only if PM-CON > PM25-PRI) PM10-FIL = PM10-PRI - PM-CON PM25-FIL = PM25-PRI - PM-CON
5	PM10-FIL	PM-CON = HEAT_USED * EMIS_FACT PM10-PRI = PM-CON + PM10-FIL PM25-FIL = PM10-FIL / F10_F25 ratio PM25-PRI = PM-CON + PM25-FIL
6	PM10-FIL PM25-FIL	PM-CON = HEAT_USED * EMIS_FACT PM10-PRI = PM-CON + PM10-FIL PM25-PRI = PM-CON + PM25-FIL
7	PM10-FIL PM10-PRI PM25-FIL PM25-PRI	PM-CON = HEAT_USED * EMIS_FACT
8	PM-PRI	PM-CON = HEAT_USED * EMIS_FACT PM-PRI = PM-CON (only if PM-CON > PM-PRI) PM-FIL = PM-PRI - PM-CON PM10-FIL = PM-FIL * F10_FIL ratio PM10-PRI = PM-CON + PM10-FIL PM25-FIL = PM10-FIL / F10_F25 ratio PM25-PRI = PM-CON + PM25-FIL
9	PM-PRI PM10-PRI	PM-CON = HEAT_USED * EMIS_FACT PM10-PRI = PM-CON (only if PM-CON > PM10-PRI) PM10-FIL = PM10-PRI - PM-CON PM25-FIL = PM10-FIL / F10_F25 ratio PM25-PRI = PM-CON + PM25-FIL
10	PM-PRI PM10-FIL	PM-CON = HEAT_USED * EMIS_FACT PM10-PRI = PM-CON + PM10-FIL PM25-FIL = PM10-FIL / F10_F25 ratio PM25-PRI = PM-CON + PM25-FIL

Case	PM Reported	Augmentation Methodology
11	PM-FIL	PM-CON = HEAT_USED * EMIS_FACT PM10-FIL = PM-FIL * F10_FIL ratio PM10-PRI = PM-CON + PM10-FIL PM25-FIL = PM10-FIL / F10_F25 ratio PM25-PRI = PM-CON + PM25-FIL
12	PM-FIL PM10-FIL PM25-FIL	PM-CON = HEAT_USED * EMIS_FACT PM10-PRI = PM-CON + PM10-FIL PM25-PRI = PM-CON + PM25-FIL
13	PM-CON PM10-FIL PM25-FIL	PM10-PRI = PM10-FIL + PM-CON PM25-PRI = PM25-FIL + PM-CON
14	PM-CON PM10-FIL PM10-PRI	PM25-FIL = PM10-FIL / F10_F25 ratio PM25-PRI = PMCON + PM25-FIL
15	PM-CON PM10-FIL PM10-PRI PM25-FIL PM25-PRI	None required; all PM compounds present
16	PM-CON PM-PRI	None required; only one occurrence and emissions were trivial
17	PM-CON PM-PRI PM10-FIL PM10-PRI PM25-FIL PM25-PRI	None required; all PM compounds present
18	PM-CON PM-FIL PM-PRI PM10-FIL PM10-PRI PM25-FIL PM25-PRI	None required; all PM compounds present

2.2.2 NONEGU PM Augmentation

The nonEGU PM augmentation process utilized the methodology developed for MARAMA for the 2002 MANE-VU Version 3 inventory. The steps in the PM augmentation process were as follows:

- Step 1: Initial QA and remediation of S/L provided PM pollutants;
- Step 2: Updating of PM factor ratios previously developed for MARAMA based on factors from the Factor Information and Retrieval (FIRE) Data System and the USEPA PM Calculator (Appendix C provides the PM ratio table by SCC and control device);
- Step 3: Implementation of the ratios developed in step 2.; and
- Step 4: Presentation of PM augmentation results to S/L agencies for review and comment.

2.2.2.1 Initial QA and Remediation of PM Pollutants

Before we ran the nonEGU PM augmentation process, we reviewed the data for inconsistencies. Inconsistent values were be replaced. The consistency checks and replacement actions were as follows:

1. If PM10-PRI >0 and PM25-PRI > PM10-PRI (and PM10-FIL, PM25-FIL and PM-CON are null or 0), then set PM25-PRI = PM10-PRI.
2. If PM10-FIL > 0 and PM25-FIL > PM10-FIL (and PM10-PRI, PM25-PRI and PM-CON are null or 0), then set PM25-FIL = PM10-FIL.
3. If PM10-PRI >0 and PM10-FIL > PM10-PRI (and PM25-PRI, PM25-FIL and PM-CON are null or 0), then set PM10-FIL = PM10-PRI.
4. If PM25-PRI > 0 and PM25-FIL > PM25-PRI (and PM10-PRI, PM10-FIL and PM-CON are null or 0), then set PM25-FIL = PM25-PRI.

The consistency checks revealed very few occurrences of inconsistencies, and when inconsistencies did occur, the emission values were very small. As a result, S/L agencies were not asked to review this information and provide corrections because the inconsistencies did not involve significant emission sources. The replacement actions above were appropriate for an inventory used for regional air quality modeling.

2.2.2.2 Updating of PM Factor Ratios

The augmentation steps require the use of ratios developed from available emissions and particle size distribution data. These ratios are needed when only one PM term is available,

and two or more terms need to be augmented. Examples of how we used the PM ratios are shown below:

PM-FIL × RatioCON/FIL = PM-CON

PM-PRI × RatioCON/PRI = PM-CON

PM-CON × RatioFIL/CON = PM-FIL

PM-CON × RatioPRI/CON = PM-PRI

For the MANE-VU 2002 inventory, a table of PM compound ratios was developed. The development of this table is documented in the *TSD for the 2002 MANE-VU SIP Modeling Inventories, Version 3*. The primary deliverable of this step of the process was the development of a table keyed by SCC, primary control device, and secondary control device. This table is called the SCC Control Device Ratios table (Reference Tables MANE-VU_PMAugmentation.mdb). We updated this table to include SCC, primary control device, and secondary control device codes found in the 2007 inventory that were not contained in the 2002 MANE-VU inventory. Appendix C provides the PM ratio table by SCC and control device.

2.2.2.3 NonEGU PM Emission Calculations

The gap-filling requires that the data be analyzed and separated into cases. The cases determine which math steps and ratios of PM terms will be applied. Exhibit 2.5 shows the various cases and the augmentation method that was applied.

After completing the calculations, the data was QA checked to ensure that the calculations resulted in consistent values for the PM complement. On a few occasions, the mix of ratio value and the pollutants and values provided by the S/L agency resulted in negative values when FIL was back-calculated. In this case the negative FIL value was set to zero and the PRI value was readjusted. In a few cases the appropriate combination of ratios, SCC, and control efficiencies were not available to calculate the PM10-PRI and PM25-PRI values. In these cases, PM10-PRI and PM25-PRI were set equal.

Exhibit 2.5 – Cases and Required Steps to Augment nonEGU PM Emissions

Case	PM Reported	Augmentation Methodology
1	PM25-PRI	PM-CON = PM25-PRI * CON_P25 ratio PM25-FIL = PM25-PRI - PM-CON PM10-FIL = PM25-FIL * F10_F25 ratio PM10-PRI = PM-CON + PM10-FIL
2	PM10-PRI	PM-CON = PM10-PRI * CON_P10 ratio PM10-FIL = PM10-PRI - PM-CON PM25-FIL = PM10-FIL / F10_F25 ratio PM25-PRI = PM-CON + PM25-FIL
3	PM25-PRI PM10-PRI	PM-CON = PM10-PRI * CON_P10 ratio PM10-FIL = PM10-PRI - PM-CON PM25-FIL = PM25-PRI - PM-CON
4	PM10-FIL	PM-CON = PM-CON * CON_F10 ratio PM10-PRI = PM-CON + PM10-FIL PM25-FIL = PM10-FIL / F10_F25 ratio PM25-PRI = PM-CON + PM25-FIL
5	PM10-FIL PM25-FIL	PM-CON = PM10-FIL * CON_F10 ratio PM10-PRI = PM-CON + PM10-FIL PM25-PRI = PM-CON + PM25-FIL
6	PM10-FIL PM10-PRI	PM-CON = PM10-PRI - PM10-FIL PM25-FIL = PM10-FIL * F25_F10 ratio PM25-PRI = PM-CON + PM25-FIL
7	PM25-FIL	PM-CON = PM25-FIL * CON_F25 ratio PM10-FIL = PM25-FIL * F10-F25 ratio PM10-PRI = PM-CON + PM10-FIL PM25-PRI = PM-CON + PM25-FIL
8	PM10-FIL PM10-PRI PM25-FIL PM25-PRI	PM-CON = PM25-PRI - PM25-FIL
9	PM-PRI	PM-CON = PM-PRI * CON_PRI ratio PM-FIL = PM-PRI - PM-CON PM10-FIL = PM-FIL * F10_FIL ratio PM10-PRI = PM-CON + PM10-FIL PM25-FIL = PM10-FIL / F10_F25 ratio PM25-PRI = PM-CON + PM25-FIL
10	PM25-FIL PM25-PRI	PMCON = PM25-PRI - PM25-FIL PM10-FIL = PM25-FIL * F10_F25 ratio PM10-PRI = PM-CON + PM10-FIL
11	PM-CON PM10-FIL PM25-FIL	PM10-PRI = PM-CON + PM10-FIL PM25-PRI = PM-CON + PM25-FIL

Case	PM Reported	Augmentation Methodology
12	PM-CON	PM10-FIL = PM-CON * F10_CON ratio PM25-FIL = PM10-FIL * F25_F10 ratio PM10-PRI = PM-CON + PM10-FIL PM25-PRI = PM-CON + PM25-FIL
13	PM-CON PM10-FIL PM10-PRI	PM25-FIL = PM10-FIL / F10_F25 ratio PM25-PRI = PMCON + PM25-FIL
14	PM-CON PM10-FIL PM10-PRI PM25-FIL PM25-PRI	None required; all PM compounds present
15	PM-CON PM-FIL	PM10-FIL = PM-CON / CON_F10 ratio PM25-FIL = PM10-FIL / F10_F25 ratio PM10-PRI = PM-CON + PM10-FIL PM25-PRI = PM-CON + PM25-FIL
16	PM-CON PM10-PRI PM25-PRI	PM10-FIL = PM10-PRI - PM-CON PM25-FIL = PM25-PRI - PM-CON
17	PM-FIL	PM10-FIL = PM-FIL * F10_FIL ratio PM_CON = PM10-FIL * CON_F10 ratio PM25-FIL = PM10-FIL / F10_F25 ratio PM10-PRI = PM-CON + PM10-FIL PM25-PRI = PM-CON + PM25-FIL

2.3 EMISSION RELEASE POINT QA CHECKS

Stack parameters are an important component of an emission inventory used for regional air quality modeling. Careful QA is required to ensure that the point source emissions are properly located both horizontally and vertically on the modeling grid. This section describes the procedures used to quality assure, augment, and where necessary, revise, stack parameters using standardized procedures to identify and correct stack data errors. These procedures were implemented within the NIF file itself, and are based on the QA procedures built into SMOKE that are designed to catch missing or out-of-range stack parameters.

2.3.1 QA Checks and Gap-Filling for Location Coordinates

Because air quality modeling strives to replicate the actual physical and chemical processes that occur in an inventory domain, it is important that the physical location of emissions be determined as accurately as possible. The emission release (ER) point record is used to report the location and relevant physical attributes of the emission release point. Location

coordinates must be reported to identify where emissions are released to the ambient air, via a stack or non-stack (e.g., fugitive release). For a non-stack, or fugitive release, coordinates may represent the general location where emissions are released.

In the ER record, location data may be reported as x and y coordinates (X – Y) from either of two coordinate systems - Latitude / Longitude (LATLON), or Universal TransMercator (UTM). X - Y coordinates reported as Latitude and Longitude must be reported in the decimal degree format. X - Y coordinates reported as UTM Easting and UTM Northing, must be reported in kilometers.

UTM data received from MARAMA was processed by the Contractor Team and converted to Latitude Measure and Longitude Measure in decimal degrees, as is required by the SMOKE emissions processing system. All conversions of UTM to LATLON were made using a spreadsheet[1] developed by Professor Steven Dutch, School of Natural and Applied Sciences, University of Wisconsin - Green Bay. This spreadsheet tool allowed for batch conversion of UTM data to decimal degree format and was configured for WGS 84 DATUM. While errors using this spreadsheet are typically a few meters, rarely 10 or more, the accuracy of the conversion is limited to the accuracy of the initial UTM data.

Once conversions were made to LATLON decimal degrees, reasonableness checks were conducted on each release point relative to county centroids and min/max coordinates associated with the FIPS codes assigned to each stack. If a stack was located outside the western-, eastern-, northern- or southern-most boundary of the county (based on SMOKE's county lat/lon file), the point was flagged for additional review. Flagged sources were then mapped with GIS software to determine their placement relative to the FIPS County associated with the stack. If a source was found to be outside of the county boundaries, it was identified for further review.

2.3.2 QA Checks and Gap-Filling for Emission Release Parameters

In preparing emissions for grid modeling, valid parameters for the physical characteristics of each release point (stack height, diameter, temperature, velocity, and flow) are necessary to correctly place facility release points and associated emissions into vertical layers for proper air quality modeling. The USEPA's QA guidance for diagnosing stack parameter issues was generally applied to identify QA issues in the S/L point source inventories. The QA guidance involved diagnosing the correct assignment of the ERP type (i.e., stack or

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[1] http://www.uwgb.edu/dutchs/FieldMethods/UTMSystem.htm

fugitive), parameters with zero values, parameters not within the range of values specified in the USEPA's QA procedures, and consistency checks (i.e., comparing calculated values against the values reported in the inventory). In many cases errors were caused by missing or zero values.

The first step of our quality assurance (QA) involves review of the Emission Release Point Type. Using this type code, we used a routine to assess the validity of the stack parameters, to replace values if necessary, and to fill-in missing data points. We employed a routine that compared each emission release point parameter to a minimum and maximum range of values and when that parameter was missing or was found to exist outside of that range, we augmented the parameter. We also checked non-fugitive stack parameters for internal consistency between:

- stack height and diameter, and
- stack diameter, exit gas velocity, and exit gas flow rate.

When internal consistency was not met, we provided replacement values for the parameters.

The following steps summarize the process of finding and replacing missing, out-of-range, or internally inconsistent stack parameters.

Step 1: For fugitive emission release points, replace stack parameters

For fugitive emission release points (ERPTYPE=01), we first compared the existing fugitive emission height against the following range thought to be representative of the minimum and maximum values allowable for most fugitive emission release points.

Fugitive Release Height: 0.1 to 100 ft

In all but one case, the fugitive release height was valid. For that one case, we set the fugitive release height to 100 feet. For all other cases, we kept the fugitive release height and replaced all other stack parameters with the defaulted values listed below. In some cases, the fugitive release height was blank but the S/L agency provided a stack height and we retained the S/L supplied stack height. In other cases, the S/L agency provided a temperature for the fugitive emissions and we retained the S/L supplied temperature. The following summarizes the procedure for filling in stack parameters for fugitive emission release points:

Stack Height: use fugitive release height, if valid; if fugitive release height not present and stack height provided, use the stack height; if neither fugitive release height or stack height not present, use 10 feet as the default.

Stack Temperature: use temperature provided by S/L agency, if valid; otherwise used 72 ^{o}F.

Stack Diameter: use 0.003 feet for fugitive sources

Stack Velocity: 0.0003 feet per second for fugitive sources

Stack Flow: use 0.0 cubic feet per second for fugitive sources

Step 2: For non-fugitive emission release points, find and replace out-of-range or missing stack heights and temperatures

For non-fugitive emission release points, we compared existing stack parameters against a set of the following ranges thought to be representative of the minimum and maximum values allowable for most emission release points.

Stack Height: 0.1 to 1000 feet

Stack Temperature: 50 to 1,800 ^{o}F

Stack Diameter: 0.1 to 50 feet

Missing or out-of range parameters were identified and evaluated. If not realistic, missing or out-of range parameters were replaced using the procedures described below.

Stack Height: All stack heights were less than the maximum value of 1000 feet. Numerous stack heights were zero or missing, in which case the stack height was filled in using national default sets of physical parameter data based on the SCC. The stack parameter national default database is included as Appendix D.

Stack Temperature: There were 30 records where the stack temperature exceeded 1,800 ^{o}F. We reviewed the stack description table for these records, which indicated that most of these stacks were for flares or furnaces. We deemed the S/L supplied temperature data as plausible and retained the S/L provided value. There were 100 records where the stack temperature was less than 50 ^{o}F and not equal to 0 ^{o}F or missing. We reviewed the stack description table for these records. Many of these stacks were for refrigerated tanks or other sources where the S/L supplied temperature data was deemed plausible. For example, a nylon manufacturing facility in Virginia emits thousands of tons of NOx in 2007. Most of the NOx is

emitted from a handful of fairly cold stacks, with exit gas temperatures generally ranging from 40-60 degrees. Rather than replace these S/L supplied values that seemed plausible with national defaults, we retained the S/L supplied data. Where the stack temperature was reported as 0 ^{o}F or missing, we replaced the stack temperature with the national default based on the SCC.

Step 3: For non-fugitive emission release points, find and replace out-of-range or missing stack diameters, velocities, and flow rates

First, we evaluated the stack diameter to determine if it was within the valid range of 0.1 to 50 feet. There were 200 records where the stack diameter exceeded 50 feet. We reviewed the stack description table for these records. Most of these were large storage tanks, cooling towers, wastewater treatment ponds or area-type sources such as process equipment leaks. Based on this review, we deemed the S/L supplied diameter data as plausible and retained the S/L provided value.

There were 66 records with missing stack diameters where both the velocity and flow rate were provided. For these records, the stack diameter was calculated using the following equation:

Stack Diameter [ft] = SQRT (4 * Stack Flow [cu ft/sec] / (Stack Velocity [ft/sec] * π [Pi]))

For the remaining cases where the stack diameter was reported as zero or missing, we replaced the stack diameter with the national default based on the SCC.

Next, the velocity and flow rate were evaluated. If the diameter, velocity and flow rate were all non-zero, we assessed internal consistency between diameter, velocity and flow rate using the following equation:

Stack Flow [cu ft/sec] = (π [Pi] * (Stack Diameter [ft] / 2) ^ 2) * Stack Velocity [ft/sec]

If the calculated and reported flow rates are within 10 % of one another, then internal consistency was assumed and no additional steps were taken. If the internal consistency was not met for velocity and flow rate, Exhibit 2.6 below provides details on the approach taken to correct missing, out-of-range values, or internally inconsistent values for velocity and flow rate based on different scenarios. Velocity and flow rate were augmented either by calculation or the use of national defaults by SCC when necessary.

Exhibit 2.6 - Stack Parameter Data Replacement Matrix

(X = Data value present)

Diameter	Velocity	Flow Rate	Action
-	X	X	1. Calculate diameter using velocity and flow rate. 2. Check that calculated diameter is within range.
-	-	-	1. Replace diameter, velocity, and flow rate with national SCC default values.
-	-	X	1. Replace diameter, velocity, and flow rate with national SCC default values.
-	X	-	1. Replace diameter, velocity, and flow rate with national SCC default values.
X	-	-	1. Default velocity using national default sets. 2. Calculate flow rate using internal consistency formula.
X	-	X	1. Calculate velocity using internal consistency formula. 2. Check that calculated velocity is within range (less than 150 ft/sec). A. If calculated velocity is not within range, then default all 3 parameters using national default sets.
X	X	-	1. Check that velocity is within range (less than 150 ft/sec). A. If velocity is within range, then: > Calculate flow rate using internal consistency formula. B. If velocity is not within range, then: > Default all 3 parameters using national default sets.
X	X	X	1. Check that velocity is within range (less than 150 ft/sec). A. If velocity is within range and flow rate does not meet internal consistency for diameter, velocity and flow rate, then: > Calculate flow rate using internal consistency formula. B. If velocity is not within range, then: > Calculate velocity using internal consistency formula. > Check that calculated velocity is within range. If so, then default to calculated velocity. > If calculated velocity is not within range, then default all 5 parameters using national default set.

2.4 IDENTIFICATION OF EGUs AND NONEGUs

In the past, point sources have been categorized as either EGUs or nonEGUs using a variety of schemes. The SCC, standard industrial classification code (SIC), and North American Industry Classification System (NAICS) code have been used to classify sources as either EGU or nonEGU. Another scheme that has been used is to classify as EGU sources that is required to report emissions to USEPA's CAMD hourly emission database. For consistency in both reporting and projecting emissions to the future, the MANE-VU+VA inventory using the following scheme for classifying point sources:

- CAMD EGU – these are units that report emissions to the USEPA CAMD hourly emission database and have been classified by States as EGUs;
- CAMD nonEGU - these are units that report emissions to the USEPA CAMD hourly emission database and have been classified by States as nonEGUs; and
- OTHER – all other nonEGU point sources and small EGU point sources not included in the above categories.

Data elements were add to the NIF EP table to include the above classification scheme. This classification scheme was reviewed and approved by ERTAC.

2.5 VERSION 2 - STAKEHOLDER COMMENT AND RESPONSE

On October 6, 2009, MARAMA provided a notice to stakeholders of the opportunity to review the initial draft of the 2007 point source inventory data and documentation. Stakeholders were invited to review and comment on the draft 2007 inventory of air emissions from point sources to be used for regional air quality modeling. On October 20, MARAMA hosted a conference call that provided an opportunity for stakeholders to ask questions about the draft 2007 point source modeling inventory. Written comments were reviewed by the State inventory staff and MARAMA, and resulted in several changes to the draft documentation and inventory data. The changes requested by stakeholders and approved by the States are summarized in the following subsections.

2.5.1 Connecticut Response to Stakeholder Comments

Sikorsky Aircraft provided comments on roughly ten sources regarding the SO2, PM, and VOC emissions. The requested changes were very small (under a ton per year). Connecticut accepted Sikorsky Aircraft's comments.

Covanta Energy commented that the annual NOx emissions for the Covanta Bristol Unit #1 (Facility ID 09003-0902, emission unit P0026) were abnormally low because of a temporary pilot test of a NOx emission control technology. Covanta requested that 2005 emissions should be used since the 2007 actual emissions are not representative of previous or subsequent years. Since the 2007 inventory is being used for air quality modeling that will be tied to actual air quality data, Connecticut decided to use actual 2007 emission values rather than 2005 values as requested by Covanta. Connecticut will consider this comment again during the development of the future year inventories to ensure that reasonable future year emissions are estimated.

Hamilton Sundstrand commented that three emission units at its facility (Facility ID 09003-8602, emission units P0038, P0079, and R0097) were permanently shut down in 2008. Since the 2007 inventory is being used for air quality modeling that will be tied to actual air quality data, Connecticut decided to use actual 2007 emission values. Connecticut will consider this comment again during the development of the future year inventories to ensure that reasonable future year emissions are estimated.

NRG Energy provided very minor revisions to the SO2, NOx, CO, VOC, PM and NH3 emissions data for the Montville (Facility ID 09011-1505) and Norwalk (Facility ID 09001-4214) facilities. Connecticut accepted these changes.

2.5.2 Maryland Response to Stakeholder Comments

NRG Energy requested a change to the VOC emissions for the Vienna Power Generating Station (Facility ID 019-0013, emission unit 4-0065). Maryland agreed to make the change, revising the VOC emissions from 0.9455 to 0.9641 tons per year.

Transcontinental Gas Pipe Line Company commented that the inventory for its facility in Howard County (Facility ID 027-0223) has 12 internal combustion engines represented by one grouped emission unit, which gives the impression that there is one large source when there are actually 12 smaller units. Maryland did not change the inventory based on this comment since the 12 engines are nearly identical and identifying each engine individually is not needed for the 2007 modeling inventory.

Covanta Energy requested changes to the stack parameters for the three units at the Montgomery County Resource Recovery Facility (Facility ID 031-1718). Maryland agreed to make those revisions.

2.5.3 Massachusetts Response to Stakeholder Comments

Saint Gobain Containers requested minor changes to the annual emissions and stack parameters for its facility in Milford (Facility ID 25027-1200856). Massachusetts accepted the changes and the 2007 inventory was updated to reflect the stakeholder comments.

Verallia formerly (Saint Gobain Containers) also provided comments on the 2007 PM2.5 emissions for all sources and stated that they may not contain appropriate condensable emissions. The company did not provide revised estimates or suggestions for improving the estimates of condensable emissions. For facilities that did not report PM2.5 or condensable emissions, the PM2.5 or condensable emissions were calculated using the methodogy described in Section 2.2.2. MARAMA acknowledges that there is some uncertainty regarding the methodology, but lacking source-specific data the methodology is the best available technique at this time for filling in the missing PM2.5 or condensable emissions.

Verallia formerly (Saint Gobain Containers) also indicated that stack flow rate data was missing for their plants in Massachusetts. The facilities facilities did have stack velocity data. This data gap was filled by calculating the flow rate using the stack diameter and the stack exit velocity.

2.5.4 New Jersey Response to Stakeholder Comments

RRI Energy provided updated emissions and stack data for several of its facilities, mostly minor changes to PM emission values and revisions to stack parameters. New Jersey agreed to make the revisions provided by RRI Energy.

BASF identified that its plant in East Newark (Facility ID 34017-10419) was permanently shut down and did not operate in 2007. New Jersey agreed and the 2007 emissions were set to zero.

Merck & Co., Inc indicated that its facility in Rahway, NJ (Facility ID 34039-41712) emitted 3.42 tons/yr of ammonia emissions from their boilers in 2007. New Jersey agreed and the ammonia emissions were added to the inventory.

Georgia Pacific Gypsum LLC submitted updates for its Camden facility (Facility ID 34007-51611) to correct the 2007 emissions based upon recent stack test data for board dryer U7 and process emissions factors from kettles U3, U4 and U5. Total PM2.5 emissions were also updated using current AP-42 factors for the Gypsum industry. In

addition, the ammonia emissions were missing from the inventory. New Jersey agreed to make the requested changes.

E.R. Squibb & Sons, LLC, requested changes to the ammonia and PM2.5 emissions for its facilities in Lawrenceville, NJ (Facility ID 34021-61052), New Brunswick, NJ (Facility ID 34023-17739), and Hopewell (Facility ID 34021-61053). New Jersey agreed to make the requested changes.

Schering Corporation supplied corrections to the ammonia emissions from its Kenilworth facility (Facility ID 34039-41806). New Jersey agreed to make the requested changes.

ConocoPhillips Company provided revisions to ammonia and VOC emissions for the Bayway Refinery (Facility ID 34039-41805). They also provided revisions to selected SCCs for certain heaters, sulfur recovery units, truck loading activities, marine vessel loading activities, and emergency flares. ConocoPhillips also requested that certain parts of the refinery be modeled as area sources rather than point sources, and provided rectangular grid coordinates to define the area sources. While this change would be appropriate for a fence line modeling study, it cannot not be accommodated in a multi-State regional air quality model since the SMOKE emission modeling system is not capable of handling area sources that are smaller than the air quality model grid cell. Therefore, this change was not made.

Covanta Energy requested minor revisions to the ammonia and PM emissions at the Union County Resource Recovery Facility (Facility ID 34039-41814) and Warren Energy Resource Facility (Facility ID 34041-85455). New Jersey agreed to make those revisions.

Air Engineering submitted comments on behalf of EF Kenilworth LLC (Facility ID 34029-41741), requesting minor changes to PM emissions and revisions to stack parameters. New Jersey agreed to make the requested changes.

Air Engineering submitted comments on behalf of Rowan University (Facility ID 34015-55779), requesting adding ammonia emissions for its sources. New Jersey agreed to make the requested changes.

Air Engineering submitted comments on behalf of The College of New Jersey (Facility ID 34021-61008), requesting adding ammonia emissions for its sources and revisions to stack parameters. New Jersey agreed to make the requested changes.

Actavis requested the addition of 0.13 tons per year of ammonia for their facility (Facility ID 34039-40295). New Jersey agreed to make the addition.

PSEG Power LLC requested changes to SCCs and stack parameters, as well as numerous minor changes to emission estimates, for its facilities in New Jersey. New Jersey agreed to make the revisions. PSEG also requested the units classified as "insignificant units" be excluded from the modeling inventory. New Jersey elected to keep the emissions from insignificant units in the inventory because the purpose of the inventory is to model all of the emissions actually emitted in 2007.

MRPC/OEC-LES requested changes SCCs, ammonia and PM emissions, and stack parameters for its facility (Facility ID 34029-78901). New Jersey agreed to make the revisions.

2.5.5 New York Response to Stakeholder Comments

Covanta Energy provided updated PM emissions and stack data for several of its facilities, mostly minor changes to PM emission values and revisions to stack parameters. New York agreed to make the revisions provided by Covanta Energy.

NRG Energy provided updated PM emissions and stack data for its facilities. NRG Energy also provided updated data for the individual turbine units at the Astoria Gas Turbine Power Plant (ORISID=55243). New York agreed to make the revisions provided by NRG Energy. NRG Energy also noted that baghouses are being installed at the Dunkirk and Huntley coal-fired plants. These changes were noted and will be accounted for in the future year inventories.

2.5.6 Pennsylvania Response to Stakeholder Comments

Covanta Energy requested changes to stack parameters at the Delaware Valley (Facility ID 420450059), Lancaster County (Facility ID 420710145), Plymouth (420910295) and Harrisburg (Facility ID 420430017) facilities. Covanta also requested minor changes to the emission estimates at the Plymouth facility. Pennsylvania agreed to make those revisions.

RRI Energy provided updated emissions and stack data for several of its facilities. The most notable change was a significant increase in PM emissions at several coal-fired units. Pennsylvania agreed to make the revisions provided by RRI Energy.

Saint Gobain Containers requested minor changes to the annual emissions and stack parameters for its facility in Port Allegheny (Facility ID 420830006). Pennsylvania accepted the changes and the 2007 inventory was updated to reflect the stakeholder comments.

Verallia formerly (Saint Gobain Containers) also provided comments on the 2007 PM2.5 emissions for all sources and stated that they may not contain appropriate condensable emissions. The company did not provide revised estimates or suggestions for improving the estimates of condensable emissions. For facilities that did not report PM2.5 or condensable emissions, the PM2.5 or condensable emissions were calculated using the methodogy described in Section 2.2.2. MARAMA acknowledges that there is some uncertainty regarding the methodology, but lacking source-specific data the methodology is the best available technique at this time for filling in the missing PM2.5 and condensable emissions.

The National Lime Association requested changes to the PM emissions for four of their member facilities: Mercer Lime & Stone (Facility ID 420190021), Graymont/Pleasant Gap (Facility ID 420270003), Carmeuse Lime/Millard Lime (Facility ID 420750016), and OWB Refractories (Facility ID 421330007). Pennsylvania accepted the changes and the 2007 inventory was updated to reflect the stakeholder comments.

Magnesita Refractories (formerly LWB Refractories) provided minor revisions to stack data and PM emission estimates for the facility. Pennsylvania determined that no changes to the 2007 inventory were needed since the PM2.5 emissions were small (about 20 tons per year) and that PM2.5 emissions of this magnitude should not adversely impact the results of regional air quality modeling analyses using these inventories.

Carmeuse Lime provided minor revisions to stack data and PM emission estimates for the facility. Pennsylvania determined that no changes to the 2007 inventory were needed since the PM2.5 emissions were small (about 10 tons per year) and that PM2.5 emissions of this magnitude should not adversely impact the results of regional air quality modeling analyses using these inventories.

2.5.7 Virginia Response to Stakeholder Comments

Virginia received comments from Covanta Energy and Transco requesting very minor changes to the emissions for their facilities (generally less than 0.1 ton change in emissions). Virginia decided not to make those changes because of the insignificant impact on the regional modeling inventory.

BASF identified that its plant in Virginia is permanently shut down. Since it did operate in 2007, the actual 2007 emissions will be used for the 2007 modeling. Emissions from the plant will be set to zero for future year inventories.

Michigan Cogen Systems requested minor changes to stack parameters for their facility. Virginia approved the requested changes.

Virginia received revised stack parameters for about 20 units at the Chemical Lime Company's Kimbalton Plant. Due to the location of this facility and the size of the emissions in 2007, Virginia determined that the recommended changes should not affect air quality modeling results for 2007.

Virginia received comments from Carmeuse Natural Chemicals regarding the PM2.5 emissions at two of its facilities in Virginia. Since the company did not provide PM2.5 emissions to Virginia, the PM2.5 emissions were calculated using the methodogy described in Section 2.2.2. Virginia acknowledged that there is some uncertainty regarding the methodology, but lacking source-specific data the methodology is the best available technique at this time for filling in the missing PM2.5 emissions. Virginia determined that no changes to the 2007 inventory were needed since the PM2.5 emissions from these two kilns were small (less than 20 tons per year) and that PM2.5 emissions of this magnitude should not adversely impact the results of regional air quality modeling analyses using these inventories.

2.6 VERSION 2 - ADDITIONAL STATE-SPECIFIC UPDATES

Several States and local agencies provided revisions and updates following their review of the initial draft of the point source inventory posted in October, 2009. These changes are summarized in the following subsections.

2.6.1 Connecticut

During the review of the initial draft 2007 inventory, Connecticut identified several emission units with unexpectedly high emission values. Connecticut determined that its original submittal had emissions adjusted for rule effectiveness. Since the 2007 inventory is being used for air quality modeling that will be tied to actual air quality data, Connecticut decided to use actual 2007 emission values rather than values that had been artificially adjusted to account for rule effectiveness. The Contractor calculated the actual emissions for all units with a non-zero rule effectiveness value by backing out the rule effectiveness value. These actual emission values were supplied to Connecticut for review and approval. Connecticut recommended that the actual emissions calculated by the Contractor be used instead of the values originally supplied by Connecticut which included rule effectiveness.

Connecticut indicated that some of the PM records in their original submittal used incorrect pollutant codes. Connecticut indicated that the PM records in their original submittal for oil and coal-fired boilers should have been submitted as PM10-FIL and not PM10-PRI. All natural gas-fired units and oil-fired turbines were correctly reported as

PM10-PRI. The PM augmentation routine described in Section 1.3 was re-executed for the coal- and oil-fired units.

2.6.2 Delaware

No revisions to the initial inventory were requested or made.

2.6.3 District of Columbia

The District of Columbia made revisions to the emission inventory for Benning Road (Facility ID 11001-0001). There are four emission units at the facility designated as Units 1, 2, 15, and 16. Units 15 and 16 report emissions to USEPA's CAMD CEM database, while units 1 and 2 do not. Units 1 and 2 were not included in the initial point source inventory. These two units were added to the inventory and increased facility-wide SO2 emissions by about 100 tons per year and NOx emissions by 50 tons per year. Smaller increases were added for the other pollutants.

2.6.4 Maine

Maine provided a small correction to the SO2 emissions for the Maine Independence Station (Facility ID 2301900115).

Maine provided small corrections to the SO2 and NOx emissions for Westbrook Energy Center (Facility ID 2300500193). Also there was an error in the cross-reference between the USEPA CAMD database and the State's NIF database, which was corrected.

2.6.5 Maryland

No additional revisions beyond those requested by stakeholder were requested or made.

2.6.6 Massachusetts

An error in the PM augmentation routine was detected that incorrectly replaced State-reported PM25-FIL values. The Contractor reviewed the PM augmentation routine and identified the error that affected "Case 5" nonEGU PM25-FIL and PM25-PRI values. This error also affected numerous small sources in Massachusetts. The error was corrected and the State-reported PM25-FIL values were retained during the PM augmentation process and that the PM25-PRI values were correctly calculated using the State-reported PM25-FIL value.

Massachusetts identified errors in the ammonia emissions for 2007 for the Stony Brook Energy Center (25013-0420001) and New Bedford Energy (25005-1200634). Massachusetts provided corrected ammonia emission estimates for these two facilities. This change reduced ammonia emissions in Massachusetts by about 2,300 tons.

2.6.7 Maine

Maine identified on error in the PM augmentation routine that incorrectly replaced State-reported PM25-FIL values. The Contractor reviewed the PM augmentation routine and identified the error that affected "Case 5" nonEGU PM25-FIL and PM25-PRI values. The error was corrected and the State-reported PM25-FIL values were retained during the PM augmentation process and that the PM25-PRI values were correctly calculated using the State-reported PM25-FIL value.

2.6.8 New Hampshire

An error in the PM augmentation routine was detected that incorrectly replaced State-reported PM25-FIL values. The Contractor reviewed the PM augmentation routine and identified the error that affected "Case 5" nonEGU PM25-FIL and PM25-PRI values. This error also affected numerous small sources in New Hampshire. The error was corrected and the State-reported PM25-FIL values were retained during the PM augmentation process and that the PM25-PRI values were correctly calculated using the State-reported PM25-FIL value.

2.6.9 New Jersey

New Jersey identified numerous emission units that were inadvertently missing from their initial submittal. Most of these units were flagged as "insignificant units" or "non-source fugitive" sources in New Jersey's data system and were excluded during the initial conversion to NIF tables. New Jersey subsequently identified these "unmatched" units and submitted pertinent data for inclusion in the 2007 modeling inventory. The Contractor added these units and emissions to the NIF database. The emissions added to the inventory from these units were about: 60 tpy of CO, 50 tpy of NOx, 672 tpy of PM10-PRI,257 tpy of PM25-PRI, 5 tpy of SO2, and 1,477 tpy of VOC.

Ammonia emissions were missing from New Jersey's initial submittal. New Jersey supplied the missing ammonia emissions, which added about 845 tpy of NH3 to the point source inventory.

2.6.10 Pennsylvania – Allegheny County

Allegheny County's initial 2007 submittal included only the five "very large" sources that were submitted to USEPA for the 2007 NEI. After the release of the initial version of the point source inventory in October, 2009, the agency provided a second submittal with an addition 31 facilities. The second submittal was subjected to the QA and PM augmentation procedures described previously in Sections 1.2 and 1.3 of this report.

2.6.11 Pennsylvania - Philadelphia

Philadelphia provided the following revisions to the initial draft inventory:

- Boiler #3 at Sunoco Chemical Frankford Plant (Facility ID 4210101551 and emission point 052) was linked to CAMD ORIS ID 880007 and boilerID 52.
- VOC emissions at Cardone Industries (Facility ID 4210103887) were increased from 75.96 to 143.98 tons per year.

2.6.12 Rhode Island

Rhode Island revised the emissions for Providence Metallizing Co. (Facility ID 44007AIR1230 and emission point 2). All emissions for this emission point were changed to zero for 2007.

2.6.13 Vermont

No revisions to the initial inventory posted in October 2009 were requested or made.

2.6.14 Virginia

After the release of the initial version of the point source inventory in October, 2009, the agency provided a second submittal with a number of additional distributed generation units. The second submittal was subjected to the QA and PM augmentation procedures described previously in Sections 1.2 and 1.3 of this report. A flag was added to the EP table to identify the distributed generation units for both the units in Virginia's original submittal as well as the new units.

Virginia indicated that all of the PM records in their original submittal used incorrect pollutant codes. Records in the original submittal designated as PM10-PRI should have been submitted as PM10-FIL, and PM25-PRI should have been PM25-FIL. The PM augmentation routine described in Section 1.3 was re-executed after changing all PM10-PRI to PM10-FIL and all PM25-PRI to PM25-FIL.

Virginia revised the PM data for the Mirant Potomac River Generating Station (SiteID: 51-510-00003) using 2007 condensable test data using the test method with the nitrogen purge to replace the emission factors previously applied by the Contractor.

Virginia requested that the plantID for the Dominion Leesburg Compressor Station be changed from 51-107-71978 to 51-107-01016.

Virginia requested that the plantID for the Transcontinental Gas Pipeline Station 175 be changed from 51-065-40789 to 51-065-00016.

Virginia's review of stack test data Greif Packaging LLC (51-009-00022) showed an incorrect emissions factor applied in 2007. The 2007 emissions factor for CO was 54 lbs CO/ton processed. The test factor was 5.6 lbs CO/ton processed. The 2007 data was corrected using the lower emissions factor.

2.7 VERSION 3 REVISIONS

2.7.1 Emission Offsets

Mulitple states (CT, MA, MD, NH and NJ) added county level records account for account emission reduction credits (ERCs) issued to stationary sources pursuant to state regulation. States provided ERCs on a county-by-county basis. Fictitious facilities with an identifier of "OFFSET99999" were created for each county using SCC 23-99-000-000 (miscellaneous industrial processes: not elsewhere classified) Stack data were developed that assumed that emissions were released at the county centroid with an assumed release height of 10 feet. For the 2007, ERC emissions were set to zero since the banked emissions were not actually emitted in 2007. The ERCs will be included in the future year inventories and air quality modeling analysis.

2.8 ANNUAL 2007 POINT SOURCE EMISSION SUMMARY

Exhibits 2.7 to 2.20 present State-level summaries of 2002 and 2007 annual point source emissions by pollutant and compare 2007 annual emissions from CAMD EGUs, CAMD nonEGUs, and OTHER point sources. The 2002 emissions are those that were developed previously for Version 3 of the MANE-VU and the VISTAS best-and-final inventory for Virginia.

For most States and pollutants, point source emissions have decreased from 2002 to 2007. Notable exceptions are substantial increases in PM10-PRI and PM25-PRI emissions in Maryland, Pennsylvania, and Virginia. These increases are primarily due to a better representation of condensable emissions in the 2007 inventory, especially for coal-fired power plants. New data provided by these States confirm that condensable emissions were underreported in the 2002 inventory.

In 2007, CAMD EGUs accounted for about 88% of SO2 emissions, 62% of NOx, 51% of PM10-PRI, and 54% of PM25-PRI emissions. Non-CAMD reporting sources accounted for 94% of VOC and 82% of CO emissions in 2007.

Exhibit 2.7 – 2002 and 2007 Point Source CO Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	4,053	3,679	-9%
Delaware	9,766	7,753	-21%
District of Columbia	248	311	25%
Maine	17,005	14,483	-15%
Maryland	99,032	81,770	-17%
Massachusetts	21,641	10,108	-53%
New Hampshire	2,725	3,164	16%
New Jersey	12,300	10,548	-14%
New York	66,427	66,357	0%
Pennsylvania	121,524	101,440	-17%
Rhode Island	2,234	1,653	-26%
Vermont	1,078	2,146	99%
Virginia	70,688	70,353	0%
	428,721	**373,765**	**-13%**

Exhibit 2.8 – EGU and nonEGU 2007 Point Source CO Emissions by State

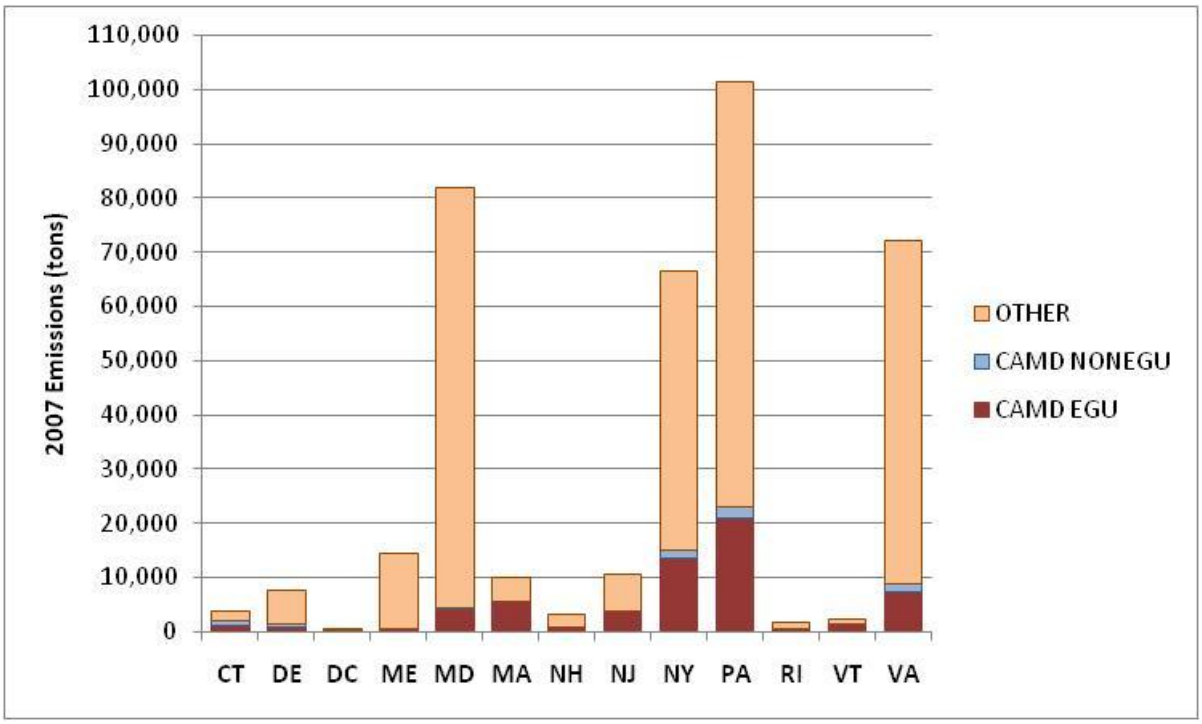


Exhibit 2.9 – 2002 and 2007 Point Source NH3 Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	0	0	
Delaware	196	94	-52%
District of Columbia	4	0	-100%
Maine	845	665	-21%
Maryland	305	137	-55%
Massachusetts	1,578	647	-59%
New Hampshire	74	128	73%
New Jersey	0	918	
New York	1,861	2,417	30%
Pennsylvania	1,388	2,379	71%
Rhode Island	58	74	28%
Vermont	0	0	
Virginia	3,230	1,830	-43%
	9,539	**9,289**	**-3%**

Exhibit 2.10 – EGU and nonEGU 2007 Point Source NH3 Emissions by State

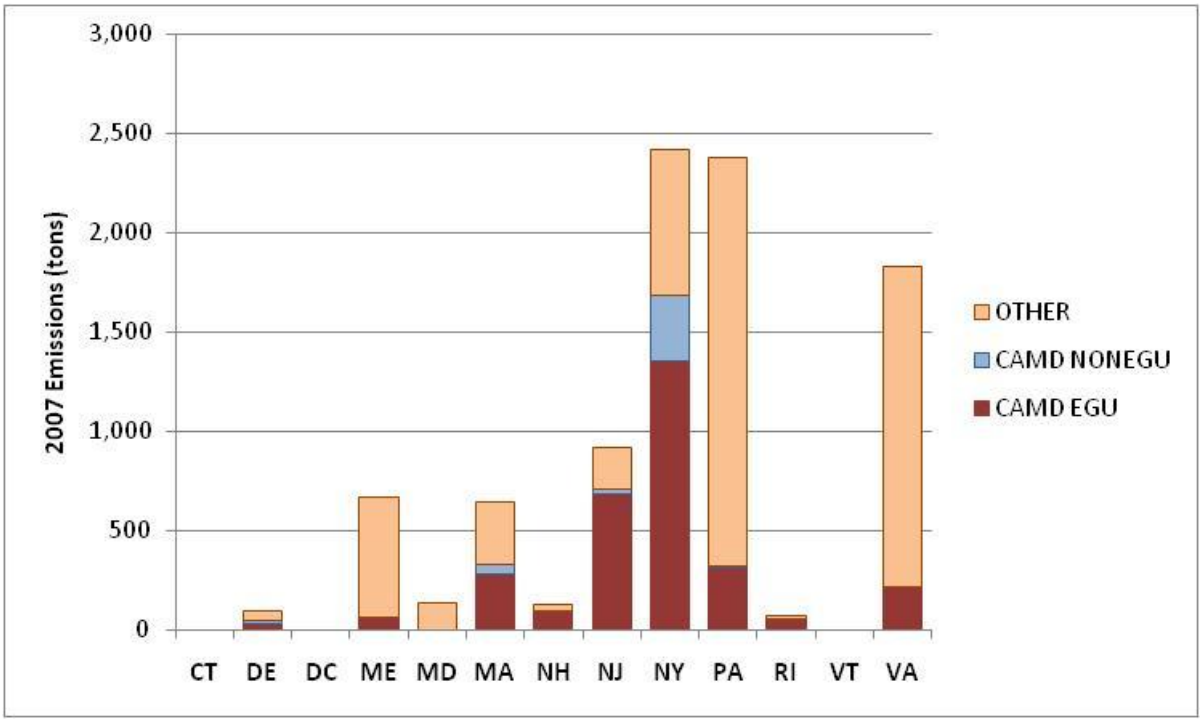


Exhibit 2.11 – 2002 and 2007 Point Source NOx Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	12,923	10,061	-22%
Delaware	16,345	15,628	-4%
District of Columbia	780	789	1%
Maine	19,939	17,746	-11%
Maryland	95,369	74,890	-21%
Massachusetts	48,607	23,628	-51%
New Hampshire	9,759	7,441	-24%
New Jersey	51,593	30,088	-42%
New York	118,978	83,033	-30%
Pennsylvania	297,379	258,379	-13%
Rhode Island	2,764	1,444	-48%
Vermont	787	811	3%
Virginia	147,300	112,938	-23%
	822,523	**636,876**	**-23%**

Exhibit 2.12 – EGU and nonEGU 2007 Point Source NOx Emissions by State

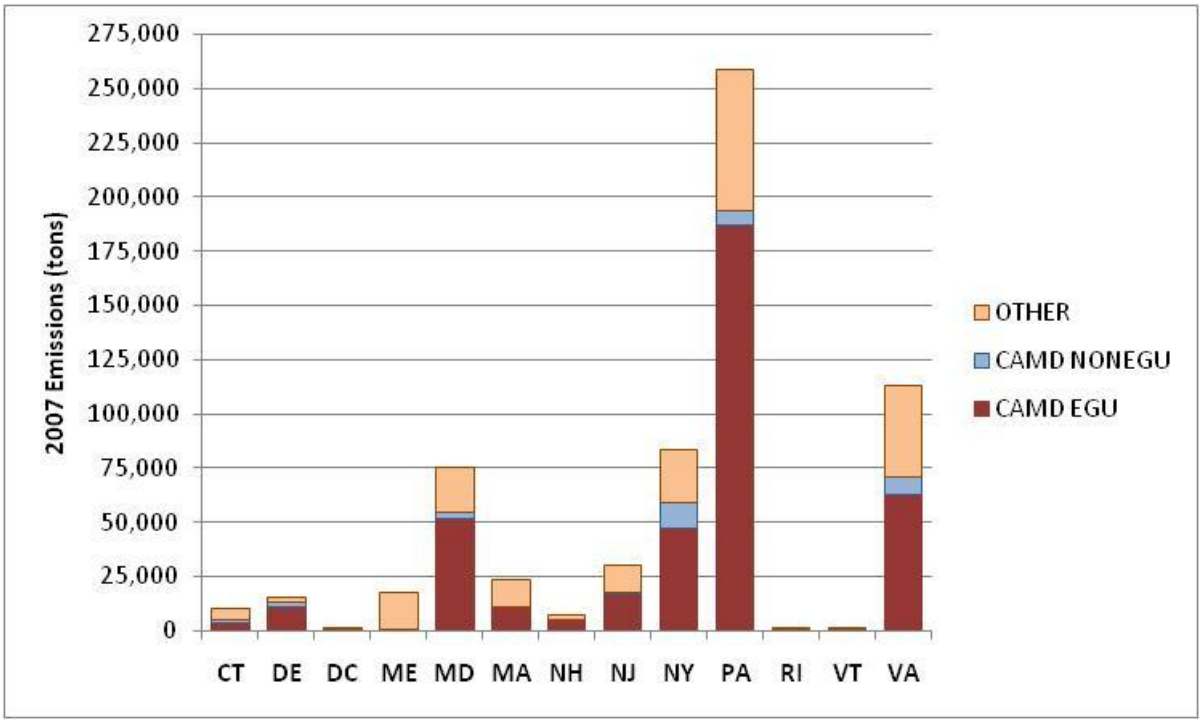


Exhibit 2.13 – 2002 and 2007 Point Source PM10-PRI Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	1,617	1,350	-17%
Delaware	4,217	3,465	-18%
District of Columbia	161	59	-63%
Maine	7,289	4,896	-33%
Maryland	9,046	19,322	114%
Massachusetts	5,852	5,604	-4%
New Hampshire	3,332	1,925	-42%
New Jersey	6,072	7,642	26%
New York	10,392	9,507	-9%
Pennsylvania	40,587	49,745	23%
Rhode Island	300	189	-37%
Vermont	304	146	-52%
Virginia	17,211	19,203	12%
	106,380	**123,053**	**16%**

Exhibit 2.14 – EGU and nonEGU2007 Point Source PM10-PRI Emissions by State

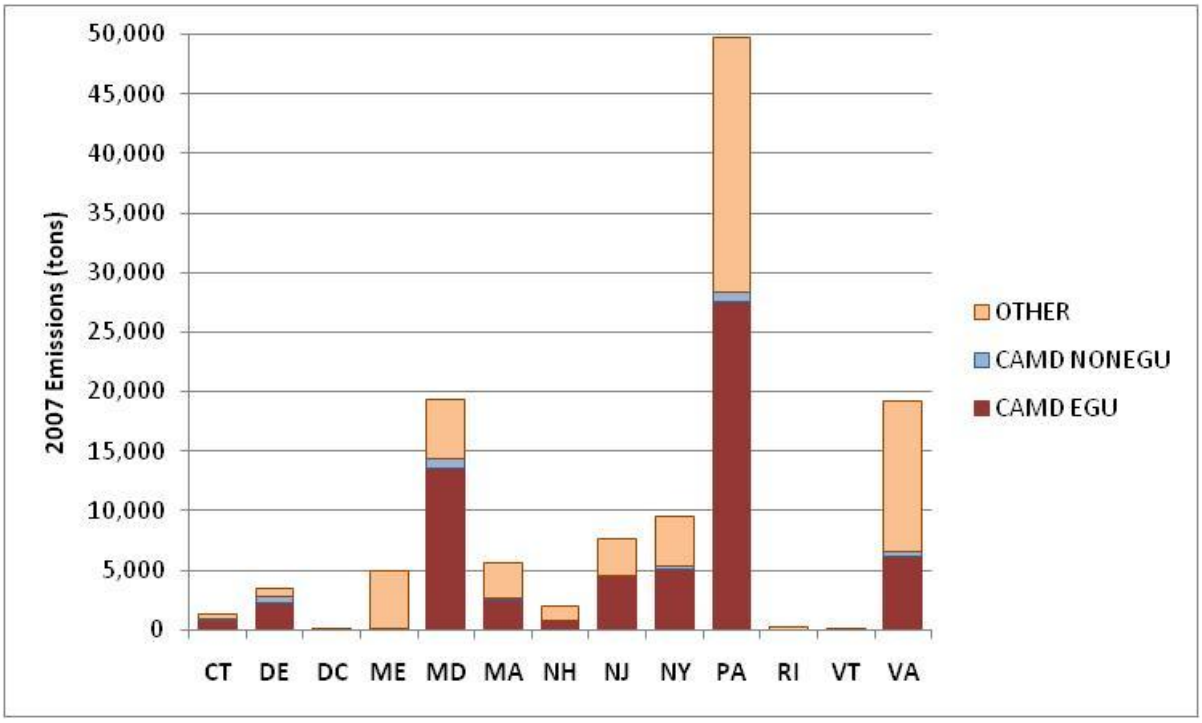


Exhibit 2.15 – 2002 and 2007 Point Source PM25-PRI Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	1,283	1,242	-3%
Delaware	3,666	3,107	-15%
District of Columbia	132	53	-60%
Maine	5,787	3,852	-33%
Maryland	5,054	15,682	210%
Massachusetts	4,161	4,864	17%
New Hampshire	2,938	1,663	-43%
New Jersey	4,779	6,821	43%
New York	7,080	5,999	-15%
Pennsylvania	20,116	32,460	61%
Rhode Island	183	140	-23%
Vermont	267	114	-57%
Virginia	12,771	14,888	17%
	68,217	**90,885**	**33%**

Exhibit 2.16 – EGU and nonEGU 2007 Point Source PM25-PRI Emissions by State

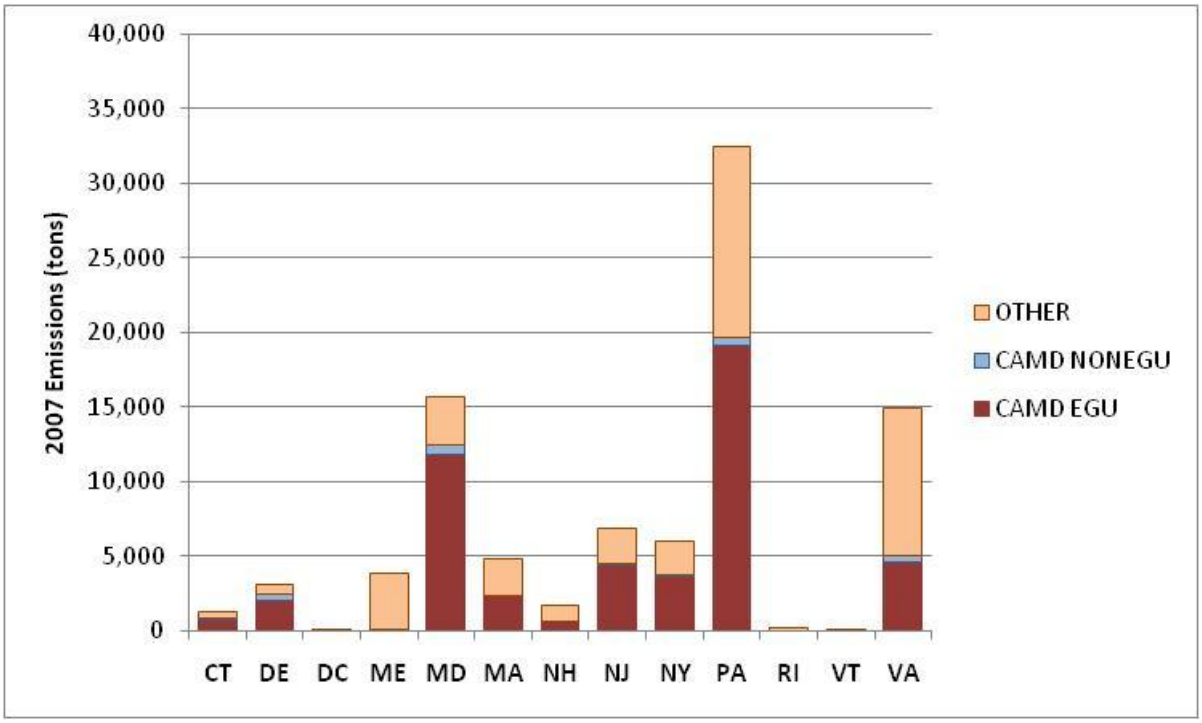


Exhibit 2.17 – 2002 and 2007 Point Source SO2 Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	15,988	7,971	-50%
Delaware	73,744	43,088	-42%
District of Columbia	963	612	-36%
Maine	23,711	17,248	-27%
Maryland	290,929	305,383	5%
Massachusetts	106,960	63,229	-41%
New Hampshire	46,560	45,258	-3%
New Jersey	61,217	40,703	-34%
New York	294,729	152,751	-48%
Pennsylvania	995,175	1,028,056	3%
Rhode Island	2,666	1,516	-43%
Vermont	905	322	-64%
Virginia	305,106	243,048	-20%
	2,218,653	**1,949,185**	**-12%**

Exhibit 2.18 – EGU and nonEGU 2007 Point Source SO2 Emissions by State

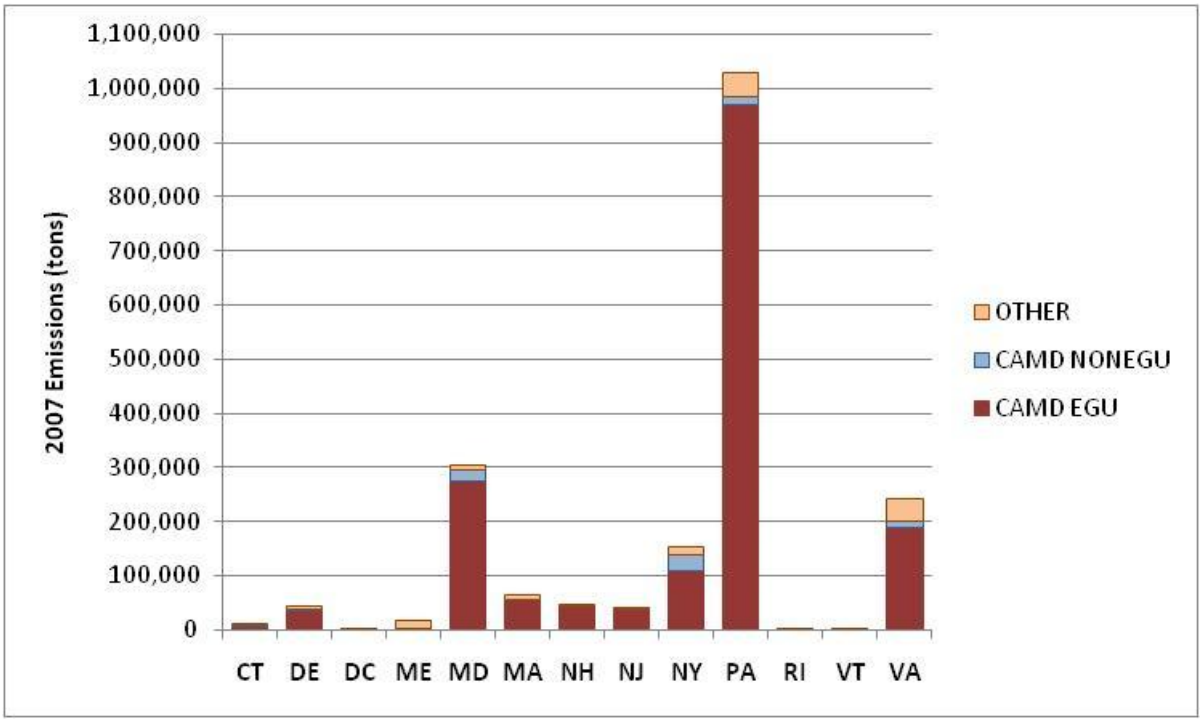
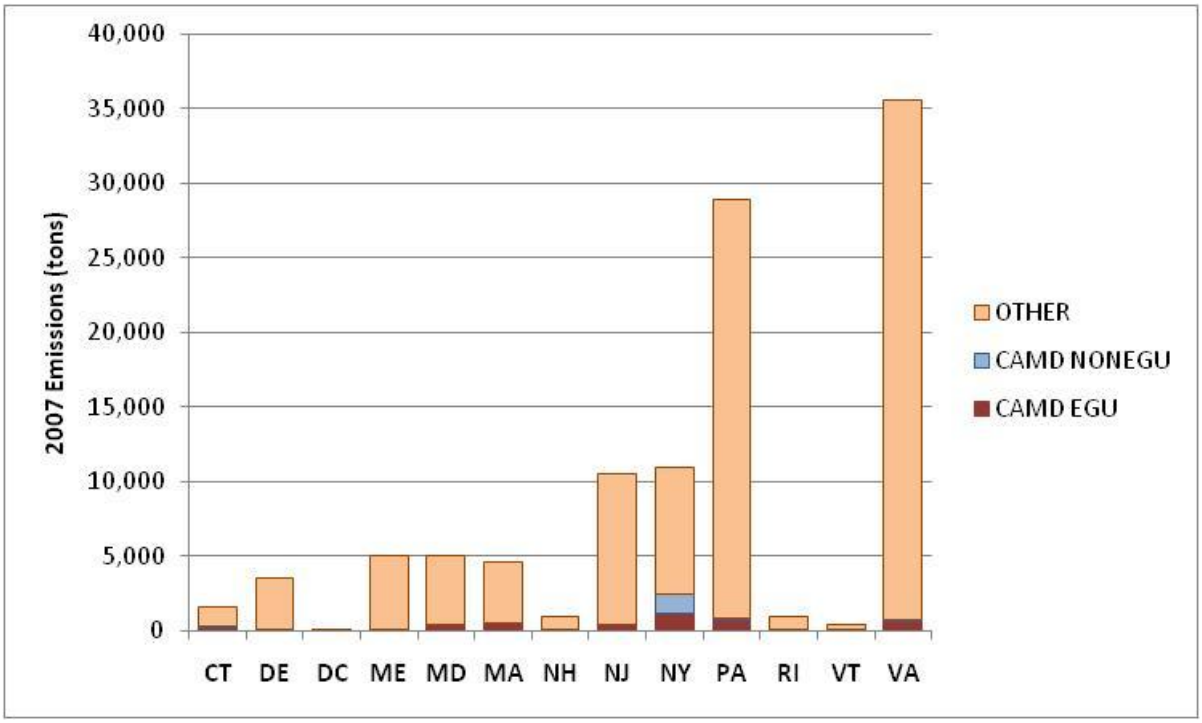


Exhibit 2.19 – 2002 and 2007 Point Source VOC Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	4,907	1,590	-68%
Delaware	4,755	3,489	-27%
District of Columbia	69	59	-14%
Maine	5,319	5,022	-6%
Maryland	6,187	4,986	-19%
Massachusetts	8,350	4,557	-45%
New Hampshire	1,599	916	-43%
New Jersey	16,547	10,526	-36%
New York	11,456	10,891	-5%
Pennsylvania	37,323	28,965	-22%
Rhode Island	1,928	970	-50%
Vermont	1,097	395	-64%
Virginia	43,906	35,618	-19%
	143,443	**107,984**	**-25%**

Exhibit 2.20 – EGU and nonEGU 2007 Point Source VOC Emissions by State



3.0 HOURLY 2007 INVENTORY FOR LARGE POINT SOURCES

The sources included in the hourly inventory include those that report hourly emissions to USEPA's CAMD database as required by market-based regulatory programs including the USEPA Acid Rain and NOx Budget Trading Programs. In Virginia, the hourly inventory also includes distributed generation (DG) units. These Virginia units are mainly internal combustion engines that participate in a demand-response program. The hourly SO2, NOx, and heat input data were used to prepare SMOKE files for modeling that used actual 2007 hourly emissions data.

3.1 DATA SOURCES FOR HOURLY EMISSIONS

The 2007 hourly point source inventory was developed using the 2007 annual emissions inventory developed as discussed in Section 2 of this report, data from the USEPA's CAMD hourly emissions database, hourly emissions data provided by the Virginia Department of Environmental Quality (VDEQ), and hourly emissions data for 6-month reporting units provided by the Maryland Department of the Environment (MDE).

3.1.1 2007 Annual Emission Inventory

As described in Section 2 of this TSD, S/L agencies prepared and submitted emission inventory files in the NIF format. A crosswalk was developed to match facilities and units in the USEPA CAMD hourly database to units in the 2007 Version 1 annual inventory. This process is necessary because the data submitted by the S/L agencies and data submitted by companies to CAMD do not use the same facility or boiler/unit identifiers to identify a particular unit. The crosswalk matched a unit in the NIF annual inventory (using the State, County, PlantID, PointID, StackID and SegmentID) with its counterpart in the USEPA CAMD hourly database (using the ORISID and BoilerID). As previously discussed in Section 2, the final version of the crosswalk is included as Appendix A in this TSD. Complete documentation of the development of the annual inventory and crosswalk table can be found in Section 2 of this report.

3.1.2 EPA CAMD Hourly Database

The second source of data was the hourly emissions data reported to USEPA by facilities to comply with various provisions of the Clean Air Act. Affected facilities are required to report hourly emissions of NOx and SO2, as well as other operational parameters such as hourly emission rate, gross load and heat input. Some units are required to submit hourly emissions data for both NOx and SO2 for the entire 12 month reporting period. Other units are required to submit hourly emissions data only for NOx for the entire 12 month reporting period. Still other units are required to submit hourly emissions data only for

NOx for the 6 month ozone season. Finally, there are a very small number of units that reported hourly emissions for a 9-month period. The USEPA CAMD hourly database is subjected to extensive QA/QC by both USEPA and the reporting facilities.

For this analysis, we used the "Part 75 Prepackaged Data Sets - hourly emissions data formatted for use with the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system". The 2007 hourly data was obtained from the USEPA Clean Air Markets web site (USEPA 2009c).

3.1.3 Virginia Hourly Data for Distributed Generation Units

The third set of data came from VDEQ. Distributed generation units are mainly internal combustion engines that participate in a demand-response program. These are small units, each usually no more than two or three megawatts in capacity, and they generally run on distillate fuel oil. These units are not required to report hourly emissions to USEPA's CAMD. Most are permitted for well below 100 tons of NOx emissions annually and do not run frequently. Annual emissions of NOx are usually not very large from these units. However, ozone season daily emissions estimates from previous ozone SIPs show that facilities that have one or more of these types of units can be quite significant NOx emitters when examined on an ozone season daily basis.

In past modeling efforts, these units were either not included in the emission inventory, or if they were included, were modeled using the SMOKE default temporal profile for the given SCC. To improve the hourly temporal allocation for these units, VADEQ undertook a substantial effort to develop hourly emission profiles using 2007 operations data obtained from utilities for their demand response programs as well as other facility-specific data. These data were used to create a 2007 profile for when these units generally operated. VDEQ used these generic profiles to prepare SMOKE PTHOUR files for each DG unit listed in the annual emissions inventory.

Complete documentation of the data sources and methods used by VDEQ is included as Appendix E - *VDEQ Conceptual Description for DG draft Feb 25, 2010.doc.*

3.1.4 Maryland Hourly Data for Six Month Reporters

The final set of data came from the Maryland Department of the Environment (MDE). MDE filled in the non-ozone season hourly emissions data for certain units that only reported ozone season hourly emissions to USEPA CAMD. MDE identified facilities which reported only 6 months worth of data to CAMD and submitted requests to these facilities for the missing 6 months of data. MDE provided the values in a CAMD-formatted table similar to the Part 75 Prepackaged Data Set format.

3.2 METHODOLOGY FOR DEVELOPING HOURLY SMOKE FILES

SMOKE requires two input files for processing hourly point source emissions:

- PTINV File. This file contains annual emissions data, stack parameters, geographic coordinates, and other information. This file can be in Inventory Data Analyzer (IDA), Emission Modeling System-95 (EMS-95), or one-line-per record (ORL) format. The ORL format from SMOKE Version 2.6 was selected for this project and is shown in Exhibit 3.1.

- PTHOUR File. This file contains the hour-specific data. This file can be in either EMS-95 format or Continuous Emissions Monitoring (CEM) format. The SMOKE Version 2.6 EMS-95 traditional format was selected for this project and is shown in Exhibit 3.2.

The following subsections describe how the PTINV ORL annual emissions file and the PTHOUR EMS-95 hour-specific emission files were created.

3.2.1 Conversion of Annual NIF Inventory to SMOKE ORL Format for PTINV

The 2007 annual inventory was developed in NIF format. Flags were added to the NIF EP table to indicate whether a unit was matched to a CAMD hourly unit or a Virginia DG unit. Matching units in the NIF file were converted to SMOKE PTINV ORL format. To facilitate QA of files and summarization of emissions, six different ORL files were created for the following types of sources:

- Annual emissions for units that reported hourly to USEPA CAMD for the entire 12 months of 2007;
- Ozone season emissions for units that reported to USEPA CAMD for either 6 or 9 months of 2007 (except for 6 month reporting units in Maryland);
- Non-ozone season emissions for units that reported to USEPA CAMD for either 6 or 9 months of 2007 (except for 6 month reporting units in Maryland);
- Units that reported hourly to USEPA CAMD for the either 6 or 9 months of 2007 in Maryland;
- Units that are classified as distributed generation units by VDEQ; and
- All other units (these are not associated with the hourly PTHOUR files); temporal allocation for these units will be accomplished using the standard SMOKE V2.6 temporal allocation profiles.

The ORL files were quality assured to conform to the SMOKE PTINV ORL format and to prevent double counting of emissions.

Exhibit 3.1 – SMOKE ORL Format for PTINV

Position	Name	Type	Description
A	FIPS	Int	Five digit FIPS code for state and county (required)
B	PLANTID	Char	Plant Identification Code (15 characters maximum) (required; this is the same as the State Facility Identifier in the NIF)
C	POINTID	Char	Point Identification Code (15 characters maximum) (required; this is the same as the Emission Unit ID in the NIF)
D	STACKID	Char	Stack Identification Code (15 characters maximum) (recommended; this is the same as the Emissions Release Point ID in the NIF)
E	SEGMENT	Char	DOE Plant ID (15 characters maximum) (recommended; this is the same as the Process ID in the NIF)
F	PLANT	Char	Plant Name (40 characters maximum) (recommended)
G	SCC	Char	Ten character SCC (required)
H	ERPTYPE	Char	Emissions release point type (2 characters maximum); indicates type of stack (not used by SMOKE) • 01 = fugitive • 02 = vertical stack • 03 = horizontal stack • 04 = goose neck • 05 = vertical with rain cap • 06 = downward-facing vent
I	SRCTYPE	Char	Source type (not used)
J	STKHGT	Real	Stack Height (ft) (required)
K	STKDIAM	Real	Stack Diameter (ft) (required)
L	STKTEMP	Real	Stack Gas Exit Temperature (°F) (required)
M	STKFLOW	Real	Stack Gas Flow Rate (ft^3/sec) (optional; automatically calculated by **Smkinven** from velocity and diameter if not given in file)
N	STKVEL	Real	Stack Gas Exit Velocity (ft/sec) (required)
O	SIC	Int	Standard Industrial Classification Code (recommended)
P	MACT	Char	Maximum Available Control Technology Code (6 characters maximum) (optional)
Q	NAICS	Char	North American Industrial Classification System Code (6 characters maximum) (optional)

Position	Name	Type	Description
R	CTYPE	Char	Coordinate system type (1 character maximum) (required) • L = Latitude/longitude
S	XLOC	Real	X location (required); Longitude (decimal degrees)
T	YLOC	Real	Y location (required); Latitude (decimal degrees)
U	UTMZ	Int	UTM zone (not used)
V	CAS	Char	Pollutant CAS number or other code (16 characters maximum) (required; this is called the pollutant code in the NIF)
W	ANN_EMIS	Real	Annual Emissions (tons/year) (required)
X	AVD_EMIS	Real	Average-day Emissions (tons/average day) (not used)
Y	CEFF	Real	Control Efficiency percentage (give value of 0-100) (recommended, if left blank, SMOKE default is 0)
Z	REFF	Real	Rule Effectiveness percentage (give value of 0-100) (recommended, if left blank, SMOKE default is 100)
AA	CPRI	Int	Primary Control Equipment Code (not used by SMOKE)
BB	CSEC	Int	Secondary Control Equipment Code (not used by SMOKE)
CC	NEI_UNIQUE_ID	Char	For units that report hourly emissions to CAMD, this field contains a code to indicate how frequently the unit operated in 2007 (i.e., <15%, 15-50%, or >50% of available hours) For Virginia DG units, this field contains the descriptor “VA DG”. For units that do not have an association in the PTHOUR file, this field contains the descriptor “NonHourly”.
DD	ORIS_FACILITY_CODE	Char	DOE Plant ID (generally recommended, and required if matching to hour-specific CEM data)
EE	ORIS_BOILER_ID	Char	Boiler Identification Code (recommended)

Fields not currently used by SMOKE Version 2.6 after field position EE have been excluded from the ORL file to reduce file size.

Exhibit 3.2 – SMOKE EMS-95 Traditional Format for Individual Hour-Specific Files

Position	Name	Type	Description
1-2	STID	Int	State FIPS Code (required)
3-5	CYID	Int	County FIPS Code (required)
6-20	FCID	Char	Facility ID (a.k.a. plant ID) (required)
21-32	SKID	Char	Point ID (required)
33-44	DVID	Char	Stack ID (required)
45-56	PRID	Char	Segment ID (required)
57-61	POLID	Char	Pollutant name (required)
62-69	DATE	Char	Date in MM/DD/YY format. Years less than 70 are treated as century 2000 (required)
70-72	TZONNAM	Char	Time zone name associated with emissions data. Valid entries are GMT, ADT, AST, EDT, EST, CDT, CST, MDT, MST, PDT, and PST. (required)
73-79	HRVAL1	Real	Hourly emissions for hour 1 (short tons/hour) (required)
80-86	HRVAL2	Real	Hourly emissions for hour 2 (short tons/hour) (required)
87-93	HRVAL3	Real	Hourly emissions for hour 3 (short tons/hour) (required)
...			
234-240	HRVAL24	Real	Hourly emissions for hour 24 (short tons/hour) (required)
241-248	DAYTOT	Real	Daily emissions total (short tons/day)
249	Blank	Blank	Blank
250-259	SCC	Char	SCC (required).
261-276	DATNAM	Char	Blank

3.2.2 PTHOUR Methodology for 12 Month Reporters

For units that reported hourly data to USEPA CAMD for the entire 12 months of 2007, the annual emissions in the PTINV ORL files were allocated to specific hours using the actual NOx, SO2, and heat input-based hour-specific data in the USEPA CAMD database. This ensured that the annual emission values provided by the S/L agencies were maintained and distributed to specific hours using actual 2007 hourly data.

The methodology for creating the PTHOUR files is as follows. First, hourly SO2 and NOx mass and heat input values in the USEPA CAMD database were summed for each unit to

create annual values. Next, annual emission records in the ORL file were matched to a corresponding hourly CAMD unit using the crosswalk file. The hourly values in the PTHOUR file were calculated using the following equations, depending on the pollutant:

Hourly NOx emissions

$$\text{Hourly PTHOUR NOx emissions} = \frac{\text{annual ORL NOx emissions} * \text{hourly CAMD NOx emissions}}{\text{CAMD summed annual NOx emissions}}$$

Hourly SO2 emissions for units with non-zero SO2 emissions in the CAMD database

$$\text{Hourly PTHOUR SO2 emissions} = \frac{\text{annual ORL SO2 emissions} * \text{hourly CAMD SO2 emissions}}{\text{CAMD summed annual SO2 emissions}}$$

Hourly SO2 emissions for units with zero SO2 emissions in the CAMD database

Hourly PTHOUR SO2 emissions = annual ORL SO2 emissions * annual factor

Where annual factor = hourly CAMD heat input / annual summed CAMD heat input

Hourly emissions for other pollutants (CO, NH3, PM10-PRI, PM25-PRI, VOC)

Hourly PTHOUR POLL emissions = annual ORL POLL emissions * annual factor

Where annual factor = hourly CAMD heat input / annual summed CAMD heat input

If CAMD heat input data are not available, the steam load was used instead, if available, followed by gross load as a last resort.

3.2.3 PTHOUR Methodology for 6 Month Reporters

About 15 percent of the units in the 2007 CAMD hourly database only reported data for the ozone season, i.e., the second and third quarters, as allowed by their reporting requirements. These units are referred to as 6-months units in this document. Two separate PTINV ORL files were created – one for the 6-month ozone season and one for the 6-month non-ozone season. The CAMD hourly data for these units were used to develop ozone season PTINV and PTHOUR files. For the non-ozone season, a PTINV file was created and was used with re-adjusted SMOKE temporal profiles to develop hourly emissions for the non-ozone season.

The CAMD hourly database for 6-month units contains NOx emissions, heat input and other parameters for the 6 month period. The CAMD hourly data for April through September was used directly and was summed to calculate the ozone season NOx emissions. To calculate the non-ozone season NOx emissions, total CAMD NOx emissions for a 6-month unit was subtracted from the annual NOx emissions of the corresponding unit in the S/L supplied NIF database. In some cases, the 6-month NOx

emissions in the CAMD database were greater than the annual emissions in the S/L NIF database. For those cases, non-ozone season emissions were set to zero.

Ozone season emissions of other pollutant are not available from the CAMD database. These emissions were estimated based on a ratio of ozone season NOx emissions to annual NOx emissions. This ratio was applied to the annual emissions from the NIF database. To calculate the non-ozone season emissions for the other pollutants, the total ozone season emissions for the 6-month unit was subtracted from the annual emissions reported for that unit in the S/L supplied NIF database. The PTHOUR files for the ozone season were created as follows. First, hourly NOx mass and heat input values in the USEPA CAMD database were summed for each unit to create ozone season values. Next, ozone season emission records in the ORL file were matched to the hourly CAMD unit using the crosswalk file. Hourly emissions were calculated using the following equations:

Hourly NOx emissions

$$\text{Hourly PTHOUR NOx emissions} = \frac{\text{6-month ORL NOx emissions} * \text{hourly CAMD NOx emissions}}{\text{CAMD summed 6-month NOx emissions}}$$

Hourly emissions for other pollutants (CO, NH3, PM10-PRI, PM25-PRI, SO2, VOC)

$$\text{Hourly PTHOUR POLL emissions} = \text{annual ORL POLL emissions} * \text{annual factor}$$

$$\text{Where annual factor} = \text{hourly CAMD heat input} / \text{6-month summed CAMD heat input}$$

If CAMD heat input data are not available, the steam load was used instead, if available, followed by gross load as a last resort.

Hourly data for the non-ozone season was developed using the methodology discussed in Section 3.4 of this TSD.

3.2.4 PTHOUR Methodology for Maryland 6 Month Reporters

MDE identified facilities that only reported 6 months of data to CAMD and requested data from those facilities for the 6 months outside of the ozone season. MDE manually entered hourly values into a CAMD-formatted table similar to the Part 75 Prepackaged Data Set format for the following units.

Plant Name	ORIS	UNITS
Constellation Perryman	1556	CT1, CT2, CT3, CT4
Constellation Riverside	1559	CT6
Constellation Westport	1560	CT5
Mirant Chalk Point	1571	GT2, SMECO
Mirant Morgantown	1573	GT3, GT4, GT5, GT6

The PTHOUR files for the Maryland 6-month reporters were created as described here. First, hourly SO2 and NOx mass and heat input in the MDE hourly database were summed for each unit to create annual totals. Next, annual emission records for all pollutants in the ORL file were matched to the hourly records using the crosswalk file. Hourly emissions in the PTHOUR file were calculated using the following equations, depending on the pollutant:

Hourly NOx emissions

$$\text{Hourly PTHOUR NOx emissions} = \frac{\text{annual ORL NOx emissions} * \text{hourly MDE NOx emissions}}{\text{MDE summed annual NOx emissions}}$$

Hourly SO2 emissions for units with SO2 emissions in the MDE database

$$\text{Hourly PTHOUR SO2 emissions} = \frac{\text{annual ORL SO2 emissions} * \text{hourly MDE SO2 emissions}}{\text{MDE summed annual SO2 emissions}}$$

Hourly SO2 emissions for units without SO2 emissions in the MDE database

Hourly PTHOUR SO2 emissions = annual ORL SO2 emissions * annual factor

Where annual factor = hourly MDE heat input / annual summed MDE heat input

Hourly emissions for other pollutants (CO, NH3, PM10-PRI, PM25-PRI, VOC)

Hourly PTHOUR POLL emissions = annual ORL POLL emissions * annual factor

Where annual factor = hourly MDE heat input / annual summed MDE heat input

If MDE heat input data are not available, the steam load was used instead, if available, followed by gross load as a last resort.

3.2.5 PTHOUR Methodology for Virginia Distributed Generation Units

Complete documentation of the data sources and methods used by VDEQ is included as Appendix E - *VDEQ Conceptual Description for DG draft Feb 25, 2010.doc.*

3.2.6 QA of PTINV and PTHOUR Files

A number of QA activities were undertaken to ensure that the PTINV and PTHOUR files were complete, consistent with the 2007 NIF annual inventory, and did not double count any emission source. Specific QA steps included:

- The ORL annual emission files were quality assured to conform to the SMOKE PTINV ORL format and match the values reported in the original NIF file.
- The PTHOUR files were quality assured to conform to the SMOKE PTHOUR EMS-95 traditional format, the sum of emissions in the PTHOUR file equals the

ORL annual emissions, the number of hourly data records equals 8760, the number of days equals 365, and that all pollutants were included in the PTHOUR file.

These QA checks verified that the original NIF annual values and the annual sum of the hourly values matched.

3.3 DEVELOPMENT OF HOURLY PROFILES FOR 6-MONTH REPORTING UNITS

Since some CAMD units only report data for the ozone season, there was a need for a set of actual 2007 hourly temporal profiles to be used in simulating hourly emissions for these units in non-ozone season months. The following subsections describe the steps taken by Alpine Geophysics in preparing this file.

3.3.1 Annual Profile Preparation

The 2007 hourly CEM data was obtained from CAMD's "Data and Maps" website for each State in the MANE-VU+VA region. Using these data, we filtered the individual source list within each State to only those units reporting each hour of the year (i.e., 8,760 hours of data). This ensured that the resulting profiles are not influenced by units which only report during summertime months for ozone season programs.

For this filtered source list, we summed three variables: total NOx and SO2 mass and heat input as reported in these hourly files at both a State monthly and a State total basis. For each of the three variables, monthly distribution ratios were calculated by dividing each State's monthly sum by their total annual sum as shown in Equation 1 below.

Equation 1. Monthly ratio calculation.

$$\text{Monthly Ratio}_{\text{State, Var}} = \text{Monthly Sum}_{\text{State, Var}} / \text{Annual Sum}_{\text{State, Var}}$$

Where,

Var = CEM-based variable of SO2, NOx or heat input

Exhibit 3.3 provides an example calculation for this step, both in tabular and graphical format.

The resulting ratios were normalized for each variable to provide SMOKE with the monthly distribution factors necessary to process annual emissions into a monthly result. An example monthly profile using the data from Exhibit 3.3 is shown in Exhibit 3.4.

Exhibit 3.3 – Example Application of Calculated Ratios for Actual 2007 by Month

		Actual Reported Value Sums [2007]			Calculated Ratios		
State	**Month**	**SO2 Mass**	**NOx Mass**	**Heat Input**	**SO2**	**NOx**	**Heat Input**
NY	Jan	22,423,391	10,809,292	60,408,685	0.1046	0.0942	0.0809
NY	Feb	29,299,033	12,448,052	67,590,104	0.1366	0.1084	0.0905
NY	Mar	21,364,883	10,327,432	63,106,554	0.0996	0.0900	0.0845
NY	Apr	16,454,881	9,221,500	55,568,488	0.0767	0.0803	0.0744
NY	May	12,855,963	8,198,597	53,421,346	0.0600	0.0714	0.0715
NY	Jun	14,525,239	9,282,277	65,577,304	0.0677	0.0809	0.0878
NY	Jul	16,311,783	10,372,119	74,182,361	0.0761	0.0904	0.0993
NY	Aug	17,757,143	11,156,733	82,322,615	0.0828	0.0972	0.1102
NY	Sep	15,809,719	8,879,373	63,553,452	0.0737	0.0773	0.0851
NY	Oct	15,055,032	7,390,952	55,149,951	0.0702	0.0644	0.0738
NY	Nov	14,471,865	7,561,984	47,280,729	0.0675	0.0659	0.0633
NY	Dec	18,092,057	9,155,587	58,804,999	0.0844	0.0798	0.0787
NY	**Total**	**214,420,988**	**114,803,899**	**746,966,587**	**1.0000**	**1.0000**	**1.0000**

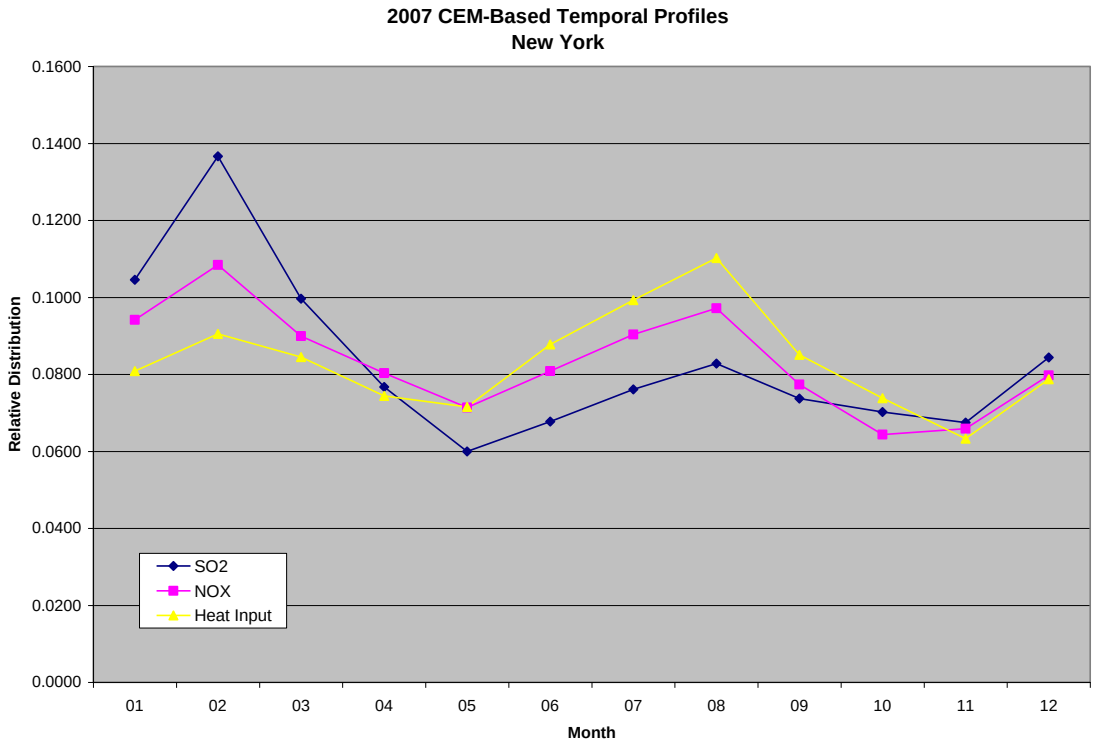


Exhibit 3.4 - Example SMOKE profile for monthly distribution of New York annual emissions using heat input.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Monthly Ratio	0.0809	0.0905	0.0845	0.0744	0.0715	0.0878	0.0993	0.1102	0.0851	0.0738	0.0633	0.0787	1.0000
Monthly Profile	809	905	845	744	716	878	994	1103	851	739	633	788	10005

The profile in the above table can then be associated to the profile cross-reference lookup either by State, State-SCC or some other combination allowing each non-CEM (PTHOUR) reporting unit to have annual emissions allocated. Existing day of week and diurnal profiles from the EPA CHIEF website were used to allocate emissions to finer smaller time periods within each month.

3.3.2 Non-Annual Profile Development

A number of units were identified which require monthly distribution for timeframes outside of the ozone season (when these units are not required to report CEMs). The monthly profiles described in 3.3.1 were modified for use with these units. To account for emissions at these sources not included in prepared hourly (PTHOUR) SMOKE input files, the monthly profiles were zeroed out during the months when hourly CAMD emissions were reported. Concurrently, the TOTAL profile sum was adjusted to accurately reflect the ratio of month to total distribution. An example of this adjustment is shown with highlight in Exhibit 3.5.

Exhibit 3.5 - Example SMOKE profile for adjusted monthly distribution of New York seasonal emissions using heat input.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Monthly Ratio	0.0809	0.0905	0.0845	0.0744	0.0715	0.0878	0.0993	0.1102	0.0851	0.0738	0.0633	0.0787	1.0000
Monthly Profile	809	905	845	744	716	878	994	1103	851	739	633	788	10005
Adjusted Profile	809	905	845	0	0	0	0	0	0	739	633	788	4719

3.3.3 Issue for Consideration

In the USEPA CAMD files only a few CAMD 6-month units reported emissions in April 2007. As a result, the April hourly CAMD data was not used in MARAMA's simulation. Instead, an adjusted profile for five month operation was prepared and used for these sources.

3.4 VERSION 2 - STATE AND STAKEHOLDER REVIEW

On March 15, 2010, MARAMA invited States and stakeholders to review and comment on the draft 2007 hourly inventory of air emissions from point sources. States and stakeholders were provided a 4-week comment period. Written comments were reviewed by the State inventory staff and MARAMA, and resulted in several changes to the draft documentation and inventory data. The changes requested by stakeholders and approved by the States are summarized in the following subsections.

3.4.1 Massachusetts

Massachusetts commented that the majority of the Massachusetts facilities reviewed the CAMD-to-NIF crosswalk and indicated they found no major errors. Some facilities expressed concern that several dual fuel units appeared to have their total NOx emissions doubled, reported separately for both oil and gas. The Contractor reviewed the database and verified that no double counting of emissions occurs. For multiple-fuel units, the Appendix A spreadsheet matches each CAMD record to ALL fuel records in the NIF database, making it appear that the CAMD emissions are counted more than once. MARAMA will use the NIF emissions from State database in regional modeling and the hourly data from the matching CAMD unit to allocate NIF emissions to hourly data for modeling. Emissions will not be double counted for units using multiple fuels.

3.4.2 New York

NRG Energy identified an issue with the hourly emissions for those units in the NIF database when multiple units exhaust from a common stack. In NY's database, multiple units are represented by a single emission unit, whereas in the CAMD database each unit is represented individually. That is why there is a CAMD BLR6ID with no equivalent NIF labels in Appendix A. The Contractor discussed the issue with NRG and devised a solution for the Huntley and Dunkirk Steam Generating Stations by adding emissions units to the NIF tables in cases where there are combined stacks. Annual emissions in the NIF database will be apportioned to each unit based on annual heat input from the USEPA CAMD database. This will allow a proper match to the hourly data for each Unit and

ensure that the proper CAMD hourly emissions were used in developing the PTHOUR files for the units at these two facilities.

New York State also worked to improve the linkages between the NIF annual emissions and the CAMD hourly emissions. Not all cases could be resolved, and New York is continuing to review the data.

3.4.3 Pennsylvania

RRI Energy commented that they agree with the approach for calculating hourly emissions as described in Section 3.3 of this report.

3.4.4 Virginia

Virginia reviewed the data in the hourly files and provided three updates needed for the VA cross reference between NIF and CAMD information. These updates do not affect large emission units, but they were made to make the cross reference as correct as possible, as follows:

- For ORIS CODE 55439, NIF ID 51-065-00021, facility name Tenaska Virginia Generating Station was added to CAMD Boiler ID CTGDB1 with the NIF identifier Stack 1, Point 1, Segment 2. This stack point segment was left out of the cross reference and represents the emissions from the duct burner on this turbine.
- For ORIS CODE 55439, NIF ID 51-065-00021, facility name Tenaska Virginia Generating Station was added to CAMD Boiler ID CTGDB3 with the NIF identifier Stack 3, Point 9, Segment 2. This stack point segment was left out of the cross reference and represents the emissions from the duct burner on this turbine.
- For ORIS CODE 52089, NIF ID 51-071-00062, facility name Duke Energy Generation Services of Narrows was deleted for the NIF identifier Stack 1, Point 1, Segment 3 from CAMD Boiler ID BLR007. This stack point segment represents the emissions from the ash handling system for the boilers, and the emissions would be better represented by generic profiles rather than CAMD profiles.

Virginia also commented that some facilities have empty date stamps (i.e., MM/DD/YY field is listed as “xx/xx/xxEST“ where x is blank space). For example, in 12 month units files, 51-033-00040 and 51-065-00021 combined have either 21 or 39 lines with empty date stamps. Similarly, in 6 month units files, 09-009-6614 (in New Haven, Connecticut) have 6 or 12 lines without date stamps. The Contractor identified errors in the CAMD to NIF crosswalk that caused this situation to occur. Fixing the CAMD to NIF crosswalk resolved all occurrences of this problem.

3.5 VERSION 3 REVISIONS

3.5.1 Massachusetts Stony Brook Energy Center NH3 Emissions

Massachusetts identified errors in the ammonia emissions for 2007 for the Stony Brook Energy Center (25013-0420001) and New Bedford Energy (25005-1200634). Massachusetts provided corrected ammonia emission estimates for these two facilities. This change reduced ammonia emissions in Massachusetts by about 2,300 tons.

New Bedford Energy does not report hourly emissions to CAMD, so no changes to the PTHOUR files were needed for this source.

The Stony Brook Energy Center has three units that are 12-month CAMD reporters and two units that are 5-month CAMD reporters. The PTHOUR monthly files for 5-month and 12-month reporters were revised to provide corrected NH3 emissions for the Stony Brook units.

4.0 ANNUAL 2007 INVENTORY FOR AREA SOURCES

4.1 AREA SOURCE CATEGORIES

Area sources are relatively small sources of air pollutants that are diffused over a wide geographical area. They include sources that individually are insignificant, but in aggregate may comprise significant emissions. Examples are emissions from home heating systems, house painting, consumer products usage, and small industrial or commercial operations that are not permitted as point sources. There are 356 individual area source categories in the MANE-VU+VA inventory, categorized by a 10-digit SCC. Major grouping (categories at the 7-digit SCC) included in the area source inventory are shown in Exhibit 4.1.

The USEPA has develops area source emission estimation methodologies and estimates for the NEI on a three-year cycle, and inventories are available for 2002, 2005, and 2008 (USEPA 2010a).

For many categories, unless specifically instructed otherwise by the States, the Contractor used the most recent data from USEPA. These sources included ammonia emissions from livestock and fertilizers which came from a recent application of the Carnegie Mellon University (CMU) ammonia model to produce 2007 emissions and output from a version of the Residential Wood Combustion (RWC) model developed by USEPA and run with updated 2007 data to produce emission estimates for that source category. In addition, a number of States requested that the Contractor include USEPA data on wildfire emissions developed as part of USEPA's SMARTFIRE system.

In the following sections, we describe the data that was available from USEPA and that was used for categories where States did not submit data. Next we describe the State data submittals that were used to override the USEPA data. We summarize the ultimate source of the area source data that each State decided to use for each source category. Finally, we present a State-level summary of emissions by pollutant.

Exhibit 4.1 – Area Source Category Definitions

7-Digit SCC	7-Digit SCC Description
21-01-001	Stationary Fuel; Electric Utility; Anthracite Coal
21-01-002	Stationary Fuel; Electric Utility; Bituminous/Sub-butuminousSub-butuminous Coal
21-01-004	Stationary Fuel; Electric Utility; Distillate Oil
21-01-005	Stationary Fuel; Electric Utility; Residual Oil
21-01-006	Stationary Fuel; Electric Utility; Natural Gas
21-02-001	Stationary Fuel; Industrial; Anthracite Coal

7-Digit SCC	7-Digit SCC Description
21-02-002	Stationary Fuel; Industrial; Bituminous/Sub-butuminous Coal
21-02-004	Stationary Fuel; Industrial; Distillate Oil
21-02-005	Stationary Fuel; Industrial; Residual Oil
21-02-006	Stationary Fuel; Industrial; Natural Gas
21-02-007	Stationary Fuel; Industrial; Liquified Petroleum Gas (LPG)
21-02-008	Stationary Fuel; Industrial; Wood
21-02-011	Stationary Fuel; Industrial; Kerosene
21-03-001	Stationary Fuel; Commercial/Institutional; Anthracite Coal
21-03-002	Stationary Fuel; Commercial/Institutional; Bituminous/Sub-butuminous Coal
21-03-004	Stationary Fuel; Commercial/Institutional; Distillate Oil
21-03-005	Stationary Fuel; Commercial/Institutional; Residual Oil
21-03-006	Stationary Fuel; Commercial/Institutional; Natural Gas
21-03-007	Stationary Fuel; Commercial/Institutional; Liquified Petroleum Gas (LPG)
21-03-008	Stationary Fuel; Commercial/Institutional; Wood
21-03-011	Stationary Fuel; Commercial/Institutional; Kerosene
21-04-001	Stationary Fuel; Residential; Anthracite Coal
21-04-002	Stationary Fuel; Residential; Bituminous/Sub-butuminous Coal
21-04-004	Stationary Fuel; Residential; Distillate Oil
21-04-006	Stationary Fuel; Residential; Natural Gas
21-04-007	Stationary Fuel; Residential; Liquified Petroleum Gas (LPG)
21-04-008	Stationary Fuel; Residential; Wood
21-04-009	Stationary Fuel; Residential; Firelog
21-04-011	Stationary Fuel; Residential; Kerosene
22-94-000	Mobile Sources; Paved Roads; All Paved Roads
22-96-000	Mobile Sources; Unpaved Roads; All Unpaved Roads
23-01-000	Industrial Processes; Chemical Manufacturing: SIC 28; All Processes
23-01-030	Industrial Processes; Chemical Manufacturing: SIC 28; Process Emissions from Pharmaceutical
23-02-002	Industrial Processes; Food and Kindred Products: SIC 20; Commercial Cooking – Charbroiling
23-02-003	Industrial Processes; Food and Kindred Products: SIC 20; Commercial Cooking – Frying
23-02-040	Industrial Processes; Food and Kindred Products: SIC 20; Grain Mill Products
23-02-050	Industrial Processes; Food and Kindred Products: SIC 20; Bakery Products
23-02-070	Industrial Processes; Food and Kindred Products: SIC 20; Fermentation/Beverages
23-02-080	Industrial Processes; Food and Kindred Products: SIC 20; Miscellaneous Food and Kindred Prods
23-07-030	Industrial Processes; Wood Products: SIC 24; Millwork, Plywood, and Structural Members
23-07-060	Industrial Processes; Wood Products: SIC 24; Miscellaneous Wood Products
23-08-000	Industrial Processes; Rubber/Plastics: SIC 30; All Processes
23-09-100	Industrial Processes; Fabricated Metals: SIC 34; Coating, Engraving, and Allied Services
23-11-010	Industrial Processes; Construction: SIC 15 - 17; Residential
23-11-020	Industrial Processes; Construction: SIC 15 - 17; Industrial/Commercial/Institutional
23-11-030	Industrial Processes; Construction: SIC 15 - 17; Road Construction
23-25-000	Industrial Processes; Mining and Quarrying: SIC 14; All Processes
23-25-020	Industrial Processes; Mining and Quarrying: SIC 14; Crushed and Broken Stone

7-Digit SCC	7-Digit SCC Description
23-25-030	Industrial Processes; Mining and Quarrying: SIC 14; Sand and Gravel
23-90-008	Industrial Processes; In-process Fuel Use; Wood
23-99-000	Industrial Processes; Industrial Processes: NEC; Industrial Processes: NEC
23-99-010	Industrial Processes; Industrial Refrigeration; Refrigerant Losses
24-01-001	Solvent Utilization; Surface Coating; Architectural Coatings
24-01-002	Solvent Utilization; Surface Coating; Architectural Coatings - Solvent-based
24-01-003	Solvent Utilization; Surface Coating; Architectural Coatings - Water-based
24-01-005	Solvent Utilization; Surface Coating; Auto Refinishing: SIC 7532
24-01-008	Solvent Utilization; Surface Coating; Traffic Markings
24-01-015	Solvent Utilization; Surface Coating; Factory Finished Wood: SIC 2426 thru 242
24-01-020	Solvent Utilization; Surface Coating; Wood Furniture: SIC 25
24-01-025	Solvent Utilization; Surface Coating; Metal Furniture: SIC 25
24-01-030	Solvent Utilization; Surface Coating; Paper: SIC 26
24-01-040	Solvent Utilization; Surface Coating; Metal Cans: SIC 341
24-01-045	Solvent Utilization; Surface Coating; Metal Coils: SIC 3498
24-01-050	Solvent Utilization; Surface Coating; Miscellaneous Finished Metals: SIC 34 - (341 + 3498)
24-01-055	Solvent Utilization; Surface Coating; Machinery and Equipment: SIC 35
24-01-060	Solvent Utilization; Surface Coating; Large Appliances: SIC 363
24-01-065	Solvent Utilization; Surface Coating; Electronic and Other Electrical: SIC 36 - 363
24-01-070	Solvent Utilization; Surface Coating; Motor Vehicles: SIC 371
24-01-075	Solvent Utilization; Surface Coating; Aircraft: SIC 372
24-01-080	Solvent Utilization; Surface Coating; Marine: SIC 373
24-01-085	Solvent Utilization; Surface Coating; Railroad: SIC 374
24-01-090	Solvent Utilization; Surface Coating; Miscellaneous Manufacturing
24-01-100	Solvent Utilization; Surface Coating; Industrial Maintenance Coatings
24-01-102	Solvent Utilization; Surface Coating; Industrial Maintenance Coatings
24-01-103	Solvent Utilization; Surface Coating; Industrial Maintenance Coatings
24-01-200	Solvent Utilization; Surface Coating; Other Special Purpose Coatings
24-01-990	Solvent Utilization; Surface Coating; All Surface Coating Categories
24-15-000	Solvent Utilization; Degreasing; All Processes/All Industries
24-15-005	Solvent Utilization; Degreasing; Furniture and Fixtures (SIC 25): All Processes
24-15-010	Solvent Utilization; Degreasing; Primary Metal Industries (SIC 33): All Processes
24-15-020	Solvent Utilization; Degreasing; Fabricated Metal Products (SIC 34): All Processes
24-15-025	Solvent Utilization; Degreasing; Industrial Machinery and Equipment (SIC 35): All Processes
24-15-030	Solvent Utilization; Degreasing; Electronic and Other Elec. (SIC 36): All Processes
24-15-035	Solvent Utilization; Degreasing; Transportation Equipment (SIC 37): All Processes
24-15-040	Solvent Utilization; Degreasing; Instruments and Related Products (SIC 38): All Processes
24-15-045	Solvent Utilization; Degreasing; Miscellaneous Manufacturing (SIC 39): All Processes
24-15-050	Solvent Utilization; Degreasing; Transportation Maintenance Facilities (SIC 40-45): All Processes
24-15-055	Solvent Utilization; Degreasing; Automotive Dealers (SIC 55): All Processes
24-15-060	Solvent Utilization; Degreasing; Miscellaneous Repair Services (SIC 76): All Processes
24-15-065	Solvent Utilization; Degreasing; Auto Repair Services (SIC 75): All Processes

7-Digit SCC	7-Digit SCC Description
24-15-100	Solvent Utilization; Degreasing; All Industries: Open Top Degreasing
24-15-130	Solvent Utilization; Degreasing; Electronic and Other Elec. (SIC 36): Open Top Degreasing
24-15-200	Solvent Utilization; Degreasing; All Industries: Conveyerized Degreasing
24-15-230	Solvent Utilization; Degreasing; Electronic and Other Elec. (SIC 36): Conveyerized Degreasing
24-15-300	Solvent Utilization; Degreasing; All Industries: Cold Cleaning
24-15-360	Solvent Utilization; Degreasing; Auto Repair Services (SIC 75): Cold Cleaning
24-20-000	Solvent Utilization; Dry Cleaning; All Processes
24-20-010	Solvent Utilization; Dry Cleaning; Commercial/Industrial Cleaners
24-25-000	Solvent Utilization; Graphic Arts; All Processes
24-25-010	Solvent Utilization; Graphic Arts; Lithography
24-25-020	Solvent Utilization; Graphic Arts; Letterpress
24-25-030	Solvent Utilization; Graphic Arts; Rotogravure
24-25-040	Solvent Utilization; Graphic Arts; Flexography
24-30-000	Solvent Utilization; Rubber/Plastics; All Processes
24-40-000	Solvent Utilization; Misc. Industrial; All Processes
24-40-020	Solvent Utilization; Misc. Industrial; Adhesive (Industrial) Application
24-60-000	Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; All Processes
24-60-100	Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; All Personal Care Products
24-60-200	Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; All Household Products
24-60-400	Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; All Automotive Aftermarket
24-60-500	Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; All Coatings and Related
24-60-600	Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; All Adhesives and Sealants
24-60-800	Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; All FIFRA Related Products
24-60-900	Solvent Utilization; Misc. Non-industrial: Consumer and Commercial; Miscellaneous Products
24-61-020	Solvent Utilization; Misc. Non-industrial: Commercial; Asphalt Application: All Processes
24-61-021	Solvent Utilization; Misc. Non-industrial: Commercial; Cutback Asphalt
24-61-022	Solvent Utilization; Misc. Non-industrial: Commercial; Emulsified Asphalt
24-61-023	Solvent Utilization; Misc. Non-industrial: Commercial; Asphalt Roofing
24-61-200	Solvent Utilization; Misc. Non-industrial: Commercial; Adhesives and Sealants
24-61-800	Solvent Utilization; Misc. Non-industrial: Commercial; Pesticide Application: All Processes
24-61-850	Solvent Utilization; Misc. Non-industrial: Commercial; Pesticide Application: Agricultural
24-61-870	Solvent Utilization; Misc. Non-industrial: Commercial; Pesticide Application: Non-Agricultural
24-65-000	Solvent Utilization; Misc. Non-industrial: Consumer; All Products/Processes
24-65-800	Solvent Utilization; Misc. Non-industrial: Consumer; Pesticide Application
25-01-011	Storage and Transport; Petroleum and Petroleum Product Storage; Residential PFCs
25-01-012	Storage and Transport; Petroleum and Petroleum Product Storage; Commercial PFCs
25-01-030	Storage and Transport; Petroleum and Petroleum Product Storage;
25-01-050	Storage and Transport; Petroleum and Petroleum Product Storage; Bulk Terminals
25-01-055	Storage and Transport; Petroleum and Petroleum Product Storage; Bulk Plants
25-01-060	Storage and Transport; Petroleum and Petroleum Product Storage; Gasoline Service Stations
25-01-080	Storage and Transport; Petroleum and Petroleum Product Storage; Airports : Aviation Gasoline
25-01-090	Storage and Transport; Petroleum and Petroleum Product Storage;

7-Digit SCC	7-Digit SCC Description
25-01-995	Storage and Transport; Petroleum and Petroleum Product Storage; All Storage Types
25-05-020	Storage and Transport; Petroleum and Petroleum Product Transport; Marine Vessel
25-05-030	Storage and Transport; Petroleum and Petroleum Product Transport; Truck
25-05-040	Storage and Transport; Petroleum and Petroleum Product Transport; Pipeline
25-30-010	Storage and Transport; Bulk Materials Storage; Commercial/Industrial
26-01-000	Waste Disposal; On-site Incineration; All Categories
26-01-010	Waste Disposal; On-site Incineration; Industrial
26-01-020	Waste Disposal; On-site Incineration; Commercial/Institutional
26-01-030	Waste Disposal; On-site Incineration; Residential
26-10-000	Waste Disposal; Open Burning; All Categories
26-10-030	Waste Disposal; Open Burning; Residential
26-10-040	Waste Disposal; Open Burning; Municipal (collected from residences, parks,other for central burn)
26-20-000	Waste Disposal; Landfills; All Categories
26-20-030	Waste Disposal; Landfills; Municipal
26-30-010	Waste Disposal; Wastewater Treatment; Industrial
26-30-020	Waste Disposal; Wastewater Treatment; Public Owned
26-30-050	Waste Disposal; Wastewater Treatment; Public Owned
26-40-000	Waste Disposal; TSDFs; All TSDF Types
26-60-000	Waste Disposal; Leaking Underground Storage Tanks; Leaking Underground Storage Tanks
26-80-001	Waste Disposal; Composting; 100% Biosolids (e.g., sewage sludge, manure, mixtures)
26-80-002	Waste Disposal; Composting; Mixed Waste (e.g., a 50:50 mixture of biosolids and green wastes)
28-01-000	Misc. Area Sources; Agriculture Production - Crops; Agriculture – Crops
28-01-001	Misc. Area Sources; Agriculture Production - Crops;
28-01-002	Misc. Area Sources; Agriculture Production - Crops;
28-01-500	Misc. Area Sources; Agriculture Production - Crops; Agricultural Field Burning - whole field
28-01-700	Misc. Area Sources; Agriculture Production - Crops; Fertilizer Application
28-05-001	Misc. Area Sources; Agriculture Production - Livestock; Beef cattle - finishing / dry-lots
28-05-002	Misc. Area Sources; Agriculture Production - Livestock; Beef cattle production composite
28-05-003	Misc. Area Sources; Agriculture Production - Livestock; Beef cattle - finishing / pasture/range
28-05-007	Misc. Area Sources; Agriculture Production - Livestock; Poultry production - layers with dry mgmt
28-05-008	Misc. Area Sources; Agriculture Production - Livestock; Poultry production - layers with wet mgmt
28-05-009	Misc. Area Sources; Agriculture Production - Livestock; Poultry production – broilers
28-05-010	Misc. Area Sources; Agriculture Production - Livestock; Poultry production – turkeys
28-05-018	Misc. Area Sources; Agriculture Production - Livestock; Dairy cattle composite
28-05-019	Misc. Area Sources; Agriculture Production - Livestock; Dairy cattle - flush dairy
28-05-020	Misc. Area Sources; Agriculture Production - Livestock; Cattle and Calves Waste Emissions
28-05-021	Misc. Area Sources; Agriculture Production - Livestock; Dairy cattle - scrape dairy
28-05-022	Misc. Area Sources; Agriculture Production - Livestock; Dairy cattle - deep pit dairy
28-05-023	Misc. Area Sources; Agriculture Production - Livestock; Dairy cattle - dry-lot/pasture dairy
28-05-024	Misc. Area Sources; Agriculture Production - Livestock;
28-05-025	Misc. Area Sources; Agriculture Production - Livestock; Swine production composite
28-05-026	Misc. Area Sources; Agriculture Production - Livestock;

7-Digit SCC	7-Digit SCC Description
28-05-027	Misc. Area Sources; Agriculture Production - Livestock;
28-05-028	Misc. Area Sources; Agriculture Production - Livestock;
28-05-030	Misc. Area Sources; Agriculture Production - Livestock; Poultry Waste Emissions
28-05-035	Misc. Area Sources; Agriculture Production - Livestock; Horses and Ponies Waste Emissions
28-05-039	Misc. Area Sources; Agriculture Production - Livestock; Swine production - ops with lagoons
28-05-040	Misc. Area Sources; Agriculture Production - Livestock; Sheep and Lambs Waste Emissions
28-05-045	Misc. Area Sources; Agriculture Production - Livestock; Goats Waste Emissions
28-05-047	Misc. Area Sources; Agriculture Production - Livestock; Swine production - deep-pit house
28-05-053	Misc. Area Sources; Agriculture Production - Livestock; Swine production - outdoor
28-06-010	Misc. Area Sources; Domestic Animals Waste Emissions; Cats
28-06-015	Misc. Area Sources; Domestic Animals Waste Emissions; Dogs
28-07-020	Misc. Area Sources; Wild Animals Waste Emissions; Bears
28-07-025	Misc. Area Sources; Wild Animals Waste Emissions; Elk
28-07-030	Misc. Area Sources; Wild Animals Waste Emissions; Deer
28-07-040	Misc. Area Sources; Wild Animals Waste Emissions; Birds
28-10-001	Misc. Area Sources; Other Combustion; Forest Wildfires
28-10-003	Misc. Area Sources; Other Combustion; Cigarette Smoke
28-10-005	Misc. Area Sources; Other Combustion; Managed Burning, Slash (Logging Debris)
28-10-010	Misc. Area Sources; Other Combustion; Human Perspiration and Respiration
28-10-014	Misc. Area Sources; Other Combustion; Prescribed Burning
28-10-015	Misc. Area Sources; Other Combustion; Prescribed Forest Burning
28-10-020	Misc. Area Sources; Other Combustion; Prescribed Rangeland Burning
28-10-025	Misc. Area Sources; Other Combustion; Charcoal Grilling - Residential
28-10-030	Misc. Area Sources; Other Combustion; Structure Fires
28-10-035	Misc. Area Sources; Other Combustion; Firefighting Training
28-10-050	Misc. Area Sources; Other Combustion; Motor Vehicle Fires
28-10-060	Misc. Area Sources; Other Combustion; Cremation
28-10-090	Misc. Area Sources; Other Combustion; Open Fire
28-30-000	Misc. Area Sources; Catastrophic/Accidental Releases; All Catastrophic/Accidental Releases
28-30-010	Misc. Area Sources; Catastrophic/Accidental Releases; Transportation Accidents
28-70-000	Misc. Area Sources; ;

4.2 USEPA AREA SOURCE DATA

USEPA emissions inventories and emission estimation tools were used to create a preliminary version of the 2007 area source inventory. States reviewed the data available from USEPA and made a determination on a category by category basis of whether the USEPA data was acceptable for their State. This section describes the data and tools available from USEPA.

4.2.1 USEPA 2008 National Emission Inventory

Prior to preparation of the 2008 inventory, USEPA, in consultation with ERTAC, revised the recommended emission factors and estimation methods for many area source categories, as listed below. The goal was to provide standardized emission calculations and related documentation across states. These were used by USEPA's contractor to develop 2008 emission estimates for fifteen area source categories to support development of the 2008 National Emission Inventory (NEI). In general, county-level criteria and HAP pollutant emissions were estimated at the SCC level. In most cases, activity data was collected for 2008. In cases where 2008 activity data did not exist, data from the most recent year available was used, as reported in the documentation.

- Agriculture Production - Livestock
- Asphalt Paving
- Aviation Gasoline Distribution
- Commercial Cooking
- Construction Dust
- Commercial/Institutional Fuel Combustion
- Fertilizer Application
- Gasoline Distribution
- Industrial Fuel Combustion
- Open Burning
- Road Dust
- Publicly Owned Treatment Works (POTW)
- Residential Heating
- Solvent Usage - Surface Coatings
- Solvent Usage - Other

The emission factors from the ERTAC process and the resulting 2008 emissions developed by USEPA were available for State use in this 2007 inventory development process (USEPA 2010a).

4.2.2 EPA Residential Wood Combustion (RWC) Tool

EPA worked with a group of State, local, and regional planning organization representatives to develop a new methodology for estimating RWC emissions (USEPA 2010b). USEPA developed a Microsoft Access Tool to allow S/L agencies to calculate annual emissions from RWC sources. The new methodology: 1) accounts for appliances not included in the old methodology (e.g., outdoor hydronic heaters); 2) makes the methodology easier for States to input location-specific knowledge; and 3) updates many of the assumptions made to calculate emissions (for example, the percent conventional versus USEPA certified wood stoves).

EPA updated the RWC tool with 2007 population data and provided it to States to review the input parameters, including county populations, appliance profiles, burn rates, density of cordwood by county, appliance populations, and emission factors by SCC. The only changes that were made to the model itself were for Vermont, which provided updated burn rates and other appliance populations. The Contractor reran the revised 2007 RWC tool for all states. The results of this run are included in the inventory with the exception of New Jersey. New Jersey revised certain model inputs, re-ran the RWC tool on their own, and provided the Contractor with the resulting NIF files.

4.2.3 EPA CMU Agricultural Ammonia Model

In preparation for the 2008 NEI, USEPA used the Carnegie Mellon University (CMU) Ammonia Model to generate an ammonia emission inventory for the continental United States based on 2007 activity levels. No significant change was made to the emission factors in the model. The primary sources of ammonia are two agricultural operations:

- Livestock refers to domesticated animals intentionally reared for the production of food, fiber, or other goods or for the use of their labor. The definition of livestock in this category includes beef cattle, dairy cattle, ducks, geese, goats, horses, poultry, sheep, and swine.
- Fertilizer refers to any nitrogen-based compound, or mixture containing such a compound, that is applied to land to improve plant fitness.

The Contractor obtained from USEPA a recent run of the CMU model for 2007 and provided it to the States for their review (USEPA 2010c). The USEPA data provided to MARAMA included emissions for livestock and fertilizer application. The CMU model is also capable of estimating ammonia emissions from non-domestic animals (deer, bear, etc.) and domesticated pets (dogs and cats) as well as other things such as human perspiration. However, none of these sources were included in the runs of the CMU model that EPA provided to MARAMA. Thus, unless a State supplied emission estimates for those categories, they were not included in the 2007 inventory.

4.2.4 EPA SMARTFIRE Emissions Database

SMARTFIRE is an algorithm and database system developed and built within a geographic information system (GIS) framework that combines multiple sources of fire information and reconciles them into a unified data set (SONOMA 2009). SMARTFIRE data sources include satellite fire detects and ground reports of fire incidents for various wild land management agencies. SMARTFIRE was developed by the USDA Forest Service AirFire Team and Sonoma Technology, Inc. under a grant from NASA.

SMARTFIRE interfaces with the BlueSky framework to estimate daily, location-specific fire emissions.

The Contractor obtained from USEPA a file of 2007 annual, county-level emissions data for wild land fires as calculated using the SMARTFIRE methodology. The Contractor provided the inventory and documentation to States for their review and consideration.

4.3 STATE-SPECIFIC DATA

States reviewed the documentation and resulting emission files for each USEPA estimation methodology. Each State made a decision of whether to accept the USEPA inventory (NEI 2008, RWC tool results, CMU ammonia model results, SMARTFIRE results) or to develop their own emission estimates for these categories. Based on state choices, the Contractor initiated collection of the State supplied data. Generally states provided their data in NIF3.0 format; however some data was provided in spreadsheets in a State-specific format or in the new EIS Emissions format. Where necessary, data was converted to NIF format, filling in as many NIF fields as possible with state-supplied data.

State submitted emission files were augmented using USEPA data as directed by the States. Where 2008 NEI data were used to fill missing categories in the 2007 MANE VU+VA inventory, no growth adjustment was made to the emissions. This is because States felt that activity in 2008 to 2007 was similar due to the economic downturn.

The emissions data is housed in NOF formatted files, which provide additional fields at the end of each table to identify the data source and revision date. Those data elements provide a the data lineage for each source category, thus improving the overall inventory quality assurance (QA). The values in the DATA_SOURCE field in the EM table are shown in Exhibit 4.2. Exhibit 4.3 summarizes the data sources used for each MARAMA State and major source category.

Exhibit 4.2 – Values Contained in the DATA_SOURCE Field of the EM Table

EM Table DATA-SOURCE Value	Description of Data Source
2005NEIv2	All of the records are for CT, which used this value in their submittal to the Contractor – data taken directly by CT from the 2005 NEI version 2
2008NEI	Emissions based on USEPA's 2008 NEI using the USEPA data and methodologies described in Section 4.2.1 of this TSD
EPA	Emissions based on USEPA's 2008 NEI using the USEPA data and methodologies described in Section 4.2.1 of this TSD
EPA NEI05	Emissions based on USEPA's 2005 NEI as a gap-filling measure where 2007 data were not available from State or USEPA
EPA RWC Mo	Emissions based on USEPA's Residential Wood Combustion model
EPA/Ratio	PM emissions were generated using USEPA-supplied emission values and ratios of condensable to PM-PRI or other ratios as necessary to complete the PM spectrum of pollutants
EPA-CMU	Emissions based on USEPA's 2007 run of the CMU ammonia model
MARAMA02BY	Emissions based on MARAMA's 2002 Version 3 area source inventory as a gap-filling measure where 2007 data were not available from the State or USEPA
MARAMA2009	Emissions based on MARAMA's 2009 Version 3 area source inventory as a gap-filling measure where 2007 data not available from State or USEPA
MOVES	Vehicle refueling emissions calculated by NESCAUM using the MOVES model in the inventory mode
NEI0508INT	Emissions were linearly interpolated for 2007 based on values in the 2005 NEI and the 2008 NEI
NEI08CTMOD	All of the records are for CT, which used this value in their submittal to the Contractor – these records were based on the 2008 NEI data modified by CT air quality staff
SEMAP07	Emissions for Virginia are based on SEMAPs 2007 area source inventory
State MOVES	Vehicle refueling emissions calculated by the state using the MOVES model in the inventory mode
State RWC	Emissions for New Jersey based on NJ-specific application of USEPA's Residential Wood Combustion model
State	Emissions were provided directly by the State and represent actual 2007 emissions
StateRatio	PM emissions were generated using State-supplied emission values and ratios of condensable to PM-PRI or other ratios as necessary to complete the PM spectrum of pollutants

Exhibit 4.3 – Data Sources Generally Used by Each State for Each Area Source Category

SCC4 Description	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT	VA
2101 Fuel Comb. / Utility	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	State	n/a	n/a	n/a	n/a
2102 Fuel Comb. / Industrial	State	State	State	n/a	n/a	State	State	State	State	State	State	State	State
2103 Fuel Comb. / Commercial	State	State	State	State	State	State	State	State	State	State	State	State	State
2104 Residential Other Fuels	State	State	State	State	State	State	State	State	State	State	EPA	State / USEPA	State
2104 Residential Wood Comb.	EPA RWC	State	EPA RWC	State	State	EPA RWC	State	State RWC	State	State	EPA RWC	EPA RWC	EPA RWC
2294 Paved Road Dust	State	State	State	State	State	State	State	State	State	State	State	State	State
2296 Unpaved Road Dust	EPA	n/a	State	State	State	EPA	EPA	State	EPA	EPA	EPA	State	EPA
2302 Food & Kindred Products	EPA	State	State	State	State	State	EPA	State	State	State	EPA	EPA	State / USEPA
2311 Construction	EPA	State	State	State	State	n/a	State / USEPA	State	EPA	EPA	EPA	EPA	EPA
2325 Mining & Quarrying	State	n/a	n/a	State	n/a	EPA NEI05	EPA NEI05	State	MARAMA 09	EPA NEI05	n/a	EPA NEI05	State
2399 Industrial Refrigeration	State	n/a	n/a	n/a	n/a	n/a	n/a	State	n/a	n/a	n/a	n/a	n/a
2401 Surface Coating	EPA	State	State	State	State	State	State	State	State	State	EPA	EPA	State
2415 Degreasing	EPA	State	State	State	State	State	State	State	State	State	EPA	EPA	State
2420 Dry Cleaning	EPA	State	State	n/a	State	State	EPA	State	n/a	State	EPA	EPA	State
2425 Graphic Arts	EPA	State	State	State	State	State	State	State	State	State	EPA	EPA	State

SCC4 Description	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT	VA
2440 Industrial Adhesives	2005NEI	State	n/a	State	State	State	n/a	State	MARAMA 09	n/a	n/a	n/a	n/a
2460 Consumer/Comm Products	EPA	State	State	State	State	State	State	State	n/a	State	EPA	EPA	State
2461 Road Asphalt	2005NEI	State	State	State	State	State	State	State	State	State	State	EPA	State
2465 Consumer Products	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	State	n/a	n/a	n/a	n/a
2501 Portable Fuel Containers	NEI0508 INT	State	State	n/a	State	EPA	EPA	State	State	State	State	EPA	EPA
2501 Gas Stations Stage 1	2008NEI	State	State	State	State	State	State	State	EPA	State	State	State	State
2501 Gas Stations Stage 2	MOVES	MOVES	MOVES	MOVES	MOVES	MOVES	MOVES	MOVES	State MOVES	State MOVES	MOVES	MOVES	State MOVES
2501 Aviation Gas Stage 1/2	EPA	State	State	State	State	State	n/a	State	n/a	n/a	EPA	State	EPA
2505 Tank Truck Transport	2008NEI	State	State	State	State	State	n/a	State	EPA	State	State	State	State
2610 Open Burning	EPA	State	State	State	State	EPA	State	State	EPA	State / USEPA	EPA	EPA	EPA
2620 Landfills	State	State	n/a	State	State	State	State	State	State	n/a	n/a	n/a	n/a
2630 Wastewater Treatment	EPA	State	State	State	State	State	State	State	State	State	EPA	EPA	EPA
2660 Leaking Underground Tanks	State	State	n/a	State	State	State	State	State	n/a	n/a	n/a	n/a	State
2680 Composting	State	n/a	n/a	State	n/a	n/a	State	State	n/a	n/a	n/a	n/a	n/a
2801 Agriculture Tilling	State	State	n/a	State	State	State	State	State	n/a	EPA NEI05	EPA NEI05	State	State

SCC4 Description	CT	DE	DC	ME	MD	MA	NH	NJ	NY	PA	RI	VT	VA
2801 Agriculture Field Burning	n/a	n/a	n/a	State	n/a	n/a	n/a	State	n/a	n/a	n/a	n/a	n/a
2801 Agriculture Fertilizer	EPA CMU	State	n/a	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU
2805 Agriculture Livestock	EPA CMU	State	n/a	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU	EPA CMU
2810 Forest Wildfires	n/a	State	n/a	State	State	State	n/a	State	State	EPA	n/a	State	SEMAP 07
2810 Prescribed Fires	n/a	State	State	State	State	n/a	n/a	State	State	n/a	n/a	n/a	SEMAP 07
2810 Structure Fires	State	State	State	State	State	State	State	State	State	n/a	n/a	State	State

Note: this table provides a general indication of the data source used for each major source category. Refer to the NIF EM table for a comprehensive listing of the Data Source for each individual county/SCC/pollutant.

4.4 VERSION 2: STATE AND STAKEHOLDER REVIEW AND COMMENT

The draft MS Access area source files were provided to States and stakeholders for review and comment. Within the Access database three queries were provided to allow the States to summarize emissions by State, county, SCC and pollutant to assist with the review. States and stakeholders provided comments and changes for incorporation and/or change. The following subsections describe the comments received and other QA activities performed that were ultimately incorporated into the final area source inventory.

4.4.1 National Park Service Comments

The only comments received from outside stakeholders came from the National Park Service (NPS). The NPS requested that the documentation be updated to more clearly identify the data sources used by each State for each category. Exhibits 4.2 and 4.3 were prepared in response to this request. Note that Exhibit 4.2 provides only a general indication of the data source used for each major source category. Reviewers are directed to the NOF EM table for a comprehensive listing of the Data Source used for each individual county/SCC/pollutant record. The NPS also commented on the large differences in emissions from some categories between 2002 and 2007. These differences were evaluated and are addressed in Section 4.4.3 and 4.5 of this TSD.

4.4.2 Checks for Missing Categories, Double Counting, Outliers, and Differences between 2002 and 2007 Inventories

As shown previously in Exhibit 4.3, a variety of data sources and methods are used by States to develop the 2007 inventory. The potential exists for categories to be inadvertently omitted, double counted (for example by including both State-specific and USEPA estimates), or to have a large per-capita or per-employee variation from State-to-State.

To guard against omission or double counting, the Contractor and MARAMA prepared a series of SCC level summary reports and manually reviewed them to determine potentially missing source categories. Among the reports were the following:

- "SCC in both 2002 and 2007" compares emissions by State and SCC for SCCs contained in both the 2002 and 2007 inventories.
- "2002 SCCs NOT in 2007" contains the SCCs that were in the 2002 inventory, but not in the first draft of the 2007 inventory.
- "2007 SCCs NOT in 2002" contains the SCCs that were in the 2007 inventory, but not in the 2002 inventory.

There are both increases and decreases in emissions between 2002 and 2007 depending upon the State and pollutant. In order to better understand these differences, we also prepared charts to graphically depict the major differences between the 2002 and 2007 area source inventories. Finally 4-digit SCC summaries were prepared to identify gaps.

States were asked to review these QA reports and provide responses to fill in gaps or address potentially anomalous emission estimates. Several instances were found where a State did not have emissions for a relatively important source category in the draft 2007 inventory. Examples are several SCCs related to PM emissions from construction, agricultural tilling and mining & quarrying operations. These gaps were brought to the attention of the affected States for resolution. In some cases, States provided data for the missing categories or advised the Contractor to fill in the gap using available data from existing USEPA or MARAMA inventories. In other cases, States indicated that emissions from the missing categories were small and determined that the effort to fill the missing category gap was not justified.

We reviewed SO2 and NOx emissions by State from industrial, commercial/institutional, and residential fuel combustion. Since the OTC is considering additional control measures for the industrial/commercial/institutional fuel combustion category, these values were closely scrutinized. Pennsylvania showed a dramatic increase in emissions from 2002 to 2007 for both SO2 and NOx for the industrial fuel combustion category. New York showed a substantial decrease in both the industrial and commercial/institutional categories from 2002 to 2007. Pennsylvania provided updated estimates for Version 3 of the inventory. New York did not provide an explanation of the possible reason for the differences, and no changes to the 2007 values were made.

A comparison of 2002 and 2007 VOC emissions by State for three types of solvent evaporation categories revealed that two States – Maine and New York – appear to have double-counted VOC emissions for this category using two different SCCs (24-60-xxx-xx and 24-65-xxx-xx). Maine and New York reviewed the issue and provided updates to eliminate the double counting issue.

4.5 VERSION 3 REVISIONS

4.5.1 Use of New USEPA Road Dust Equation

In January 2011, USEPA issued a new methodology (USEPA 2011) for developing emission factors for re-entrained particulate matter from vehicles traveling over a paved surface such as a road or parking lot. The new methodology was not used in Version 2 of the MANE-VU+VA 2007 inventory as it was not finalized in time.

This January 2011 version of the paved road emission factor equation only estimates particulate emissions from suspended road surface material. Particulate emissions from vehicle exhaust, brake wear, and tire wear are now estimated separately using USEPA's MOVES model. This approach eliminates possible double counting of emissions resulting from use of the previous version of the equation in this section and MOVES to estimate particulate emissions from vehicle traffic on paved roads.

All states (except Maine) submitted revised paved road emission estimates using the new methodology for Version 3 of the 2007 MANE-VU+VA inventory. Exhibit 4.4 compares the 2007 PM10 and PM2.5 emissions using the new and previous methodology. PM10 emissions are lower using the new methodology, while PM2.5 emissions are higher.

Exhibit 4.4 –2007 Paved Road Dust PM10 and PM2.5 Emission Estimates

State	PM10-PRI		PM25-PRI	
	Version2 (tons/yr)	Version 3 New Method (tons/yr)	Version2 (tons/yr)	Version 3 New Method (tons/yr)
Connecticut	16,085	6,722	688	1,680
Delaware	10,217	4,556	724	1,143
District of Columbia	1,841	819	81	201
Maine*	16,536	16,536	1,665	1,665
Maryland**	12,813	13,798	3,160	3,387
Massachusetts	32,748	27,392	1,622	6,724
New Hampshire	8,821	7,985	524	1,960
New Jersey	38,210	19,914	1,142	4,979
New York	95,075	46,348	5,818	11,376
Pennsylvania	92,927	46,806	6,114	11,489
Rhode Island	4,387	3,833	204	941
Vermont	11,326	5,659	979	1,389
Virginia	50,827	29,637	2,966	7,275
Total	**391,814**	**230,004**	**25,690**	**54,207**

* Maine did not provide paved road emissions using the new method.
** Maryland used a draft version of the new AP-42 method for Version 2.

4.5.2 Use of MOVES Model to Estimate Stage II Emissions

States elected to use the Stage II emissions as calculated by the MOVES model, and to include those emissions in the area source sector emission summaries. Stage II emissions result from the refueling of motor vehicles at gasoline service stations. NESCAUM, PA, NY, and VA each executed the MOVES model in inventory mode to calculate vehicle refueling emissions. The MOVES estimates were used instead of the estimates provided

by states for Version 2 of the inventory. The MOVES estimates are not included in the onroad sector summaries or modeling files so that the emissions will not be double counted. Exhibit 4.5 compares the Stage II VOC emissions in the 2008 NEI to the emissions calculated using the MOVES model. VOC emissions are higher using MOVES in some states, lower in others. Appendix F contains NESCAUM's documentation of the MOVES modeling. Appendix G contains the VOC control efficiencies by county used in the MOVES modeling for displacement losses and for spillage losses.

Exhibit 4.5 –Stage II Refueling VOC Emissions for 2007 Using NMIM and MOVES

State	NEI2008 (tons/yr)	2007 Version 3 Using MOVES (tons/yr)
Connecticut	483	286
Delaware	284	294
District of Columbia	71	52
Maine	809	709
Maryland	1,933	2,132
Massachusetts	980	807
New Hampshire	412	419
New Jersey	2,287	2,500
New York	7,604	8,787
Pennsylvania	5,313	6,581
Rhode Island	178	180
Vermont	128	122
Virginia	4,464	5,569
Total	**24,947**	**28,437**

4.5.3 Connecticut Changes for Fuel Combustion

Connecticut provided updated 2007 emission estimates for non-wood fuel combustion for the residential, commercial/institutional and industrial source categories. Connecticut previously relied on USEPA's 2005 NEI-v2 (commercial/institutional and industrial) and USEPA's 2008 NEI (residential) for these categories. Prompted by reviews provided by MARAMA, Connecticut subsequently discovered that USEPA's inventory assumed a 2.25% sulfur level for residual fuel oil compared to a CT regulatory maximum of 1.0% sulfur. In addition, Connecticut could not verify whether USEPA's 2005 NEI-v2 adjusted its area source estimates to avoid double counting of point sources. As a result, Connecticut has decided to use emission estimates from its draft-2005 periodic emissions inventory (PEI) for the non-wood fuel combustion portions of the three cited categories.

The draft-2005 PEI includes only CO, VOC and NOx emissions, so fuel use values were multiplied by USEPA emission factors obtained from the 2008 NEI to calculate estimates of annual SO2 and PM2.5 emissions. Emissions for 2005 are assumed to be representative of 2007, with no growth adjustments.

Connecticut identified errors in the Version 2 inventory that were corrected in Version 3. The CO emissions for residential distillate oil combustion were incorrectly reported as winter season emissions instead of annual emissions. Version 2 emissions for residential, commercial/institutional, and industrial kerosene combustion were based on NEI 2008 values. Connecticut indicated that kerosene emissions in the state are included under the distillate oil category. Emissions for the kerosene combustion SCCs were set to zero in Version 3 to avoid double counting of emissions. For a few SCCs, the sum of the PM10-FIL and PM-CON emissions did not equal the PM10-PRI emissions, and the sum of the PM25-FIL and PM-CON emissions did not equal the PM25-PRI emissions. Revisions to the PM10-PRI and PM25-PRI emissions were made to correct the error.

4.5.4 Connecticut Revisions for AIM Coatings and Auto Refinishing

Version 2 of the 2007 inventory for AIM coatings was based on USEPA 2008 NEI values, which accounted for the implementation of the OTC model rule for AIM coatings in Connecticut. Since Connecticut's AIM rule did not go into place in time to produce 2007 reductions, the 2008 NEI values for those SCCs were increased for the Version 3 inventory. The emission factor used to calculate emissions was changed from 2.41 to 3.02 lbs/person to reflect the absence of reductions from the CT AIM rule in 2007.

Version 2 of the 2007 inventory for industrial maintenance coatings was based on USEPA 2008 NEI values, which accounted for the implementation of the OTC model rule for AIM coatings in Connecticut. Since Connecticut's AIM rule did not go into place in time to produce 2007 reductions, the 2008 NEI values for those SCCs were increased for the Version 3 inventory. The emission factor used to calculate emissions was changed from 0.15 to 0.96 lbs/person to reflect the absence of reductions from the CT AIM rule in 2007.

Version 2 of the 2007 inventory for auto refinishing coatings was based on USEPA 2008 NEI values, which did not account for the implementation of the OTC model rule for mobile equipment repair and refinishing in Connecticut. A rule similar to the OTC rule was in place in Connecticut in April 2006. Since Connecticut's auto refinishing rule was in place prior to 2007, the 2008 NEI values for those SCCs were reduced for the Version 3 inventory. The emission factor used to calculate emissions was changed from 89 to 55 lbs/employee to reflect the 38 percent reduction in VOC emissions from the Connecticut auto refinishing rule in 2007.

4.5.5 District of Columbia Residential Wood Combustion

Emissions for residential wood combustion in the District of Columbia were missing from Version 2 of the 2007 MANE-VU+VA area source inventory. These emissions were originally estimated using the USEPA RWC tool, but were inadvertently left out of the 2007 inventory. The 2007 emissions calculated by the USEPA RWC tool were added.

4.5.6 Maryland Degreasing VOC Emisions

Maryland provided revised estimates for VOC emissions for the degreasing category.

4.5.7 Massachusetts NH3 Emisions

Massachusetts added NH3 emissions from humans (SCC 28-10-010-000), cats (SCC 28-06-010-000), and dogs (SCC 28-06-015-000) that were missing in Version 2.

4.5.8 New Jersey Bakeries and Auto Refinishing VOC Emisions

New Jersey revised the VOC emissions for bakeries and auto refinishing.

4.5.9 New York VOC Emisions from Residential Wood Combustion

New York revised the CO and VOC emissions for all residential wood combustion SCCs.

4.5.10 Pennsylvania Industrial Coal Combustion

Pennsylvania revised the industrial coal emissions for SCCs 2102001000 and 2102002000. This revision was accomplished using one of the two new preferred methods of point subtraction based on activity throughputs (coal usage). The revised activity method is performed by subtracting the point source coal usage from the state coal usage totals, and then calculating the area source emissions, which is a more accurate calculation estimate.

4.5.11 Pennsylvania Residential Distillate Oil Combustion

Pennsylvania's original submittal for SO2 emissions for residential distillate oil were incorrectly underreported by a factor of 100. This error was corrected in Version 3.

4.5.12 Virginia Industrial Coal Combustion

Virginia identified an error in the Version 2 emissions from industrial coal combustion (SCC=21-02-002-000) resulting from a misinterpretation of activity data from the Energy Information Administration. Virginia now believes that all industrial coal combustion is accounted for in the point source inventory. All emissions for this SCC were zeroed out for all counties in Virginia.

4.5.13 Multiple States Open Burning and Commercial Cooking

USEPA updated their emissions estimates for the 2008 NEI in August, 2011. Several states relied on the USEPA estimates for use in the 2007 MANE-VU+VA inventory. These revisions included:

- For commercial cooking (SCCs 23-02-002-xxx and 23-02-003-xxx), USEPA added emission factors for PM-CON and emissions for PM25-PRI were recalculated.
- For open burning (26-10-000-100, 26-10-000-400, 26-10-000-500, 26-10-030-000), USEPA updated per capita waste generation and recalculated emissions.

Emissions for states using the USEPA estimates were updated to reflect these changes.

4.6 ANNUAL 2007 AREA SOURCE EMISSION SUMMARY

Overall, estimated area source emissions decreased from 2002 to 2007 in the region for all pollutants. Area source emissions are generally a product of both activity and emission factors. Changes in both activity and emission factors occurred between 2002 and 2007 for several categories resulting in changes in emission estimates.

Exhibit 4.6 summarizes 2002 and 2007 area source CO emissions by State. Exhibit 4.7 presents the 2007 CO emissions by State and major source category. Most States show a significant reduction in CO area source emissions between 2002 and 2007. The District of Columbia, Rhode Island and Vermont show increases. Regionwide, area source emissions of CO are estimated to be 33% lower in 2007 than was estimated in 2002. Most of the area source CO emissions result from residential wood combustion and open burning, and the emission estimation methods used for these categories changed between 2002 and 2007. Therefore, the substantial changes in CO emissions from 2002 to 2007 are primarily due to different emission estimation methodologies used for the 2002 and 2007 inventories.

Exhibit 4.8 summarizes 2002 and 2007 area source NH3 emissions by State. Exhibit 4.9 presents the 2007 NH3 emissions by State and major source category. Most States show a reduction in NH3 area source emissions between 2002 and 2007, except for the District of Columbia, which show substantial percentage increase. It should be noted that the magnitude of NH3 emissions in the District are very small in comparison to regional emissions, and the large percentage increase is insignificant in the context of regional air quality modeling. Regionwide, area source emissions of NH3 are estimated to be 15% lower in 2007 than was estimated in 2002. Nearly all area source NH3 emissions result from agricultural livestock and fertilizer categories which were calculated by USEPA using the CMU ammonia model. Reductions in animal populations and fertilizer usage between 2007 and 2002 are the reason for the change.

Exhibit 4.10 summarizes 2002 and 2007 area source NOx emissions by State. Exhibit 4.11 presents the 2007 NOx emissions by State and major source category. Most States show decreases between 2002 and 2007, except for Pennsylvania and Vermont, which show increases. Regionwide, area source emissions of NOx are estimated to be 28% lower in 2007 than was estimated in 2002. Nearly all area source NOx emissions are from the industrial, commercial, and residential (non-wood fuel) categories.

Exhibit 4.12 summarizes 2002 and 2007 area source PM10-PRI emissions by State. Exhibit 4.13 presents the 2007 PM10-PRI emissions by State and major source category. Regionwide, area source emissions of PM10-PRI are estimated to be 29% lower in 2007 than was estimated in 2002. PM10-PRI emissions are attributable to the paved/unpaved road dust, construction activity, mining & quarrying, and agricultural tilling categories. Changes in the emission calculation methodology for road dust from paved roads accounts for a substantial portion of the decrease.

Exhibit 4.14 summarizes 2002 and 2007 area source PM25-PRI emissions. Exhibit 4.15 presents the 2007 PM25-PRI emissions by State and major source category. Regionwide, area source emissions of PM25-PRI are estimated to be 19% lower in 2007 than was estimated in 2002. PM25-PRI emissions result from residential wood combustion, paved/unpaved road dust, construction activity, mining & quarrying, and open burning categories. Changes in the emission calculation methodology for road dust from paved roads and residential wood combustion accounts for a substantial portion of the changes.

Exhibit 4.16 summarizes 2002 and 2007 area source SO2 emissions by State. Exhibit 4.17 presents the 2007 SO2 emissions by State and major source category. Most States show decreases between 2002 and 2007, except for Connecticut and Pennsylvania, which show increases. Regionwide, area source emissions of SO2 are estimated to be 42% lower in 2007 than was estimated in 2002. Nearly all area source SO2 emissions are from the industrial, commercial, and residential (non-wood fuel) categories.

Exhibit 4.18 summarizes 2002 and 2007 area source VOC emissions by State. Exhibit 4.19 presents the 2007 VOC emissions by State and major source category. All States show substantial reductions in VOC emissions from 2002 to 2007. Regionwide, area source emissions of VOC are estimated to be 45% lower in 2007 than was estimated in 2002. Part of the difference can be explained by post-2002 control measures for architectural coatings, consumer products, degreasing and portable fuel containers. But, as was discuss for CO emissions, part of the difference is due to differences in the methodologies used to estimate emissions from residential wood combustion.

Exhibit 4.6 – 2002 and 2007 Area Source CO Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	70,198	41,496	-41%
Delaware	14,052	8,266	-41%
District of Columbia	2,300	5,488	139%
Maine	109,223	50,496	-54%
Maryland	141,179	74,188	-47%
Massachusetts	137,496	79,226	-42%
New Hampshire	79,647	39,677	-50%
New Jersey	97,657	77,687	-20%
New York	356,254	205,055	-42%
Pennsylvania	266,935	217,079	-19%
Rhode Island	8,007	15,419	93%
Vermont	43,849	51,109	17%
Virginia	155,873	132,098	-15%
	1,482,669	**997,285**	**-33%**

Exhibit 4.7 – 2007 Area Source CO Emissions by Category and State (tons/year)

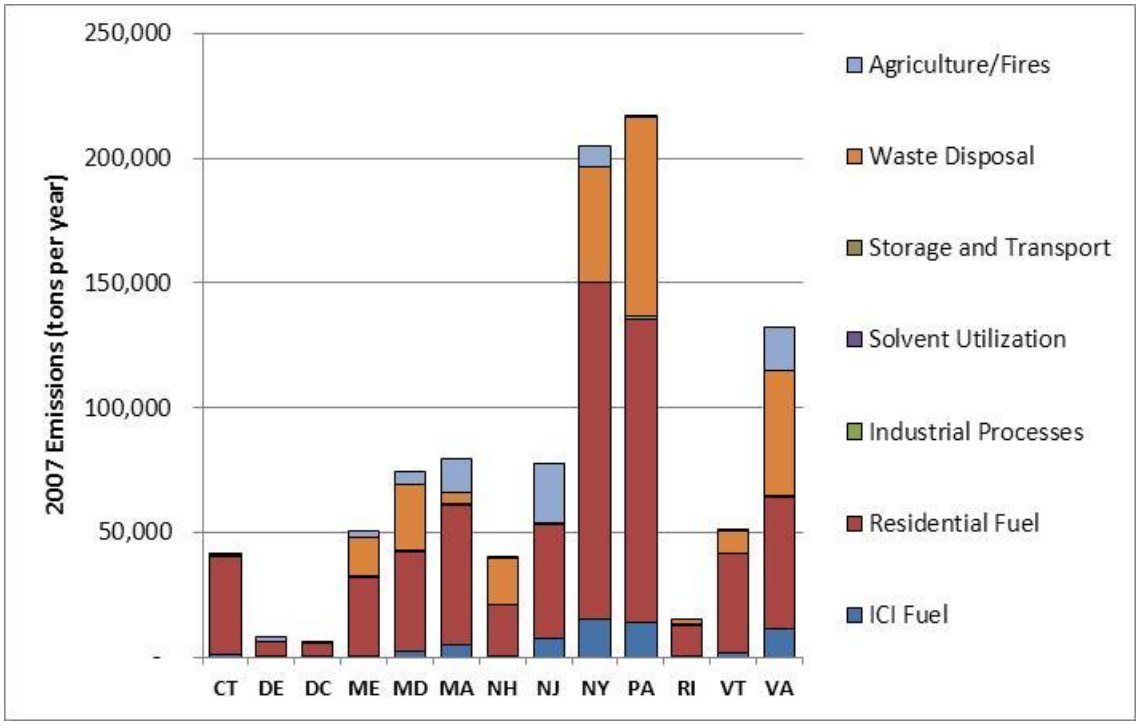


Exhibit 4.8 – 2002 and 2007 Area Source NH3 Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	5,318	4,421	-17%
Delaware	13,278	12,382	-7%
District of Columbia	14	183	1188%
Maine	8,747	5,736	-34%
Maryland	25,835	26,006	1%
Massachusetts	18,809	13,791	-27%
New Hampshire	2,158	1,500	-30%
New Jersey	17,572	15,736	-10%
New York	67,422	45,693	-32%
Pennsylvania	79,911	72,569	-9%
Rhode Island	883	625	-29%
Vermont	9,848	8,013	-19%
Virginia	43,905	43,394	-1%
	293,699	**250,049**	**-15%**

Exhibit 4.9 – 2007 Area Source NH3 Emissions by Category and State (tons/year)

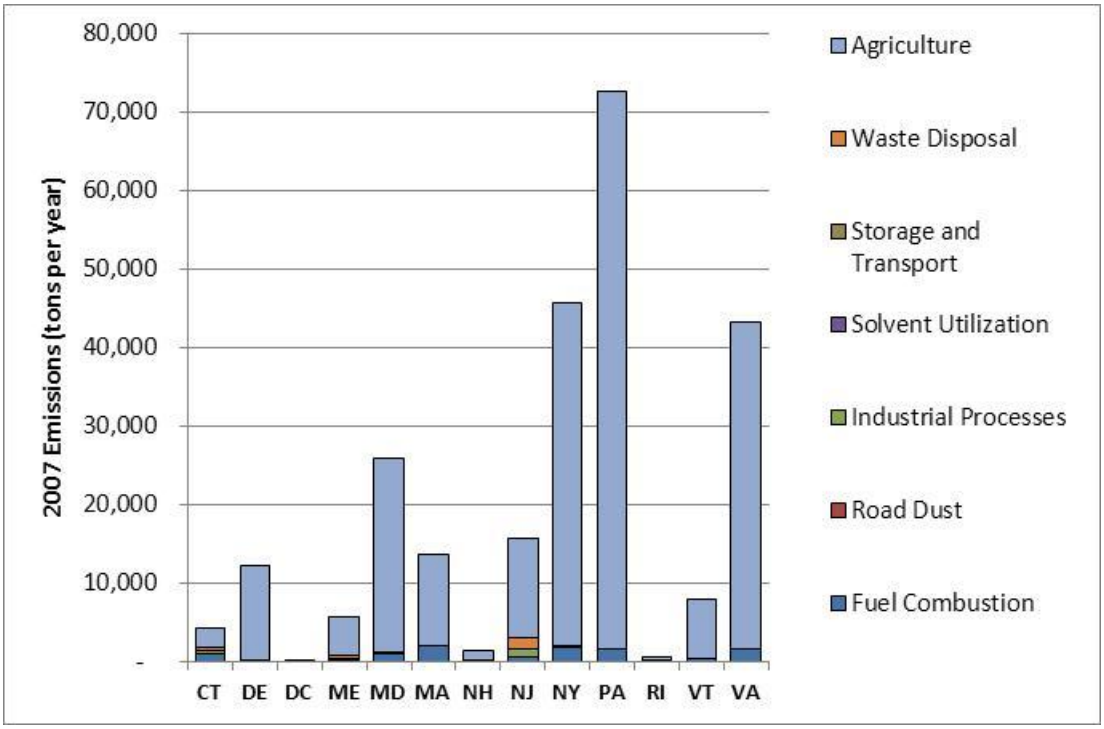


Exhibit 4.10 – 2002 and 2007 Area Source NOx Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	12,689	12,422	-2%
Delaware	2,608	2,237	-14%
District of Columbia	1,644	1,547	-6%
Maine	7,360	6,656	-10%
Maryland	15,678	10,312	-34%
Massachusetts	34,281	20,252	-41%
New Hampshire	10,960	4,737	-57%
New Jersey	26,692	24,175	-9%
New York	98,803	72,053	-27%
Pennsylvania	47,591	47,545	0%
Rhode Island	3,886	3,469	-11%
Vermont	3,208	3,996	25%
Virginia	51,418	19,056	-63%
	316,817	**228,458**	**-28%**

Exhibit 4.11 – 2007 Area Source NOx Emissions by Category and State (tons/year)

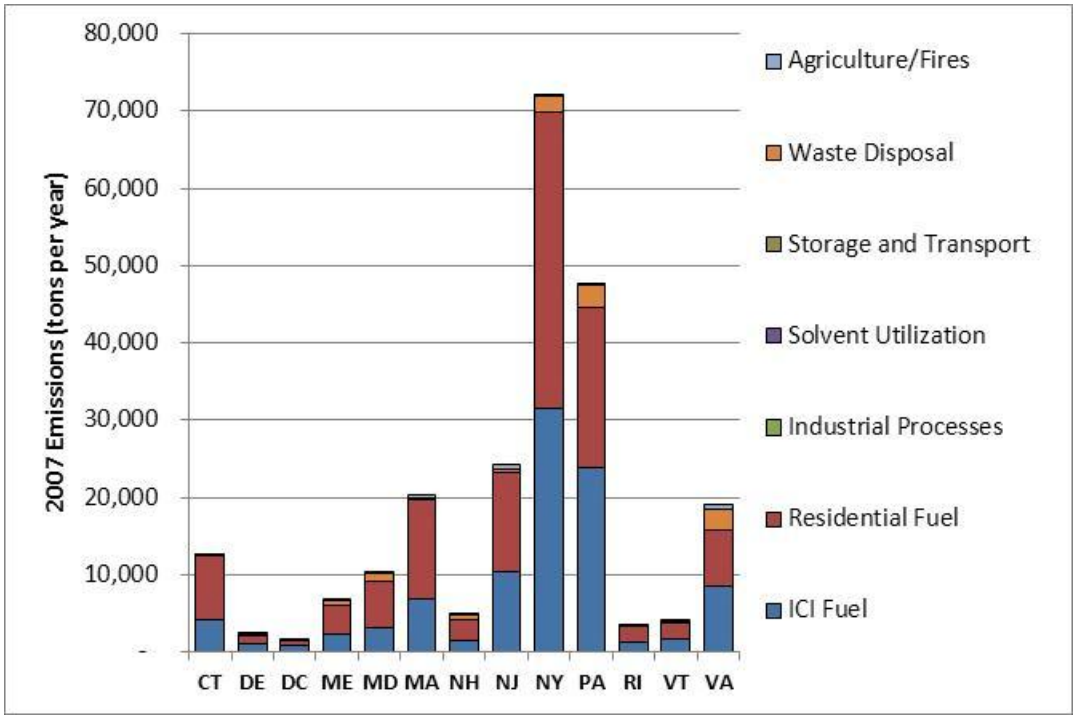


Exhibit 4.12 – 2002 and 2007 Area Source PM10-PRI Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	48,281	30,577	-37%
Delaware	13,039	10,499	-19%
District of Columbia	3,269	4,873	49%
Maine	168,953	54,445	-68%
Maryland	95,060	72,454	-24%
Massachusetts	192,860	148,756	-23%
New Hampshire	43,329	27,742	-36%
New Jersey	61,601	39,140	-36%
New York	369,595	272,674	-26%
Pennsylvania	391,897	287,998	-27%
Rhode Island	8,295	11,361	37%
Vermont	56,131	47,993	-14%
Virginia	237,577	183,341	-23%
	1,689,886	**1,191,853**	**-29%**

Exhibit 4.13 – 2007 Area Source PM10-PRI Emissions by Category and State (tons/year)

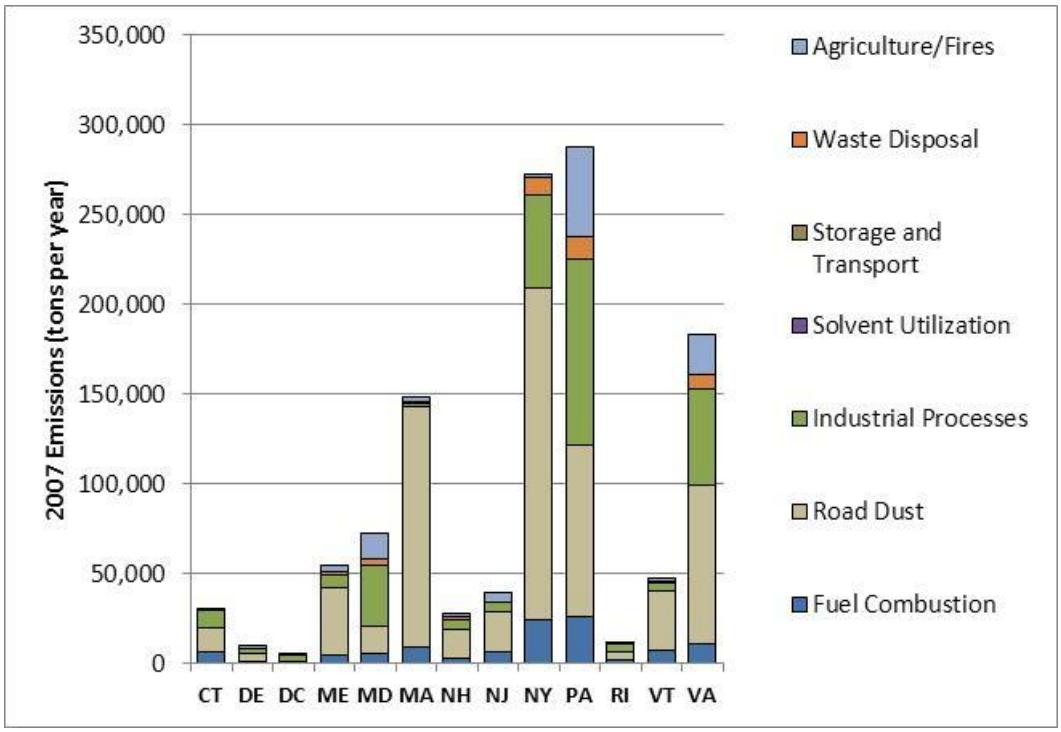


Exhibit 4.14 – 2002 and 2007 Area Source PM25-PRI Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	14,247	10,606	-26%
Delaware	3,204	3,031	-5%
District of Columbia	805	1,542	91%
Maine	32,774	12,526	-62%
Maryland	27,318	19,789	-28%
Massachusetts	42,083	30,438	-28%
New Hampshire	17,532	8,623	-51%
New Jersey	19,350	18,299	-5%
New York	87,155	63,906	-27%
Pennsylvania	74,925	73,514	-2%
Rhode Island	2,064	3,896	89%
Vermont	11,065	13,106	18%
Virginia	43,989	44,102	0%
	376,510	**303,378**	**-19%**

Exhibit 4.15 – 2007 Area Source PM25-PRI Emissions by Category and State (tons/year)

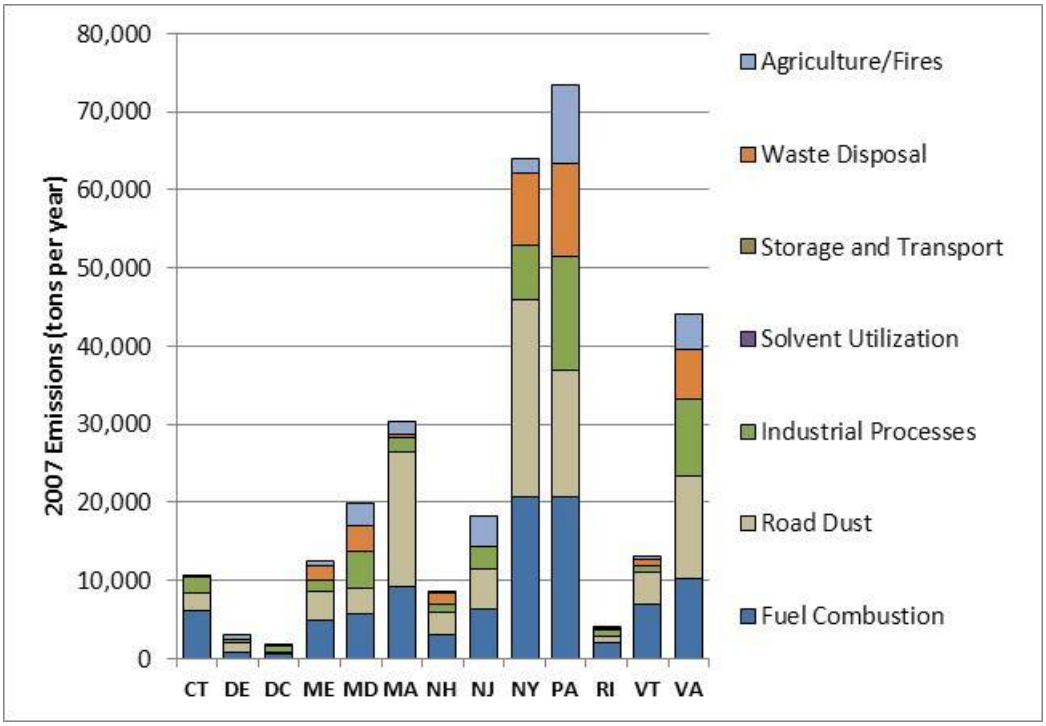


Exhibit 4.16 – 2002 and 2007 Area Source SO2 Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	12,419	16,083	30%
Delaware	1,588	1,144	-28%
District of Columbia	1,336	1,241	-7%
Maine	13,149	9,812	-25%
Maryland	12,393	5,960	-52%
Massachusetts	25,488	19,859	-22%
New Hampshire	7,072	5,283	-25%
New Jersey	10,744	8,811	-18%
New York	130,409	70,044	-46%
Pennsylvania	63,679	66,584	5%
Rhode Island	4,557	3,897	-14%
Vermont	4,088	3,752	-8%
Virginia	105,890	17,098	-84%
	392,812	**229,569**	**-42%**

Exhibit 4.17 – 2007 Area Source SO2 Emissions by Category and State (tons/year)

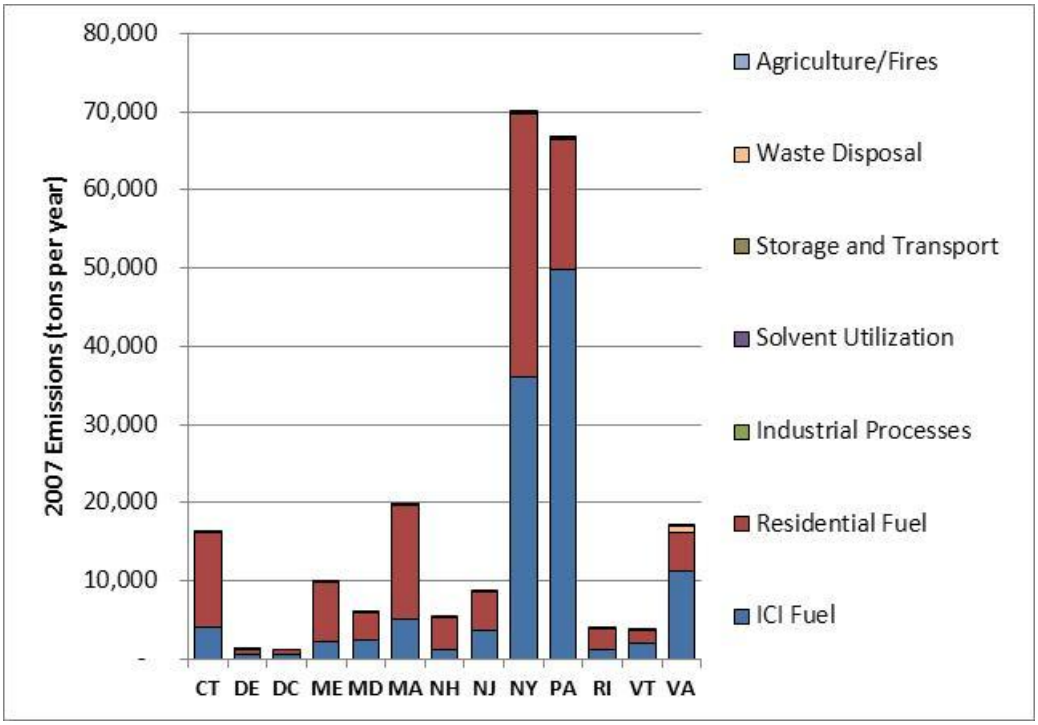
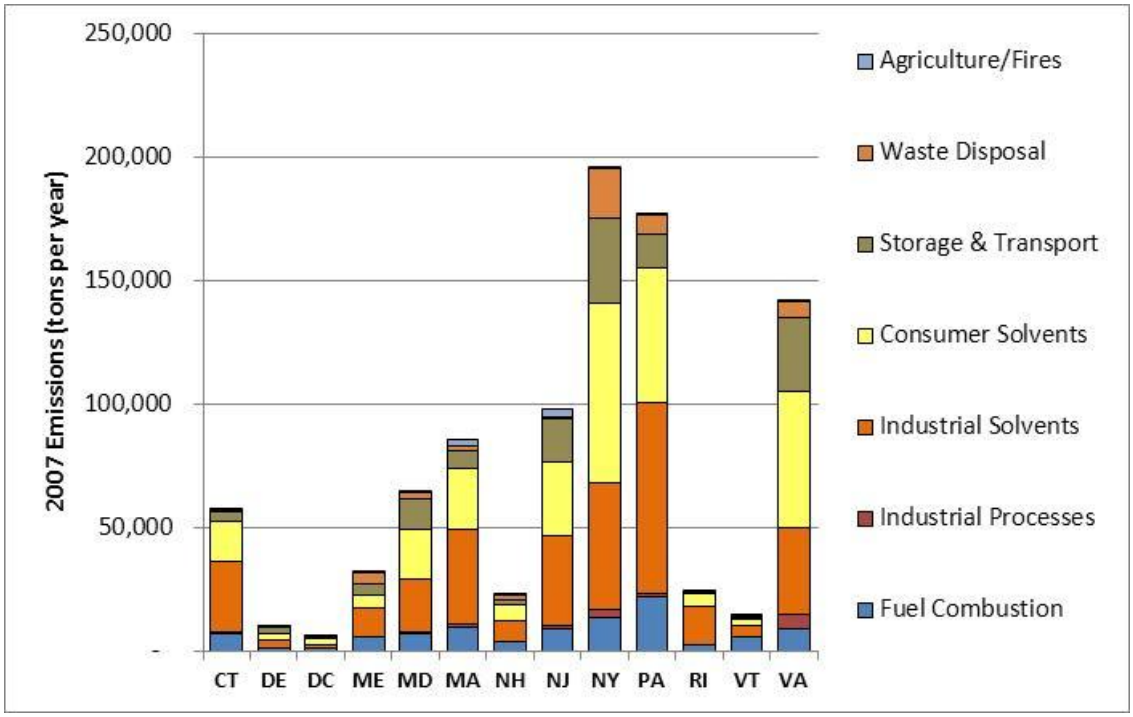


Exhibit 4.18 – 2002 and 2007 Area Source VOC Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	87,302	57,253	-34%
Delaware	15,520	9,482	-39%
District of Columbia	6,432	5,568	-13%
Maine	100,621	31,966	-68%
Maryland	120,254	64,429	-46%
Massachusetts	155,557	85,870	-45%
New Hampshire	65,371	22,343	-66%
New Jersey	167,882	98,121	-42%
New York	507,291	195,976	-61%
Pennsylvania	240,785	176,781	-27%
Rhode Island	31,402	24,214	-23%
Vermont	23,266	14,108	-39%
Virginia	172,989	142,218	-18%
	1,694,670	**928,330**	**-45%**

Exhibit 4.19 – 2007 Area Source VOC Emissions by Category and State (tons/year)



5.0 ANNUAL 2007 INVENTORY FOR NONROAD SOURCES INCLUDED IN THE NONROAD MODEL

5.1 NONROAD MODEL CATEGORIES

The USEPA's NONROAD model estimates emissions from equipment such as recreational marine vessels, recreational land-based vehicles, farm and construction machinery, lawn and garden equipment, aircraft ground support equipment (GSE) and rail maintenance equipment. This equipment is powered by diesel, gasoline, compressed natural gas or liquefied petroleum gas engines.

The National Mobile Inventory Model (NMIM) was developed by USEPA to estimate county-level emissions for certain types of nonroad equipment. NMIM uses the current version the NONROAD model. The NMIM national county database contains monthly input data to reflect county specific fuel parameters and temperatures. Most of the work associated with executing NMIM involved updating the NMIM county database with State-specific information. For this analysis, we used the NMIM2008 software (version NMIM20090504), the NMIM County Database (version NCD20090531), and NONROAD2008a (July 2009 version) as a starting point (USEPA 2009d). Changes were made to the NCD20090531 based on State review.

5.2 VERSION 2 INVENTORY DEVELOPMENT

The following subsections describe how Version 2 of the inventory was prepared.

5.2.1 State Review of NMIM Meteorology Data and Fuel Characteristics

The Contractor obtained from USEPA the National County Database (NCD20090531) for use as a starting point for preparing the modeling data sets. NCD20090531contains the 2007 year-specific meteorology data set that USEPA used to calculate 2007 emissions in addition to fuel revisions for years 2006-2011. These fuel values are updates to those in the 2007 USEPA NMIM run which used NCD20090327. It was decided to use NCD20090531 as a starting point for development of the NONROAD input files for the 2007 modeling inventory. NCD20090531 was made available for state comment.

Several States commented on fuel characteristics data and changes were made to the underlying MySQL database to incorporate those changes into the model. These included changes to Reid Vapor Pressure, sulfur and oxygenate fractions. Where changes were made, the Contractor created new gasoline types and IDs using the NMIM MySQL NCD database default entries as a starting point. Only information related to criteria pollutant emission calculations was changed. Information related to air toxics that was contained in

the initial default fuel characteristic tables was not adjusted. Thus the fuel types created for the NMIM modeling should NOT be used for air toxics modeling. To further separate the data in the fuel characteristics tables from other modeling efforts, the Contractor created a separate NCD for use exclusively for this modeling effort.

Exhibit 5.1 shows the number of added gasoline fuel record types added to the "gasoline" table in the MySQL NCD database. The total number of added fuel records was 118 new gasoline types. These records were given GasolineID values of 4462 to 4479 inclusive.

Exhibit 5.1 – Gasoline Fuel Record Types Add to MySQL NCD Database

State	Number of revised gasoline records
CT	10
MD	48
NH	15
NJ	20
NY	25

Although records were added for NY, they were not used since NY performed their own NONROAD modeling (see below).

5.2.2 Update of NMIM Allocation Files for Population and Housing

Several NONROAD categories use housing unit or population data to allocate the emissions to the county level from State calculations. States identified some discrepancies in the housing and population data contained in the NONROAD model and requested that the Contractor update the allocation files for those categories. As a consequence, the Contractor obtained 1 and 2 unit housing information and updated 2007 population estimates. Data were obtained from the sources listed in Exhibit 5.2. :

Exhibit 5.2 – Data Sources for Population and Housing Data

Source Type	Data Source
2007 Population Data Source	http://www.census.gov/popest/counties/CO-EST2008-01.html
Total Housing Data Source	http://www.census.gov/popest/housing/HU-EST2007-CO.html
1 yr - 1 and 2 Unit Housing Data	2007 American Community Survey 1-Year Estimates
3 yr - 1 and 2 Unit Housing Data	B25024. UNITS IN STRUCTURE - Universe: HOUSING UNITS Data Set: 2005-2007 American Community Survey 3-Year Estimates, Survey: American Community Survey

Three sources for the housing unit data were required to evaluate all counties within the region. Census data are frequently withheld when the data reporting can lead to disclosure

of confidential business information or due to incomplete survey response. For the 1 and 2 unit housing data, the predominant source was the 1 year 1 and 2 unit housing data. If that was unavailable due to either confidentiality issues or lack of survey response, then the 3 year data was used by determining an average value for the three year period. Finally if no data were available for the 3 year 1 and 2 unit housing information, total housing unit data were utilized. The revised housing unit data affected the allocation of residential lawn and garden equipment. Revised allocation files for all MARAMA States (except NY) were developed and utilized in the NMIM modeling for this category.

For the population data, the latest county estimates of population were obtained from the Census Bureau. These estimates were available for all counties within the MARAMA region. Again, revised allocation files were developed for all States within the MARAMA region with the exception of NY. These revised allocation files applied to railroad maintenance equipment and AC/refrigeration equipment.

A revised population allocation file was prepared for NH as part of this effort, but those data were not obtained from the Census Bureau. The NH population data were provided by NH and were obtained from the "2007 Population Estimates of New Hampshire Cities and Towns", New Hampshire Office of Energy and Planning, June 2008." Those data were used in lieu of the Census Bureau data.

In addition, Pennsylvania provided changes to the values for 1 and 2 unit housing for 2007. The source of these data was not cited.

5.2.3 State-Specific Data Incorporated in NMIM

In addition to the global updates to the housing and population allocation files in the MARAMA region, several States submitted additional information used to update the underlying data used to calculate emissions from nonroad sources. The data submitted and the updates resulting from these submittals are discussed below by State.

5.2.3.1 Connecticut

Connecticut only provided updated information related to the gasoline characteristics. No additional changes were submitted.

5.2.3.2 Delaware

Delaware provided revised values for several additional allocation files beyond those for population and housing units. Data for 2005 were submitted and updated files were developed for the following allocation categories: golf courses, recreational marine vessels, snow blowers, number of wholesale establishments, landscaping employees, and

manufacturing employees. In addition, Delaware also submitted data on the engine populations for 2005 for the following recreational marine vessels:

2282005010	2-Str Outboard
2282005015	2-Str Personal Water Craft
2282010005	4-Str Inboard/Sterndrive
2282020005	Dsl - Inboard
2282020010	Dsl - Outboard

The updated population values for 2005 were added to the corresponding file for the NONROAD model and were used for the 2007 runs. Because of the way NONROAD handles missing data, if data for 2007 are not found, the most current data (in this case 2005) are used to assist in determining a 2007 value.

5.2.3.3 Maryland

Maryland only provided information to update the gasoline characteristics. No additional changes were submitted.

5.2.3.4 New Hampshire

As indicated above, New Hampshire provided State-specific population data from their own data source for their counties for use in preparing the population allocation files. A revised population allocation file was prepared for NH as part of this effort, but those data were not obtained from the Census Bureau. The NH population data were provided by NH and were obtained from the "2007 Population Estimates of New Hampshire Cities and Towns", New Hampshire Office of Energy and Planning, June 2008. Those data were used in lieu of the Census Bureau data.

5.2.4 New Jersey

New Jersey provided revised gasoline characteristics values as well as NONROAD equipment population data with revised data on equipment population values for Airport Ground Support Equipment. In addition, NJ provided revised human population data for 2002, 2005, 2010, 2015 and 2020. These data (along with the 2007 data generated from the Census Bureau) were added to the NJ population allocation file.

5.2.4.1 New York

New York opted to not have the Contractor calculate emissions using NMIM for their State. Instead, NY calculated their own emissions for the nonroad category and submitted the output files to the Contractor for post processing. The output files submitted by NY were monthly output runs from the NONROAD model for each county. The Contractor

simply post-processed these files to combine emissions and throughput values for each county into an annual emissions number. Summary annual files were submitted to NY by the Contractor for approval. No other work on the NY emissions was performed by the Contractor.

5.2.4.2 Pennsylvania

Pennsylvania provided revised data for the 1 and 2 unit housing information for 2007. Those data were used in lieu of the Census Bureau data for 2007 in the allocation file. The source of these data was not cited.

5.2.5 NMIM Run Specification

The run specifications for each NMIM run were developed on a State-by-State basis. The settings for each specification panel within the NMIM model are detailed below.

- Description: A short descriptive term for the run was entered for each State specific run.
- Geography: The "county" option was selected for each State specific run. All counties within a State were selected for the run.
- Time: On the time panel, the year 2007 was selected in the drop down box and added to the year selections area. The Use Yearly Weather Data check box was also selected. Every month in the Months check box area was selected.
- Vehicles/Equipment: Only the nonroad vehicle/equipment area was selected. All fuels and all vehicle types were selected for each State run.
- Fleet: No selections or information was entered in this panel.
- Pollutants: All criteria pollutants (with HC reported as VOC) were selected except for CO_2. Exhaust PM10 and PM2.5 were also selected.
- Advanced features: Only the server and database were selected in this panel.
- Output: Under the Geographic Representation panel the County selection was made. In the General Output area, a new database was selected on the server for the output.

All added external files for use in each State run were placed in the external files directory of the NCD. Entries for all external files included were added to the countynrfiles table of the NCD.

5.2.6 State and Stakeholder Review of Version 2

The Contractor completed the NMIM modeling runs in October of 2009. The results were made available to States and Stakeholders for review and comment. Based on the comments received, the following issues were addressed, and in some cases, changes were made to the 2007 nonroad inventory for sources included in NMIM.

5.2.6.1 Connecticut

Connecticut requested several changes to the NMIM inputs, which were incorporated into a new 2007 NMIM run. Connecticut indicated that the RFG areas were not applied to counties correctly. RVP values were modified by a small amount to reflect USEPA RFG sample averages for the appropriate mapping of Connecticut counties to RFG areas. Connecticut identified discrepancies in the RFG average sulfur values for 2007 and provided updated values. Connecticut also provided updated values for the calculated oxygen weight percents for ethanol.

5.2.6.2 New Jersey

New Jersey identified a very minor issue with the fuels data used for the 2007 NMIM runs. After considering the insignificant impact it would have on the emission totals, they agreed the fuels data used in the original NMIM run were adequate.

5.2.7 Removal of Airport Ground Support Equipment Emissions

The NMIM/NONROAD model includes emissions from airport ground support equipment. As discussed in detail in Section 6 of this TSD, emissions from airport ground support equipment is also included in USEPA's aircraft inventory that was prepared using the Federal Aviation Administration's Emissions and Dispersion Modeling System (EDMS). Correspondence with USEPA indicated that USEPA considers the emissions calculated by EDMS to be better than those calculated by NONROAD. For this reason, all emissions calculated by NMIM/NONROAD for airport ground support equipment were removed from the inventory to avoid double counting emissions.

5.3 CHANGES MADE FOR VERSION 3

Two main modifications were made to the nonroad inventory for 2007 for version 3 of the inventory. First, Virginia and New York requested that their emissions be recalculated using the information developed for the MARAMA States. The Virginia reruns were performed for all categories except for ground support equipment and for recreational marine vessels. Those values replaced the SEMAP supplied values used in versions prior to version 3. As indicated above, New York had originally provided data from

NONROAD model runs that they performed separately. For this version of the inventory, New York emissions were calculated using NMIM runs set up using the same criteria as those for other states in earlier versions of the inventory. Both New York and Virginia were provided with the opportunity to review fuel characteristics prior to their runs. Only Virginia made changes to the fuels, however the only changes that were made were to assign alternative default fuels for gasoline powered engines to counties. The fuel characteristics were not modified from the NMIM defaults, only the fuel IDs associated with a particular county/month combination were changed to another default fuel. Those changes were instituted in the NCD developed specifically for MARAMA. Default values for diesel, LPG and CNG were maintained for Virginia. New York did not request any changes to the default values. In addition, the revisions made to the housing population allocation files were instituted for both states.

The second change was to modify the recreational marine vessel populations for all states except Vermont and Maine. A revised population file was prepared for Virginia but not utilized in the version 3 runs. Virginia used the NMIM default engine population for recreational marine vessels for version 3 runs. The revised population data were provided by the National Marine Manufacturers Association (NMMA). Total state populations for each of the three major categories contained in the NONROAD model (outboard, inboard/sterndrive and personal watercraft) were provided for each state. Because the population files used by the NONROAD model (and thus NMIM) were configured with population values for various horsepower categories, AMEC determined the fraction of the total for each marine vessel type in each horsepower category from the NONROAD default population files. These fractions were then used to allocate the total state population obtained from NMMA to the various horsepower categories.

The only exception to this was that some states added in data for sailboats to the NMMA data. The sailboat populations were split among two of the default NONROAD categories. In addition, New Hampshire provided their own revised population file. Their population data were provided by the New Hampshire DMV and is not from NMMA.

5.4 SUMMARY OF NMIM MODELING RESULTS FOR 2007

Exhibits 5.3 to 5.9 present State-level summaries that compare 2002 and 2007 annual emissions for NMIM/NONROAD sources (excluding airport ground support equipment) from Version 3 of the MARAMA inventory. The 2002 emissions are those that were developed previously for Version 3 of the MANE-VU and the VISTAS best-and-final inventory for Virginia. Note that previous versions of this document had emissions for

Virginia derived from VISTAS/SEMAP NMIM results. For this document the Virginia data is from NMIM runs made consistent with the MARAMA approach.

For most States and pollutants, emissions from NMIM/NONROAD sources decreased from 2002 to 2007.

- CO emissions generally decreased by 15-30% in all States, in part due to turnover to newer, cleaner engines.
- NH3 emissions showed increases from 2002 to 2007 for all states except Connecticut and New Jersey which showed modest decreases.
- Emissions of NO_x, PM10-PRI, and PM25-PRI generally decreased by 9-20% from 2002 to 2007, with some States showing slightly higher or slight lower decreases.
- For SO_2, emissions decreased by 40-50% in all States except New Hampshire and Rhode Island.
- VOC emissions decreased between 5-35% over the same time period.

In addition, the estimated decrease in emissions was due to differences in the versions of the NONROAD model that were used to develop the 2002 and 2007 inventories. The new version of the model (NONROAD 2008a) used for the 2007 inventory accounts for new exhaust and evaporative emission controls, and predicts substantially less HC and CO, and somewhat less NO_x and PM emissions than earlier versions of NONROAD with use of comparable scenario inputs. NH3 was relatively unaffected by the new NONROAD version.

Exhibit 5.3 – 2002 and 2007 NMIM/NONROAD CO Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	274,388	181,817	-34%
Delaware	65,954	55,173	-16%
District of Columbia	18,775	14,319	-24%
Maine	148,555	131,319	-12%
Maryland	424,777	297,832	-30%
Massachusetts	448,399	324,793	-28%
New Hampshire	128,572	90,461	-30%
New Jersey	692,548	445,302	-36%
New York	1,219,168	911,813	-25%
Pennsylvania	903,168	719,517	-20%
Rhode Island	71,573	54,028	-25%
Vermont	61,732	52,497	-15%
Virginia	582,895	415,093	-29%
	5,040,503	**3,693,965**	**-27%**

Exhibit 5.4 – 2007 NMIM CO Emissions by Category and State (tons/year)

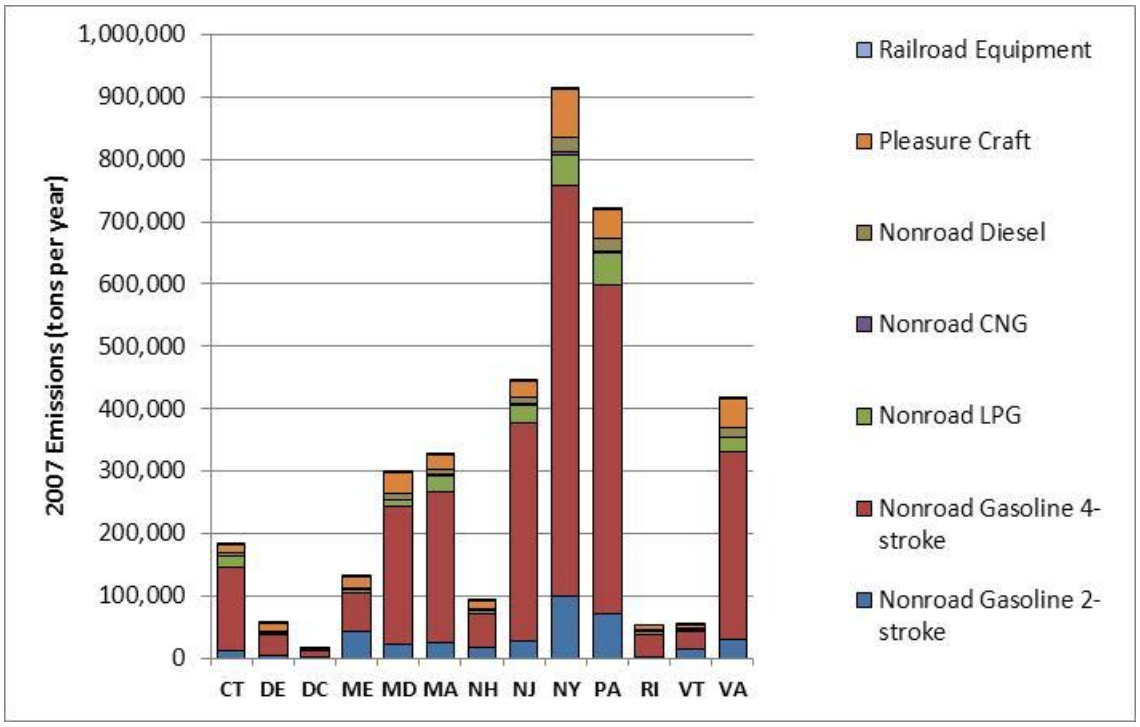


Exhibit 5.5 – 2002 and 2007 NMIM/NONROAD NH3 Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	17	16	-1%
Delaware	5	6	13%
District of Columbia	2	3	9%
Maine	11	13	11%
Maryland	28	29	4%
Massachusetts	28	28	0%
New Hampshire	9	10	11%
New Jersey	43	40	-8%
New York	79	83	5%
Pennsylvania	55	60	9%
Rhode Island	4	5	15%
Vermont	5	5	12%
Virginia	42	45	5%
	328	**342**	**4%**

Exhibit 5.6 – 2007 NMIM NH3 Emissions by Category and State (tons/year)

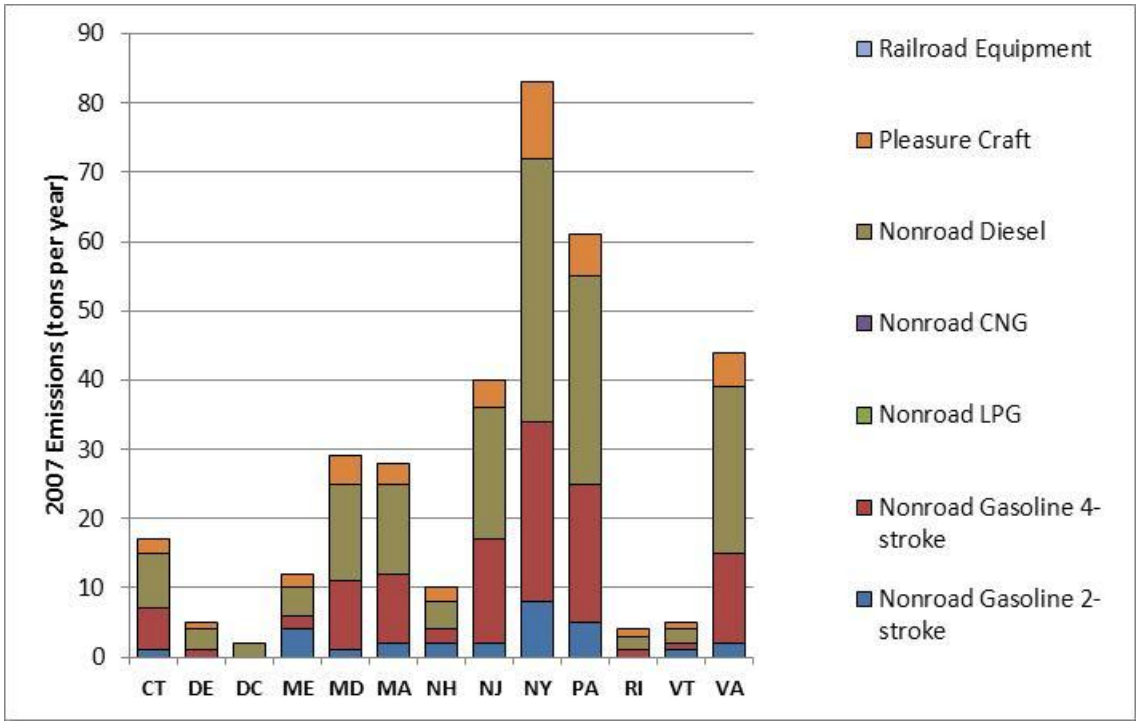


Exhibit 5.7 – 2002 and 2007 NMIM/NONROAD NOx Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	17,897	16,056	-10%
Delaware	5,798	4,998	-14%
District of Columbia	3,066	2,788	-9%
Maine	8,229	7,439	-10%
Maryland	27,789	25,726	-7%
Massachusetts	30,047	26,471	-12%
New Hampshire	8,150	8,562	5%
New Jersey	43,515	36,345	-16%
New York	78,601	72,271	-8%
Pennsylvania	62,265	55,362	-11%
Rhode Island	4,564	4,388	-4%
Vermont	4,170	3,743	-10%
Virginia	40,788	41,325	1%
	334,878	**305,475**	**-9%**

Exhibit 5.8 – 2007 NMIM NOx Emissions by Category and State (tons/year)

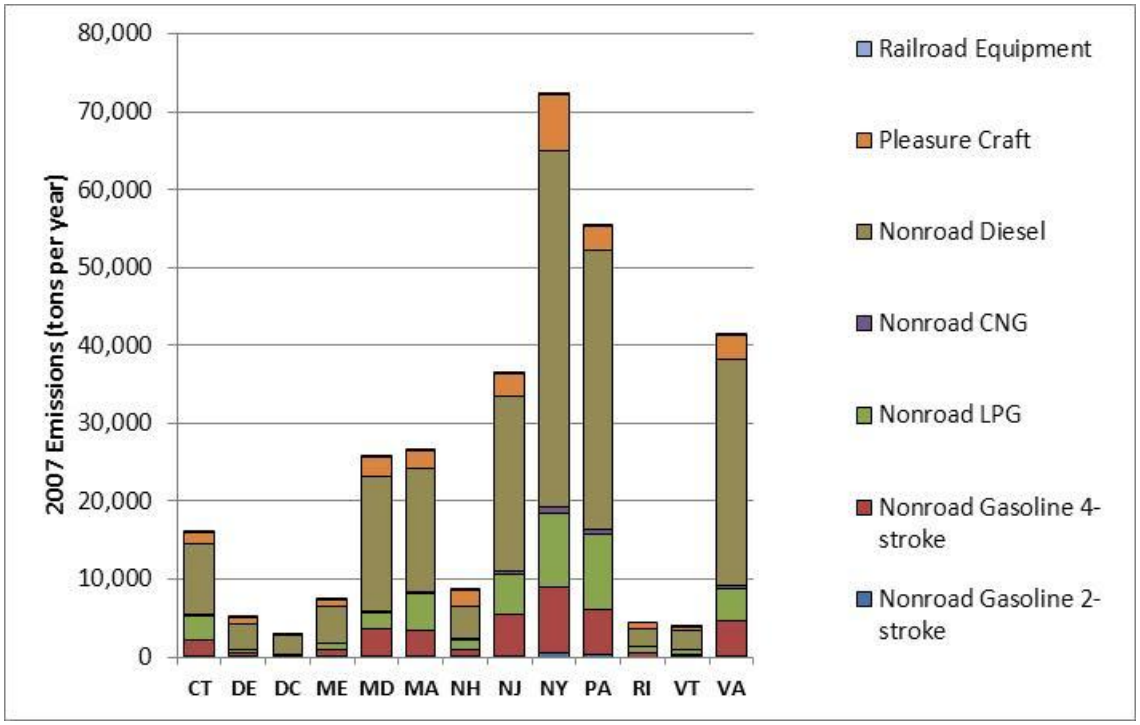


Exhibit 5.9 – 2002 and 2007 NMIM/NONROAD PM10-PRI Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	1,713	1,412	-18%
Delaware	570	476	-17%
District of Columbia	298	242	-19%
Maine	1,204	1,151	-4%
Maryland	3,119	2,600	-17%
Massachusetts	2,887	2,384	-17%
New Hampshire	947	846	-11%
New Jersey	4,285	3,377	-21%
New York	8,332	7,059	-15%
Pennsylvania	6,281	5,623	-10%
Rhode Island	403	367	-9%
Vermont	518	482	-7%
Virginia	4,901	4,128	-16%
	35,459	**30,146**	**-15%**

Exhibit 5.10 – 2007 NMIM PM10-PRI Emissions by Category and State (tons/year)

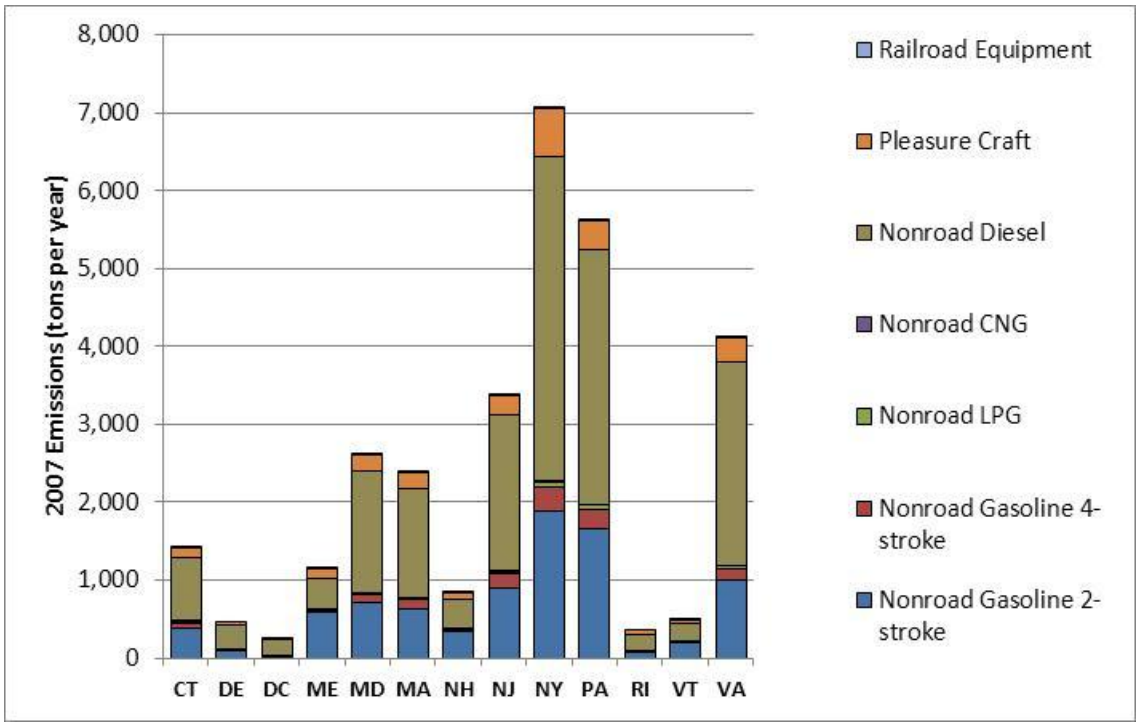


Exhibit 5.11 – 2002 and 2007 NMIM/NONROAD PM25-PRI Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	1,578	1,343	-15%
Delaware	525	453	-14%
District of Columbia	288	234	-19%
Maine	1,135	1,080	-5%
Maryland	2,870	2,473	-14%
Massachusetts	2,659	2,268	-15%
New Hampshire	872	799	-8%
New Jersey	3,951	3,213	-19%
New York	7,670	6,715	-12%
Pennsylvania	5,784	5,346	-8%
Rhode Island	371	349	-6%
Vermont	477	455	-5%
Virginia	4,665	3,933	-16%
	32,844	**28,660**	**-13%**

Exhibit 5.12 – 2007 NMIM PM25-PRI Emissions by Category and State (tons/year)

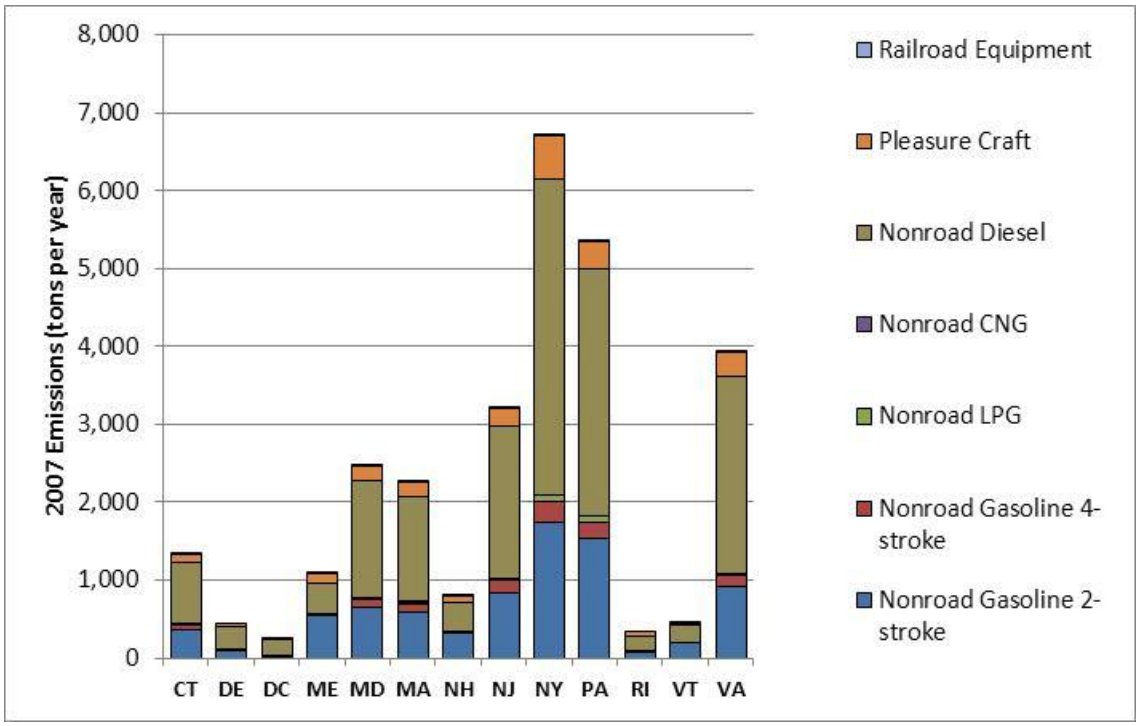


Exhibit 5.3 – 2002 and 2007 NMIM/NONROAD SO2 Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	1,377	802	-42%
Delaware	513	266	-48%
District of Columbia	341	196	-43%
Maine	772	416	-46%
Maryland	2,569	1,436	-44%
Massachusetts	2,428	1,377	-43%
New Hampshire	673	441	-34%
New Jersey	3,525	1,905	-46%
New York	6,961	3,957	-43%
Pennsylvania	5,292	2,972	-44%
Rhode Island	335	211	-37%
Vermont	368	202	-45%
Virginia	3,982	2,284	-43%
	29,136	**16,464**	**-43%**

Exhibit 5.14 – 2007 NMIM SO2 Emissions by Category and State (tons/year)

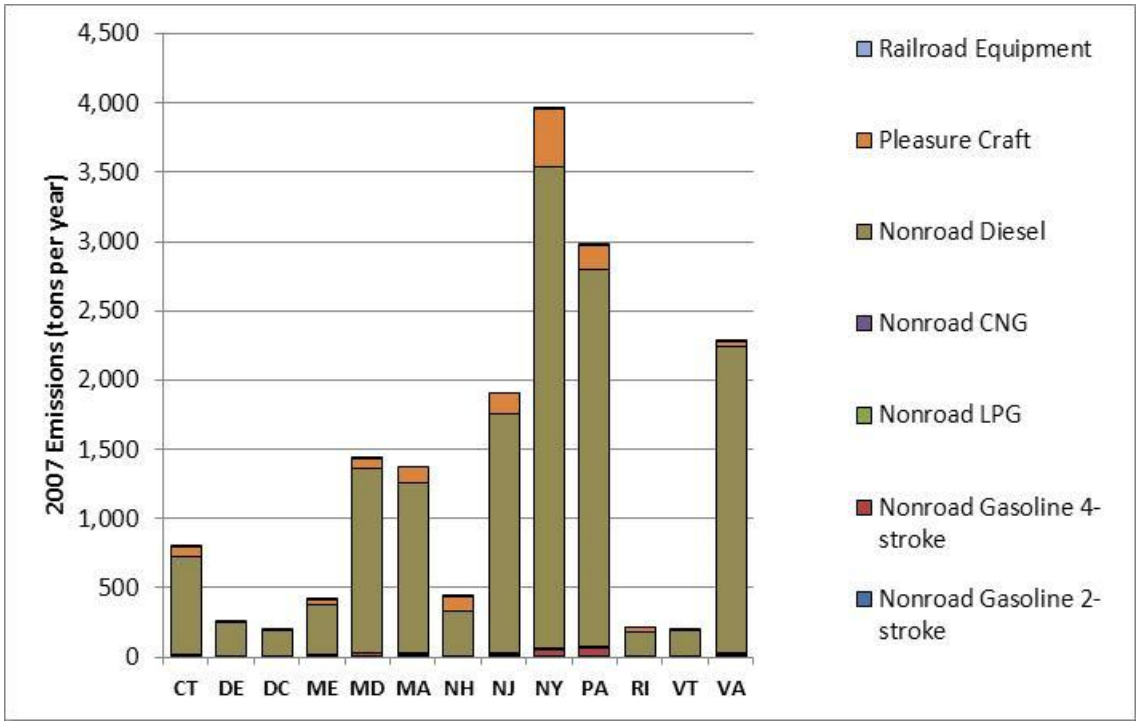
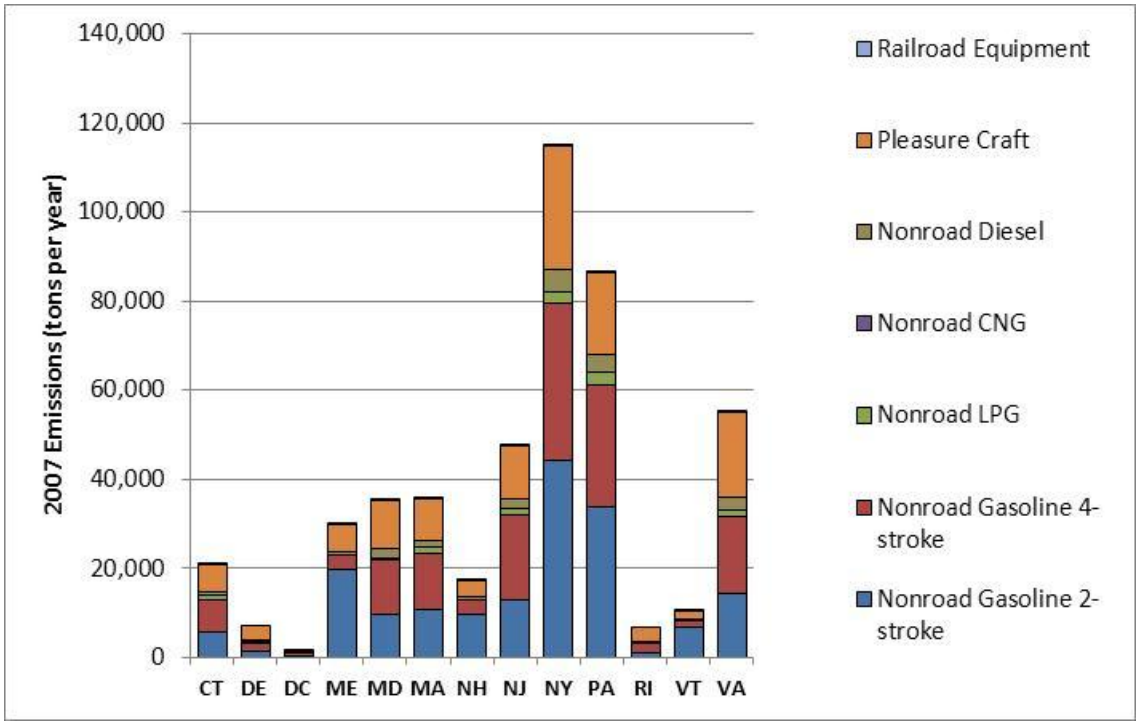


Exhibit 5.15 – 2002 and 2007 NMIM/NONROAD VOC Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	33,519	20,721	-38%
Delaware	7,531	7,157	-5%
District of Columbia	2,053	1,324	-36%
Maine	30,741	29,880	-3%
Maryland	53,035	35,160	-34%
Massachusetts	54,836	35,676	-35%
New Hampshire	22,238	17,108	-23%
New Jersey	81,900	47,521	-42%
New York	155,463	114,935	-26%
Pennsylvania	99,241	86,397	-13%
Rhode Island	7,699	6,721	-13%
Vermont	10,520	10,339	-2%
Virginia	53,487	55,135	3%
	612,262	**468,074**	**-24%**

Exhibit 5.16 – 2007 NMIM VOC Emissions by Category and State (tons/year)



6.0 ANNUAL 2007 INVENTORY FOR NONROAD SOURCES – MARINE VESSELS, AIRPORTS, AND RAIL

The Contractor estimated 2007 base year emissions for the Marine Vessel, Airports, and Rail (MAR) categories using USEPA/ERTAC data, USEPA/ERTAC data revised or augmented with state supplied data; or State supplied data. Data for each MAR category was obtained from USEPA and ERTAC for use as a default data set. The USEPA and ERTAC data, developed to support the 2008 inventory, was provided to states for review. State inventory personnel determined which of the above approaches was appropriate for their state. MARAMA coordinated the collection of supplemental or replacement data from states. The sections below describe the default data sources as well as the modifications received from states for each inventory segment.

6.1 COMMERCIAL MARINE VESSELS

For commercial marine vessels, data was obtained from USEPA 2008 NEI (USEPA 2010d). Initial draft database files were provided to the Contractor by USEPA for Category 1 and 2 CMV and for Category 3 CMV. The Category 1 and 2 database contained emissions for both ports and underway vessels.

The Category 3 database included tables containing emissions from approach, interport, port and RSZ. This database includes emissions from CMV operation within 12 nautical miles of shore. Emissions beyond the 12 nautical mile boundaries are not included in this inventory, but will be provided by USEPA to emission modelers in SMOKE format for inclusion in air quality modeling. These tables were matched to GIS ArcInfo shape files for use in plotting emissions.

Several MARAMA States indicated that they had CMV emissions that they preferred over those provided by USEPA. However, these emissions were only available in NIF area source file format (county/SCC summary level) and not spatially allocated. Thus for consistency, the Contractor summarized the emissions from USEPA to the county/SCC level and input that data into a database format. In late December 2009, USEPA provided the Contractor with a final version of the CMV emissions summarized at the county/SCC level. The file was a Microsoft Access database (2008CMVCntySummary.mdb). That database contained a summary table containing the State/county FIPS code, the SCC, pollutant code and 2008 annual emissions (in tons). The Contractor used that database to update the NIF format database for those MARAMA States that had indicated that they wished to use the USEPA data. The USEPA 2008 NEI data was used directly for 2007.

No changes were made to the 2008 data for 2007 (i.e., the 2007 emissions were assumed to be equal to 2008).

Four States (CT, DC, RI, VA) used the USEPA NEI data for all CMV categories. Virginia supplemented the USEPA CMV data by adding military vessels to the inventory. VT indicated that they wanted to use USEPA data but no CMV emissions were in the USEPA database for VT. Six States (DE, ME, MA, NH, NJ and PA) supplied State specific data for all categories. Maryland used USEPA NEI data for diesel CMV and State-specific data for residual CMV. New York used State-specific data for diesel CMV and upstate residual CMV, and USEPA NEI data for seven counties in the New York City metro area.

Note that NY included VOC emissions from lightering operations in the CMV inventory using SCC 22-80-002-000. Delaware included VOC emissions from lightering operations in the point source inventory. No other State has significant lightering operations.

Exhibit 6.1 indicates the data source by State and SCC for the emissions in the MARAMA 2007 base year inventory for CMV.

Exhibit 6.1 – Data Sources for Commercial Marine Vessel Inventory

State	22-80-002-100 Diesel Port	22-80-002-200 Diesel Underway	22-80-003-100 Residual Port	22-80-003-200 Residual Underway	22-83-000-000 All Fuels Military
CT	EPA	EPA	EPA	EPA	n/a
DE	State	State	State	State	n/a
DC	n/a	EPA	n/a	EPA	n/a
ME	State	State	State	State	n/a
MD	EPA	EPA	State	State	n/a
MA	State*	State*	State	State	n/a
NH	State	State	State	State	n/a
NJ	State	State	State	State	n/a
NY	State	State	State / EPA	State / EPA	n/a
PA	State	State	State	State	n/a
RI	EPA	EPA	EPA	EPA	n/a
VT	n/a	n/a	n/a	n/a	n/a
VA	EPA	EPA	EPA	EPA	State

* MA used different SCCs that the other States for diesel CMV to identify Harbor vessels, fishing vessels, military vessels, port operations, and underway operation.

6.2 AIRPORTS (AIRCRAFT AND GROUND SUPPORT EQUIPMENT)

For airport emissions, states either used their own data or a database developed by USEPA to support the 2008 NEI (USEPA2010e). The USEPA database was developed on an airport by airport basis. Data files provided included:

- EIS facility site ID
- State facility site ID Facility site name
- State and county FIPS code Source classification code
- Pollutant code
- Airport emissions and
- The sum of landing and take offs (LTOs).

In addition, a database containing geographic information on each facility (latitude and longitude) along with operational information related to LTOs but contained no emissions data.

For States that used the USEPA inventory the USEPA 2008 NEI airport data was summarized at the county/SCC level to provide a starting point. The remaining States provided NIF format county/SCC level files. Once the initial inventory was compiled it was formatted in NIF format and the resultant database was provided to the States for review and comment. Changes resulting from States comments were made to the initial inventory.

Exhibit 6.2 indicates by State and SCC which components of the inventory came from different data sources. In those instances where the data source is listed as “EPA”, the data are taken directly from the 2008 NEI. 2008 data were used directly to represent 2007 emissions. No changes to the 2008 data were applied for the 2007 base year inventory. Exhibit 6.2 also indicates that for a number of States, the emission estimates represent blended sources. For example, several of the States providing their own data only provided emission estimates for aircraft emissions but not emissions for ground support equipment (GSE) or auxiliary power units (APUs). For those States, 2008 USEPA NEI data were added to the inventory to provide those estimates. Those States were DE and ME. MD provided State supplied GSE/APU emissions but without a break down of the GSE emissions by fuel type. In addition, NY provided EDMS output files for all aircraft and GSE/APU emissions from each individual airport. Those emissions also had GSE emissions as a single value without an indication of the fuel type of the equipment. In both cases (NY and MD), the fuel type ratios used in the USEPA NEI were used to divide GSE emissions by fuel type. Those ratios were:

SCC	SCC Level Two	Fraction
2265008005	Off-highway Vehicle Gasoline, 4-Stroke	0.1686
2267008005	LPG	0.0165
2268008005	CNG	0.0131
2270008005	Off-highway Vehicle Diesel	0.8017

Finally, while Exhibit 6.2 indicates that most of VA's emissions were derived from USEPA data, military aircraft operations emissions were provided by VA and were added to the USEPA data. However because these data were added as individual airports in counties where there were already emissions, when the data were summarized the data source was maintained as USEPA since the majority of emissions were derived from the USEPA inventory.

For Version 3, the only changes were to use a revised airport inventory for New Jersey.

Exhibit 6.2 – Data Sources for Airport Operations Inventory

State	2265, 2267, 2268, 2270 GSE	2275001xxx Military	2275020xxx Commercial	2275050xxx General Aviation	2275060xxx Air Taxi	2275070xxx APUs
CT	State	State	State	State	State	State
DE	EPA	State	State	State	State	EPA
DC	n/a	n/a	n/a	State	n/a	n/a
ME	EPA	State	State	State	State	EPA
MD	State and EPA	State	State	State	State	State and EPA
MA	EPA	EPA	EPA	EPA	EPA	EPA
NH	State	State	State	State	State	n/a
NJ	State	State	State	State	State	State
NY	State	n/a	State	State	n/a	State
PA	EPA	EPA	EPA	EPA	EPA	EPA
RI	EPA	EPA	EPA	EPA	EPA	EPA
VT	EPA	EPA	EPA	EPA	EPA	EPA
VA	EPA	EPA	EPA	EPA	EPA	EPA

6.3 RAILROAD LOCOMOTIVES AND RAILYARDS

The ERTAC 2008 inventory for railroad locomotives and rail yards was provided to MANEVU+VA States for review to determine if the inventory should be included in the 2007 base year emission inventory (ERTAC 2010a, ERTAC 2010b). The ERTAC rail inventory included three categories of locomotive emissions: Class I line-haul, Class I rail yard switchers, and Class II/III short line and regional railroads. The original files provided to the Contractor for the ERTAC inventory included several spreadsheets. There spreadsheets were:

1. EmissionsByCounty_Round61.xls (county level Class I line haul emissions)
2. EmissionsByState_Round61.xls (State level Class I line haul emissions)
3. R-1 Fuel Use Data Summary 20072.xls (line haul fuel use data for 2007)
4. Rail-Class_II_III_revised 4-20-2010.xls (Class II and III county level emissions by rail line, along with link, mileage, and fuel usage information)

The data in the Class II and III spreadsheet was summarized by county and converted into NIF format. The Class I emissions were also converted into NIF format. Both Class I and Class II/III emissions were reported as hydrocarbons (HC). These emissions were converted to VOC emissions by multiplying the HC emissions by a factor of 1.053 (USEPA 2009e) for all states except Maryland, where a factor of 1.0478 was used. In addition, all 2008 emissions were assumed to equal 2007 emissions.

Three States (PA, VA and VT) used the ERTAC data directly without modification for the three categories included in the ERTAC inventory (Class I Line Haul, Class II/III Line Haul, Yard/Switcher Locomotives). New Jersey used the ERTAC Class I data and State-supplied data for Class II/III and Yard locomotives. New York used the ERTAC yard locomotive data and State-supplied data for Class I and Class II/III. All other States made changes to the 2008 ERTAC inventory, either to add/modify included sources or to revise emission values to 2007 values.

ERTAC did not develop emission estimates for Line Haul Passenger (AMTRAK) or Line Haul Commuter locomotives. Six States (CT, DC, MD, NY, PA, and VA) provided emission estimates for AMTRAK diesel locomotives. Note that the AMTRAK northeast corridor line uses electric powered locomotives, so there are no emissions from diesel AMTRAK locomotives in DE, NJ, RI, and MA. Seven States (CT, DC, MD, MA, NJ, NY, and PA) provided emission estimates for diesel commuter locomotives in their State.

Exhibit 6.3 provides a breakdown by State and SCC of the data sources for emissions from railroads and rail yards. Once the draft inventory was prepared the NIF database was provided to the MARAMA States for review. Only minor corrections were made to the database prior to submittal for stakeholder review and comments.

Exhibit 6.3 – Data Sources for Railroad Locomotive and Railyard Inventory

State	2285002006 Line Haul Class I Ops	2285002007 Line Haul Class II/III Ops	2285002008 Line Haul Passenger	2285002009 Line Haul Commuter	2285002010 Yard Locomotives
CT	State	State	State	State	State
DE	State	State	n/a	n/a	State
DC	State	n/a	State	State	State
ME	n/a	State	n/a	n/a	State
MD	State	State	State	State	State
MA	State	State	n/a	State	State
NH	n/a	State	n/a	n/a	n/a
NJ	EPA / ERTAC	State	n/a	State	State
NY	State	State	State	State	EPA / ERTAC
PA	EPA / ERTAC	EPA / ERTAC	State	State	EPA / ERTAC
RI	State	State	n/a	n/a	State
VT	EPA / ERTAC	EPA / ERTAC	n/a	n/a	n/a
VA	EPA / ERTAC	EPA / ERTAC	State	n/a	EPA / ERTAC

6.4 STAKEHOLDER REVIEW AND COMMENT

Draft inventory data files and documentation for MAR sources was posted on the MARAMA website in August 2010 for stakeholder review. No comments on the MAR inventory were received.

6.5 VERSION 3 REVISIONS

6.5.1 New Jersey MAR Revisions

Following the completion of Version 2 of the 2007 MANE-VU+VA inventory in February 2011, New Jersey provided several revisions to the MAR inventory, as follows:

- developed a new airport inventory using the FAA's EDMS;
- provided revised emission estimates for all commercial marine vessel categories;
- allocated GSE emissions calculated by EDMS to four fuel types (gasoline, LPG, CNG, and diesel) using the apportionment factors listed in Section 6.2. Previously in Version 2, all GSE fuel use was assigned to diesel engines. The revisions did not change the total GSE emissions, simply distributes the EDMS emissions over the four GSE fuel types.

6.5.2 Adjustment of Rail VOC Emissions

It was discovered that the ERTAC-reported rail emissions for VOC were actually hydrocarbon emissions. For locomotive engines, USEPA estimated that VOC emissions can be assumed to be equal to 1.053 times the hydrocarbon emissions (USEPA2009e). This adjustment was not made to the rail inventory developed by ERTAC. The ERTAC inventory assumed that VOC emissions equal hydrocarbon emissions. Some states (DE, NH, RI) made this adjustment in the rail inventories that were used in Version 2. The remaining states did not make the adjustment and the Version 2 VOC emissions were multiplied by 1.053 to generated revised emissions for Version 3. Maryland made a partial adjustment in Version 2, and specified that a factor of 1.0478 should be used to adjust

6.6 SUMMARY OF MAR INVENTORY FOR 2007

Exhibits 6.4 to 6.10 compare the 2002 and 2007 emissions by State and pollutant for MAR sources. The 2002 emissions are those that were developed previously for Version 3 of the MANE-VU and the VISTAS best-and-final inventory for Virginia. It is likely that many of the differences between the 2002 and 2007 emissions are due to changes in the emission estimation methodologies for CMV, airports, and railroads.

CO emissions are primarily from aircraft and GSE engines used at airports. CMV is the largest sector for NOx emissions, but there are also substantial NOx emissions from airports and railroad locomotives. SO2 emissions are primarily from the CMV category. All three sectors also generate PM and VOC emissions.

Exhibit 6.4 – 2002 and 2007 MAR CO Emissions by State (tons/year)

	Marine Vessels			Airports			Rail Locomotives		
STATE	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**
CT	603	1,077	79%	1,565	4,659	198%	362	184	-49%
DE	1,138	554	-51%	1,575	1,625	3%	144	75	-48%
DC	1	1	1%	0	14	n/a	73	73	0%
ME	376	522	39%	4,487	32,879	633%	69	188	173%
MD	431	2,795	548%	11,575	10,265	-11%	789	700	-11%
MA	1,231	1,473	20%	11,294	15,495	37%	748	646	-14%
NH	169	89	-47%	2,031	2,089	3%	71	88	24%
NJ	1,424	1,619	14%	29,375	21,878	-26%	580	665	15%
NY	1,790	3,475	94%	11,895	17,403	46%	1,551	3,061	97%
PA	1,111	1,294	16%	24,799	26,540	7%	3,359	2,987	-11%
RI	0	522	n/a	1,424	1,739	22%	55	15	-73%
VT	0	0	n/a	521	2,420	365%	20	72	262%
VA	1,082	3,735	245%	11,873	22,009	85%	1,186	2,701	128%
	9,356	**17,155**	**83%**	**112,414**	**159,016**	**41%**	**9,007**	**11,456**	**27%**

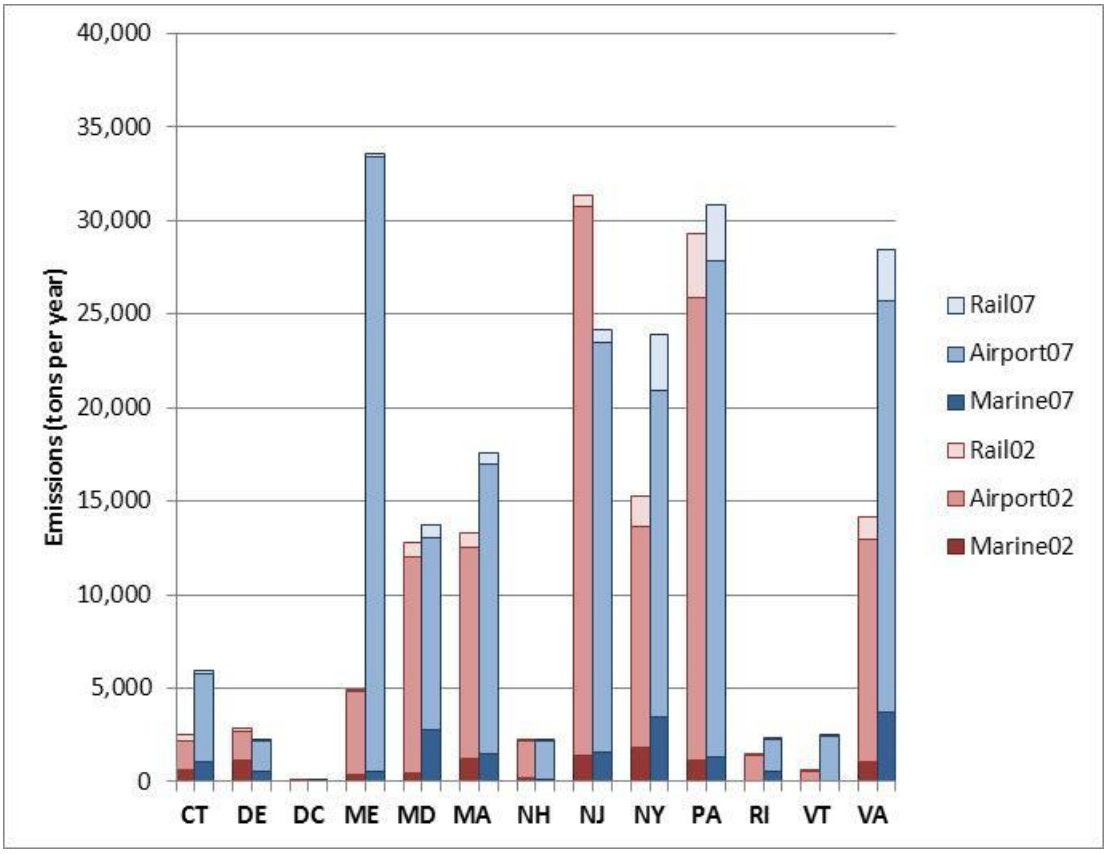


Exhibit 6.5 – 2002 and 2007 MAR NH3 Emissions by State (tons/year)

	Marine Vessels			Airports			Rail Locomotives		
STATE	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**
CT	0	3	n/a	0	0	n/a	0	1	n/a
DE	0	0	n/a	0	0	n/a	0	0	n/a
DC	0	0	n/a	0	0	n/a	0	0	n/a
ME	0	0	n/a	0	0	n/a	0	0	n/a
MD	0	8	n/a	0	0	n/a	0	0	n/a
MA	0	0	n/a	0	0	n/a	0	2	n/a
NH	0	0	n/a	0	0	n/a	0	0	n/a
NJ	0	8	n/a	0	0	n/a	0	2	n/a
NY	0	2	n/a	0	0	n/a	0	0	n/a
PA	0	13	n/a	0	0	n/a	0	9	n/a
RI	0	1	n/a	0	0	n/a	0	0	n/a
VT	0	0	n/a	0	0	n/a	0	0	n/a
VA	0	9	n/a	0	0	n/a	0	8	n/a
	0	**44**	**n/a**	**0**	**0**	**n/a**	**0**	**23**	**n/a**

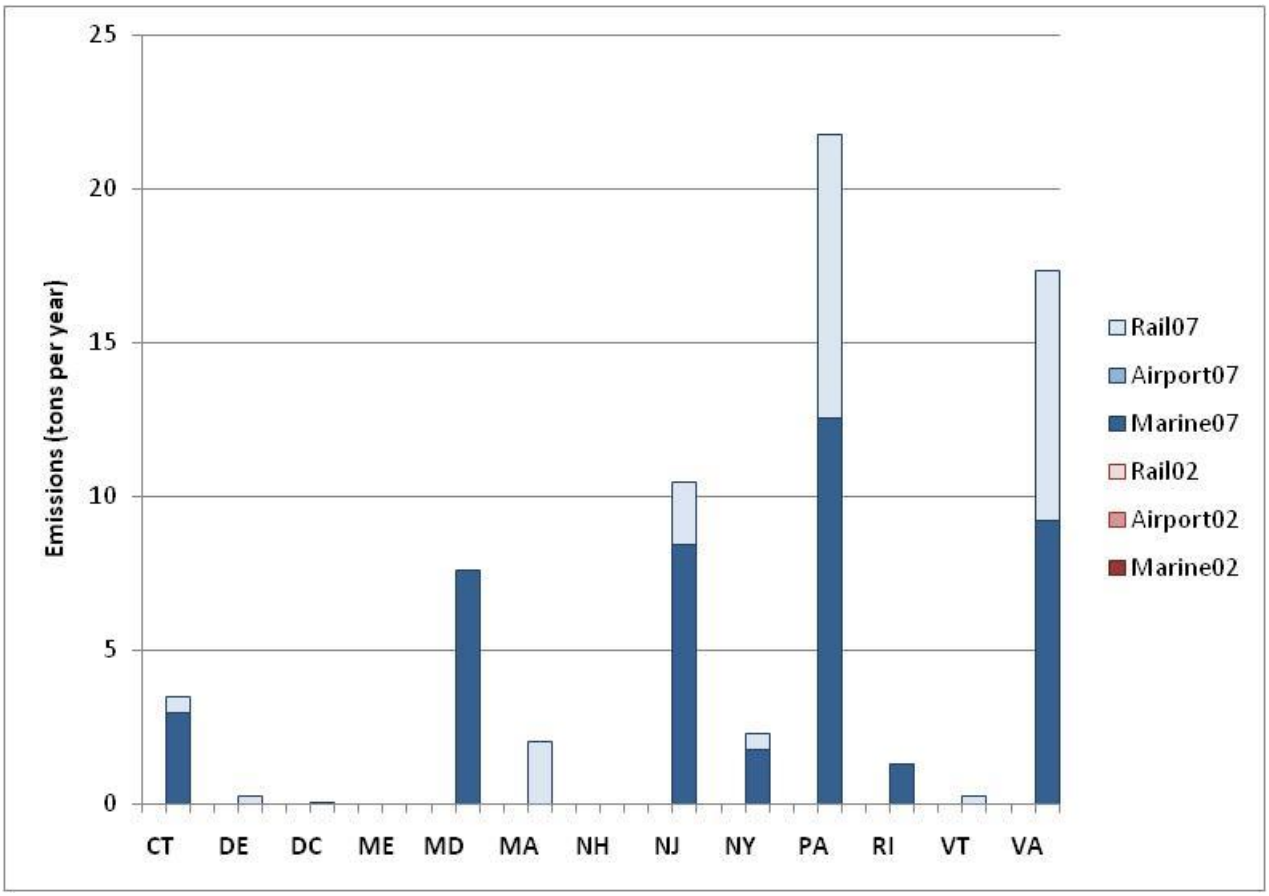


Exhibit 6.6 – 2002 and 2007 MAR NOx Emissions by State (tons/year)

	Marine Vessels			Airports			Rail Locomotives		
STATE	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**
CT	4,577	6,528	43%	415	713	72%	2,612	1,723	-34%
DE	8,362	5,094	-39%	970	805	-17%	1,105	384	-65%
DC	4	6	56%	0	0	n/a	502	505	1%
ME	1,154	1,659	44%	184	134	-27%	269	1,369	409%
MD	2,531	16,027	533%	2,038	1,910	-6%	5,145	4,767	-7%
MA	2,590	3,246	25%	2,988	3,190	7%	7,161	6,133	-14%
NH	1,284	271	-79%	162	278	72%	332	891	169%
NJ	10,981	11,197	2%	4,739	5,105	8%	5,721	5,957	4%
NY	12,266	28,180	130%	4,880	6,998	43%	14,162	20,675	46%
PA	8,217	11,378	38%	4,131	3,738	-10%	29,292	20,675	-29%
RI	1	2,829	n/a	263	289	10%	186	144	-22%
VT	0	0	n/a	48	103	114%	7	736	10416%
VA	3,088	21,760	605%	3,885	5,520	42%	11,882	18,319	54%
	55,055	**108,174**	**96%**	**24,703**	**28,783**	**17%**	**78,376**	**82,279**	**5%**

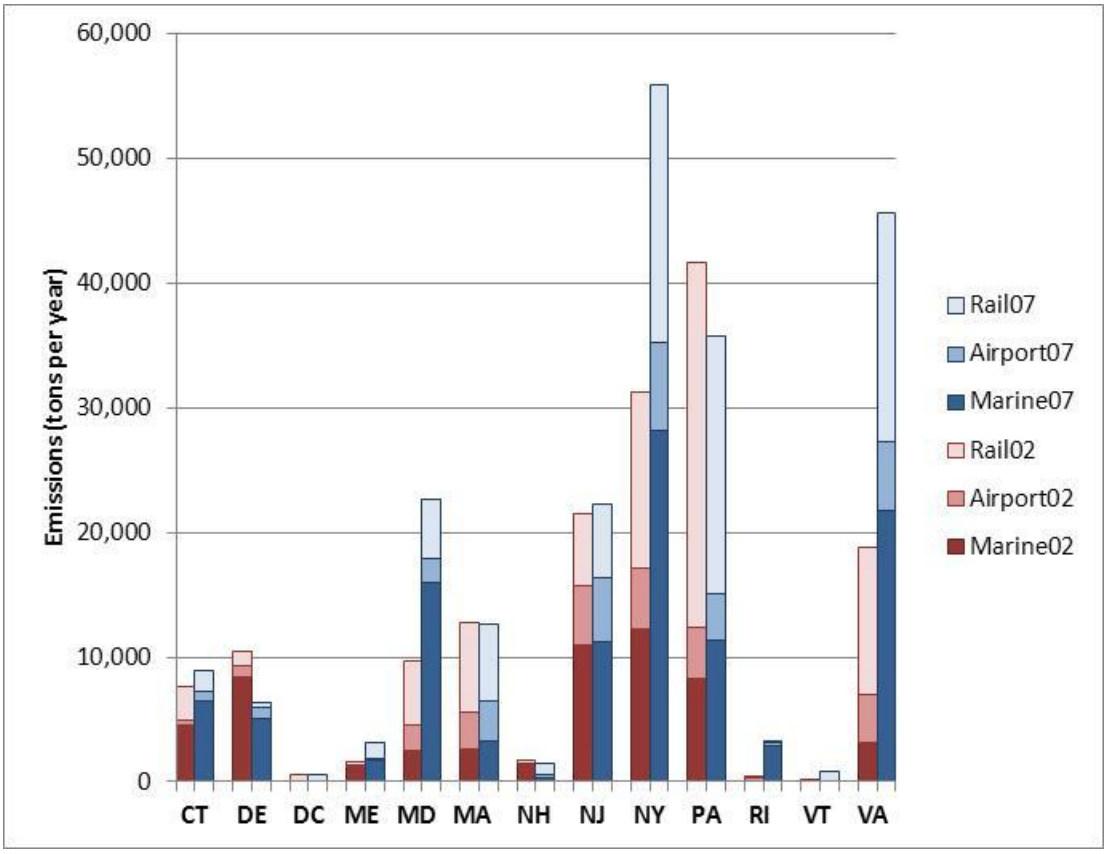


Exhibit 6.7 – 2002 and 2007 MAR PM10-PRI Emissions by State (tons/year)

	Marine Vessels			Airports			Rail Locomotives		
STATE	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**
CT	194	311	61%	45	66	46%	5	46	812%
DE	393	327	-17%	28	27	-5%	31	15	-50%
DC	0	0	n/a	0	0	n/a	12	12	-2%
ME	129	395	206%	97	83	-15%	8	28	246%
MD	637	657	3%	1,012	74	-93%	172	166	-3%
MA	217	316	45%	246	295	20%	183	159	-13%
NH	54	13	-76%	49	37	-24%	10	22	120%
NJ	796	622	-22%	280	170	-39%	143	160	12%
NY	506	1,671	230%	409	140	-66%	358	608	70%
PA	253	524	107%	2,421	396	-84%	792	704	-11%
RI	0	112	n/a	93	22	-76%	6	4	-40%
VT	0	0	n/a	12	46	282%	1	18	1712%
VA	359	946	164%	2,010	821	-59%	1,529	634	-59%
	3,538	**5,895**	**67%**	**6,702**	**2,176**	**-68%**	**3,250**	**2,574**	**-21%**

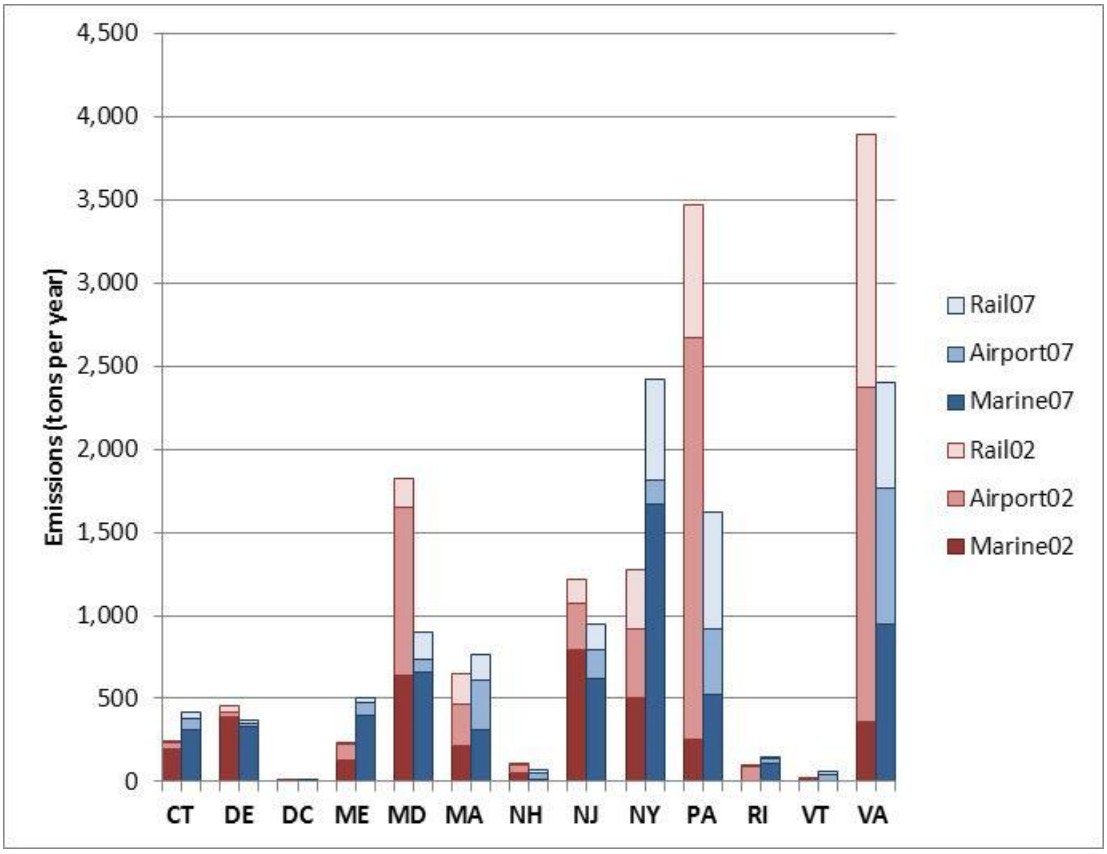


Exhibit 6.8 – 2002 and 2007 MAR PM25-PRI Emissions by State (tons/year)

	Marine Vessels			Airports			Rail Locomotives		
STATE	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**
CT	178	296	66%	38	51	35%	5	39	686%
DE	354	305	-14%	20	19	-7%	28	15	-47%
DC	0	0	n/a	0	0	n/a	11	11	4%
ME	119	364	205%	69	61	-11%	8	25	218%
MD	637	606	-5%	698	16	-98%	155	161	4%
MA	200	290	45%	226	215	-5%	143	145	2%
NH	50	12	-76%	36	27	-24%	9	21	132%
NJ	732	575	-21%	195	143	-27%	128	147	15%
NY	466	1,541	231%	362	139	-62%	323	572	77%
PA	232	484	109%	1,718	294	-83%	713	650	-9%
RI	0	108	n/a	68	17	-75%	5	3	-34%
VT	0	0	n/a	9	32	259%	1	17	1567%
VA	330	908	175%	1,970	580	-71%	1,375	586	-57%
	3,298	**5,489**	**66%**	**5,409**	**1,595**	**-71%**	**2,904**	**2,395**	**-18%**

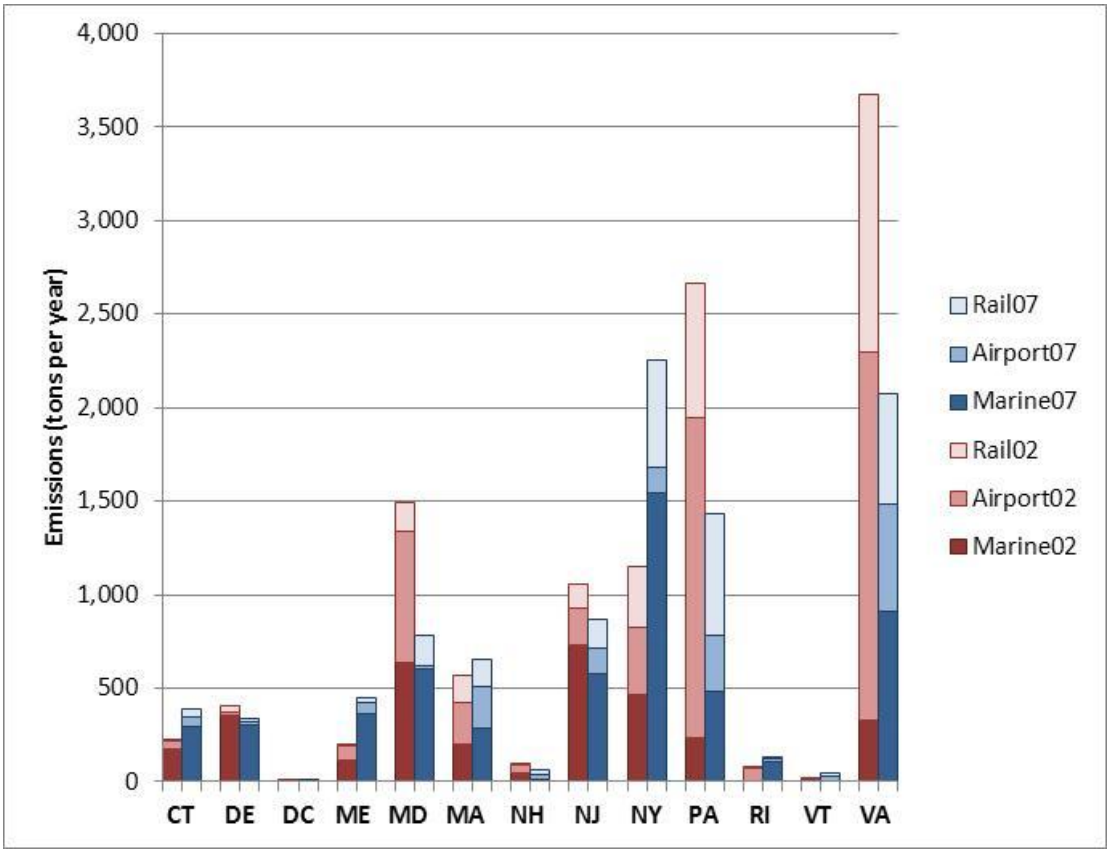


Exhibit 6.9 – 2002 and 2007 MAR SO2 Emissions by State (tons/year)

	Marine Vessels			Airports			Rail Locomotives		
STATE	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**
CT	671	1,386	107%	39	96	145%	4	57	1323%
DE	3,377	2,079	-38%	30	55	84%	64	5	-92%
DC	1	1	30%	0	0	n/a	33	37	11%
ME	128	189	47%	3	14	376%	15	92	514%
MD	4,739	2,170	-54%	262	247	-6%	374	64	-83%
MA	489	698	43%	284	218	-23%	591	66	-89%
NH	188	506	169%	15	28	86%	16	10	-36%
NJ	11,444	6,712	-41%	374	507	35%	352	55	-84%
NY	4,753	9,321	96%	440	699	59%	765	616	-19%
PA	297	3,067	933%	399	416	4%	1,934	211	-89%
RI	0	632	n/a	29	30	3%	14	5	-61%
VT	0	0	n/a	5	12	134%	1	5	412%
VA	386	4,058	951%	272	424	56%	3,641	192	-95%
	26,473	**30,819**	**16%**	**2,152**	**2,746**	**28%**	**7,804**	**1,416**	**-82%**

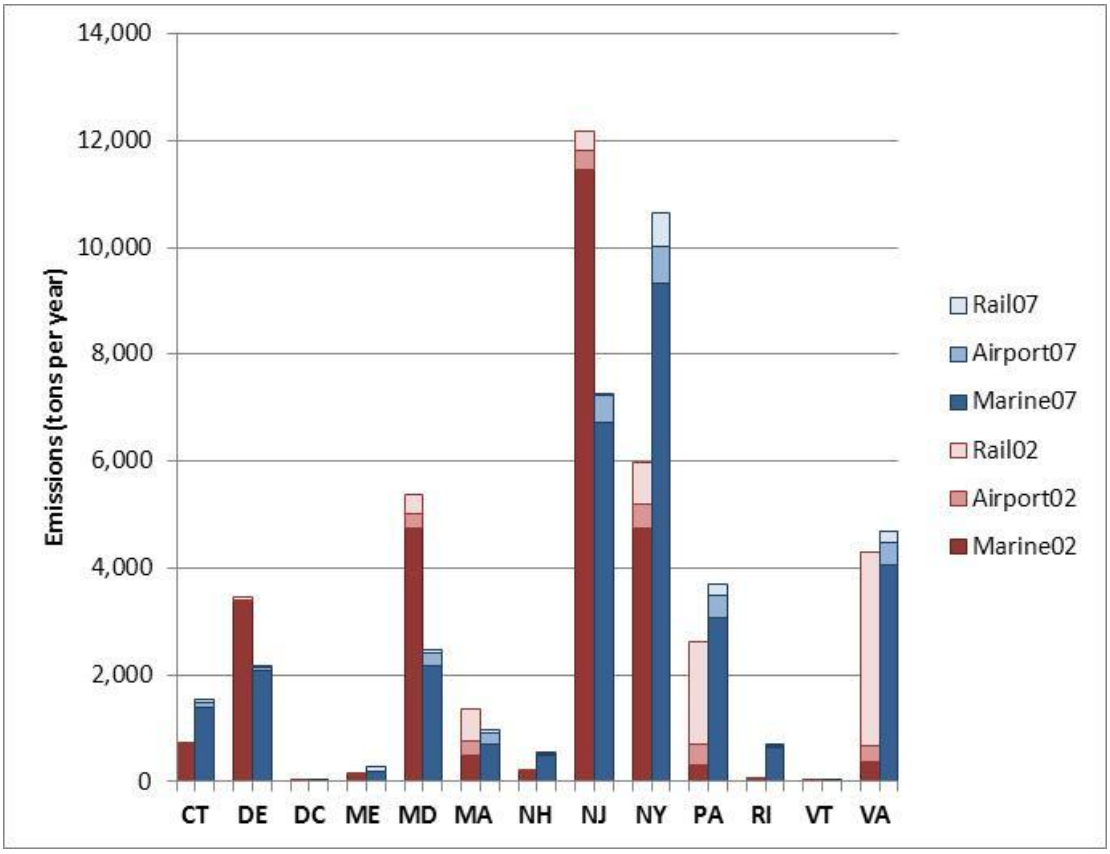
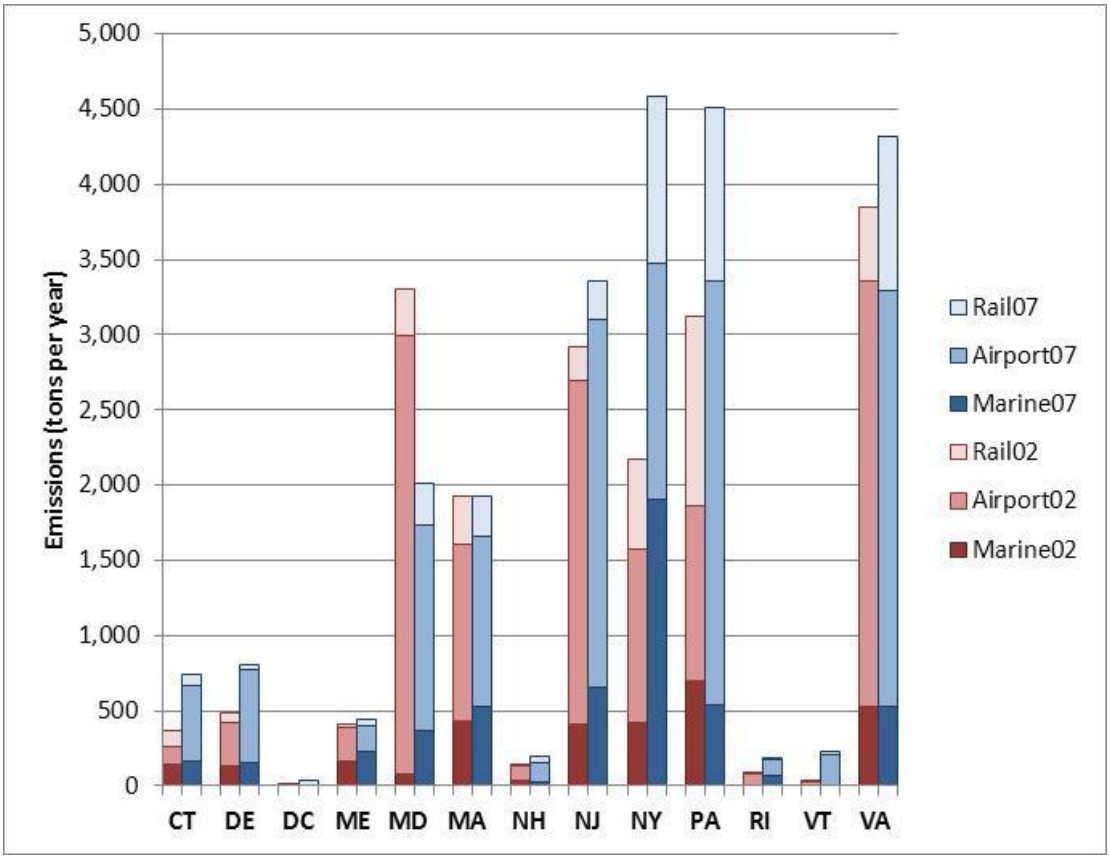


Exhibit 6.10 – 2002 and 2007 MAR VOC Emissions by State (tons/year)

	Marine Vessels			Airports			Rail Locomotives		
STATE	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**	**2002**	**2007**	**Change**
CT	143	161	13%	115	509	343%	114	73	-36%
DE	132	158	20%	290	620	114%	60	28	-53%
DC	0	0	n/a	0	1	n/a	20	34	70%
ME	166	233	41%	222	161	-27%	19	51	166%
MD	74	371	401%	2,920	1,365	-53%	312	271	-13%
MA	433	528	22%	1,177	1,129	-4%	312	267	-15%
NH	40	23	-43%	88	134	53%	15	35	136%
NJ	413	658	59%	2,281	2,438	7%	221	258	17%
NY	424	1,905	349%	1,145	1,571	37%	600	1,112	85%
PA	703	538	-23%	1,155	2,813	144%	1,260	1,153	-8%
RI	0	64	n/a	74	112	51%	10	8	-22%
VT	0	0	n/a	27	204	655%	2	29	1331%
VA	531	522	-2%	2,825	2,764	-2%	492	1,025	108%
	3,059	**5,163**	**69%**	**12,319**	**13,822**	**12%**	**3,437**	**4,343**	**26%**



7.0 ANNUAL 2007 INVENTORY FOR ONROAD SOURCES

7.1 OVERALL PROCESS TO DEVELOP THE ONROAD INVENTORY

EPA's recently released MOVES2010 (**MO**tor **V**ehicle **E**mission **S**imulator) is now the official model for estimating air pollution emissions from onroad mobile sources including buses, cars, trucks and motorcycles. MOVES2010 replaces MOBILE6.2, the previous mobile source model. MOVES input files are somewhat more detailed than the MOBILE6.2 input files. To assist in the transition to the new model, USEPA developed software tools to convert MOBILE6.2 inputs for MOVES. In addition, the MOVES model includes a preprocessing tool called the County Data Manager (CDM) to convert spreadsheet based information to MySQL database files required by MOVES.

States were offered the option of having NESCAUM perform the MOVES modeling using input data provided by and/or reviewed by the state. Three states elected to perform the MOVES modeling for their state using in-house resources. Exhibit 7.1 shows the approach selected by each state:

Exhibit 7.1 – MOVES Modeling Approach by State

States Providing MOBILE6.2 Input Files to NESCAUM	States Providing MOVES Input Files to NESCAUM	States Performing MOVES Modeling Themselves
DC, ME, NH, RI	CT, DE, MD, MA, NJ, VT	NY, PA, VA

7.2 MOVES MODEL RUN SPECIFICATIONS AND DOCUMENTATION

Appendix F contains NESCAUM's documentation of the MOVES modeling.

7.3 SUMMARY OF ONROAD INVENTORY

Exhibits 7.2 to 7.8 compare the 2002 and 2007 onroad emissions by state for each pollutant. The 2002 emissions were estimated using MOBILE6, while the 2007 emissions were estimated using MOVES. Differences between 2002 and 2007 results from the change in emission estimation methodologies (MOBILE6 vs. MOVES), VMT growth, and turnover of the vehicle fleet to newer, cleaner fuels and engines.

Exhibit 7.2 – 2002 and 2007 OnroadCO Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	562,124	365,925	-35%
Delaware	160,760	124,893	-22%
District of Columbia	66,018	36,379	-45%
Maine	410,958	215,689	-48%
Maryland	1,000,763	598,180	-40%
Massachusetts	1,039,100	583,234	-44%
New Hampshire	306,793	195,916	-36%
New Jersey	1,273,513	719,402	-44%
New York	3,711,150	2,024,775	-45%
Pennsylvania	2,784,197	1,962,326	-30%
Rhode Island	186,197	115,532	-38%
Vermont	248,248	115,532	-53%
Virginia	1,858,598	1,195,237	-36%
	13,608,417	**8,253,020**	**-39%**

2002 emissions were estimated using MOBILE6; 2007 emissions were estimated using MOVES

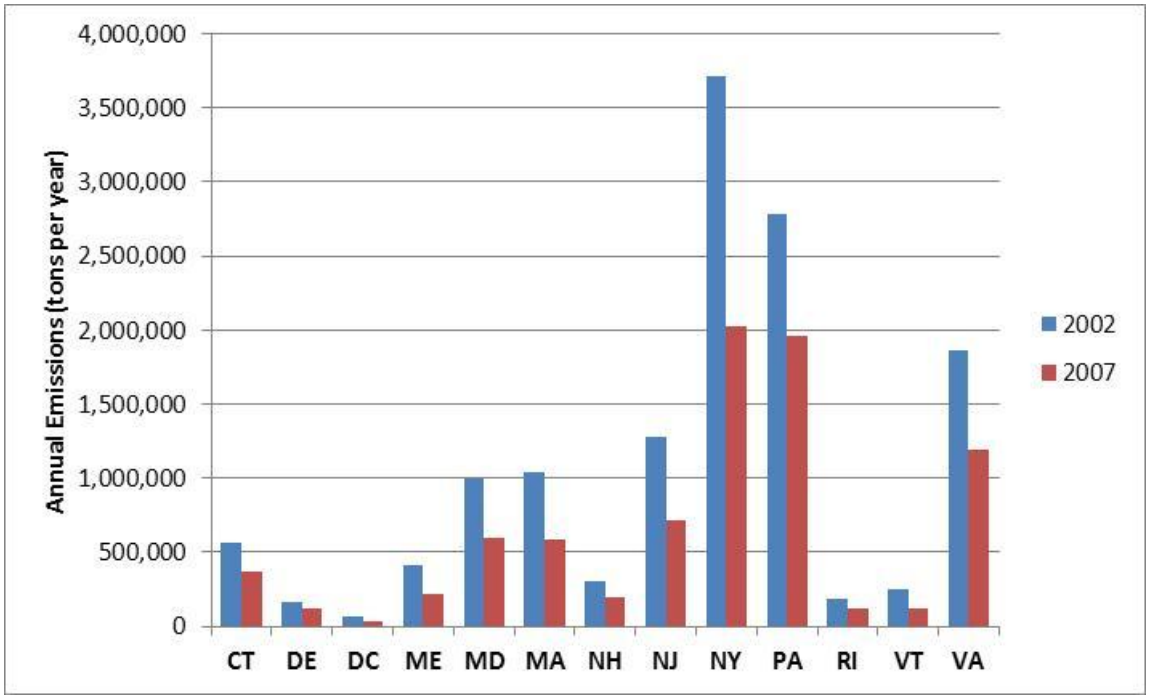


Exhibit 7.3 – 2002 and 2007 Onroad NH3 Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	3,294	1,309	-60%
Delaware	903	406	-55%
District of Columbia	398	158	-60%
Maine	1,468	605	-59%
Maryland	5,594	2,335	-58%
Massachusetts	5,499	2,194	-60%
New Hampshire	1,447	511	-65%
New Jersey	7,382	3,216	-56%
New York	14,681	6,831	-53%
Pennsylvania	10,532	5,278	-50%
Rhode Island	853	356	-58%
Vermont	934	356	-62%
Virginia	7,918	4,041	-49%
	60,902	**27,597**	**-55%**

2002 emissions were estimated using MOBILE6; 2007 emissions were estimated using MOVES

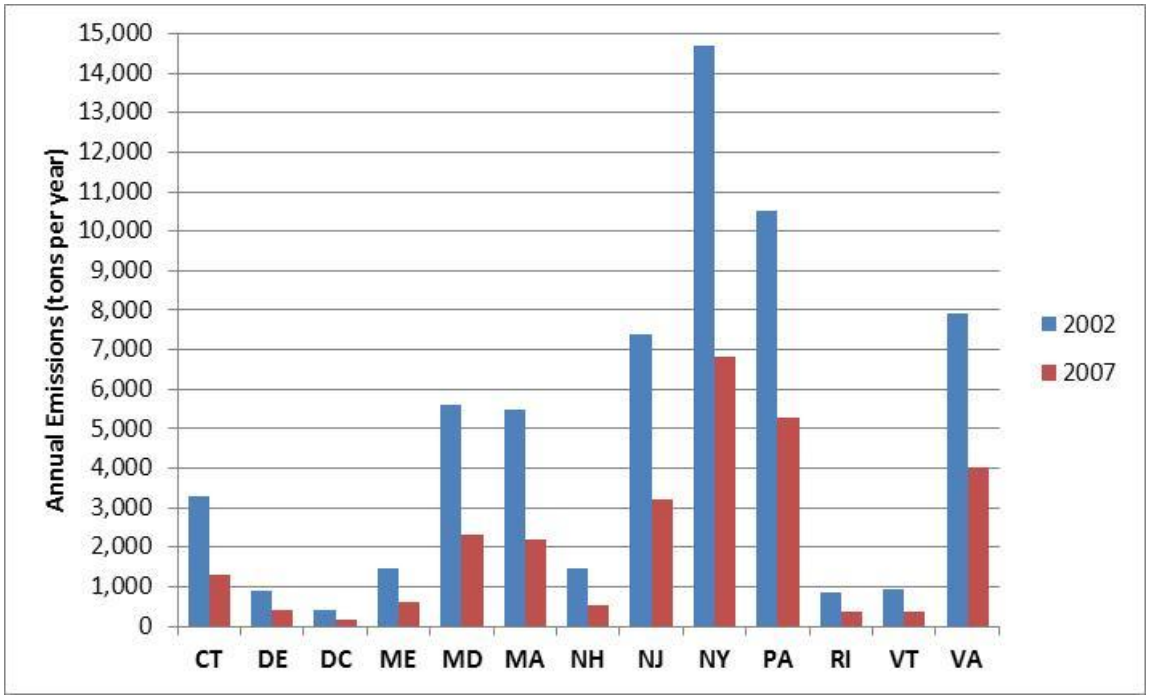


Exhibit 7.4 – 2002 and 2007 Onroad NOx Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	68,816	53,814	-22%
Delaware	21,341	24,456	15%
District of Columbia	8,902	8,714	-2%
Maine	54,687	36,844	-33%
Maryland	122,210	114,792	-6%
Massachusetts	143,368	73,328	-49%
New Hampshire	33,283	33,858	2%
New Jersey	152,076	135,139	-11%
New York	319,733	305,617	-4%
Pennsylvania	346,472	353,083	2%
Rhode Island	16,677	18,055	8%
Vermont	20,670	18,055	-13%
Virginia	182,482	197,822	8%
	1,490,716	**1,373,575**	**-8%**

2002 emissions were estimated using MOBILE6; 2007 emissions were estimated using MOVES

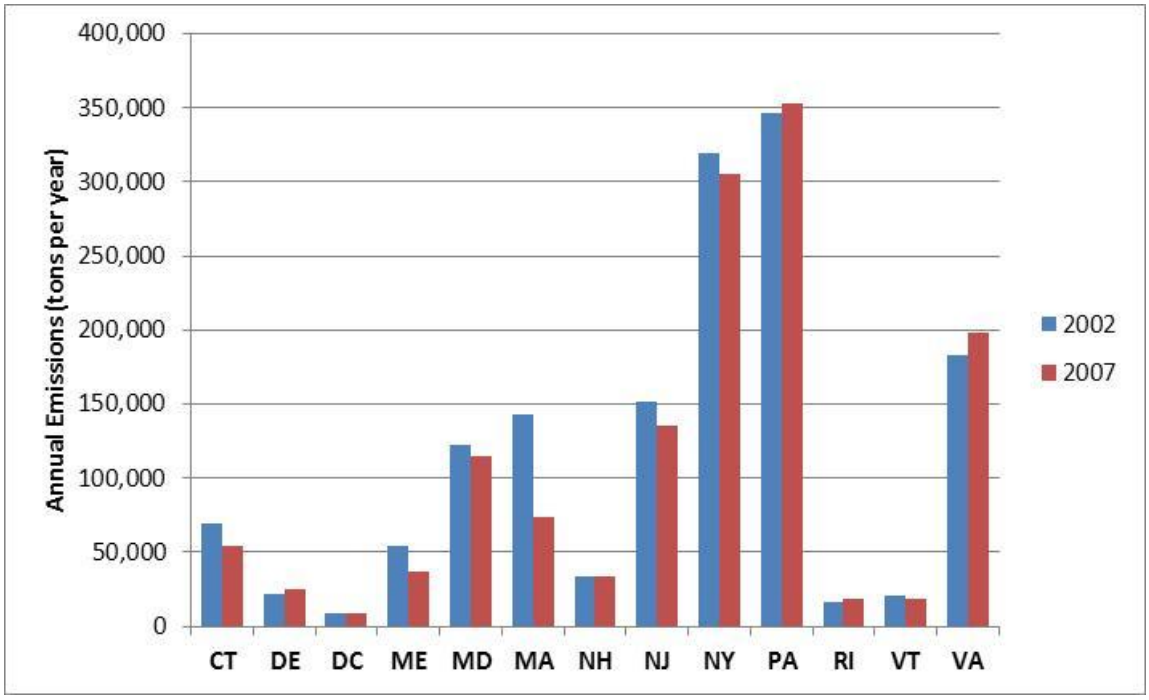


Exhibit 7.5 – 2002 and 2007 Onroad PM10-PRI Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	1,580	2,057	30%
Delaware	581	828	42%
District of Columbia	222	387	74%
Maine	1,239	1,507	22%
Maryland	3,168	4,103	29%
Massachusetts	3,408	2,915	-14%
New Hampshire	814	1,479	82%
New Jersey	3,725	5,013	35%
New York	8,457	14,765	75%
Pennsylvania	7,351	12,947	76%
Rhode Island	345	754	118%
Vermont	670	754	13%
Virginia	4,358	6,799	56%
	35,920	**54,307**	**51%**

2002 emissions were estimated using MOBILE6; 2007 emissions were estimated using MOVES

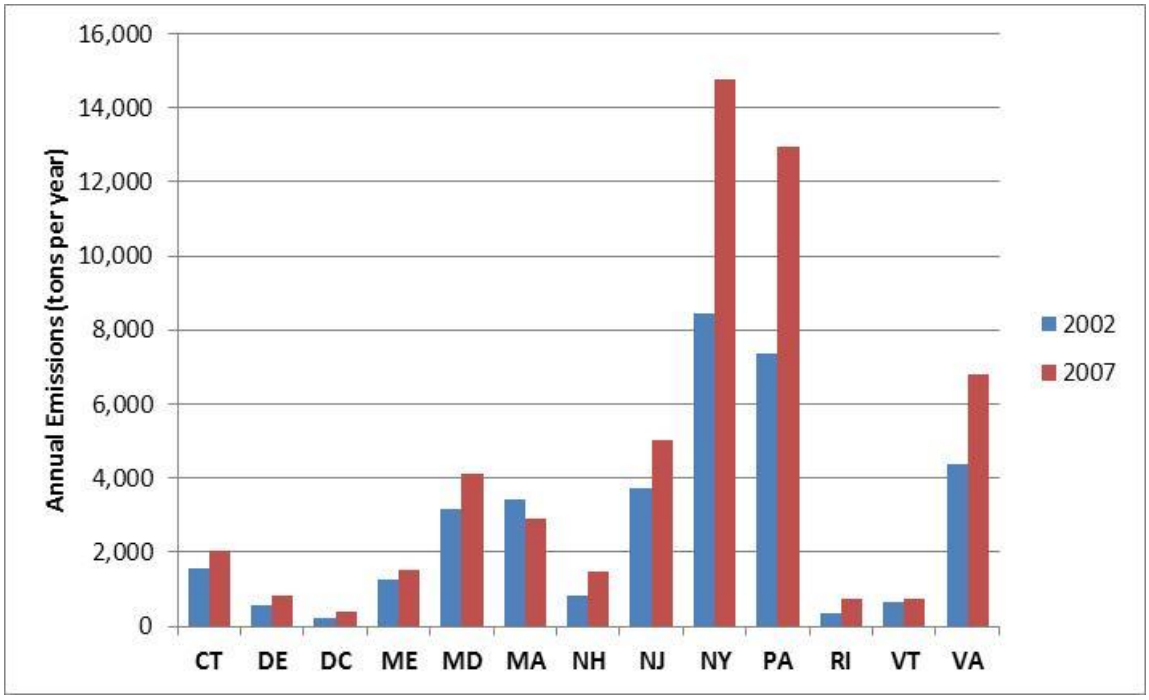


Exhibit 7.6 – 2002 and 2007 Onroad PM25-PRI Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	1,042	1,949	87%
Delaware	415	795	91%
District of Columbia	153	373	144%
Maine	934	1,443	54%
Maryland	2,200	3,924	78%
Massachusetts	2,410	2,768	15%
New Hampshire	562	1,418	152%
New Jersey	2,469	4,789	94%
New York	5,898	14,115	139%
Pennsylvania	5,331	12,393	132%
Rhode Island	211	719	241%
Vermont	483	719	49%
Virginia	2,987	6,499	118%
	25,095	**51,903**	**107%**

2002 emissions were estimated using MOBILE6; 2007 emissions were estimated using MOVES

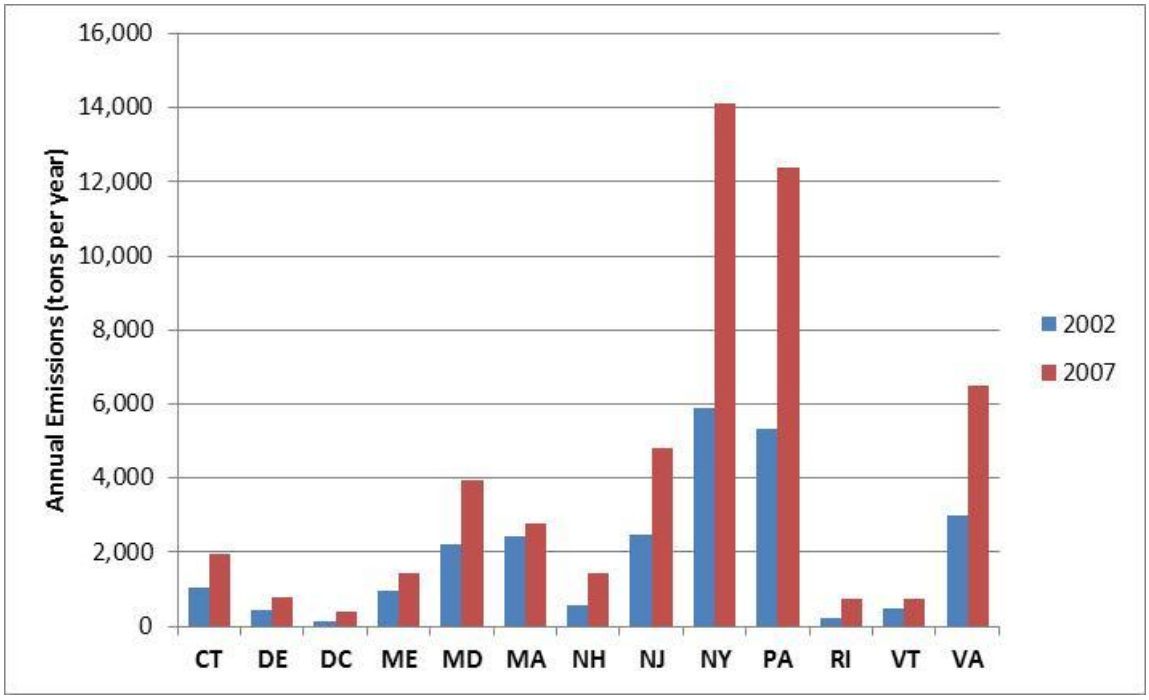


Exhibit 7.7 – 2002 and 2007 NMIM/NONROAD SO2 Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	1,667	402	-76%
Delaware	584	202	-65%
District of Columbia	271	89	-67%
Maine	1,804	377	-79%
Maryland	4,058	936	-77%
Massachusetts	4,399	769	-83%
New Hampshire	777	275	-65%
New Jersey	3,649	921	-75%
New York	10,640	2,187	-79%
Pennsylvania	10,924	2,518	-77%
Rhode Island	425	179	-58%
Vermont	894	179	-80%
Virginia	6,086	1,435	-76%
	46,176	**10,468**	**-77%**

2002 emissions were estimated using MOBILE6; 2007 emissions were estimated using MOVES

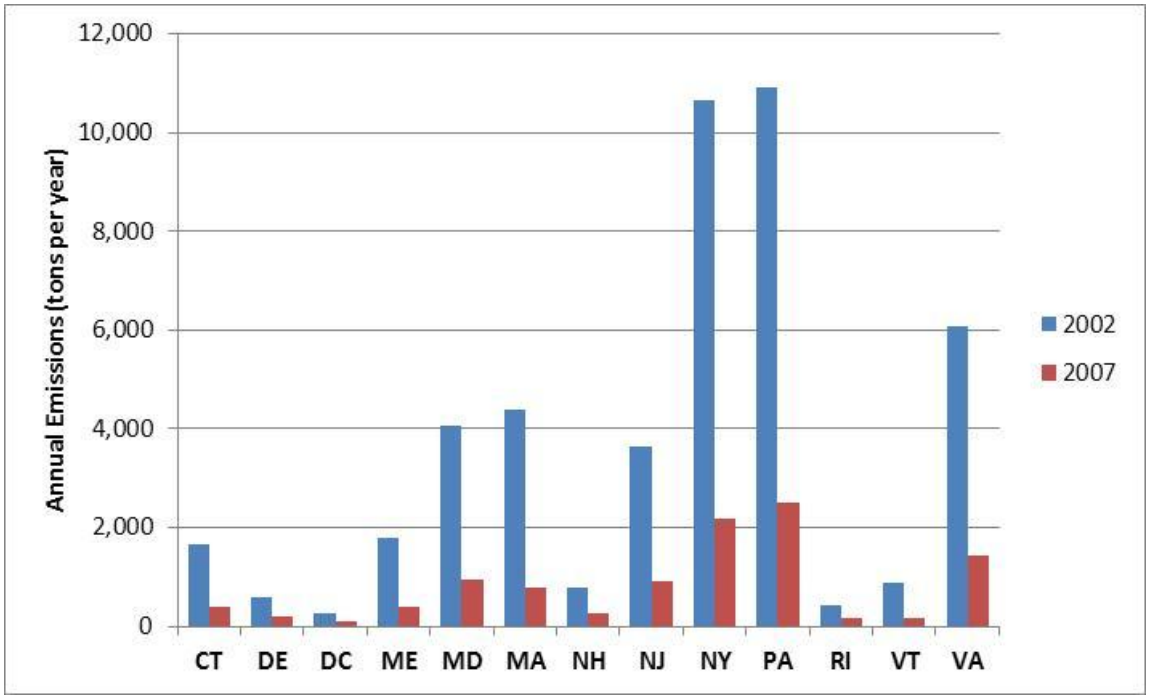
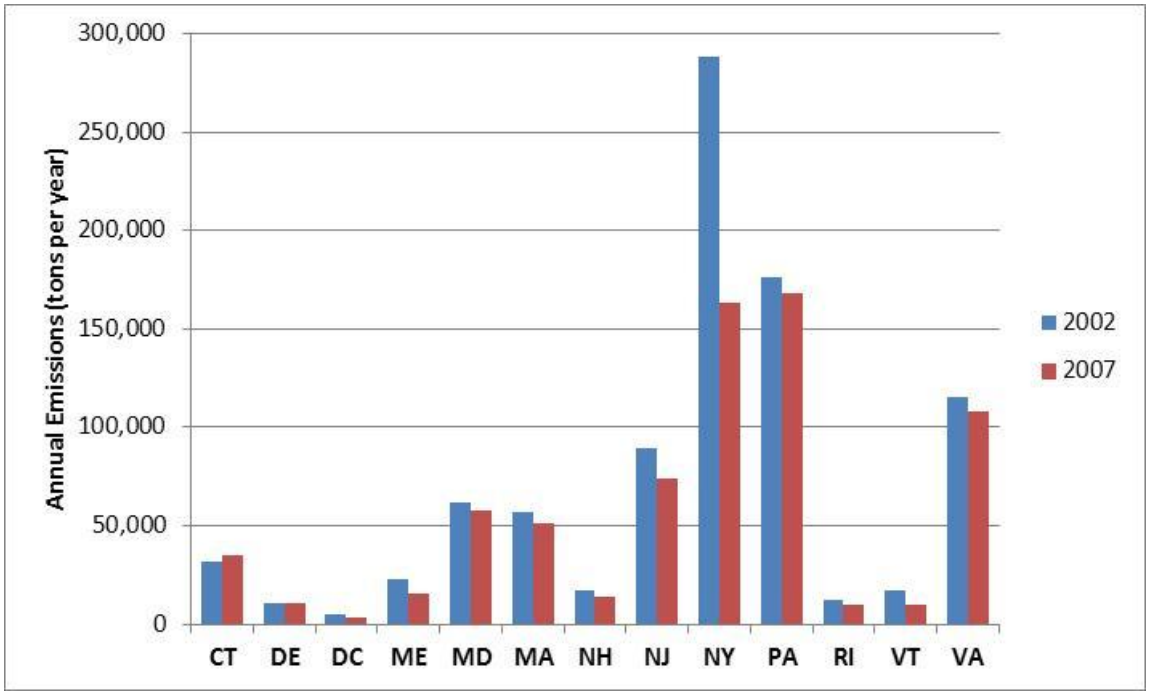


Exhibit 7.8 – 2002 and 2007 Onroad VOC Emissions by State (tons/year)

STATE	2002	2007	Change
Connecticut	31,755	35,363	11%
Delaware	10,564	10,771	2%
District of Columbia	4,895	3,598	-27%
Maine	23,037	15,382	-33%
Maryland	61,847	57,789	-7%
Massachusetts	57,186	51,149	-11%
New Hampshire	16,762	13,650	-19%
New Jersey	89,753	73,624	-18%
New York	287,845	163,290	-43%
Pennsylvania	176,090	168,289	-4%
Rhode Island	12,538	9,780	-22%
Vermont	17,288	9,780	-43%
Virginia	114,994	108,001	-6%
	904,554	**720,465**	**-20%**

2002 emissions were estimated using MOBILE6; 2007 emissions were estimated using MOVES



8.0 PREPARATION OF SMOKE MODEL FILES

Air quality modelers in the Mid-Atlantic and Northeastern States use the SMOKE Modeling System to create gridded, speciated, hourly emissions for input into a variety of air quality models. This section describes how the SMOKE inventory files were developed. It also describes how the SMOKE the temporal allocation, speciation, and spatial allocation profiles, respectively, were developed.

8.1 PREPARATION OF SMOKE EMISSION FILES

8.1.1 Point Source SMOKE Emission Files

Annual point source inventories were prepared in SMOKE PTINV ORL format. As previously discussed in Section 3.2.1, PTINV files were created for the following types of sources:

- Annual emissions for units that reported hourly data to USEPA CAMD for the entire 12 months of 2007;
- Ozone season emissions for units that reported hourly emissions to USEPA CAMD for either 6 or 9 months of 2007 (except for 6 month reporting units in Maryland);
- Non-ozone season emissions for units that reported hourly emissions to USEPA CAMD for either 6 or 9 months of 2007 (except for 6 month reporting units in Maryland);
- Units that reported hourly emissions to USEPA CAMD for either 6 or 9 months of 2007 in Maryland;
- Units that are classified as distributed generation units by VDEQ; and
- All other units (these are not associated with the hourly PTHOUR files; temporal allocation for these units will be accomplished using the standard SMOKE V2.6 temporal allocation profiles).

The ORL were quality assured to conform to the SMOKE PTINV ORL format and to prevent double counting of emissions in the ORL files.

EPA has developed a methodology to reduce fugitive dust emissions for use in air quality modeling analyses (USEPA 2007b). It is considered a logical step to account for the removal of particles near their emission source by vegetation and surface features. For the MANEVU+VA 2007 inventory the transport factors were NOT applied to the point source inventory because of the very small amount of fugitive particulate emissions in the point source inventory.

Hourly point source inventories were prepared for units that report hourly emissions to USEPA's Clean Air Markets Division in SMOKE PTHOUR EMS-95 format. Because of

the large size of the PTHOUR files, separate files were prepared by month. As previously discussed in Section 3.2.1, the following PTHOUR files were created:

- 12 monthly PTHOUR files for units that reported hourly emissions to USEPA CAMD for the entire 12 months of 2007;
- 5 monthly PTHOUR files (May-September) for units that reported hourly emissions to USEPA CAMD only for the ozone season 2007;
- 12 monthly PTHOUR files for units in Maryland that reported hourly emissions to USEPA CAMD for the either 6 or 9 months of 2007; and
- 12 monthly PTHOUR files for units in Virginia that are classified as distributed generations units

Since some CAMD units only report hourly emissions data for the ozone season, there was a need for a set of actual 2007 hourly temporal profiles to be used in simulating hourly emissions for these units in non-ozone season months. Section 3.4 of this TSD discusses the development of the SMOKE temporal profiles for the non-ozone season months for these units.

8.1.2 Area Source SMOKE Emission Files

Annual area source inventories were prepared in SMOKE ARINV ORL format. In developing the SMOKE ARINV ORL files for area sources, the USEPA "transport factor" was applied to reduce fugitive dust emissions to account for the removal of particles near their emission source by vegetation and surface features. The transport factor was NOT applied to the NIF-formatted annual emissions, but only to the SMOKE ARINV ORL-formatted file.

The standard transport fractions and SCC assignments from the USEPA CHIEF website were used to reduce the PM10-PRI and PM25-PRI emissions in the MANEVU+VA 2007 area source inventory. Two files were used. The first file contains a list of SCCs for which the transport factor was applied. The major source categories included paved and unpaved roads, construction activity, agricultural crop land tilling, and agricultural livestock operations. The second file contains the transport factor which varies by county. For example, in Connecticut the transport factors ranges from 0.21 in Tolland County to 0.44 in New Haven County.

Applying the transport factor to area source fugitive dust emissions significantly reduces that amount of particulate matter included in the air quality modeling. Exhibit 8.1 compares the 2007 area source PM10-PRI and PM25-PRI emissions before and after the application of the transport fraction. Region wide, PM10-PRI emissions are reduced by 53 percent and PM25-PRI emissions are reduced by 29 percent by applying the transport

fraction. The percent reduction varies by State due to the relative importance of the area source fugitive dust emissions compared to non-fugitive dust source emissions. The bottom part of Exhibit 8.1 shows the key area source fugitive dust categories and the reductions applied by using the transport fraction.

Exhibit 8.1 – Comparison of 2007 Area Source Emissions With and Without the Application of the Fugitive Dust Transport Factor (tons/year)

	PM10-PRI			PM25-PRI		
State/SCC	**Without Transport Factor**	**With Transport Factor**	**Percent Reduction**	**Without Transport Factor**	**With Transport Factor**	**Percent Reduction**
Emissions by State for All Area Source SCCs						
CT	30,577	15,591	49	10,606	8,396	21
DE	10,499	7,208	31	3,031	2,407	21
DC	4,873	2,445	50	1,542	1,120	27
ME	54,445	20,227	63	12,526	8,744	30
MD	72,454	38,520	47	19,789	14,710	26
MA	148,756	58,380	61	30,438	18,621	39
NH	27,742	10,650	62	8,623	5,832	32
NJ	39,140	24,801	37	18,299	14,944	18
NY	272,674	140,760	48	63,906	47,023	26
PA	287,998	138,571	52	73,514	50,855	31
RI	11,361	5,553	51	3,896	2,957	24
VT	47,993	19,097	60	13,106	9,434	28
VA	183,341	78,204	57	44,102	29,533	33
All States and SCCs	**1,191,853**	**560,007**	**53**	**303,378**	**214,576**	**29**
MANE-VU+VA Emissions for Selected SCCs						
2294000000 Paved Roads	230,004	78,795	66	54,207	18,727	65
2296000000 Unpaved Roads	417,951	129,150	69	41,525	12,837	69
2311xxxxxxx Construction	205,811	74,598	64	20,934	7,585	64
2801000003 Ag. Tilling	94,443	33,949	64	17,789	6,511	64

8.1.3 Nonroad NMIM SMOKE Emission Files

As discussed in Section 5, the NMIM/NONROAD model was executed using specifications to generate monthly emission files. Monthly SMOKE ARINV ORL files were created. Average day emissions were calculated by dividing the NONROAD generated monthly emissions by the number of days in each month. Various summary reports were prepared to verify agreement between the average day, monthly, and annual emissions.

8.1.4 Nonroad MAR SMOKE Emission Files

Annual inventories for marine vessels, airport operations and railroad locomotives were prepared in SMOKE ARINV ORL format for each county in the region. Average day emissions were calculated by dividing the annual emissions by 365 days. The ORL files for Category 3 commercial marine vessels include only the emissions that occur in State waters (generally from the shoreline to 3–10 nautical miles from shore).

8.1.5 Onroad SMOKE Emission Files

Smoke emission files for the onroad sector are being developed by NESCAUM under a separate contract. Please contact NESCAUM for documentation and data files.

8.1.1 Biogenic SMOKE Emission Files

Smoke emission files for the biogenic sector are being developed by New Jersey and New York under separate efforts. Please contact MARAMA to obtain documentation and data files for biogenic sources.

8.1.1 SMOKE Emission Files for Areas Outside of the MANE-VU+VA Region

Smoke emission files for areas outside of the MANE-VU+VA are currently under development. Contact MARAMA for further information.

8.2 REVIEW OF SMOKE AUXILIARY FILES

The following activities were performed to quality assure and improve the SMOKE speciation, spatial and temporal profiles:

- QA checks were made to ensure that all SCCs in the annual emission inventory files are cross-referenced to SCCs in the SMOKE profiles. In cases where a proper cross-reference does not exist, the SMOKE files were updated using data for similar SCCs or as otherwise determined on a case-by-case basis.

- SMOKE temporal profiles were reviewed and documented for key categories. Recommendations for improving SMOKE temporal profiles were made for categories where improved data is available and are reasonable feasible to use.
- SMOKE spatial profiles were reviewed and documented for selected categories. Recommendations for improving SMOKE spatial profiles were made for categories where improved data is available and are reasonable feasible to use.

Each of these activities is documented in Appendix F of this TSD.

8.2.1 SMOKE Speciation Files

Based upon the review of Appendix F by SMOKE emission modelers in the Northeast / Mid-Atlantic region, MARAMA directed the Contractor to make the following changes to the SMOKE auxiliary files as recommended in Appendix F.

<u>GSREF Speciation Cross-Reference File</u>

- Added records for SCC/pollutant code combinations in the 2007 inventory that needed to be added to the GSREF file

<u>GSPRO Speciation Profiles</u>

- No changes were needed

8.2.2 SMOKE Spatial Allocation Files

Based upon the review of Appendix F by SMOKE emission modelers in the Northeast / Mid-Atlantic region, MARAMA directed the Contractor to make the following changes to the SMOKE auxiliary files as recommended in Appendix F.

<u>AMGREF Spatial Allocation Cross-Reference File</u>

- Added records for SCCs in the 2007 inventory that needed to be added to the AMGREF file

<u>SRGDESC Spatial Surrogate Code Descriptions</u>

- No changes were needed

To spatially allocate county-level emissions from airports, SMOKE modelers will use the SMOKE ARTOPNT file to allocate county-level to specific point source airport locations instead of being assigned spatial surrogates. We reviewed this SMOKE file and confirmed the county-level commercial aircraft emissions are being allocated to the location of the

large airport in the county. The only adjustment to the SMOKE ARTOPNT file was as follows:

- Changed the allocation factors for commercial aircraft (SCCs 2275000000, 2275020000, and 2275070000) in Queens County NY to allocate county-level commercial aircraft emissions to JFK Airport and LaGuardia airport based on the 2008 LTO data from USEPA's 2008 emission inventory

Emissions for Category 3 commercial marine vessels will be spatially allocated using the following procedures:

- For operations from shoreline to roughly 3-10 nautical miles from the shore, the county-level Category 3 emissions prepared by States will be allocated to grid cells using the SMOKE spatial allocation files (profile 800 {Marine Ports} for port emissions, profile 810 {Navigable Waterway Activity} for underway emissions);

- For operations outside of State waters (generally 10-200 nautical miles from shore) Northeast / Mid-Atlantic emission modelers will use a Category C3 ORL files (ptinv_eca_imo_fixFIPS_US_caps_2005_19OCT2010_orl.txt) generated by EPA for 2005. The SMOKE modelers will zero out the emissions that have been assigned to counties to avoid double counting of emissions with the State-provided emissions discussed in the previous bullet.

See Appendix F for a further discussion of the Category 3 spatial allocation issue.

8.2.3 SMOKE Temporal Allocation Files

Based upon the review of Appendix F by SMOKE emission modelers in the Northeast / Mid-Atlantic region, MARAMA directed the Contractor to make the following changes to the SMOKE auxiliary files as recommended in Appendix F.

<u>AMPTREF Temporal Cross-Reference File</u>

- Added records for SCCs in the 2007 inventory that needed to be added to the AMPTREF file

- Changed the monthly allocation code for commercial aircraft (SCC 2275000000) and auxiliary power units (SCC 2275070000) from 246 to 99246 (the new profile code that uses the Bureau of Transportation Statistics {BLS} monthly air travel data for 2007)

- Changed the day-of-week allocation code for commercial aircraft (SCC 2275000000) and auxiliary power units (SCC 2275070000) from 7 to 99007 (the new profile code that uses the BLS day-of-week air travel data for 2007)
- Changed the hour-of-day allocation code for commercial aircraft (SCC 2275000000) and auxiliary power units (SCC 2275070000) from 26 to 99026 (the new profile code that uses the BLS hour-of-day air travel data for 2007)
- Changed the monthly allocation code for SCCs 22-80-003-100 (CMV/Residual/ Port) and 22-80-003-200 (CMV/Residual/Underway) from 262 to 19531, which is the code the EPA recently developed for their C3 inventory

<u>AMPTPRO Temporal Allocation Profiles</u>

- Added the monthly allocation code of 99246 (the new profile code that uses the Bureau of Transportation Statistics {BLS} monthly air travel data for 2007)
- Added the day-of-week allocation code of 99007 (the new profile code that uses the BLS day-of-week air travel data for 2007)
- Added the hour-of-day allocation code of 99026 (the new profile code that uses the BLS hour-of-day air travel data for 2007)

9.0 FINAL DELIVERABLES

Exhibits 9.1 and 9.2 identify all of the deliverable products for the 2007 MANE-VU+VA emission inventory developed by the Contractor under this contract. The exhibit also identifies deliverables associated with the 2007 MANE-VU+VA under development by other agencies.

All files are stored on MARAMA ftp site:

Address: ftp.marama.org

Login ID: regionalei

Password: marama2007

Files are stored in the following directories:

\MARAMA 07-17-20 Version 3\Final 2007 (Version 3_3)\NIF

\MARAMA 07-17-20 Version 3\Final 2007 (Version 3_3)\SMOKE

\MARAMA 07-17-20 Version 3\Final 2007 (Version 3_3)\TSD

\MARAMA 07-17-20 Version 3\Final 2007 (Version 3_3)\XLS

The deliverables are described in 9.1 and 9.2.

Exhibit 9.1 – NIF Data and Emission Summary Files for the 2007 MANE-VU+VA Emission Inventory

File Description	File Name	Format	Notes
2007 Annual Point Source Emission Inventory in NOF format	MANEVU+VA_V3_3_Point_2007_NOF.mdb	NOF ACCESS	EP table modified to include fields to (1) identify units as CAMD-EGU, CAMD-nonEGU, and OTHER; (2) include the CAMD ORIS and UNITID for CAMD units; and (3) identify the percent operating time classification for CAMD units. See file for Field Definitions
2007 Annual Area Source Emission Inventory in NOF format	MANEVU+VA_V3_3_Area_2007_NOF.mdb	NOF ACCESS	See file for Field Definitions
2007 Annual NMIM/NONROAD Source Emission Inventory in NOF format	2007MARAMANRNMIMv3.mdb	NOF ACCESS	See file for Field Definitions.
2007 Annual Commercial Marine Vessel, Airport, and Rail (MAR) Emission Inventory in NOF format	MANEVU+VA_V3_3_MAR_2007.mdb	NOF ACCESS	See file for Field Definitions
2007 Annual Point Source Emission Inventory in a spreadsheet format to facilitate State and Stakeholder review	MANEVU+VA_V3_3_Point_2007_Process_Emissions.xls	MS Excel	See file for Column Definitions
2007 Annual Point Source Emission Inventory summaries by State and Source Classification Code (SCC)	MANEVU+VA_V3_3_Point_2007_State_SCC_Summary.xls	MS Excel	See file for Column Definitions
2007 Annual Area Source Emission Inventory summaries by State/SCC	MANEVU+VA_V3_3_Area_2007_State_SCC_Summary.xls	MS Excel	See file for Column Definitions
2007 Annual NMIM/NONROAD Emission Inventory summaries by State and SCC	MANEVU+VA_V3_3_NMIM_2007_State_SCC_Summary.xls	MS Excel	See file for Column Definitions.
2007 Annual MAR Emission Inventory summaries by State and SCC	MANEVU+VA_V3_3_MAR_2007StateSCCSummaries.xls	MS Excel	See file for Column Definitions

Exhibit 9.2 – SMOKE Files for the 2007 MANE-VU+VA Emission Inventory

File Description	File Name	Format	Notes
2007 Annual Point Source Emission Inventory in SMOKE ORL format	PTINV_2007_NonHourly_jan2012.orl PTINV_2007_12MonthUnits_feb2011.orl PTINV_2007_Ozone_5MonthUnits_feb2011.orl PTINV_2007_NonOzone_5MonthUnits_feb2011.orl PTINV_2007_VADGUnits_march2010.orl PTINV_2007_MD6MonthUnits_march2010.orl	SMOKE PTINV ORL	One file for all non-hourly units and five separate files for units with hourly emissions. See Section 3.2.1 for the TSD for discussion of the files and Exhibit 3.1 for the file format.
SMOKE PTHOUR EMS-95 zip files with hourly emissions for each month of 2007 for units that report hourly emissions to CAMD for the entire 12 months in 2007. The zip file contains 12 monthly files.	pthour_2007_jan_12MonthUnits_nov2011.ems pthour_2007_feb_12MonthUnits_nov2011.ems pthour_2007_mar_12MonthUnits_nov2011.ems pthour_2007_apr_12MonthUnits_nov2011.ems pthour_2007_may_12MonthUnits_nov2011.ems pthour_2007_jun_12MonthUnits_nov2011.ems pthour_2007_jul_12MonthUnits_nov2011.ems pthour_2007_aug_12MonthUnits_nov2011.ems pthour_2007_sep_12MonthUnits_nov2011.ems pthour_2007_oct_12MonthUnits_nov2011.ems pthour_2007_nov_12MonthUnits_nov2011.ems pthour_2007_dec_12MonthUnits_nov2011.ems	SMOKE PTHOUR EMS-95	See Exhibit 3.2 for file format
SMOKE PTHOUR EMS-95 files with hourly emissions for 5 months of 2007 for units classified as "5-month reporters" in all States except MD. The zip file contains 5 monthly files.	pthour_2007_may_5MonthUnits_Jan2012.ems pthour_2007_jun_5MonthUnits_Jan2012.ems pthour_2007_jul_5MonthUnits_Jan2012.ems pthour_2007_aug_5MonthUnits_Jan2012.ems pthour_2007_sep_5MonthUnits_Jan2012.ems	SMOKE PTHOUR EMS-95	See Exhibit 3.2 for file format
SMOKE PTHOUR EMS-95 files with hourly emissions for each month of 2007 for units classified as "6-month reporters" in MD. The zip file contains 12 monthly files.	pthour_2007_jan_MD6MonthUnits_march2010.ems pthour_2007_feb_MD6MonthUnits_march2010.ems pthour_2007_mar_MD6MonthUnits_march2010.ems pthour_2007_apr_MD6MonthUnits_march2010.ems pthour_2007_may_MD6MonthUnits_march2010.ems pthour_2007_jun_MD6MonthUnits_march2010.ems pthour_2007_jul_MD6MonthUnits_march2010.ems pthour_2007_aug_MD6MonthUnits_march2010.ems pthour_2007_sep_MD6MonthUnits_march2010.ems	SMOKE PTHOUR EMS-95	See Exhibit 3.2 for file format

File Description	File Name	Format	Notes
	pthour_2007_oct_MD6MonthUnits_march2010.ems pthour_2007_nov_MD6MonthUnits_march2010.ems pthour_2007_dec_MD6MonthUnits_march2010.ems		
SMOKE PTHOUR EMS-95 files with hourly emissions for each month of 2007 for units classified as "distributed generation units" by the Virginia DEQ. The zip file contains 12 monthly files.	pthours_2007_jan_VADGunits_march2010.ems pthours_2007_feb_VADGunits_march2010.ems pthours_2007_mar_VADGunits_march2010.ems pthours_2007_apr_VADGunits_march2010.ems pthours_2007_may_VADGunits_march2010.ems pthours_2007_jun_VADGunits_march2010.ems pthours_2007_jul_VADGunits_march2010.ems pthours_2007_aug_VADGunits_march2010.ems pthours_2007_sep_VADGunits_march2010.ems pthours_2007_oct_VADGunits_march2010.ems pthours_2007_nov_VADGunits_march2010.ems pthours_2007_dec_VADGunits_march2010.ems	SMOKE PTHOUR EMS-95	See Exhibit 3.2 for file format
2007 Annual Area Source Emission Inventory in SMOKE ORL format	arinv_marama_2007_jan2012_w_tf_orl.txt.gz	SMOKE ARINV ORL	This file has the PM transport factors by county applied to the NOF emissions. See section 8.1.2 for discussion. See http://www.smoke-model.org/version2.6/html/ for file format
2007 Annual MAR Emission Inventory in SMOKE ORL format	ARINV_2007_MAR_Jan2012.txt	SMOKE ARINV ORL	See http://www.smoke-model.org/version2.6/html/ for file format; includes commercial marine vessels, airports (including GSE), and railroad locomotives
2007 Monthly NMIM/NONROAD Emission Inventory in SMOKE ORL format	arinv_nonroad_2007_jan_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_feb_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_mar_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_apr_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_may_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_jun_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_jul_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_aug_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_sep_29sep2010_v1_orl.txt.gz	SMOKE ARINV ORL	See http://www.smoke-model.org/version2.6/html/ for file format

File Description	File Name	Format	Notes
	arinv_nonroad_2007_oct_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_nov_29sep2010_v1_orl.txt.gz arinv_nonroad_2007_dec_29sep2010_v1_orl.txt.gz		
SMOKE formatted temporal profiles for units that report to CAMD for only part of 2007.	ptpro_2007_marama_egu_13apr2010.txt	SMOKE PTPRO	See http://www.smoke-model.org/version2.6/html/ for file format and Section 3.4 of this TSD for discussion of these files
SMOKE formatted temporal cross-reference tables for annual time periods	ptref_2007_marama_egu_annual_13apr2010.txt	SMOKE PTREF	
SMOKE formatted temporal cross-reference tables for nonozone time periods	ptref_2007_marama_egu_nonozone_13apr2010.txt	SMOKE PTREF	
SMOKE formatted temporal profiles	MARAMA_amptref_v3_3_revised_10feb2011_v1.txt	SMOKE AMPTREF	Updated SMOKE temporal files based on EPA's 2005v4 modeling platform. See Section 8.2.3 of this TSD for discussion of the updates made.
SMOKE formatted temporal cross-reference tables	MARAMA_amptpro_2005_us_can_revised_10feb2011_v0.txt	SMOKE AMPTPRO	
SMOKE formatted spatial fridding cross-reference file	MARAMA_amgref_us_can_mex_revised_17feb20110_v8.txt	SMOKE AMGREF	Updated SMOKE spatial files based on EPA's 2005v4 modeling platform. See Section 8.2.2 of this TSD for discussion of the updates made.
SMOKE formatted spatial surrogate designation file	MARAMA_srgdesc_36km_revised_10feb2011_v1.txt	SMOKE SRGDESC	
SMOKE formatted area to point file for airports	MARAMA_artopnt_2002detroit_10feb2011_v0.txt	SMOKE ARTOPNT	
SMOKE formatted speciation profile	MARAMA_gspro_cmaq_cb05_soa_2005ck_05b_10feb2011.txt	SMOKE GSPRO	Updated SMOKE speciation files based on EPA's 2005v4 modeling platform. See Section 8.2.1 of this TSD for discussion of the updates made.
SMOKE formatted speciation cross-reference file	MARAMA_gsref_cmaq_cb05_soa_2005ck_05b_17feb2011.txt	SMOKE GSREF	

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E-2: MANE-VU Emissions Inventory TSD 2017/2020 Projections

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Technical Support Document for the Development of the 2017 / 2020 Emission Inventories for Regional Air Quality Modeling in the Northeast / Mid-Atlantic Region Version 3.3

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About MARAMA

The Mid-Atlantic Regional Air Management Association, Inc. is a voluntary, non-profit association of ten state and local air pollution control agencies. MARAMA's mission is to strengthen the skills and capabilities of member agencies and to help them work together to prevent and reduce air pollution in the Mid-Atlantic Region. MARAMA provides cost-effective approaches to regional collaboration by pooling resources to develop and analyze data, share ideas, and train staff to implement common requirements.

Table of Contents

1.0 INTRODUCTION 1

1.1 INVENTORY PURPOSE 1
1.2 POLLUTANTS 2
1.3 SOURCE CATEGORIES 2
1.4 DATA FORMATS 4
1.5 INVENTORY VERSIONS 4
1.5.1 Version 1 Modeling Inventory 4
1.5.2 Version 2 Modeling Inventory 5
1.5.3 Version 3 Modeling Inventories with Existing and Potential Controls 5
1.6 REPORT ORGANIZATION 6

2.0 IDENTIFICATION OF EGU AND NONEGU POINT SOURCES 7

3.0 GROWTH PROJECTION FACTORS FOR NONEGUS AND AREA SOURCES 15

3.1 AEO FUEL USE PROJECTIONS 15
3.2 POPULATION PROJECTIONS 16
3.3 EMPLOYMENT PROJECTIONS 23
3.4 VEHICLE MILES TRAVELED PROJECTIONS 23
3.5 NO GROWTH ASSIGNMENT FOR CERTAIN AREA SOURCE CATEGORIES 23
3.6 EPA 2020 PROJECTIONS FOR RESIDENTIAL WOOD AND LIVESTOCK 27
3.7 SCC, SIC, NAICS AND GROWTH PARAMETER CROSSWALK 28
3.8 FINAL GROWTH FACTORS FOR NONEGU / AREA SOURCES 28
3.9 EMISSION REDUCTION CREDITS 30

4.0 AREA SOURCE CONTROL FACTORS 33

4.1 FEDERAL RULES AFFECTING AREA SOURCES 33
4.2 FEDERAL MACT RULES 34
4.3 RECENT CONTROL TECHNIQUE GUIDELINES 35
4.4 OTC MODEL RULES FOR AREA SOURCES 37
4.4.1 OTC Model Rule for Adhesives/Sealants 39
4.4.2 OTC Model Rules for Architectural and Industrial Maintenance Coatings 40
4.4.3 OTC Model Rule for Asphalt Paving 43
4.4.4 OTC Model Rules for Consumer Products 44
4.4.5 OTC Model Rules for Mobile Equipment Repair and Refinishing 46
4.4.6 OTC Model Rules for Portable Fuel Containers 49
4.4.7 OTC Model Rule for Solvent Cleaning 50
4.4.8 OTC Model Rules for ICI Boilers 51
4.4.9 OTC Model Rule for New, Small, Natural Gas-fired Boilers 53
4.4.10 MANE-VU Low Sulfur Fuel Oil Strategy 55

5.0 NONEGU POINT SOURCE CONTROL FACTORS 56

5.1 FEDERAL ACTIONS AFFECTING NONEGU POINT SOURCES 56
5.2 RECENT CONTROL TECHNIQUE GUIDELINES 59
5.3 OTC MODEL RULES FOR NONEGUs 59
5.3.1 OTC 2006 Model Rule for Adhesives and Sealants 62
5.3.2 OTC 2009/2010 Model Rule for Large Storage Tanks 63
5.3.3 OTC 2006 Model Rule for Asphalt Production Plants 64
5.3.4 OTC 2006 Model Rule for Cement Manufacturing Plants 64
5.3.5 OTC 2006 Model Rule for Glass and Fiberglass Furnaces 66
5.3.6 OTC 2006 Model Rule for ICI Boilers 66
5.4 FUEL OIL SULFUR LIMITS 69
5.5 STATE-SPECIFIC NONEGU CONTROL FACTORS 70

6.0 NONROAD MODEL CATEGORIES 72

6.1 STATE REVIEW OF NMIM FUEL CHARACTERISTICS 72
6.2 USE OF EXTERNAL FILES IN THE PROJECTION YEAR NMIM RUNS 73
6.3 NMIM RUN SPECIFICATIONS 73
6.4 REMOVAL OF AIRPORT GROUND SUPPORT EQUIPMENT 74
6.5 STATE AND STAKEHOLDER REVIEW AND COMMENT 74
6.6 CHANGES MADE FOR VERSION 3 MODEL RUNS 74
6.7 NMIM/NONROAD GROWTH AND CONTROL INFORMATION 76

7.0 NONROAD MAR SOURCE CATEGORIES 80

7.1 COMMERCIAL MARINE VESSELS 80
7.1.1 CMV Diesel Growth Factors 80
7.1.2 CMV Diesel Control Factors 81
7.1.3 CMV Residual Oil Growth Factors 82
7.1.4 CMV Residual Oil Control Factors 82
7.1.5 Military Vessels Growth and Control Factors 83
7.2 AIRCRAFT 83
7.2.1 Aircraft Growth Factors 84
7.2.2 Aircraft Control Factors 85
7.3 RAILROAD EQUIPMENT 86
7.3.1 Railroad Growth Factors 87
7.3.2 Railroad Control Factors 87

8.0 SUMMARY OF PROJECTED EMISSIONS 89

8.1 AREA SOURCE PROJECTED EMISSIONS 89
8.2 NONEGU POINT SOURCE PROJECTED EMISSIONS 98
8.3 NONROAD NMIM SOURCE PROJECT EMISSIONS 107
8.4 NONROAD COMMERCIAL MARINE VESSEL EMISSIONS 115

8.5 NONROAD AIRPORT EMISSIONS 123
8.6 NONROAD RAILROAD LOCOMOTIVE EMISSIONS 131

9.0 PREPARATION OF SMOKE MODEL FILES 139

9.1 NONEGU POINT SOURCE SMOKE EMISSION FILES 139
9.2 AREA SOURCE SMOKE EMISSION FILES 139
9.3 NONROAD NMIM SMOKE EMISSION FILES 139
9.4 NONROAD MAR SMOKE EMISSION FILES 140

10.0 FINAL DELIVERABLES 141

11.0 REFERENCES 146

List of Appendices

Appendix A Identification of EGUs and NonEGUs

Appendix B1 AEO2010 New England.xls

Appendix B2 AEO2010 Mid Atlantic.xls

Appendix B3 AEO2010 South Atlantic.xls

Appendix B4 AEO2011 New England.xls

Appendix B5 AEO2011 Mid Atlantic.xls

Appendix B6 AEO2011 South Atlantic.xls

Appendix B7 AEO2010 vs AEO2011 Comparison.docx

Appendix C Population Factors.xls

Appendix D Employment Factors.xls

Appendix E VMT Factors.xls

Appendix F USEPA2020 Residential Wood Projection Factors

Appendix G USEPA 2020 Livestock Projection Factors

Appendix H Stage II Control Factors

Appendix I Area Source ICI Boiler Control Factor Derivation.xlsx

Appendix J Area Source New Small Gas-Fired Boiler Control Factor Derivation

Appendix K Fuel Oil Sulfur Contents and MANE-VU Limits

Appendix L – Supporting Data for Final MAR Source Growth and Control Factors for 2017 and 2020

List of Exhibits

Exhibit 2.1 2007 EGU and NonEGU Point Source CO Emissions
Exhibit 2.2 2007 EGU and NonEGU Point Source NH3 Emissions
Exhibit 2.3 2007 EGU and NonEGU Point Source NOx Emissions
Exhibit 2.4 2007 EGU and NonEGU Point Source PM10-PRI Emissions
Exhibit 2.5 2007 EGU and NonEGU Point Source PM25-PRI Emissions
Exhibit 2.6 2007 EGU and NonEGU Point Source SO2 Emissions
Exhibit 2.7 2007 EGU and NonEGU Point Source VOC Emissions

Exhibit 3.1 Growth Factors for Coal Fuel Use by AEO Region 2007 - 2025
Exhibit 3.2 Growth Factors for Residual Oil Fuel Use by AEO Region 2007 - 2025
Exhibit 3.3 Growth Factors for Distillate Oil Fuel Use by AEO Region 2007 - 2025
Exhibit 3.4 Growth Factors for Natural Gas Fuel Use by AEO Region 2007 - 2025
Exhibit 3.5 Growth Factors for Gasoline Fuel Use by AEO Region 2007 – 2025
Exhibit 3.6 Population Growth Factors by AEO Region 2007 – 2025
Exhibit 3.7. Employment Growth Factors by AEO Region 2007 - 2025
Exhibit 3.8 State VMT Growth Factors 2007 – 2020
Exhibit 3.9 Area Source Categories with No Growth Assignment
Exhibit 3.10 State Recommendations to Address Negative Growth for the NonEGU Point Source Sector
Exhibit 3.11 State Recommendations to Address Negative Growth and Other Growth Factors for the Area Source Sector

Exhibit 4.1 USEPA Estimated Percent Reductions for RICE MACT Standard
Exhibit 4.2 Summary of Area Source OTC Control Measures
Exhibit 4.3 State Recommendations for OTC Adhesives/Sealants Rule
Exhibit 4.4 State Recommendations for OTC AIM Rule
Exhibit 4.5 State Recommendations for OTC Cutback and Emulsified Asphalt Paving
Exhibit 4.6 VOC Emission Factors for Consumer Products
Exhibit 4.7 State Recommendations for OTC 2001 and 2006 Consumer Products Rules
Exhibit 4.8 VOC Emission Reductions for Auto Refinishing
Exhibit 4.9 State Recommendations for OTC Auto Refinishing Rule
Exhibit 4.10 State Recommendations for OTC and Federal Portable Fuel Container Rules
Exhibit 4.11 State Recommendations for OTC Solvent Cleaning Rule

Exhibit 4.12 Area Source Emission Reductions from New Jersey ICI Boiler NOx Rules

Exhibit 4.13 OTC Resolution 06-02 Guidelines for ICI Boiler NOx Rules

Exhibit 4.14 NOx Emission Reductions Expected from the OTC Rule for New, Small, Natural Gas-fired Units

Exhibit 4.15 MANE-VU Low Sulfur Fuel Oil Strategy

Exhibit 5.1 USEPA Estimated Percent Reductions for RICE MACT Standard

Exhibit 5.2 Summary of Point Source OTC Control Measures

Exhibit 5.3 State Recommendations for OTC Adhesives/Sealants Rule

Exhibit 5.4 NonEGU Point Source Emission Reductions from New Jersey ICI Boiler NOx Rules

Exhibit 5.5 OTC Resolution 06-02 Guidelines for ICI Boiler NOx Rules

Exhibit 6.1 Control Programs Included in the NMIM/NONROAD Model

Exhibit 7.1 CMV Diesel Control Factors by Year, Pollutant, and SCC

Exhibit 7.2 CMV Residual Oil Control Factors by Year, Pollutant, and SCC

Exhibit 7.3 Crosswalk between SCC and FAA Operations Type

Exhibit 7.4 Region-wide Growth Factors from 2007 by FAA Operations Type

Exhibit 7.5 Rail Control Factors by Year, Pollutant, and SCC

Exhibit 8.1 2007 and Projected Future Year Area Source CO Emissions

Exhibit 8.2 2007 and Projected Future Year Area Source NH3 Emissions

Exhibit 8.3 2007 and Projected Future Year Area Source NOx Emissions

Exhibit 8.4 2007 and Projected Future Year Area Source PM10-PRI Emissions

Exhibit 8.5 2007 and Projected Future Year Area Source PM25-PRI Emissions

Exhibit 8.6 2007 and Projected Future Year Area Source SO2 Emissions

Exhibit 8.7 2007 and Projected Future Year Area Source VOC Emissions

Exhibit 8.8 2007 and Projected Future Year NonEGU Point Source CO Emissions

Exhibit 8.9 2007 and Projected Future Year NonEGU Point Source NH3 Emissions

Exhibit 8.10 2007 and Projected Future Year NonEGU Point Source NOx Emissions

Exhibit 8.11 2007 and Projected Future Year NonEGU Point Source PM10-PRI Emissions

Exhibit 8.12 2007 and Projected Future Year NonEGU Point Source PM25-PRI Emissions

Exhibit 8.13 2007 and Projected Future Year NonEGU Point Source SO2 Emissions

Exhibit 8.14 2007 and Projected Future Year NonEGU Point Source VOC Emissions

Exhibit 8.15 2007 and Projected Future Year NONROAD Source CO Emissions

Exhibit 8.16 2007 and Projected Future Year NONROAD Source NH3 Emissions
Exhibit 8.17 2007 and Projected Future Year NONROAD Source NOx Emissions
Exhibit 8.18 2007 and Projected Future Year NONROAD Source PM10-PRI Emissions
Exhibit 8.19 2007 and Projected Future Year NONROAD Source PM25-PRI Emissions
Exhibit 8.20 2007 and Projected Future Year NONROAD Source SO2 Emissions
Exhibit 8.21 2007 and Projected Future Year NONROAD Source VOC Emissions
Exhibit 8.22 2007 and Projected Future Year Marine Vessel CO Emissions
Exhibit 8.23 2007 and Projected Future Year Marine Vessel NH3 Emissions
Exhibit 8.24 2007 and Projected Future Year Marine Vessel NOx Emissions
Exhibit 8.25 2007 and Projected Future Year Marine Vessel PM10-PRI Emissions
Exhibit 8.26 2007 and Projected Future Year Marine Vessel PM25-PRI Emissions
Exhibit 8.27 2007 and Projected Future Year Marine Vessel SO2 Emissions
Exhibit 8.28 2007 and Projected Future Year Marine Vessel VOC Emissions
Exhibit 8.29 2007 and Projected Future Year Airport CO Emissions
Exhibit 8.30 2007 and Projected Future Year Airport NH3 Emissions
Exhibit 8.31 2007 and Projected Future Year Airport NOx Emissions
Exhibit 8.32 2007 and Projected Future Year Airport PM10-PRI Emissions
Exhibit 8.33 2007 and Projected Future Year Airport PM25-PRI Emissions
Exhibit 8.34 2007 and Projected Future Year Airport SO2 Emissions
Exhibit 8.35 2007 and Projected Future Year Airport VOC Emissions
Exhibit 8.36 2007 and Projected Future Year Railroad Locomotive CO Emissions
Exhibit 8.37 2007 and Projected Future Year Railroad Locomotive NH3 Emissions
Exhibit 8.38 2007 and Projected Future Year Railroad Locomotive NOx Emissions
Exhibit 8.39 2007 and Projected Future Year Railroad Locomotive PM10-PRI Emissions
Exhibit 8.40 2007 and Projected Future Year Railroad Locomotive PM25-PRI Emissions
Exhibit 8.41 2007 and Projected Future Year Railroad Locomotive SO2 Emissions
Exhibit 8.42 2007 and Projected Future Year Railroad Locomotive VOC Emissions

Exhibit 10.1 – NIF Data Files
Exhibit 10.2 – Emission Summary Files
Exhibit 10.3 – SMOKE Files

Acronyms and Abbreviations

Acronym	Description
CAMD	Clean Air Markets Division (USEPA)
CAP	Criteria Air Pollutant
CEM	Continuous Emission Monitoring
CMV	Commercial Marine Vessel
CO	Carbon Monoxide
CTG	Control Technique Guideline
EGU	Electric Generating Unit
ERTAC	Eastern Regional Technical Advisory Committee
FIPS	Federal Information Processing Standard
GACT	Generally available control technology
GSE	Ground Support Equipment
MACT	Maximum Achievable Control Technology
MANE-VU	Mid-Atlantic/Northeast Visibility Union
MANE-VU+VA	MANE-VU States plus Virginia
MAR	Marine, Airport, Rail
MARAMA	Mid-Atlantic Regional Air Management Association
MOBILE6	USEPA model
MOVES	Motor Vehicle Emissions Simulator
NAICS	North American Industry Classification System code
NCD	National County Database
NEI	National Emission Inventory
NESCAUM	Northeast States for Coordinated Air Use Management
NH3	Ammonia
NIF3.0	National Emission Inventory Input Format Version 3.0
NMIM	National Mobile Input Model
NOF3.0	National Emission Inventory Output Format Version 3.0
NONROAD	USEPA model
NOx	Oxides of nitrogen
OAQPS	Office of Air Quality Planning and Standards (USEPA)
ORL	One-record-per-line (SMOKE Format)
OTAQ	Office of Transportation and Air Quality (USEPA)
PFC	Portable Fuel Container
PM-CON	Primary PM, Condensable portion only (< 1 micron)
PM-FIL	Primary PM, Filterable portion only
PM-PRI	Primary PM, includes filterables and condensables PM-PRI= PM-FIL + PM-CON

Acronym	**Description**
PM10-FIL	Primary PM10, Filterable portion only
PM10-PRI	Primary PM10, includes filterables and condensables, PM10- PRI = PM0-FIL + PM-CON
PM25-FIL	Primary PM2.5, Filterable portion only
PM25-PRI	Primary PM2.5, includes filterables and condensables PM25-PRI= PM25-FIL + PM-CON
RWC	Residential Wood Combustion
SEMAP	Southeast Modeling, Analysis and Planning
SIC	Standard Industrial Classification code
SIP	State Implementation Plan
SCC	Source Classification Code
S/L	State/local
SMOKE	Sparse Matrix Operator Kernel Emissions
SO2	Sulfur Dioxide
USEPA	U.S Environmental Protection Agency
VISTAS	Visibility Improvement State and Tribal Association of the Southeast
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds

1.0 INTRODUCTION

This technical support document (TSD) explains the data sources and methods used to prepare criteria air pollutant (CAP) and ammonia (NH3) emission projections for 2017 and 2020 for the Northeast and Mid-Atlantic/Northeast region. The region includes the jurisdictions in the Mid-Atlantic / Northeast Visibility Union (MANE-VU) area plus Virginia. In this document, these jurisdictions will be referred to as the MANE-VU+VA region. The MANE-VU+VA region includes Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia.

1.1 INVENTORY PURPOSE

The MANE-VU+VA regional inventories will be used to concurrently address national ambient air quality standard (NAAQS) requirements for the new ozone and fine particle ambient standards and to evaluate progress towards long-term regional haze goals. The emission inventories will support a single integrated, one-atmosphere air quality modeling platform, state air quality attainment demonstrations, and other state air quality technical analyses.

The future year inventories account for emissions growth associated with changes in population, fuel use, and economic activity. The future year inventories also refect the emission changes between 2007 and the two future years that are projected under two emission control scenarios:

- Existing Controls – this scenario represents the best estimates for the future year, accounting for all in-place controls that are fully adopted into federal or individual state regulations or State Implementation Plans (SIPs). In the past, this inventory is also referred to as the "on-the-books (OTB)" inventory. Air quality modelers often refer to this scenario as the "future base case."

- Potential New OTC Controls – this scenario accounts for all of the emission reductions from the existing control scenario plus new state or regional measures that are under consideration by the Ozone Transport Commission (OTC) or individual states. This is a "what if" scenario that assumes that all states in the MANE-VU+VA region except Virginia will adopt all new OTC control measures under consideration by 2017. Air quality modelers sometimes call this the "future control case." It does not include any potential new <u>federal</u> control measures that are under consideration.

The U.S. Environmental Protection Agency (USEPA) has provided guidance on developing emission projections to be used with models and other analyses for demonstrating attainment of air quality goals for ozone, fine particles, and regional haze (USEPA 1999, USEPA 2005a, USEPA 2007a). In addition, the USEPA has recently developed its own emission projections that provide data on growth and future controls that were useful in developing the MANE-VU+VA future year emission inventories (USEPA 2010a). The guidance and information available from USEPA was followed and used, as appropriate, in developing the future year emission projections.

1.2 POLLUTANTS

The inventory includes annual emissions for carbon monoxide (CO), ammonia (NH3), oxides of nitrogen (NOx), particulate matter (PM), sulfur dioxide (SO2), and volatile organic compounds (VOC). The PM species in the inventory are categorized as: filterable and condensable particles with an aerodynamic diameter less than or equal to a nominal 10 and 2.5 micrometers (i.e., PM10-PRI and PM25-PRI); filterable particles with an aerodynamic diameter less than or equal to a nominal 10 and 2.5 micrometers (i.e., PM10-FIL and PM25-FIL); and condensable particles (PM-CON). Note that PM10-PRI equals the sum of PM10-FIL and PM-CON, and PM25-PRI equals the sum of PM25-FIL and PM-CON.

1.3 SOURCE CATEGORIES

Emission inventory data from six general categories are needed to support air quality modeling: electric generating units (EGUs), stationary nonEGU point-sources, stationary area-sources, on-road mobile sources, nonroad mobile sources, and biogenic/geogenic emissions. This report documents the development of emission projections for three of these sectors, as follows:

- **NonEGU Point Sources** are individual facilities and are further subdivided by stack, emission unit ("point"), and emission process ("segment"). Point source data include source-specific information on source location (e.g., latitude/longitude coordinates); stack parameters (stack diameter and height, exit gas temperature and velocity); type of process (source classification code {SCC}); and annual emissions.

- **Stationary Area Sources** include sources that in and of themselves are quite small, but in aggregate may contribute significant emissions. Examples include small industrial/commercial facilities, residential heating furnaces, VOCs volatizing from

house painting or consumer products, gasoline service stations, and agricultural fertilizer/pesticide application.

- **Non-road Mobile Sources** include internal combustion engines used to propel marine vessels, airplanes, and locomotives, or to operate equipment such as forklifts, lawn and garden equipment, portable generators, etc. For activities other than marine vessels, airplanes, and railroad locomotives (MAR), the inventory was developed using the most current version of USEPA's NONROAD model as embedded in the National Mobile Inventory Model (NMIM). Since the NONROAD model does not include emissions from MAR sources, these emissions were estimated based on data and methodologies used in recent USEPA regulatory impact analyses.

For these three sectors, emissions projections were compiled on an annual basis to represent conditions in 2017 and 2020.

Emission projections for the three other sectors are being developed by the OTC under separate efforts:

- **EGU Point Sources** are units that generate electric power and sell most of that power to the electrical grid. Emission projections for EGUs are being developed as part of an inter-RPO coordination effort under the direction of the Eastern Regional Technical Advisory Committee (ERTAC).

- **On-road Mobile Sources** are sources of air pollution from internal combustion engines used to propel cars, trucks, buses, and other vehicles on public roadways. Emission projections for on-road mobile sources are being developed under a separate effort by the OTC that will use the USEPA Motor Vehicle Emission Simulator (MOVES) model.

- **Biogenic** emissions are emitted by natural sources, such as plants, trees, and soils. The sharp scent of pine needles, for instance, is caused by monoterpenes, which are VOCs. The USEPA developed estimates of biogenic emissions from vegetation for natural areas, crops, and urban vegetation. The USEPA estimates take into account the geographic variations in vegetation land cover and species composition, as well as seasonal variations in leaf cover. Emission projections for biogenic sources will be developed under a separate effort by the OTC modeling team.

Documentation of the emission projections for these three sectors will be available from the OTC.

1.4 DATA FORMATS

The annual mass emissions inventory files were prepared in the National Emissions Inventory (NEI) Output Format Version 3.0 (NOF 3.0). Spreadsheets summarizing emissions by county, sector, source classification code, and pollutant were also prepared.

These annual emission inventories will be converted (through the emissions modeling process) from their original resolution (e.g., annual, county level) to input files for air quality models. These input files require emissions to be specified by model grid cell, hour, and model chemical species. The emission modelers in the MANE-VU+VA region are using the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system and data formats. Emission inventory files were prepared in SMOKE compatible format.

1.5 INVENTORY VERSIONS

1.5.1 Version 1 Modeling Inventory

Work commenced in 2009 to assemble comprehensive 2007 and future year emission inventories to support air quality modeling. Using data available from state agencies and the USEPA, detailed point and area source emission inventories were compiled. The NONROAD model was used to estimate emissions for the nonroad equipment categories included in the model. State and USEPA data were used to assemble the inventory for nonroad sources not included in the NONROAD model (marine vessels, aircraft, and railroad locomotives, collectively referred to as the MAR sector).

For the point, area, and MAR sectors, growth factors are applied to account for changes in population, fuel use and economic activity. Next, control factors are applied to account for future emission reductions from post-2007 control measures. The NONROAD model was used to project emissions for the nonroad equipment included in the model. The control scenario developed accounted for post-2007 emission reductions from promulgated federal, State, local, and site-specific control programs and proposed control programs that are reasonably anticipated to result in post-2007 emission reductions. A series of quality assurance steps are conducted to ensure the development of complete, accurate, and consistent emission inventories. The inventories are provided in two formats – SMOKE One-Record-Per-Line (ORL) format and a spreadsheet format suitable for SIP submittals. Finally, emission summary tables by state and pollutant were developed.

Version 1 of the 2007 base year inventory and the emission projections for 2013/2017/2020 were released for state and stakeholder review in late 2009 and early 2010.

1.5.2 Version 2 Modeling Inventory

Following the review of Version 1, significant efforts were made to improve the inventory by using more state-specific data and correcting errors or omissions that were uncovered. These improvements were completed in February of 2011 and are referred to as Version 2 of the MANE-VU+VA 2007 and 2013/2017/2020 inventories. The inventories were documented in two TSDs (MARAMA 2011a, MARAMA 2011b).

1.5.3 Version 3 Modeling Inventories with Existing and Potential Controls

Beginning in the fall of 2011, MARAMA sponsored development of Version 3 of the 2007 base year modeling inventory to incorporate new paved road emission estimates, revised modeling of nonroad and onroad sources, and other state-specific changes (MARAMA2012).

This report documents the development of Version 3 of the future year inventories for the area source, nonEGU, and nonroad sectors. The future year modeling inventories for EGU) are currently being developed under a separate effort lead by ERTAC. The future year modeling inventories for onroad sources are currently being developed by NESCAUM, MARAMA or individual states.

In Version 3, the state Air Directors issued guidance on the future year emission control scenarios to be developed, as follows:

- “A special meeting of the Air Directors was convened to discuss the controlled inventory. During that call many Air Directors indicated that they would not be able to clearly identify which of the control measures their states would adopt because of the uncertainty surrounding the ozone standard. Therefore, all states, except Virginia, requested that the contractor be instructed to calculate the effect of all measures being fully adopted by both 2017 and 2020. This will allow modelers to assess the potential effect of the measures if they were fully implemented on air quality. We can also then test the assumptions that we have been making about the cumulative percent reduction from the measures.”

Thus, these TSD discusses two future control scenarios: an “existing controls” scenario scenario intended to include all 2017/2020 control measaures included in an individual state’s regulations or SIP, and a "what if" scenario that assumes that all states adopt certain new control measures by 2017.

1.6 REPORT ORGANIZATION

Section 2 describes how point source emission units were classified into the EGU or nonEGU point source categories. Section 3 discusses the growth projection factors assembled for area and nonEGU point sources. Sections 4 and 5 describe the control factors used for area and nonEGU point sources, respectively. Section 6 describes the NONROAD model runs made for the future years. Section 7 documents how emissions for marine vessels, aircraft, and railroad equipment were projected. Section 8 provides state level emission pollutant summaries for area, nonEGU point, NONROAD, and MAR sectors. Section 9 documents the creation of SMOKE inventory modeling input files. Section 10 identifies the file names for final deliverable products. References for the TSD are provided in Section 11.

2.0 IDENTIFICATION OF EGU AND NONEGU POINT SOURCES

Only the emissions from point sources classified as nonEGUs are being projected using the methods and data contained in this report. Emissions from EGU point sources are being developed by ERTAC.

States were asked to classify units in the 2007 MANE-VU+VA emissions inventory as either EGU or nonEGU. Most, but not all, of the units that are required to report hourly emissions to USEPA's Clean Air Markets Division (CAMD) are classified as EGUs. CAMD implements USEPA's rule found in Volume 40 Part 75 of the Code of Federal Regulations (CFR), which requires an hourly accounting of emissions from each affected unit - i.e., sources participating in an emissions cap and trade program under the Acid Rain Control Program, the NOx Budget Trading Program, or the Clean Air Interstate Rule.

For the ERTAC projection methodology, the following guidance was provided to states to classify a unit as an EGU if it meets the following criteria:

- An EGU sells most of the power generated to the electrical grid;
- An EGU burns mostly commercial fuel. Commercial fuel in this case means natural gas, oil, and coal. Wood is not considered a commercial fuel because some states identify wood as renewable. Therefore, to avoid double counting, units that burn wood and other renewable sources (depending on each state's own definition) should not be considered as an EGU (unless it is already in the CAMD database).

The following are units were <u>not</u> considered as EGU for emission projections: (1) a unit that generates power for a facility but occasionally sells to the grid; (2) emergency generators; or (3) distributed generation units.

States were provided with a list of units that report to CAMD (USEPA 2009a) and a list of units with an electric generating unit SCC (1-01-xxx-xx or 2-01-xxx-xx). States identified which units should be classified as EGUs and which should be classified as nonEGUs. Appendix A identifies the units that report emissions to CAMD and whether they are classified as EGUs or nonEGUs for emission projection purposes. A few states also identified units with SCCs beginning with 1-01 or 2-01 that do not report to CAMD but which should be classified as EGUs; however, for emission projection purposes these units will be processed using the nonEGU projection methodology described in this report.

Exhibits 2.1 to 2.7 summarize EGU and nonEGU emissions for 2007. For these exhibits, EGUs are defined as units that report emissions to CAMD and have been classified as EGUs by the states for emission projection purposes.

Exhibit 2.1 2007 EGU and NonEGU Point Source CO Emissions (tons per year)

State	EGU	NonEGU	Total
CT	1,095	2,584	3,679
DE	726	7,027	7,753
DC	10	301	311
ME	460	14,023	14,483
MD	4,196	77,574	81,770
MA	5,516	4,592	10,108
NH	910	2,254	3,164
NJ	3,640	6,932	10,572
NY	13,480	52,877	66,357
PA	20,900	80,540	101,440
RI	602	1,051	1,653
VT	1,444	702	2,146
VA	7,273	63,080	70,353
TOTAL	**60,252**	**313,537**	**373,789**

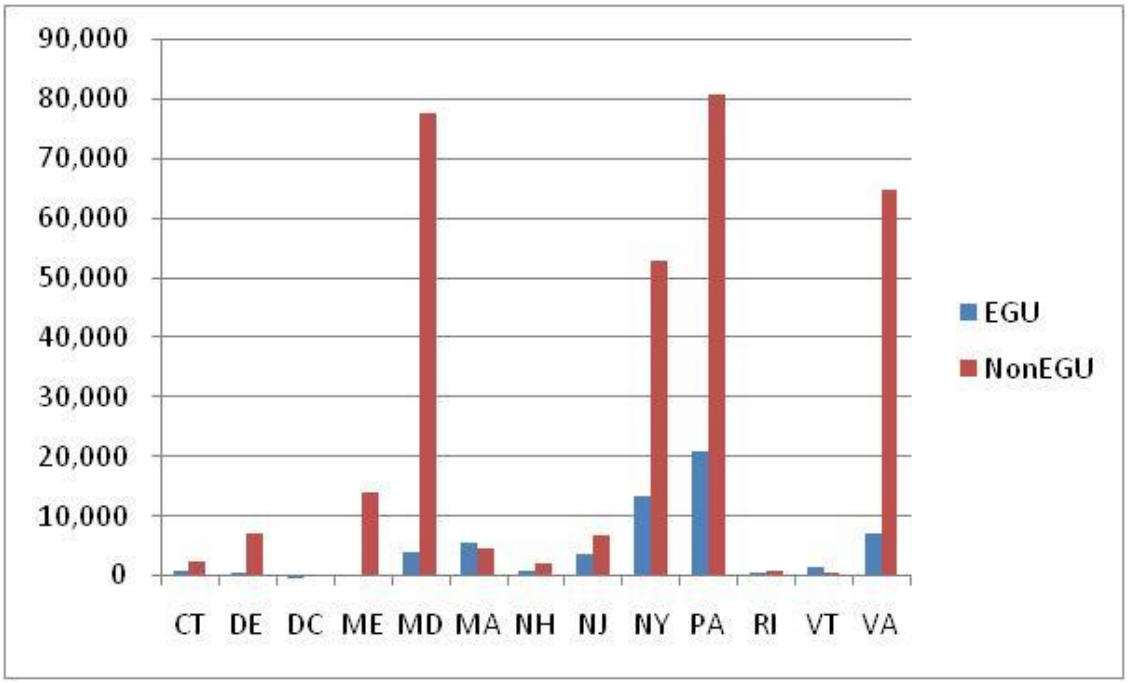


Exhibit 2.2 2007 EGU and NonEGU Point Source NH3 Emissions (tons per year)

State	EGU	NonEGU	Total
CT	0	0	0
DE	32	62	94
DC	0	0	0
ME	59	606	665
MD	0	137	137
MA	283	365	648
NH	98	30	128
NJ	708	210	918
NY	1,354	1,063	2,417
PA	309	2,070	2,379
RI	58	16	74
VT	0	0	0
VA	212	1,618	1,830
TOTAL	**3,113**	**6,177**	**9,290**

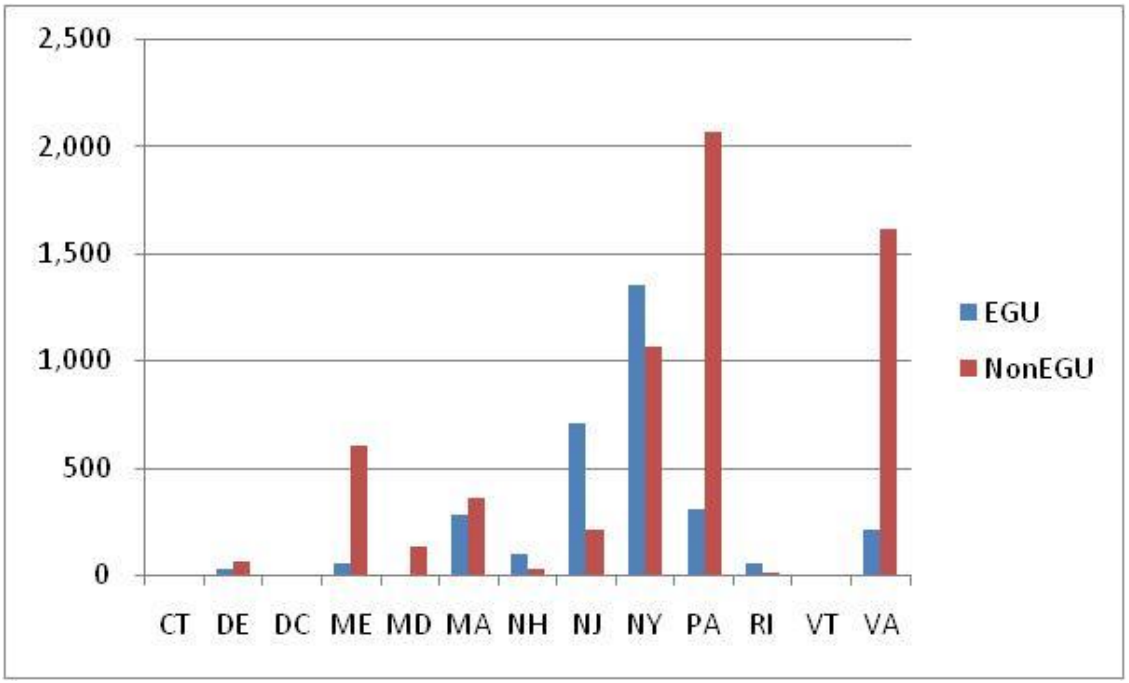


Exhibit 2.3 2007 EGU and NonEGU Point Source NOx Emissions (tons per year)

State	EGU	NonEGU	Total
CT	3,760	6,301	10,061
DE	10,507	5,121	15,628
DC	55	734	789
ME	696	17,050	17,746
MD	51,418	23,472	74,890
MA	10,755	12,873	23,628
NH	4,754	2,687	7,441
NJ	16,571	14,030	30,601
NY	47,450	35,583	83,033
PA	186,997	71,382	258,379
RI	494	950	1,444
VT	370	441	811
VA	62,673	50,265	112,938
TOTAL	**396,500**	**240,889**	**637,389**

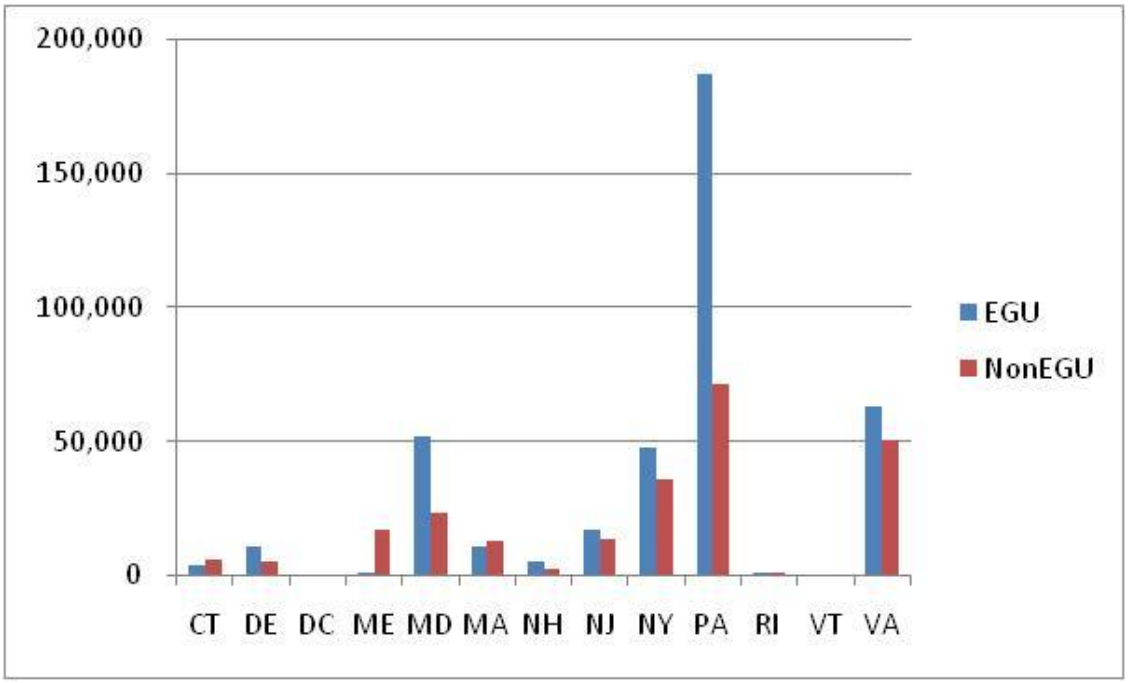


Exhibit 2.4 2007 EGU and NonEGU Point Source PM10 Emissions (tons per year)

State	EGU	NonEGU	Total
CT	705	645	1,350
DE	2,268	1,197	3,465
DC	13	46	59
ME	148	4,748	4,896
MD	13,611	5,711	19,322
MA	2,575	3,029	5,604
NH	784	1,141	1,925
NJ	4,496	3,188	7,684
NY	5,044	4,463	9,507
PA	27,470	22,275	49,745
RI	16	173	189
VT	0	146	146
VA	6,175	13,028	19,203
TOTAL	**63,305**	**59,790**	**123,095**

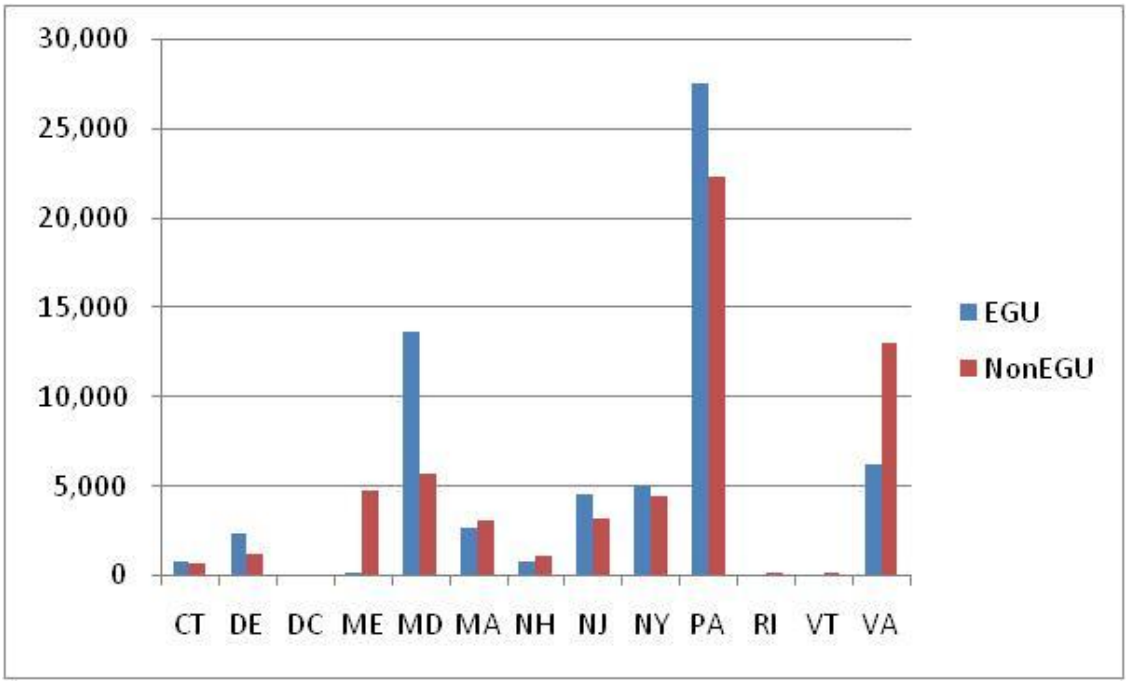


Exhibit 2.5 2007 EGU and NonEGU Point Source PM2.5 Emissions (tons per year)

State	EGU	NonEGU	Total
CT	669	573	1,242
DE	2,024	1,083	3,107
DC	10	43	53
ME	125	3,727	3,852
MD	11,805	3,877	15,682
MA	2,292	2,572	4,864
NH	602	1,061	1,663
NJ	4,410	2,453	6,863
NY	3,585	2,414	5,999
PA	19,071	13,389	32,460
RI	16	124	140
VT	0	114	114
VA	4,593	10,295	14,888
TOTAL	**49,202**	**41,725**	**90,927**

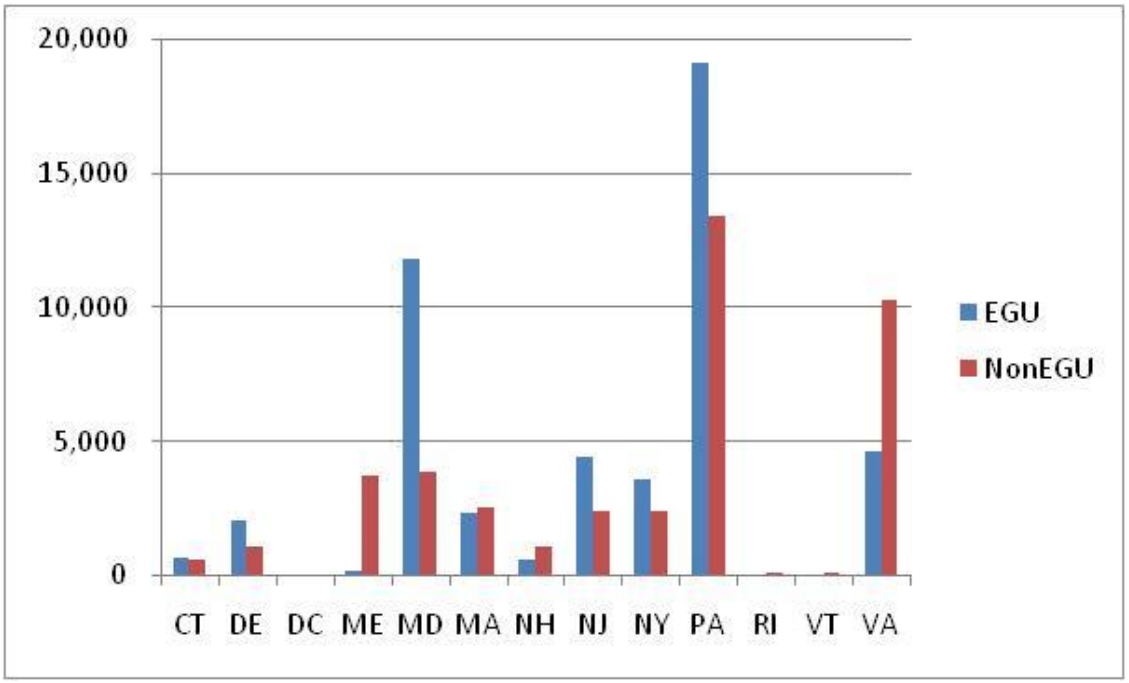


Exhibit 2.6 2007 EGU and NonEGU Point Source SO2 Emissions (tons per year)

State	EGU	NonEGU	Total
CT	4,786	3,185	7,971
DE	34,882	8,206	43,088
DC	141	471	612
ME	1,677	15,571	17,248
MD	274,207	31,176	305,383
MA	54,172	9,057	63,229
NH	42,524	2,734	45,258
NJ	37,302	3,490	40,792
NY	108,444	44,307	152,751
PA	970,726	57,330	1,028,056
RI	16	1,500	1,516
VT	6	316	322
VA	188,562	54,486	243,048
TOTAL	**1,717,445**	**231,829**	**1,949,274**

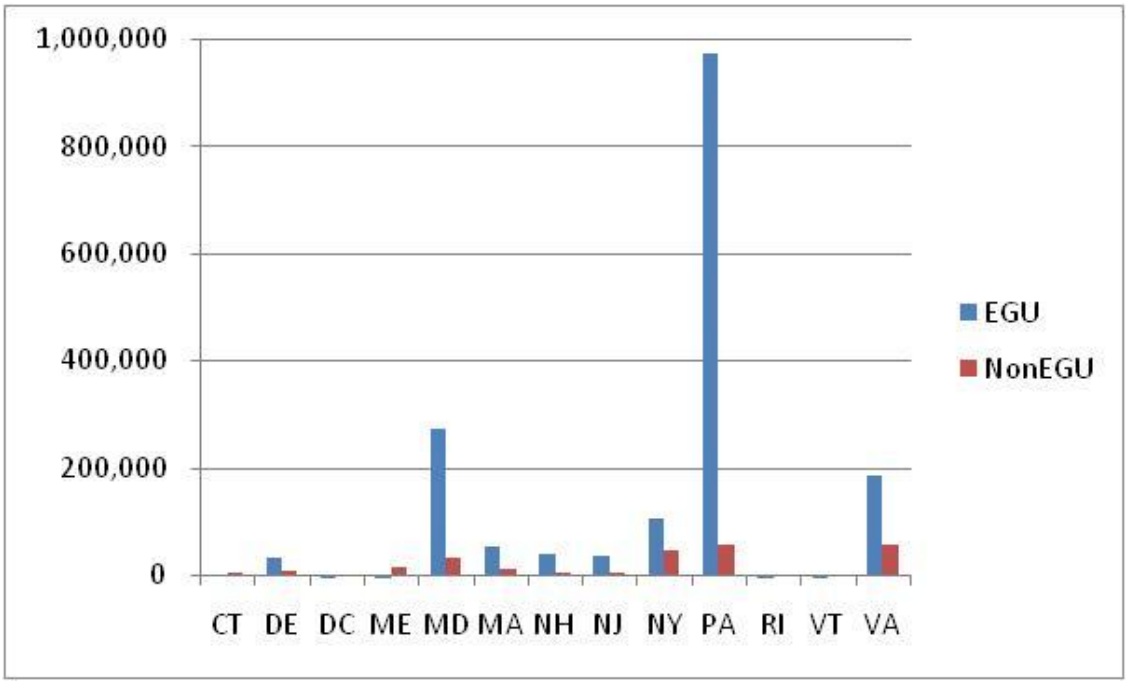
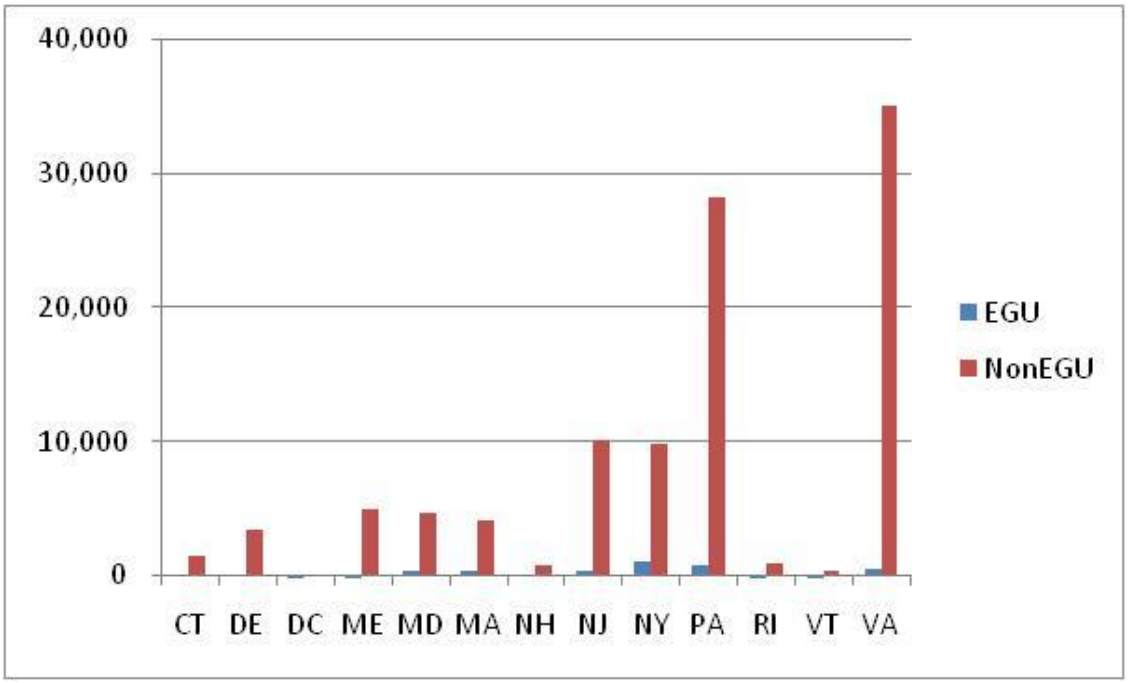


Exhibit 2.7 2007 EGU and NonEGU Point Source VOC Emissions (tons per year)

State	EGU	NonEGU	Total
CT	143	1,447	1,590
DE	83	3,406	3,489
DC	2	57	59
ME	35	4,987	5,022
MD	389	4,597	4,986
MA	463	4,094	4,557
NH	110	806	916
NJ	420	10,620	11,040
NY	1,119	9,772	10,891
PA	770	28,195	28,965
RI	49	921	970
VT	22	373	395
VA	600	35,018	35,618
TOTAL	**4,205**	**104,293**	**108,498**



3.0 GROWTH PROJECTION FACTORS FOR NONEGUs AND AREA SOURCES

The area and nonEGU point source growth factors were developed using six sets of data:

- The Annual Energy Outlook (AEO) fuel consumption forecasts;
- County-level population projections;
- State-level employment projections by NAICS code;
- County-level vehicle miles travelled (VMT) projections;
- USEPA projections for livestock and residential wood combustion; and
- Other state-specific emission projection data.

The priority for applying these growth factors was to first use the state-supplied projection data (if available). If state-supplied data were not provided, then the AEO projection factors were used for fuel consumption sources, and the population/employment/VMT data were used for other source categories.

3.1 AEO FUEL USE PROJECTIONS

The AEO is published annually by the U.S. Energy Information Administration (EIA). It presents long-term projections of energy supply, demand, and prices through 2035, based on results from EIA's National Energy Modeling System (NEMS). NEMS projects the production, imports, conversion, consumption, and prices of energy, subject to assumptions on macroeconomic and financial factors, world energy markets, resource availability and costs, behavioral and technological choice criteria, energy technology cost and performance characteristics, and demographics.

AEO provides regional fuel-use forecasts for various fuel types (e.g., coal, residual oil, distillate oil, natural gas) by end use sector (e.g., residential, commercial, industrial, transportation, and electric power). Energy use projections are reported at the Census division level. The census divisions grouped states as follows:

- South Atlantic - DE, DC, MD, VA
- Middle Atlantic – NJ, NY, PA
- New England – CT, ME, MA, NH, RI, VT

Appendices B1, B2, and B3 contain the AEO2010 fuel use projections for each of these three regions. Appendices B4, B5, and B6 contain the AEO2011 fuel use projections

Version 2 of the MANE-VU+VA future year inventories was developed using AEO2010 (EIA2010). After the release of Version 2, AEO2011 was published (EIA2011). MARAMA reviewed the updated fuel forecasts and compared the AEO2010 and AEO2011 projections. Appendix B7 documents MARAMA's analysis. MARAMA

calculated the difference in projected fuel usage between AEO2010 and AEO2011 for the residential, commercial, industrial, transportation, and electric power sector for the distillate fuel oil, residual fuel oil, coal, natural gas, and renewable fuel types. MARAMA identified thresholds for what constitutes a major change as follows:

- An increase or decrease of 1% or less is considered to be no change and did not warrant a change in the growth factors between Versions 2 and 3 of the inventory;
- An increase or decrease of between 1% and 5% is considered to be a minor change, and states agreed that these differences between AEO2010 and AEO2011 did not warrant a change in the growth factors between Versions 2 and 3 of the inventory;
- An increase or decrease above 5% is considered a major change, and warrants a change in the growth factors used in Version 3.

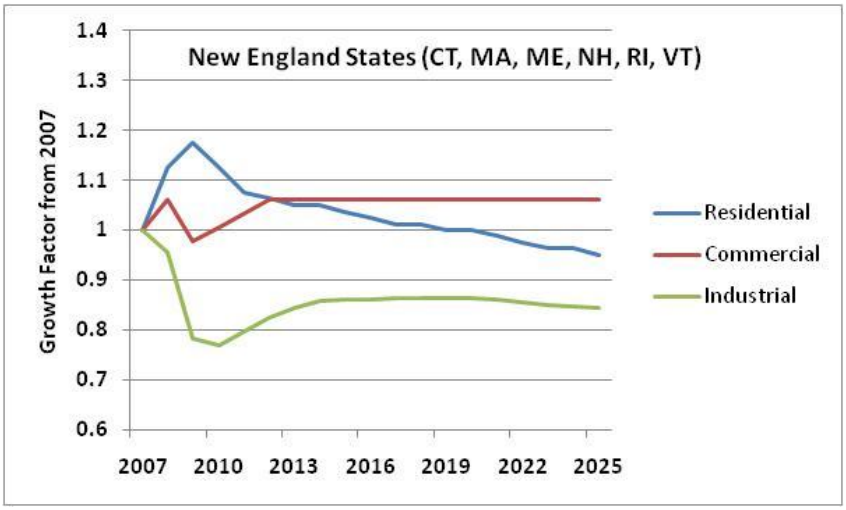
MARAMA recommended that the AEO2010 projections be retained for all residential, commercial, and industrial sector fuel use, except for industrial natural gas usage, where the AEO2011 projections will be used for Version 3 of the future year modeling inventory. New Jersey elected to use the more recent growth factors from AEO2011 instead of the AEO2010 growth factors for all area source fossil fuel use categories.

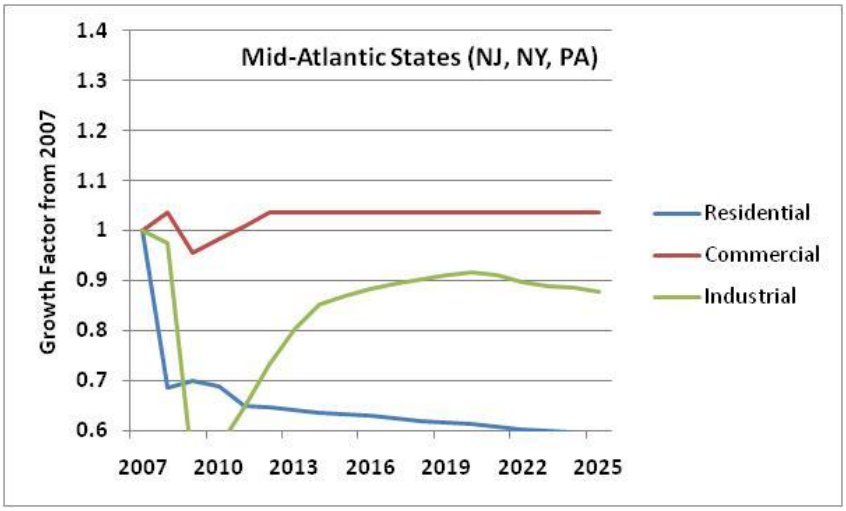
Exhibits 3.1 to 3.5 summarize the projected fuel use rates by source sector (residential, commercial, industrial, transportation) , AEO region, and fuel type for the years 2007 to 2025. The unusual growth in commercial residual oil use in the South Atlantic region could not be explained; Maryland elected to use manufacturing employment instead of the AEO2010 growth factor for commercial residual oil combustion, while Virginia and the District chose to assume flat growth in this sector.

3.2 POPULATION PROJECTIONS

States provided county-level 2007 populations and projections for future years. The historical and projection years varied from state-to-state, so values were interpolated, when necessary, to create population estimates for each year from 2007 to 2025. The population data were normalized to create growth factors from 2007 for each future year. For example, Delaware had a population of 861,087 in 2007 and the projected population in 2017 is 953,204, then the growth factor for 2017 is 953,204 / 861,087 = 1.107.

Population projections are provided in Appendix C. Exhibit 3.6 summarizes the population growth factors by state and AEO2010 region. Population is projected to grow in every state between 2007 and 2025. The population growth in the New England states varies significantly by state. Population growth in the South Atlantic states is projected to be much higher than in the New England and Mid-Atlantic states.





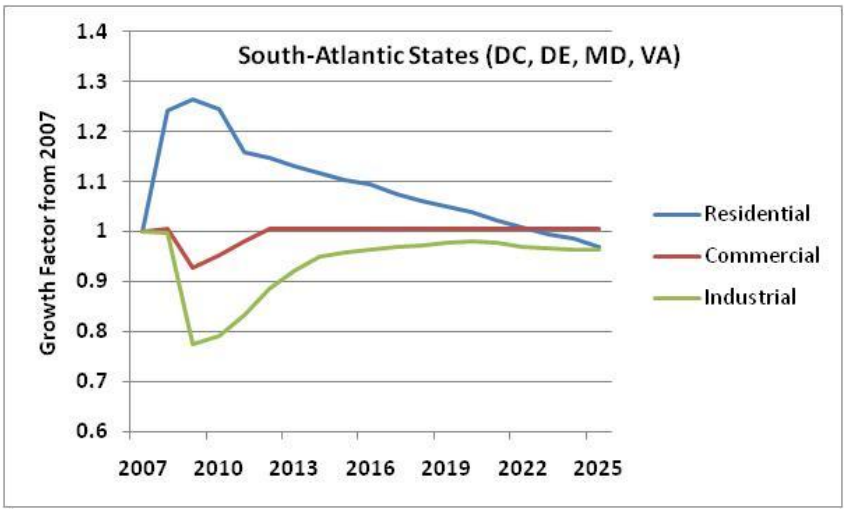
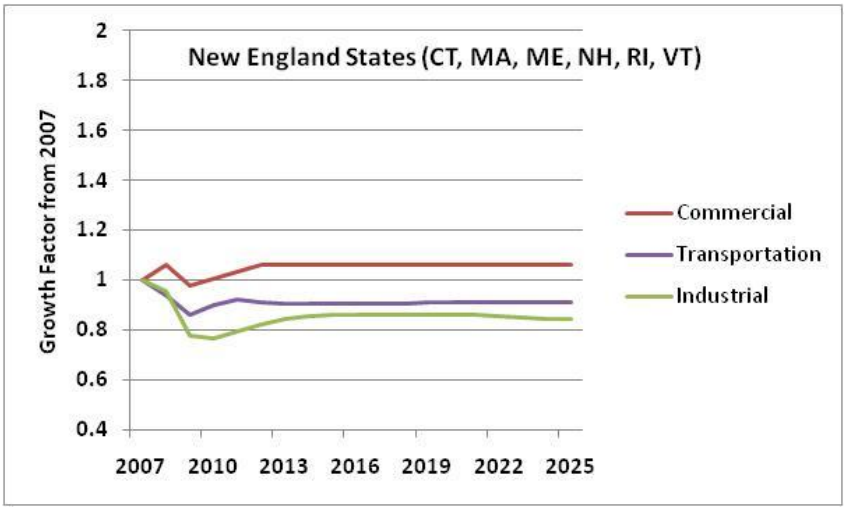
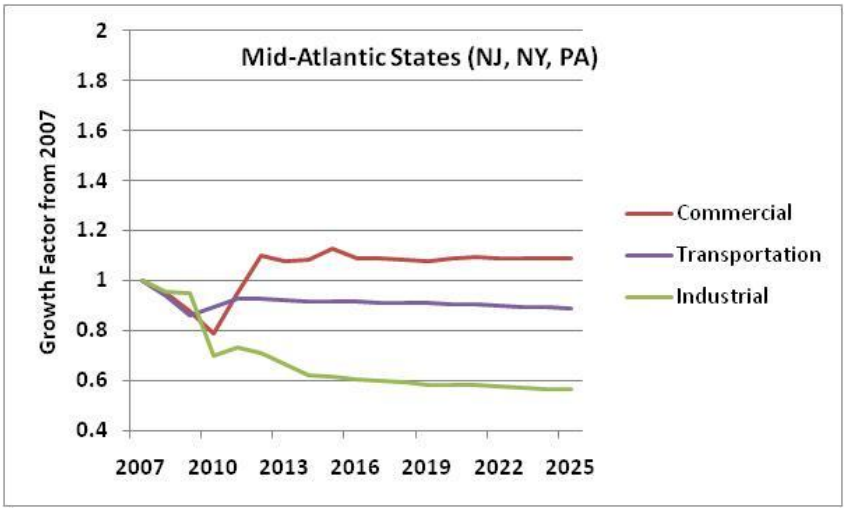


Exhibit 3.1 AEO2010 Growth Factors for Coal by AEO Region 2007 – 2025





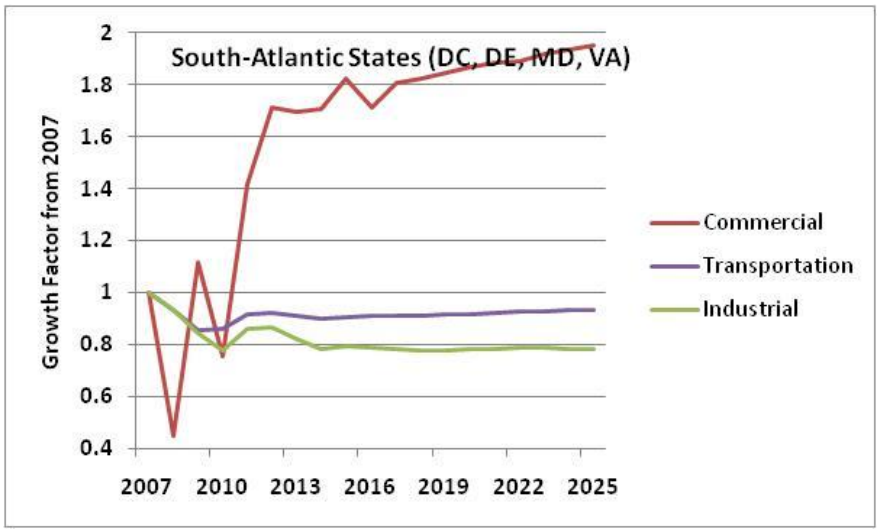
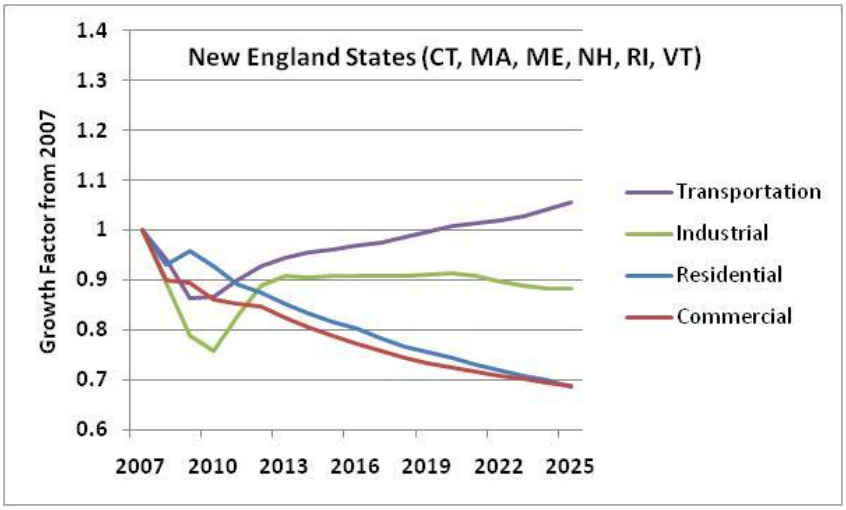
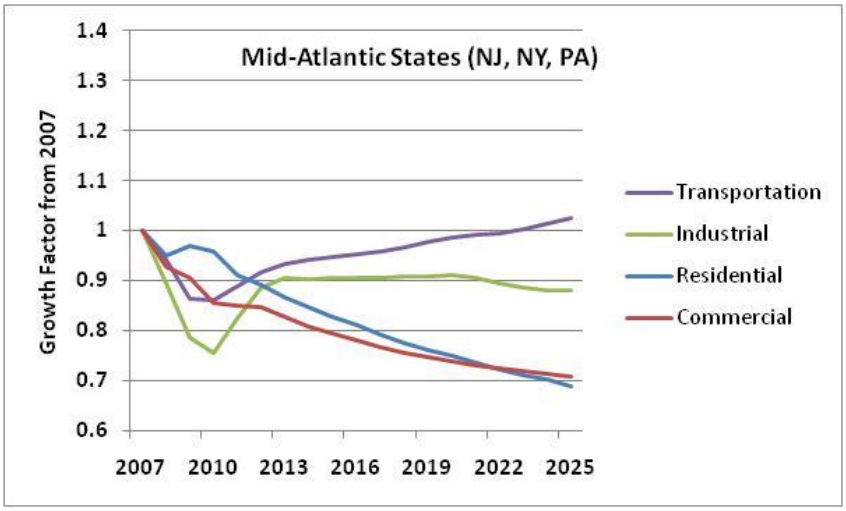


Exhibit 3.2 Growth Factors for Residual Oil by AEO Region 2007 – 2025





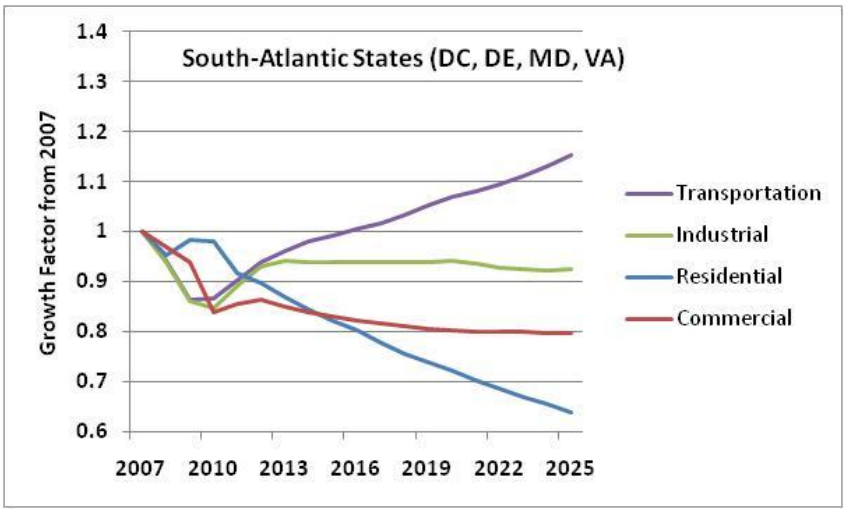
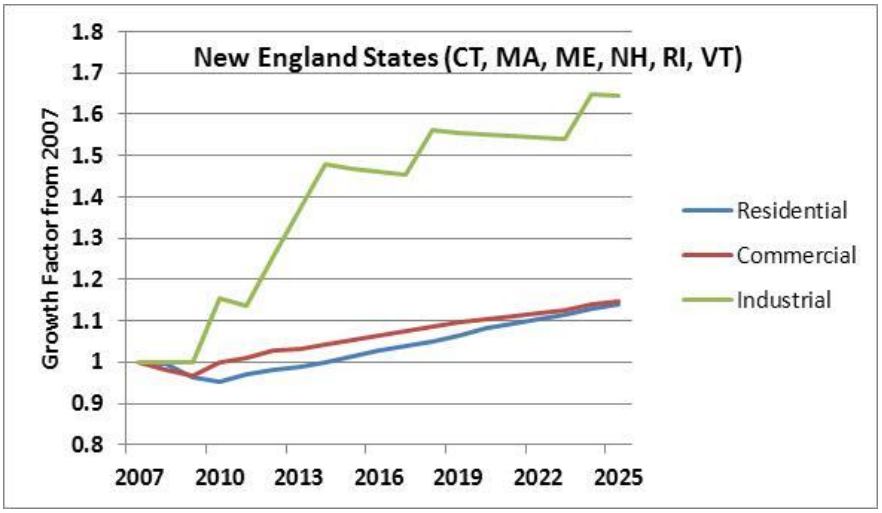
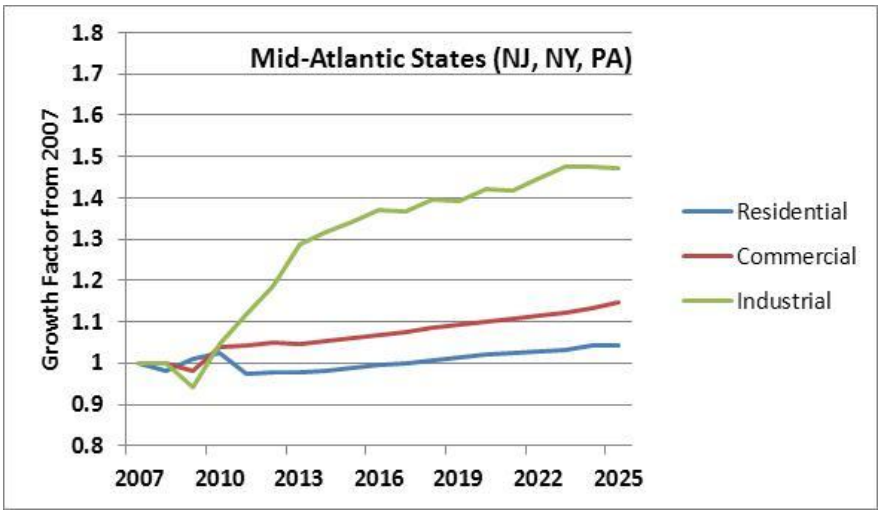


Exhibit 3.3 AEO2010 Growth Factors for Distillate Oil by AEO Region 2007 – 2025





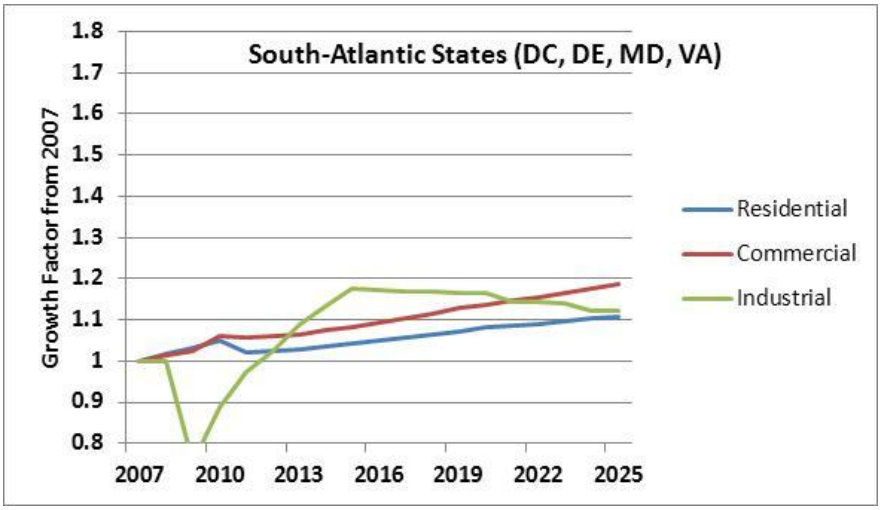
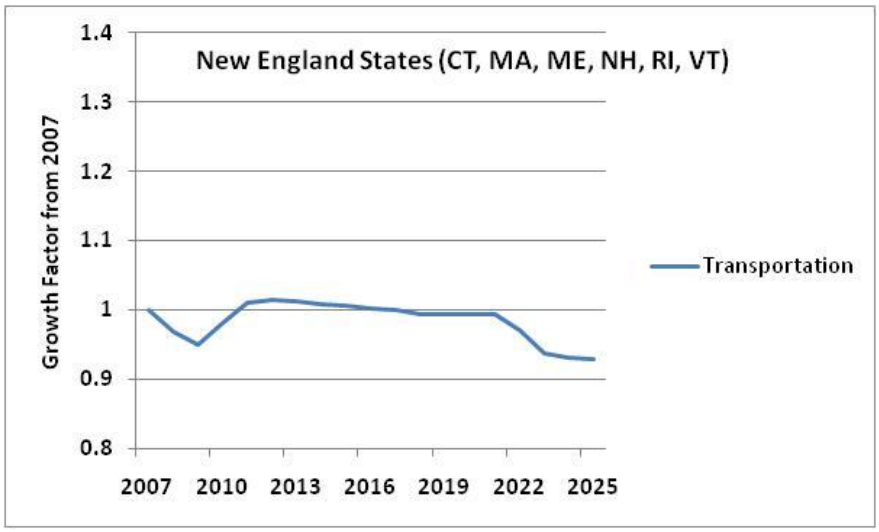
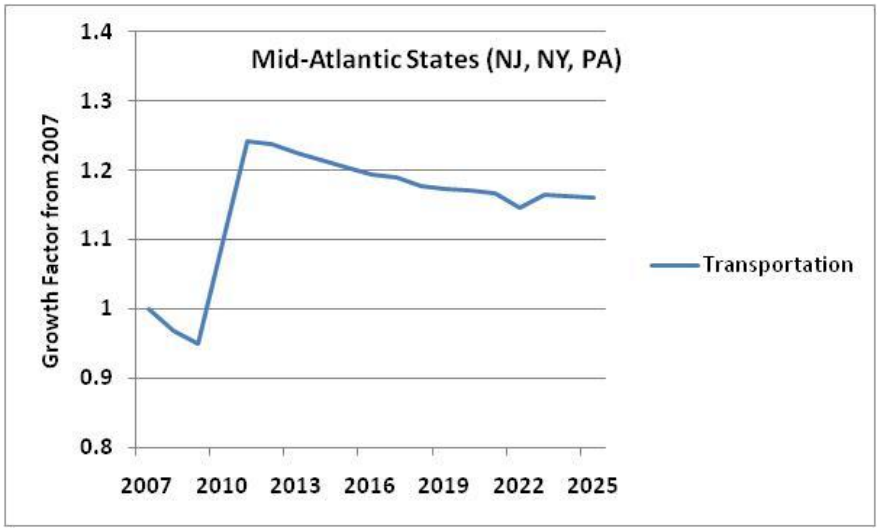


Exhibit 3.4 Growth Factors for Natural Gas by AEO Region 2007 – 2025
AEO2010 for Residential/Commercial, AEO2011 for Industrial





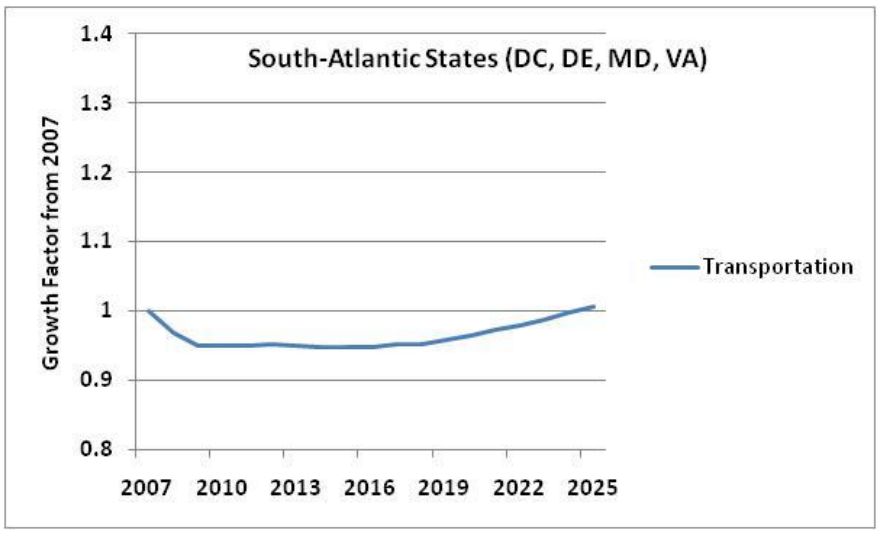


Exhibit 3.5 AEO2010 Growth Factors for Gasoline by AEO Region 2007 – 2025

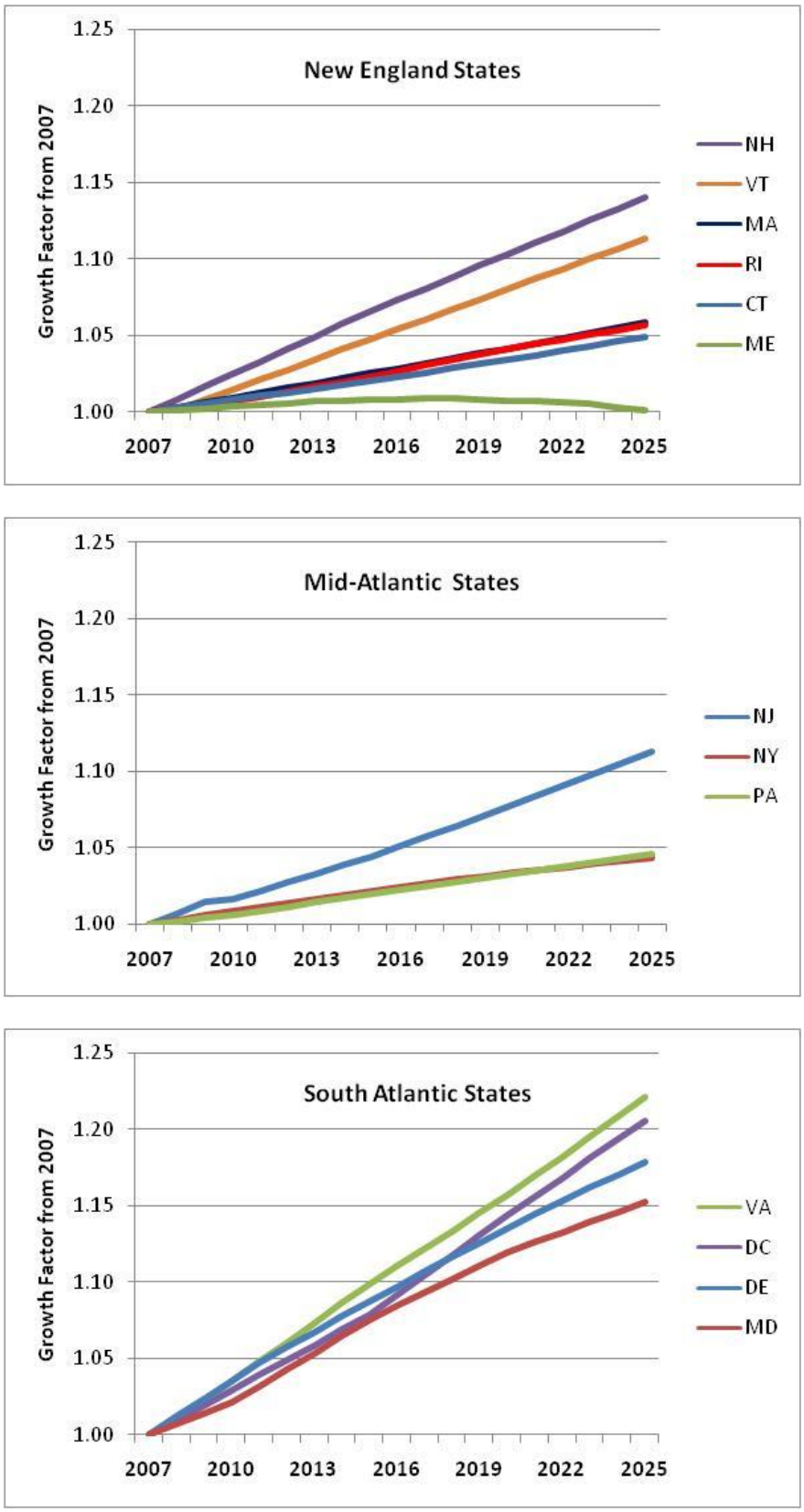


Exhibit 3.6 Population Growth Factors by AEO Region 2007 – 2025

3.3 EMPLOYMENT PROJECTIONS

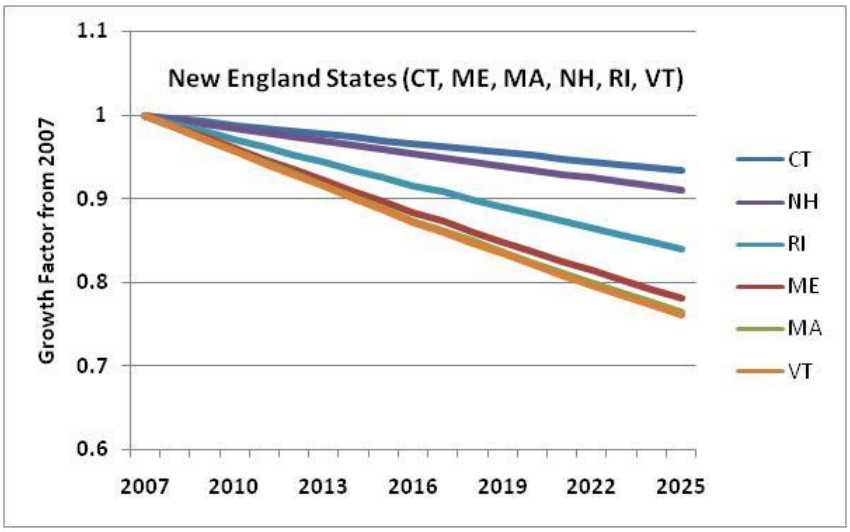
Every two years, the federal Bureau of Labor Statistics produces long-term industry and occupation forecasts for ten future years and states are asked to do the same for their respective economies. The most recent projections from state Department's of Labor of for the period 2006 to 2016, most of which were published in 2008. These 10-year forecasts are updated every other year. The next set of state-specific projections will be for the period 2008 to 2018. Only the District of Columbia and Delaware were able to provide employment projections for 2008 to 2018; the 2008 to 2018 projections were not available for other states in time for use on this project. The employment projections are state-wide by 3-digit NAICS code. Employment projections are provided in Appendix D. Exhibit 3.7 summarizes the manufacturing employment (NAICS sector 31-33) growth factors by state and AEO2010 region. States in the Northeast / Mid-Atlantic region show a marked decrease in manufacturing employment from 2007 forward.

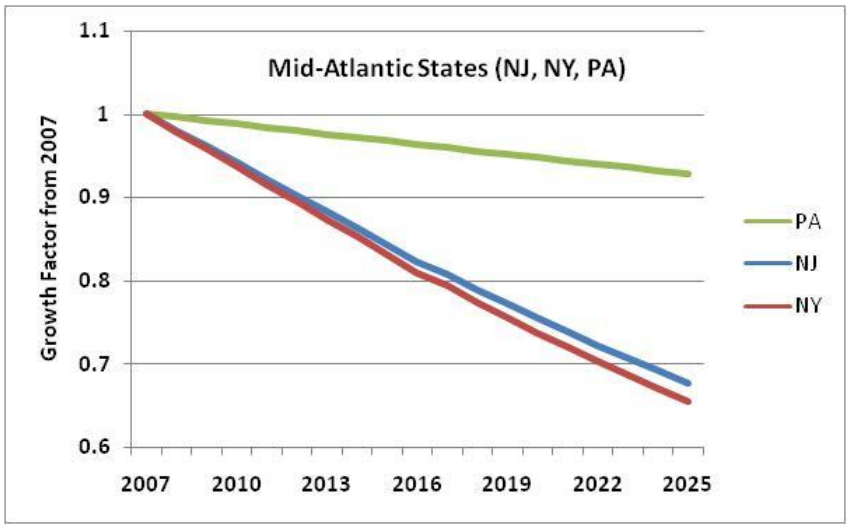
3.4 VEHICLE MILES TRAVELED PROJECTIONS

States developed projections of vehicle miles traveled (VMT) for 2007, 2017 and 2020 which were used as the growth factor for projecting emissions from re-entrained road dust from travel on paved roads (SCC 22-94-000-000). The 2007 and future year VMT are identical to those used in the MOVES modeling. Exhibit 3.8 shows the state level VMT growth between 2007 and 2020. Growth factors for years where VMT were not directly provided by states were estimated by a linear interpolation of available data. County-specific VMT projections are provided in Appendix E.

3.5 NO GROWTH ASSIGNMENT FOR CERTAIN AREA SOURCE CATEGORIES

For several area source categories, it seems reasonable that emissions would not change from the 2007 values. No growth was applied to the 2007 emissions for the area source categories shown in Exhibit 3.9.





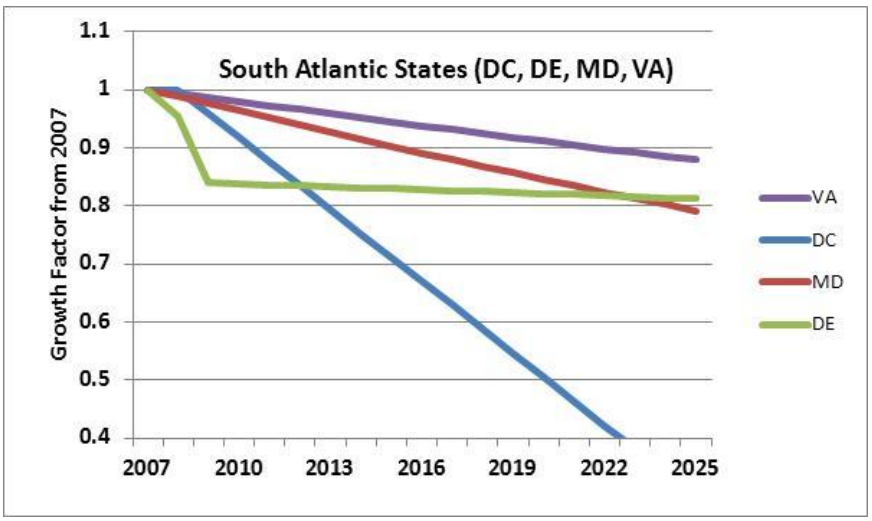
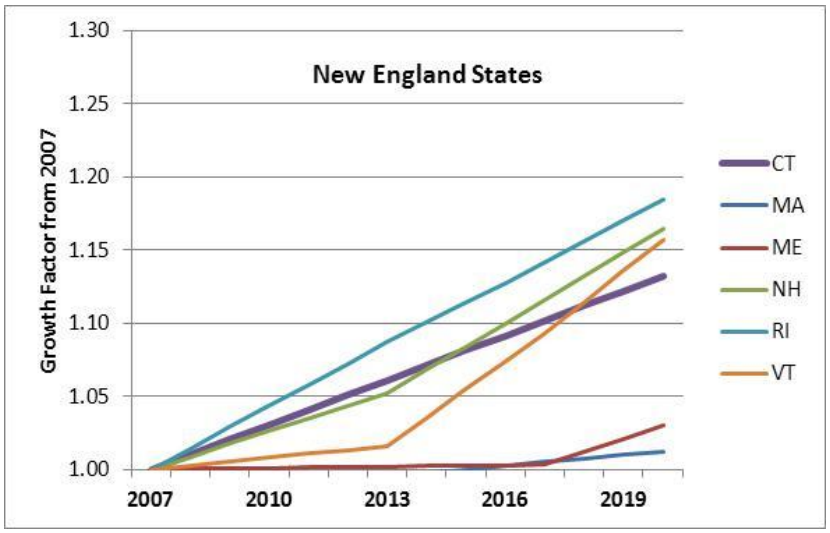
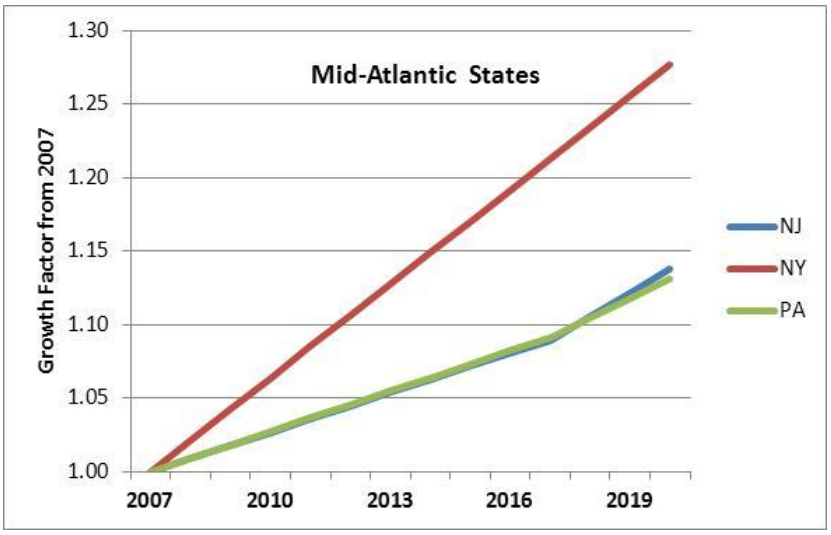


Exhibit 3.7. Manufacturing Employment Growth Factors by AEO Region 2007 - 2025





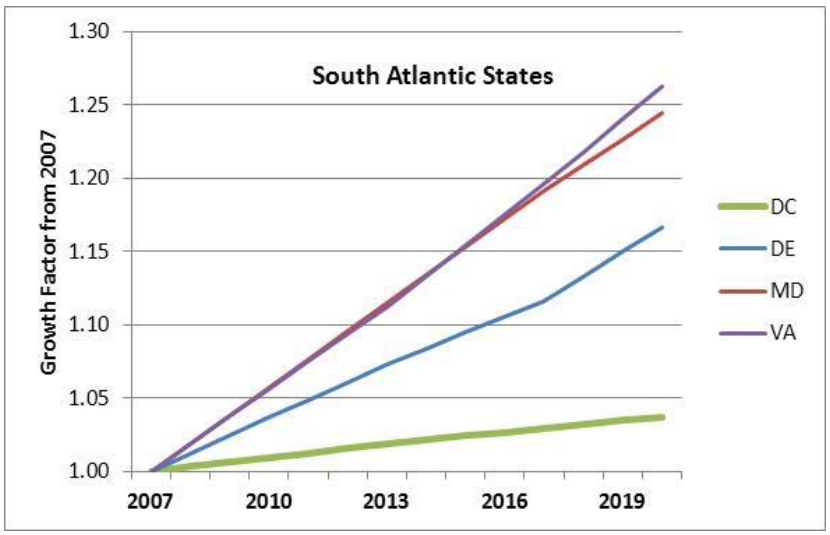


Exhibit 3.8 State VMT Growth Factors 2007 – 2020

Exhibit 3.9 Area Source Categories with No Growth Assignment

SCC	SCC Description
2296000000	Unpaved Roads /All Unpaved Roads /Total: Fugitives
2401008000	Surface Coating /Traffic Markings /Total: All Solvent Types
2461020000	Misc Non-industrial: Commercial /Asphalt Application: All Processes /Total: All
2461021000	Misc Non-industrial: Commercial /Cutback Asphalt /Total: All Solvent Types
2461022000	Misc Non-industrial: Commercial /Emulsified Asphalt /Total: All Solvent Types
2461023000	Misc Non-industrial: Commercial /Asphalt Roofing /Total: All Solvent Types
2601000000	On-site Incineration /All Categories /Total
2601010000	On-site Incineration /Industrial /Total
2601010000	On-site Incineration /Industrial /Total
2601020000	On-site Incineration /Commercial/Institutional /Total
2601020000	On-site Incineration /Commercial/Institutional /Total
2601030000	On-site Incineration /Residential /Total
2610000100	Open Burning /All Categories /Yard Waste - Leaf Species Unspecified
2610000400	Open Burning /All Categories /Yard Waste - Brush Species Unspecified
2610000500	Open Burning /All Categories /Land Clearing Debris (use 28-10-005-000 for Loggin
2610030000	Open Burning /Residential /Household Waste (use 26-10-000-xxx for Yard Wastes)
2610040400	Open Burning /Municipal (from residences, parks,other for central burn)
2660000000	Leaking Underground Storage Tanks /Leaking Underground Storage Tanks /Total: All
2680001000	Composting /100% Biosolids (e.g., sewage sludge, manure, mixtures of these matls
2680002000	Composting /Mixed Waste (e.g., a 50:50 mixture of biosolids and green wastes)
2806010000	Domestic Animals Waste Emissions /Cats /Total
2806015000	Domestic Animals Waste Emissions /Dogs /Total
2807020001	Wild Animals Waste Emissions /Bears /Black Bears
2807020002	Wild Animals Waste Emissions /Bears /Grizzly Bears
2807025000	Wild Animals Waste Emissions /Elk /Total
2807030000	Wild Animals Waste Emissions /Deer /Total
2807040000	Wild Animals Waste Emissions /Birds /Total
2810001000	Forest Wildfires - Wildfires – Unspecified
2810005000	Managed Burning, Slash (Logging Debris) /Unspecified Burn Method
2810010000	Human Perspiration and Respiration /Total
2810014000	Prescribed Burning /Generic - Unspecified land cover, ownership, class/purpose
2810015000	Prescribed Forest Burning /Unspecified
2810020000	Prescribed Rangeland Burning /Unspecified
2810030000	Structure Fires /Unspecified
2810035000	Firefighting Training /Total
2810050000	Motor Vehicle Fires /Unspecified
2810060200	Cremation /Animals
2810090000	Open Fire /Not categorized
2820010000	Cooling Towers /Process Cooling Towers /Total
2830000000	Catastrophic/Accidental Releases /All Catastrophic/Accidental Releases /Total
2830010000	Catastrophic/Accidental Releases /Transportation Accidents /Total

3.6 EPA 2020 PROJECTIONS FOR RESIDENTIAL WOOD AND LIVESTOCK

EPA's Office of Air Quality Planning and Standards (OAQPS) made available its 2020 emissions projections associated with its 2005-based v4 modeling platform. MARAMA used the OAQPS emission projection parameters for two area source sectors –livestock and residential wood combustion. OAQPS's methodology and data sources are summarized below (USEPA 2008a).

OAQPS projected residential wood combustion emissions are based on the expected increase in the number of low-emitting wood stoves and the corresponding decrease in other types of wood stoves. As newer, cleaner woodstoves replace older, more polluting stoves, there will be an overall reduction of emissions from this category. The approach used by OAQPS was developed as part of a modeling exercise to estimate the expected benefits of the woodstove changeout program. This methodology uses a combination of growth and control factors and is based on activity not pollutant. The growth and control are accounted for in a single factor for each residential wood SCC (certain SCCs represent controlled equipment, while other SCCs represent uncontrolled equipment). Control factors are indirectly incorporated based on which stove is used. The specific assumptions OAQPS made were:

- Fireplaces, SCC=2104008001: increase 1%/year;
- Old woodstoves, SCC=2104008002, 2104008010, 2104008051: decrease 2%/year;
- New woodstoves, SCC=2104008003, 2104008004, 2104008030, 2104008050, 2104008052 or 2104008053: increase 2%/year.

For the general woodstoves and fireplaces category (SCC 2104008000) OAQPS computed a weighted average distribution based on 19.4% fireplaces, 71.6% old woodstoves, 9.1% new woodstoves using 2002 Platform emissions for PM2.5. These fractions are based on the fraction of emissions from these processes in states that did not have the "general woodstoves and fireplaces" SCC in the 2002 NEI. This approach results in an overall decrease of 1.056% per year for this source category. Appendix F contains the residential wood projection data from OAQPS.

OAQPS based growth in emissions from livestock on projections of growth in animal population. Except for dairy cows and turkeys, the animal projection factors are derived from national-level animal population projections from the U.S. Department of Agriculture (USDA) and the Food and Agriculture Policy and Research Institute (FAPRI).

For dairy cows and turkeys OAQPS assumed that there would be no growth in emissions. This assumption was based on an analysis of historical trends in the number of such animals compared to production rates. While productions rates have increased, the number of animals has declined. In particular, the dairy cow population is projected to decrease in the future as it has for the past few decades; however, milk production is expected to increase over the same period. Thus, OAQPS does not believe that production forecasts provide representative estimates of the future number of cows and turkeys. Therefore, OAQPS did not use these forecasts for estimating future-year emissions from these animals. Note that the ammonia emissions from dairies are related to both animal population and nitrogen excretion. Appendix G contains the livestock projection data from OAQPS.

3.7 SCC, SIC, NAICS AND GROWTH PARAMETER CROSSWALK

Since the employment projections were based on 3-digit NAICS code, it was necessary to map NAICS codes to SCCs and SIC codes that were used by states. Employment projections at the more specific 4-digit or 6-digit NAICS codes were not available.

The first step for developing a comprehensive crosswalk between the different source classification codes (SCC, SIC, and NAICS codes) and emission activity growth indicators was to compile a complete list of the NAICS codes in the 2007 point source inventory. Some states use the SIC code while other use the NAICS code. Still other states use both the SIC and NAICS codes. When the NAICS code was not available SIC codes were converted to NAICS codes. The 6-digit NAICS code was truncated to a 3-digit code, which represents major industry subsectors of the economy. A U.S. Census Bureau document was used to perform this conversion (CENSUS 2000).

The next step was to review parameters that could be used as the emission activity growth indicator for each SCC or NAICS. We initially relied on two USEPA crosswalks (USEPA 2004a, USEPA 2004b) to match area and nonEGU point source SCCs to AEO2010 categories, employment NAICS codes, and population. The sector specific spreadsheets identify the growth parameter used to project emissions for each SCC.

3.8 FINAL GROWTH FACTORS FOR NONEGU / AREA SOURCES

The previous section described the growth factors initially recommended to project future year emissions inventories for area and non-EGU sources. Draft growth and control factors, and a draft technical support document, were circulated for review by MARAMA and state agencies. During the review, it was noted that several emissions categories show

negative growth into the future, particularly categories related to fossil fuel combustion and manufacturing employment.

Many of the growth factors used to project emissions for area and non-EGU sources were based on the AEO2010 fuel consumption forecasts and state-level employment projections. The AEO2010 forecasts show declining trends for many fuel consumption sectors, especially industrial, residential, and commercial distillate fuel oil use. Similarly, the employment projections show declines in the predicted number of employees for many sectors of the economy. This is particularly true for the manufacturing sector, which is of interest because this sector is often associated with higher emissions than those for other sectors. By contrast, the employment projections show increasing trends in retail and service-related sectors. However, these sectors are not typically associated with significant emissions.

Predicted declines in fuel use and employment resulted in growth factors less than unity (i.e., represent negative growth) for many area and non-EGU point source categories. Consequently, for some categories, emissions are lower for the projected future years than for the base year, even before the application of control assumptions (i.e. the future "growth only" emissions are lower than the base year emissions). The MARAMA emissions inventory workgroup met on several occasions via conference calls and email exchanges to discuss whether the negative growth projections were realistic, and what additional assumptions should be made. A topic of particular concern is negative growth for non-EGU point sources versus the treatment of Emissions Reduction Credits (ERCs) in the future year inventories (see Section 3.9 for a discussion of how ERCs were handled).

One conclusion the workgroup reached is that growth methods and assumptions for area sources and non-EGUs should be as consistent as possible with those that are being used by the Eastern Regional Technical Advisory Committee (ERTAC) for the projection of emissions from EGUs. ERTAC is using AEO2010 as a starting point for estimating projected future year emissions, and their preliminary analysis shows some indications of negative growth. But their analysis is still on-going, and it is too early in the process to draw firm conclusions or make solid recommendations at this time regarding their work and its relationship to the area and non-EGU projections.

A few states cited the importance of the negative growth issue for non-EGUs and how it relates to their ERC programs which are critical to new businesses being able to locate in those states. Because businesses could apply for and sell ERCs at the level of the base year inventory, it would not be realistic to show negative growth for non-EGU point sources. During an economic downturn, a facility could shut down and sell its ERCs,

making the effective level of future year emissions equal to (i.e. no lower than) the base year. Therefore, a recommended conservative approach for addressing negative growth for non-EGU point sources is to set a minimum growth rate of 1 (no growth).

During the July 23, 2010 conference call held to discuss the negative growth issue, state and agency representatives on the call were polled as to whether or not they felt that the current set of proposed growth factors - including the negative growth factors - were realistic for their state or district. In reply, some representatives mentioned that they have observed historic state-specific data that supports the trends displayed by the proposed growth factors. Other representatives mentioned that they feel comfortable with the growth factors and don't have a technical basis to change them or suggest others.

As a result of these discussions, each state provided guidance on how to handle projections when negative growth is indicated. Exhibit 3.10 shows the state recommendations for nonEGU point source, and Exhibit 3.11 shows the state recommendations for area sources. The sector specific spreadsheets identify the growth parameter used to project emissions for each SCC.

3.9 EMISSION REDUCTION CREDITS

Mulitple states (Connecticut, Maryland, Massachesetts, New Hampshire and New Jersey) added county level records account for account emission reduction credits (ERCs) issued to stationary sources pursuant to state regulations. States provided ERCs on a county-by-county basis. Fictitious facilities with an identifier of “OFFSET99999” were created for each county using SCC 23-99-000-000 (miscellaneous industrial processes: not elsewhere classified). Stack data were developed that assumed that emissions were released at the county centroid with an assumed release height of 10 feet. For the 2017 and 2020 inventories, ERC emissions were set to the amount of banked emissions available in 2007.

Delaware included the banked credits at the specific locations that they were generated.

Virginia does not have a formal banking and trading program. Virginia used growth rates of 1 for those SCCs in the point source emissions inventory that showed a negative growth. In addition, for units that have or are projected to have shut down, Virginia preserved the 2007 emissions in the inventory to account for potential use as offsets or credits.

Other states did not provide any additional information on how to account for ERCs.

Exhibit 3.10 State Recommendations to Address Negative Growth for the NonEGU Point Source Sector

State	AEO Growth Factors	Employment Growth Factors
CT	Use no growth (growth factor=1) when AEO growth is negative; otherwise use AEO2010 if positive growth	Use state DOL employment projections by 3-digit NAICS
DE	Use AEO2010 growth rates	For 2013, use state DOL employment projections by 3-digit NAICS; For 2017 and 2020, use no growth (growth factor=1) when employment growth is negative; otherwise use employment if positive growth
DC	Use AEO2010 growth rates	Use 2008-2018 employment projections; use no growth (growth factor=1) when employment growth is negative; otherwise use employment if positive growth
ME	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS
MD	Do not use AEO growth factors Use MD DOL employment projections for industrial and commercial fuel use SCCs, unless employment growth rate is negative, in which case use no growth (growth factor=1)	Use updated state DOL employment projections by 3-digit NAICS; For DoD facilities, account for impacts of Base Realignment and Closure; For source that have closed, account for emission reduction credits
MA	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS
NH	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS
NJ	New Jersey submitted state specific growth factors. Used either state specific growth factors, no growth (growth factor=1) when state AEO growth is negative or AEO if positive growth	NJ submitted state specific growth factors. Used either state specific factors, no growth (growth factor=1) when state DOL employment growth is negative or employment if positive growth
NY	Use no growth (growth factor=1) when AEO growth is negative; otherwise use AEO2010 if positive growth	Use no growth (growth factor=1) when employment growth is negative; otherwise use employment if positive growth
PA	Use no growth (growth factor=1) when AEO growth is negative; otherwise use AEO2010 if positive growth	Use no growth (growth factor=1) when employment growth is negative; otherwise use employment if positive growth
RI	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS
VT	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS
VA	Use no growth (growth factor=1) when AEO growth is negative; otherwise use AEO2010 if positive growth	Use no growth (growth factor=1) when employment growth is negative; otherwise use employment if positive growth

Exhibit 3.11 State Recommendations to Address Negative Growth and Other Growth Factors for the Area Source Sector

State	AEO Growth Factors	Employment Growth Factors	Population Growth Factors
CT	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections
DE	Use AEO2010 growth rates; no growth for suspect AEO2010 projection for commercial / institutional residual oil	For 2013, use state DOL employment projections by 3-digit NAICS; For 2017 and 2020, use no growth (growth factor=1) when employment growth is negative; otherwise use employment if positive growth	Use county-level population projections
DC	Use AEO2010 growth rates; no growth for suspect AEO2010 projection for commercial / institutional residual oil	Use DOL employment growth for NAICS 722 for food and kindred product SCC; otherwise use orginial estimates	For dry cleaning, use employment growth for NAICS 812 instead of population
ME	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections
MD	Not using AEO2010; used employment for commercial & institurional fuel; used housing units for residential fuel	Provided updated employment projections; changed xwalk between NAICS code and SCC for selected source categories	Provided updated population projections by county
MA	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections
NH	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections
NJ	NJ submitted state specific growth factors. For fuel combustion categories only, used AEO2011 growth rates except for residual oil (use no growth)	NJ submitted state specific growth factors.	NJ submitted state specific growth factors and provided population projections by county
NY	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections
PA	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections
RI	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections
VT	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections
VA	Use AEO2010 growth rates; no growth for suspect AEO2010 projection for commercial / institutional residual oil	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections

4.0 AREA SOURCE CONTROL FACTORS

Control factors were developed to estimate post-2007 emission reductions resulting from on-the-books regulations and proposed regulations/actions. Control factors were developed for the following national and regional measures:

- Federal Rules Affecting Area Sources
- Federal MACT Rules
- Control Technique Guidelines
- OTC Model Rules

These control programs are discussed in the following subsections. The control factors used for area sources are provided in V3_3 Area_07_17_20.xlsx

4.1 FEDERAL RULES AFFECTING AREA SOURCES

USEPA made available its 2020 emissions projections associated with its 2005-based v4 modeling platform (USEPA 2010b). USEPA accounted for control strategies for four area source categories. These categories, and their treatment in the emission projection inventories, are described below:

- Woodstoves - As noted in Section 3.6, USEPA developed projection factors to account for the replacement of retired woodstoves that emit at pre-new source performance standard (NSPS) levels with lower-emitting woodstoves. We used USEPA's latest methodology which uses a combination growth and control factor and is based on activity and not pollutant. The growth and control are accounted for in a single factor for specific SCCs that account for the turnover from pre-NSPS to post-NSPS woodstove.
- Landfills: USEPA estimated a 75% reduction in VOC emissions from municipal solid waste landfills. However, since the compliance date for this standard was January 2004, no post-2007 reductions were applied to the MANE-VU+VA projection inventory since the emission reductions from this MACT standard should be reflected in the 2007 inventory and not as an additional post-2007 credit.
- Vehicle Refueling (Stage II): VOC emissions from the gasoline Stage II (vehicle refueling) are affected by two emission control programs. Many areas in the region have Stage II vapor recovery rules that were in effect prior to 2007 that require the capture of gasoline vapors generated when a motor vehicle fuel tank is filled at a gasoline station. The vapors are transferred from the fuel tank in the vehicle to the storage tank at the station as the vehicle fuel tank is filled. Beginning with the 1998 model year, USEPA established a phase-in schedule requiring vehicles to

incorporate on-board equipment to capture the gasoline vapor emissions from refueling. These controls, referred to as on-board refueling vapor recovery (ORVR), have been required on the vast majority of gasoline powered motor vehicles since the 2006 model year. VOC emissions for 2020 from vehicle refueling were estimated by NESCAUM using the MOVES model (NESCAUM2011). VOC emissions for 2017 were estimated by interpolating between the MOVES 2007 and 2020 results. Appendix H contains the VOC control efficiencies by county used in the MOVES modeling for displacement losses and for spillage losses.

- Portable fuel containers (PFCs): VOC emissions from PFCs will be reduced due to the federal regulation controlling air toxic emissions from mobile sources promulgated in 2007. Most northeastern and mid-Atlantic states had already adopted similar regulations prior to the federal rule. Refer to the OTC 2006 model rules subsection later in this document (Section 4.4.6) for a discussion of the approach for accounting for VOC emission reductions from PFCs.

4.2 FEDERAL MACT RULES

USEPA developed guidance for estimating VOC and NOx emission changes from MACT Rules (USEPA 2007b). We reviewed the guidance to identify possible area source controls associated with the federal maximum achievable control technology (MACT) standards for controlling hazardous air pollutants (HAPs). Although designed to reduce HAPs, many of the MACT standards also provide a reduction in criteria air pollutants. The USEPA document provides an estimate of the percent reduction in VOC and NOx from each standard, and the compliance date for the standard. This information was used to determine whether the MACT standard provided post-2007 emission reductions. For example, if a compliance period of a MACT standard was 2007 or earlier, then we assumed that the emission reductions from the MACT standard should be reflected in the baseline year and not as an additional post- 2007 credit.

Only one area source category was listed in the USEPA guidance document - municipal solid waste landfills. Since the compliance date for this standard was January 2004, no post-2007 reductions were applied since the emission reductions from the MACT standard should be reflected in the 2007 inventory and not as an additional post-2007 credit.

USEPA has or will soon develop MACT standards for about 70 area source categories. We reviewed USEPA's 2020 emissions projections described in the previous section and found that USEPA did not include emission reductions from recent area source MACT standards. We conducted a review of USEPA's air toxic website and found that USEPA

determined that many area source MACT standards would result in nationwide reductions in criteria air pollutants in addition to the reductions in HAP emissions. However, many states in the MANE-VU+VA region already have emission standards for many categories that are as stringent as the Federal area source MACT standards. For example, many states in the MANE-VU+VA region already have requirements as stringent as the Gasoline Distribution MACT and GACT (generally achievable control technology) standards, and little additional VOC reductions would be realized in the region. Given the resources allocated to this project, it was beyond the scope to conduct an analysis of the area source MACT requirements and state-by-state emission regulations to determine whether there would be emission reductions resulting from the area source MACT standards.

The only exception to the above discussion of area source MACT standards pertains to the recently promulgated rules for reciprocating internal combustion engines (RICE). USEPA made available an estimate of the percent reduction in emissions attributable to the RICE MACT rule in 2012 and 2014 (USEPA 2010c). The USEPA 2014 estimates shown in Exhibit 4.1 were used for the MANE-VU+VA 2017 and 2020 inventories.

4.3 RECENT CONTROL TECHNIQUE GUIDELINES

Control Techniques Guidelines (CTGs) are documents issued by USEPA to provide states with recommendation on VOC controls from a specific product or source category in an ozone nonattainment area. USEPA issued new or updated CTGs for 13 VOC categories in 3 groups during 2006, 2007 and 2008 (USEPA 2008b). The categories are:

- 2006 CTGs
  - Flat Wood Paneling Coatings
  - Industrial Cleaning Solvents
  - Flexible Package, Lithographic and Letterpress Printing
- 2007 CTGs
  - Large Appliance Surface Coating
  - Metal Furniture Coatings
  - Paper Film and Foil Coatings
- 2008 CTGs
  - Miscellaneous Metal Parts Coatings
  - Plastic Parts Coatings
  - Auto and Light-duty Truck Assembly Coatings
  - Fiberglass Boat Manufacturing
  - Miscellaneous Industrial Adhesives

States indicated that they expected very littleadditional reductions from these new or amended CTGs. Therefore, no emission reductions were included in the inventory.

Exhibit 4.1 USEPA Estimated Percent Reductions for RICE MACT Standard by 2014

SCC	CO	NOx	PM10	PM2.5	VOC	SCC Description
2101004000	12.42		7.57	7.57	30.85	Electric Utility;Distillate Oil;Total: Boilers and IC Engines
2101004002	16.9		11.81	11.81	33.78	Electric Utility;Distillate Oil;All IC Engine Types
2101006000	11.07	7.97			16.71	Electric Utility;Natural Gas;Total: Boilers and IC Engines
2101006002	15.47	9.87			21.24	Electric Utility;Natural Gas;All IC Engine Types
2102004000	12.42		7.57	7.57	30.85	Industrial;Distillate Oil;Total: Boilers and IC Engines
2102006000	11.07	7.97			16.71	Industrial;Natural Gas;Total: Boilers and IC Engines
2102006002	15.47	9.87			21.24	Industrial;Natural Gas;All IC Engine Types
2103004000	12.42		7.57	7.57	30.85	Commercial/Institutional;Distillate Oil;Total: Boilers and IC Engines
2103006000	11.07	7.97			16.71	Commercial/Institutional;Natural Gas;Total: Boilers and IC Engines
2199004000	12.42		7.57	7.57	30.85	Area Source Fuel Combustion;Distillate Oil;Total: Boilers and IC Engines
2199004002	16.9		11.81	11.81	33.78	Area Source Fuel Combustion;Distillate Oil;All IC Engine Types
2199006000	11.07	7.97			16.71	Area Source Fuel Combustion;Natural Gas;Total: Boilers and IC Engines
2310000000	19.86	12.53			23.87	Oil and Gas Production: All Processes;Total: All Processes
2310000220	19.86	12.53			23.87	Oil and Gas Exploration/Production; Drill Rigs
2310000440	19.86	12.53			23.87	Oil and Gas Exploration/Production; Saltwater Disposal Engines
2310001000	19.86	12.53			23.87	Oil and Gas Production: SIC 13; On-shore;Total: All Processes
2310002000	19.86	12.53			23.87	Oil and Gas Production: SIC 13; Off-shore;Total: All Processes
2310020000	19.86	12.53			23.87	Oil and Gas Production: SIC 13;Natural Gas;Total: All Processes
2310020600	19.86	12.53			23.87	Oil and Gas Exploration and Production;Natural Gas;Compressor Engines
2310023000	19.86	12.53			23.87	Oil and Gas Exploration and Production;Natural Gas;Cbm Gas Well - Dewatering Pump Engines

4.4 OTC MODEL RULES FOR AREA SOURCES

The Ozone Transport Commission (OTC) developed model rules for member states in 2001 for several area source categories: consumer products, architectural and industrial maintenance (AIM) coatings, portable fuel containers (PFCs), mobile equipment repair and refinishing, solvent cleaning, and industrial boilers. In 2006 the OTC introduced model rules for two additional area source categories (adhesives/sealants and asphalt paving), more stringent requirements for consumer products, portable fuel containers, and industrial boilers. In 2009/2010, the OTC recommended additional controls for autobody refinishing operations, consumer products, AIM coatings, and small new natural gas-fired boilers. In addition, MANE-VU states committed to the use of low sulfur home heating, distillate and residual fuel oil. Exhibit 4-2 briefly describes the OTC and MANE-VU control measures affecting area sources that have been recommended for adoption by the states in the OTR.

Individual states are in various stages of adopting the OTC recommendations into their rules and SIPs. OTC's status reports were reviewed to identify each state's adoption status (OTC 2009, OTC 2011a, OTC2011b). To obtain further clarification, states were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the OTC model rule or recommendation and whether credit for each rule was already accounted for in the 2007 inventory.

To evaluate the impact of the rules currently in place as well as the potential adoption of all control measures by all states except Virginia, the state Air Directors specified that two emission control scenarios should be developed as follows:

- Existing Controls - this scenario represents the best estimates for the future year, accounting for all in-place controls that are fully adopted into federal or individual state regulations or SIPs.
- Potential New OTC Controls – this scenario accounts for all of the emission reductions from the existing control scenario plus new state or regional measures that are under consideration by the OTC or individual states. This is a "what if" scenario that assumes that all states in the MANE-VU+VA region except Virginia will adopt all new OTC control measures under consideration by 2017. It does not include any potential new <u>federal</u> control measures that are under consideration.

The following paragraphs describe the control factors applied for each control measure by state and future year.

Exhibit 4.2 Summary of Area Source OTC Control Measures

Source Category	Pollutants	Description
Consumer Products	VOC	OTC 2001. Specified VOC content limits for certain categories that are more stringent than Federal limits OTC 2006. Included additional products and more restrictive VOC limits for certain products OTC 2009/2010. Specified more restrictive VOC limits for 14 existing consumer product categories and three new categories
Architectural and Industrial Maintenance Coatings	VOC	OTC 2001. Specified VOC content limits for certain categories that are more stringent than Federal limits OTC 2009/2010. Eliminated 15 categories (replaced by new categories or deemed unnecessary), added 10 new categories, and specified stricter VOC limits for 19 categories
Portable Fuel Containers	VOC	OTC 2001. Provided container design specifications to reduce emissions from spillage and evaporation OTC 2006. Revised and clarified design specifications and added kerosene containers and utility jugs.
Mobile Equipment Repair and Refinishing	VOC	OTC 2001. Required use of high efficiency coating application equipment, spray gun cleaning equipment that minimizes solvent loss, and enclosed spray gun cleaning. OTC 2009/2010. Limited the VOC content of coatings more stringent than the Federal limits and the VOC content of cleaning solvents
Solvent Cleaning	VOC	OTC 2001. Established hardware and operating requirements for specified vapor cleaning machines, and solvent volatility limits and operating practices for cold cleaners
Adhesives and Sealants	VOC	OTC 2006. Provided VOC content limits and other restrictions on adhesives used primarily by commercial and industrial users.
Asphalt Paving	VOC	OTC 2006. Suggested VOC content limits for emulsified and cutback asphalts use for road paving
NOx ICI Boiler Controls	NOx	OTC 2001. Recommended NOx emission rate limits for industrial boilers greater than 5 mmBtu/hour OTC 2006. Recommended lower NOx emission rate limits for industrial, commercial, and institutional boilers OTC 2010. Recommended national NOx controls for ICI boilers
Small Natural Gas-Fired Boilers	NOx	OTC 2009/2010. Recommended NOx emission rate limits for new boilers less than 5 mmBtu/hr
Low Sulfur Fuel Oil	SO2	MANE-VU 2006. Recommends sulfur content limits for home heating oil, distillate oil, and residual oil

4.4.1 OTC Model Rule for Adhesives/Sealants

VOC emissions in this category are primarily from commercial applications such as floor covering installation (carpet and wood flooring), roof installations and repair and upholstery shops. The category also includes industrial applications such as wood product manufacturers. Adhesives in small containers are not included in this category but are regulated under the consumer products regulations.

The OTC 2006 model rule for industrial adhesives and sealants is based on the reasonably available control technology (RACT) and best available retrofit control technology (BARCT) determination by the California Air Resources Board (CARB) developed in 1998. The OTC model rule regulates the application of adhesives, sealants, adhesive primers and sealant primers by providing options for appliers to either use a product with a VOC content equal to or less than a specified limit or to use add-on controls to achieve an equivalent reduction. The emission reduction benefit estimation methodology for area sources is based on information developed and used by CARB as discussed in their 1998 RACT report. A 64.4 percent reduction in VOC emissions was estimated for SCC 24-40-020-000.

States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the 2006 OTC recommendations and whether the estimated reduction in VOC emissions should be applied in 2017 and 2020. State-by-state recommendations are shown in Exhibit 4.3.

It should be noted that not all states account for emissions from this category in a separate area source inventory. Some states, based on information received from USEPA, excluded this category because the emissions to some extent may be accounted for in the area source commercial and consumer products category or in the nonEGU point source inventory.

Exhibit 4.3 State Recommendations for OTC Industrial Adhesives/Sealants Rule

State	Is Rule Accounted for in 2007 Inventory*	Incremental VOC Reduction to Apply:			
		2017 Existing Controls	2017 Potential Controls	2020 Existing Controls	2020 Potential Controls
CT	No	64.4	0	64.4	0
DE	No	64.4	0	64.4	0
DC	No	n/a	n/a	n/a	n/a
ME	No	64.4	0	64.4	0
MD	No	64.4	0	64.4	0

State	Is Rule Accounted for in 2007 Inventory*	Incremental VOC Reduction to Apply:			
		2017 Existing Controls	2017 Potential Controls	2020 Existing Controls	2020 Potential Controls
MA	No	64.4	0	64.4	0
NH	No	n/a	n/a	n/a	n/a
NJ	No	64.4	0	64.4	0
NY	No	64.4	0	64.4	0
PA	No	64.4	0	64.4	0
RI	No	n/a	n/a	n/a	n/a
VT	n/a	n/a	n/a	n/a	n/a
VA	No	n/a	n/a	n/a	n/a

* n/a means SCC 24-40-020-000 not included in 2007 inventory; see text for further discussion

4.4.2 OTC Model Rules for Architectural and Industrial Maintenance Coatings

On August 14, 1998, USEPA issued the final version of their National Volatile Organic Compound Emission Standards for Architectural Coatings under Section 183(e) of the Clean Air Act. This final rule applied only to manufacturers and importers of architectural coatings, and set VOC content limits for 61 coating categories. This rule specifically allowed states or local governments to adopt more stringent coating limits.

The OTC adopted an AIM model rule more stringent than the national rule, and based primarily on the 2000 CARB suggested control measure (SCM) for AIM coatings. The 2001 OTC model rule was estimated to provide a 31 percent incremental reduction in VOC emissions compared to the Federal Part 59 rule and was applied to the following SCCs:

- 24-01-001-000 All Architectural Coatings
- 24-01-002-000 Architectural Coatings Solvent Based
- 24-01-003-000 Architectural Coatings Water Based
- 24-01-008-000 Traffic Markings
- 24-01-100-000 Industrial Maintenance Coatings
- 24-01-200-000 Other Special Purpose Coatings

The OTC 2009/2010 model rule is an update of the 2001 model rule. It is based the 2007 CARB suggested control measure. The OTC 2009/2010 rule includes new categories which were defined in the 2007 CARB measure and revised limits for several coating

categories In addition to the revised limits in the 2007 CARB SCM, the OTC model rule also includes a more stringent VOC limit for the Industrial Maintenance (IM) coating category that was included in the 2000 CARB SCM. The 2000 CARB SCM proposed a limit of 250 g/L with an optional limit of 340 g/L for colder climates. The 2002 OTC model rule included the 340 g/l due to concerns about the ability to comply in the colder northeast. Because of the success of implementing the revised limit throughout California and the advent of t-butyl acetate as a delisted solvent, OTC believes a 250 g/L VOC limit is now feasible and has included this new lowered limit in the 2010 model rule.

The CARB SCM data was used to estimate a 34.4 percent reduction for architectural coatings and a 9.7 percent reduction for traffic markings. For industrial maintenance coatings, a 26.5 percent reduction was estimated based on lowering the VOC content limit from 340 g/L to 250 g/L. Other specialty coatings are another form of industrial high performance maintenance coatings (IM), so the IM control factor was also used for the other specialty coatings SCC.

States were polled to determine whether they had adopted a rule that would achieve reductions equivalent to the 2006 OTC recommendations and whether the estimated reduction in VOC emissions should be applied in 2017 and 2020. Many states adopted the rule prior to 2007 and have already accounted for the reductions attributable to the rule in their 2007 inventories. Other states had compliance dates after 2007 and the effect of the rule was not accounted for in their 2007 inventory. State-by-state recommendations to account for the AIM rule are shown in Exhibit 4.4.

Exhibit 4.4 State Recommendations for OTC AIM Rule

State	Is OTC 2001 Rule Accounted for in 2007 Inventory*	Incremental VOC Percent Reduction to Apply:			
		2017 Existing Controls	2017 Potential Controls	2020 Existing Controls	2020 Potential Controls
CT	No	31 AIM	34.4 ARCH 9.7 TM 26.5 IM	31 AIM	34.4 ARCH 9.7 TM 26.5 IM
DE	Yes	0 AIM	34.4 ARCH 9.7 TM 26.5 IM	0 AIM	34.4 ARCH 9.7 TM 26.5 IM
DC	Yes	0 AIM	34.4 ARCH 9.7 TM 26.5 IM	0 AIM	34.4 ARCH 9.7 TM 26.5 IM
ME	No	31 AIM	34.4 ARCH 9.7 TM	31 AIM	34.4 ARCH 9.7 TM

State	Is OTC 2001 Rule Accounted for in 2007 Inventory*	Incremental VOC Percent Reduction to Apply:			
		2017 Existing Controls	2017 Potential Controls	2020 Existing Controls	2020 Potential Controls
			26.5 IM		26.5 IM
MD	Yes	0 AIM	34.4 ARCH 9.7 TM 26.5 IM	0 AIM	34.4 ARCH 9.7 TM 26.5 IM
MA	No	31 AIM	34.4 ARCH 9.7 TM 26.5 IM	31 AIM	34.4 ARCH 9.7 TM 26.5 IM
NH	No	0 AIM	55.5 ARCH 37.7 TM 49.4 IM	0 AIM	55.5 ARCH 37.7 TM 49.4 IM
NJ	Yes	0 AIM	34.4 ARCH 9.7 TM 26.5 IM	0 AIM	34.4 ARCH 9.7 TM 26.5 IM
NY	Yes	0 AIM	34.4 ARCH 9.7 TM 26.5 IM	0 AIM	34.4 ARCH 9.7 TM 26.5 IM
PA	Yes	0 AIM	34.4 ARCH 9.7 TM 26.5 IM	0 AIM	34.4 ARCH 9.7 TM 26.5 IM
RI	No	31 AIM	34.4 ARCH 9.7 TM 26.5 IM	31 AIM	34.4 ARCH 9.7 TM 26.5 IM
VT	No	0 AIM	55.5 ARCH 37.7 TM 49.4 IM	0 AIM	55.5 ARCH 37.7 TM 49.4 IM
VA-NVA	Yes	0 AIM	0 AIM	0 AIM	0 AIM
VA-FRD	No	31 AIM	0 AIM	31 AIM	0 AIM
VA-Other	No	0 AIM	0 AIM	0 AIM	0 AIM

AIM – includes all AIM coatings listed below:
ARCH – architectural
TM - traffic markings
IM - industrial maintenance

VA-NVA includes the cities/counties in the Northern Virginia emission control area
VA-FRD includes the cities/counties in the Fredericksburg emission control area
VA-Other includes cities/counties in Virginia not listed above

4.4.3 OTC Model Rule for Asphalt Paving

OTC Resolution 06-02 recommends that states establish rules to achieve a 20 percent reduction in VOC emissions from the application and use of emulsified and cutback asphalt. The reductions apply to the following SCCs:

- 24-61-021-000 Cutback Asphalt
- 24-61-022-000 Emulsified Asphalt

States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the 2006 OTC recommendations and whether the estimated reduction in VOC emissions should be applied in 2017 and 2020. Some states adopted the rule prior to 2007 and have already accounted for the reductions attributable to the rule in their 2007 inventories. Other states had compliance dates after 2007 and the effect of the rule was not accounted for in their 2007 inventory. State recommendations to account for the asphalt paving recommendation are shown in Exhibit 4.5.

Exhibit 4.5 State Recommendations for OTC Cutback and Emulsified Asphalt Paving Recommendation

State	Is Rule Accounted for in 2007 Inventory*	Incremental VOC Percent Reduction to Apply:			
		2017 Existing Controls	2017 Potential Controls	2020 Existing Controls	2020 Potential Controls
CT	No	20	0	20	0
DE	Yes	0	0	0	0
DC	No	0	20	0	20
ME	No emissions in inventory	0	0	0	0
MD	No	0	20	0	20
MA	No	20	0	20	0
NH	No	0	20	0	20
NJ	No	56% Cutback 25% Emulsified	0	56% Cutback 25% Emulsified	0
NY	No	20	0	20	0
PA	No	0	20	0	20
RI	No	20	0	20	0
VT	No emissions in inventory	0	0	0	0
VA-NVA	No	0	0	0	0
VA-Other	No	0	0	0	0

4.4.4 OTC Model Rules for Consumer Products

Several states began regulating the VOC content of consumer products in the early 1990s. The USEPA promulgated a national rule in 1998 (40CFR, Part 59, Subpart C). Both the California Air Resources Board (CARB) and the OTC states have periodically updated their state rules to obtain VOC reductions beyond those required by the federal rule. Following the lead of CARB, the OTC 2001 model rule for consumer products adopted more stringent VOC content limits for certain categories. The OTC 2006 model rule modified the OTC 2001 model rule based on amendments adopted by CARB in July 2005 to include additional products and more stringent VOC limits for certain products. CARB amended their rules again in 2006 and the OTC 2010 model rule is based on those amendments.

The OTC 2010 model amendments have more restrictive VOC limits for 14 existing consumer product categories (15 including subcategories) and three new categories (five including subcategories) will be regulated for the first time with VOC limits. The OTC 2010 model rule amendments also clarify or modify previously defined or regulated categories. The model rules also contained optional prohibitions on the use of chlorinated toxic compounds in certain consumer product categories. CARB adopted these provisions simultaneous with their VOC limits to address the use of non-VOC chlorinated solvent use increasing as they are used as replacement compounds.

The VOC percentage reduction from the various rules and amendments are summarized in Exhibit 4.6. The emissions reductions from the latest OTC consumer products rule update used information developed by CARB for its 2006 amendments. The OTC estimated a 4.8 percent reduction of the total consumer products inventory for states that included CARB's ban of chlorinated toxic compounds in brake cleaners, and an estimated 3.3 percent reduction of the total consumer products inventory for states that did not include this ban.

States reported VOC emissions from consumer products inventory in two different manners – using an aggregated SCC or subcategory SCCs, as follows:

Aggregated SCC:	24-60-000-000 Consumer Products, All Products
	24-65-000-000 Consumer Products, All Products
Disaggregated SCCs:	24-60-100-000 Consumer Products, Personal Care Products
	24-60-200-000 Consumer Products, Household Products
	24-60-400-000 Consumer Products, Auto Aftermarket Products
	24-60-500-000 Consumer Products, Coatings
	24-60-600-000 Consumer Products, Adhesives and Sealants
	24-60-800-000 Consumer Products, FIFRA Products
	24-60-900-000 Consumer Products, Misc. Products

Exhibit 4.6 VOC Emission Factors for Consumer Products

Uncontrolled Emission Factor:	=	7.84 lbs/capita
Emission Factor after 1998 Federal Rule:	=	7.06 lbs/capita
Percent Reduction from 1998 Federal Rule compared to uncontrolled	=	100%* (7.84 - 7.06) / 7.84
	=	9.95%
Emission Factor after 2001 OTC Rule	=	6.06 lbs/capita
Percent Reduction from 2001 OTC Rule compared to Federal Rule	=	100%* (7.06 - 6.06) / 7.06
	=	14.2%
Emission Factor after 2006 OTC Rule	=	5.94 lbs/capita
Percent Reduction from 2006 OTC Rule compared to OTC 2001 Rule	=	100%* (6.06 -5.94) / 6.06
	=	2.0%
Emission Factor after 2010 OTC Rule (without brake cleaner chlorinated toxic ban)	=	5.745 lbs/capita
Percent Reduction from 2010 OTC Rule compared to OTC 2006 Rule	=	100%* (5.94 – 5.745) / 5.94
	=	3.3%
Emission Factor after 2010 OTC Rule (with brake cleaner chlorinated toxic ban)	=	5.655 lbs/capita
Percent Reduction from 2010 OTC Rule compared to OTC 2006 Rule	=	100%* (5.94 – 5.655) / 5.94
	=	4.8%

The reductions shown above were applied to the above SCCs based on each state's adoption of the various rules and amendments as well as the decision with respect to the ban on chlorinated toxic compounds used in brake cleaners. States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the OTC 2006 recommendations and whether the estimated reduction in VOC emissions should be applied in 2017 and 2020. For the 2001 OTC rule, some states adopted the rule prior to 2007 and have already accounted for the reductions attributable to the OTC 2001 rule in their 2007 inventories. Other states had compliance dates after 2007 and the effect of the OTC 2001 rule was not accounted for in their 2007 inventory. None of the states have accounted for the OTC 2006 rule in their 2007 inventories. State-by-state recommendations to account for both the OTC 2001 and 2006 consumer products rules are shown in Exhibit 4.7.

Exhibit 4.7 State Recommendations for OTC 2001 and 2006 Consumer Products Rules

State	Is 2001 Rule Accounted for in 2007 Inventory	Is 2006 Rule Accounted for in 2007 Inventory	VOC Percent Reduction to use in:			
			2017 Existing Controls	2017 Potential Controls	2020 Existing Controls	2020 Potential Controls
CT	No	No	15.9	4.8	15.9	4.8
DE	Yes	No	2.0	4.8	2.0	4.8
DC	No	No	2.0	4.8	2.0	4.8
ME	No	No	15.9	4.8	15.9	4.8
MD	Yes	No	2.0	4.8	2.0	4.8
MA	No	No	15.9	4.8	15.9	4.8
NH	No	No	14.2	5.2	14.2	5.2
NJ	Yes	No	2.0	4.8	2.0	4.8
NY	Yes	No	2.0	4.8	2.0	4.8
PA	Yes	No	2.0	4.8	2.0	4.8
RI	No	No	15.9	4.8	15.9	4.8
VT	No	No	0	18.6	0	18.6
VA-NVA	Yes	No	2.0	0	2.0	0
VA-FRD	No	No	15.9	0	15.9	0
VA-RCH	No	No	15.9	0	15.9	0
VA-Other	No	No	0	0	0	0

NH indicated that their amendments to include the OTC 2006 recommendations won't be completed in time to include in the OTB/OTW inventory

4.4.5 OTC Model Rules for Mobile Equipment Repair and Refinishing

The USEPA promulgated a national rule in 1998 (40CFR, Part 59, Subpart B) to limit the VOC content of coatings usedin the refinishing of automobiles. The federal standards were estimated to reduce nationwide emissions of VOC by about 37 percent compared to uncontrolled 1998 emissions. The 2002 OTC model rule established requirements for using higher efficiency coating application equipment, such as high volume-low pressure paint guns, using spray gun cleaning equipment that minimizes solvent loss, and enclosed spray gun cleaning. The Federal VOC limits on the paints was maintained in the model rule. An incremental control effectiveness of 38 percent was estimated for the OTC 2001 model rule (post-1998 federal standard emissions).

The 2009 OTC model rule for Motor Vehicle and Mobile Equipment Non-assembly Line Coating Operations (2009 OTC MVME model rule) seeks to limit the VOC content in coatings and cleaning solvents used in motor vehicle and mobile equipment non-assembly line coating operations. The 2009 OTC MVME model rule is an update of the 2002 OTC MERR model rule. The OTC developed the 2009 OTC MVME Model Rule using the CARB 2005 Suggested Control Measure (SCM) for Automotive Coatings as a guideline. The CARB 2005 SCM estimated a 65 percent reduction in VOC emissions from 2002 CARB baseline emissions, which are post-1998 federal standard emissions. Similar reductions of 65 percent are expected from implementation of the 2009 OTC MVME Model Rule.

A few OTC states adopted the 2002 OTC model rule and accounted for the 38 percent reduction in the 2007 MANEVU+VA inventory. Other states adopted the 2002 OTC model rules after 2007, so the reduction was not included in 2007 but was included in the 2017/2020 "on-the-books" inventory. Still other states have not yet adopted the 2002 OTC model rule. Exhibit 4.8 summarizes the percent reductions that will be applied based on the adoption status of each state:

Exhibit 4.8 VOC Emission Reductions for Auto Refinishing

State Rule Adoption Status	VOC Reduction:	
	2017/2020 Existing	2017/2020 Potential
Accounted for 2002 OTC rule in 2007 inventory Will adopt 2009 OTC rule by 2017	0 %	65 %
Did not account for 2002 OTC rule in 2007 inventory Did account for 2002 OTC rule in 2017/2020 OTB inventory Will adopt 2009 OTC rule by 2017	38 %	65 %
Did not account for 2002 OTC rule in 2007 inventory Did not account for it in 2017/2020 OTB inventory Will adopt 2009 OTC rule by 2017	0 %	78.3 %

The reductions have traditionally been applied to the following area source SCCs:

24-01-005-000 Auto Refinishing / All Solvent Types

24-01-005-500 Auto Refinishing / Surface Preparation Solvents

24-01-005-600 Auto Refinishing / Primers

24-01-005-700 Auto Refinishing / Top Coats

24-01-005-800 Auto Refinishing / Clean-up Solvents

States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the 2006 OTC recommendations and whether the estimated reduction in VOC emissions should be applied in 2017 and 2020. Many states adopted the rule prior to 2007 and have already accounted for the reductions attributable to the rule in their 2007 inventories. Other states had compliance dates after 2007 and the effect of the rule was not accounted for in their 2007 inventory. State-by-state recommendations to account for the auto refinishing rule are shown in Exhibit 4.9.

Exhibit 4.9 State Recommendations for OTC Auto Refinishing Rule

State	Is OTC 2001 Rule Accounted for in 2007 Inventory*	Incremental VOC Reduction to Apply:			
		2017 Existing Controls	2017 Potential Controls	2020 Existing Controls	2020 Potential Controls
CT	Yes	0	65	0	65
DE	Yes	0	65	0	65
DC	No	38	65	38	65
ME	No	38	65	38	65
MD	Yes	Yes	0	65	0
MA	No	0	78.3	0	78.3
NH	No	0	78.3	0	78.3
NJ	Yes	0	65	0	65
NY	Yes	0	65	0	65
PA	Yes	0	65	0	65
RI	Yes	0	65	0	65
VT	No emissions in inventory	0	0	0	0
VA-NVA	Yes	0	0	0	0
VA-FRD	No	38	0	38	0
VA-Other	No	0	0	0	0

4.4.6 OTC Model Rules for Portable Fuel Containers

In 2001, the OTC developed a model rule to control VOC emissions from portable fuel containers. The 2001 model rule was based on the technical work conducted by California Air Resources Board (CARB) for developing California's 2000 fuel container rule. Several, but not all, of the MANEVU+VA states adopted regulations which became effective prior to 2007.

After OTC developed its model rule in 2001, CARB realized that its original study and rule had some defects and decided to conduct further studies and research on fuel containers. Based on its new studies, CARB revised its rule twice. In 2006, the OTC developed a second model rule for PFCs to reflect the CARB revisions. Thereafter, USEPA developed a federal rule in 2007 which included, among other things, requirements for portable fuel containers equivalent to OTC's 2006 requirements.

The federal requirements became effective on January 1, 2009. States have analyzed the federal rule and determined that the federal rule has requirements that are essentially equivalent to the OTC 2006 model rule. These new federal requirements will reduce hydrocarbon emissions from uncontrolled fuel containers by approximately 75 percent. Assuming a 10-year turnover to compliant cans, only 10 percent of the existing inventory of PFCs will comply with the new requirements in 2010. Therefore, only 10 percent of the full emission benefit estimated by USEPA will occur by 2010 – the incremental reduction will be about 7.5 percent in 2010. In 2013, there will be a 40 percent turnover to compliant cans, resulting in an incremental reduction of about 60 percent. By 2017, the will be 80 percent penetration to compliant PFCs, resulting in an incremental reduction of 58 percent in 2018. By 2020, there will be 100 percent penetration to compliant PFCs, resulting in an incremental reduction of 75 percent in 2020.

The reductions apply to the following SCCs:

- 25-01-011-xxx Residential PFCs
- 24-01-012-xxx Commercial PFCs

States were polled to determine the status of PFC regulations in each state. Some states have adopted a rule that would achieve reductions equivalent to the 2001 or 2006 OTC rules. Other states will rely exclusively on the Federal rule. State-by-state recommendations to account for the OTC and federal PFC rules are shown in Exhibit 4.10.

Exhibit 4.10 State Recommendations for OTC and Federal Portable Fuel Container Rules

State	Compliance Date for OTC 2001 Rule	Compliance Date for OTC 2006 Rule	Rely on Federal Rule?	VOC Percent Reduction to use in:			
				2017 Existing Controls	2017 Potential Controls	2020 Existing Controls	2020 Potential Controls
CT	May 2004	Jun 2008	No	81	0	81	0
DE	Jan 2003	Apr 2010	Yes	75	0	78	0
DC	Dec 2004	Feb 2012	Yes	79	0	81	0
ME	Jan 2004	n/a	Yes	77	0	80	0
MD	May 2003	Jan 2009	No	76	0	79	0
MA	n/a	n/a	Yes	77	0	85	0
NH	n/a	Jan 2008	No	85	0	85	0
NJ	Jan 2005	Jan 2009	No	83	0	83	0
NY	Jan 2005	Jan 2010	Yes	79	0	82	0
PA	Jan 2005	n/a	Yes	75	0	78	0
RI	n/a	n/a	Yes	77	0	85	0
VT	n/a	n/a	Yes	77	0	85	0
VA-NVA	Jan 2005	Aug 2010	Yes	79	0	82	0
VA-FRD	Jan 2008	Aug 2010	Yes	83	0	85	0
VA-RCH	n/a	n/a	Yes	77	0	85	0
VA-Oth	n/a	n/a	Yes	77	0	85	0

4.4.7 OTC Model Rule for Solvent Cleaning

The OTC model rule establishes hardware and operating requirements for specified vapor cleaning machines, and solvent volatility limits and operating practices for cold cleaners. An incremental control effectiveness of 66 percent was estimated for the OTC model rule relative to the base case. The reductions apply SCCs in the 24-15-xxx-xxx series (Degreasing All Industries and Processes). States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the 2001 OTC recommendations and whether the estimated reduction in VOC emissions should be applied in 2017 and 2020. Many states adopted the rule prior to 2007 and have already accounted for the reductions attributable to the rule in their 2007 inventories. Other states had compliance dates after 2007 and the effect of the rule was not accounted for in their 2007 inventory. State-by-state recommendations to account for the solvent cleaning rule are shown in Exhibit 4.11.

Exhibit 4.11 State Recommendations for 2001 OTC Solvent Cleaning Rule

State	Is Rule Accounted for in 2007 Inventory*	Incremental VOC Reduction to Apply:			
		2017 Existing Controls	2017 Potential Controls	2020 Existing Controls	2020 Potential Controls
CT	No	66	0	66	0
DE	Yes	0	0	0	0
DC	No	66	0	66	0
ME	No	66	0	66	0
MD	Partially	30	0	30	0
MA	No	66	0	66	0
NH	No	0	66	0	66
NJ	Yes	0	0	0	0
NY	Yes	0	0	0	0
PA	Yes	0	0	0	0
RI	No	66	0	66	0
VT	n/a	0	66	0	66
VA-NVA	Yes	0	0	0	0
VA-Other	No	0	0	0	0

4.4.8 OTC Model Rules for ICI Boilers

In Resolution 06-02, the OTC Commissioners recommended that OTC member states pursue as necessary and appropriate state-specific rulemakings or other implementation methods to establish emission reduction percentages, emission rates or technologies for ICI boilers based on guidelines that varied by boiler size and fuel type.

States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the 2006 OTC recommendations and whether the estimated reduction in NOx emissions should be applied in 2017 and 2020. All but one state indicated that they have not adopted rules for area sources equivalent to the 2006 OTC recommendations. New Jersey specified that they have post-2007 ICI boiler rules that reduce NOx emissions and provided the estimates of the reductions in NOx emissions by SCC resulting from boiler tuneup requirements, as shown in Exhibit 4.12:

Exhibit 4.12 Area Source Emission Reductions from New Jersey ICI Boiler NOx Rules

SCC	Source Category	Percent Reduction from Tuneups 2007-2017	Rule Effectiveness	Rule Penetration	Overall Percent Reduction 2007-2017
2102004000	Industrial Distillate	25%	80%	30%	6%
2102005000	Industrial Residual	25%	80%	30%	6%
2102006000	Industrial Natural Gas	25%	80%	30%	6%
2102007000	Industrial LPG	25%	80%	30%	6%
2103004000	Commercial Distillate	25%	80%	30%	6%
2103005000	Commercial Residual	25%	80%	30%	6%
2103006000	Commercial Natural Gas	25%	80%	30%	6%
2103007000	Commercial LPG	25%	80%	30%	6%

Other states indicated that they will likely depend on USEPA national rule for possible inclusion in the BOTW inventory. OTC Resolution 10-01 (June, 2010) called on USEPA for national regulations for ICI boilers. The guidelines from OTC Resolution 06-02 shown in Exhibit 4.13 were used to estimate potential area source NOx reductions for the "what if" control scenario for all states in the MANE-VU+VA inventory except New Jersey and Virginia.

Exhibit 4.13 OTC Resolution 06-02 Guidelines for ICI Boiler NOx Rules

Boiler Size (mmBtu/hr)	NOx Percent Reduction from Base Emissions by Fuel Type			
	Natural Gas	#2 Fuel Oil	#4/#6 Fuel Oil	Coal
<25	10	10	10	10
25 to 50	50	50	50	50*
50 to 100	10	10	10	10*
100 to 250	76	40	40	40*
>250	**	**	**	**

* Resolution 06-02 did not specify a percent reduction for coal; for modeling purposes, the same percent reduction specified for #4/#6 fuel oil was used for coal.

** Resolution 06-02 specified the reduction for > 250mmBtu/hour boilers to be the "same as EGUs of similar size." The OTC Commissioners have not yet recommended an emission rate or percent reduction for EGUs. As a result, no reductions for ICI boilers > 250 mmBtu/hour were included in the potential controls inventory.

Since the above guidelines vary by boiler size and fuel type, the specific percent reduction applied to an area source category depends on the SCC and design capacity of the source. The SCC identifies the fuel type (for example, SCC 21-02-004-xxx describes distillate oilfired industrial boilers, SCC 21-02-006-xxx describes natural gas-fired industrial boilers). The area source inventory does not contain any information on the sizes of the units included in the inventories. To apportion area source emissions to the boiler size ranges listed above, we used data from an Oak Ridge National Laboratory study (EEA 2005). We used the national estimates of boiler capacity by size range to calculate the percentage of total boiler capacity in each size range. Since the Oak Ridge report distinguished between industrial boilers and commercial/institutional boilers, we developed separate profiles for industrial boilers and for commercial/institutional boilers. We used these boiler size profiles to calculate weighted average percent reductions industrial boilers by fuel type and commercial/institutional boilers by fuel type, as follows:

- 34.5 percent reduction in NOx emissions from industrial boilers, all fuel types
- 28.1 percent reduction in NOx emissions from commercial/institutional boilers, all fuel types

Appendix I contains the data used to develop the NOx control factors for area source ICI boilers.

4.4.9 OTC Model Rule for New, Small, Natural Gas-fired Boilers

The provisions of this model rule limit NOx emissions from new natural gas-fired ICI and residential boilers, steam generators, process heaters, and water heaters greater than 75,000 BTUs and less than 5.0 million BTUs. This model rule may be implemented as a manufacturing restriction, a sales restriction, a use restriction, or a combination of these restrictions. Each implementing state agency will choose the entities to regulate after consideration of the agency's compliance assurance and enforcement practices and policies.

The emission limits of this model rule were developed from requirements now in effect in certain jurisdictions, including: (1) San Joaquin Valley Air Pollution Control District Rule 4308 for boilers, steam generators, process heaters and water heaters with maximum rated heat input capacity equal to or greater than 75,000 Btu/hr and up to but less than 2.0 million Btu/hr; (2) San Joaquin Valley Air Pollution Control District Rule 4307 for gas-fired and liquid fuel-fired boilers, steam generators, and process heaters with maximum rated capacity of 2.0 million Btu/hr up to and including 5.0 million Btu/hr; and (3) similar rules adopted by other California Air Pollution Control Districts and the State of Texas.

Since the OTC model rule is based on SJVAPCD Rules 4307 and 4308, one method for estimating potential NOx reductions for the OTC states from both Rule 4307 and Rule 4308 is to compare the natural gas usage in the San Joaquin Valley to the natural gas usage in the OTC states and calculate the proportional NOx reductions.

The SJV 4308 Rule, Final Staff Report estimated NOx reductions of 2.0 annual average tons per day (730 tons per year), and the 2008 SJV 4307 Rule Proposal estimated NOx reductions of 1.15 annual average tons per day (420 tons per year). The total reduction from both rules was estimated to be 3.15 tons per day (1,150 tons per year) after a 15-year period for complete turnover to compliant equipment. These SJV data were used to calculate a ton per year emission reduction, assuming implementation begins in 2014, as summarized in Exhibit 4.14 and further documented in Appendix J.

Exhibit 4.14 NOx Control Factors for the OTC Rule for New, Small, Natural Gas-fired Units

State	Percent Reduction in NOx Emissions from Residential and Commercial Natural Gas Use	
	2017	2020
CT	5.0%	8.4%
DE	6.1%	10.1%
DC	2.3%	3.9%
ME	0.0%	0.0%
MD	3.2%	5.4%
MA	5.3%	8.8%
NH	7.1%	11.8%
NJ	3.5%	5.9%
NY	5.1%	8.5%
PA	4.7%	7.8%
RI	7.0%	11.7%
VT	3.1%	5.1%
VA	0%	0%

4.4.10 MANE-VU Low Sulfur Fuel Oil Strategy

MANE-VU developed a low sulfur fuel oil strategy to help states develop Regional Haze SIPs (MANE_VU 2007). The sulfur in fuel oil recommendations are shown in Exhibit 4.15 and vary by state, type of fuel oil, and year of implementation.

Exhibit 4.15 MANE-VU Low Sulfur Fuel Oil Strategy

Inner Zone States (DE, NJ, NY, PA)		
Fuel Oil Type	**Sulfur Content 2012**	**Sulfur Content 2016**
Distillate	500 ppm	15 ppm
#4 Residual	0.25 %	0.25 %
#6 Residual	0.3 to 0.5 %	0.3 to 0.5 %
Outer Zone States (CT, DC, MA, MD, ME, NH, RI, VT)		
Fuel Oil Type	**Sulfur Content 2014**	**Sulfur Content 2018**
Distillate	500 ppm	15 ppm
#4 Residual	n/a	0.25 to 0.5 %
#6 Residual	n/a	0.5 %

Each state was polled and asked to provide guidance as to when, if at all, the MANE-VU strategy would be incorporated into their state rules. States were also asked to provide the 2007 sulfur contents for each fuel type by county in order to calculate the percent reduction in emissions for the future years. Three states (MD, NJ, and NY) have adopted or are committed to adopting the strategy into their rules. The reductions for these three states were accounted for in the "existing controls" inventory. All other jurisdictions indicated that not enough regulatory development progress has been made to include the reductions in future years with absolute certainty. The potential reductions for these states were accounted for in the "potential new controls" inventory. One state (VA) has no plans to adopt the low sulfur fuel oil strategy. The percent reductions by fuel type and county are contained in Appendix K.

5.0 NONEGU POINT SOURCE CONTROL FACTORS

Control factors were developed to estimate post-2007 emission reductions resulting from on-the-books regulations and proposed regulations/actions. Control factors were considered for the following national and regional measures:

- Federal Rules Affecting NonEGU Point Sources
- Control Technique Guidelines
- OTC Model Rules

These control programs are discussed in the following subsections. The control factors used for nonEGU point sources are provided in V3_3 NonEGU_07_17_20.xlsx.

5.1 FEDERAL ACTIONS AFFECTING NONEGU POINT SOURCES

USEPA made available its 2020 emissions projections associated with its 2005-based v4 modeling platform (USEPA 2010a). These categories, and how they were accounted for in the MANE-VU+VA emission projection inventories, are described below:

- MACT Standards - USEPA developed guidance for estimating VOC and NO_x emission changes from MACT Rules (USEPA 2007b). We reviewed the guidance to identify nonEGU source controls associated with MACT standards for controlling HAPs. The information concerning MACT compliance periods was used to determine whether the MACT standard resulted in post-2007 emission reductions. Because major source categories had a compliance period of 2007 or earlier, we assumed that the emission reductions from the MACT standard should be reflected in the baseline year and not as an additional post- 2007 credit. The only exception to the above discussion of area source MACT standards pertains to the recently promulgated rules for reciprocating internal combustion engines. USEPA made available an estimate of the percent reduction in emissions attributable to the RICE MACT rule in 2012 and 2014 (USEPA 2010b). These reductions by SCC are shown in Exhibit 5.1. The USEPA 2014 estimates were used for the MANE-VU+VA 2017, 2020 and 2025 inventories.

- Industrial, Commercial, and Institutional Boilers and Process Heaters MACT Standard - USEPA' s 2020 control factor file identified a number of solid fuel-burning SCCs for which they estimated an 87% reduction in both PM10 and PM2.5. These were used for 2025 also for the affected SCCs.

Exhibit 5.1 USEPA Estimated Percent Reductions for RICE MACT Standard

SCC	CO	NOx	PM10	PM2.5	VOC	SCC Description
20100102	20.36		15.14	15.14	36.72	Electric Generation;Distillate Oil (Diesel);Reciprocating
20100105	20.36		15.14	15.14	36.72	Electric Generation;Distillate Oil (Diesel);Reciprocating: Crankcase Blowby
20100107	20.36		15.14	15.14	36.72	Electric Generation;Distillate Oil (Diesel);Reciprocating: Exhaust
20100202	19.86	12.53			23.87	Electric Generation;Natural Gas;Reciprocating
20100207	19.86	12.53			23.87	Electric Generation;Natural Gas;Reciprocating: Exhaust
20200102	20.36		15.14	15.14	36.72	Industrial;Distillate Oil (Diesel);Reciprocating
20200104	20.36		15.14	15.14	36.72	Industrial;Distillate Oil (Diesel);Reciprocating: Cogeneration
20200107	20.36		15.14	15.14	36.72	Industrial;Distillate Oil (Diesel);Reciprocating: Exhaust
20200202	19.86	12.53			23.87	Industrial;Natural Gas;Reciprocating
20200204	19.86	12.53			23.87	Industrial;Natural Gas;Reciprocating: Cogeneration
20200207	19.86	12.53			23.87	Industrial;Natural Gas;Reciprocating: Exhaust
20200253	19.18	37.96			29.74	Industrial;Natural Gas;4-cycle Rich Burn
20200254	37.85				28.59	Industrial;Natural Gas;4-cycle Lean Burn
20200256	37.85				28.59	Industrial;Natural Gas;4-cycle Clean Burn
20200301	19.18	37.96			29.74	Industrial;Gasoline;Reciprocating
20200307	19.18	37.96			29.74	Industrial;Gasoline;Reciprocating: Exhaust
20201001	19.86	12.53			23.87	Industrial;Liquified Petroleum Gas (LPG);Propane
20201002	19.86	12.53			23.87	Industrial;Liquified Petroleum Gas (LPG);Butane
20201702	19.18	37.96			29.74	Industrial;Gasoline;Reciprocating Engine
20201707	19.18	37.96			29.74	Industrial;Gasoline;Reciprocating: Exhaust
20300101	20.36		15.14	15.14	36.72	Commercial/Institutional;Distillate Oil (Diesel);Reciprocating
20300105	20.36		15.14	15.14	36.72	Commercial/Institutional;Distillate Oil (Diesel);Reciprocating: Crankcase Blowby
20300106	20.36		15.14	15.14	36.72	Commercial/Institutional;Distillate Oil (Diesel);Reciprocating: Evaporative Losses
20300107	20.36		15.14	15.14	36.72	Commercial/Institutional;Distillate Oil (Diesel);Reciprocating: Exhaust
20300201	19.86	12.53			23.87	Commercial/Institutional;Natural Gas;Reciprocating

SCC	CO	NOx	PM10	PM2.5	VOC	SCC Description
20300204	19.86	12.53			23.87	Commercial/Institutional;Natural Gas;Cogeneration
20300207	19.86	12.53			23.87	Commercial/Institutional;Natural Gas;Reciprocating: Exhaust
20300301	19.18	37.96			29.74	Commercial/Institutional;Gasoline;Reciprocating
20300307	19.18	37.96			29.74	Commercial/Institutional;Gasoline;Reciprocating: Exhaust
20301001	19.86	12.53			23.87	Commercial/Institutional;Liquified Petroleum Gas (LPG);Propane
20301002	19.86	12.53			23.87	Commercial/Institutional;Liquified Petroleum Gas (LPG);Butane
20400401	19.18	37.96			29.74	Engine Testing;Reciprocating Engine;Gasoline
20400402	20.36		15.14	15.14	36.72	Engine Testing;Reciprocating Engine;Diesel/Kerosene
20400403	20.36		15.14	15.14	36.72	Engine Testing;Reciprocating Engine;Distillate Oil: CI: CI: VOC 2005cr = 0
31000203	19.86	12.53			23.87	Oil and Gas Production;Natural Gas Production;Compressors
50100421	19.86	12.53			23.87	Solid Waste Disposal;Landfill Dump;Waste Gas Recovery: Internal Combustion Device

- Petroleum refinery enforcement settlements - For the facilities identified by USEPA located in New Jersey and Pennsylvania we applied post-2007 estimated reductions for NO_x, PM10, PM2.5, and SO_2 to affected units.

5.2 RECENT CONTROL TECHNIQUE GUIDELINES

Control Techniques Guidelines (CTGs) are documents issued by USEPA to provide states with the USEPA's recommendation on how to control the emissions of VOC from a specific type of product or source category in an ozone nonattainment area. USEPA issued new or updated CTGs for 13 VOC categories in 3 groups during 2006, 2007 and 2008 (USEPA 2008b). The categories are:

- 2006 CTGs
  - Flat Wood Paneling Coatings
  - Industrial Cleaning Solvents
  - Flexible Package Printing
  - Lithographic Printing
  - Letterpress Printing
- 2007 CTGs
  - Large Appliance Surface Coating
  - Metal Furniture Coatings
  - Paper Film and Foil Coatings
- 2008 CTGs
  - Miscellaneous Metal Parts Coatings
  - Plastic Parts Coatings
  - Auto and Light-duty Truck Assembly Coatings
  - Fiberglass Boat Manufacturing
  - Miscellaneous Industrial Adhesives

States indicated that they expected very little additional reductions from these new or amended CTGs. Therefore, no emission reductions were included in the inventory.

5.3 OTC MODEL RULES FOR NONEGUs

The OTC developed NOx control measures for industrial, commercial, and institutional (ICI) boilers and distributed generation units in 2001 (OTC 2001). We reviewed the OTC's status reports to identify states status in adopting the OTC 2001 model rules (OTC 2009). Most states have adopted the OTC model rules with compliance dates in 2007 or earlier. As a result, we assumed that the emission reductions from the 2001 OTC model rules for nonEGUs are already reflected in the 2007 inventory and no post- 2007 reductions were applied.

In 2006, the OTC introduced model rules (OTC 2007) for one nonEGU VOC source category (adhesives/sealants) and new/more stringent requirements for several NOx source categories (asphalt production plants, cement kilns, glass/fiberglass furnaces, and industrial, commercial, and institutional {ICI} boilers).

These model rules and recommendations provided a consistent framework for air pollution regulation throughout the region. In addition, MANE-VU provided recommendations to require low sulfur home heating, distillate and residul fuel oil. Exhibit 5-2 briefly describes the OTC and MANE-VU control measures affecting point sources that have been recommended for adoption by the states in the OTR. Recommendations for EGUs are not addressed in this section since the projection of EGU emissions is being accomplished by ERTAC under a separate agreement.

Individual states are in various stages of adopting the OTC recommendations into the rules and SIPs. We reviewed the OTC's status reports to identify each state's adoption status (OTC 2009, OTC 2011a, OTC2011b). To obtain further clarification, states were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the OTC model rule or recommendation and whether credit for each rule was already accounted for in the 2007 inventory.

Not all states have adopted all rules. In order to evaluate the impact of both the rules currently in place as well as the potential adoption of all control measures by all states, the state Air Directors specified that two emission control scenarios should be developed.

- Existing Controls - this scenario represents the best estimates for the future year, accounting for all in-place controls that are fully adopted into federal or individual state regulations or SIPs.
- Potential New OTC Controls – this scenario accounts for all of the emission reductions from the existing control scenario plus new state or regional measures that are under consideration by the OTC or individual states. This is a "what if" scenario that assumes that all states in the MANE-VU+VA region except Virginia will adopt all new OTC control measures under consideration by 2017. It does not include any potential new <u>federal</u> control measures that are under consideration.

The following paragraphs describe the control factors applied for each control measure by state and future year.

Exhibit 5.2 Summary of Point Source OTC Control Measures

Source Category	Pollutants	Description
EGUs	NOx	OTC 2001. Provided emission standards for stationary combustion turbines, emergency generators, and load shaving units. OTC 2009/2010. Recommended NOx emission rate limits for oil and gas boilers serving EGUs and emission rate limits for high energy demand day combustion turbines.
Asphalt Production Plants	NOx	OTC 2006. Provided emission rate limits and recommended a 35% reduction in NOx emissions.
Cement Kilns	NOx	OTC 2006. Provided emission rate limits and recommended a 60% reduction in NOx emissions.
Glass Furnaces	NOx	OTC 2006. Provided emission rate limits and recommended a 85% reduction in NOx emissions.
ICI Boiler Controls	NOx	OTC 2001. Recommended NOx emission rate limits for industrial boilers greater than 5 mmBtu/hour OTC 2006. Recommended lower NOx emission rate limits for industrial, commercial, and institutional boilers OTC 2010. Recommended national NOx controls for ICI boilers
Low Sulfur Fuel Oil	SO2	MANE-VU 2006. Recommends sulfur content limits for home heating oil, distillate oil, and residual oil
Adhesives and Sealants	VOC	OTC 2006. Provided VOC content limits and other restrictions on adhesives used in industrial and commercial settings.
Large Petroleum Storage Tanks	VOC	OTC 2009/2010. Addresses high vapor pressure VOCs, such as gasoline and crude oil, stored in large aboveground stationary storage tanks, which are typically located at refineries, terminals and pipeline breakout stations.

5.3.1 OTC 2006 Model Rule for Adhesives and Sealants

The 2006 OTC model rule is intended to achieve VOC emission reductions from adhesive application sources. The OTC 2006 model rule for adhesives and sealants is based on the reasonably available control technology (RACT) and best available retrofit control technology (BARCT) determination by the California Air Resources Board (CARB) developed in 1998. The emission reduction benefit estimation methodology is based on information developed and used by CARB for their RACT/BARCT determination in 1998. The vast majority of the emissions regulated by this rule are in the area source inventory.

For point sources, we first identified those sources applying adhesives and sealants (using the SCC of 4-02-007-xx, adhesives application). Next, we reviewed the 2007 inventory to determine whether these sources had existing capture and control systems. Most of the sources did not have control information in the NIF database. However, several sources reported capture and destruction efficiencies in the 70 to 99 percent range, with a few sources reporting capture and destruction efficiencies of 99+ percent. Sources with existing control systems that exceeded an 85 percent overall capture and destruction efficiency would comply with the OTC 2006 model rule provision for add-on air pollution control equipment; therefore, no additional reductions were calculated for these sources. For point sources without add-on control equipment, we used a 64.4 percent reduction based on the CARB determination.

States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the 2006 OTC model rule and whether the estimated reduction in VOC emissions should be applied in 2017 and 2020. New Hampshire indicated that they have no existing rule in place and no reductions should be applied. Virginia indicated that reductions from existing rules only apply in three regions:

- Northern Virginia (Arlington, Alexandria, Manassas, Manassas Park, Prince William, Loudon, Fairfax, Fairfax City, Falls Church, and Stafford),
- Fredericksburg (Fredericksburg and Spotsylvania), and
- Richmond (Charles City, Colonial Heights, Chesterfield, Hopewell, Hanover, Petersburg, Henrico, City of Richmond, and Prince George).

All other states have existing rules in place that will require VOC reductions before 2017. Exhibit 5.3 shows the reduction that were applied by state under both the existing controls inventory and the “what if” inventory.

Exhibit 5.3 State Recommendations for OTC Adhesives/Sealants Rule

State	Is Rule Accounted for in 2007 Inventory*	Incremental VOC Reduction to Apply:			
		2017 Existing Controls	2017 Potential Controls	2020 Existing Controls	2020 Potential Controls
CT	No	64.4	0	64.4	0
DE	No	64.4	0	64.4	0
DC	n/a	n/a	n/a	n/a	n/a
ME	No	64.4	0	64.4	0
MD	No	64.4	0	64.4	0
MA	No	64.4	0	64.4	0
NH	No	0	64.40	0	64.4
NJ	No	64.4	0	64.4	0
NY	No	64.4	0	64.4	0
PA	No	64.4	0	64.4	0
RI	No	64.4	0	64.4	0
VT	n/a	n/a	n/a	n/a	n/a
VA-NVA	No	64.4	0	64.4	0
VA-FRD	No	64.4	0	64.4	0
VA-RCH	No	64.4	0	64.4	0
VA-Other	No	0	0	0	0

* Some sources in the 2007 inventory had VOC controls greater than 85% and already complied with the requirements; no incremental reduction was taken for these sources (see text)
n/a - no affected point sources identified in the inventory

5.3.2 OTC 2009/2010 Model Rule for Large Storage Tanks

The OTC model rule addresses high vapor pressure VOCs, such as gasoline and crude oil, stored in large aboveground stationary storage tanks, which are typically located at refineries, terminals and pipeline breakout stations. The OTC model rule is based on recent revisions to New Jersey's VOC storage tank rules located at N.J.A.C. 7:27-16.2. The OTC model rules requires: 1) retrofiting floating roof tanks to reduce emissions from deck fittings; 2) retrofitting external floating roof tanks with domes; 3) controlling roof landing losses; and 4) adding controls for degassing and interior tank cleaning. New Jersey estimated reductions for tanks located in New Jersey would total approximately 2,000 tons per year by 2020. In making these estimates, New Jersey developed the following VOC percent reduction estimates for the following categories of storage tanks:

Tank Location	Point Source SCC	VOC Percent Reduction	
		2017	2020
Refinery	4-03-011-xx (floating roof tank SCCs, gasoline or crude oil only)	82	85
Bulk Terminal	4-04-001-xx (floating roof tank SCCs)	40	50
Bulk Plant and Pipeline Breakout Station	4-04-002-xx (floating roof tank SCCs gasoline or crude oil only)	52	65

Only New Jersey has existing rules in place, and the above percent reductions were applied to the existing controls inventory.

For all other states with affected sources, the potential reductions from the OTC rule were applied in the "what if" inventory.

5.3.3 OTC 2006 Model Rule for Asphalt Production Plants

The OTC recommended that member states pursue state-specific rulemakings or other implementation methods that would achieve a 35 percent reduction in NOx emissions. States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the 2006 OTC model rule and whether the estimated reduction in NOx emissions should be applied in 2017 and 2020. Only Maine, New Jersey and New York indicated that the reductions should be applied. A 35 percent reduction in NOx emissions for fuel burning SCCs in the 3-05-002-xx series was applied to the existing controls inventory for Maine, New Jersey, and New York.

All other states indicated that the NOx reductions should not be applied in the existing controls inventory. The 35 percent reduction for other states was applied in the "what if" inventory.

5.3.4 OTC 2006 Model Rule for Cement Manufacturing Plants

Cement kilns are located in Maine, Maryland, New York, Pennsylvania, and Virginia. The OTC recommended state-specific rulemakings or other implementation methods that would result in about a 60 percent reduction in uncontrolled levels NOx emissions or meet the following emission limits based on kiln type:

- Wet: 3.88 lb/ton clinker
- Long Dry: 3.44 lb/ton clinker
- Preheater: 2.36 lb/ton clinker
- Precalciner: 1.52 lb/ton clinker

Cement kilns are already subject to NOx controls as part of Phase I of the NO_x SIP call or state-specific RACT requriements. The emission reductions resulting from the NOx SIP call or RACT requirements are already accounted for in the 2007 inventory.

The following methods were used to calculate the additional reductions from the OTC 2006 Control Measure in each state:

- Maine has a single kiln that was converted from an existing wet process cement kiln to a dry process (preheater/precalciner type) kiln and underwent a BACT review around 2005. The permitted emission rate is 1,533 tons per year with an annual capacity of 766,500 tons of clinker (e.g., about 4 lbs/ton of clinker). Maine does not plan on any additional controls, so no incremental reductions were applied for the either the existing controls or "what if" inventory.

- Maryland indicated controls will become effective in 2011 for the two facilities in the state. Maryland specified a 25 percent reduction for the Holcim facility and a 40 percent reduction for the Lehigh facility for the existing controls inventory. No reductions were specified for the two kilns at the Essroc facility for the existing controls inventory. No additional reductions were specified for any cement kiln for the "what if" inventory.

- New York three cement plants: Each has a different RACT requirement effective 7/1/2012. The three limits are; 6.59 lb/ton, 2.88 lb/ton and 1.5 lb/tom (30 day rolling average). For this inventory, we have assumed that these post-2007 RACT requirements have an incremental control efficiency of 40 percent and we have applied this reduction in the existing controls inventory. No additional reductions were specified for any cement kiln for the "what if" inventory.

- Pennsylvania provided kiln-specific projected future year NOx emissions for 2017 and 2020 based on existing post-2007 state requirements. A kiln-specific control factor was calculated based on the ratio of the future year emissions to the 2007 emissions and was applied for the existing controls inventory. No additional reductions were specified for any cement kiln for the "what if" inventory.

- Virginia has a single preheater/precalciner kiln that is not located in the OTR. Virginia does not plan on any additional controls since the facility is not in the OTR, so no incremental reductions were applied for the either the existing controls or "what if " inventories.

5.3.5 OTC 2006 Model Rule for Glass and Fiberglass Furnaces

The OTC recommended state-specific rulemakings or other implementation methods to achieve an approximately 85 percent reduction in NOx emissions from uncontrolled levels. Emission reductions for glass and fiberglass furnaces were calculated using the methodology previously developed and documented in the OTC report (OTC 2007). Glass and fiberglass furnaces are located in Maryland, Massachusetts, New Jersey, New York, Pennsylvania, and Virginia. The following methods were used to calculate the additional reductions from the OTC 2006 Control Measure in each state:

- Maryland indicated that a 48 percent reduction should be applied to the single glass manufacturing facility in Maryland.
- Massachusetts indicated that they have a single facility with two furnaces furnaces; one furnace installing oxy-firing at 1.3 lb NOx per ton of glass, and the other at 5.3 lb/ton. The facility will be complying with EPA NSR enforcement Consent Decree by 2017. Massachusetts indicated that plant-wide emissions are expected to decrease by 35 percent in 2017 and 2020.
- New Jersey indicated that a 50 percent reduction in NOx emissions should be applied to glass and fiberglass furnaces in 2013, 2017, 2020 and 2025.
- New York did not provide guidance regarding glass and fiberglass furnaces. We used the percent reductions developed and documented in the previous round of emission projections developed for MARAMA (MARAMA 2007). An incremental control efficiency of 70 percent was used for New York glass and fiberglass furnaces in that inventory.
- Virginia indicated that they have no plans to implement the OTC measure, and no NOx reductions were applied to glass/fiberglass furnaces in Virginia.

All of the above reductions for glass and fiberglass furnaces were accounted for in the existing controls inventory. No additional reductions were specified for any glass or fiberglass furnace for the “what if” inventory.

5.3.6 OTC 2006 Model Rule for ICI Boilers

In Resolution 06-02, the OTC recommended that OTC member states pursue as necessary and appropriate state-specific rulemakings or other implementation methods to establish emission reduction percentages, emission rates or technologies for ICI boilers based on guidelines that varied by boiler size and fuel type..

States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the 2006 OTC recommendations and whether the estimated reduction in NOx emissions should be applied in 2017 and 2020. Most states have not adopted rules equivalent to the 2006 OTC recommendations. These states indicated that they will likely to depend on USEPA national rule for possible inclusion in the BOTW inventory. Specifically, the OTC Resolution 10-01 (June, 2010) called on USEPA for national regulations for ICI boilers.

Three states specified that that have adopted post-2007 ICI boiler rules to reduce NOx emissions. The percent reductions for ICI boilers were for these states were calculated as describe in the following paragraphs.

New Jersey provided NOx percent reductions that varied by heat input rate and fuel/boiler type and included an 80 percent rule effectiveness adjustment, as shown in Exhibit 5.4. The NIF file submitted by New Jersey for this project did not include the boiler design capacity. This data gap was filled using the boiler design capacities previously developed for the OTC study in 2006, if available; otherwise the SCC description was used to assign a default boiler design capacity. No additional reductions were specified for the "what if" inventory for New Jersey.

Exhibit 5.4 NonEGU Point Source Emission Reductions from New Jersey ICI Boiler NOx Rules

Heat Input Rate (mmBtu/hr)	Fuel/Boiler Type	Overall % Reduction 2007-2017
at least 5 but < 10	All	20%
at least 10 but < 20	All	20%
at least 25 but < 50	Natural gas only	40%
	No. 2 Fuel oil only	40%
	Refinery fuel gas and other gaseous fuels	40%
	Other liquid fuels	40%
	Duel Fuel using fuel oil and/or natural gas	40%
at least 50 but < 100	Natural gas only	40%
	No. 2 Fuel oil only	27%
	Other liquid fuels	27%
	Duel Fuel using fuel oil and/or natural gas	40%
at least 100 or greater	No. 2 Fuel oil only	40%

New York specified that a 50 percent reduction should be applied in the existing controls inventory for all boilers with greater than 25 mmBtu/hour design capacity. The NIF file submitted by New York for this project did not include the boiler design capacity. This data gap was filled using the boiler design capacities previously developed for the OTC study in 2006, if available; otherwise the SCC description was used to assign a default boiler design capacity. No additional reductions were specified for the "what if" inventory for New York.

New Hampshire specified that reductions should be applied to boilers in the 50-100 and 100-250 mmBtu/hour size ranges. We used the methodology previously developed and documented in the OTC report (OTC 2007). Reductions vary by size range and fuel type. State-by-state emission reduction percentages were developed by comparing the state emission limit in lbs/mmBTU to the OTC 2006 recommended limit. There are no coal-fired ICI boilers in New Hampshire. For other fossil fuels used in New Hampshire, the NOx percent reduction was as follows:

- Natural gas, 50-100 mmBtu/hr: 50% reduction
- Natural gas, 100-250 mmBtu/hr: 0% reduction
- Residual/distillate oil, 50-100 mmBtu/hr: 33.3% reduction
- Residual/distillate oil, 100-250 mmBtu/hr: 33.3% reduction

No additional reductions were specified for the "what if" inventory for New Hampshire.

All other states do not have existing rules that would result in post-2007 emission reductions. These states indicated that they will likely to depend on USEPA national rule for possible inclusion in the BOTW inventory. Specifically, the OTC Resolution 10-01 (June, 2010) called on USEPA for national regulations for ICI boilers. However, in order to estimate the potential NOx emission reductions for the "what if" control scenario, the guidelines from OTC Resolution 06-02 shown in Exhibit 5.5 were used to estimate potential NOx reductions in the "what if" inventory for those states without existing rules, except Virginia.

Exhibit 5.5 OTC Resolution 06-02 Guidelines for ICI Boiler NOx Rules

Boiler Size (mmBtu/hr)	NOx Percent Reduction from Base Emissions by Fuel Type			
	Natural Gas	#2 Fuel Oil	#4/#6 Fuel Oil	Coal
<25	10	10	10	10
25 to 50	50	50	50	50*
50 to 100	10	10	10	10*
100 to 250	76	40	40	40*

>250	**	**	**	**

* Resolution 06-02 did not specify a percent reduction for coal; for modeling purposes, the same percent reduction specified for #4/#6 fuel oil was used for coal.

** Resolution 06-02 specified the reduction for > 250mmBtu/hour boilers to be the "same as EGUs of similar size." The OTC Commissioners have not yet recommended an emission rate or percent reduction for EGUs. As a result, no reductions for ICI boilers > 250 mmBtu/hour were included in the potential controls inventory.

Since the above guidelines vary by boiler size and fuel type, the specific percent reduction applied to an individual source depends on the SCC and design capacity of the source. The SCC identifies the fuel type, while the design capacity identifies the boiler size. In many cases, the design capacities in the MANE-VU NIF database were missing. The following hierarchy was used in filling in gaps where design capacities were missing:

- Use the design capacity field from the NIF EU table, if available;
- Use the design capacities provided by agencies to fill in the data gaps in the MANE-VU 2002 inventory;
- Use design capacity as reported either the Unit Description field in the NIF EU table or the Process Description field from the NIF EP table, if available;
- Use design capacity from the source's Title V permit, if the Title V permit was online;
- Use the SCC description to determine the design capacity (for example, SCC 1-02-006-01 describes a >100 mmBtu/hr natural gas-fired boiler, SCC 1-02-006-02 describes a 10-100 mmBtu/hr natural gas-fired boiler).

After performing this gap-filling exercise, each boiler was assigned to one of the size ranges and fuel types shown in the above table. The emission reduction percentages by boiler size range and fuel type were then applied.

5.4 FUEL OIL SULFUR LIMITS

MANE-VU developed a low sulfur fuel oil strategy to help states develop Regional Haze SIPs (MANE-VU 2007). As previously discussed in Section 4.5, Each state was polled and asked to indicate when, if at all, the MANE-VU strategy would be incorporated into their state rules. States were also asked to provide the 2007 sulfur contents for each fuel type by county in order to calculate the percent reduction in emissions for the future years. Three states (MD, NJ, and NY) have adopted or are committed to adopting the strategy into their rules. The reductions for these three states were accounted for in the "existing

controls" inventory. All other jurisdictions indicated that not enough regulatory development progress has been made to include the reductions in future years with absolute certainty. The potential reductions for these states were accounted for in the "potential new controls" inventory. One state (VA) has no plans to adopt the low sulfur fuel oil strategy. The percent reductions by fuel type and county are contained in Appendix K.

5.5 STATE-SPECIFIC NONEGU CONTROL FACTORS

The following state-specific nonEGU control factors were provided:

- **Bellefield Boiler Plant, Allegheny County.** Allegheny County indicated that this facility changed their fuel source from coal to natural gas in July 2009 and future year emissions were changed to reflect the fuel switch.
- **USS Clairton Works**, **Allegheny County.** The facility will remove Batteries 7-9 and have Battery C operational by 2013, resulting in a change in PM emissions in 2013. Also, USS Clairton Works will remove Batteries 1-3 and have Battery D operational in 2015, resulting in a change in PM emissions in 2017 and 2020.
- **Chrysler, Delaware.** The Chrysler facility (ID 1000300128) shut down in 2009. Delaware specified that only a 25 percent reduction should be taken for all pollutants since some emissions will be banked for future use by other sources.
- **O S G Ship Management (ID 1000500093), Delaware.** Delaware provided source-specific growth factors and percent reductions in VOC emissions for 2017 and 2020 from the lightering operations at O S G Ship Management (ID 1000500093).
- **Control Technology Guidance (CTG) Documents, Delaware.** Delaware determined that VOC emission reductions from new CTG recommendations would be very small. Although the new CTGs set up new recommendations for higher control efficiencies, the actual VOC reductions would be minimum, if not none, because most DE's existing facilities are not affected by the new requirements and emissions from those facilities are relatively small (based on 2002 inventory).
- **Unit Shutdowns, Delaware.** Delaware identified several emission units that have shut down at the following facilities: Dow Reichhold Specialty Latex (ID 1000100016), SPI Poly-Ols (ID 1000300426), and Invistas (ID 1000500002). Emissions for all pollutants were set to zero for these units.

- **Dover Air Force Base, Delaware.** Delaware identified four boilers at Dover Air Force Base (ID 1000100001) that ceased using fuel oil in March 2010. SO2 emissions for these boilers were set to zero.
- **Premcor Refinery NOx Plantwide Cap, Delaware.** The refinery was sold to the Delaware City Refining Company and an agreement was reached with DNREC's Secretary that allows plant-wide applicability limit (cap) for NOx. To project emissions, as well as for modeling purposes, Delaware decided to spread out the NOx-cap to each stack. Delaware estimated a plantwide reduction of 10.05 percent in 2013 and 41.22 percent in both 2017 and 2020.
- **Wausau Paper Specialty Products, Maine.** The Wausau Paper Specialty Products facility (ID 2300700007) closed in 2009. All emissions were set to zero for this facility in the 2017 and 2020 projection inventories.
- **2009 NJ Rule for NOx for Municipal Solid Waste Incinerators, New Jersey.** This rule will achieve a 27 percent reduction from one facility - Camden County Energy Recovery Associates, L.P. (ID 3400751614).
- **NJ rule for VOC Storage Tanks, New Jersey.** New Jersey provided expected VOC emission reductions resulting from post-2007 rules for VOC storage tanks. For refinery floating roof storage tanks (SCC 4-03-011-xx), the reductions are 75 percent for 2013, 82 percent for 2017, and 85 percent for 2020. For bulk terminal tanks (SCC 4-04-001-xx), the reductions are 20 percent for 2013, 40 percent for 2017, and 50 percent for 2020. For pipeline breakout stations (SCCs 4-04-002-xx and 4-06-005-xx), the reductions are 26 percent for 2013, 52 percent for 2017, and 65 percent for 2020.
- **International Paper – Franklin Mill, Virginia.** The International Paper – Franklin Mill (ID 5109300006) closed effective 2010. All emissions were set to zero for this facility in the 2017 and 2020 projection inventories.

6.0 NONROAD MODEL CATEGORIES

The USEPA's NONROAD model estimates emissions from equipment such as recreational marine vessels, recreational land-based vehicles, farm and construction machinery, lawn and garden equipment, aircraft ground support equipment (GSE) and rail maintenance equipment. This equipment is powered by diesel, gasoline, compressed natural gas (CNG) or liquefied petroleum gas (LPG) engines.

The National Mobile Inventory Model (NMIM) was developed by USEPA to develop county-level emission estimates for certain types of nonroad equipment. NMIM uses the current version the NONROAD model to develop emission estimates and was used to develop the projection inventories discussed here. The NMIM national county database contains monthly input data to reflect county specific fuel parameters and temperatures. Most of the work associated with executing NMIM involved updating the NMIM county database with State-specific information. For this analysis, we used the NMIM2008 software (version NMIM20090504), the National County Database (version NCD20090531), and NONROAD2008a (July 2009 version) as a starting point. Changes were made to the NCD20090531 based on review of data by the States. The purpose of this review was to create a new NCD specific to the 2007 base year model runs and the three projection year model runs. Changes were made to a copy of the NCD20090531 to create a new NCD used for the emission inventory runs. That NCD is called NCD20090910MARAMA.

6.1 STATE REVIEW OF NMIM FUEL CHARACTERISTICS

For the 2017 and 2020 projection year inventories, AMEC provided data on fuel characteristics from the NCD20090531 to the States to determine if they had additional changes required for the fuel characteristics for future year inventories. None of the States had changes to the fuel characteristics, except for CT which provided revisions to the six fuels that they had provided for the 2007 base year inventory to account for a number of changes including changes to RVP and fuel sulfur.

Connecticut provided updated values for the volume and market share components for ethanol which is used by NMIM to determine the oxygen percentage for NONROAD runs. Complete data replacement records were obtained for CT for the following tables: gasoline inputs, diesel inputs, countymonthyear inputs, and datasource inputs. CT added six new fuels which were given NRGasolineIds of 5000-5005 inclusive. Data was provided for both the base year (2007) and projection years (2013, 2017, and 2020).

The diesel fuel sulfur values for the projection years were maintained at their default values for all other States since they matched the USEPA recommended values.

6.2 USE OF EXTERNAL FILES IN THE PROJECTION YEAR NMIM RUNS

For the 2007 base year inventory (MARAMA 2012), revisions were made to the allocation files for several categories. These files are used to allocate emissions calculated at the state level down to the county level and to add entries to the countynrfile NCD table. States were asked if they would like to revise this table for future years. No revisions were recommended. Thus external files used for the 2007 base year runs were used in the runs for the projection years.

6.3 NMIM RUN SPECIFICATIONS

The specifications for each NMIM run were developed for groups of States within the MANE-VU+VA region. All States except for CT, NY, NJ and PA were run together for each year. CT was run alone for 2007, 2017, and 2020 because changes were requested for the base year. NY, NJ and PA were run together for each individual projection year. The settings for each specification panel within the NMIM model for the projection year runs are detailed below.

- Description: A short descriptive term for the run was entered for each specific run.
- Geography: The "county" option was selected for each run. All counties within the State were selected.
- Time: Every month in the Months check box area was selected. On the time panel, the year (2017 or 2020) was selected in the drop down box and added to the year selections area. With the exception of the CT, all runs were performed for only one year. The Use Yearly Weather Data check box was selected; however, year specific data was not available within NMIM for the projection years. The only years included within the NMIM model for NCD20090531 are 1999-2008 inclusive. If the specific year requested is not available, then NMIM uses 20 year average data for the estimates. Thus while the Use Yearly Weather Data box was checked, since the specific year was not there (except for the CT 2007 base year re-run), the 20 year average data in the countymonthhour table are used. However, because the meteorology data for future years will be assumed to be the same as was used for 2007, AMEC revised the AverageTemp and AverageRelHumidity values in the countymonthhour table of the NCD20090910MARAMA to reflect actual 2007 values. Thus the values in that table are 2007 values not 20 year average values and thus causes the NMIM model to run with the same data used for the 2007 base year runs.
- Vehicles/Equipment: Only the nonroad vehicle/equipment area was selected. All fuels and all vehicle types were selected for each State run. Aircraft ground support

equipment was included in the run specifications but those records were removed during post-processing steps.

- Fleet: No selections or information was entered in this panel.
- Pollutants: Exhaust PM10, PM2.5, and Criteria pollutants (with HC reported as VOC) were selected except for CO_2.
- Advanced features: Only the server and database were selected in this panel.
- Output: Under the Geographic Representation panel the County selection was made. In the General Output area, a new database was selected on the server for the output.

All added external files for use in each State run were placed in the externalfiles directory of the NCD. Entries for all external files included were included in the countynrfiles table of the NCD.

6.4 REMOVAL OF AIRPORT GROUND SUPPORT EQUIPMENT

The NMIM/NONROAD model calculates emissions from airport ground support equipment. As discussed in Section 7 of this TSD, emissions from airport ground support equipment is also included in USEPA's aircraft inventory prepared using the Federal Aviation Administration's Emissions and Dispersion Modeling System (EDMS). Correspondence with USEPA indicated that USEPA considers the emissions calculated by EDMS to be better than those calculated by NONROAD. For this reason, all emissions calculated by NMIM/NONROAD for airport ground support equipment were removed from the inventory to avoid double counting.

6.5 STATE AND STAKEHOLDER REVIEW AND COMMENT

New York state provided the results of their own NONROAD model runs for 2017 and 2020. These model results were provided by month and were used instead of the NMIM model runs made by MACTEC.

6.6 CHANGES MADE FOR VERSION 3 MODEL RUNS

Two sectors of the inventory were updated in version 3. First, Virginia and New York requested that their emissions be recalculated using the information developed through Version 2 of the inventory for the MARAMA States. The Virginia reruns were performed for all categories except for ground support equipment and for recreational marine vessels. Recreational marine vessel emissions for Virginia were calculated along with those for other states (see below). Those values replaced the SEMAP supplied values used in versions prior to Version 3. In addition, estimates for all sectors of the inventory for New York other than ground support equipment and recreational marine vessels were calculated

using NMIM default data for the MARAMA area. New York had originally provided data from NONROAD model runs that they performed separately. For Version 3 of the inventory, New York emissions were calculated using NMIM runs set up using the same criteria as those for other states in earlier versions of the inventory. Both New York and Virginia were provided with the opportunity to review fuel characteristics prior to their runs. Only Virginia made changes to the fuels, however the only changes that were made were to assign alternative default fuels to counties. The fuel characteristics were not modified from the NMIM defaults, only the fuel IDs associated with a particular county/month combination were changed to another default fuel. Those changes were instituted in the NCD developed specifically for MARAMA. New York did not request any changes to the default values. In addition, the revisions made to the housing population allocation files were instituted for both states.

The second change in version 3 was to modify the recreational marine vessel populations for all states except Vermont and Maine. A revised population file was prepared for Virginia but not utilized in the version 3 runs. Estimates for Virginia, Vermont and Maine were prepared using the growth algorithm built into the NMIM/NONROAD model. For all other states, revised population data was estimated for the years 2017 and 2020. EPA had recommended that rather than use the default growth algorithm of the model for those states that had their 2007 base year data updated for this category, separate population estimates for each projection year should be prepared and included in the population files. The 2007 population data was provided by the National Marine Manufacturers Association (NMMA). Total state populations for each of the three major categories contained in the NONROAD model (outboard, inboard/sterndrive and personal watercraft) were provided for each state. Because the population files used by the NONROAD model (and thus NMIM) were configured with population values for various horsepower categories, AMEC (formerly AMEC) determined the fraction of the total for each marine vessel type in each horsepower category from the NONROAD default population files. These fractions were then used to allocate the total state population obtained from NMMA to the various horsepower categories.

The only exception to this was that some states added in data for sailboats. The sailboat populations were split among two of the default categories. In addition, New Hampshire provided their own revised population file. Their population data for New Hampshire was provided by the New Hampshire DMV and is not from NMMA.

AMEC then used the national growth factors supplied in the default NMIM/NONROAD model to estimate populations for each year. Each horsepower/population category in the 2007 population file was grown to either 2017 or 2020 using the ratio between the 2005

and 2015 growth factors (to represent growth between 2007 and 2017) and between the 2005 and 2025 growth factors (to represent growth between 2007 and 2020). Those ratios were used to grow the 2007 population to 2017 and 2020 respectively. The only exception to this was Pennsylvania. Pennsylvania presented data indicating that there was little growth expected during the time periods that were considered and thus maintained the 2007 population estimates for both 2017 and 2020.

Pennsylvania presented information showing from historical data that indicated a downward trend in the overall motorized pleasure craft population in 6 of the last 9 years. The data also indicated that the population was essentially unchanged in the last three years due to an adverse economic environment. Populations of all motorized pleasure craft in Pennsylvania as tracked by the Pennsylvania Fish and Boat Commission showed nearly a 6 percent decline from 2001 to 2007 or an average annual decline of 1.0 percent over that period. Pleasure craft populations remained nearly unchanged from 2008 to 2010.

As a consequence, they forecaste zero percent growth for pleasure craft is from 2007 to 2017 and 2007 to 2020. The types of pleasure craft affected by this growth rate are:

- 2282005010, 2-stroke outboard,
- 2282005015, 2-stroke personal water craft,
- 2282010005, 4-stroke inboard/sterndrive,
- 2282020005, diesel inboard/sterndrive, and
- 2282020010, diesel outboards

6.7 NMIM/NONROAD GROWTH AND CONTROL INFORMATION

In estimating future year emissions, the NMIM/NONROAD model includes growth and scrappage rates for equipment in addition to a variety of control programs. It is not possible separate out the future year emissions due to “growth only” or “control only” in a single run. That is, the model run provides a single future year estimate that is a “growth and control” scenario.

The growth data used in the NMIM/NONROAD model is documented in a USEPA report (USEPA 2004c). The GROWTH packet of the NONROAD model cross-references each SCC to a growth indicator code. The indicator code is an arbitrary code that identifies an actual predicted value such as human population or employment that is used to estimate the future year equipment population. The GROWTH packet also defines the scrappage curves used to estimate the future year model year distribution.

The NMIM/NONROAD model also accounts for all USEPA emission standards for nonroad equipment. There are mulitiple standards that vary by equipment type, rated power, model year, and pollutatant. Exhibit 6.1 is a summary of the emission control programs accounted for in the NMIM/NONROAD model. A complete summary of the nonroad equipment emission standards can be found on the USEPA nonroad emission standards reference guide website (USEPA 2011).

Exhibit 6.1 Control Programs Included in the NMIM/NONROAD Model

Regulation	Description
Control of Air Pollution; Determination of Significance for Nonroad Sources and Emission Standards for New Nonroad Compression Ignition Engines At or Above 37 Kilowatts 59 FR 31036 June 17, 1994	This rule establishes Tier 1 exhaust emission standards for HC, NOx, CO, and PM for nonroad compression-ignition (CI) engines ≥37kW (≥50hp). Marine engines are not included in this rule. The start dates and pollutants affected vary by hp category as follows: 50-100 hp: Tier 1,1998; NOx only 100-175 hp: Tier 1, 1997; NOx only 175-750 hp: Tier 1, 1996; HC, CO, NOx, PM >750 hp: Tier 1, 2000; HC, CO, NOx, PM
Emissions for New Nonroad Spark-Ignition Engines At or Below 19 Kilowatts; Final Rule 60 FR 34581 July 3, 1995	This rule establishes Phase 1 exhaust emission standards for HC, NOx, and CO for nonroad spark-ignition engines ≤19kW (≤25hp). This rule includes both handheld (HH) and nonhandheld (NHH) engines. The Phase 1 standards become effective in 1997 for : Class I NHH engines (<225cc), Class II NHH engines (≥225cc), Class III HH engines (<20cc), and Class IV HH engines (≥20cc and <50cc). The Phase 1 standards become effective in 1998 for: Class V HH engines (≥50cc)
Final Rule for New Gasoline Spark-Ignition Marine Engines; Exemptions for New Nonroad Compression-Ignition Engines at or Above 37 Kilowatts and New Nonroad Spark-Ignition Engines at or Below 19 Kilowatts 61 FR 52088 October 4, 1996	This rule establishes exhaust emission standards for HC+NOx for personal watercraft and outboard (PWC/OB) marine SI engines. The standards are phased in from 1998-2006.
Control of Emissions of Air Pollution From Nonroad Diesel Engines 63 FR 56967 October 23, 1998	This final rule sets Tier 1 standards for engines under 50 hp, phasing in from 1999 to 2000. It also phases in more stringent Tier 2 standards for all engine sizes from 2001 to 2006, and yet more stringent Tier 3 standards for engines rated over 50 hp from 2006 to 2008. The Tier 2 standards apply to NMHC+NOx, CO, and PM, whereas the Tier 3 standards apply to NMHC+NOx and CO. The start dates by hp category and tier are as follows:

Regulation	**Description**
	hp<25: Tier 1,2000; Tier 2, 2005; no Tier 3 25-50 hp: Tier 1, 1999; Tier 2, 2004; no Tier 3 50-100 hp: Tier 2, 2004; Tier 3, 2008 100-175 hp: Tier 2, 2003; Tier 3, 2007 175-300 hp: Tier 2, 2003; Tier 3, 2006 300-600 hp: Tier 2, 2001, Tier 3, 2006 600-750 hp: Tier 2, 2002; Tier 3, 2006 >750 hp: Tier 2, 2006, no Tier 3 This rule does not apply to marine diesel engines above 50 hp.
Phase 2: Emission Standards for New Nonroad Nonhandheld Spark Ignition Engines At or Below 19 Kilowatts 64 FR 15207 March 30, 1999	This rule establishes Phase 2 exhaust emission standards for HC+NOx for nonroad nonhandheld (NHH) spark-ignition engines ≤19kW (≤25hp). The Phase 2 standards for Class I NHH engines (<225cc) become effective on August 1, 2007 (or August 1, 2003 for any engine initially produced on or after that date). The Phase 2 standards for Class II NHH engines (≥225cc) are phased in from 2001-2005.
Phase 2: Emission Standards for New Nonroad Spark-Ignition Handheld Engines At or Below 19 Kilowatts and Minor Amendments to Emission Requirements Applicable to Small Spark-Ignition Engines and Marine Spark-Ignition Engines; Final Rule 65 FR 24268 April 25, 2000	This rule establishes Phase 2 exhaust emission standards for HC+NOx for nonroad handheld (HH) spark-ignition engines ≤19kW (≤25hp). The Phase 2 standards are phased in from 2002-2005 for Class III and Class IV engines and are phased in from 2004-2007 for Class V engines.
Control of Emissions From Nonroad Large Spark-Ignition Engines and Recreational Engines (Marine and Land-Based); Final Rule 67 FR 68241 November 8, 2002	This rule establishes exhaust and evaporative standards for several nonroad categories: 1) Two tiers of emission standards are established for large spark-ignition engines over 19 kW. Tier 1 includes exhaust standards for HC+NOx and CO and is phased in from 2004-2006. Tier 2 becomes effective in 2007 and includes exhaust standards for HC+NOx and CO as well as evaporative controls affecting fuel line permeation, diurnal emissions and running loss emissions. 2) Exhaust and evaporative emission standards are established for recreational vehicles, which include snowmobiles, off-highway motorcycles, and all-terrain vehicles (ATVs). For snowmobiles, HC and CO exhaust standards are phased-in from 2006-2012. For off-highway motorcycles, HC+NOx and CO exhaust emission standards are phased in from 2006-2007. For ATVs, HC+NOx and CO exhaust emission standards are phased in from 2006-2007. Evaporative emission standards for fuel tank and hose permeation apply to all recreational vehicles beginning in 2008. 3) Exhaust emission standards for HC+NOx, CO, and PM for recreational marine diesel engines over 50 hp begin in 2006-2009, depending on the engine displacement. These are “Tier 2” equivalent standards.

Regulation	**Description**
Control of Emissions of Air Pollution From Nonroad Diesel Engines and Fuel; Final Rule (Clean Air Nonroad Diesel Rule – Tier 4) 69 FR 38958 June 29, 2004	This final rule sets Tier 4 exhaust standards for CI engines covering all hp categories (except marine and locomotives), and also regulates nonroad diesel fuel sulfur content. 1) The Tier 4 start dates and pollutants affected vary by hp and tier as follows: hp<25: 2008, PM only 25-50 hp: Tier 4 transitional, 2008, PM only; Tier 4 final, 2013, NMHC+NOx and PM 50-75 hp: Tier 4 transitional, 2008; PM only; Tier 4 final, 2013, NMHC+NOx and PM 75-175 hp: Tier 4 transitional, 2012, HC, NOx, and PM; Tier 4 final, 2014, HC,NOx,PM 175-750 hp:Tier 4 transitional, 2011, HC, NOx, and PM; Tier 4 final, 2014, HC,NOx,PM >750 hp: Tier 4 transitional, 2011, HC, NOx, and PM; Tier 4 final, 2015, HC,NOx,PM 2) This rule will reduce nonroad diesel fuel sulfur levels in two steps. First, starting in 2007, fuel sulfur levels in nonroad diesel fuel will be limited to a maximum of 500 ppm, the same as for current highway diesel fuel. Second, starting in 2010, fuel sulfur levels in most nonroad diesel fuel will be reduced to 15 ppm.
Control of Emissions From Nonroad Spark-Ignition Engines and Equipment; Final Rule (Bond Rule) 73 FR 59034 October 8, 2008	This rule establishes exhaust and evaporative standards for small SI engines and marine SI engines: 1) Phase 3 HC+NOx exhaust emission standards are established for Class I NHH engines starting in 2012 and for Class II NHH engines starting in 2011. There are no new exhaust emission standards for handheld engines. New evaporative standards are adopted for both handheld and nonhandheld equipment. The new evaporative standards control fuel tank permeation, fuel hose permeation, and diffusion losses. The evaporative standards begin in 2012 for Class I NHH engines and 2011 for Class II NHH engines. For handheld engines, the evaporative standards are phased-in from 2012-2016. 2) More stringent HC+NOx and CO standards are established for marine SI PWC/OB engines beginning in 2010. In addition, new exhaust HC+NOx and CO standards are established for sterndrive and inboard (SD/I) marine SI engines also beginning in 2010. High performance SD/I engines are subject to separate HC+NOx and CO exhaust standards that are phased-in from 2010-2011. New evaporative standards were also adopted for all marine SI engines that control fuel hose permeation, diurnal emissions, and fuel tank permeation emissions. The hose permeation, diurnal, and tank permeation standards take effect in 2009, 2010, and 2011.

Source: USEPA 2010e

7.0 NONROAD MAR SOURCE CATEGORIES

The USEPA's NONROAD model does not estimate emissions for three nonroad source categories: commercial marine vessel, aircraft, and railroad locomotives. The emission projection methodology and data sources for these three categories (collectively referred to as marine, airport, railroad {or MAR}) are discussed in this section. The data used to calculate the growth and control factors for MAR sources are included in Appendix L.

7.1 COMMERCIAL MARINE VESSELS

For the purpose of emission calculations, marine vessel engines are divided into three categories based on displacement (swept volume) per cylinder. Category 1 and Category 2 marine diesel engines typically range in size from about 500 to 8,000 kW (700 to 11,000 hp). These engines are used to provide propulsion power on many kinds of vessels including tugboats, pushboats, supply vessels, fishing vessels, and other commercial vessels in and around ports. They are also used as stand-alone generators for auxiliary electrical power on vessels. Category 3 marine diesel engines typically range in size from 2,500 to 70,000 kW (3,000 to 100,000 hp). These are very large marine diesel engines used for propulsion power on ocean-going vessels such as container ships, oil tankers, bulk carriers, and cruise ships.

The majority of marine vessels are powered by diesel engines that are either fueled with distillate or residual fuel oil blends. For the purpose of emission inventories, USEPA has assumed that Category 3 vessels primarily use residual blends while Category 1 and 2 vessels typically use distillate fuels.

EPA developed national emission inventories for Category 1 and 2 vessels and Category 3 vessels for calendar years 2002 through 2040 as part of its effort to develop emission standards for these vessels. The methodologies used to develop the emission projections (for both a baseline and controlled scenario) are documented in a regulatory impact assessment (USEPA 2008c). We used the USEPA data and methodologies from these RIAs to develop separate growth and control factors for Category 1 and 2 vessels (diesel) and Category 3 vessels (residual).

7.1.1 CMV Diesel Growth Factors

For Category 1 and 2 diesel vessels, USEPA used projection data for domestic shipping from the AEO2006 (EIA 2006). The annual growth rate reported in the RIA is 0.9%. More recent growth data for domestic shipping is available in the AEO2010 (EIA 2010). Since Category 1 and 2 vessels primarily accounts for activity data for ships that carry domestic cargo, we decided to use the recent growth data for domestic shipping available

in the AEO2010. We used Table A-7 of the AEO2010 for international shipping to calculate the growth factor for 2007-2013 to be 0.975, for 2007-2017 to be 1.003, and for 2007-2020 to be 1/033. These growth factors were used for for CMV diesel port emissions (SCC 22-80-002-100) and CMV diesel underway emissions (SCC 22-80-002-200).

7.1.2 CMV Diesel Control Factors

In developing their emission projections, USEPA developed two scenarios that accounted for both the 2004 nonroad diesel rule and the 2008 diesel marine vessel rule:

- The USEPA's baseline (pre-control) inventory accounted for:
    1. the 0.9 percent annual growth in fuel use,
    2. the impact of existing engine regulations that took effect in 2008,
    3. the 2004 Clean Air Nonroad Diesel Rule that will decrease the allowable levels of sulfur in fuel beginning in 2012, and
    4. fleet turnover.
- The USEPA's controlled inventory accounted for:
    1. the 0.9 percent annual growth in fuel use;
    2. the reductions included in the baseline inventory, and the reductions from USEPA's 2008 rule Final Locomotive-Marine rule for Tier 3 and 4 engines; and
    3. The 2008 final rule that includes the first-ever national emission standards for existing marine diesel engines, applying to engines larger than 600kW when they are remanufactured. The rule also sets Tier 3 emissions standards for newly-built engines that are phasing in from 2009. Finally, the rule establishes Tier 4 standards for newly-built commercial marine diesel engines above 600kW, phasing in beginning in 2014.

To calculate a control factor that accounts for reductions included in the USEPA controlled inventory, it was necessary to first calculate a "growth only" scenario applying USEPA's 0.9 percent annual growth rate to the 2006 base emissions. Once the growth rate was applied, then a control factor for each pollutant was calculated by dividing the future year controlled emissions by the future year "growth only" emissions. Exhibit 7.1 shows the control factors for 2017 and 2020 for diesel commercial marine vessels.

Exhibit 7.1 CMV Diesel Control Factors by Year and Pollutant

Year	CO	NOx	PM10	PM2.5	SO2	VOC
2013	0.885	0.787	0.747	0.747	0.464	0.871
2017	0.830	0.642	0.550	0.550	0.076	0.708
2020	0.801	0.537	0.460	0.460	0.032	0.586

7.1.3 CMV Residual Oil Growth Factors

For Category 3 residual oil vessels, data from an USEPA-sponsored study was used to develop an annualized growth factor of 4.5 percent for the region. A few states considered the growth rate to be extremely high and not reflective of recent economic conditions. Since USEPA's Category 3 vessel inventory is primarily based on activity data for ships that carry foreign cargo, we decided to use the recent growth data for international shipping available in the AEO2010. We used data from Table A-7 of the AEO2010 for international shipping to calculate the growth factor for 2007-2013 to be 0.940, for 2007-2017 to be 0.946, and for 2007-2020 to be 0.950. These growth factors were used for CMV residual oil port emissions (SCC 22-80-003-100) and CMV residual oil underway emissions (SCC 22-80-003-200).

7.1.4 CMV Residual Oil Control Factors

On December 22nd, 2009, USEPA announced final emission standards under the Clean Air Act for new marine diesel engines with per-cylinder displacement at or above 30 liters (called Category 3 marine diesel engines) installed on U.S.-flagged vessels. The final engine standards are equivalent to those adopted in the amendments to Annex VI to the International Convention for the Prevention of Pollution from Ships (a treaty called "MARPOL"). The emission standards apply in two stages: near-term standards for newly-built engines will apply beginning in 2011, and long-term standards requiring an 80 percent reduction in NOx will begin in 2016. USEPA also adopted changes to the diesel fuel program to allow for the production and sale of diesel fuel with no more than 1,000 ppm sulfur for use in Category 3 marine vessels. The regulations generally forbid production and sale of fuels with more than 1,000 ppm sulfur for use in most U.S. waters, unless operators achieve equivalent emission reductions in other ways.

On March 26, 2010, the International Maritime Organization (IMO) officially designated waters off North American coasts as an emissions control area (ECA) in which stringent international emission standards will apply to ships. In practice, implementation of the ECA means that ships entering the designated area would need to use compliant fuel for the duration of their voyage that is within that area, including time in port and voyages whose routes pass through the area without calling on a port. The North American ECA

includes waters adjacent the Atlantic extending up to 200 nautical miles from east coast of the United States. The quality of fuel that complies with the ECA standard will change over time. From the effective date in 2012 until 2015, fuel used by vessels operating in designated areas cannot exceed 1.0 percent sulfur (10,000 ppm). Beginning in 2015, fuel used by vessels operating in these areas cannot exceed 0.1 percent sulfur (1000 ppm). Beginning in 2016, NOx aftertreatment requirements become applicable.

To calculate a control factor that accounted for reductions included in the USEPA controlled inventory, it was necessary to first calculate a "growth only" scenario applying USEPA's 4.5 percent annual growth rate to the 2006 base emissions. Once the growth rate was applied, then a control factor for each pollutant was calculated by dividing the future year controlled emissions by the future year "growth only" emissions.

Exhibit 7.2 shows the control factors for 2017 and 2020 for residual oil commercial marine vessels.

Exhibit 7.2 CMV Residual Oil Control Factors by Year and Pollutant

Year	CO	NOx	PM10	PM2.5	SO2	VOC
2013	1.000	0.736	0.353	0.353	0.270	1.000
2017	1.000	0.654	0.216	0.216	0.120	1.000
2020	1.000	0.597	0.137	0.137	0.036	1.000

7.1.5 Military Vessels Growth and Control Factors

Virginia reported emissions for military vessels, but did not distinguish between diesel or residual fuels. We assumed that there would be "no growth" for military vessel activity and emissions in Virginia would remain at 2007 levels in 2017 and 2020. Virginia was the only state to report emission from military vessels.

7.2 AIRCRAFT

Aircraft emissions in the 2007 MANE-VU+VA inventory are available on either a county-by-county or airport-by-airport basis for six types of aircraft operations:

- Air carrier operations represent landings and take-offs (LTOs) of commercial aircraft with seating capacity of more than 60 seats;
- Commuter/air taxi operations are one category. Commuter operations include LTOs by aircraft with 60 or fewer seats that transport regional passengers on

scheduled commercial flights. Air taxi operations include LTOs by aircraft with 60 or fewer seats conducted on non-scheduled or for-hire flights;

- General aviation represents all civil aviation LTOs not classified as commercial;
- Military operations represent LTOs by military aircraft;
- Ground Support Equipment (GSE) typically includes aircraft refueling and baggage handling vehicles and equipment, aircraft towing vehicles, and passenger buses; and
- Auxiliary power units (APUs) provide power to start the main engines and run the heating, cooling, and ventilation systems prior to starting the main engines.

7.2.1 Aircraft Growth Factors

Aircraft operations were projected to future years by applying activity growth using data on itinerant (ITN) operations at airports as reported in the Federal Aviation Administration's (FAA) Terminal Area Forecast (TAF) System for 2009-2030 (FAA 2010). The ITN operations are defined as aircraft take-offs or landings. This information is available for approximately 3300 individual airports. Actual LTOs are reported for 2007 and projected LTOs are provided for all years up to 2030.

We aggregated and applied this information at the county level for the four operation types: commercial, general, air taxi, military. We computed growth factors for each operation type by dividing future-year ITN by 2007-year ITN. We assigned factors to inventory SCCs based on the operation type, as shown in Exhibit 7.3.

Exhibit 7.3 Crosswalk between SCC and FAA Operations Type

SCC	SCC Description	FAA Operation Type Used for Growth Factor
2265008005	Airport Ground Support Equipment, 4-Stroke Gas	Total Itinerant Operations
2267008005	Airport Ground Support Equipment, LPG	Total Itinerant Operations
2268008005	Airport Ground Support Equipment, CNG	Total Itinerant Operations
2270008000	Airport Ground Support Equipment, Diesel	Total Itinerant Operations
2270008005	Airport Ground Support Equipment, Diesel	Total Itinerant Operations
2275001000	Aircraft /Military Aircraft /Total	Itinerant Military Operations
2275020000	Aircraft /Commercial Aircraft /Total: All Types	Itinerant Air Carrier Operations
2275050000	Aircraft /General Aviation /Total	Itinerant General Aviation Operations
2275050011	Aircraft /General Aviation /Piston	Itinerant General Aviation Operations
2275050012	Aircraft /General Aviation /Turbine	Itinerant General Aviation Operations

SCC	SCC Description	FAA Operation Type Used for Growth Factor
2275060000	Aircraft /Air Taxi /Total	Itinerant Air Taxi Operations
2275060011	Aircraft /Air Taxi /Piston	Itinerant Air Taxi Operations
2275060012	Aircraft /Air Taxi /Turbine	Itinerant Air Taxi Operations
2275070000	Aircraft /Aircraft Auxiliary Power Units /Total	Total Itinerant Operations

Exhibit 7.4 summarizes the region-wide growth factors by FAA operation type. The growth factor for individual airports/counties may deviate substantially from these region-wide growth factors.

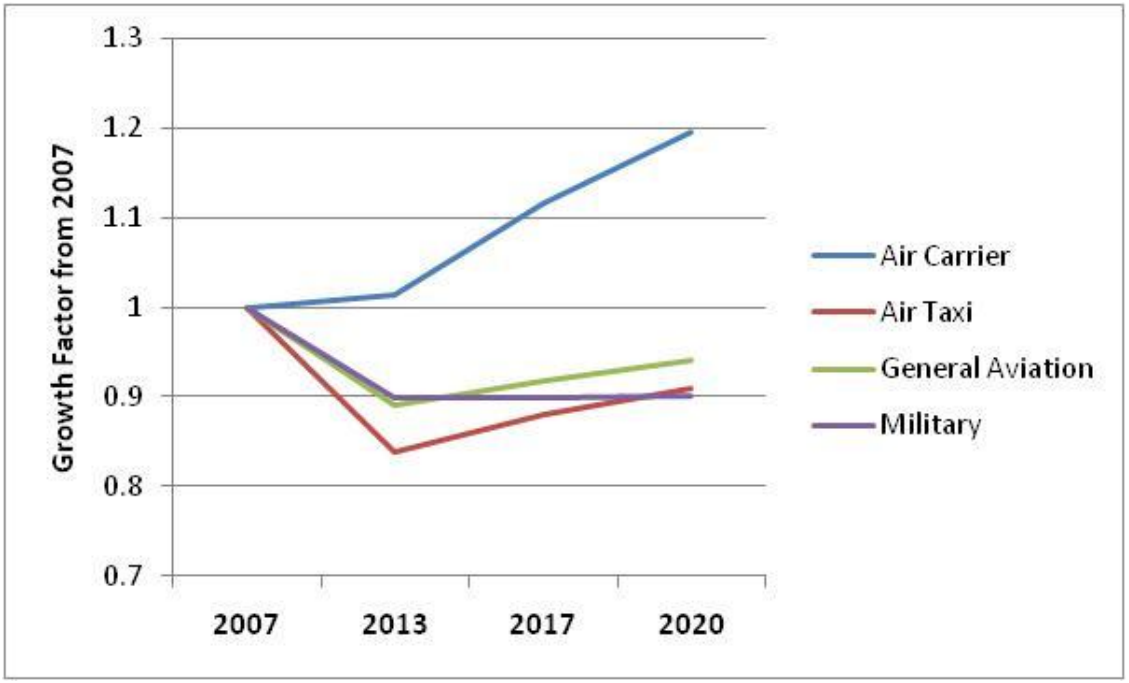


Exhibit 7.4 Region-wide Growth Factors from 2007 by FAA Operations Type

7.2.2 Aircraft Control Factors

The NOx aircraft engine emissions standards adopted by USEPA in November 2005 (USEPA 2005b) were reviewed. The standards are equivalent to the NOx emission standards (adopted in 1999 for implementation beginning in 2004) of the United Nations International Civil Aviation Organization (ICAO), and will bring the United States aircraft standards into alignment with the international standards. The standards apply to new aircraft engines used on commercial aircraft including small regional jets, single-aisle and

twin-aisle aircraft, and 747s and larger aircraft. The standards also apply to general aviation and military aircraft, which sometimes use commercial engines. For example, small regional jet engines are used in executive general aviation aircraft, and larger commercial aircraft engines may be used in military transport aircraft.

Nearly all previously certified or in-production engine models currently meet or perform better than the standards USEPA adopted in the November 2005 rule. In addition, manufacturers have already been developing improved technology in response to the ICAO standards. According to USEPA's recent analysis for the proposed transport rule (USEPA 2010a), this rule is expected to reduce NOx emissions by approximately 2 percent in 2015 and 3 percent in 2020. Because of the relatively small amount of NOx reductions, our aircraft emission projections do not account for this control program.

EPA has also issued an Advance Notice of Proposed Rulemaking (ANPR) on lead emissions from piston-engine aircraft using leaded aviation gasoline (USEPA 2010d). However, this rule has not yet been adopted and co-benefits for criteria air pollutants are likely to be small. Therefore, the effects of this rule were not included in the future-year emissions projections.

7.3 RAILROAD EQUIPMENT

Railroad locomotive engine emissions in the 2007 MARAMA inventory are classified into the following categories:

- Class I line haul locomotives are operated by large freight railroad companies and are used to power freight train operations over long distances (SCC 22-85-002-006);
- Class II/III line haul locomotives are operated by smaller freight railroad companies and are used to power freight train operations over long distances (SCC 22-85-002-007);
- Inter-city passenger train locomotives are operated primarily by Amtrak to provide inter-city passenger transport (SCC 22-85-002-008);
- Independent commuter rail systems operate locomotives provide passenger transport within a metropolitan area (SCC 22-85-002-009); and
- Yard/switch locomotives are used in freight yards to assemble and disassemble trains, or for short hauls of trains that are made up of only a few cars (SCC 22-85-002-010).

7.3.1 Railroad Growth Factors

In March 2008, USEPA finalized a three part program that will dramatically reduce emissions from diesel locomotives of all types -- line-haul, switch, and passenger rail. As part of this work USEPA developed a national emission inventory for calendar years 2002 through 2040. Emission projections methodologies for a baseline and controlled scenario were developed and documented (USEPA 2008c). USEPA used projection data from the AEO2006 (EIA 2006). Table A-7 of AEO2006 showed that freight rail energy use will grow 1.6 percent annually.

More recent growth data is available in the AEO2010 which was published in May 2010. There are separate projections for passenger rail and freight rail energy use. For the MANE VU+VA inventory we relied on the more recent AEO2010 growth projections.

Passenger rail data from AEO2010 Table A-7 was used to calculate the growth factor for 2007-2013 to be 1.046, for 2007-2017 to be 1.121, and for 2007-2020 to be 1.171. These growth factors were applied to inter-city passenger train locomotives (SCC 22-85-002-008) and independent commuter rail systems (SCC 22-85-002-009).

For freight rail, the data from AEO2010 Table A-7 was used to calculate the growth factor for 2007-2013 to be 0.969, for 2007-2017 to be 1.018, and for 2007-2020 to be 1.053. We used the freight rail annual growth factors for Class I line haul (SCC 22-85-002-006), Class II/III line haul (SCC 22-85-002-007), and yard switch (SCC 22-85-002-010) locomotives.

7.3.2 Railroad Control Factors

USEPA developed two scenarios that accounted for both the 2004 nonroad diesel rule and the 2008 diesel locomotive rule:

- The USEPA baseline (pre-control) inventory accounted for
    1. AEO2006 annual growth in fuel use,
    2. The impact of existing regulations for Tier 0, 1, and 2 locomotive engines that take effect in 2008,
    3. The 2004 Clean Air Nonroad Diesel Rule that will decrease allowable levels of sulfur in locomotives fuel beginning in 2012, and
    4. Fleet turnover.
- The USEPA controlled inventory accounted for
    1. AEO2006 annual growth in fuel use,
    2. Reductions included in the baseline inventory, and

3. Reductions from USEPA's 2008 rule Final Locomotive-Marine rule for Tier 3 and 4 engines. This rule lowered diesel sulfur content and tightened emission standards for existing and new locomotives.
4. Voluntary retrofits under the National Clean Diesel Campaign are not included in our projections.

To calculate a factor that accounted for reductions included in the USEPA controlled inventory, it was necessary to first calculate a "growth only" scenario applying USEPA's 1.6% annual growth rate to the 2006 base emissions. Once the growth rate was applied, then a control factor for each pollutant was calculated by dividing the future year controlled emissions by the future year "growth only" emissions.

Exhibit 7.5 shows the control factors for 2017 and 2020 for the five locomotive classifications and pollutants.

Exhibit 7.5 Rail Control Factors by Year, Pollutant, and SCC

Year	NOx	PM10	PM2.5	HC	CO	VOC	SO2
SCC 22-85-002-006 Line Haul Class I Operations							
2017	0.633	0.449	0.449	0.480	1.000	0.480	0.003
2020	0.547	0.364	0.364	0.382	1.000	0.382	0.003
SCC 22-85-002-007 Line Haul Class II / III Operations							
2017	0.960	0.791	0.791	1.000	1.000	1.000	0.003
2020	0.920	0.752	0.752	1.000	1.000	1.000	0.003
SCC 22-85-002-008 Inter-City Passenger							
2017	0.421	0.402	0.402	0.437	0.917	0.437	0.003
2020	0.340	0.294	0.294	0.290	0.895	0.290	0.003
SCC 22-85-002-009 Commuter Rail							
2017	0.421	0.402	0.402	0.437	0.917	0.437	0.003
2020	0.340	0.294	0.294	0.290	0.895	0.290	0.003
SCC 22-85-002-010 Yard / Switch							
2017	0.843	0.712	0.712	0.809	1.000	0.809	0.003
2020	0.771	0.650	0.650	0.726	1.000	0.726	0.003

8.0 SUMMARY OF PROJECTED EMISSIONS

8.1 AREA SOURCE PROJECTED EMISSIONS

Exhibits 8.1 to 8.7 summarize the 2007 and projected future year area source emissions by state for each criteria air pollutant. Seven values are listed for each pollutant:

- 2007 emissions
- 2017 projected emissions with growth only (GO)
- 2017 projected emissions with growth and existing controls (GC)
- 2017 projected emissions with growth, existing and potential new OTC controls (GX)
- 2020 projected emissions with growth only (GO)
- 2020 projected emissions with growth and existing controls (GC)
- 2020 projected emissions with growth, existing and potential new OTC controls (GX)

Detailed summaries by County and SCC are provided on MARAMA's ftp site.

CO emissions in most states decline between 2007 and 2020, primarily due to decreases in residential wood combustion emissions resulting from the turnover to NSPS-compliant wood stoves. The two exceptions are DC and NY, where there is a slight increase in CO emissions from 2007 to 2020. There are no additional reductions expected from potential new OTC control measures.

NH3 emissions are projected to increase in most states between 2007 and 2020. This is due primarily to the growth predicted for fertilizer application on cropland and certain livestock waste products. There are no additional reductions expected from any existing control program or any potential new OTC control measures.

Under the "growth only" scenario, NOx emissions are projected to decline by about 5 percent between 2007 and 2017 due to AEO fuel use projections that generally show decreases in residential, commercial, and industrial fuel consumption. Under the "existing controls" scenario, NOx emissions in 2017 are projected to decrease by about 6.7 percent regionwide from 2007 levels due primarily to RICE MACT controls. Under the "potential new OTC controls" scenario, NOx emissions are projected to decrease by about 17 percent between 2007 and 2017 due to potential new controls on ICI boilers and new, small, natural gas-fired units.

PM10-PRI emissions are projected to increase slightly in all states between 2007 and 2017. Reentrained road dust on paved roads is a large source of PM10-PRI emissions and is directly proportional to the projected increases in VMT on paved roads. These increases from paved road dust are somewhat offset by decreases resulting from the turnover to NSPS-compliant wood stoves and the AEO fuel use projections that generally show

decreases in residential, commercial, and industrial fuel consumption, especially for coal and oil. There are no additional reductions expected from potential new OTC control measures.

PM25-PRI emissions are projected to increase slightly from 2007 to 2020. Increases from paved road dust are somewhat offset by decreases resulting from the turnover to NSPS-compliant wood stoves and the AEO fuel use projections that generally show decreases in residential, commercial, and industrial fuel consumption, especially for coal and oil. There are no additional reductions expected from potential new OTC control measures.

Under the "growth only" scenario, SO2 emissions are projected to decline by about 16 percent between 2007 and 2017 due to AEO fuel use projections that generally show decreases in residential, commercial, and industrial fuel consumption, especially for coal and oil. Under the "existing controls" scenario, SO2 emissions in 2017 are projected to decrease by about 42 percent regionwide from 2007 levels due primarily to low sulfur fuel oil limits in MD, NJ, and NY. Under the "potential new OTC controls" scenario, SO2 emissions are projected to decrease by about 68 percent between 2007 and 2017 due to the potential implementation of low sulfur fuel oil limits in other MANE-VU states.

Under the "growth only" scenario, VOC emissions are projected to decrease slightly due to the turnover to NSPS-compliant wood stoves and the turnover over of vehicles equipped with on-board vapor recovery canisters. Under the "existing controls" scenario, VOC emissions in 2017 are projected to decrease by about 10 percent regionwide from 2007 levels due implementation of various OTC control measures in multiple states. Under the "potential new OTC controls" scenario, VOC emissions are projected to decrease by about 15 percent between 2007 and 2017 due to the continued implementation of both OTC control measures.

Exhibit 8.1 2007 and Projected Future Year Area Source CO Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	41,496	38,245	38,161	38,161	37,352	37,266	37,266
DE	8,266	7,961	7,881	7,881	7,857	7,776	7,776
DC	5,488	5,319	5,247	5,247	5,274	5,200	5,200
ME	50,496	47,290	47,266	47,266	46,359	46,337	46,337
MD	74,188	72,896	72,631	72,631	72,501	72,231	72,231
MA	79,226	75,912	75,482	75,482	75,073	74,626	74,626
NH	39,677	37,470	37,405	37,405	36,883	36,816	36,816
NJ	77,687	74,444	73,562	73,562	73,298	72,406	72,406
NY	205,055	218,875	218,374	218,374	223,510	223,021	223,021
PA	217,079	205,020	203,489	203,489	202,084	200,507	200,507
RI	15,419	14,391	14,308	14,308	14,097	14,011	14,011
VT	51,109	46,595	46,551	46,551	45,288	45,243	45,243
VA	132,098	129,923	129,479	129,479	129,390	128,937	128,937
	997,285	**974,342**	**969,836**	**969,836**	**968,966**	**964,377**	**964,377**

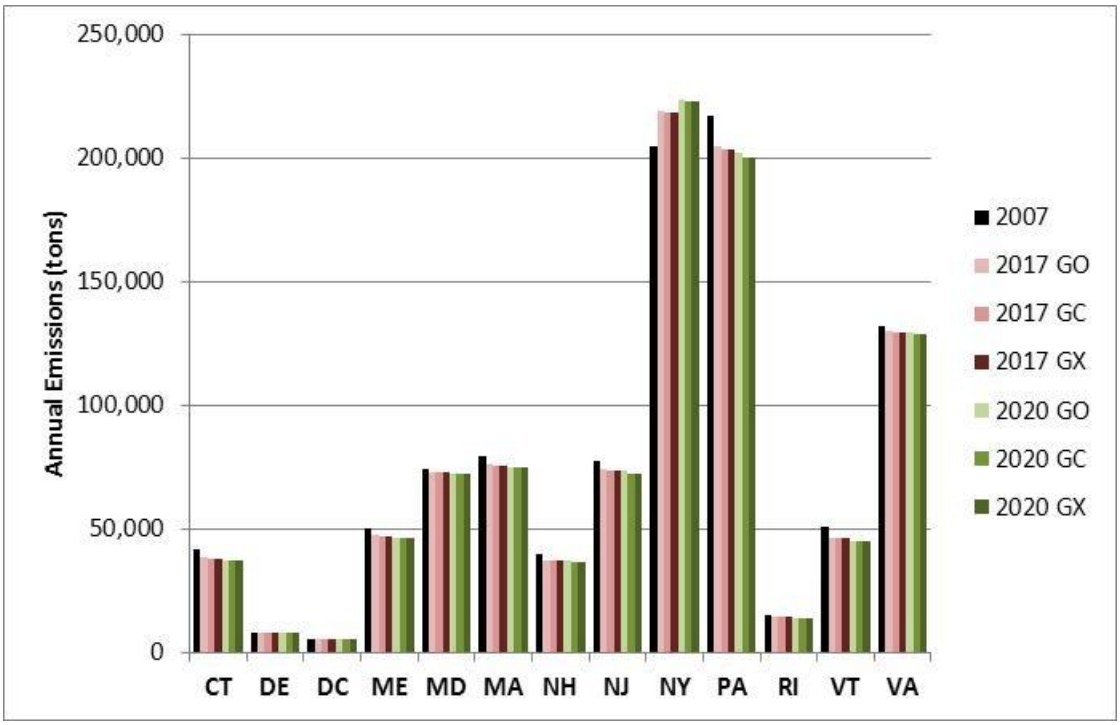


Exhibit 8.2 2007 and Projected Future Year Area Source NH3 Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	4,421	4,451	4,451	4,451	4,476	4,476	4,476
DE	12,382	15,233	15,233	15,233	15,924	15,924	15,924
DC	183	188	188	188	191	191	191
ME	5,736	6,203	6,203	6,203	6,337	6,337	6,337
MD	26,006	26,081	26,081	26,081	26,102	26,102	26,102
MA	13,791	13,913	13,913	13,913	13,996	13,996	13,996
NH	1,500	1,528	1,528	1,528	1,534	1,534	1,534
NJ	15,736	16,375	16,375	16,375	16,593	16,593	16,593
NY	45,693	46,221	46,221	46,221	46,368	46,368	46,368
PA	72,569	77,383	77,383	77,383	78,550	78,550	78,550
RI	625	629	629	629	636	636	636
VT	8,013	8,013	8,013	8,013	8,013	8,013	8,013
VA	43,394	45,862	45,862	45,862	46,434	46,434	46,434
	250,049	**262,079**	**262,079**	**262,079**	**265,152**	**265,152**	**265,152**

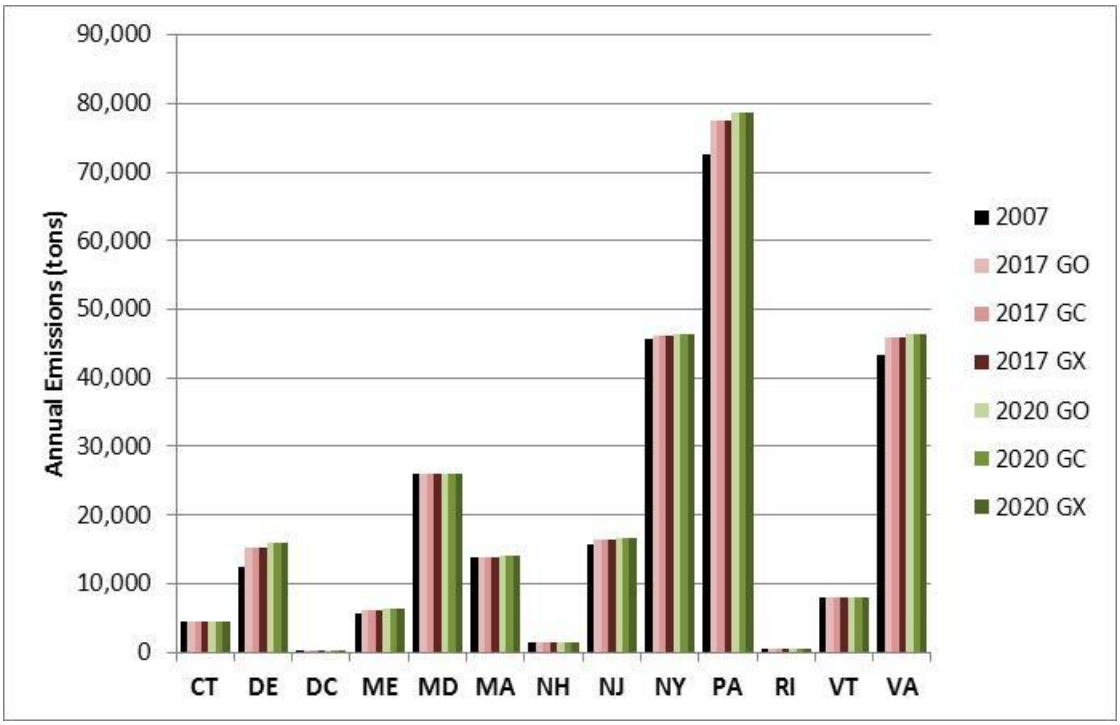


Exhibit 8.3 2007 and Projected Future Year Area Source NOx Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	12,421	11,278	11,101	9,747	11,232	11,049	9,560
DE	2,237	2,292	2,210	1,796	2,300	2,218	1,768
DC	1,547	1,620	1,560	1,318	1,654	1,592	1,325
ME	6,656	5,960	5,960	5,734	5,851	5,851	5,633
MD	10,312	11,148	10,948	9,887	11,389	11,185	9,978
MA	20,252	19,316	18,984	16,730	19,498	19,151	16,638
NH	4,737	4,196	4,152	3,761	4,156	4,111	3,699
NJ	24,175	24,662	23,331	22,727	24,685	23,339	22,310
NY	72,053	63,961	63,711	55,057	63,337	63,082	53,872
PA	47,545	47,179	45,925	37,636	47,613	46,318	37,392
RI	3,469	3,370	3,301	2,830	3,400	3,329	2,788
VT	3,996	3,667	3,641	3,305	3,672	3,645	3,302
VA	19,056	18,704	18,411	18,411	18,821	18,520	18,520
	228,457	**217,352**	**213,235**	**188,939**	**217,608**	**213,387**	**186,784**

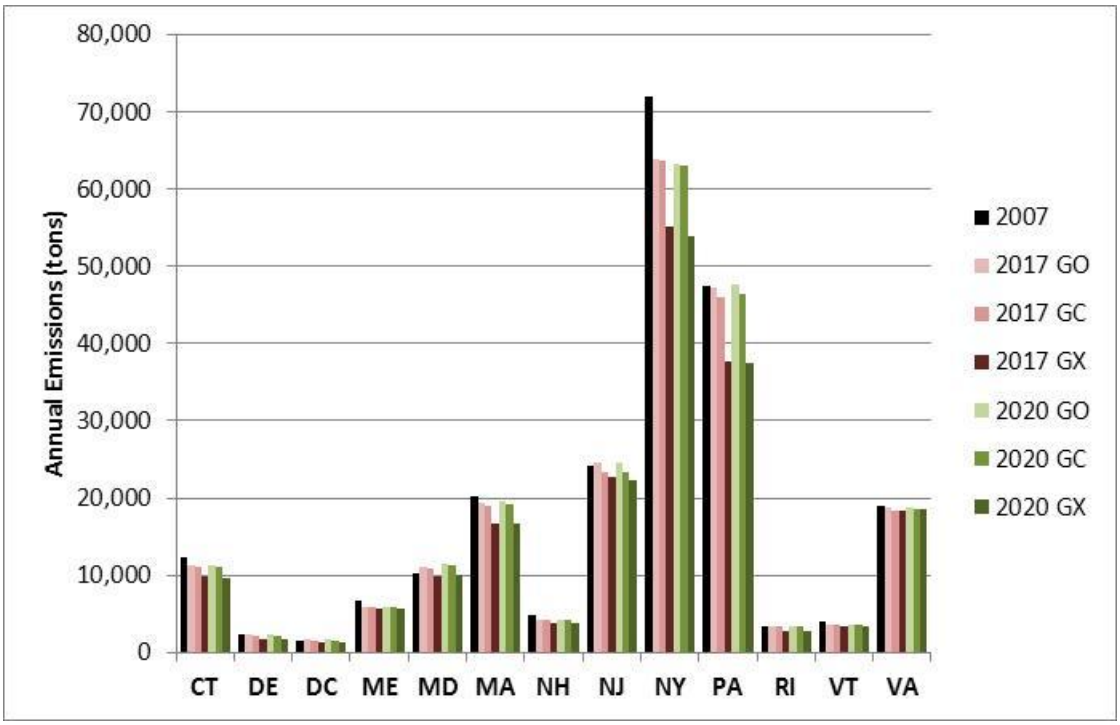


Exhibit 8.4 2007 and Projected Future Year Area Source PM10-PRI Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	30,577	31,061	31,052	31,052	31,224	31,214	31,214
DE	10,499	11,169	11,168	11,168	11,675	11,675	11,675
DC	4,873	5,078	5,077	5,077	5,141	5,141	5,141
ME	54,445	54,438	54,431	54,431	54,995	54,988	54,988
MD	72,454	78,559	78,555	78,555	80,345	80,340	80,340
MA	148,756	148,471	148,459	148,459	148,577	148,564	148,564
NH	27,742	28,916	28,912	28,912	29,420	29,416	29,416
NJ	39,140	41,202	41,189	41,189	42,104	42,090	42,090
NY	272,674	291,578	291,476	291,476	297,738	297,639	297,639
PA	287,998	295,026	295,006	295,006	298,020	298,001	298,001
RI	11,361	12,151	12,150	12,150	12,395	12,394	12,394
VT	47,993	47,675	47,671	47,671	47,823	47,819	47,819
VA	183,341	188,240	188,211	188,211	190,126	190,097	190,097
	1,191,853	**1,233,566**	**1,233,356**	**1,233,356**	**1,249,581**	**1,249,377**	**1,249,377**

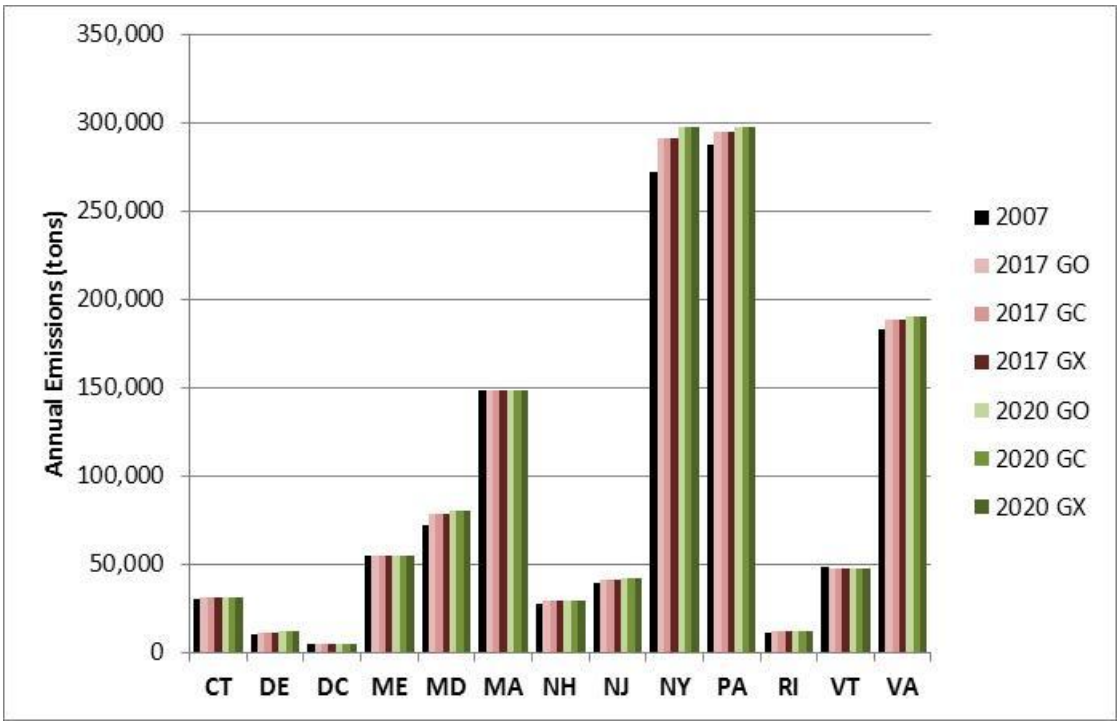


Exhibit 8.5 2007 and Projected Future Year Area Source PM25-PRI Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	10,606	10,298	10,290	10,290	10,225	10,217	10,217
DE	3,031	3,131	3,131	3,131	3,212	3,212	3,212
DC	1,542	1,560	1,560	1,560	1,567	1,566	1,566
ME	12,526	12,068	12,062	12,062	12,005	11,999	11,999
MD	19,789	20,888	20,884	20,884	21,206	21,201	21,201
MA	30,438	29,955	29,945	29,945	29,893	29,883	29,883
NH	8,623	8,602	8,598	8,598	8,637	8,633	8,633
NJ	18,299	18,453	18,441	18,441	18,579	18,568	18,568
NY	63,906	68,492	68,408	68,408	70,080	70,000	70,000
PA	73,514	73,070	73,054	73,054	73,243	73,227	73,227
RI	3,896	3,923	3,922	3,922	3,937	3,936	3,936
VT	13,106	12,596	12,593	12,593	12,520	12,517	12,517
VA	44,102	44,872	44,851	44,851	45,237	45,216	45,216
	303,378	**307,908**	**307,739**	**307,739**	**310,340**	**310,175**	**310,175**

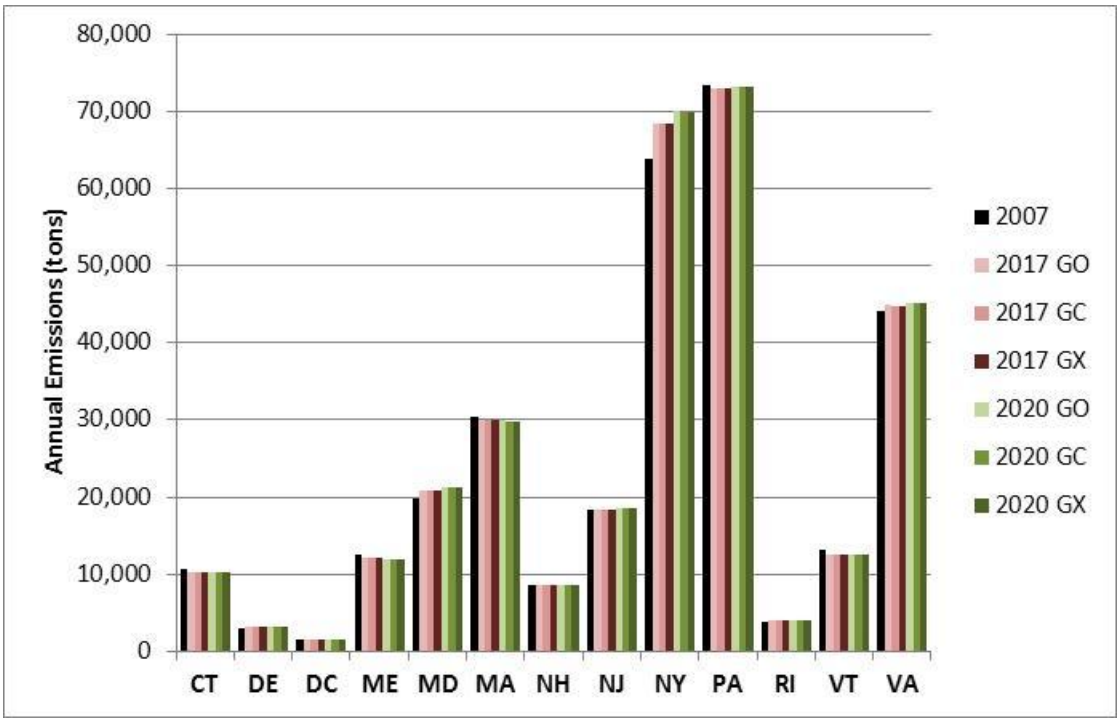


Exhibit 8.6 2007 and Projected Future Year Area Source SO2 Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	16,083	12,943	12,943	3,325	12,401	12,401	838
DE	1,144	946	946	107	911	911	106
DC	1,241	995	995	181	953	953	23
ME	9,812	7,870	7,870	1,450	7,609	7,609	200
MD	5,960	6,566	1,674	1,674	6,745	1,704	1,704
MA	19,859	15,996	15,996	4,093	15,357	15,357	1,391
NH	5,283	4,176	4,176	804	3,991	3,991	147
NJ	8,811	7,423	706	706	7,090	704	704
NY	70,044	58,753	11,651	11,651	57,030	11,670	11,670
PA	66,584	55,878	55,878	32,309	55,018	55,018	32,278
RI	3,897	3,222	3,222	1,270	3,108	3,108	491
VT	3,752	3,158	3,158	1,654	3,085	3,085	634
VA	17,098	14,880	14,880	14,880	14,616	14,616	14,616
	229,569	**192,807**	**134,097**	**74,104**	**187,914**	**131,127**	**64,803**

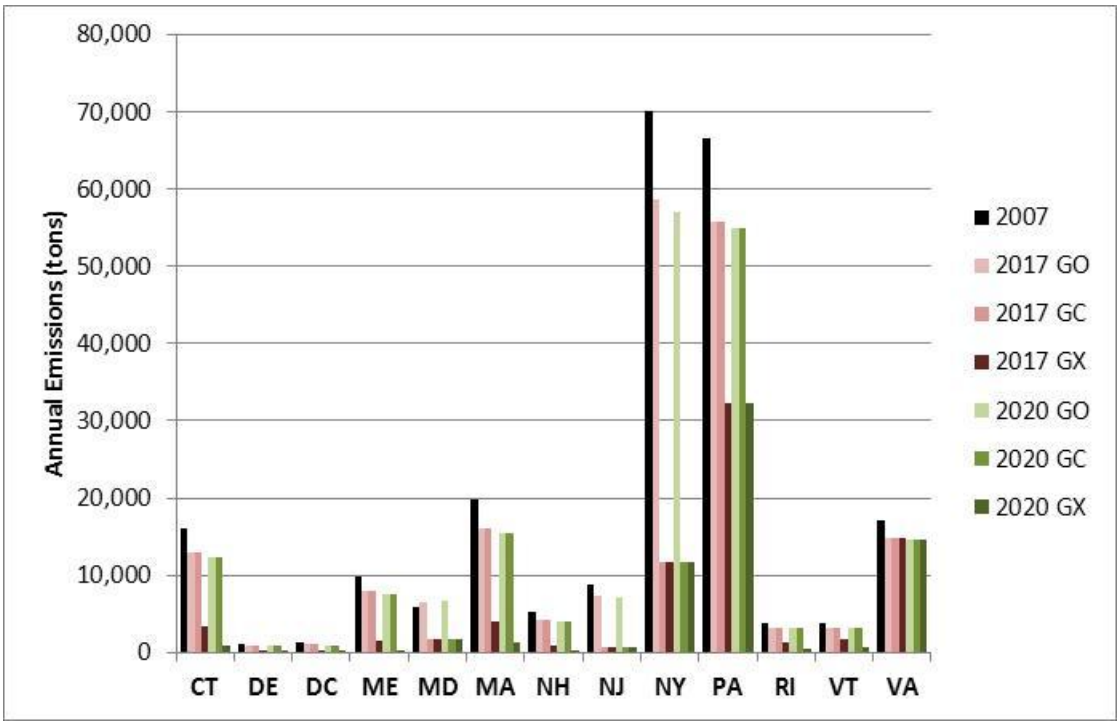
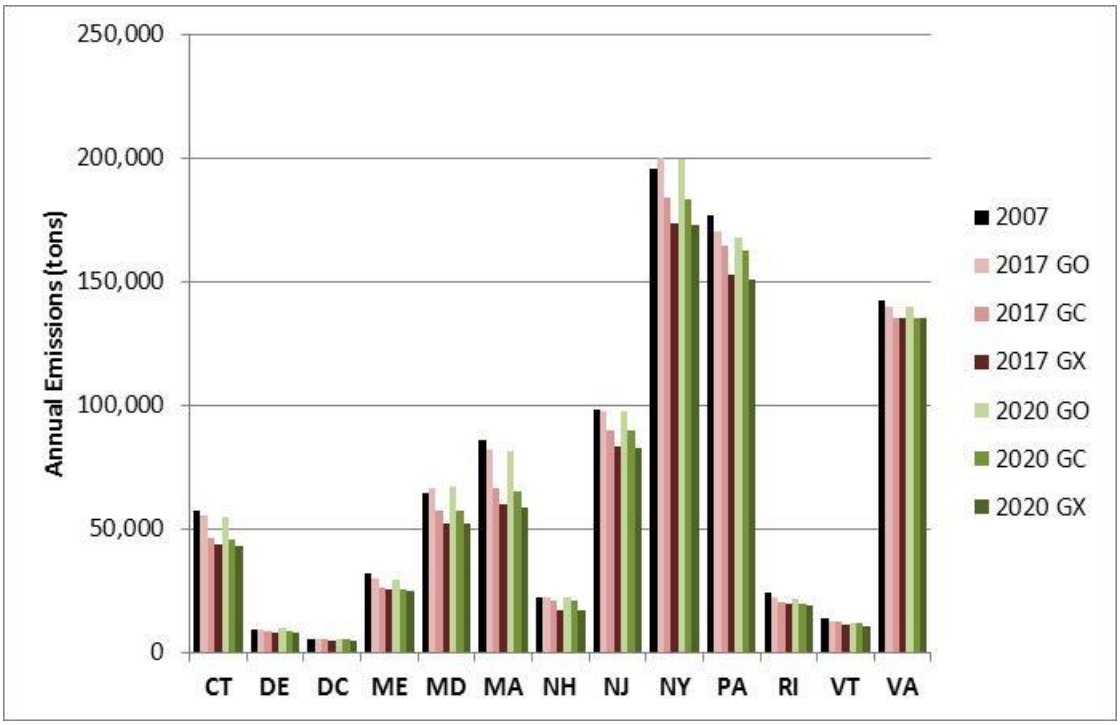


Exhibit 8.7 2007 and Projected Future Year Area Source VOC Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	57,253	55,386	46,364	43,764	54,857	45,849	43,229
DE	9,482	9,525	8,631	7,910	9,596	8,673	7,930
DC	5,568	5,540	5,324	4,932	5,591	5,369	4,965
ME	31,966	29,957	26,113	25,412	29,422	25,631	24,931
MD	64,429	66,399	57,045	52,018	66,825	57,042	51,901
MA	85,870	82,334	66,211	59,886	81,373	65,306	58,945
NH	22,343	22,117	20,894	17,258	22,041	20,807	17,164
NJ	98,121	97,769	89,972	83,323	97,551	89,699	82,956
NY	195,976	199,975	184,269	173,703	199,522	183,721	173,081
PA	176,781	170,123	164,863	153,166	167,744	162,374	150,596
RI	24,214	22,319	20,292	19,603	21,796	19,750	19,053
VT	14,108	12,516	12,311	10,972	12,127	11,904	10,561
VA	142,218	139,719	135,379	135,379	139,631	135,002	135,002
	928,330	**913,678**	**837,668**	**787,325**	**908,077**	**831,128**	**780,314**



8.2 NONEGU POINT SOURCE PROJECTED EMISSIONS

Exhibits 8.8 to 8.14 summarize the 2007 and projected future year area source emissions by state for each criteria air pollutant. Seven values are listed for each pollutant:

- 2007 emissions
- 2017 projected emissions with growth only (GO)
- 2017 projected emissions with growth and existing controls (GC)
- 2017 projected emissions with growth, existing and potential new OTC controls (GX)
- 2020 projected emissions with growth only (GO)
- 2020 projected emissions with growth and existing controls (GC)
- 2020 projected emissions with growth, existing and potential new OTC controls (GX)

Detailed summaries by County and SCC are provided on MARAMA's ftp site.

Regionwide, CO emissions increase slightly between 2007 and 2020. Maryland shows a significant decline due to a source closure. Maine, New Hampshire, and Vermont show significant increases due to projected increases in nonEGU wood combustion. There are no additional reductions expected from potential new OTC control measures.

NH3 emissions are projected to increase slightly between 2007 and 2020. There are no additional reductions expected from any existing control program or any potential new OTC control measures.

Under the "growth only" scenario, regional NOx emissions are projected to increase by about 12 percent from 2007 to 2017. This is due partially to the projected increases in fuel consumption and the addition of ERCs to the inventory. Under the "existing controls" scenario, NOx emissions are projected to be about 2 percent lower in 2017 than in 2007 because of petroleum refinery enforcement settlements; source shutdowns; ICI boiler controls in New Hampshire, New Jersey, and New York; and additional controls on glass furnace and cement kilns. Under the "potential new OTC controls" scenario, NOx emissions are projected to be about 5 percent lower in 2017 than in 2007 because of ICI boiler controls in additional states.

Under the "growth only" scenario, regional PM10-PRI and PM2.5-PRI emissions are projected to increase slightly. Under the "existing controls" scenario, PM10-PRI and PM2.5-PRI are project to be about 5 percent lower in 2017 than in 2007 due primarily to reductions the ICI boiler MACT standard and source closures. There are no additional reductions expected from potential new OTC control measures.

Under the "growth only" scenario, regional SO2 emissions are projected to remain relatively constant from 2007 to 2017. Under the "existing controls" scenario, SO2

emissions are projected to be about 5 percent lower in 2017 than in 2007 because of petroleum refinery enforcement settlements; source shutdowns; and low sulfur fuel oil requirements in Maryland, New Jersey, and New York. Under the "potential new OTC controls" scenario, SO2 emissions are projected to be about 8 percent lower in 2017 than in 2007 because of low sulfur fuel oil limits in additional states. SO2 emission are projected to be about 12 percent lower in 2020 than in 2007 because of additional low sulfur fuel oil limits in outer zone states that are projected to take effect in 2018..

VOC emissions are projected to increase slightly between 2007 and 2020 under the "growth only" scenario due primarily to the inclusion of ERCs in the future year inventories. Under the "existing controls" scenario, VOC emissions are projected to be less than 1 percent lower in 2017 than in 2007, with reductions resulting from the RICE MACT standard and OTC adhesives application rule. Under the "potential new OTC controls" scenario, VOC emissions are projected to be about 1.5 percent lower in 2017 than in 2007 due to the projected implementation of the OTC rule on large storage tanks.

Exhibit 8.8 2007 and Projected Future Year NonEGU CO Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	2,583	3,067	3,041	3,041	3,197	3,171	3,171
DE	7,027	7,300	7,271	7,271	7,320	7,292	7,292
DC	301	335	327	327	338	330	330
ME	14,023	20,975	20,941	20,941	21,238	21,204	21,204
MD	77,574	68,273	68,221	68,221	68,323	68,268	68,268
MA	4,592	5,999	5,919	5,919	6,165	6,082	6,082
NH	2,255	4,977	4,975	4,975	5,084	5,081	5,081
NJ	6,907	7,227	7,151	7,151	7,323	7,246	7,246
NY	52,877	54,959	54,646	54,646	55,439	55,115	55,115
PA	80,540	84,178	83,211	83,211	84,799	83,800	83,800
RI	1,051	873	870	870	940	937	937
VT	702	1,242	1,242	1,242	1,294	1,294	1,294
VA	63,079	67,090	65,740	65,740	67,833	66,212	66,212
	313,512	**326,496**	**323,556**	**323,556**	**329,293**	**326,031**	**326,031**

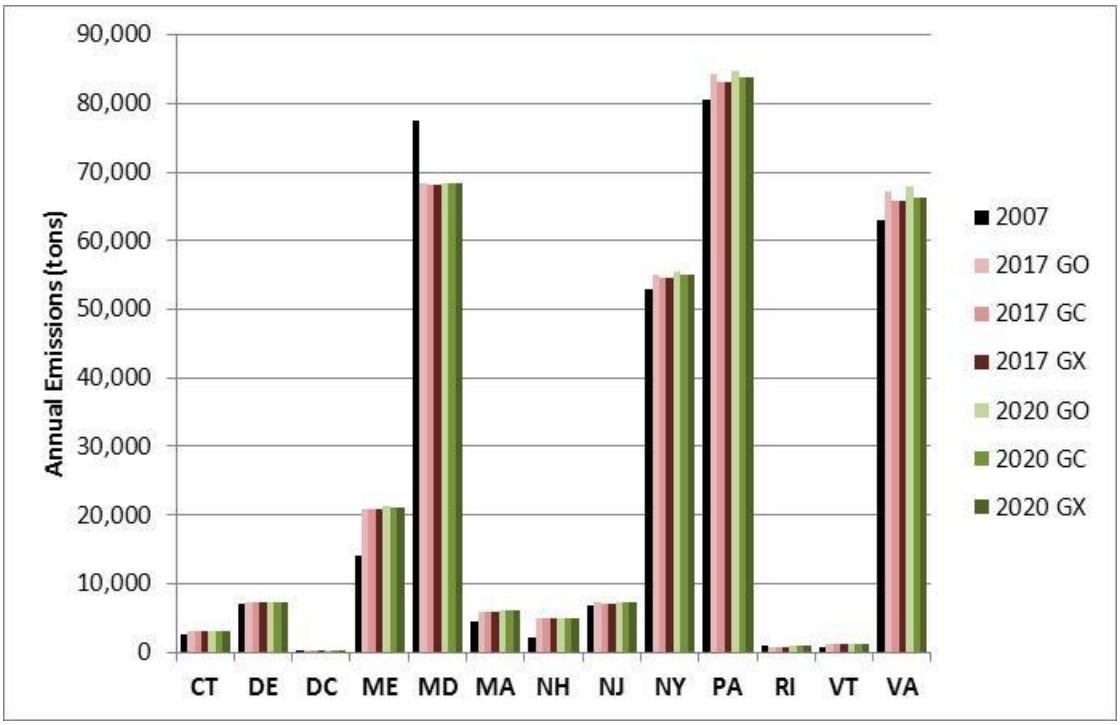


Exhibit 8.9 2007 and Projected Future Year NonEGU NH3 Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	0	0	0	0	0	0	0
DE	62	63	58	58	63	58	58
DC	0	0	0	0	0	0	0
ME	605	588	585	585	569	566	566
MD	137	137	137	137	137	137	137
MA	365	353	353	353	357	357	357
NH	30	36	36	36	36	36	36
NJ	208	216	216	216	219	219	219
NY	1,064	1,083	1,083	1,083	1,086	1,086	1,086
PA	2,070	2,111	2,111	2,111	2,119	2,119	2,119
RI	16	13	13	13	13	13	13
VT	0	0	0	0	0	0	0
VA	1,618	1,698	1,698	1,698	1,709	1,709	1,709
	6,175	**6,298**	**6,290**	**6,290**	**6,307**	**6,300**	**6,300**

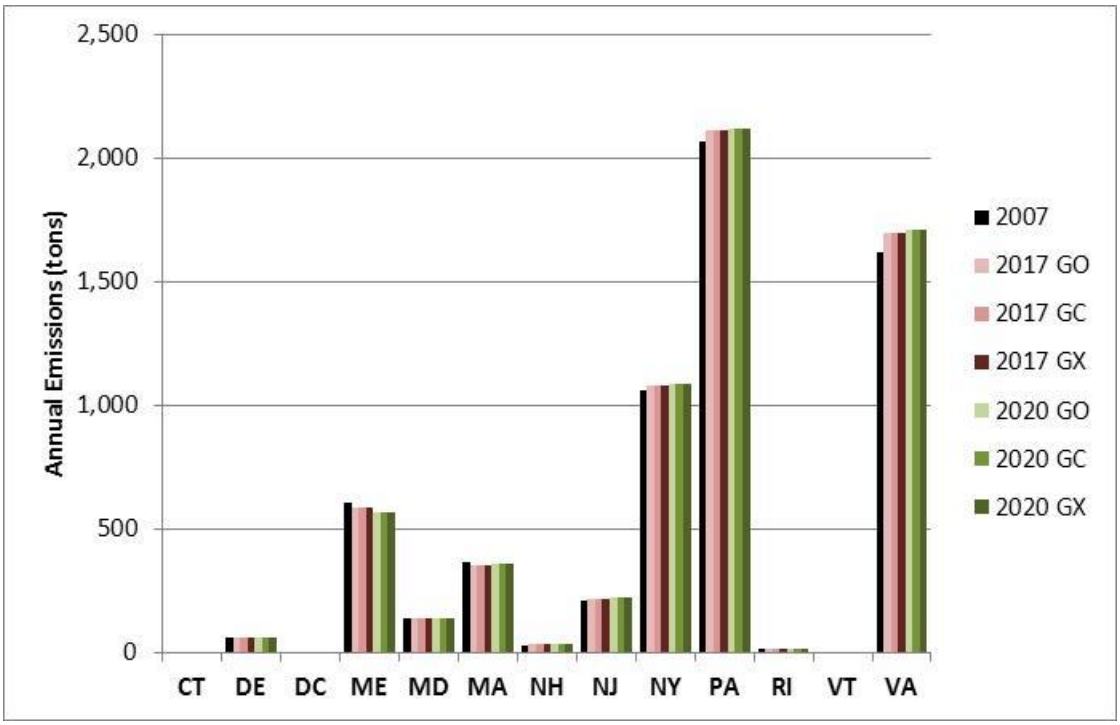


Exhibit 8.10 2007 and Projected Future Year NonEGU NOx Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	6,302	8,949	8,913	8,531	9,336	9,297	8,900
DE	5,122	4,774	3,328	2,861	4,652	3,271	2,796
DC	734	844	779	598	860	792	609
ME	17,050	20,527	20,398	19,272	20,573	20,447	19,332
MD	23,472	28,520	26,322	25,197	28,694	26,496	25,353
MA	12,872	15,011	14,797	13,238	15,525	15,298	13,695
NH	2,687	5,529	3,388	3,277	5,642	3,467	3,356
NJ	13,517	14,880	11,879	11,879	15,155	12,092	12,092
NY	35,583	38,125	27,632	27,632	38,686	28,080	28,080
PA	71,382	76,378	63,904	61,046	77,220	62,606	59,691
RI	950	857	854	720	868	862	727
VT	441	791	791	743	808	808	761
VA	50,265	53,919	53,236	53,236	54,476	53,591	53,591
	240,378	**269,103**	**236,221**	**228,228**	**272,496**	**237,107**	**228,984**

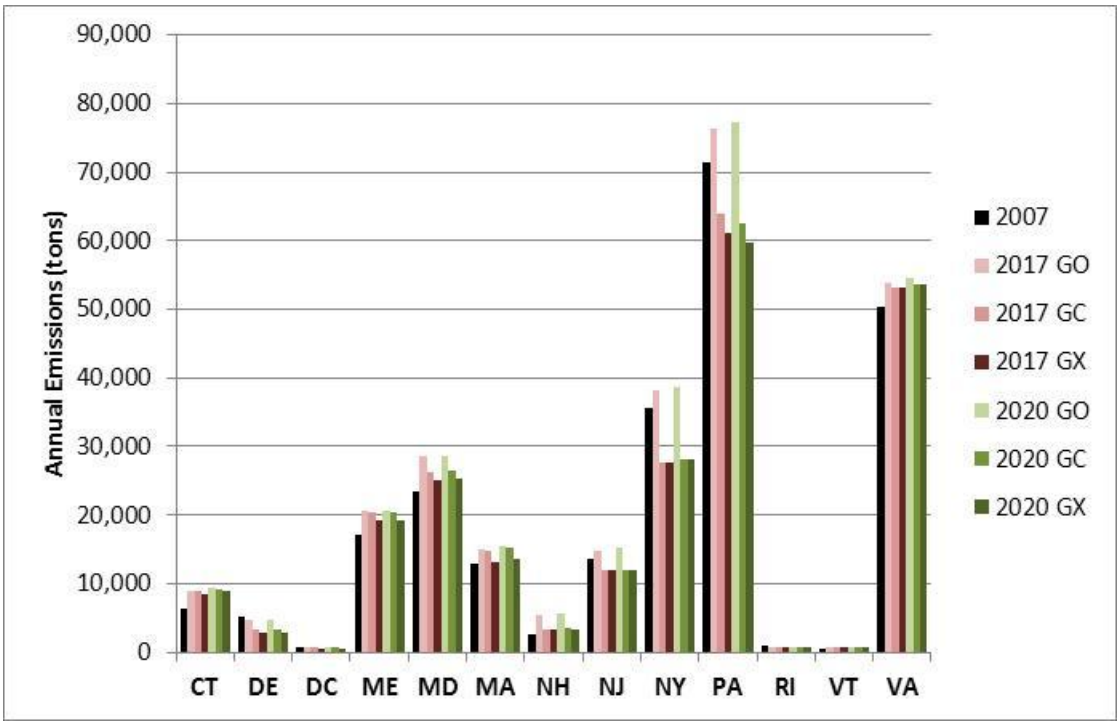


Exhibit 8.11 2007 and Projected Future Year NonEGU PM10-PRI Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	645	702	594	594	717	609	609
DE	1,197	1,140	973	973	1,115	947	947
DC	46	52	29	29	53	30	30
ME	4,748	4,667	4,475	4,475	4,636	4,449	4,449
MD	5,711	6,177	5,498	5,498	6,181	5,502	5,502
MA	3,029	2,927	2,904	2,904	2,977	2,953	2,953
NH	1,141	1,259	1,258	1,258	1,270	1,269	1,269
NJ	3,147	3,381	3,331	3,331	3,444	3,392	3,392
NY	4,463	4,572	4,260	4,260	4,595	4,283	4,283
PA	22,275	22,832	20,891	20,891	22,937	20,996	20,996
RI	173	174	174	174	179	179	179
VT	146	128	128	128	128	128	128
VA	13,028	13,419	12,517	12,517	13,507	12,602	12,602
	59,749	**61,430**	**57,032**	**57,032**	**61,741**	**57,339**	**57,339**

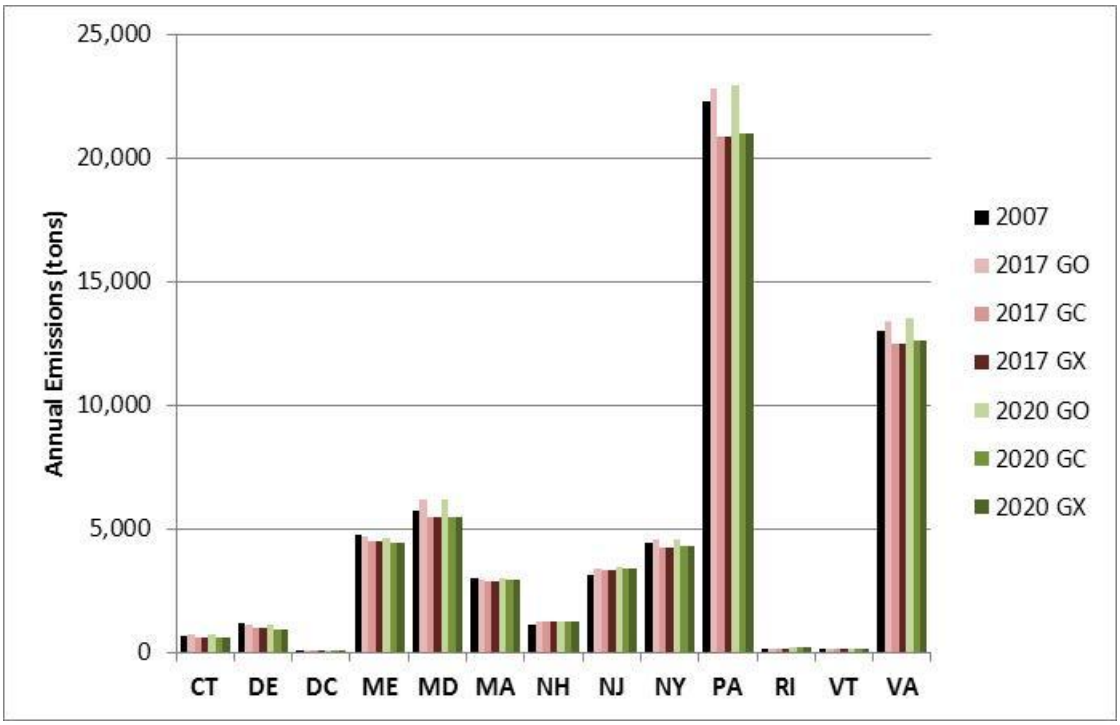


Exhibit 8.12 2007 and Projected Future Year NonEGU PM25-PRI Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	573	627	526	526	641	540	540
DE	1,083	1,021	876	876	993	848	848
DC	43	48	28	28	48	29	29
ME	3,727	3,811	3,658	3,658	3,802	3,653	3,653
MD	3,876	4,328	3,764	3,764	4,336	3,772	3,772
MA	2,572	2,495	2,485	2,485	2,542	2,532	2,532
NH	1,061	1,169	1,169	1,169	1,179	1,179	1,179
NJ	2,452	2,583	2,533	2,533	2,625	2,574	2,574
NY	2,415	2,517	2,329	2,329	2,538	2,350	2,350
PA	13,389	13,851	12,729	12,729	13,934	12,845	12,845
RI	124	124	124	124	128	128	128
VT	114	98	98	98	97	97	97
VA	10,296	10,611	9,885	9,885	10,674	9,947	9,947
	41,726	**43,281**	**40,204**	**40,204**	**43,538**	**40,492**	**40,492**

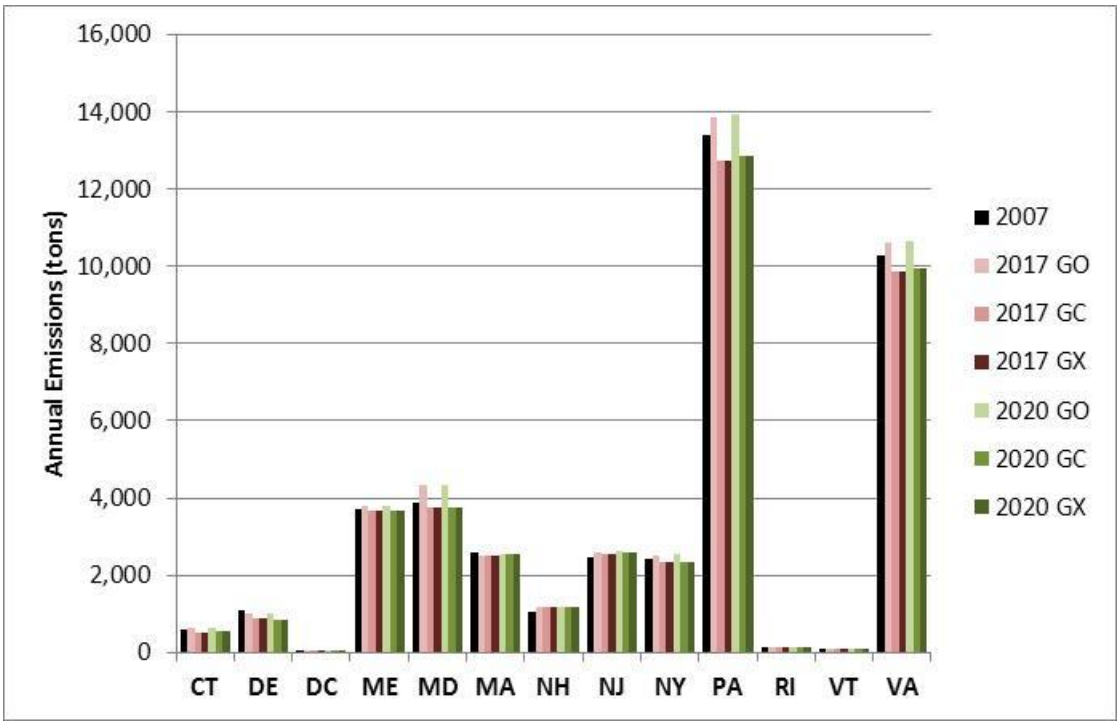


Exhibit 8.13 2007 and Projected Future Year NonEGU SO2 Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	3,185	3,236	3,236	3,117	3,253	3,253	2,773
DE	8,206	7,883	6,541	5,598	7,703	6,357	5,378
DC	471	510	380	358	518	382	337
ME	15,571	13,194	12,678	12,462	13,049	12,545	6,510
MD	31,176	36,658	34,278	34,278	36,636	34,289	34,289
MA	9,057	8,259	8,041	7,592	8,254	8,041	5,192
NH	2,734	2,655	2,655	2,582	2,658	2,658	1,030
NJ	3,401	3,736	2,591	2,591	3,818	2,645	2,645
NY	44,307	44,712	42,072	42,072	44,792	42,150	42,150
PA	57,330	58,464	53,489	49,814	58,627	53,652	49,975
RI	1,501	1,415	1,415	1,321	1,437	1,437	1,002
VT	316	248	248	243	243	243	92
VA	54,486	55,328	52,044	52,044	55,623	52,338	52,338
	231,742	**236,297**	**219,668**	**214,071**	**236,610**	**219,988**	**203,710**

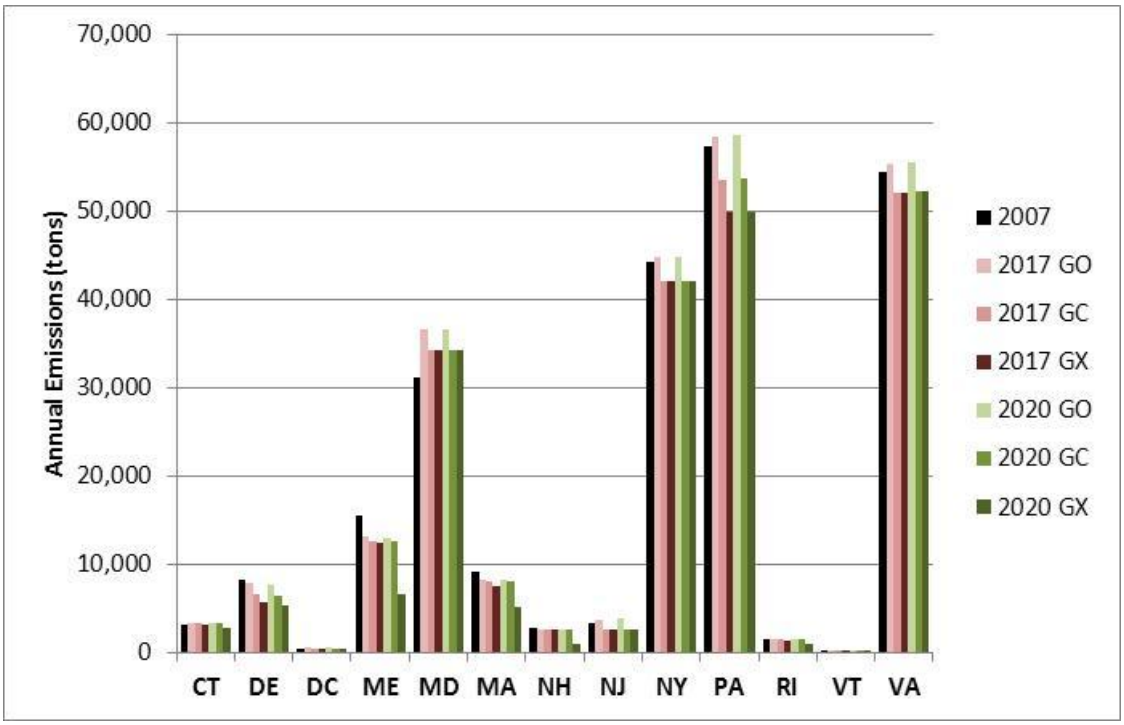
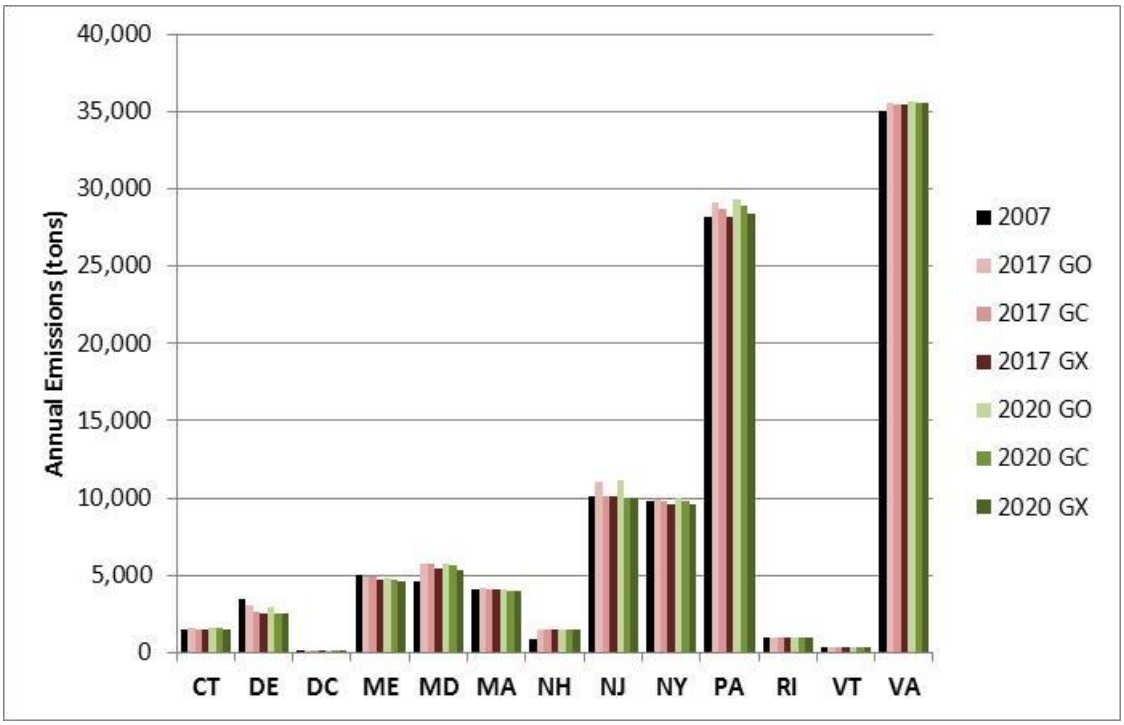


Exhibit 8.14 2007 and Projected Future Year NonEGU VOC Emissions (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	1,447	1,547	1,530	1,468	1,574	1,556	1,476
DE	3,406	3,068	2,588	2,547	2,972	2,572	2,530
DC	58	60	59	59	60	59	59
ME	4,987	4,931	4,885	4,745	4,760	4,718	4,559
MD	4,598	5,745	5,715	5,466	5,707	5,677	5,367
MA	4,094	4,156	4,102	4,057	4,077	4,022	3,965
NH	807	1,490	1,489	1,448	1,479	1,478	1,440
NJ	10,106	11,044	10,086	10,086	11,180	10,041	10,041
NY	9,772	9,948	9,815	9,640	9,985	9,849	9,635
PA	28,195	29,153	28,712	28,236	29,376	28,925	28,396
RI	922	950	945	919	967	963	930
VT	373	316	316	316	302	302	302
VA	35,018	35,538	35,461	35,461	35,670	35,593	35,593
	103,783	**107,947**	**105,705**	**104,450**	**108,110**	**105,755**	**104,292**



8.3 NONROAD NMIM SOURCE PROJECT EMISSIONS

Exhibits 8.15 to 8.21 summarize the 2007 and projected emissions for NONROAD model sources by state for each criteria air pollutant. Seven values are listed for each pollutant:

- 2007 emissions
- 2017 projected emissions with growth only (GO)
- 2017 projected emissions with growth and existing controls (GC)
- 2017 projected emissions with growth, existing and potential new OTC controls (GX)
- 2020 projected emissions with growth only (GO)
- 2020 projected emissions with growth and existing controls (GC)
- 2020 projected emissions with growth, existing and potential new OTC controls (GX)

Detailed summaries by County and SCC are provided on MARAMA's ftp site.

It is not possible to isolate the emission changes due to growth versus the emission changes due to future controls in a single NMIM run. Therefore, the emissions under the growth only (GO) and growth and existing controls (GC) scenarios are the same. There are currently no potential new OTC control measures for sources whose emissions are estimated by the NONROAD model. Therefore, the emissions under the growth and existing controls (GC) and with growth, existing and potential new OTC controls (GX) scenarios are the same.

Exhibit 8.15 presents a state-level comparison of 2007, 2017 and 2020 annual CO emissions for NMIM/NONROAD sources. Emissions decrease by about 21% between 2007 and 2013, but remain relatively flat from 2017 to 2020.

Exhibit 8.16 shows that annual NH3 emissions are very small relative to other source sectors (e.g., agricultural ammonia) and generally increase slightly from 2007 to 2020.

Exhibit 8.17 shows that annual NOx emissions decrease by about 42% between 2007 and 2020 and by about 49% between 2007 and 2020 due to the turnover to newer engines subject to more stringent national emission standards.

Exhibits 8.18 and 8.19 shows that PM10-PRI and PM25-PRI emissions decrease about 33% between 2007 and 2020 and by about 41% between 2007 and 2020.

Exhibit 8.20 shows that annual SO2 emissions are virtually eliminated by 2017 due to lower national limits on the sulfur content of nonroad diesel fuel.

Exhibit 8.21 shows that annual VOC emissions decrease by about 41% between 2007 and 2020 and by about 46% between 2007 and 2020 due to the turnover to newer engines subject to more stringent national emission standards.

Exhibit 8.15 2007/2013/2017/2020 NMIM/NONROAD CO Emissions by State (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	181,817	143,586	143,586	143,586	147,193	147,193	147,193
DE	55,173	40,188	40,188	40,188	40,703	40,703	40,703
DC	14,319	10,246	10,246	10,246	10,322	10,322	10,322
ME	131,319	92,029	92,029	92,029	90,629	90,629	90,629
MD	297,832	247,766	247,766	247,766	254,083	254,083	254,083
MA	324,793	240,812	240,812	240,812	246,540	246,540	246,540
NH	90,461	73,012	73,012	73,012	73,294	73,294	73,294
NJ	445,302	362,054	362,054	362,054	372,857	372,857	372,857
NY	911,813	716,153	716,153	716,153	730,897	730,897	730,897
PA	719,517	533,798	533,798	533,798	542,133	542,133	542,133
RI	54,028	35,863	35,863	35,863	36,713	36,713	36,713
VT	52,497	35,978	35,978	35,978	35,608	35,608	35,608
VA	415,093	335,531	335,531	335,531	341,458	341,458	341,458
	3,693,965	**2,867,016**	**2,867,016**	**2,867,016**	**2,922,431**	**2,922,431**	**2,922,431**

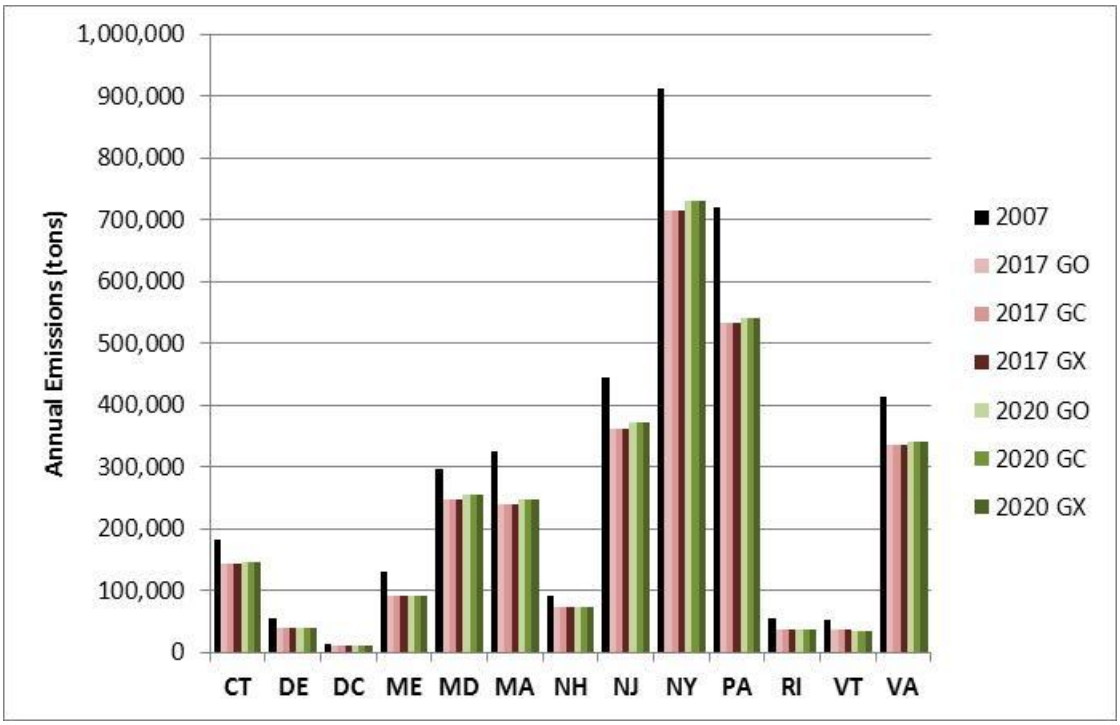


Exhibit 8.16 2007/2013/2017/2020 NMIM/NONROAD NH3 Emissions by State (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	16	20	20	20	21	21	21
DE	6	6	6	6	7	7	7
DC	3	3	3	3	3	3	3
ME	13	15	15	15	15	15	15
MD	29	35	35	35	37	37	37
MA	28	34	34	34	36	36	36
NH	10	12	12	12	13	13	13
NJ	40	47	47	47	50	50	50
NY	83	99	99	99	105	105	105
PA	60	71	71	71	74	74	74
RI	5	5	5	5	5	5	5
VT	5	6	6	6	6	6	6
VA	45	53	53	53	55	55	55
	342	**405**	**405**	**405**	**427**	**427**	**427**

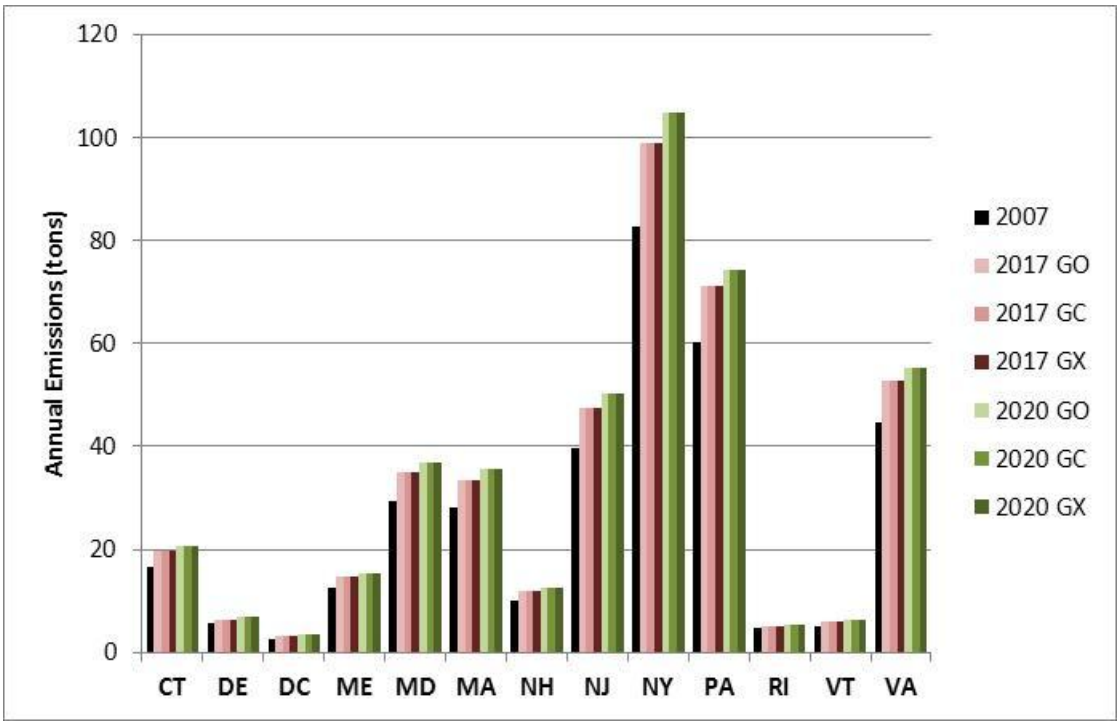


Exhibit 8.17 2007/2013/2017/2020 NMIM/NONROAD NOx Emissions by State (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	16,056	8,748	8,748	8,748	7,786	7,786	7,786
DE	4,998	3,096	3,096	3,096	2,723	2,723	2,723
DC	2,788	1,534	1,534	1,534	1,250	1,250	1,250
ME	7,439	5,216	5,216	5,216	4,783	4,783	4,783
MD	25,726	15,357	15,357	15,357	13,481	13,481	13,481
MA	26,471	14,820	14,820	14,820	13,163	13,163	13,163
NH	8,562	5,530	5,530	5,530	5,277	5,277	5,277
NJ	36,345	20,713	20,713	20,713	18,361	18,361	18,361
NY	72,271	43,490	43,490	43,490	38,871	38,871	38,871
PA	55,362	30,467	30,467	30,467	26,182	26,182	26,182
RI	4,388	2,348	2,348	2,348	2,114	2,114	2,114
VT	3,743	2,364	2,364	2,364	2,109	2,109	2,109
VA	41,325	23,658	23,658	23,658	20,189	20,189	20,189
	305,475	**177,343**	**177,343**	**177,343**	**156,288**	**156,288**	**156,288**

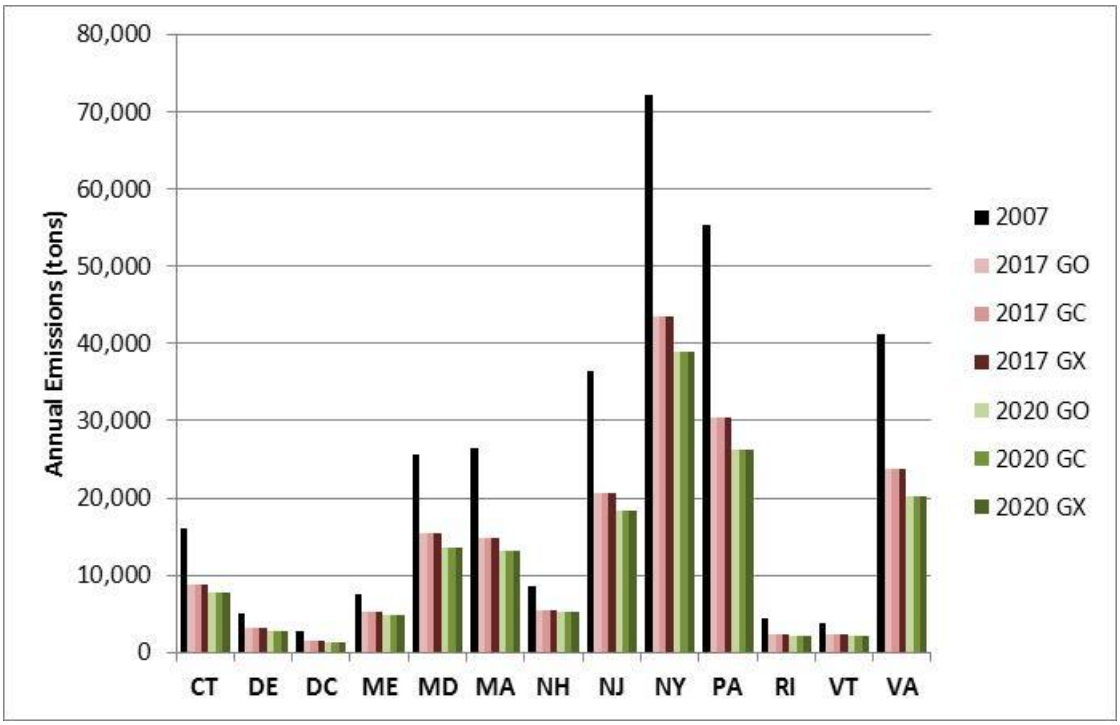


Exhibit 8.18 2007/2013/2017/2020 NMIM/NONROAD PM10-PRI Emissions by State (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	1,412	976	976	976	868	868	868
DE	476	300	300	300	258	258	258
DC	242	138	138	138	106	106	106
ME	1,151	810	810	810	706	706	706
MD	2,600	1,781	1,781	1,781	1,570	1,570	1,570
MA	2,384	1,630	1,630	1,630	1,438	1,438	1,438
NH	846	595	595	595	527	527	527
NJ	3,377	2,347	2,347	2,347	2,086	2,086	2,086
NY	7,059	4,684	4,684	4,684	4,075	4,075	4,075
PA	5,623	3,717	3,717	3,717	3,217	3,217	3,217
RI	367	229	229	229	202	202	202
VT	482	327	327	327	281	281	281
VA	4,128	2,695	2,695	2,695	2,319	2,319	2,319
	30,146	**20,229**	**20,229**	**20,229**	**17,652**	**17,652**	**17,652**

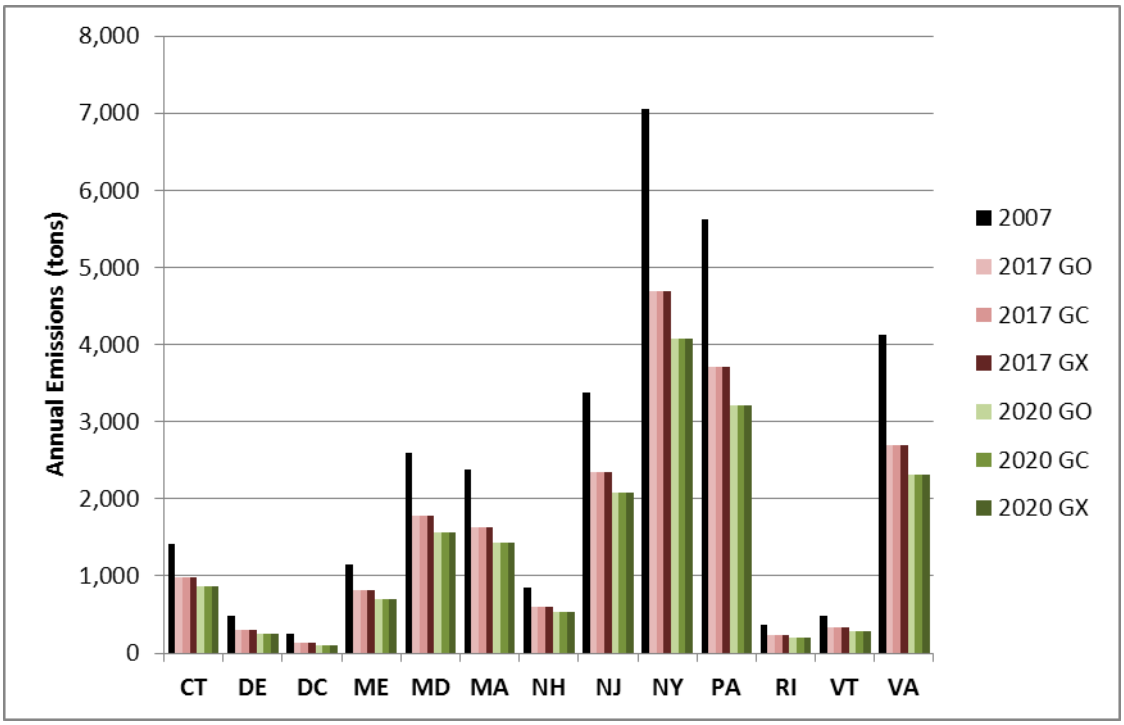


Exhibit 8.19 2007/2013/2017/2020 NMIM/NONROAD PM25-PRI Emissions by State (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	1,343	922	922	922	818	818	818
DE	453	284	284	284	243	243	243
DC	234	132	132	132	102	102	102
ME	1,080	756	756	756	657	657	657
MD	2,473	1,681	1,681	1,681	1,477	1,477	1,477
MA	2,268	1,540	1,540	1,540	1,355	1,355	1,355
NH	799	559	559	559	494	494	494
NJ	3,213	2,217	2,217	2,217	1,964	1,964	1,964
NY	6,715	4,430	4,430	4,430	3,843	3,843	3,843
PA	5,346	3,511	3,511	3,511	3,029	3,029	3,029
RI	349	216	216	216	191	191	191
VT	455	307	307	307	263	263	263
VA	3,933	2,549	2,549	2,549	2,185	2,185	2,185
	28,660	**19,105**	**19,105**	**19,105**	**16,621**	**16,621**	**16,621**

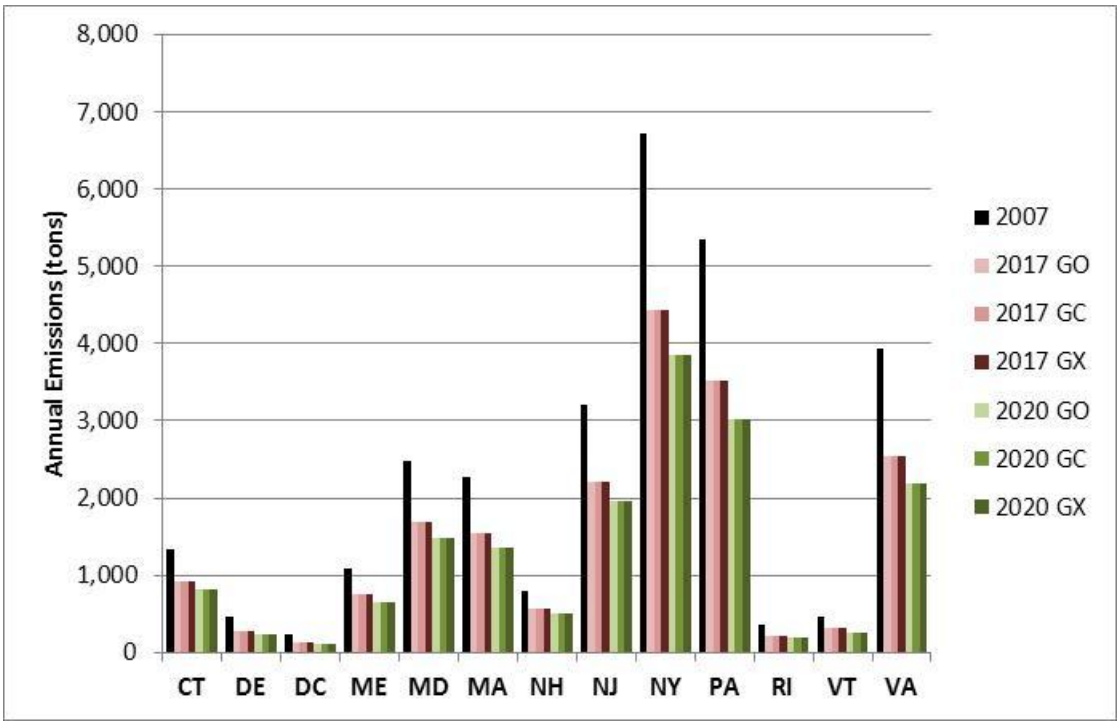


Exhibit 8.20 2007/2013/2017/2020 NMIM/NONROAD SO2 Emissions by State (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	802	30	30	30	32	32	32
DE	266	7	7	7	7	7	7
DC	196	3	3	3	3	3	3
ME	416	16	16	16	17	17	17
MD	1,436	36	36	36	38	38	38
MA	1,377	41	41	41	44	44	44
NH	441	16	16	16	18	18	18
NJ	1,905	55	55	55	58	58	58
NY	3,957	118	118	118	126	126	126
PA	2,972	84	84	84	86	86	86
RI	211	7	7	7	7	7	7
VT	202	7	7	7	7	7	7
VA	2,284	90	90	90	94	94	94
	16,464	**511**	**511**	**511**	**537**	**537**	**537**

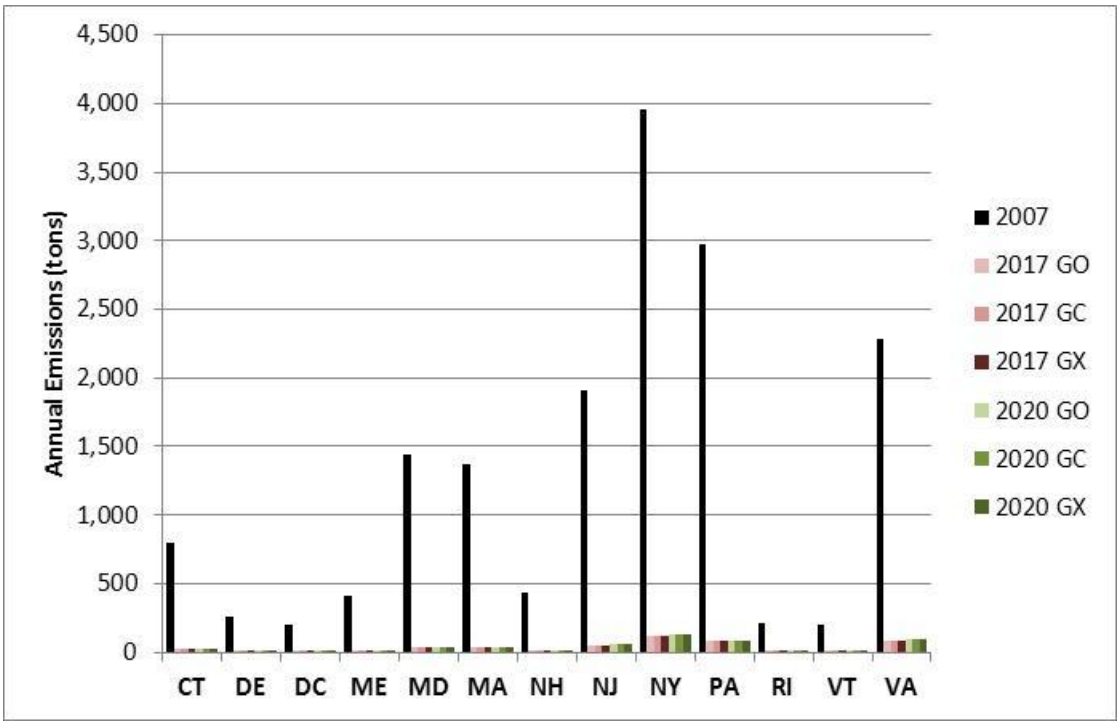
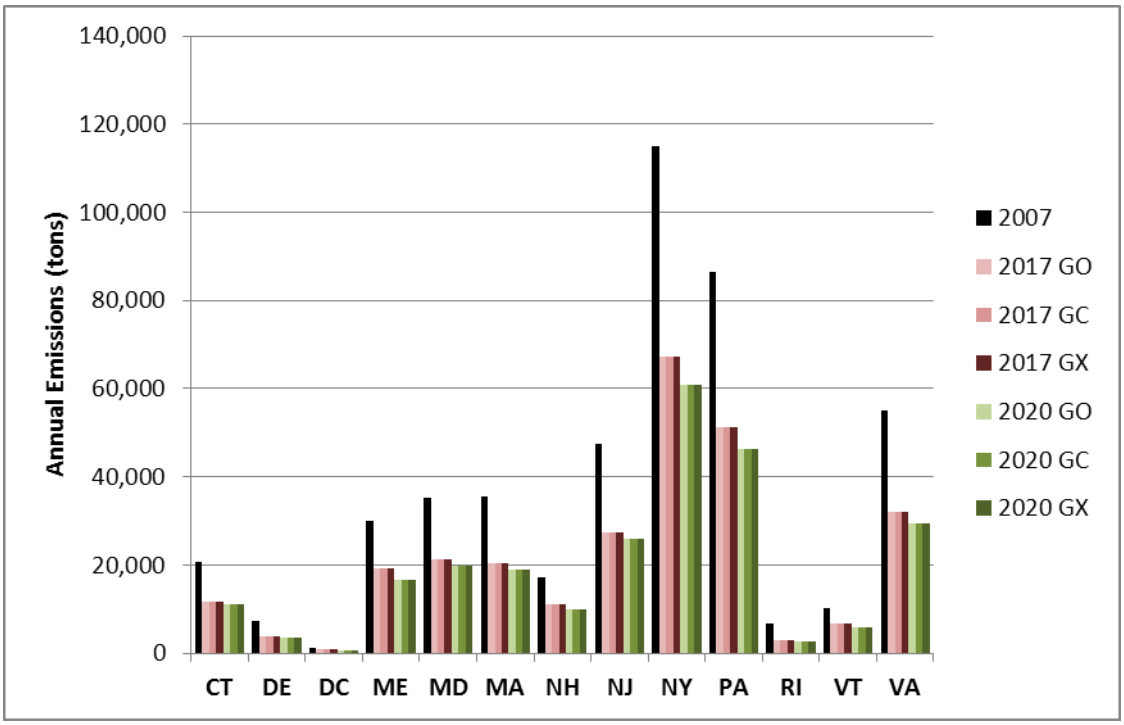


Exhibit 8.21 2007/2013/2017/2020 NMIM/NONROAD VOC Emissions by State (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	20,721	11,803	11,803	11,803	10,985	10,985	10,985
DE	7,157	3,888	3,888	3,888	3,498	3,498	3,498
DC	1,324	749	749	749	710	710	710
ME	29,880	19,303	19,303	19,303	16,729	16,729	16,729
MD	35,160	21,226	21,226	21,226	19,890	19,890	19,890
MA	35,676	20,510	20,510	20,510	18,990	18,990	18,990
NH	17,108	11,030	11,030	11,030	9,785	9,785	9,785
NJ	47,521	27,430	27,430	27,430	25,802	25,802	25,802
NY	114,935	67,238	67,238	67,238	60,945	60,945	60,945
PA	86,397	51,382	51,382	51,382	46,399	46,399	46,399
RI	6,721	2,885	2,885	2,885	2,657	2,657	2,657
VT	10,339	6,714	6,714	6,714	5,864	5,864	5,864
VA	55,135	32,141	32,141	32,141	29,303	29,303	29,303
	468,074	**276,299**	**276,299**	**276,299**	**251,556**	**251,556**	**251,556**



8.4 NONROAD COMMERCIAL MARINE VESSEL EMISSIONS

Exhibits 8.22 to 8.28 summarize the 2007 and projected future year commercial marine vessel emissions by state for each criteria air pollutant. Seven values are listed for each pollutant:

- 2007 emissions
- 2017 projected emissions with growth only (GO)
- 2017 projected emissions with growth and existing controls (GC)
- 2017 projected emissions with growth, existing and potential new OTC controls (GX)
- 2020 projected emissions with growth only (GO)
- 2020 projected emissions with growth and existing controls (GC)
- 2020 projected emissions with growth, existing and potential new OTC controls (GX)

Detailed summaries by County and SCC are provided on MARAMA's ftp site.

Emissions of all pollutants except NH3 are projected to decrease as a result of Federal rules affecting Category 1 / 2 and Category 3 marine engines, including more stringent engine emission standards and sulfur in fuel limitations. There are currently no potential new OTC control measures for commercial marine vessels.

Exhibit 8.22 presents a state-level comparison of 2007, 2017 and 2020 annual CO emissions for commercial marine vessels. Emissions decrease by about 13 percent from 2007 to 2017, and 12 percent from 2007 to 2020.

Exhibit 8.23 shows that there are very little NH3 emissions from this sector.

Exhibit 8.24 shows that annual NOx emissions from commercial marine vessels decrease by 32 percent from 2007 to 2017 and 40 percent from 2007 to 2020.

Exhibits 9.25 and 9.26 show that annual PM10-PRI and PM2.5-PRI emissions from commercial marine vessels decrease substantially after 2007. For both pollutants, emissions are reduced by about 57 percent from 2007 to 2017 and 66 percent from 2007 to 2020.

Exhibit 8.27 shows that that annual SO2 emissions from commercial marine vessels decrease dramatically after 2007. SO2 emissions are reduced by about 89 percent from 2007 to 2017 and 93 percent from 2007 to 2020.

Exhibit 8.28 shows that annual VOC emissions from commercial marine vessels decrease by 15 percent from 2007 to 2017, and 20 percent from 2007 to 2020.

Exhibit 8.22 2007 and Projected CO Emissions for CMV (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	1,078	1,073	912	912	1,102	908	908
DE	554	543	485	485	554	484	484
DC	1	1	1	1	1	1	1
ME	522	521	438	438	536	435	435
MD	2,795	2,792	2,350	2,350	2,871	2,337	2,337
MA	1,473	1,475	1,232	1,232	1,518	1,225	1,225
NH	89	84	83	83	85	84	84
NJ	1,619	2,202	2,067	2,067	2,427	2,254	2,254
NY	3,476	3,452	2,961	2,961	3,541	2,949	2,949
PA	1,294	1,283	1,106	1,106	1,315	1,102	1,102
RI	522	523	437	437	538	434	434
VT	0	0	0	0	0	0	0
VA	3,735	3,731	3,166	3,166	3,831	3,150	3,150
	17,156	**17,681**	**15,238**	**15,238**	**18,319**	**15,363**	**15,363**

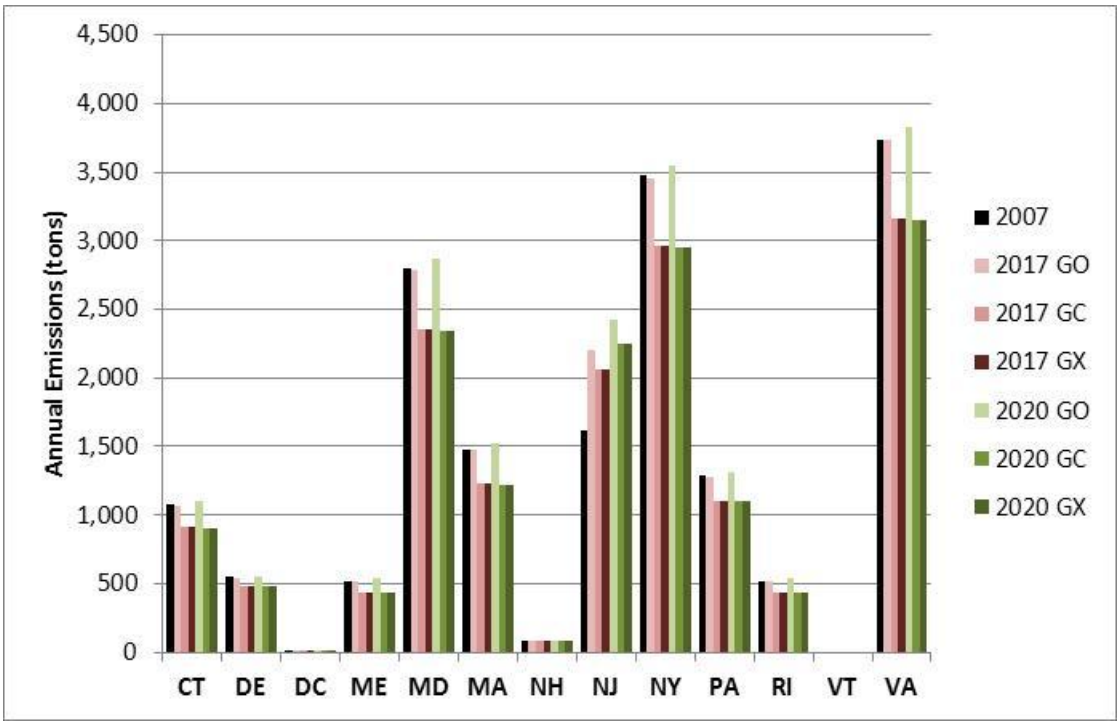


Exhibit 8.23 2007 and Projected NH3 Emissions for CMV (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	3	3	3	3	3	3	3
DE		0	0	0	0	0	0
DC	0	0	0	0	0	0	0
ME		0	0	0	0	0	0
MD	8	8	8	8	8	8	8
MA		0	0	0	0	0	0
NH		0	0	0	0	0	0
NJ	8	11	11	11	12	12	12
NY	2	2	2	2	2	2	2
PA	13	12	12	12	13	13	13
RI	1	1	1	1	1	1	1
VT	0	0	0	0	0	0	0
VA	9	9	9	9	9	9	9
	44	**46**	**46**	**46**	**47**	**47**	**47**

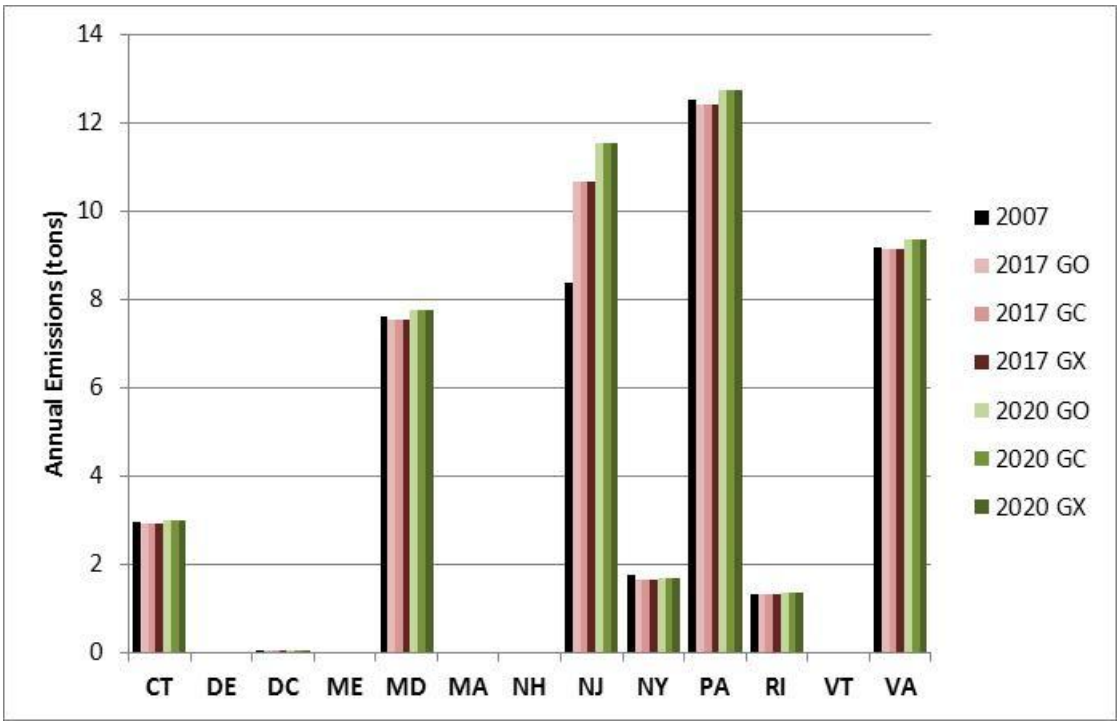


Exhibit 8.24 2007 and Projected NOx Emissions for CMV (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	6,528	6,454	4,162	4,162	6,608	3,642	3,642
DE	5,095	4,966	3,217	3,217	5,054	2,857	2,857
DC	6	6	4	4	6	3	3
ME	1,659	1,638	1,057	1,057	1,676	926	926
MD	16,027	15,929	10,256	10,256	16,343	8,922	8,922
MA	3,246	3,247	2,086	2,086	3,340	1,803	1,803
NH	271	258	169	169	260	154	154
NJ	11,197	15,318	11,140	11,140	16,906	10,251	10,251
NY	28,180	27,913	17,990	17,990	28,598	15,709	15,709
PA	11,378	11,237	7,249	7,249	11,498	6,350	6,350
RI	2,829	2,825	1,816	1,816	2,904	1,572	1,572
VT	0	0	0	0	0	0	0
VA	21,760	21,643	14,445	14,445	22,172	12,750	12,750
	108,175	**111,435**	**73,591**	**73,591**	**115,365**	**64,937**	**64,937**

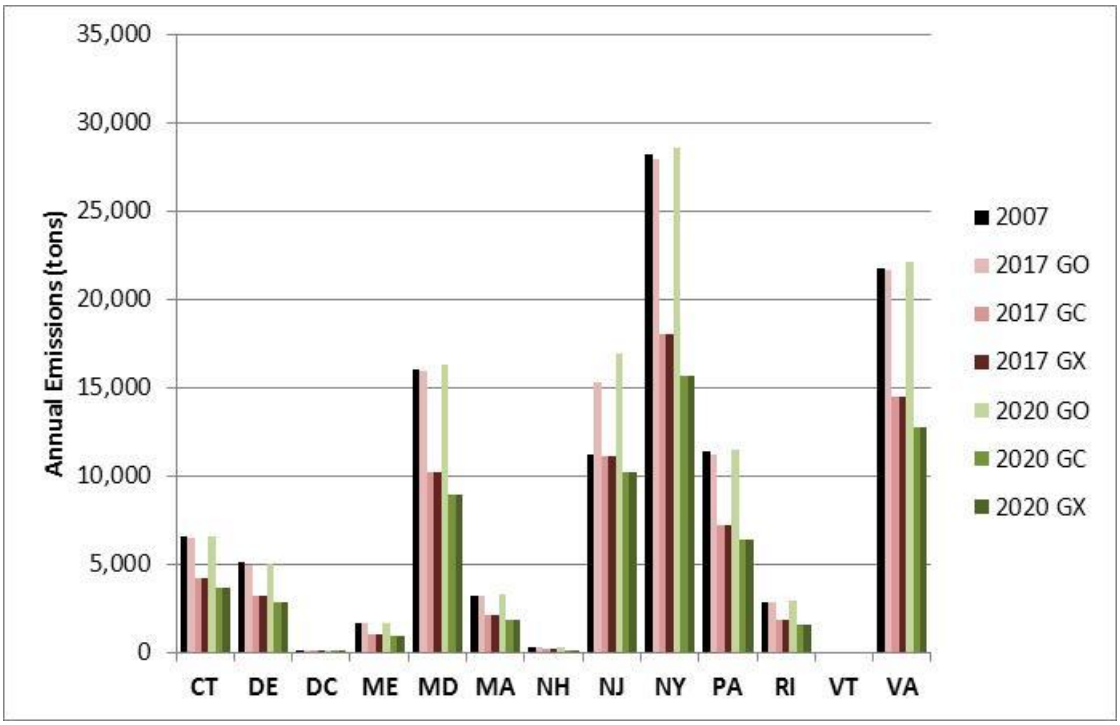


Exhibit 8.25 2007 and Projected PM10-PRI Emissions for CMV (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	312	305	124	124	310	101	101
DE	327	315	99	99	319	75	75
DC	0	0	0	0	0	0	0
ME	395	384	144	144	391	114	114
MD	657	649	301	301	664	251	251
MA	316	315	162	162	323	138	138
NH	13	12	3	3	13	2	2
NJ	622	887	244	244	989	241	241
NY	1,671	1,649	753	753	1,686	626	626
PA	524	511	197	197	519	158	158
RI	112	112	55	55	115	47	47
VT	0	0	0	0	0	0	0
VA	947	934	461	461	953	394	394
	5,897	**6,072**	**2,543**	**2,543**	**6,283**	**2,146**	**2,146**

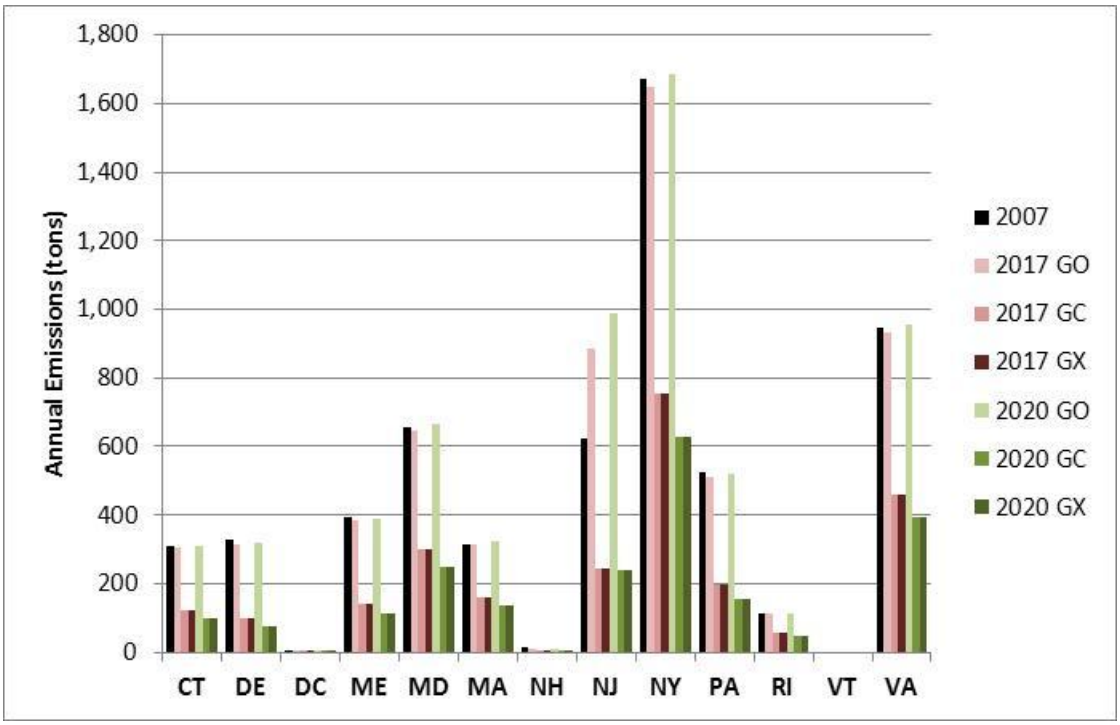


Exhibit 8.26 2007 and Projected PM25-PRI Emissions for CMV (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	296	290	119	119	295	97	97
DE	305	294	93	93	297	70	70
DC	0	0	0	0	0	0	0
ME	364	354	132	132	359	105	105
MD	606	600	285	285	614	239	239
MA	290	289	149	149	297	127	127
NH	12	11	3	3	12	2	2
NJ	575	820	225	225	915	223	223
NY	1,541	1,520	695	695	1,555	578	578
PA	484	472	183	183	480	146	146
RI	108	107	53	53	110	45	45
VT	0	0	0	0	0	0	0
VA	908	896	446	446	915	383	383
	5,491	**5,654**	**2,384**	**2,384**	**5,851**	**2,016**	**2,016**

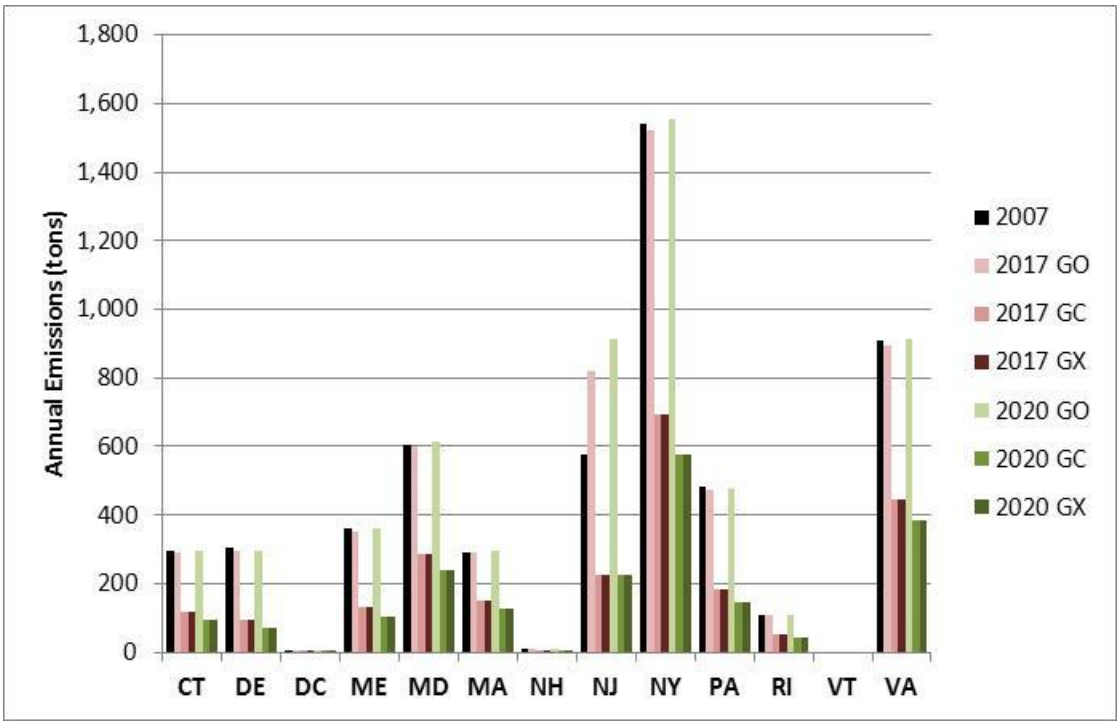


Exhibit 8.27 2007 and Projected SO2 Emissions for CMV (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	1,386	1,327	147	147	1,341	60	60
DE	2,079	1,984	225	225	2,000	84	84
DC	1	1	0	0	1	0	0
ME	189	185	17	17	189	12	12
MD	2,170	2,099	217	217	2,128	109	109
MA	698	684	64	64	698	42	42
NH	506	482	55	55	486	20	20
NJ	6,712	10,085	403	403	11,405	452	452
NY	9,321	9,181	821	821	9,383	601	601
PA	3,067	2,909	343	343	2,925	111	111
RI	632	607	66	66	613	28	28
VT	0	0	0	0	0	0	0
VA	4,058	3,928	940	940	3,969	747	747
	30,820	**33,473**	**3,296**	**3,296**	**35,139**	**2,268**	**2,268**

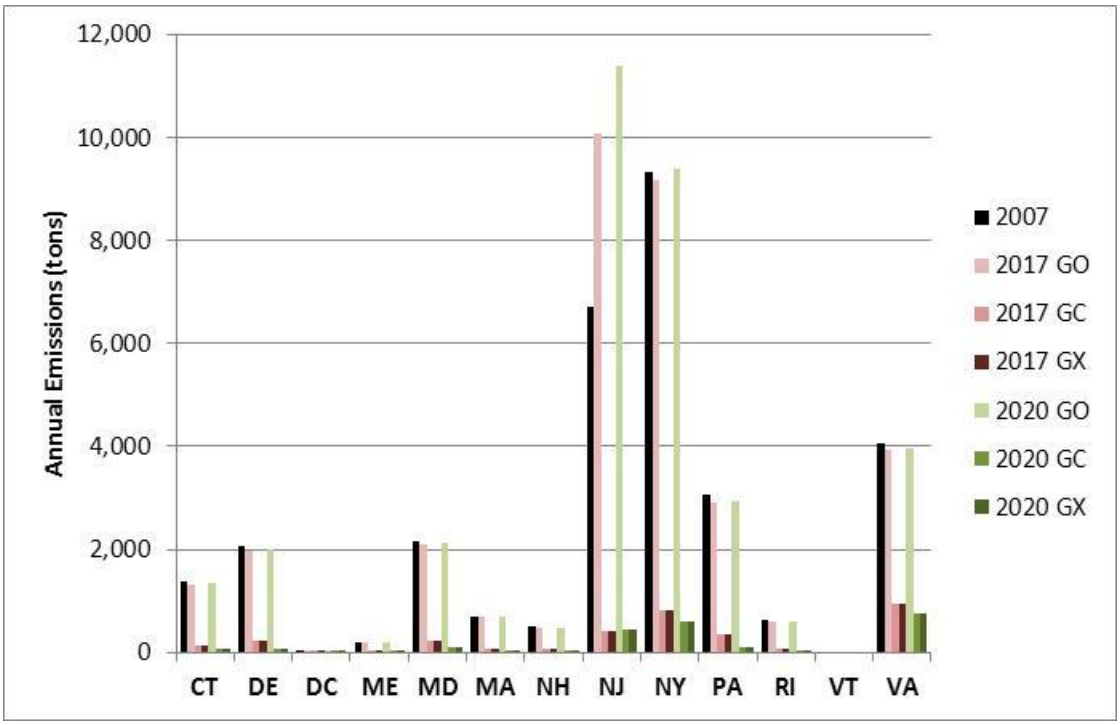
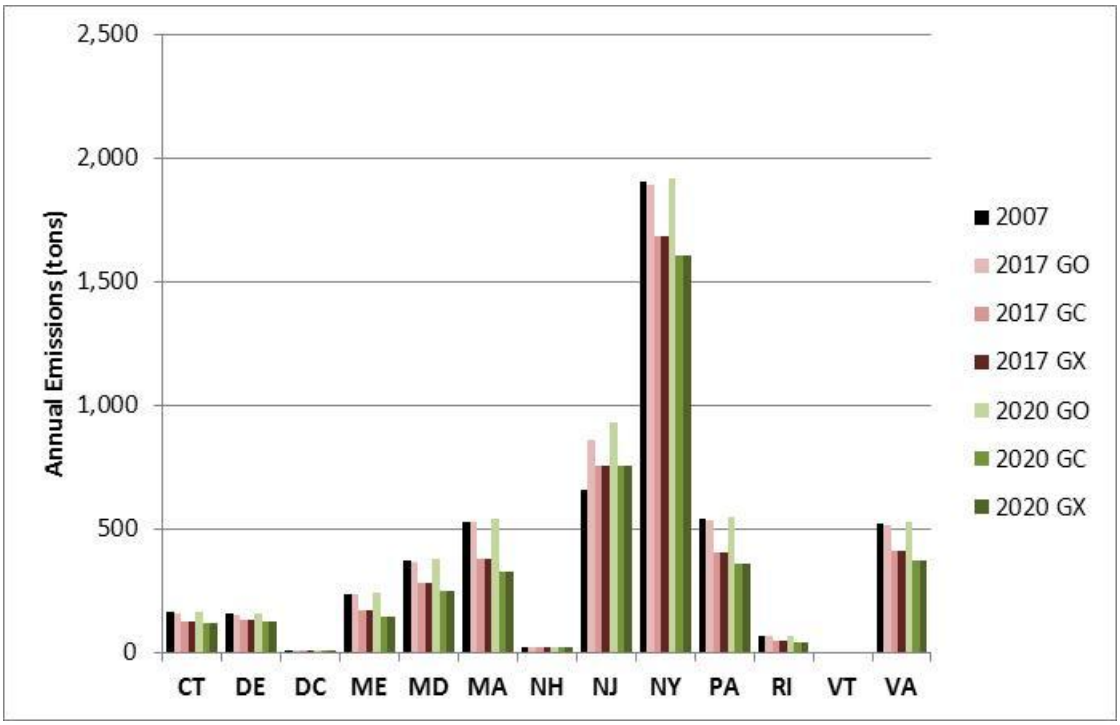


Exhibit 8.28 2007 and Projected VOC Emissions for CMV (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	161	158	127	127	162	117	117
DE	158	153	133	133	156	127	127
DC	0	0	0	0	0	0	0
ME	234	234	168	168	240	145	145
MD	371	367	282	282	376	252	252
MA	528	529	381	381	544	328	328
NH	23	21	21	21	22	21	21
NJ	658	857	753	753	933	754	754
NY	1,906	1,895	1,681	1,681	1,918	1,606	1,606
PA	538	534	406	406	547	360	360
RI	64	64	47	47	66	42	42
VT	0	0	0	0	0	0	0
VA	523	518	409	409	530	370	370
	5,164	**5,331**	**4,410**	**4,410**	**5,493**	**4,121**	**4,121**



8.5 NONROAD AIRPORT EMISSIONS

Exhibits 9.29 to 9.35 summarize the 2007 and projected future year airport emissions by state for each criteria air pollutant. Seven values are listed for each pollutant:

- 2007 emissions
- 2017 projected emissions with growth only (GO)
- 2017 projected emissions with growth and existing controls (GC)
- 2017 projected emissions with growth, existing and potential new OTC controls (GX)
- 2020 projected emissions with growth only (GO)
- 2020 projected emissions with growth and existing controls (GC)
- 2020 projected emissions with growth, existing and potential new OTC controls (GX)

Detailed summaries by County and SCC are provided on MARAMA's ftp site.

There were no NH3 emissions reported for airport operations. Emissions of other pollutants are projected to change as a result of changes in airline activity levels. No state or Federal rules were identified that would reduce emissions from aircraft operations in the future. There are currently no potential new OTC control measures for airports.

CO, PM10, PM2.5 and VOC emissions are projected to remain relatively constant between 2007 levels by 2017. By 2020, the will be a slight increase in emissions from 2007 due to increased operations by 2020.

NOx and SO2 emissions are projected to increase by 7 percent from 2007 levels by 2017 and by 13 percent by 2020 due to increased air traffic.

Exhibit 8.29 2007 and Projected CO Emissions for Airports (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	4,659	4,224	4,224	4,224	4,386	4,386	4,386
DE	1,625	1,550	1,550	1,550	1,593	1,593	1,593
DC	14	14	14	14	14	14	14
ME	32,879	32,774	32,774	32,774	32,802	32,802	32,802
MD	10,265	10,042	10,042	10,042	10,335	10,335	10,335
MA	15,495	14,592	14,592	14,592	14,940	14,940	14,940
NH	2,089	1,861	1,861	1,861	1,883	1,883	1,883
NJ	21,878	21,837	21,837	21,837	22,411	22,411	22,411
NY	17,403	18,579	18,579	18,579	19,706	19,706	19,706
PA	26,540	26,165	26,165	26,165	27,345	27,345	27,345
RI	1,739	2,255	2,255	2,255	2,280	2,280	2,280
VT	2,420	2,100	2,100	2,100	2,127	2,127	2,127
VA	22,009	22,689	22,689	22,689	23,190	23,190	23,190
	159,016	**158,684**	**158,684**	**158,684**	**163,012**	**163,012**	**163,012**

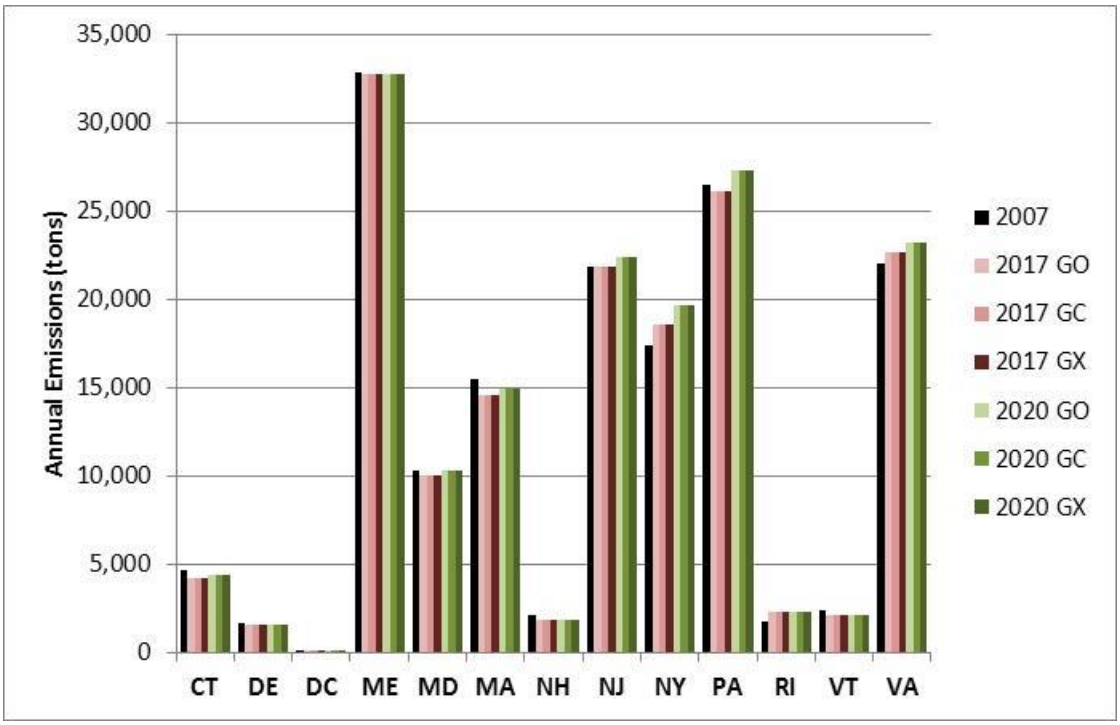


Exhibit 8.30 2007 and Projected NH3 Emissions for Airports (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	0	0	0	0	0	0	0
DE	0	0	0	0	0	0	0
DC	0	0	0	0	0	0	0
ME	0	0	0	0	0	0	0
MD	0	0	0	0	0	0	0
MA	0	0	0	0	0	0	0
NH	0	0	0	0	0	0	0
NJ	0	0	0	0	0	0	0
NY	0	0	0	0	0	0	0
PA	0	0	0	0	0	0	0
RI	0	0	0	0	0	0	0
VT	0	0	0	0	0	0	0
VA	0	0	0	0	0	0	0
	0	0	0	0	0	0	0

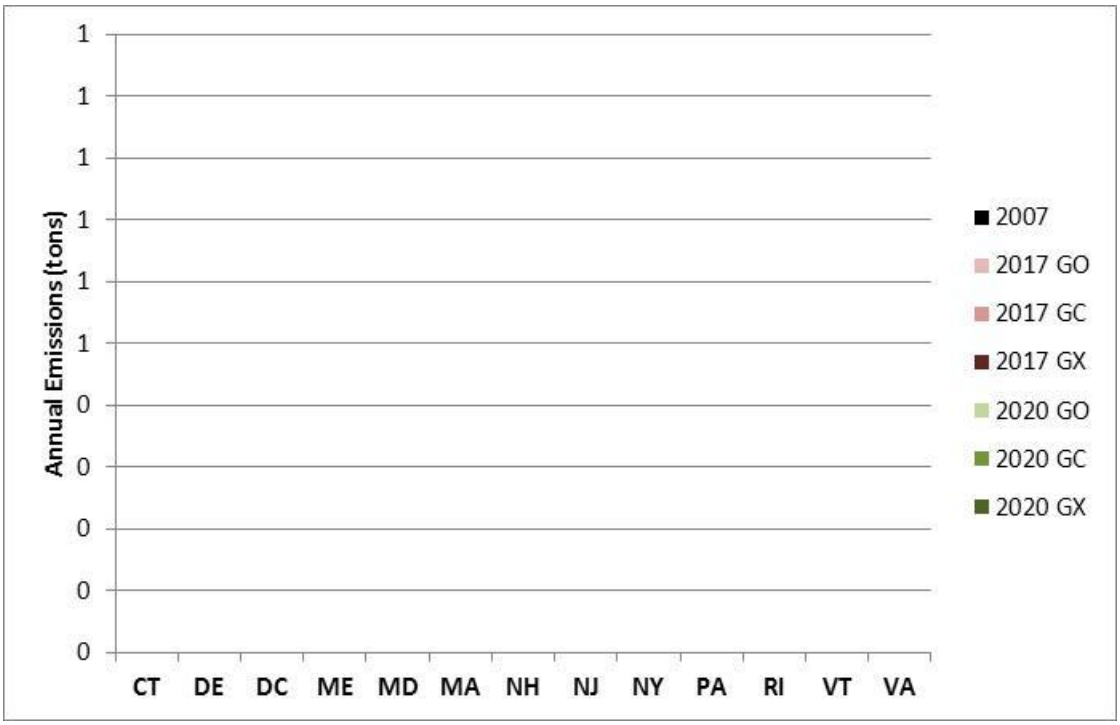


Exhibit 8.31 2007 and Projected NOx Emissions for Airports (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	713	657	657	657	688	688	688
DE	805	801	801	801	802	802	802
DC	0	0	0	0	0	0	0
ME	134	144	144	144	144	144	144
MD	1,910	2,021	2,021	2,021	2,119	2,119	2,119
MA	3,190	3,267	3,267	3,267	3,365	3,365	3,365
NH	278	256	256	256	260	260	260
NJ	5,105	5,408	5,408	5,408	5,612	5,612	5,612
NY	6,998	8,081	8,081	8,081	8,789	8,789	8,789
PA	3,738	4,094	4,094	4,094	4,406	4,406	4,406
RI	289	281	281	281	294	294	294
VT	103	113	113	113	117	117	117
VA	5,520	5,762	5,762	5,762	5,889	5,889	5,889
	28,783	**30,885**	**30,885**	**30,885**	**32,485**	**32,485**	**32,485**

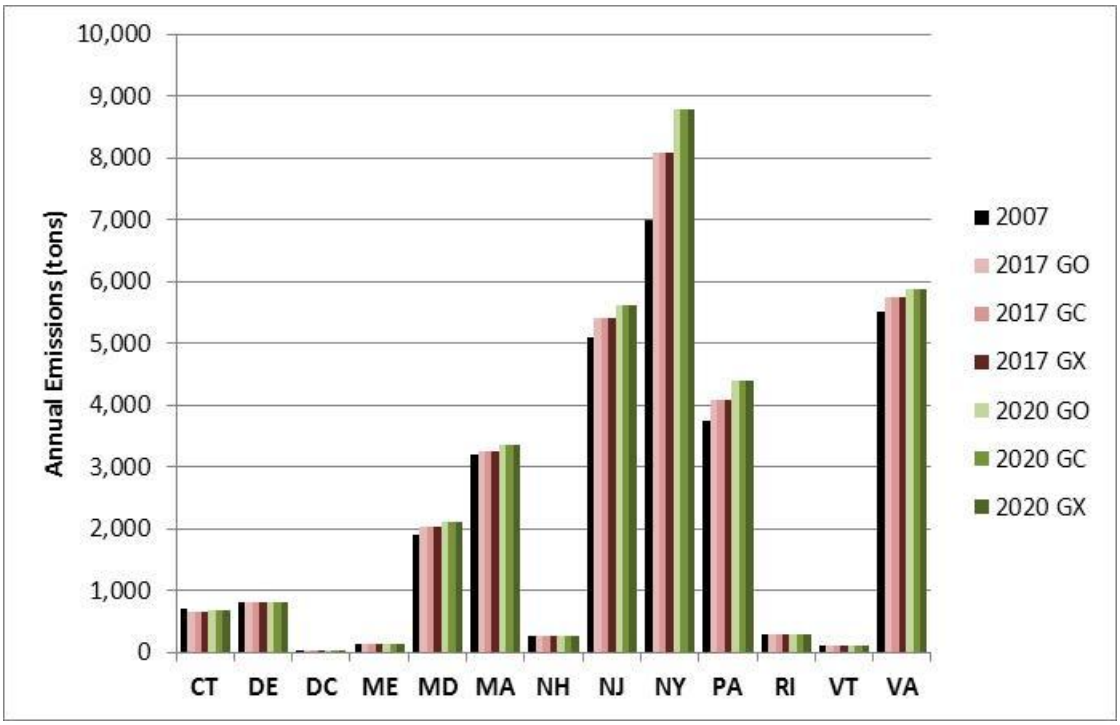


Exhibit 8.32 2007 and Projected PM10-PRI Emissions for Airports (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	66	59	59	59	61	61	61
DE	27	25	25	25	25	25	25
DC	0	0	0	0	0	0	0
ME	83	82	82	82	82	82	82
MD	74	70	70	70	73	73	73
MA	295	284	284	284	289	289	289
NH	37	34	34	34	34	34	34
NJ	170	173	173	173	177	177	177
NY	140	158	158	158	170	170	170
PA	396	385	385	385	400	400	400
RI	22	33	33	33	33	33	33
VT	46	40	40	40	40	40	40
VA	821	840	840	840	847	847	847
	2,176	**2,183**	**2,183**	**2,183**	**2,234**	**2,234**	**2,234**

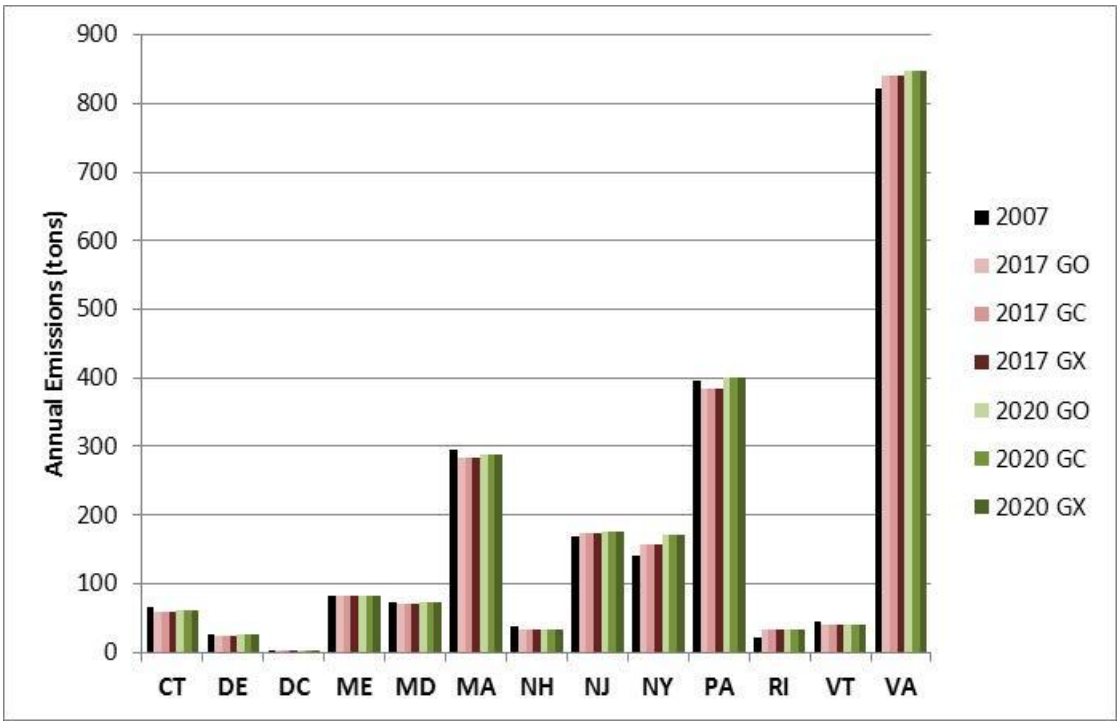


Exhibit 8.33 2007 and Projected PM25-PRI Emissions for Airports (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	51	46	46	46	48	48	48
DE	19	17	17	17	18	18	18
DC	0	0	0	0	0	0	0
ME	61	61	61	61	61	61	61
MD	16	17	17	17	17	17	17
MA	215	208	208	208	212	212	212
NH	27	25	25	25	25	25	25
NJ	143	146	146	146	150	150	150
NY	139	157	157	157	170	170	170
PA	294	288	288	288	300	300	300
RI	17	25	25	25	25	25	25
VT	32	28	28	28	29	29	29
VA	580	595	595	595	601	601	601
	1,595	**1,613**	**1,613**	**1,613**	**1,656**	**1,656**	**1,656**

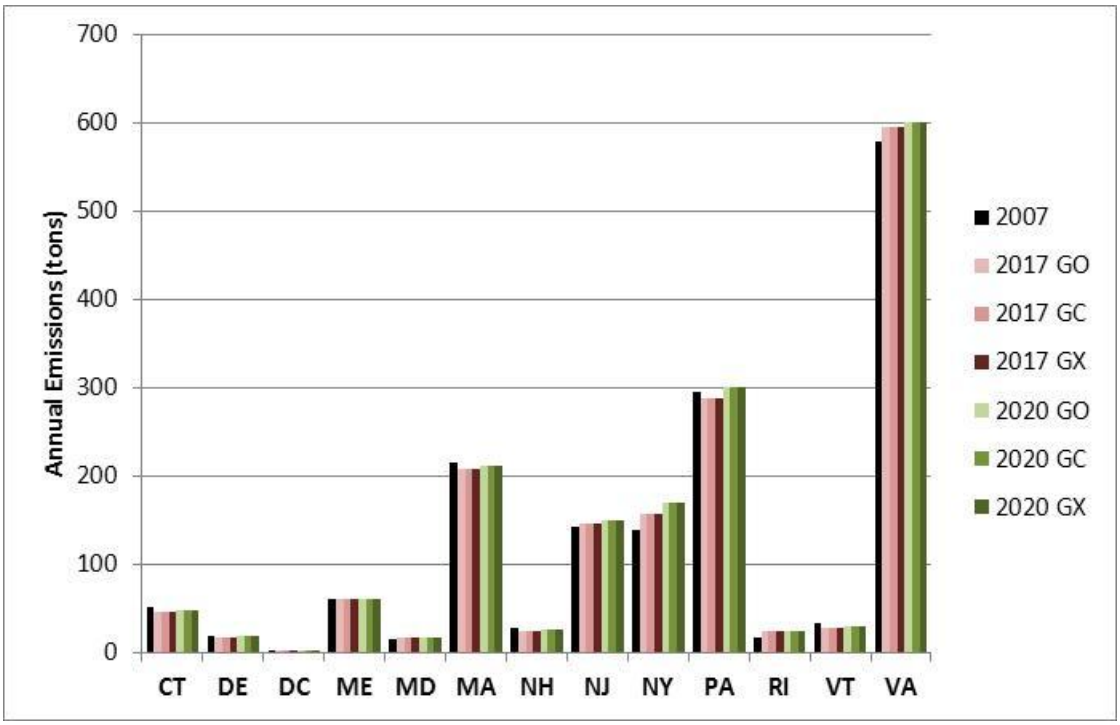


Exhibit 8.34 2007 and Projected SO2 Emissions for Airports (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	96	87	87	87	91	91	91
DE	55	55	55	55	55	55	55
DC	0	0	0	0	0	0	0
ME	14	16	16	16	16	16	16
MD	247	255	255	255	266	266	266
MA	218	226	226	226	236	236	236
NH	28	26	26	26	26	26	26
NJ	507	534	534	534	557	557	557
NY	699	808	808	808	877	877	877
PA	416	455	455	455	488	488	488
RI	30	29	29	29	31	31	31
VT	12	13	13	13	13	13	13
VA	424	455	455	455	466	466	466
	2,746	**2,959**	**2,959**	**2,959**	**3,122**	**3,122**	**3,122**

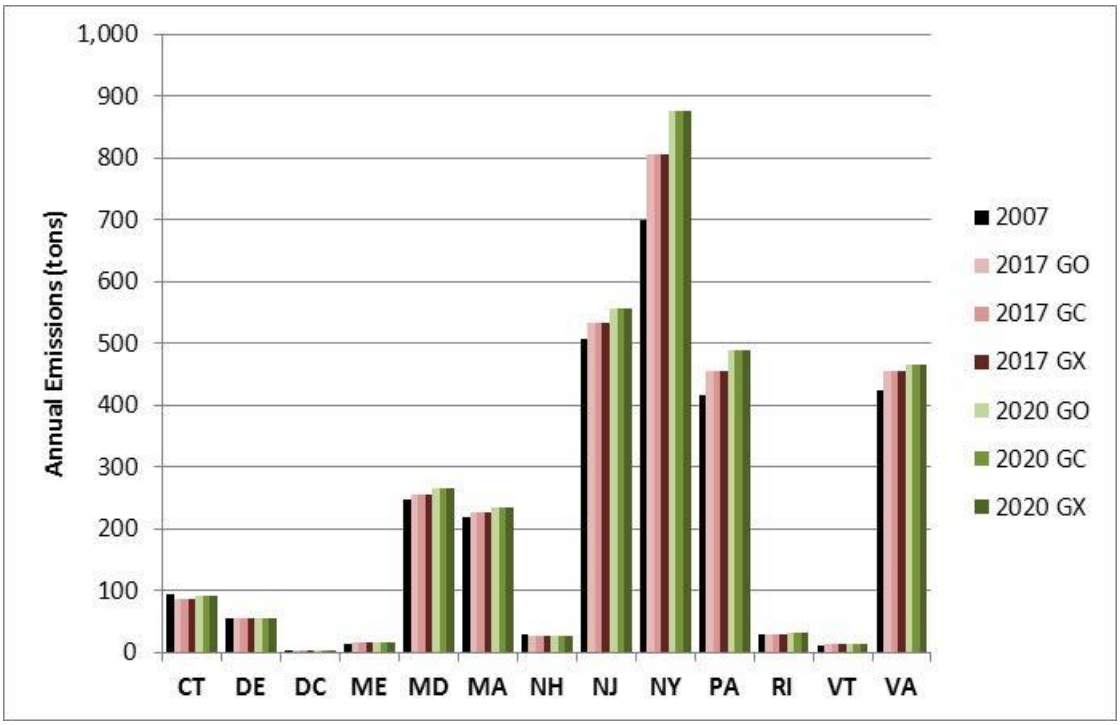
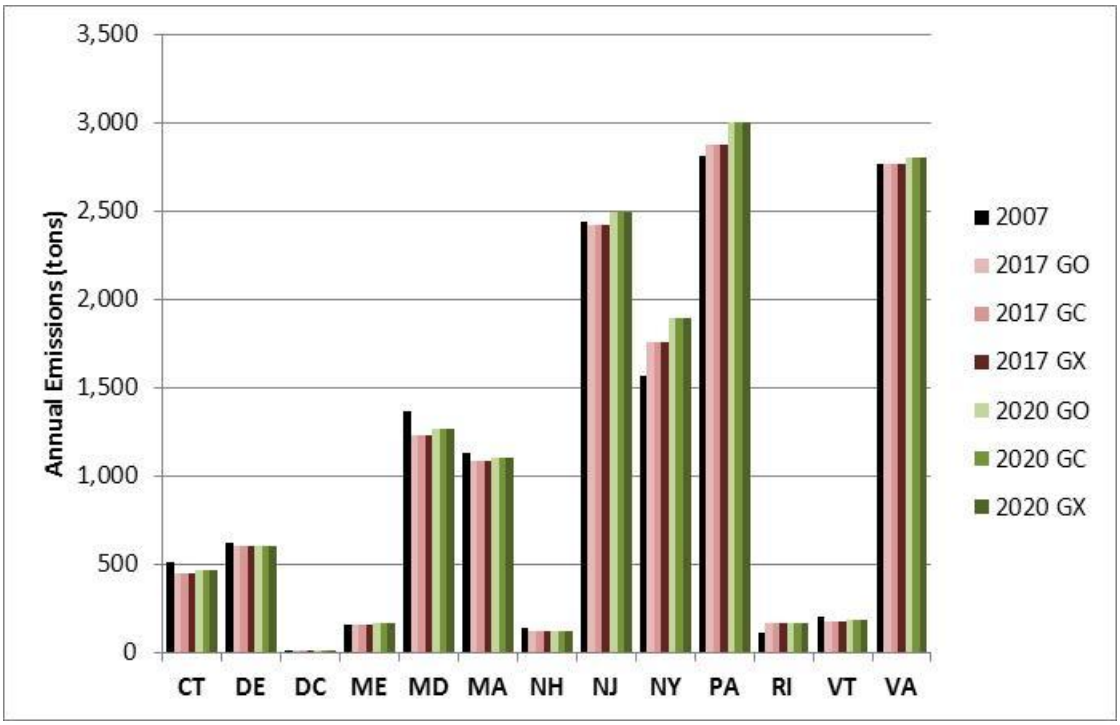


Exhibit 8.35 2007 and Projected VOC Emissions for Airports (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	509	452	452	452	469	469	469
DE	620	598	598	598	600	600	600
DC	1	1	1	1	1	1	1
ME	161	161	161	161	162	162	162
MD	1,365	1,228	1,228	1,228	1,265	1,265	1,265
MA	1,129	1,080	1,080	1,080	1,105	1,105	1,105
NH	134	116	116	116	118	118	118
NJ	2,438	2,426	2,426	2,426	2,498	2,498	2,498
NY	1,571	1,761	1,761	1,761	1,896	1,896	1,896
PA	2,813	2,879	2,879	2,879	3,004	3,004	3,004
RI	112	166	166	166	168	168	168
VT	204	179	179	179	181	181	181
VA	2,764	2,764	2,764	2,764	2,802	2,802	2,802
	13,822	**13,813**	**13,813**	**13,813**	**14,269**	**14,269**	**14,269**



8.6 NONROAD RAILROAD LOCOMOTIVE EMISSIONS

Exhibits 9.36 to 9.42 summarize the 2007 and projected future year railroad locomotive emissions by state for each criteria air pollutant. Seven values are listed for each pollutant:

- 2007 emissions
- 2017 projected emissions with growth only (GO)
- 2017 projected emissions with growth and existing controls (GC)
- 2017 projected emissions with growth, existing and potential new OTC controls (GX)
- 2020 projected emissions with growth only (GO)
- 2020 projected emissions with growth and existing controls (GC)
- 2020 projected emissions with growth, existing and potential new OTC controls (GX)

Detailed summaries by County and SCC are provided on MARAMA's ftp site.

Emissions of all pollutants except CO and NH3 are projected to decrease as a result of Federal rules affecting railroad locomotive engines, including more stringent engine emission standards and sulfur in fuel limitations. There are currently no potential new OTC control measures for railroad locomotives.

Exhibit 8.36 presents a state-level comparison of 2007, 2017 and 2020 annual CO emissions for railroad locomotives. CO emissions show small changes (< 7 percent) between 2007 and 2017/2020.

Exhibit 8.37 shows that there are very little NH3 emissions from this sector.

Exhibit 8.38 shows that annual NOx emissions from railroad locomotives decrease by 33 percent from 2007 to 2017, and 39 percent from 2007 to 2020.

Exhibits 9.39 and 9.40 show that annual PM10-PRI and PM2.5-PRI emissions from railroad locomotives decrease substantially after 2007. For both pollutants, emissions are reduced by about 49 percent from 2007 to 2017, and 57 percent from 2007 to 2020.

Exhibit 8.41 shows that SO2 emissions from railroad locomotives are virtually eliminatd by 2017.

Exhibit 8.42 shows that annual VOC emissions from railroad locomotives decrease by 42 percent from 2007 to 2017 and 50 percent from 2007 to 2020.

Exhibit 8.36 2007 and Projected CO Emissions for Railroads (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	184	198	188	188	206	193	193
DE	75	76	76	76	79	79	79
DC	73	75	75	75	78	77	77
ME	188	191	191	191	198	198	198
MD	700	720	713	713	746	736	736
MA	646	695	662	662	723	679	679
NH	88	90	90	90	93	93	93
NJ	665	780	744	744	818	771	771
NY	3,061	3,181	3,122	3,122	3,298	3,220	3,220
PA	2,987	3,044	3,041	3,041	3,149	3,145	3,145
RI	15	15	15	15	16	16	16
VT	72	74	74	74	76	76	76
VA	2,701	2,758	2,750	2,750	2,854	2,843	2,843
	11,456	**11,899**	**11,741**	**11,741**	**12,333**	**12,126**	**12,126**

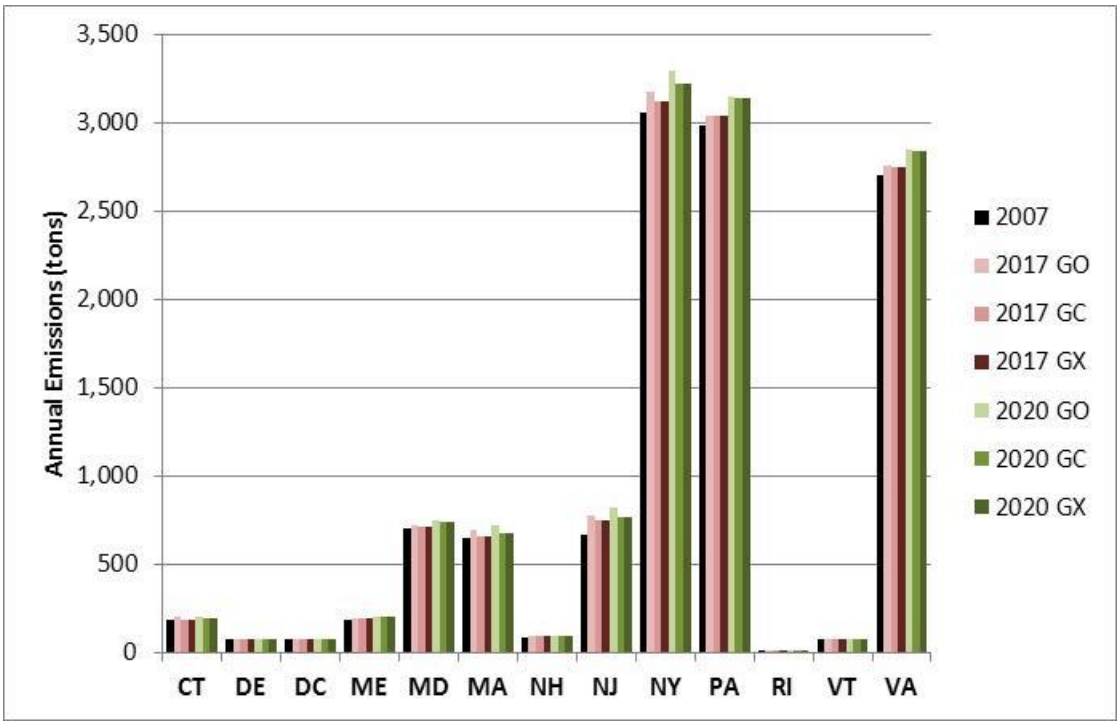


Exhibit 8.37 2007 and Projected NH3 Emissions for Railroads (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	1	1	1	1	1	1	1
DE	0	0	0	0	0	0	0
DC	0	0	0	0	0	0	0
ME	0	0	0	0	0	0	0
MD	0	0	0	0	0	0	0
MA	2	2	2	2	2	2	2
NH	0	0	0	0	0	0	0
NJ	2	2	2	2	3	3	3
NY	0	1	1	1	1	1	1
PA	9	9	9	9	10	10	10
RI	0	0	0	0	0	0	0
VT	0	0	0	0	0	0	0
VA	8	8	8	8	9	9	9
	23	**24**	**24**	**24**	**25**	**25**	**25**

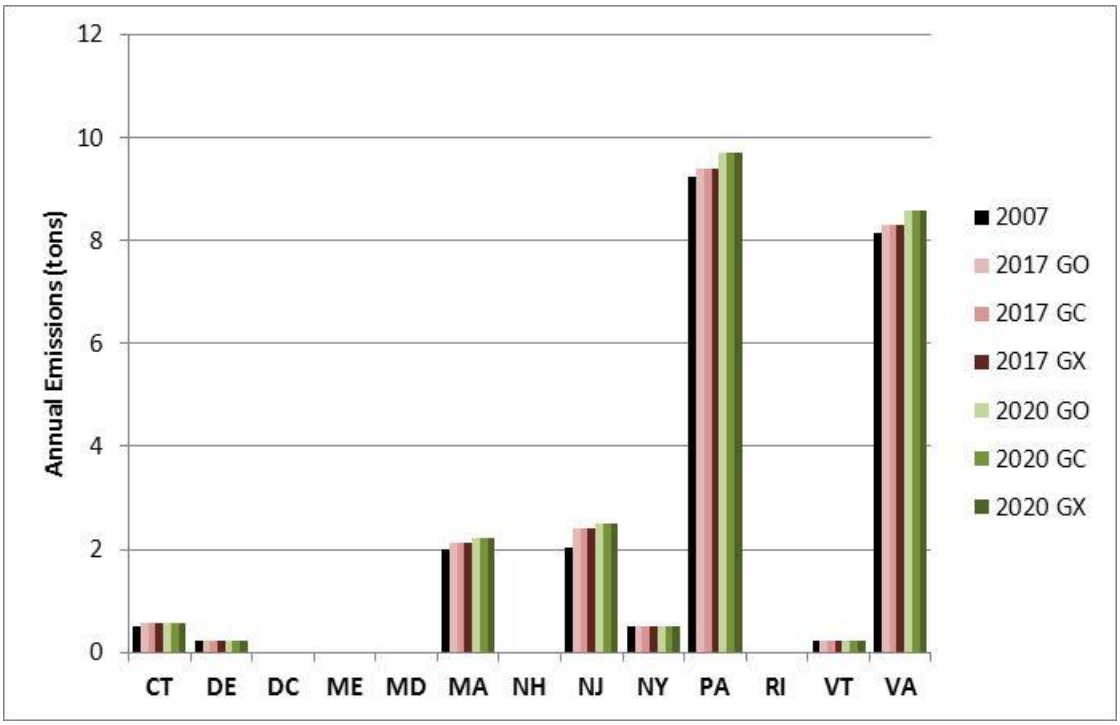


Exhibit 8.38 2007 and Projected NOx Emissions for Railroads (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	1,723	1,866	1,088	1,088	1,942	991	991
DE	384	391	279	279	404	256	256
DC	505	521	353	353	540	322	322
ME	1,369	1,394	1,289	1,289	1,442	1,262	1,262
MD	4,767	4,904	3,127	3,127	5,078	2,815	2,815
MA	6,133	6,623	3,743	3,743	6,893	3,368	3,368
NH	891	907	871	871	939	864	864
NJ	5,957	6,982	3,839	3,839	7,323	3,469	3,469
NY	20,675	21,473	13,144	13,144	22,259	11,782	11,782
PA	20,675	21,080	14,413	14,413	21,808	13,174	13,174
RI	144	147	99	99	152	90	90
VT	736	749	719	719	775	713	713
VA	18,319	18,728	12,061	12,061	19,381	10,856	10,856
	82,279	**85,765**	**55,025**	**55,025**	**88,936**	**49,960**	**49,960**

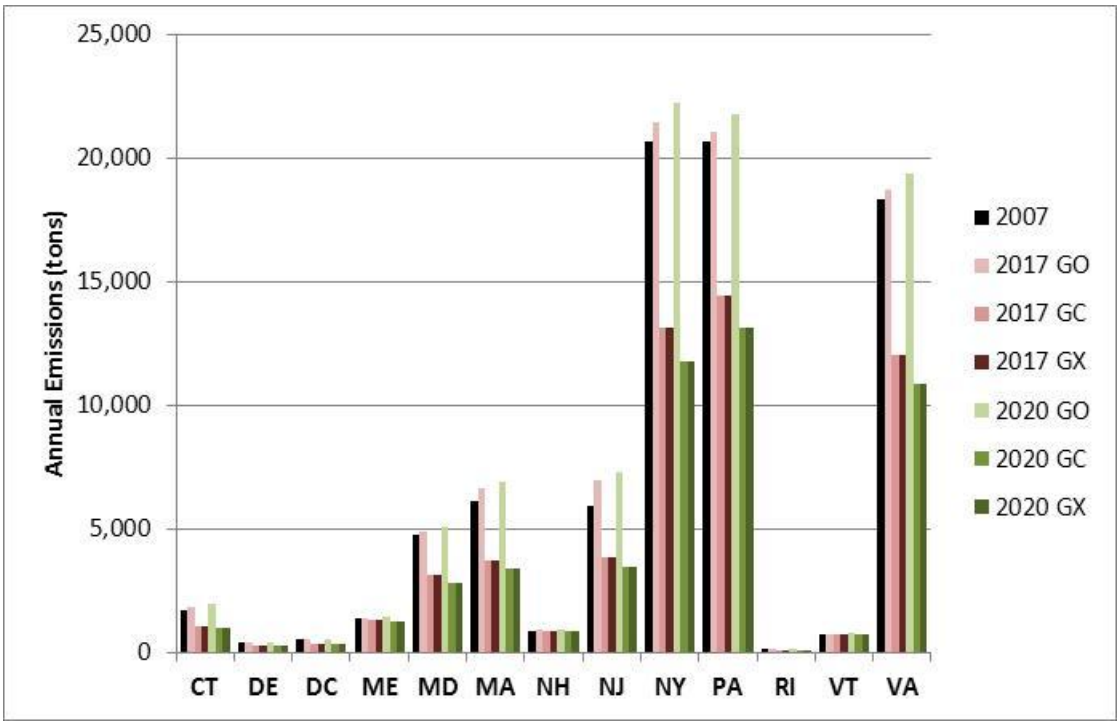


Exhibit 8.39 2007 and Projected PM10-PRI Emissions for Railroads (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	46	49	27	27	51	23	23
DE	15	16	8	8	16	7	7
DC	12	12	6	6	13	6	6
ME	28	28	22	22	29	21	21
MD	166	171	80	80	177	68	68
MA	159	171	84	84	178	71	71
NH	22	22	18	18	23	17	17
NJ	160	187	89	89	196	75	75
NY	608	631	295	295	654	249	249
PA	704	717	356	356	742	309	309
RI	4	4	2	2	4	2	2
VT	18	18	15	15	19	14	14
VA	634	648	303	303	670	257	257
	2,574	**2,675**	**1,303**	**1,303**	**2,772**	**1,119**	**1,119**

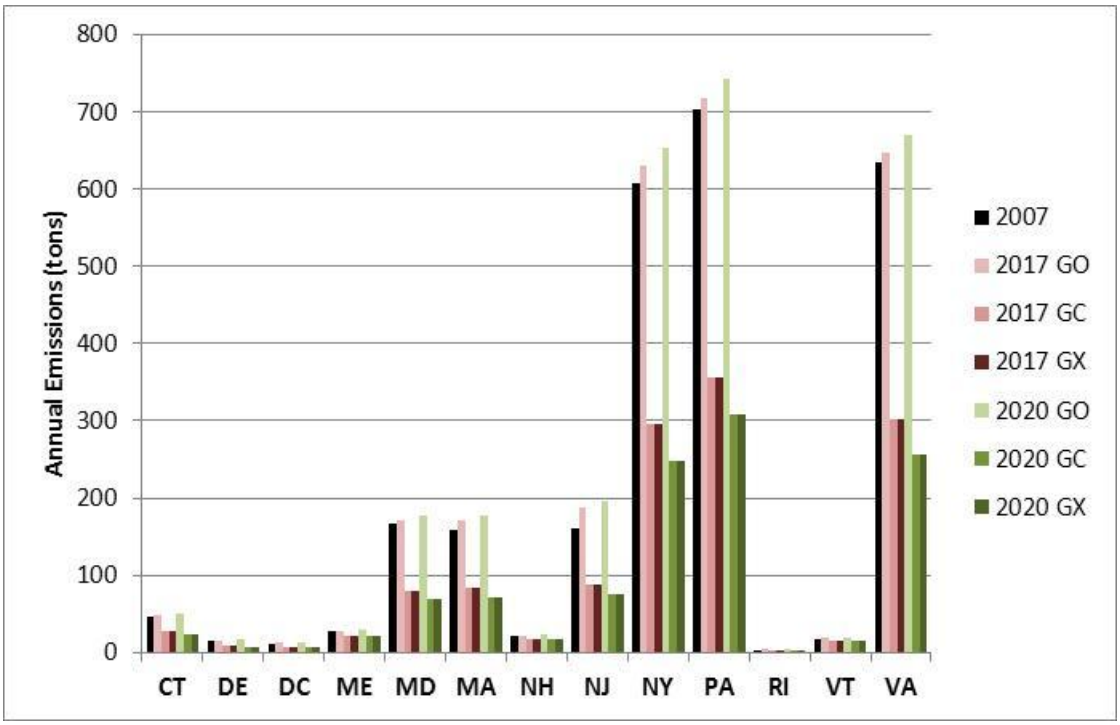


Exhibit 8.40 2007 and Projected PM25-PRI Emissions for Railroads (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	39	42	22	22	44	19	19
DE	15	15	8	8	16	7	7
DC	11	12	6	6	12	6	6
ME	25	26	20	20	27	19	19
MD	161	166	78	78	172	66	66
MA	145	157	77	77	163	65	65
NH	21	21	17	17	22	17	17
NJ	147	173	82	82	181	69	69
NY	572	595	278	278	616	235	235
PA	650	663	330	330	686	286	286
RI	3	3	2	2	3	1	1
VT	17	17	13	13	18	13	13
VA	586	599	280	280	620	238	238
	2,395	**2,488**	**1,213**	**1,213**	**2,579**	**1,041**	**1,041**

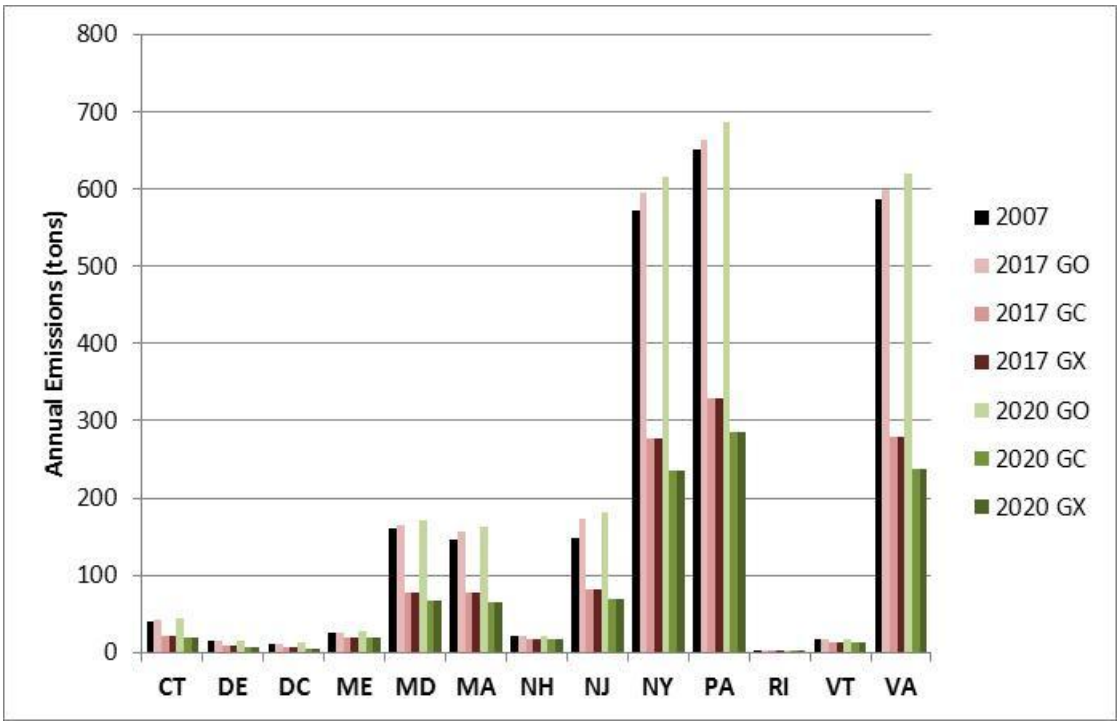


Exhibit 8.41 2007 and Projected SO2 Emissions for Railroads (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	57	61	5	5	64	5	5
DE	5	5	0	0	6	0	0
DC	37	38	0	0	39	0	0
ME	92	94	0	0	97	0	0
MD	64	66	0	0	68	0	0
MA	66	70	0	0	73	0	0
NH	10	10	0	0	11	0	0
NJ	52	61	0	0	64	0	0
NY	616	641	2	2	665	2	2
PA	211	216	1	1	223	1	1
RI	5	6	0	0	6	0	0
VT	5	5	0	0	5	0	0
VA	192	196	1	1	203	1	1
	1,413	**1,469**	**9**	**9**	**1,522**	**10**	**10**

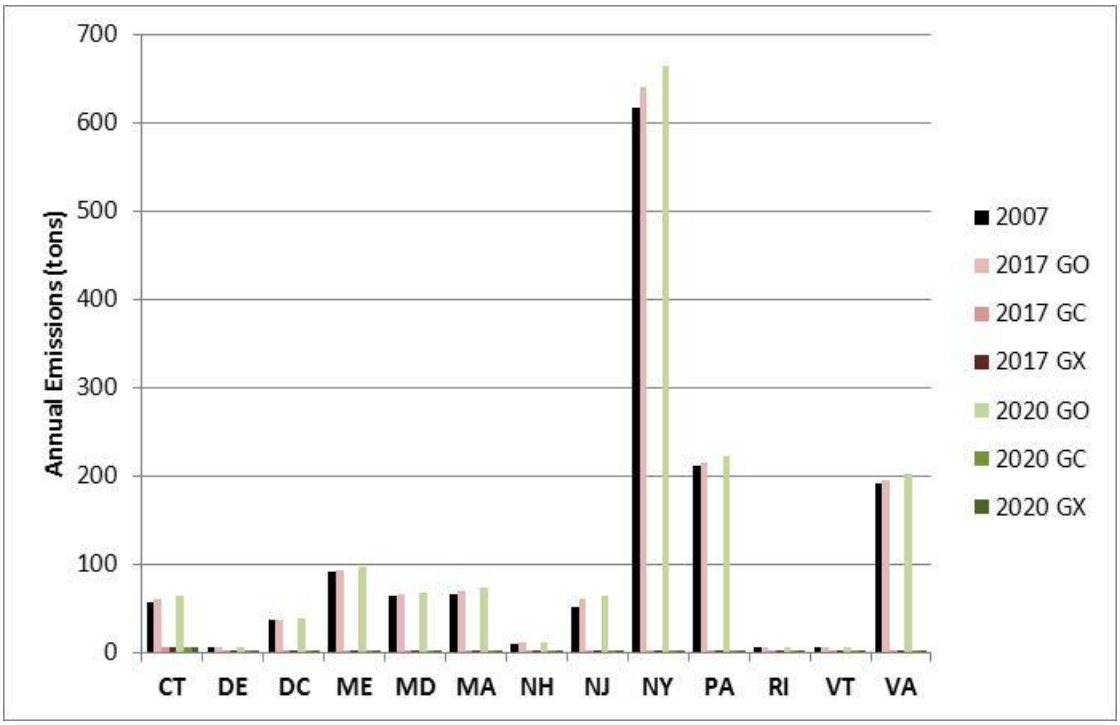
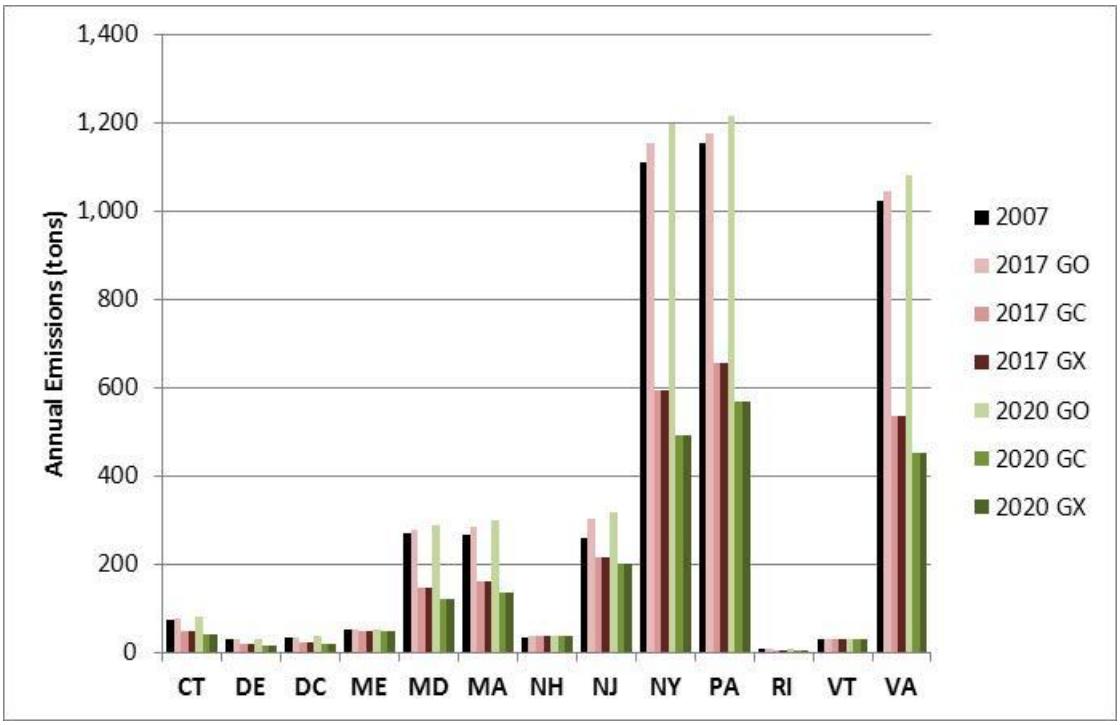


Exhibit 8.42 2007 and Projected VOC Emissions for Railroads (tons)

	2007	2017 Growth Only	2017 Growth & Existing Controls	2017 Growth & Existing & New OTC Controls	2020 Growth Only	2020 Growth & Existing Controls	2020 Growth & Existing & New OTC Controls
State	**2007**	**2017 GO**	**2017 GC**	**2017 GX**	**2020 GO**	**2020 GC**	**2020 GX**
CT	73	79	49	49	82	42	42
DE	28	29	17	17	30	15	15
DC	34	35	23	23	36	20	20
ME	51	51	47	47	53	47	47
MD	271	279	146	146	289	122	122
MA	267	286	162	162	298	135	135
NH	35	36	36	36	37	37	37
NJ	258	302	216	216	317	200	200
NY	1,112	1,155	596	596	1,197	493	493
PA	1,153	1,176	655	655	1,216	569	569
RI	8	8	4	4	8	4	4
VT	29	29	29	29	30	30	30
VA	1,025	1,047	537	537	1,083	451	451
	4,343	**4,511**	**2,519**	**2,519**	**4,676**	**2,167**	**2,167**



9.0 PREPARATION OF SMOKE MODEL FILES

Air quality modelers in the Mid-Atlantic and Northeastern states use the SMOKE Modeling System to create gridded, speciated, hourly emissions for input into a variety of air quality models. This section describes how the SMOKE inventory files were developed. It also describes how the SMOKE the temporal allocation, speciation, and spatial allocation profiles, respectively, were developed. . SMOKE inventory files were created for the following types of sources (which are described in Section 1.3):

9.1 NONEGU POINT SOURCE SMOKE EMISSION FILES

Annual nonEGU point source inventories were prepared in SMOKE PTINV ORL format.

9.2 AREA SOURCE SMOKE EMISSION FILES

Annual area source inventories for 2017 and 2020 were prepared in SMOKE ARINV ORL format. In developing the SMOKE ARINV ORL files for area sources, the USEPA "transport factor" was applied to reduce fugitive dust emissions to account for the removal of particles near their emission source by vegetation and surface features. The transport factor was NOT applied to the NIF-formatted annual emissions, but only to the SMOKE ARINV ORL-formatted file.

The standard transport fractions and SCC assignments from the USEPA CHIEF website (USEPA 2007c) were used to reduce the PM10-PRI and PM25-PRI emissions in the area source inventories. Two files were used. The first file contains a list of SCCs for which the transport factor was applied. The major source categories included paved and unpaved roads, construction activity, agricultural crop land tilling, and agricultural livestock operations. The second file contains the transport factor which varies by county. For example, in Connecticut the transport fraction ranges from 0.21 in Tolland County to 0.44 in New Haven County.

Applying the transport factor to area source fugitive dust emissions significantly reduces that amount of particulate matter included in the air quality modeling. Region wide, PM10-PRI emissions are reduced by about 54 percent and PM25-PRI emissions are reduced by about 25 percent by applying the transport fraction. The percent reduction varies by state due to the relative importance of the area source fugitive dust emissions compared to non-fugitive dust source emissions.

9.3 NONROAD NMIM SMOKE EMISSION FILES

As discussed in Section 7, the NMIM/NONROAD model was executed using specifications to generate monthly emission files. Monthly SMOKE ARINV ORL files

were created. Average day emissions were calculated by dividing the NONROAD generated monthly emissions by the number of days in each month. Summary reports were prepared to verify agreement between the average day, monthly, and annual emissions.

9.4 NONROAD MAR SMOKE EMISSION FILES

Annual inventories for marine vessels, airport operations and railroad locomotives were prepared in SMOKE ARINV ORL format for each county in the region. Average day emissions were calculated by dividing the annual emissions by 365 days. The ORL files for Category 3 commercial marine vessels include only the emissions that occur in state waters (generally from the shoreline to 3–10 nautical miles from shore).

10.0 FINAL DELIVERABLES

Exhibits 10.1 to10.3 identify the deliverable products for the 2017 and 2020 MANE-VU+VA emission inventories developed by MACTEC under this contract. The exhibit also identifies deliverables associated with the 2017 and 2020 MANE-VU+VA inventories under development by other agencies.

Files are stored on MARAMA ftp site:

Address: ftp.marama.org

Login ID: regionalei

Password: marama2007

Files are stored in the following directories:

\MARAMA 07-17-20 Version 3\Final 2017 2020 (Version 3_3)/NIF

\MARAMA 07-17-20 Version 3\Final 2017 2020 (Version 3_3)/SMOKE

\MARAMA 07-17-20 Version 3\Final 2017 2020 (Version 3_3)/TSD

\MARAMA 07-17-20 Version 3\Final 2017 2020 (Version 3_3)/XLS

The contents of each folder are provided in Exhibits 10.1, 10.2, and 10.3.

Exhibit 10.1 – NIF Data Files for the 2017/2020 MANE-VU+VA Emission Inventories

File Description	**File Name**	**Format**	**Notes**
2017 Annual Point Source Emission Inventory in NOF format	MANEVU+VA_V3_3 Point_2017_NOF.mdb	NOF ACCESS	File includes only those point sources classified as "nonEGU" according to the ERTAC definition. See file for Field Definitions
2020 Annual Point Source Emission Inventory in NOF format	MANEVU+VA_V3_3 Point_2020_NOF.mdb	NOF ACCESS	
2017 Annual Area Source Emission Inventory in NOF format	MANEVU+VA_V3_3 Area_2017_NOF.mdb	NOF ACCESS	See file for Field Definitions
2020 Annual Area Source Emission Inventory in NOF format	MANEVU+VA_V3_3 Area_2020_NOF.mdb	NOF ACCESS	See file for Field Definitions
2017 Annual NMIM/NONROAD Emission Inventory in NOF format	2017MARAMANMIMv3.mdb	NOF ACCESS	See file for Field Definitions
2020 Annual NMIM/NONROAD Emission Inventory in NOF format	2020MARAMANMIMv3.mdb	NOF ACCESS	See file for Field Definitions
2017 Annual MAR Emission Inventory in NOF format	MANEVU+VA_V3_3_MAR_2017_NOF.mdb	NOF ACCESS	See file for Field Definitions
2020 Annual MAR Emission Inventory in NOF format	MANEVU+VA_V3_3_MAR_2020_NOF.mdb	NOF ACCESS	See file for Field Definitions

Exhibit 10.2 – Summary Spreadsheet Files for the 2017/2020 MANE-VU+VA Emission Inventories

File Description	File Name	Format	Notes
County/SCC level emissions for all 2017/2020 scenarios	V3_3 Area_07_17_20.xlsx	MS EXCEL	See file for Field Definitions
Excel summary of emissions by State and SCC for 2017	MANEVU+VA_V3_3_Area_2017_ExistingControls_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions
Excel summary of emissions by State and SCC for 2017	MANEVU+VA_V3_3_Area_2017_What IfControls_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions
Excel summary of emissions by State and SCC for 2020	MANEVU+VA_V3_3_Area_2020_ExistingControls_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions
Excel summary of emissions by State and SCC for 2020	MANEVU+VA_V3_3_Area_2020_What IfControls_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions
Tables and graphs used in the TSD	TSD V3_3 2017_2020 Area Graphs.xlsx	MS EXCEL	See file for Field Definitions
County/SCC level emissions for all 2017/2020 scenarios	V3_3 MAR_07_17_20.xlsx	MS EXCEL	See file for Field Definitions
Excel summary of emissions by State and SCC for 2017	MANEVU+VA_V3_3_MAR_2017_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions
Excel summary of emissions by State and SCC for 2020	MANEVU+VA_V3_3_MAR_2020_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions
Tables and graphs used in the TSD	TSD V3_3 2017_2020 MAR Graphs.xlsx	MS EXCEL	See file for Field Definitions
Process level emissions for all 2017/2020 scenarios	V3_3 NonEGU_07_17_20.xlsx	MS EXCEL	See file for Field Definitions
Excel summary of emissions by State and SCC for 2017	MANEVU+VA_V3_3_NonEGU_2017_ExistingControls_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions
Excel summary of emissions by State and SCC for 2017	MANEVU+VA_V3_3_NonEGU_2017_What IfControls_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions
Excel summary of emissions by State and SCC for 2020	MANEVU+VA_V3_3_NonEGU_2020_ExistingControls_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions

Excel summary of emissions by State and SCC for 2020	MANEVU+VA_V3_3_NonEGU_2020_What IfControls_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions
Tables and graphs used in the TSD	TSD V3_3 2017_2020 NonEGU Graphs.xlsx	MS EXCEL	See file for Field Definitions
Excel summary of emissions by State and SCC for 2017	MANEVU+VA_V3_3_NMIM_2017_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions
Excel summary of emissions by State and SCC for 2020	MANEVU+VA_V3_3_NMIM_2020_StateSCCSummaries.xlsx	MS EXCEL	See file for Field Definitions
Tables and graphs used in the TSD	TSD V3_3 2017_2020 NMIM Graphs.xlsx	MS EXCEL	See file for Field Definitions

Exhibit 10.2 – SMOKE Files for the 2013/2017/2020 MANE-VU+VA Emission Inventories

File Description	File Name	Format	Notes
2017 Annual Point Source Emission Inventory in SMOKE ORL format	PTINV_2017_NonHourly_ExistingControls_Jan2012.orl	SMOKE PTINV ORL	Files includes only those point sources classified as "nonEGU" according to the ERTAC definition. See file for Field Definitions
2017 Annual Point Source Emission Inventory in SMOKE ORL format	PTINV_2017_NonHourly_WhatIfControls_Jan2012.orl	SMOKE PTINV ORL	
2020 Annual Point Source Emission Inventory in SMOKE ORL format	PTINV_2020_NonHourly_ExistingControls_Jan2012.orl	SMOKE PTINV ORL	
2020 Annual Point Source Emission Inventory in SMOKE ORL format	PTINV_2020_NonHourly_WhatIfControls_Jan2012.orl	SMOKE PTINV ORL	
2017 Annual Area Source Emission Inventory in SMOKE ORL format	ARINV_2017_Area_ExistingControls_Jan2012.orl	SMOKE ARINV ORL Nonpoint	These files have the PM transport factors by county applied to the NOF emissions. See section 10.2 for discussion. See http://www.smoke-model.org/version2.6/html/ for file format
2017 Annual Area Source Emission Inventory in SMOKE ORL format	ARINV_2017_Area_WhatIfControls_Jan2012.orl	SMOKE ARINV ORL Nonpoint	
2020 Annual Area Source Emission Inventory in SMOKE ORL format	ARINV_2020_Area_ExistingControls_Jan2012.orl	SMOKE ARINV ORL nonpoint	
2020 Annual Area Source Emission Inventory in SMOKE ORL format	ARINV_2020_Area_WhatIfControls_Jan2012.orl	SMOKE ARINV ORL nonpoint	
2013 Annual MAR Source Emission Inventory in SMOKE ORL format	ARINV_2017_MAR_Jan2012.txt	SMOKE ARINV ORL Nonpoint	See http://www.smoke-model.org/version2.6/html/ for file format
2017 Annual MAR Source Emission Inventory in SMOKE ORL format	ARINV_2020_MAR_Jan2012.txt	SMOKE ARINV ORL Nonpoint	See http://www.smoke-model.org/version2.6/html/ for file format

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E-3: LADCO and SEMAP 2007 Summaries

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Regional Air Quality Analyses for Ozone, $PM_{2.5}$, and Regional Haze: Base C Emissions Inventory (September 12, 2011)

The Lake Michigan Air Directors Consortium, in conjunction with its member states, are conducting air quality modeling for ozone and fine particles ($PM_{2.5}$) in preparation for future State Implementation Plan (SIP) work. The modeling analyses are focused on examining model performance (by comparing base year modeled and monitored concentrations) and providing strategy-relevant information (through a series of model sensitivity runs). This document describes the development of the latest base year emissions inventory (Base Cv7). Improvements to the base year inventory are summarized in the table below.

Table 1. Summary of Base C Inventory Improvements

Sector	Activity
Point	Updated State data (Indiana, Iowa, Minnesota, Ohio, Wisconsin)
	Updated EGU-nonEGU splitting
Area	Updated State data (Indiana, Iowa, Minnesota, Ohio, Wisconsin)
	Improved PM speciation profiles
	Revised woodburning emissions
Nonroad	Incorporated ERTAC rail data
Other	Reviewed and identified appropriate speciation profiles

Overview

The primary base year selected for initial modeling is 2007.[1] Meteorology was developed for using MM5 and WRF. (Note: WRF meteorology is being used in the latest base year modeling.) The base year inventory was developed in phases, as summarized in Table 2.

Outstanding emissions inventory issues include:

- Reliability of the MOVES-based on-road emission estimates. (Note, a separate effort is underway to do a top-down evaluation of these emissions using ambient monitoring data.)
- Reliability of new MEGAN biogenic emission estimates
- Development of improved agricultural ammonia emission estimates
- Use of improved PM and VOC speciation profiles
- Appropriateness of assumed transportable dust fraction (i.e., 90%)
- Inclusion of both PM-filterable and PM-condensible emissions
- Inclusion of fire emissions

[1] Limited modeling was also performed for a 2008 base year, but a decision was made to focus on 2007 because of generally higher air quality concentrations in that year. In addition, the LADCO States recently decided to update the modeling base year to 2011. Work is underway to prepare emissions and meteorology for this year. Until the new inventory and meteorology are ready, LADCO will continue to use the 2007 base year data in its regional modeling analyses.

Table 2. Contents of Basecase Inventory

Sector	Base B	Base Cv2	Base Cv4	Base Cv7
EGU Point	2007 CEM data (annualized w/ 2005-2007 temporal)	2007 CEM data (annualized w/ updated temporal) (updated EGU-nonEGU splitting)		Improved Translation from Staging tables to NIF(IL,OH)
Non-EGU Point	2008 State data	2008 State data (updated EGU-nonEGU splitting and PM-condensibles)	Updated State data	Improved Translation from Staging tables to NIF(IL,OH)
Area	2008 State data	Improved PM speciation profiles	Updated State data Modified woodburning emissions	
Nonroad	2007 NONROAD2008			
MAR	Base M	Rail – ERTAC Marine – Base M (w/ 2005 Sip inventory growth) Aircraft – 2008 State date		
Agricultural Ammonia	Base M			
Biogenics	MEGAN			
On-road	Base M (new grid) B+: initial MOVES emissions	MOVES w/ nat'l ldefaults (MW states only)	MOVES w/ nat'l defaults (all states)	
Fires	(not included)	(not included)	(not included)	
Non-LADCO Region	Base M			

Note: The other versions of Base C (Cv3, Cv5, Cv6) reflected minor corrections to individual sectors.

Summary of Base Year Emissions

The emissions base year for the current regional modeling is 2008. 2008 emissions were provided for EGU point, nonroad, on-road, and biogenics, and 2008 emissions (only) were provided for the other sectors (non-EGU point and area). Based on consultation with the States and examination of various emission surrogates (e.g., population, employment, and VMT), 2008 emissions for these sectors were used "as is" to represent 2007 emissions.

For on-road, off-road, ammonia, and biogenic sources, emissions were estimated using emission models. Three other off-road categories are not accounted for by the NONROAD emissions model: commercial marine, aircraft, and rail. Marine emissions will continue to be based on LADCO's Base M (2005) inventory. Aircraft emissions for 2008 were provided by the States. Rail emissions were based on the new 2008 inventory prepared by ERTAC. For point and area sources, emissions were prepared using data supplied by the States. Further discussion is provided below for each source sector in the LADCO region. For the rest of the modeling domain, Base M inventories will be used until more recent inventories are available from other regional organizations.

A summary of annual emissions by pollutant and source sector is provided in Figure 1. A more complete emissions summary is provided in Attachment 1.

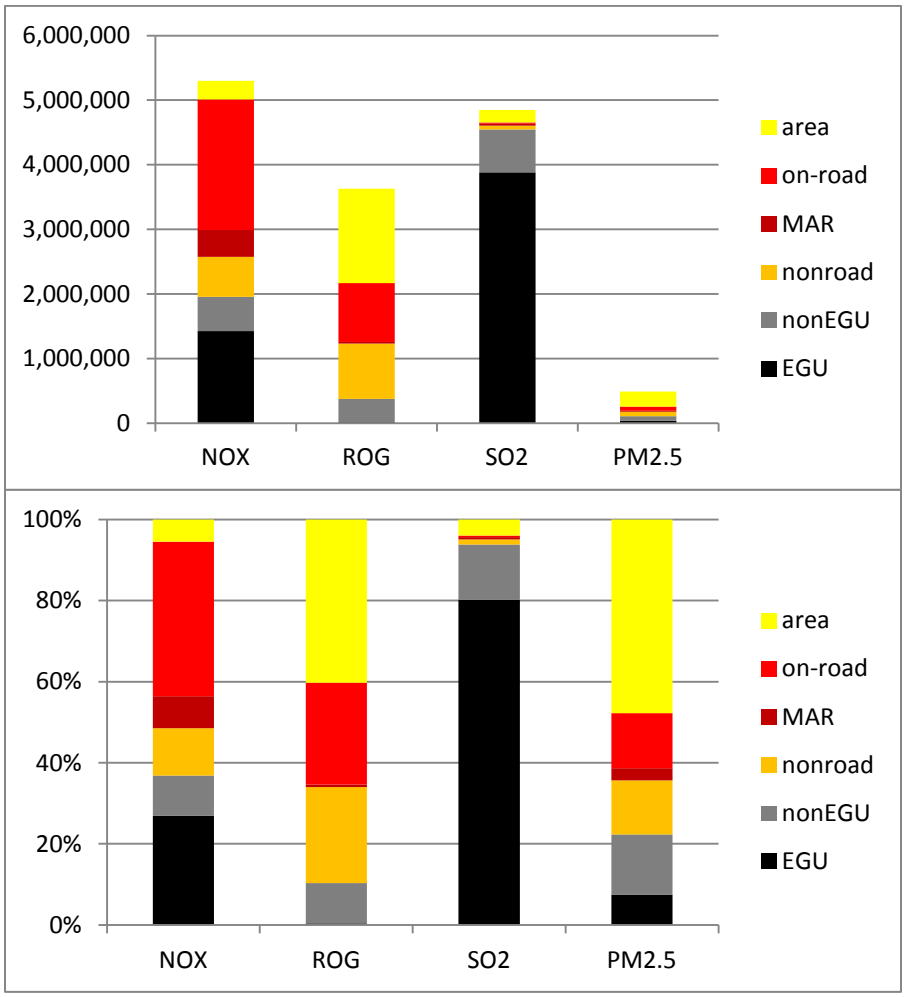


Figure 1. Annual emissions summary by pollutant and source sector

On-Road Sources: Emission estimates were derived using EPA's new MOVES2010a model for on-road motor vehicles. MOVES2010a was developed for state/local air quality and transportation agencies to use in preparing on-road inventories for SIPs and transportation conformity. MOVES2010 replaced the previous model for estimating on-road mobile source emissions, MOBILE6.2. EPA guidance is for states to use MOVES2010a "in ozone, CO, PM, and NO2 SIP development as expeditiously as practicable."

MOVES2010a was developed principally to be run in an "inventory" mode (i.e., monthly average, county-level emission estimates), which is what state/local agencies need for their SIP inventories and conformity demonstrations. For photochemical modeling, however, more refined temporal and spatial information is desired. Two options exist for providing this more refined information: (1) running MOVES2010a for each hour (using concurrent meteorological conditions) to provide the appropriate emission factor, or (2) developing MOVES2010a "look-up" tables which cover the expected ranges of key meteorological variables and then using the tables to provide the emission factor for each hour based on the concurrent meteorological conditions. Initial PC-based modeling showed that the first option was prohibitive. Subsequent Linux-based modeling produced a factor of 2 decrease in model run times, but still suggested that the look-up table option was preferable.

Using a Linux-based version of MOVES2010a created by Wisconsin DNR, on-road motor vehicle inventories were prepared based on a multi-step process:

Step 1: A state-level run was conducted to produce temporal profiles for each state for weekday and weekend emissions as a function of pollutant, emission type (exhaust and evaporative), and vehicle type (gasoline and diesel).

Step 2: A county-level run was conducted for each representative county for January and July to produce a weekday and weekend emission estimate for these two months.

Step 3: The monthly profiles were applied to the representative county results to generate a weekday and weekend emission estimate for all months.

For Base Cv4, national defaults were used in the MOVES runs. State-specific inputs were supplied by most LADCO States, but were not used to produce a modeling inventory.[2] The resulting county-level weekday and weekend emission estimates for each month were then modeled as an area source in EMS. Emission processing assumptions include:

Temporal: Weekday emissions assigned to Monday-Friday, and weekend emissions assigned to Saturday-Sunday. It should be noted that the emission files already reflect hourly values.

Spatial: Applied 2002 surrogates based on roadway type.

Speciation: Exhaust and evaporative emissions by vehicle type (gasoline and diesel) were speciated separately.

[2] Preliminary MOVES runs for a few cities (Cleveland, Milwaukee, and E.St.Louis) indicate that the emission estimates are about 8-10% higher using state-specific inputs.

Off-Road Sources: NMIM2008 was run (using default monthly temperatures) by Wisconsin DNR for the 2007 and 2008 for the five LADCO States plus MN, IA, and MO. Local data for agricultural equipment, construction equipment, commercial marine, recreational marine, and railroads were prepared previously by contractors (Environ, 2004, E.H. Pechan, 2004, and Environ, 2007a, 2007b).

Three other off-road categories are not accounted for by the NMIM emissions model: commercial marine, aircraft, and rail. Marine emissions will continue to be based on LADCO's Base M (2005) inventory (Environ, 2007a). A summary of the annual emissions by vessel type for the 5-state LADCO region are provided in Table 3.

Table 3. Annual Commercial Marine Emissions for 2005 (LADCO Region)

Vessel Type	HC[1]	CO	NOx	PM[1]	SO2
Deep Draft Vessels at Ports	69	122	1,400	82	651
Deep Draft Vessels (mid-Lake)	47	1,055	12,955	652	5,489
Push Boats on Rivers and Lakes	472	4,023	21,689	525	1,905
Tugs	98	857	4,575	110	397
Ferries	26	223	1,107	29	85
Other special (excursion) vessels	7	41	289	6	23
Support vessels	1	10	54	1	5
Dredges	2	22	122	3	66
Commercial Fishing	29	110	7	2	1
Military vessels (Coast Guard)	77	264	138	3	15

[1] HC converted to VOC and PM-total to PM10 and PM2.5 using EPA factors.

Aircraft emissions for 2008 were provided by the States.

Rail emissions were based on the new 2008 inventory prepared by ERTAC. Emissions data were developed for rail yards and line haul operations. Documentation for the rail emissions is available at http://www.ertac.us/rail/index.html

Area and Point Sources: EMS was run by LADCO using data supplied by the LADCO States and Minnesota to produce weekday, Saturday, and Sunday emissions for each month. The ERTAC recommendations on area sources were followed in preparing these data.

Two significant area source improvements were made in developing Base Cv4: application of appropriate PM speciation profiles, and adjustment of residential wood combustion (RWC) emissions. First, several PM area source categories, which were using the default speciation profile, were assigned SCC-specific profiles based on several recent references (CMU, 2004, EC/R, 2005, and Turner, 2010). This resulted in significantly more primary OC and EC emissions.

Second, Michigan DEQ adjusted EPA's RWC tool to reallocate the indoor furnaces and outdoor hydronic heaters (*8510 and *8610, respectively) to nonMSA counties. Counties that are part of an MSA, were assigned zero appliances for both categories. Additionally, an issue with double counting some county activity data in WI and MI was addressed. Table 4 shows the statewide changes in emissions from the standard tool to the revised tool. These changes resulted in a shift in the spatial distribution of emissions, and (due to the double counting) a reduction in statewide emissions in some states.

Table 4. Standard and Adjusted Residential Wood Combustion Emissions

		Standard RWC Tool	Adjusted RWC Tool		Adjusted RWC Tool	Adjusted RWC Tool	Adjusted RWC Tool	Adjusted RWC Tool
State	**Pollutant**	**Emissions**	**Emissions**		**2104008400**	**2104008510**	**2104008610**	**sum**
17	Primary PM10	13,880	14,012		51	4,570	2,454	7,075
18	Primary PM10	11,729	11,724		37	3,762	3,274	7,073
26	Primary PM10	35,143	27,255		91	4,537	6,630	11,257
27	Primary PM10	17,741	17,741		45	879	3,860	4,784
39	Primary PM10	25,703	23,332		80	7,919	5,890	13,889
55	Primary PM10	23,407	20,311		53	2,887	6,156	9,096

For EGU point sources, the annual and summer season emissions were temporalized for modeling purposes using profiles prepared by Scott Edick (Michigan DEQ) based on CEM data. Figure 3 shows the location (and magnitude) of non-EGU and EGU point sources.

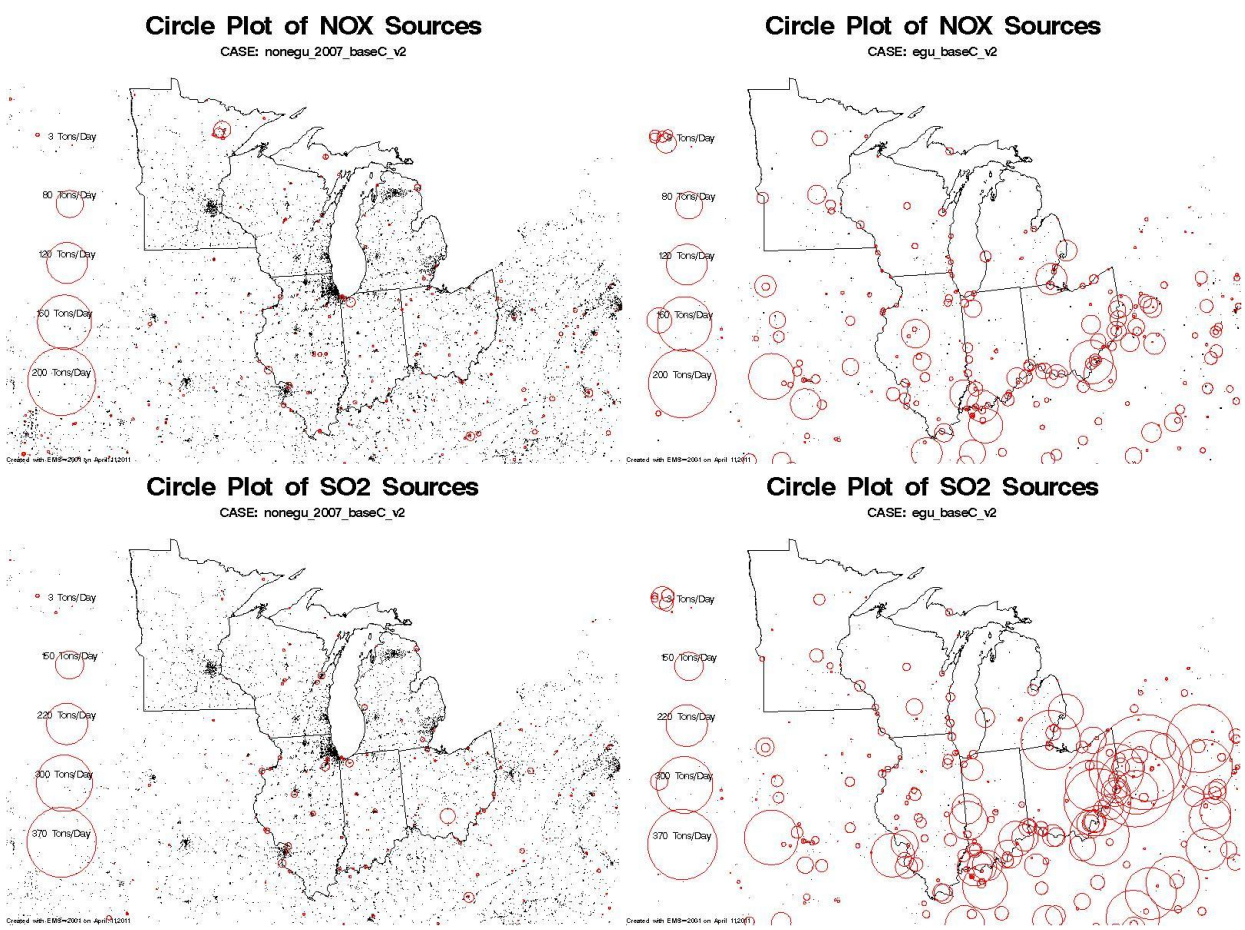


Figure 3. Spatial plot of non-EGU (left) and EGU (right) sources

Biogenics: Environ, under contract to the Midwest Ozone Group, produced day-specific biogenic emissions for the full modeling domain using the CONCEPT/MEGAN biogenics model for 2007 and 2008 (Guenther, et al, 2006, and Sakulyanontvittaya, et al, 2008). MEGAN2.03a was used, which is a modified version of MEGANv2.03 available from http://acd.ucar.edu/~guenther/MEGAN/MEGAN.htm. The improvements for the modified version include:

- Enabling input of temperature and solar radiation data from various sources. Previous versions of MEGAN obtained these data only from MCIP model outputs. Environ developed code to allow input of solar radiation from satellite data and temperature from MM5 and MM5CAMX models.
- Pre-processors were developed to allow the use of alternative modeling grids developed in ArcGIS.
- The MEGAN code is currently capable of outputting model-ready data for CMAQ. The MEGAN code was modified to include outputting of CAMx model-ready data.
- Modification of the MEGAN FORTRAN code that runs on Linux to accept observed temperature data and satellite radiation data and generate emissions for grid-definitions that are developed using ArcGIS.

Figure 4 compares the biogenic isoprene and NO emission estimates for 2007 with those for 2005 (Base M).

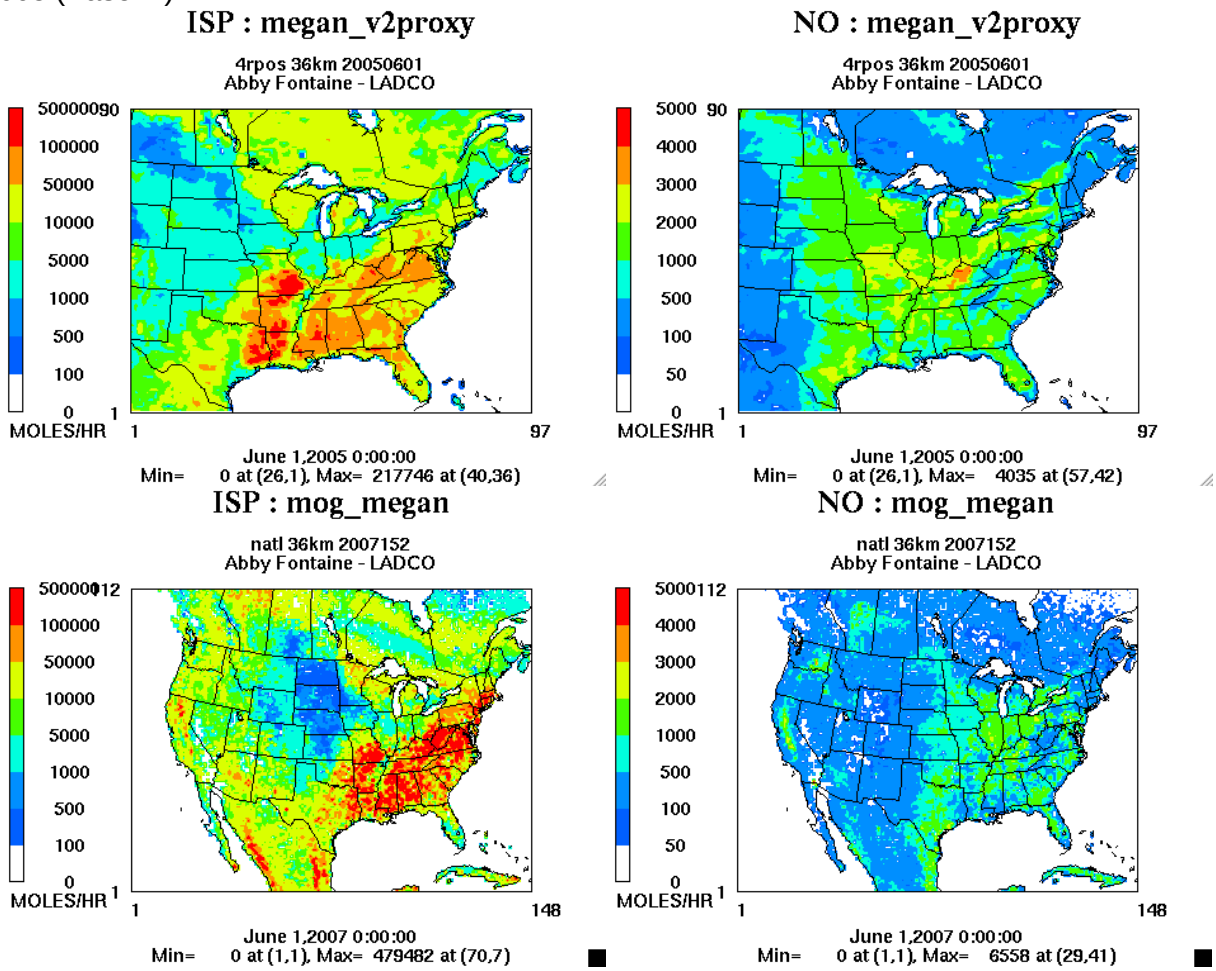
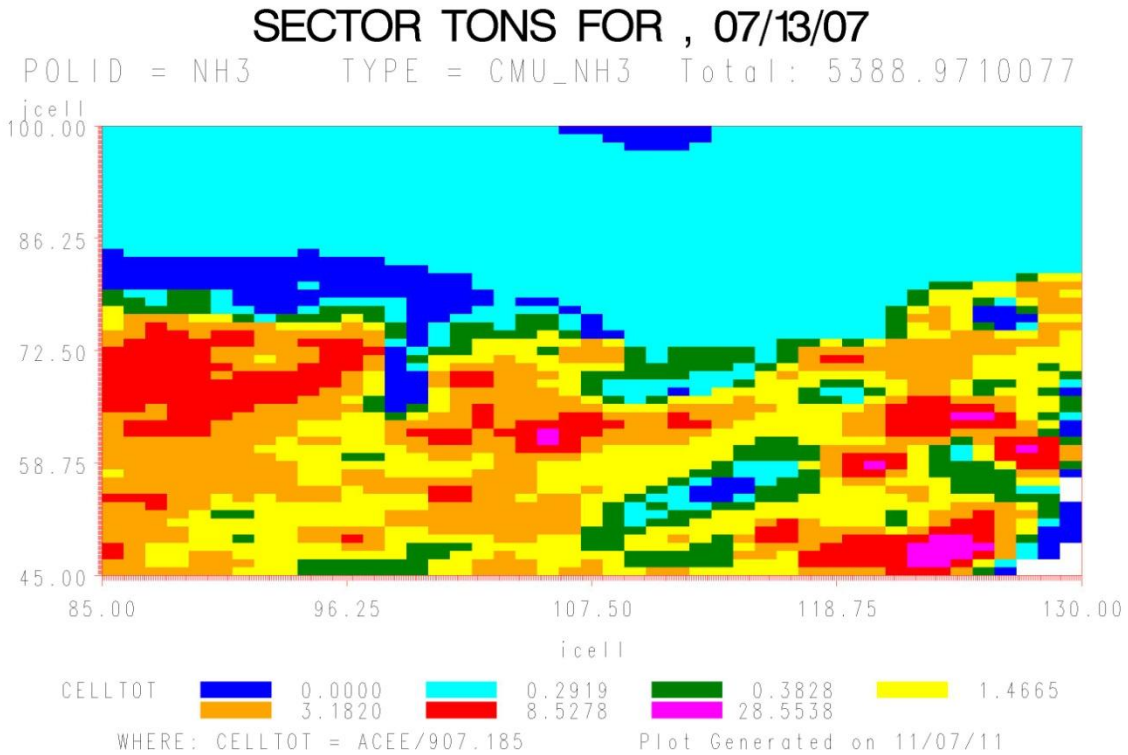


Figure 4. Biogenic emissions: isoprene (left column) and NO (right column) for 2005 (top) and 2007 (bottom)

Ammonia: The agricultural ammonia emissions were based on Carnegie Mellon University's Ammonia Emission Inventory for the Continental United States (http://www.cmu.edu/ammonia).

Specifically, the CMU annual emissions for 2002 were first grown to reflect 2007 conditions based on the methodology use to create the 2005 LADCO SIP inventories. A new process-based ammonia emissions model developed for LADCO (see Zhang, et al, 2005, and Mansell, et al, 2005) was then used to develop temporal factors – i.e., month of year, and hour of day to reflect the impact of average meteorology on livestock emissions.

Emissions Tile plot for Livestock Ammonia in the Upper Midwest and Mid Atlantic States.



Canadian Emissions: Scott Edick (Michigan DEQ) processed the 2005 Canadian National Pollutant Release Inventory, Version 1.0 (NPRI). A subset of the NPRI data (emissions and stack parameters) relevant to the air quality modeling were reformatted and used in the regional modeling.

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Development of the point, fire and on-road mobile source base year inventory for SEMAP

Bill Barnard

AMEC Environment & Infrastructure

Point Source Inventory

- Base year inventory for 2007 prepared for both the EGU and non-EGU source sectors
  - Inventory was to be developed for regional modeling use
  - point sources were typically those classified as major under Title V or sources required to submit hourly emissions data to EPA under various Clean Air Act programs.
    - Some State and local agencies included smaller sources in the point source inventory.

Point Source Inventory (cont'd)

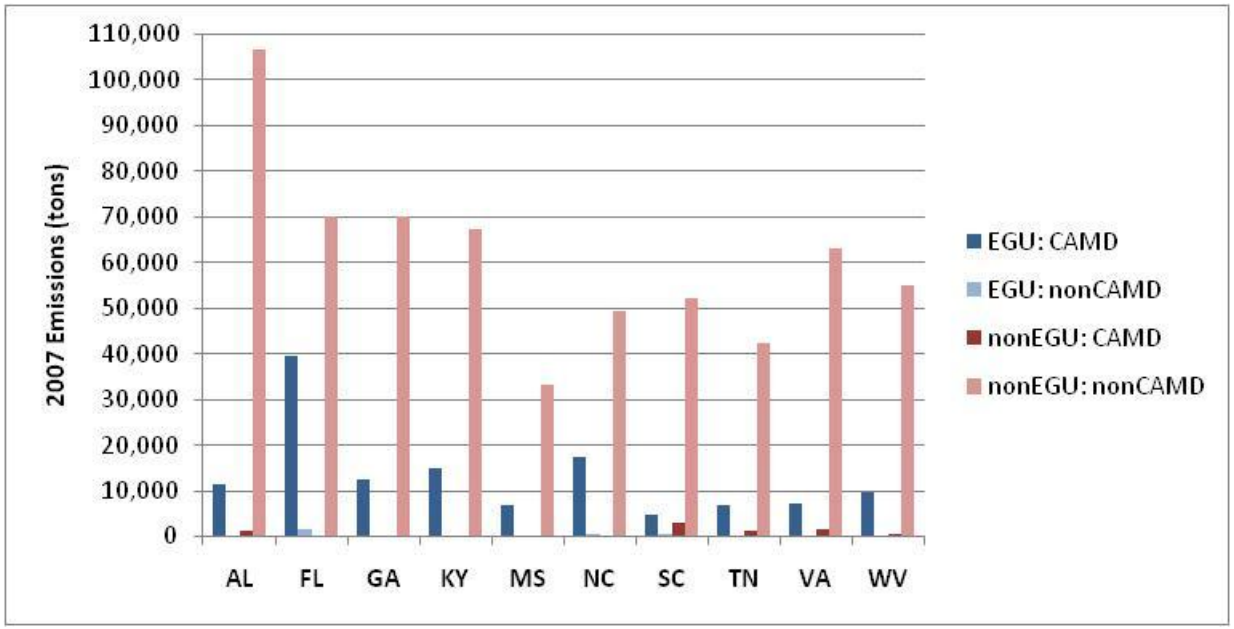
- 2007 point source inventory was developed using data submitted by State and local agencies in the region
  - Preferred data source was 2007 data prepared for CERR submittals - Some States had to use other data to submit or supplement their submittals
  - Also used the data from the CAMD hourly emission monitoring database for EGUs
- Augmentation required for some pollutants
  - PM augmentation followed similar procedure used for VISTAS 2002 base year and for 2002 EPA NEI
  - PM augmentation procedure followed a prioritized approach

Point Source Inventory (cont'd)

- Quality assurance checks
  - State and local agencies asked to review and comment on initial version of inventory and all subsequent revisions
  - AMEC prepared a CAMD-to-NIF crosswalk spreadsheet for States to review and verify that:
    - the linkages are correct
    - there are no large sources missing from the CAMD-to-NIF crosswalk
    - there are not any large discrepancies between the emissions reported to CAMD and the emissions reported in the SEMAP database.
  - Emission release points checked for both location information and for operating characteristics (height, width, temperature, etc)
  - Stakeholders (EPA, the regulated community, academia, environmental groups, and the general public) provided option to review initial version and all subsequent revisions
  - EPA QA tool used to check the NIF file prepared for the inventory

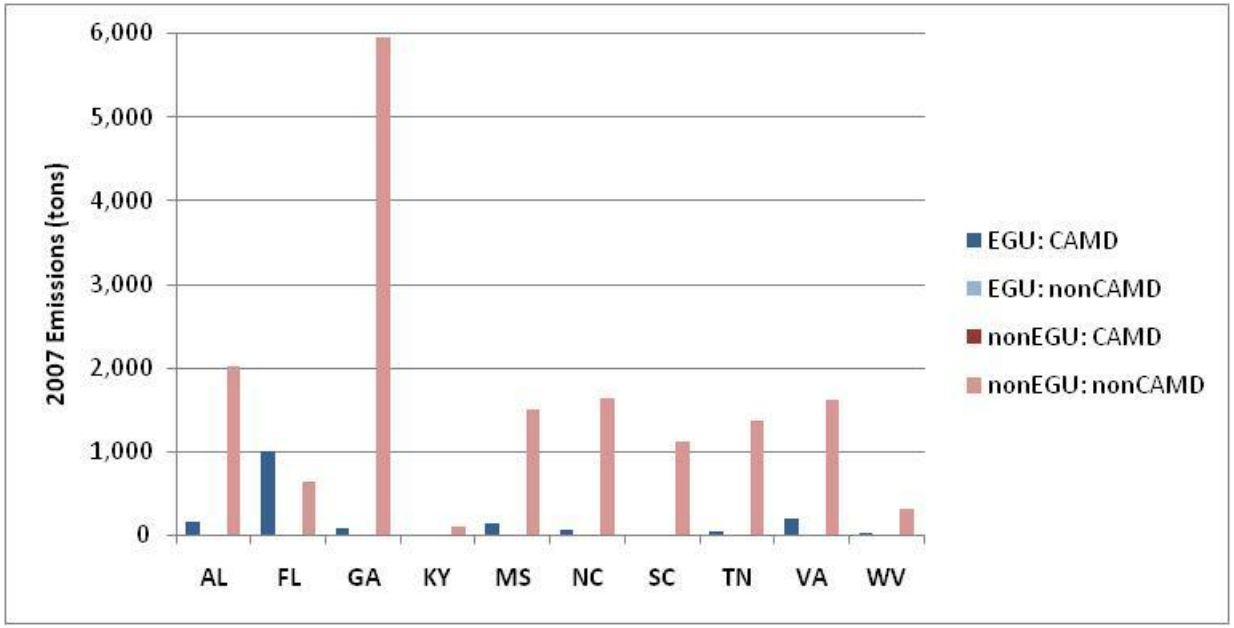
Point Source Inventory CO Emissions

STATE	2002	2007	Change
Alabama	185,550	119,344	-36%
Florida	139,045	111,280	-20%
Georgia	140,561	82,547	-41%
Kentucky	122,555	82,553	-33%
Mississippi	59,871	40,294	-33%
North Carolina	64,461	66,811	4%
South Carolina	63,305	60,375	-5%
Tennessee	122,348	51,185	-58%
Virginia	70,688	72,029	2%
West Virginia	100,220	65,230	-35%
SEMAP	**1,068,604**	**751,648**	**-30%**



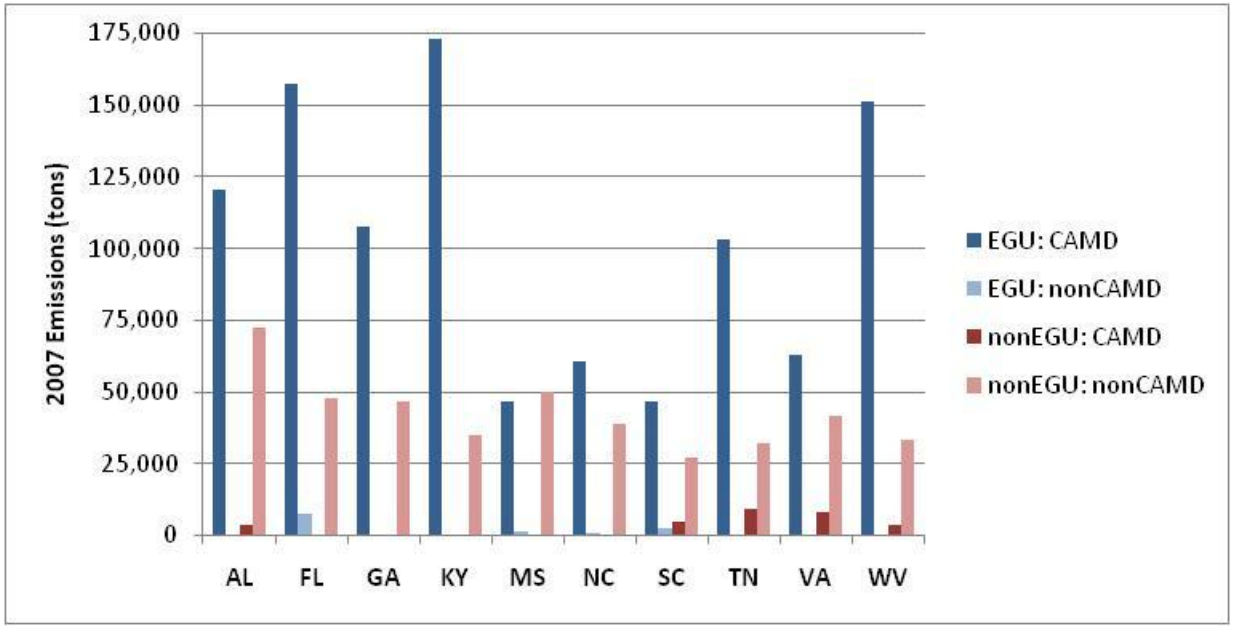
Point Source Inventory NH_3 Emissions

STATE	2002	2007	Change
Alabama	2,200	2,191	0%
Florida	1,657	1,661	0%
Georgia	3,697	6,046	64%
Kentucky	1,000	113	-89%
Mississippi	1,359	1,640	21%
North Carolina	1,234	1,707	38%
South Carolina	1,553	1,125	-28%
Tennessee	1,817	1,429	-21%
Virginia	3,230	1,830	-43%
West Virginia	453	366	-19%
SEMAP	**18,200**	**18,107**	**-1%**



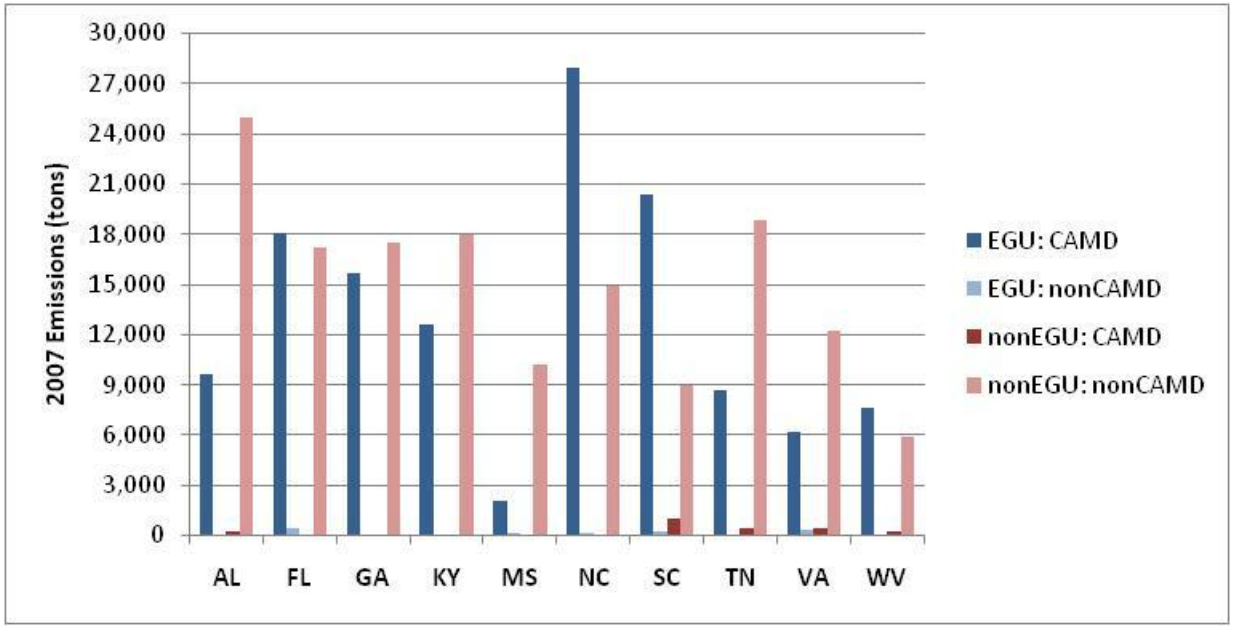
Point Source Inventory NO_x Emissions

STATE	2002	2007	Change
Alabama	244,348	197,963	-19%
Florida	302,834	237,473	-22%
Georgia	196,767	154,041	-22%
Kentucky	237,209	210,213	-11%
Mississippi	104,661	98,183	-6%
North Carolina	196,782	100,379	-49%
South Carolina	130,394	81,220	-38%
Tennessee	221,652	144,763	-35%
Virginia	147,300	112,938	-23%
West Virginia	277,589	188,629	-32%
SEMAP	**2,059,536**	**1,525,801**	**-26%**



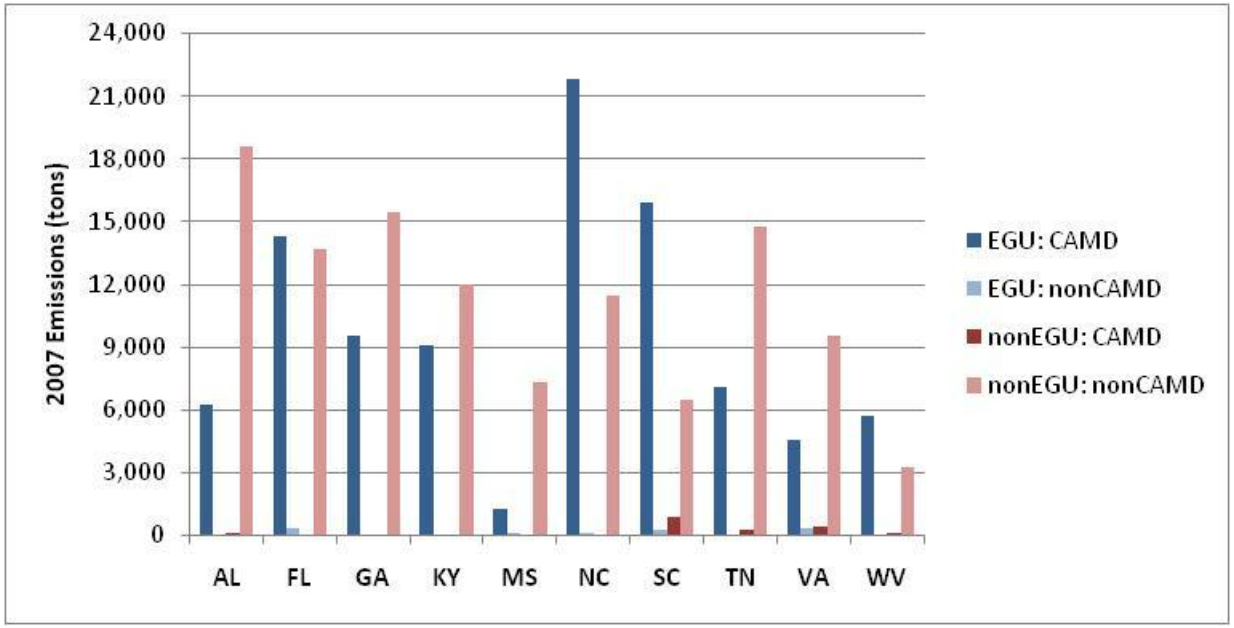
Point Source Inventory PM10-PRI Emissions

STATE	2002	2007	Change
Alabama	32,886	34,776	6%
Florida	57,243	35,796	-37%
Georgia	32,834	33,214	1%
Kentucky	21,326	30,678	44%
Mississippi	21,106	12,368	-41%
North Carolina	36,592	42,995	17%
South Carolina	35,542	30,605	-14%
Tennessee	49,814	27,874	-44%
Virginia	17,211	19,203	12%
West Virginia	22,076	35,457	61%
SEMAP	**326,630**	**302,966**	**-7%**



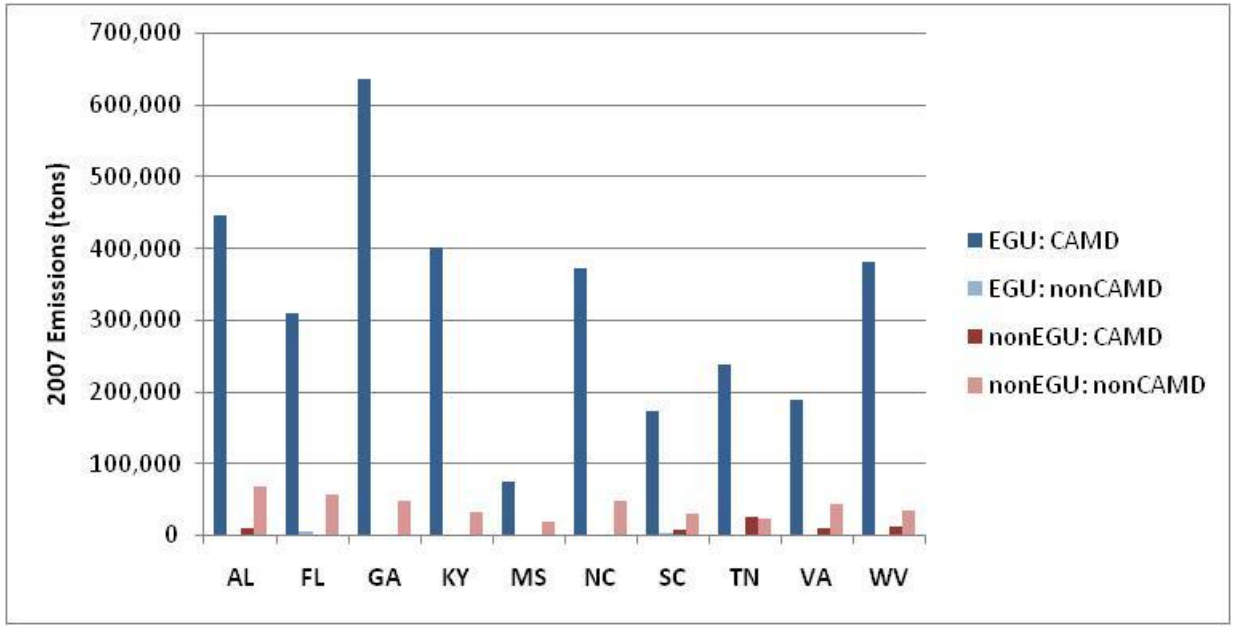
Point Source Inventory PM25-PRI Emissions

STATE	2002	2007	Change
Alabama	23,291	24,930	7%
Florida	46,148	28,418	-38%
Georgia	22,401	25,059	12%
Kentucky	14,173	21,111	49%
Mississippi	11,044	8,731	-21%
North Carolina	26,998	33,444	24%
South Carolina	27,399	23,493	-14%
Tennessee	39,973	22,144	-45%
Virginia	12,771	14,875	16%
West Virginia	15,523	30,552	97%
SEMAP	**239,721**	**232,756**	**-3%**



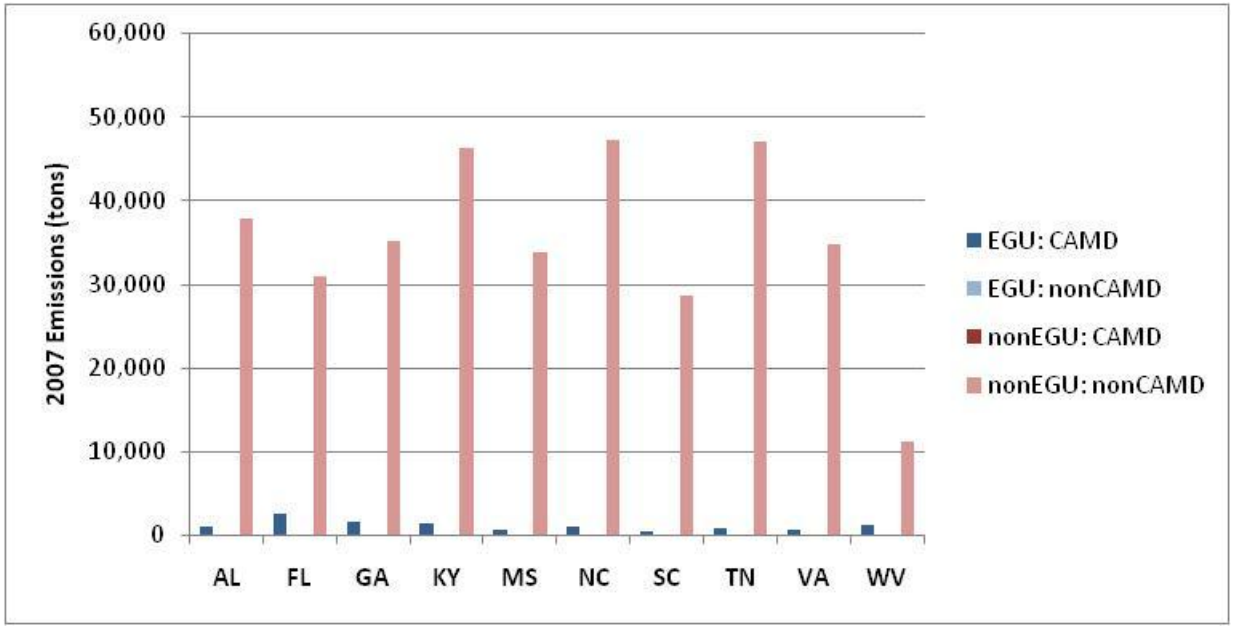
Point Source Inventory SO_2 Emissions

STATE	2002	2007	Change
Alabama	544,309	526,620	-3%
Florida	518,721	379,590	-27%
Georgia	568,731	683,358	20%
Kentucky	518,086	410,414	-21%
Mississippi	103,388	94,978	-8%
North Carolina	522,113	420,438	-19%
South Carolina	259,916	216,125	-17%
Tennessee	413,755	287,668	-30%
Virginia	305,106	243,048	-20%
West Virginia	570,153	428,350	-25%
SEMAP	**4,324,278**	**3,690,588**	**-15%**



Point Source Inventory VOC Emissions

STATE	2002	2007	Change
Alabama	49,332	38,877	-21%
Florida	40,995	33,683	-18%
Georgia	34,952	36,717	5%
Kentucky	46,321	47,679	3%
Mississippi	43,852	34,587	-21%
North Carolina	62,170	48,349	-22%
South Carolina	38,927	29,281	-25%
Tennessee	85,254	48,103	-44%
Virginia	43,906	35,618	-19%
West Virginia	15,775	12,503	-21%
SEMAP	**461,484**	**365,397**	**-21%**



ON-ROAD MOBILE SOURCES

Status of MOVES Tasks

- All tasks except for summarization of SMOKE Emission Reports and Project Management are complete
- SMOKE Emission Report summaries are expected to be complete in early April
- Project Management & Technology Transfer task is on-going

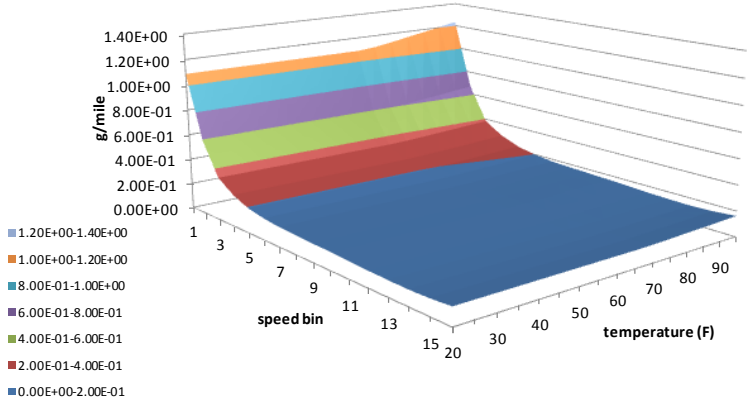
Some Challenges of Running MOVES

- "Young" model
  - Significant shakedown period
  - Development of MOVES inputs (e.g., VMT, vehicle populations) by representative county more difficult than anticipated
  - Choice of runtime options (e.g., temperature field, temperature increments, fuel season) can dramatically impact results
  - Identified numerous bugs - examples include:
    - errant emission factors were output for winter fuel season at high temperatures
    - emission factors were missing for some SCC-road type combinations and some pollutants
    - certain PM emission factors that were output were in error due to formulation problems
- Long MOVES run times
  - Emissions factor mode – One fuel season, one county on high-end computer (average runtime: ~8 hours)
  - Emissions inventory mode – one day per month per county on high-end computer (average runtime: ~1.5 hours)
- Sensitivity analyses conducted for RH and RVP
- Quality assurance is difficult as MOVES generates hundreds of thousands of records per run

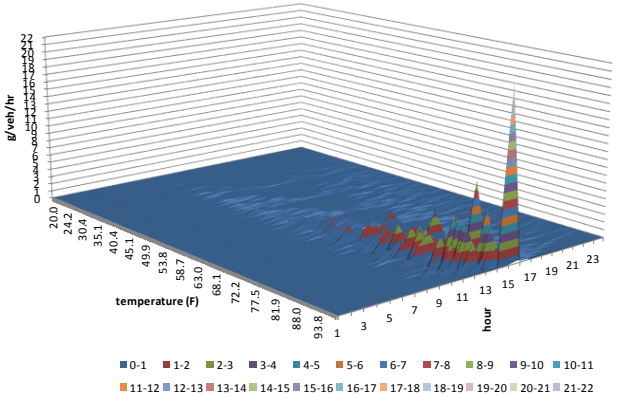
QA of Emissions Factors

- New tools had to be developed for QA

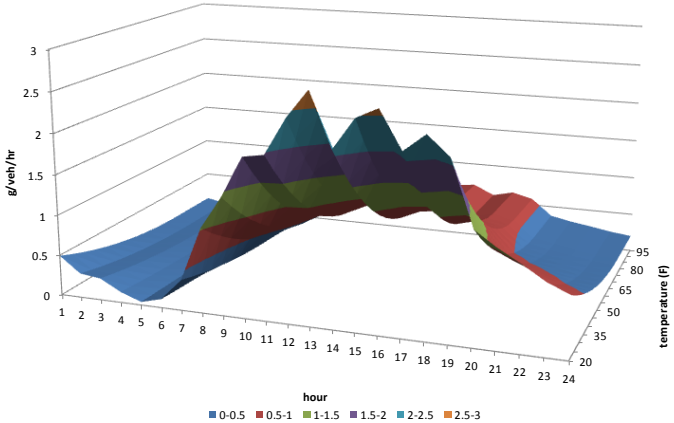
Rate Per Distance



Rate Per Profile



Rate Per Vehicle



Summary of SMOKE Reports

- Reduce approximately 50 GB of SMOKE reports into something more manageable
- Excel workbook with VBA scripts
  - Reduces SMOKE report data
  - Prepares numerous canned reports
  - Allows user to perform limited ad-hoc reporting
- One workbook per state
- Canned reports include:
  - Annual summary by county
  - Monthly summary by county
  - Working on average day summaries by year, season, month

Example Monthly Summary by County report for MOVES

SMOKE report summary (Alabama).xlsm - Microsoft Excel

A5723 | 1073

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	#				tons/day	tons/day	tons/day	tons/day	tons/day	tons/day	tons/day	tons/day	tons/day	tons/day	tons/day
2	#FIPS	State	County	SCC	CO	NO	NO2	HONO	VOC_INV	NH3	SO2	SULF	PEC	POC	PSO4
3	1001	Alabama	Autauga Co	2201001000	137.6035	8.2779	0.277182	0.068995	15.6975	0	0.0250922	0	0.0523503	0.081089	0.0001
4	1001	Alabama	Autauga Co	2201001110	40.7972	6.3057	0.7655	0.057023	1.56311	0.41075	0.11383	0	0.0291905	0.106741	0.001
5	1001	Alabama	Autauga Co	2201001130	6.8306	1.26066	0.152947	0.0114002	0.37347	0.082817	0.0249107	0	0.00428424	0.0153173	0.0003
6	1001	Alabama	Autauga Co	2201001150	9.9076	1.71789	0.208118	0.0155321	0.55448	0.110594	0.0347732	0	0.0059315	0.0210999	0.000
7	1001	Alabama	Autauga Co	2201001170	11.84	1.90315	0.230159	0.0172043	0.67858	0.119392	0.039713	0	0.0067048	0.023701	0.000
8	1001	Alabama	Autauga Co	2201001190	2.29448	0.346918	0.041881	0.00313563	0.136488	0.0209992	0.0074508	0	0.00124591	0.0043737	0.0001
9	1001	Alabama	Autauga Co	2201001210	5.877	0.89066	0.107513	0.0080502	0.349836	0.053833	0.0190987	0	0.00322919	0.0113463	0.000
10	1001	Alabama	Autauga Co	2201001230	0	0	0	0	0	0	0	0	0	0	
11	1001	Alabama	Autauga Co	2201001250	0	0	0	0	0	0	0	0	0	0	
12	1001	Alabama	Autauga Co	2201001270	39.3614	5.4401	0.65549	0.049156	2.55243	0.329493	0.125202	0	0.0229167	0.081919	0.002
13	1001	Alabama	Autauga Co	2201001290	22.5244	3.10795	0.37454	0.0280836	1.46018	0.188477	0.071629	0	0.0129447	0.0462298	0.001
14	1001	Alabama	Autauga Co	2201001310	4.2837	0.59064	0.071177	0.0053374	0.277632	0.0358279	0.0136193	0	0.00244786	0.008739	0.0003
15	1001	Alabama	Autauga Co	2201001330	15.3321	2.11869	0.255308	0.019145	0.99433	0.128373	0.048773	0	0.0088825	0.0317415	0.001
16	1001	Alabama	Autauga Co	2201020000	169.9411	8.0775	0.250182	0.067158	15.2962	0	0.0193587	0	0.0559274	0.094958	0.0001
17	1001	Alabama	Autauga Co	2201020110	35.414	5.3269	0.58015	0.047638	1.33994	0.167678	0.070207	0	0.0091027	0.092939	0.000
18	1001	Alabama	Autauga Co	2201020130	6.8018	1.19994	0.130862	0.0107324	0.342568	0.038003	0.0166091	0	0.00149901	0.0141366	0.0002
19	1001	Alabama	Autauga Co	2201020150	9.6291	1.59508	0.174341	0.0142694	0.51016	0.050017	0.0229611	0	0.00205644	0.0187354	0.000
20	1001	Alabama	Autauga Co	2201020170	11.099	1.69623	0.185952	0.0151788	0.62097	0.052472	0.0256928	0	0.00227971	0.019863	0.000
21	1001	Alabama	Autauga Co	2201020190	2.10313	0.297839	0.0327341	0.00266572	0.125185	0.0090205	0.004766	0	0.00042337	0.00350849	0.0001
22	1001	Alabama	Autauga Co	2201020210	6.2339	0.88474	0.097236	0.0079192	0.37127	0.0267528	0.0141348	0	0.00126716	0.0105372	0.0003
23	1001	Alabama	Autauga Co	2201020230	0	0	0	0	0	0	0	0	0	0	
24	1001	Alabama	Autauga Co	2201020250	0	0	0	0	0	0	0	0	0	0	
25	1001	Alabama	Autauga Co	2201020270	32.7533	4.1266	0.45163	0.0369228	2.09211	0.12807	0.072258	0	0.0069573	0.060138	0.001
26	1001	Alabama	Autauga Co	2201020290	17.5521	2.20789	0.241646	0.0197544	1.12086	0.068614	0.03871	0	0.00368819	0.0317733	0.000
27	1001	Alabama	Autauga Co	2201020310	3.56429	0.448	0.04903	0.0040082	0.227546	0.013928	0.0078586	0	0.00074531	0.0064111	0.0001
28	1001	Alabama	Autauga Co	2201020330	12.7577	1.60713	0.175882	0.0143788	0.81495	0.049895	0.0281446	0	0.00269844	0.023297	0.000
29	1001	Alabama	Autauga Co	2201040000	58.3904	2.77537	0.085959	0.0230754	5.255906	0	0.0066517	0	0.0192154	0.0326289	4.5439
30	1001	Alabama	Autauga Co	2201040110	13.1858	1.98347	0.216009	0.0177379	0.49892	0.062443	0.0261405	0	0.00338901	0.0346055	0.0003
31	1001	Alabama	Autauga Co	2201040130	2.33675	0.41228	0.04496	0.00368748	0.117702	0.0130581	0.0057063	0	0.00051504	0.004857	0.0000
32	1001	Alabama	Autauga Co	2201040150	3.30841	0.54805	0.059897	0.0049025	0.175271	0.0171832	0.0078885	0	0.00070654	0.0064368	0.0001
33	1001	Alabama	Autauga Co	2201040170	3.8133	0.58277	0.063886	0.0052147	0.213358	0.0180273	0.0088271	0	0.00078323	0.0068246	0.0001
34	1001	Alabama	Autauga Co	2201040190	0.7224	0.102301	0.0112441	0.00091571	0.043001	0.00309878	0.00163712	0	0.00014542	0.00120519	0.0000
35	1001	Alabama	Autauga Co	2201040210	2.00586	0.284707	0.0312886	0.00254832	0.119469	0.0086101	0.0045489	0	0.000407748	0.00339073	0.0001
36	1001	Alabama	Autauga Co	2201040230	0	0	0	0	0	0	0	0	0	0	
37	1001	Alabama	Autauga Co	2201040250	0	0	0	0	0	0	0	0	0	0	
38	1001	Alabama	Autauga Co	2201040270	11.2533	1.41777	0.155163	0.0126849	0.71879	0.044007	0.0248238	0	0.00239026	0.0206615	0.000
39	1001	Alabama	Autauga Co	2201040290	6.0314	0.75855	0.083023	0.006787	0.38512	0.0235737	0.0133004	0	0.00126709	0.0109156	0.0003
40	1001	Alabama	Autauga Co	2201040310	1.30743	0.164319	0.0179847	0.0014702	0.083466	0.0051087	0.00288264	0	0.000273369	0.00235167	0.0000
41	1001	Alabama	Autauga Co	2201040330	4.6799	0.58955	0.06452	0.005275	0.298957	0.0183024	0.0103247	0	0.00098994	0.0085461	0.0002
42	1001	Alabama	Autauga Co	2201070000	40.0858	1.34434	0.0400836	0.0111647	2.757818	0	0.0029572	0	0.0121014	0.0205634	0.0000
43	1001	Alabama	Autauga Co	2201070110	21.0156	2.86439	0.197286	0.0246906	0.8143	0.0416381	0.0296038	0	0.00324523	0.0309832	0.0005
44	1001	Alabama	Autauga Co	2201070130	4.06812	0.58688	0.0423379	0.00507426	0.189523	0.0095544	0.006502	0	0.000555558	0.00478574	0.0001
45	1001	Alabama	Autauga Co	2201070150	6.5751	0.82586	0.058936	0.0071357	0.314405	0.0126805	0.0096426	0	0.00074257	0.00593922	0.0002

Month01 | Month02 | Month03 | Month04 | Month05 | Month06 | Month07 | Month08 | Month09

Ready | Average: 29343066.89 | Count: 78 | Sum: 2230073084 | 100%

FIRES

Fire Emission Inventory Development

- Used a step-wise procedure
  - Receive fire activity data from State and local agencies within the SESARM region.
  - Obtain data on wildfires, prescribed burns, agricultural burning and waste/land clearing burning activities from State and Federal fire officials. Data on acres burned, fuel loadings and emission factors were sought from these officials.
  - Evaluate the data received by the State and local agencies to determine whether or not the data were usable and what information was included with the submitted data. This included a quality assurance step performed to ensure that the submitted data contained all necessary information needed to develop 2007 emission estimates.

Fire Emission Inventory Development

- Used a step-wise procedure (cont'd)
  - Quality assure the data submitted by fire officials for completeness and for location information.
  - Develop fire emission estimates.
  - Provide files to the modeling contractor for use in the base year SMOKE air quality modeling for SESARM.
  - Develop and provide National Emission Inventory Input Files (NIF) for the SESARM States to include the calculated emissions data
- Original approach was to use CONSUME to calculate emissions but most States did not have the required data necessary to use model with many default values
- The preliminary version of the inventory was provided to the State/local agencies for review and comment

Fire Emission Inventory Development

- Data Required
  - Number of acres burned (per day if available)
  - Date of fire – Actual days were preferred but time period of fire was acceptable (start and end dates).
  - Type of material burned (pine, oak, etc.) or NFDRS or other fuel categorization code
  - Fuel loading (tons/acre)
  - Location of fire – Latitude/latitude/longitude information in decimal degrees (rather than degrees/minutes/seconds) was preferred, but if not available, the minimum acceptable information was the county in which the fire was located. State and County FIPS codes were to be included with all entries.
  - Name of fire or fire control project if available and applicable (primarily wildfires or Rx burns)

Data Provided

Data provided by the States

State	Agriculture	Prescribed	Land Clearing	Wildfires
AL	✓	✓		✓
FL	✓	✓	✓	✓
GA	✓	✓	✓	✓
KY				✓
MS				
NC		✓		✓
SC	✓	✓		✓
TN				✓
VA		✓		✓
WV				✓

Data provided by Federal agencies

Agency	Agriculture	Prescribed	Land Clearing	Wildfires
USFS		✓		✓
FWS		✓		✓
NPS		✓		✓
DOD		✓		

Data Manipulation/Augmentation

- Location data was QA'ed using a GIS to determine if location information was correct
  - Records that showed locations different than the State/county they were listed in or in the ocean were returned to States/locals for review and correction
- Data augmentation followed a priority scheme
  - Submitter-supplied data – if provided, these values were always used
  - National Fire Danger Rating System (NFDRS) Model value assigned fuel loading
  - Fire Behavior Prediction System (FPBS) fuel model – the FBPS fuel model value was mapped to a NFDRS value and the fuel loading was determined via the crosswalk between the two systems.
  - Material burned type (a NFDRS value was assigned if the material burned could be easily matched to a NFDRS fuel model)
  - Default values provided by State/Federal fire personnel – these values were only used where they were missing or where AMEC was specifically instructed to use them.
  - Finally, for some fire types (e.g., agricultural burning or land clearing of debris), AP-42 fuel loadings were utilized.
- All fuel loading values based on fuel models were consumption weighted fuel loadings

Special Circumstances for Data

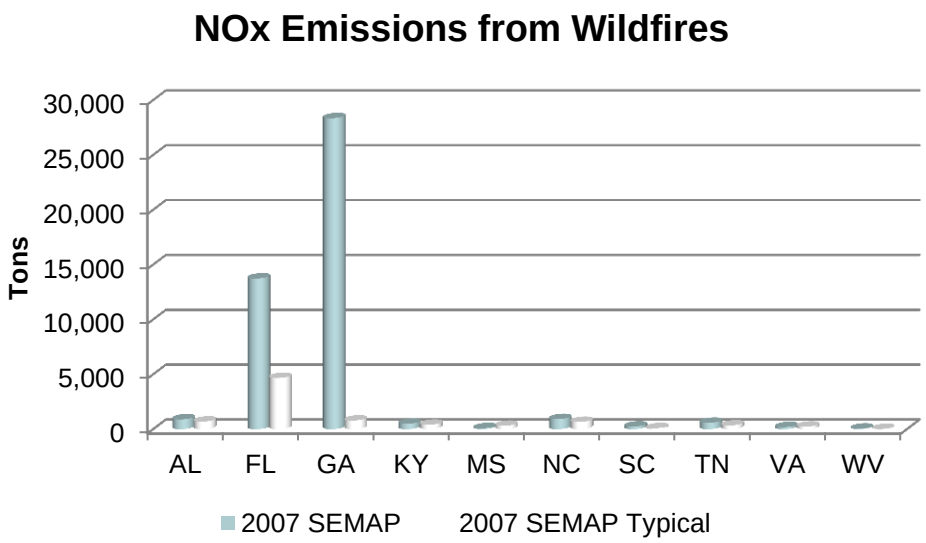
- MS
  - MS did not submit any fire data so EPA SMARTFIRE data for MS was used for emissions
  - Only included wildfires and a category for all other fire types
- GA
  - GA data on Rx burns only contained information on acres burned per month
  - EPA SMARTFIRE data used to allocate the acreage to specific days
- Data for States that did not submit fire data for specific fire types filled in via county level area source NIF format

Typical Year Fire Estimates

- Data collected on acreage burned by fire type by county for 2006-2008 collected
- Average acreage by fire type and county calculated.
- Exceptional event fires were removed for FL, GA, NC, SC, TN and VA
- Ratio to actual 2007 acreage calculated and applied by fire type to obtain a “typical” fire acreage by county and fire type
- Emissions calculated using typical acreages. All other data maintained (e.g., fuel loading, etc)
- Dates and location also maintained from 2007 data

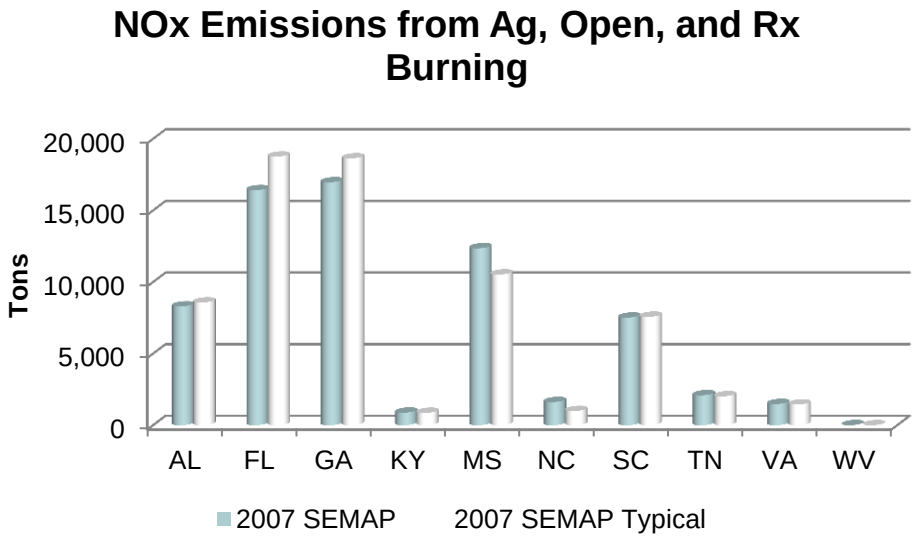
Example Results – Wildfire NO_x

	SEMAP 2007	SEMAP 2007 Typical
AL	894	693
FL	13,740	4,667
GA	28,352	791
KY	494	404
MS	94	310
NC	919	661
SC	245	88
TN	581	343
VA	190	230
WV	54	19
Total	**45,563**	**8,207**



Example Results – Ag, Rx and Land Clearing NO_x

	SEMAP 2007	SEMAP 2007 Typical
AL	8,299	8,575
FL	16,418	18,762
GA	16,969	18,638
KY	882	867
MS	12,360	10,528
NC	1,620	992
SC	7,518	7,576
TN	2,095	2,022
VA	1,482	1,450
WV	7	4
Total	**67,651**	**69,413**



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SESARM 2007 BASE YEAR STATIONARY AREA AND NONROAD MOBILE SOURCE INVENTORIES

Briefing for SESARM Stakeholders

June 2012

TranSystems|E.H. Pechan & Associates

Overview

- **Base Year Inventory Development**
  - Stationary Area Source Procedures
  - Nonroad Mobile Source Procedures
  - Quality Assurance Procedures
- **Base Year Summary Charts**
- **Example Base Year Maps**
- **List of Deliverables**
- **Next Steps**

Base Year Inventory Development

- **General Methods for Base Year Inventory Development**
  - Priority for state/local (S/L) agency supplied data
  - Supplemented with
    - Estimates developed for SEMAP
    - 2008 National Emissions Inventory (NEI) - adjusted for 2007
    - Eastern Research Technical Advisory Consortium (ERTAC) – Locomotives
    - 2002 NEI
  - Comparative review to identify issues for S/L input
  - Data merge
  - QA included S/L review of emission summaries/density maps
  - Revisions incorporated

Base Year Inventory Development – Stationary Area Sources

- **Memo Describing Methods/Data Used to Develop EPA's Preliminary Emission Estimates for the 2008 Area Source NEI**
  - S/L agencies use to determine preferred use of their or EPA data
- **2008 Area Source NEI**
  - Adjusted to reflect 2007 year activity levels
  - Adjusted to remove point source emissions
- **S/L Agencies Provide Emissions Data**
- **Comparative Review of S/L Data w/ 2008 & 2002 Area Source NEI**
  - Missing source categories
  - Missing pollutants
  - Request for S/L input on how to address missing information/potential double counting

Base Year Inventory Development – Stationary Area Sources (cont'd)

- **SEMAP Emission Estimates Developed for Key Categories**
  - Industrial and Commercial/Institutional Fuel Combustion
    - Emissions not available from EPA
    - Use of activity data that best reflect 2007
    - Incorporation of S/L comments
  - Stage I Gasoline Service Station Unloading
    - Request S/L review of all key inputs (e.g., filling technologies, gasoline RVP)
    - Follow-up to obtain valid/complete input data
    - Incorporation of S/L comments

Base Year Inventory Development – Stationary Area Sources (cont'd)

- **SEMAP Emission Estimates Developed for Key Categories**
  - Residential Wood Combustion (RWC)
    - Higher than expected emissions in urban relative to rural areas
    - Revisions incorporated into EPA RWC tool
      - Wood-burning Appliance Profiles
        - Removal of estimated proportion of non-wood burning (e.g., natural gas) units
        - Development of sub-MSA appliance profiles
        - Default urban profile applied to urban areas for which sub-MSA data not available
      - Refinement to Wood Consumption Rates
        - Apply urban rate adjustment (~54%) to average rate in urban counties.
        - Apply rural rate adjustment (~156%) to rural counties

Base Year Inventory Development – Nonroad Mobile Sources

- **Nonroad Sector Includes Following Categories:**
  - NONROAD Model
    - Recreational marine and land-based vehicles, farm, construction and industrial machinery, lawn and garden equipment
  - Aircraft
    - Aircraft engine and support equipment
  - Commercial Marine Vessels
    - Ocean-going and inland waterway traffic
    - Fueled by residual and marine diesel oil
  - Locomotives
    - Freight and passenger locomotives

Base Year Inventory Development – Nonroad Mobile Sources (cont'd)

- **NONROAD Model**
  - Prepared using EPA's National Mobile Inventory Model (NMIM2008)
    - Run for every month in 2007; summed to annual basis
  - S/L agencies were asked to review NMIM County Database for 2007 and provide revisions to the NMIM inputs
  - State data provided primarily for:
    - Monthly gasoline Reid Vapor Pressure, weight percent oxygen
    - Gasoline and diesel sulfur content

Base Year Inventory Development – Nonroad Mobile Sources, Aircraft

- **2007 Estimates Based on EPA's 2008 NEI, Back-cast to 2007**
  - EPA reported emissions for ~ 20,000 airports as point sources
  - ~ 4,000 of these represent larger commercial airports and were modeled using Federal Aviation Administration's (FAA's) Emission Dispersion Modeling System (EDMS)
  - Remaining airports represent general aviation and air taxi; estimated using fleet average emission factors
  - Auxiliary power units and ground support equipment also reported
    - GSE removed from NONROAD model results

- **State/Local Agency Comments Incorporated**
  - Military base aircraft activity not estimated by EPA

Base Year Inventory Development – Nonroad Mobile Sources, Commercial Marine Vessels

- **2007 Estimates Based on EPA's 2008 NEI, Adjusted to 2007**
- **Inventory Includes:**
  - Category 1 and 2 vessels typically using marine diesel oil
  - Category 3 vessels primarily use residual blends
  - GIS shape files used to assign port and underway emissions to counties/line segments.
- **Supplemented with State/Local Agency Emissions Data**
  - Data provided for the Port of Charleston
  - Inland waterway emissions for local TN agencies

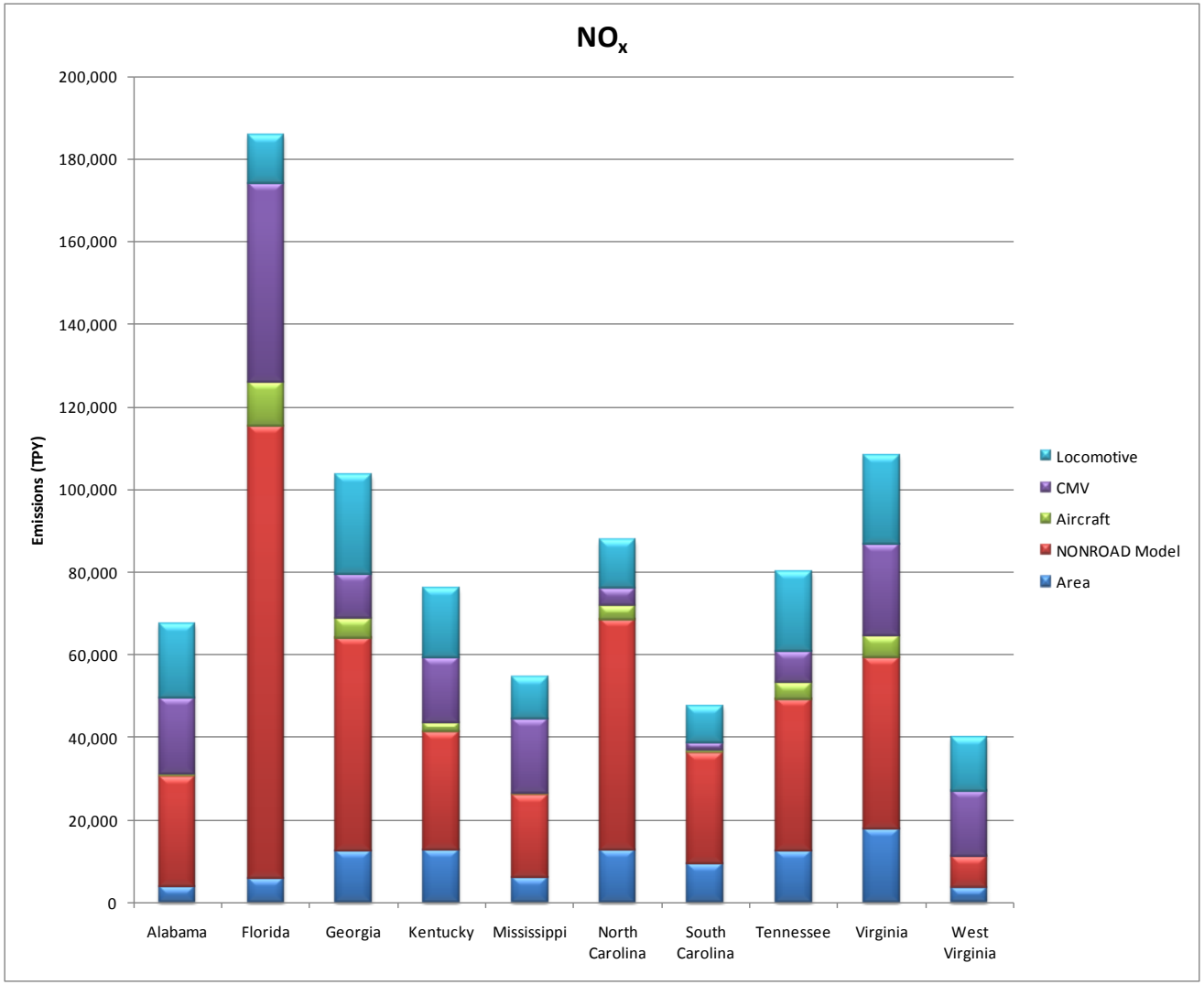
Base Year Inventory Development – Nonroad Mobile Sources, Locomotives

- **2007 Estimates Based on ERTAC Inventory for:**
  - Class I line haul and switchyard
  - Class II/III line haul
- **Passenger and Commuter Rail Emissions**
  - Based on EPA's 2002 NEI, grown to 2007
- **State/Local Agency Emission Estimates Also Incorporated**

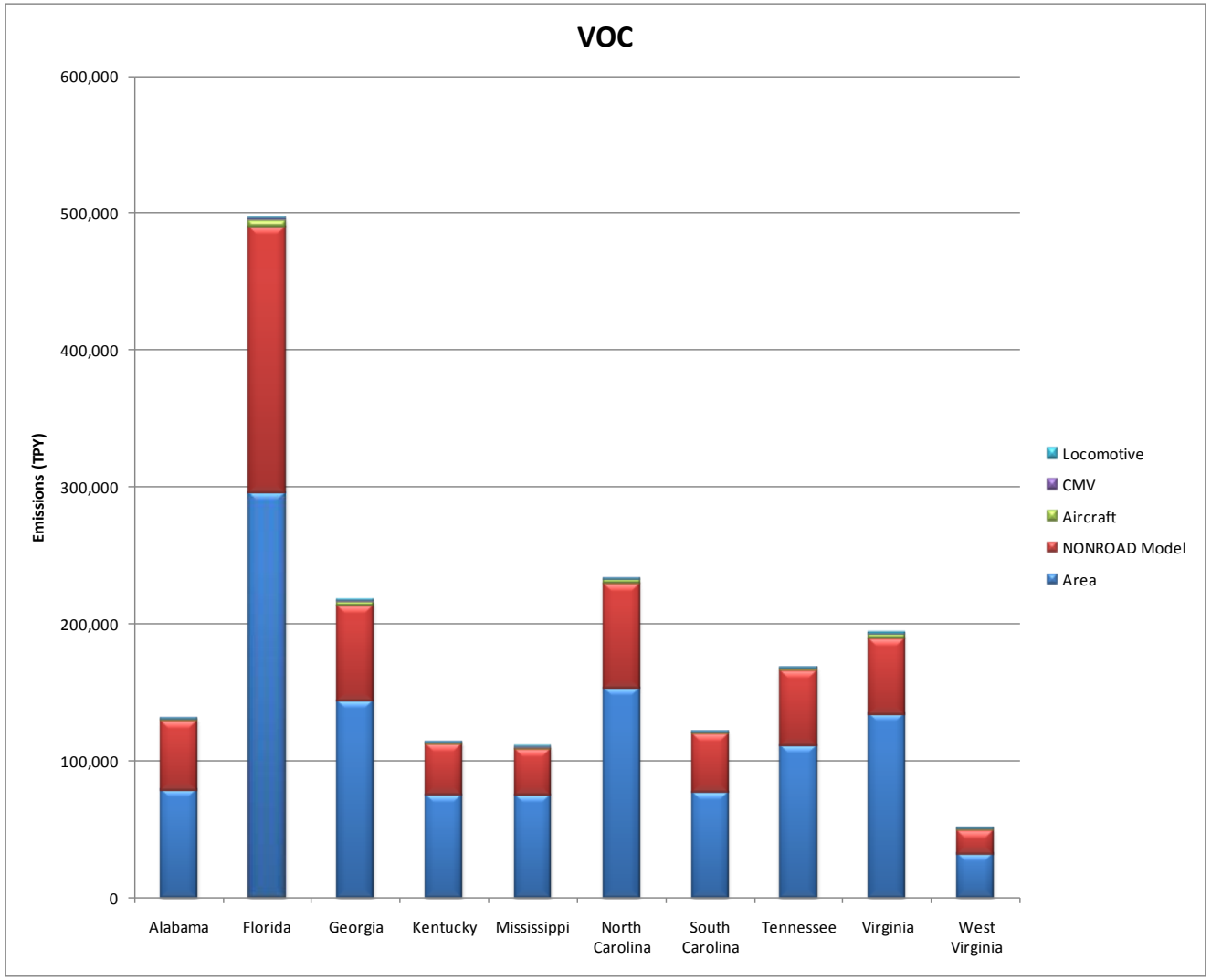
Base Year Inventory Development – Quality Assurance

- **Extensive Interaction with S/L Agencies on Methods/Inputs/Estimates**
- **Independent Review (incorporation of S/L comments, point source subtractions, etc.)**
- **Emission Summaries**
  - Major source categories (e.g., combustion sources)
  - Source classification categories
  - Regional, state, county-level
- **Emission Density Maps**
  - County-level by major source category
- **NIF Format and Content Checker Program**

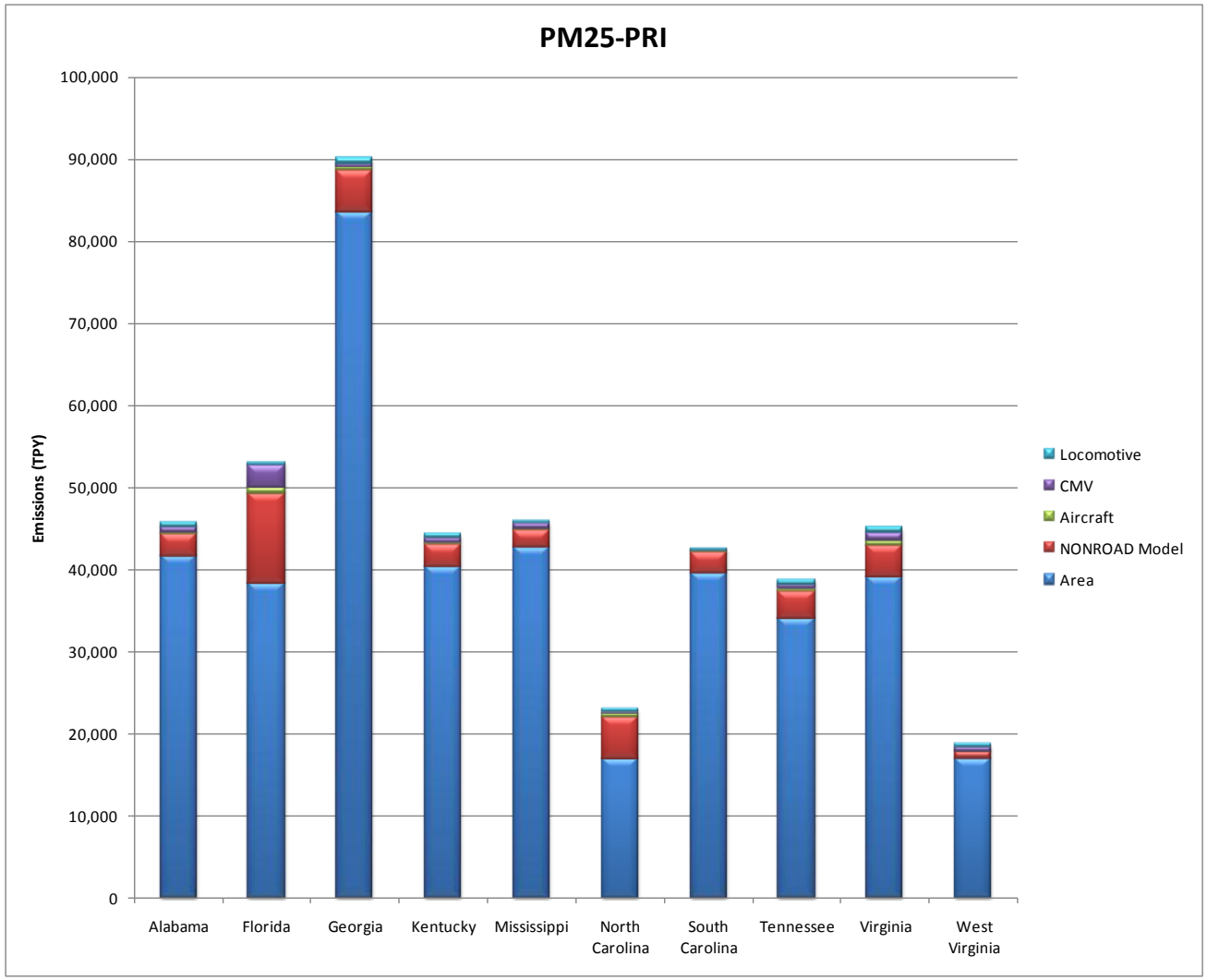
Summary of 2007 Base Year Emissions by Major Category



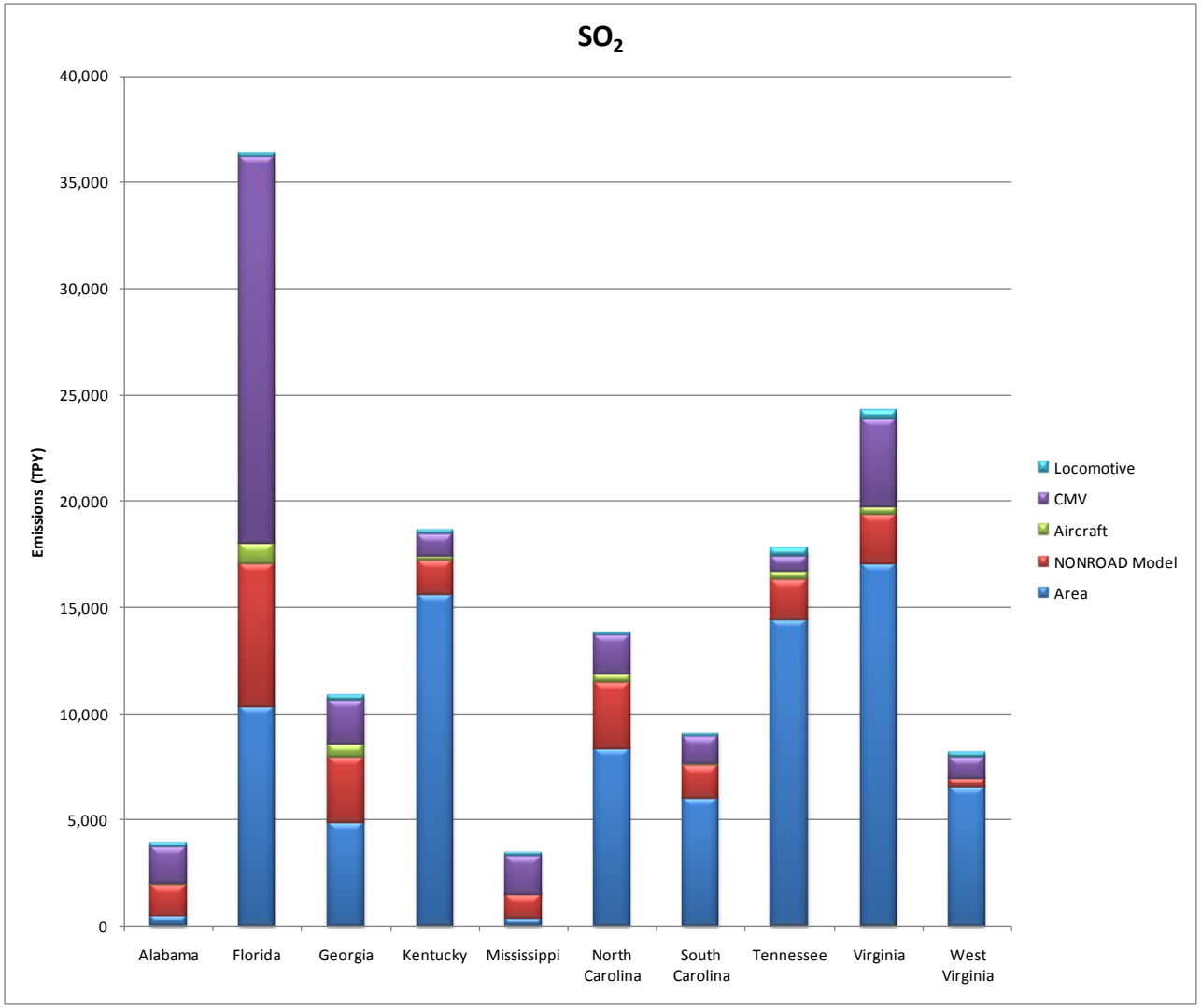
Summary of 2007 Base Year Emissions by Major Category (cont'd)



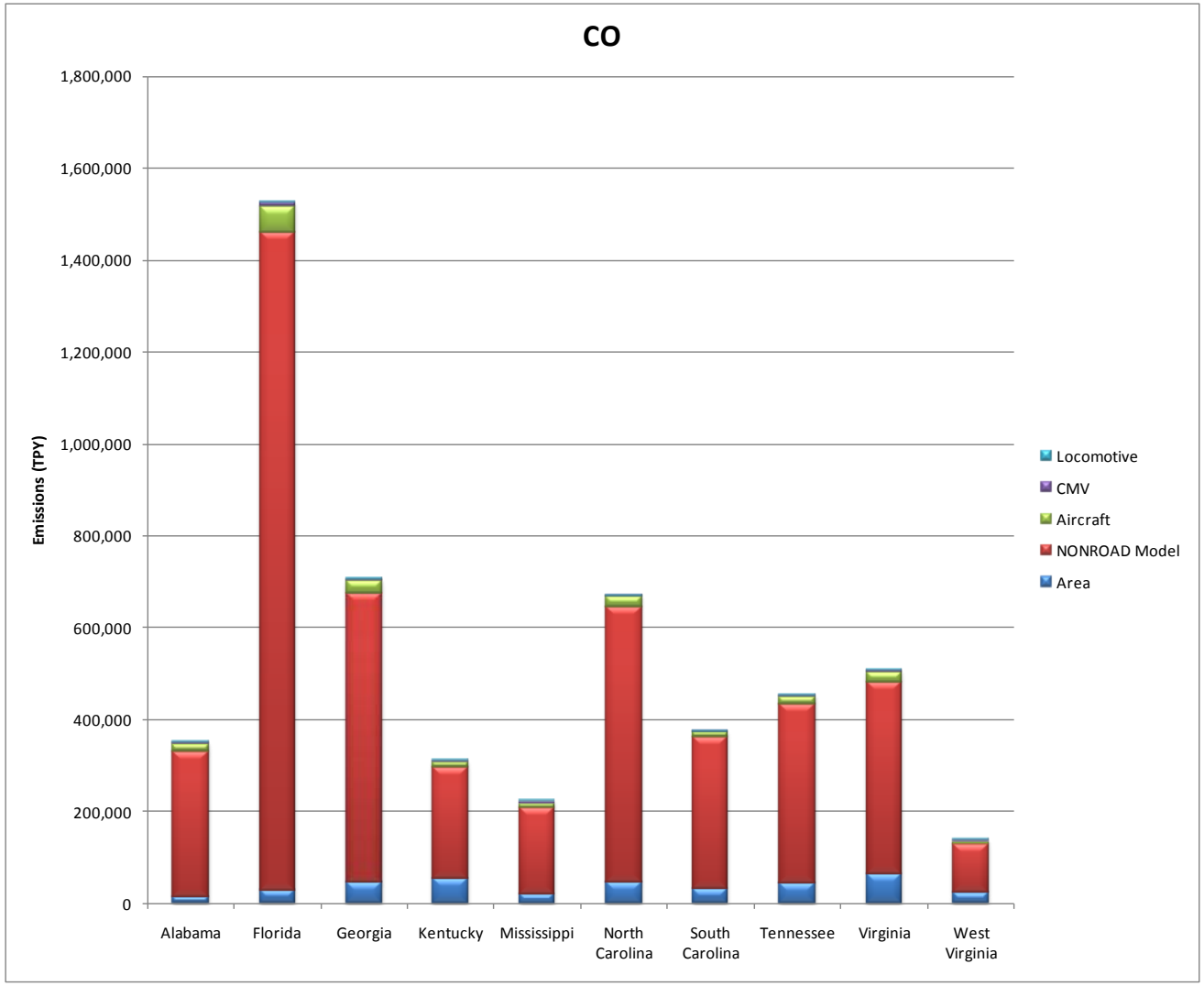
Summary of 2007 Base Year Emissions by Major Category (cont'd)



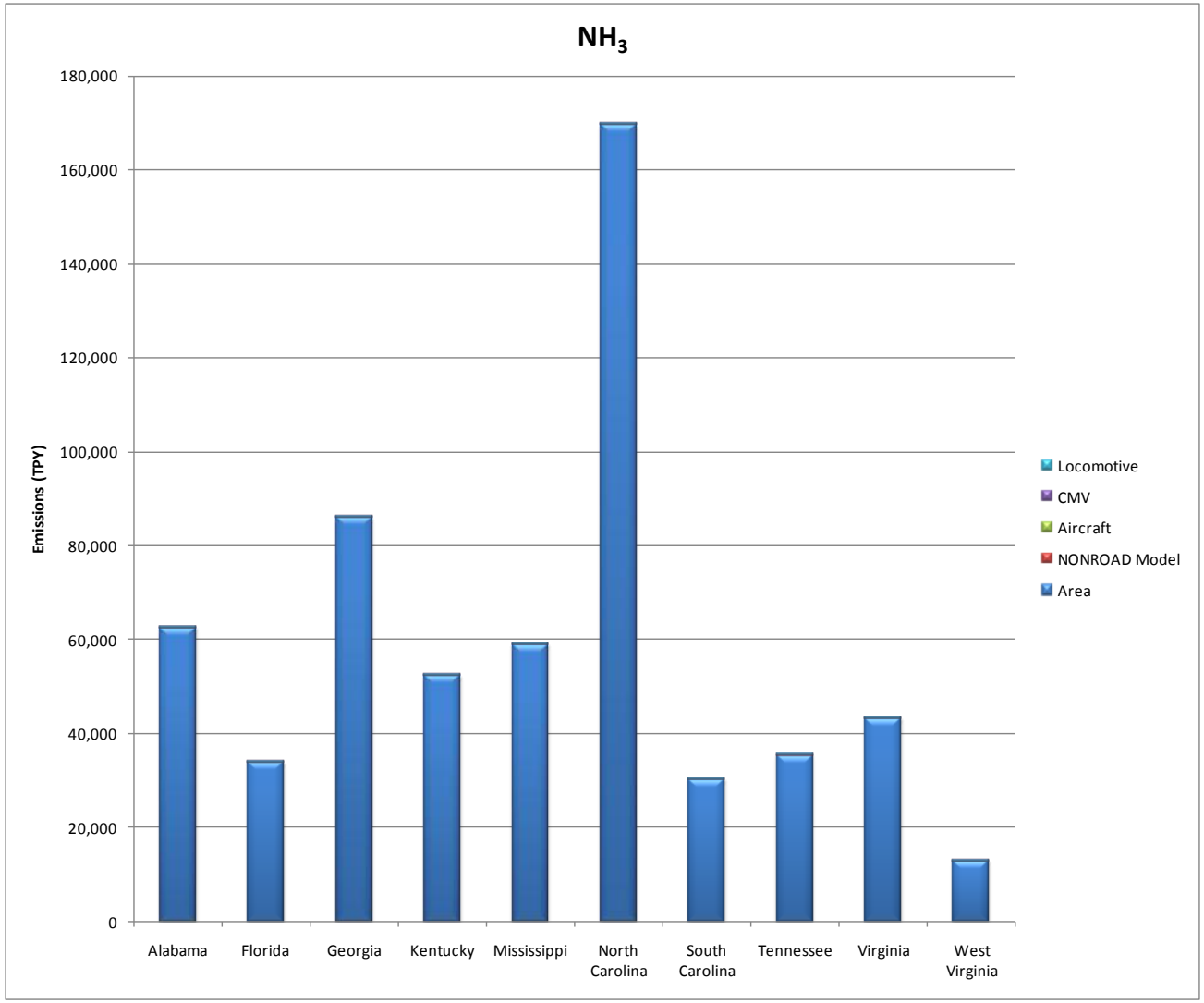
Summary of 2007 Base Year Emissions by Major Category (cont'd)



Summary of 2007 Base Year Emissions by Major Category (cont'd)



Summary of 2007 Base Year Emissions by Major Category (cont'd)

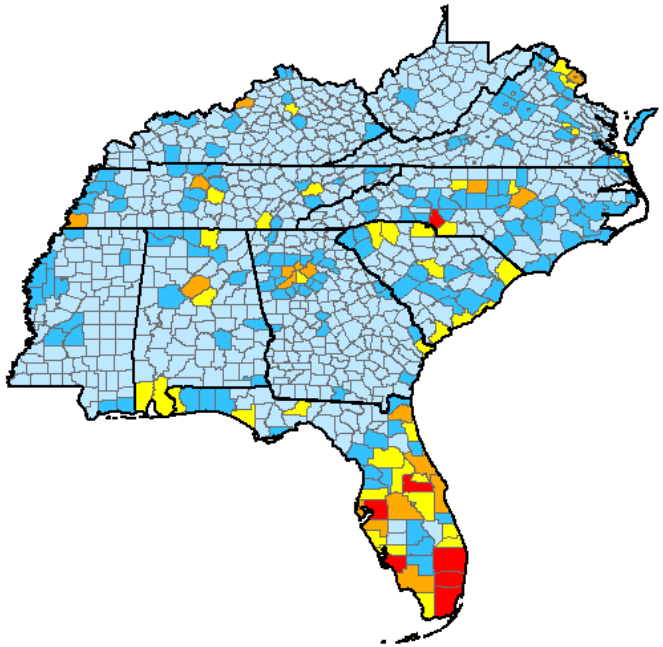


Geographic Distribution of Base Year Emissions

2007 Actual Final Revised
SEMAP Domain
Non-road
NONROAD2007
NOx

2007 Emissions [TPY]

- > 4837.03
- 2666.93 - 4837.03
- 1237.44 - 2666.93
- 416.67 - 1237.44
- < 416.67
- 0

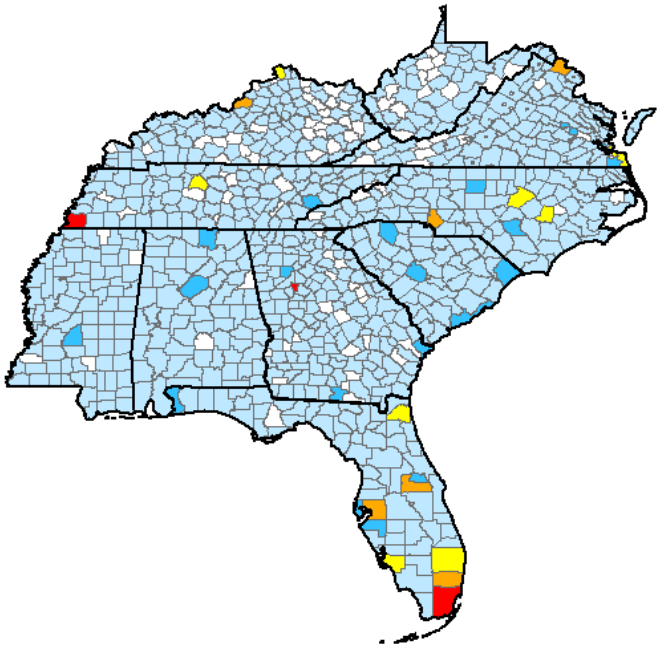


Geographic Distribution of Base Year Emissions (cont'd)

2007 Actual Final Revised
SEMAP Domain
Non-road
Aircraft
NOx

2007 Emissions [TPY]

- > 2350.52
- 896.29 - 2350.52
- 238.81 - 896.29
- 57.78 - 238.81
- < 57.78
- 0

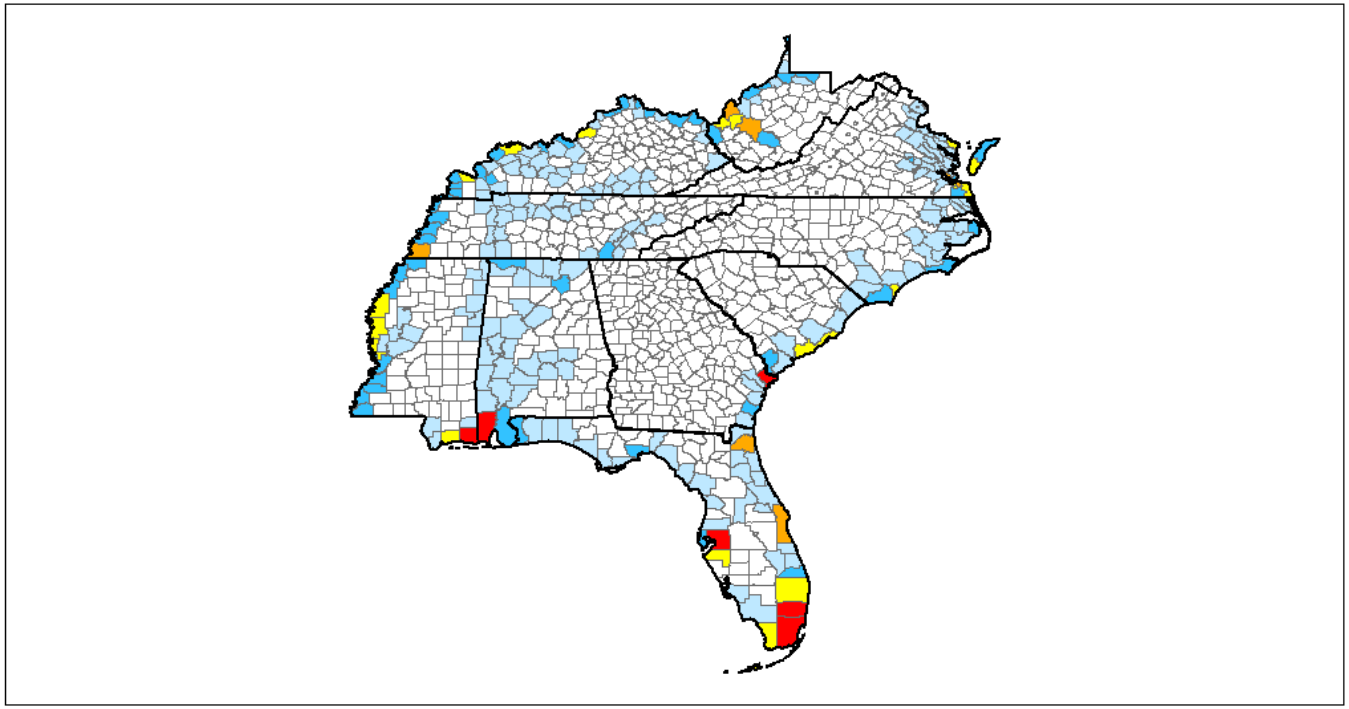


Geographic Distribution of Base Year Emissions (cont'd)

2007 Actual Final Revised
SEMAP Domain
Non-road
Marine Vessel
NOx

2007 Emissions [TPY]

- > 7129.15
- 3024.47 - 7129.15
- 1047.45 - 3024.47
- 219.75 - 1047.45
- < 219.75
- 0

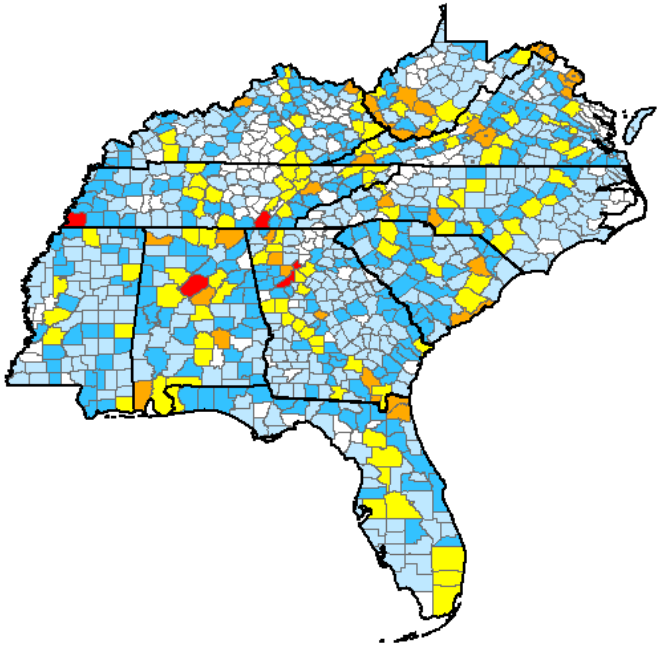


Geographic Distribution of Base Year Emissions (cont'd)

2007 Actual Final Revised
SEMAP Domain
Non-road
Rail
NOx

2007 Emissions [TPY]

- > 1335.67
- 647.73 - 1335.67
- 320.94 - 647.73
- 113.96 - 320.94
- < 113.96
- 0

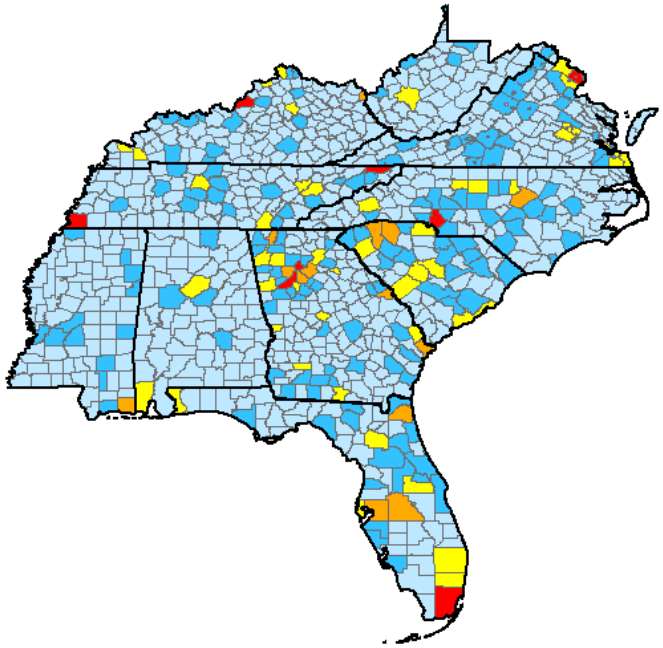


Geographic Distribution of Base Year Emissions (cont'd)

2007 Actual Final Revised
SEMAP Domain
Non-point
All
NOx

2007 Emissions [TPY]

- > 1478.78
- 760.94 - 1478.78
- 334.54 - 760.94
- 116.71 - 334.54
- < 116.71
- 0

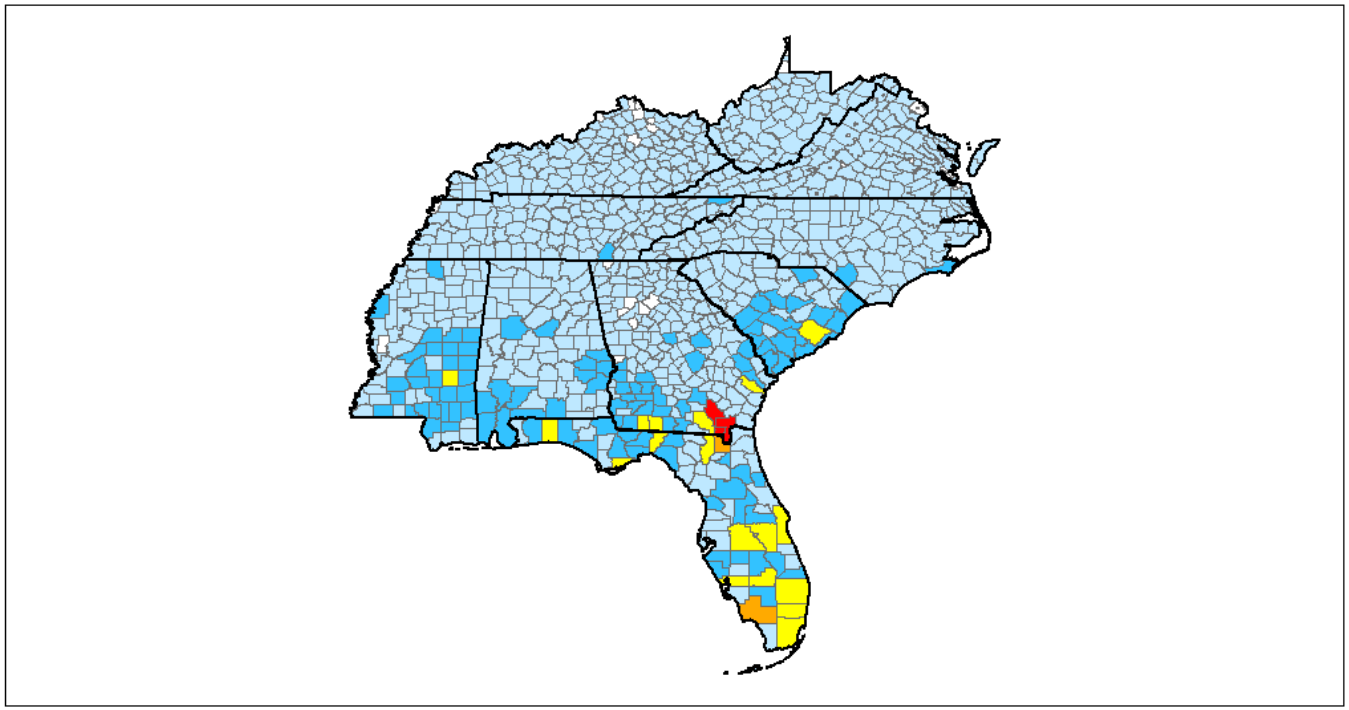


Geographic Distribution of Base Year Emissions (cont'd)

2007 Actual Final Revised
SEMAP Domain
Fire
All
NOx

2007 Emissions [TPY]

- > 5771.51
- 2437.34 - 5771.51
- 642.42 - 2437.34
- 161.04 - 642.42
- < 161.04
- 0

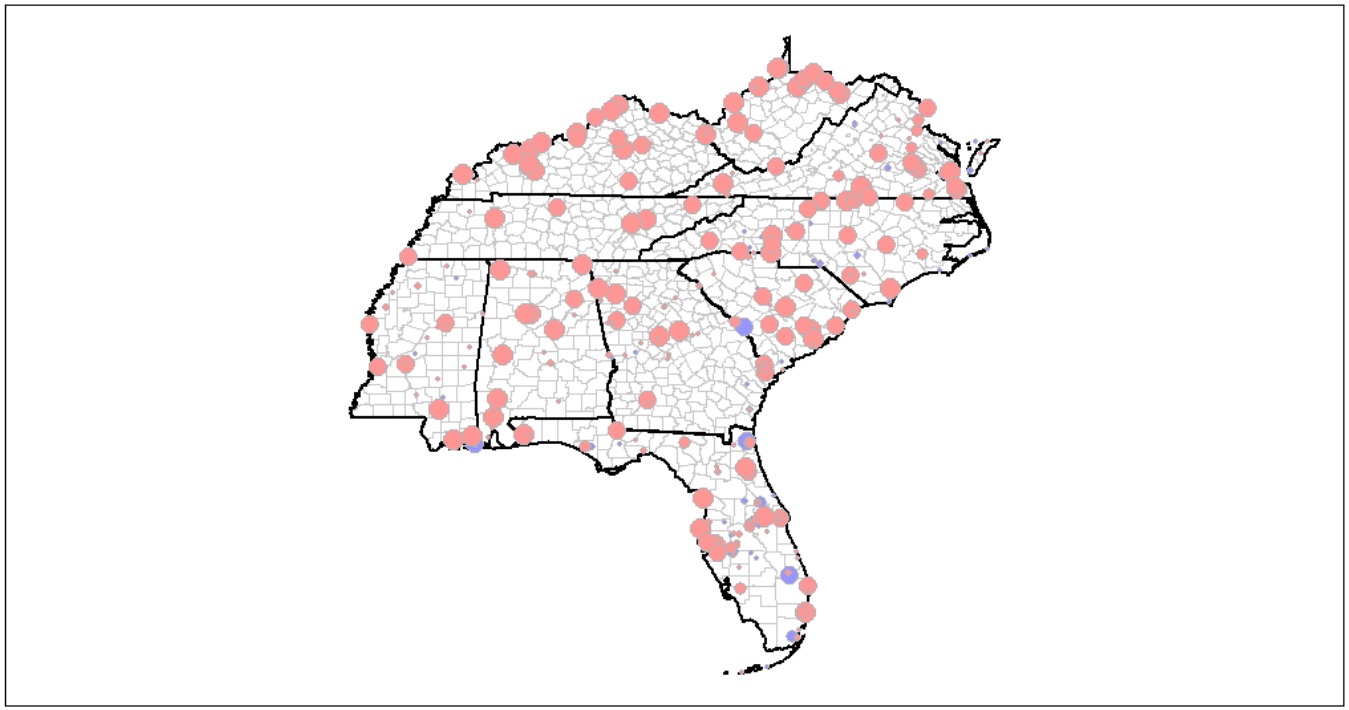


Geographic Distribution of Base Year Emissions (cont'd)

2007 Actual Final Revised
SEMAP Domain
Point
EGU
NOx

2007 Emissions [TPY]

- > 5,000
- 1,000 - 5,000
- 250 - 1,000
- 100 - 250
- 1 - 100

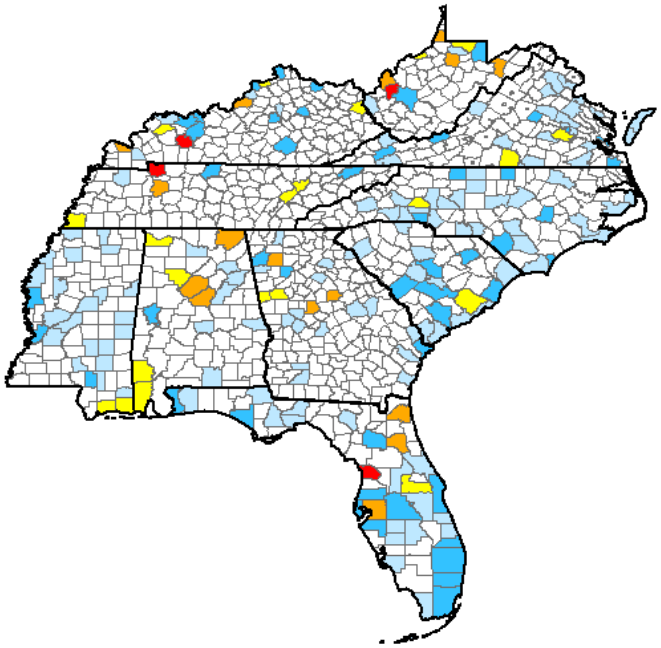


Geographic Distribution of Base Year Emissions (cont'd)

2007 Actual Final Revised
SEMAP Domain
Point
EGU
NOx

2007 Emissions [TPY]

- > 26170.29
- 16430.24 - 26170.29
- 8678.94 - 16430.24
- 2563.4 - 8678.94
- < 2563.4
- 0

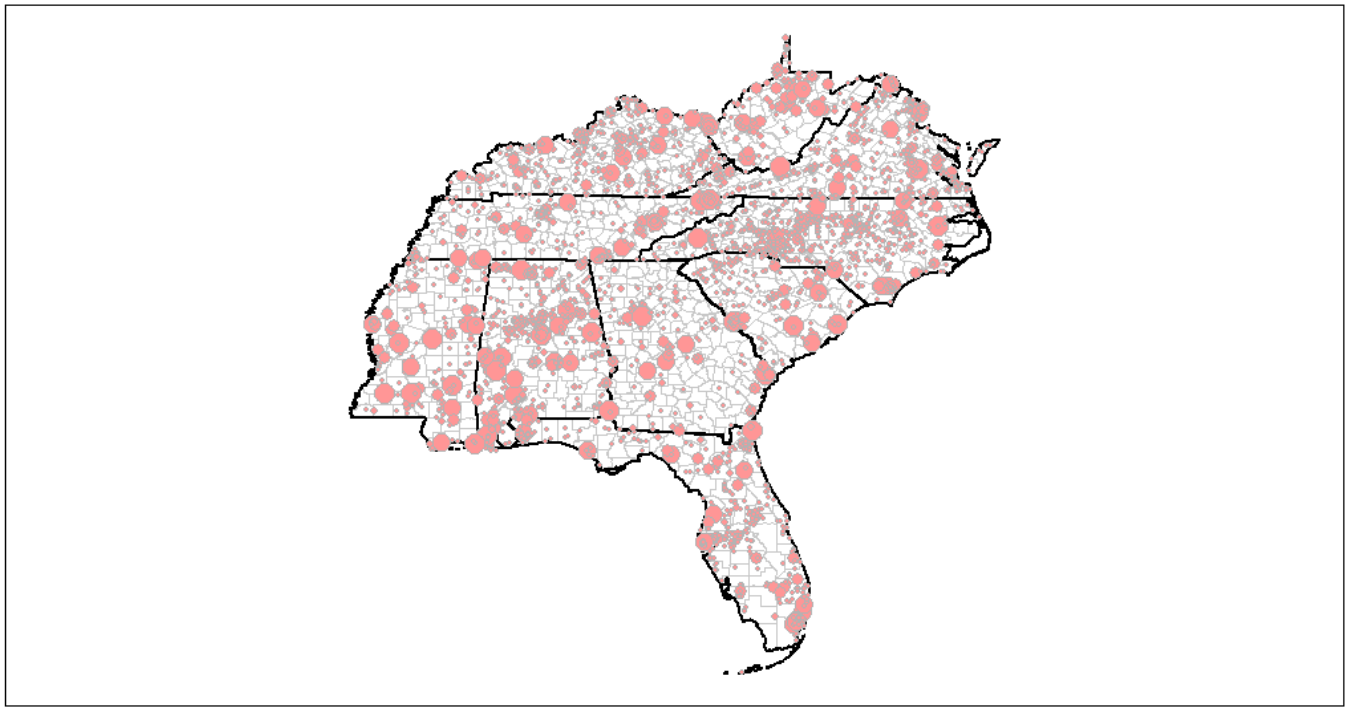


Geographic Distribution of Base Year Emissions (cont'd)

2007 Actual Final Revised
SEMAP Domain
Point
Non-EGU
NOx

2007 Emissions [TPY]

- > 2,000
- 1,000 - 2,000
- 250 - 1,000
- 100 - 250
- 1 - 100

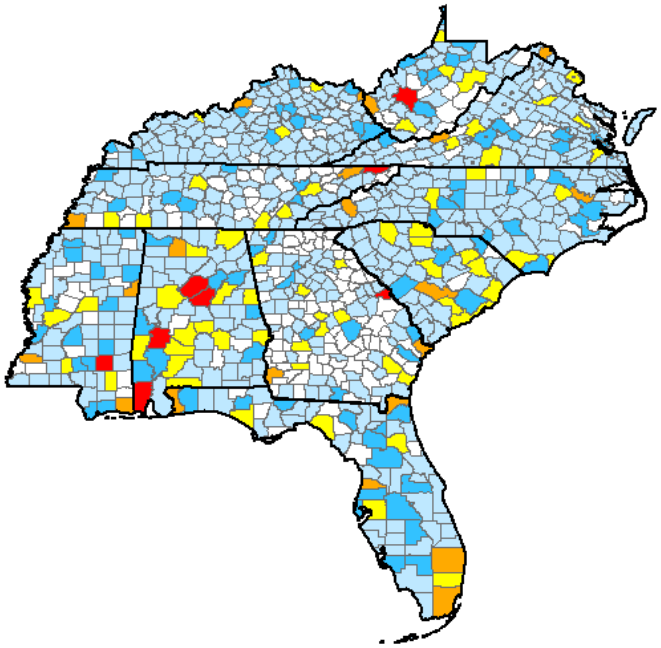


Geographic Distribution of Base Year Emissions (cont'd)

2007 Actual Final Revised
SEMAP Domain
Point
Non-EGU
NOx

2007 Emissions [TPY]

- > 5015.75
- 2861.2 - 5015.75
- 1503.44 - 2861.2
- 480.76 - 1503.44
- < 480.76
- 0



Base Year Inventory Deliverables

- Regional and State Summaries by Major Category
- County-level Summaries by SCC
- Emission Density Maps
- Inventory Files in NIF
- NMIM (NONROAD Model) Monthly Modeling Files

Next Steps

- **Growth and Control Factor Development**
  - Stationary Area and Nonroad Mobile ACL sources
    - Preparing growth factors representing activity change from base year to forecast years (2017-2025)
    - Preparing control factors modeling post-2007 emission impacts of control programs in select forecast years
    - Preparing forecast year inventory for 2018
  - NONROAD model sources
    - NMIM run for 2018 (will first need review of default inputs by S/L agencies)
  - MOVES run needed to develop forecast year Stage II vehicle refueling control factors for 2018, as well as select years from 2017 and 2025
    - Years in between will be interpolated

E-4: National Emissions Inventory (NEI) 2008 Version 2 TSD

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2008 National Emissions Inventory, version 2 Technical Support Document

June 2012 - DRAFT

June 2012

2008 National Emissions Inventory, version 2
Technical Support Document
DRAFT

U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Air Quality Assessment Division
Emissions Inventory and Analysis Group
Research Triangle Park, North Carolina

Contents

List of Tables v
List of Figures vi
Acronyms and Chemical Notations viii
1 Introduction 1
1.1 What data are included in the 2008 NEI, version 2 General Public release? 1
1.2 What is included in this documentation? 1
1.3 Where can I obtain the 2008 NEI data? 2
1.3.1 Emission Inventory System Gateway 2
1.3.2 2008 NEI main webpage query tool 2
1.3.3 Air Emissions and "Where you live" 2
1.3.4 Modeling files 3
1.4 Why is the NEI created? 3
1.5 How is the NEI created? 3
1.6 Who are the target audiences for the 2008 NEI? 5
1.7 What are appropriate uses of the 2008 NEI version 2 and what are the caveats about the data? 6
2 2008 inventory contents overview 8
2.1 What are EIS Sectors and what list was used for this document? 8
2.2 What do the data show about the sources of data in the 2008 NEI? 10
2.3 What are the top sources of some key pollutants? 15
2.4 How does this NEI compare to past inventories? 17
2.4.1 Differences in approaches 17
2.4.2 Differences in emissions 19
2.5 How well are tribal data and regions represented in the 2008 NEI? 22
2.6 What does this NEI tell us about mercury? 23
3 Stationary sources 29
3.1 Stationary source approaches 29
3.1.1 Sources of data overview and selection hierarchies 29
3.1.2 Particulate matter augmentation 34
3.1.3 Chromium augmentation 35
3.1.4 Use of the 2008 Toxics Release Inventory 37
3.1.5 HAP augmentation based on emission factor ratios 46
3.1.6 EPA nonpoint data 53
3.1.7 Additional Gap filling efforts targeted at high risk and specific mercury categories 58
3.2 Agriculture – Crops & Livestock Dust 62
3.3 Agriculture – Fertilizer Application 62
3.4 Agriculture – Livestock Waste 62
3.4.1 Sector Description 62
3.4.2 Sources of data overview and selection hierarchy 62
3.4.3 Spatial coverage and data sources for the sector 63
3.4.4 EPA-developed livestock waste emissions data 63
3.4.5 Summary of quality assurance methods 68

3.5 Bulk Gasoline Terminals 69
3.6 Commercial Cooking 69
3.7 Dust – Construction Dust 69
3.8 Dust – Paved Road Dust 69
3.9 Dust – Unpaved Road Dust 69
3.10 Fuel Combustion – Electric Generation 69
3.10.1 Sector Description 69
3.10.2 Sources of data overview and selection hierarchy 70
3.10.3 Spatial coverage and data sources for the sector 73
3.10.4 Overwrite datasets used for EGUs 73
3.10.5 EPA-developed EGU emissions data 74
3.10.6 Alternative facility and unit IDs needed for matching with other databases 77
3.10.7 Summary of quality assurance methods 77
3.11 Fuel Combustion – Industrial Boilers 77
3.12 Fuel Combustion – Commercial/Institutional 77
3.13 Fuel Combustion – Residential – Natural Gas, Oil, and Other 82
3.14 Fuel Combustion – Residential – Wood 82
3.15 Gas Stations 82
3.16 Industrial Processes – Cement Manufacturing 82
3.17 Industrial Processes – Chemical Manufacturing 82
3.18 Industrial Processes – Ferrous Metals 83
3.19 Industrial Processes – Mining 83
3.20 Industrial Processes – Non-ferrous Metals 83
3.21 Industrial Processes – Oil & Gas Production 83
3.22 Industrial Processes – Petroleum Refineries 83
3.23 Industrial Processes – Pulp & Paper 83
3.24 Industrial Processes – Storage and Transfer 83
3.25 Industrial Processes – NEC (Other) 83
3.26 Miscellaneous Non-industrial NEC (Other) 83
3.27 Solvent – Consumer & Commercial Solvent Use 83
3.28 Solvent – Degreasing, Dry Cleaning, and Graphic Arts 83
3.29 Solvent – Industrial and Non-Industrial Surface Coating 83
3.30 Waste Disposal 83
4 Mobile sources 84
4.1 Mobile sources overview 84
4.2 Aircraft 84
4.2.1 Sector Description 85
4.2.2 Sources of data overview and selection hierarchy 85
4.2.3 Spatial coverage and data sources for the sector 86
4.2.4 Overwrite dataset used for aircraft sector 86
4.2.5 EPA-developed aircraft emissions estimates 87
4.2.6 Summary of quality assurance methods 89
4.3 Commercial Marine Vessels 91

4.3.1 Sector Description 91
4.3.2 Sources of data overview and selection hierarchy 93
4.3.3 Spatial coverage and data sources for the sector 94
4.3.4 Overwrite datasets used for commercial marine vessel sector 94
4.3.5 EPA-developed commercial marine vessel emissions data 94
4.3.6 Summary of quality assurance methods 96
4.4 Locomotives 99
4.4.1 Sector Description 99
4.4.2 Sources of data overview and selection hierarchy 99
4.4.3 Spatial coverage and data sources for the sector 100
4.4.4 Overwrite datasets used for locomotives sector 100
4.4.5 EPA-developed locomotive emissions data 101
4.4.6 Summary of quality assurance methods 102
4.5 Nonroad Equipment – Diesel, Gasoline, and other 103
4.5.1 Sector Description 103
4.5.2 Sources of data overview and selection hierarchy 103
4.5.3 Spatial coverage and data sources for the sector 105
4.5.4 EPA-developed NMIM-based nonroad emissions data 105
4.5.5 Summary of quality assurance methods 106
4.6 On-road – all Diesel and Gasoline vehicles 109
4.6.1 Sector Description 109
4.6.2 Sources of data overview and selection hierarchy 109
4.6.3 Spatial coverage and data sources for the sector 110
4.6.4 EPA-developed on-road mobile emissions data for the continental U.S. 110
4.6.5 EPA-developed on-road mobile emissions data for Alaska, Hawaii, Puerto Rico and the Virgin Islands 118
4.6.6 Summary of quality assurance methods 119
5 Fires 121
5.1 Wildfires and Prescribed burning 121
5.1.1 Sector Description 121
5.1.2 Sources of data overview and selection hierarchy 122
5.1.3 Spatial coverage and data sources for the sector 124
5.1.4 EPA-developed fire emissions estimates 125
5.1.5 Wildland Fire HAP Augmentation 130
5.1.6 Summary of quality assurance methods 130
5.2 Fires – Agricultural field burning 131
5.2.1 Sector Description 131
5.2.2 Sources of data overview and selection hierarchy 132
5.2.3 Spatial coverage and data sources for the sector 133
5.2.4 EPA-developed agricultural emissions data 135
5.2.5 Summary of quality assurance methods 136
6 Biogenics – Vegetation and Soil 136
7 Quality assessment 137

7.1 What are the quality criteria used to assess the inventory? ... 137
7.2 How did the 2008 NEI compare to the quality criteria? ... 137
7.3 What EIS sectors seem to be incomplete and for which key pollutants? ... 137
7.4 How can the quality of the emissions data be further evaluated by users? ... 137
7.5 What improvements in the NEI and EIS submission process are planned for the future? ... 137
8 Supporting data and summaries ... 138
8.1 Supporting data ... 138
8.2 Supporting summaries ... 141
9 References ... 143

List of Tables

Table 1: Point source reporting thresholds (potential to emit) for criteria pollutants in the Air Emissions Reporting Rule 4
Table 2: Examples of major current uses of the NEI 5
Table 3: EIS sectors and associated emissions categories and document sections 9
Table 4: EIS sectors and associated CAP emissions and total HAP (1000 short tons/year) 16
Table 5: Tribal Participation in the 2008 NEI 22
Table 6: Datasets, groups, and amount of Hg in 2008 NEI from each 24
Table 7: Trends in Mercury Emissions – 1990, 2005, and 2008 25
Table 8: Data sources and selection hierarchy used for point sources 30
Table 9: Data sources and selection hierarchy used for nonpoint sources 33
Table 10: Valid chromium pollutant codes 35
Table 11: Calculations for generating the point chromium augmentation dataset (EPA Chromium Split v2) 37
Table 12: Mapping of TRI Pollutant Codes to EIS Pollutant codes 42
Table 13: Pollutant Groups 45
Table 14: CAP Surrogate assignments to derive HAP-to-CAP Emission Factor Ratios 47
Table 15: Invalid pollutant codes for HAP augmentation 49
Table 16: Conversion factors HAP emission factors for HAP augmentation 50
Table 17: Physical Conversion Factors Used 50
Table 18: EPA-estimated emissions sources expected to be exclusively nonpoint 53
Table 19: Emissions sources not estimated by EPA with potential nonpoint and point contribution 55
Table 20: Solvent sectors nonpoint HAP-VOC and calculated missing HAP-VOC 57
Table 21: Emissions sources using data from former EPA inventories 57
Table 22: Emissions sources not included from EPA data sources 58
Table 23: Hg-emitting Facilities in the S/L/T agency review process with insufficient information to gap fill 59
Table 24: High Risk Facilities in the S/L/T agency review process with insufficient information to gap fill 60
Table 25: Agencies that Submitted Livestock Waste Data 62
Table 26: 2008 NEI agricultural livestock data selection hierarchy 63
Table 27: Source Classification Codes used in the agricultural livestock sector 63
Table 28: Emission Factors for NH3 emissions used for EPA's agricultural livestock data 66
Table 29: Agencies that Submitted EGU data 71
Table 30: 2008 NEI EGU data selection hierarchy by EGU fuel groups from EIS Sectors 73
Table 31: Agency-submitted, PM Augmentation, and total PM10 and PM2.5 emissions for EGU sectors (short tons/year) 74
Table 32: Agencies that submitted data for the Fuel Combustion - Industrial Boilers, ICEs Sectors 79
Table 33: 2008 NEI selection hierarchy for datasets used by the Fuel Comb - Industrial Boilers, ICEs Sectors 81
Table 34: Source classification codes for the aircraft sector in the 2008 NEI 85
Table 35: Agencies that submitted aircraft emissions data 86
Table 36: 2008 NEI aircraft data selection hierarchy 86
Table 37: Agencies that submitted aircraft activity data for EPA's emissions calculation 87
Table 38: SCCs included in the EPA-created aircraft emissions dataset 88
Table 39: Non-aircraft related SCCs reported by S/L/T agencies to airports 91

Table 40: Commercial Marine SCCs and Emission Types 92
Table 41: Additional Commercial Marine SCCs used by California and Kentucky..... 92
Table 42: Agencies that Submitted Commercial Marine Emissions Data 93
Table 43: 2008 NEI commercial marine vehicle selection hierarchy..... 93
Table 44: Commercial Marine SCCs for which EPA Provided Estimates 94
Table 45: Example of Potential Error in NJ County Diesel CMV Emissions Due to Merge of Inconsistent County/Shape/SCC/EmissionType/Pollutant combinations 97
Table 46: SCC/Pollutant combinations where State total 2008 NEI is greater than agency or EPA estimates..... 98
Table 47: Locomotive SCCs, descriptions, and EPA estimation status 99
Table 48: Agencies that submitted Rail Emissions to the 2008 NEI 99
Table 49: 2008 NEI locomotives selection hierarchy 100
Table 50: Agency Submittals of NONROAD inputs and nonroad smissions 104
Table 51: 2008 NEI Non-road equipment selection hierarchy 105
Table 52: Nonroad SCCs included in 2008 NEI that were not in S/L/T agency submittals..... 108
Table 53: 2008 NEI on-road mobile selection hierarchy 109
Table 54: Characteristics for Representative County Groupings 112
Table 55: Pollutants estimated through national emission factors 118
Table 56: Source classification codes for wildland fires 122
Table 57: Agencies that submitted wildfire and prescribed burning emissions data 122
Table 58: Fire emissions submitted by tribal agencies (short tons/year) 123
Table 59: 2008 NEI wildfire and prescribed fires selection hierarchy..... 124
Table 60: Pollutants estimated by EPA for wildland fires and HAP emission factors 126
Table 61: Source Classification Codes in the NEI for Agricultural Burning..... 132
Table 62: Agencies that submitted agricultural fire emissions to the 2008 NEI 132
Table 63: State Emission Estimates for Agricultural Burning using EPA methods (short tons/year)..... 133
Table 64: 2008 NEI supporting data access information..... 138
Table 65: 2008 NEI supporting summaries..... 141

List of Figures

Figure 1: Data sources for point and nonpoint emissions for criteria pollutants 11
Figure 2: Data sources for point and nonpoint emissions for acid gases and HAP VOCs 11
Figure 3: Data sources for point and nonpoint emissions for Pb and HAP metals 12
Figure 4: Point inventory - submission types - includes local agencies..... 13
Figure 5: Nonpoint inventory – submission types – includes local agencies 13
Figure 6: On-road inventory – submission types – does not include local agencies..... 14
Figure 7: Nonroad equipment inventory – submission types – does not include local agencies 15
Figure 8: Comparison of 2008 NEI v2 to 2005 NEI v2 CAPs, excluding wildfires..... 20
Figure 9: Data sources of Hg emissions in the 2008 NEI, by data category 23
Figure 10: States with state- or local-provided Hg emissions in the point data category of the 2008 NEI 25
Figure 11: Proportion of Fires by Type using EPA Methods 128
Figure 12: Acres Burned using EPA Methods 129

Figure 13: 2008 $PM_{2.5}$ Emissions using EPA methods 129
Figure 14: 2008 $PM_{2.5}$ wild land fire emissions using EPA methods 131
Figure 15: 2008 NEI state-total PM2.5 emissions from agricultural fires 134
Figure 16: Identification of states that submitted agricultural burning emissions to the NEI 135

Acronyms and Chemical Notations

AERR	Air Emissions Reporting Rule
APU	Auxiliary power unit
BSO	Benzene Soluble Organics
C1	Category 1 (commercial marine vessels)
C2	Category 2 (commercial marine vessels)
C3	Category 3 (commercial marine vessels)
CAIR	Clean Air Interstate Rule
CAMD	Clean Air Markets Division (of EPA Office of Air and Radiation)
CAP	Criteria Air Pollutant
CEC	North American Commission for Environmental Cooperation
CEM	Continuous Emissions Monitoring
CERR	Consolidated Emissions Reporting Rule
CFR	Code of Federal Regulations
CHIEF	Clearinghouse for Inventories and Emissions Factors
CMU	Carnegie Mellon University
CMV	Commercial marine vessels
CO	Carbon Monoxide
CSV	Comma Separated Variable
E10	10% ethanol gasoline
EDMS	Emissions and Dispersion Modeling System
EGU	Electric Generating Utility
EIS	Emission Inventory System
EAF	Electric arc furnace
EF	Emission factor
EMFAC	Emission FACtor (model) – for California
EPA	Environmental Protection Agency
ERG	Eastern Research Group
ERTAC	Eastern Regional Technical Advisory Committee
FAA	Federal Aviation Administration
FCCS	Fuel Characteristic Classification System
GIS	Geographic information systems
GPA	Geographic phase-in area
GSE	Ground support equipment
HAP	Hazardous Air Pollutant
HCl	Hydrogen Chloride (Hydrochloric acid)
Hg	Mercury
HMS	Hazard Mapping System
ICR	Information collection request
I/M	Inspection and maintenance
IPM	Integrated Planning Model
KMZ	Keyhole Markup Language, zipped (used for displaying data in Google Earth

LRTAP	Long-range Transboundary Air Pollution
LTO	Landing and takeoff
MATS	Mercury and Air Toxics Standards
MCIP	Meteorology-Chemistry Interface Processor
MMT	Manure management train
MOBILE6	Mobile Source Emission Factor Model, version 6
MOVES	Motor Vehicle Emissions Simulator
MSO	Methylene Chloride Soluble Organics
MW	Megawatts
MWC	Municipal waste combustors
NAA	Nonattainment area
NAAQS	National Ambient Air Quality Standards
NARAP	North American Regional Action Plan
NASS	USDA National Agriculture Statistical Service
NATA	National Air Toxics Assessment
NCD	National County Database
NEEDS	National Electric Energy Data System (database)
NEI	National Emissions Inventory
NH3	Ammonia
NMIM	National Mobile Inventory Model
NO	Nitrous oxide
NO2	Nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOX	Nitrogen oxides
O_3	Ozone
OAQPS	Office of Air Quality Standards and Planning (of EPA)
ORIS	Office of Regulatory Information Systems
OTAQ	Office of Transportation and Air Quality (of EPA)
PADD	Petroleum Administration for Defense Districts
PAH	Polycyclic Aromatic Hydrocarbons
Pb	Lead
PCB	Polychlorinated Biphenyl
PM	Particulate matter
PM25-CON	Condensable PM2.5
PM25-FIL	Filterable PM2.5
PM25-PRI	Primary PM2.5 (condensable plus filterable)
PM2.5	Particulate matter 2.5 microns or less in diameter
PM10	Particular matter 10 microns or less in diameter
PM10-FIL	Filterable PM10
PM10-PRI	Primary PM10
POM	Polycyclic Organic Matter
PSC	Program system code (in EIS)
RFG	Reformulated Gasoline

RPD	Rate per distance
RPP	Rate per profile
RPV	Rate per vehicle
Rx	Prescribed (fire)
SCC	Source classification code
SFv1	SMARTFIRE version 1
SFv2	SMARTFIRE version 2
S/L/T	State, local, and tribal (agencies)
SMARTFIRE	Satellite Mapping Automated Reanalysis Tool for Fire Incident Reconciliation
SMOKE	Sparse Matrix Operator Kernel Emissions
SO2	Sulfur dioxide
SO4	Sulfate
TAF	Terminal Area Forecasts
TEISS	Tribal Emissions Inventory Software Solution
TRI	Toxics Release Inventory
UNEP	United Nations Environment Programme
USDA	United States Department of Agriculture
VMT	Vehicle miles traveled
VOC	Volatile organic compounds
WebFIRE	Factor Information Retrieval System
WFU	Wildland fire use
WLF	Wildland fire
WRF	Weather Research and Forecasting Model

1 Introduction

1.1 What data are included in the 2008 NEI, version 2 General Public release?

The 2008 National Emissions Inventory (NEI), version 2 General Public Release (hereafter referred to as the 2008 NEI) is a national compilation of emissions sources collected from state, local, and tribal air agencies as well as from emissions information from the Environmental Protection Agency (EPA) emissions programs including the Toxics Release Inventory (TRI), emissions trading programs such as the Acid Rain Program, and data collected as part of EPA regulatory development for reducing emissions of air toxics. The NEI program develops datasets, blends data from these multiple sources, and performs quality assurance steps that further enhance and augment the compiled data. The emissions data in the NEI are compiled for detailed emissions processes within a facility for large "point" sources or as a county total for smaller "nonpoint" sources and spatially dispersed sources such as on-road and nonroad mobile sources. For some fires, the data are compiled as day-specific events in the "event" portion of the inventory.

The pollutants included in the NEI are the pollutants related to implementation of the National Ambient Air Quality Standards (NAAQS), known as criteria air pollutants (CAPs), as well as hazardous air pollutants (HAPs) associated with EPA's Air Toxics Program. The CAPs have ambient concentration limits or are precursors for pollutants with such limits from the NAAQS program. These pollutants include lead (Pb), carbon monoxide (CO), nitrogen oxides (NOX), volatile organic compounds (VOC), sulfur dioxide (SO2), ammonia (NH3), particulate matter 10 microns or less (PM10) and particulate matter 2.5 microns or less (PM2.5). The HAP pollutants include the 187 remaining HAP pollutants from the original 188 listed in Section 112(b) of the 1990 Clean Air Act Amendments[1]. Key HAP emissions sources include mercury (Hg), hydrochloric acid (HCl) and other acid gases, heavy metals such as nickel and cadmium, and hazardous organic compounds such as benzene, formaldehyde, and acetaldehyde.

1.2 What is included in this documentation?

This document provides central reference for the 2008 NEI. The primary purpose of this document is to explain the sources of information included in the inventory. This includes showing which sources of data are used for each sector, and then providing more information about the EPA-created components of the data. For each emissions sector, we provide a synopsis of the types of sources that are included in that sector.

Section 2 explains the sectors that we use for summarizing the 2008 NEI and organizing this document, and it provides an overview of the contents of the inventory and a summary of mercury emissions. Sections 3, 0, and 5 provide the sector-by-sector documentation for the stationary, mobile, and fire emissions respectively. Section 7 provides a quality assessment of the 2008 NEI. Finally, Section 8 provides instructions for accessing supporting materials, and Section 9 provides the references. A separate document contains the appendices.

[1] The current list of HAPs is available at http://www.epa.gov/ttn/atw/188polls.html.

1.3 Where can I obtain the 2008 NEI data?

The 2008 NEI data are available in several different ways, as follows. EPA continues to review and streamline the approach for accessing the NEI data.

1.3.1 Emission Inventory System Gateway

http://www.epa.gov/ttn/chief/eis/gateway/

The Emission Inventory System (EIS) Gateway is available to all EPA staff, EIS data partners responsible for submitting data to EPA (i.e., the state, local, and tribal air agency staff), and contractors working for EPA on emissions related work. The Gateway can be used to obtain raw input datasets and create summary files from these datasets as well as the 2008 NEI general public releases. Use the link provided above for more information about how to obtain an account and to access the gateway itself. Note that if you run facility, unit or process level reports in EIS, you will get the final 2008 NEI v2 emissions, but the facility inventory, which is dynamic in EIS, will reflect more current information. For example, if an Agency ID has been changed since the time we ran the reports for the public website (mid February, 2012), then that new Agency ID will be in the EIS report but not in the report on the public site.

1.3.2 2008 NEI main webpage query tool

http://www.epa.gov/ttn/chief/net/2008inventory.html

The 2008 NEI webpage is available from the Clearinghouse for Inventories and Emissions factors (CHIEF) website. It includes a query tool that allows for summaries by EIS Sector (see Section 2.1) or the more traditional Tier 1 summary level used in the EPA Trends Report. Summaries from this site include national, state-, and county-level of CAP and HAP emissions. You can choose which states, EIS Sectors, Tiers, and pollutants to include in custom-generated reports to download Comma Separated Value (CSV) files to import into Microsoft® Excel ® or other spreadsheet tools. Biogenic emissions and tribal data are also available from this tool.

1.3.3 Air Emissions and "Where you live"

Main: http://www.epa.gov/air/emissions/
Where you live: http://www.epa.gov/air/emissions/where.htm

The Air Emissions website provides emissions of CAP pollutants except for ammonia using point-and-click maps and bar charts to provide access to summary and detailed emissions data. The maps, charts, and underlying data (in CSV format) can be saved from the website and used in documents or spreadsheets.

In addition, the "Where you live" feature of the Air Emissions website allows users to select states and EIS sectors (see Section 2.1) to create KMZ files used by Google Earth. You must have Google Earth installed on your computer to open the files. You can customize the maps to select the sectors of interest, and all other sectors will go into an "Other" category on the maps. The resulting maps allow you to click on the icons for each facility to get a chart of emissions associated with each facility for all criteria pollutants.

1.3.4 Modeling files

http://www.epa.gov/ttn/chief/emch/index.html#2008

The modeling files are provided in formats that can be read by the Sparse Matrix Operator Kernel Emissions (SMOKE, http://www.smoke-model.org). These formats are also CSV formats that can be read by other systems, such as databases. EPA makes changes to the NEI prior to use in modeling, so both the original 2008 NEI v2 data as well as the latest available modeling files can be found at this website.

1.4 Why is the NEI created?

The NEI is created to provide EPA, federal and state decision makers, the U.S. public, and other countries the U.S.'s best and most complete estimates of CAP and HAP emissions. While EPA is not directly obligated to create the NEI under the Clean Air Act, the Act authorizes the EPA Administrator to implement data collection efforts needed to properly administer the NAAQS program. Therefore, the Office of Air Quality Planning and Standards (OAQPS) maintains the NEI program in support of the NAAQS. Furthermore, the Clean Air Act requires states to submit emissions to EPA as part of their State Implementation Plans that describe how they will meet the NAAQS, and the NEI is used as one mechanism for states to meet some of those emissions requirements, particularly for the 3-year reporting requirements.

While the NAAQS program is the basis on which EPA collects CAP emissions from the state, local, and tribal air agencies, it does not require collection of HAP emissions. For this reason, the HAP reporting requirements are voluntary. Nevertheless, the HAP emissions are an essential part of the NEI program. These emissions estimates allow EPA to assess progress in meeting HAP reduction goals described in the Clean Air Act amendments of 1990. These reductions seek to reduce the negative impacts to people of HAP emissions in the environment, and the NEI allows EPA to assess how much emissions have been reduced since 1990.

1.5 How is the NEI created?

The NEI is created based on both regulatory and technical components. The Air Emissions Reporting Rule (AERR) is the rule that requires states to submit emissions of CAP emissions and provides the framework for voluntary submission of HAP emissions. The 2008 NEI is the first inventory compiled using the AERR, rather than its predecessor the Consolidated Emissions Reporting Rule (CERR). The AERR requires agencies to report all sources of emissions, except fires and biogenic sources. Open fire sources such as wildfires are encouraged but not required. Sources are divided into large categories: stationary sources are "point" or "nonpoint" (county totals) and mobile sources are either on-road (cars and trucks driven on paved and unpaved roads) or non-road (locomotives, aircraft, marine, off-road vehicles and nonroad equipment such as lawn and garden equipment). The AERR has emissions thresholds that determine whether a state, local, or tribal (S/L/T) agency must report stationary source emissions as "point" sources or whether the emissions can be lumped together into a county total as "nonpoint" sources.

The AERR includes emissions thresholds above which states must report stationary emissions as point sources with the remainder of the stationary emissions reported as nonpoint sources. The AERR changed the way these reporting thresholds work as compared to the CERR to make these thresholds "potential to emit" thresholds rather than actual emissions thresholds. In both the CERR and the AERR, the emissions that are reported are actual emissions, despite that the criteria for which sources to report is now based on potential emissions. The

AERR requires emissions reporting every year, with additional requirements every third year in the form of lower point source emissions thresholds, and 2008 is one of these third-year inventories.

Table 1 provides the potential-to-emit reporting thresholds that applied for the 2008 NEI cycle. "Type B" is the terminology in the rule that represents the lower emissions thresholds required for point sources in the triennial years. The reporting thresholds are sources with potential to emit 100 tons/year or more for most criteria pollutants with the exceptions of CO (1000 tons/year) and Pb (5 tons/year). As shown in the table, special requirements apply to nonattainment area (NAA) sources, where even lower thresholds apply.

Table 1: Point source reporting thresholds (potential to emit) for criteria pollutants in the Air Emissions Reporting Rule

Pollutant		2008 NEI thresholds: potential to emit (tons/yr)	
		Everywhere (Type B sources)	NAA sources[1]
1	SOx	≥ 100	≥ 100
2	VOC	≥ 100	O_3 (moderate) ≥ 100
3	VOC	.....	O_3 (serious) ≥ 50
4	VOC	.....	O_3 (severe) ≥ 25
5	VOC	.....	O_3 (extreme) ≥ 10
6	NOX	≥ 100	≥ 100
7	CO	≥ 1000	O_3 (all areas) ≥ 100
8	CO	.....	CO (all areas) ≥ 100
9	Pb	≥ 5	≥ 5
10	PM10.....	≥ 100	PM10 (moderate) ≥ 100
11	PM10.....	.....	PM10 (serious) ≥ 70
12	PM2.5.....	≥ 100	≥ 100
13	NH3	≥ 100	≥ 100

[1] NAA = Nonattainment Area. Special point source reporting thresholds apply for certain pollutants by type of nonattainment area. The pollutants by nonattainment area are: Ozone: VOC, NOX, CO; CO: CO; PM10: PM10

Based on the AERR requirements, S/L/T agencies submit emissions of point, nonpoint, on-road mobile, nonroad mobile, and fires emissions sources. These submissions are sent to EIS (http://www.epa.gov/ttn/chief/eis/gateway/index.html) that EPA then uses to review and assemble the data from the S/L/T agencies. For the 2008 NEI, these submissions were due to EPA by June 30, 2010 and states continued to revise their submissions through November 2011. Extra time was allotted to agencies for the 2008 NEI since it was the first inventory for which EIS was used. Starting with the 2009 inventory, S/L/T agency data are due by December 31 of the year following the inventory year (e.g., 2009 submissions were due by December 31, 2010).

Once the reporting NEI period has closed, EPA works with states to identify any agencies that missed the reporting window, provide feedback on data quality such as outliers and apparently missing data by comparing to previously established emissions ranges and past inventories. In addition, EPA works to augment the HAP inventories with additional data sources such as TRI, data developed by the air toxics and residual risk programs, and other augmentation procedures. This documentation provides a detailed account of EPA's quality assurance and augmentation methods.

1.6 Who are the target audiences for the 2008 NEI?

The comprehensive nature of the NEI allows for many uses and therefore its target audiences include EPA staff and policy makers, the U.S. public, other federal and state decision makers, and other countries. Table 2 below lists the major current uses of the NEI and the plans for use of the 2008 NEI in those efforts. These uses include those by EPA in support of the NAAQS, Air Toxics, and other programs as well as uses by other federal and regional agencies and international support. In addition to this list, the NEI is used to respond to Congressional inquiries, provide data that supports university research, and allow environmental groups to understand sources of air pollution.

Table 2: Examples of major current uses of the NEI

Audience	Purposes	Last NEI data used[1]
U.S. Public	Learn about sources of air emissions	2008 NEI v2
EPA – NAAQS	Regulatory Impact Analysis – benefits estimates using air quality modeling	Modified 2005 NEI, v2 for PM NAAQS proposal
	SO2 NAAQS Monitoring Implementation - Population Weighted Emissions Index	2008 NEI v1.5
	Pb Monitoring Rule	2005 NEI v2
	Pb NAAQS final designations	2008 NEI v1.5
	PB NAAQS review	Ongoing
	Transport Rule air quality modeling (e.g., Clean Air Interstate Rule, Cross-State Air Pollution Rule)	Modified 2005 NEI, v2
	State Implementation Plans – source of emissions data for regions outside of the state jurisdiction	2008 NEI v1.5
EPA – Air toxics	National Air Toxics Assessment (NATA)	Modified 2005 NEI, v2
	Mercury and Air Toxics Standard – mercury risk assessment and Regulatory Impact Assessment	Modified 2005 NEI, v2
	Residual Risk and Technology Review – starting point for inventory development	2008 NEI v1.5 and v1
EPA - other	Inspector General – review of oil and gas industry	2008 NEI v1.5
	NEI booklet – analysis of emissions inventory data	2002 NEI, v3
	Report on the Environment	2005 NEI, v2
	Air Emissions website for providing graphical access to CAP emissions for state maps and Google Earth views of facility total emissions	2008 NEI v1.5
	Department of Transportation, national transportation sector summaries of CAPs	2008 NEI v1.5
	Black Carbon Report to Congress	Modified 2005 NEI, v2
Other federal or regional agencies	Western Regional Air Partnership – modeling in support of Regional Haze SIPs and other air quality issues	Not known
	National Oceanic and Atmospheric Administration (NOAA) air quality forecasting	Not known
International	United Nations Economic Commission for Europe's Convention on Long-range Transboundary Air Pollution (LRTAP)	2005 NEI v1.5
	United Nations Environment Programme (UNEP) – global mercury program	Modified 2005 NEI, v2
	North American Commission for Environmental Cooperation (CEC) – North American Regional Action Plan (NARAP) on Mercury	Not known

[1] These were correct at the time of 2008 NEI v2 release. Some uses of the data will be updated to use the 2008 NEI v2.

1.7 What are appropriate uses of the 2008 NEI version 2 and what are the caveats about the data?

As shown in the preceding section, the NEI provides a readily-available comprehensive inventory of both CAP and HAP emissions to meet a variety of users needs. Although the accuracy of individual emissions estimates will vary from facility-to-facility or county-to-county, the NEI largely meets the needs of these users in the aggregate. Some NEI users may wish to evaluate and revise the emission estimates for specific pollutants from specific source types for either the entire US or for smaller geographical areas as their particular needs may dictate. Regulatory uses of the NEI by the EPA such as for the Clean Air Interstate Rule always include a public review and comment period. Large-scale assessment uses such as the NATA study provide an effective screening tool for identifying potential risks, the results of which should be reviewed in more detail, including an assessment of the key emissions and other modeling inputs.

One of the primary goals of the NEI is to provide the best assessment of current emissions levels using the data, tools and methods currently available. For significant emissions sectors of key pollutants, the available data, tools and methods typically evolve over time in response to identified deficiencies and the need to understand the costs and benefits of proposed emissions reductions. As these method improvements have been made, there have not been consistent efforts to revise previous NEI year estimates to use the same methods as the current year. Therefore, care must be taken when reviewing different NEI year publications as a time series with the goal of determining the trend or difference in emissions from year to year. An example of such a method change in the 2008 NEI v2 is the use of the Motor Vehicle Emissions Simulator (MOVES) model[2] for the on-road data category. Previous NEI 2008 versions and NEI years had used the Mobile Source Emission Factor Model, version 6 (MOBILE6)[3] and earlier versions of the MOBILE model for this data category, and the change of model has been demonstrated to make significant changes in some pollutants. EPA's rulemaking packages typically provide a consistent trend estimate across base and future years using the same estimation model or methods, but these efforts do not extend to re-estimation of past NEI years. Other significant emissions sectors which have seen improvements and therefore inconsistent trend data through the years include paved and unpaved road PM emissions, animal waste ammonia emissions, and residential wood combustion emissions. In addition, the 2008 NEI v2 uses updated emissions factors for several metal HAPs and acid gases from coal-fired utility boilers.

Appendix A of this document provides a detailed listing of the issues that were identified during the course of the development of the 2008 NEI and the current status of those issues. The Appendix includes all issues identified as part of the 2008 NEI versions 1, 1.5, and 2. This same information is available in spreadsheet form from the spreadsheet "2008 NEI v2 issues 24apr2012.xlsx" (see Section 8.1 for access information), and the spreadsheet will be kept more up to date than the Appendix. If the spreadsheet is newer, it will have a different date as part of the name, and is also available from the main 2008 NEI data page listed in Section 1.3.2.

In addition to the issues, users should take caution in using the emissions data for filterable and condensible components of particulate matter (PM10-FIL, PM2.5-FIL and PM-CON) which is not complete and should not be used at any aggregated level. These data are provided for users who wish to better understand the components

[2] See http://www.epa.gov/otaq/models/moves/index.htm
[3] See http://www.epa.gov/otaq/m6.htm

of the primary PM species, where they are available, in the disaggregated, process-specific emissions reports. Where not reported by S/L/T, EPA augments these components (see Section 3.1.2). However, not all sources are covered by this routine, and in mobile source models, only the primary particulate species are estimated. Thus, users interested in PM emissions should use the primary species of particulate matter (PM10-PRI and PM25-PRI), described in this document simply as PM10 and PM2.5.

Also some data summaries may include the pollutant "Chromium." EPA speciated emissions for Chromium (pollutant code=7440473, see Section 3.1.3) into hexavalent chromium and trivalent chromium (Chromium (VI) and Chromium III), other than the less than 1 pound of nonpoint emissions inadvertently missed by the speciation routine. Therefore, 2008 NEI v2 data summaries for "Chromium" will show emissions of 0 or close to 0. Users should use the data for Chromium (VI), Chromium III, Chromic Acid (VI) and Chromium Trioxide, but not for Chromium.

The primary unresolved issues in the 2008 NEI v2 are described below.

- The only emissions for any data category in the 2008 NEI for South Dakota are those provided by EPA. Users of the NEI are encouraged to augment 2008 South Dakota point source emissions with data from past inventories.
- It is suspected but not fully confirmed that for a few states, the point source primary PM10 and primary PM2.5 emissions may be underestimated due to the reporting of only the filterable portions of particulate matter as the full filterable plus condensable equals "primary" particulate pollutants by the States. On-road, Nonroad, and probably most of Nonpoint emissions for these States are expected to accurately reflect the full filterable plus condensable particulate emissions due to the available models and emission factors for those data categories.
- Landfills have not been estimated by EPA for the 2008 NEI, as had been done in earlier NEI years. Some States do report some pollutants for some of their larger landfills, and these have been included in the 2008 NEI. This is expected to be largely an issue for some toxics. The scope of the underestimate is uncertain, due to an expectation that many landfills have been adding gas collection systems as a result of various control programs and the value of the collected gas as a fuel.
- There may be some double-counting of rail switchyard emissions in a small number of locations, due to State reporting of nonpoint county emissions and EPA reporting of the larger switchyards as point sources. In the counties where this occurs it is not known if the nonpoint county emissions reported by the States have been adjusted to exclude the point sources reported by EPA. See also Section 4.4.6.
- EPA's methods for fires, which rely heavily on satellite data, generally do not capture the smaller fires (generally not less than 100 acres), and thus the EPA estimates for acres burned and the emissions are likely low in most cases. The same can be said for interference to remote sensing caused by excess cloud cover and/or canopy cover.
- In addition to this general underestimation for some fires, there may be minor double-counting in cases where Tribes also submitted fires data. The Tribal data were included in the 2008 NEI as submitted by the Tribes. No attempts were made to avoid the possible double count that would occur with the possible overlap of EPA data or State data and the Tribal-reported data (see Section 5.1.2). To do this, accurate shape files for the various Tribal lands would be required.

- As described in Section 2.6, 0.5 tons of Hg from boilers were inadvertently left out of the 2008 NEI, but have been added to summary tables for mercury provided in that section.
- In using the NEI in modeling applications, many unresolved inconsistencies were identified among reported stack velocities, flows, and diameters.
- For future year projections of the 2008 NEI that will substitute Integrated Planning Model (IPM) results for Electric Generating Utilities (EGUs), the mapping of NEI units to IPM units from the National Electric Energy Data System (NEEDS) database (used to define the units for IPM) is somewhat incomplete. Users of the data should confirm that any deficiencies in the mapping are resolved in 2008 NEI modeling files also provided by EPA.

2 2008 inventory contents overview

2.1 What are EIS Sectors and what list was used for this document?

EIS Sectors are being used for the first time with the release of the 2008 NEI. These sectors have been developed to better group emissions for both CAP and HAP summary purposes. The sectors are based simply on grouping the emissions by the emissions process based on the source classification code (SCC) to the EIS sector. The SCC-EIS Sector cross-walk used for the summaries provided in this document ("scc_eissector_xwalk_2008neiv2.xlsx") is part of the supporting data (see Section 8.1 for access information). In building this list, we gave consideration not only to the types of emissions sources our data users most frequently ask for, but also to the need to have a relatively concise list in which all sectors have a significant amount of emissions of at least one pollutant. Users of the NEI are free to obtain the SCC-level data and modify the EIS Sector cross-walk to make custom groupings of their own or to request assistance from EPA to do so.

Some of the sectors include the nomenclature "NEC", which stands for "not elsewhere classified." This simply means that those emissions processes were not appropriate to include in another EIS sector and their emissions were too small individually to include as its own EIS sector.

Traditionally, the inventory has been compiled and considered using four major categories, which are also categories in EIS: point, nonpoint, on-road, and nonroad. In EIS, another category called "event" has been added and is used to compile day-specific data from fires. While events could be other non-fire intermittent releases such as chemical spills, these have been a focus of the NEI creation effort. Table 3 shows the EIS sectors in the left most column and identifies the EIS category associated with that sector. It also identifies in the rightmost column the section number of this document that provides more information about that EIS sector. As the column illustrates, many EIS sectors include emissions from more than one EIS category because the EIS sectors are compiled based on the type of emissions sources rather than the category. One particularly large change from the traditional labeling of sectors and categories is for the EIS sectors "Mobile – Aircraft", "Mobile – Commercial Marine Vessels", and "Mobile – Locomotives" that are included in EIS as part of the nonpoint category rather than the nonroad category. This change is related only to how the data are compiled by EIS and has no other significance for the emissions values themselves. However, NEI users who sum emissions by EIS category rather than EIS sector should be aware that this change will give differences from historical summaries of "nonpoint" and "nonroad" data unless care is taken to assign those emissions to the historical grouping.

Table 3: EIS sectors and associated emissions categories and document sections

Sector name	Point	Nonpoint	On-road	Nonroad	Event	Document Section
Agriculture - Crops & Livestock Dust		☑				3.2
Agriculture - Fertilizer Application		☑				3.3
Agriculture - Livestock Waste	☑	☑				3.4
Bulk Gasoline Terminals	☑	☑				3.5
Commercial Cooking		☑				3.6
Dust - Construction Dust	☑	☑				3.7
Dust - Paved Road Dust		☑				3.8
Dust - Unpaved Road Dust		☑				3.9
Fires - Agricultural Field Burning		☑				5.2
Fires - Prescribed Burning		☑			☑	5.1
Fires - Wildfires		☑			☑	5.1
Fuel Comb - Comm/Institutional - Biomass	☑	☑				0
Fuel Comb - Comm/Institutional - Coal	☑	☑				0
Fuel Comb - Comm/Institutional - Natural Gas	☑	☑				0
Fuel Comb - Comm/Institutional - Oil	☑	☑				0
Fuel Comb - Comm/Institutional - Other	☑	☑				0
Fuel Comb - Electric Generation - Biomass	☑					3.10
Fuel Comb - Electric Generation - Coal	☑					3.10
Fuel Comb - Electric Generation - Natural Gas	☑					3.10
Fuel Comb - Electric Generation - Oil	☑					3.10
Fuel Comb - Electric Generation - Other	☑					3.10
Fuel Comb - Industrial Boilers, ICEs - Biomass	☑	☑				3.11
Fuel Comb - Industrial Boilers, ICEs - Coal	☑	☑				3.11
Fuel Comb - Industrial Boilers, ICEs - Natural Gas	☑	☑				3.11
Fuel Comb - Industrial Boilers, ICEs - Oil	☑	☑				3.11
Fuel Comb - Industrial Boilers, ICEs - Other	☑	☑				3.11
Fuel Comb - Residential - Natural Gas		☑				3.13
Fuel Comb - Residential - Oil		☑				3.13
Fuel Comb - Residential - Other		☑				3.13
Fuel Comb - Residential - Wood		☑				0
Gas Stations	☑	☑				0
Industrial Processes - Cement Manufacturing	☑					0
Industrial Processes - Chemical Manufacturing	☑	☑				0
Industrial Processes - Ferrous Metals	☑					0
Industrial Processes - Mining	☑	☑				0
Industrial Processes - NEC	☑	☑				0
Industrial Processes - Non-ferrous Metals	☑	☑				0
Industrial Processes - Oil & Gas Production	☑	☑				0

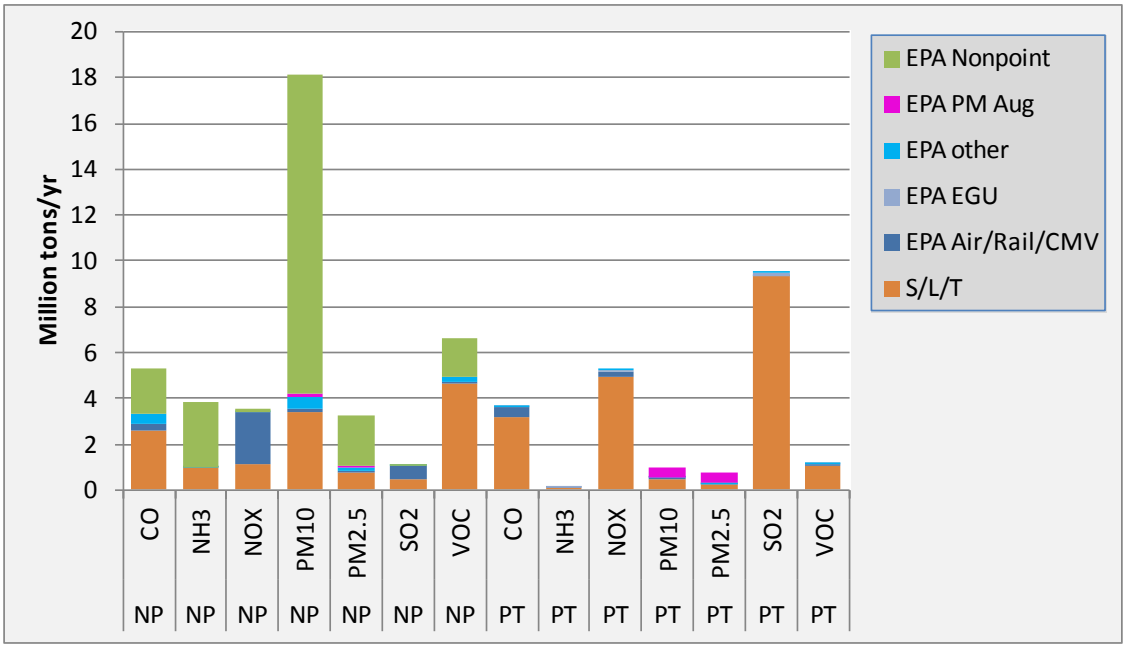
Sector name	Point	Nonpoint	On-road	Nonroad	Event	Document Section
Industrial Processes - Petroleum Refineries	☑	☑				0
Industrial Processes - Pulp & Paper	☑					0
Industrial Processes - Storage and Transfer	☑	☑				0
Miscellaneous Non-Industrial NEC	☑	☑				0
Mobile - Aircraft	☑	☑				4.2
Mobile - Commercial Marine Vessels	☑	☑				4.3
Mobile - Locomotives	☑	☑				4.4
Mobile - Non-Road Equipment - Diesel	☑			☑		4.5
Mobile - Non-Road Equipment - Gasoline	☑			☑		4.5
Mobile - Non-Road Equipment - Other	☑			☑		4.5
Mobile - On-road – Diesel Heavy Duty Vehicles			☑			4.6
Mobile - On-road – Diesel Light Duty Vehicles			☑			4.6
Mobile - On-road – Gasoline Heavy Duty Vehicles			☑			4.6
Mobile - On-road – Gasoline Light Duty Vehicles			☑			4.6
Solvent - Consumer & Commercial Solvent Use		☑				0
Solvent - Degreasing	☑	☑				0
Solvent - Dry Cleaning	☑	☑				0
Solvent - Graphic Arts	☑	☑				0
Solvent - Industrial Surface Coating & Solvent Use	☑	☑				0
Solvent - Non-Industrial Surface Coating		☑				0
Waste Disposal	☑	☑				0

2.2 What do the data show about the sources of data in the 2008 NEI?

Data in the NEI come from a variety of sources. The emissions are predominantly from S/L/T agencies for both CAP and HAP emissions. In addition, EPA quality assures and augments the data provided by states to assist with data completeness, particularly with the HAP emissions since the S/L/T HAP reporting is voluntary. Additional details on EPA's augmentation datasets are available in the remainder of this document.

Figure 1 shows the proportion of criteria pollutant emissions from various data sources in the NEI for point and nonpoint sources (data sources from on-road, nonroad, and fire sources are described later in this section; these sectors are different because they each have their own emissions model). For the nonpoint data in the figure (left 7 bars), most of the emissions come from EPA sources of data, with S/L/T agency data the majority for VOC and CO. The large "EPA Nonpoint" bar for PM10 is predominantly dust sources from unpaved roads (7 million tons), agricultural dust from crop cultivation (3.6 million tons), and construction dust (1.5 million tons). For point data in the figure (right 7 bars), most of the emissions come from S/L/T agency data, with EPA data making up a large proportion only for the PM10 and PM2.5 with the EPA PM Augmentation dataset ("EPA PM Aug" in the figure, see Section 3.1.2). The data sources shown in the figure are described in more detail in Section 3.

Figure 1: Data sources for point and nonpoint emissions for criteria pollutants



In Figure 2, the nonpoint HAP VOCs are evenly split between EPA (250,000 tons) and S/L/T agency (241,000 tons) data sources. The nonpoint acid gases are very small, with 6,700 tons from S/L/T agencies and 3,500 tons from the EPA nonpoint dataset. For point sources, the bulk of the acid gases emissions (primarily HCl) comes from two EPA EGU datasets (138,000 tons) in addition to 42,000 tons from S/L/T agencies , while most of the HAP VOC emissions come from the S/L/T/ agency data (179,000 tons) and just 33,000 tons from TRI.

Figure 2: Data sources for point and nonpoint emissions for acid gases and HAP VOCs

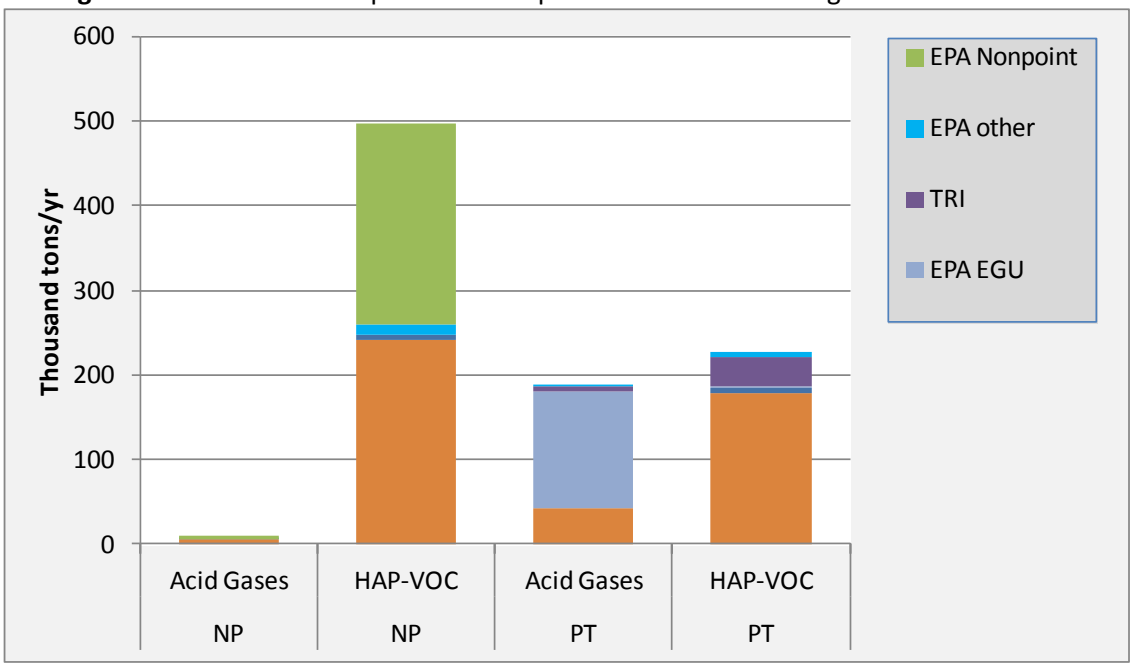
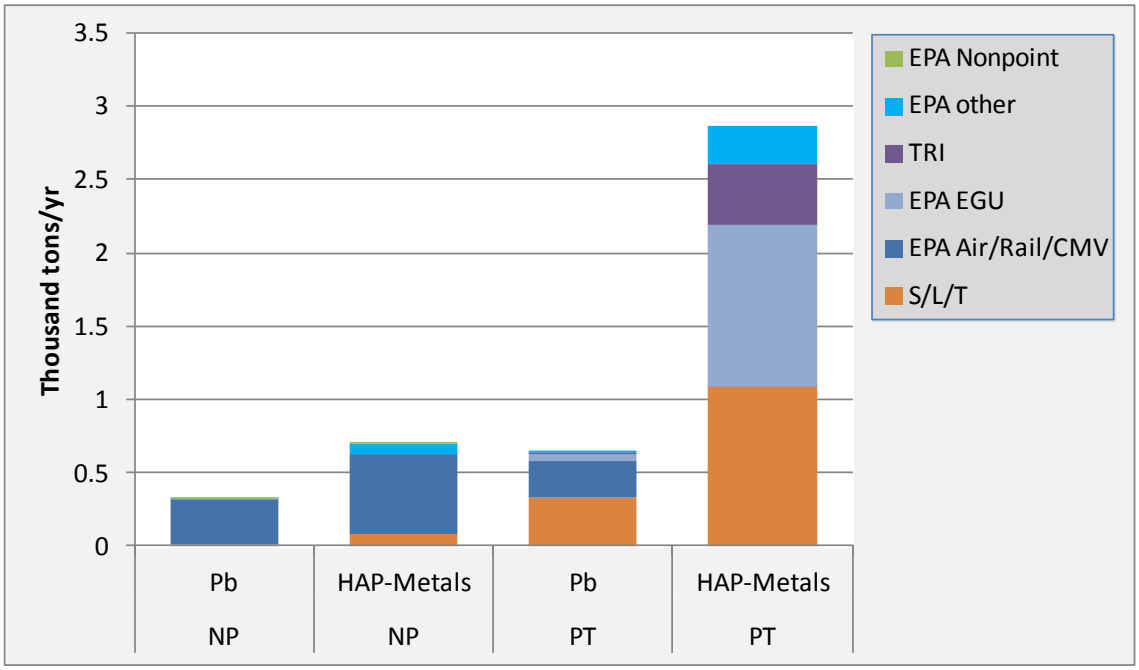


Figure 3 shows emissions sources for Pb and HAP metal emissions. For nonpoint sources, almost all of the emissions are from the EPA nonroad dataset, which includes emissions from airports, locomotives, and commercial marine vessels. For point sources, about half of the Pb comes from S/L/T agency data (330 tons),

while the EPA nonroad dataset airport emissions makes up a substantial part of the rest (250 tons). For metals, the point sources data has a significant portion from S/L/T agencies (1,090 tons), with the rest from the EPA EGU dataset (1,100 tons), TRI (420 tons), and other EPA datasets (250 tons).

Figure 3: Data sources for point and nonpoint emissions for Pb and HAP metals



As shown in the figures above, S/L/T agency data are the bulk of the stationary source emissions in the NEI for all pollutants except PM10, HAP-VOCs, and HAP-Metals. Nearly all states (and locals responsible for submitting inventories) submitted data to EPA for the 2008 NEI. The figures below provide more detail about which states submitted data to the NEI for the stationary and mobile categories. In Sections 3 through 5, we explain more about what data actually was used by EPA in creating the NEI for each sector. Usually, but not always, EPA uses the data provided by the states. These figure present the states for which data were available to EPA in compiling the 2008 NEI.

Figure 4 shows that all states except South Dakota submitted point source CAP emissions and all states but Utah, South Dakota, Indiana, Georgia, Connecticut, and Alaska submitted point source HAP emissions. Generally, when states submitted CAP emissions they submitted all of the CAPs, but for HAP emissions there is more variability in the data provided. S/L/T agencies can only report what they collect, and collection varies depending on state, local, and tribal reporting regulations. In the case of Indiana, point source HAP data are collected (voluntarily) but not reported to EPA[4].

[4] See the Indiana voluntary HAP reporting program at http://www.in.gov/idem/4582.htm.

Figure 4: Point inventory - submission types - includes local agencies

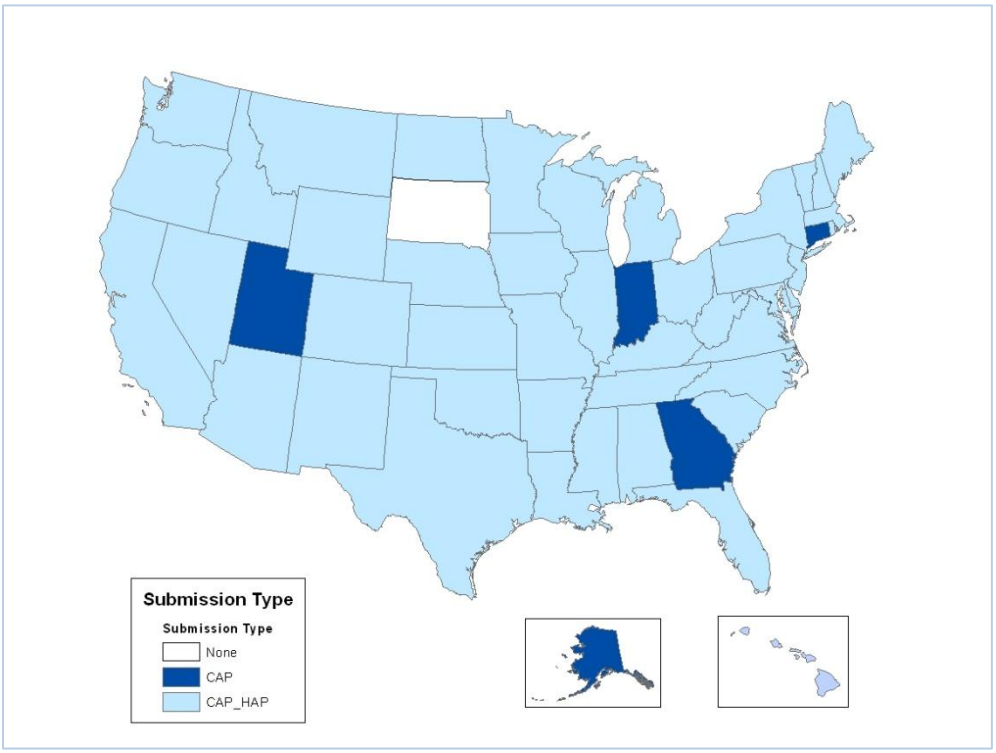
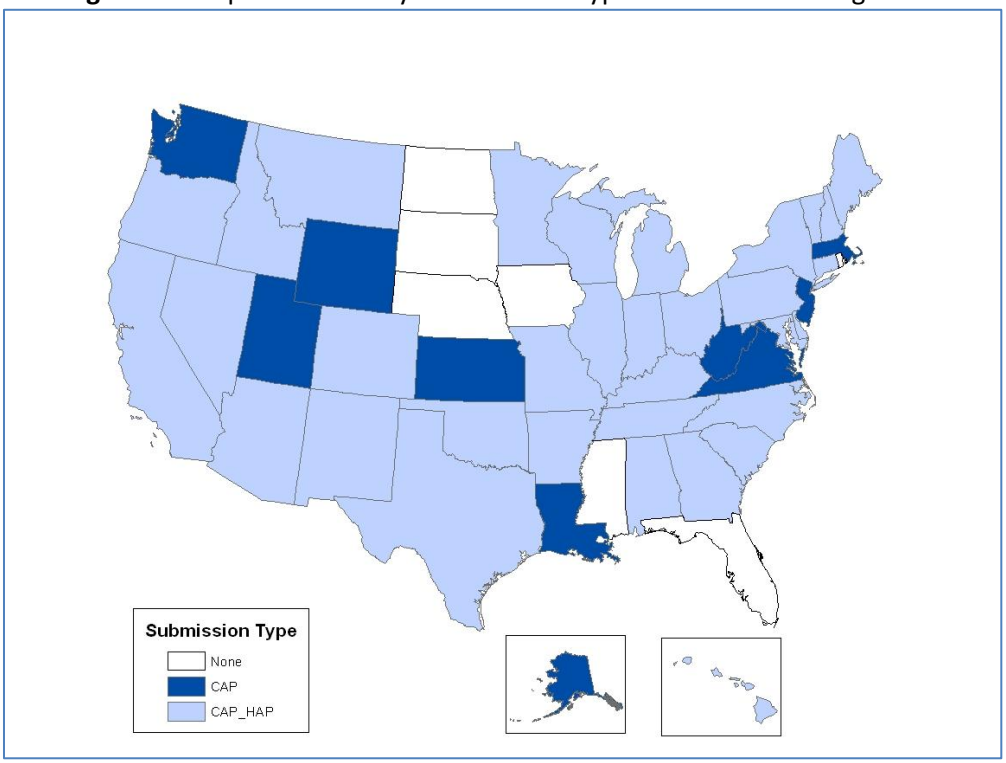


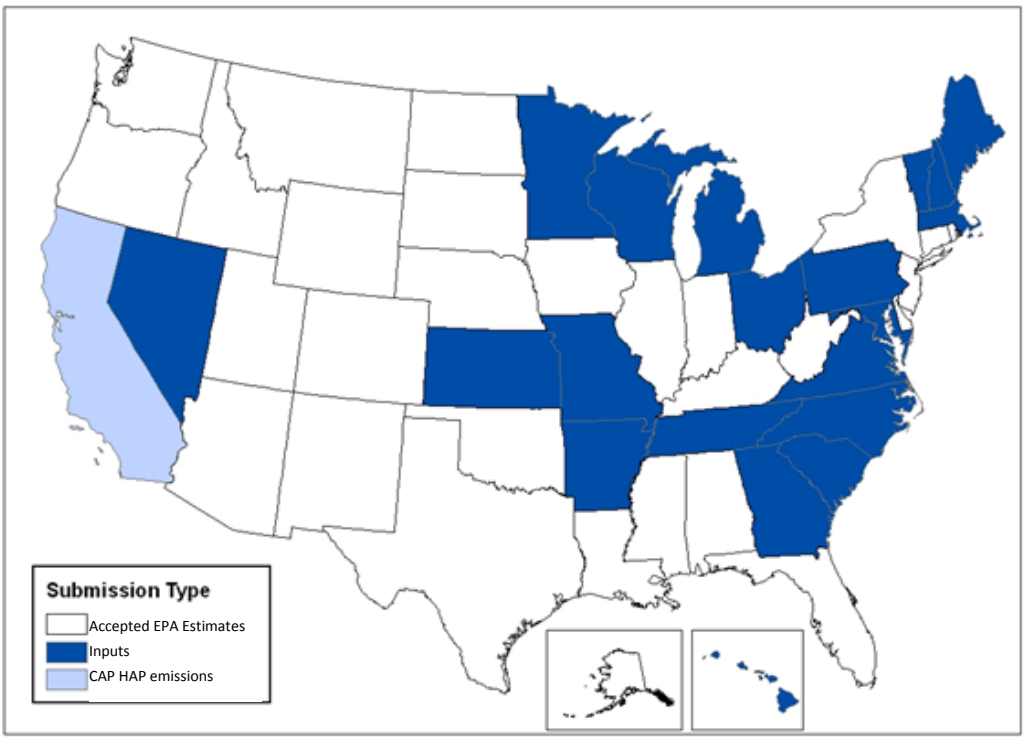
Figure 5 shows the states that submitted nonpoint emissions: 41 states submitted CAPs and 32 also submitted HAPs. Only 7 states did not submit any nonpoint emissions, and at least some of these notified EPA that EPA's estimates were acceptable for the source types that EPA estimated.

Figure 5: Nonpoint inventory – submission types – includes local agencies



For on-road mobile sources, emissions in all states except California are based on the MOVES model. California emissions are estimated by the EMFAC (short for Emission FACtor) model[5] and California has provided CAP and HAP emissions which are used in the 2008 NEI. As shown in Figure 6 below, 30 states accepted EPA estimates without providing any on-road model inputs. This is a higher number of states than in past inventories because the NEI timing relative to the release of the MOVES model did not allow for states to submit MOVES-based emissions. Nineteen states provided some form of either the National Mobile Inventory Model (NMIM)[6] or MOVES inputs to EPA, including vehicle miles traveled (VMT), which EPA used to prepare inputs to the MOVES model.

Figure 6: On-road inventory – submission types – does not include local agencies



Like on-road mobile, the nonroad mobile sector gives a patchwork of scenarios for providing different data types. Again, California has provided EPA CAP and HAP emissions based on a different model than the other states – the OFFROAD model[7]. Other states emissions come from the NONROAD model[8], often through the use of the NMIM, which drives the NONROAD model. In Idaho, Texas, and Kansas, state agencies submitted nonroad emissions for CAP and HAP pollutants. For Utah, Illinois, Pennsylvania, and New York, the states submitted CAP emissions only. Eighteen states submitted NONROAD model inputs, that EPA could use to generate emissions, and the remaining states accepted EPA estimates.

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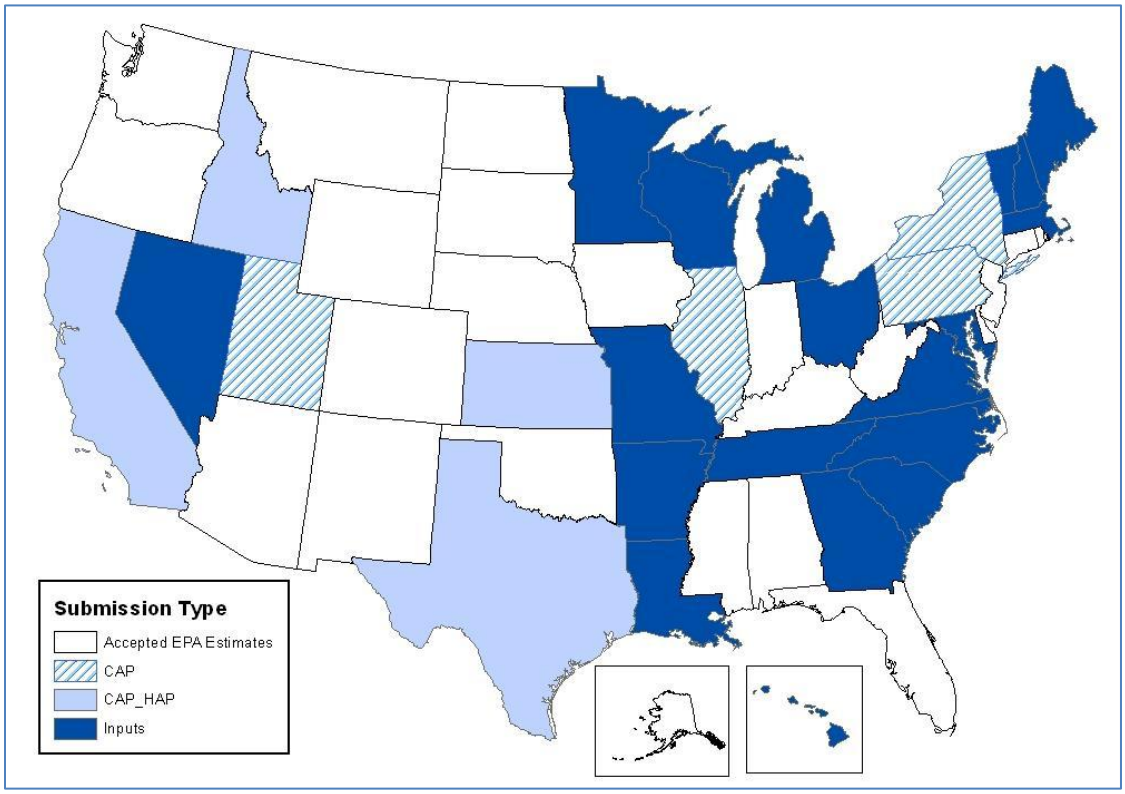
[5] See "EMFAC Overview" link available at http://www.arb.ca.gov/msei/onroad/background.htm
[6] See http://www.epa.gov/otaq/nmim.htm
[7] The OFFROAD model and documentation are available at http://www.arb.ca.gov/msei/offroad/offroad.htm.
[8] The NONROAD model and documentation are available at http://www.epa.gov/otaq/nonrdmdl.htm

Figure 7: Nonroad equipment inventory – submission types – does not include local agencies



In addition to the maps above, each sector-specific section below has maps that show the distribution of state and EPA data for CAPs and HAPs. Finally, Appendix B provides a table that shows for each EIS sector whether the data comes from S/L/T agencies or a selection of EPA created datasets including TRI.

2.3 What are the top sources of some key pollutants?

This section simply provides a summary of criteria pollutants and total HAP emissions for all of the EIS sectors, including the biogenic emissions from vegetation and soil. Emissions in federal waters and from vegetation and soils have been split out and totals both with and without these emissions are included. Emissions in federal waters includes offshore drilling platforms and commercial marine vessel emissions outside the typical 3-10 nautical mile boundary defining state waters. These emissions values are subject to change and are bounded by the caveats and methods described by this documentation.

Table 4: EIS sectors and associated CAP emissions and total HAP (1000 short tons/year)

	1,000 short tons/yr								
Sector	**CO**	**VOC**	**NOX**	**SO2**	**PM2.5**	**PM10**	**NH3**	**Lead**	**Total HAP[1]**
Agriculture - Crops & Livestock Dust					923	4,650			1.49E-2
Agriculture - Fertilizer Application							1,190		
Agriculture - Livestock Waste		92			7.49	24	2,448		1.92E-5
Bulk Gasoline Terminals	0.777	93	0.392	1.48E-2	8.78E-2	0.101	4.28E-4	2.49E-5	5.45
Commercial Cooking	30	13	6.19E-4	9.52E-5	86	89			5.22
Dust - Construction Dust	0.168	1.66E-2	7.32E-2	1.00E-3	220	2,115	8.34E-4	2.22E-9	3.64E-2
Dust - Paved Road Dust					280	1,539			
Dust - Unpaved Road Dust					812	8,104			
Fires - Agricultural Field Burning	576	53	25	3.42	66	68	3.88	9.73E-4	6.48
Fires - Prescribed Fires	8,176	1,697	139	65	701	824	119		240
Fires - Wildfires	12,203	2,847	96	70	999	1,178	198		1,051
Fuel Comb - Comm/Institutional - Biomass	17	0.541	5.49	1.70	2.52	3.07	0.219	5.80E-4	0.676
Fuel Comb - Comm/Institutional - Coal	15	0.418	20	88	2.13	4.65	0.136	3.46E-3	1.88
Fuel Comb - Comm/Institutional - Natural Gas	100	8.94	146	1.24	5.94	6.16	1.06	8.91E-4	1.50
Fuel Comb - Comm/Institutional - Oil	18	2.62	60	66	3.93	4.78	0.807	9.49E-4	0.824
Fuel Comb - Comm/Institutional - Other	12	0.932	9.20	1.22	0.541	0.657	3.64E-2	1.53E-3	8.82E-2
Fuel Comb - Electric Generation - Biomass	21	1.09	10	2.76	1.48	1.80	1.49	1.90E-3	1.38
Fuel Comb - Electric Generation - Coal	573	29	2,813	7,603	276	370	11	4.97E-2	144
Fuel Comb - Electric Generation - Natural Gas	93	9.45	181	15	20	21	11	1.27E-3	2.83
Fuel Comb - Electric Generation - Oil	13	1.95	82	142	9.45	11	1.65	3.14E-3	0.794
Fuel Comb - Electric Generation - Other	27	2.05	27	15	1.93	2.47	2.25	3.76E-3	1.27
Fuel Comb - Industrial Boilers, ICEs - Biomass	192	8.30	80	25	32	39	1.70	1.49E-2	7.34
Fuel Comb - Industrial Boilers, ICEs - Coal	59	2.17	208	663	24	51	0.495	2.08E-2	15
Fuel Comb - Industrial Boilers, ICEs - Natural Gas	367	60	777	38	29	32	6.50	5.29E-3	22
Fuel Comb - Industrial Boilers, ICEs - Oil	26	3.72	93	135	9.16	13	0.955	2.67E-3	0.740
Fuel Comb - Industrial Boilers, ICEs - Other	121	6.33	72	67	31	33	0.741	4.70E-3	2.33
Fuel Comb - Residential - Natural Gas	94	13	230	1.41	5.06	5.41	38	2.04E-4	0.920
Fuel Comb - Residential - Oil	14	1.74	57	121	5.87	6.76	2.62	3.80E-3	0.138
Fuel Comb - Residential - Other	49	2.90	38	8.90	1.07	1.56	0.380	1.33E-4	7.23E-2
Fuel Comb - Residential - Wood	2,378	350	35	10	344	345	20	4.62E-4	70
Gas Stations	9.41E-3	643	2.13E-2	2.96E-3	6.16E-3	6.44E-3	3.42E-4	5.24E-4	28
Industrial Processes - Cement Manuf	100	9.19	186	106	13	24	0.889	8.29E-3	3.61
Industrial Processes - Chemical Manuf	205	99	77	196	23	30	19	1.19E-2	31
Industrial Processes - Ferrous Metals	467	19	63	33	36	44	0.625	7.89E-2	2.41
Industrial Processes - Mining	29	1.89	5.93	3.80	106	748	1.88E-3	2.60E-3	0.824
Industrial Processes - NEC	260	217	198	158	120	187	51	4.05E-2	58
Industrial Processes - Non-ferrous Metals	328	16	16	132	20	25	0.994	8.62E-2	9.63
Industrial Processes - Oil & Gas Production	219	1,688	409	61	7.11	10	2.75E-2	5.36E-5	8.33
Industrial Processes - Petroleum Refineries	84	68	93	144	24	27	3.00	5.17E-3	5.87
Industrial Processes - Pulp & Paper	132	130	74	40	40	49	5.95	5.14E-3	54
Industrial Processes - Storage and Transfer	17	238	6.72	5.53	23	53	4.97	9.33E-3	15
Miscellaneous Non-Industrial NEC	29	227	1.81	0.159	3.18	3.73	11	4.02E-4	25
Mobile - Aircraft	458	35	121	13	4.22	10		0.571	8.49
Mobile - Commercial Marine Vessels	143	21	827	150	35	37	0.398	2.90E-3	3.35
Mobile - Locomotives	120	44	846	11	25	28	0.362	2.28E-3	4.09
Mobile - Non-Road Equipment - Diesel	870	166	1,551	32	122	127	1.08	3.27E-5	41
Mobile - Non-Road Equipment - Gasoline	15,462	2,281	250	2.35	55	61	0.837	2.14E-6	539
Mobile - Non-Road Equipment - Other	1,015	47	187	0.741	2.09	2.10	1.07		0.196

	1,000 short tons/yr								
Sector	**CO**	**VOC**	**NOX**	**SO2**	**PM2.5**	**PM10**	**NH3**	**Lead**	**Total HAP[1]**
Mobile - On-road – Diesel Heavy Duty Vehicles	981	238	3,353	85	204	224	6.00		45
Mobile - On-road – Diesel Light Duty Vehicles	47	11	75	2.64	5.64	6.23	0.334		1.91
Mobile - On-road – Gasoline Heavy Duty Vehicles	2,530	166	251	1.48	4.09	6.96	4.71		45
Mobile - On-road – Gasoline Light Duty Vehicles	32,492	2,640	3,455	29	82	138	128		733
Solvent - Consumer & Commercial Solvent Use	3.46E-2	1,619	1.04E-2	7.62E-3	1.32E-2	2.41E-2	6.89E-2	5.19E-6	174
Solvent - Degreasing	0.162	198	0.337	0.339	5.49E-2	6.06E-2	5.11E-3	5.74E-4	28
Solvent - Dry Cleaning	8.80E-4	49		5.00E-7	1.58E-2	1.58E-2	1.25E-4		3.86
Solvent - Graphic Arts	3.20	356	3.85	2.67E-2	0.252	0.277	8.84E-2	3.18E-4	24
Solvent - Industrial Surface Coating & Solvent Use	3.35	648	2.76	0.322	3.46	3.93	0.236	4.30E-3	75
Solvent - Non-Industrial Surface Coating		429					1.83E-2		68
Waste Disposal	1,384	180	97	21	205	240	66	1.15E-2	42
Sub Total (no federal waters)	**82,552**	**17,784**	**17,356**	**10,369**	**6,066**	**21,631**	**4,366**	**0.963**	**3,659**
Fuel Comb - Industrial Boilers, ICEs - Natural Gas	78	1.42	64	4.02E-2	0.383	0.383			
Fuel Comb - Industrial Boilers, ICEs - Oil	1.83	0.352	7.55	0.715	0.327	0.337			
Fuel Comb - Industrial Boilers, ICEs - Other	5.02E-3	3.06E-4	4.47E-3	2.84E-5	9.69E-5	9.69E-5			
Industrial Processes - Oil & Gas Production	1.85	58	2.31	0.266	5.99E-2	6.06E-2			
Industrial Processes - Storage and Transfer		0.909							
Mobile - Commercial Marine Vessels	61	26	738	457	56	61	0.292	1.60E-3	0.799
Sub Total (federal waters)	**143**	**87**	**813**	**458**	**57**	**62**	**0.292**	**1.60E-3**	**0.799**
Sub Total (all but vegetation and soil)	**82,696**	**17,871**	**18,168**	**10,827**	**6,123**	**21,693**	**4,367**	**0.965**	**3,660**
Biogenics - Vegetation and soil[2]	6,474	31,744	1,078						4,322
Total	**89,170**	**49,615**	**19,246**	**10,827**	**6,123**	**21,693**	**4,367**	**0.965**	**7,981**

[1] Total HAP does not include diesel PM, which is not a HAP listed by the Clean Air Act

[2] Biogenic vegetation and soil emissions excludes emissions from Alaska, Hawaii, and territories

2.4 How does this NEI compare to past inventories?

Many similarities between the 2008 NEI approaches and past NEI approaches exists, notably that the data are largely compiled from data submitted by S/L/T agencies for CAPs, and that the HAP emissions have greater augmentation by EPA because they are a voluntary contribution from the partner agencies. The NEI program continues with the 2008 NEI to work towards a complete compilation of the nation's CAPs and HAPs. EPA provided feedback to states during the compilation of the data on critical issues (such as missing Hg data) as has been done in the past and EPA improved the inventory for the release of version2. In addition to these similarities, there are some important differences in how the 2008 NEI has been created and the resulting emissions, which are described in the following two subsections.

2.4.1 Differences in approaches

The 2008 NEI is the first inventory compiled with the EIS. This new system greatly improved the collection approach from less structured approaches used in the past. The hundreds of automated QA checks in EIS have undoubtedly improved the data quality and allowed EPA more time to review the data prior to publication. One outcome of this additional QA and review is the more lengthy list of caveats identified in Section 1.7 and Appendix A.

For the inventory in general, but primarily affecting stationary sources, we have consolidated the number of HAP compounds significantly for metals and cyanides and provided conversion factors to enable S/L/T agencies to provide them as the metal or cyanide that is important for risk. For all data categories we provide only

speciated chromium and specific allowable chromium species by speciating agency-reported total chromium (see section 3.1.3). This was done to allow easier toxicity weighting of the inventories and more streamlined risk modeling.

For point sources, the augmentation approach for using TRI has changed in the 2008 NEI. Since TRI has facility total emissions and not emissions for each emissions process, EPA needs to assign a process SCC code to the emissions. In the past, the practice had been to assign a miscellaneous code of "39999999" to these emissions. This prevents the emissions from being assigned to meaningful emissions categories (like the EIS sectors) for summaries among other limitations. For the 2008 NEI, EPA apportioned the HAP emissions to the available processes at the facilities based on CAP emissions (see Section 3.1.4). For high risk sources (see Section 3.1.7), we used TRI data even if there were no CAPs to use to apportion them. For other sources, however, the approach did not use TRI emissions when CAPs were not available for apportioning, resulting in less TRI emissions used overall and missing emissions in some cases. EPA is currently evaluating the impact of this result and expects to further revise the TRI augmentation in subsequent NEI years to use more TRI data and also use better SCC assignments.

Also for point sources, HAP emissions were augmented using some new approaches. EPA used results from the 2005 NATA to help prioritize review of the highest risk sources for additional review by Sl/L/T agencies and EPA (see Section 3.1.7). Additionally, EPA used CAP-HAP emissions ratios to augment other sources, where HAP emissions were clearly missing (see Section 3.1.5).

Another difference for point sources is related to latitude/longitude coordinates. EIS allows the NEI to have both facility coordinates as well as release point (e.g., stack) coordinates, whereas previous NEI databases could store only coordinates at release points[9]. These two separate sets of values allowed EPA to assess whether the facility coordinates and the release point coordinates were in the same vicinity and make adjustments to resolve inconsistencies in collaboration with the S/L/T/ agencies. In part through this process, we have ensured that priority facilities with high emissions and/or high risk have accurate coordinates.

In past inventories, the NEI development approach carried forward a larger quantity of older NEI data for use in the NEI than was done for the 2008 NEI. We changed our approach on widespread use of prior year emissions both to prevent EPA's creation of faulty data as well as to address state concerns that EPA overestimated emissions by pulling data forward that was incorrect or duplicative. This approach prevents double counting and overestimation of emissions at the expense of potentially missing some emissions.

For nonpoint sources, EPA collaborated with S/L/T agencies to devise a more consistent approach across states and build tools for states to use for compiling nonpoint emissions (see Section 3.1.6). We believe that this approach has improved consistency in nonpoint source emission estimates across the NEI for many sectors. It also resulted in improvements to the approaches (such as updated algorithms or emission factors) for many sectors. Past feedback on some source categories such as industrial boilers had been that EPA should not

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[9] In past inventories, release point coordinates were sometimes the same for all release points, suggesting that only a facility latitude/longitude was available. Both the facility coordinates and release point coordinates are available in EIS. For released 2008 NEI data such as modeling files that are given at the process level, the release point coordinates are used whenever available, and the facility coordinates are used only when more detailed release point locations are not available.

augment the data with its own estimates because emissions were double-counted with emissions in the point source category. Therefore, as also explained in Section 3.1.6, EPA did not augment some sectors that had significant potential double-counting concerns between nonpoint and point sources. EPA still developed estimation methods for S/L/T agency use to help improve consistency.

For onroad mobile sources, the 2008 NEI v2 uses the MOVES model for the first time. In addition, the MOVES-based emissions have been compiled using daily meteorology data for 2008 rather than monthly averages used in past approaches, and then summed to an annual value. Section 4.6 provides more information on our approaches. Our approach predicts higher NOx and PM emissions than included in the 2005 NEI, based on the MOBILE6 model.

For nonroad mobile sources, emissions at airports are treated comprehensively as point sources. In past inventories, some airports were point sources while others were aggregated to a total nonpoint county estimate. The processes included at each airport are aircraft exhaust, ground support equipment, and auxiliary power units. The emissions for aircraft ground support equipment and aircraft auxiliary power units associated with aircraft-specific activity were estimated by the Federal Aviation Administration (FAA) Emissions and Dispersion Modeling System (EDMS) using the assumptions and defaults incorporated in the model. This is a significant change from the previous NEI emissions, for which ground support equipment estimates came from the NONROAD model and auxiliary power unit emissions were not included in EPA's estimates. In addition, in-flight Pb emissions have been included in the 2008 NEI for the first time and are reflected in the totals for the "Mobile Sources – Aircraft" sector. Section 4.2.5.2 provides more information.

For fires, EPA has used the SMARTFIRE2 system for the first time in the 2008 NEI v2. This system eliminated a shortcoming in the 2005 NEI that did not assign all fires to either wildfire or prescribe burning categories. Another update for HAP augmentation of state emissions has resulted in increases in HAP VOC emissions, most notably in California. EPA continues to review this method for subsequent NEI years. In addition, an updated method for agricultural burning has allowed EPA to include these emissions comprehensively across the US. More information on all fire approaches is available in Section 5.

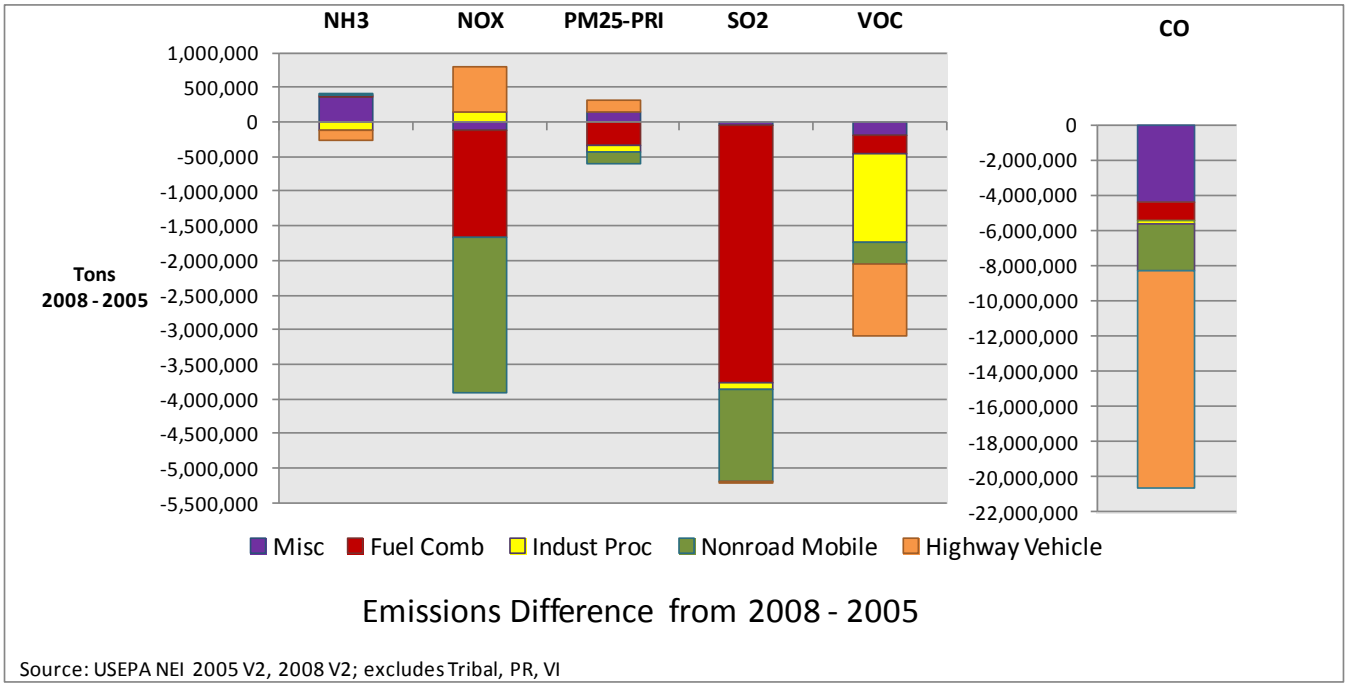
2.4.2 Differences in emissions

EPA continues to review the differences in emissions between the 2008 NEI and past inventories, and we are working to produce a more complete assessment of the 2008 NEI. In the interim, we have created this brief comparison of some selected CAPs based on highly aggregated data categories, also known as Tier1.

Figure 8 illustrates key differences between the 2008 NEI v2 and the 2005 NEI v2, excluding wildfires. As shown in the figure, emissions of all pollutants except NH3 have decreased from 2005, with some notable increases in particular sectors despite the overall decrease. As explained for each pollutant below, many of these differences are based on methods changes and do not reflect real differences from 2005 to 2008. In the following descriptions, all comparison relate to the data shown in

Figure **8,** which excludes fires classified as wildfire emissions (most notably for CO, some wildfire emissions are actually part of the miscellaneous category shown in the figure).

Figure 8: Comparison of 2008 NEI v2 to 2005 NEI v2 CAPs, excluding wildfires



2008 NH3 emissions are 3% higher than 2005 emissions. The increase in the miscellaneous category comes from an increase in prescribed fires and waste disposal, the latter largely due to the addition of municipal/commercial composting emissions. The decrease in industrial processes is largely from decreases in point sources associated with food and agricultural product production. The decrease in highway vehicle emissions is mostly caused by changing to MOVES from MOBILE6, though the VMT did decrease by 0.8% from 2005 to 2008 accounting for a very small portion of the 54% decrease in highway vehicle NH3.

For NOx, 2008 emissions are 15% lower than 2005, though the overall differences are impacts significantly by methods differences. Although NOx emissions increase from the highway vehicle and industrial production sectors, these are offset by significant reductions in fuel combustion and the nonroad mobile categories. The increase in the highway vehicle emissions is associated with the change to the MOVES model, which is primarily caused by changes in emission rates from light duty and heavy duty trucks, and a more thorough treatment of extended idle emissions from heavy duty vehicles. The industrial processes increase is the net result of increases and decreases within the grouping. Increases are apparent for metals processing (20%) and petroleum and related industries (20%), which are offset by decreases in chemical manufacturing (-10%), storage and transport (-46%), waste disposal and recycling (-34%), and other industrial processes (-15%). The decreases in fuel combustion are primarily related to implementation of the Clean Air Interstate Rule (CAIR) for EGUs and decreases in non-EGU combustion assumed to be associated with the economy (e.g., facility closures), lower facility throughputs, and controls for attainment of ozone standards. The large decrease in the nonroad mobile sector is partly real reductions in railroad emissions (-24%), gas equipment (-45%), and nonroad diesel equipment (-7%) with a largely artificial decrease in commercial marine (-70%). The commercial marine decrease is related to the attribution of emissions to states rather than to real decreases. In 2005 NEI, emissions from vessels out to 200 nautical miles (nm) were allocated to “state” emissions, whereas in the 2008 NEI, emissions only in state waters (usually 3-10 nm) were allocated to states.

For PM2.5, 2008 emissions are 6% lower than 2005, partly due again to the attribution of emissions in the commercial marine portion of the inventory (79% lower than 2005). The increases in the highway vehicle category are associated with the change to the MOVES model, which has higher PM2.5 emissions than MOBILE6 because of temperature impacts on PM2.5 included in MOVES only and based on new emissions testing. The increases in the miscellaneous category are related to increases in dust from agricultural tilling and livestock (67%) and from paved roads (128%). Increases in prescribed fires are also evident, but these are partly caused by the large number of "unclassified" fires not included as prescribed fires in our 2005 NEI total (this limitation has been removed in 2008, so more fires have been classified as prescribed in 2008 simply because of the method change). The decreases in PM2.5 associated with fuel combustion are assumed to be related to co-benefits from SO2 controls on EGUs implemented for CAIR as well as economic throughput. In addition to the nonroad category artifact reductions in commercial marine vehicles, the aircraft emissions decreased by 56% largely resulting from the updated estimation approach.

2008 SO2 emissions are 35% lower than 2005 emissions, and again an artificial 88% reduction in commercial marine emissions is a contributor. The primary source of the decreases are emissions reductions from EGUs as a result of CAIR and additional decreases in other fuel combustion sectors, perhaps related to decreased throughput and the economy and somewhat from enforcement actions.

For VOC, 2008 emissions are 17% lower than in 2005 based on decreases across all major category groups shown above. Some decreases are real, while the highway vehicle decreases are largely from methods changes. For the miscellaneous category, much of the decreases come from bulk gas terminals, agricultural burning, and nonpoint petroleum product storage. For the fuel combustion category, there was a general decrease across all combustion sectors. For industrial processes, there was an increase in some processes, most notably the oil & gas sector, but widespread decreases across many other processes with substantial decreases in the solvent surface coating industrial and non-industrial sectors accounting for the overall decrease. The nonroad mobile category has decreases across all components, though the commercial marine decreases are also an artifact of the reallocation approach in 2008. Finally, the highway vehicle decrease is caused largely by the change to the MOVES model, for which light duty cars and trucks tend to have similar or lower VOC emissions than in MOBILE6. This is because new exhaust and evaporative emissions test data has demonstrated that MOBILE6 was overly pessimistic in estimating how emissions from mid-1990s and later vehicles would increase with age.

Finally, 2008 CO emissions are 23% lower than in 2005. While the miscellaneous category has an increase in CO from prescribed fires (again due largely to methods changes), this is greatly offset by decreases from miscellaneous non-industrial processes including a 10.4 million ton decrease in SCC 2810090000 (uncategorized open fires) down to about 7,300 tons in 2008, with emissions submitted by just one state (Utah), one tribe, and one local agency. In 2005, these emissions were included by EPA for 47 states based on the uncategorized fires identified by SMARTFIRE in the 2005 process. Thus, this difference actually includes differences due to uncategorized wildfires from 2005 and is an artifact of the methods changes. The fuel combustion decrease are primarily from industrial boilers in 2008, which could be partly related to EPA not filling in nonpoint industrial boilers which has caused double counted emissions in past inventories. For nonroad sources, part of this decrease is from the artificial decreases in commercial marine as described above, with an even larger decrease from gasoline equipment. Finally, the onroad mobile source model change to MOVES in 2008 drove the CO 12 million ton decrease shown above, with diesel vehicles decreasing 17% and gasoline vehicles decreasing 56%.

2.5 How well are tribal data and regions represented in the 2008 NEI?

The 2008 NEI includes emissions from 20 Tribal regions within the borders of the continental U.S. EPA does not add emissions for Tribal Nations that do not provide data, and so a review of what data were submitted provides details about what Tribes have emissions included in the 2008 NEI. Table 5 summarizes which Tribal Nations submitted data to the NEI and for which source categories (these categories have been defined previously in Section 1.5). In this table, a "CAP_HAP" designation indicates that both criteria and hazardous air pollutants were submitted by the tribe. CAP indicates that only criteria pollutants were submitted. Facilities on Tribal land were augmented using TRI, HAPs and PM in the same manner as facilities under the State jurisdiction, as explained in Section 3; therefore Tribal Nations in Table 5 with just a CAP flag will also have some HAP emissions in most cases.

During the 2008 submission period, the Tribal Emission Inventory System Software (TEISS) was undergoing a large upgrade to adjust to the change from the National Inventory Input Format to the new Consolidated Emissions Reporting structure. TEISS is used by the majority of the Tribes in creating their emission inventories. This upgrade took much longer than anticipated and prevented many Tribes from participating in the 2008 National Emission Inventory.

Table 5: Tribal Participation in the 2008 NEI

Tribe	Point	Nonpoint	On-road	Nonroad	Events
Citizen Potawatami Nation, Oklahoma					CAP, HAP
Confederated Tribes of the Colville Reservation, Washington	CAP, HAP				
Eastern Band of Cherokee Indians		CAP, HAP	CAP, HAP	CAP, HAP	
Fond du Lac Band of Lake Superior Chippewa	CAP	CAP			
Kootenai Tribe of Idaho		CAP, HAP	CAP, HAP	CAP, HAP	
Leech Lake Band of Ojibwe Reservation	CAP	CAP			
Little River Band of Ottawa Indians, Michigan		CAP		CAP	
Makah Indian Tribe of the Makah Indian Reservation	CAP, HAP	CAP, HAP		CAP	
Navajo Nation	CAP, HAP				
Nez Perce Tribe	CAP, HAP	CAP, HAP	CAP, HAP	CAP	
Northern Cheyenne Tribe	CAP	CAP	CAP		
Omaha Tribe of Nebraska	CAP	CAP, HAP		CAP	
Prairie Band of Potawatomi Indians	CAP	CAP, HAP			
Pueblo of Pojoaque	CAP	CAP, HAP	CAP		
Red Lake Band of Chippewa Indians, Minnesota		CAP, HAP			
Sac and Fox Nation of Missouri in Kansas and Nebraska Reservation		CAP, HAP			
Salt River Pima Maricopa Indian Community Environmental Protection and Natural Resources Division	CAP, HAP				
Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho	CAP, HAP	CAP, HAP	CAP, HAP	CAP	
Southern Ute Indian Tribe	CAP, HAP				
Washoe Tribe of California and Nevada		CAP, HAP			

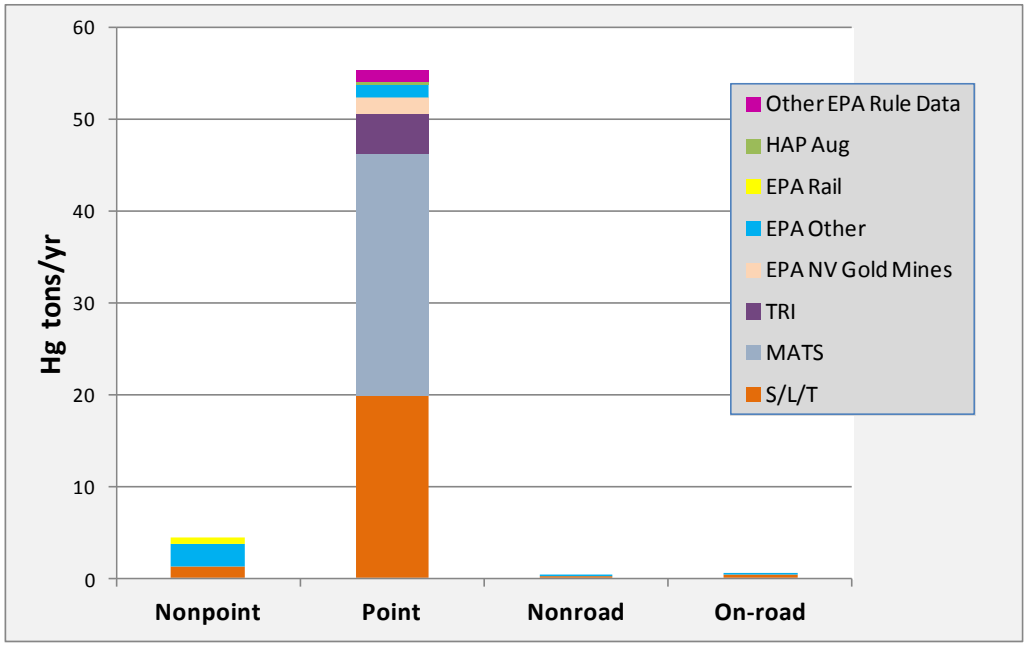
2.6 What does this NEI tell us about mercury?

This documentation includes this Hg section because of the importance of this pollutant and because the sectors used to categorize Hg are different than the sectors presented for the other pollutants. The Hg sectors primarily focus on regulatory categories and categories of interest to the international community.

Hg emission estimates in the 2008 NEI sum to 61 tons with 59 tons from stationary sources and 2 tons from mobile sources. Of the stationary source emissions, the inventory shows that 29.6 tons come from coal- or oil-fired EGUs with units larger than 25 megawatts (MW), with oil-fired units making up just 0.1 ton of that total. The other sources of emissions are summarized below for the special Hg sectors.

We used a variety of data sources to create the 2008 NEI Hg inventory, as shown Figure 9 below. The datasets are described in more detail starting in Section 3.1.1, and we highlight some key datasets here. For EGUs, we used an approach developed for the Mercury and Air Toxics Standards (MATS) rule during 2011[10], and used 2008-specific activity. The MATS-based data are labeled "MATS" in the figure. Also for EGUs, 11% of the Hg data are from S/L/T agency data instead of the MATS-based data. These data were used for units with continuous emissions monitors (CEMs) for mercury, or where EPA was aware that the units had been tested in 2008. In addition, S/L/T data were used for 65% of the other stationary source emissions, and is represented by "S/L/T" in the figure. We used several other datasets developed by EPA including TRI (see Section 3.1.4), EPA HAP Augmentation or "HAP Aug" in the figure (see Section 3.1.5), and other EPA data called "Other EPA rule data" and "EPA Other" in the figure (see Section 3.1.7). The "Other EPA rule data" is from recent EPA rule development by the EPA OAQPS Sector Policies and Programs Division (SPPD).

Figure 9: Data sources of Hg emissions in the 2008 NEI, by data category



[10] See "Memorandum: Emissions Overview: Hazardous Air Pollutants in Support of the Final Mercury and Air Toxics Standard" EPA-454/R-11-014, 12/1/2011, available at http://www.epa.gov/ttn/atw/utility/emis_overview_memo_matsfinal.pdf, or at Docket number EPA-HQ-OAR-2009-0234

In addition to Figure 9, Table 6 breaks out the emissions data sources further into the amounts of Hg from each individual dataset used in the selection. More information on these datasets is available in Sections 3.1.1 through 3.1.7 for stationary sources, Sections 4.5.2 through 4.5.5 for nonroad mobile sources, and sections 4.6.2 through 4.6.6 for on-road mobile sources.

Table 6: Datasets, groups, and amount of Hg in 2008 NEI from each

Data Category	Dataset name (see section 3.1.1)	Mercury Emissions (tons/yr) *	Grouped Data Source for Chart
Nonpoint	2008 V2 Responsible Agency Selection	1.31	S/L/T
	Misc NP Hg Cats	1.26	EPA Other
	EIAG all in NP	1.16	EPA Other
	EPA Rail, nonpoint	0.69	EPA Rail
	EPA CMV	0.04	EPA Other
	EPA Overwrite Nonpoint v1.5	0.02	EPA Other
	EPA Possible Pt Source Contrib V1_5	< 0.01	EPA Other
Point	2008 MATS-based EGU emissions	26.33	MATS
	2008 V2 Responsible Agency Selection	19.94	S/L/T
	EPA TRI Augmentation v2	4.33	TRI
	EPA NV Gold Mines	1.70	EPA NV Gold Mines
	EPA other data developed for using ahead of SLT for gapfilling	1.27	EPA Other
	2008 EPA Rule Data from OAQPS/SPPD	1.18	Other EPA Rule Data
	EPA HAP Augmentation v2	0.32	HAP Aug
	EPA 2005NATA values pulled forward to gapfill	0.17	EPA Other
	EPA Rail, point	0.05	EPA Rail
	EPA EGU v1.5	0.02	EPA Other
Nonroad (Section 4.5.2)	Responsible Agency Dataset	0.30	S/L/T
	EPA Nonroad using NCD20100602	0.01	EPA Other
	EPA Nonroad using NCD20101201	< 0.01	EPA Other
On-road (Section 4.6.2)	Responsible Agency Dataset (California and tribes only)	0.36	S/L/T
	2008_EPA_Mobile	0.32	EPA Other

Since mercury is a HAP, it is reported voluntarily by S/L/T agencies. For the 2008 NEI, 42 states reported point source Hg emissions; Figure 10 identifies the states that included state or local data. Tribal mercury data are not reflected in this figure. Two tribal agencies reported point source Hg: Confederated Tribes of the Colville Reservation, Washington and Makah Indian Tribe of the Makah Indian Reservation.

Figure 10: States with state- or local-provided Hg emissions in the point data category of the 2008 NEI

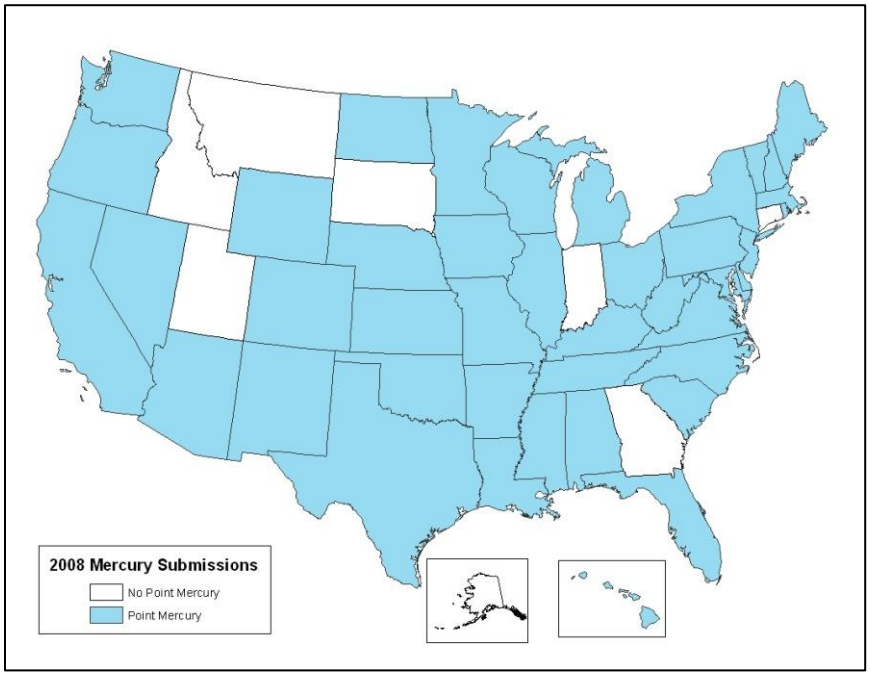


Table 7 shows the 2008 NEI mercury emissions for the key categories of interest in comparison to 1990. Also shown are the most recent 2005 emissions, which were used in support of the MATS rule. The file "epa_2008_nei_v2 _hg.accdb" shows the categories assignments at the facility-process level for point sources, the county-SCC level for the nonpoint data category and the county level for onroad and nonroad data categories (see Section 8.1 for access information).

Table 7: Trends in Mercury Emissions – 1990, 2005, and 2008

Source Category	1990 Emissions (tpy) Baseline NEI for HAPs, 11/14/2005	2005 Emissions (tpy) 2005 MATS proposal 3/15/2011	2008 Emissions (tpy) 2008 NEI v2[1]	Categorization Approach, 2008 NEI
Utility Coal Boilers	58.8	52.2	29.5	Regulatory code, NESHAP: MATS rule.
Hospital/Medical/ Infectious Waste Incineration	51	0.2	0.1	Manually assigned based on examination of facility name and/or unit/process descriptions
Municipal Waste Combustors	57.2	2.3	1.3	Regulatory codes: Section 129 rules for Small Municipal Waste Combustors (MWC) and Large MWC
Industrial/Commercial/ Institutional Boilers and Process Heaters	14.4	6.4	4.5 [1]	SCC list- chose only processes with these SCCs that were not already tagged with rule or via manual approach
Mercury Cell Chlor-Alkali Plants	10	3.1	1.3	Regulatory code: NESHAP, Mercury Cell Chlor-Alkali Plants. Manually corrected a regulatory code assigned to units at a a facility that terminated the chlor-alkali process but still emitted Hg in 2008 due to remediation of the equipment and the soil around the unit.

Source Category	1990 Emissions (tpy) Baseline NEI for HAPs, 11/14/2005	2005 Emissions (tpy) 2005 MATS proposal 3/15/2011	2008 Emissions (tpy) 2008 NEI v2[1]	Categorization Approach, 2008 NEI
Electric Arc Furnaces	7.5	7.0	4.7	Regulatory code: Area Source rule for "Stainless & Non-stainless Steel Manufacturing: Electric Arc Furnaces" plus 2 major sources that have EAFs
Commercial/Industrial Sold Waste Incineration	Not available	1.1	0.02	Manually assigned based on examination of unit/process description and how it was categorized in 2005
Hazardous Waste Incineration	6.6	3.2	1.3	Combination of regulatory code, NESHAP: Hazardous Waste Incineration, and manual examination based on examination of unit/process description and how it was categorized in 2005.
Portland Cement Non-Hazardous Waste	5.0	7.5	4.2	Regulatory code: NESHAP, Portland Cement Manufacturing
Gold Mining	4.4	2.5	1.7	Facility Type
Sewage Sludge Incineration	2	0.3	0.45	Manually assigned based on examination of unit/process description, SCC, and how it was categorized in 2005
Mobile Sources	Not available	1.2	1.7	SCC
Other Categories	29.5	18	10.3	
Total (all categories)	**246**	**105**	**61**	

[1] For Industrial/Commercial/Institutional Boilers and Process Heaters, the 2008 NEI v2 raw data (i.e., in "epa_2008_nei_v2 Hg.accdb") will sum to just 4.0 tons, but we have listed the additional known 0.5 tons that should have been included.

The top emitting 2008 Mercury categories are: EGUs (rank 1), electric arc furnaces (rank 2), industrial, commercial and institutional boilers and process heaters (rank 3), Portland cement, excluding hazardous waste kilns (rank 4), and gold mining (rank 5). Note that we discovered a large number of coal-fired boilers (industrial, commercial, institutional) that did not have any Hg emissions and thus believe that emissions for this sector are underestimated. The missing emissions from boilers are 0.5 tons, which have been added to the totals above; more details on this are provided below. This addition moves that sector from rank 4 to rank 3.

As shown in Table 5, 2008 mercury emissions are 44 tons lower than in the 2005 inventory. Half of this difference is due to lower mercury emissions from EGUs covered by MATS; the other half is due to lower emissions from stationary sources other than EGUs. The lower emissions in 2008 are due to a combination of methodology differences, state rules, consent decrees, activity levels (e.g., lower cement production in 2008) and reductions that occurred from facilities prior to MACT compliance dates. For EGUs, the difference in emissions from 2005 to 2008 is due primarily to the installation of Hg controls to comply with state specific rules and voluntary reductions, and the co-benefits of Hg reductions from control devices installed for the reduction of SO2 and PM as a result of state and federal actions, such as New Source Review enforcement actions. The MATS rule is expected to reduce mercury by an additional 23 tons by 2016.

To understand better the differences in emissions from 2005 to 2008, we conducted a detailed analysis to identify and quantify the differences for the Portland Cement sector. The 2005 emissions for the Portland

Cement industry were largely the same as the emissions developed in support of the Portland Cement NESHAP whereas the 2008 emissions are from S/L/T agencies (68% of the Hg) and TRI (32% of the Hg). The Portland Cement NESHAP total of 7.5 tons/yr is 78% higher than the 2008 value of 4.2 tons/yr. After analyzing the underlying data and approach for the NESHAP emissions and conducting case studies on the NEI emissions, we estimated that about half of the 3.2 ton difference in the estimates is due to lower actual production at cement facilities in 2008 as compared to production capacity used in the NESHAP and the other half is due to differences in the emission rates used. We compared the actual 2008 clinker production[11] to the production used in the NESHAP and found that the NESHAP production for non-hazardous waste kilns was 20% higher than 2008. We also evaluated throughput data supplied by some states to the NEI and found that the throughput was much lower in NEI than that used for the NESHAP.

For other categories, the difference in emissions from 2005 to 2008 is similarly due to a combination of methodological differences in the approaches used to develop the two inventories, in addition to reductions in activity between 2008 and 2005, and reductions implemented by states ahead of Federal regulations and other factors. For the nonEGU categories, the 2008 NEI uses data primarily submitted by S/L/T agencies. Where S/L/T agency data are missing, EPA supplemented the information using the TRI for the year 2008 and other datasets such as the data gathered by EPA for rule development (e.g., National Emission Standards for Hazardous Air Pollutants); these data were used for situations in which S/L/T data were not available. In very few cases where no data were available but the facility was believed to be in operation in 2008, data were carried forward from the 2005 inventory at the request of S/L/T agencies.

Past inventories such as the 2005 NEI have used S/L/T data, but for the key Hg categories, data gathered for rule development were used *ahead* of S/L/T agency data. The Portland Cement Hg emissions discussed above is one such example. For a large number of rules data were developed from Information Collection Request (ICRs) that for some categories represented years prior to and subsequent to 2005. In the 2008 NEI, the practice of always using rule data ahead of S/L/T agency data has not continued. Instead, we reviewed the available data with the states for key Hg categories and generally allowed the states to choose which value to use (see Sections 3.1.5.4 and 3.1.7). In addition, the 2005 NEI development approach carried a larger quantity of older NEI data forward for use in the 2005 inventory than was done for the 2008 NEI. We changed our approach on widespread use of prior year emissions both to prevent EPA's creation of faulty data as well as to address state concerns that EPA overestimated emissions by pulling data forward that was incorrect or duplicative.

The 2008 NEI is also believed to be lower for some categories due to economic reasons and due to early reductions for some categories. There were facility shut downs and reduced operations at chemical manufacturing facilities and in metals industries. For other categories, a combination of voluntary and state programs has reduced Hg ahead of MACT standards. For gold mines, reductions occurred initially due to a voluntary program developed by EPA Region 9 and Nevada and then further reductions were achieved through a Nevada state regulatory program. In the mercury chlor-alkali industry, facilities have been switching technologies to eliminate Hg emissions from chlorine production. Many switched prior to 2008 and several switched after; therefore, even more reductions from chlor-alkali facilities are expected to be seen in the 2011 NEI. For electric arc furnaces, emissions are lower due to methods of emission estimating.

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[11] United States Geological Survey, Cement data: http://minerals.usgs.gov/minerals/pubs/commodity/cement/.

As stated earlier, the 2008 NEI is missing some coal fired boiler Hg emissions from industrial, commercial and institutional boilers. For this category, we used the Boiler MACT ICR emissions data to gap fill missing S/L/T agency data for only the highest emitting Hg units that were able to be matched to processes in the 2008 NEI. This gap-filling resulted in the use of 19 units (or unit groups) from the Boiler MACT ICR database out of a total of more than 7700 Boiler MACT units in the Boiler MACT ICR database. The other gap filing approaches were the use of TRI data (Section 3.1.4) and the HAP augmentation approach (Section 3.1.5).

For the HAP augmentation approach, we applied emission factor ratios of Hg to filterable PM10 to S/L/T-reported (or EPA augmented) filterable PM10. When analyzing the coal fired boilers without Hg we found 339 coal fired boiler processes with no Hg (163 facilities). Of these units, 231 coal fired boiler processes had nonzero filterable PM10, but zero Hg. This is because some filterable PM10 augmentation (resulting from quality assurance of the initial augmentation) occurred *after* the HAP augmentation was finished. Also, there were units at facilities with facility types of "EGU" that were not gap-filled because we had expected the EGU augmentation (Section 3.10.5) fill in for those source, but it did not do so for a few smaller units not regulated by MATS. We computed that these coal-fired boilers, if gap-filled via the HAP augmentation approach, would have contributed an additional 0.4 tons of Hg to this category. We also found 108 coal fired boilers that were missing PM but had other criteria pollutants. Thus, we believe we are missing at least 0.4 tons of Hg from coal-fired boilers. We also identified 1,739 oil fired boilers with no Hg; 992 of them had PM10-FIL and should have thus been gap filled, amounting to an additional 0.1 tons. Thus, the total missed emissions are estimated to be 0.5 tons.

3 Stationary sources

3.1 Stationary source approaches

Stationary source emissions data are inventoried as point sources or nonpoint sources. These data are provided by S/L/T agencies, and for certain sectors and/or pollutants, they are supplemented with data from EPA. This section describes the various sources of data and the priority for each of the datasets for choosing the data value to use when multiple data sources are available for the same emissions source.

3.1.1 Sources of data overview and selection hierarchies

Table 8 and Table 9 describe the datasets comprising the point and nonpoint inventories, respectively, and the hierarchy for combining these datasets in construction of the NEI. While the bulk of these datasets are for stationary sources of emissions, some of these datasets contain mobile sources so that emissions from airports and rail yards could be included as point sources.

EPA developed all datasets other than those containing S/L/T agency data and the Offshore platform dataset. We used various methods and databases to compile the EPA generated datasets, which the tables and subsequent subsections fully describe. The primary purpose of the EPA datasets is to add or "gap fill" pollutants or sources not provided by S/L/T agencies and to resolve inconsistencies in S/L/T-reported pollutant submissions for PM (Section 3.1.2) and chromium (Section 3.1.3). EPA also developed a dataset to overwrite S/L/T agency data where known problems or obvious outliers exist. During the fall of 2011, EPA performed an extensive review of emissions and conducted a focused data review effort for facilities identified as "high risk" in the 2005 NATA, and facilities in important Hg emitting source categories (Section 3.1.7). Results of this effort provided additional emissions estimates in both the S/L/T agency dataset and in EPA datasets. This review also resulted in emissions data for some facilities being brought forward from the 2005 NATA inventory, resulting in the dataset called "EPA 2005NATA values pulled forward to gapfill". Many of the EPA datasets used in the point source data category were developed to include the data and recommendations provided by S/L/T agencies resulting from this review.

The hierarchy or "order" provided in the tables below defines which data are to be used for situations where multiple datasets provide emissions for the same pollutant and emissions process. The dataset with the lowest order on the list is preferentially used over other datasets. The tables include the rationale for why each dataset was assigned its position in the hierarchy. Two exceptions to the hierarchy are provided in the last row of the tables. These exceptions change the hierarchy for two jurisdictions so that the EPA EGU v1.5 data were chosen ahead of the S/L/T agency data, and to exclude any greenhouse gases and pollutants in the pollutant group "dioxins/furans"[12] from the selection.

[12] Dioxins/furans include all pollutants with pollutant category name of: Dioxins/Furans as 2,3,7,8-TCDD TEQs, Dioxins/Furans as 2,3,7,8-TCDD TEQs -I/89, Dioxins/Furans as 2,3,7,8-TCDD TEQs - WHO/98, which were valid pollutant groups for reporting 2008 emissions. The specific compounds and codes are in the pollutant code tables at: http://www.epa.gov/ttn/chief/net/neip/appendix_6.mdb.

Table 8: Data sources and selection hierarchy used for point sources

Dataset name (and Short Name[λ])	Description and Rationale for the Order of the Selected Datasets	Order
EPA Overwrite Point v1.5 (2008EPA_ OverPT15)	This dataset addresses three known issues in the S/L/T agency data: 1) All acenaphthylene emissions for the airport SCC of 2275050012 (general aviation turbine) are set to a value of zero since the emission factor (EF) used in the S/L/T agency datasets was incorrect (see Section 4.2.4). 2) Some states added airport emissions to new "units" and "processes" at the EPA airport facilities. To avoid double counting, this dataset overwrites the state data for these situations with zero values. The EPA data are used instead and are located at the valid units and processes as defined by EPA (see Section 4.2.4). 3) PM emissions (all species) for 46 Pennsylvania EGU processes (based on highest emitting) are set to the values developed in the EPA EGU v1.5 dataset (9th row in this table) since it was determined that PA reported the primary PM using the filterable value, significantly underestimating the total (primary) PM. See Appendix C for details. This dataset is first because it serves to overwrite the data in the S/L/T agency datasets	1
EPA PM Augmentation, V2 (2008EPA_PM25)	PM species added to gap fill missing S/L/T agency data or make corrections where S/L/T agency have inconsistent PM species' emissions. Uses speciation factors from the PM Calculator for covered SCCs. For others, checks/corrects discrepancies or missing PM species using basic relationships such as ensuring that PM2.5 is less than or equal PM10 (See Section 3.1.2). This dataset is ahead of the S/L/T agency data because in addition to filling in missing data, it also corrects S/L/T agency values based on feedback from the agencies.	2
EPA Chromium Split v2 (2008EPA_ CHROMv2)	Contains corrected and speciated hexavalent and trivalent chromium emissions derived from the S/L/T agency data for sources in which S/L/T agency reports the total (unspeciated) chromium pollutant (See Section 3.1.3). This dataset is ahead of the S/L/T agency data because it replaces S/L/T agency total chromium with speciated chromium.	3
Other EPA data (2008EPA_OTHER)	HAP emissions that S/L/T agencies recommended EPA use as part of the high risk and NATA2005 review (see 3.1.7). S/L/T agencies could not submit data themselves for various reasons. Additionally, this dataset contains Region 2 data for benzene and coke oven emissions for Tonawanda Coke Corp based on recent testing. This datasets is ahenda of the S/L/T agency data because it changes S/L/T emission values based on feedback from the agencies.	4
2008 MATS-based EGU emissions (2008EPA_MATS)	Lead, mercury, HAP metal and acid gas HAP emissions from the MATS rule information collection request, including unit-specific test data and emissions data derived from EFs from a 2010 testing program and 2008 throughput. The dataset excludes MATS Hg emissions for units where EPA knew states had test data or that the unit had Hg continuous emission monitoring systems in 2008 (this exclusion allows the S/L/T agency Hg emissions to be chosen ahead of MATS for such units). These data are selected ahead of state data because they are expected to be generally more accurate because they are based on unit specific tests or based on the latest available EFs derived from testing of similar units, and consistent with the MATS rule. See Section 3.10.	5

Dataset name (and Short Name[λ])	Description and Rationale for the Order of the Selected Datasets	Order
2008 V2 Responsible Agency Selection	S/L/T agency submitted data (multiple datasets – one for each reporting agency) These data are selected ahead of other datasets with the five exceptions listed above.	6
EPAAirports1109 (2008EPA_AIR)	This is a mobile source dataset. Emissions of CAP and HAP for aircraft operations including commercial, general aviation, air taxis and military aircraft, auxiliary power units and ground support equipment computed by EPA for approximately 20,000 airports. Methods include the use of the Federal Aviation Administration's Emissions and Dispersion Modeling System. See Section 4.2. EPA airport data are selected for a county only if S/L/T agency data are not, with the exception of airport data discussed in the first dataset.	7
EPA Rail, point (2008EPA_RAIL)	This is a mobile source dataset. Emissions of CAP and HAP for diesel rail yard locomotives at 753 rail yards. CAP emissions computed using yard-specific emission factors using yard-specific fleet information and on national fuel values allocated to rail yards using an approximation of line haul activity within the yard. HAP emissions computed using HAP-to-CAP emission ratios. See Section 4.4. EPA Rail data are selected for a county only if S/L/T agency data are not.	8
2008 Offshore (2008EPA_MMS)	CAP Emissions from Offshore oil platforms located in Federal Waters in the Gulf of Mexico developed by the U.S. Department of the Interior, Bureau of Ocean and Energy Management, Regulation, and Enforcement (Wilson et. al, 2010) in the National Inventory Input Format and converted to the CERS format by EPA. See also http://www.gomr.boemre.gov/homepg/regulate/environ/airquality/gulfwide_emission_inventory/2008GulfwideEmissionInventory.html. The selection order for this dataset is not important because the data do not overlap with other datasets.	9
EPA EGU v1.5 (2008EPA_EGU15)	Uses Clean Air Markets Division (CAMD) NOX, SO2 and other pollutants (including HAPs) computed using CAMD heat inputs and EFs (see Section 3.10). These EPA non-MATS EGU data are selected for a facility only if S/L/T agency data are not present.	10
2008 EPA Rule Data from OAQPS/SPPD (2008EPA_Rule_Data)	Mercury emissions from categories for which rule data were used to gap fill missing S/L/T agency data. Includes: municipal waste combustors, electric arc furnaces, mercury cell chloralkali plants and industrial, commercial and institutional boilers. For this latter category, 19 units from the Boiler MACT information collection request database that were able to be matched to units in the emissions inventory system were used. These data are selected for a facility only when not included in the S/L/T agency data.	11
EPA NV Gold Mines (2008_NVGLD)	Mercury emissions developed from published results of the Nevada Mercury Control Program - Annual Emissions Reporting (http://ndep.nv.gov/bapc/hg/aer.html) for 2008. Because of issues with the 2008 testing, data for Homestake Mining Co. – Ruby Hill and Barrick Goldstrike Mines, Inc. were based on validated 2009 test data provided by Nevada. The Nevada Gold Mine data are selected for a mine only when alternative emissions are not included in the S/L/T agency data.	12

Dataset name (and Short Name[λ])	Description and Rationale for the Order of the Selected Datasets	Order
EPA coke oven (2008EPA_CK)	Coke oven emissions computed from AP-42 or updated from 2005 NATA values using 2008 production data. Emissions/approaches provided by a few states that did not report coke oven emissions in the S/L/T agency data. These data are selected for a facility only when alternative emissions are not included in the S/L/T agency data.	13
EPA TRI Augmentation v2 (2008TRI)	TRI data for the year 2008. This dataset includes the TRI data assigned manually to processes in EIS to facilities in the NATA review (Section 3.1.7) and TRI emissions assigned to processes based on the distribution of surrogate CAPs via the approach described in Section 3.1.4. These data are selected for a facility only when alternative emissions are not included in the S/L/T agency data. These data are selected for a facility only when alternative emissions are not included in the S/L/T agency data.	14
EPA HAP Augmentation v2 (2008EPA_HAPv2)	HAP data computed from S/L/T agency criteria pollutant data using HAP/CAP emission factor ratios based on the EPA Factor Information Retrieval System (WebFIRE) database as described in Section 3.1.5. These data are selected below the TRI data because the TRI data are expected to be better.	15
EPA 2005NATA values pulled forward to gapfill (2008EPA_ 05NATA_GAPFL)	Emissions from the 2005 NATA inventory used as directed by states for facilities that were part of the NATA review described in Section 3.1.7. Also includes 2005 NATA Hg emissions from some hazardous waste incinerators, where states did not provide Hg data but there were hazardous waste incinerator processes with non-zero emissions of criteria pollutants reported by the agency. These data are selected last because they are the least preferred method for supplementing HAP emissions, though the way it was developed should have not caused overlap with other datasets.	16

Exceptions to the hierarchy

1. Connecticut and Douglas County, Nebraska: Changed the hierarchy of EGUv1.5 to go ahead of state data (moved from 10 to 4). These exceptions were made because several of the EGUs reported by CTDEP had much lower emissions than the EPA EGU v1.5 dataset, even for the SO2 and NOX emissions that are CEM-based in the EPA EGU v1.5 dataset, and because the Douglas County dataset for the one EGU included in the EPA EGU v1.5 dataset did not contain unit and process specific emissions. Note that we mistakenly put the EGUv1.5 data below the PM-Augmentation data so that PM data in the selection (i.e., 2008v2) were a mix of augmented (from state-reported) and EGUv1.5, instead of a consistent set of EGUv1.5 emissions for all 5 PM species.
2. Excluded dioxin/furan individual pollutants and groups and green house gas pollutants, pending further review of the accuracy and completeness of the data.

[λ] The dataset short name is the name that EIS will list in its process-level reports

Table 9: Data sources and selection hierarchy used for nonpoint sources

Dataset name (and Short Name[λ])	Description	Order
EPA PM Augmentation NP (PM Aug NP)	Adds PM species to fill in missing S/L/T agency data or make corrections where S/L/T agency data have inconsistent emissions across PM species. Uses the PM calculator for processes covered by that database. For other processes, checks/corrects discrepancies or missing PM species using basic relationships such as ensuring that PM2.5 is less than or equal PM10 (See Section 3.1.2).	1
EPA Overwrite Nonpoint v1.5 (2008EPA_OverNP15)	Overwrites some unreasonably high values that came in from S/L/T agencies with zero values to prevent outliers from entering the released data. Also overwrites submitted total (unspeciated) chromium for commercial marine vessel (CMV) emissions with zero value to prevent total chromium from being included in the 2008 NEI	2
Rail_EPACorrections (2008RRCOR)	This is a mobile source dataset. Overwrite submitted unspeciated chromium and other pollutants that did not conform to pollutant/SCCs in EPA dataset. Also overwrites county submittals for counties/SCCs where EPA data exists in shape files.	3
EPA Chromium Split v2 (2008EPA_CHROMv2)	Speciated S/L/T agency chromium emissions based on total chromium provided by S/L/T agencies. Speciation based on SCC code. See Section 3.1.3.	4
2008 V2 Responsible Agency Selection	S/L/T agency submitted data (multiple datasets – one for each reporting agency) These data are selected ahead of other datasets with the five exceptions listed above. See also file "matrix_submittals for Version 2 Feb 13 2011.xlsx" for a list of submitting agencies and for what nonpoint sectors they submitted data (see Section 8.2 for access information).	5
Misc NP Hg Cats (Misc NP Hg)	Dataset that includes Hg data used in the 2002 NEI for the following categories: fluorescent light breakage, fluorescent light recycling, laboratory activities, and dental amalgam. These 2002 NEI data were not estimated for 2008 but are categories that were largely unavailable from the S/L/T AGENCY data.	6
EPA CMV (2008EPA_ERG)	This is a mobile source dataset. EPA CMV estimates. See Section 4.3.	7
EPA Rail, nonpoint (2008EPA_RAIL)	This is a mobile source dataset. EPA Rail estimates. See Section 4.4.	8
EIAG all in NP (2008EPA_NPa)	Contains data for categories for which all of the data should exist in the nonpoint categories, such as residential heating, consumer solvent use and paved roads. See Section 3.1.6.	9
2008 EPA Ag Fires (2008AgFire)	Agricultural fire emissions are estimated by EPA for all agencies that did not submit them. EPA estimates relied on using satellite data to identify, by default, lands on which agricultural burning activity occurred in 2008. Geographic Information Systems (GIS) analysis was then used to cross-check these lands with those that burn only crops. These "cropland" activity data were then converted to emissions based on state- and crop-specific emission factors (compiled, as available, from the literature) combined with state usage patterns of these crops. See Section 5.1.4.	10

EPA Possible Pt Source Contrib V1_5 (2008EPA_NPd15)	Contains data for categories in which there was the possibility of point source contribution (or overlap). These categories include industrial, commercial and institutional emissions that are often accounted for in the point source inventory. EPA did not want to add these emissions to the NEI without doing some analysis to determine if the S/L/T had accounted for them in the point. To do this, the EPA queried the point source S/L/T datasets to determine if certain point source SCCs were present. If the point source SCCs were present, then EPA assumed that the S/L/T agency covered them in point and the EPA nonpoint data were not included in this dataset. If the point source SCCs were not present, then the EPA data were added to this dataset, which means that the data would be in the NEI provided the S/L/T did not provide nonpoint data (S/L/T agency dataset is #5 in this hierarchy). There was no attempt by EPA to adjust nonpoint data with the point data. See Section 3.1.6.	11
Exceptions to the hierarchy 1) Excluded S/L/T agency data submitted for SCC= 2810015000 (Prescribed Forest Burning) and 2810020000 (Prescribed Rangeland Burning) since these were included in the EVENTS county-level summary. Prescribed and wildfires are EVENTS categories whereas agricultural burning and other open burning are in the nonpoint data category. 2) Excluded dioxin/furan individual pollutants and groups and green house gas pollutants, pending further review of the accuracy and completeness of the data.		

[λ] The dataset short name is the name that EIS will list in its process-level reports

For point sources there are two known issues with the final data selected for version 2. First, when the datasets were combined, 2008 S/L/T agency emissions data were dropped for processes for which the last process year is less than 2008. The last process year indicates the last year the process was in operation so the software did not pick up these emissions for use in the 2008 NEI. In the future, emissions will not be accepted if the last process year is prior to the inventory year. The amount of emissions dropped is summarized in Appendix A, Table A-6. The second issue is an error in the order of the point source datasets for Connecticut and Douglas county Nebraska. The order should have placed the EPA EGU v1.5 dataset ahead of the "EPA PM Augmentation, v2" dataset since the "EPA PM Augmentation, v2" values are computed based on S/L/T-submitted PM. We intended to use the complete set of PM from the EGU v1.5 dataset for all PM species for these two jurisdictions. This only affects EGUs in these two geographic areas, and only affects the PM species that come from the "EPA PM Augmentation, v2" dataset for these EGUs. Table A-7 of Appendix A shows the magnitude of the error at the facility-level. In summary, for Douglas Nebraska, the error does not affect primary (i.e., total) PM2.5 or primary PM10; it affects only the filterable and condensable species. For Connecticut, primary PM2.5 is expected to be underestimated by 191 tons; the primary PM10 is not affected by the error.

3.1.2 Particulate matter augmentation

S/L/T agency submission of particulate matter (PM) emissions to the NEI are required to include primary PM10 (called PM10-PRI in EIS and NEI outputs) and primary PM2.5 (PM25-PRI). In addition, EPA requests states provide filterable PM (PM10-FIL and PM25-FIL) along with condensable PM (PM-CON). EPA needed to augment the PM components submitted by S/L/T agencies to ensure completeness of the PM components in the final NEI and to ensure that S/L/T agency data did not contain inconsistencies. An example of an inconsistency is if the S/L/T agency submitted a primary PM2.5 value that was greater than a primary PM10 value for the same process. Commonly, the augmentation added condensable PM or PM filterable (PM10-FIL and/or PM25-FIL)

where none was provided or primary PM2.5 where only primary PM10 was provided, or vice versa. Additional information on the procedure is provided in the 2008 NEI v2 PM augmentation documentation (Dorn, 2012).

In general, emissions for PM species missing from S/L/T agency inventories were calculated by applying factors to the PM emissions data supplied by the S/L/T agencies. These conversion factors were first used in the 1999 NEI's "PM Calculator" and are described in Strait et al. (2003). The resulting methodology allows EPA to derive missing PM10-FIL or PM25-FIL emissions from incomplete S/L/T agency submissions based on the SCC and PM controls that describe the emissions process. In cases where condensable emissions are not reported, conversion factors developed by Strait et al. (2003) are applied to S/L/T agency reported PM species or species derived from the PM Calculator databases.

3.1.3 Chromium augmentation

This section describes the procedure we used for augmenting chromium emissions to generate trivalent chromium and hexavalent chromium from S/L/T agency reported total (unspeciated) chromium.

EPA augmented S/L/T agency-reported chromium emissions through a dataset that splits the S/L/T agency-reported total chromium (pollutant code 7440473) into trivalent chromium and hexavalent chromium species. This dataset also computed the trivalent and/or hexavalent species where total chromium was reported with either hexavalent or trivalent chromium for the same process. This procedure had no impact on S/L/T agency data that were provided as hexavalent and/or trivalent chromium or where a S/L/T agency reported chromium trioxide and chromic acid (VI) as long as there was no total chromium at the same process.

The 2008 reporting cycle has 5 valid pollutant codes for chromium as shown in Table 10.

Table 10: Valid chromium pollutant codes

Pollutant Code	Description	Pollutant Category Name
1333820	Chromium Trioxide	Chromium Compounds
16065831	Chromium III	Chromium Compounds
18540299	Chromium (VI)	Chromium Compounds
7440473	Chromium	Chromium Compounds
7738945	Chromic Acid (VI)	Chromium Compounds

In the above table, all but "chromium" is considered speciated (chromium is referred to as "total chromium" in the remainder of this section). Total chromium could contain a mixture of chromium with different valence states. Since one of the main inventory uses is for risk assessment and the valence states of chromium have very different risks, speciated chromium is the most useful pollutants for the NEI and why we have included this augmentation.

EPA augmented the emissions by developing datasets containing speciated chromium based on the S/L/T agency reported total chromium and the process. The resulting chromium augmentation datasets contain a value of zero for total chromium, which overwrites the S/L/T submitted total chromium so as not to double count with the EPA dataset speciated chromium. The speciated data are contained in the dataset "EPA chromium Split v2" (3rd row of Table 8 for point and the 4th row of Table 9 for nonpoint).

This augmentation addresses two issues described below.

1. **Removes Ambiguity from Overlapping Pollutants:** S/L/T agencies sometimes report total chromium emissions, (pollutant code = 7440473) with hexavalent chromium (18540299) and/or trivalent chromium (16065831) for the same process. As explained in the HAP reporting webinar "How to Report HAP Emissions for the 2008 NEI" (http://www.epa.gov/ttn/chief/eidocs/training.html#eis), EPA interprets total chromium to be the sum of hexavalent chromium and trivalent chromium. Thus, EPA assumes that when a S/L/T agency submits total chromium emissions as well as hexavalent and/or trivalent chromium, then the state has submitted emissions mass that is double counted. The Emissions Inventory System (EIS) does not flag such double counting as an error, and as a result we have received data from S/L/T agencies that we need to augment to eliminate these apparently overlapping chromium compounds. Note that it is not double counting to have any form of chromium along with chromic acid mist (7738945) or chromium trioxide (7738945), which are specific chromium compounds that we treat as additive to whatever other chromium is already reported for the process. Users of the NEI data are most interested in hexavalent chromium, chromic acid mist and chromium trioxide. There may be other chromium ions (such as chromium II); however, they do not have any risk information associated them and thus we treat them along with trivalent chromium.

2. **Provides a consistent speciated chromium inventory:** EPA would like the NEI to only include speciated chromium emissions consistently throughout the inventory. While total chromium is a valid pollutant in the NEI, many users of the data request chromium emissions to be speciated into hexavalent chromium and trivalent chromium in order to estimate health risks. It is simpler for us and our users to have only the speciated forms in the released data and total chromium is available by adding the speciated emissions.

For point sources, we used the following sequential hierarchy to perform the speciation. For nonpoint sources, only the SCC code was used for speciation.

1. Regulatory Code speciation profiles; For pulp and paper (Regulatory Codes R63-0018, R63-0045 and R63-0018-02), a combination of Regulatory Code and SCC code was used.
2. SCC speciation profiles if Regulatory code speciation profiles are unavailable.
3. If Regulatory code and SCC speciation profiles are unavailable, we used a default to hexavalent chromium (18540299) percentage of 34%, which is the default value also used starting with the 1996 NATA (US EPA, 2001) and is based on the highest value tested from oil combustion (note that the average is 18%).

The speciation factors used are provided in the workbook Chromium_speciation_factors.xls (see Section 8.1 for access information). The first tab provides the Regulatory Code/SCC based chromium speciation profiles. The second tab provides the remaining Regulatory Code chromium speciation profiles. The third tab provides the SCC-based chromium speciation profiles. The fourth tab provides the SCC-based Chromium speciation profiles used for the nonpoint data category. We include the Maximum Achievable Control Technology code "MACT code" in the tables for historical reasons. The speciation data were initially developed by "MACT" category and we have mapped this to Regulatory Code for use in the 2008 NEI because MACT code has been replaced by Regulatory code.

Table 11 shows the calculations made for developing the EPA chromium corrections, speciated dataset, and meta data used for the Emissions Calculation Method Code and the Emissions Comment fields in EIS. This table does not apply to the nonpoint chromium speciation because it was more straightforward. The only step taken was to speciate the chromium using the SCC-based profiles provided in the workbook discussed above.

Table 11: Calculations for generating the point chromium augmentation dataset (EPA Chromium Split v2)

Case	S/L/T-reported the pollutants for a process:			Approach to create emissions for "EPA Chromium Split v2" dataset Manipulation	Meta data for EmissionsCalculationMethodCode (ECMC) and EmissionsComments (EC)
	Cr[1]	Hex[1]	Tri[1]		
1	X			Speciate using speciation factors in "Chromium_speciation_factors.xls"	ECMC = 5 (USEPA Speciation Profile) EC = "Speciation of <Agency> reported chromium via SCC: hex <value>%; tri <value> %" [2, 3]
2	X	X		Set Cr emissions to 0, and add Tri to be computed as follows: Tri = Cr – Hex. Note: if Tri is <0 it is set to 0.	ECMC=2 (Engineering Judgment) EC= "Replacement dataset corrects <Agency>-reported Cr overlap. Remove Cr and add Tri computed as Tri=Cr-Hex" [2]
3	X	X	X	**If Cr > Hex + Tri:** Set Cr emissions to zero. Subtract: Cr –(Hex + Tri) and add the difference to the existing Tri. Rationale: When total is greater than hex+tri, we assume total and hex as valid and re-calculate a new 'Tri'. This is because we assume that Cr^{+2} may be the difference that explains why total Cr is greater than the two pieces. **If Cr < Hex + Tri:** then set Cr emissions to 0 and keep Hex and Tri as-is. Rationale: where total Cr is less than sum of Hex+Tri, we assume that the hex and tri are correct, and thus remove the total.	**If Cr > Hex + Tri:** ECMC=2 (Engineering Judgment) EC= "Value corrects Chromium (Cr) overlap. Added difference between <Agency>-reported Aggregated Cr and <Agency>-reported hexavalent Cr to <Agency>-reported trivalent Cr. Difference assumed to represent divalent chromium, which we include with trivalent Cr." [2] **If Cr < Hex + Tri** ECMC=2 (Engineering Judgment) EC= "Replacement dataset corrects Cr overlap. Remove <Agency> reported aggregated chromium because it is assumed to overlap with <Agency>-reported hexavalent and trivalent chromium." [2]
4	X		X	Set Cr emissions to 0, and add Hex to be computed as follows: Hex = Cr – Tri Note: if Hex is <0 it is set to 0.	ECMC=2 (Engineering Judgment) EC= "Replacement dataset corrects <Agency>-reported Cr overlap. Remove Cr and add Hex computed as Hex=Cr-Tri"
5		X	X	No augmentation	
6		X		No augmentation	
7			X	No augmentation	

[1] Cr=chromium (pollutant code = 7440473); Hex=hexavalent chromium (18540299); Tri = trivalent chromium (16065831).
[2] <Agency> is the value of the agency program system code for the process containing the S/L/T agency data.
[3] <value> is the appropriate numerical value of the percent of trivalent or hexavalent chromium.

3.1.4 Use of the 2008 Toxics Release Inventory

EPA used 2008 TRI data to supplement point source HAP emissions provided to EPA by S/L/T agencies. The resulting augmentation dataset is labeled as "EPA TRI Augmentation, v2"in Table 8 and in EIS. This dataset is a combination of 1) TRI data that were assigned to facilities lacking S/L/T agency-reported HAP and Pb emissions using a mostly automated procedure (roughly 2,400 facilities) and 2) TRI data that were assigned to a relatively

small number of facilities (roughly 200 facilities) using a more manual approach as a result of the EPA high risk and Hg review. This section describes the methodology used for the automated procedure.

The basis of the TRI augmentation dataset is the 2008 EPA TRI. TRI is an EPA database containing data on disposal or other releases including air emissions of over 650 toxic chemicals from thousands of U.S. facilities. One of TRI's primary purposes is to inform communities about toxic chemical releases to the environment. Data are submitted annually by U.S. facilities that meet TRI reporting criteria. The TRI database used in this project was named US_2008_v09.zip downloaded in March 2011 and is available from http://www.epa.gov/tri/tridata/data/basicplus/index.html.

The general approach used to develop the automated portion of the TRI Augmentation file is described here, followed by a more detailed stepwise list below. In general, we matched TRI facilities with facilities in the Emission Inventory System and then apportioned TRI emissions to EIS facilities at the process-level using allocations derived from S/L/T agency-reported CAP surrogate emissions. Apportioning is necessary because emissions in the TRI database are summed to a facility-wide resolution, whereas the NEI has process-level (i.e., unit, process) resolution. Where there were no S/L/T agency-reported CAP emissions, TRI emissions were not used. The following CAP surrogates were used to apportion the emissions: (1) VOC- used for HAPs that are also VOC, (2) PM10-filterable – used for particulate HAPs and Hg, and (3) SO2 – used for acid gas HAPs. The use of these S/L/T agency data to assign the TRI data meant that if a facility did not have S/L/T agency reported emissions for the CAP surrogate, then TRI emissions for the HAP assigned to that surrogate would not be used. This limitation did not exist in the manual approach whereby TRI facility-level emissions were manually assigned to processes within the matched facilities.

The following steps describe in detail the development of automated portion of the TRI Augmentation database.

1. **Create a TRI_ID to EIS_ID crosswalk (i.e., match TRI facilities to EIS facilities)**
   The TRI emissions database contains two data elements that are used to uniquely identify a facility site. These are the TRI Facility ID (TRI_ID) and the Facility Registry System ID (FRS_ID). The TRI_ID is an identification number unique to the TRI. The EPA FRS_ID is a facility code also used in EPA's Envirofacts database. The EPA NEI uses the field "EIS Identifier" (EIS_ID) to uniquely identify facilities. A FRS_ID to EIS_ID crosswalk developed during the 2008 NEI effort was used as an initial step in linking the TRI emissions to the NEI facilities.

   This crosswalk was supplemented with additional matches from the TRI database that provided using the TRI_ID and FRS_ID fields. The crosswalk was also checked to ensure that TRI facilities matched properly to the EIS facilities using latitude, longitude, street address, facility name, city, county, and state for both TRI and EIS facilities. 'Hand checks' were performed for facilities that differed in location by more 0.01 degree longitude or 0.00725 degrees latitude (since roughly a 0.02 difference in the longitude is 1 mile and a 0.0145 difference in the latitude is 1 mile; our criteria was to look at 0.5 mile differences and greater) and which did not have identical facility names, street address, city, county, and state. We also manually removed matches where it was discovered that one TRI facility represented multiple EIS facilities to prevent double counting of TRI emissions data. Such differences can happen when the state inventories a facility in a different manner than the facility itself reports their emissions to TRI. The resulting TRI to EIS crosswalk file is "TRI to EIS crosswalk.accdb" (see Section 8.1 for access

information). This crosswalk contains all the potential matches reviewed; the ones we used in the automated approach have a "Y" in the "MATCH" field.

2. **Combine the TRI data for individual chemicals and chemical groups and create a total air emissions field**
   The TRI database organizes the air emissions into "Chemical Groups", and there is some overlap in these groups that we resolved prior to using the data. The TRI Chemical Group "metals and metal compounds" includes air releases of both elemental metals and compounds, but the metals are also included as individual elemental metals. If for the same facility, a metal compound and the metal group were reported, we summed the emissions together. For example, if a facility reported chromium compounds and chromium as separate pollutants, we summed these emissions together and assigned them to just chromium emissions. This assumed that the facility would not intentionally double count mass of a compound. We also combined stack and fugitive air emissions from the TRI datasets to generate the total air emissions for each pollutant at a facility. Our allocation method for assigning the TRI stack and fugitive emissions to the NEI emissions processes did not attempt to allocate using the "stack" or "fugitive" denotation from TRI.

3. **Update the 2008 S/L/T submission database with the PM10-FIL Augmentation updates**
   PM10-FIL is one of the criteria air pollutants used to assign TRI emissions at matching EIS facilities to the processes within that facility. The PM10-FIL data from the PM Augmentation dataset was merged with the S/L/T PM10-FIL data to provide a more complete set of PM10-FIL for use in the allocation of TRI emissions to processes at the facility. This step allowed more TRI data to be used than if we had used only the S/L/T agency submitted PM10-FIL.

4. **Map TRI pollutant codes to valid EIS pollutant codes.**
   Table 12 provides the pollutant mapping from TRI pollutants to NEI pollutants. Only CAA pollutants from the TRI are included and even some of these were not used- including ammonia (our focus was HAPs and lead), dioxins/furans (which we excluded from the inventory) and others we could not map to specific NEI pollutants (e.g., diisocyanates and certain glycol ethers).

5. **Remove TRI records to avoid double counting, as follows:**
   a. When S/L/T agency submissions contained matching HAPs or HAPs belonging to HAP groups such as cresols, xylenes and polycyclic organic matter. The pollutant group assignments are shown in Table 13. For example, if a S/L/T agency-submitted emissions for any pollutant group member at the facility, we assume that the emissions from that pollutant group were already provided by the S/L/T agency and did not add emissions of that HAP or HAP group from the TRI.
   b. When emissions records were already submitted in other EPA HAP datasets or for which TRI emissions were assigned using a manual approach (See Section 3.1.7) such as for cement and electric arc furnace facilities.
   c. When the NEI facility type was "Electricity Generation via Combustion" since this category is gap filled with two other EPA datasets (MATS and EGU).

6. **Calculate the allocation factors to develop process-level emissions.**
   S/L/T agency CAP emissions reported at the process level were used as surrogates for allocating the TRI data. The surrogate assignments are shown in Table 12. We computed allocation factors for the surrogates based on the fraction of surrogate pollutant emissions at each process. Emissions allocations were limited to processes that contributed to least 1 percent of emissions. The reason is that we did not want to allocate HAPS emissions to processes that had very small emissions. Where CAP emissions were less than 1 percent, the factor was set to zero and the allocations were re-normalized in order to use all of the facility-level TRI emissions.

   The allocation approach is done to prevent all of the HAP emissions from getting assigned to a single process, which can cause artifacts in data summaries when the processes are summed to EIS sectors or other ways. The resulting allocation approach however has the disadvantage of assigning HAPs to processes that may not actually have those HAP emissions. Thus, at facilities where TRI data have been used, the process-level HAP emissions should be viewed with this limitation in mind. Past NEIs have assigned all of these emissions to a default process code SCC of 39999999, which caused other artifacts, such as a disproportionate amount of HAP emissions getting summed to "miscellaneous" categories in some instances. While we have not eliminated the use of this SCC from this version of the NEI, we have reduced its use in hopes of eventual elimination from future inventories.

7. **Calculate process-level emissions by multiplying the TRI facility level emissions with the allocation factors computed for the surrogate CAPs.**

8. **Speciate process-level total chromium emissions into hexavalent and trivalent emissions and remove total chromium emissions.**
   This followed the procedure described in Section 3.1.3, except that we did not create zero emissions records for total chromium (we simply did not add total chromium to the dataset) and we only speciated the total chromium since the TRI does not provide either hexavalent or trivalent chromium.

The following quality assurance/quality control checks were performed in the development of the data.

1. **Review high TRI emissions values for selected and high risk HAPs and for lead; exclude any data suspected to be outliers.**
   For the following pollutants, we looked at the highest and sometimes second highest TRI facility values included in the initial version prior to building the NEI for mercury, lead, chromium, manganese, nickel, arsenic, 1,3 butadiene, benzene, toluene, ethyl benzene, p-xylene, methanol, acrolein, carbon tetrachloride, tetrachloroethylene, methylene chloride, acrylonitrile, 1,4-dichlorobenzene, ethylene oxide, hydrochloric acid, hydrogen fluoride, chlorine, 2,4-toluene diisocyanate, hexamethylene diisocyanate, and naphthalene. In some cases, we suspected these highest values to be outliers and excluded them from the augmentation dataset. For lead, we looked at all facilities with total 2008 TRI emissions greater than 0.5 tons (which will be the new threshold for reporting lead emissions to the NEI). Where there was no evidence the values were incorrect, we notified the responsible agency. As a result we changed the following prior to using the TRI data in the NEI:

a. We did not use TRI lead (pollutant code = 7439921) from PEMCO (TRI ID = 35983CHVTCEWING; EIS Facility ID = 7915711). Rationale: 2008 emissions above 0.5 tons (regulatory threshold) and determine that 2008 was inconsistent with TRI data from other years, plus this is a coating manufacturer, which is very unlikely to emit lead at the levels reported to TRI.
b. We did not use TRI lead (7439921) from APPLETON COATED L.L.C. (TRI ID= 54113PPLTN540PR; EIS Facility ID= 6805511).
c. We did not use manganese (7439965) from Orthman Manufacturing Inc (TRI ID = 68850RTHMNRR2; EIS Facility ID = 6702911) – the 2008 value in TRI exceeded 2 million pounds and was very inconsistent with TRI data from other years
d. We changed tetrachloroethylene total emissions (facility wide) (127184) from 19500 pounds to 1815 pounds for Flint Hills Resources LP – Pine Bend (TRI ID = 55164KCHRFPOBOX; EIS Facility ID = 6275811). We called facility and were informed that the TRI value was an outlier. We received a revised value by email on 12/15/2011 from the plant representative.

2. **Excluded the TRI Polycyclic Aromatic Hydrocarbons (PAH) for facilities with coke oven emissions**. Where we found TRI PAH at the same processes as coke oven emissions we did not use it. The PAH removal was to prevent possible double counting between PAH and the coke oven emissions pollutants. In the state reported data, if a state reported PAH and coke oven emissions we did not take any action; but here we chose not to add PAH from TRI from an EPA dataset to prevent double counting emissions.

3. **Check overlaps across TRI and other datasets.** As explained in step 5 above, we analyzed other datasets to make sure we would not be double counting emissions when adding TRI data. Once we put all of the datasets together, we checked again for overlaps. From this check we discovered overlaps between the TRI dataset and the 2008EPA_MATS and EPA EGU v1.5 datasets. These overlaps occurred because for EGUs, we used the EIS "Facility type" field to identify (and remove from TRI) EGUs rather than comparing the facilities in these datasets to facilities in the TRI. It would have been a better approach to directly compare the datasets because there are facilities that do not have a facility type of "Electricity Generation Via Combustion" in the 2008EPA_MATS and EPA EGU v1.5 datasets. For these facilities, emissions for the same pollutant were taken from two separate datasets and assigned to processes differently such that when combined to generate the NEI, the facility total no longer matched the TRI. To prevent a double count, we changed some of the emissions in the TRI dataset as follows:

   a. HORSEHEAD CORP/MONACA SMELTER (EIS Facility ID = 7991511). The MATS data overlap the original TRI dataset. Because the MATS value was greater than the TRI value, we removed the TRI dataset selenium emissions. We adjusted the cadmium value in the TRI dataset so that when summed with the MATS value, the facility total would reflect the original value in 2008 TRI. We did not change chromium due to speciation issues –, the amount of hexavalent chromium at the coal fired boilers (MATS sources) is 60.5 lbs which is greater than the facility total TRI value of 53.9 lbs. Of the 53.9 lbs total TRI, 9 lbs was allocated to the MATS sources and the rest to the other industrial processes. If any double counting did occur, it would have been less than the 44.9 lbs of TRI allocated to the non-MATS industrial processes.

b. DOMTAR PAPER CO/JOHNSONBURG MILL (EIS Facility ID = 6559611). We adjusted the TRI phenol value for the non EGU processes such that when summed with the value from the EPA EGU v1.5 dataset, the NEI facility total would equal the TRI facility total.

c. CEMEX CNSTRCTION MATERIALS FLORIDA, LLC (EIS Facility ID = 716011). We allocated TRI nickel emissions to the cement kilns and made sure total emissions match the original TRI value when the TRI cement kiln value for nickel was summed with MATS coal-fired boiler value for nickel.

d. Did not adjust overlaps found at NEW ENERGY CORPORTION (EIS Facility ID = 5552411) and HGLATFELTER CO/SPRING GROVE (EIS Facility ID = 4966111) as they were determined to be insignificant.

Table 12: Mapping of TRI Pollutant Codes to EIS Pollutant codes

TRI CAS	TRI Pollutant Name	EIS Pollutant Code	EIS Pollutant Name	Allocation Surrogate
79345	1,1,2,2-TETRACHLOROETHANE	79345	1,1,2,2-TETRACHLOROETHANE	VOC
79005	1,1,2-TRICHLOROETHANE	79005	1,1,2-TRICHLOROETHANE	VOC
57147	1,1-DIMETHYL HYDRAZINE	57147	1,1-DIMETHYL HYDRAZINE	VOC
120821	1,2,4-TRICHLOROBENZENE	120821	1,2,4-TRICHLOROBENZENE	VOC
96128	1,2-DIBROMO-3-CHLOROPROPANE	96128	1,2-DIBROMO-3-CHLOROPROPANE	VOC
106887	1,2-BUTYLENE OXIDE	106887	1,2-EPOXYBUTANE	VOC
75558	PROPYLENEIMINE	75558	1,2-PROPYLENIMINE	VOC
106990	1,3-BUTADIENE	106990	1,3-BUTADIENE	VOC
542756	1,3-DICHLOROPROPYLENE	542756	1,3-DICHLOROPROPENE	VOC
1120714	PROPANE SULTONE	1120714	1,3-PROPANESULTONE	VOC
106467	1,4-DICHLOROBENZENE	106467	1,4-DICHLOROBENZENE	VOC
95954	2,4,5-TRICHLOROPHENOL	95954	2,4,5-TRICHLOROPHENOL	VOC
88062	2,4,6-TRICHLOROPHENOL	88062	2,4,6-TRICHLOROPHENOL	VOC
94757	2,4-DICHLOROPHENOXY ACETIC ACID	94757	2,4-DICHLOROPHENOXY ACETIC ACID	VOC
51285	2,4-DINITROPHENOL	51285	2,4-DINITROPHENOL	VOC
121142	2,4-DINITROTOLUENE	121142	2,4-DINITROTOLUENE	VOC
53963	2-ACETYLAMINOFLUORENE	53963	2-ACETYLAMINOFLUORENE	VOC
79469	2-NITROPROPANE	79469	2-NITROPROPANE	VOC
119937	3,3'-DIMETHYLBENZIDINE	119937	3,3'-DIMETHYLBENZIDINE	VOC
101144	4,4'-METHYLENEBIS(2-CHLOROANILINE)	101144	4,4'-METHYLENEBIS(2-CHLORANILINE)	VOC
101779	4,4'-METHYLENEDIANILINE	101779	4,4'-METHYLENEDIANILINE	VOC
534521	4,6-DINITRO-O-CRESOL	534521	4,6-DINITRO-O-CRESOL	VOC
92671	4-AMINOBIPHENYL	92671	4-AMINOBIPHENYL	VOC
100027	4-NITROPHENOL	100027	4-NITROPHENOL	VOC
75070	ACETALDEHYDE	75070	ACETALDEHYDE	VOC
60355	ACETAMIDE	60355	ACETAMIDE	VOC
75058	ACETONITRILE	75058	ACETONITRILE	VOC
98862	ACETOPHENONE	98862	ACETOPHENONE	VOC
107028	ACROLEIN	107028	ACROLEIN	VOC
79061	ACRYLAMIDE	79061	ACRYLAMIDE	VOC
79107	ACRYLIC ACID	79107	ACRYLIC ACID	VOC
107131	ACRYLONITRILE	107131	ACRYLONITRILE	VOC
107051	ALLYL CHLORIDE	107051	ALLYL CHLORIDE	VOC
62533	ANILINE	62533	ANILINE	VOC
7440360	ANTIMONY	7440360	ANTIMONY	PM10-FIL
N010	ANTIMONY COMPOUNDS	7440360	ANTIMONY	PM10-FIL
7440382	ARSENIC	7440382	ARSENIC	PM10-FIL
N020	ARSENIC COMPOUNDS	7440382	ARSENIC	PM10-FIL
1332214	ASBESTOS (FRIABLE)	1332214	ASBESTOS	PM10-FIL
71432	BENZENE	71432	BENZENE	VOC
92875	BENZIDINE	92875	BENZIDINE	VOC
98077	BENZOIC TRICHLORIDE	98077	BENZOTRICHLORIDE	VOC
100447	BENZYL CHLORIDE	100447	BENZYL CHLORIDE	VOC
7440417	BERYLLIUM	7440417	BERYLLIUM	PM10-FIL
N050	BERYLLIUM COMPOUNDS	7440417	BERYLLIUM	PM10-FIL
92524	BIPHENYL	92524	BIPHENYL	VOC
117817	DI(2-ETHYLHEXYL) PHTHALATE	117817	BIS(2-ETHYLHEXYL)PHTHALATE	VOC
75252	BROMOFORM	75252	BROMOFORM	VOC
7440439	CADMIUM	7440439	CADMIUM	PM10-FIL
N078	CADMIUM COMPOUNDS	7440439	CADMIUM	PM10-FIL

TRI CAS	TRI Pollutant Name	EIS Pollutant Code	EIS Pollutant Name	Allocation Surrogate
156627	CALCIUM CYANAMIDE	156627	CALCIUM CYANAMIDE	PM10-FIL
133062	CAPTAN	133062	CAPTAN	VOC
63252	CARBARYL	63252	CARBARYL	VOC
75150	CARBON DISULFIDE	75150	CARBON DISULFIDE	VOC
56235	CARBON TETRACHLORIDE	56235	CARBON TETRACHLORIDE	VOC
463581	CARBONYL SULFIDE	463581	CARBONYL SULFIDE	VOC
120809	CATECHOL	120809	CATECHOL	VOC
57749	CHLORDANE	57749	CHLORDANE	VOC
7782505	CHLORINE	7782505	CHLORINE	SO2
79118	CHLOROACETIC ACID	79118	CHLOROACETIC ACID	VOC
108907	CHLOROBENZENE	108907	CHLOROBENZENE	VOC
67663	CHLOROFORM	67663	CHLOROFORM	VOC
107302	CHLOROMETHYL METHYL ETHER	107302	CHLOROMETHYL METHYL ETHER	VOC
126998	CHLOROPRENE	126998	CHLOROPRENE	VOC
7440473	CHROMIUM	7440473	CHROMIUM	PM10-FIL
N090	CHROMIUM COMPOUNDS(EXCEPT CHROMITE ORE MINED IN THE TRANSVAAL REGION)	7440473	CHROMIUM	PM10-FIL
7440484	COBALT	7440484	COBALT	PM10-FIL
N096	COBALT COMPOUNDS	7440484	COBALT	PM10-FIL
1319773	CRESOL (MIXED ISOMERS)	1319773	CRESOL/CRESYLIC ACID (MIXED ISOMERS)	VOC
108394	M-CRESOL	108394	M-CRESOL	VOC
95487	O-CRESOL	95487	O-CRESOL	VOC
106445	P-CRESOL	106445	P-CRESOL	VOC
98828	CUMENE	98828	CUMENE	VOC
N106	CYANIDE COMPOUNDS	57125	CYANIDE	PM10-FIL
132649	DIBENZOFURAN	132649	DIBENZOFURAN	VOC
84742	DIBUTYL PHTHALATE	84742	DIBUTYL PHTHALATE	PM10-FIL
111444	BIS(2-CHLOROETHYL) ETHER	111444	DICHLOROETHYL ETHER	VOC
62737	DICHLORVOS	62737	DICHLORVOS	VOC
111422	DIETHANOLAMINE	111422	DIETHANOLAMINE	VOC
64675	DIETHYL SULFATE	64675	DIETHYL SULFATE	VOC
131113	DIMETHYL PHTHALATE	131113	DIMETHYL PHTHALATE	VOC
77781	DIMETHYL SULFATE	77781	DIMETHYL SULFATE	VOC
79447	DIMETHYLCARBAMYL CHLORIDE	79447	DIMETHYLCARBAMOYL CHLORIDE	VOC
N120	DIISOCYANATES		NA- pollutant not used	
N150	DIOXIN AND DIOXIN-LIKE COMPOUNDS		NA- pollutant not used	
106898	EPICHLOROHYDRIN	106898	EPICHLOROHYDRIN	VOC
140885	ETHYL ACRYLATE	140885	ETHYL ACRYLATE	VOC
51796	URETHANE	51796	ETHYL CARBAMATE CHLORIDE	VOC
75003	CHLOROETHANE	75003	ETHYL CHLORIDE	VOC
100414	ETHYLBENZENE	100414	ETHYL BENZENE	VOC
106934	1,2-DIBROMOETHANE	106934	ETHYLENE DIBROMIDE	VOC
107062	1,2-DICHLOROETHANE	107062	ETHYLENE DICHLORIDE	VOC
107211	ETHYLENE GLYCOL	107211	ETHYLENE GLYCOL	VOC
75218	ETHYLENE OXIDE	75218	ETHYLENE OXIDE	VOC
96457	ETHYLENE THIOUREA	96457	ETHYLENE THIOUREA	VOC
75343	ETHYLIDENE DICHLORIDE	75343	ETHYLIDENE DICHLORIDE	VOC
50000	FORMALDEHYDE	50000	FORMALDEHYDE	VOC
N230	CERTAIN GLYCOL ETHERS	171	N/A Pollutant not used	
76448	HEPTACHLOR	76448	HEPTACHLOR	VOC
118741	HEXACHLOROBENZENE	118741	HEXACHLOROBENZENE	VOC
87683	HEXACHLORO-1,3-BUTADIENE	87683	HEXACHLOROBUTADIENE	VOC
77474	HEXACHLOROCYCLOPENTADIENE	77474	HEXACHLOROCYCLOPENTADIENE	VOC
67721	HEXACHLOROETHANE	67721	HEXACHLOROETHANE	VOC
110543	N-HEXANE	110543	HEXANE	VOC
302012	HYDRAZINE	302012	HYDRAZINE	VOC
7647010	HYDROCHLORIC ACID (1995 AND AFTER “ACID AEROSOLS” ONLY)	7647010	HYDROCHLORIC ACID	SO2
7664393	HYDROGEN FLUORIDE	7664393	HYDROGEN FLUORIDE	SO2
123319	HYDROQUINONE	123319	HYDROQUINONE	VOC
7439921	LEAD	7439921	LEAD	PM10-FIL
N420	LEAD COMPOUNDS	7439921	LEAD	PM10-FIL
58899	LINDANE	58899	1,2,3,4,5,6-HEXACHLOROCYCLOHEXANE	VOC
108316	MALEIC ANHYDRIDE	108316	MALEIC ANHYDRIDE	VOC

TRI CAS	TRI Pollutant Name	EIS Pollutant Code	EIS Pollutant Name	Allocation Surrogate
7439965	MANGANESE	7439965	MANGANESE	PM10-FIL
N450	MANGANESE COMPOUNDS	7439965	MANGANESE	PM10-FIL
7439976	MERCURY	7439976	MERCURY	PM10-FIL
N458	MERCURY COMPOUNDS	7439976	MERCURY	PM10-FIL
67561	METHANOL	67561	METHANOL	VOC
72435	METHOXYCHLOR	72435	METHOXYCHLOR	VOC
74839	BROMOMETHANE	74839	METHYL BROMIDE	VOC
74873	CHLOROMETHANE	74873	METHYL CHLORIDE	VOC
71556	1,1,1-TRICHLOROETHANE	71556	METHYL CHLOROFORM	VOC
74884	METHYL IODIDE	74884	METHYL IODIDE	VOC
108101	METHYL ISOBUTYL KETONE	108101	METHYL ISOBUTYL KETONE	VOC
624839	METHYL ISOCYANATE	624839	METHYL ISOCYANATE	VOC
80626	METHYL METHACRYLATE	80626	METHYL METHACRYLATE	VOC
1634044	METHYL TERT-BUTYL ETHER	1634044	METHYL TERT-BUTYL ETHER	VOC
75092	DICHLOROMETHANE	75092	METHYLENE CHLORIDE	VOC
60344	METHYL HYDRAZINE	60344	METHYLHYDRAZINE	VOC
121697	N,N-DIMETHYLANILINE	121697	N,N-DIMETHYLANILINE	VOC
68122	N,N-DIMETHYLFORMAMIDE	68122	N,N-DIMETHYLFORMAMIDE	VOC
91203	NAPHTHALENE	91203	NAPHTHALENE	VOC
7440020	NICKEL	7440020	NICKEL	PM10-FIL
N495	NICKEL COMPOUNDS	7440020	NICKEL	PM10-FIL
98953	NITROBENZENE	98953	NITROBENZENE	VOC
90040	O-ANISIDINE	90040	O-ANISIDINE	VOC
95534	O-TOLUIDINE	95534	O-TOLUIDINE	VOC
60117	4-DIMETHYLAMINOAZOBENZENE	60117	4-DIMETHYLAMINOAZOBENZENE	VOC
123911	1,4-DIOXANE	123911	P-DIOXANE	VOC
82688	QUINTOZENE	82688	PENTACHLORONITROBENZENE	VOC
87865	PENTACHLOROPHENOL	87865	PENTACHLOROPHENOL	VOC
108952	PHENOL	108952	PHENOL	VOC
75445	PHOSGENE	75445	PHOSGENE	VOC
7803512	PHOSPHINE	7803512	PHOSPHINE	VOC
7723140	PHOSPHORUS (YELLOW OR WHITE)	7723140	PHOSPHORUS	PM10-FIL
85449	PHTHALIC ANHYDRIDE	85449	PHTHALIC ANHYDRIDE	PM10-FIL
1336363	POLYCHLORINATED BIPHENYLS	1336363	POLYCHLORINATED BIPHENYLS	VOC
191242	BENZO(G,H,I)PERYLENE	191242	BENZO[G,H,I,]PERYLENE	PM10-FIL
85018	PHENANTHRENE	85018	PHENANTHRENE	PM10-FIL
N590	POLYCYCLIC AROMATIC COMPOUNDS	130498292	PAH, total	PM10-FIL
106503	P-PHENYLENEDIAMINE	106503	P-PHENYLENEDIAMINE	VOC
123386	PROPIONALDEHYDE	123386	PROPIONALDEHYDE	VOC
114261	PROPOXUR	114261	PROPOXUR	VOC
78875	1,2-DICHLOROPROPANE	78875	PROPYLENE DICHLORIDE	VOC
75569	PROPYLENE OXIDE	75569	PROPYLENE OXIDE	VOC
91225	QUINOLINE	91225	QUINOLINE	VOC
106514	QUINONE	106514	QUINONE	VOC
7782492	SELENIUM	7782492	SELENIUM	PM10-FIL
N725	SELENIUM COMPOUNDS	7782492	SELENIUM	PM10-FIL
100425	STYRENE	100425	STYRENE	VOC
96093	STYRENE OXIDE	96093	STYRENE OXIDE	VOC
127184	TETRACHLOROETHYLENE	127184	TETRACHLOROETHYLENE	VOC
7550450	TITANIUM TETRACHLORIDE	7550450	TITANIUM TETRACHLORIDE	VOC
108883	TOLUENE	108883	TOLUENE	VOC
95807	2,4-DIAMINOTOLUENE	95807	TOLUENE-2,4-DIAMINE	VOC
8001352	TOXAPHENE	8001352	TOXAPHENE	VOC
79016	TRICHLOROETHYLENE	79016	TRICHLOROETHYLENE	VOC
121448	TRIETHYLAMINE	121448	TRIETHYLAMINE	VOC
1582098	TRIFLURALIN	1582098	TRIFLURALIN	VOC
108054	VINYL ACETATE	108054	VINYL ACETATE	VOC
75014	VINYL CHLORIDE	75014	VINYL CHLORIDE	VOC
75354	VINYLIDENE CHLORIDE	75354	VINYLIDENE CHLORIDE	VOC
108383	M-XYLENE	108383	M-XYLENE	VOC
95476	O-XYLENE	95476	O-XYLENE	VOC
106423	P-XYLENE	106423	P-XYLENE	VOC
1330207	XYLENE (MIXED ISOMERS)	1330207	XYLENES (MIXED ISOMERS)	VOC

Table 13: Pollutant Groups

Group Name	Pollutant Code	Pollutant
Chromium	7440473	Chromium
	1333820	Chromium Trioxide
	7738945	Chromic Acid (VI)
	18540299	Chromium (VI)
	16065831	Chromium III
Xylenes (Mixed Isomers)	1330207	Xylenes (Mixed Isomers)
	95476	o-Xylene
	106423	p-Xylene
	108383	m-Xylene
Cresol/Cresylic Acid (Mixed Isomers)	1319773	Cresol/Cresylic Acid (Mixed Isomers)
	95487	o-Cresol
	108394	m-Cresol
	106445	p-Cresol
Polychlorinated Biphenyls	1336363	Polychlorinated Biphenyls (PCBs)
	2050682	4,4'-Dichlorobiphenyl (PCB-15)
	2051243	Decachlorobiphenyl (PCB-209)
	2051607	2-Chlorobiphenyl (PCB-1)
	25429292	Pentachlorobiphenyl
	26601649	Hexachlorobiphenyl
	26914330	Tetrachlorobiphenyl
	28655712	Heptachlorobiphenyl
	53742077	Nonachlorobiphenyl
	55722264	Octachlorobiphenyl
	7012375	2,4,4'-Trichlorobiphenyl (PCB-28)
Polycyclic Organic Matter (POM)	120127	Anthracene
	129000	Pyrene
	130498292	PAH, total
	189559	Dibenzo[a,i]Pyrene
	189640	Dibenzo[a,h]Pyrene
	191242	Benzo[g,h,I,]Perylene
	191300	Dibenzo[a,l]Pyrene
	192654	Dibenzo[a,e]Pyrene
	192972	Benzo[e]Pyrene
	193395	Indeno[1,2,3-c,d]Pyrene
	194592	7H-Dibenzo[c,g]carbazole
	195197	BenzoIphenanthrene
	198550	Perylene
	203123	Benzo(g,h,i)Fluoranthene
	203338	Benzo(a)Fluoranthene
	205823	Benzo[j]fluoranthene
	205992	Benzo[b]Fluoranthene
	206440	Fluoranthene
	207089	Benzo[k]Fluoranthene
	208968	Acenaphthylene
	218019	Chrysene
	224420	Dibenzo[a,j]Acridine

Group Name	Pollutant Code	Pollutant
	226368	Dibenz[a,h]acridine
	2381217	1-Methylpyrene
	2422799	12-Methylbenz(a)Anthracene
	250	PAH/POM – Unspecified
	26914181	Methylanthracene
	3697243	5-Methylchrysene
	41637905	Methylchrysene
	42397648	1,6-Dinitropyrene
	42397659	1,8-Dinitropyrene
	50328	Benzo[a]Pyrene
	53703	Dibenzo[a,h]Anthracene
	5522430	1-Nitropyrene
	56495	3-Methylcholanthrene
	56553	Benz[a]Anthracene
	56832736	Benzofluoranthenes
	57835924	4-Nitropyrene
	57976	7,12-Dimethylbenz[a]Anthracene
	602879	5-Nitroacenaphthene
	607578	2-Nitrofluorene
	65357699	Methylbenzopyrene
	7496028	6-Nitrochrysene
	779022	9-Methyl Anthracene
	8007452	Coal Tar
	832699	1-Methylphenanthrene
	83329	Acenaphthene
	85018	Phenanthrene
	86737	Fluorene
	86748	Carbazole
	90120	1-Methylnaphthalene
	91576	2-Methylnaphthalene
	91587	2-Chloronaphthalene
Cyanide & Compounds	57125	Cyanide
	74908	Hydrogen Cyanide
Nickel & Compounds	7440020	Nickel
	12035722	Nickel Subsulfide
	1313991	Nickel Oxide
	604	Nickel Refinery Dust

3.1.5 HAP augmentation based on emission factor ratios

For use in cases where S/L/T agencies did not report HAP emissions and TRI data were not available, we calculated HAP emissions by multiplying the appropriate surrogate CAP emissions (provided by S/L/T agencies) by an emissions ratio of HAP to CAP emission factors from WebFIRE (http://www.epa.gov/ttn/chief/webfire/index.html). The spreadsheet "HAP EF Ratios Derived from WebFIRE.xls" (see Section 8.1 for access information) provides the 2,417 emissions ratios by SCC. For each ratio, the spreadsheet provides the HAP and CAP Factor Ids for the Efs used to build these ratios. These Factor Ids

identify each unique EF in the WebFIRE database. Where the factor Ids in that spreadsheet are null, it means we used a ratio from a similar WebFIRE SCC. This was only done for Hg from boilers, to allow for a more complete gap filling of Hg from boilers. Additional ratios were added to allow more complete gap filling of boilers and process heaters that used fuel types similar to those covered in WebFIRE but are not explicitly in WebFIRE.

Table 14 provides the specific CAPs used for each HAP emission factor calculated.

A key result of our approach is that the resulting HAP augmentation dataset does not include HAP emissions for facilities where the HAP was reported by an S/L/T agency at any process at the facility. For example, if a facility reported formaldehyde at process A only, and the WebFIRE Emission factor database yields formaldehyde emissions for processes A, B, and C, then the HAP augmentation dataset would not contain formaldehyde from any processes at the facility. If that facility had no formaldehyde, then the HAP augmentation dataset would have formaldehyde for processes A, B and C. This approach was taken to be conservative in our attempt to prevent double counted emissions, which is necessary because we know that some states aggregate their HAP emissions and assign to fewer or different processes than their CAP emissions. These types of differences are expected since CAPs are required at the process level, but HAPs are entirely voluntary.

Table 14: CAP Surrogate assignments to derive HAP-to-CAP Emission Factor Ratios

Description	Pollutant Code	CAP Surrogate	Description	Pollutant Code	CAP Surrogate
1,1,2,2-Tetrachloroethane	79345	VOC	Ethyl Chloride	75003	VOC
1,1,2-Trichloroethane	79005	VOC	Ethylene Dibromide	106934	VOC
1,3-Butadiene	106990	VOC	Ethylene Dichloride	107062	VOC
1,3-Dichloropropene	542756	VOC	Ethylidene Dichloride	75343	VOC
1,4-Dichlorobenzene	106467	VOC	Fluoranthene	206440	PM10-FIL
2,2,4-Trimethylpentane	540841	VOC	Fluorene	86737	PM10-FIL
2,4-Dinitrophenol	51285	VOC	Formaldehyde	50000	VOC
2-Chloronaphthalene	91587	PM10-FIL	Hexane	110543	VOC
2-Methylnaphthalene	91576	PM10-FIL	Hydrochloric Acid	7647010	SO2
4,4'-Methylenediphenyl Diisocyanate	101688	VOC	Hydrogen Fluoride	7664393	SO2
4-Nitrophenol	100027	VOC	Hydroquinone	123319	VOC
Acenaphthene	83329	PM10-FIL	Indeno[1,2,3-c,d]Pyrene	193395	PM10-FIL
Acenaphthylene	208968	PM10-FIL	Isophorone	78591	VOC
Acetaldehyde	75070	VOC	Lead	7439921	PM10-FIL
Acetonitrile	75058	VOC	Manganese	7439965	PM10-FIL
Acetophenone	98862	VOC	Mercury	7439976	PM10-FIL
Acrolein	107028	VOC	Methanol	67561	VOC
Acrylonitrile	107131	VOC	Methyl Bromide	74839	VOC
Anthracene	120127	PM10-FIL	Methyl Chloride	74873	VOC
Antimony	7440360	PM10-FIL	Methyl Chloroform	71556	VOC
Arsenic	7440382	PM10-FIL	Methyl Iodide	74884	VOC
Benz[a]Anthracene	56553	PM10-FIL	Methyl Isobutyl Ketone	108101	VOC
Benzene	71432	VOC	Methyl Tert-Butyl Ether	1634044	VOC

Description	Pollutant Code	CAP Surrogate
Benzo[a]Pyrene	50328	PM10-FIL
Benzo[b]Fluoranthene	205992	PM10-FIL
Benzo[e]Pyrene	192972	PM10-FIL
Benzo[g,h,I,]Perylene	191242	PM10-FIL
Benzo[k]Fluoranthene	207089	PM10-FIL
Beryllium	7440417	PM10-FIL
Biphenyl	92524	VOC
Bis(2-Ethylhexyl)Phthalate	117817	VOC
Cadmium	7440439	PM10-FIL
Carbon Disulfide	75150	VOC
Carbon Tetrachloride	56235	VOC
Chlorine	7782505	SO2
Chlorobenzene	108907	VOC
Chloroform	67663	VOC
Chromium	7440473	PM10-FIL
Chromium (VI)	18540299	PM10-FIL
Chromium Trioxide	1333820	PM10-FIL
Chrysene	218019	PM10-FIL
Cobalt	7440484	PM10-FIL
Cumene	98828	VOC
Dibenzo[a,h]Anthracene	53703	PM10-FIL
Dibenzofuran	132649	VOC
Dibutyl Phthalate	84742	PM10-FIL
Dimethyl Phthalate	131113	VOC
Ethyl Benzene	100414	VOC

Description	Pollutant Code	CAP Surrogate
Methylene Chloride	75092	VOC
Naphthalene	91203	VOC
Nickel	7440020	PM10-FIL
Nickel Oxide	1313991	PM10-FIL
o-Xylene	95476	VOC
PAH, total	130498292	PM10-FIL
PAH/POM – Unspecified	250	PM10-FIL
Pentachlorophenol	87865	VOC
Perylene	198550	PM10-FIL
Phenanthrene	85018	PM10-FIL
Phenol	108952	VOC
Phosgene	75445	VOC
Phosphorus	7723140	PM10-FIL
Polychlorinated Biphenyls	1336363	VOC
Propionaldehyde	123386	VOC
Propylene Dichloride	78875	VOC
Pyrene	129000	PM10-FIL
Selenium	7782492	PM10-FIL
Styrene	100425	VOC
Tetrachloroethylene	127184	VOC
Toluene	108883	VOC
Trichloroethylene	79016	VOC
Vinyl Chloride	75014	VOC
Vinylidene Chloride	75354	VOC
Xylenes (Mixed Isomers)	1330207	VOC

The HAP Augmentation process consisted of three main steps: (1) calculating HAP-to-CAP ratios from existing WebFIRE emission factors, (2) adding Hg ratios for boiler and process-heater SCCs using similar fuels as those covered in step 1, and (3) calculating HAP emissions from these ratios and the surrogate CAP emissions. In addition, a fourth step was used to perform special quality assurance for Hg. These steps are described in more detail in the three subsections below.

3.1.5.1 Step 1: Extract and Modify WebFIRE Emission Factors and Calculate HAP-to-CAP ratios

The following list provides the various parts of Step 1 to extract and modify the WebFIRE emission factors and calculate the HAP-to-CAP ratios

1. Download latest WebFIRE database from the U.S. EPA: (WebFIREFactors.csv downloaded on 12/19/10). Each separate record in that file is identified with a unique "Factor ID".
2. Delete all Revoked and Controlled Emission Factors. This means that only ratios of uncontrolled emission factors were used in this approach.
3. Change WebFIRE pollcode 246 to 130498292 (PAH).

4. Change WebFIRE pollcode 40 to 250 (unspecified PAH/POM).
5. Change WebFIRE pollcode 102 (Benzo[b+k]Fluoranthene to 205992 (Benzo[b]Fluoranthene). Although these are not identical compounds, both have the same risk factors.
6. Remove Efs for the pollutants shown in Table 15: Invalid pollutant codes for HAP augmentationTable 15 because they are not valid pollutant codes in the 2008 NEI and there are no valid pollutant codes that represent these pollutants.

Table 15: Invalid pollutant codes for HAP augmentation

Pollutant code	Last Valid Year	Pollutant description
37871004	2005	Total Heptachlorodibenzo-p-Dioxin
34465468	2005	Hexachlorodibenzo-p-Dioxin
30402154	2005	Total Pentachlorodibenzofuran
136677093	2005	Dioxins, Total, W/O Individ. Isomers Reported {PCDDS}
136677106	2005	Polychlorinated Dibenzofurans, Total

7. Remove Efs for pollcode 140 (coke oven emissions) since (at the time) we did not have an approach to map from this code to the benzene soluble organics (BSO) or Methylene Chloride Soluble Organics (MSO) pollutant codes.[13]
8. Remove Efs for pollcode 78933 (methyl ethyl ketone) because it is no longer a HAP.
9. Remove Efs for pollcode 123739 (crotonaldehyde) because it is not a HAP.
10. Remove Efs that begin with "<" because these are usually based on minimum detection limits. We chose to ignore emission factors based on minimum detection limits as a conservative approach to not adding emissions where they may not exist.
11. Assign the midpoint of emission factor ranges as new emission factor for the situation in which emission factor is given as a range of values.
12. Multiply the EF for pollcode 1317368 (Lead (II) Oxide) by 0.92832 and rename pollcode to 7439921 (lead). The 0.92832 value is the fraction of lead ion in the total compound.
13. Multiply EF for pollcode 1317346 (Manganese Trioxide) by 0.69599 and rename pollcode to 7439965 (manganese). The 0.69599 value is the fraction of manganese ion in the total compound.
14. Delete PAH, total and PAH/POM-Unspecified factors when the SCC has other specific POM Efs. This affects FactorIDs: 5530, 5859, 8111, 9741, 11611, 11971, 12109, 12176, 12295, 12651, and 22965.
15. Remove all records for which there is a HAP emission factor but no Surrogate CAP factor.
16. Convert HAPs with different EF bases (denominators) as compared to the CAP Efs using the default heat content by fuel type as shown in Table 16 and other physical conversion factors as shown in Table 17.

[13] We have since determined that we could have used either of the MSO or BSO codes, since these two methods for measuring extractable organic matter extract about the same quantity of coke oven pollutant mass.

Table 16: Conversion factors HAP emission factors for HAP augmentation

Fuel	Heat Content
Coal	13,000 BTU/lb or 26 mmBTU/ton
Anthracite coal	12,300 BTU/lb or 24.6 mmBTU/ton
lignite coal	7,200 BTU/lb or 14.4 mmBTU/ton
Residual oil	150,000 BTU/gallon
Distillate oil	140,000 BTU/gallon
Diesel	137,000 BTU/gallon
Kerosene	135,000 BTU/gallon
LPG	94,000 BTU/gallon
Natural gas	1,050 BTU/SCF
Coke Oven gas	590 BTU/SCF
Wood	5,200 BTU/lb
Process Gas	not assigned a default heat content

Table 17: Physical Conversion Factors Used

Conversion	Physical factors used
lb/k-gal	mg/kL×(3.785L/gal)×(2.2046E-6 lb/mg)
lb/ton	g/Mg×(1Mg/1E6g)×(2000 lb/ton) µg/kg×(1kg/1E9µg)×(2000 lb/ton)
lb/1000 barrels	lb/MMBTU×(140 MMBTU/1000 gallons oil)×(42 gallons/barrel)
lb/MMBTU	lb/ton wood×(1 ton/2000lb)×(1lb/5200BTU)×(1E6 BTU/MMBTU)
lb/million cubic feet	ng/J×(1kg/1E12ng)×(2.204lb/kg)×(1.055E9 J/MMBTU)×(1050 MMBTU/million cubic feet NG)

17. Remove all HAP emission factors that cannot be physically converted to the same units as the associated CAP emission factor units. A ratio will not be valid if it is not in the same units.
18. Remove any CAP emission factors that have formulas that cannot be calculated. In practice, this step applied only to one natural gas fired ceramic kiln emission factor with a formula in terms of the sulfur content of the raw material (FactorID 18899).
19. Calculate all CAP emission factors with formulas, using default ash content of 8% and sulfur content of 1.7% for coal (bituminous), 0.24% sulfur content for distillate oil, 1.2% sulfur content for residual oil.
20. Calculate minimum and maximum HAP factors per SCC and pollutant. Delete Factor IDs 12817-12846 because there were 30 different factors, very different in EF, for different processes not distinguishable at the SCC level. Delete Factor IDs 13047-13054 because there were 8 different factors, very different in EF, for different processes not distinguishable at the SCC level.
21. Delete HAP factors with multiple unrated factors for an SCC/pollutant combo that are at least an order of magnitude apart and have no way to be distinguished for accuracy. An unrated factor is one in which the Webfire database Quality field is "U". FactorIDs affected include: 13444-13446, 13441-13443, 13482-13484, 15222-15224, 22936-22937, 13836-13841, 15890-15891, 12864-12865, 24974-24977.
22. Speciate total chromium (pollutant code 7440473) WebFIRE emission factors into hexavalent and trivalent chromium by SCC using the SCC-based speciation factors that were used for developing the "EPA chromium fix overlaps and speciate" dataset (see Section 3.1.3). SCCs without process-specific factors were speciated using the default speciation factor of 34% hexavalent chromium. Where there was an existing WebFIRE

factor for hexavalent or trivalent chromium, the WebFIRE factor took precedence. Afterwards, all total chromium factors are deleted prior to computing HAP emissions.

23. Calculate dimensionless ratios of HAPs to surrogate CAPs for all HAPs.
24. Delete HAP factors with a HAP to CAP EF ratio greater than 1. This was done because it is not plausible to have more metal PM than total PM or more VOC HAPs than total VOC. We did not want to create implausible inconsistencies in the EPA-supplied data.
25. Renormalize HAP to CAP ratios in cases where the SCC-level HAP to CAP ratios exceed 1 (342 ratios affected).

3.1.5.2 Step 2: Add HAP-to-CAP ratios for Hg from boiler and process heaters

We investigated all boiler and process heater SCCs that did not have ratios because they were missing from WebFIRE. We determined that some of these SCCs were similar to other SCCs covered in WebFIRE and thus used the ratios from the similar SCCs. We chose the ratio based on fuel type. If there were multiple WebFIRE SCCs with that fuel type, we chose the lowest ratio. In this step we also removed ratios associated with Hg emissions from natural gas combustion since there is uncertainty in the amount of Hg emitted from this process, and we do not compute Hg emissions from natural gas consumption in the nonpoint data category.

3.1.5.3 Step 3: Emissions Calculations

The following list provides the steps needed to calculate the HAP emissions to be included in the HAP Augmentation dataset.

1. Extract the CAP data for VOC, PM-10FIL and SO2 from a modified version of the 2008 RAS that incorporated PM Augmentation updates (PM augmentation is described in Section 3.1.2). Therefore, VOC and SO2 CAP emissions are always from the S/L/T dataset, but PM10-FIL come from both the S/L/T dataset and from the EPA Augmentation dataset for processes for which S/L/T data have no PM10-FIL and the PM Augmentation dataset included data. The extraction only considered annual CAP emissions and all emissions were converted to pounds.
2. Apply ratios to all surrogate emissions data.
3. Keep only HAP emissions for which there are no HAP emissions of that particular HAP at any process in the facility. The one exception is that we allowed Hg from boilers to be gap filled by the HAP Augmentation dataset at unmatched processes. As part of this step, we considered overlapping pollutant groups. For example, we considered that if any PCB was reported at a facility, then no other PCB's should be allowed. Pollutant groups were created for Chromium, Xylenes (Mixed Isomers), Cresol/Cresylic Acid (Mixed Isomers), Polychlorinated Biphenyls, Polycyclic Organic Matter, Selenium, Cyanide, and Nickel. The one exception to this is that we did not remove Hg from boiler SCCs (other than boilers at the facilities described in Step 7).
4. Exclude HAP emissions that are higher than the maximum emissions level reported by any S/L/T for that pollutant and SCC (to avoid producing HAP emissions through HAP augmentation that are higher than any S/L/T reported value for the SCC/HAP, which could be an outlier). When determining the maximum reported S/L/T value, we excluded the suspect S/L/T data. For hexavalent chromium, we excluded emissions from the final HAP Augmentation dataset if the hexavalent chromium exceeded the maximum S/L/T total chromium multiplied by the default speciation factor of 0.34; for and trivalent chromium, we excluded emissions from the final HAP Augmentation dataset if the trivalent chromium exceeded the maximum S/L/T total chromium multiplied by the default speciation factor of 0.66.

5. Exclude HAP emissions that have no SCC/pollutant match in S/L/T reported data. These were excluded because there was no comparison dataset to determine whether any of these records could be outliers, which is a conservative approach to avoid adding erroneous data.
6. Exclude HAP emissions that were included in other EPA datasets that were higher in hierarchy.
7. Exclude HAP emissions from the HAP augmentation dataset for any sources with "Facility Type" set to "Electricity Generation via Combustion".

3.1.5.4 Step 4: Special QA for Hg

We investigated the SCCs with the greatest Hg emissions in the HAP Augmentation dataset. In particular, we looked at SCCs where national total augmented Hg emissions exceeded 40 pounds and the SCC was not coal burning. As a result of that QA, we adjusted the final HAP Augmentation dataset. The adjustments made were not only for Hg but also for other HAPs since the issues we identified by looking only at Hg were present for other HAPs as well. The following items describe the results of this special QA:

Based on a national SCC-level summary of the HAP augmentation dataset, we found that SCC 30600106 (Industrial Processes; Petroleum Industry; Process Heaters; Process Gas-fired) had the highest augmented Hg emissions of any SCC; in fact, augmented emissions from this SCC was higher than the next highest SCC by a factor of 3. The cause of this outlier was that this SCC had different units of measure for the HAP versus CAP emission factor. The units for the Hg EF are pounds per million BTUs heat input, and the units for the CAP surrogate (PM10-FIL) are pounds per million cubic feet process gas burned. Although this is a process gas SCC, we had chosen to use the natural gas default heat content to convert the HAP Efs to the same units as the surrogate CAP EF. We suspect that the very high HAP/CAP ratios for Hg were a result of the impact of the heat content of process gas being different from the heat content as natural gas. We presumed this issue would not only be Hg-specific but would impact all of the HAPs because all had the same discrepancy in the EF units between HAP and CAP; therefore, we decided to remove all HAP emissions from this SCC from the HAP augmentation dataset. In addition, this QA prompted our investigation of any other process gas SCC that had different units of measure and were converted to the same units based on the heat content of natural gas. We found three additional SCCs where this occurred and removed all HAP emissions from the HAP augmentation dataset from these SCCs as well. The final result of this check was that we excluded all HAP emissions from the HAP Augmentation dataset for any process with the following process gas SCCs: 10200701, 10300701, 30600106, and 30609904.

Also as part of the QA, we found 255 lbs of Hg augmented from 8 processes with SCC= 50100101 (Waste Disp-Govt /Municipal Incineration /Starved Air: Multiple Chamber). This was unexpected because this SCC represents the municipal waste combustion process for which we had already filled in Hg emissions from other EPA datasets and the HAP augmentation approach excludes gap filling for processes covered by other datasets (except for boiler Hg). We discovered that these 8 processes had the incorrect SCC included in EIS by reviewing other descriptive information on the facilities, units and processes. Since the basis of the HAP to CAP ratios is the SCC, we chose not to use any augmented emissions for these 8 processes. We also reviewed EIS emissions processes for SCC 50200501 (Waste Disposal; Solid Waste Disposal – Commercial/Institutional; Incineration: Special Purpose; Med Waste Controlled Air Incin-aka Starved air, 2-stg, or Modular comb). These appeared all to be medical/hospital/infectious waste processes and were missing 2008 Hg emissions that had been present in

previous NEIs (2002,2005). Based on this review, no adjustments were made to the HAP Augmentation dataset for this SCC.

3.1.6 EPA nonpoint data

For the 2008 NEI, the EPA developed emission estimates for many nonpoint sectors in collaboration with a consortium of state and regional planning organizations called the Eastern Regional Technical Advisory Committee (ERTAC, http://www.ertac.us/). This task is referred to by ERTAC as the "Area Source Comparability" project on the ERTAC website, and a subgroup was developed to work on this project. The purpose of the subgroup and project was to agree on methodologies, emission factors, and SCCs for a number of important nonpoint sectors, and then EPA would prepare the emissions estimates for all states using the group's final approaches. During the 2008 NEI inventory development cycle while the S/L/T agencies were submitting emissions data, states could accept the ERTAC estimates or they could go beyond the "default" methodologies and submit further improved data. The ERTAC process is described in Dorn et al. (2010) and a spreadsheet showing the sectors, SCCs, emission factors, and a brief description of the methodologies called "ERTAC_state_comparison.xlsx" (see Section 8 for access information). Below are tables that describe the sectors for which EPA developed emission estimates. Some sectors EPA expects to be entirely in the nonpoint (and not point source) data category, i.e., residential heating. These are listed in Table 18.

Table 18: EPA-estimated emissions sources expected to be exclusively nonpoint

EPA-estimated emissions source description	Supporting data file name (see also Section 8)	EIS Sector Name
Residential Heating; anthracite coal	res_anthra_coal_epa_data.zip	Fuel Comb – Residential – Other
Residential Heating; bituminous coal	res_bit_coal_epa_data.zip	Fuel Comb – Residential – Other
Residential Heating; distillate oil	res_distillate_fuel_rvsd090711.zip	Fuel Comb – Residential – Oil
Residential Heating; natural gas	res_ng_rvsd090711.zip	Fuel Comb – Residential – Natural Gas
Residential Heating; liquefied petroleum gas	res_lpg_rvsd090711.zip	Fuel Comb – Residential – Other
Residential Heating; Fireplaces	res_wood_comb_epa_data.zip	Fuel Comb – Residential – Wood
Residential Heating; Free standing woodstoves	res_wood_comb_epa_data.zip	Fuel Comb – Residential – Wood
Residential Heating; Fireplace Inserts	res_wood_comb_epa_data.zip	Fuel Comb – Residential – Wood
Residential Heating; Pellet Stoves	res_wood_comb_epa_data.zip	Fuel Comb – Residential – Wood
Residential Heating; Indoor Furnaces	res_wood_comb_epa_data.zip	Fuel Comb – Residential – Wood
Residential Heating; Outdoor Hydronic Heaters	res_wood_comb_epa_data.zip	Fuel Comb – Residential – Wood
Residential Heating; Firelog	res_wood_comb_epa_data.zip	Fuel Comb – Residential – Wood

EPA-estimated emissions source description	Supporting data file name (see also Section 8)	EIS Sector Name
Residential Heating; Kerosene	res_kerosene_rvsd090711.zip	Fuel Comb – Residential – Oil
Paved Roads	paved_roads_rvsd090711.zip	Dust – Paved Road Dust
Unpaved Roads	roads_unpaved_epa_data.zip	Dust – Unpaved Road Dust
Commercial Cooking	commercial_cooking_rvsd090711.zip	Commercial Cooking
Dust from Residential Construction	construction_road_res_nonres_rvsd090711.zip	Dust – Construction Dust
Dust from Commercial Institutional	construction_road_res_nonres_rvsd090711.zip	Dust – Construction Dust
Dust from Road Construction	construction_road_res_nonres_rvsd090711.zip	Dust – Construction Dust
Mining and Quarrying	mining_and_quarrying_2008v2.zip	Industrial Processes – Mining
Architectural Coatings	architectural_coatings_epa_data2.zip	Solvent – Non-Industrial Surface Coating
Traffic Markings	traffic_paints_eis_format.zip	Solvent – Industrial Surface Coating & Solvent Use
Consumer & Commercial – All personal care products	consumer_solvents_epa_data.zip	Solvent – Consumer & Commercial Solvent Use
Consumer & Commercial – All household products	consumer_solvents_epa_data.zip	Solvent – Consumer & Commercial Solvent Use
Consumer & Commercial – All coatings and related products	consumer_solvents_epa_data.zip	Solvent – Consumer & Commercial Solvent Use
Consumer & Commercial – All adhesives and sealants	consumer_solvents_epa_data.zip	Solvent – Consumer & Commercial Solvent Use
Consumer & Commercial – All FIFRA related products	consumer_solvents_epa_data.zip	Solvent – Consumer & Commercial Solvent Use
Cutback Asphalt Paving	asphalt_paving_cutback_epa_data.zip	Solvent – Consumer & Commercial Solvent Use
Emulsified Asphalt Paving	asphalt_paving_emulsified_epa_data.zip	Solvent – Consumer & Commercial Solvent Use
Consumer Pesticide Application	pesticides_consumer_epa_data.zip	Solvent – Consumer & Commercial Solvent Use
Commercial Pesticide Application	ag_pesticide_application_2008v2.zip	Solvent – Consumer & Commercial Solvent Use
Residential Portable Gas Cans	portable_fuel_containers_epa_data.zip	Miscellaneous Non-Industrial NEC
Commercial Portable Gas Cans	portable_fuel_containers_epa_data.zip	Miscellaneous Non-Industrial NEC
Aviation Gasoline Stage 1	aviation_gasoline_distribution_stage1_ epa_data.zip	Gas Stations
Aviation Gasoline Stage 2	av_gas_distrib_stage2_rsvd090711.zip	Gas Stations
Open Burning – Leaves	ob_leaf_brush_rvsd090711.zip	Waste Disposal
Open Burning – Brush	ob_leaf_brush_rvsd090711.zip	Waste Disposal
Open Burning – Residential Household Waste	ob_msw_doc_rvsd090711.zip	Waste Disposal

EPA-estimated emissions source description	Supporting data file name (see also Section 8)	EIS Sector Name
Open Burning – Land Clearing Debris	ob_land_clearing_debris_rvsd090711.zip	Waste Disposal
Publicly Owned Treatment Works	potw_epa_data.zip	Waste Disposal
Agricultural Tilling	ag_tilling_2008v2.zip	Agriculture – Crops & Livestock Dust
Fertilizer Application	fertilizer_application_epa_data.zip	Agriculture – Fertilizer Application
Animal Husbandry	animal_husbandry_epa_data.zip	Agriculture – Livestock Waste
Human Cremation	human_cremation_2810060100_emissions.zip	Miscellaneous Non-Industrial NEC

There are other sectors for which EPA expects that may overlap with the point source. In other words, some sources will be submitted as point sources and some sources are submitted as nonpoint, i.e., fuel combustion at commercial or institutional facilities. In these cases, EPA did not attempt to estimate the nonpoint emissions because these could cause double-counting with the state-supplied point sources. Rather, EPA required S/L/T agencies to prevent double-counting of emissions themselves. So, if a S/L/T agency submitted point sources, they were to also submit nonpoint emissions for which the emissions were reduced to account for the portion submitted as point sources. Table 19 lists these emissions sources.

Table 19: Emissions sources not estimated by EPA with potential nonpoint and point contribution

EPA-estimated emissions source description	Supporting data file name (see also Section 8)	EIS Sector Name
Industrial Fuel Combustion	fuel_comb_ici_epa_data.zip	Fuel Comb – Industrial Boilers, ICEs – All Fuels
Commercial/Institutional Fuel Combustion	fuel_comb_ici_epa_data.zip	Fuel Comb – Comm/Institutional – All Fuels
Industrial Surface Coating – Auto Refinishing	auto_refinishing_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Factory Finished Wood	factory_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Wood Furniture	wood_furniture_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Metal Furniture	metal_furniture_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Paper Foil and Film	paper_film_foil_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Metal Can Coating	metal_cans_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Sheet Strip and Coil	sheet_strip_coil_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Machinery and Equipment	machinery_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Large Appliances	large_appliance_epa_data2.zip	Solvent – Industrial Surface Coating & Solvent Use

EPA-estimated emissions source description	Supporting data file name (see also Section 8)	EIS Sector Name
Industrial Surface Coating – Electronic and other Electric Coatings	electronic_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Motor Vehicles	motorvehicles_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Aircraft	aircraft_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Marine	marine_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Railroad	railroads_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Surface Coating – Miscellaneous Manufacturing	misc_manufacturing_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Industrial Maintenance Coatings	56ndus_maintenance_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Other Special Purpose Coatings	other_special_epa_data.zip	Solvent – Industrial Surface Coating & Solvent Use
Degreasing	degreasing_epa_data.zip	Solvent – Degreasing
Graphic Arts	graphic_arts_epa_data.zip	Solvent – Graphic Arts
Dry Cleaning	dry_cleaning_epa_data.zip	Solvent – Dry Cleaning
Gasoline Distribution – Stage 1 Bulk Plants	gas_distrib_stage_1_bulk_plants_epa_data.zip	Bulk Gasoline Terminals
Gasoline Distribution – Stage 1 Bulk Terminals	gas_distrib_stage_1_bulk_terminals_epa_data.zip	Bulk Gasoline Terminals
Gasoline Distribution – Stage 1 Pipelines	gas_distrib_stage_1_pipelines_epa_data.zip	Industrial Processes – Storage and Transfer
Gasoline Distribution – Stage 1 Service Station Unloading	gas_distrib_serv_station_unloading_epa_data.zip	Gas Stations
Gasoline Distribution – Stage 1 Underground Storage Tanks	gas_distrib_stage_1_ust_breathing_and_ emptying_epa_data2.zip	Gas Stations
Gasoline Distribution – Stage 1 Trucks In Transit	gas_distrib_stage_1_tank_trucks_in_transit_ epa_format.zip	Industrial Processes – Storage and Transfer
Gasoline Distribution – Stage 2 Refueling at Pump	gas_distrib_stage2_epa_data.zip	Gas Stations

As part of the quality assurance, EPA examined whether some of these categories had VOC but not HAP VOC. Since many of these sectors are known and important emitters of HAP VOC, when VOC is provided without HAP VOC this is a clear case of missing emissions. For example, EIS sectors such as "Solvent - Consumer & Commercial Solvent Use" and "Solvent - Degreasing" are major emitters of HAP VOCs that are included in Table 19. Since we did not augment these sectors, the HAP VOC is missing in the released NEI data as well. To estimate the extent of the missing HAP VOC, we calculated ratios of HAP VOC to VOC for each SCC associated with these categories using data supplied by the states that did submit HAP VOC for those SCCs. We then applied those ratios by SCC to the VOC emissions from states and SCCs without associated HAP VOC. We

estimated that about 189,900 tons of HAP VOC are clearly missing from the inventory. We believe this to be a conservative estimate because it does not account for missing glycol ethers, missing PAH/POM or situations where states submitted only some of the VOC HAPs but not all of them. Note that this calculation of HAP VOC was made using a chemical definition of HAP VOC and not a regulatory definition, so that chemicals such as Tetrachloroethylene (a,k.a. PERC) that are not listed as VOCs for regulatory purposes were included in the mass estimate of missing emissions.

Table **20** below illustrates the breakout by EIS sector of the calculated missing HAP VOC. The largest estimated sources of missing HAP VOC are in the EIS sectors for consumer and commercial solvent use and industrial surface coating and solvent use, making up 68% of the total estimated missing HAP VOC.

Table 20: Solvent sectors nonpoint HAP-VOC and calculated missing HAP-VOC

EIS Sector	2008 NEI HAP-VOC	Missing HAP-VOC	Total
Solvent - Consumer & Commercial Solvent Use	172,443	78,151	250,594
Solvent - Degreasing	24,430	28,587	53,017
Solvent - Dry Cleaning	2,901	16,394	19,294
Solvent - Graphic Arts	18,032	13,606	31,638
Solvent - Industrial Surface Coating & Solvent Use	46,835	51,395	98,230
Solvent - Non-Industrial Surface Coating	58,929	1,793	60,721
Total	**323,569**	**189,926**	**513,495**

For a few emissions sources listed in Table 21, EPA did not create new 2008 estimates. Rather than have missing emissions where S/L/T agencies did not submit the data, EPA included data from past inventories. Where S/L/T agencies did submit emissions, these data are included rather than this fallback data. The 1999 NEI documentation referenced in the table is available at ftp://ftp.epa.gov/EmisInventory/finalnei99ver3/haps/documentation/nonpoint/nonpt99ver3_aug2003.pdf and the 2002 NEI documentation referenced in the table is available at ftp://ftp.epa.gov/EmisInventory/2002finalnei/documentation/nonpoint/2002nei_final_nonpoint_documentation0206version.pdf.

Table 21: Emissions sources using data from former EPA inventories

Emissions source	EIS Sector Name	Reference
Dental Preparation and Use	Miscellaneous Non-Industrial NEC	Documentation for the 1999 Base Year Nonpoint area source National Emission Inventory for HAPs, page A-30
General Laboratory Activities	Miscellaneous Non-Industrial NEC	Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and HAPs, page A-106
Lamp (fluorescent) Recycling	Miscellaneous Non-Industrial NEC	Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and HAPs, page A-109
Lamp (fluorescent) Breakage at Landfills	Miscellaneous Non-Industrial NEC	Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and HAPs, page A-107

Finally, there are some emissions sources for which we did not compute 2008 emissions nor use old inventories to fill in where states did not provide estimates. These sources are listed in Table 22 below. If a state within the NEI data does not include emissions for these emissions sources, then either that state does not have such sources or the state did not send EPA these emissions. The file "matrix_submittals for Version 2 Feb 13 2011.xlsx" has a list of submitting agencies and for what nonpoint sectors they submitted data (see Section 8.2 for access information).

Table 22: Emissions sources not included from EPA data sources

Emissions source	EIS Sector Name
Cotton Ginning	Agriculture – Crops
Grain Elevators	Agriculture – Crops & Livestock Dust
Commercial/Institutional Wood Combustion	Fuel Comb – Comm/Institutional – Biomass
Industrial Wood Combustion	Fuel Comb – Industrial Boilers, ICEs – Biomass
Oil and Gas Production	Industrial Processes – Oil & Gas Production
Animal Cremation	Miscellaneous Non-Industrial NEC
Drum and Barrel Reclamation	Miscellaneous Non-Industrial NEC
Hospital Sterilization	Miscellaneous Non-Industrial NEC
Structure Fires	Miscellaneous Non-Industrial NEC
Swimming Pools	Miscellaneous Non-Industrial NEC
Open Burning – Scrap Tires	Waste Disposal

Of this list, oil and gas production is the most significant source of emissions. EPA recommends that users of the NEI look to alternative data sources to fill in emissions from this emissions source, which was in a high growth pattern during calendar year 2008. For future inventories, EPA is developing a default method to ensure the oil and gas sector has emissions in future NEIs for all states that have this activity.

3.1.7 Additional Gap filling efforts targeted at high risk and specific mercury categories

EPA performed a targeted review with the help of S/L/T data submitters for facilities that had been identified as high risk in the 2005 NATA and for facilities in specific mercury source categories. The "high risk" facilities for our analysis were those that contributed greater than 100 in a million for cancer risk or produced a noncancer hazard index greater than 5 in the 2005 NATA. We provided to S/L/T agencies a "high risk" spreadsheet showing facility-level emissions of the risk driver pollutant(s) for these facilities. We excluded coke oven facilities from this list because they were covered under a separate review process. As part of the review spreadsheet, we included the emissions values from 2005NATA, 2008 TRI and 2008 S/L/T emissions (or blanks when not provided). Of the approximately 440 facilities included in the list, approximately 190 had 2008 S/L/T agency-submitted data for the risk driver pollutant. Where there were no S/L/T agency data, 140 had 2008 TRI data. We requested that the S/L/T agencies review the emissions, provide feedback, and provide data or their preferred approaches for gap filling where there was missing S/L/T values. We also requested that the S/L/T agencies provide the EIS process ID codes to allow us to assign any TRI facility-level emissions to the EIS/NEI processes. As a result of the review, we added additional data to the NEI through the datasets described in Table 8 by the following dataset short names: "2008TRI", "2008EPA_OTHER", and "2008EPA_05NATA_GAPFL". In some situations, states added emission or revised their own data through EIS, and so these revisions are reflected in the S/L/T datasets in EIS.

For the mercury review, we provided a review package for the following categories: Portland cement manufacturing, gold mining, electric arc furnaces, hazardous waste incineration, chemical manufacturing, mercury cell-chloralkali plants, municipal waste combustors, iron and steel foundries, and integrated iron and steel. In addition to 2005 NATA and 2008 TRI emissions values, we also included rule data that were available from the OAQPS rule developed. Unlike the high risk package, we only included facilities for which mercury emissions were missing from the 2008 S/L/T data or for which the S/L/T data were very different from TRI or the 2005 NATA. Similar to the high risk review, the mercury review resulted in the added emission data for the following datasets: "2008TRI", "2008EPA_OTHER", and "2008EPA_05NATA_GAPFL", as well as S/L/T agencies revising the data they provided EPA in EIS.

In most cases, the S/L/T agencies did not provide the allocation method to gap fill the facility emissions to the appropriate processes. As a result, we used our best judgment to do that, and some examples are as follows. For cement, we allocated all metal HAPs to the cement kilns. For electric arc furnaces, we allocated them to the melt shop or furnace. For a number of high risk facilities, it was not obvious how to allocate the emissions, so EPA used the S/L/T agency-reported CAP emissions (similar to the automated TRI approach) to allocate the HAPs to the processes. The allocation method is provided in the emissions comment field in the EIS results.

The review package results can be found in three separate spreadsheets (see Section 8.1 for access information): high_risk_nata2005_poll_forSLT_reviewed.xlsx (high risk), Hg_EAF_forSLT_reviewed.xlsx (EAF Hg), and HgFacilities_for_SLT_reviewed.xlsx (Hg other than EAFs).

In some cases, there was insufficient information to determine how to gap fill the emissions or whether the facility even operated in 2008. Those facilities are listed in Table 23 (for Hg) and Table 24 (for high risk). These facilities remain without emissions of Hg or the HAP risk driver pollutant in this version of the inventory.

Table 23: Hg-emitting Facilities in the S/L/T agency review process with insufficient information to gap fill

EIS FIPS	EIS State	EIS Facility ID	Category	EIS Facility Name	EIS company name	EIS Address	EIS City	NATA 2005 Hg (lbs) – facility total	NATA data source(s) | Year:
42101	PA	4950811	Hazardous Waste Incineration	Sunoco Chemicals (Former Allied Signal)	Na	4700 Bermuda Street	Philadelphia	5.569941	P | 2005
13245	GA	554311	Hazardous Waste Incineration	DSM Chemicals North America, Inc.	Na	1 Columbia Nitrogen Road	Augusta	2.257605	BOI-AUG | 2005, P | 2005
22019	LA	6425811	Hazardous Waste Incineration	Olin Corporation Lake Charles Plant	Olin Corporation	900-960 Interstate 10 West	Westlake	3.140196	P | 2005
49045	UT	7199411	Hazardous Waste Incineration	Tooele Army Depot	Tooele Army Depot	Environmental Management Division	Tooele	2.48208	BOI-AUG | 2005, P | 2005
22011	LA	7226211	Hazardous Waste Incineration	MeadWestvaco South Carolina LLC – Specialty Chemicals Division	MeadWestvaco South Carolina LLC	400 Crosby Rd	De Ridder	15.39388	P | 2005

EIS FIPS	EIS State	EIS Facility ID	Category	EIS Facility Name	EIS company name	EIS Address	EIS City	NATA 2005 Hg (lbs) – facility total	NATA data source(s) | Year:
22073	LA	7226711	Hazardous Waste Incineration	Angus Chemical Co	Angus Chemical Co	350 Hwy 2	Sterlington	1.023719	P | 2005
22005	LA	8465311	Hazardous Waste Incineration	Rubicon LLC – Geismar Plant	Rubicon LLC	9156 Hwy 75	Geismar	1.726265	P | 2005, S | 2005
22005	LA	8465611	Hazardous Waste Incineration	BASF Corp – Geismar Site	BASF Corp	8404 River Rd (Hwy 75)	Geismar	1.298019	P | 2005
***NATA data source code: T=TRI, S=State, L=Local, P is EPA data from rule development, BOI-AUG is boiler augmentation**									

Table 24: High Risk Facilities in the S/L/T agency review process with insufficient information to gap fill

EIS FIPS	EIS State	EIS Facility ID	EIS Facility Name	EIS Company Name	EIS Address	EIS City	High risk HAP	NATA Emissions (2005NATA) (lbs) – facility total	NATA data source(s) | Year*:
01047	AL	10553911	RENOSOL SEATING L.L.C		6 MEADOWCRAFT PKWY	SELMA	2,4-TOLUENE DIISOCYANATE	311.63	T | 2005
01015	AL	10569811	INDUSTRIAL PLATING CO. INC.		1300 CLYDESDALE AVE	ANNISTON	CHROMIUM (VI) COMPOUNDS	10	T | 2005
12031		4358511	APAC- SOUTHEAST, INC.	NA			ARSENIC COMPOUNDS	52.208	N | 2002
21093	KY	5345511	THE GATES CORP	NA	300 COLLEGE ST RD	ELIZABETHTOWN	2-CHLOROACETOPHENONE	437.184	N | 2002
22101	LA	5061311	COTE BLANCHE ISLAND TANK BATTERY #1	SWIFT ENERGY OPERATING LLC	10 MI E	CYPREMORT PT	BENZENE	14877.58	R | 2002, R | 2005
22005	LA	5985911	SCI FABRICATION SHOP	NA	36445 OLD PERKINS RD.	PRAIRIEVILLE	CHROMIUM (VI) COMPOUNDS	149	N | 2002
22017	LA	6116511	CADDO MANUFACTURING LLC	VIVIAN INDUSTRIAL PLASTICS INC	680 S PARDUE	VIVIAN	METHYLENE DIPHENYL DIISOCYANATE	4285	N | 2002, S | 2005
25025	MA	3959411	FEDERAL METAL FINISH	FEDERAL METAL FINISHING INC	18 DORRANCE ST	BOSTON	CHROMIC ACID (VI)	400	S | 2005
25025	MA	3959411	FEDERAL METAL FINISH	FEDERAL METAL FINISHING INC	18 DORRANCE ST	BOSTON	CHROMIC ACID (VI)	400	S | 2005
25025	MA	3959411	FEDERAL METAL FINISH	FEDERAL METAL FINISHING INC	18 DORRANCE ST	BOSTON	CHROMIC ACID (VI)	400	S | 2005
25025	MA	3959411	FEDERAL METAL FINISH	FEDERAL METAL FINISHING INC	18 DORRANCE ST	BOSTON	CHROMIC ACID (VI)	400	S | 2005
25013	MA	5922911	SUDDEKOR LLC	NA	240 BOWLES RD	AGAWAM	CHROMIUM (VI) COMPOUNDS	146	N | 2002
28035	MS	7071711	MISSISSIPPI TANK AND MANUFACTURING COMPANY	AI006151	3000 WEST SEVENTH STREET	HATTIESBURG	4,4'-METHYLENEDIANILINE	280	N | 2002
36103	NY	8535611	WEST BABYLON LANDFILL	NA	125 GLEAM ST	BABYLON	ACRYLONITRILE	1328.491	N | 1999
39155	OH	7330911	UNITED REFRACTORIES	NA	1929	WARREN	CHROMIUM (VI)	169	N | 2002

EIS FIPS	EIS State	EIS Facility ID	EIS Facility Name	EIS Company Name	EIS Address	EIS City	High risk HAP	NATA Emissions (2005NATA) (lbs) – facility total	NATA data source(s) | Year*:
			INC		LARCHMONT AVE.		COMPOUNDS		
39035	OH	7749211	A-BRITE PLATING CO	NA	3000 W. 121 ST.	CLEVELAND	CHROMIUM (VI) COMPOUNDS	255	T | 2005
39035	OH	7783011	ALCON INDS INC	NA	7990 BAKER AVE.	CLEVELAND	CHROMIUM (VI) COMPOUNDS	250	N | 2002
39035	OH	7783011	ALCON INDS INC	NA	7990 BAKER AVE.	CLEVELAND	NICKEL COMPOUNDS	250	N | 2002
39049	OH	7788911	CRANE PERFORMANCE SIDING L L C NORTH		1550 UNIVERSAL RD.	COLUMBUS	CHROMIUM (VI) COMPOUNDS	74.3	T | 2005
39169	OH	8425611	PREMIUM BUILDING PRODS CO	NA	13985 CONGRESS RD.	WEST SALEM	CHROMIUM (VI) COMPOUNDS	255	T | 2005
42029	PA	2983211	TEMTCO STEEL – PENNSYLVANIA DIV	NA	41 S. SECOND AVE.	PHOENIXVILLE	CHROMIUM (VI) COMPOUNDS	1574	T | 2005
42133	PA	3002111	ESAB GROUP INC	NA	801 WILSON AVENUE	HANOVER	CHROMIUM (VI) COMPOUNDS	250	T | 2005
42133	PA	3002811	PRECISION COMPONENTS CORP	NA	500 LINCOLN ST.	YORK	CHROMIUM (VI) COMPOUNDS	250	N | 2002
42071	PA	3059311	M H EBY INC	NA	1194 MAIN ST.	BLUE BALL	CHROMIUM (VI) COMPOUNDS	250	N | 2002
42095	PA	3744911	CHRIN BROS SANI LDFL/CHRIN LDFL	IESI PA BETHLEHEM LDFL CORP	635 INDUSTRIAL DR	EASTON	CADMIUM COMPOUNDS	691.8	N | 2002
42049	PA	3767111	STERIS CORP	NA	2424 W. 23RD ST.	ERIE	CHROMIUM (VI) COMPOUNDS	87	T | 2005
42091	PA	3848711	TUBE METHODS INC/BRIDGEPORT	GLOBAL PKG INC	RAMBO & DEPOT ST	BRIDGEPORT	TRICHLOROETHYLENE	33940	S | 2005
42121	PA	3893311	JOY TECH INC PLANT #1	NA	325 BUFFALO ST.	FRANKLIN	LEAD COMPOUNDS	1447	T | 2005
42013	PA	4701911	SKF USA INC ALTOONA PLANT	NA	1000 LOGAN BLVD.	ALTOONA	CHROMIUM (VI) COMPOUNDS	250	N | 2002
42081	PA	4952411	LYCOMING ENGINES/OLIVER ST PLT	TEXTRON LYCOMING	652 OLIVER ST	WILLIAMS PORT	CHROMIUM (VI) COMPOUNDS	304.8642	BOI-AUG | 2005, R | 2002, R | 2006
42041	PA	6464711	AMES TRUE TEMPER INC	NA	465 RAILROAD AVE.	CAMP HILL	NICKEL COMPOUNDS	500	N | 2002
42011	PA	7888811	SFS INTEC/WYOMISSING	SFS INTEC INC	SPRING ST & VAN REED RD	WYOMISSING	CHROMIUM (VI) COMPOUNDS	2480	N | 2002
42027	PA	7889111	GRAYMONT PA INC/PLEASANT GAP & BELLEFONTE PLTS	GRAYMONT PA INC	N THOMAS ST	BELLEFONTE	MANGANESE COMPOUNDS	1389.6002	BOI-AUG | 2005, S | 2005
42007	PA	8520511	TEGRANT DIVERSIFIED BRANDS INC/NEW BRIGHTON FAC	EATON CORP	BLOCKHOUSE RUN RD	NEW BRIGHTON	CHROMIUM (VI) COMPOUNDS	500	T | 2005
42007	PA	8520511	TEGRANT DIVERSIFIED BRANDS INC/NEW BRIGHTON FAC	EATON CORP	BLOCKHOUSE RUN RD	NEW BRIGHTON	MANGANESE COMPOUNDS	500	T | 2005
45045	SC	3965911	STEVENS AVIATION:DONALDSON PARK	NA	600 DELAWARE ST, DONALDSON RD	GREENVILLE	STRONTIUM CHROMATE	1061.464	R | 2006, R | 2002

***NATA data source code: T=TRI, S=State, L=Local, R,P is EPA data from rule development, BOI-AUG is boiler augmentation**

3.2 Agriculture – Crops & Livestock Dust

[Placeholder. See also Section 3.1 and Appendix B]

3.3 Agriculture – Fertilizer Application

[Placeholder. See also Section 3.1 and Appendix B]

3.4 Agriculture – Livestock Waste

3.4.1 Sector Description

Livestock refers to domesticated animals intentionally reared for the production of food, fiber, or other goods or for the use of their labor. The definition of livestock in this category includes beef cattle, dairy cattle, ducks, geese, goats, horses, poultry, sheep, and swine.

3.4.2 Sources of data overview and selection hierarchy

The agricultural livestock waste sector includes data from four components: 2 EPA overwrite datasets, the S/L/T agency submitted data, and the default EPA generated livestock emissions.

The agencies listed in Table 25 submitted emissions for this sector.

Table 25: Agencies that Submitted Livestock Waste Data

Agency	Type
Chattanooga Air Pollution Control Bureau	Local
Maricopa County Air Quality Department	Local
Arizona Department of Environmental Quality	State
California Air Resources Board	State
Delaware Deparment of Natural Resources and Environmental Control	State
Hawaii Department of Health Clean Air Branch	State
Idaho Department of Environmental Quality	State
Illinois Environmental Protection Agency	State
Kansas Department of Health and Environment	State
Louisiana Department of Environmental Quality	State
Maine Department of Environmental Protection	State
Maryland Department of the Environment	State
New Jersey Department of Environment Protection	State
North Carolina Department of Environment and Natural Resources	State
Ohio Environmental Protection Agency	State
Tennessee Department of Environmental Conservation	State
Utah Division of Air Quality	State
Kootenai Tribe of Idaho	Tribal
Little River Band of Ottawa Indians, Michigan	Tribal
Nez Perce Tribe of Idaho	Tribal
Omaha Tribe of Nebraska	Tribal
Prairie Band Potawatomi Nation	Tribal
Sac & Fox Nation of Missouri in Kansas and Nebraska	Tribal
Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho	Tribal

Agency	Type
Washoe Tribe of California and Nevada	Tribal

Table 26 shows the selection hierarchy for the agricultural livestock waste sector.

Table 26: 2008 NEI agricultural livestock data selection hierarchy

Priority	Dataset Name	Dataset Content
1	EPA Overwrite Point v1.5	Overwrites NH3 data from this sector in California to replace with the EPA dataset (see also Section 3.4.5)
2	EPA PM Augmentation, V2	Augments small amounts of PM emissions in Colorado, Texas, and Wisconsin
3	State/Local/Tribal Data	Agency submitted emissions
4	EIAG all in NP	EPA-generated data, including livestock waste emissions (see Section 3.4.4)

3.4.3 Spatial coverage and data sources for the sector

[Placeholder for maps of CAP and HAP emissions]

3.4.4 EPA-developed livestock waste emissions data

EPA's approach to calculating emissions for this sector consisted of four general steps, as follows:

- Determine county-level activity data, i.e., the population of animals for 2007 (see Section 3.4.4.1).
- For beef, dairy, poultry, and swine, apportion animal populations to a manure management train (MMT) for each county (see Section 3.4.4.2). Animal populations for ducks, geese, goats, horses, and sheep were not apportioned to MMTs.
- Modify the emission factor files provided with the Carnegie Mellon University (CMU) Ammonia Model v. 3.6 (Davidson et al., 2004) to ensure that every county had an assigned emission factor (see Section 3.4.4.3).
- Use the CMU Ammonia Model v. 3.6 to calculate ammonia emissions based on the updated county-level animal populations and emission factors (see Sections 3.4.4.4 and 3.4.4.5).

For this source category, EPA computed emissions for the SCCs listed in Table 27. S/L/T submitted other SCCs in some cases.

Table 27: Source Classification Codes used in the agricultural livestock sector

SCC	SCC Description, level 3	SCC Descriptions, level 4
2805001100	Beef cattle - finishing operations on feedlots (drylots)	Confinement
2805001200	Beef cattle - finishing operations on feedlots (drylots)	Manure handling and storage
2805001300	Beef cattle - finishing operations on feedlots (drylots)	Land application of manure
2805002000	Beef cattle production composite	Not Elsewhere Classified
2805003100	Beef cattle - finishing operations on pasture/range	Confinement
2805007100	Poultry production – layers with dry manure management systems	Confinement
2805007300	Poultry production – layers with dry manure management systems	Land application of manure

SCC	SCC Description, level 3	SCC Descriptions, level 4
2805008100	Poultry production – layers with wet manure management systems	Confinement
2805008200	Poultry production – layers with wet manure management systems	Manure handling and storage
2805008300	Poultry production – layers with wet manure management systems	Land application of manure
2805009100	Poultry production – broilers	Confinement
2805009200	Poultry production – broilers	Manure handling and storage
2805009300	Poultry production – broilers	Land application of manure
2805010100	Poultry production – turkeys	Confinement
2805010200	Poultry production – turkeys	Manure handling and storage
2805010300	Poultry production – turkeys	Land application of manure
2805018000	Dairy cattle composite	Not Elsewhere Classified
2805019100	Dairy cattle – flush dairy	Confinement
2805019200	Dairy cattle – flush dairy	Manure handling and storage
2805019300	Dairy cattle – flush dairy	Land application of manure
2805021100	Dairy cattle – scrape dairy	Confinement
2805021200	Dairy cattle – scrape dairy	Manure handling and storage
2805021300	Dairy cattle – scrape dairy	Land application of manure
2805022100	Dairy cattle – deep pit dairy	Confinement
2805022200	Dairy cattle – deep pit dairy	Manure handling and storage
2805022300	Dairy cattle – deep pit dairy	Land application of manure
2805023100	Dairy cattle – drylot/pasture dairy	Confinement
2805023200	Dairy cattle – drylot/pasture dairy	Manure handling and storage
2805023300	Dairy cattle – drylot/pasture dairy	Land application of manure
2805025000	Swine production composite	Not Elsewhere Classified (see also 28-05-039, -047, -053)
2805030000	Poultry Waste Emissions	Not Elsewhere Classified (see also 28-05-007, -008, -009)
2805030007	Poultry Waste Emissions	Ducks
2805030008	Poultry Waste Emissions	Geese
2805035000	Horses and Ponies Waste Emissions	Not Elsewhere Classified
2805039100	Swine production – operations with lagoons (unspecified animal age)	Confinement
2805039200	Swine production – operations with lagoons (unspecified animal age)	Manure handling and storage
2805039300	Swine production – operations with lagoons (unspecified animal age)	Land application of manure
2805040000	Sheep and Lambs Waste Emissions	Total
2805045000	Goats Waste Emissions	Not Elsewhere Classified
2805047100	Swine production – deep-pit house operations (unspecified animal age)	Confinement
2805047300	Swine production – deep-pit house operations (unspecified animal age)	Land application of manure
2805053100	Swine production – outdoor operations (unspecified animal age)	Confinement

3.4.4.1 Activity Data

County-level animal population numbers for 2007 were obtained from the U.S. Department of Agriculture's 2007 Census of Agriculture report (http://www.agcensus.usda.gov/ accessed April 30, 2009). 2007 data were used because they were the most recent available at the time these estimates were prepared. For Virginia, the county-level census data includes animal populations from Virginia's 39 independent cities. For some counties

and states, census data were withheld to avoid disclosing data for individual farms. However, the total national-level animal numbers and most state-level animal numbers for each livestock type reported in the Census include those animal numbers not disclosed at the county-level. When available, state-level animal numbers from the United States Department of Agriculture (USDA) National Agriculture Statistical Service (NASS) online database (http://www.nass.usda.gov/Data_and_Statistics/Quick_Stats/, accessed 28 January 2010) were used for states with undisclosed animal numbers in the 2007 Census of Agriculture. To determine the total number of undisclosed animals, we summed and subtracted disclosed county-level animal numbers for each livestock type from the total state animal numbers. The total undisclosed animal population for a specific livestock type was then allocated to those counties reporting undisclosed data proportionally based on the number of farms raising that livestock in each county. If the state-level data were undisclosed and not available in the NASS database, then national animal numbers were used to determine undisclosed state numbers in a manner similar to the case where counties had undisclosed data. We then summed and subtracted the disclosed county-level data from the state-level data to determine animal numbers not disclosed at the county-level. We then allocated the difference to those counties with undisclosed data proportionally based on the number of farms raising that livestock in each county. States that had undisclosed data at the state level are as follows: for broilers, Massachusetts and Rhode Island; for layers, Arizona, Connecticut, Delaware, Idaho, Kansas, Maine and New Mexico; for turkeys, Colorado and Oklahoma; for pullets, Arizona, Connecticut, Delaware, Hawaii, Idaho, Kansas, Massachusetts, New Mexico, North Dakota, and South Dakota; and for ducks, New Jersey and Utah.

3.4.4.2 Apportion activity data to manure management trains

To run the model using 2007 animal population, it was necessary to match the 2007 animal information to the CMU model's (v3.6) input files, which were based on 2002 animal population and MMTs. We apportioned the 2007 county-level animal population data to MMTs based on data available in the model. A MMT consists of an animal confinement area (e.g., drylot, pasture, flush, scrape); components used to store, process, or stabilize the manure (e.g., anaerobic lagoons, deep pits); and a land application site where manure is used as a fertilizer source (US EPA, 2005). It is important to apportion the animal populations to MMTs because it has a large impact on the emissions estimates in the CMU model for the animals using that approach. Not all animals types were apportioned to MMTs. MMTs for ducks, geese, goats, horses, and sheep are not a part of the model. Also, some animal category names did not match the category names currently in the model. See the example of "Other Cattle" described below.

The apportionment was based on county-level MMT percentages derived from the CMU Ammonia Model v3.6, which was originally developed for a 2002 inventory year. For each livestock type, we divided the CMU Model's 2002 county-level number of animals in each MMT by the total county-level animal population for that livestock type to calculate the percentage of total animals managed by each MMT. In cases where the county-level numbers were zero in the CMU Ammonia Model and the county animal population in 2007 for that MMT was not zero, we assigned the county state-level MMT percentages. We then multiplied the county-level animal population for each livestock type by the MMT percentages to apportion the 2007 animal populations to each MMT. The result of this approach is that the proportion of animals in each MMT is unchanged from the CMU model's 2002-based approach to the 2008 NEI.

Cattle reported as "Other Cattle" in the 2007 Census of Agriculture were divided between dairy cattle and beef cattle at the county-level using percent allocations derived from county-level dairy and beef cattle reported in the 2007 Census of Agriculture and corrected for undisclosed data. The animal numbers from "Other Cattle"

apportioned to dairy and beef cattle were used to grow the "Dairy Cattle – Composite and Beef Cattle – Composite" activity input files from 2002 to 2007 for input to the CMU Ammonia Model.

County-level pullet numbers reported in the 2007 Census of Agriculture were used to grow the "Poultry – Composite" activity input file from 2002 to 2007 for input to the CMU Ammonia Model.

3.4.4.3 Emission Factors

Table 28 provides information on emission factors used in the EPA emissions estimate. The table lists "county" for county-specific emission factors, and "state" for state-specific emission factors. The emission factor for the poultry composite categories was obtained from an EPA report (US EPA, 2005). The county-level emission factors for the beef composite and dairy composite categories were developed using beef and dairy cattle emission factors provided with the CMU Model. Specifically, weighted average emission factors were calculated based on the number of beef or dairy cattle in each MMT from the CMU Model's 2002 activity files and the emission factor assigned to each MMT. The calculations made for the beef composite are available in the file "County-Level Emission Factors for Beef Composite.xls", and the calculations for the dairy composite are available in the file "County-level Emission factors for Diary Component.xls" (see Section 8.1 for access information, specifically the ReadMe.doc file listed in the ag_livestock_waste folder of Table 64). All other emission factors are consistent with those included in the CMU Ammonia Model v.3.6.

The emission factors for some counties in the CMU Ammonia Model files were zero. To ensure that all counties with animal populations were assigned emissions factors, the emission factor input files provided with the CMU Ammonia Model were modified. For all counties with an emission factor of zero, the emission factor was replaced with the state average emission factor. If all counties in the state had emission factors of zero, then the county emission factor was replaced with the national average emission factor.

The state average emission factor was calculated by summing the counties with non-zero emission factors in the state and dividing the total by the number of counties in that state with non-zero emission factors. The national average emission factors listed in the table were calculated by summing the counties with non-zero emission factors in the nation and dividing the total by the number of counties in the nation with non-zero emission factors. The final county-specific and state-specific emission factors are available in the file "Emission Factors for Ag animal husbandry 2008v2.xlsx" (see Section 8.1 for access information, specifically the ReadMe.doc file listed in the ag_livestock_waste folder of Table 64).

Table 28: Emission Factors for NH3 emissions used for EPA's agricultural livestock data

Description	Emission Factor	Emission Factor Unit	Emission Factor Reference (see footnotes)
Beef Cattle – Composite	county	kg NH_3/cow/month	2
Beef Cattle – Drylot Operation – Confinement	9.45E-01	kg NH_3/cow/month	1
Beef Cattle – Drylot Operation – Land Application	state	kg NH_3/cow/month	1
Beef Cattle – Drylot Operation – Manure Storage	3.78E-04	kg NH_3/cow/month	1
Beef Cattle – Pasture Operation – Confinement	county	kg NH_3/cow/month	1
Dairy Cattle – Composite	county	kg NH_3/cow/month	2
Dairy Cattle – Deep Pit Dairy Confinement	2.42E+00	kg NH_3/cow/month	1
Dairy Cattle – Deep Pit Dairy Land Application	state	kg NH_3/cow/month	1
Dairy Cattle – Deep Pit Dairy Manure Storage	1.13E-01	kg NH_3/cow/month	1
Dairy Cattle – Drylot Dairy Confinement	state	kg NH_3/cow/month	1
Dairy Cattle – Drylot Dairy Land Application	state	kg NH_3/cow/month	1

Description	Emission Factor	Emission Factor Unit	Emission Factor Reference (see footnotes)
Dairy Cattle – Drylot Dairy Manure Storage	state	kg NH_3/cow/month	1
Dairy Cattle – Flush Dairy Confinement	2.00E+00	kg NH_3/cow/month	1
Dairy Cattle – Flush Dairy Land Application	state	kg NH_3/cow/month	1
Dairy Cattle – Flush Dairy Manure Storage	state	kg NH_3/cow/month	1
Dairy Cattle – Scrape Dairy Confinement	state	kg NH_3/cow/month	1
Dairy Cattle – Scrape Dairy Land Application	state	kg NH_3/cow/month	1
Dairy Cattle – Scrape Dairy Manure Storage	state	kg NH_3/cow/month	1
Ducks	7.67E-02	kg NH_3/duck/month	1
Geese	7.67E-02	kg NH_3/goose/month	1
Goats	5.29E-01	kg NH_3/goat/month	1
Horses	1.02E+00	kg NH_3/horse/month	1
Poultry – Broiler Operation – Confinement	8.32E-03	kg NH_3/bird/month	1
Poultry – Broiler Operation – Land Application	6.80E-03	kg NH_3/bird/month	1
Poultry – Broiler Operation – Manure Storage	1.51E-03	kg NH_3/bird/month	1
Poultry – Composite	2.00E-02	kg NH_3/bird/month	3
Poultry – Layers – Dry Manure Operation – Confinement	3.36E-02	kg NH_3/bird/month	1
Poultry – Layers – Dry Manure Operation – Land Application	county	kg NH_3/bird/month	1
Poultry – Layers – Wet Manure Operation – Confinement	9.45E-03	kg NH_3/bird/month	1
Poultry – Layers – Wet Manure Operation – Land Application	county	kg NH_3/bird/month	1
Poultry – Layers – Wet Manure Operation – Manure Storage	county	kg NH_3/bird/month	1
Poultry – Turkey Operation – Confinement	3.78E-02	kg NH_3/bird/month	1
Poultry – Turkey Operation – Land Application	3.40E-02	kg NH_3/bird/month	1
Poultry – Turkey Operation – Storage	6.80E-03	kg NH_3/bird/month	1
Sheep	2.65E-01	kg NH_3/sheep/month	1
Swine – Composite	county	kg NH_3/pig/month	1
Swine – Deep Pit Operation – Confinement	2.65E-01	kg NH_3/pig/month	1
Swine – Deep Pit Operation – Land Application	county	kg NH_3/pig/month	1
Swine – Lagoon Operation – Confinement	2.27E-01	kg NH_3/pig/month	1
Swine – Lagoon Operation – Land Application	county	kg NH_3/pig/month	1
Swine – Lagoon Operation – Manure Storage	county	kg NH_3/pig/month	1
Swine – Outdoor Operation – Confinement	county	kg NH_3/pig/month	1

[1] Davidson, et al., 2004

[2] Dorn, 2009

[3] US EPA, 2005

3.4.4.4 Emissions

The livestock activity files provided with the CMU Ammonia Model v.3.6 were replaced with the updated county-level animal population files (Sections 3.4.4.1 and 3.4.4.2) and modified emission factors files. We then ran the CMU Ammonia Model v.3.6 to create county/SCC ammonia emissions. EPA's county-level emissions can be found in the supporting materials in the file "animal_husbandry_epa_data.zip" as listed in Table 18, Section 3.1.6. See also Section 8.1 for data access information.

3.4.4.5 Sample Calculations

Allocation of Undisclosed Data

From the 2007 Census of Agriculture, the total national number of beef cattle in Alabama is 678,949. The total number of beef cattle disclosed at the county-level is 388,827.

Total number of beef cattle undisclosed at the county-level = 678,949 – 338,827 = 340,122

From the 2007 Census of Agriculture, the total number of farms in Alabama not disclosing beef cattle numbers is 10,518.

Average beef cattle per farm not disclosing data = 340,122 / 10,518 = 32.3

For 2007, Baldwin County, Alabama beef cattle data were not disclosed. The total number of farms with beef cattle in Baldwin County is 343.

Estimated number of beef cattle in Baldwin County = 32.3 x 343 = 11,092

Manure Management Train

From the 2002 CMU Ammonia Model input files, Chilton County, Alabama had 79 beef cattle under drylot management and 18,900 beef cattle under pasture management in 2002.

Total beef cattle = 79 + 18,900 = 18,979

% of beef cattle under drylot management = 79 / 18,979 = 0.42

% of beef cattle under pasture management = 18,900 / 18,979 = 99.58

The total number of beef cattle for Chilton County reported in the 2007 Census of Agriculture is 7,939.

Number of beef cattle under drylot management in 2007 = 7,939 x 0.0042 = 33

Number of beef cattle under pasture management in 2007 = 7,939 x 0.9958 = 7,906

"Other Cattle"

For Clay County, Alabama, the 2007 Census of Agriculture reports the number of "Other Cattle" as 5,471, the number of dairy cattle as 216, and the number of beef cattle as 9,096.

Total beef and dairy cattle reported = 216 + 9,096 = 9,312

% of other cattle assigned to beef cattle = (9,096/9,312)*100 = 97.68

% of other cattle assigned to dairy cattle = (216/9,312)*100 = 2.32

Other cattle allocated to beef cattle = 5,471 x .9768 = 5,344

Other cattle allocated to dairy cattle = 5,471 x 0.0232 = 127

3.4.5 Summary of quality assurance methods

The EPA data for 2008 and 2005 were compared to the state-submitted data at the state-SCC level and in the case of local county agencies, at the county-SCC level. Findings are below.

- For Idaho, Illinois, Utah, Kansas, and Maricopa County, double-counting of EPA and state data occurred. This was corrected by removing the EPA data, thus allowing only agency data to be selected.

- California data were significantly higher than EPA's and all at one SCC. The state wanted to submit updated emissions but due to timing issues, was unable to accomplish. EPA chose to block the state data from being selected and therefore the EPA data were selected. CA agreed with this approach.
- North Carolina data were about 1/12 of the EPA data. Confirmed with NC staff that their submittal looked more like monthly data than annual. NC resubmitted correct annual data for 2008 NEI, version 2.

3.5 Bulk Gasoline Terminals

[Placeholder. See also Section 3.1 and Appendix B]

3.6 Commercial Cooking

[Placeholder. See also Section 3.1 and Appendix B]

3.7 Dust – Construction Dust

[Placeholder. See also Section 3.1 and Appendix B]

3.8 Dust – Paved Road Dust

[Placeholder. See also Section 3.1 and Appendix B]

3.9 Dust – Unpaved Road Dust

[Placeholder. See also Section 3.1 and Appendix B]

3.10 Fuel Combustion – Electric Generation

This section includes the description of five EIS sectors:

- Fuel Comb – Electric Generation – Coal
- Fuel Comb – Electric Generation – Oil
- Fuel Comb – Electric Generation – Natural Gas
- Fuel Comb – Electric Generation – Biomass
- Fuel Comb – Electric Generation – Other

They are treated here in a single section because the methods used are the same across all sectors.

3.10.1 Sector Description

These five sectors are defined by the point source SCCs beginning with 1-01 and 2-01. There are no nonpoint contributions to this sector. These SCCs include boilers, combustion gas turbines, combined cycle units, and reciprocating engines firing any type of fuel for the purpose of turning a generator connected to the electrical grid. The primary fuels used by the boilers are coal and natural gas. A much smaller number of oil and wood-fired boilers are also included in the oil and natural gas sectors. Various waste or by-products such as municipal waste, bagasse, petroleum coke, and tires are also used in some boilers. The primary fuel used by the combustion gas turbines and combined cycle units is natural gas, although some distillate oil is also used. The reciprocating engines are generally much smaller in terms of generating capacity and also much less efficient than either the boilers and steam turbines or the combustion gas turbines. The engines are primarily fired by natural gas or diesel oil, but there are some which use various available waste gases, such as landfill gas.

The SCC-based EIS sector definitions will cause a different universe of units to be included in these sectors than would other definitions of EGUs. For example, the EIS sector definitions do not include a heat input or generator

output size threshold. In contrast, some EPA regulatory applications define EGUs to include only units with capacity greater than 25 MW. Many of the engines and some of the combustion gas turbines in the EIS sectors for EGUs are well below 25 MW generating capacity. The boilers and steam turbine-generators, and particularly those fired on coal, are almost always greater than 25 MW capacity, except for some older units.

The use of SCCs in the NEI by S/L/T agencies impacts the units included in these EIS sectors. There are some boilers and gas turbines in industrial facilities which cogenerate both electricity for distribution to the public power grid and process steam for their internal use. Some S/L/T agencies reporting to the NEI use an SCC (1-01 or 2-01) that would include these units in one of the EGU sectors, while others use an Industrial (1-02 or 2-02) or a Commercial/Institutional (1-03 or 2-03) SCC. This can result in boilers or gas turbines not connected to the public power grid being included in these EGU sectors, with the SCC assigned based upon either strictly their large size (some EPA references to utility boilers have cited them as greater than 100 mmBTU/Hr heat input) or because they may generate electrical power for internal consumption.

3.10.2 Sources of data overview and selection hierarchy

The EGU sectors includes data from three EPA overwrite datasets, emissions based on data from the MATS rule development, the S/L/T agency submitted data, and four other EPA generated datasets that impact this sector.

The agencies listed in Table 29 submitted emissions for these sectors. A box with a “X” means that the agency submitted data for EGU units included in that EGU fuel group for the individual EIS Sectors.

Table 29: Agencies that Submitted EGU data

Agency	Type	Coal	Oil	Natural Gas	Biomass	Other
Alabama Department of Environmental Management	State	X	X	X	X	X
Alaska Department of Environmental Conservation	State	X	X	X		X
Allegheny County Health Department	Local	X	X	X	X	
Arizona Department of Environmental Quality	State	X	X	X	X	X
Arkansas Department of Environmental Quality	State	X	X	X	X	X
California Air Resources Board	State	X	X	X	X	X
Chattanooga Air Pollution Control Bureau	Local		X	X		
City of Albuquerque	Local		X	X		X
Clark County Department of Air Quality and Environmental Management	Local		X	X		
Colorado Department of Public Health and Environment	State	X	X	X		X
Connecticut Department Of Environmental Protection	State		X	X		X
DC Department of Health Air Quality Division	State		X			
Delaware Deparment of Natural Resources and Environmental Control	State	X	X	X		X
Florida Department of Environmental Protection	State	X	X	X	X	X
Forsyth County Environmental Affairs Department	Local		X			X
Georgia Department of Natural Resources	State	X	X	X	X	X
Hawaii Department of Health Clean Air Branch	State	X	X			X
Illinois Environmental Protection Agency	State	X	X	X	X	X
Indiana Department of Environmental Management	State	X	X	X		X
Iowa Department of Natural Resources	State	X	X	X	X	X
Jefferson County (AL) Department of Health	Local	X	X	X		
Kansas Department of Health and Environment	State	X	X	X		X
Kentucky Division for Air Quality	State	X	X	X	X	X
Lincoln/Lancaster County Health Department	Local	X				
Louisiana Department of Environmental Quality	State	X	X	X		X
Louisville Metro Air Pollution Control District	Local	X	X	X		
Maine Department of Environmental Protection	State		X	X	X	X
Maryland Department of the Environment	State	X	X	X		X
Massachusetts Department of Environmental Protection	State	X	X	X	X	X
Mecklenburg County Air Quality	Local		X			
Memphis and Shelby County Health Department – Pollution Control	Local	X	X	X		X
Metro Public Health of Nashville/Davidson County	Local		X	X		X
Michigan Department of Environmental Quality	State	X	X	X	X	X
Minnesota Pollution Control Agency	State	X	X	X	X	X
Mississippi Dept of Environmental Quality	State	X	X	X		
Missouri Department of Natural Resources	State	X	X	X	X	X
Montana Department of Environmental Quality	State	X	X	X		X
Navajo Nation	Tribal	X				

Agency	Type	Coal	Oil	Natural Gas	Biomass	Other
Nebraska Environmental Quality	State	X	X	X	X	X
Nevada Division of Environmental Protection	State	X	X	X		X
New Hampshire Department of Environmental Services	State	X	X	X	X	X
New Jersey Department of Environment Protection	State	X	X	X		X
New Mexico Environment Department Air Quality Bureau	State	X	X	X		
New York State Department of Environmental Conservation	State	X	X	X	X	X
North Carolina Department of Environment and Natural Resources	State	X	X	X	X	X
North Dakota Department of Health	State	X	X	X		
Ohio Environmental Protection Agency	State	X	X	X	X	X
Oklahoma Department of Environmental Quality	State	X	X	X		X
Olympic Region Clean Air Agency	Local		X	X		
Omaha Air Quality Control Division	Local	X				
Oregon Department of Environmental Quality	State	X	X	X	X	X
Pennsylvania Department of Environmental Protection	State	X	X	X	X	X
Philadelphia Air Management Services	Local	X	X	X		X
Pinal County	Local	X		X		
Puget Sound Clean Air Agency	Local		X	X		X
Rhode Island Department of Environmental Management	State		X	X		X
South Carolina Department of Health and Environmental Control	State	X	X	X	X	X
Southern Ute Indian Tribe	Tribal			X		X
Tennessee Department of Environmental Conservation	State	X	X	X	X	X
Texas Commission on Environmental Quality	State	X	X	X		X
Utah Division of Air Quality	State	X	X	X		
Vermont Department of Environmental Conservation	State		X			
Virginia Department of Environmental Quality	State	X	X	X	X	X
Washington State Department of Ecology	State	X	X	X	X	X
Washoe County Health District	Local		X			X
West Virginia Division of Air Quality	State	X	X	X	X	X
Western North Carolina Regional Air Quality Agency (Buncombe Co.)	Local	X	X	X		
Wisconsin Department of Natural Resources	State	X	X	X	X	X
Wyoming Department of Environmenal Quality	State	X	X	X		X

Table 30 shows the selection hierarchy for the EGU sectors. A box with a “X” means that the dataset contributed to the EGU sector for that fuel group.

Table 30: 2008 NEI EGU data selection hierarchy by EGU fuel groups from EIS Sectors

Priority	Dataset Name	Dataset Contents and Impact	Coal	Oil	Natural Gas	Biomass	Other
1	EPA Overwrite Point v1.5	Overwrites PM emissions from Pennsylvania. See also Table 8 and Appendix C.	X	X	X		
2	EPA PM Augmentation, V2	Augments PM data in 47 states and some tribes (see Section 3.1.2)	X	X	X	X	X
3	EPA Chromium Split v2	Splits total chromium into speciated chromium in 37 states (see Section 3.1.3)	X	X	X	X	X
4	2008 MATS-based EGU emissions (2008EPA_MATS)	Overwrites Hg, other metals, and acid gases to use data from the MATS rule in 49 states and some tribes (see Section 3.10.5)	X	X	X	X	X
5	State/Local/Tribal Data	Agency submitted emissions	X	X	X	X	X
6	EPA EGU v1.5	Augments CAP and HAP emissions in 46 states and some tribes (see Section 3.10.5).	X	X	X	X	X
7	2008 EPA Rule Data from OAQPS/SPPD	Adds Hg: 2 lbs in California, 130 lbs in Indiana, and 22 lbs in Missouri	X				X
8	EPA NV Gold Mines	Adds 41 lbs of Hg in Nevada		X			
9	EPA TRI Augmentation v2	Adds Pb and other HAP emissions in 26 states (see Section 3.1.4)	X	X	X	X	X
10	EPA HAP Augmentation v2	Adds Pb and other HAP emissions in 46 states (see Section 3.1.5)	X	X	X	X	X

3.10.3 Spatial coverage and data sources for the sector

[Placeholder for maps of CAP and HAP emissions]

3.10.4 Overwrite datasets used for EGUs

The three overwrite datasets listed in Table 30 include the main overwrite dataset "EPA Overwrite Point v1.5" used to eliminate problematic or conflicting records from the agency submissions, the "EPA PM Augmentation, V2" previously described in Section 3.1.2, and the "EPA Chromium Split v2", previously described in Section 3.1.3. Of these datasets, the first has very little impact, simply overwriting some erroneous Pennsylvania PM records. The chromium split only splits the mass of emissions provided by states rather than add mass, however, this split is important for uses of the inventory that estimate toxics risk, since the hexavalent portion of the chromium drives the risk.

The PM Augmentation dataset has the most impact on this sector, contributing 36% of the total PM10 mass and 40% of the total PM2.5 to these sectors. Table 31 provides the emissions contribution from all S/L/T agencies and from the EPA PM augmentation data for each of the EIS sectors associated with EGUs.

Table 31: Agency-submitted, PM Augmentation, and total PM10 and PM2.5 emissions for EGU sectors (short tons/year)

EIS Sector	PM10 Agency (tons)	PM10 Aug (tons)	PM10 Total (tons)	PM2.5 Agency (tons)	PM2.5 Aug (tons)	PM2.5 Total (tons)
Fuel Comb – Electric Generation – Biomass	1,244	546	1,789	429	1,041	1,469
Fuel Comb – Electric Generation – Coal	239,619	130,111	369,730	170,720	104,943	275,662
Fuel Comb – Electric Generation – Natural Gas	11,950	9,481	21,431	10,464	9,758	20,222
Fuel Comb – Electric Generation – Oil	4,983	6,312	11,295	4,033	5,416	9,449
Fuel Comb – Electric Generation – Other	1,379	1,106	2,485	890	1,046	1,935
Total	**259,174**	**147,556**	**406,730**	**186,534**	**122,203**	**308,738**

3.10.5 EPA-developed EGU emissions data

In addition to the S/L/T-reported data, EPA developed two separate emissions datasets specifically for EGUs. The first EPA dataset developed (EPA EGU v1.5 in EIS) made use of the hourly SO2 and NOx continuous emissions monitoring (CEM) data and hourly heat input values reported by facilities to EPA's Clean Air Market Division (CAMD). The annual sum of the reported heat input values for 2008 were used to estimate emissions for a set of CAP and HAP pollutants (dependent upon unit type and primary fuel), and the annual SO2 and NOx sums were used directly, for a set of 1984 emission units at 751 different facilities. These units included coal-fired boilers (74 pollutants, including the SO2 and NOx), oil-fired boilers (41 pollutants), gas-fired boilers (39 pollutants), gas-fired simple turbines and combined cycle units (18 pollutants), and petroleum coke-fired boilers (73 pollutants).

In some applications, the NEI is compared against future-year emissions estimated by the IPM model. This model predicts SO2, NOX, Hg, and HCl as part of its primary functions and uses emission factors for these pollutants that reflect the future-year controls associated with the individual units. Other pollutants such as VOC, PM2.5, PM10, and metal HAPs are estimated using IPM post-processing. The emission factors used for the EPA EGU v1.5 dataset were consistent with the factors used by the IPM post-processing. However, for many of the EGU units for HAPs (including Hg and HCl), the dataset based on MATS (described below) supersedes this dataset. The starting point for the EPA EGU v1.5 dataset from CAMD is "CAMD08annualallprg_103009.txt", and it is available with the other supporting materials (see Section 8.1 for access information). More information on the approach used is available in Rothschild (2010).

In the 2008 NEI v2 selection hierarchy, the EPA EGU v1.5 dataset was used after any S/L/T-reported emissions for these emission units, except for one State and one local agency. For Connecticut, the State-reported values for SO2 and NOx were noted to be significantly lower than the CEM values available from the original CAMD data and therefore lower than the EPA EGU v1.5 dataset. For Douglas County, Nebraska, the emissions had been reported by the local agency as single facility-wide totals for each facility, rather than the individual unit emissions available in the CEM and heat input derived dataset. For these two locations only, the S/L data were selected after the EPA EGU v1.5 dataset.

The second EPA EGU emissions dataset (2008EPA_MATS in EIS) was developed after v1.5 of the 2008 NEI had been released. This dataset was for a smaller subset of units than covered by the first dataset, and for only a portion of the HAPs, with no CAPs except for Pb. The emission units included in the 2008EPA_MATS dataset were those electric utility coal and oil-fired units greater than 25 MW expected to be regulated by the MATS rule finalized by EPA in December 2011. This included 1194 emission units at 491 facilities. The set of pollutants estimated in this dataset included hydrochloric and hydrofluoric acid gases and hydrogen cyanide, and twelve metal HAPs: antimony, arsenic, beryllium, cadmium, trivalent chromium, hexavalent chromium, cobalt, lead, manganese, mercury, nickel, and selenium.

The 2008 heat input data used for the MATS-based data were related to the MATS non-Hg case studies and the "current base" inventory development effort described in Houyoux and Strum (2011). The preferred source of unit-level annual heat input data were CAMD unit-level annual heat input data for 2008, which we downloaded from the CAMD website for all units that report these data. The units associated with the MATS non-Hg case studies that do not report to CAMD or were missing heat input for 2008 were contacted directly to obtain actual unit-specific annual heat input data. These plants included: Spruance Genco (ORIS 54081) Units 1, 2, 3, and 4 (2002 only); Wabash River (ORIS 1010) Unit PG7221FA; and HECO Waiau (ORIS 766) Units 3, 4, 5, 6, 7, and 8.

For the remaining non-CAMD, non-case study units, annual heat inputs had to be estimated. For many of these units, the MATS ICR data had obtained the unit-specific maximum hourly heat input capacity and the actual unit-specific three-year (2007-2009) average capacity factor. These unit-specific data were used in conjunction with nationwide trends from the CAMD units to estimate annual unit-level heat inputs for 2008. The specific methodology and an example calculation are available in the tab "Att_1_ICR_Data" of "2_Attachments_1_and_2_HTIP_Calcs.xls" (see Section 8.1 for access information). For some units, only the unit-specific maximum hourly heat input rating was available (no average capacity factor was available). The 2008 unit-level heat input was estimating using the maximum hourly heat input in conjunction with an assumed capacity factor of 1.0 and nationwide trends from the CAMD units. The specific methodology and an example calculation are provided the tab "Attach_2_No_Data" of the spreadsheet just listed.

Annual 2008 heat input values (as well as 2002-2010 values developed for MATS) for the final list of affected units (boilers) are available through the MATS supporting materials in the "2-Heat_Inputs" tab of the MATS emission inventory workbook (http://www.epa.gov/ttn/atw/utility/mats_final_current_base_hap_inven.xlsx).

The emission factors used were those unit-specific and updated average emission factors that had been developed to support the MATS rule (Houyoux et al., 2011). Because these factors were believed to be much more up-to-date and more reliable than what EPA had previously made available for S/L/T use, the 2008EPA_MATS emissions dataset was used ahead of S/L/T-reported values for these fifteen pollutants, with one area of exception. For mercury, there are some units that were already required by State or local regulations to monitor their emissions using mercury CEMs by 2008. Where EPA could determine that the S/L/T-reported mercury emissions were based on such CEMs or 2008-specific test data, EPA removed the emission factor based values from the 2008EPA_MATS dataset to allow the S/L/T-reported CEM values to be selected for the 2008 NEI.

In summary, the 2008 NEI v2 for EGUs is comprised of largely S/L/T-reported data for the CAPs and any HAPs that the S/L/T agencies reported other than the fifteen MATS-estimated pollutants. For those fifteen MATS-estimated pollutants, the 2008 NEI v2 is comprised largely of the EPA estimates, except S/L/T agency data were

used for mercury where it was believed to be based upon use of a CEM or unit-specific test. Other HAPs for the MATS-regulated units, and all HAPs for units not part of MATS, include S/L/T agency emissions values where they were reported (with PM and Chromium augmentation, if needed), or include the EPA EGU v1.5 emissions where no S/L/T agency emissions were reported. Appendix B provides a table summarizing the data sources used in the EGU sectors.

For both of the EPA-created datasets, the emissions were estimated at the unit level, because that is the level at which the CAMD heat input activity data are available. EPA assumed for both of the EPA datasets that all heat input came from the primary fuel, and the emission factors used reflected only that primary fuel. The resultant unit-level estimates had to be loaded into EIS at the process-level to meet the EIS requirement that emissions can only be associated with the most detailed (process) level, which includes fuel used. For the EGU sectors, the unit level represents the boiler or gas turbine unit as a whole, while the process level represents the individual fuels burned within the units. The EPA emissions were therefore loaded into EIS at the single process for the primary fuel that was used by the responsible S/L/T agency for reporting their emissions.

As part of our approach, we needed to match the EGU units from the EPA datasets to the process IDs used by the responsible agencies to ensure that the EIS selection software used only one emissions estimate for a process-pollutant combination, rather than one estimate from each data supplier. Using data at a process-pollutant from more than one data supplier would double-count emissions. Because the EPA EGU v1.5 dataset was only to be used where no S/L/T agency estimate was available for a given pollutant, it was only necessary to report the EPA estimate to any one of potentially multiple process IDs reported by the responsible agency for a unit and pollutant, as long as that process was likely one which would contain at least some of the responsible agency's estimate for the pollutant. If that primary process contained any portion of the responsible agency's reported emissions for a pollutant, the EPA estimate would not be selected. But because the 2008EPA_MATS estimates were to be chosen ahead of the responsible agency values, it was necessary to ensure that the MATS dataset would prevent all process IDs that were reported for a given unit from being selected. For this reason, in cases where the responsible agency reported a unit's emissions using two different coal processes and a small oil process, the MATS dataset contain one matching process ID with the actual EPA estimates for the entire unit, plus two other matching process IDs with zero emissions values for the fifteen pollutants. This approach prevented double counting. The approach for matching EIS units with the MATS data is documented in Johnson and Bullock (2012).

The matching of the EPA emissions sets to the responsible agency facility, unit and process IDs was done largely by using the Office of Regulatory Information Systems (ORIS) plant and CAMD boiler IDs as found in the original CAMD dataset described in the first paragraph of this section, and matching these to the same two IDs as had been previously stored in EIS. We also compared the facility names and counties for agreement, and we made manual revisions to the codes in EIS wherever discrepancies were noted. As a final confirmation that the correct emissions unit and a reasonable process ID in EIS had been matched to the EPA data, the magnitudes of the SO2 and NOx emissions for all preliminary matches were compared between the S/L/T agency-reported datasets and the EPA datasets. We identified and resolved several discrepancies from this emissions comparison.

EPA performed these ID matching confirmation step on the 2008 NEI v1 data and an EPA EGU v1 dataset, and we repeated the step using the 2008 NEI v1.5 data. Because a few S/L/T agencies had added new data or revised the unit or process IDs prior to creating the v1.5 data, an EPA EGU v1.5 dataset had to be created for the revised process ID matches. Several v1 matches were removed from the v1.5 dataset due to the uncertainty of

some of the matches for some of the smaller emitting units. If the responsible S/L/T agency did not report some emissions for some of these non-matched units and processes, no EPA estimates were available in the EPA EGU v1.5 dataset for gap filling. Finally, the comparison and discrepancy review process was repeated for the 2008EPA_MATS dataset prior to finalizing the 2008 NEI v2.

3.10.6 Alternative facility and unit IDs needed for matching with other databases

The 2008 NEI v2 data contains two sets of alternate unit identifiers related to the ORIS plant and CAMD boiler IDs (as found in the CAMD heat input activity dataset) for export to the SMOKE modeling file. The first set is stored in EIS with a Program System Code (PSC) of "EPACAMD". The alternate unit IDs are stored as a concatenation of the ORIS Plant ID and CAMD boiler ID with "CAMDUNIT" between the two IDs. These IDs are exported to the SMOKE file in the fields named ORIS_FACILITY_CODE and ORIS_BOILER_ID. These two fields are used by the SMOKE processing software to replace the annual NEI emissions values with the appropriate hourly CEM values at model run time. The second set of alternate unit IDs are stored in EIS with a PSC of "EPAIPM" and are exported to the SMOKE file as a field named "IPM_YN". The SMOKE processing software uses this field to determine if the unit is one that will have future year projections provided by the IPM model.

The storage format of these alternate unit IDs, in both EIS and in the exported SMOKE file, replicates the IDs as found in the NEEDS database used as input to the IPM model. The NEEDS IDs are a concatenation of the ORIS plant ID and the CAMD boiler ID, with either a "_B_" or a "_G_" between the two IDs, indicating "Boiler" or "Generator". Note that the ORIS Plant IDs and CAMD boiler IDs as stored in the CAMDBS dataset and in the NEEDS database are almost always the same, but that there are occasional differences for the same unit.

The "EPACAMD" alternate unit IDs available in EIS are believed to be a complete set of all those that can safely be used for the purpose of substituting hourly CEM values during SMOKE processing. The "EPAIPM" alternate unit IDs in EIS are not a complete listing of all the NEEDS/IPM units, although most of the larger emitters, including all of the EPACAMD CEM units, do have an EPAIPM alternate unit ID. The NEEDS database includes a larger set of smaller, non-CEM units.

3.10.7 Summary of quality assurance methods

A detailed description of the quality assurance steps used for creating the two EPA EGU emissions datasets can be found in Rothschild (2010) and for the matching of MATS data to EIS units in Johnson and Bullock (2012). The S/L/T agency-reported data were subject to the same overall emissions outlier analysis that was performed on the S/L/T point source emissions datasets as a whole. That outlier analysis included an initial comparison of the process-level reported emissions values to the established EIS warning level thresholds specified by SCC and pollutant. The individual values above the threshold were sorted for each of 30 key pollutants and the largest values were reviewed to identify any unusual patterns such as all of the largest values being from the same reporting agency or the largest two or three values being significantly larger than the subsequent values. As a second comparison, facility-level sums for each of the key pollutants were compared to each other in a similar fashion, and were also compared to the largest facility totals seen in the Toxics Release Inventory reports for 2008, by pollutant and by facility type. We identified and provided questionable emissions values for S/L/T agency review. All such flagged values for EGUs were either revised or confirmed as accurate by the responsible S/L/T agency.

3.11 Fuel Combustion – Industrial Boilers

This section includes the description of five EIS sectors:

- Fuel Comb - Industrial Boilers, ICEs - Coal
- Fuel Comb - Industrial Boilers, ICEs – Oil
- Fuel Comb - Industrial Boilers, ICEs - Natural Gas
- Fuel Comb - Industrial Boilers, ICEs – Biomass
- Fuel Comb - Industrial Boilers, ICEs – Other

They are treated here in a single section because the methods used are the same across all sectors.

3.11.1 Sector Description

These five sectors are defined by the point source SCCs beginning with 1-02, 2-02 and 2-040 and the nonpoint SCCs 2102 and 280152. These SCCs include boilers, internal combustion engines (ICE), including reciprocating and turbines, space heaters and orchard heaters firing any type of fuel. The primary fuels used by the boilers are coal, oil and natural gas. Other fuels used by industrial boilers include biomass, waste products and process gases. The primary fuels used by the ICE are natural gas and oil, but there are some which use various available process gases and liquified petroleum gas (LPG).

The SCC-based EIS sector definitions will cause a different universe of units to be included in these sectors than would other definitions of boilers, turbines or reciprocating internal combustion engines. For example, the Industrial/Commercial/Institutional Boilers and Process Heaters MACT include 25 MW and smaller boilers used to generate electricity; these boilers are not included in the sectors described here because they have SCCs beginning with 1-01. Thus the EIS sector definition would put these units, which are considered industrial boilers for the purpose of the MACT, in the Fuel Combustion – Electric Generation sector described in 3.10. In addition, while CO Boilers are in this sector, they are not included in the Industrial/Commercial/Institutional Boilers and Process Heaters MACT category.

Also as described above in 3.10 the use of SCCs in the NEI by S/L/T agencies impacts the units included in these EIS sectors. There are some boilers and gas turbines in industrial facilities which cogenerate electricity for distribution to the public power grid and process steam for their internal use. Some S/L/T agencies reporting to the NEI use an SCC (1-01 or 2-01) that would include these units in one of the EGU sectors, while others use an Industrial (1-02 or 2-02) or a Commercial/Institutional (1-03 or 2-03) SCC. This can result in boilers or gas turbines not connected to the public power grid being included in these EGU sectors and not the Industrial sectors.

In addition to the potential of ambiguity in assigning SCCs to industrial boiler units that may be used to generate electricity, there is also mis-assignment where the wrong SCC is applied to clearly defined units. For this reason, when looking at individual units, other description fields may be useful in accurately categorizing the unit.

3.11.2 Sources of data overview and selection hierarchy

The industrial fuel combustion sectors include data from S/L/T and 12 EPA datasets that cover both point and nonpoint datacategories. Table 32 shows the agencies that submitted data in each of the data categories for each of the fuel combustion – industrial boilers and ICE sectors. Where only 0 emissions were submitted (sum across all pollutants submitted), these are shown as zeroes in the table.

Table 32: Agencies that submitted data for the Fuel Combustion - Industrial Boilers, ICEs Sectors

		Nonpoint					Point				
Agenchy	Type	Bio-mass	Coal	Nat Gas	Oil	Other	Bio-mass	Coal	Nat Gas	Oil	Other
Alabama Department of Environmental Management	S		0	0	X	0	X	X	X	X	X
Alaska Department of Environmental Conservation	S			X	X			X	X	X	X
Allegheny County Health Department	L							X	X	X	X
Arizona Department of Environmental Quality	S		X	X	X	X		X	X	X	X
Arkansas Department of Environmental Quality	S						X	X	X	X	X
California Air Resources Board	S			X	X	X	X	X	X	X	X
Chattanooga Air Pollution Control Bureau (CHCAPCB)	L	0	0	X	X	X		X	X	X	
City of Albuquerque	L	X	0		X	X			X	X	X
Clark County Department of Air Quality and Environmental Management	L		X	0	X	X			X	X	X
Colorado Department of Public Health and Environment	S						X	X	X	X	X
Confederated Tribes of the Colville Reservation, Washington	T						X			X	
Connecticut Department Of Environmental Protection	S								X	X	X
DC Department of Health Air Quality Division	S		0	0	X	X			X	X	
Delaware Deparment of Natural Resources and Environmental Control	S		0	X	X	X		X	X	X	X
Eastern Band of Cherokee Indians	T				X						
Florida Department of Environmental Protection	S						X	X	X	X	X
Fond du Lac Band of the Minnesota Chippewa Tribe	T								X		
Forsyth County Environmental Affairs Department	L						X	X	X	X	X
Georgia Department of Natural Resources	S						X	X	X	X	X
Hawaii Department of Health Clean Air Branch	S		0	X	X	X				X	X
Idaho Department of Environmental Quality	S	0	0	X	X	X	X	X	X	X	X
Illinois Environmental Protection Agency	S	0	0	X	X	0	X	X	X	X	X
Indiana Department of Environmental Management	S			X	X	X	X	X	X	X	X
Iowa Department of Natural Resources	S						X	X	X	X	X
Jefferson County (AL) Department of Health	L							X	X	X	X
Kansas Department of Health and Environment	S		0	X	X	X		X	X	X	X
Kentucky Division for Air Quality	S						X	X	X	X	X
Kootenai Tribe of Idaho	T	0	0	X	X	X					
Lane Regional Air Pollution Authority	L						X		X	X	X
Leech Lake Band of Ojibwe Reservation	T								X		
Lincoln/Lancaster County Health Department	L							X	X		
Louisiana Department of Environmental Quality	S		X	X	X	X	X	X	X	X	X
Louisville Metro Air Pollution Control District	L			0			X	X	X	X	X
Maine Department of Environmental Protection	S						X	X	X	X	X
Maricopa County Air Quality Department	L			X	X				X	X	X
Maryland Department of the Environment	S							X	X	X	X
Massachusetts Department of Environmental Protection	S	X	0	X	X	X	X	X	X	X	X
Mecklenburg County Air Quality	L							X	X	X	X
Memphis and Shelby County Health Department - Pollution Control	L								X	X	X
Metro Public Health of Nashville/Davidson County	L						0	X	X	X	X
Michigan Department of Environmental Quality	S		X	X	X	X	X	X	X	X	X
Minnesota Pollution Control Agency	S	X	X	X	X	X	X	X	X	X	X
Mississippi Dept of Environmental Quality	S						X	X	X	X	X
Missouri Department of Natural Resources	S	X	X	X	X	0	X	X	X	X	X
Montana Department of Environmental Quality	S						X	X	X	X	X
Navajo Nation	T								X		
Nebraska Environmental Quality	S							X	X	X	X

		Nonpoint					Point				
Agenchy	Type	Bio-mass	Coal	Nat Gas	Oil	Other	Bio-mass	Coal	Nat Gas	Oil	Other
Nevada Division of Environmental Protection	S							X	X	X	X
New Hampshire Department of Environmental Services	S			X	X	X	X		X	X	X
New Jersey Department of Environment Protection	S		0	0	X	X		X	X	X	X
New Mexico Environment Department Air Quality Bureau	S						X		X	X	
New York State Department of Environmental Conservation	S	X	X	0	X	X	X	X	X	X	X
Nez Perce Tribe	T	0	0	X	X	X	X				
North Carolina Department of Environment and Natural Resources	S	X	0	X	X	X	X	X	X	X	X
North Dakota Department of Health	S							X	X	X	X
Ohio Environmental Protection Agency	S	X	0	X	X	X	X	X	X	X	X
Oklahoma Department of Environmental Quality	S	X	X	X	X	X	X	X	X	X	X
Olympic Region Clean Air Agency	L						X		X	X	X
Oregon Department of Environmental Quality	S						X	0	X	X	X
Pennsylvania Department of Environmental Protection	S	X	X	X	X	X	X	X	X	X	X
Philadelphia Air Management Services	L							0	X	X	X
Pinal County	L						X		X	X	
Puget Sound Clean Air Agency	L						X		X	X	X
Rhode Island Department of Environmental Management	S								X	X	X
Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho	T	0	0	X	X	X					
South Carolina Department of Health and Environmental Control	S	X	0	X	X	0	X	X	X	X	X
Southern Ute Indian Tribe	T								X		
Tennessee Department of Environmental Conservation	S	X	X	X	X	X	X	X	X	X	X
Texas Commission on Environmental Quality	S			X			X	X	X	X	X
Utah Division of Air Quality	S							X	X	X	X
Vermont Department of Environmental Conservation	S	X		X	X	X	X			X	
Virginia Department of Environmental Quality	S	X		X	X	X	X	X	X	X	X
Washington State Department of Ecology	S						X	X	X	X	X
West Virginia Division of Air Quality	S		X	X	X		X	X	X	X	X
Western North Carolina Regional Air Quality Agency (Buncombe Co.)	L								X	X	
Wisconsin Department of Natural Resources	S	X		X	X		X	X	X	X	X
Wyoming Department of Environmenal Quality	S							X	X	X	X

Table 33 shows the selection hierarchy for all datasets contributing emissions to the Fuel Comb - Industrial Boilers, ICEs Sectors. This selection hierarchy combines the S/L/T data with the EPA datasets. As can be seen, most of the datasets used for this selection have data for the point source data category only.

Table 33: 2008 NEI selection hierarchy for datasets used by the Fuel Comb - Industrial Boilers, ICEs Sectors

DataSetName	Description	Point	Non-point
EPA Overwrite Point v1.5	Overwrites PM emissions from Pennsylvania. See also Table 7 and Appendix C. Even though these are EGUs, some of the SCCs used by PA puts them in the Industrial sector.	1	
EPA PM Augmentation V2	PM species added to gap fill missing S/L/T agency data or make corrections where S/L/T agency have inconsistent PM species' emissions. See also Table 7	2	1
EPA PM Augmentation NP	Adds PM species to fill in missing S/L/T agency data or make corrections where S/L/T agency data have inconsistent emissions across PM species. See Table 8		2
EPA Chromium Split v2	Contains corrected and speciated hexavalent and trivalent chromium emissions derived from the S/L/T agency data for sources in which S/L/T agency reports the total (unspeciated) chromium pollutant. See also Table 7.	3	
EPA other data developed for using ahead of SLT for gapfilling	Data added to boiler and ICE SCCs resulting from from the high risk and Hg review and from the Region 2 Tonawanda facility for the boiler burning coke oven gas	4	
2008EPA_MATS	Emissions data for units identified as MATS units (based on ORIS Ids) but with SCCs (incorrect) that put these units in the industrial sector (I,e., first 3 digits are 102). Emissions for these are small compared to MATS units that have fuel combustion - electricity generation SCCs.	5	
S/L/T data		6	
2008EPA_MMS	Boiler engine and turbine emissions from Offshore oil platforms located in Federal Waters in the Gulf of Mexico . See also Table 7.	7	
EPA EGU v1.5	EPA non-MATS EGU data developed from CAMD heat input and EFs. See also Section 3.10.	8	
2008 EPA Rule Data from OAQPS/SPPD	19 units were gapfilled with Hg emissions using the Boiler MACT rule data. These 19 were among the highest emissions in the Boiler MACT database for which no emissions were provided by S/L/T.	9	
EPA TRI Augmentation v2	Toxics Release inventory data used for gap-filling. Some were assinged to industrial fuel combustion sector SCCs based on the proportion of CAPS at those SCCs. See Table 7 and Section 3.1.4.	10	
EPA HAP Augmentation v2	HAP data computed from S/L/T agency criteria pollutant data using HAP/CAP emission factor ratios . See Table 7 and in Section 3.1.5.	11	
EPA 2005NATA values pulled forward to gapfill	Emissions from the 2005 NATA inventory used as directed by states for facilities that were part of the NATA review described in Section 3.1.7. Done for one facility in WV burning liquid waste in an industrial boiler.3.1.7	12	

3.11.3 EPA-developed fuel combustion –Industrial Boilers, ICEs emissions data

EPA developed data for industrial nonpoint fuel combustion (see Table **19**) that was not used in the 2008 NEI v2. The purpose of the information was to assist S/L/T to develop their own nonpoint estimates by accounting for the point source contribution that they submitted, and the total fuel available for combustion tracked by the Energy Information Administration. For point sources, the EPA developed data from various data sets as listed in Table 33. The rule data (2008 EPA Rule Data from OAQPS/SPPD) consisted of Hg emissions from the Boiler MACT ICR data. While this database included emissions for thousands of units, we only used 19 units' emissions due to the difficulty in matching the rule data to the EIS facilities, units and processes. The 19 units we used were units where emissions were not provided by S/L/T, were easy to match to EIS based on unit descriptions, and were among the top Hg emitters.

3.11.4 Summary of quality assurance methods

Data analyses involving comparison of emissions between 2008 and 2005 showed large discrepancies in emissions from this sector between the two years. We determined that some states did not properly perform the point source reconciliation between nonpoint and point contributions to this sector. This issue was found early enough in the 2008 NEI development process to fix some data prior to the v2 release (e.g., for Georgia, Virginia and Pennsylvania, as shown by the entries in the issues list, ftp://ftp.epa.gov/EmisInventory/2008v2/doc/2008neiv2_issues.xlsx, categorized as "identified in v1_5 and resolved in v2"). However, there were other situations that did not allow sufficient time and remain as issues for v2 (e.g., Tennessee and potentially Missouri).

Another quality assurance method conducted for Hg was to look at boiler SCCs and check for Hg emissions. Other than for natural gas consumption, Hg is expected. As it turned out, some boilers even after gapfilling using TRI and HAP augmentation did not have Hg emitted. We computed that we were missing 0.5 tons of Hg. Note that this issue included all boilers, not just from the industrial sector.

3.12 Fuel Combustion – Commercial/Institutional

[Placeholder. See also Section 3.1 and Appendix B]

3.13 Fuel Combustion – Residential – Natural Gas, Oil, and Other

[Placeholder. See also Section 3.1 and Appendix B]

3.14 Fuel Combustion – Residential – Wood

[Placeholder. See also Section 3.1 and Appendix B]

3.15 Gas Stations

[Placeholder. See also Section 3.1 and Appendix B]

3.16 Industrial Processes – Cement Manufacturing

[Placeholder. See also Section 3.1 and Appendix B]

3.17 Industrial Processes – Chemical Manufacturing

[Placeholder. See also Section 3.1 and Appendix B]

3.18 Industrial Processes – Ferrous Metals

[Placeholder. See also Section 3.1 and Appendix B]

3.19 Industrial Processes – Mining

[Placeholder. See also Section 3.1 and Appendix B]

3.20 Industrial Processes – Non-ferrous Metals

[Placeholder. See also Section 3.1 and Appendix B]

3.21 Industrial Processes – Oil & Gas Production

[Placeholder. See also Section 3.1 and Appendix B]

3.22 Industrial Processes – Petroleum Refineries

[Placeholder. See also Section 3.1 and Appendix B]

3.23 Industrial Processes – Pulp & Paper

[Placeholder. See also Section 3.1 and Appendix B]

3.24 Industrial Processes – Storage and Transfer

[Placeholder. See also Section 3.1 and Appendix B]

3.25 Industrial Processes – NEC (Other)

[Placeholder. See also Section 3.1 and Appendix B]

3.26 Miscellaneous Non-industrial NEC (Other)

[Placeholder. See also Section 3.1 and Appendix B]

3.27 Solvent – Consumer & Commercial Solvent Use

[Placeholder. See also Section 3.1 and Appendix B]

3.28 Solvent – Degreasing, Dry Cleaning, and Graphic Arts

[Placeholder. See also Section 3.1 and Appendix B]

3.29 Solvent – Industrial and Non-Industrial Surface Coating

[Placeholder. See also Section 3.1 and Appendix B]

3.30 Waste Disposal

[Placeholder. See also Section 3.1 and Appendix B]

4 Mobile sources

4.1 Mobile sources overview

Mobile sources are sources of pollution caused by vehicles transporting goods or people (e.g., highway vehicles, aircraft, rail, and marine vessels) and other nonroad engines and equipment, such as lawn and garden equipment, construction equipment, engines used in recreational activities, and portable industrial, commercial, and agricultural engines.

EPA created a comprehensive set of mobile source emissions data for criteria and hazardous air pollutants for all states, Puerto Rico, and US Virgin Islands as a starting point for the NEI. EPA uses models to estimate emissions for most of the mobile sources categories. During training for their 2008 NEI cycle, EPA encouraged S/L/T/ agencies to submit model inputs, rather than emissions, so that EPA could use those inputs beyond the 2008 NEI for future year projections. Agencies had the option to accept EPA's estimates or submit new emissions or emission inputs to replace or enhance EPA's data.

For development and documentation purposes, the major groups of mobile sources are aircraft (Section 4.2), commercial marine vessels (Section 4.3), locomotives (Section 4.4), nonroad equipment (Section 4.5), and on-road vehicles (Section 4.6). In addition, EPA developed nationally consistent datasets for all of those sectors, though without the benefit of local-specific model inputs in all cases. The sections below explain how we created the initial estimates, which S/L/T agencies provided model inputs or emissions data for each sector, and how the EPA data and S/L/T agency data were blended to produce the NEI.

For on-road vehicles, EPA transitioned from the MOBILE6 model to the MOVES model, and this transition occurred during the 2008 NEI submission and development process. Thus, S/L/T agencies submitted inputs and emissions for the on-road sector based on MOBILE6, in the form of inputs to the NMIM system used to run the MOBILE6 model[14]. Where agencies submitted model inputs in the form of NMIM inputs, we used them to generate both nonroad and on-road emissions. For on-road, we converted the NMIM inputs for input to MOVES, which requires some assumptions and is not as robust as using state-supplied MOVES inputs. In a limited number of cases, states had and provided MOVES inputs that we used.

In general, EPA used the data submitted by S/L/T agencies unless EPA determined that the data caused double counting or invalid pollutant or pollutant/emission type combinations inclusion. For example, we excluded S/L/T agency-provided estimates for methyl tert-butyl ether, a gas additive no longer used in US fuel supply. More details are provided in the sections that follow.

4.2 Aircraft

EPA estimated emissions related to aircraft activity for all known airports, including seaplane ports and heliports, in the 50 states, Puerto Rico, and US Virgin Islands. All of the approximately 20,000 individual airports are geographically located by latitude/longitude and stored in the NEI as point sources. As part of the development process, S/L/T agencies had the opportunity to provide both activity data as well emissions to the NEI. When activity data were provided, EPA used that data to calculate EPA's emissions estimates.

[14] except for California, which provided emissions from the EMFAC model

4.2.1 Sector Description

The aircraft sector includes all aircraft types used for public, private, and military purposes. This includes four types of aircraft: (1) Commercial, (2) Air Taxis, (3) General Aviation, and (4) Military. A critical detail about the aircraft is whether each aircraft is turbine- or piston-driven, which allows the emissions estimation model to assign the fuel used, jet fuel or aviation gas, respectively. The fraction of turbine- and piston-driven aircraft is either collected or assumed for all aircraft types.

Commercial aircraft include those used for transporting passengers, freight, or both. Commercial aircraft tend to be larger aircraft powered with jet engines. Air Taxis carry passengers, freight, or both, but usually are smaller aircraft and operate on a more limited basis than the commercial aircraft. General Aviation includes most other aircraft used for recreational flying and personal transportation. Finally, military aircraft are associated with military purposes, and they sometimes have activity at non-military airports.

The national AT and GA fleet includes both jet and piston-powered aircraft. Most of the Air Taxi and General Aviation fleet are made up of larger piston-powered aircraft, though smaller business jets can also be found in these categories. Military aircraft cover a wide range of aircraft types such as training aircraft, fighter jets, helicopters, and jet-powered and piston-powered planes of varying sizes.

The 2008 NEI also includes emission estimates for aircraft auxiliary power units (APUs) and aircraft ground support equipment (GSE) typically found at airports, such as aircraft refueling vehicles, baggage handling vehicles, and equipment, aircraft towing vehicles, and passenger buses. These APUs and GSE are located at the airport facilities as point sources along with the aircraft exhaust emissions. However, these emissions are included in the EIS Sectors for Non-road equipment (gasoline, diesel, and other), described in Section 4.5.

This sector includes the SCCs listed in Table 34 below:

Table 34: Source classification codes for the aircraft sector in the 2008 NEI

SCC	SCC Description
2275001000	Mobile Sources; Aircraft; Military Aircraft; Total
2275020000	Mobile Sources; Aircraft; Commercial Aircraft; Total: All Types
2275050011	Mobile Sources; Aircraft; General Aviation; Piston
2275050012	Mobile Sources; Aircraft; General Aviation; Turbine
2275085000	Mobile Sources; Aircraft; Unpaved Airstrips; Total
27501014	Internal Combustion Engines; Fixed Wing Aircraft L & TO Exhaust; Military; Jet Engine: JP-4
27601014	Internal Combustion Engines; Rotary Wing Aircraft L & TO Exhaust; Military; Jet Engine: JP-4
27601015	Internal Combustion Engines; Rotary Wing Aircraft L & TO Exhaust; Military; Jet Engine: JP-5
27602011	Internal Combustion Engines; Rotary Wing Aircraft L & TO Exhaust; Commercial; Jet Engine: Jet A

4.2.2 Sources of data overview and selection hierarchy

The aircraft sector includes data from three data components: a corrections dataset, S/L/T agency-provided emissions data, and an EPA dataset that is enhanced with state- and local-provided model inputs.

The S/L/T agency data were received from agencies listed in Table 35. As described in Section 4.2.4, all aircraft process emissions submitted by Georgia, Illinois, and Washoe County, NV were excluded by overwrites in the EPA Overwrite Point v1.5 dataset to prevent double counting with the EPA data.

Table 35: Agencies that submitted aircraft emissions data

Agency	Agency Type
Alabama Department of Environmental Management	State
City of Huntsville Division of Natural Resources and Environmental Mgmt	Local
California Air Resources Board	State
Illinois Environmental Protection Agency	State
North Carolina Department of Environment and Natural Resources	State
Washoe County Health District	Local
Pinal County	Local
Pennsylvania Department of Environmental Protection	State
Texas Commission on Environmental Quality	State
Wisconsin Department of Natural Resources	State
Fond du Lac Band of the Minnesota Chippewa Tribe	Tribal

The selection hierarchy used for aircraft is shown below in Table 36. This hierarchy pulls the relevant datasets for this sector from the overall point sources hierarchy listed in Table 8.

Table 36: 2008 NEI aircraft data selection hierarchy

Priority	Dataset Name	Dataset Content
1	EPA Overwrite Point v1.5	Overwrites some S/L/T emissions data with zeros to prevent use of invalid acenaphthylene emission factors and to prevent double counting in the final dataset (Section 4.2.4)
2	State/Local/Tribal Data	Submitted aircraft emissions
3	EPAAirports1109	EPA data (Section 4.2.5)

4.2.3 Spatial coverage and data sources for the sector

The aircraft sector includes emissions in every state, Puerto Rico, and the US Virgin Islands as well as six tribes.

[Placeholder for CAP and HAP maps and associated observations]

4.2.4 Overwrite dataset used for aircraft sector

This dataset has two purposes for airport emissions. First, all acenaphthylene emissions for the airport SCC of 2275050012 (general aviation turbine) are set to zero with this dataset to prevent use of an incorrect emission factor used in the state-supplied data. The submitted S/L/T estimates appeared almost identical to EPA's, which were subsequently found to be in error and removed. The states with records for this correction are Alabama, California, Illinois, North Carolina, and Wisconsin.

Second, some states added airport emissions to new "units" and "processes" at the EPA airport facilities. If these data had been merged with the EPA data without this overwrite dataset, the emissions at the new "units"

and "processes" would have been added to the units at the EPA "units" and "processes" at these airports. This situation occurred for all airports in Georgia and Washoe County, NV for CAP emissions and Illinois for CAP and HAP emissions. To avoid double counting, this corrections dataset overwrites the all of the state aircraft data with zero values. The NEI selection then includes the EPA emissions data instead, which are located at the valid units and processes defined by EPA at the start of the NEI development cycle.

4.2.5 EPA-developed aircraft emissions estimates

EPA developed emissions estimates associated with an aircrafts' landing and takeoff (LTO) cycle. The cycle begins when the aircraft approaches the airport on its descent from cruising altitude, lands, taxis to the gate, and idles during passenger deplaning. It continues as the aircraft idles during passenger boarding, taxis back out onto the runway for subsequent takeoff, and ascent (climbout) to cruising altitude. Thus, the five specific operating modes in an LTO are (1) Approach, (2) Taxi/idle-in, (3) Taxi/idle-out, (4) Takeoff, and (5) Climbout.

The LTO cycle provides a basis for calculating aircraft emissions. During each mode of operation, an aircraft engine operates at a fairly standard power setting for a given aircraft category. Emissions for one complete cycle are calculated using emission factors for each operating mode for each specific aircraft engine combined with the typical period of time the aircraft is in the operating mode.

In spring 2009, the EPA posted preliminary LTO data for review prior to developing the aircraft inventory. EPA encouraged the S/L/T agencies to review the materials and provide comments on any necessary corrections to:

1. Airport names and locations for airports to be included in the EIS facility inventory;
2. LTO information that will be used to estimate emissions for each airport;
3. Aircraft/engine combinations to link to FAA LTO data including default assumptions and AircraftEngineCodeTypes for EIS submittals; and
4. Lead estimates and the lead estimation methodology.

The following S/L/T agencies submitted aircraft activity data that EPA incorporated as inputs to the final EPA dataset model run.

Table 37: Agencies that submitted aircraft activity data for EPA's emissions calculation

Agency	Agency Type
Connecticut Department of Environmental Protection	State
Minnesota Pollution Control Agency	State
New Jersey Department of Environmental Protection	State
Wisconsin Department of Natural Resources	State
Mecklenburg County North Carolina	Local
Ventura County California Air Pollution Control District	Local
Regional Air Pollution Control Agency (Dayton and Montgomery County Ohio)	Local

4.2.5.1 Emissions for aircraft with detailed aircraft-specific activity data

For airports where the available LTO, from agencies or FAA data bases, included detailed aircraft-specific make and model information (e.g., Boeing 747-200 series), EPA used the FAA's EDMS, Version 5.1 (FAA, 2008a). This

type of detail is available for most LTOs at 3410 larger airports that have commercial air traffic. Smaller, and most general aviation only, airports would not have aircraft specific activity detail available.

Emissions for GSE and APUs associated with aircraft-specific activity were also estimated by EDMS, using the assumptions and defaults incorporated in the model. This is significant change from the previous NEI emissions where GSE estimates came from the NONROAD model and APUs were not included in EPA's estimates. These emissions are mapped to the EIS Sectors for Non-road equipment (gasoline, diesel, and other), described in Section 4.5.

EPA estimated aircraft-related emissions for the SCCs identified in Table 38 and associated EIS Sector, where available.

Table 38: SCCs included in the EPA-created aircraft emissions dataset

SCC	Description	Data Category	EIS Sector
2265008005	Airport Ground Support Equipment, 4-Stroke Gasoline	Point	Mobile – Non-Road Equipment – Gasoline
2267008005	Airport Ground Support Equipment, LPG	Point	Mobile – Non-Road Equipment – Other
2268008005	Airport Ground Support Equipment, CNG	Point	
2270008005	Airport Ground Support Equipment, Diesel	Point	Mobile – Non-Road Equipment – Diesel
2275001000	Aircraft /Military Aircraft /Total	Point	Mobile – Aircraft
2275020000	Aircraft /Commercial Aircraft /Total: All Types	Point	Mobile – Aircraft
2275050011	Aircraft /General Aviation /Piston	Point	Mobile – Aircraft
2275050012	Aircraft /General Aviation /Turbine	Point	Mobile – Aircraft
2275060011	Aircraft /Air Taxi /Piston	Point	Mobile – Aircraft
2275060012	Aircraft /Air Taxi /Turbine	Point	Mobile – Aircraft
2275070000	Aircraft /Aircraft Auxiliary Power Units /Total	Point	Mobile – Non-Road Equipment – Other
2275087000	Aircraft/In-flight (non-Landing-Takeoff cycle)	Nonpoint	Mobile – Aircraft

4.2.5.2 Emissions for airports without detailed aircraft-specific activity data

EPA estimated emissions for aircraft where detailed aircraft-specific activity data were not available by combining aircraft operations data from FAA's Terminal Area Forecasts (TAF) and 5010 forms (See http://www.faa.gov/airports/airport_safety/airportdata_5010/). These sources provide LTO estimates for general aviation airports. Because the aircraft make and models were not available, EPA used assumptions regarding the percent of these LTOs that were associated with piston-driven (using aviation gas) versus turbine-driven (using jet fuel) aircraft. Specifically, EPA assumed that at airports, 72.5% of all General Aviation and 23.1% of all Air Taxi activity were powered by piston-powered aircraft, with the remainder powered by turbine aircraft. At heliports, EPA assumed that 36.1% of all General Aviation and 2% of all Air Taxi activity were powered by piston-powered, with the remainder powered by turbine engines. These fractions were developed based on FAA's General Aviation and Part 135 Activity Surveys – CY 2008 (FAA, 2008b). Then EPA estimated emissions based on the percent of each aircraft type, LTOs, and emission factors.

Pb emission estimates were handled differently from the other pollutants. Lead emissions are associated with leaded aviation fuel used in piston driven aircraft associated with general aviation. EDMS has a limited number of piston engine aircraft in its aircraft data and is currently not set up to calculate metal emissions; therefore, we did not use it to estimate aircraft lead emissions. Lead emissions are instead based on per-LTO emissions factors, assumptions about lead content in the fuel, and lead retention rates in the piston engines and oil. The general equation is:

$$\text{LTO Pb (tons)} = \frac{\text{(piston – engine LTO)(avgas Pb g/LTO)(1-Pb retention)}}{\text{907,180 g/ton}}$$

The LTO estimate requires assumptions about the number of piston engines per plane, and number of LTOs necessary to account for US average fuel usage. The assumptions are detailed in a project report (ERG, 2011a). In addition, a summary of the EPA-only airport lead emissions "airportlead_20110406.xlsx" is available (see Section 8.2). This summary is not the same as any summaries of the 2008 NEI, which include about 21 tons of Pb emissions data from S/L/T agencies. Texas submitted an additional 24.3 tons of Pb at airports for SCC 2275050011. This addition and lower Pb emissions submitted by other states for some airports result in the 2008 NEI being 21 tons higher than the EPA-only data for emissions at airports.

In-flight lead emissions, which have not been previously included in the NEI, were calculated based on national aviation gasoline consumption and similar assumptions noted above about lead fuel content and retention rates. Lead emissions associated with airport LTO activities were subtracted from the national fuel based lead emissions to approximate in-flight lead emissions which were allocated to individual states and noted with the county code 777. This county code is not used to identify any actual counties across the US, and thus provides a way of uniquely finding all in-flight emissions in the NEI database. A summary of the EPA in-flight lead emissions "out_of_lto_pb_summary_120211.xlsx" is available (see Section 8.2). This summary is the same as summaries of the 2008 NEI, which do not include data from S/L/T/ agencies for in-flight Pb emissions.

4.2.6 Summary of quality assurance methods

The Documentation for Aircraft Component of the National Emissions Inventory Methodology addresses the QA for the EPA estimates. The agency-submitted aircraft emission estimates were compared to EPA's estimates by pollutant and SCC at the unit (e.g. commercial, general aviation, military, air taxi) and process (SCC).

- Findings and impacts
    - Illinois submitted 35654 records with zero emissions for processes that were not already populated with EPA data. The result of submitting a zero emissions process where there is no competing data is the same as no submittal. There is no effect in the 2008 NEI since Illinois records were overwritten because of the units/process duplication discussed in section 4.2.4
    - 5 agencies (California, Huntsville, Illinois, North Carolina, Wisconsin) reported pollutants not reported for airports by EPA (PM-CON, PM10-FIL, and Dibenzo[a,h]Anthracene). The data were not adjusted, thus in the 2008 NEI selection, only these airports will have emissions from these pollutants.
    - 4 agencies reported non-aircraft related SCCs to airport facilities, as shown in Table 39. Of these, Cloquet Carlton County Airport (EIS Facility ID = 8263311) had no aircraft-related SCCs

reported. No changes were made to these by EPA. However, typically facilities that are identified as “airport” contain only aircraft-related SCC emissions.

Table 39: Non-aircraft related SCCs reported by S/L/T agencies to airports

EIS Facility Identifier	Agency Facility Identifier	Agency PSC	Site Name	SCC	Sector
8263311	05	TR405	Cloquet Carlton County Airport	10300603	Fuel Comb – Comm/Institutional – Natural Gas
10581911	A141	COHDNREM	Huntsville – Madison County Airport Authority	39999999	Industrial Processes – NEC
12342611	10046	Pinal	Arizona Soaring	40600307	Gas Stations
10026511	401131395	CARB	COUNTY OF SAN LUIS OBISPO-OCEANO AIRPORT	20200102	Fuel Comb – Industrial Boilers, ICEs – Oil

- Alabama, California, Illinois, North Carolina, and Wisconsin submitted acenaphthalene from SCC 2275050012 (general aviation turbine). The state estimates were almost identical to EPA's, which were subsequently found to be in error, since there should be no acenaphthalene from this SCC. EPA removed these estimates from the EPA data and the S/L/T agency estimates were overwritten in the EPA Overwrite Point dataset as described in Section 4.2.4.
- Washoe, Illinois, and Georgia submitted 100% of their aircraft emissions to units and processes that duplicated ones already present in the airport facility inventory, rather than using existing units and processes. Using those records in the 2008 NEI would cause the agency records to add to (instead of replace) EPA estimates. This finding resulted in the EPA corrections described as part of the "EPA Overwrite Point v1.5" dataset as described in Section 4.2.4.

4.3 Commercial Marine Vessels

The 2008 NEI includes emissions from CMV activity in the 50 states, Puerto Rico, and US Virgin Isles, out to 200 nautical miles from the US coastline.

4.3.1 Sector Description

The CMV sector includes boats and ships used either directly or indirectly in the conduct of commerce or military activity. The majority of vessels in this category are powered by diesel engines that are either fueled with distillate or residual fuel oil blends. For the purpose of this inventory, we assume that Category 3 (C3) vessels primarily use residual blends while Category 1 and 2 (C1 and C2) vessels typically used distillate fuels.

The C3 inventory includes vessels which use C3 engines for propulsion. C3 engines are defined as having displacement above 30 liters per cylinder. The resulting inventory includes emissions from both propulsion and auxiliary engines used on these vessels, as well as those on gas and steam turbine vessels. Geographically, the inventories include port and interport emissions that occur within the area that extends 200 nautical miles (nm) from the official U.S. baseline, which is roughly equivalent to the border of the U.S. Exclusive Economic Zone. Only some of these emissions are allocated to states based on official state boundaries that typically extend 3 miles offshore (see Section 4.3.5).

The C1 and C2 vessels tend to be smaller ships that operate closer to shore, and along inland and intercoastal waterways. Naval vessels are not included in this inventory, though Coast Guard vessels are included as part of the C1 and C2 vessels.

The CMV source category does not include recreational marine vessels, which are generally less than 100 feet in length, most being less than 30 feet, and powered by either inboard or outboard. These emissions are included in those calculated by the NONROAD model in the nonroad category and EIS sectors of the 2008 NEI.

Each of the commercial marine SCCs requires an appropriate emissions type (M=maneuvering, H=hotelling, C=cruise, Z=reduced speed zone) because emission factors vary by emission type. Each SCC and emissions type combination was allocated to a shape file identifier in the nonpoint inventory. The allowed combinations are shown in Table 40. The default values are those assumed when the actual emission type may be unknown; for example, emissions that occur in shipping lanes are assumed to be 'cruising' and cannot be 'hotelling', which only occurs at ports.

Table 40: Commercial Marine SCCs and Emission Types

SCC	SCC Description	Allowed	Default
2280002100	Marine Vessels, Commercial Diesel Port	M	M
2280002200	Marine Vessels, Commercial Diesel Underway	C	C
2280003100	Marine Vessels, Commercial Residual Port	H	H
2280003100	Marine Vessels, Commercial Residual Port	M	H
2280003200	Marine Vessels, Commercial Residual Underway	C	C
2280003200	Marine Vessels, Commercial Residual Underway	Z	C

In addition, the additional SCCs in Table 41 were submitted by California and Kentucky (as denoted) and included in the NEI. We suspect but could not confirm that these emissions double-count emissions from the EPA shapefile-based datasets.

Table 41: Additional Commercial Marine SCCs used by California and Kentucky

SCC	SCC Description	States
28000211	Internal Combustion Engines; Marine Vessels, Commercial; Diesel; Crew Boats: Main Engine Exhaust: Idling	CA
28000212	Internal Combustion Engines; Marine Vessels, Commercial; Diesel; Crew Boats: Main Engine Exhaust: Maneuvering	CA, KY
28000213	Internal Combustion Engines; Marine Vessels, Commercial; Diesel; Crew Boats: Auxiliary Generator Exhaust: Hotelling	CA
28000216	Internal Combustion Engines; Marine Vessels, Commercial; Diesel; Supply Boats: Main Engine Exhaust: Idling	CA
28000217	Internal Combustion Engines; Marine Vessels, Commercial; Diesel; Supply Boats: Main Engine Exhaust: Maneuvering	CA, KY
28000218	Internal Combustion Engines; Marine Vessels, Commercial; Diesel; Supply Boats: Auxiliary Generator Exhaust: Hotelling	CA

4.3.2 Sources of data overview and selection hierarchy

The commercial marine vessels sector includes data from four data components: two corrections datasets, S/L/T agency-provided emissions data, and an EPA dataset of CMV emissions.

EPA received emissions data from the agencies identified in Table 42.

Table 42: Agencies that Submitted Commercial Marine Emissions Data

Agency	Agency Type	Notes
California Air Resources Board	State	Removed from EIS see Section 4.3.6
Delaware Department of Natural Resources and Environmental Control	State	
Idaho Department of Environmental Quality	State	Removed from EIS see section 4.3.6
Illinois Environmental Protection Agency	State	Removed from EIS see section 4.3.6
Kansas Department of Health and Environment	State	Removed from EIS see section 4.3.6
Kootenai Tribe of Idaho	Tribal	All emissions records are zero
Louisville Metro Air Pollution Control District	Local	
Maryland Department of the Environment	State	Removed from EIS see section 4.3.6
New Hampshire Department of Environmental Services	State	Removed from EIS see section 4.3.6
New Jersey Department of Environment Protection	State	
Nez Perce Tribe	Tribal	
Pennsylvania Department of Environmental Protection	State	
Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho	Tribal	
South Carolina Department of Health and Environmental Control	State	
Texas Commission on Environmental Quality	State	

Table 43 shows the selection hierarchy for the CMV sector.

Table 43: 2008 NEI commercial marine vehicle selection hierarchy

Priority	Dataset Name	Dataset Content
1	EPA Overwrite Nonpoint v1.5	Overwrites submitted unspeciated chromium with zero value to prevent unspeciated chromium from being included in the 2008 NEI (Section 4.3.4)
2	EPA Chromium Split v2	Speciates total chromium in California for SCCs 28000212 and 28000217 (Section 4.3.4).
3	State/Local/Tribal Data	Submitted commercial marine vessel emissions
4	EPA CMV	EPA data (Section 4.3.5)

4.3.3 Spatial coverage and data sources for the sector

The commercial marine vessel sector includes emissions in every state except Arizona, Colorado, Montana, Nevada, New Mexico, North Dakota, South Dakota, Utah, Vermont, and Wyoming. It also includes emissions for Puerto Rico and US Virgin Islands, three tribes, as well as emissions in federal waters.

[Placeholder for CAP and HAP maps and associated observations]

4.3.4 Overwrite datasets used for commercial marine vessel sector

For commercial marine vessels, the "EPA Overwrite Nonpoint v1.5" dataset contained only records that zeroed out Texas's unspeciated chromium from this sector. The amount of chromium was not replaced with speciated chromium data because the amount was trivial and this was a late-breaking finding of our quality assurance efforts.

4.3.5 EPA-developed commercial marine vessel emissions data

EPA estimated CMV emission estimates[15] as a collaborative effort between the Office of Transportation and Air Quality (OTAQ) and OAQPS. EPA developed the Category 3 commercial marine inventories for a base year of 2002 and then projected to 2008 by applying regional adjustment factors to account for growth. In addition, EPA developed and applied NOX adjustment factors to account for implementation of the NOX Tier 1 standard. The C3 growth factors, NOX adjustment factors by tier and calendar year, and NOX adjustment factors by engine type and speed are defined in Appendix A of the 2008 NEI CMV documentation (ERG, 2010). For Category 1 and 2 marine diesel engines, the emission estimates were consistent with the 2008 Locomotive and Marine federal rule making (US EPA, 2003). EPA derived HAP estimates by applying toxic fractions to VOC or PM estimates.

EPA then allocated these emissions to individual GIS polygons (see Sections 4.3.5.1 and 4.3.5.2) using appropriate methods that varied by operating mode (i.e., hotelling, maneuvering, reduced speed zone, and underway). For example, port emissions appear only in port polygons, federal water emissions in federal waters. HAP emissions were estimated by applying speciation profiles to each polygon's VOC and PM estimates; see also Appendix B of the 2008 NEI CMV documentation (ERG, 2010).

EPA allocated emissions estimates based on activity to GIS polygons representing port and waterway. GIS polygons allowed the estimation/allocation of emissions to defined port, waterway, and coastal areas, leading to improved spatial resolution compared to previous county-level emissions.

Agencies also submitted emissions to this sector. The SCCs for which EPA developed estimates are in Table 44.

Table 44: Commercial Marine SCCs for which EPA Provided Estimates

SCC	Description	Data Category
2280002100	Marine Vessels, Commercial Diesel Port	Nonpoint
2280002200	Marine Vessels, Commercial Diesel Underway	Nonpoint
2280003100	Marine Vessels, Commercial Residual Port	Nonpoint
2280003200	Marine Vessels, Commercial Residual Underway	Nonpoint

[15] While CO2 estimates were also developed, the 2008 NEI does not include GHG and so these are not available except through the EPA-developed dataset included in EIS.

4.3.5.1 Allocation of Port Emissions

EPA developed port boundaries using a variety of resources to identify the most accurate port boundaries. First, GIS data or maps provided directly from the port were used. Next, maps or port descriptions from local port authorities, port districts, etc. were used in combination with existing GIS data to identify port boundaries. Finally, satellite imagery from tools such as Google Earth and street layers from StreetMap USA were used to delineate port areas. We placed primary emphasis on mapping the 117 ports with Category 3 vessel activity using available shape files of the port area. The Port of Huntington was developed differently given its large extent and limited available map data. The state of West Virginia provided a revised shape file of US Army Corps of Engineers port terminals reported to be part of the Port of Huntington-Tristate area. The revised shape that includes a 200 meter buffer of the water features near these port terminals was created to identify the port area.

In all cases, polygons were created on land, bordering waterways and coastal areas, and were split by county boundary, such that no shape file crosses county lines and county total emission can be easily summed. Each polygon was identified by the port name and state and county FIPS in addition to a unique ShapeID. Smaller ports with Category 1 and 2 activities were mapped as small circles, such that the port is much like a point source, but without the complication of emissions appearing in both point and nonpoint inventories. Note that no Category 3 emissions were mapped to small circles. The final shapefile contained 159 ports and 196 polygons, considering that a single port can cross county boundaries and thus include multiple polygons. The final shapefile is listed as "port_032310.zip" in Section 8.1.

To develop emissions for the Category 1 and 2 part of the inventory, EPA started with criteria emissions and activity as a single national number. We allocated the emissions and activity data to ports based on total commodity tonnage data obtained from the U.S. Army Corps of Engineers Principal Ports file for 2007 (U.S. Army Corps of Engineers, 2009; see also data file "pport07.xls" listed in Section 8.1). Emissions were then assigned to polygons within a port based on fraction of the port's area within each shape.

For the Category 3 activity, EPA developed port-level criteria and CO2 emissions for 117 of the largest U.S. from port activity (maneuvering and hotelling modes) in megawatt hours. We then assigned emissions to shape file polygons within a port based on fraction of port area. HAP emissions were then speciated from VOC and PM estimates for each mode, using emission factors for C3 vessels; see also Appendix A of the 2008 NEI CMV documentation (ERG, 2010).

4.3.5.2 Allocation of Underway Emissions

Category 1 and 2 criteria emissions were allocated to underway polygons in state waters based on total commodity movements (in tons) data obtained from USACE (US ACE, 2001). These data were waterway-specific, so waterways that crossed into multiple FIPs had emissions assigned by waterway length in each polygon. HAP emissions were then speciated from VOC and PM estimates using the methodology described in Section 2.3 of ERG (2010) for each polygon.

For Category 3, EPA/OTAQ developed line shapefiles indicating port-specific approach segment length and related emissions and activity in the reduced speed zones, the mode when the ship slows to improve vessel handling near land, on a per-port basis. HAP emissions were then speciated from VOC and PM estimates using

the methodology described in for each polygon as described above. The shapefiles used for the underway emissions are available in the file "shipping_lanes_111309.zip" as listed in Section 8.1.

For Category 3 Interport emissions, EPA created 4km gridded emissions for interport-only emissions for CO, CO2, HC, NOx, SOx, and PM10, as described in Section 4.3.5. EPA used GIS to overlay the 4-km grid with county boundaries including state waters to allocate to counties, and the rest of the 4-km data were allocated to federal waters and labeled with state/county codes starting with 85 in EIS. County boundaries in the NEI extend to the transition from state to federal waters, typically three miles off shore. HAP emissions were then speciated from VOC and PM estimates using the methodology discussed above.

4.3.6 Summary of quality assurance methods

EPA compared shape-, state-, and county-level sums in (1) EPA default data, (2) S/L/T agency submittals and (3) the resultant 2008 NEI selection by

- Included pollutants, SCCs, SCC-Emission Types
- Emissions summed to agency and SCC level

Findings prior to corrections and release

- For a given county, the 2008 NEI includes agency emissions only where the reporting/identification codes used by the state exactly matched the codes used by EPA (i.e., the shape, SCC, emission type, and pollutant) or where emissions occur in counties with no shape IDs (i.e., submitted as county totals). When the same codes are used, EIS can replace EPA data. Several agencies that submitted using shape files included more or fewer shapes (or counties with no shape files) than the EPA dataset. The result would have been a merging of the agency and EPA data, which needed to be prevented to avoid double counting. EPA contacted submitting agencies and provided assistance to those willing to resubmit their data in shape files or agree to accept EPA's default data. Because the remaining agency data could not be included in EIS without double counting, it had to be deleted from EIS. This occurred for California, Idaho, Illinois, Kansas, Maryland. Of these, only Kansas agreed to EPA's data, the others did not respond to request for resubmittal.
- Most agencies included the same or fewer SCCs than the EPA dataset. However, California, DC, Delaware, New Hampshire, Texas, and Maricopa included additional SCCs.
    - Examples:
        - California and Louisville Metro Air Pollution Control District included CMV point source SCCs. These may result in emissions double counting with EPA shapefile-based data.
- The 2008 NEI uses EPA data for any County/ShapeID/pollutant/SCC/emission type combination that is present in EPA's dataset and not in the agency's. This automated merging of EPA and S/L/T data can result in overestimates where processes are incongruent. For instance, in NJ diesel CMV emissions are likely overestimated due to process mismatch in EPA and NJ estimates.

Table 45: Example of Potential Error in NJ County Diesel CMV Emissions Due to Merge of Inconsistent County/Shape/SCC/EmissionType/Pollutant combinations

FIPS	ShapeID	SCC	EmissionsTypeCode	Pollutant Code	EPA	NJ_Submittal	2008NEIv2
34017	10085	2280002100	M	NOX	17,616.90		17,616.90
34017	2827	2280002200	C	NOX	236.50	751.88	751.88
34017	2832	2280002200	C	NOX	144.19	458.40	458.40
34017	2829	2280002200	C	NOX	79.82	253.77	253.77
34017	2828	2280002200	C	NOX	43.25	137.49	137.49
34017	2834	2280002200	C	NOX	26.58	84.49	84.49
34017	2831	2280002200	C	NOX	8.88	28.24	28.24
34017	2830	2280002200	C	NOX	6.04	19.20	19.20
			Total		18,162.16	1,733.47	19,350.37

- Most agencies either did not submit HAPs or did not submit all the HAPs that EPA estimated. In this case, EPA data will appear in the 2008 NEI for any HAPs not in the S/L/T agency data. This can cause problems when the resultant 2008 NEI may have VOC and PM emissions less than the EPA VOC or PM, and there may be a mathematical inconsistency between VOC HAPs and PM HAPs with the criteria pollutants. There will also be an inconsistency because of the different approaches used to compute CAPs and HAPs.
    - Example:
        - New Hampshire submitted CAPs only. For SCC 2280002200, the New Hampshire total VOC and PM are used in the NEI and are much less than EPA's VOC and PM estimates, Since the NEI uses EPA's VOC HAPs and PM HAPs, the sum of these could be greater than the criteria VOC and PM also in the NEI. This phenomenon occurs for the Rockingham County, NH (FIP= 33015) sum for VOC, primary PM10 and primary PM2.5, and may occur elsewhere at a shape ID level.
- The 2008 NEI uses EPA data for any pollutant/SCC/emission type combination that is present in EPA's dataset and not in the agency's.
- Most agencies either did not submit HAPs or did not submit all the HAPs that EPA estimated. In this case, EPA data will appear in the 2008 NEI for any HAPs not in the S/L/T agency data. This can cause problems when the resultant 2008 NEI may have VOC and PM emissions less than the EPA VOC or PM, and there may be a mathematical inconsistency between VOC HAPs and PM HAPs with the criteria pollutants. There will also be an inconsistency because of the different approaches used to compute CAPs and HAPs.
    - Example:
        - New Hampshire submitted CAPs only. For SCC 2280002200, the New Hampshire total VOC and PM are used in the NEI and are much less than EPA's VOC and PM estimates. Since the NEI uses EPA's VOC HAPs and PM HAPs, the sum of these could be greater than the criteria VOC and PM also in the NEI. This phenomenon occurs for the

Rockingham County, NH (FIP= 33015) sum for VOC, PM10-PRI and PM25-PRI, and may occur elsewhere at a shape ID level.

- 2008 NEI emissions can be greater than both the EPA and the agency estimates when:
  - Either the agency or EPA dataset has populated sets of counties or shapes or has different SCC/emission type, such that the 2008 NEI has more SCCs or SCC/emission types than either the EPA or agency datasets.
    - Example: In the following Agency/SCC/CAP combinations, the 2008 NEI selection total is greater than both the EPA and agency emissions:

Table 46: SCC/Pollutant combinations where State total 2008 NEI is greater than agency or EPA estimates

State	SCC	Allowed
TX	2280003100	NH3
TX	2280003100	PM10-PRI
TX	2280003100	PM25-PRI
TX	2280003100	SO2
TX	2280003200	VOC
TX	2280003200	NOX
TX	2280003100	CO
TX	2280003200	SO2
TX	2280003200	NOX
SC	2280003200	PM25-PRI
SC	2280003200	PM10-PRI
SC	2280003200	NH3
SC	2280003200	NOX
SC	2280003200	CO
SC	2280003200	VOC
NH	2280002200	SO2

- EPA estimates for Louisiana diesel CMV emissions (SCC=2280002*) were challenged in similar previous NEI data as too high (http://www.dnr.mo.gov/env/apcp/docs/appendixh-7.pdf). There is also a conference paper from the 2005 EI conference: http://www.epa.gov/ttnchie1/conference/ei14/session8/sullivan.pdf). The state was contacted 12/2011 and had no other dataset alternatives and agreed users should be cautioned on this potential over estimate.
- The EPA dataset does not include tribal areas. Therefore the 2008 NEI is equal to the tribal submission in the three tribal regions that provided data. These tribes used only SCCs 2280002100 and 2280002200.
- All emission records submitted by Kootenai Tribe of Idaho contained zero emission records. They are included in 2008 NEI, but since they are zero, have no effect.

4.4 Locomotives

4.4.1 Sector Description

The locomotive sector includes railroad locomotives powered by diesel-electric engines. A diesel-electric locomotive uses 2-stroke or 4-stroke diesel engines and an alternator or a generator to produce the electricity required to power its traction motors. The locomotive source category is further divided up into categories: Class I line haul, Class II/III line haul, Passenger, Commuter, and Yard. Table 47 below indicates locomotive SCCs and whether EPA estimated emissions. If EPA did not estimate the emissions, then all emissions from that SCC that appear in the inventory are from S/L/T agencies.

Table 47: Locomotive SCCs, descriptions, and EPA estimation status

SCC	Description	EPA /ERTAC Estimated?	Data Category
2285002006	Mobile Sources Railroad Equipment Diesel Line Haul Locomotives: Class I Operations	Yes – in shape files	Nonpoint
2285002007	Mobile Sources Railroad Equipment Diesel Line Haul Locomotives: Class II / III Operations	Yes-in shape files	Nonpoint
2285002008	Mobile Sources Railroad Equipment Diesel Line Haul Locomotives: Passenger	no	Nonpoint
2285002009	Mobile Sources Railroad Equipment Diesel Line Haul Locomotives: Commuter Lines	no	Nonpoint
2285002010	Railroad Equipment Diesel Yard Locomotives	no	Nonpoint
28500201	Internal Combustion Engines Railroad Equipment Diesel Yard	Yes – as point sources	Point

4.4.2 Sources of data overview and selection hierarchy

The locomotives sector includes data from five data components: three corrections datasets, S/L/T agency-provided emissions data, and an EPA dataset of locomotive emissions.

EPA estimated emissions from select locomotive SCCs. The agencies listed in Table 48 also submitted emissions to the same or other locomotive SCCs.

Table 48: Agencies that submitted Rail Emissions to the 2008 NEI

Agency Organization	Agency Type
Alaska Department of Environmental Conservation	State
California Air Resources Board	State
Connecticut Department Of Environmental Protection	State
DC-District Department of the Environment	Local
Delaware Department of Natural Resources and Environmental Control	State
Idaho Department of Environmental Quality	State
Illinois Environmental Protection Agency	State
Kansas Department of Health and Environment	State
Louisville Metro Air Pollution Control District	Local
Maricopa County Air Quality Department	Local
Maryland Department of the Environment	State
New Hampshire Department of Environmental Services	State

Nez Perce Tribe	Tribal
North Carolina Department of Environment and Natural Resources	State
Omaha Tribe of Nebraska	Tribal
Oregon Department of Environmental Quality	State
Pennsylvania Department of Environmental Protection	State
Sac and Fox Nation of Missouri in Kansas and Nebraska Reservation	Tribal
Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho	Tribal
Texas Commission on Environmental Quality	State
Utah Division of Air Quality	State
Washoe County Health District	Local

Table 49 shows the selection hierarchy for the locomotive sector.

Table 49: 2008 NEI locomotives selection hierarchy

Priority	Dataset Name	Dataset Content
1	EPA PM Augmentation, V2 (point)	Zeros out PM species in Texas and Kansas
2	EPA Chromium Split v2 (point)	Zeros out submitted locomotive chromium in Texas and Kansas.
3	Rail_EPACorrections (nonpoint)	Also overwrites county submittals for counties/SCCs where EPA data exists in shape files (see Section 4.4.4)
4	Responsible Agency Dataset (point and nonpoint)	Submitted locomotive emissions
5	EPA Rail (point and nonpoint)	EPA data (see Section 4.4.5)

4.4.3 Spatial coverage and data sources for the sector

The locomotives sector includes emissions in all states, DC, Puerto Rice, and some tribes.

[Placeholder for CAP and HAP maps and associated observations]

4.4.4 Overwrite datasets used for locomotives sector

EPA used three overwrite datasets to make changes to the data provided by S/L/T agencies. The “EPA PM Augmentation, V2” and “EPA Chromium Split v2” datasets zeroed out small amounts of PM and unspeciated chromium. The “Rail_EPACorrections” dataset zeros out agency submissions to prevent double counting with EPA data. Since EPA’s dataset used shapefiles, when agencies submitted without shapefiles but rather as a county total, EIS was unable to blend the two datasets properly. This limitation would have resulted in double-counting of the data. Since we knew that EPA data were complete but we did not know whether the S/L/T agency data were complete, we overwrote the S/L/T data with zeros and selected the EPA data for the 2008 NEI. This approach was needed in California, Connecticut, DC, Idaho, Illinois, Maricopa County, Maryland, North Carolina, Oregon, Louisville and the Washoe County Health District. In most of these regions, some state data are still used.

4.4.5 EPA-developed locomotive emissions data

EPA's national rail estimates were developed by the Eastern Regional Technical Advisory Committee hereafter referenced as ERTAC Rail. This group is comprised of eastern states' regulatory agencies in collaboration with the rail industry. ERTAC Rail developed emissions estimates based on fuel data obtained from the American Association of Railroads for each subcategory. California locomotive emission estimates were handled separately from the rest of the United States because of their use of low sulfur locomotive diesel fuels.

ERTAC Rail used confidential railroad-provided data to generate railroad-specific criteria emission estimates for line haul and rail yards at the rail segment and rail yard level, respectively. In addition to the sections below, additional information is available in the project report (ERG, 2011b).

4.4.5.1 Line Haul Criteria Emissions Estimates

Criteria pollutant emissions were estimated by applying emission factors to the total amount of distillate fuel oil used by line haul locomotives. Fuel usage was obtained from publically available Class I Railroad Annual Reports (Form R-1). The R-1 reports are submitted to the Surface Transportation Board annually and include financial and operations data to be used in monitoring rail industry health and identifying changes that may affect national transportation policy. Additionally, each railroad provided fleet mix information that allowed ERTAC Rail to calculate railroad-specific emission factors. Weighted Efs per pollutant for each gallon of fuel used (gm/gal or lbs/gal) were calculated for each Class I railroad fleet based on its fraction of line haul locomotives at each regulated Tier level. EPA emission factors were used for PM2.5, SO2, and NH3.

The weighted emission factors were then applied to the link-specific fuel consumption to obtain emissions for each rail segment. Given the confidentiality of the activity data, emissions for criteria pollutants were provided to EPA by ERTAC Rail by county for Class I line haul. Class II/III rail was provided by railroad company and county.

4.4.5.2 Rail Yard Criteria Emissions Estimates

Rail yard locations were identified using a database from the Federal Railroad Administration. Criteria pollutant emissions were estimated by applying emission factors to the total amount of distillate fuel used by locomotives. Each railroad provided fleet mix information that allowed ERTAC to calculate railroad-specific emission factors. The company-specific, system wide fleet mix was used to calculate weighted average emissions factors for switchers operated by each Class I railroad. EPA emission factors were used for PM2.5, SO2, and NH3.

R-1 report-derived fuel use was allocated to rail yards using an approximation of line haul activity data within the yard. These fuel consumption values were further revised by direct input from the Class I railroads. The weighted emission factors were then applied to the yard-specific fuel consumption to obtain emissions for each yard. Since the rail yard inventory was based on publically-available data, the final criteria emission estimates were provided per rail yard.

4.4.5.3 Hazardous Air Pollutant Emissions Estimates

HAP emissions were estimated by applying speciation profiles to the VOC or PM estimates. Since California uses low sulfur diesel fuel and emission factors specific for California railroad fuels were available, calculations of California's emissions were done separately from the other states. HAP estimates were calculated at the yard and link level, after the criteria emissions had been allocated.

4.4.5.4 Allocation to Rail Segments and Yards

Class I line haul emissions were allocated to rail segments (GIS line shapes) based on segment-specific railroad traffic data (ton miles) obtained from the Department of Transportation. Because Class II/III railroads are less likely to use rail segments that are heavily traveled by Class I railroads, the activity-based approach used for Class I lines was not appropriate. Instead, Class II/III line haul emissions were allocated to rail segments using segment length as a proxy. The dataset "railway_20110921.zip" contains the shapefiles used (see Section 8.1 for access information).

Rail yard point source emissions were developed based on yard name and ownership properties. As a result, unique yards needed to be identified and emissions summed. 753 unique yards were identified nationwide. This is known to be an underestimate of the total number of yards due to limited available data. Once the unique yards were identified and criteria emissions were summed at the yard, the PM and VOC-based HAP speciation profile was applied to estimate HAP emissions at each yard.

4.4.6 Summary of quality assurance methods

EPA and Agency submitted emissions were compared at shape, state, and county to EPA default values. All of the EPA rail emissions were allocated to shape files in the EPA dataset. Where agencies submitted as county-level records in the same counties as the shapes, EIS could not correctly merge the EPA and agency data. Therefore, agencies were asked to resubmit rail emissions in shapes.

Findings

- The 2008 NEI uses only agency emissions in counties where the agency submissions matched to the same shape/SCC/pollutant combinations such that they had priority over EPA data, or where emissions occur in counties with no shape IDs. Several agencies that submitted in shape files included more or fewer shapes (or counties with no shape files) than the EPA dataset. When fewer shapes were submitted, the EPA data were still used for those shapes and the state data were used for the shapes submitted.
- Most agencies included the same or fewer SCCs than the EPA dataset. Several agencies included passenger and commuter (SCC =2285002008 and 2285002009, respectively), a known omission in the EPA dataset, but thought to be a far smaller contributor to emissions than line haul. Where states submitted passenger and commuter rail emissions, they were included in the final NEI.
- New Hampshire submitted CAPs only. For SCC 2285002007, the Sullivan County, NH (FIP= 33019) sum for primary PM10 and primary PM2.5 are about 50% less than EPA's. Since the NEI uses EPA's PM HAPs, the HAP sum will be greater than the PM also in the NEI. This phenomenon may occur elsewhere at a shape ID level.
- EPA put rail yards in point format for SCC=28500201. However EPA acknowledges that the coverage is not complete due to limited activity data available. EPA did not attempt to reconcile with agency submissions for nonpoint rail yards (SCC= 2285002010). Where agencies submitted nonpoint rail yards in the same counties as EPA point rail yards, there is a potential for double counting. This happens in California, DC, Maryland and Oregon. In the counties where this occurs it is not known if the nonpoint county emissions reported by the States have been adjusted to exclude the point sources reported by EPA.

- Most agencies either did not submit HAPs or did not submit all the HAPs EPA used, and therefore EPA data will appear in the NEI for any HAPs in the EPA dataset and not in agency data.
- Agency rail emissions that were not in shape files but occur in counties with EPA shape estimates were overwritten with 0 emissions records if the agencies did not resubmit, to avoid duplication. Submitted rail emission were removed or overwritten for the following agencies: California, Connecticut, DC, Idaho, Illinois, Maricopa County, Maryland, Oregon, Louisville and Washoe.
- An EPA correction file overwrites agency data to 0 tons emissions where unspeciated chromium (pollutant code = 7440473) were submitted in Texas and Kansas.
- Where agencies submitted CAPs only, EPA data fills in the missing HAP. This is problematic when the resultant 2008NEI selection may have VOC and PM is less than the EPA VOC or PM, and there may be a mathematical inconsistency between VOC HAPs and PM HAPs with the criteria pollutants. There will also be an inconsistency because of the different approaches used to compute CAPs and HAPs.
- 2008 NEI emissions can be greater than both the EPA and the agency estimates when either the agency or EPA dataset has populated sets of counties or shapes or has different SCCs, such that the 2008 NEI has more SCCs or shapes than either the EPA or agency datasets.
- Review of Texas rail data (SCC=2285002006) shows that emissions of all pollutants in all but the most industrial counties is suspiciously low. Texas was notified 12/2011 and did not choose to update the data, though they acknowledged the emissions values are low.
- The EPA dataset does not include tribal areas. Therefore the 2008 NEI is equal to the tribal submission only, and therefore will not have consistent SCCs and pollutants as are present in counties.

4.5 Nonroad Equipment – Diesel, Gasoline, and other

Although "nonroad" is used to refer to all transportation sources that are not on-highway, these EIS sectors and this section address nonroad equipment other than locomotives, aircraft, or commercial marine vehicles.

4.5.1 Sector Description

This section deals specifically with emissions processes calculated by the EPA's NONROAD model (http://www.epa.gov/otaq/nonrdmdl.htm) and the OFFROAD model (http://www.arb.ca.gov/msei/offroad/offroad.htm) approved for use by California. They include nonroad engines and equipment, such as: lawn and garden equipment, construction equipment, engines used in recreational activities, portable industrial, commercial, and agricultural engines.

The NMIM (http://www.epa.gov/otaq/nmim.htm) is EPA's consolidated mobile emissions estimation system that allows EPA to produce nonroad mobile emissions in a consistent and automated way for the entire country. EPA encouraged agencies to submit NMIM inputs to the EIS for the 2008 NEI for inclusion in the National County Database (NCD) . The NCD contains all the county-specific information needed to run NONROAD. It also contains the ratios that are applied to NONROAD outputs to estimate emissions of HAPs, dioxins/furans, and some metals. NMIM was run for both on-road and nonroad emissions for the 2008 NEI, but on-road emissions were subsequently replaced by the newer MOVES model estimates described in section 4.6.

4.5.2 Sources of data overview and selection hierarchy

EPA ran NMIM for nonroad sources twice for estimates used in the final 2008 NEI. EPA developed a default NCD and replaced its tables and external files with agency data that were submitted by June 1, 2010. Then EPA ran

NMIM again to include additional submittals that arrived by December 1, 2010. For more information on what information agencies submitted in their NCD files and how EPA ran the NONROAD model, see Section 4.5.4 and the more detailed EPA documentation (E.H. Pechan, 2011).

Agencies also submitted nonroad emissions. In addition to EPA's estimates, the agencies included in Table 50 submitted inputs and/or emissions to the 2008 NEI.

Table 50: Agency Submittals of NONROAD inputs and nonroad smissions

Agency	NONROAD inputs submitted by	Submitted CAP or HAP emissions
Arkansas Department of Environmental Quality	June	
DC-District Department of the Environment	June, December	
California Air Resources Board		CAP_HAP
Delaware Department of Natural Resources and Environmental Control		CAP
Eastern Band of Cherokee Indians	December	CAP_HAP
Georgia Department of Natural Resources	June	
Hawaii Department of Health Clean Air Branch	June	
Idaho Department of Environmental Quality		CAP_HAP
Illinois Environmental Protection Agency		CAP
Kansas Department of Health and Environment		CAP
Kootenai Tribe of Idaho		CAP
Little River Band of Ottawa Indians, Michigan		CAP
Louisville Metro Air Pollution Control District		CAP
Louisiana Department of Environmental Quality	November	
Maine Department of Environmental Protection	June	
Makah Indian Tribe of the Makah Indian Reservation		CAP
Maricopa County Air Quality Department		CAP
Maryland Department of the Environment	June	
Massachusetts Department of Environmental Protection	December	
Metro Public Health of Nashville/Davidson County		CAP_HAP
Michigan Department of Environmental Quality	December	
Minnesota Pollution Control Agency	December	
Missouri Department of Natural Resources	June, December	
Nevada Division of Environmental Protection	December	
New Hampshire Department of Environmental Services	June	
Nez Perce Tribe		CAP
New York State Department of Environmental Conservation		CAP
North Carolina Department of Environment and Natural Resources	June	
Ohio Environmental Protection Agency	December	
Omaha Tribe of Nebraska		CAP
Pennsylvania Department of Environmental Protection	June	CAP
Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho		CAP
South Carolina Department of Health and Environmental Control	December	
Tennessee Department of Environmental Conservation	December	
Texas Commission on Environmental Quality		CAP_HAP
Utah Division of Air Quality		CAP
Vermont Department of Environmental Conservation	June	
Virginia Department of Environmental Quality	June	

Agency	NONROAD inputs submitted by	Submitted CAP or HAP emissions
Wisconsin Department of Natural Resources	December	

The 2008 NEI merged EPA and agency data according to the hierarchy described by Table 51. Agency emissions were used except where they were determined to result in double counting or suspect pollutant inclusion. More detail on this in the sections that follow.

Table 51: 2008 NEI Non-road equipment selection hierarchy

Priority	Dataset Name	Dataset Content
1	EPA Correction Dataset – Nonroad	Overwrites submitted emissions that do not conform to pollutant and emission types expected
2	Responsible Agency Dataset	Submitted nonroad emissions
3	EPA Nonroad using NCD20101201	Includes NMIM NONROAD inputs received after June 1 and before November 30, 2010
4	EPA Nonroad using NCD20100602	Includes NMIM NONROAD inputs received before June 1, 2010 and EPA default inputs for remaining counties
Exception: California		
1	EPA Correction Dataset – Nonroad	Overwrites submitted emissions that do not conform to pollutant and emission types expected
2	Responsible Agency Dataset	CA Submitted nonroad emissions

4.5.3 Spatial coverage and data sources for the sector

Nonroad equipment emissions are included in every state, DC, Puerto Rice, and the Virgin Islands.

[Placeholder for CAP and HAP maps]

4.5.4 EPA-developed NMIM-based nonroad emissions data

For nonroad equipment, EPA requested that S/L/T agencies submit model inputs for use in running NMIM to produce NONROAD model emissions for 2008. After EPA completed the NMIM runs for areas that submitted data, EPA then loaded the resulting data into the EIS for S/L/T agency review. More information on these emissions is provided below and the full documentation (E.H. Pechan, 2011).

The EPA developed the EPA 2008 nonroad data in multiple phases. In the first phase, EPA ran NMIM for year 2008 for the entire country. This NMIM run used EPA default modeling inputs incorporated into "NCD20090327" (the naming convention reflects the NCD's lock-down date). These default inputs represented EPA's initial assumptions concerning key modeling parameters such as fuel blends, ambient temperatures, and on-road VMT. The 2008 nonroad source emission estimates from this phase were listed in the EIS under the dataset descriptions "EPA Nonroad using NCD20090327". The EPA then discovered a need to update some of the fuel parameter values from the assumptions used in NCD20090327. Consequently, EPA developed an updated NCD

reflecting the revised values, which was posted in EIS as "EPA NMIM Activity NCD20090531." This NCD was then posted for review/update by S/L/T agencies.

For the second phase, EPA set a deadline of June 1, 2010 for agencies to submit changes to the NCD20090531 values for their areas. After obtaining any necessary clarification on these changes from S/L/T agencies, EPA modified the NCD to reflect S/L/T updates, ran NMIM for 2008 for the entire country, and processed annual NMIM emissions output for loading into the EIS. This 2008 nonroad source NEI development phase resulted in the EIS emissions dataset "EPA Nonroad using NCD20100602".

In the third and final phase, agencies were afforded the opportunity to review EPA's emission estimates and provide additional revisions to NMIM inputs. After updating the NCD to reflect these revisions, EPA ran NMIM a final time and produced the EIS emissions dataset "EPA Nonroad using NCD20101201". This dataset only covers the geographical areas that submitted changes between July 2010 and November 2010.[16] The resulting NMIM county database that includes all of the data used to produce all of the final EPA data used is available in the file "ncd20101201.zip" (see Section 8.1 for access information).

4.5.5 Summary of quality assurance methods

Quality assurance steps performed on EPA's estimates are described in the documentation (E.H. Pechan, 2011).

EPA also performed QA steps on the agency-submitted data. We compared state and county EPA defaults, agency submittals and selection results by (1) included pollutants, SCCs, SCC-Emission Types (nonroad emission types are R=refueling, E=evap, X=exhaust), and (2) emissions summed to agency level.

Findings

- Although the agency data are assumed to better reflect state- or county-specific inputs, results can be significantly different for key pollutants, such as NOx, that will have an impact on ozone and PM formation in and around the state.
- Several agencies had only 1 or 2 of the 3 emission types: X (exhaust), E (evaporative), or R (refueling). The 2008 NEI selection results in higher emissions than EPA or agency estimates where SCC/emission type combinations are not congruent, because the remaining EPA estimates are included for any combinations not already in agency data. This is particularly the case for VOC and volatile HAPs where all agency emissions are reported as X (exhaust) and EPA estimates for R (refueling) and E (evaporative) values are added in the 2008 NEI.
    - Examples:
        - VOC in Utah is 3% greater in the 2008 NEI than in the agency submittal, 34% greater in Texas, and 30% greater in Jefferson Co, Kentucky; due in part to addition of remaining emission types in EPA dataset.
    - Based on EPA analysis of the emissions level, EPA changed every record submitted by Pennsylvania from emission type "E" (evaporative) to "X" (exhaust).

[16] Although Lincoln County Nebraska data were provided in time for the June submittal deadline, EPA uploaded the NMIM results in the NCD20101201 dataset rather than the NCD20100602 dataset.

    - The dataset "EPA Correction Dataset – Nonroad" zeroes out agency data where pollutant code/emission type combinations do not exist in EPA's dataset (e.g., evaporative PM) because they are not valid combinations in the NONROAD model.
- Some agencies may have overwritten a previous submittal with the resubmission of a single pollutant.
    - Examples
        - Idaho submittal includes nonzero records only for primary PM10
        - Louisville Metro submittal only includes SO2
    - In these cases, the agency-submitted data has been included only for the pollutants submitted in the last submission, and EPA data were used for the other pollutants
- When either the agency and EPA datasets have different SCCs or more SCC/ emission type combinations than the other, the 2008 NEI will have more SCCs or SCC/emission types than either the EPA or agency datasets does alone. This was only the case in Texas and Idaho. The possible adverse impacts of adding emissions to these two states due to this issue do not outweigh the benefits of using the state data, which is often significantly different from EPA data. The SCCs that EPA's dataset included and the agency did not are shown in Table 52.
    - Example:
        - NOx in Texas is 4% higher than the agency submittal, primary PM2.5 is 19% higher; due to 10 additional SCCs in EPA and not in agency submittal. This can be avoided by agencies in future submissions by submitting zero values for emissions from these SCCs if that is the agency's intent.

Table 52: Nonroad SCCs included in 2008 NEI that were not in S/L/T agency submittals

State	SCC	Description
ID	2268010010	CNG Industrial Equipment Other Oil Field Equipment
ID	2265007015	Off-highway Vehicle Gasoline, 4-Stroke Logging Equipment Forest Eqp – Feller/Bunch/Skidder
ID	2270010010	Off-highway Vehicle Diesel Industrial EquipmentOther Oil Field Equipment
ID	2265010010	Off-highway Vehicle Gasoline, 4-Stroke Industrial Equipment Other Oil Field Equipment
ID	2265007010	Off-highway Vehicle Gasoline, 4-Stroke Logging Equipment Shredders : 6 HP
ID	2270007015	Off –highway Vehicle Diesel Logging Equipment Forest Eqp – Feller/Bunch/Skidder
ID	2260007005	Off-highway Vehicle Gasoline, 2-Stroke Logging Equipment Chain Saws : 6 HP
TX	2270004036	Off-highway Vehicle Diesel Lawn and Garden EquipmentSnowblowers (Commercial)
TX	2260004071	Off-highway Vehicle Gasoline, 2-Stroke Lawn and Garden Equipment Turf Equipment (Commercial)
TX	2265004036	Off-highway Vehicle Gasoline, 4-Stroke Lawn and Garden Equipment Snowblowers (Commercial)
TX	2260004036	Off-highway Vehicle Gasoline, 2-Stroke Lawn and Garden Equipment Snowblowers (Commercial)
TX	2267004066	LPG Lawn and Garden Equipment Chippers/Stump Grinders (Commercial)
TX	2270004056	Off-highway Vehicle Diesel Lawn and Garden EquipmentLawn and Garden Tractors Commercial)
TX	2268010010	CNG Industrial Equipment Other Oil Field Equipment
TX	2270010010	Off-highway Vehicle Diesel Industrial Equipment Other Oil Field Equipment
TX	2265010010	Off-highway Vehicle Gasoline, 4-Stroke Industrial Equipment Other Oil Field Equipment
TX	2265004056	Off-highway Vehicle Gasoline, 4-Stroke Lawn and Garden Equipment Lawn and Garden Tractors (Commercial)

- Most agencies did not submit HAPs, and therefore the data in the2008 NEI came from the EPA-created data. We considered whether including EPA data for HAPs but state and/or state plus EPA data for CAPs could cause any problems. Since the 2008 NEI for criteria VOC and PM is always larger than the EPA VOC or PM for any state, we can be assured that the 2008 NEI criteria VOC will always be larger than the sum of the 2008 NEI VOC HAPs, and that the 2008 NEI criteria PM will always be larger than the sum of the 2008 NEI PM HAPs. Nevertheless, there is still an inconsistency between CAPs and HAPs because of the different approaches used to compute each of them.
- The California submittal differed dramatically from EPA dataset in SCC and pollutant coverage due to being estimated with a different model. The two data sources could not be merged without numerous double counts. Only California data were used in this case. The 2008 NEI in California does not agree well with the rest of the country.
    - Example:
        - California nonroad data does not include NH3, and therefore it is missing from the 2008 NEI as well
- The EPA dataset does not include tribal areas. Therefore the 2008 NEI contains only tribal submission data and includes only the SCCs and pollutants submitted by tribes, which can be different from the county data.

- Agencies emissions are likely to capture local scale details that EPA data may not, particularly because most the agencies submitting emissions did not submit input data. Some agency data differ significantly from EPA's.
    - Examples:
        - Texas NOx is 20% higher than EPA
        - Delaware and New York SO2 are each about 300% higher than EPA, perhaps indicating higher sulfur fuel usage than EPA assumed.

4.6 On-road – all Diesel and Gasoline vehicles

This section includes the description of four EIS sectors:

- Mobile – On-road – Diesel Heavy Duty Vehicles
- Mobile – On-road – Diesel Light Duty Vehicles
- Mobile – On-road – Gasoline Heavy Duty Vehicles
- Mobile – On-road – Gasoline Light Duty Vehicles

They are treated here in a single section because the methods used are the same across all sectors.

4.6.1 Sector Description

The four sectors for on-road mobile sources include emissions from motorized vehicles that are normally operated on public roadways. This includes passenger cars, motorcycles, minivans, sport-utility vehicles, light-duty trucks, heavy-duty trucks, and buses. The sectors include emissions from parking areas as well as emissions while the vehicles are moving.

SCCs starting with 22010 define the light duty gasoline vehicles including motorcycles, with the exception of SCCs starting with 220107, which define the heavy duty gasoline vehicles. SCCs starting with 22300 define the light duty diesel vehicles, with the exception of SCCs starting with 223007 that define the heavy duty diesel vehicles.

Prior versions of the 2008 NEI and past NEIs included emissions from the MOBILE6 model. The 2008 NEI v2 is the first NEI to include emissions from the MOVES model.

4.6.2 Sources of data overview and selection hierarchy

All 2008 NEI on-road estimates were calculated by EPA using MOVES, except in California. Table 53 shows the selection hierarchy

Table 53: 2008 NEI on-road mobile selection hierarchy

Priority	Dataset Name	Dataset Content
1	2008_EPA_MOBILE	EPA's draft MOVES2010b-based estimates
Exception: California and tribes		
1	EPA Correction Dataset – Onroad	Overwrites submitted emissions that do not conform to pollutant and emissions types expected
2	Responsible Agency Dataset	Submitted on-road emissions

California submitted emissions to the NEI based on the EMFAC model, which is a separately EPA-approved model to be used only in California. Because California's emissions were calculated with a different model, the emissions are not congruent with the rest of the country in terms of SCCs used, pollutants present, and emission type coverage.

During the 2008 NEI development cycle for on-road mobile emissions, EPA requested that S/L/T agencies submit NMIM inputs for use in an EPA 2008 NEI NMIM run to generate MOBILE6-based emissions. At the start of the 2008 NEI cycle, the MOVES model had not yet been released for criteria pollutants and the input formats were not stable, and so it was not possible for EPA to collect the MOVES input formats or MOVES-based emissions. A summary of the NMIM input submittals and EPA's conversion of VMT to inputs is described in Section 3.2.3 of the project documentation for EPA's mobile data (E.H. Pechan, 2011). EPA used the NMIM inputs to update the EPA NMIM input database. If an agency submitted on-road emissions (which includes VMT data) rather than NMIM inputs, then EPA compiled the VMT from this submittal for use in EPA's NMIM run. EPA used the NMIM database to create 2008 on-road emissions using NMIM, which were used in version 1 and 1.5 of the 2008 NEI along with any emissions submitted by agencies that did not provide NMIM inputs.

After the formal 2008 NEI submission period had ended, EPA provided S/L/T agencies the opportunity to provide MOVES inputs. A few states provided these data, which were used in subsequent data development steps described below. No agencies submitted MOVES-based emissions estimates. EPA converted the NMIM database for input to MOVES and then overlaid these data with the MOVES inputs provided by some states. The resulting database was the starting point for the MOVES-based emissions described below, and as described, EPA continued to make changes to the database prior to running MOVES for the NEI.

Several tribes submitted data based on the MOBILE6 model, but these data were not included in the NEI selection because of the switch to a MOVES-based inventory. The tribal data is available in EIS. These tribes were: the Kootenai Tribe of Idaho, the Eastern Band of Cherokee Indians, the Nez Perce Tribe, the Northern Cheyenne Tribe, the Pueblo of Laguna, New Mexico, and the Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho.

4.6.3 Spatial coverage and data sources for the sector

The on-road mobile sectors include emissions in every state, Puerto Rico, and the US Virgin Islands.

[Placeholder for CAP and HAP maps and associated observations]

4.6.4 EPA-developed on-road mobile emissions data for the continental U.S.

For the 2008 NEI, EPA estimated emissions for every county in the U.S. except for California. For the continental U.S., we used county-specific inputs and tools that integrated the MOVES model with the SMOKE[17] emission inventory model to take advantage of the gridded hourly temperature information available from meteorology modeling used for air quality modeling. This integrated "SMOKE-MOVES" tool was developed by EPA in 2010 and is in use by states and regional planning organizations for regional air quality modeling. SMOKE-MOVES

[17] A beta version of SMOKE v3.0 was used for the 2008 NEI v2. The current version is available at: http://www.smoke-model.org/index.cfm

requires emission rate "lookup" tables generated by MOVES that differentiate emissions by process (running, start, vapor venting, etc.), vehicle type, temperature, speed, hour of day, etc. To generate the MOVES emission rates that could be applied across the U.S., EPA used an automated process to run MOVES to produce emission factors by temperature and speed for 167 "representative counties," to which every other county could be mapped, as detailed below. Using the MOVES emission rates, SMOKE selected appropriate emissions rates for each county, hourly temperature, SCC, and speed bin and multiplied the emission rate by activity (VMT or vehicle population) to produce emissions. These calculations were done for every county, grid cell, and hour in the continental U.S. and aggregated to produce continental U.S. emissions. The MOVES "RunSpec" files (that tells MOVES what to run for each representative county) are available in the file "RepCounty_Runspecs.zip" (see Section 8.1 for access information). A full listing of datasets available as supporting information for the on-road MOVES runs is available in Section 8.1 and these are referenced in the subsections below.

EPA used a different approach for states and territories outside the lower 48 states. For Alaska, Hawaii, Puerto Rico and the Virgin Islands, EPA ran MOVES in "inventory mode" for each county and month, using county-specific inputs. More information is provided Section 4.6.5.

SMOKE-MOVES can be used with different versions of the MOVES model. For the 2008 NEI, EPA used a modified version of MOVES2010a (http://www.epa.gov/otaq/models/moves/index.htm). Since the release of MOVES2010a, EPA has continued to improve MOVES. The NEI was modeled between the release of MOVES2010a (September 2010) and the release of MOVES2010b (April 2012), and used an intermediate draft version of the MOVES2010b model. This version of the model included improvements to handling of refueling and extended idle emissions, addressed errors in the MOVES2010a emission rates for ammonia (NH3), nitrous oxide (NO) and nitrogen dioxide (NO2), and included the capability to model additional hazardous air pollutants. EPA made other changes to the MOVES2010a model to facilitate the large number of parallel runs that needed to be done to complete the NEI. Details on the changes to air toxics are detailed in a separate technical report (US EPA, 2012). Full documentation for MOVES2010b will be available when the model is released.

Using SMOKE-MOVES for creating the NEI requires numerous steps, as described in the sections below:

- Determine which counties will be used to represent other counties in the MOVES runs (see Section 4.6.4.1)
- Determine which months will be used to represent other month's fuel characteristics (see Section 4.6.4.2)
- Create MOVES inputs needed only for MOVES runs (see Sections 4.6.4.3 and 4.6.4.4). MOVES requires county-specific information on vehicle populations, age distributions, and inspection-maintenance programs for each of the representative counties.
- Create inputs needed both by MOVES and by SMOKE, including a list of temperatures needed by running the SMOKE-MOVES "Met4moves" tool (see Sections 4.6.4.5 and 4.6.4.6).
- Run MOVES to create emission factor tables (see Section 4.6.4.7)
- Run SMOKE to apply the emission factors to activities to calculate emissions (see Section 4.6.4.8)
- Aggregate the results at the county-SCC level for the NEI (see Section 4.6.4.9)

4.6.4.1 Representative counties

Although EPA compiles county-specific databases for all counties in the nation, actual county-specific data are rare. Instead, much of our "county" data are based on state-wide estimates or national defaults. For the NEI, rather than explicitly model every county in the nation, we have done detailed modeling for some counties and less detailed estimates for the other counties. This approach dramatically reduces the number of modeling runs required to generate inventories and still takes into account important differences between counties.

In this approach, we group counties that have similar properties that would result in similar emission rates. We explicitly model only one county in the group (the "representative" county) to determine emission rates. These rates are then used in combination with county specific activity and meteorology data, to generate inventories for all of the counties in the group. The grouping of counties was based on several characteristics as summarized in Table 54 below.

Table 54: Characteristics for Representative County Groupings

County Grouping Characteristic	Description
PADD	Petroleum Administration for Defense Districts (PADDs). PADD 1 is divided into three sub-PADD groupings and each sub-group is treated as a separate PADD (1a, 1b and 1c). Each state belongs to a PADD and all counties in any state are within the same PADD.
Fuel Parameters	Weighted average gasoline fuel properties for January and July 2008, including RVP, sulfur level, ethanol fraction and percent benzene
Emission Standards	Some states have adopted California highway vehicle emission standards or plan to adopt them. Since implementation of the standards varies, each state with California standards is treated separately.
Inspection/Maintenance Programs	Counties were grouped within a state according to whether or not they had an inspection/maintenance (I/M) program. All I/M programs within a state were considered as a single program, even though each county may be administered separately and have a different program design.
Altitude	Counties were categorized as high or low altitude based on the criteria set forth by EPA certification procedures (4,000 feet above sea level).
Fleet Age	The weighted average age of passenger cars.
Total VMT	County total vehicle miles traveled.

The result is a set of 167 county groups with similar fuel, emission standards, altitude, I/M programs and fleet age. For each group, the county with the highest total VMT was chosen as the representative county for the group (this VMT is not used to calculate the emissions however). A summary of the representative counties is available in the spreadsheet included in "MCXREF_2008_summary.zip" and the MOVES County Database Manager databases are available in the file "RepCounty_Counties.zip" (see Section 8.1 for access information).

For each county group, SMOKE-MOVES generated a set of emission rates that varied by SCC (vehicle type and road type), fuel, speed, temperature, and humidity; thus, we did not need to consider the fleet mix, fuel, speed, temperature range, or humidity in our grouping characteristics. This greatly increased the number of counties that can be grouped, and reduced the number of MOVES runs required.

4.6.4.2 Fuel months

The concept of a fuel month is used to indicate when a particular set of fuel properties should be used in a MOVES simulation. Similar to the reference county, the fuel month reduces the computational time of MOVES by using a single month to represent a set of months. For the 2008 NEI runs, EPA used January or July to represent other months. For example, if the grams/mile exhaust emission rates in January were identical to February's rates for a given reference county, temperature, and other factors, then we used a single fuel month to represent January and February. In other words, only one of the months was modeled through MOVES. The hour-specific VMT, temperature and other factors for February were still used to calculate emissions in February, but the emission factors themselves were not recreated since one month could represent the other month sufficiently. The fuel months used for each representative county are available in the spreadsheet included in "MFMREF_2008.zip" (see Section 8.1 for access information).

4.6.4.3 Fuels

Although state-submitted NMIM and MOVES input data may have included information about fuel properties, the MOVES runs for the 2008 NEI were run using a set of fuel properties for each county in 2008 generated by EPA. We developed these data using a combination of purchased fuel survey data, proprietary fuel refinery information and known federal and local regulatory constraints.

The 2008 fuels generated by EPA were developed by interpolating between a 2005 reference fuel supply and a 2017 fuel supply that had been developed for use in EPA regulation development, using year-by-year gasoline fuel property regulations (such as sulfur and benzene control) and projected national ethanol penetration levels per year based on the 2011 Ethanol Industry Outlook (Renewable Fuels Association, 2011). EPA made adjustments to align 10% ethanol (E10) fuel properties in interpolated years.

The following list provides a step-by-step outline of the interpolation steps applied to create the 2008 fuel supply database.

1) Methyl tertiary butyl ether, ethyl tert-butyl ether, and teriary amyl methyl ether fuel blends were removed from the 2005 fuel supply and replaced with appropriate E10 (a mixture of 10% ethanol and 90% gasoline) levels and properties found from refinery modeling.

2) Reformulated Gasoline (RFG) areas were adjusted to contain only E10 blends and associated fuel properties.

3) Ethanol blends from 2005 were removed and replaced with appropriate properties found from the updated refinery modeling used to generate the 2017 fuel supply.

4) Gasoline sulfur levels were reduced to 30 ppm for all counties outside of the Geographic Phase-in Area (GPA). Counties within the GPA remain at the sulfur levels found in the 2005 reference case. The counties in the GPA are defined in the Code of Federal Regulations (CFR Title 40 Section 80.215).

5) E10 market share was adjusted by county to a minimum market share of 45%. Counties with market share above 45%, including RFG counties, remain at the higher market share.

6) Diesel fuel was carried over from the 2005 fuel supply.

4.6.4.4 Other local MOVES inputs

In addition to fuels and the information also needed by SMOKE (in the following sections), MOVES also required inputs such as age distribution and I/M program descriptions for each of the representative counties. At the county level, these inputs provide an opportunity to assure that the model properly accounts for the most recent available local data. When these data were available from the state-supplied NMIM inputs, we converted the NMIM data (version NCD20101201) for use in MOVES. EPA manually imported the 2008 data from Delaware and Utah into a MOVES format. Only data related to VMT, vehicle populations, speed distributions and age distributions were imported. Fuel data submitted by states was not used for the 2008 NEI in order to use the latest EPA estimates and make selecting representing counties easier. Similarly, meteorological data from states were not used, since the NEI calculations used the SMOKE generated meteorological data instead. Other state data from the NMIM data format were not used because of the project schedule and resource constraints.

In the few cases where MOVES input data were provided, we used that data. At their request, we converted 2007 data (already in MOVES format) submitted by Florida and Shelby County, Tennessee for use in calendar year 2008, augmenting with 2008 calendar year VMT, population and average speed estimates. Extensive 2008 data were provided by Texas, but these data were not easily converted to MOVES format, so EPA did not have time to include these data. EPA also received additional data from Connecticut, but the data were received too late to be included. When state-supplied data were not available, we used MOVES defaults.

When state-supplied data were not available, we used MOVES defaults. In the state-provided data, EPA identified errors in age distributions provided for two counties in Arkansas (FIPS codes 05015, 05143) which resulted in anomalous results. Those age distributions were replaced with default distributions prior to the final run of MOVES for the NEI.

For the continental U.S., all of these MOVES inputs were organized by representative counties. This means that only the counties used to represent other counties had specific information for the MOVES runs. As listed in Section 8.1, the MOVES input data for the representative counties are available in several sets of files provided with the supporting data for this documentation.

4.6.4.5 Temperature and humidity

Ambient temperature can have a large impact on emissions. Low temperatures are associated with high start emissions for many pollutants. High temperatures are associated with greater running emissions due to the higher engine load of air conditioning. High temperatures also are associated with higher evaporative emissions.

The 12-km gridded meteorological input data for the entire year of 2008 covering the continental United States were derived from simulations of version 3.1 of the Weather Research and Forecasting Model (WRF, http://wrf-model.org), Advanced Research WRF core (Skamarock, et al., 2008). The WRF Model is a mesoscale

numerical weather prediction system developed for both operational forecasting and atmospheric research applications. The Meteorology-Chemistry Interface Processor (MCIP) version 3.6 (http://www.cmascenter.org/help/model_docs/mcip/3.6/ReleaseNotes) was used as the software for maintaining dynamic consistency between the meteorological model, the emissions model, and air quality chemistry model. The hourly gridded meteorological data were post-processed by met4moves to determine the maximum temperature ranges, average relative humidity, and a series of diurnal temperature profiles. The hourly gridded meteorological data (output from MCIP) was also used directly by SMOKE (Section 4.6.4.7).

EPA applied the SMOKE-MOVES tool Met4moves to the WRF-based gridded, hourly temperatures to generate a list of all the possible temperatures and temperature profiles that are needed for MOVES to create the emission-factor lookup tables. "Temperature profiles" are arrays of 24 temperatures that describe how temperatures change over a day, and they are used by MOVES to estimate vapor venting emissions. In SMOKE-MOVES, the vapor venting emissions are called "rate-per-profile" processing.

The temperature lists were organized based on the representative counties and fuel months as described in Sections 4.6.4.1 and 4.6.4.2, respectively. Temperatures were analyzed for all of the counties that are mapped to the representative counties, i.e., for the county groups, and for all the months that were mapped to the fuel months. EPA used Met4moves to determine the minimum and maximum temperatures in a county group for the January fuel month and for the July fuel month, and the minimum and maximum temperatures for each hour of the day. Met4moves also generated temperature profiles using the minimum and maximum temperatures and 10 degree intervals.

The treatment of humidity was simpler. Met4moves calculated an average day-time (6 am to 6 pm) relative humidity for the county group for the months mapped to July and for the months mapped to January. When the emission factors are applied by SMOKE (Section 4.6.4.7), the appropriate (July or January) humidity was used for all runs of the county group.

Met4moves can be run in daily or monthly mode for producing SMOKE input. In monthly mode, the temperature range is determined by looking at the range of temperatures over the whole month for that specific county. Therefore, there is one temperature range per county per month. While in daily mode, the temperature range is determined by evaluating the range of temperatures in that county for that day. The output for the daily mode is one temperature range per county per day and is a more detailed approach for modeling the vapor venting emissions. EPA ran Met4moves in daily mode for 2008 NEI.

The resulting temperatures provided to the representative counties are available in the file "RepCounty_temperatures.zip" (see Section 8.1 for access information). The gridded, hourly temperature data used are publicly available only upon request and with provision of a disk media to copy these very large datasets (contact info.chief@epa.gov).

4.6.4.6 VMT, vehicle population, and speed

SMOKE requires county-specific VMT, population, and average speed by SCC to calculate the gridded or county emissions. Unlike the other inputs that are needed just for the representative counties, these inputs are needed for every county. When available, VMT and vehicle population estimates were obtained from data submitted by states. The state submitted input data are discussed in Section 4.6.4.4. As described above, most of the VMT information used was converted to a MOVES format from data originally supplied to EPA as NMIM input data.

Data obtained from the NCD did not contain vehicle population data. When population data were not available, the vehicle population data were derived from the state supplied VMT data using methodologies provided in MOVES guidance for that purpose.

The average speeds provided to SMOKE for each county were derived from the default national average speed distributions found in the default MOVES2010a database AvgSpeedDistribution table. These average speeds are the average speeds developed for the previous EPA highway vehicle emission factor model, MOBILE6. EPA used the MOVES distribution of average speeds for each hour of the day for each road type to calculate an overall average speed for each hour of the day. These hourly average speeds were weighted together using the default national average hourly VMT distribution found in the MOVES default database HourlyVMTFraction table, to calculate an average speed for each road type. This average speed by road type was provided to SMOKE for each county.

SMOKE requires VMT by county and SCC, but MOVES is not based on the traditional NEI SCCs. Because the VMT in each MOVES county database is by the broader category of "HPMSVtype", it was necessary to allocate this VMT to the SCCs. We did this by running MOVES at the national level for 2008 with MOVES defaults. Then we used the activity output to determine default ratio of sourcetype VMT to HPMSVtype VMT. We also used this output to determine ratios of sourcetype/fueltype to sourcetype VMT. We used the NCD20110908.baseyearvmt to determine "roadtype ratios" i.e., allocation from MOVES roadtypes to SCCroadtypes by county and SCCvtype (same as P5vclass). Because some ratios were missing, we used ratios for cars (vtype=1) to fill in any missing ratios . Next we applied these ratios and the MOVES2010a (MOVESdb20100830) sccvtypedistribution for model year 2008 to allocate VMT to SCCVtype. And we used roadtype ratios previously derived from NCD to allocate countyroadtype VMT to SCC roadtypes. Finally, we used county-specific monthvmtfractions to allocate VMT to each month.

Vehicle populations also had to be allocated to SCC. We started with state-provided (or default) MOVES inputs on vehicle populations by county. These were provided by vehicle sourcetype. We had to allocate this population by fueltype and to the various SCC categories. To do this, we ran MOVES at the national level for 2008 with default inputs. This generated activity by sourcetype and fuel type, so we could determine the default split of each sourcetype between gasoline and diesel fueled- vehicles. Using this ratio and the MOVES2010a (MOVESdb20100830) sccvtypedistribution for model year 2008, we allocated the MOVES default population to SCC.

The MOVES MySQL databases that include the VMT and vehicle population used for the representative counties are listed in Section 8.1. The SMOKE input VMT, vehicle population, speed data, and hourly speed profiles used to estimate emissions for every county are available in the files "VMT_NEI_2008_updated2_18jan2012_v3.zip", "VPOP_NEI_2008_18jan2012_v3.zip", "SPEED_2008NEI_18nov2011_v0.zip", and "spdpro_2008nei_18nov2011_v0.zip" (see Section 8.1 for access information).

4.6.4.7 Run MOVES to create emission factors

EPA used the SMOKE-MOVES driver scripts to run MOVES for each of the representative counties, fuel-months, and the listed temperatures and temperature profiles. This step resulted in three EF tables created for each representative county and fuel month: Rate per Distance (RPD), rate per vehicle (RPV), and rate per profile (RPP).

4.6.4.8 Run SMOKE to create emissions

The SMOKE-MOVES program that combines activity data and emission factors is "Movesmrg". EPA ran Movesmrg for each of the three sets of emission factor tables (RPD, RPV, and RPP). During the Movesmrg run, the program uses the hourly, gridded temperature (for RPD and RPV) or daily temperature profile (for RPP) to select the proper emissions rates and compute emissions. These calculations were done for all counties and SCCs in the SMOKE inputs, covering the continental U.S.

The emissions process RPD is for modeling the on-network emissions. This includes the following modes: vehicle exhaust, evaporation, evaporative permeation, brake wear, and tire wear. For RPD, the activity data are monthly VMT, average monthly speed, and hourly speed profiles for weekday versus weekend (SMOKE "SPDPRO" file)[18]. The SMOKE program temporal takes vehicle and roadtype specific temporal profiles and distributes the monthly VMT to day of the week and hour. Movesmrg reads the speed data for that county and SCC and the temperature from the gridded hourly data and uses these values to look-up the appropriate EF from the representative county's EF table. It then multiplies this EF by temporalized VMT to calculate the emissions for that grid cell and hour. This is repeated for each pollutant and SCC in that grid cell.

The emission process RPV is for modeling the off-network emissions. This includes the following modes: vehicle exhaust, evaporative, and evaporative permeation. For RPV, the activity is vehicle population. Movesmrg reads the temperature from the gridded hourly data and uses the temperature plus SCC and the hour of the day to look up the appropriate EF from the representative county's EF table. It then multiplies this EF by the vehicle population for that SCC and FIPS to calculate the emissions for that grid cell and hour. This repeats for each pollutant and SCC in that grid cell.

The emission process RPP is for modeling the off-network emissions for parked vehicles. This includes the mode vehicle evaporative (fuel vapor venting). For RPP, the activity is vehicle population. Movesmrg reads the county based diurnal temperature range from met4moves' output for SMOKE. It uses this temperature range to determine the most similar idealized diurnal profile from the EF table using the temperature min and max, SCC, and hour of the day. It then multiplies this EF by the vehicle population for that SCC and FIPS to calculate the emissions for that grid cell and hour. This repeats for each pollutant and SCC within the county.

The result of the Movesmrg processing is hourly, gridded data suitable for use in air quality modeling as well as daily reports for the three processing streams (RPD, RPV, and RPP). The results include emissions for each county, rather than just for the representative counties, because Movesmrg has taken the county-specific activity and combined it with the representative county emission rates to produce emissions.

4.6.4.9 Post-Processing to Generate Annual Inventory

For the purposes of the NEI, EPA needed emissions data by county, SCC, pollutant, and emission type (exhaust, evaporative, brake wear, and tire wear). EPA developed and used a set of scripts to combine the emissions from the three sets of reports and from all days to create the annual inventory.

Metals and dioxins were generated through a separate process. Instead of having county, process, and temperature specific emission factors, a national EF for each pollutant/SCC combination was multiplied by the

[18] If the SPDPRO file is available, the hourly speed takes precedence over the average monthly speed.

appropriate VMT for a specific county to create annual emissions for that pollutant. Table 55 lists the pollutants that we estimated using national Efs.

Table 55: Pollutants estimated through national emission factors

NEI pollutant	Description
16065831	Chromium III
1746016	2,3,7,8-Tetrachlorodibenzo-p-Dioxin
18540299	Chromium (VI)
19408743	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin
3268879	Octachlorodibenzo-p-Dioxin
35822469	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin
39001020	Octachlorodibenzofuran
39227286	1,2,3,4,7,8-Hexachlorodibenzo-p-Dioxin
40321764	1,2,3,7,8-Pentachlorodibenzo-p-Dioxin
51207319	2,3,7,8-Tetrachlorodibenzofuran
55673897	1,2,3,4,7,8,9-Heptachlorodibenzofuran
57117314	2,3,4,7,8-Pentachlorodibenzofuran
57117416	1,2,3,7,8-Pentachlorodibenzofuran
57117449	1,2,3,6,7,8-Hexachlorodibenzofuran
57653857	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin
60851345	2,3,4,6,7,8-Hexachlorodibenzofuran
67562394	1,2,3,4,6,7,8-Heptachlorodibenzofuran
70648269	1,2,3,4,7,8-Hexachlorodibenzofuran
72918219	1,2,3,7,8,9-Hexachlorodibenzofuran
7439965	Manganese
7439976	Mercury
7440020	Nickel
7440382	Arsenic
N2O	Nitrous Oxide

The on-road emissions for Alaska, Hawaii, Puerto Rico and the Virgin Islands, which EPA generated via MOVES in inventory mode (see Section 4.6.5) were appended to the on-road inventory generated from SMOKE-MOVES. The emissions for metals and dioxins were also appended to the on-road inventory to create the final emissions. This complete inventory was submitted to the EIS as the EPA estimates for the on-road sector. The resulting EIS dataset is named “2008_EPA_MOBILE”.

4.6.5 EPA-developed on-road mobile emissions data for Alaska, Hawaii, Puerto Rico and the Virgin Islands

Since the meteorology domain used by EPA for running SMOKE-MOVES covered only the continental U.S., EPA used the MOVES “inventory mode” to create emissions for Alaska, Hawaii, Puerto Rico and the Virgin Islands. These runs used the average monthly hourly temperatures and humidity values available in the MOVES database as derived from the NMIM database described above (see Section 4.6.4.4).

The MOVES inputs used for these emissions are available as described in Section 8.1. The file "AKHIPRVI_Counties.zip" contains the MOVES county database manager databases, and the file "AKHIPRVI_Runspecs.zip" contains the run specifications used to run MOVES. Lastly, the file "akhiprvi_temperatures.zip" contains the MySQL database containing the tables that describe the temperatures and relative humidity values used for these states and territories.

4.6.6 Summary of quality assurance methods

EPA did a series of checks and comparisons against both the inputs and the resulting emissions to quality assure the on-road inventory. The following is a list of the more significant checks and resulting corrections:

- Checked the VMT data by comparing the 2008 with a 2005 based activity data. Also analyzed the ratio VMT to vehicle population to look for extreme values. Identified widespread errors in ID and NV. Found additional problems in two counties in CA and 10 counties in VA. Updated the VMT in consultation with OTAQ. Reran RPD (the processes that are dependent on VMT) for the above counties.
- Checked the consistency of VMT with vehicle population and identified counties in which there was VMT but no vehicle population. Updated the vehicle population in consultation with OTAQ for the following FIPS (16061, 30069, 31005, 51610, and 51685). Reran RPP and RPV (processes that are dependent on vehicle population) for these counties.
- Many counties in Texas had identical extremely high populations and VMT. We reran all 254 Texas counties using older data.
- Three counties in Florida and one in Tennessee were missing monthvmt and roadtypedistribution tables and had to be re-run using MOVES default values.
- The county databases for Norton City VA (51720) listed zero VMT and zero population. We substituted county data from the 2005 NEI.
- Cottonwood, MN (27033) had an unreasonably low vehicle population of only 82 vehicles. Instead, we used VMT from NCD 20101201 and Population/VMT ratios from the 2005 NEI.
- Three counties in Florida (12086, 12033, 12057) had populations and VMT that were inconsistent with independent sources. We substitute more consistent county inputs provided in spring 2011.
- Identified a large number of missing SCCs in the activity data for Georgia. Determined that there was a truncation problem in the conversion of the MOBILE6 activity data submitted by the states into MOVES activity data. Returned to the original state submitted VMT data and reprocessed it for SMOKE-MOVES.
- Identified errors in age distributions in two counties in Arkansas (FIPS codes 05015, 05143) which resulted in anomalous results. The state supplied age distributions were replaced with default distributions prior to the final run of MOVES for the NEI. Generated new Efs for these two reference counties and reran RPD, RPP, and RPV for all of Arkansas and Louisiana.
- Identified a problem with the toluene and xylenes HAP emissions for diesel vehicles. Recalculated these emissions by using a fixed ratio of toluene to VOC (0.00433) and xylenes to VOC (0.003784). Applied these factors to whole inventory (both portion generated by SMOKE-MOVES and MOVES directly) to generated new toluene and xylene emissions for diesel SCCs.
- Compared the on-road results to similar results from the previous version of the 2008 NEI. The previous version was prepared using MOBILE6. We found numerous differences between the two sets of results. Detailed comparisons by state, county and SCC vehicle type showed that most of the differences were due to updated input data from the states, or to differences between the two emission models. In

particular, based on an updated understanding of vehicle emissions, the MOVES model generally predicts much higher NOx, PM and ammonia emissions compared to the MOBILE6 model. And, the MOVES model generally predicts lower emissions of hydrocarbons and carbon monoxide (Beardsley, 2010). These trends were evident in the comparisons of the two NEI versions.

- The comparisons between Version 1.5 and Version 2 of the 2008 NEI did identify one problem with Version 2. Sulfur dioxide emissions and sulfate emissions are incorrectly inflated. This also overestimates emissions of total PM2.5 and total PM10 (since those totals include sulfates). This overestimate was due to a mistake in the default values for sulfur levels in 2008 diesel fuels. The magnitude of the error varies by county, depending on the ratio of the modeled and the actual diesel sulfur levels. Diesel fuel levels should have been closer to 15ppm sulfur because of the Ultra Low Sulfur Diesel rulemaking phase-in, rather than the average of ~100ppm actually included. This error did not significantly affect total emissions from diesel vehicles, but it caused the calculated values for SO2 and SO4 emissions for diesel vehicles to be too high.
- Compared the 2008 NEI v2 with a similar run done for 2005 using 2005 inputs. In general, this comparison indicated the expected growth of emissions over those three years. It also identified an error in two county-specific age distributions that were fixed before the 2008 NEI was finalized, and identified errors in county VMT and populations that we were able to repair before finalizing the inventory.
- Air toxic results were quality assured by back-calculating toxics ratios from inventory outputs to ensure they were consistent with inventory inputs.

5 Fires

Fire sources in this section are sources of pollution caused by the inadvertent or intentional burning of biomass including forest, rangeland (e.g., grasses and shrubs), and agricultural vegetative residue. This section describes the 2008 NEI wildfires (Section 5.1), prescribed burning (also Section 5.1), and agricultural burning (Section 5.1.4). Other types of fires are included in other EIS sectors, such as "Fuel Combustion – Residential – Wood" (Section 0), the "Waste Disposal" (Section 0), which includes fires from burning yard waste, land clearing, residential household waste, logging debris, and commercial, institutional, industrial, and "open dump" burning of biomass and other refuse; and "Miscellaneous Non-Industrial NEC" (Section 0), which includes structure fires, firefighting as part of waste disposal, firefighting training fires, motor vehicle fires, and other open fires.

5.1 Wildfires and Prescribed burning

This section describes the 2008 NEI approach for wildfires, prescribed burning, and wild land fire use, collectively called "wild land" fires (WLFs). Precise definitions of these types of fires are provided below in Section 5.1.1. These are included in the same section because the approach used is generally the same, except with slight differences for the blending of EPA data with data supplied by S/L/T agencies.

For the 2008 NEI, the EIS database contains wildfires and prescribed fires as both event-based (point source, day-specific) data and nonpoint data. The EPA dataset for wildfires and prescribed fires used the event structure, some S/L/T agencies also used this structure, and other S/L/T agencies used the nonpoint structure (for prescribed fires). Because some EIS features have not yet been built, EPA was unable to combine these data sources into a single selection for the wildfire and prescribed burning sectors, and so we combined the data outside of EIS. The 2008 NEI website (see Section 1.3.2) provides the combined wildfire and prescribed fire data at the county-SCC resolution, but this same information is not yet available directly through EIS reports.

5.1.1 Sector Description

WLFs are generally defined as any non-structural fire that occurs in wild lands. Included in WLFs are the following types of fires:

- Prescribed (Rx) fire: Any fire ignited by management actions to meet specific objectives, generally related to the reduction of the biomass potentially available for wildfires.
- Wildfire (WF): An unplanned, unwanted WLF including unauthorized human-caused fires, escaped prescribed fire projects, or other inadvertent fire situation where objective is to put the fire out.
- Wildland Fire Use (WFU): The application of appropriate management response to naturally-ignited WLFs to accomplish specific resource mgmt objective in pre-designated areas outlined in fire management plans. In other words, an unplanned fire that is subsequently controlled and used as a Rx fire to meet specific objectives.

A significant improvement to the 2008 NEI over the 2005 NEI and previous data released for 2008 is that we have eliminated the "unclassified" fires in the EPA dataset as a result of advancements in the Satellite Mapping Automated Reanalysis Tool for Fire Incident Reconciliation (SMARTFIRE) approach by using SMARTFIRE version 2 (SFv2), as described in Section 5.1.4. The unclassified fires had previously been caused by the satellite-based SMARTFIRE version 1 (SFv1) approach, where no methods had been implemented to assign a wildfire or

prescribed fire status when ground-based (observational) data were not available for a particular fire. In SFv1, these fires were assigned to an unclassified status, but that is no longer the case.

Table 56 lists the SCCs that define these three different types of WLFs in the 2008 NEI, both for EPA data and for S/L/T data. Note that EPA data has only one unique SCC for each of these types of fires. Data submitted by S/L/T agencies can have several different SCCs that define prescribed fires. As described below, EPA's approach to combine EPA data with S/L/T data for the 2008 NEI considers all SCCs that define any one type of fire and appropriately combines emissions from those SCCs.

Table 56: Source classification codes for wildland fires

Data Origin	Wildfires	Prescribed Burns	Wildland Fire Use
EPA	2810001000	2810015000	2810001001
States/Locals/Tribes	2810001000	2811015000 2810015000 2810020000	2810001001

5.1.2 Sources of data overview and selection hierarchy

The wildfire and Rx fire EIS sectors include data from three components: S/L/T agency-provided emissions data (event-based and nonpoint county totals), an EPA dataset created from SFv2 (see Section 5.1.4), and a HAP augmentation effort to estimate HAPs from CAP emissions where state data were used (see Section 5.1.5). The combination of these data are only available as summary information on the 2008 NEI website and not in EIS, as mentioned above. Summaries of the agency-supplied data are available in the spreadsheets "StateData_wildlandFires.xlsx" for the state data and "TribalData_wildlandFires.xlsx" for the tribal data (see Section 8.2).

The S/L/T agency data were received from agencies listed in Table 57. The table notes when the data were provided as events or as nonpoint data.

Table 57: Agencies that submitted wildfire and prescribed burning emissions data

Agency	Agency Type	Rx provided	Wildfire provided
Arizona	State/Local	as nonpoint	as event
California	State	as nonpoint	
Delaware	State	as nonpoint	
Georgia	State	as nonpoint	as event
Idaho	State	as nonpoint	
Illinois	State	as nonpoint	
Louisiana	State	as nonpoint	
Maine	State	as nonpoint	as event
Maryland	State	as nonpoint[1]	
New Mexico	State	as nonpoint[1]	
New York	State	as nonpoint[1]	
Nevada	State	as nonpoint	
New Jersey	State	as nonpoint	
North Carolina	State/Local	as nonpoint	as event

Agency	Agency Type	Rx provided	Wildfire provided
Utah	State	as nonpoint	
Washington	State	as nonpoint	
Alaska	State	as event WFU	as event
Citizen Potawatami Nation, Oklahoma	Tribe		as event
Eastern Band of Cherokee Indians	Tribe	as nonpoint	
Fond du Lac Band of the Minnesota Chippewa Tribe	Tribe	as nonpoint	
Kootenai Tribe of Idaho	Tribe	as nonpoint	
Leech Lake Band of Ojibwe	Tribe	as nonpoint	
Nez Perce Tribe of Idaho	Tribe	as nonpoint	
Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montana	Tribe	as nonpoint	
Omaha Tribe of Nebraska	Tribe	as nonpoint	
Prairie Band Potawatomi Nation	Tribe	as nonpoint	
Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho	Tribe	as nonpoint	

[1] Submitted HAP emissions only

As shown in the table above, several tribes submitted both prescribed and wildfire data to the NEI using the SCCs shown above in Table 56. These data are summarized and reported in the 2008 NEI as received. EPA did not resolve any double counting that may occur because EPA and State data may already cover the same areas that these Tribal data encompass. EPA did not augment the tribal fires with HAP emissions. Updated shapefiles were not available to accurately represent tribal lands to enable EPA to try and extract out the fires from the NEI estimated by EPA and the states that are coincident with the fires reported by Tribes. Table 58 summarizes the small amounts emissions included in the NEI from tribal submissions. These are only double-counted if these emissions were large enough to have been picked-up by the satellite-based approach with SFv2, and we have not been able to assess that possibility.

Table 58: Fire emissions submitted by tribal agencies (short tons/year)

Tribe	Within State	CO	NOx	VOC	SO2	PM2.5	PM10	NH3	Acetalde-hyde	Formalde-hyde	Toluene
Kootenai Tribe of Idaho	ID	1,032	35	67		134	149	7	4	4	1
Nez Perce Tribe of Idaho	ID										
Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho	ID										
Prairie Band Potawatomi Nation	KS	159	3	7	1	13	15	1			
Fond du Lac Band of the Minnesota Chippewa Tribe	MN	923		3		6	120	4			
Leech Lake Band of Ojibwe	MN										
Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montana	MT	15,608		312		1,070	1,159				
Eastern Band of Cherokee Indians	NC	59	2	10							
Omaha Tribe of Nebraska	NE	196					26	2			
Citizen Potawatami Nation, Oklahoma	OK	2917	83	500		354	354				
All tribes		**20,894**	**123**	**899**	**1**	**1,577**	**1,823**	**14**	**4**	**4**	**1**

For tribes that did not submit data, EPA did not assign the fires based on the tribal land boundaries. These fires were assigned to the states within which the tribal lands fall.

Table 59 shows the selection hierarchy for the wildfire and Rx burning sectors.

Table 59: 2008 NEI wildfire and prescribed fires selection hierarchy

Priority	Dataset Name	Dataset Content	Is Dataset in EIS?
1	State/Local/Tribal Data	Submitted data as listed above. Null values were filled in with EPA data in the subsequent datasets, whereas zero estimates were left as zeros.	Yes
2	EPA event data based on SFv2	CAP and HAP emissions	No
3	EPA HAP augmentation	HAP augmentation for wildfires and prescribed fires (Section 5.1.5)	No

If a S/L/T agency submitted any type of fire emissions data, it was used as first choice. If a state submitted data only for some counties, then the counties for which there were null values were filled in using the EPA data. If any zero values were submitted by states, they were used as zero in contrast to what was done when a null value was submitted by the state. Several states reported prescribed fire data to the non point inventory. These data were shifted to the Events inventory and summarized along with wildfires in the EPA summaries. It should be noted that when states submitted prescribed fire data to the nonpoint inventory, they were submitted as a county total for the year 2008. The Event inventory, on the other hand, is a day- and location-specific inventory. When the prescribed fire data submitted as non-point were "shifted" to the events inventory for summary purposes, the summaries were all done at a county level, and as a sum for the total year, so that no attempts were made to assign the county-based prescribed fires to day-specific events.

Alaska submitted fire emissions, and those were used as reported. There was no backfilling of missing fires in Alaska, because EPA only estimated fire emissions for the contiguous 48 states for 2008. Since Hawaii, Puerto Rico, and US Virgin Islands did not report any fire emissions, these regions have no WLF emissions in the final 2008 NEI.

5.1.3 Spatial coverage and data sources for the sector

The 2008 NEI includes wildfire and Rx fire emissions for all continental US states and Alaska. These emissions represent a combination of state-submitted information and EPA-estimated emissions from these fires. The EPA methods are described in Section 5.1.4 below. The way we blended these emissions to arrive at state totals is summarized in above. Table 57 above shows which states submitted wildfire, Rx, and WFU emissions to the NEI. A positive entry in this table only indicates that an agency submitted some data to the NEI; these data were used as supplied as the hierarchy in Table 59 indicates. In most cases, many counties were null and were therefore filled in using EPA data.

Table 57 shows that the States of AZ, CA, ID, NY, NM, and UT submitted some wildfire, Rx, and WFU data. Here, counties that had null CAP values were backfilled using EPA data for those counties. For the States of DE, IL, MD, and NY, only prescribed fire data were received from the States. For these states, all wildfire data were filled in using the EPA-created data. In addition, prescribed fires that were null for any counties were also filled in using

EPA data for counties that EPA methods found emissions from prescribed fires. HAP augmentation was also done to fill in HAP emissions for states that submitted only CAP emissions, as described in Section 5.1.5. For all the other 35 states, no state data were received, and we used only the EPA data.

As described above, Tribal data were summarized directly from their reporting to the EIS.

5.1.4 EPA-developed fire emissions estimates

For the dataset developed by EPA for the 2008 NEI, we used the following general equation to estimate wildfires and prescribed fires. Accurate estimates of fire emissions rely on accurate estimates of the terms in the Equation below.

*Emissions = Area burned * Fuel Load Available * Fuel Consumed (Burn Efficiency) * Emission Factors*

Daily CAP emission estimates were prepared using the software SFv2 (Pollard et al., 2011a)**,** which include fire estimation algorithms and is built within a database. Additional information on the approaches specific to the NEI are available in Raffuse (2012). SFv2 estimates the "Area burned" term in the above equation, in conjunction with the Bluesky framework model that estimates the last three terms in the above equation. The "fuel load available" term is estimated using the Fuel Characteristic Classification System (FCCS) maps in the Bluesky model. The "fuel consumed" term is estimated from Bluesky using the CONSUME3 model, which predicts the fraction of fuel that burns based on many parameters including fuel moisture. Finally, the "Emission Factors" term is estimated in Bluesky using the Fire Emissions Prediction Simulator which relies on Efs from the literature apportioned by flaming and smoldering combustion. Since SFv2 was recently developed, direct references to its development in conjunction with updated Bluesky methods are not yet available; however, the following reference can be used in general for past applications of these process models in the SF/Bluesky process: http://getbluesky.org/smartfire/

The EPA data estimate emissions for 38 pollutants. These pollutants are listed in Table 60 below. CAPs were estimated via SFv2 as just described, while HAPs were estimated using emission factors also shown in the table, with further information available in (Pace, 2007).

Table 60: Pollutants estimated by EPA for wildland fires and HAP emission factors

Pollutant	**HAP Emission factor (lb/ton fuel consumed)**
PM2.5	N/A
PM10	
CO	
CO2	
CH4	
NOx	
NH3	
SO2	
VOC	
1,3-butadiene	0.405
Acrolein	0.424
Toluene	0.56825
n-hexane	0.0164025
Anthracene	0.005
Pyrene	0.00929
o,m,p-xylene	0.242
benzo(ghi)perlyene	0.00508
benzo(e)pyrene	0.00266
indeno(1,2,3-cd)pyrene	0.00341
benzo©phenanthrene	0.0039
Perylene	0.000856
benzo(a)fluoranthene	0.0026
Fluoranthene	0.00673
benzo(k)fluoranthene	0.0026
Chrysene	0.0062
methylpyrene,-fluoranthene	0.00905
methylbenzopyrenes	0.00296
Methylchrysene	0.0079
Methylanthracene	0.00823
Carbonylsulfide	0.000534
Formaldehyde	2.575
benzo(a)pyrene	0.00148
benz(a)anthracene	0.0062
Benzofluoranthenes	0.00514
Benzene	1.125
Methylchloride	0.128325
Acetaldehyde	0.40825
Phenanthrene	0.005

SFv2 uses both satellite-detected and ground-reported fires to produce daily fire information (locations and area burned). Previous versions of the NEI relied on SFv1, which reconciled ICS-209 ground reports and hot spots

from the NOAA Hazard Mapping System (HMS). This reconciliation was performed using a single algorithm that relies primarily on the HMS data to provide the information critical for emissions inventories—fire location, daily growth, and final size. In contrast, SFv2, is not a single algorithm; rather, it is a modular framework for collecting, processing, and reconciling fire information from a variety of satellite, ground-based, and other sources. Many key updates were made to the overall SFv2 process, including improvements in (1) identification and sizing of fires needed for the "Area Burned" term and (2) the burn characteristics needed for the "Fuel Load Available" and "Fuel Consumed" terms. The key updates include:

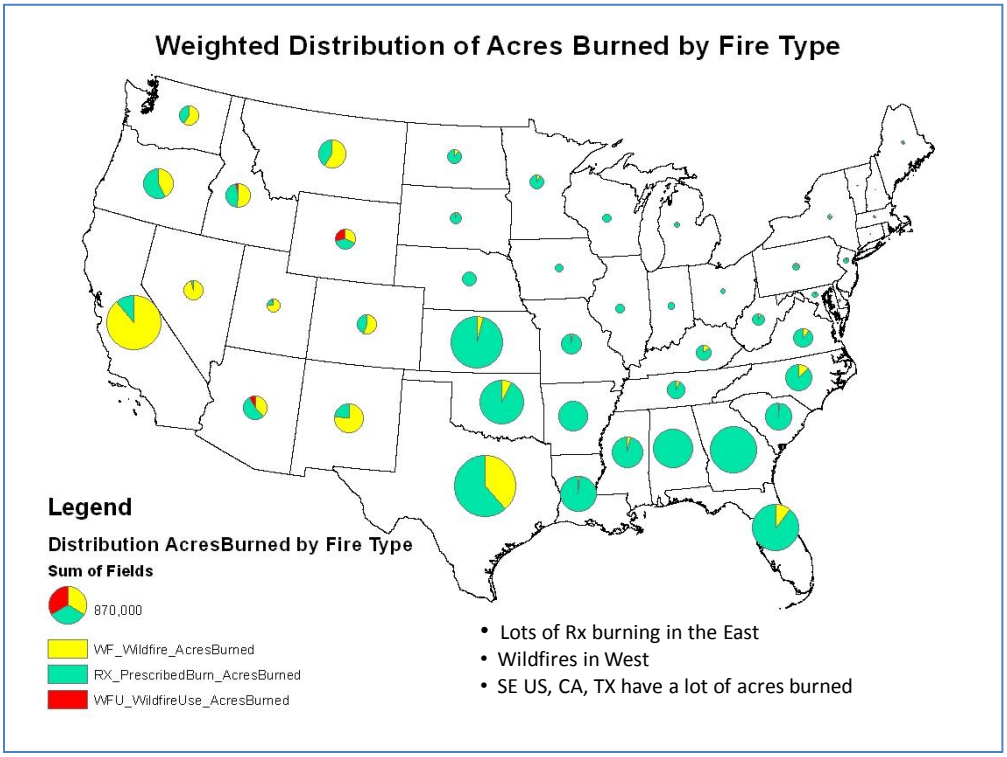
- Ability to combine data from many types of fire information sources, including satellite-derived fire detections, satellite- or helicopter-derived burn scar polygons, and ground-based reports from federal and state agencies.
- Support for more than one reconciliation algorithm, or "stream."
- Improved and (currently) up-to-date methodologies for determining fire type, fire size, and fire date.
- Assignment of all fires into one of the three fire types discussed above. This is a significant improvement from past versions of SMARTFIRE in which many fires in the NEI were left as "unclassified".
- Use of monitoring trends in burn severity burn scar perimeters in place of the more operational helicopter-flown perimeters from GeoMac that were used in previous versions of SMARTFIRE to identify fire sizes.
- An updated fuel bed map, specifically the most recent (at this time) 1-km FCCS fuel bed map[19]
- Updated Consume 3 Python code for fuel consumption calculations

Thus, SFv2 represents a significant step forward in the use of multiple fire information data sources for the development of fire emissions inventory activity data. More extensive details can be found in the project documentation (Pollard et al., 2011a and Raffuse, 2012).

Using the SFv2 approach, some of EPA's 2008 emissions data are shown in several summary maps below. First shown is the proportion of each type of fire by state in Figure 11. In the West, there are more wildfires than in the East, where most of the burning is seen to be from prescribed burning.

[19] Fuel bed information is available at http://www.fs.fed.us/pnw/fera/fccs/.

Figure 11: Proportion of Fires by Type using EPA Methods



Then, Figure 12 shows the total acres burned on a county-by-county basis. Active areas are seen in northern California and in some southeastern parts of the US. Shown immediately below the "acres burned" map is Figure 13, which shows PM2.5 emissions. For emissions, the pattern is based on not only on acres burned, but also on fuel consumption, fuel loading, and how emission factors vary by fire type and other dynamics that occur in a given type of fire. Certain areas in the country (eastern NC, northern MN, northern CA) stand out for emissions but not necessarily for acres burned. This is likely due to the relationship between fire characteristics and emission factors: prescribed fires likely have lower amounts of emissions due to flame being cooler compared to wildfires; extensive smoldering causing emissions to accumulate over time; peat type fires burning extensive duff; wildfires burning very hot and for a long duration causing higher emissions. For example, in eastern NC, there is seen to be a 'hotspot' of PM2.5 emissions though the acres burned do not stand out. This is due to the Evans road fires, which was a peat fire, and which lasted over a month in June 2008, and caused extensive smoldering and burning of duff. More information on this fire can be found at (WITN, 2008). All of EPA's data using the SFv2 approach on a daily basis by county and fire type can be found in the access database named Emissions.mdb (see Section 8.1 for access information and for supporting files that describe database fields).

Figure 12: Acres Burned using EPA Methods

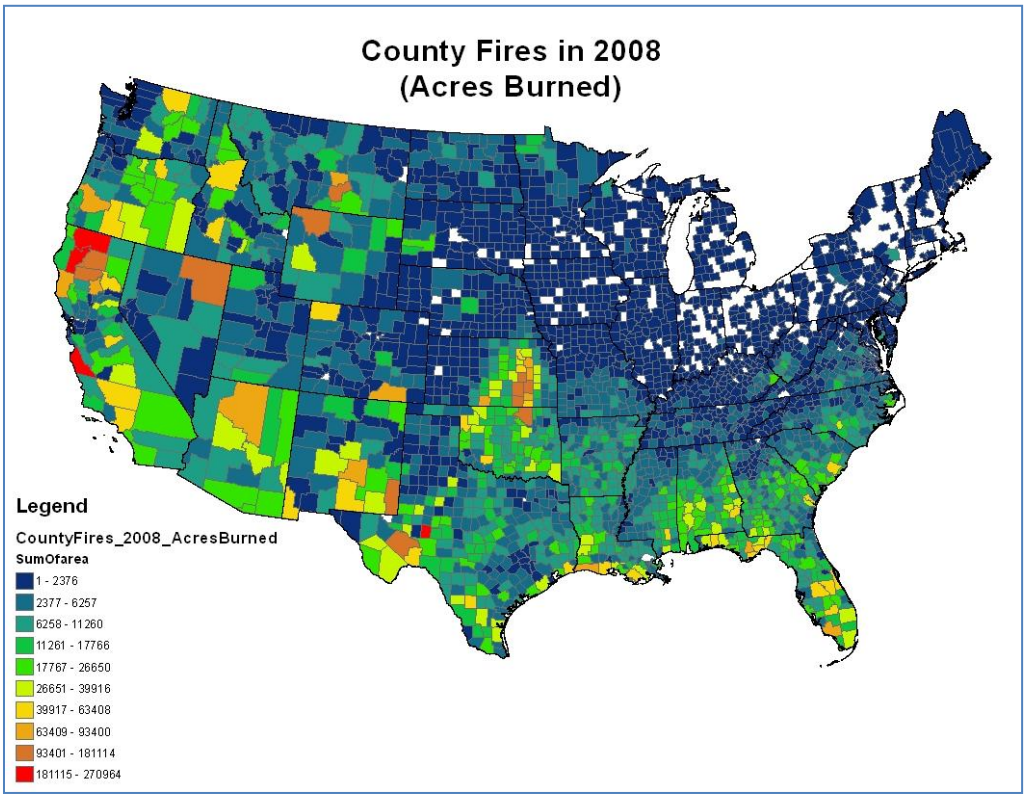
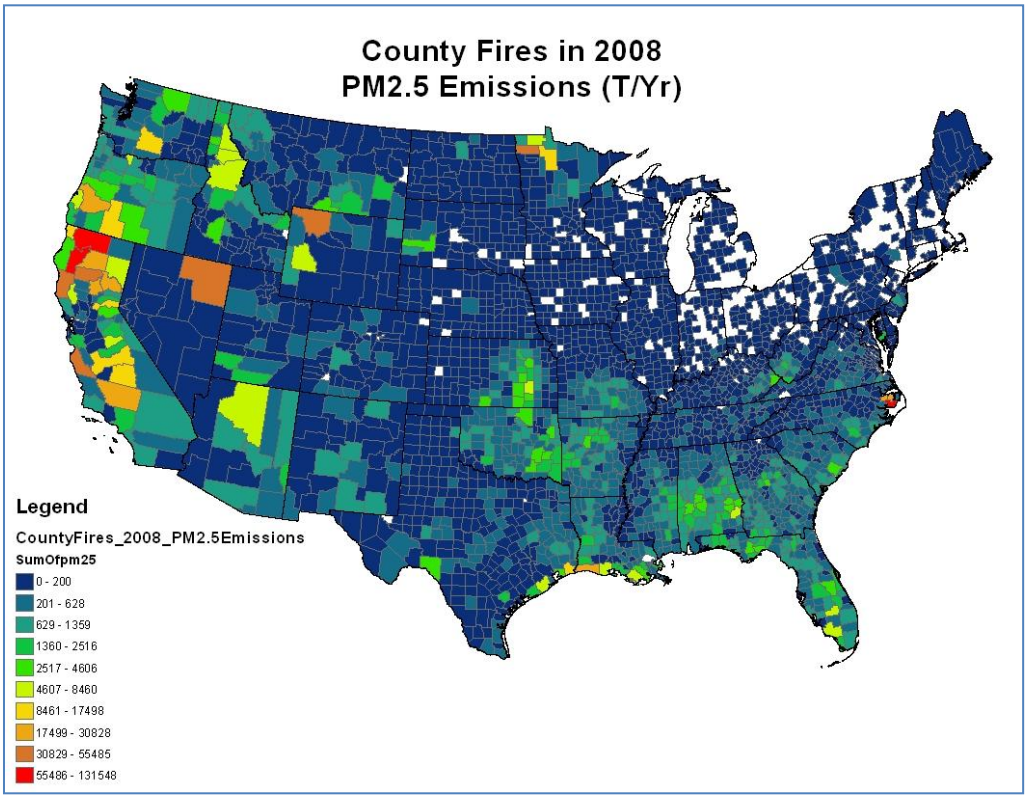


Figure 13: 2008 $PM_{2.5}$ Emissions using EPA methods



5.1.5 Wildland Fire HAP Augmentation

For WLFs, all CAPs and CAP precursor emissions are estimated via the SFv2 approach as described above. In addition, a set of 29 HAPs are estimated by applying the activity levels estimated from the methods above with the emission factors in Table 60. These same 29 HAPs have been estimated for fires over the past 10 years or so for the NEI by EPA.

State data always took precedent over EPA data. However, most states did not submit HAP data, and some submitted HAPs that are not a part of the list in Table 49. We used the following rules to augment HAP emissions to give a consistent list of HAPs included for fires.

- Only State data were augmented using the approach below, Tribal data were not. Tribal data are summarized as reported, with the caveat that there may be some double counting with already State and EPA data.
- If a state reported any of the HAPs in the list above, it was carried through to the 2008 NEI.
- If a state reported any HAPs outside of what is shown in the list of 29 above, it is retained in EIS, but not released in the 2008 NEI. This approach provides for a nationally consistent dataset with respect to the pollutants that are included.
- If a state reported a zero value for any of the HAPs, that zero was retained in the 2008 NEI.
- If a state did not report any of the 29 HAPs above, EPA augmented the data estimate each of the 29 HAPs. This was the case for most of the states. This was done as follows:
    - Using summaries of the EPA dataset based on SFv2, we computed a state-by-state ratio of each of the HAPs to CO emissions. This was done because most states reported CO emissions. These ratios are available in "hap_augmenatation_2008neiv2_Wlfires.xls" (see Section 8.1 for access information). EPA had used PM2.5 emissions in the past, but more S/L/T agencies did not report PM2.5 from fires than CO.
    - We applied these state-specific ratios (regardless of fire type) to county-summed estimates of CO emissions supplied by the state (the ratios will be constant across all counties in a state) to estimate each of the HAPs. These HAPs were then included in the 2008 NEI (via the website only) as EPA based information.

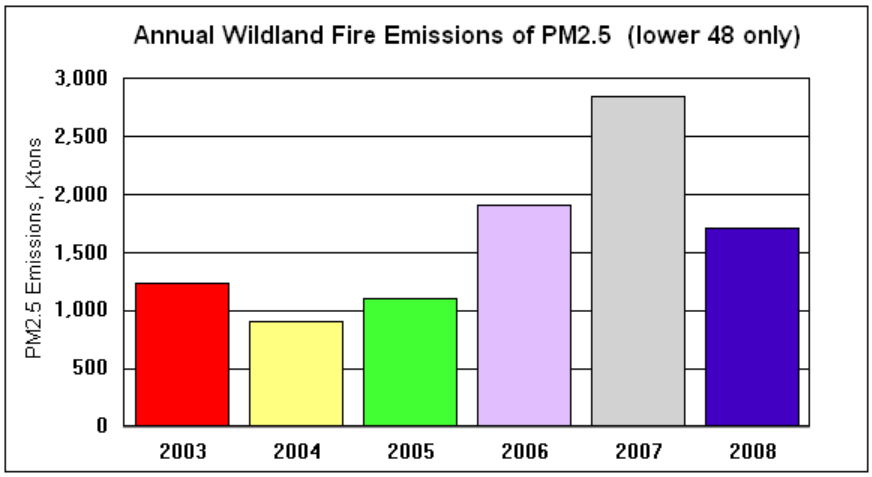
5.1.6 Summary of quality assurance methods

- WLFs' emissions developed using the methods above were compared to past EPA efforts to estimate emissions from these same categories. Some of the spatial patterns were similar, but since wild fires exhibit great inter-annual variability, it was difficult to make emissions-output or "area burned" comparisons year-to year. In addition, in the recent past EPA inventories (2003 through an earlier version of 2008) using SFv1, much of the area burned could not be classified into a type of fires and as such they were labeled as "unclassified" fires. In the 2008 NEI, SFv2 is used, and thus, all fires are classified, which made comparisons of prescribed burning especially more difficult with previous EPA inventories. For the Eastern states, if the assumption is made that most of the previously "unclassified" fires were prescribed burns (which is logical based on the patterns shown in Figure 11 above), then the PM2.5 emission estimates for those states compare well to the 2008 emissions developed here.
- Where states submitted data, we compared them to EPA estimates in those same counties. Some matches were good (e.g., Georgia, Arizona were within 10%), while some were from 15% less than EPA

to 75% more than EPA estimates depending on the state and pollutant. The state agencies were not required to provide (and did not provide) documentation of their methods for identification, classification, and quantification of emissions from fires, which makes comparisons more difficult.

- We compared total mass of emissions (the sum of all WLFs) to past EPA inventories, which generally showed that all pollutants were in a reasonable range given the year to year variability that would be expected from these types of fires. This is shown in Figure 14 below, which shows SF-based PM2.5 emissions from 2003 to 2008. As mentioned previously the estimates for 2003-2007 reflect use of SFv1, whereas our 2008NEI relies on use of SFv2 for EPA-based data, so that caveat should be considered when looking at this time series. However, the overall model is the same and, as such, the agreement across years for total emissions is still relevant. As shown in the figure, the total of 1.7 million tons of PM2.5 estimated in 2008 is in line with past estimates.

Figure 14: 2008 $PM_{2.5}$ wild land fire emissions using EPA methods



5.2 Fires – Agricultural field burning

EPA's approach to estimate agricultural fire emissions was done for the very first time in the 2008 NEI. In addition to the data submitted by S/L/T agencies, EPA developed a nationally consistent agricultural fires estimate that relies on SFv1 for fire and activity level identification (acres burned). Then, EPA converted these activity levels into emissions using emission factors and crop-usage patterns on a state-by-state basis. These annual agricultural fire estimates reside in the EPA's non-point inventory, which are county based totals for 2008. They are also available outside of EIS as monthly totals upon request.

5.2.1 Sector Description

Agricultural burning refers to fires that occur over lands used for cultivating crops and agriculture. The SCCs that pertain to this source in the NEI are listed below. EPA data are all put into one SCC, while state-submitted data are entered into one of 24 different SCCs as shown in Table 61.

Table 61: Source Classification Codes in the NEI for Agricultural Burning

Data Origin	Agricultural Fires – SCCs used
EPA	2801500000
States/Locals/Tribes	2801500000, 2801500100, 2801500111,2801500130, 2801500150,2801500170, 2801500181, 2801500191, 2801500220, 2801500250, 2801500261, 2801500262, 2801500300, 2801500320, 2801500330, 2801500350, 2801500350, 2801500390, 2801500410, 2801500420, 2801500430, 2801500500, 2801500600, 2801520000

5.2.2 Sources of data overview and selection hierarchy

The agricultural fire sector includes data from three components: S/L/T agency-provided emissions data, the EPA Chromium Split v2 dataset (see Section 3.1.3), and an EPA dataset created from SFv2 (see Section 5.1.4).

The chromium augmentation data were used only to 132peciated California total chromium to hexavalent and trivalent chromium. The EPA dataset includes emissions from the pollutants VOC, NOx, SO2, CO, PM2.5, CO2 and methane because we had emission factors available for these. The CO2 and methane emissions were not included in the final 2008 NEI, but are available upon request. The state data also includes HAP emissions (California, Delaware, Idaho, the Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho, the Kootenai Tribe of Idaho, and the Nez Perce Tribe), and in some cases NH3 emissions (California, Hawaii, Idaho, Louisiana, New Jersey, and the Washoe Tribe of California and Nevada).

Table 62 lists the state and tribal agencies that submitted agricultural fire emissions.

Table 62: Agencies that submitted agricultural fire emissions to the 2008 NEI

Agency	Agency Type
California Air Resources Board	State
Delaware Department of Natural Resources and Environmental Control	State
Georgia Department of Natural Resources	State
Hawaii Department of Health Clean Air Branch	State
Idaho Department of Environmental Quality	State
Kootenai Tribe of Idaho	Tribal
Louisiana Department of Environmental Quality	State
New Jersey Department of Environment Protection	State
Nez Perce Tribe	Tribal
Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho	Tribal
Utah Division of Air Quality	State
Washington State Department of Ecology	State
Washoe Tribe of California and Nevada	Tribal

When we created the 2008 NEI, these data are combined such that in any state that submitted data, only that data were used to represent that area in the final NEI for the pollutants submitted. As with WLFs, any counties or pollutants that were null were backfilled with EPA-based county estimates (of criteria pollutants that we estimated). EPA did not augment HAPs for agricultural fires. Any “zero” submissions were left as zero in the 2008 NEI for those counties and pollutants.

5.2.3 Spatial coverage and data sources for the sector

Using the methods described above, EPA developed county-by-county agriculture burning estimates for the contiguous United States. Table 63 summarizes the national EPA estimates for Ag burning for each State. Figure 15 summarizes, as an example, the PM2.5 emissions data at a state level based on these EPA data. Total PM2.5 emissions for the 48 contiguous states in the US based on EPA methods is about 50,000 tons.

Table 63: State Emission Estimates for Agricultural Burning using EPA methods (short tons/year)

State[1]	NOx	SO_2	VOC	CO	PM2.5	CO_2	CH_4
Alabama	129.6	17.28	259.2	2980.8	432	92577.6	129.6
Arizona	21.6	3.78	43.2	550.8	59.4	10179	16.2
Arkansas	3654.7	678.73	4698.9	55864.7	7309.4	1836226	1566.3
California	464	92.8	928	11484	1276	245340	348
Colorado	74.5	8.94	163.9	1564.5	268.2	47575.7	74.5
Delaware	8.5	1.02	18.7	178.5	30.6	5428.1	8.5
Florida	1685.6	231.77	3581.9	32658.5	3371.2	915912.9	1053.5
Georgia	836.4	111.52	1533.4	18819	2648.6	552024	697
Iowa	475.3	54.32	950.6	9709.7	1561.7	331487.8	475.3
Idaho	76.2	12.7	228.6	2565.4	279.4	44627.8	101.6
Illinois	468.3	53.52	869.7	9633.6	1471.8	324063.6	468.3
Indiana	213.5	24.4	396.5	4392	671	147376	213.5
Kansas	2065	330.4	3717	49560	6195	1221654	1652
Kentucky	155.4	20.72	310.8	3367	518	106267.7	155.4
Louisiana	1738.1	273.13	2979.6	33023.9	4469.4	1018527	1241.5
Maryland	18.6	2.48	37.2	421.6	58.9	12415.5	18.6
Michigan	15.6	1.82	31.2	322.4	49.4	9960.6	15.6
Minnesota	555	74	1110	12395	1850	387575	555
Missouri	1162.2	154.96	2324.4	25762.1	3680.3	800368.4	1162.2
Mississippi	1032.6	154.89	1893.1	22545.1	3269.9	703372.7	860.5
Montana	45.2	6.78	90.4	1175.2	113	20475.6	33.9
North Carolina	320.4	42.72	587.4	7315.8	1014.6	214935	320.4
North Dakota	568	99.4	1278	16898	1704	350172	568
Nebraska	390	52	780	8710	1300	276510	390
New Jersey	3.6	0.42	7.2	75.6	10.8	2265.6	3
New Mexico	7.6	1.14	15.2	180.5	24.7	3908.3	7.6
Nevada	1.8	0.27	8.1	47.7	9.9	900	2.7
New York	2	0.24	4.4	42	6.8	1226.4	2
Ohio	70.2	9.36	140.4	1579.5	234	49888.8	70.2
Oklahoma	637.6	127.52	1275.2	18171.6	1753.4	361997.4	478.2
Oregon	78.4	11.76	176.4	2077.6	235.2	39160.8	78.4
Pennsylvania	5.5	0.66	13.2	128.7	19.8	3822.5	5.5
South Carolina	121.8	16.24	243.6	2821.7	406	85706.6	121.8
South Dakota	102.5	14.35	205	2398.5	328	66030.5	102.5
Tennessee	207	27.6	414	4795.5	690	148729.5	207
Texas	453	81.54	815.4	10962.6	1540.2	282943.8	362.4
Utah	2.7	0.36	8.1	61.2	9.9	1168.2	2.7
Virginia	32	4.48	70.4	819.2	115.2	23225.6	32
Washington	152.8	26.74	305.6	4240.2	420.2	78042.6	114.6
Wisconsin	60.5	8.47	145.2	1415.7	229.9	43935.1	72.6
Wyoming	4.2	0.56	12.6	99.4	16.8	1961.4	5.6
US 2008 Totals	**18,118**	**2,836**	**32,672**	**381,815**	**49,653**	**10,869,964**	**13,794**

[1] No agricultural fires identified through satellite detection methods in Connecticut, West Virginia, or Rhode Island

As an example, the PM2.5 emissions data in Table 1 are summarized in Figure 15 below. It is apparent that EPA's methods for estimating emissions from Agricultural fires show higher levels in the Mississippi Valley States and some states in the West.

Figure 15: 2008 NEI state-total PM2.5 emissions from agricultural fires

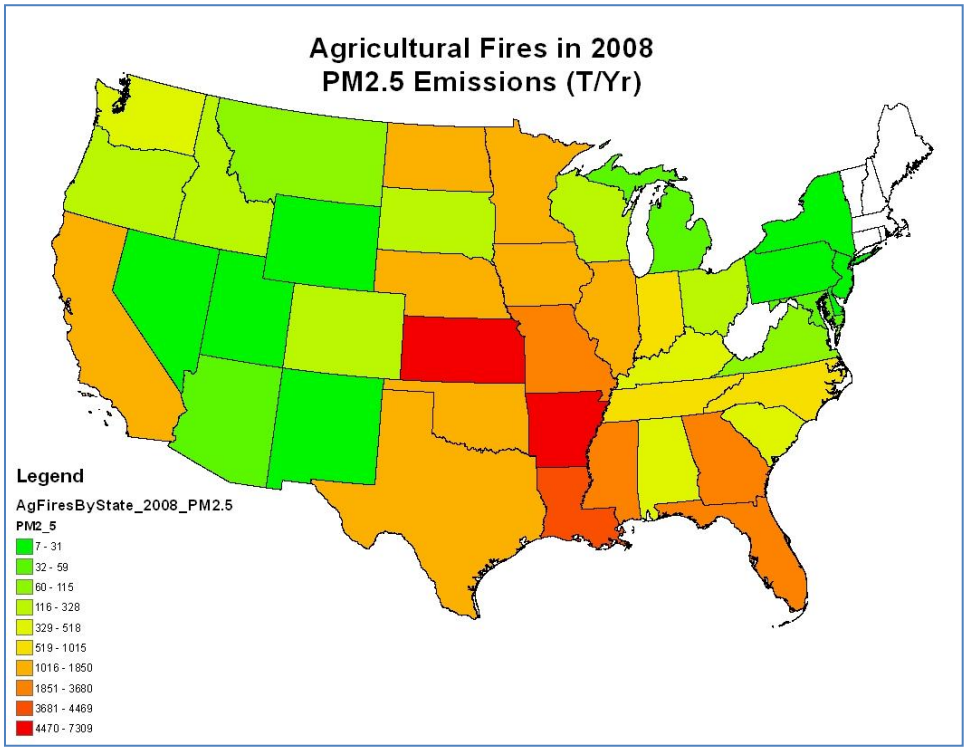
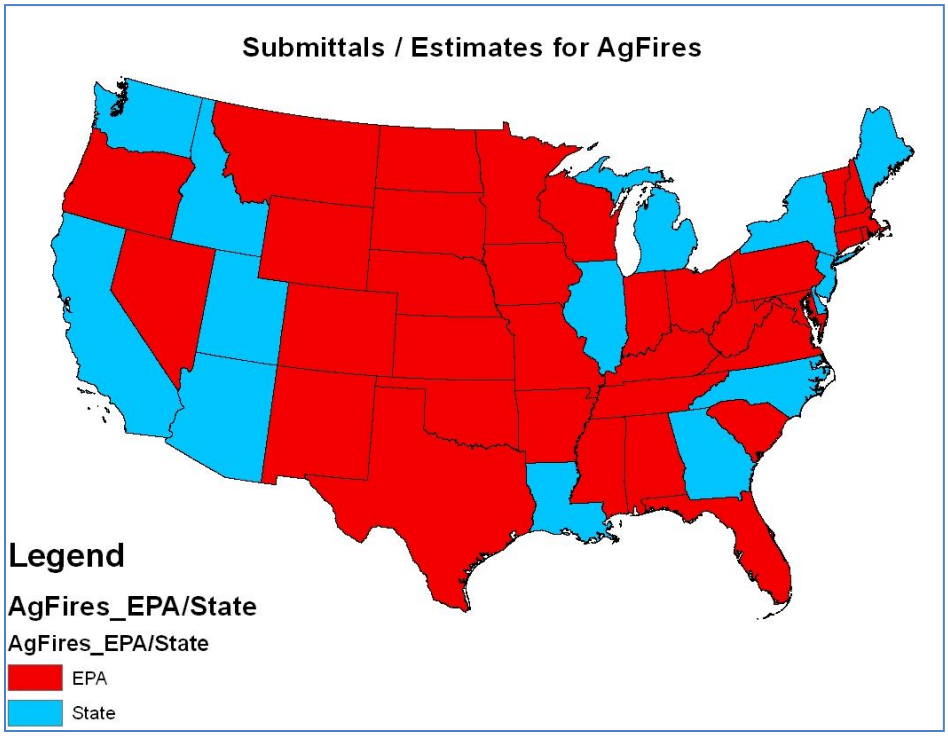


Figure 16 below shows states that submitted agricultural burning data to the NEI. As with other fire data, any state that submitted data, that data were used to represent that area in the final NEI. And as always for fires, any data that were null (missing counties) were backfilled with EPA-based county estimates. Any "zero" submissions were left as zero in the final NEI for those areas. Unlike with wild land fires, no efforts were made to augment pollutants. EPA's list of pollutants for agricultural fires is listed above in Table 63. States may or may not have submitted Ag fire data for those same pollutants, and the final NEI reflects only what the States have submitted.

Figure 16: Identification of states that submitted agricultural burning emissions to the NEI



5.2.4 EPA-developed agricultural emissions data

EPA's emission estimates for Agricultural Fires begin with SFv1, and are described more fully in the EPA project documentation (Pollard et al., 2011b). This is the older version of SMARTFIRE and we did not use this for the wildfires or prescribed fires as described in Section 5.1. We do not believe that using SFv1 for agricultural burning emissions caused significant uncertainties because the enhancements made to SFv2 are not expected to have significant changes for agricultural fires.

To compile the agricultural fire emissions, the fire locations from SFv1 were spatially overlaid with the fuel loading data from the FCCS module. The result is a FCCS code assigned to all fire records and locations from SFv1. We assumed that those prescribed and unclassified fires with a FCCS code of 0 were agricultural fires. These fires were extracted from the 2008 SFv1 result to make an agricultural fire database table. Then using ARCGIS, we further categorized fires as having occurred on "rangeland," "cropland," or "other" land use using the USGS 2006 National Land Cover database (http://www.mrlc.gov/nlcd2006.php). EPA only retained the "cropland" fires in its agricultural fire inventory, since the Emission Factors EPA had available reflect crop burning only. These raw "activity" for a count of cropland fires are available on a state-by-state basis from the spreadsheet "rawag_activity_bystate.xlsx" (see Section 8.1 for access information).

We next converted these activity levels to emission estimates. This is done using the equation below, which is very similar to the equation used for the Wild land fire emissions in the NEI.

Emissions = number of fire pixels identified x 100 x (state-specific, crop-specific, weighted) Emission Factors

We first assume that each fire pixel (from the satellite images used by SFv1) is equivalent to 100 acres. We next estimated emissions on a state-by-state basis using crop-burning based emission factors available in the

literature along with state burn-usage patterns (harvesting patterns) of these crops. The specific crops which are included here based on publically available Efs include: wheat, sorghum, sunflower, oats, corn, barley, rice, alfalfa hay, grass seed, and sugarcane. The Efs and usage factors (crop harvesting) for these crops by state are available in the spreadsheet "Ag Efs for Sat Detects.xlsx" (see Section 8.1 for access information). Emissions estimates for each county in the US result from multiplication of the number of pixels by a hundred acres/pixel and then by the appropriately weighted EF. Efs were available only for certain pollutants: VOC, NOx, SO2, CO, PM2.5, CO2 and CH4. PM10 was set equal to PM2.5, since agricultural burning is expected to produce PM that is mostly less than 2.5 microns. These 8 pollutants are the only ones inventoried by EPA for agricultural fires (though some states submitted HAP emissions for agricultural fires, which are included in the 2008 NEI).

5.2.5 Summary of quality assurance methods

- We compared state-by-state agricultural burning emissions to peer-reviewed estimates (McCarty, 2011) that do not include the year 2008. Spatial patterns of burning density (and the relative amounts of the various crops burned) were similar between the NEI and these other data. For example, the Mississippi Valley, California, Florida, and the Northwest areas showed higher level of emissions than many other states with both methods. Emissions levels varied due to the different emission factors and methods used. For example, averaging the years 2003-2007 presented in the McCarty work leads to an estimate of about 25,000 tons of PM2.5 emissions for the contiguous 48 states; whereas the EPA 2008 methods described here yields about 50,000 tons of PM2.5.
- For states that submitted agricultural burning data (see map in Figure 16), we compared those data to EPA estimates in the same counties. The matches between State and EPA data varied, with Eastern states generally matching better. It is difficult to arrive at major conclusions because we have limited information on the methods used by states in estimating agricultural burning emissions.

6 Biogenics – Vegetation and Soil

This section is a placeholder for future additional documentation.

7 Quality assessment

[This section will be included in future versions of this documentation]

7.1 What are the quality criteria used to assess the inventory?

7.2 How did the 2008 NEI compare to the quality criteria?

7.3 What EIS sectors seem to be incomplete and for which key pollutants?

7.4 How can the quality of the emissions data be further evaluated by users?

7.5 What improvements in the NEI and EIS submission process are planned for the future?

8 Supporting data and summaries

The previous sections provide number references to both supporting data and key output summaries. The following two subsections provide a map to that information. All supporting input data and summaries referenced in the sections above can be obtained through the CHIEF ftp site at:

ftp://ftp.epa.gov/EmisInventory/2008v2/doc/

8.1 Supporting data

Table 64 provides information on how to access the supporting data referenced in the preceding sections. The column at the far left lists the files that can be downloaded from the FTP site listed above. The "File names included" column of the table lists the file names included in each of the zip files – it is these file names that are referenced in the other sections of this document. The "Description" column of this table provides a summary of the purpose of the data file listed on that row.

Table 64: 2008 NEI supporting data access information

File name	File names included	Description
2008neiv2 issues.xlsx	Same	Latest caveats list. May be more up to date that the list provided in Appendix A.
scc_eissector_xwalk_ 2008neiv2.xlsx	Same	Cross-walk between source classification codes (SCCs) and EIS sectors.
2008nei_supdata_2.zip	section2-mercury epa_2008_nei_v2_hg.accdb	Assignments of mercury-specific categories used in Table 7 to the 2008 NEI v2 by process (point) and county (nonpoint, onroad and nonroad).
2008nei_supdata_3a.zip	section3-stationary/ag_livestock_waste/ ReadMe.doc *See other data files as explained in the* **ReadMe.doc** *file*	Supporting data for EPA agricultural livestock emissions estimates including input and output files from the emissions model used.
	Section3-stationary/nonpoint ERTAC_state_comparison.xlsx	For the nonpoint sectors included in the ERTAC process: provides the sectors, SCCs, emission factors and includes a brief description of the methodologies.
	Section3-stationary/point/ 2_Attachments_1_and_2_HTIP_Calcs. xls	Example calculations for calculating unit-level heat input when not available from CAMD.
	Section3-stationary/point/ CAMD08annualallprg_103009.txt	Annual 2008 emissions and heat input activity data for all units reporting to the CAMD data system as of Oct 30, 2009
	section3-stationary/point/ Chromium_speciation_factors.xls	Factors used to speciate total chromium (Section 3.1.3)
	section3-stationary/point/ EAF ICR Test Data Summary-area_major(EPA Rule Data).xls	Electric Arc Furnace test data summary
	section3-stationary/point/ HAP EF Ratios Derived from	Ratios used in the HAP augmentation process

File name	File names included	Description
	WebFIRE.xls	
	section3-stationary/point/ Hg_EAF_forSLT_reviewed.xlsx	Data sent to states for review of electric arc furnace emissions and results
	section3-stationary/point/ HgFacilities_for_SLT_reviewed.xlsx	Data sent to states for review of high Hg facilities and results
	section3-stationary/point/ high_risk_nata2005_poll_forSLT_ reviewed.xlsx	Data sent to states for reviewed of high risk facilities and results
	section3-stationary/point/ TRI to EIS crosswalk.accdb	TRI to EIS Facility ID crosswalk
2008nei_supdata_3b.zip (nonpoint emissions)	section3-np_emissions/ File names provided in Table 18 (Section 3.1.6)	Data files with EPA nonpoint emissions data and methods for some nonpoint categories
2008nei_supdata_3c.zip (nonpoint tools)	section3-np_tools/ File names provided in Table 19 (Section 3.1.6)	Tools with best methods for nonpoint categories without emissions estimated
2008nei_supdata_4a.zip	section4-mobile/air_loco_marine/ pport07.xls	US Army Corps of Engineers Principal Ports file for 2007.
	Section4-mobile/air_loco_marine/ port_032310.zip	Shapefile for allocation of commercial marine vessel port emissions
	section4-mobile/air_loco_marine/ shipping_lanes_111309.zip	Shapefile for allocation of commercial marine vessel shipping lane emissions
	section4-mobile/air_loco_marine/ railway_20110921.zip	Shapefile for locomotive emissions allocation
2008nei_supdata_4b.zip	section4-mobile/nonroad_equip/ ncd20101201.zip	NMIM county database for EPA nonroad emissions and earlier versions (prior to 2008 NEI v2) of on-road emissions.
2008nei_supdata_4c.zip	section4-mobile/onroad/ Onroad_Read_Me.docx	Description of contents of the folder
	section4-mobile/onroad/ VPOP_NEI_2008_18jan2012_v3.zip	Contains the estimated vehicle population data used in the SMOKE run. SMOKE FF10 format – see SMOKE user manual: www.smoke-model.org
	section4-mobile/onroad/ VMT_NEI_2008_updated2_ 18jan2012_v3.zip	Contains the estimated annual and monthly vehicle miles traveled used in the SMOKErun. SMOKE FF10 format – see SMOKE user manual: www.smoke-model.org
	section4-mobile/onroad/ AKHIPRVI_Counties.zip	Contains the individual MOVES County Data Manager databases (folders) in MySQL format for all of the counties in Alaska, Hawaii, Puerto Rico and the Virgin Islands.
	Section4-mobile/onroad/ AKHIPRVI_Runspecs.zip	Contains all of the MOVES run specifications (ASCII files, XML format) that were used to run MOVES to obtain the emission inventories for the Alaska,

File name	File names included	Description
		Hawaii, Puerto Rico and the Virgin Island counties.
	Section4-mobile/onroad/ akhiprvi_temperatures.zip	Contains the MySQL database (folder) containing the tables (in MySQL format) that describe the temperatures and relative humidity values used for the Alaska, Hawaii, Puerto Rico and the Virgin Island counties.
	Section4-mobile/onroad/ SPEED_2008NEI_18nov2011_v0.zip	Contains the estimated vehicle average speed data used in the SMOKErun. SMOKE FF10 format – see SMOKE user manual: www.smoke-model.org
	section4-mobile/onroad/ spdpro_2008nei_18nov2011_v0.zip	Contains the estimated vehicle average hourly speed data used in the SMOKE run.SMOKE SPDPRO format – see SMOKE user manual: www.smoke-model.org
	section4-mobile/onroad/ Lev_standards.zip	Contains the MySQL databases (folders) containing the tables (in MySQL format) that provide alternate vehicle emission rates for those states which have adopted California emission standards. The appropriate database is indicated in the run specification for each county.
	Section4-mobile/onroad/ MCXREF_2008_summary.zip	MS Excel spreadsheet: list of counties selected to be the representative counties for the 2008 NEI and associated counties represented.
	Section4-mobile/onroad/ MFMREF_2008.zip	MS Excel spreadsheet: list of the months that are represented by the January and July results from the representative counties.
	Section4-mobile/onroad/ RepCounty_Counties.zip	Contains the individual MOVES County Data Manager databases (folders) in MySQL format for just the representing counties.
	Section4-mobile/onroad/ RepCounty_Runspecs.zip	Contains all of the MOVES run specifications (ASCII files, XML format) that were used to run MOVES to obtain the emission inventories for the representing counties.
	Section4-mobile/onroad/ RepCounty_temperatures.zip	Contains the MySQL databases (folders) containing the tables (in MySQL format) that describe the temperatures and relative humidity values used for the representing counties. These temperature and humidity values correspond to the range of meteorology values needed for the emission rates

File name	File names included	Description
		used by SMOKE and do not represent daily average temperature values.
2008nei_supdata_5.zip	section5-fires/Ag Fires/ Ag Efs for Sat Detects.xlsx	Emission factors used for agricultural fires emission factors.
	Section5-fires/Ag Fires/ rawag_activity_bystate.xlsx	Agricultural fires activities by state based on Smartfire v1.
	Section5-fires/Smartfire2/ AgActivityFieldDescriptions.xlsx	Field descriptions for table "AgActivityClean" fields in "Emissions.mdb". This is included in the Wildland Fires folder because it goes with the database from Smartfire version2 processing.
	Section5-fires/Smartfire2/ Emissions.mdb	2008 daily wild land fire emission inventory and agriculture fire activity database based on Smartfire version 2 and Bluesky Framework v3.3.0. The agricultural fire activity from this database was not used for the NEI. Rather, the data from the Smartfire version 1 was used, as explained in Section 5.2.
	section5-fires/Smartfire2/ EmissionsFieldDescriptions2008.xls	Field descriptions for wild land fire and emissions-related fields in "Emissions.mdb"
	section5-fires/Smartfire2/ HAP_augmentation_2008neiv2_ Wlfires.xlsx	HAP/CO ratios for states that submitted wildfire and/or prescribed fires data. These ratios are based on EPA estimates and then used to "augment" and estimate HAPs for counties in which CO emissions were reported by the States.
	Section5-fires/Smartfire2/ SummaryTables2008.xls	Aggregated data for Smartfire2-based 2008 wild land fire emission inventory in 'Emissions.mdb'

8.2 Supporting summaries

All supporting summaries listed here are available in the file "2008neiv2_supsumm.zip" included with the documentation on the 2008 NEI website.

Table 65: 2008 NEI supporting summaries

Section No.	Summary file	Description
Section 1: Introduction		
Section 2: Overview		
Section 3: Stationary sources		

Section No.	Summary file	Description
	summaries/matrix_submittals for Version 2 Feb 13 2011.xls	Lists which reporting agencies submitted data for major subcategories of nonpoint emissions (not organized by EIS sector)
Section 4: Mobile sources		
	summaries/ out_of_lto_pb_summary_120211.xlsx	Summary of EPA-generated in-flight lead emissions
	summaries/ airportlead_20110406.xlsx	Summary of EPA-generated airport lead emissions (the NEI includes some EPA data and some S/L/T/ agency data)
Section 5: Fires		
	summaries/ StateData_wildlandFires.xls	All the State data reported for WLFs at the county level
	summaries/ TribalData_wildlandFires.xls	Summary of Tribal data (submitted by tribes)

9 References

All references cited in this documentation that have documents associated with them (rather than websites) are provided in the zipped file "2008nei_references.zip". All of the files not listed with a URL in the right hand column below are included in the "references" folder of this zipped file.

Section	Reference	File name or website
Section 1: Introduction		
Section 2: Overview		
Section 3: Stationary sources		
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E-5: Transport Rule (CSAPR) Emissions Inventory TSD

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Technical Support Document (TSD)

for the final Transport Rule

Docket ID No. EPA-HQ-OAR-2009-0491

Emissions Inventory Final Rule TSD

June 28, 2011

U.S. Environmental Protection Agency
Office of Air and Radiation
Office of Air Quality Planning and Standards
Air Quality Assessment Division

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TABLE OF CONTENTS

ACRONYMS ..... **IV**

LIST OF TABLES ..... **VI**

LIST OF FIGURES ..... **VII**

LIST OF APPENDICES ..... **VIII**

1 INTRODUCTION **1**

2 2005 EMISSION INVENTORIES AND APPROACHES **4**

2.1 2005 NEI POINT SOURCES (PTIPM AND PTNONIPM) 10
2.1.1 IPM sector (ptipm) *11*
2.1.2 Non-IPM sector (ptnonipm) *13*
2.2 2005 NONPOINT SOURCES (AFDUST, AG, NONPT) 15
2.2.1 Area fugitive dust sector (afdust) *15*
2.2.2 Agricultural ammonia sector (ag) *16*
2.2.3 Other nonpoint sources (nonpt) *19*
2.3 FIRES (AVEFIRE) 21
2.4 BIOGENIC SOURCES (BIOG) 22
2.5 2005 MOBILE SOURCES (ON_NOADJ, ON_MOVES_RUNPM, ON_MOVES_STARTPM, NONROAD, ALM_NO_C3, SECA_C3) 22
2.5.1 Onroad gasoline exhaust cold-start mode PM (on_moves_startpm) *25*
2.5.2 Onroad gasoline exhaust running mode PM (on_moves_runpm) *27*
2.5.3 Onroad mobile with no adjustments for daily temperature (on_noadj) *28*
2.5.4 Nonroad mobile sources: NMIM-based (nonroad) *28*
2.5.5 Nonroad mobile sources: locomotive and non-C3 commercial marine (alm_no_c3) *29*
2.5.6 Nonroad mobile sources: C3 commercial marine (seca_c3) *31*
2.6 EMISSIONS FROM CANADA, MEXICO AND OFFSHORE DRILLING PLATFORMS (OTHPT, OTHAR, OTHON) 34
2.7 SMOKE-READY NON-ANTHROPOGENIC INVENTORIES FOR CHLORINE 36

3 EMISSIONS MODELING SUMMARY **37**

3.1 KEY EMISSIONS MODELING SETTINGS 38
3.1.1 Spatial configuration *39*
3.1.2 Chemical speciation configuration *41*
3.1.3 Temporal processing configuration *49*
3.2 EMISSIONS MODELING ANCILLARY FILES 51
3.2.1 Spatial allocation data *51*
3.2.2 Chemical speciation ancillary files *56*
3.2.3 Temporal allocation ancillary files *60*

4 DEVELOPMENT OF 2012 AND 2014 BASE-CASE EMISSIONS **68**

4.1 STATIONARY SOURCE PROJECTIONS: EGU SECTOR (PTIPM) 74
4.2 STATIONARY SOURCE PROJECTIONS: NON-EGU SECTORS (PTNONIPM, NONPT, AG, AFDUST) 75
4.2.1 Livestock emissions growth (ag, afdust) *75*
4.2.2 Residential wood combustion growth (nonpt) *76*
4.2.3 Gasoline Stage II growth and control (nonpt, ptnonipm) *77*
4.2.4 Portable fuel container growth and control (nonpt) *78*
4.2.5 Aircraft growth (ptnonipm) *79*
4.2.6 Stationary source control programs, consent decrees & settlements, and plant closures (ptnonipm, nonpt) *80*
4.2.7 Oil and gas projections in TX, OK, and non-California WRAP states (nonpt) *85*
4.2.8 Future-year VOC Speciation for gasoline-related sources (ptnonipm, nonpt) *86*
4.3 MOBILE SOURCE PROJECTIONS 86

4.3.1 Onroad mobile (on_noadj, on_moves_runpm, on_moves_startpm) 87
4.3.2 Nonroad mobile (nonroad)..... 88
4.3.3 Locomotives and Class 1 & 2 commercial marine vessels (alm_no_c3)..... 89
4.3.4 Class 3 commercial marine vessels (seca_c3)..... 91
4.3.5 Future-year VOC Speciation (on_noadj, nonroad) 92
4.4 CANADA, MEXICO, AND OFFSHORE SOURCES (OTHAR, OTHON, AND OTHPT)..... 93

5 SOURCE APPORTIONMENT 94

6 REMEDY CASE 94

7 EMISSION SUMMARIES..... 98

8 REFERENCES..... 111

Acronyms

BAFM	Benzene, Acetaldehyde, Formaldehyde and Methanol
BEIS	Biogenic Emissions Inventory System
C3	Category 3 (commercial marine vessels)
CAIR	Clean Air Interstate Rule
CAMD	The EPA's Clean Air Markets Division
CAM_X	Comprehensive Air Quality Model with Extensions
CAP	Criteria Air Pollutant
CARB	California Air Resources Board
CEM	Continuous Emissions Monitoring
CHIEF	Clearinghouse for Inventories and Emissions Factors
Cl	Chlorine
CMAQ	Community Multiscale Air Quality
CMV	Commercial marine vessel
CO	Carbon monoxide
EGU	Electric generating units
EPA	Environmental Protection Agency
EMFAC	Emission Factor (California's onroad mobile model)
EEZ	Exclusive Economic Zone
FAA	Federal Aviation Administration
FCCS	Fuel Characteristic Classification System
FIPS	Federal Information Processing Standards
HAP	Hazardous Air Pollutant
HCl	Hydrochloric acid
Hg	Mercury
HGNRVA	Natural recycled, volcanic and anthropogenic Hg
HMS	Hazard Mapping System
ICI	Industrial/Commercial/Institutional (boilers and process heaters)
ICR	Information Collection Request
IMO	International Marine Organization
IPM	Integrated Planning Model
ITN	Itinerant
MACT	Maximum Achievable Control Technology
MMS	Minerals Management Service (now known as the Bureau of Energy Management, Regulation and Enforcement (BOEMRE)
MOBILE	OTAQ's model for estimation of onroad mobile emissions factors
MOVES	Motor Vehicle Emissions Simulator -- OTAQ's model for estimation of onroad mobile emissions – replaces the use of the MOBILE model
MSAT2	Mobile Source Air Toxics Rule
NEEDS	National Electric Energy Database System
NEI	National Emission Inventory
NESHAP	National Emission Standards for Hazardous Air Pollutants
NH_3	Ammonia
nm	nautical mile
NMIM	National Mobile Inventory Model
NOAA	National Oceanic and Atmospheric Administration
NODA	Notice of Data Availability
NONROAD	OTAQ's model for estimation of nonroad mobile emissions
NO_X	Nitrogen oxides
OAQPS	The EPA's Office of Air Quality Planning and Standards

OTAQ	The EPA's Office of Transportation and Air Quality
ORD	The EPA's Office of Research and Development
ORL	One Record per Line
PF	Projection Factor, can account for growth and/or controls
PFC	Portable Fuel Container
$PM_{2.5}$	Particulate matter less than or equal to 2.5 microns
PM_{10}	Particulate matter less than or equal to 10 microns
ppm	Parts per million
RIA	Regulatory Impact Analysis
RRF	Relative Response Factor
RWC	Residential Wood Combustion
RPO	Regional Planning Organization
SCC	Source Classification Code
SMARTFIRE	Satellite Mapping Automated Reanalysis Tool for Fire Incident Reconciliation
SMOKE	Sparse Matrix Operator Kernel Emissions
SO_2	Sulfur dioxide
SOA	Secondary Organic Aerosol
SPPD	Sector Policies and Programs Division
TAF	Terminal Area Forecast
TCEQ	Texas Commission on Environmental Quality
TSD	Technical support document
VOC	Volatile organic compounds
VMT	Vehicle miles traveled
WRAP	Western Regional Air Partnership

List of Tables

Table 1-1. List of cases run in support of the Final Transport Rule air quality modeling 1
Table 2-1. Platform sectors used in emissions modeling for the 2005 platform, version 4.2 4
Table 2-2. Summary of significant changes between v4 and v4.2 platforms by sector.....7
Table 2-3. 2005 Emissions by Sector: VOC, NO_X, CO, SO_2, NH_3, PM_{10}, $PM_{2.5}$ 9
Table 2-4. SCCs in the afdust platform sector.....16
Table 2-5. Livestock SCCs extracted from the 2002 NEI to create the ag sector 17
Table 2-6. Fertilizer SCCs extracted from the 2002 NEI for inclusion in the "ag" sector 19
Table 2-7. Additional TCEQ oil and gas emissions added to the 2005v2 NEI.....20
Table 2-8. SCCs provided with Oklahoma oil and gas sector emissions.....21
Table 2-9. Changes to Oklahoma oil and gas emissions.....21
Table 2-10. Data sources for onroad mobile sources in the 2005v4 and 2005v4.2 platforms[1] 23
Table 2-11. SCCs in the 2005 alm_no_c3 inventory compared to the 2002 platform alm sector30
Table 2-12. Adjustment factors to update the 2005 seca_c3 sector emissions for the v4.2 platform.....33
Table 2-13. Contiguous U.S. C3 CMV emissions in the 2005v4 and 2005v4.2 platforms 34
Table 2-14. Summary of the othpt, othar, and othon sectors changes from the 2002 platform ...35
Table 3-1. Key emissions modeling steps by sector. 38
Table 3-2. Descriptions of the 2005-based platform grids 40
Table 3-3. Model species produced by SMOKE for CB05 with SOA for CMAQ4.7 and CAM_X* 42
Table 3-4. Integration status of benzene, acetaldehyde, formaldehyde and methanol (BAFM) for each platform sector 46
Table 3-5. Source-category specific criteria for integrating nonpt SCCs for categories comprising 80% of the nonpoint VOC emissions.....47
Table 3-6. Temporal settings used for the platform sectors in SMOKE, v4.2 platform 50
Table 3-7. U.S. Surrogates available for the 2005v4.2 platform. 52
Table 3-8. Surrogate assignments to new mobile categories in the 2005v4 platform 53
Table 3-9. Canadian Spatial Surrogates for 2005-based platform Canadian Emissions (v4.2 unchanged from v4).....55
Table 3-10. Differences between two profiles used for commercial marine residual oil 58
Table 3-11. Differences between two profiles used for coal combustion 58
Table 3-12: $PM_{2.5}$ speciation profile updates assignments for the v4 platform.....58
Table 3-13. Summary of VOC speciation profile approach by sector for 2005.....59
Table 3-14. Summary of spatial surrogates, temporal profiles, and speciation profiles used by gasoline vehicle types for the onroad parking area-related SCCs.....63
Table 3-15. Summary of spatial surrogates, temporal profiles, and speciation profiles used by diesel vehicle types for the onroad parking area-related SCCs from MOVES2010. 65
Table 4-1. Control strategies and growth assumptions for creating the 2012 and 2014 base-case emissions inventories from the 2005 base case 71
Table 4-2. Growth factors from year 2005 to future years for Animal Operations 76
Table 4-3. Projection Factors for growing year 2005 Residential Wood Combustion Sources...77
Table 4-4. Factors used to project 2005 base-case aircraft emissions to future years 79
Table 4-5. Summary of Non-EGU Emission Reductions Applied to the 2005 Inventory due to Unit and Plant Closures 81

Table 4-6. Future-year ISIS-based cement industry annual reductions (tons/yr) for the non-EGU (ptnonipm) sector 83
Table 4-7. State-level non-MACT Boiler Reductions from ICR Data Gathering 83
Table 4-8. National Impact of RICE Controls on 2012 and 2014 Non-EGU Projections 84
Table 4-9. Impact of Fuel Sulfur Controls on 2014 Non-EGU Projections 85
Table 4-10. Oil and Gas NO_X and SO_2 Emissions for 2005, 2012, and 2014 including additional reductions due to the RICE NESHAP 86
Table 4-11. Factors applied to year 2005 emissions to project locomotives and Class 1 and Class 2 Commercial Marine Vessel Emissions 89
Table 4-12. NO_X, SO_2, and $PM_{2.5}$ Factors to Project Class 3 Commercial Marine Vessel emissions to 2012 and 2014 91
Table 4-13. Future-year Profiles for Mobile Source Related Sources 92
Table 6-1. Transport Rule Status of States 96
Table 7-1. State-level Total NO_X Emissions for each Transport Rule Modeling Case in 48 States and Washington, D.C. 99
Table 7-2. State-level Total SO_2 Emissions for each Transport Rule Modeling Case in 48 States and Washington, D.C. 100
Table 7-3. State-level Electric Generating Unit Sector NO_X Emissions for each Transport Rule Modeling Case in 48 States and Washington, D.C. 102
Table 7-4. State-level Electric Generating Unit Sector SO_2 Emissions for each Transport Rule Modeling Case in 48 States and Washington, D.C. 104
Table 7-5. Group 1 and Group 2 States NO_X Total Emissions for each Transport Rule Modeling Case 106
Table 7-6. Group 1 and Group 2 States SO_2 Total Emissions for each Transport Rule Modeling Case 108
Table 7-7. Group 1 and Group 2 States NO_X EGU Sector Emissions for each Transport Rule Modeling Case 109
Table 7-8. Group 1 and Group 2 States SO_2 EGU Sector Emissions for each Transport Rule Modeling Case 110
Table 7-9. 26-State Total and Electric Generating Unit Sector Summer NO_X Emissions for each Transport Rule Modeling Case 110

List of Figures

Figure 2-1. MOVES exhaust temperature adjustment functions. 26
Figure 3-1. Air quality modeling domains 40
Figure 3-2. Process of integrating BAFM with VOC for use in VOC Speciation 45
Figure 3-3. Diurnal Profiles based on road type (use local for “start”) and whether the road is urban versus rural 62
Figure 3-4. Diurnal temporal profile for HDDV 2B through 8B at Parking areas 62
Figure 4-1. MOVES exhaust temperature adjustment functions for 2005, 2012, and 2014 88
Figure 4-2. Tier 2 Fraction of Light Duty Vehicles 93
Figure 6-1. States Covered by the Final Transport Rule 95
Figure 6-2. Group 1 and Group 2 States Covered by the Annual PM Component of the Final Transport Rule 96

List of Appendices

Appendix A: Revisions to 2005 Inventories from Version 4 to Version 4.2
Appendix B: Ancillary Input Data and Parameter Differences between 2005 and Future-year Scenarios
Appendix C: SMOKE Input Inventory Data Files used for each Transport Rule Modeling Case
Appendix D: Summary of Future Base Case Transport Rule Non-EGU Control Programs, Closures and Projections

1 Introduction

This technical support document (TSD) provides the details of emissions data processing done in support of the Environmental Protection Agency's (EPA) final rulemaking effort for the Federal Transport Rule (hereafter referred to as Transport Rule). The Transport Rule air quality modeling results were evaluated with respect to the 1997 annual and 2006 24-hour National Ambient Air Quality Standards (NAAQS) for particulate matter less than 2.5 microns ($PM_{2.5}$), as well as the 1997 8-hour ozone NAAQS.

The emissions and modeling effort for Transport Rule consists of four 'complete' emissions cases: 2005 base case, 2012 base case, 2014 base case, and 2014 remedy (i.e., "control") case. Table 1-1 provides more information on these emissions cases. The purpose of 2005 base case is to provide a 2005 case that is consistent with the methods used in the future-year base cases and remedy case. For regulatory applications, this case is used with the outputs from the 2012 base case in the relative response factor (RRF) calculations to identify future nonattainment and maintenance. For more information on the use of RRFs, please see the Air Quality Modeling Final Rule TSD. The outputs of the 2014 remedy case were compared to the outputs from the 2014 base case to quantify the benefits of the rule. Not listed in Table 1-1 are source apportionment runs that were based on the 2012 base case and used to quantify the contributions of emissions in upwind states to the annual average 24-hour $PM_{2.5}$ and 8-hour ozone concentrations in other states in 2012. For more information on the benefits of this rulemaking, please see the Regulatory Impact Assessment for the Transport Rule NFR.

Table 1-1. List of cases run in support of the Final Transport Rule air quality modeling

Case Name	Internal EPA Abbreviation	Description
2005 base case	2005cs	2005 case created using average-year fires data and an average-year temporal allocation approach for Electrical Generating Units (EGUs); used for computing relative response factors with 2012 and 2014 scenarios.
2005 evaluation case	2005as	2005 case created for air quality model performance evaluation that uses actual 2005 and 2005 continuous emissions monitoring (CEM) data for EGUs.
2012 base case	2012cs	2012 "baseline" scenario, representing the best estimate for the future year without implementation of EGU remedy controls.
2014 base case	2014cs	2014 "baseline" scenario, representing the best estimate for the future year without implementation of EGU remedy controls.
2014 Remedy case	2014cs_tr1remedy	2014 EGU remedy or "control" scenario to address significant contribution for the 1997 ozone and annual PM standards, and 2006 daily PM standard.

The air quality modeling platform consists of all the emissions inventories and input ancillary files, along with the meteorological, initial condition, and boundary condition files needed to run the air quality model. The platform for this rule uses all Criteria Air Pollutants (CAPs) and the following select Hazardous Air Pollutants (HAPs): chlorine (CL2), hydrochloric acid or hydrogen chloride (HCl) and benzene, acetaldehyde, formaldehyde and methanol. The latter four are also denoted 'BAFM'. The Final Transport Rule modeling platform is called the "CAP-BAFM 2005-Based Platform, Version 4.2" platform (we will use the shortened name "2005v4.2" in this documentation).

The data used in the 2005 emissions base case are an updated version of the 2005-based air quality modeling platform that was used for the Transport Rule Proposal (2005v4). This TSD describes the emissions inventory and emissions modeling for the 2005v4.2 version of the platform used for the Final Transport Rule, and focuses on the changes made since the 2005v4 platform. The 2005v4 platform is documented at the emissions modeling clearinghouse website, http://www.epa.gov/ttn/chief/emch/, under the section entitled "2005-Based Modeling Platform" and the subsection entitled "CAP-BAFM 2005-Based Platform Version 4 (do not use for Mercury)". It should be noted that this 2005v4.2 platform includes all non-mercury (Hg) updates reflected in the 2005v4.1 platform, which is under the section entitled "CAP-Hg-BAFM 2005-Based Platform Version 4.1 (use for Mercury)".

The 2005v4.2 platform includes both the evolutionary platform changes between 2005v4 and 2005v4.2, as well as implementation of inventory changes resulting from the incorporation of comments on the Transport Rule Proposal. For details on the emissions inventory-related comments received on the Transport Rule NPR and the EPA's responses to those, see the document "Emissions Inventories Response to Comments for the Transport Rule NFR". This document is in the Transport Rule docket (EPA-HQ-OAR-2009-0491) and is posted on the emissions modeling clearinghouse website listed above. For simplicity, this TSD refers to the cumulative changes in both the 2005v4.1 and 2005v4.2 platforms, thus any comparisons made in this document will be against data in the 2005v4 platform used in the Transport Rule Proposal. For more information on the emissions inventories used for the Transport Rule Proposal, see the document "Federal Transport Rule Emissions Inventory for Air Quality Modeling Technical Support Document", available in the Transport Rule docket and on the emissions modeling clearinghouse website specified above.

The underlying 2005 inventories used are most significantly defined by: 1) for point sources: the 2005 National Emission Inventory (NEI) version 2, and 2) for onroad mobile sources: the Motor Vehicle Emissions Simulator with database corrections for diesel toxics (MOVES2010) (http://www.epa.gov/otaq/models/moves/index.htm). This document describes the approach and data used to produce the emission inputs to the air quality model used in the 2005v4.2 platform for the 2005 and future-year scenarios.

Emissions preparation for the 2005v4.2 platform supports both the Community Multiscale Air Quality (CMAQ) model and the Comprehensive Air Quality Model, with extensions (CAM_X). Both models support modeling ozone (O_3), and particulate matter (PM), and require hourly and gridded emissions of chemical species from the following inventory pollutants: carbon monoxide (CO), nitrogen oxides (NO_X), volatile organic compounds (VOC), sulfur dioxide (SO_2), ammonia (NH_3), particulate matter less than or equal to 10 microns (PM_{10}), and individual component species for particulate matter less than or equal to 2.5 microns ($PM_{2.5}$). In addition, the CMAQ Carbon Bond 05 (CB05) chemical mechanism with chlorine chemistry, which is part of the "base" version of CMAQ, allows explicit treatment of BAFM and includes HAP emissions of HCl and CL2. In the platform, BAFM emissions come from either the NEI values for benzene, formaldehyde, acetaldehyde and methanol (BAFM) or via speciation of NEI VOC into the component species. For the Transport Rule air quality modeling, only the CAM_X model was used.

The creation of emission inputs for the 2005v4.2 platform included:

(1) modifying the emission inventories used for the 2005v4 base case,
(2) updating the emissions modeling ancillary files used by the emissions modeling tools, and
(3) applying the emissions modeling tools.

The primary emissions modeling tool used to create the air quality model-ready emissions was the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system (http://www.smoke-model.org/index.cfm).

We used SMOKE version 2.6 to create emissions files for a 36-km national grid, and a 12-km Eastern grid for the 2005 base case (also known as the "2005cs_05b" case).

The 2005v4.2 platform includes a base case for 2005 (2005cs) and a traditional model evaluation case (2005as). The evaluation case is identical to the base case except that it uses 2005-specific fire emissions and 2005 hour-specific continuous emission monitoring (CEM) data for electric generating units (EGUs). The 2005 base case in the 2005v4.2 platform includes an "average year" scenario for fires and an illustrative (rather than year-specific) temporal allocation approach for EGUs to allocate annual 2005 emissions to days and hours. This approach to temporal allocation of emissions was used for all base and control cases modeled to provide temporal consistency between the years. It is intended to be a conceivable representation of temporal allocation of the emissions without tying the approach to a single year. For example, each year has different days and different locations with large fires, unplanned EGU shutdowns, and periods of high electricity demand. By using a base-case approach such as the one used on 2005v4.2, the temporal and spatial aspects of the inventory for these sources are maintained into the future-year modeling. This avoids potentially spurious year-specific artifacts in the air quality modeling estimates. The 2005v4.2 platform biogenic emissions data is the same as the 2005v4 platform and was held constant between the 2005 case and all future-year cases.

The 2005v4.2 platform was developed using the concepts, tools and emissions modeling data from the EPA's 2005v4 platform, documented by:
ftp://ftp.epa.gov/EmisInventory/2005v4/2005_emissions_tsd_07jul2010.pdf (main document) , ftp://ftp.epa.gov/EmisInventory/2005v4/2005_emissions_tsd_appendices_11may2010.pdf (appendices to the main document), and http://www.epa.gov/ttn/chief/emch/transport/tr_proposal_emissions_tsd.pdf (future year).

The future-year inventories, ancillary files, and detailed projection data used for this modeling are available in the Transport Rule docket at EPA-HQ-OAR-2009-0491 as part of the Final Transport Rulemaking. Since the data are large, the data files themselves are not posted with online access through the docket. A more convenient access location is the 2005 platform section of the EPA Emissions Modeling Clearinghouse website (http://www.epa.gov/ttn/chief/emch/index.html#2005). The Final Transport Rule data files are provided as a subheading under this main link.

In the remainder of this document, we provide a description of the approaches taken for the emissions modeling in support of air quality modeling for the Transport Rule. In Section 2, we review the 2005 base-case inventory (2005cs_05b) and provide high–level emissions summaries. Section 3 describes the emissions modeling and the ancillary files used with the emission inventories. In Section 4, we describe the development of the future year 2012 (2012cs_05b) and 2014 (2014cs_05b) base cases. The 2012 Source Tagging scenarios are described in Section 5. The 2014 EGU Transport Rule Remedy (Control) case (2014cs_tr1remedy_05b) is discussed in Section 6. In Section 7 we provide data summaries comparing the modeling cases, followed by the technical references for this document. Appendices A through D provide additional details about specific technical methods. Some additional emission summaries are also provided in the Final Transport Rule Regulatory Impact Analysis, Chapter 3.

2 2005 Emission Inventories and Approaches

This section describes the 2005 emissions data created for input to SMOKE that is part of the 2005v4.2 platform. As with the 2005v4 platform, the primary basis for the 2005 stationary source emission inputs is the 2005 National Emission Inventory (NEI), version 2, which includes emissions of CO, NO_X, VOC, SO_2, NH_3, PM_{10}, $PM_{2.5}$ and hazardous air pollutants (HAPs). The HAPs we used from this inventory are mercury, chlorine (CL2), hydrogen chloride (HCl), benzene, acetaldehyde, formaldehyde, and methanol. We began with the same SMOKE-formatted inventory inputs as the 2005v4 platform (the EPA case name: 2005ck_05b) and made the changes described below.

Documentation for the 2005 NEI can be found at: http://www.epa.gov/ttn/chief/net/2005inventory.html#documentation. For inventories outside of the United States, which include Canada and Mexico, we used the latest available base-year inventories as discussed in Section 2.6. The 2005 NEI includes five sectors: nonpoint (formerly called "stationary area") sources, point sources, nonroad mobile sources, onroad mobile sources, and fires. Because the 2005v4.2 platform includes only a base case as opposed to a model evaluation case, the day-specific wildfire and prescribed burning data from the 2005 NEI was not used; rather an average fire inventory is used for both base and future years. In addition to the NEI data, biogenic emissions and emissions from the Canadian and Mexican inventories are included in the 2005v4.2 platform. Some inventories are augmented with other emissions data as explained below.

For the purposes of preparing the air quality model-ready emissions, we split the 2005 emissions inventory into "platform" sectors in the same way as was done in the 2005v4 platform. The significance of an emissions modeling or "platform" sector is that the data is run through all of the SMOKE programs except the final merge (Mrggrid) independently from the other sectors. The final merge program then combines the sector-specific gridded, speciated and hourly emissions together to create CMAQ-ready emission inputs. These inputs are then converted into emissions that can be used by CAM_X, as was needed for the Transport Rule modeling.

Table 2-1 presents the sectors in the 2005 platform. The sector abbreviations are provided in italics; these abbreviations are used in the SMOKE modeling scripts and inventory file names, and throughout the remainder of this document. Table 2-1 does not describe in specific detail the updates in the 2005v4.2 platform from those in the 2005v4 platform. The specific updates to the 2005v4.2 platform as compared to the 2005v4 platform are highlighted in Table 2-2 and discussed in detail later in this section.

Table 2-1. Platform sectors used in emissions modeling for the 2005 platform, version 4.2

Platform Sector: ***short name***	**2005 NEI Sector**	**Description and resolution of the data input to SMOKE**
EGU (also called the IPM sector): ***ptipm***	Point	2005v2 NEI point source EGUs mapped to the Integrated Planning Model (IPM) model using the National Electric Energy Database System (NEEDS) 2006 version 4.10. Day-specific emissions created for input into SMOKE. Includes updates from Transport Rule comments and evolutionary improvements from 2005v4.
Non-EGU (also called the non-IPM sector): ***ptnonipm***	Point	All 2005v2 NEI point source records not matched to the ptipm sector. Includes all aircraft emissions and point source fugitive dust emissions for which county-specific PM transportable fractions were applied. Annual resolution. Includes updates from Transport Rule comments and evolutionary improvements from 2005v4.

Platform Sector: *short name*	2005 NEI Sector	Description and resolution of the data input to SMOKE
Average-fire: ***avefire***	Not applicable	Average-year wildfire and prescribed fire emissions, unchanged from the 2005v4 platform; county and annual resolution.
Agricultural: ***ag***	Nonpoint	NH_3 emissions from NEI nonpoint livestock and fertilizer application, county and annual resolution. Unchanged from the 2005v4 platform.
Area fugitive dust: ***afdust***	Nonpoint	PM_{10} and $PM_{2.5}$ from fugitive dust sources from the NEI nonpoint inventory after application of county-specific PM transportable fractions. Includes building construction, road construction, paved roads, unpaved roads, agricultural dust), county and annual resolution. Unchanged from the 2005v4 platform.
Remaining nonpoint: ***nonpt***	Nonpoint	Primarily 2002 NEI nonpoint sources not otherwise included in other SMOKE sectors; county and annual resolution. Also includes updated Residential Wood Combustion emissions, year 2005 non-California WRAP oil and gas Phase II inventory, year 2005 Texas and Oklahoma oil and gas inventories, and updates resulting from Transport Rule comments.
Nonroad: ***nonroad***	Mobile: Nonroad	Monthly nonroad emissions from the National Mobile Inventory Model (NMIM) using NONROAD2005 version nr05c-BondBase, which is equivalent to NONROAD2008a, since it incorporated Bond rule revisions to some of the base-case inputs and the Bond rule controls did not take effect until later. NMIM was used for all states except California. Monthly emissions for California created from annual emissions submitted by the California Air Resources Board (CARB) for the 2005v2 NEI**.**
locomotive, and non-C3 commercial marine: ***alm_no_c3***	Mobile: Nonroad	Primarily 2002 NEI non-rail maintenance locomotives, and category 1 and category 2 commercial marine vessel (CMV) emissions sources, county and annual resolution. Aircraft emissions are included in the Non-EGU sector (as point sources) and category 3 CMV emissions are contained in the seca_c3 sector. Includes updates resulting from Transport Rule comments.
C3 commercial marine: ***seca_c3***	Mobile : Nonroad	Annual point source-formatted, year 2005 category 3 (C3) CMV emissions, developed for the rule called "Control of Emissions from New Marine Compression-Ignition Engines at or Above 30 Liters per Cylinder", usually described as the Emissions Control Area (ECA) study (http://www.epa.gov/otaq/oceanvessels.htm). Utilized final projections from 2002, developed for the C3 ECA Proposal to the International Maritime Organization (EPA-420-F-10-041, August 2010). Includes updates resulting from Transport Rule comments.
Onroad California, NMIM-based, and MOVES sources not subject to temperature adjustments: ***on_noadj***	Mobile: onroad	Three, monthly, county-level components: 1) California onroad, created using annual emissions for all pollutants, submitted by CARB for the 2005v2 NEI. NH_3 (not submitted by CARB) from MOVES2010. 2) Onroad gasoline and diesel vehicle emissions from MOVES2010 not subject to temperature adjustments: exhaust CO, NO_X, VOC, NH3, benzene, formaldehyde, acetaldehyde, 1,3-butadiene, acrolein, naphthalene, brake and tirewear PM, and evaporative VOC, benzene, and naphthalene. 3) Onroad emissions for Hg from NMIM using MOBILE6.2, other than for California.

Platform Sector: *short name*	2005 NEI Sector	Description and resolution of the data input to SMOKE
Onroad cold-start gasoline exhaust mode vehicle from MOVES subject to temperature adjustments: *on_moves_startpm*	Mobile: onroad	Monthly, county-level MOVES2010-based onroad gasoline emissions subject to temperature adjustments. Limited to exhaust mode only for PM species and naphthalene. California emissions not included. This sector is limited to cold start mode emissions that contain different temperature adjustment curves from running exhaust (see on_moves_runpm sector).
Onroad running gasoline exhaust mode vehicle from MOVES subject to temperature adjustments: *on_moves_runpm*	Mobile: onroad	Monthly, county-level draft MOVES2010-based onroad gasoline emissions subject to temperature adjustments. Limited to exhaust mode only for PM species and naphthalene. California emissions not included. This sector is limited to running mode emissions that contain different temperature adjustment curves from cold start exhaust (see on_moves_startpm sector).
Biogenic: *biog*	Not applicable	Hour-specific, grid cell-specific emissions generated from the BEIS3.14 model, including emissions in Canada and Mexico. Unchanged from the 2005v4 platform.
Other point sources not from the NEI: *othpt*	Not applicable	Point sources from Canada's 2006 inventory and Mexico's Phase III 1999 inventory, annual resolution. Also includes annual U.S. offshore oil 2005v2 NEI point source emissions. Unchanged from the 2005v4 platform.
Other nonpoint and nonroad not from the NEI: *othar*	Not applicable	Annual year 2006 Canada (province resolution) and year 1999 Mexico Phase III (municipio resolution) nonpoint and nonroad mobile inventories. Unchanged from the 2005v4 platform.
Other onroad sources not from the NEI: *othon*	Not applicable	Year 2006 Canada (province resolution) and year 1999 Mexico Phase III (municipio resolution) onroad mobile inventories, annual resolution. Unchanged from the 2005v4 platform.

The emission inventories in SMOKE input format for the 2005 base case are available at the 2005v4.2 website (see the end of Section 1). The "readme" file provided indicates the particular zipped files associated with each platform sector.

Before discussing the specific components of the 2005v4.2 emissions platform, we provide in Table 2-2 a summary of the significant differences between the 2005v4 emissions platform and the 2005v4.2 platform. The sectors that did not change between 2005v4.2 and 2005v4 are not included in the table and are the following: average fire, agriculture, area fugitive dust, biogenic sources, and "other" (i.e. non-US) point, nonpoint, nonroad, and onroad sources.

Table 2-2. Summary of significant changes between v4 and v4.2 platforms by sector

Platform Sector	Summary of Significant Inventory Differences from V4 to V4.2
IPM sector: *ptipm*	1) Added or changed ORIS Boiler IDs to some units with missing or incorrect values, and for a subset of these, recomputed annual emissions of NO_X, SO_2 or both using 2005 CEM data. Only replaced emissions if 2005 CEM data were confirmed to be for the entire year (since some CEMs only run for the summer season). A facility-level summary of these changes is provided in Appendix A, Table A-1 of the 2005v4.1 TSD: http://www.epa.gov/ttn/chief/emch/toxics/2005v4.1_appendices.pdf. 2) Moved several stacks and units from the ptnonipm sector, assigning ORIS facility and boiler codes and matching stack parameters to those provided in the future-year IPM emissions. These edits ensure future-year EGUs are not double counted and that base year and future-year stack parameters are similar. Affected plants are listed in Appendix A, Table A-1. 3) Deleted several units from the inventory that were found to be either double counts or closed. Affected plants are listed in Appendix A, Table A-2.
Non-IPM sector: *ptnonipm*	1) Revised 2005 emissions to remove duplicates, improve estimates from ethanol plants, and reflect new emissions and controls information collected from industry and a state through the Boiler MACT Information Collection Request (ICR). 2) Moved several stacks and units from the ptnonipm sector to the ptipm sector (Appendix A, Table A-1). This edit prevents double counting of EGU emissions in the future years. 3) Deleted several units from the inventory that were found to be either double counts or closed. Affected plants are listed in Appendix A, Table A-2. 4) Revised emissions in several states using improved information obtained from Transport Rule comments.
Remaining nonpoint sector: *nonpt*	1) Added: year 2005 oil and gas data for Texas and Oklahoma provided by these states. Replaced previous Oklahoma oil and gas emissions from this sector (SCC 2310000000). No removals for Texas since the new oil and gas emissions only cover oil rig emissions that are in the nonroad sector. The nonroad sector emissions were not removed because they were very small compared to the newer Texas oil and gas emissions added to this sector and the possibility of double counting was not able to be confirmed by the EPA. 2) Changed pesticide category to "no-integrate," thereby using VOC speciation (rather than the HAP emissions) to compute the BAFM emissions. 3) Incorporation of Transport Rule comments including: i) replacing Delaware fuel combustion, residential wood burning, and open burning, ii) removing South Carolina residual oil emissions from industrial boilers, iii) replacing Nebraska industrial fuel combustion emissions. State level changes that include these impacts are shown in Appendix A, Table A-3.
Nonroad sector: *nonroad*	Added PM to 7 California counties which were found to be 0 in the 2005v4 platform. Data used came from an earlier version of the 2005 inventory provided by CARB, which had the same PM values as the 2005v2 NEI other than in the missing counties, for which nonzero PM values were provided.
locomotive, and non-C3 commercial marine: *alm_no_c3*	Updated diesel fuel commercial marine vessel emissions in Delaware per Transport Rule comments. The impacts of these changes are shown in Appendix A, Table A-3.

Platform Sector	Summary of Significant Inventory Differences from V4 to V4.2
C3 commercial marine: *seca_c3*	1) Revised 2005 emissions reflect the final projections from 2002 developed for the category 3 commercial marine vessel Emissions Control Area (ECA) Proposal to the International Maritime Organization (EPA-420-F-10-041, August 2010). 2) Projected Canada as part of the ECA rather than an "outside the ECA" region, using region-specific growth rates. For example, British Columbia emissions were projected the same as "North Pacific" growth and control used in Washington. Therefore the v4.2 seca_c3 inventories contain Canadian province codes. 3) Updated Delaware emissions per Transport Rule comments. 4) Redefined the spatial extent of state boundaries off-shore from up to 200 nautical miles to under 10 miles based on Mineral Management Service (MMS) state-federal water boundaries data. This item did not change emissions but it drastically reduces areas that are assigned to states.
Onroad California, NMIM-based, and MOVES sources not subject to temperature adjustments: *on_noadj*	1) For all states except California: All pollutants and modes (exhaust, tire and brake wear) from all vehicle types are now from MOVES2010. In the 2005v4 platform, only exhaust mode onroad gasoline vehicles, other than motorcycles, were included from MOVES in this sector and the rest had been from MOBILE6. 2) For California: Replaced NMIM-based NH_3 with MOVES2010 emissions for California because California does not provide NH_3 in its onroad inventory. For the 2005v4 platform, we used NH_3 from NMIM but since MOVES generates all criteria pollutants, we now use MOVES.
Onroad cold-start gasoline exhaust mode vehicle from MOVES subject to temperature adjustments: *on_moves_startpm*	For the 2005v4.2 platform, this sector uses MOVES2010 based emissions for all exhaust mode onroad gasoline vehicle types including motorcycles. In the v4 version, motorcycle exhaust mode PM emissions relied on NMIM and were therefore in the on_noadj sector, and other exhaust mode gasoline vehicle PM emissions used the draft version of MOVES. As with v4, these PM and naphthalene cold start mode emissions are subject to grid cell and hourly temperature adjustments.
Onroad running gasoline exhaust mode vehicle from MOVES subject to temperature adjustments: *on_moves_runpm*	Same change as "***on_moves_startpm"***

Annual emission summaries for 2005v4.2, with comparisons to 2005v4 CAPs emissions by emissions modeling sector are provided in Table 2-3. VOC totals are before BAFM speciation (i.e., they are inventory VOC emissions, and not the sum of VOC emissions after BAFM speciation.

The emission inventories for input to SMOKE for the 2005 base case are available at the 2005v4 website (see the end of Section 1) under the link "Data Files" (see the "2005emis" directory). The inventories "readme" file indicates the particular zipped files associated with each platform sector.

Table 2-3. 2005 Emissions by Sector: VOC, NO_X, CO, SO_2, NH_3, PM_{10}, $PM_{2.5}$

Sector short name	2005 VOC [tons/yr]		2005 NOX [tons/yr]		2005 CO [tons/yr]		2005 SO2 [tons/yr]		2005 NH3 [tons/yr]		2005 PM10 [tons/yr]		2005 PM2_5 [tons/yr]	
	V4.2	V4	V4.2	V4	V4.2	V4	V4.2	V4	V4.2	V4	V4.2	V4	V4.2	V4
afdust											8,858,992	same	1,030,391	same
ag									3,251,990	same				
alm_no_c3	67,690	same	1,922,723	1,924,925	270,007	same	153,068	154,016	773	same	59,342	59,366	56,666	56,687
seca_c3 (US component)	4,580	22,367	130,164	642,088	11,862	53,746	97.485	417,312			11,628	53,580	10,673	49,294
seca_c3 (non-US component)	62,132	18,241	1,801,699	526,760	146,027	42,959	1,085,894	319,200			146,312	43,014	134,604	39,574
nonpt	7,530,578	7,474,512	1,696,902	1,683,490	7,410,946	7,376,314	1,216,362	1,252,645	133,962	134,080	1,349,639	1,349,685	1,079,906	1,076,954
nonroad	2,691,844	same	2,115,408	same	19,502,718	same	197,341	same	1,972	same	211,807	209,100	201,138	198,734
on_noadj	3,949,362	3,123,642	9,142,274	7,203,876	43,356,130	41,647,066	177,977	144,216	156,528	295,203	308,497	170,554	236,927	115,991
on_moves _runpm											54,071	46,430	49,789	42,753
on_moves_ startpm											22,729	23,607	20,929	21,738
ptipm	41,089	40,950	3,729,161	3,728,190	603,788	601,564	10,380,883	10,381,411	21,995	21,684	602,236	615,095	496,877	508,903
ptnonipm	1,309,895	1,310,085	2,226,250	2,247,228	3,214,833	3,222,221	2,082,159	2,117,649	158,524	159,003	646,373	653,957	433,381	442,656
avefire	1,958,992	same	189,428	same	8,554,551	same	49,094	same	36,777	same	796,229	same	684,035	same
Canada othar[1]	1,281,095	same	734,587	same	3,789,362	same	95,086	same	546,034	same	1,666,188	same	432,402	same
Canada othon	270,872	same	524,837	same	4,403,745	same	5,309	same	21,312	same	14,665	same	10,395	same
Canada othpt	447,313	same	857,977	same	1,270,438	same	1,664,040	same	21,268	same	117,669	same	68,689	same
Mexico othar	586,842	same	249,045	same	644,733	same	101,047	same	486,484	same	143,816	same	92,861	same
Mexico othon	183,429	same	147,419	same	1,455,121	same	8,270	same	2,547	same	6,955	same	6,372	same
Mexico othpt	113,044	same	258,510	same	88,957	same	980,359	same	0	same	125,385	same	88,132	same
offshore othpt	51,240	same	82,581	same	89,812	same	1,961	same	0	same	839	same	837	same

1. Canada provided 2006 fires but we did not use them in the 2005 platform (for neither v4.2 nor v4)

The remainder of Section 2 provides details about the data contained in each of the 2005 platform sectors. Different levels of detail are provided for different sectors depending on the availability of reference information for the data, the degree of changes or manipulation of the data needed for preparing it for input to SMOKE, and whether the 2005v4.2 platform emissions changed appreciably since the previously-documented 2005v4 platform.

2.1 2005 NEI point sources (ptipm and ptnonipm)

Point sources are sources of emissions for which specific geographic coordinates (e.g., latitude/longitude) are specified, as in the case of an individual facility. A facility may have multiple emission points, which may be characterized as units such as boilers, reactors, spray booths, kilns, etc. A unit may have multiple processes (e.g., a boiler that sometimes burns residual oil and sometimes burns natural gas). Note that this section describes only NEI point sources within the contiguous United States. The offshore oil platform (othpt sector) and category 3 CMV emissions (seca_c3 sector) are also point source formatted inventories that are discussed in Section 2.6 .

After removing offshore oil platforms (othpt sector), we created two platform sectors from the remaining 2005v2 NEI point sources for input into SMOKE: the EGU sector – also called the Integrated Planning Model (IPM) sector (i.e., ptipm) and the non-EGU sector – also called the non-IPM sector (i.e., ptnonipm). This split facilitates the use of different SMOKE temporal processing and future-year projection techniques for each of these sectors. The inventory pollutants processed through SMOKE for both ptipm and ptnonipm sectors were: CO, NO_X, VOC, SO_2, NH_3, PM_{10}, and $PM_{2.5}$ and the following HAPs: HCl (pollutant code = 7647010), and CL2 (code = 7782505). We did not utilize BAFM from these sectors as we chose to speciate VOC without any use (i.e., integration) of VOC HAP pollutants from the inventory (integration is discussed in detail in Section 3.1.2.1).

The ptnonipm emissions were provided to SMOKE as annual emissions. The ptipm emissions for the base case were input to SMOKE as daily emissions.

Documentation for the development of the 2005 point source NEI v2, is at: http://www.epa.gov/ttn/chief/net/2005inventory.html#documentation. A summary of this documentation describes these data as follows:

1. Electric generating unit (EGU) emissions are obtained from emissions/heat input from the EPA's Acid Rain Program for Continuous Emissions Monitoring System (CEMS) reporting. The following approach applied to units in the 2002 NEI that matched to 2005 CEMS units. For pollutants covered by the CEMS, the 2005 CEMS data were used. For CEMS units with pollutants not covered by CEMS (e.g., VOC, $PM_{2.5}$, HCl) unit-specific ratios of 2005 to 2002 heat input were applied to 2002v3 NEI emissions to obtain 2005 estimates.

2. Non-EGU stationary source development for the 2005 NEI focused on improving the following sectors:

a. HAP data received from States and industry to support the MACT program, including the recent Risk and Technology Review rulemaking
b. 2005 State, local, and tribal data submitted to the EPA under the Consolidated Emissions Reporting Rule (CERR)
c. HAP data from Toxic Release Inventory (TRI) for missing facilities and pollutants
d. Off-shore platform data from Mineral Management Services (MMS)

The changes made to the 2005v2 NEI point inventory prior to modeling 2005v4 are as follows:

- The tribal data, which do not use state/county Federal Information Processing Standards (FIPS) codes in the NEI, but rather use the tribal code, were assigned a state/county FIPS code of 88XXX, where XXX is the 3-digit tribal code in the NEI. We made this change because SMOKE requires the 5-digit state/county FIPS code.
- Stack parameters were defaulted for some point sources when modeling in SMOKE. SMOKE uses an ancillary file, called the PSTK file that provides default stack parameters by SCC code to either gap fill stack parameters if they are missing in the NEI, or to correct stack parameters if they are outside the ranges specified in SMOKE as acceptable values. The SMOKE PSTK file is contained in the ancillary file directory of the 2005v4 website (see the end of Section 1).
- We applied a transport fraction to all SCCs that we identified as PM fugitive dust, to prevent the overestimation of fugitive dust impacts in the grid modeling as described in Section 2.2.1.

There are several changes made to the ptipm and ptnonipm sectors for the 2005v4.2 platform that were briefly discussed in Table 2-2. One of these changes involved reassigning stacks, units and facilities from the ptnonipm sector to the ptipm sector because it was determined that these sources were reflected in the future-year IPM data. By moving these sources from ptnonipm to ptipm, we prevent their being double counted in future-year emissions processing. These changes and other updates in the ptipm and ptnonipm sectors for 2005v4.2 are discussed in the following sections.

2.1.1 IPM sector (ptipm)

The ptipm sector contains emissions from EGUs in the 2005v2 NEI point inventory that we were able match to the units found in the NEEDS database. While we originally used version 3.02 of NEEDS to split out the ptipm sector for v4 of the platform, there were no changes to the mapping when we moved to NEEDs version 4.10 (http://www.epa.gov/airmarkets/progsregs/epa-ipm/index.html). The IPM model provides future-year emission inventories for the universe of EGUs contained in the NEEDS database. As described below, this matching was done (1) to provide consistency between the 2005 EGU sources and future-year EGU emissions for sources which are forecasted by IPM and (2) to avoid double counting in projecting point source emissions.

The 2005v4 platform document provides additional details on how the 2005 NEI point source inventory was split into the ptipm and ptnonipm sectors.

Creation of temporally resolved emissions for the ptipm sector

Another reason we separated the ptipm sources from the other sources was due to the difference in the temporal resolution of the data input to SMOKE. For the base-case 2005 run, the ptipm sector uses daily emissions input into SMOKE. The daily emissions are computed from the annual emissions. First, we allocate annual emissions to each month (this process occurs outside of SMOKE). To do this, we created state-specific, three-year averages of 2004-2006 CEM data. These average annual-to-month factors were assigned to sources by state. To allocate the monthly emissions to each day, we used the 2005 CEM data to compute state-specific month-to-day factors, averaged across all units in each state. The resulting daily emissions were input into SMOKE. The daily-to-hourly allocation was performed with SMOKE using diurnal profiles. The development of these diurnal ptipm-specific profiles, which are considered ancillary data for SMOKE, is described in Section 3.2.3.

Ptipm updates from the 2005v4 platform used in creating the 2005v4.2 platform

- We started with the same ptipm/ptnonipm split as was used for the v4 platform; however, we changed some emissions values based on updates we made to some ORIS identifiers in the ptipm file. For a subset of the units for which we added or changed ORIS identifiers, we recomputed annual emissions for SO_2, NO_X or both using the CEMS data available at the EPA's data and maps website.[2] Facility-level impacts of these changes are provided in Appendix A, Table A-1 of the 2005v4.1 TSD: http://www.epa.gov/ttn/chief/emch/toxics/2005v4.1_appendices.pdf.
- Several sources in the 2005v4 ptnonipm inventory were found to be EGU emissions that were either found in the future-year IPM inventories or determined to have closed between 2005 and the future years. If these emissions were retained in the ptnonipm sector, then future-year projections would either double-count these EGU emissions, or incorrectly not close these units; in both cases, future-year EGU emissions were inflated in the 2005v4 platform. Therefore, we reassigned these known EGU emissions to the ptipm sector. In situations where emissions were moved from ptnonipm to ptipm and these sources were not closed in the future (they were in the future-year IPM inventories), facility, and unit identifier codes were changed to match IPM codes, and more importantly, ORIS facility and boiler identifier codes were also changed to match IPM codes and hence, the CEMS data base. Facilities and units that were moved from the ptnonipm to ptipm sector for 2005v4.2 are provided in Appendix A, Table A-1.
- Several units and facilities in the 2005v4 ptipm inventory were found to be either double counts, or were determined to have closed prior to 2005. In most cases, these deletions were for closures at facilities reported in the 2002 NEI that were not updated in the 2005 NEI as closed. These changes are detailed in Appendix A, Table A-2.

[2] http://camddataandmaps.epa.gov/gdm/index.cfm?fuseaction=emissions.wizard

2.1.2 Non-IPM sector (ptnonipm)

The non-IPM (ptnonipm) sector contains all 2005v2 NEI point sources that we did not include in the IPM (ptipm) sector.[3] The ptnonipm sector contains fugitive dust PM emissions from vehicular traffic on paved or unpaved roads at industrial facilities or coal handling at coal mines.[4] Prior to input to SMOKE, we reduced the fugitive dust PM emissions to estimate the emissions that remain aloft by applying county-specific fugitive dust transportable fraction factors. This is discussed further in Section 2.2.1.

For some geographic areas, some of the sources in the ptnonipm sector belong to source categories that are contained in other sectors. This occurs in the inventory when states, tribes or local programs report certain inventory emissions as point sources because they have specific geographic coordinates for these sources. They may use point source SCCs (8-digit) or non-point, onroad or nonroad (10-digit) SCCs. In the 2005 NEI, examples of these types of sources include: aircraft emissions in all states, waste disposal emissions in several states, firefighting training in New Mexico, several industrial processes and solvent utilization sources in North Carolina and Tennessee, livestock (i.e., animal husbandry) in primarily Kansas and Minnesota, and petroleum product working losses.

The modifications between the published 2005v2 NEI and the 2005v4 ptnonipm inventory we used for modeling are summarized here:

Ptnonipm changes from the original 2005v2 inventory for the v4 platform development

- Removed duplicate annual records. We did not delete some apparent duplicates because they were in fact covering different parts of the year (i.e., the emissions in the inventory file were sub-annual).
- Removed a source with a state/county FIPS code of 30777; the "777" county FIPS represents portable facilities that move across counties, but is not currently a valid state/county FIPS code in the SMOKE ancillary file "COSTCY". This Montana FIPS code was located in northern Wyoming and contained very small emissions.
- Dropped sources with coordinates located well into the oceans or lakes.
- Fixed the coordinates for several larger sources that had a state/county FIPS code mismatch with their inventory coordinates greater than 10 km and emissions greater than 10 tons per year of either NO_X, VOC, SO_2, or 5 tons/yr of $PM_{2.5}$. These corrections were limited to a small number of plants in Arizona, Indiana, Kentucky, Ohio, and Virginia.

In addition to the ptnonipm inventory updates implemented in the 2005v4 platform, we applied the following updates in the 2005v4.2 ptnonipm sector:

[3] Except for the offshore oil and day-specific point source fire emissions data which are included in separate sectors, as discussed in sections 2.6 and 2.3.1, respectively.

[4] Point source fugitive dust emissions, which represent a very small amount of PM, were treated the same way in the 2002 platform but were treated as a separate sector in the 2001 Platform.

Ptnonipm updates from 2005v4 platform used in creating the 2005v4.2 platform

- As discussed in Section 2.1.1, several sources in the 2005v4 ptnonipm inventory were found to be EGU emissions that were either found in the future-year IPM inventories or determined to have closed between 2005 and the future years. Therefore, we reassigned these known EGU emissions to the ptipm sector; these are provided in Appendix A, Table A-1.
- Several units and facilities in the 2005v4 ptnonipm inventory were found to be either double counts, or were determined to have closed prior to 2005. In most cases, these deletions were for closures at facilities reported in the 2002 NEI that were not updated in the 2005 NEI as closed.
- Evolutionary inventory updates and updates from the Transport Rule comments were applied to several facilities. A list of all facilities with updated or deleted ptnonipm emissions between 2005v4 and 2005v4.2 is provided in Appendix A. One of the most significant evolutionary updates was incorporating the PM condensable portion of emissions to the Clarion Steel Plant in Allegheny County Pennsylvania (PLANTID=4200300032), where by-product Coke Manufacturing, quenching PM condensable emissions were augmented, increasing total plant-level $PM_{2.5}$ emissions from under 500 annual tons in the 2005v4 platform to approximately 2,000 annual tons in the 2005v4.2 platform.
- We added the North Dakota ADM facility (FIPS code = 38067) that was in the 2005v1 NEI but was missing from the 2005v2 NEI and was not determined to have shut down. The 2002-based emissions were added to the ptnonipm file, since 2005 data were not available.
- We added an inventory of 2005 ethanol plants using plant names and data provided by the EPA's Office of Transportation and Air Quality for use in a previous modeling effort (Renewable Fuel Standards 2), which included these with the 2005v1 inventory. The list below includes only the ethanol plants that were used in the previous modeling effort but were missing from the 2005v2 NEI.

State/County FIPS code	Plant Name	CO (tons/yr)	NOX (tons/yr)	PM10 (tons/yr)	PM2.5 (tons/yr)	SO2 (tons/yr)	VOC (tons/yr)
06065	Golden Cheese Company of CA	10	30	12	1	39	14
13205	Wind Gap Farms (Anheuser/Miller Brewery)	1	2	1	0	3	1
19033	Golden Grain Energy LLC	147	424	170	15	540	201
19035	Little Sioux Corn Processors	184	534	213	19	679	252
19055	Permeate Refining	3	9	4	0	12	4
19057	Big River Resources, LLC	109	315	126	13	401	149
19083	Hawkeye Renewables, LLC	115	333	133	14	424	158
19093	Quad-County Corn Processors	57	164	65	7	208	77
19167	Siouxland Energy & Livestock Coop (SELC)	209	606	243	26	772	287
21047	Commonwealth Agri-Energy, LLC	46	133	53	5	170	63
31047	Cornhusker Energy Lexington (CEL)	25	73	29	3	93	34
31145	SW Energy, LLC.	42	121	49	5	154	57
35041	Abengoa Bioenergy Corporation	10	30	12	1	39	14
46005	Heartland Grain Fuels, LP	0	1	0	0	1	0

46109	North Country Ethanol (NCE)	63	182	73	7	231	86
19109	Global Ethanol	29	85	34	3	108	40
20055	Reeve Agri-Energy	52	152	61	6	193	72
	TOTAL TONS	1,104	3,195	1,278	127	4,066	1,510

2.2 2005 nonpoint sources (afdust, ag, nonpt)

The 2005v2 NEI typically used the same values for nonpoint emissions as were found in the 2002 NEI. This modeling platform took a similar approach, with a couple of notable exceptions discussed in Section 2.2.3. We created several sectors from the 2002 nonpoint NEI. We removed the nonpoint tribal-submitted emissions to prevent possible double counting with the county-level emissions. Because the tribal nonpoint emissions are small, we do not anticipate these omissions having an impact on the results at the 36-km and 12-km scales used for this modeling. The documentation for the nonpoint sector of the 2005 NEI is available at: http://www.epa.gov/ttn/chief/net/2005inventory.html

In the rest of this section, we describe in more detail each of the platform sectors into which we separated the 2005 nonpoint NEI, and the changes we made to these data. We will refer to the 2002 platform documentation for sectors that did not change.

2.2.1 Area fugitive dust sector (afdust)

The emissions for this sector are unchanged from the 2005v4 platform, and the documentation is repeated here for convenience. However, we changed the temporal allocation of the emissions to account for day-of-week variation. In particular, we used updated dust profiles that are consistent with the activity related to non-dust profiles for similar processes. The processes and profiles updated are provided in Pouliot, et. al., 2010. In previous modeling, all days within the same month had the same emissions.

The area-source fugitive dust (afdust) sector contains PM_{10} and $PM_{2.5}$ emission estimates for 2002 NEI nonpoint SCCs identified by the EPA staff as dust sources. This sector is separated from other nonpoint sectors to make it easier to apply a "transport fraction," which reduces emissions to reflect observed diminished transport from these sources at the scale of our modeling. Application of the transport fraction prevents the overestimation of fugitive dust impacts in the grid modeling as compared to ambient samples. Categories included in this sector are paved roads, unpaved roads and airstrips, construction (residential, industrial, road and total), agriculture production and all of the mining 10-digit SCCs beginning with the digits "2325." It does not include fugitive dust from grain elevators because these are elevated point sources.

We created the afdust sector from the 2002 NEI based on SCCs and pollutant codes (i.e., PM_{10} and $PM_{2.5}$) that are considered "fugitive". A complete list of all possible fugitive dust SCCs (including both 8-digit point source SCCs and 10-digit nonpoint SCCs) is provided at: http://www.epa.gov/ttn/chief/emch/dustfractions/tf_scc_list2002nei_v2.xls. However, not all of the SCCs in this file are present in the 2002 NEI. The SCCs included in the 2002 NEI that comprise the 2005 (and 2002) platform afdust sector (which are a subset of the SCCs in the web link) are provided in Table 2-4.

Table 2-4. SCCs in the afdust platform sector

SCC	SCC Description
2275085000	Mobile Sources;Aircraft;Unpaved Airstrips;Total
2294000000	Mobile Sources;Paved Roads;All Paved Roads;Total: Fugitives
2296000000	Mobile Sources;Unpaved Roads;All Unpaved Roads;Total: Fugitives
2296005000	Mobile Sources;Unpaved Roads;Public Unpaved Roads;Total: Fugitives
2296010000	Mobile Sources;Unpaved Roads;Industrial Unpaved Roads;Total: Fugitives
2311000000	Industrial Processes;Construction: SIC 15 - 17;All Processes;Total
2311010000	Industrial Processes;Construction: SIC 15 - 17;Residential;Total
2311010040	Industrial Processes;Construction: SIC 15 - 17;Residential;Ground Excavations
2311010070	Industrial Processes;Construction: SIC 15 - 17;Residential;Vehicle Traffic
2311020000	Industrial Processes;Construction: SIC 15 - 17;Industrial/Commercial/Institutional;Total
2311020040	Industrial Processes;Construction: SIC 15 - 17;Industrial/Commercial/Institutional;Ground Excavations
2311030000	Industrial Processes;Construction: SIC 15 - 17;Road Construction;Total
2325000000	Industrial Processes;Mining and Quarrying: SIC 14;All Processes;Total
2801000000	Miscellaneous Area Sources;Agriculture Production - Crops;Agriculture - Crops;Total
2801000002	Miscellaneous Area Sources;Agriculture Production - Crops;Agriculture - Crops;Planting
2801000003	Miscellaneous Area Sources;Agriculture Production - Crops;Agriculture - Crops;Tilling
2801000005	Miscellaneous Area Sources;Agriculture Production - Crops;Agriculture - Crops;Harvesting
2801000007	Miscellaneous Area Sources;Agriculture Production - Crops;Agriculture - Crops;Loading
2805000000	Miscellaneous Area Sources;Agriculture Production - Livestock;Agriculture - Livestock;Total
2805001000	Miscellaneous Area Sources;Agriculture Production - Livestock;Beef cattle - finishing operations on feedlots (drylots);Dust Kicked-up by Hooves (use 28-05-020, -001, -002, or -003 for Waste

Our approach was to apply the transportable fractions by county such that all afdust SCCs in the same county receive the same factor. The approach used to calculate the county-specific transportable fractions is based on land use data and is described by:
http://www.epa.gov/ttn/chief/emch/dustfractions/transportable_fraction_080305_rev.pdf
As this paper mentions, a limitation of the transportable fraction approach is the lack of monthly variability, which would be expected due to seasonal changes in vegetative cover. Further, the variability due to soil moisture, precipitation, and wind speeds is not accounted for by the methodology. An electronic version of the county-level transport fractions can be found at:
http://www.epa.gov/ttn/chief/emch/dustfractions/transportfractions052506rev.xls

The 2002 platform documentation describes an error in which the transportable fraction application for $PM_{2.5}$ was not applied. This error was fixed for the 2005v4.2 platform, and 2005 $PM_{2.5}$ afdust emissions are therefore correctly about 43% less than those in the 2002 platform.

2.2.2 Agricultural ammonia sector (ag)

This sector is unchanged from the 2005v4 platform; the documentation is repeated here for completeness.

The agricultural NH_3 "ag" sector is comprised of livestock and agricultural fertilizer application emissions from the nonpoint sector of the 2002 NEI. This sector is unchanged in the 2005

platform. The rest of this section documentation is therefore very similar to that in the 2002 documentation.

In building this sector we extracted livestock and fertilizer emissions based on the SCC. The livestock SCCs are listed in Table 2-5, and the fertilizer SCCs are listed in Table 2-6.

Table 2-5. Livestock SCCs extracted from the 2002 NEI to create the ag sector

SCC	SCC Description*
2805000000	Agriculture - Livestock;Total
2805001100	Beef cattle - finishing operations on feedlots (drylots);Confinement
2805001200	Beef cattle - finishing operations on feedlots (drylots);Manure handling and storage
2805001300	Beef cattle - finishing operations on feedlots (drylots);Land application of manure
2805002000	Beef cattle production composite;Not Elsewhere Classified
2805003100	Beef cattle - finishing operations on pasture/range;Confinement
2805007100	Poultry production - layers with dry manure management systems;Confinement
2805007300	Poultry production - layers with dry manure management systems;Land application of manure
2805008100	Poultry production - layers with wet manure management systems;Confinement
2805008200	Poultry production - layers with wet manure management systems;Manure handling and storage
2805008300	Poultry production - layers with wet manure management systems;Land application of manure
2805009100	Poultry production - broilers;Confinement
2805009200	Poultry production - broilers;Manure handling and storage
2805009300	Poultry production - broilers;Land application of manure
2805010100	Poultry production - turkeys;Confinement
2805010200	Poultry production - turkeys;Manure handling and storage
2805010300	Poultry production - turkeys;Land application of manure
2805018000	Dairy cattle composite;Not Elsewhere Classified
2805019100	Dairy cattle - flush dairy;Confinement
2805019200	Dairy cattle - flush dairy;Manure handling and storage
2805019300	Dairy cattle - flush dairy;Land application of manure
2805020001	Cattle and Calves Waste Emissions;Milk Cows
2805020002	Cattle and Calves Waste Emissions;Beef Cows
2805020003	Cattle and Calves Waste Emissions;Heifers and Heifer Calves
2805020004	Cattle and Calves Waste Emissions;Steers, Steer Calves, Bulls, and Bull Calves
2805021100	Dairy cattle - scrape dairy;Confinement
2805021200	Dairy cattle - scrape dairy;Manure handling and storage
2805021300	Dairy cattle - scrape dairy;Land application of manure
2805022100	Dairy cattle - deep pit dairy;Confinement
2805022200	Dairy cattle - deep pit dairy;Manure handling and storage
2805022300	Dairy cattle - deep pit dairy;Land application of manure
2805023100	Dairy cattle - drylot/pasture dairy;Confinement
2805023200	Dairy cattle - drylot/pasture dairy;Manure handling and storage
2805023300	Dairy cattle - drylot/pasture dairy;Land application of manure
2805025000	Swine production composite;Not Elsewhere Classified (see also 28-05-039, -047, -053)
2805030000	Poultry Waste Emissions;Not Elsewhere Classified (see also 28-05-007, -008, -009)
2805030001	Poultry Waste Emissions;Pullet Chicks and Pullets less than 13 weeks old
2805030002	Poultry Waste Emissions;Pullets 13 weeks old and older but less than 20 weeks old
2805030003	Poultry Waste Emissions;Layers
2805030004	Poultry Waste Emissions;Broilers
2805030007	Poultry Waste Emissions;Ducks
2805030008	Poultry Waste Emissions;Geese
2805030009	Poultry Waste Emissions;Turkeys
2805035000	Horses and Ponies Waste Emissions;Not Elsewhere Classified

SCC	SCC Description*
2805039100	Swine production - operations with lagoons (unspecified animal age);Confinement
2805039200	Swine production - operations with lagoons (unspecified animal age);Manure handling and storage
2805039300	Swine production - operations with lagoons (unspecified animal age);Land application of manure
2805040000	Sheep and Lambs Waste Emissions;Total
2805045000	Goats Waste Emissions;Not Elsewhere Classified
2805045002	Goats Waste Emissions;Angora Goats
2805045003	Goats Waste Emissions;Milk Goats
2805047100	Swine production - deep-pit house operations (unspecified animal age);Confinement
2805047300	Swine production - deep-pit house operations (unspecified animal age);Land application of manure
2805053100	Swine production - outdoor operations (unspecified animal age);Confinement

* All SCC Descriptions begin "Miscellaneous Area Sources;Agriculture Production – Livestock"

The "ag" sector includes all of the NH_3 emissions from fertilizer from the NEI. However, the "ag" sector does not include all of the livestock ammonia emissions, as there are also significant NH_3 emissions from livestock in the point source inventory that we retained from the 2002 NEI. Note that in these cases, emissions were not also in the nonpoint inventory for counties for which they were in the point source inventory; therefore no double counting occurred. Most of the point source livestock NH_3 emissions were reported by the states of Kansas and Minnesota. For these two states, farms with animal operations were provided as point sources using the following SCCs[5]:

- 30202001: Industrial Processes; Food and Agriculture; Beef Cattle Feedlots; Feedlots General
- 30202101: Industrial Processes; Food and Agriculture; Eggs and Poultry Production; Manure Handling: Dry
- 30203099: Industrial Processes; Food and Agriculture; Dairy Products; Other Not Classified

There are also livestock NH_3 emissions in the point source inventory with SCCs of 39999999 (Industrial Processes; Miscellaneous Manufacturing Industries; Miscellaneous Industrial Processes; Other Not Classified) and 30288801 (Industrial Processes; Food and Agriculture; Fugitive Emissions; Specify in Comments Field). We identified these sources as livestock NH_3 point sources based on their facility name. The reason why we needed to identify livestock NH_3 in the ptnonipm sector was to properly implement the emission projection techniques for livestock sources, which cover all livestock sources, not only those in the ag sector, but also those in the ptnonipm sector.

[5] These point source emissions are also identified by the segment ID, which is one of the following: "SWINE", "CATTLE", "DAIRY", or "PLTRY".

Table 2-6. Fertilizer SCCs extracted from the 2002 NEI for inclusion in the "ag" sector

2002 SCC	2002 SCC Description*
2801700001	Anhydrous Ammonia
2801700002	Aqueous Ammonia
2801700003	Nitrogen Solutions
2801700004	Urea
2801700005	Ammonium Nitrate
2801700006	Ammonium Sulfate
2801700007	Ammonium Thiosulfate
2801700010	N-P-K (multi-grade nutrient fertilizers)
2801700011	Calcium Ammonium Nitrate
2801700012	Potassium Nitrate
2801700013	Diammonium Phosphate
2801700014	Monoammonium Phosphate
2801700015	Liquid Ammonium Polyphosphate
2801700099	Miscellaneous Fertilizers

* All descriptions include "Miscellaneous Area Sources; Agriculture Production – Crops; Fertilizer Application" as the beginning of the description.

2.2.3 Other nonpoint sources (nonpt)

Nonpoint sources that were not subdivided into the afdust, ag, or avefire sectors were assigned to the "nonpt" sector.

The 2002 platform documentation describes the creation of the 2002 nonpt sector in great detail, but the rest of this section will simply document what has changed for the 2005v4.2 platform. Below is a list of changes made from the 2002 platform both for the v4 platform and for the v4.2 platform. Details on the changes to 2002 for the version 4 platform are in the v4 documentation.

Updates to the nonpt sector from 2002 platform made for creation of the nonpt sector of the 2005v4 platform

- The 2005 platform replaces 2002v3 NEI non-California Western Regional Air Partnership (WRAP) oil and gas emissions (SCCs beginning with "23100") with WRAP year 2005 Phase II oil and gas emissions.
- Residential wood combustion (RWC) emissions were replaced with data for Oregon and New York. This update is consistent with the 2005v2 NEI.
- RWC VOC emissions were recalculated for all states except California to reflect an updated emissions factor for VOC from RWC sources. This update is consistent with the 2005v2 NEI.
- We utilized benzene, formaldehyde, acetaldehyde and methanol (BAFM) emissions from sources that met the HAP-CAP integration criteria discussed in Section 3.1.2.1 (i.e., the "integrate" sources). We removed BAFM from sources that did not meet the integration criteria (i.e., the "no-integrate" sources) so that BAFM would not be double counted with the BAFM generated via speciation of VOC.

Updates from 2005v4 platform used in creating the 2005v4.2 platform

- We changed the integration status for pesticide emissions from using the "integrate" case to using the "no-integrate" case. The main reason is that there were significant benzene emissions from this category in the NEI that was considered incorrect. The NEI benzene came from solvent utilization data (Fredonia) for "other markets" for the year 1998. Since benzene no longer allowed in pesticides, we chose to eliminate the use of these HAP data and use a VOC speciation profile that did not include benzene emissions to be more consistent with the changed regulations.
- We replaced Delaware fuel combustion (all industrial, commercial, and residential), residential wood combustion, and open burning with revised state estimates for NOX, SO2, and PM. The impact of this inventory change is shown in Appendix A, Table A-3.
- We removed South Carolina residual oil emissions from industrial boilers. We determined that these nonpoint emissions were a double count from those in the point inventory. Removing these emissions is consistent with the preliminary 2008 NEI data submittal. The impact of this inventory change is shown in Appendix A, Table A-3.
- We replaced Nebraska industrial fuel combustion emissions with 2005 Central Regional Air Planning Association (CENRAP) dataset, version G. The impact of this inventory change is shown in Appendix A, Table A-3.
- We added oil and gas emissions for Texas and replaced oil and gas emissions with updated 2005 data from Oklahoma.

TCEQ Oil and Gas Emissions

The Texas Commission on Environmental Quality (TCEQ) provided 2005 oil and gas emissions which we added to the nonpt sector. The emissions were for a single SCC: 2310000220 Industrial Processes; Oil and Gas Exploration and Production; All Processes; Drill Rigs. The TCEQ indicated that these should replace emissions in the nonroad inventory from the NONROAD model (drill rigs: SCC=2270010010). Because the nonroad emissions are significantly less than the updated nonpt emissions, we did not remove the nonroad emissions. Both the TCEQ and related nonroad emissions from the 2005 NEI are summarized in Table 2-7.

Table 2-7. Additional TCEQ oil and gas emissions added to the 2005v2 NEI

Pollutant	TCEQ Emissions 2005, added to nonpt (tons/yr)	NEI 2005 Emissions (nonroad inventory), not subtracted (tons/yr)
CO	15,878	1,396
NH_3		3
NO_X	42,854	4,704
PM_{10}	3,036	275
$PM_{2.5}$	2,945	267
SO_2	5,977	573
VOC	4,337	340

Oklahoma Oil and Gas Emissions

The state of Oklahoma provided and emissions replacement for their 2005 oil and gas sector emissions. These data added emissions for the SCCs shown in Table 2-8.

Table 2-8. SCCs provided with Oklahoma oil and gas sector emissions

SCC	SCC Description
31000103	Crude Oil Production;Wells: Rod Pumps*
31000122	Crude Oil Production;Drilling and Well Completion*
31000203	Natural Gas Production;Compressors*
31000215	Natural Gas Production;Flares Combusting Gases >1000 BTU/scf*
31000222	Natural Gas Production;Drilling and Well Completion*
31000227	Gas Production;Glycol Dehydrator Reboiler Still Stack*
31000228	Natural Gas Production;Glycol Dehydrator Reboiler Burner*
31000403	Industrial Processes;Oil and Gas Production;Process Heaters;Crude Oil
31000404	Industrial Processes;Oil and Gas Production;Process Heaters;Natural Gas
31088811	Industrial Processes;Oil and Gas Production;Fugitive Emissions;Fugitive Emissions

* These SCC descriptions start with the preface "Industrial Processes;Oil and Gas Production"

In addition, this update removed emissions for SCC 2310000000, which is "Industrial Processes;Oil and Gas Production: SIC 13;All Processes;Total: All Processes."

The resultant Oklahoma emissions are shown below in Table 2-9. Note that Oklahoma instructed that PM_{10} emissions were size $PM_{2.5}$, and therefore no coarse PM (PMC) was generated and PM_{10} is the same as PM2.5

Table 2-9. Changes to Oklahoma oil and gas emissions

Pollutant	2005 Oklahoma Oil and gas emissions 2005, removed from nonpt (tons/yr)	2005 Oklahoma Oil and gas emissions, added to nonpt (tons/yr)
CO	11,251	32,821
VOC	104,193	155,908
NO_X	66,480	39,668
SO_2	0	1,014
$PM_{10} = PM_{2.5}$	0	1,918

2.3 Fires (avefire)

The purpose of the avefire sector is to represent emissions for a typical year's fires for use in projection year inventories, since the location and degree of future-year fires are not known. This approach keeps the fires information constant between the 2005 base case and future-year cases to eliminate large and uncertain differences between those cases that would be caused by changing the fires. Using an average of multiple years of data reduces the possibility that a

single-year's high or low fire activity would unduly affect future-year model-predicted concentrations.

The avefire sector contains wildfire and prescribed burning emissions. It excludes agricultural burning and other open burning sources, which are included in the nonpt sector. Generally, their year-to-year impacts are not as variable as wildfires and non-agricultural prescribed/managed burns.

We use this sector for the 2005 base case, and all future-year cases. Emissions are annual and county-level. The same emissions are used in the v4 and v4.2 versions of the 2005-based platform. Refer to the 2005v4 platform documentation for more information.

2.4 Biogenic sources (biog)

This sector is unchanged from the 2005v4 platform; the documentation is repeated here for completeness.

The biogenic emissions were computed based on 2005 meteorology data using the BEIS3.14 model within SMOKE. The 2002 platform used the BEIS3.13 model; otherwise, all underlying land use data and parameters are unchanged for the 2005 platform.

The BEIS3.14 model creates gridded, hourly, model-species emissions from vegetation and soils. It estimates CO, VOC, and NO_X emissions for the U.S., Mexico, and Canada. The BEIS3.14 model is described further in:
http://www.cmascenter.org/conference/2008/slides/pouliot_tale_two_cmas08.ppt

The inputs to BEIS include:

- Temperature data at 2 meters which were obtained from the meteorological input files to the air quality model,
- Land-use data from the Biogenic Emissions Landuse Database, version 3 (BELD3). BELD3 data provides data on the 230 vegetation classes at 1-km resolution over most of North America, which is the same land-use data were used for the 2002 platform.

2.5 2005 mobile sources (on_noadj, on_moves_runpm, on_moves_startpm, nonroad, alm_no_c3, seca_c3)

For the 2005 platform, as indicated in Table 2-2, we separated the 2005 onroad emissions into three sectors: (1) “on_moves_startpm”; (2) “on_moves_runpm”; and (3) “on_noadj”. The on_moves_startpm and on_moves_runpm sectors are processed separately because these sectors contain gasoline exhaust PM emissions that are subject to mode-specific (start versus running) hourly temperature adjustments during SMOKE processing. All pollutants and sources in the on_noadj sector are not subject to hourly temperature adjustments. The aircraft, locomotive, and commercial marine emissions are divided into two nonroad sectors: “alm_no_c3” and “seca_c3”,

and as previously mentioned, the aircraft emissions are in the non-EGU (ptnonipm) point inventory. The seca_c3 emissions are treated as point emissions with an elevated release component while all other nonroad emissions are treated as county-specific low-level emissions.

The onroad emissions were primarily based on the publicly released 12/21/2009 version of the Motor Vehicle Emissions Simulator (MOVES2010) (http://www.epa.gov/otaq/models/moves/). MOVES was run with a state/month aggregation using county-average fuels for each state, state/month-average temperatures, and national default vehicle age distributions. 2005 Vehicle Miles Travelled (VMT), consistent with the 2005v2 NEI, were used.

The major changes between v4.2 and v4 versions of the 2005-based platform are that (1) we used a publicly released version of MOVES (MOVES2010), rather than a draft version of MOVES; (2) we used the MOVES emissions for all vehicle types and modes (as opposed to non-motorcycle gasoline exhaust vehicles only); (3) MOVES2010 emissions cover all criteria pollutants and criteria pollutant precursors (as opposed to draft MOVES that covered only exhaust mode $PM_{2.5}$, VOC, NO_X and CO); and (4) we used NH_3 from MOVES for California (as opposed to NH_3 from NMIM) since California-supplied emissions in the 2005v2 NEI do not include NH_3. It should also be noted that the exhaust $PM_{2.5}$ from diesel vehicles, which had previously come from NMIM but in v4.2 comes from MOVES, are not impacted by cold temperatures. In addition, PM brake wear and tire wear mode emissions are now provided in MOVES in v4.2; these emissions for both gasoline and diesel vehicles are also not impacted by cold temperatures.

Table 2-10 lists the data source for all pollutants, vehicle types, and modes (e.g., exhaust, evaporative, brake and tire wear) for all pollutants in the 2005v4 and 2005v4.2 emissions modeling platform. Naphthalene, 1-3-butadiene, and acrolein are also provided by MOVES2010 but were not included in our 2005v4.2 platform.

Table 2-10. Data sources for onroad mobile sources in the 2005v4 and 2005v4.2 platforms[1]

Pollutants/vehicles/modes	2005v4	2005v4.2
$PM_{2.5}$; gasoline exhaust, partially speciated[2]	Draft MOVES	MOVES2010
$PM_{2.5}$; diesel exhaust, partially speciated[2]	NMIM	MOVES2010
$PM_{2.5}$, brake and tirewear, unspeciated	NMIM	MOVES2010
VOC, Benzene (except refueling); gasoline	Draft MOVES	MOVES2010
VOC, Benzene (except refueling); diesel	NMIM	MOVES2010
CO, NO_X, SO_2, NH_3, Acetaldehyde, Formaldehyde; gasoline	Draft MOVES	MOVES2010
CO, NO_X, SO_2, NH_3, Acetaldehyde, Formaldehyde; diesel	NMIM	MOVES2010

[1] For California, 2005v4 and 2005v4.2 use draft MOVES and MOVES2010 (respectively) only for NH_3.
[2] Exhaust mode $PM_{2.5}$ species from MOVES consist of: PEC, PSO_4 and the difference between $PM_{2.5}$ and PEC (named as "PM25OC"). Procedures to produce the species needed are provided in Appendix D of the 2005v4.1 TSD: http://www.epa.gov/ttn/chief/emch/toxics/2005v4.1_appendices.pdf. Diesel partially speciated emissions are not impacted by cold temperatures and do not need to be adjusted by gridded temperature as do the gasoline exhaust particulate emissions. Brake wear and tire wear $PM_{2.5}$ emissions were not pre-speciated.

Similar to the v4 platform, we used the MOVES data to create emissions by state and month (and SCC) and then allocated to counties based on 2005 NMIM-based county-level data. The reason for using the state resolution was due to (a) run time issues that made a county run for the entire nation infeasible in the timeframe required and (b) incomplete efforts to create a national database of county-specific inputs to MOVES. For 2005v4.2, no pollutants are obtained from the 2005 NMIM runs.

The 2005v2 NEI does not contain the MOVES data that we use for the 2005 platform. Instead, it contains onroad and nonroad mobile emissions that we generated using NMIM (EPA, 2005a) for all of the U.S. except for California.[6] The NMIM data was used only to allocate California-submitted data to road types, to allocate the state-month-SCC MOVES data to counties, and for some of the nonroad mobile sources. NMIM relies on calculations from the MOBILE6 and NONROAD2005 models as described below, and in the NEI documentation. Inputs to NMIM are posted with the 2005 Emission Inventory.

NMIM creates the onroad and nonroad emissions on a month-specific basis that accounts for temperature, fuel types, and other variables that vary by month. Inventory documentation for the 2005v2 NEI onroad and nonroad sectors is also posted with other 2005 NEI documentation; the direct link is:
ftp://ftp.epa.gov/EmisInventory/2005_nei/mobile/2005_mobile_nei_version_2_report.pdf

The residual fuel commercial marine vessel (CMV), also referred to as Category 3 (C3) from the 2002 platform were replaced with a set of approximately 4-km resolution point source format emissions; these were modeled separately as point sources in the "seca_c3" sector for the 2005 platform. They were updated for v4.2 by using revised 2005 emissions from the category 3 commercial marine vessel sector to reflect the final projections from 2002 developed for the category 3 commercial marine Emissions Control Area (ECA) Proposal to the International Maritime Organization (EPA-420-F-10-041, August 2010). Unlike for the v4 platform, we projected Canada as part of the ECA, using region-specific growth rates; thus the v4.2 seca_c3 inventories contain Canadian province codes for near shore emissions.

The nonroad sector, based on NMIM did not change for the v4.2 platform other than for California, for which missing $PM_{2.5}$ emissions for 7 counties was discovered. We corrected these $PM_{2.5}$ emissions by using an earlier version of the 2005 submittal which California had provided values for the 7 counties.

The mobile sectors are compiled at a county and SCC resolution, with the exception of the seca_c3 sector that uses point sources to map the pre-gridded data to the modeling domain. Similar to v4, in v4.2, tribal data from the alm_no_c3 sector have been dropped because we do not have spatial surrogate data, and the emissions are small; these data were removed from the SMOKE input inventories for 2005.

[6] Although OTAQ generated emissions using NMIM for California, these were not used in the 2005 NEI version 2, but rather were replaced by state-submitted emissions. Since California did not submit NH_3, values from MOVES were used.

Most mobile sectors use the HAP portion on the inventory to provide benzene, acetaldehyde, formaldehyde and/or methanol to the modeling inputs through HAP VOC "integration", as described in Section 3.1.2.1. A few categories of nonroad sources (CNG and LPG-fueled equipment) do not have the BAFM pollutants in the inventory and therefore utilize the "no-integrate", "no-hap-use" case, which means VOC from these sources is speciated to provide BAFM.

2.5.1 Onroad gasoline exhaust cold-start mode PM (on_moves_startpm)

This sector contains MOVES2010 emissions for PM and naphthalene[7] for non-California onroad gasoline cold-start exhaust. These emissions (and the on_moves_runpm sector discussed in the next section) are processed separately from the remainder of the onroad mobile emissions because they are subject to hourly temperature adjustments, and these temperature adjustments are different for cold-start and running exhaust modes.

Temperature adjustments were applied to account for the strong sensitivity of PM and naphthalene exhaust emissions to temperatures below 72ºF. Because it was not feasible to run MOVES directly for all of the gridded, hourly temperatures needed for modeling, we created emissions of PM and naphthalene exhaust at 72ºF and applied temperature adjustments after the emissions were spatially and temporally allocated. The $PM_{2.5}$ (and naphthalene) adjustment factors were different for starting and running exhaust because these two processes respond differently to temperature as shown in Figure 2-1 which shows how these emissions increase with colder temperatures. The temperature adjustment factor in this figure is defined in terms of primary elemental carbon (PEC) as follows:

PEC = Adjustment Factor x PEC_72

Where:

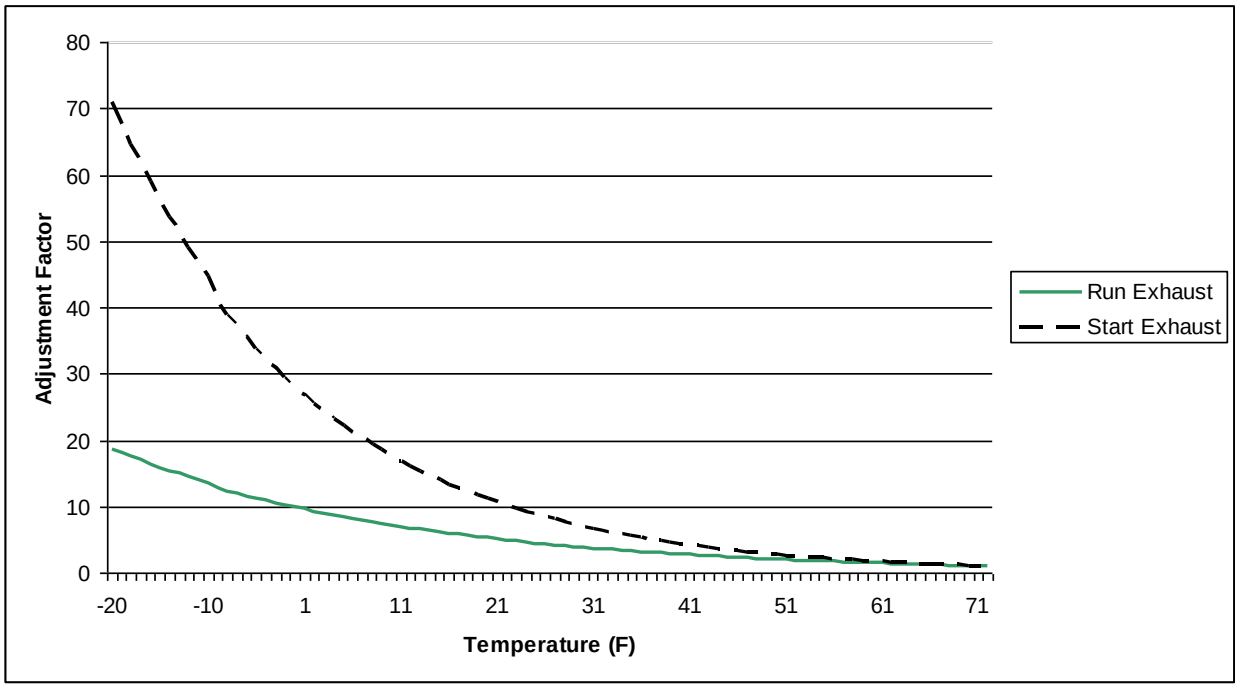
PEC = PEC at Temperatures below 72ºF
PEC_72 = PEC at 72ºF or higher

As seen in the figure, start exhaust emissions increase more than running exhaust emissions as temperatures decrease from 72ºF.

Figure 2-1 also shows that the actual adjustments are different for start exhaust and running exhaust emissions. The method for applying these adjustments was the same for both start and running exhaust sectors: They were applied to SMOKE gridded, hourly intermediate files, based upon the gridded hourly temperature data (these same data are also input to the air quality model). One result of this approach is that inventory summaries based on the raw SMOKE inputs for the on_moves_startpm and on_moves_runpm sectors will not be valid because they will not include the temperature adjustments. As a result, the post-processing for temperature adjustments included computing the emissions totals at state, county, and month resolution to use for summaries.

[7] Naphthalene is not used in the 2005v4 CAP-BAFM platform, but it is contained in the MOVES emissions.

Figure 2-1. MOVES exhaust temperature adjustment functions.



The MOVES output data required pre-processing to develop county-level monthly ORL files for input to SMOKE. As stated earlier, the resolution of the MOVES data was state-SCC totals, and the state level data were allocated to county level prior to input into SMOKE. An additional pre-processing step was for the exhaust $PM_{2.5}$, for which emissions from MOVES were partially speciated. To retain the speciated elemental carbon and sulfate emissions from MOVES, the speciation step that is usually done in SMOKE was performed prior to SMOKE, and it was modified to allow the temperature adjustments to be applied to only the species affected by temperature as described in the list below. Finally, because the start exhaust emissions were broken out separately from running exhaust emissions, they were assigned to new SCCs (urban and rural parking areas) that allowed for the appropriate spatial and temporal profiles to be applied in SMOKE.

A list of the procedures performed to prepare the MOVES data for input into SMOKE is provided here.

i. We allocated state-level emissions to counties using state-county emission ratios by SCC, pollutant, month, and emissions mode (e.g., evaporative, exhaust, brake wear, and tire wear) for each month. The ratios were computed using NMIM 2005 data (same data included in the 2005v2 NEI).

ii. We assigned these start exhaust emissions to urban and rural SCCs based on the county-level ratio of emissions from urban versus rural local roads from the NMIM onroad gasoline exhaust mode data. For example, we split light duty gasoline vehicle (LDGV) start emissions in the state-total MOVES data (assigned SCC 2201001000) into urban (2201001370) and rural (2201001350) based on the ratio of LDGV urban (2201001330) and rural (2201001210) local roads.

iii. We converted MOVES-based $PM_{2.5}$ species at 72ºF to SMOKE-ready PM species. The SMOKE-ready species are listed below and the speciation technique used to obtain the SMOKE-ready species is further discussed in Appendix D of the 2005v4.1 TSD: http://www.epa.gov/ttn/chief/emch/toxics/2005v4.1_appendices.pdf.

- NAPHTH_72: unchanged from MOVES-based file, subject to temperature adjustment below 72ºF.
- PEC_72: unchanged from MOVES-based PM25EC, subject to temperature adjustment below 72ºF.
- POC_72: modified MOVES-based PM25OC to remove metals, PNO3 (computed from MOVES-based PM25EC), NH_4 (computed from MOVES-based PM25SO4 and PNO3), and MOVES-based PM25SO4. Subject to temperature adjustment below 72ºF.
- PSO4: unchanged from MOVES-based PM25SO4, not subject to temperature adjustment.
- PNO3: computed from MOVES-based PM25EC, not subject to temperature adjustment.
- OTHER: sum of computed metals (fraction of MOVES-based PM25EC) and NH_4 (computed from PNO3 and PSO4), not subject to temperature adjustment.
- PMFINE_72: Computed from OTHER and fraction of POC_72. Subject to temperature adjustment below 72 ºF.
- PMC_72: Computed as fraction of sum of PMFINE_72, PEC_72, POC_72, PSO4, and PNO3. Subject to temperature adjustment below 72 ºF.

The total MOVES PM emissions are conserved during allocation from states to counties, and from the generic total "start" SCCs to the two new parking SCCs that end in "350" and "370". PEC and PSO4 components of $PM_{2.5}$ emissions are also conserved as they are simply renamed from the MOVES species "PM25EC" and "PM25SO4". However, as seen above, POC, PNO3, and PMFINE components involve multiplying the MOVES PM species by components of an onroad gasoline exhaust speciation profile described in Appendix D of the 2005v4.1 TSD.

2.5.2 Onroad gasoline exhaust running mode PM (on_moves_runpm)

This sector is identical to the on_moves_startpm sector discussed in Section 2.5.1, but contains running exhaust emissions instead of cold-start exhaust emissions. The same pollutants are in this sector, and allocation from the MOVES state-level to county-level inventory is a simple match by SCC and month to NMIM state-county ratios. The only reason this sector is separated from on_moves_startpm is because the temperature adjustments are less extreme for these running emissions at colder temperatures when compared to the curve for cold-start emissions (Figure 2-1).

2.5.3 Onroad mobile with no adjustments for daily temperature (on_noadj)

This sector consists of the bulk of the onroad mobile emissions, which are not covered by the on_moves_startpm and on_moves_runpm sectors. These emissions did not receive any temperature adjustments in our processing. There are four sources of data that are pre-processed to create two sets of monthly inventories for this sector.

1. MOVES-based onroad gasoline and diesel: These are the MOVES-based emissions monthly (not including gasoline exhaust mode PM and naphthalene) consisting of the following:

    a. Gasoline Exhaust: VOC, NO_X, CO, SO_2, NH_3, 1,3-butadiene (106990), acetaldehyde (75070), acrolein (107028), benzene (71432), formaldehyde (50000), and brake and tire wear $PM_{2.5}$;

    b. Diesel Exhaust: Partially-speciated $PM_{2.5}$ (that were fully speciated prior to input into SMOKE (via Appendix D of the 2005v4.1 TSD: http://www.epa.gov/ttn/chief/emch/toxics/2005v4.1_appendices.pdf), VOC, NO_X, CO, SO_2, NH_3, 1,3-butadiene (106990), acetaldehyde (75070), acrolein (107028), benzene (71432), formaldehyde (50000), and brake and tire wear $PM_{2.5}$. Because diesel exhaust PM does not require the same intermediate temperature adjustments as gasoline exhaust PM, diesel exhaust PM can therefore be processed with the remaining onroad mobile emissions.

    c. Evaporative: Non-refueling VOC, benzene, and naphthalene (91203).

    For the pollutants listed, these non-California MOVES emissions encompass the same sources as the on_moves_startpm and on_moves_runpm sectors: light duty gasoline vehicles, light duty gasoline trucks (1 & 2), and heavy duty gasoline vehicles, but they do not require the same intermediate temperature adjustments and can therefore be processed with the remaining onroad mobile emissions. These emissions contain both running and parking sources and they are pre-processed from state-level to county-level much like the on_moves_startpm and on_moves_runpm sectors already discussed. The preprocessing for the non-PM emissions did not require species calculations because the raw MOVES emissions translated directly to SMOKE inventory species.

2. California onroad inventory: California 2005v2 NEI complete CAP/HAP onroad inventory. California monthly onroad emissions are year 2005 and are based on September 2007 California Air Resources Board (CARB) data from Chris Nguyen. NH_3 emissions are from MOVES2010 runs for California. We retained only those HAPs that are also estimated by NMIM for onroad mobile sources; all other HAPs provided by California were dropped. The California onroad inventory does not use the SCCs for Heavy Duty Diesel Vehicles (HDDV) class 6 & 7 (2230073XXX) emissions. California does not specify road types, so we used NMIM-based California ratios to break out vehicle emissions to the match the more detailed NMIM level.

2.5.4 Nonroad mobile sources: NMIM-based (nonroad)

This sector includes monthly exhaust, evaporative and refueling emissions from nonroad engines (not including commercial marine, aircraft, and locomotives) that are derived from NMIM for all states except California, which were corrected due to an inadvertent omission of $PM_{2.5}$ from

seven counties. Thus, except for seven counties in California, emissions from this sector did not change between the v4 and v4.2 platform versions, and we repeat the documentation here for completeness.

NMIM relied on the version of the NONROAD2005 model (NR05c-BondBase) used for the marine spark ignited (SI) and small SI engine final rule, published May 2009 (EPA, 2008). For 2005, the NONROAD2005 model (NR05c-BondBase) is equivalent to NONROAD2008a, since it incorporated Bond rule revisions to some of the base-case inputs and the Bond rule controls did not take effect until future years. As with the onroad emissions, NMIM provides nonroad emissions for VOC by three emission modes: exhaust, evaporative and refueling. Unlike the onroad sector, refueling emissions nonroad sources are not dropped from processing for this sector.

The EPA/OTAQ ran NMIM to create county-SCC emissions for the 2005v2 NEI nonroad mobile CAP/HAP inventory, and similar to on_noadj, we removed California NMIM emissions that were submitted separately by California. Emissions were converted from monthly totals to monthly average-day based on the number of days in each month. Similar to onroad NMIM emissions, the EPA default inputs were replaced by state inputs where provided. The NMIM inventory documentation describes this and all other details of the NMIM nonroad emissions development:
ftp://ftp.epa.gov/EmisInventory/2005_nei/mobile/2005_mobile_nei_version_2_report.pdf

California nonroad
California monthly nonroad emissions are year 2005 and are based on September 2007 California Air Resources Board (CARB) data from Chris Nguyen, other than for the $PM_{2.5}$ missing from 7 counties, which used the March 2007 version. In addition, NH_3 emissions are from NMIM runs for California because these were not included in the California NEI submittal. HAP emissions were estimated by applying HAP-to-CAP ratios computed from California data provided in the 2005v2 NEI submittal. We retained only those HAPs that are also estimated by NMIM for nonroad mobile sources; all other HAPs were dropped.

The CARB-based nonroad data did not have mode-specific data for VOC (exhaust, evaporative, and refueling). To address this inconsistency with other states, we split the annual total California data into monthly, mode-specific nonroad emissions for California using the NMIM results. Details on this process are documented separately (Strum, 2007). Nonroad refueling emissions for California were computed as Gasoline Transport (SCC=2505000120) emissions multiplied by a factor of 0.46 (to avoid double counting with portable fuel container (PFC) emissions in the nonpt sector) and were allocated to the gasoline equipment types based on ratios of evaporative-mode VOC. The factor of 0.46 was computed by dividing the NMIM-derived California refueling for 2005 by the sum of portable fuel container emissions and NMIM-derived refueling for 2005.

2.5.5 Nonroad mobile sources: locomotive and non-C3 commercial marine (alm_no_c3)

The alm_no_c3 sector contains CAP and HAP emissions from locomotive and commercial marine vessel (CMV) sources, except for category 3/residual-fuel (C3) CMV and railway

maintenance. In modeling platforms prior to the 2005v4 platform, this sector also contained aircraft emissions. Point-source airports were included in the non-EGU point sector (ptnonipm) through the 2005v2 NEI point source inventory. The C3 CMV emissions are in the seca_c3 sector. We note that the "a" in the "alm_no_c3" sector name is now misleading because aircraft are no longer in this sector. With the exception of revised Delaware CMV emissions from the Transport Rule comments, this sector is unchanged from the v4 platform.

The remaining emissions in the alm_no_c3 sector are year 2002 emissions unchanged from the 2002 platform; we repeat the 2005v4 documentation for completeness. The SCCs in the alm_no_c3 sector are listed in Table 2-11.

Table 2-11. SCCs in the 2005 alm_no_c3 inventory compared to the 2002 platform alm sector

SCC	Action	SCC Description
2275000000	Emissions removed and replaced by aircraft in ptnonipm sector for 2005 platform	Mobile Sources; Aircraft: All Aircraft Types and Operations: Total
2275001000	Emissions removed and replaced by aircraft in ptnonipm sector for 2005 platform	Mobile Sources; Aircraft: Military Aircraft: Total
2275020000	Emissions removed and replaced by aircraft in ptnonipm sector for 2005 platform	Mobile Sources; Aircraft: Commercial Aircraft: Total: All Types
2275050000	Emissions removed and replaced by aircraft in ptnonipm sector for 2005 platform	Mobile Sources; Aircraft: General Aviation: Total
2275060000	Emissions removed and replaced by aircraft in ptnonipm sector for 2005 platform	Mobile Sources; Aircraft: Air Taxi: Total
2280002100	Retained from 2002 platform	Mobile Sources;Marine Vessels, Commercial;Diesel;Port emissions
2280002200	Retained from 2002 platform	Mobile Sources;Marine Vessels, Commercial;Diesel;Underway emissions
2280003100	Emissions removed and replaced by seca_c3 inventories for 2005 platform	Mobile Sources;Marine Vessels, Commercial;Residual;Port emissions
2280003200	Emissions removed and replaced by seca_c3 inventories for 2005 platform	Mobile Sources;Marine Vessels, Commercial;Residual;Underway emissions
2280004000	Retained from 2002 platform	Mobile Sources;Marine Vessels, Commercial;Gasoline;Total, All Vessel Types
2285002006	Retained from 2002 platform	Mobile Sources;Railroad Equipment;Diesel;Line Haul Locomotives: Class I Operations
2285002007	Retained from 2002 platform	Mobile Sources;Railroad Equipment;Diesel;Line Haul Locomotives: Class II / III Operations
2285002008	Retained from 2002 platform	Mobile Sources;Railroad Equipment;Diesel;Line Haul Locomotives: Passenger Trains (Amtrak)
2285002009	Retained from 2002 platform	Mobile Sources;Railroad Equipment;Diesel;Line Haul Locomotives: Commuter Lines
2285002010	Retained from 2002 platform	Mobile Sources;Railroad Equipment;Diesel;Yard Locomotives

The documentation of the 2002 NEI for the category 1 and 2 (C1/C2) commercial marine and locomotive emissions is available at:
http://www.epa.gov/ttn/chief/net/2002inventory.html#documentation

For modeling purposes, the following additional changes were made to the NEI data for the 2005v4 platform:

- For the 2005v4 platform, we removed C3 CMV SCCs (residual fuel) and aircraft SCCs.
- Removed railway maintenance emissions (SCCs 2285002015, 2285004015, and 2285006015) because these are included in the nonroad NMIM monthly inventories. This change was made for the 2002 platform and is retained here in the 2005 platform.
- For the purpose of CAP-HAP VOC integration as discussed in Section 3.1.2.1, we removed benzene, formaldehyde, and acetaldehyde for all sources that we did not integrate these HAPs with VOC. As discussed in Section 3.1.2.1, sources are considered no-integrate when the source of data between VOC and VOC HAPs is inconsistent or VOC analysis of VOC and VOC HAPs indicates the source is not integrated. Although our CAP-HAP integration approach also required the removal of methanol for no-integrate sources, the only sources in this sector that included methanol were in California, where we used the integrate approach for all sources and therefore did not need to remove it.

The 2002 platform documentation goes into greater detail on the locomotives and C1/C2 CMV emissions in this sector.

2.5.6 Nonroad mobile sources: C3 commercial marine (seca_c3)

The raw seca_c3 sector emissions data were developed in an ASCII raster format used since the Emissions Control Area-International Marine Organization (ECA-IMO) project began in 2005, then known as the Sulfur Emissions Control Area (SECA). These emissions consist of large marine diesel engines (at or above 30 liters/cylinder) that until very recently, were allowed to meet relatively modest emission requirements, often burning residual fuel. The emissions in this sector are comprised of primarily foreign-flagged ocean-going vessels, referred to as Category 3 (C3) CMV ships. The seca_c3 (ECA) inventory includes these ships in several intra-port modes (cruising, hoteling, reduced speed zone, maneuvering, and idling) and underway mode and includes near-port auxiliary engines. An overview of the ECA-IMO project and future-year goals for reduction of NO_X, SO_2, and PM C3 emissions can be found at:
http://www.epa.gov/oms/regs/nonroad/marine/ci/420f09015.htm

The resulting coordinated strategy, including emission standards under the Clean Air Act for new marine diesel engines with per-cylinder displacement at or above 30 liters, and the establishment of Emission Control Areas is at: http://www.epa.gov/oms/oceanvessels.htm.

The raw ECA inventory started as a set of ASCII raster datasets at approximately 4-km resolution that we converted to SMOKE point-source ORL input format as described in http://www.epa.gov/ttn/chief/conference/ei17/session6/mason.pdf.

In summary, this paper describes how the ASCII raster dataset was converted to latitude-longitude, mapped to state/county FIPS codes that extend up to 200 nautical miles (nm) from the coast, assigned stack parameters, and how the monthly ASCII raster dataset emissions were used to create monthly temporal profiles. Counties in 2005v4 were assigned as extending up to 200nm from the coast because of this was the distance to the edge of the Exclusive Economic Zone (EEZ), a distance that would be used to define the outer limits of ECA-IMO controls for these vessels.

The base year ECA inventory is 2002 and consists of these CAPs: PM_{10}, CO, CO_2, NH_3, NO_X, SO_X (assumed to be SO_2), and Hydrocarbons (assumed to be VOC). The EPA developed regional growth (activity-based) factors that we applied to create the v4 platform 2005 inventory from the 2002 data.

We computed HAPs directly from the CAP inventory and the calculations are therefore consistent; therefore, the entire seca_c3 sector utilizes CAP-HAP VOC integration to use the VOC HAP species directly, rather than VOC speciation profiles.

For the v4.2 platform, we chose only to include some HAPs in the seca_c3 sector: benzene, formaldehyde, and acetaldehyde. We projected these HAPs using the same VOC factors as used in 2005v4:

Benzene	= VOC * 9.795E-06
Acetaldehyde	= VOC * 2.286E-04
Formaldehyde	= VOC * 1.5672E-03

We converted the emissions to SMOKE point source ORL format, allowing for the emissions to be allocated to modeling layers above the surface layer. We also corrected FIPS code assignments for one county in Rhode Island. All non-US emissions (i.e., in waters considered outside of the 200nm EEZ, and hence out of the U.S. and Canadian ECA-IMO controllable domain) are simply assigned a dummy state/county FIPS code=98001. The SMOKE-ready data have also been cropped from the original ECA-IMO data to cover only the 36-km air quality model domain, which is the largest domain used for this effort.

Seca_c3 updates from 2005v4 platform used in creating 2005v4.2 platform

There are several updates to the seca_c3 emissions from 2005v4 to 2005v4.2:

1) Delaware provided updated county total emissions in the Transport Rule comments. There are several other changes that impact Delaware state total emissions discussed below.
2) Region-specific and pollutant-specific growth factors were updated for the v4.2 platform as compared to the v4 platform to be consistent with the final projections from 2002, developed for the C3 ECA Proposal to the International Maritime Organization (EPA-420-F-10-041, August 2010). The exception to this is Delaware, where county totals

were modified to match those provided in Transport Rule comments. The updated factors that we used to project from 2002 to 2005 are presented in Table 2-12. These updated 2002 to 2005 projection factors for 2005v.2 are approximately 1% higher for all pollutants nationally.

Table 2-12. Adjustment factors to update the 2005 seca_c3 sector emissions for the v4.2 platform.

	2005 Adjustments Relative to 2002					
Region	**NO_X**	**PM_{10}**	**$PM_{2.5}$**	**VOC (HC)**	**CO**	**SO2**
East Coast (EC)[1]	1.10524	1.15242	1.15383	1.15256	1.15238	1.15244
Gulf Coast (GC)	1.04056	1.08521	1.08269	1.08467	1.08536	1.08530
North Pacific (NP)	1.07254	1.11354	1.09817	1.11358	1.11318	1.11339
South Pacific (SP)	1.12539	1.17416	1.17257	1.17055	1.17012	1.17565
Great Lakes (GL)	1.04397	1.06264	1.06241	1.06341	1.06280	1.06251
Outside ECA	1.08654	1.13186	1.13186	1.13186	1.13186	1.13186

1 –Delaware emissions were provided for 2005 from Transport Rule comments.

3) In addition to the updated values, near-shore Canadian emissions are now assigned to regions whereas previously Canadian sources used the "Outside ECA" factors. Canada uses North Pacific, Great Lakes and East Coast depending on where the emissions are. For example, near-shore emissions around Vancouver British Columbia are projected from 2002 using North Pacific (NP) factors rather than "Outside ECA" factors.

4) One of the most significant comments from the Transport Rule Proposal was the assignment in 2005v4 of state boundaries that extended to the 200nm EEZ distance offshore. This had potentially unrealistic impacts on source apportionment modeling (see Section 5) because large emissions from shipping lanes far from shore were attributable to states whose coastlines were up to 200nm away. For 2005v4.2, we obtained state-federal water boundaries data from the Mineral Management Service (MMS) that extended only 3 to 10 miles off shore. It is important to note that the emission values did not change as a result of this update, only the state to which those emissions from 3 to 200 miles offshore were assigned. We retained separate dummy "FIPS" for these offshore emissions to ensure that they were projected to future years based on the appropriate regional-based factors in Table 2-12.

5) The 2005v4 ECA-based C3 inventory did not delineate between ports and underway (or other C3 modes such as hoteling, maneuvering, reduced-speed zone, and idling) emissions; therefore, we assigned these emissions to the broad ("total") SCC for C3 CMV (2280003000). For 2005v4.2, we used a U.S. ports spatial surrogate dataset to simply map the seca_c3 emissions ports or underway SCCs. This had no effect on temporal allocation or speciation compared to existing profiles for underway and port C3 emissions (2280003100 and 2280003200).

The net impact of all the 2005v4.2 changes to U.S. total NO_X, SO_2, and $PM_{2.5}$ seca_c3 emissions are shown in Table 2-13. Again, with the exceptions of NO_X, $PM_{2.5}$, and most notably, SO_2 in Delaware, approximately 99% of these differences are solely attributable to reclassification of U.S. states to the 3-10 mile MMS boundaries in 2005v4.2 rather than the 200nm EEZ boundaries in 2005v4.

Table 2-13. Contiguous U.S. C3 CMV emissions in the 2005v4 and 2005v4.2 platforms

Pollutant	2005v4	2005v4.2
NO_X	642,000	130,000
$PM_{2.5}$	49,000	11,000
SO_2	417,000	97,000

2.6 Emissions from Canada, Mexico and offshore drilling platforms (othpt, othar, othon)

These sectors are unchanged from the 2005v4 platform; the documentation is included here for completeness. The emissions from Canada, Mexico, and Offshore Drilling platforms are included as part of five sectors: othpt, othar, and othon.

The "oth" refers to the fact that these emissions are "other" than those in the 2005 NEI, and the third and fourth characters provide the SMOKE source types: "pt" for point, "ar" for "area and nonroad mobile", and "on" for onroad mobile. All "oth" emissions are CAP-only inventories. Mexico's emissions are unchanged from the 2002 platform with one exception –one stack diameter was updated (recomputed from stack velocity and flowrate) in the Mexico border states point inventory.

For Canada we updated the emissions from the 2002 platform, migrating the data from year 2000 inventories to year 2006 inventories for the 2005 platform. We migrated to these 2006 Canadian emissions despite not receiving future-year emissions, as we were advised by Canada that the improvement in the 2006 inventory over the 2000 inventory was more significant than the undesirable effect of retaining these 2006 emissions for all future-year modeling. We applied several modifications to the 2006 Canadian inventories:

i. We did not include wildfires, or prescribed burning because Canada does not include these inventory data in their modeling.
ii. We did not include in-flight aircraft emissions because we do not include these for the U.S. and we do not have an appropriate approach to include in our modeling.
iii. We applied a 75% reduction ("transport fraction") to PM for the road dust, agricultural, and construction emissions in the Canadian "afdust" inventory. This approach is more simplistic than the county-specific approach used for the U.S., but a comparable approach was not available for Canada.
iv. We did not include speciated VOC emissions from the ADOM chemical mechanism.
v. Residual fuel CMV (C3) SCCs (22800030X0) were removed because these emissions are included in the seca_c3 sector, which covers not only emissions close to Canada but also emissions far at sea. Canada was involved in the inventory development of the seca_c3 sector emissions.
vi. Wind erosion (SCC=2730100000) and cigarette smoke (SCC=2810060000) emissions were removed from the nonpoint (nonpt) inventory; these emissions are also absent from our U.S. inventory.

vii. Quebec $PM_{2.5}$ emissions (2,000 tons/yr) were removed for one SCC (2305070000) for Industrial Processes, Mineral Processes, Gypsum, Plaster Products due to corrupt fields after conversion to SMOKE input format. This error should be corrected in a future inventory.

viii. Excessively high CO emissions were removed from Babine Forest Products Ltd (British Columbia SMOKE plantid='5188') in the point inventory. This change was made at our discretion because the value of the emissions was impossibly large.

ix. The county part of the state/county FIPS code field in the SMOKE inputs were modified in the point inventory from "000" to "001" to enable matching to existing temporal profiles.

For Mexico we continued to use emissions for 1999 (Eastern Research Group Inc., 2006) which were developed as part of a partnership between Mexico's Secretariat of the Environment and Natural Resources (Secretaría de Medio Ambiente y Recursos Naturales-SEMARNAT) and National Institute of Ecology (Instituto Nacional de Ecología-INE), the U.S. EPA, the Western Governors' Association (WGA), and the North American Commission for Environmental Cooperation (CEC). This inventory includes emissions from all states in Mexico.

The offshore emissions include point source offshore oil and gas drilling platforms. We used updated emissions from the 2005v2 NEI point source inventory. The offshore sources were provided by the Mineral Management Services (MMS).

Table 2-14 summarizes the data in the "oth" sectors and indicates where these emissions have been updated from the 2002 platform.

Table 2-14. Summary of the othpt, othar, and othon sectors changes from the 2002 platform

Sector	Components	Changes from 2002 platform
othpt	Mexico, 1999, point	None
	Canada, 2006, point	Uses emissions from 2006 National Pollutant Release Inventory (NPRI), 3 components: 1) upstream oil and gas sector emissions for all CAPs except VOC; 2) VOC sources pre-speciated to CB05 speciation except for benzene; 3) Remaining point source emissions.
	Offshore, 2005, point	Uses emissions from 2005 v2 point inventory
othar	Mexico, 1999, nonpoint	None
	Mexico, 1999, nonroad	None
	Canada, 2006, nonpoint	Uses 2006 Canadian aircraft (landing and take-offs only), agricultural NH_3, fugitive dust, and remaining nonpoint inventories.
	Canada, 2006, nonroad	Uses 2006 Canadian nonroad mobile, non-C3 marine, and locomotives inventories.
othon	Mexico, 1999, onroad	None

Sector	Components	Changes from 2002 platform
	Canada, 2006, onroad	Uses 2006 Canadian onroad inventory. Emissions are given at vehicle type resolution only (i.e., does not include road types).

2.7 SMOKE-ready non-anthropogenic inventories for chlorine

For the ocean chlorine, we used the same data as in the CAP and HAP 2002-based platform. See ftp://ftp.epa.gov/EmisInventory/2002v3CAPHAP/documentation for details.

3 Emissions Modeling Summary

Both the CMAQ and CAM_X models require hourly emissions of specific gas and particle species for the horizontal and vertical grid cells contained within the modeled region (i.e., modeling domain). To provide emissions in the form and format required by the model, it is necessary to "pre-process" the "raw" emissions (i.e., emissions input to SMOKE) for the sectors described above in Section 2. In brief, the process of emissions modeling transforms the emissions inventories from their original temporal resolution, pollutant resolution, and spatial resolution into the resolution hourly, speciated, gridded resolution required by the air quality model.

As seen in Section 2, the temporal resolution of the emissions inventories input to SMOKE for the 2005 platform varies across sectors, and may be hourly, monthly, or annual total emissions. The spatial resolution, which also can be different for different sectors, may be individual point sources or county totals (province totals for Canada, municipio totals for Mexico). The pre-processing steps involving temporal allocation, spatial allocation, pollutant speciation, and vertical allocation of point sources are referred to as emissions modeling. This section provides some basic information about the tools and data files used for emissions modeling as part of the 2005 platform. Since we devoted Section 2 to describing the emissions inventories, we have limited the descriptions of data in this section to the ancillary data SMOKE uses to perform the emissions modeling steps. Note that all SMOKE inputs for the 2005v4.2 platform emissions are available at the 2005v4.2 website (see the end of Section 1).

We used SMOKE version 2.6 to pre-process the raw emissions to create the emissions inputs for CMAQ and then converted those to inputs suitable for CAM_X. The emissions processing steps and ancillary data for v4.2 were very similar to those done for v4. A summary of the revisions is as follows:

- We updated the ancillary files to handle additional MOVES SCCs related to parking area emissions and to make some changes to the temporal and spatial approaches that were originally assigned to parking area SCCs.
- We changed speciation profiles for headspace vapor (VOC).
- We changed the $PM_{2.5}$ speciation profile for category 3 commercial marine vessels burning residual oil.
- We updated the list of state-county names to include "dummy" seca_c3 FIPS for emissions outside of U.S. MMS-base state boundaries but within the 200nm EEZ (see section 2.5.6). These dummy FIPS were used for internal projections of regional offshore emissions in the ECA-IMO control area that extended up to 200nm offshore.
- We used an updated county-to-cell spatial surrogate for U.S. oil and gas emissions.
- We changed the temporal allocation approach to use: 1) profiles that vary by day of week and to use new temporal profiles for the afdust sector, 2) CENRAP-based state-specific agricultural burning profiles that vary monthly for the nonpt sector, and 3) residential natural gas combustion and commercial propane and kerosene combustion from uniform monthly to a profile that varies for the nonpt sector.

We also utilized the feature in SMOKE (updated in version 2.5) to create combination speciation profiles that could vary by state/county FIPS code and by month; we used this approach for some mobile sources as described in Section 3.1.2. For sectors that have plume rise, we used the in-line emissions capability of the air quality model to create source-based emissions files, rather than created the much larger 3-dimensional files. The air quality model-ready emissions were first created in a form appropriate for CMAQ, and were then converted to a form usable by CAM_X using a FORTRAN convertor called 'inline2camx'. This program generates the gridded surface level 2-dimensional emissions and elevated point source files necessary for CAM_X, and it also renames certain emissions species to the names needed by CAM_X. Emissions totals by specie for the entire model domain are output as reports that are then compared to reports generated by SMOKE to ensure mass is not lost or gained during this conversion process.

3.1 Key emissions modeling settings

Each sector is processed separately through SMOKE, until the final merge program (Mrggrid) is run to combine the model-ready, sector-specific emissions across sectors. The SMOKE settings in the run scripts and the data in the SMOKE ancillary files control the approaches used for the individual SMOKE programs for each sector. Table 3-1 summarizes the major processing steps of each platform sector. The "Spatial" column shows the spatial approach: "point" indicates that SMOKE maps the source from a point location (i.e., latitude and longitude) to a grid cell; "surrogates" indicates that some or all of the sources use spatial surrogates to allocate county emissions to grid cells; and "area-to-point" indicates that some of the sources use the SMOKE area-to-point feature to grid the emissions (further described in Section3.2.1.2). The "Speciation" column indicates that all sectors use the SMOKE speciation step, though biogenics speciation is done within BEIS3 and not as a separate SMOKE step. The "Inventory resolution" column shows the inventory temporal resolution from which SMOKE needs to calculate hourly emissions.

Finally, the "plume rise" column indicates the sectors for which the "in-line" approach is used. These sectors are the only ones which will have emissions in aloft layers, based on plume rise. The term "in-line" means that the plume rise calculations are done inside of the air quality model instead of being computed by SMOKE. The height of the plume rise determines the model layer into which the emissions are placed. For the 2005v4 and 2005v4.2 platforms, we did not have SMOKE compute the vertical plume rise. Instead, this was done in the air quality model using the stack data and the hourly air quality model inputs found in the SMOKE output files for each model-ready sector. The seca_c3 sector is the only sector with only "in-line" emissions, meaning that all of the entire emissions occur in aloft layers and there are no emissions in the two-dimensional, layer-1 files created by SMOKE.

Table 3-1. Key emissions modeling steps by sector.

Platform sector	Spatial	Speciation	Inventory resolution	Plume rise
ptipm	Point	Yes	daily & hourly	in-line
ptnonipm	Point	Yes	annual	in-line
othpt	Point	Yes	annual	in-line

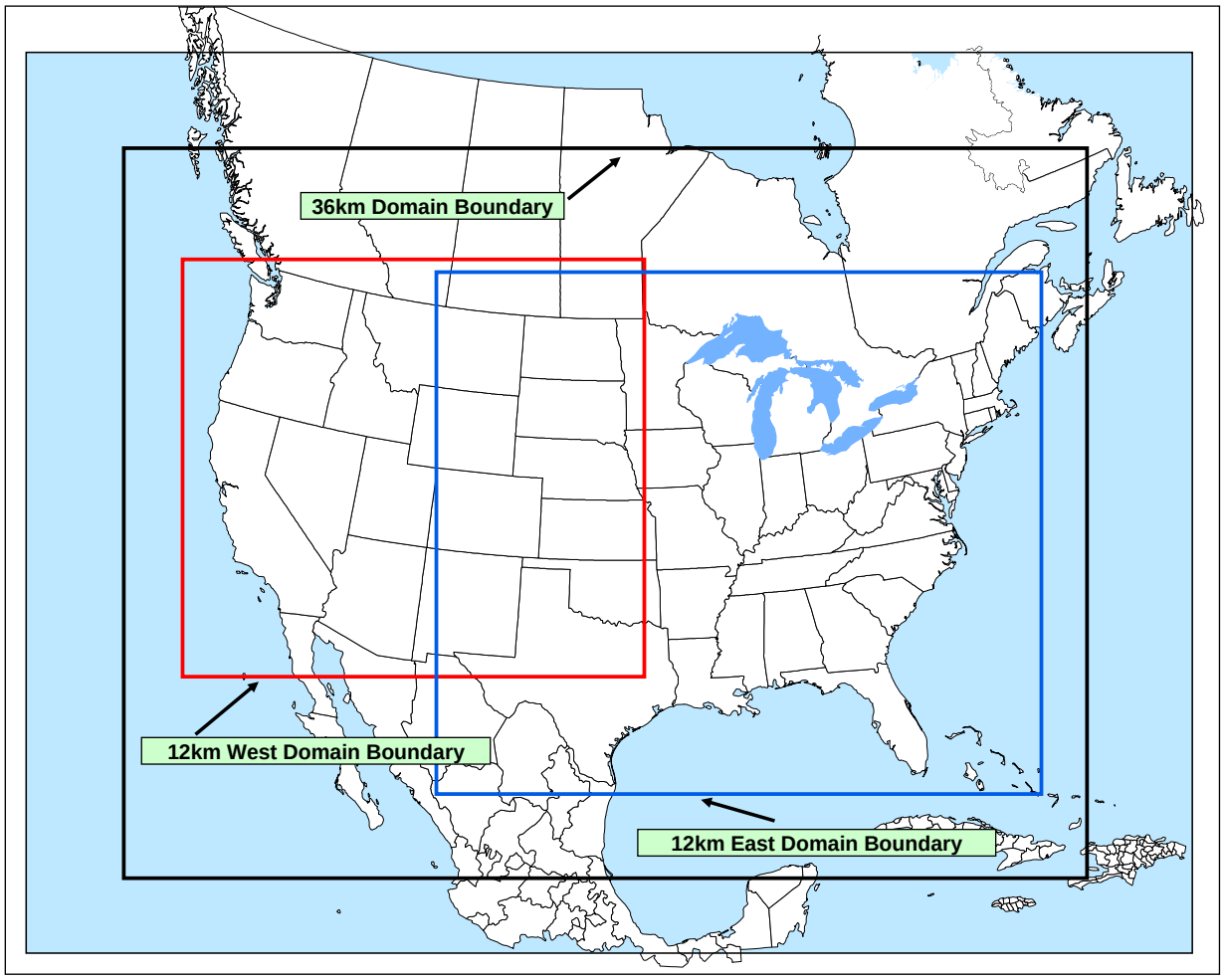
Platform sector	Spatial	Speciation	Inventory resolution	Plume rise
nonroad	surrogates & area-to-point	Yes	monthly	
othar	Surrogates	Yes	annual	
seca_c3	Point	Yes	annual	in-line
alm_no_c3	surrogates & area-to-point	Yes	annual	
on_noadj	Surrogates	Yes	monthly	
on_noadj	Surrogates	Yes	monthly	
on_moves_startpm	Surrogates	Yes	monthly	
on_moves_runpm	Surrogates	Yes	monthly	
othon	surrogates	Yes	annual	
nonpt	surrogates & area-to-point	Yes	annual	
ag	surrogates	Yes	annual	
afdust	surrogates	Yes	annual	
biog	pre-gridded landuse	in BEIS3.14	hourly	
avefire	surrogates	Yes	annual	

In addition to the above settings, we used the PELVCONFIG file, which can be optionally used to group sources so that they would be treated as a single stack by SMOKE when computing plume rise. For the 2005v4.2 platform we chose to have no grouping, which is a difference the 2005v4 platform. We changed this because grouping done for "in-line" processing will not give identical results as "offline" (i.e., processing whereby SMOKE creates 3-dimensional files). The only way to get the same results between in-line and offline is to choose to have no grouping.

3.1.1 Spatial configuration

For the 2005v4.2 platform in support of the Transport Rule, we ran SMOKE followed by CAM_X for the 36-km CONtinental United States "CONUS" modeling domain and the eastern US 12-km modeling domain (EUS) shown in Figure 3-1. Figure 3-1 also shows the 12-km western domain (WUS), but this domain was not used for Transport Rule modeling. Note that these domains were also used in the 2005v4 and 2002 platforms.

Figure 3-1. Air quality modeling domains



All three grids use a Lambert-Conformal projection, with Alpha = 33º, Beta = 45º and Gamma = -97º, with a center of X = -97º and Y = 40º. Table 3-2 describes the grids for the three domains.

Table 3-2. Descriptions of the 2005-based platform grids

Common Name	Grid Cell Size	Description (see Figure 3-1)	Grid name	Parameters listed in SMOKE grid description (GRIDDESC) file: projection name, xorig, yorig, xcell, ycell, ncols, nrows, nthik
US 36 km or CONUS-36	36 km	Entire conterminous US plus some of Mexico/Canada	US36KM_148X112	'LAM_40N97W', -2736.D3, -2088.D3, 36.D3, 36.D3, 148, 112, 1
Big East 12 km	12 km	Goes west to Colorado, covers some Mexico/Canada	EUS12_279X240	'LAM_40N97W', -1008.D3 , -1620.D3, 12.D3, 12.D3, 279, 240, 1
West 12 km	12 km	Goes east to Oklahoma, covers some of Mexico/Canada	US12_213X192	'LAM_40N97W', -2412.D3 , -972.D3, 12.D3, 12.D3, 213, 192, 1

Section 3.2.1 provides the details on the spatial surrogates and area-to-point data used to accomplish spatial allocation with SMOKE.

3.1.2 Chemical speciation configuration

The emissions modeling step for chemical speciation creates "model species" needed by the air quality model for a specific chemical mechanism. These model species are either individual chemical compounds or groups of species, called "model species." The chemical mechanism used for the 2005 platform is the CB05 mechanism (Yarwood, 2005). The same base chemical mechanism is used with CMAQ and CAM_X, but the implementation differs slightly between the two models. For details of the chemical mechanism as it is implemented in CAM_X 5.2. The specific versions of CMAQ and CAMx used in applications of this platform include secondary organic aerosol (SOA) and HONO enhancements.

From the perspective of emissions preparation, the CB05 mechanism is the same as was used in the 2002 platform except that additional input model species are needed to support the nitrous acid (HONO) chemistry enhancements and additional input model species are needed to support SOA. Table 3-3 lists the model species produced by SMOKE for use in CMAQ and CAM_X; the only three input species that were not in the CAP 2002-Based platform are nitrous acid (HONO), BENZENE and sesquiterpenes (SESQ). It should be noted that the BENZENE model species is not part of CB05 in that the concentrations of BENZENE do not provide any feedback into the chemical reactions (i.e., it is not "inside" the chemical mechanism). Rather, benzene is used as a reactive tracer and as such is impacted by the CB05 chemistry. BENZENE, along with several reactive CBO5 species (such as TOL and XYL) plays a role in SOA formation.

Table 3-3. Model species produced by SMOKE for CB05 with SOA for CMAQ4.7 and CAM_X*

Inventory Pollutant	Model Species	Model species description
CL2	CL2	Atomic gas-phase chlorine
HCl	HCL	Hydrogen Chloride (hydrochloric acid) gas
CO	CO	Carbon monoxide
NO_X	NO	Nitrogen oxide
	NO2	Nitrogen dioxide
	HONO	Nitrous acid
SO_2	SO2	Sulfur dioxide
	SULF	Sulfuric acid vapor
NH_3	NH3	Ammonia
VOC	ALD2	Acetaldehyde
	ALDX	Propionaldehyde and higher aldehydes
	BENZENE	Benzene (not part of CB05)
	ETH	Ethene
	ETHA	Ethane
	ETOH	Ethanol
	FORM	Formaldehyde
	IOLE	Internal olefin carbon bond (R-C=C-R)
	ISOP	Isoprene
	MEOH	Methanol
	OLE	Terminal olefin carbon bond (R-C=C)
	PAR	Paraffin carbon bond
	TOL	Toluene and other monoalkyl aromatics
	XYL	Xylene and other polyalkyl aromatics
Various additional VOC species from the biogenics model which do not map to the above model species	SESQ	Sesquiterpenes
	TERP	Terpenes
PM_{10}	PMC	Coarse PM > 2.5 microns and ≤ 10 microns
$PM_{2.5}$	PEC	Particulate elemental carbon ≤ 2.5 microns
	PNO3	Particulate nitrate ≤ 2.5 microns
	POC	Particulate organic carbon (carbon only) ≤ 2.5 microns
	PSO4	Particulate Sulfate ≤ 2.5 microns
	PMFINE	Other particulate matter ≤ 2.5 microns
Sea-salt species (non –anthropogenic emissions)	PCL	Particulate chloride
	PNA	Particulate sodium

*The same species names are used for the CAM_X model with exceptions as follows:
1. CL2 is not used in CAM_X
2. CAM_X particulate sodium is NA (in CMAQ it is PNA)
3. CAM_X uses different names for species that are both in CBO5 and SOA for the following: TOLA=TOL,

XYLA=XYL, ISP=ISOP, TRP=TERP. They are duplicate species in CAM_X that are used in the SOA chemistry. CMAQ uses the same names in CB05 and SOA for these species.
4. CAM_X uses a different name for sesquiterpenes: CMAQ SESQ = CAM_X SQT
5. CAM_X uses particulate species uses different names for organic carbon, coarse particulate matter and other particulate mass as follows: CMAQ POC = CAM_X POA, CMAQ PMC = CAM_X CPRM, and CMAQ PMFINE= CAM_X FPRM

The approach for speciating $PM_{2.5}$ emissions in v4.2 is the same as v4 except that in addition to the on_moves_startpm and on_moves_runpm sectors, exhaust PM from diesel is provided to SMOKE as speciated emissions. Thus, the only PM species requiring speciation in SMOKE from the onroad sector are the brake and tirewear PM2.5. Canada point sources have an SCC of 3999999999 and all use the Speciation profile '92037' which is the "Industry Manufacturing Avge profile." While this had not changed between v4 and v4.2, the documentation for v4 incorrectly stated that the Canadian point inventory (othpt sector) was pre-speciated. The Canadian point source inventory is pre-speciated for VOC but not for $PM_{2.5}$. One other difference in $PM_{2.5}$ speciation is that we used a new profile ('92200') called "simplified profile - Marine Vessel – Main Boiler - Heavy Fuel Oil – Simplified." At the time that this profile was used, we anticipated its release with SPECIATE4.3.

The approach for speciating VOC emissions from non-biogenic sources is the same for the v4.2 platform as for the v4 platform, though there are some differences in the data files used. The approach is that:

1. For some sources, HAP emissions are used in the speciation process to allow integration of VOC and HAP emissions in the NEI. This has the result of modifying the speciation profiles based on the HAP emission estimates which are presumed to be more accurate than the speciated VOC results for the HAPs; and,
2. For some mobile sources, "combination" profiles are specified by county and month and emission mode (e.g., exhaust, evaporative). SMOKE computes the resultant profile using the fraction of each specific profile assigned by county, month and emission mode. A new feature and new profile file in SMOKE (the GSPRO_COMBO file) allowed the use of this approach for the 2005v4 platform, and its use continues here.

The VOC speciation data files are different because we added another part of the nonpt sector to exclude from HAP VOC integration: the category of pesticide application. Additionally, the v4.2 platform used a new headspace profile representative of E0 gasoline, profile code 8762: "Gasoline Headspace Vapor using 0% Ethanol - Composite Profile". This profile is part of SPECIATE4.3 and was used in place of the SPECIATE4.0 profile 8737 (Composite Profile - Non-oxygenated Gasoline Headspace Vapor), which was used in the v4 platform. The new headspace profile was used for the same sources as was the previous headspace profile: year 2005 refueling and other ambient temperature evaporative gasoline processes (portable fuel containers and any evaporation of gasoline associated with gasoline storage and distribution sources).

The below subsections provide a further description of the HAP/CAP integration and use of combination profiles. Section 3.2.2 provides the details about the data files used to accomplish these speciation processing steps.

3.1.2.1 The combination of HAP BAFM (benzene, acetaldehyde, formaldehyde and methanol) and VOC for VOC speciation

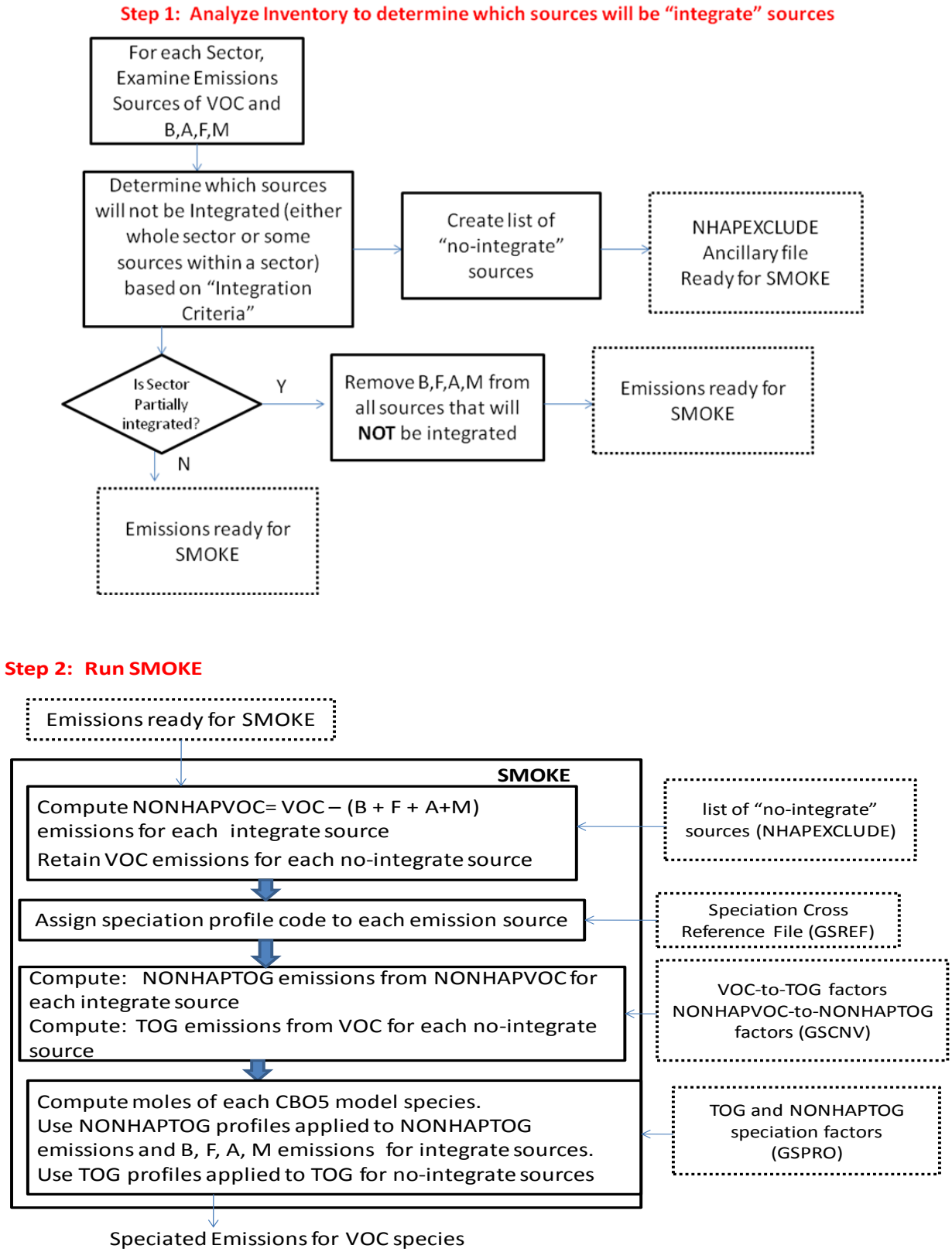
The VOC speciation approach for the 2005v4.2 platform differed from the 2002 platform in that we included, for some of the U.S. platform sectors, HAP emissions from the NEI in the speciation process. That is, instead of speciating VOC to generate all of the species listed in Table 3-3 as we did for the 2002 platform, we integrated emissions of the 4 HAPs, benzene, acetaldehyde, formaldehyde and methanol (BAFM) from the NEI with the NEI VOC. The integration process (described in more detail below) combines the BAFM HAPs with the VOC in a way that does not double count emissions and uses the BAFM directly in the speciation process. We believe that generally, the HAP emissions from the NEI are more representative of emissions of these compounds than their generation via VOC speciation.

We chose these HAPs because, with the exception of BENZENE, they are the only explicit VOC HAPs in the base version of CMAQ 4.7 (CAPs only with chlorine chemistry) model. By "explicit VOC HAPs," we mean model species that participate in the modeled chemistry using the CB05 chemical mechanism. We denote the use of these HAP emission estimates along with VOC as "HAP-CAP integration". BENZENE was chosen because it was added as a model species in the base version of CMAQ 4.7, and there was a desire to keep its emissions consistent between multi-pollutant and base versions of CMAQ.

The integration of HAP VOC with VOC is a feature available in SMOKE for all inventory formats other than PTDAY (the format used for the ptfire sector). SMOKE allows the user to specify the particular HAPs to integrate and the particular sources to integrate. The particular HAPs to integrate are specified in the INVTABLE file, and the particular sources to integrate are based on the NHAPEXCLUDE file (which actually provides the sources that are *excluded* from integration[8]). For the "integrate" sources, SMOKE subtracts the "integrate" HAPs from the VOC (at the source level) to compute emissions for the new pollutant "NONHAPVOC." The user provides NONHAPVOC-to-NONHAPTOG factors and NONHAPTOG speciation profiles. SMOKE computes NONHAPTOG and then applies the speciation profiles to allocate the NONHAPTOG to the other air quality model VOC species not including the integrated HAPs. This process is illustrated in Figure 3-2. Note that we did not need to remove BAFM from no-integrate sources in a sector where all sources are no-integrate because this is accomplished by through use of a SMOKE ancillary "INVTABLE" which essentially drops all BAFM in that sector.

[8] In SMOKE version 2.6 the options to specify sources for integration are expanded so that a user can specify the particular sources to include or exclude from integration, and there are settings to include or exclude all sources within a sector. We did not take advantage of this new flexibility in processing v4.2 emissions or v4 emissions, but the user will now have the ability for easier inclusion of specific sources to get the same result.

Figure 3-2. Process of integrating BAFM with VOC for use in VOC Speciation



We considered CAP-HAP integration for all sectors and developed "integration criteria" for some of those. Table 3-4 summarizes the integration approach for each platform sector used in Step 1 of Figure 3-2.

Table 3-4. Integration status of benzene, acetaldehyde, formaldehyde and methanol (BAFM) for each platform sector

Platform Sector	Approach for Integrating NEI emissions of Benzene (B), Acetaldehyde (A), Formaldehyde (F) and Methanol (M)
ptipm	No integration because emissions of BAFM are relatively small for this sector
ptnonipm	No integration because emissions of BAFM are relatively small for this sector and it is not expected that criteria for integration would be met by a significant number of sources
avefire	No integration
ag	N/A – sector contains no VOC
afdust	N/A – sector contains no VOC
nonpt	Partial integration; details provided below table
nonroad	For other than California: Partial integration – did not integrate CNG or LPG sources (SCC beginning with 2268 or 2267) because NMIM computed only VOC and not any HAPs for these SCCs. For California: Full integration
alm_no_c3	Partial integration; details provided below table
seca_c3	Full integration
onroad	Full integration
biog	N/A – sector contains no inventory pollutant "VOC"; but rather specific VOC species
othpt	No integration – not the NEI
othar	No integration – not the NEI
othon	No integration – not the NEI

For the nonpt sector, we used the following integration criteria to determine the sources to integrate (Step 1):

1. Any source for which BAFM emissions were from the 1996 NEI were not integrated (data source code contains a "96").

2. Any source for which the sum of BAFM is greater than the VOC was not integrated, since this clearly identifies sources for which there is an inconsistency between VOC and VOC HAPs. This includes some cases in which VOC for a source is zero.

3. For certain source categories (those that comprised 80% of the VOC emissions), we chose to integrate sources in the category per the criteria specified in the first column in Table 3-5. For most of these source categories, we allow sources to be integrated if they had the minimum combination of BAFM specified in the first column. For a few source categories, we designated all sources as "no-integrate". The one change we made from Table 3-5 for the v4.2 platform is highlighted: we changed pesticides application to "no-integrate."

4. For source categories not covered in Table 3-5 (i.e., that do not comprise the top 80% of VOC emissions), then as long as the source has emissions of one of the BFAM pollutants, then it can be integrated.

Table 3-5. Source-category specific criteria for integrating nonpt SCCs for categories comprising 80% of the nonpoint VOC emissions

minimum HAP(s) needed	SCC Tier 3	SCC Tier 3 Description	Comments
BFA	2104008000	Stationary Source Fuel Combustion;Residential;Wood	
B	2501060000	Storage and Transport;Petroleum and Petroleum Product Storage;Gasoline Service Stations	
BM	2440000000	Solvent Utilization;Miscellaneous Industrial;All Processes	Speciation profile: 3144 has no benzene but most records have it and they're from the EPA (and Calif)
FAM	2401001000	Solvent Utilization;Surface Coating;Architectural Coatings	
B	2310001000	Industrial Processes;Oil and Gas Production: SIC 13;All Processes : On-shore	
M	2460000000	Solvent Utilization;Miscellaneous Non-industrial: Consumer and Commercial;All Processes	
B	2501011000	Storage and Transport;Petroleum and Petroleum Product Storage;Residential Portable Gas Cans	
M	2425000000	Solvent Utilization;Graphic Arts;All Processes	
M	2465000000	Solvent Utilization;Miscellaneous Non-industrial: Consumer;All Products/Processes	3144 is profile, and it does have methanol (but no BFA).
BFA	2801500000	Miscellaneous Area Sources;Agriculture Production - Crops;Agricultural Field Burning - whole field set on fire	8746 is speciation profile and has BFA
M	2440020000	Solvent Utilization;Miscellaneous Industrial;Adhesive (Industrial) Application	3142 is speciation profile which has methanol (.32%) and 0 form (and no acetald, benz)
B	2501050000	Storage and Transport;Petroleum and Petroleum Product Storage;Bulk Terminals: All Evaporative Losses	
B	2310000000	Industrial Processes;Oil and Gas Production: SIC 13;All Processes	
M	2465400000	Solvent Utilization;Miscellaneous Non-industrial: Consumer;Automotive Aftermarket Products	8520 is speciation profile which doesn't have benz but does have methanol. OR is only state with benzene which is negligible
No-integrate (change from v4 platform)	2461850000	Solvent Utilization;Miscellaneous Non-industrial: Commercial;Pesticide Application: Agricultural	Profile has no benzene. Inventory benzene came from solvent utilization data (Fredonia) for "other markets" for the year 1998. Since benzene no longer allowed in pesticides, use of a no-benzene profile would give more accurate results. Note that this is a change from the v4 platform, where this sector was "integrate."
BFA	2630020000	Waste Disposal, Treatment, and Recovery;Wastewater Treatment;Public Owned	profile BFA 2002 (wastewater treatment plants). No methanol in profile. No methanol mentioned in POTW National Emissions Standards for Hazardous Air Pollutants (NESHAP). Acetaldehyde and Formaldehyde were in profile but not NESHAP. Methanol in NEI documentation.
no-integrate	2461021000	Solvent Utilization;Miscellaneous Non-industrial: Commercial;Cutback Asphalt	profile 1007 has none of these HAP. Only Minnesota has a tiny amount.
no-integrate	2401005000	Solvent Utilization;Surface Coating;Auto Refinishing: SIC 7532	Only NY has benzene. Spec. profile is 2402 and has none of these HAP. Documentation for NEI does not estimate this HAP.
use Integrate case	2301030000	Industrial Processes;Chemical Manufacturing: SIC 28;Process Emissions from Pharmaceutical Manuf (NAPAP cat. 106)	profile 2462 - has nearly 8% benzene. Will create a LOT of benzene with "no HAP use" case.

minimum HAP(s) needed	SCC Tier 3	SCC Tier 3 Description	Comments
M	2460200000	Solvent Utilization;Miscellaneous Non-industrial: Consumer and Commercial;All Household Products	profile is 3146 contains only nonzero methanol.
any 1 HAP	2415000000	Solvent Utilization;Degreasing;All Processes/All Industries	profile 8745 (non legacy but composite made up of a bunch of E-rated profiles)has M, B.
M	2401002000	Solvent Utilization;Surface Coating;Architectural Coatings - Solvent-based	profile 3139 has only M
no-integrate	2401020000	Solvent Utilization;Surface Coating;Wood Furniture: SIC 25	profile 2405 has no HAP
B	2505040000	Storage and Transport;Petroleum and Petroleum Product Transport;Pipeline	
any 1 HAP	2610030000	Waste Disposal, Treatment, and Recovery;Open Burning;Residential	profile 0121 is old and has only hexane.
any 1 HAP	2610000000	Waste Disposal, Treatment, and Recovery;Open Burning;All Categories	profile 0121 is old and has only hexane.
FAM	2401003000	Solvent Utilization;Surface Coating;Architectural Coatings - Water-based	profile 3140 has FAM
M	2460100000	Solvent Utilization;Miscellaneous Non-industrial: Consumer and Commercial;All Personal Care Products	profile (3247, nonlegacy based on CARB 1997 survey) has no M or B. However, Freedonia was used for M.
M	2465200000	Solvent Utilization;Miscellaneous Non-industrial: Consumer;Household Products	
M	2415300000	Solvent Utilization;Degreasing;All Industries: Cold Cleaning	profile 8745 (non legacy but composite made up of a bunch of E-rated profiles)has M, B.
any 1 HAP	2401040000	Solvent Utilization;Surface Coating;Metal Cans: SIC 341	profile 2408 has none. - no HAPs in NEI so this SCC will not have any integrated sources
any 1 HAP	2401050000	Solvent Utilization;Surface Coating;Miscellaneous Finished Metals: SIC 34 - (341 + 3498)	SPEC PROFILE 3127 has none - no HAPs in NEI so this SCC will not have any integrated sources
any 1 HAP	2401200000	Solvent Utilization;Surface Coating;Other Special Purpose Coatings	profile 3138 has methanol. Not legacy. 0.11% aerosol coatings.
B	2461800000	Solvent Utilization;Miscellaneous Non-industrial: Commercial;Pesticide Application: All Processes	3001 is speciation profile (not legacy) "D" rating 2004. Calif. Testing for speciation profile from 2000. Has NO benzene! Benzene came from solvent utilization data (Fredonia) for "other markets" for the year 1998.
M	2460800000	Solvent Utilization;Miscellaneous Non-industrial: Consumer and Commercial;All FIFRA Related Products	3145 has M only and just a 0.01%

For the alm_no_c3 sector, the integration criteria were (1) that the source had to have at least one of the 4 HAPs and (2) that the sum of BAFM could not exceed the VOC emissions. The criteria for this sector were less complex than the nonpt sector because it has much fewer source categories.

We used the SMOKE feature to compute speciation profiles from mixtures of other profiles in user-specified proportions. The combinations are specified in the GSPRO_COMBO ancillary file by pollutant (including pollutant mode, e.g., EXH__VOC), state and county (i.e., state/county FIPS code) and time period (i.e., month).

We used this feature for onroad and nonroad mobile and gasoline-related related stationary sources whereby the emission sources use fuels with varying ethanol content, and therefore the speciation profiles require different combinations of gasoline, E10 an E85 profiles. Since the ethanol content varies spatially (e.g., by state or county), temporally (e.g., by month) and by modeling year (future years have more ethanol) the feature allows combinations to be specified at various levels for different years.

3.1.3 Temporal processing configuration

Table 3-6 summarizes the temporal aspect of the emissions processing configuration. It compares the key approaches we used for temporal processing across the sectors. We control the temporal aspect of SMOKE processing through (a) the scripts L_TYPE (temporal type) and M_TYPE (merge type) settings and (b) the ancillary data files described in Section 3.2.3. The one change made from the v4 to the v4.2 platform is the treatment of the afdust sector. In the v4 platform we used “aveday” settings and no use of holidays such that every day in a specific month had the same emissions. In the v4.2 platform, we used “week” settings and holidays and used profiles which were day-of-week dependent for some categories, such as road dust and tilling, where non-uniform profiles were being used for other pollutants associated with these processes.

Table 3-6. Temporal settings used for the platform sectors in SMOKE, v4.2 platform

Platform sector short name (see Table 2-1)	Inventory resolution	Monthly profiles used?	Daily temporal approach [1,2]	Merge processing approach [1,3]	Process Holidays as separate days?
ptipm	daily & hourly		all	all	yes
ptnonipm	annual	yes	mwdss	all	yes
othpt	annual	yes	mwdss	all	
nonroad	monthly		mwdss	mwdss	yes
othar	annual	yes	mwdss	mwdss	
alm_no_c3	annual	yes	mwdss	mwdss	
seca_c3	annual	yes	mwdss	mwdss	
on_noadj	monthly		week	week	yes
on_moves_startpm	monthly		week	week	yes
on_moves_runpm	monthly		week	week	yes
othon	annual	yes	week	week	
nonpt	annual	yes	mwdss	mwdss	yes
ag	annual	yes	aveday	aveday	
afdust	annual	yes	week	week	yes
biog	hourly		n/a	n/a	
avefire	annual	yes	aveday	aveday	

[1] **Definitions for processing resolution:**
all = hourly emissions computed for every day of the year, inventory is already daily
week = hourly emissions computed for all days in one "representative" week, representing all weeks for each month, which means emissions have day-of-week variation, but not week-to-week variation within the month
mwdss= hourly emissions for one representative Monday, representative weekday, representative Saturday and representative Sunday for each month, which means emissions have variation between Mondays, other weekdays, Saturdays and Sundays within the month, but not week-to-week variation within the month. Also Tuesdays, Wednesdays and Thursdays are treated the same.
aveday = hourly emissions computed for one representative day of each month, which means emissions for all days of each month are the same.

[2] **Daily temporal approach** refers to the temporal approach for getting daily emissions from the inventory using the Temporal program. The values given are the values of the L_TYPE setting.

[3] **Merge processing approach** refers to the days used to represent other days in the month for the merge step. If not "all", then the SMOKE merge step just run for representative days, which could include holidays as indicated by the rightmost column. The values given are the values of the M_TYPE setting.

In addition to the resolution, temporal processing includes a ramp-up period for several days prior to January 1, 2005, which is intended to mitigate the effects of initial condition concentrations. The same procedures were used for all grids, but with different ramp-up periods for each grid:

- 36 km: 10 days (Dec 22 - Dec 31)
- 12 km (East): 3 days (Dec 29 - Dec 31)

For most sectors, our approach used the emissions from December 2005 to fill in surrogate emissions for the end of December 2004. In particular, we used December 2005 emissions

(representative days) for December 2004. For biogenic emissions, we processed December 2004 emissions using 2004 meteorology.

3.2 Emissions modeling ancillary files

In this section we summarize the ancillary data that SMOKE used to perform spatial allocation, chemical speciation, and temporal allocation for the 2005v4.2 platform. The ancillary data files, particularly the cross-reference files, provide the specific inventory resolution at which spatial, speciation, and temporal factors are applied. For the 2005v4.2 platform, we generally applied spatial factors by country/SCC, speciation factors by pollutant/SCC or (for combination profiles) state/county FIPS code and month, and temporal factors by some combination of country, state, county, SCC, and pollutant.

For the v4.2 platform, we updated the 2005v4 ancillary files in a few major areas:

1. We used new data for spatially allocating oil and gas emission sources
2. We assigned spatial, temporal and speciation profiles to parking area emissions for additional vehicle types (new data from MOVES2010) and updated previous assignments for some vehicle types (summarized in Table 3-14 and Table 3-155).
3. We updated the headspace VOC speciation profile we used for refueling.
4. We used a new profile for speciating $PM_{2.5}$ from C3 marine emissions.

3.2.1 Spatial allocation data

As described in Section 3.1.1, we performed spatial allocation for a national 36-km domain, and an Eastern 12-km domain**.** To do this, SMOKE used national 36-km and 12-km spatial surrogates and a SMOKE area-to-point data file. For the U.S. and Mexico, we used the same spatial surrogates as were used for the 2002v3 platform. For Canada we used a set of Canadian surrogates provided by Environment Canada. The spatial data files we used can be obtained from the files listed below; these are available from the 2002v3CAP (for US and Mexico) and the 2005v4 CAP-BAFM (for Canada) platform websites listed at the end of Section 1. The oil and natural gas surrogate files are posted at the 2005v4.1 website. For the v4.2 platform, all of the relevant surrogate files can be found in a single consolidated zip file: **gridding_surrogates_2005v4_2.zip**. This zip file contains the following information:

- U.S. and Mexican surrogate files at 36-km spatial resolution
- U.S. and Mexican surrogate files for surrogate files at 12 km spatial resolution
- Canadian surrogate files at 36-km spatial resolution
- Canadian surrogate files at 12-km spatial resolution
- Updated oil and gas surrogate files at 36-km and 12-km spatial resolutions for the new oil and gas surrogate (US) developed for the v4.1 platform

Additional information related to spatial allocation is found in this file:

- **ancillary_2005v4_2_smokeformat.zip:** contains spatial related data included are the grid description (GRIDDESC), surrogate description (SRGDESC), surrogate cross reference file (AGREF), and area-to-point (ARTOPNT) file. This data is provided on the

2005v4.2 website under "2005 Emissions Data Files" at: ftp://ftp.epa.gov/EmisInventory/2005v4.2/ancillary_smoke/.

The U.S., Mexican, and Canadian 12-km surrogates cover the entire CONUS domain, though they are used directly as inputs for the two separate Eastern and Western Domains shown in Figure 3-1. The SMOKE model windowed the Eastern and Western grids while it created these emissions. The remainder of this subsection provides further detail on the origin of the data used for the spatial surrogates and the area-to-point data.

3.2.1.1 Surrogates for U.S. emissions

There are 67 spatial surrogates available for spatially allocating U.S. county-level emissions to the 36-km and 12-km grid cells used by the air quality model; 66 are the same as for the v4 platform, and one new surrogate, "Oil & Gas Wells, IHS Energy, Inc. and USGS" was added for v4.2 which is discussed below. As described in Section 3.2.1.2, an area-to-point approach overrides the use of surrogates for some sources. Table 3-7 lists the codes and descriptions of the surrogates.

Table 3-7. U.S. Surrogates available for the 2005v4.2 platform.

Code	Surrogate Description	Code	Surrogate Description
N/A	Area-to-point approach (see 3.3.1.2)	515	Commercial plus Institutional Land
100	Population	520	Commercial plus Industrial plus Institutional
110	Housing	525	Golf Courses + Institutional +Industrial + Commercial
120	Urban Population	527	Single Family Residential
130	Rural Population	530	Residential - High Density
137	Housing Change	535	Residential + Commercial + Industrial + Institutional + Government
140	Housing Change and Population	540	Retail Trade
150	Residential Heating - Natural Gas	545	Personal Repair
160	Residential Heating - Wood	550	Retail Trade plus Personal Repair
165	0.5 Residential Heating - Wood plus 0.5 Low Intensity Residential	555	Professional/Technical plus General Government
170	Residential Heating - Distillate Oil	560	Hospital
180	Residential Heating - Coal	565	Medical Office/Clinic
190	Residential Heating - LP Gas	570	Heavy and High Tech Industrial
200	Urban Primary Road Miles	575	Light and High Tech Industrial
210	Rural Primary Road Miles	580	Food, Drug, Chemical Industrial
220	Urban Secondary Road Miles	585	Metals and Minerals Industrial
230	Rural Secondary Road Miles	590	Heavy Industrial
240	Total Road Miles	595	Light Industrial
250	Urban Primary plus Rural Primary	596	Industrial plus Institutional plus Hospitals
255	0.75 Total Roadway Miles plus 0.25 Population	600	Gas Stations
260	Total Railroad Miles	650	Refineries and Tank Farms
270	Class 1 Railroad Miles	675	Refineries and Tank Farms and Gas Stations
280	Class 2 and 3 Railroad Miles	680	Oil & Gas Wells, IHS Energy, Inc. and USGS
300	Low Intensity Residential	700	Airport Areas

Code	Surrogate Description	Code	Surrogate Description
310	Total Agriculture	710	Airport Points
312	Orchards/Vineyards	720	Military Airports
320	Forest Land	800	Marine Ports
330	Strip Mines/Quarries	807	Navigable Waterway Miles
340	Land	810	Navigable Waterway Activity
350	Water	850	Golf Courses
400	Rural Land Area	860	Mines
500	Commercial Land	870	Wastewater Treatment Facilities
505	Industrial Land	880	Drycleaners
510	Commercial plus Industrial	890	Commercial Timber

We did not use all of the available surrogates to spatially allocate sources in the v4.2 platform; that is, some surrogates in Table 3-7 were not assigned to any SCCs.

The creation of surrogates and shapefiles for the U.S. via the Surrogate Tool was discussed in the 2002v3 platform documentation and is not repeated here. The tool and updated documentation for it is available at http://www.ie.unc.edu/cempd/projects/mims/spatial/ and http://www.cmascenter.org/help/documentation.cfm?MODEL=spatial_allocator&VERSION=3.6&temp_id=99999. This same tool was used for the new surrogate 680, "Oil & Gas Wells, IHS Energy, Inc. and USGS"

The new surrogate "Oil & Gas Wells, IHS Energy, Inc. and USGS" was developed for oil and gas SCCs, which had previously (in the v4 platform) used surrogate 585. The data reflect data through 10/1/2005. The underlying data for this surrogate is a grid of one-quarter square mile cells containing an attribute to indicate whether the wells within the cell are predominantly oil-producing, gas-producing, both oil- and gas-producing, or the wells are dry or their production status is unknown. The well information was initially retrieved from IHS Inc.'s PI/Dwights PLUS Well Data on CD-ROM, which is a proprietary commercial database containing information for most oil and gas wells in the U.S. Cells were developed as a graphic solution to overcome the problem of displaying proprietary well data. No proprietary data are displayed or included in the cell maps. More information can be obtained from http://pubs.usgs.gov/dds/dds-069/dds-069-q/text/layer.htm and http://certmapper.cr.usgs.gov/rooms/utilities/layer_info.jsp?docId={A90AF432-612F-41F9-A315-7329FD933FB3}&type=download&docURL=http://certmapper.cr.usgs.gov/data/noga00/natl/spatial/doc/uscells05g.htm

The spatial cross-reference file was also updated to assign onroad off-network (parking area) emissions from the MOVES2010 model, new to the 2005v4 platform, were allocated as shown in Table 3-8.

Table 3-8. Surrogate assignments to new mobile categories in the 2005v4 platform

SCC & Description	Surrogate

SCC & Description	Surrogate
2201001350 Light Duty Gas Vehicles- parking areas rural 2201002350 Light Duty Gas Trucks 1&2- parking areas rural 2201004350 Light Duty Gas Trucks 3&4- parking areas rural	Rural population (same as rural local roads), code= 130
2201001370 Light Duty Gas Vehicles- parking areas urban 2201002370 Light Duty Gas Trucks 1&2- parking areas urban 2201004370 Light Duty Gas Trucks 3&4- parking areas urban	Urban population (same as urban local roads), code =120
2201070350 Heavy Duty Gasoline Vehicles 2B through 8B & Buses (HDGV)- parking areas rural 2201070370 Heavy Duty Gasoline Vehicles 2B through 8B & Buses (HDGV)- parking areas urban	Commercial plus Industrial plus Institutional, code = 520

3.2.1.2 Allocation method for airport-related sources in the U.S.

There are numerous airport-related emission sources in the 2005 NEI, such as aircraft, airport ground support equipment, and jet refueling. Unlike the 2002v3 platform in which most of these emissions were contained in sectors with county-level resolution – alm (aircraft), nonroad (airport ground support) and nonpt (jet refueling), the 2005 platform includes the aircraft emissions as point sources. As shown in Table 2-1, aircraft emissions are part of the ptnonipm sector, since the 2005v2 inventory included them as point sources.

Thus, for the 2005 platform, we used the SMOKE "area-to-point" approach for only airport ground support equipment (nonroad sector), and jet refueling (nonpt sector). The approach is described in detail in the 2002 platform documentation: http://www.epa.gov/scram001/reports/Emissions%20TSD%20Vol1_02-28-08.pdf.

We used nearly the same ARTOPNT file to implement the area-to-point approach as was used for the CAP and HAP-2002-Based platform. This was slightly updated from the CAP-only 2002 platform by further allocating the Detroit-area airports into multiple sets of geographic coordinates to support finer scale modeling that was done under a different project. We chose to retain the updated file for the 2005 platform. This approach is the same in the v4.2 and v4 platforms.

3.2.1.3 Surrogates for Canada and Mexico emission inventories

We used an updated set of surrogates for Canada to spatially allocate the 2006 Canadian emissions for the 2005v4 platform. The updated set completely replaced the 2002v3 platform surrogates for allocating the 2006 province-level Canadian emissions.

The updated surrogate data provided in the 2005v4 zip files and described in Table 3-9 came from Environment Canada. They provided the surrogates and cross references; the surrogates they provided were outputs from the Surrogate Tool (previously referenced). Per Environment Canada, the surrogates are based on 2001 Canadian census data. We changed the cross-references that Canada originally provided as follows: all assignments to surrogate '978' (manufacturing industries) were changed to '906' (manufacturing services), and all assignments to '985' (construction and mining) and '984' (construction industries) were changed to '907' (construction services) because the surrogate fractions in 984, 978 and 985 did not sum to 1. We

also changed codes for surrogates other than population that did not begin with the digit "9". The same surrogates were used for the 12-km domains as were used for the 36-km domain.

Table 3-9. Canadian Spatial Surrogates for 2005-based platform Canadian Emissions (v4.2 unchanged from v4)

Surrogate description	Filename of 2005 Platform Surrogate	Surrogate description	Filename of 2005 Platform Surrogate
Population	CA_100_NOFILL.txt	asphalt	CA_951_NOFILL.txt
Total dwelling	CA_901_NOFILL.txt	cement	CA_952_NOFILL.txt
Agriculture and Forestry and Fishing	CA_902_NOFILL.txt	chemical	CA_953_NOFILL.txt
Waste Management Service	CA_903_NOFILL.txt	commfuelcomb	CA_954_NOFILL.txt
Upstream Oil and Gas (UOG)	CA_904_NOFILL.txt	downstream_petroleum	CA_955_NOFILL.txt
Mining and Oil and Gas services	CA_905_NOFILL.txt	egu	CA_956_NOFILL.txt
Manufacturing services	CA_906_NOFILL.txt	grain	CA_957_NOFILL.txt
Construction services	CA_907_NOFILL.txt	manufacturing	CA_958_NOFILL.txt
Transportation of Passengers and goods	CA_908_NOFILL.txt	mining	CA_959_NOFILL.txt
Electric and Gas and Water utilities	CA_909_NOFILL.txt	oilgas_distibution	CA_960_NOFILL.txt
Wholesaling Merchandise services	CA_910_NOFILL.txt	smelting	CA_961_NOFILL.txt
Retailing Merchandise services	CA_911_NOFILL.txt	waste	CA_962_NOFILL.txt
Government Services	CA_915_NOFILL.txt	wood	CA_963_NOFILL.txt
All Sales	CA_920_NOFILL.txt	asphalt industries	CA_971_NOFILL.txt
Intersection of AGRFORFISH and MANUFACT	CA_921_NOFILL.txt	cement industries	CA_972_FILL.txt
Intersection of Forest and Housing	CA_922_NOFILL.txt	chemical industries	CA_973_FILL.txt
Intersection of MININGOILG and MANUFACT	CA_923_NOFILL.txt	commercial fuel combustion	CA_974_FILL.txt
Intersection of UTILITIES and DWELLING	CA_924_NOFILL.txt	downstream petroleum industries	CA_975_FILL.txt
Intersection of CONSTRUCTION and DWELLING	CA_925_NOFILL.txt	Electric utilities	CA_976_FILL.txt
Intersection of PUBADMIN and DWELLING	CA_926_NOFILL.txt	grain industries	CA_977_FILL.txt
Commercial Marine Vessels	CA_928_NOFILL.txt	manufacturing industries[1]	CA_978_FILL.txt
HIGHJET	CA_929_NOFILL.txt	mining industries	CA_979_FILL.txt
LOWMEDJET	CA_930_NOFILL.txt	smelting industries	CA_981_FILL.txt
OTHERJET	CA_931_NOFILL.txt	waste management	CA_982_NOFILL.txt
CANRAIL	CA_932_NOFILL.txt	construction industries[1]	CA_984_NOFILL.txt
LDGV	CA_934_NOFILL.txt	construction and	CA_985_NOFILL.txt

Surrogate description	Filename of 2005 Platform Surrogate	Surrogate description	Filename of 2005 Platform Surrogate
		mining[1]	
PAVED ROADS	CA_941_NOFILL.txt	TOTALBEEF[2]	CA_986_NOFILL.txt [2]
UNPAVED ROADS	CA_942_NOFILL.txt	TOTALPOUL[2]	CA_987_NOFILL.txt[2]
Oil Sands	CA_950_NOFILL.txt	TOTALSWIN[2]	CA_988_NOFILL.txt[2]
		TOTALFERT[2]	CA_989_NOFILL.txt[2]

1: Not used because fractions did not sum to 1;
2: Surrogates 986, 987, 988 and 989 were originally numbered by Canada as 611, 615, 620 and 65, respectively. We changed the numbers so that all Canadian surrogates would begin with "9".

The Mexican emissions and single surrogate (population) are the same in the v4.2 platform as were used in the 2005v4 and 2002 platforms.

3.2.2 Chemical speciation ancillary files

The following data files, provided at the 2005v4.2 website (see the end of Section 1), contain the SMOKE inputs used for chemical speciation of the inventory species to the air quality model species. SMOKE environment variable names, used in the file names, are shown using capital letters in parentheses:

- **ancillary_2005v4_2_smokeformat.zip:** inventory table (INVTABLE), NONHAPVOC emissions calculation exclusions file (NHAPEXCLUDE), speciation cross references (GSREF), speciation VOC-to-TOG conversion factors (GSCNV), speciation profiles (GSPRO), and combined, monthly speciation profiles (GSPRO_COMBO).
- **ancillary_2005v4_2_futureyear_smokeformat.zip:** speciation-related files associated with the future-year speciation changes.

The following subsections explain these SMOKE input files.

3.2.2.1 INVABLE and NHAPEXCLUDE

The INVTABLE and NHAPEXCLUDE SMOKE input files have a critical function in the VOC speciation process for emissions modeling cases utilizing HAP-CAP integration, as is done for the 2005v4.2 platform.

We prepared two different INVTABLE files to use with different sectors of the platform. For sectors in which we chose no integration across the entire sector (see Table 3-5), we created a "no HAP use" INVTABLE that set the "KEEP" flag to "N" for BAFM pollutants. Thus, any BAFM pollutants in the inventory input into SMOKE would be dropped. This approach both avoids double-counting of these species and assumes that the VOC speciation is the best available approach for these species for the sectors using the approach. The second INVTABLE, used for sectors in which one or more sources are integrated, causes SMOKE to keep the BAFM pollutants and indicates that they are to be integrated with VOC (by setting the "VOC or TOG component" field to "V" for all four HAP pollutants.

We also prepared sector-specific NHAPEXCLUDE files that provide the specific sources that are excluded from integration (see Table 3-5).

3.2.2.2 GSPRO, GSPRO_COMBO, GSREF and GSCNV

For VOC speciation, we generated the following SMOKE-ready profiles for the CB05 chemical mechanism using the Speciation Tool (Eyth, 2006):

- TOG-to-model species (used only for no-integrate sources)
- NONHAPTOG-to-model species (used only for the integrate sources)
- TOG-to-BENZENE (used only for no-integrate sources)

We added speciation profile entries that simply map NEI emissions of benzene, acetaldehyde, formaldehyde and methanol to the model species BENZENE, ALD2, FORM and METHANOL, respectively. These profiles were used only for the integrate sources. Note that we process the integrate and no-integrate sources using the same GSREF and GSPRO files. Thus, to avoid double counting of these HAP species, we removed BAFM pollutants for all no-integrate sources in the inventory. If the entire sector was no-integrate, then we were able to remove these in SMOKE (by using "N" in the INVTABLE) but if a sector was partially integrated, then we needed to remove these HAPS from the actual inventory input to SMOKE, but only for the no HAP use, no-integrate sources.

In addition to the speciation profiles, the Speciation Tool generates the SMOKE-ready speciation conversion files (GSCNV). We generated two of these: one containing profile-specific VOC-to-TOG conversion factors and the other containing profile-specific NONHAPVOC-to-NONHAPTOG conversion factors.

The TOG and $PM_{2.5}$ speciation factors that are the basis of the chemical speciation approach were developed from the SPECIATE4.2 database (http://www.epa.gov/ttn/chief/software/speciate/index.html) which is the EPA's repository of TOG and PM speciation profiles of air pollution sources. However, a few of the profiles we used in the v4.2 platform will be published in SPECIATE4.3 after the release of this documentation.

The SPECIATE database development and maintenance is a collaboration involving the EPA's ORD, OTAQ, and the EPA's Office of Air Quality Planning and Standards (OAQPS), and Environment Canada (EPA, 2006a). The SPECIATE database contains speciation profiles for TOG, speciated into individual chemical compounds, VOC-to-TOG conversion factors associated with the TOG profiles, and speciation profiles for $PM_{2.5}$. The database also contains the $PM_{2.5}$ speciated into both individual chemical compounds (e.g., zinc, potassium, manganese, lead), and into the "simplified" $PM_{2.5}$ components used in the air quality model. These simplified components are:

- PSO4 : primary particulate sulfate
- PNO3: primary particulate nitrate
- PEC: primary particulate elemental carbon
- POC: primary particulate organic carbon
- PMFINE: other primary particulate, less than 2.5 micrograms in diameter

As discussed earlier, for the v4.2 platform we updated the $PM_{2.5}$ profile used for category 3 marine vessels burning residual oil to use the profile: Marine Vessel - Main Engine - Heavy Fuel Oil which will be published in SPECIATE4.3. This profile was compiled from data published in Emission Measurements from a Crude Oil Tanker at Sea, Environ. Sci. Technol. 2008, 42, 7098–7103. Previously the Draft Residual Oil Combustion – Simplified (92072) was used. The SCCs affected were:

2280003000 Mobile Sources;Marine Vessels, Commercial;Residual;Total, All Vessel Types
2280003010 Mobile Sources;Marine Vessels, Commercial;Residual;Ocean-going Vessels
2280003100 Mobile Sources;Marine Vessels, Commercial;Residual;Port emissions
2280003200 Mobile Sources;Marine Vessels, Commercial;Residual;Underway emissions

The difference between the two profiles is provided in Table 3-10, and shows that the new profile produces much more organic carbon and less elemental carbon, sulfate, and other $PM_{2.5}$.

Table 3-10. Differences between two profiles used for commercial marine residual oil

Pollutant	Species	Split factors new c3 profile 92200 used for v4.2	Split factors residual oil combustion 92072, used for v4
PM2_5	PEC	0.005	0.01
PM2_5	PMFINE	0.5022	0.54
PM2_5	PNO3	0	0
PM2_5	POC	0.1125	0.01
PM2_5	PSO4	0.3803	0.44

We also updated the bituminous coal profile, 92095, which we had previously used for only a single nonpoint SCC (2101002000) with the sub-bituminous profile 92084, which was used for all other coal combustion SCCs. We replaced profile 92095 with 92084 for consistency. Table 3-11 shows the differences are shown below, though these are quite small and represent only a minor change to the SMOKE results:

Table 3-11. Differences between two profiles used for coal combustion

Pollutant	Species	Split factors sub-bituminous 92084	Split factors bituminous 92095
PM2_5	PEC	0.0188	0.01696
PM2_5	PMFINE	0.8266	0.827928
PM2_5	PNO3	0.0016	0.00208
PM2_5	POC	0.0263	0.026307
PM2_5	PSO4	0.1267	0.126725

We made other updates to profile assignments for the SCCs shown in Table 3-12 below as compared to the 2002 platform. These updates were kept for the v4.2 platform.

Table 3-12: $PM_{2.5}$ speciation profile updates assignments for the v4 platform

SCC	New	Pollutant	Profile Name

	Profile Code		
39900501	92025	PM2_5	Distillate Oil Combustion Source Type: Distillate Oil Combustion
49090021	92025	PM2_5	Distillate Oil Combustion Source Type: Distillate Oil Combustion
30890002	92072	PM2_5	Residential Oil Combustion Source Type: Residential Oil Combustion
10100912	92091	PM2_5	Wood Fired Boiler Source Type: Wood/Bark Combustion
10102018	92057	PM2_5	PM/SO2 controlled lignite combustion: Waste Coal Combustion
50410563	92082	PM2_5	Solid Waste Combustion Source Type: Solid Waste Combustion
10100692	92048	PM2_5	Natural Gas Combustion Source Type: Natural Gas Combustion
50100511	92086	PM2_5	Tire Burning Source Type: Tire Burning
50100512	92082	PM2_5	Solid Waste Combustion: Solid Waste Combustion
2810040000	92035	PM2_5	HDDV Source Type: Aircraft Engines

Key changes to the TOG profiles for the v4.2 platform from the 2005v4 platform are as follows:

- Used new headspace profiles for E0 (no ethanol gasoline) and E10 (10% ethanol gasoline), which will be published in SPECIATE4.3. Profile 8762 is Gasoline Headspace Vapor using 0% Ethanol - Composite Profile and Profile 8763 is Gasoline Headspace Vapor using 10% Ethanol - Composite Profile. In 2005, only the E0 profile is used. This was an oversight since we could have used the same combinations of profiles of E0 exhaust E10 exhaust (which are also the same combinations of E10 evaporative and E10 evaporative) that we used for 2005. We did, however use consistent combinations (E0/E10) in future-year modeling for the headspace profiles as the evaporative and exhaust combinations.
- Added the fuel-specific VOC profiles for the new parking area SCCs generated due to the fact that MOVES2010 was used for all vehicle types in the v4.2 platform. A summary of the assignments of all profiles (speciation, temporal and spatial surrogates) is provided in Table 3-14 for gasoline vehicles and Table 3-155 for diesel vehicles.

Table 3-13 provides a summary of the 2005 speciation approach for mobile and other fuel-related sources. It shows the updated profiles that form the 2005 combinations. The headspace profile, 8762 is a new profile for the v4.2 platform, and is used for other nonroad refueling and other fuel-related stationary source emission categories in 2005.

Table 3-13. Summary of VOC speciation profile approach by sector for 2005

Inventory type and mode	VOC speciation approach for fuels	VOC Profile Codes	2005 sectors
Mobile onroad and nonroad Exhaust	E0 and E10 combinations (excludes Tier 2)	8750 8751	on_noadj nonroad
Mobile onroad and nonroad Evaporative	E0 and E10 combinations	8753 8754	on_noadj nonroad

Inventory type and mode	VOC speciation approach for fuels	VOC Profile Codes	2005 sectors
Mobile nonroad Refueling Stationary (no mode assigned to VOC): Portable Fuel Containers, bulk plant -to-pump, refinery-to-bulk terminal	E0	8762	Nonroad nonpt

In future years, different profile combinations and a different headspace profile is used, due to the influx of greater quantities of ethanol in fuels. Changes to the above profiles for future-year scenarios will be discussed in more detail in the documentation of future-year emissions development for the rule or application of interest. In summary, we utilized additional profiles in the combinations that is appropriate. The profiles we added were Tier 2 profiles for E0 and E10 and an E10 headspace profile.

Speciation profiles for use with BEIS are not included in SPECIATE. The 2005 platform uses BEIS3.14, which includes a new species (SESQ) that was not in BEIS3.13 (the version used for the 2002 platform). Thus we added this species (it is mapped to the model species SESQT) to the set of profiles that we had been using in the 2002 platform. The profile code associated with BEIS3.14 profiles for use with CB05 uses the same as in the 2002 platform: "B10C5."

3.2.3 Temporal allocation ancillary files

The emissions modeling step for temporal allocation creates the 2005 hourly emission inputs for the air quality model by adjusting the emissions from the inventory resolution (annual, monthly, daily or hourly) that are input into SMOKE. The temporal resolution of each of the platform sectors prior to their input into SMOKE is included in the sector descriptions from Table 2-1 and repeated in the discussion of temporal settings in Table 3-6.

The monthly, weekly, and diurnal temporal profiles and associated cross references used to create the 2005 hourly emissions inputs for the air quality model were generally based on the temporal allocation data used for the 2002v3 platform. For the v4 and v4.2 platforms, we added new profile assignments for SCCs in the 2005 inventory that were not in the 2002 inventory, and we updated the profiles used for ptipm sources without CEM data to represent the year 2005.

The following data file, provided at the 2005v4 website (see the end of Section 1) contains the files used for temporal allocation of the inventory emissions. SMOKE environmental variable names, used in the file names, are shown in capital letters in parentheses:

- **ancillary_2005v4_2_smokeformat.zip:** includes temporal cross reference files used across all inventory sectors (ATREF, MTREF, and PTREF) and for ptipm sector (used for electric generating units) for the evaluation case (PTREF) and, temporal profiles (ATPRO, MTPRO, and PTPRO)

The starting point for our temporal profiles was the 2002 platform. The remainder of this section discusses the development of the new temporal profiles or profile assignments used in the 2005v4 platform.

Canadian emissions

The profiles assignments for the Canadian 2006 inventory were provided by Environment Canada along with the inventory. They provided profile assignments that rely on the existing set of temporal profiles in the 2002 platform. For point sources, they provided profile assignments by PLANTID.

WRAP Oil and Gas Inventory Profiles

The WRAP 2005 oil and gas inventory SCCs utilized uniform monthly and day of week profiles (codes 262 and 7, respectively) and an hourly profile (code 26) that put emissions in every hour, but weighted towards the day light hours.

Diurnal Profiles for Electric Generating Units (ptipm)

We updated the state-specific and pollutant-specific diurnal profiles for use in allocating the day-specific emissions for non-CEM sources in the ptipm sector. We used the 2005 CEM data to create state-specific, day-to-hour factors, averaged over the whole year and all units in each state. We calculated the diurnal factors using CEM SO_2 and NO_X emissions and heat input. We computed SO_2 and NO_X-specific factors from the CEM data for these pollutants. All other pollutants used factors created from the hourly heat input data. We assigned the resulting profiles by state and pollutant.

Area Fugitive Dust Profiles (afdust)

The monthly and day of week temporal profiles for several fugitive dust sources were changed from uniform in the v4 platform (code 262 and 7 respectively) to a summer peak/winter minimum (monthly code 22) and weekend minimum (code 18) in the v4.2 platform. These sources include fugitive dust from industrial unpaved roads and construction, residential and industrial/commercial/institutional construction, road construction, mining and quarrying, and agricultural production (planting, tilling, harvesting, and loading).

Diurnal weekday and weekend temporal profiles were changed from a simple bell curve profile (code 26) for all categories in v4 to a more dynamic profile with a morning and afternoon peak (code 2013) for paved and unpaved road dust in v4.2. Diurnal temporal profiles were changed to a zero nighttime, daytime plateau profile (code 27) for all agricultural production sources in v4.2.

Agricultural Burning Profiles in CENRAP States (nonpt)

The uniform monthly, day of week, and diurnal profiles (codes 262, 7, and 24 respectively) in the v4 platform for all agricultural burning emissions were modified in the v4.2 platform to state-specific monthly, day of week, and diurnally-varying profiles for these CENRAP region states: Arkansas, Iowa, Kansas, Louisiana, Minnesota, North Dakota, Nebraska, Oklahoma, and Texas.

Residential and Commercial/Institutional Natural Gas, LPG, and Kerosene Combustion (nonpt)

Uniform monthly (code 262) profiles in platform v4 for residential and commercial/institutional liquified petroleum gas (LPG), natural gas, and kerosene sources were changed to monthly varying with a strong winter peak in platform v4.2.

Onroad Parking Area Profiles

The SCCs and descriptions, along with the assignments chosen are shown in Table 3-14 (gasoline vehicles) and Table 3-155 (diesel vehicles). Figure 3-3 and Figure 3-4 show the diurnal profiles referred to in the tables.

Figure 3-3. Diurnal Profiles based on road type (use local for "start") and whether the road is urban versus rural

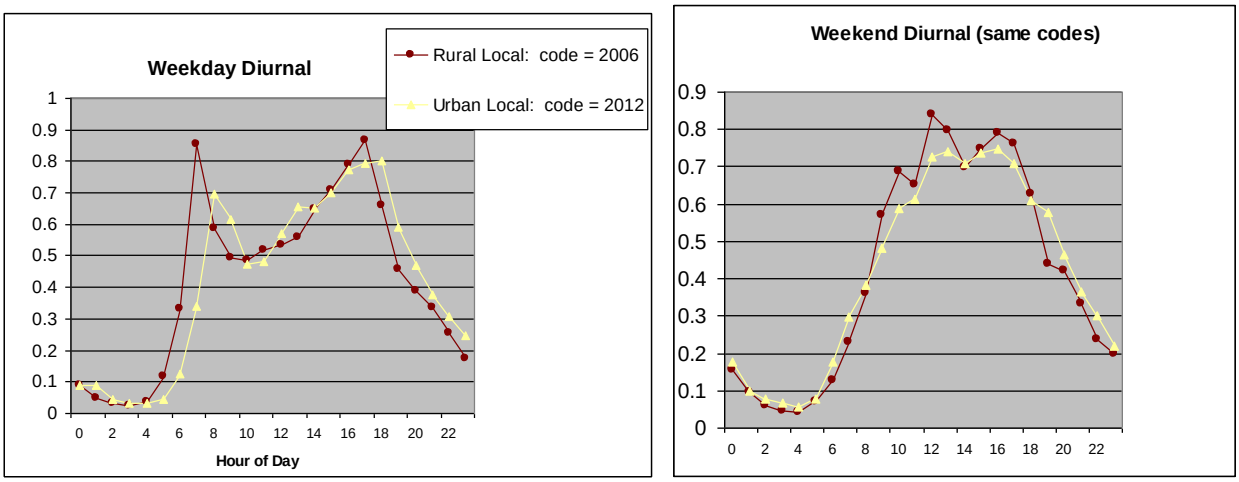


Figure 3-4. Diurnal temporal profile for HDDV 2B through 8B at Parking areas

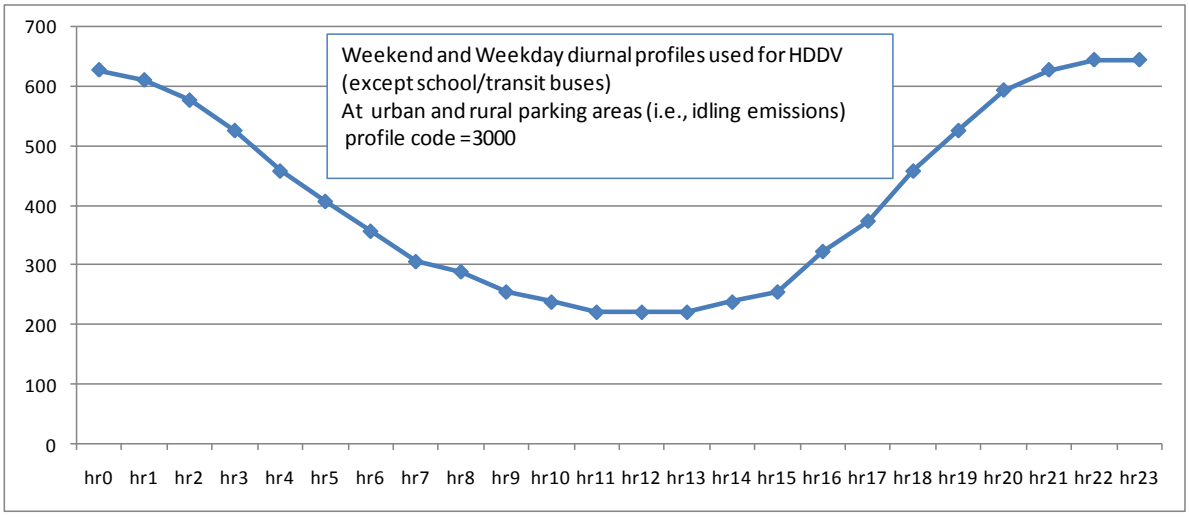


Table 3-14. Summary of spatial surrogates, temporal profiles, and speciation profiles used by gasoline vehicle types for the onroad parking area-related SCCs.

GASOLINE VEHICLE TYPES					
SCC&Description	**Surrogate**	**Temporal Profile: Monthly Variation**	**Temporal Profile: Day of Week Variation**	**Temporal Profile: Diurnal variation**	**Speciation Profile**
2201001350 Light Duty Gas Vehicles- parking areas **rural** 2201020350 Light Duty Gas Trucks 1&2- parking areas **rural** 2201040350 Light Duty Gas Trucks 3&4- parking areas **rural** 2201080370 Motorcycles (MC) - parking areas **rural**	Rural Population (same as rural local roads) 130	Not applicable – inventory contains monthly emissions	RURAL LD values are: Mon –Fri 12.1% 12.1% 12.1% 12.1% 18.3% Sat/Sun: 15.3% 18.3% Weekly_code (for SMOKE) =20021	Use same as profile as **rural local roads (Rdtype=210)**. Code = 2006 (see Figure 3-3, reddish curve)	Use same speciation profiles as what is used for LD GAS vehicles on the other roadway types. * i.e.: **EVP__VOC:** COMBO of 8753 (Gasoline Vehicle - Evaporative emission - Reformulated gasoline) & 8754 (Gasoline Vehicle - Evaporative emission - E10 ethanol gasoline) Note that these are the combinations used in 2005. In some cases, future-year profiles may also include 8755 (Gasoline Vehicle - Evaporative emission - E85) **EXH__VOC:** COMBO of 8750&8751 These combinations are used in 2005. In some cases, future-year profiles may also include combinations of 8752 (E85) , 8756 (tier 2 exhaust, E0), 8757 (tier 2 exhaust, E10) EXH__PM2.5 not needed because OTAQ supplies pre-speciated emissions BRK_PM2.5 and TIR_PM2.5 use same as other roadways (92009 and 92087, respectively)
2201001370 Light Duty Gas Vehicles- parking areas **urban** 2201020370 Light Duty Gas Trucks 1&2- parking areas **urban** 2201040370 Light Duty Gas Trucks 3&4- parking areas **urban** 2201080370	Urban Population (same as urban local roads) 120	Not applicable – inventory contains monthly emissions	URBAN LD values are: Mon-Fri 14.8% 14.8% 14.8% 14.8% 16.0% Sat Sun 13.4% and 11.6% Weekly_code (for SMOKE) =20031	Use same as profile as **urban local roads**. **(Rdtype=330)**. Code = 2012 (see Figure 3-3, yellow curve)	Same as above

GASOLINE VEHICLE TYPES					
SCC&Description	**Surrogate**	**Temporal Profile: Monthly Variation**	**Temporal Profile: Day of Week Variation**	**Temporal Profile: Diurnal variation**	**Speciation Profile**
Motorcycles (MC) - parking areas **rural**					
2201070350 Heavy Duty Gasoline Vehicles 2B through 8B & Buses (HDGV)- parking areas **rural**	Commercial plus Industrial plus Institutional (code = 520)	Not applicable – inventory contains monthly emissions	RURAL HD values are: Mon-Fri 16.8% 16.8% 16.8% 16.8% 15.9% Sat Sun 8.8% and 8.8% Weekly_code (for SMOKE) =20022	Use same as profile **rural local roads**. Code = 2006 (see Figure 3-3, reddish curve)	Same as above
2201070370 Heavy Duty Gasoline Vehicles 2B through 8B & Buses (HDGV)- parking areas **urban**	Same as above	Not applicable – inventory contains monthly emissions	URBAN HD values are: Mon-Fri 17.7% 17.7% 17.7% 17.7% 17.7% Sat Sun 7% and 5% Weekly_code (for SMOKE) =20032	Use same as profile on **urban local roads**. Code = 2012 (see Figure 3-3, yellow curve)	Same as above

Table 3-15. Summary of spatial surrogates, temporal profiles, and speciation profiles used by diesel vehicle types for the onroad parking area-related SCCs from MOVES2010.

DIESEL VEHICLE TYPES					
SCC&Description	**Surrogate**	**Temporal Profile: Monthly Variation**	**Temporal Profile: Day of Week Variation**	**Temporal Profile: Diurnal variation**	**Speciation Profile**
2230001350 Light Duty Diesel Vehicles (LDDV)- parking areas **rural** 2230060350 Light Duty Diesel Trucks 1 through 4 (M6) (LDDT))- parking areas **rural**	Rural Population (same as rural local roads) 130	Not applicable – inventory contains monthly emissions	RURAL LD values are: Mon –Fri 12.1% 12.1% 12.1% 12.1% 18.3% Sat/Sun: 15.3% 18.3% Weekly_code (for SMOKE) =20021 Rationale: choose same weekend/weekday variation for all Light Duty Vehicles on all rural road types	Use same as profile as **rural local roads (Rdtype=210)**. Code = 2006 (see Figure 3-3, reddish curve) Rationale: choose same diurnal profile for all vehicles (except HDDV 2B to 8B) for all rural parking areas (which is the profile used for rural local roads)	Use same speciation profiles as what is used for LD DIESEL vehicles, irrespective of road type. i.e.: **EVP__VOC:** ZERO emissions (placeholder profile is required by SMOKE: 4547 (Gasoline Headspace Vapor - Circle K Diesel - adjusted for oxygenates) **EXH__VOC:** 4674 (Diesel Exhaust - Medium Duty Trucks) PM2.5 : ZERO emissions →not needed since OTAQ supplies pre-speciated emissions. Placeholder profile is required by SMOKE: 92042 (LDDV Exhaust – Simplified) BRK_PM2.5 and TIR_PM2.5 use same as other roadways (92009 and 92087, respectively)
2230001370 Light Duty Diesel Vehicles (LDDV)- parking areas **urban** 2230060370 Light Duty Diesel Trucks 1 through 4 (M6) (LDDT))- parking areas **urban**	URBAN Population (same as urban local roads) 120	Not applicable – inventory contains monthly emissions	URBAN LD values are: Mon-Fri 14.8% 14.8% 14.8% 14.8% 16.0% Sat Sun 13.4% and 11.6% Weekly_code (for SMOKE) =20031 Rationale: choose same weekend/weekday variation for all Light Duty Vehicles on urban road types	Use same as profile as **urban local roads**. **(Rdtype=330)**. Code = 2012 (see Figure 3-3, yellow curve Rationale: choose same diurnal profile for all vehicles (except HDDV 2B to 8B) for all rural parking areas (which is the profile used for rural local roads)	Same as above

DIESEL VEHICLE TYPES					
SCC&Description	**Surrogate**	**Temporal Profile: Monthly Variation**	**Temporal Profile: Day of Week Variation**	**Temporal Profile: Diurnal variation**	**Speciation Profile**
2230071350 Heavy Duty Diesel Vehicles (HDDV) Class 2B-parking areas rural 2230072350 Heavy Duty Diesel Vehicles (HDDV) Class 3, 4, & 5-parking areas rural 2230073350 Heavy Duty Diesel Vehicles (HDDV) Class 6 & 7-parking areas rural 2230074350 Heavy Duty Diesel Vehicles (HDDV) Class 8A & 8B-parking areas rural	Rural primary roads code=210 Rationale: most idling will occur at truckstops	Not applicable – inventory contains monthly emissions	RURAL HD values are: Mon-Fri 16.8% 16.8% 16.8% 16.8% 15.9% Sat Sun 8.8% and 8.8% Weekly_code (for SMOKE) =20022	Construct new profile CODE=3000 which is low at daytime and high at night-time (11pm to 2am) See Figure 3-4	Use same speciation profiles as what is used for HD DIESEL vehicles, irrespective of road type. i.e.: **EVP__VOC:** ZERO emissions (placeholder profile is required by SMOKE: 4547 (Gasoline Headspace Vapor - Circle K Diesel - adjusted for oxygenates) **EXH__VOC:** 4674 (Diesel Exhaust - Medium Duty Trucks) PM2.5: ZERO emissions →not needed since OTAQ supplies pre-speciated emissions. Placeholder profile is required by SMOKE: 92035 (HDDV Exhaust – Simplified) BRK_PM2.5 and TIR_PM2.5 use same as other roadways (92009 and 92087, respectively)
2230071370 Heavy Duty Diesel Vehicles (HDDV) Class 2B-parking areas urban 2230072370 Heavy Duty Diesel Vehicles (HDDV) Class 3, 4, & 5-parking areas urban 2230073370 Heavy Duty Diesel Vehicles (HDDV) Class 6 & 7-parking areas urban 2230074370 Heavy Duty Diesel Vehicles (HDDV) Class 8A & 8B-parking areas urban	URBAN primary roads code=200 Rationale: most idling will occur at truckstops	Not applicable – inventory contains monthly emissions	URBAN LD values are: Mon-Fri 14.8% 14.8% 14.8% 14.8% 16.0% Sat Sun 13.4% and 11.6% Weekly_code (for SMOKE) =20031	Construct new profile CODE=3000 which is low at daytime and high at night-time (11pm to 2am) See Figure 3-4	Same as above

DIESEL VEHICLE TYPES					
SCC&Description	**Surrogate**	**Temporal Profile: Monthly Variation**	**Temporal Profile: Day of Week Variation**	**Temporal Profile: Diurnal variation**	**Speciation Profile**
2230075350 Heavy Duty Diesel Buses (School & Transit) - parking areas **rural**	Rural Population (same as rural local roads) 130	Not applicable – inventory contains monthly emissions	USE URBAN LD values: Mon-Fri 14.8% 14.8% 14.8% 14.8% 16.0% Sat Sun 13.4% and 11.6% Weekly_code (for SMOKE) =20031 Rationale: these vehicles follow profile of LD vehicles better than HD; day of week variation should more closely follow urban (higher weekday than weekend)	Use same as profile as **rural local roads (Rdtype=210)**. Code = 2006 (see Figure 3-3, reddish curve) Rationale: choose same diurnal profile for all vehicles (except HDDV 2B to 8B) for all rural parking areas (which is the profile used for rural local roads)	Same as above
2230075370 Heavy Duty Diesel Buses (School & Transit) - parking areas **urban**	URBAN Population (same as urban local roads) 120	Not applicable – inventory contains monthly emissions	USE URBAN LD values: Mon-Fri 14.8% 14.8% 14.8% 14.8% 16.0% Sat Sun 13.4% and 11.6% Weekly_code (for SMOKE) =20031	Use same as profile as **urban local roads**. **(Rdtype=330)**. Code = 2012 (see Figure 3-3, yellow curve Rationale: choose same diurnal profile for all vehicles (except HDDV 2B to 8B) for all rural parking areas (which is the profile used for rural local roads)	Same as above

4 Development of 2012 and 2014 Base-Case Emissions

This section describes the methods we used for developing the 2012 and 2014 future-year base-case emissions. The year 2012 source apportionment scenarios and the 2014 EGU remedy (i.e., "control") case are discussed in Sections 5 and 6, respectively. The ancillary input data in the future-year scenarios are very similar to those used in the 2005 base case except for the speciation profiles used for gasoline-related sources, which change in the future to account for increased ethanol usage in gasoline. Table B-1 of Appendix B is a table of differences between these ancillary input data between the 2005 base case and these future-year scenarios. Appendix B also provides the values for the main parameters used in the emissions modeling cases in Table B-2. The specific speciation profile changes are discussed in Sections 4.2.8 and 4.3.5. A list of inventory datasets used for this and all cases is provided in Appendix C.

The future base-case projection methodologies vary by sector. The 2012 and 2014 base cases represent predicted emissions in the absence of any further controls beyond those Federal and State measures already promulgated before emissions processing on the Transport Rule began in December, 2010. For EGU emissions (ptipm sector), the emissions reflect state rules and federal consent decrees through December 1, 2010. For mobile sources (on_noadj, on_moves_runpm, and on_moves_startpm sectors), all national measures for which data were available at the time of modeling have been included. The future base-case scenarios do reflect projected economic changes and fuel usage for EGU and mobile sectors. For nonEGU point (ptnonipm sector) and nonpoint stationary sources (nonpt, ag, and afdust sectors), local control programs that might have been necessary for areas to attain the 1997 $PM_{2.5}$ NAAQS annual standard, 2006 PM NAAQS (24-hour) standard, and the 1997 ozone NAAQS are generally not included in the future base-case projections for most states. One exception are some NOx and VOC reductions associated with the New York, Virginia, and Connecticut State Implementation Plans (SIP), which were added as part of the comments received from the Transport Rule Proposal and a larger effort to start including more local control information on stationary non-EGU sources; this is described further in Section 4.2. The following bullets summarize the projection methods used for sources in the various sectors, while additional details and data sources are given in Table 4-1.

- IPM sector (ptipm): Unit-specific estimates from IPM, version 4.10.
- Non-IPM sector (ptnonipm): Projection factors and percent reductions reflect Transport Rule comments and emission reductions due to control programs, plant closures, consent decrees and settlements, and 1997 and 2001 ozone State Implementation Plans in NY, CT, and VA. We also used projection approaches for point-source livestock, and aircraft and gasoline stage II emissions that are consistent with projections used for the sectors that contain the bulk of these emissions. Terminal area forecast (TAF) data aggregated to the national level were used for aircraft to account for projected changes in landing/takeoff activity. Year-specific speciation was applied to some portions of this sector and is discussed in Section 4.2.8.
- Average fires sector (avefire): No growth or control.
- Agricultural sector (ag): Projection factors for livestock estimates based on expected changes in animal population from 2005 Department of Agriculture data; no growth or control for NH_3 emissions from fertilizer application.
- Area fugitive dust sector (afdust): Projection factors for dust categories related to livestock estimates based on expected changes in animal population; no growth or control for other categories in this sector.

- Remaining Nonpoint sector (nonpt): Projection factors that implement Transport Rule Proposal comments and reflect emission reductions due to control programs. Residential wood combustion projections based on growth in lower-emitting stoves and a reduction in higher emitting stoves. PFC projection factors reflecting impact of the final Mobile Source Air Toxics (MSAT2) rule. Gasoline stage II projection factors based on National Mobile Inventory Model (NMIM)-estimated VOC refueling estimates for future years. Oil and gas projection estimates are provided for the non-California WRAP states as well as Oklahoma and Texas. Year-specific speciation was applied to some portions of this sector and is discussed in Section 4.2.8.
- Nonroad mobile sector (nonroad): Other than for California, this sector uses data from a run of NMIM that utilized the NR05d-Bond-final version of NONROAD (which is equivalent to NONROAD2008a), using future-year equipment population estimates and control programs to the years 2012 and 2015 and using national level inputs. Year 2014 emissions were created by interpolating 2012 and 2015 emissions. Final controls from the final locomotive-marine and small spark ignition OTAQ rules are included. California-specific data provided by the state of California, except NH_3 used 2012 and 2014 (interpolated) NMIM. Year-specific speciation was applied to some portions of this sector and is discussed in Section 4.3.5.
- Locomotive, and non-Class 3 commercial marine sector (alm_no_c3): Projection factors for Class 1 and Class 2 commercial marine and locomotives which reflect Transport Rule comments and activity growth and final locomotive-marine controls.
- Class 3 commercial marine vessel sector (seca_c3): Base-year 2005 emissions grown and controlled to 2012 and 2014, incorporating Transport Rule comments and controls based on Emissions Control Area (ECA) and International Marine Organization (IMO) global NO_X and SO_2 controls.
- Onroad mobile sector with no adjustment for daily temperature (on_noadj): MOVES2010 run (state-month) for 2012 and 2014 with results disaggregated to the county level in proportion to NMIM 2012 and NMIM 2015 emissions estimates. Temperature impacts at the monthly average resolution. California-specific data provided by the state of California, except NH_3 which was obtained from MOVES2010. VOC speciation uses different future-year values to take into account both the increase in ethanol use, and the existence of Tier 2 vehicles that use a different speciation profile. Other than California, this sector includes all non-refueling onroad mobile emissions (exhaust, evaporative, brake wear and tire wear modes) except exhaust mode gasoline PM and naphthalene emissions that are provided in the on_moves_startpm and on_moves_runpm sectors.
- Onroad PM gasoline running mode sector (on_moves_startpm): Running mode MOVES2010 year 2012 and 2014 future-year state-month estimates for PM and naphthalene, apportioned to the county level using NMIM 2012 and NMIM 2015 state-county ratios matched to vehicle and road types. Use future-year temperature adjustment file for adjusting the 72°F emissions to ambient temperatures (for elemental and organic carbon) based on grid cell hourly temperature (note that lower temperatures result in increased emissions).
- Onroad PM gasoline start mode sector (on_moves_startpm): Cold start MOVES2010 future-year 2012 and 2014 state-month estimates for PM and naphthalene, apportioned to the county level using NMIM 2012 and NMIM 2015 state-county ratios of local urban and rural roads by vehicle type. Use future-year temperature adjustment file for adjusting the 72°F emissions (for elemental and organic carbon) to ambient temperatures based on grid cell hourly temperatures (lower temperatures result in increased emissions).
- Other nonroad/nonpoint (othar): No growth or control.
- Other onroad sector (othon): No growth or control.
- Other nonroad/nonpoint (othar): No growth or control.

- Other point (othpt): No growth or control.
- Biogenic: 2005 emissions used for all future-year scenarios.

Table 4-1 summarizes the control strategies and growth assumptions by source type that were used to create the 2012 and 2014 base-case emissions from the 2005v4.2 base-case inventories. All Mexico, Canada, and offshore oil emissions are unchanged in all future cases from those in the 2005 base case. Emission summaries by sector for 2005 and future years are provided in Section 7. Note that mercury (Hg) is listed in the pollutants column; however, we did not include Hg in our v4.2 modeling. Note that a few controls are not fully promulgated by 2012 but are by 2014. For example the Maximum Achievable Control Technology (MACT) rule "Boat Manufacturing" has a compliance date in year 2013; therefore the VOC control associated with this MACT rule is not reflected in the 2012 base case but is reflected in the 2014 base and control cases.

Lists of the control, closures, projection packets (datasets) used to create Transport Rule 2012 and 2014 future year base-case scenario inventories from the 2005 base case are provided in Appendix D. Additional summaries on the emissions changes resulting from these various control programs that were too large to include in this section can be found in Appendix D, and the following files are provided with the Transport Rule final emissions data on http://www.epa.gov/ttn/chief/emch/index.html: TransportRuleFinal_2012_Projection_info.xlsx and TransportRuleFinal_2014_Projection_info.xlsx.

The remainder of this section is organized either by source sector or by specific emissions category within a source sector for which a distinct set of data were used or developed for the purpose of projections for the Transport Rule. This organization allows consolidation of the discussion of the emissions categories that are contained in multiple sectors, because the data and approaches used across the sectors are consistent and do not need to be repeated. Sector names associated with the emissions categories are provided in parentheses.

Table 4-1. Control strategies and growth assumptions for creating the 2012 and 2014 base-case emissions inventories from the 2005 base case

Control Strategies and/or growth assumptions (grouped by affected pollutants or standard and approach used to apply to the inventory)	**Pollutants affected**	**Approach/ Reference**
Non-EGU Point (ptnonipm sector) projection approaches carried forward from the Proposed Transport Rule		
MACT rules, national, VOC: national applied by SCC, MACT Boat Manufacturing *(promulgated in year 2013, thus not reflected in the 2012 base case)* Wood Building Products Surface Coating Generic MACT II: Spandex Production, Ethylene manufacture Large Appliances Miscellaneous Organic NESHAP (MON): Alkyd Resins, Chelating Agents, Explosives, Phthalate Plasticizers, Polyester Resins, Polymerized Vinylidene Chloride Reinforced Plastics Asphalt Processing & Roofing Iron & Steel Foundries Metal: Can, Coil Metal Furniture Miscellaneous Metal Parts & Products Municipal Solid Waste Landfills Paper and Other Web Plastic Parts Plywood and Composite Wood Products Carbon Black Production Cyanide Chemical Manufacturing Friction Products Manufacturing Leather Finishing Operations Miscellaneous Coating Manufacturing Organic Liquids Distribution (Non-Gasoline) Refractory Products Manufacturing Sites Remediation	VOC	EPA, 2007a
Consent decrees on companies (based on information from the Office of Enforcement and Compliance Assurance – OECA) apportioned to plants owned/operated by the companies	VOC, CO, NOx, PM, SO_2	1
DOJ Settlements: plant SCC controls for: Alcoa, TX Premcor (formerly Motiva), DE	All	2
Refinery Consent Decrees: plant/SCC controls *(a few of these controls are promulgated in year 2013, and thus are not reflected in the 2012 base case)*	NOx, PM, SO_2	3
Hazardous Waste Combustion	PM	4
Municipal Waste Combustor Reductions –plant level	PM	5
Hospital/Medical/Infectious Waste Incinerator Regulations	NO_X, PM, SO_2	EPA, 2005b
Large Municipal Waste Combustors – growth applied to specific plants	All (including Hg)	5
MACT rules, plant-level, VOC: Auto Plants	VOC	6
MACT rules, plant-level, PM & SO_2: Lime Manufacturing	PM, SO_2	7
MACT rules, plant-level, PM: Taconite Ore	PM	8
Additional projections used in the final Transport Rule modeling for non-EGU point sources (ptnonipm sector)		
NESHAP: Portland Cement (09/09/10) – plant level based on Industrial Sector Integrated Solutions (ISIS) policy emissions in 2013. The ISIS results are from the ISIS-Cement model runs for the NESHAP and NSPS analysis of July 28, 2010 and include closures. *(promulgated in year 2013, thus only known closures and new units through year 2009 were included for year 2012 –ISIS-based future-year projections included only*	Hg, NO_X, SO2, PM, HCl	13; EPA, 2010

for 2014)		
New York ozone SIP controls	VOC, NO_X, HAP VOC	14
Additional plant and unit closures provided by state, regional, and the EPA agencies and additional consent decrees. Includes updates from Transport Rule comments.	All	Appendix D
Emission reductions resulting from controls put on specific boiler units (not due to MACT) after 2005, identified through analysis of the control data gathered from the Information Collection Request (ICR) from the Industrial/Commercial/Institutional Boiler NESHAP.	NO_X, SO_2, HCl	Section 4.2.6
Reciprocating Internal Combustion Engines (RICE) NESHAP: *(SO2 controls for RICE are not effective until after 2012, but are applied in 2014)*	NO_X, CO, PM, SO_2	15
Replaced 2005 with 2008 emissions for Corn Products International, Cook County, Illinois, due to the shutdown of 3 boilers and addition of a new boiler (subject to Prevention of Significant Deterioration and Requirements). Agency Identifier: 031012ABI (ILEPA)	All	16
State fuel sulfur content rules for fuel oil *–effective only in Maine and New York in 2014*	SO_2	17
Nonpoint (nonpt sector) projection approaches carried forward from the Proposed Transport Rule		
Municipal Waste Landfills: projection factor of 0.25 applied	All	EPA, 2007a
Livestock Emissions Growth from year 2002 to year 2012 and 2014	NH3, PM	9
Residential Wood Combustion Growth and Change-outs from year 2005 to year 2012 and 2014	All	10
Gasoline Stage II growth and control from year 2005 to year 2012 and 2014	VOC	11
Portable Fuel Container Mobile Source Air Toxics Rule 2 (MSAT2) inventory growth and control from year 2005 to year 2012 and 2014	VOC	12
Additional projections used in the final Transport Rule modeling for Nonpoint sources (nonpt sector)		
RICE NESHAP: *(SO2 controls for RICE are not effective until after 2012, but are applied in 2014)*	NO_X, CO, VOC, PM, SO_2	15
Use Phase II WRAP 2005 Oil and Gas, but apply year 2012- and year 2014-specific RICE controls to these emissions	VOC, SO_2, NO_X, CO	Section 3.2.7
Use 2008 Oklahoma and Texas Oil and Gas, and apply year 2012- and year 2014-specific RICE controls to these emissions.	VOC, SO_2, NO_X, CO, PM	Section 3.2.7
New York, Connecticut, and Virginia ozone SIP controls	VOC	14, 18
State fuel sulfur content rules for fuel oil *–effective only in Maine and New York in 2014*	SO_2	17

APPROACHES/REFERENCES- Stationary Sources:

1. Appendix B in the Proposed Toxics Rule TSD: http://www.epa.gov/ttn/chief/emch/toxics/proposed_toxics_rule_appendices.pdf
2. For Alcoa consent decree, used http:// cfpub.epa.gov/compliance/cases/index.cfm; for Motiva: used information sent by State of Delaware
3. Used data provided by the EPA, OAQPS, Sector Policies and Programs Division (SPPD).
4. Obtained from Anne Pope, the US EPA - Hazardous Waste Incinerators criteria and hazardous air pollutant controls carried over from 2002 Platform, v3.1.
5. Used data provided by the EPA, OAQPS SPPD expert .
6. Percent reductions and plants to receive reductions based on recommendations by rule lead engineer, and are consistent with the reference: EPA, 2007a
7. Percent reductions recommended are determined from the existing plant estimated baselines and estimated reductions as shown in the Federal Register Notice for the rule. SO_2 percent reduction are computed by 6,147/30,783 = 20% and PM_{10} and $PM_{2.5}$ reductions are computed by 3,786/13,588 = 28%
8. Same approach as used in the 2006 Clean Air Interstate Rule (CAIR), which estimated reductions of "PM emissions by 10,538 tpy, a reduction of about 62%." Used same list of plants as were identified based on tonnage and SCC from CAIR: http://www.envinfo.com/caain/June04updates/tiop_fr2.pdf
9. Except for dairy cows and turkeys (no growth), based on animal population growth estimates from the US Department of Agriculture (USDA) and the Food and Agriculture Policy and Research Institute. See Section 3.2.1.

10. Growth and Decline in woodstove types based on industry trade group data, See Section.
11. VOC emission ratios of year 2016 (linear interpolation between 2015 and 2020) -specific from year 2005 from the National Mobile Inventory Model (NMIM) results for onroad refueling including activity growth from VMT, Stage II control programs at gasoline stations, and phase in of newer vehicles with onboard Stage II vehicle controls.
12. VOC and benzene emissions for year 2016 (linear interpolation between 2015 and 2020) from year 2002 from MSAT2 rule (EPA, 2007b)
13. Data files for the cement sector provided by Elineth Torres, the EPA-SPPD, from the analysis done for the Cement NESHAP: The ISIS documentation and analysis for the cement NESHAP/NSPS is in the docket of that rulemaking-docket # EPA-HQ-OAR-2002-005. The Cement NESHAP is in the Federal Register: September 9, 2010 (Volume 75, Number 174, Page 54969-55066
14. New York NO_X and VOC reductions obtained from Appendix J in NY Department of Environmental Conservation Implementation Plan for Ozone (February 2008): http://www.dec.ny.gov/docs/air_pdf/NYMASIP7final.pdf. See Section 3.2.6.
15. Appendix F in the Proposed Toxics Rule TSD: http://www.epa.gov/ttn/chief/emch/toxics/proposed_toxics_rule_appendices.pdf
16. The 2008 data used came from Illinois' submittal of 2008 emissions to the NEI.
17. Based on available, enforceable state sulfur rules as of November, 2010: http://www.ilta.org/LegislativeandRegulatory/MVNRLM/NEUSASulfur%20Rules_09.2010.pdf , http://www.mainelegislature.org/legis/bills/bills_124th/billpdfs/SP062701.pdf , http://switchboard.nrdc.org/blogs/rkassel/governor_paterson_signs_new_la.html , http://green.blogs.nytimes.com/2010/07/20/new-york-mandates-cleaner-heating-oil/
18. VOC reductions in Connecticut and Virginia obtained from Transport Rule comments.

Onroad mobile and nonroad mobile controls (list includes all key mobile control strategies but is not exhaustive)[a]		
National Onroad Rules: Tier 2 Rule: Signature date February, 2000 2007 Onroad Heavy-Duty Rule: February, 2009 Final Mobile Source Air Toxics Rule (MSAT2): February, 2007 Renewable Fuel Standard: March, 2010	all	1
Local Onroad Programs: National Low Emission Vehicle Program (NLEV): March, 1998 Ozone Transport Commission (OTC) LEV Program: January,1995	VOC	2
National Nonroad Controls: Clean Air Nonroad Diesel Final Rule – Tier 4: June, 2004 Control of Emissions from Nonroad Large-Spark Ignition Engines and Recreational Engines (Marine and Land Based): "Pentathalon Rule": November, 2002 Clean Bus USA Program: October, 2007 Control of Emissions of Air Pollution from Locomotives and Marine Compression-Ignition Engines Less than 30 Liters per Cylinder: October, 2008	all	3,4,5
Aircraft: Itinerant (ITN) operations at airports to year 2012 and year 2014	all	6
Locomotives: Energy Information Administration (EIA) fuel consumption projections for freight rail Clean Air Nonroad Diesel Final Rule – Tier 4: June 2004 Locomotive Emissions Final Rulemaking, December 17, 1997 Control of Emissions of Air Pollution from Locomotives and Marine: May 2008	all	EPA, 2009; 3; 4; 5
Commercial Marine: Category 3 marine diesel engines Clean Air Act and International Maritime Organization standards (April, 30, 2010) –*also includes Transport Rule comments.* EIA fuel consumption projections for diesel-fueled vessels OTAQ ECA C3 Base 2020 inventory for residual-fueled vessels Clean Air Nonroad Diesel Final Rule – Tier 4 Emissions Standards for Commercial Marine Diesel Engines, December 29, 1999 Tier 1 Marine Diesel Engines, February 28, 2003	all	7, 3; EPA, 2009

a. These control programs are the same as were used in the Proposed Transport Rule except for the C3 marine standards of April 2010, which are included in the Toxics Rule but were not included in the Proposed Transport Rule.

APPROACHES/REFERENCES – Mobile Sources

1. http://epa.gov/otaq/hwy.htm
2. Only for states submitting these inputs: http://www.epa.gov/otaq/lev-nlev.htm
3. http://www.epa.gov/nonroad-diesel/2004fr.htm
4. http://www.epa.gov/cleanschoolbus/
5. http://www.epa.gov/otaq/marinesi.htm
6. Federal Aviation Administration (FAA) Terminal Area Forecast (TAF) System, December 2008: http://www.apo.data.faa.gov/main/taf.asp
7. http://www.epa.gov/otaq/oceanvessels.htm

4.1 Stationary source projections: EGU sector (ptipm)

The future-year data for the ptipm sector used in the air quality modeling were created by version 4.10 (v4.10) of the Integrated Planning Model (IPM) (http://www.epa.gov/airmarkt/progsregs/epa-ipm/index.html). The IPM is a multiregional, dynamic, deterministic linear programming model of the U.S. electric power sector. Version 4.10 reflects state rules and consent decrees through December 1, 2010 and incorporates information on existing controls collected through the Information Collection Request (ICR), and information from comments received on the IPM-related Notice of Data Availability (NODA) published on September 1, 2010. IPM v4.10 Final included the addition of over 20 GW of existing Activated Carbon Injection (ACI) reported to the EPA via the ICR. Units with SO_2 or NO_X advanced controls (e.g., scrubber, SCR) that were not required to run for compliance with Title IV, New Source Review (NSR), state settlements, or state-specific rules were modeled by IPM to either operate those controls or not based on economic efficiency parameters.

Updates to IPM 4.10 (with respect to the version released in the IPM NODA version) include adjustments to assumptions regarding the performance of acid gas control technologies, new costs imposed on fuel-switching (e.g., bituminous to sub-bituminous), correction of lignite availability to some plants, incorporation of additional planned retirements, a more inclusive implementation of the scrubber upgrade option, and the availability of a scrubber retrofit to waste-coal fired fluidized bed combustion units without an existing scrubber. Further details on the future-year EGU emissions inventory used for this rule can be found in the incremental documentation of the IPM v.4.10 platform, available at http://www.epa.gov/airmarkets/progsregs/epa-ipm/BaseCasev410.html. Note that the Transport Rule future-year base cases do not include the Toxics Rule, which was proposed on March 16, 2011. In addition, the Boiler MACT was not represented in the final Transport Rule modeling because the rule was not final at the time the modeling was performed.

IPM is run in 5 year increments beyond year 2015. IPM results were generated for 2012 and 2015. The IPM 2015 results are valid for representing 2014, 2015, and 2016. As explained in the Transport Rule IPM TSD, additional steps were taken to ensure that the results were valid for use in a 2014, 2015 (or 2016) model run.

Directly emitted PM emissions (i.e., $PM_{2.5}$ and PM_{10}) from the EGU sector are computed via a post processing routine which applies emission factors to the IPM-estimated fuel throughput based on fuel, configuration and controls to compute the filterable and condensable components of PM. This methodology is documented in the IPM TSD.

4.2 Stationary source projections: non-EGU sectors (ptnonipm, nonpt, ag, afdust)

To project U.S. stationary sources other than the ptipm sector, we applied growth factors and/or controls to certain categories within the ptnonipm, nonpt, ag and afdust platform sectors. This subsection provides details on the data and projection methods used for these sectors. In estimating future-year emissions, we assumed that emissions growth does not track with economic growth for many stationary non-IPM sources. This "no-growth" assumption is based on an examination of historical emissions and economic data. While we are working toward improving the projection approach in future emissions platforms, we are still using the no-growth assumption for the 2005, v4.2 platform. More details on the rationale for this approach can be found in Appendix D of the Regulatory Impact Assessment for the PM NAAQS rule (EPA, 2006b).

The starting point was the emission projections done for the 2005v4 platform for the Proposed Transport Rule. The 2012 and 2014 projection factors developed for the Transport Rule Proposal (see http://www.epa.gov/ttn/chief/emch/index.html#transport) were updated for these 2012 and 2014 baseline projections. Several additional National Emission Standards for Hazardous Air Pollutants (NESHAPs) were promulgated since emission projections were done for the Proposed Transport Rule, and these were included for the 2012 and 2014 base cases. Also included in the 2012 and 2014 base cases are numerous future-year projection data from the Transport Rule comments; these data are described in the following sections.

Year-specific projection factors for years 2012 and 2014 were used for creating the 2012 and 2014 base cases unless noted otherwise. Growth factors (and control factors) are provided in the following sections where feasible. However, some sectors used growth or control factors that varied geographically and their contents could not be provided in the following sections (e.g., gasoline distribution varies by county and pollutant and has thousands of records). If the growth or control factors for a sector are not provided in a table in this document, they are available as a "projection" or "control" packet for input to SMOKE on the v4.2 platform website (see the end of Section **Error! Reference source not found.**).

4.2.1 Livestock emissions growth (ag, afdust)

Growth in ammonia (NH_3) and dust (PM_{10} and $PM_{2.5}$) emissions from livestock in the ag and afdust and ptnonipm sectors was based on projections of growth in animal population. While there are a very small amount of livestock emissions in the ptnonipm sector as compared to the ag sector, the livestock growth projection packet was inadvertently not applied to the ptnonipm that sector. This results in an underestimate of NH_3 in the ptnonipm sector of roughly 1,160 tons in 2012 and 1,390 tons in 2014 (primarily in Kansas and Minnesota for which the NH_3 were reported at specific farms in the point source inventory), and for $PM_{2.5}$ the ptnonipm sector underestimates are 3 tons in both 2012 and 2014. These omissions are expected to have a negligible impact on the air quality PM and ozone results and these omissions were made in both the future base case and Transport Rule policy case.

Table 4-2 provides the growth factors from the 2005 base-case emissions to 2012 and 2014 for animal categories applied to the ag and afdust sectors for livestock-related SCCs. For example, year 2014 beef emissions are 1.7% larger than the 2005 base-case emissions. Except for dairy cows and turkey production, the animal projection factors are derived from national-level animal population projections from the U.S. Department of Agriculture (USDA) and the Food and Agriculture Policy and Research Institute (FAPRI). For dairy cows and turkeys, we assumed that there would be no growth in emissions. This assumption was based on an analysis of historical trends in the number of such animals compared to production rates. Although productions rates have increased, the number of animals has declined. Thus, we do not believe that production forecasts provide representative estimates of the future number of cows and turkeys; therefore, we did not use these forecasts for estimating future-year emissions from these animals. In

particular, the dairy cow population is projected to decrease in the future as it has for the past few decades; however, milk production will be increasing over the same period. Note that the ammonia emissions from dairies are not directly related to animal population but also nitrogen excretion. With the cow numbers going down and the production going up we suspect the excretion value will be changing, but we assumed no change because we did not have a quantitative estimate.

The inventory for livestock emissions used 2002 emissions values therefore, our projection method projected from 2002 rather than from 2005.

Appendix E in the 2002v3 platform documentation provides the animal population data and regression curves used to derive the growth factors: http://www.epa.gov/scram001/reports/Emissions%20TSD%20Vol2_Appendices_01-15-08.pdf. Appendix F in the same document provides the cross references of livestock sources in the ag, afdust and ptnonipm sectors to the animal categories in Table 4-2.

Table 4-2. Growth factors from year 2005 to future years for Animal Operations

Animal Category	Projection Factors	
	2012	2014
Dairy Cow	1.000	1.000
Beef	1.014	1.017
Pork	1.060	1.071
Broilers	1.230	1.275
Turkeys	1.000	1.000
Layers	1.160	1.193
Poultry Average	1.178	1.214
Overall Average	1.0623	1.075

4.2.2 Residential wood combustion growth (nonpt)

We projected residential wood combustion emissions based on the expected increase in the number of low-emitting wood stoves and the corresponding decrease in other types of wood stoves. As newer, cleaner woodstoves replace older, higher-polluting wood stoves, there will be an overall reduction of the emissions from these sources. The approach cited here was developed as part of a modeling exercise to estimate the expected benefits of the woodstoves change-out program (http://www.epa.gov/burnwise). Details of this approach can be found in Section 2.3.3 of the PM NAAQS Regulatory Impact Analysis (EPA, 2006b).

The specific assumptions we made were:

- Fireplaces, SCC=2104008001: increase 1%/year
- Old woodstoves, SCC=2104008002, 2104008010, or 2104008051: decrease 2%/year
- New woodstoves, SCC=2104008003, 2104008004, 2104008030, 2104008050, 2104008052 or 2104008053: increase 2%/year

For the general woodstoves and fireplaces category (SCC 2104008000) we computed a weighted average distribution based on 19.4% fireplaces, 71.6% old woodstoves, 9.1% new woodstoves using 2002v3 Platform (these emissions have not been updated for the 2005v4 platform used for the Transport Rule Proposal 2005v4) emissions for $PM_{2.5}$. These fractions are based on the fraction of emissions from these processes in the states that did not have the "general woodstoves and fireplaces" SCC in the 2002v3 NEI. This approach results in an overall decrease of 1.056% per year for this source category.

Table 4-3 presents the projection factors used to project the 2005 base case (2002 emissions) for residential wood combustion.

Table 4-3. Projection Factors for growing year 2005 Residential Wood Combustion Sources

SCC	SCC Description	Projection Factors	
		2012	2014
2104008000	Total: Woodstoves and Fireplaces	0.8944	0.8733
2104008001	Fireplaces: General	1.10	1.12
2104008070	Outdoor Wood Burning Equipment		
2104008002	Fireplaces: Insert; non-EPA certified	0.80	0.76
2104008010	Woodstoves: General		
2104008051	Non-catalytic Woodstoves: Non-EPA certified		
2104008003	Fireplaces: Insert; EPA certified; non-catalytic	1.20	1.24
2104008004	Fireplaces: Insert; EPA certified; catalytic		
2104008030	Catalytic Woodstoves: General		
2104008050	Non-catalytic Woodstoves: EPA certified		
2104008052	Non-catalytic Woodstoves: Low Emitting		
2104008053	Non-catalytic Woodstoves: Pellet Fired		

4.2.3 Gasoline Stage II growth and control (nonpt, ptnonipm)

Emissions from Stage II gasoline operations in the 2005 base case are contained in both nonpt and ptnonipm sectors. The only SCC in the nonpt inventory used for gasoline Stage II emissions is 2501060100 (Storage and Transport; Petroleum and Petroleum Product Storage; Gasoline Service Stations; Stage II: Total). The following SIC and SCC codes are associated with gasoline Stage II emissions in the ptnonipm sector:

- SIC 5541 (Automotive Dealers & Service Stations, Gasoline Service Stations, Gasoline service stations)
- SCC 40600401 (Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Filling Vehicle Gas Tanks - Stage II;Vapor Loss w/o Controls)
- SCC 40600402 (Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Filling Vehicle Gas Tanks - Stage II;Liquid Spill Loss w/o Controls)
- SCC 40600403 (Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Filling Vehicle Gas Tanks - Stage II;Vapor Loss w/o Controls)
- SCC 40600499 (Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Filling Vehicle Gas Tanks - Stage II;Not Classified

We used a consistent approach across nonpt and ptnonipm to project these gasoline stage II emissions. The approach involved computing state-level VOC-specific projection factors from the state-level MOVES2010-based results for onroad refueling, using ratios of future–year 2012 and 2014 refueling emissions to 2005 base-case emissions. The approach accounts for three elements of refueling growth and control: (1) activity growth (due to VMT growth as input into MOVES2010), (2) emissions reductions from Stage II control programs at gasoline stations, and (3) emissions reductions resulting from the phase-in over time of newer vehicles with onboard Stage II vehicle controls. We assumed that all areas with Stage II controls in 2005 continue to have Stage II controls in 2012 and 2014. This approach is an update from the 2005v4 platform

projections in the Proposed Transport Rule; in that platform, NMIM refueling projections were used instead of MOVES2010.

We computed VOC, benzene and naphthalene projection factors at a county-specific, annual resolution as shown below; note that naphthalene, while provided by MOVES2010, is not used in the Transport Rule:

$$PF_VOC_{[state,\ future\ year]} = VOC_RFL_{[state,\ future\ year]}/VOC_RFL_{[state,\ 2005]},$$
$$PF_BENZENE_{[state,\ future\ year]} = BENZENE_RFL_{[state,\ future\ year]}/\ BENZENE\ _RFL_{[state,\ 2005]},\ \text{and}$$
$$PF_NAPHTHALENE_{[state,\ future\ year]} = PF_VOC_{[state,\ future\ year]}$$

where VOC_RFL is the VOC refueling emissions for onroad sources from MOVES2010, and
BENZENE_RFL is the BENZENE refueling emissions for onroad sources from MOVES2010

We applied these projection factors to both nonpt and ptnonipm sector gasoline stage II sources.

Chemical speciation uses certain VOC HAPs for some sources, specifically, benzene, acetaldehyde, formaldehyde, and methanol (BAFM). The VOC HAPs are used for sources that have consistent VOC and VOC HAPs using various criteria as described in the Section3.1.2.1, and these sources are called "integrated" sources. The nonpoint gasoline stage II emissions are an integrated source, and so the VOC HAPs are also projected based on ratios of future-year and base-year VOC. The only two VOC HAPs emitted from refueling are benzene and naphthalene, and both of these were projected consistently with VOC. However, naphthalene was not used in the chemical speciation (it is not B,A,F or M) and was therefore not used for this effort. Benzene was used as part of the speciation for the nonpt sector gasoline stage II sources. The ptnonipm is a "no-integrate" sector, so ptnonipm gasoline stage II sources did not use the projected benzene as part of the speciation, but rather used VOC speciation to estimate benzene.

4.2.4 Portable fuel container growth and control (nonpt)

We obtained future-year VOC emissions from Portable Fuel Containers (PFCs) from inventories developed and modeled for the EPA's MSAT2 rule (EPA, 2007a). The 10 PFC SCCs are summarized below (note that the full SCC descriptions for these SCCs include "Storage and Transport; Petroleum and Petroleum Product Storage" as the beginning of the description).

- 2501011011 Residential Portable Fuel Containers: Permeation
- 2501011012 Residential Portable Fuel Containers: Evaporation
- 2501011013 Residential Portable Fuel Containers: Spillage During Transport
- 2501011014 Residential Portable Fuel Containers: Refilling at the Pump: Vapor Displacement
- 2501011015 Residential Portable Fuel Containers: Refilling at the Pump: Spillage
- 2501012011 Commercial Portable Fuel Containers: Permeation
- 2501012012 Commercial Portable Fuel Containers: Evaporation
- 2501012013 Commercial Portable Fuel Containers: Spillage During Transport
- 2501012014 Commercial Portable Fuel Containers: Refilling at the Pump: Vapor Displacement
- 2501012015 Commercial Portable Fuel Containers: Refilling at the Pump: Spillage

Additional information on the PFC inventories is available in Section 2.2.3 of the documentation for the 2002 Platform (http://www.epa.gov/ttn/chief/emch/index.html#2002).

The future-year emissions reflect projected increases in fuel consumption, state programs to reduce PFC emissions, standards promulgated in the MSAT2 rule, and impacts of the Renewable Fuel Standard (RFS) on

gasoline volatility. Future-year emissions for PFCs were available for 2010, 2015, 2020, and 2030. In creating the inventories for 2012 and 2014, we linearly interpolated year 2010 and year 2015 inventories. Benzene and other VOC HAP future-year PFC emissions were also included in the interpolation. Benzene was used in VOC speciation for the air quality model through the modification of VOC speciation profiles calculations (no other BAFM HAPs are emitted from PFCs).

4.2.5 Aircraft growth (ptnonipm)

As with the 2005v4 platform, aircraft emissions are contained in the ptnonipm inventory. These 2005 point-source emissions are projected to future years by applying activity growth using data on itinerant (ITN) operations at airports. The ITN operations are defined as aircraft take-offs whereby the aircraft leaves the airport vicinity and lands at another airport, or aircraft landings whereby the aircraft has arrived from outside the airport vicinity. We used projected ITN information available from the Federal Aviation Administration's (FAA) Terminal Area Forecast (TAF) System: http://www.apo.data.faa.gov/main/taf.asp (publication date December 2008). This information is available for approximately 3,300 individual airports, for all years up to 2025. We aggregated and applied this information at the national level by summing the airport-specific (U.S. airports only) ITN operations to national totals by year and by aircraft operation, for each of the four available operation types: commercial, general, air taxi, military. We computed growth factors for each operation type by dividing future-year ITN by 2005-year ITN. We assigned factors to inventory SCCs based on the operation type.

The methods that the FAA used for developing the ITN data in the TAF are documented in: http://www.faa.gov/data_research/aviation/aerospace_forecasts/2009-2025/media/2009%20Forecast%20Doc.pdf

Table 4-4 provides the national growth factors for aircraft; all factors are applied to year 2005 emissions. For example, year 2012 commercial aircraft emissions are 1.9% higher than year 2005 emissions.

Table 4-4. Factors used to project 2005 base-case aircraft emissions to future years

SCC	SCC Description	Projection Factor	
		2012	2014
2275001000	Military aircraft	0.967	0.968
2275020000	Commercial aircraft	1.019	1.066
2275050000	General aviation	0.962	0.977
2275060000	Air taxi	0.872	0.897
27501015	Internal Combustion Engines;Fixed Wing Aircraft L & TO Exhaust;Military;Jet Engine: JP-5	0.967	0.968
27502001	Internal Combustion Engines;Fixed Wing Aircraft L & TO Exhaust;Commercial;Piston Engine: Aviation Gas	1.019	1.066
27502011	Internal Combustion Engines;Fixed Wing Aircraft L & TO Exhaust;Commercial;Jet Engine: Jet A	1.019	1.066
27505001	Internal Combustion Engines;Fixed Wing Aircraft L & TO Exhaust;Civil;Piston Engine: Aviation Gas	0.962	0.977
27505011	Internal Combustion Engines;Fixed Wing Aircraft L & TO Exhaust;Civil;Jet Engine: Jet A	0.962	0.977
27601014	Internal Combustion Engines;Rotary Wing Aircraft L & TO Exhaust;Military;Jet Engine: JP-4	0.967	0.968
27601015	Internal Combustion Engines;Rotary Wing Aircraft L & TO Exhaust;Military;Jet Engine: JP-5	0.967	0.968

We did not apply growth factors to any point sources with SCC 27602011 (Internal Combustion Engines; Rotary Wing Aircraft L & TO Exhaust; Commercial; Jet Engine: Jet A) because the facility names associated with these point sources appeared to represent industrial facilities rather than airports. This SCC is only in one county, Santa Barbara, California (State/County FIPS 06083).

None of our aircraft emission projections account for any control programs. We considered the NO_X standard adopted by the International Civil Aviation Organization's (ICAO) Committee on Aviation Environmental Protection (CAEP) in February 2004, which is expected to reduce NO_X by approximately 2% in 2015 and 3% in 2020. However, this rule has not yet been adopted as an EPA (or U.S.) rule; therefore, the effects of this rule were not included in the future-year emissions projections.

4.2.6 Stationary source control programs, consent decrees & settlements, and plant closures (ptnonipm, nonpt)

We applied emissions reduction factors to the 2005 emissions for particular sources in the ptnonipm and nonpt sectors to reflect the impact of stationary-source control programs including consent decrees, settlements, and plant closures. Some of the controls described in this section were obtained from comments on the Transport Rule proposal. Here we describe the contents of the controls and closures for the 2012 and 2014 base cases. Detailed summaries of the impacts of the control programs are provided in Appendix D.

Controls from the NO_X SIP call were assumed to have been implemented by 2005 and captured in the 2005 base case (2005v2 point inventory). This assumption was confirmed by review of the 2005 NEI that showed reductions from Large Boiler/Turbines and Large Internal Combustion Engines in the Northeast states covered by the NOx SIP call. The future-year base controls consist of the following:

- We did not include MACT rules where compliance dates were prior to 2005, because we assumed these were already reflected in the 2005 inventory. The EPA OAQPS Sector Policies and Programs Division (SPPD) provided all controls information related to the MACT rules, and this information is as consistent as possible with the preamble emissions reduction percentages for these rules.
- Various emissions reductions from the Transport Rule comments, including but not limited to: fuel switching at units, shutdowns, future-year emission limits, ozone SIP VOC controls for some sources in Virginia and Connecticut, and state and local control programs.
- Evolutionary information gathering of plant closures (i.e., emissions were zeroed out for future years) were also included where information indicated that the plant was actually closed after the 2005 base year and prior to Transport Rule modeling that began in the fall of 2010. We also applied unit and plant closures received from the Transport Rule comments. However, plants projected to close in the future (post-2010) were not removed in the future years because these projections can be inaccurate due to economic improvements. We also applied cement kiln (unit) and cement plant closures discussed later in Section 4.2.6.1. More detailed information on the overall state-level impacts of all control programs and projection datasets, including units and plants closed in the 2012 and 2014 base-case ptnonipm inventories are provided in Appendix D. The magnitude of all unit and plant closures on the non-EGU point (ptnonipm) sector 2005 base-case emissions is shown in Table 4-5 below.

Table 4-5. Summary of Non-EGU Emission Reductions Applied to the 2005 Inventory due to Unit and Plant Closures

State	CO (tons)	NH_3 (tons)	NO_X (tons)	PM_{10} (tons)	$PM_{2.5}$ (tons)	SO_2 (tons)	VOC (tons)
Alabama	10,680	6	4,104	2,543	2,257	1,912	870
Arizona	509	0	1,524	161	65	7	28
Arkansas	1,110	0	3,994	401	129	920	271
California	2,684	0	6,675	1,121	444	1,161	23
Delaware	93	6	1,495	350	326	5,409	391
Florida	4,136	230	7,869	1,049	577	8,547	246
Georgia	7,435	21	2,678	1,187	765	2,688	2,295
Idaho	625	6	461	14	6	17	1
Illinois	10,175	0	11,605	1,996	1,267	23,830	716
Indiana	1,058	0	4,794	486	207	8,468	157
Iowa	461	0	1,939	230	48	4,787	15
Kansas	989	4	1,624	84	48	329	52
Louisiana	3,035	127	1,878	521	337	4,114	4,061
Maine	256	13	1,906	467	212	3,767	310
Maryland	107	22	1,634	168	83	1,137	6
Massachusetts	45	7	518	114	68	1,909	55
Michigan	7,995	73	10,900	2,274	1,076	14,598	2,083
Mississippi	0	0	69	5	5	96	
Missouri	17	4	23	2	2	0	310
Nevada	204	0	2,817	212	74	175	66
New Hampshire	109	0	287	113	103	681	291
New Jersey	9	0	31	24	24	0	996
New York	5	1	48	16	11	217	14
North Carolina	12	1	94	25	17	379	7
Ohio	340		4,238	610	299	7,128	69
Oklahoma	103	4	1,757	531	184	1,498	17
Pennsylvania	1,415	4	6,117	1,293	683	6,852	116
South Carolina	1,666	4	2,115	441	266	1,052	302
Tennessee	106	0	2,229	242	146	5,407	9,065
Texas	5,395	20	9,664	1,264	642	9,216	507
Virginia	3,161	1	3,737	1,355	1,029	11,102	2,188
West Virginia	59,321	55	5,257	1,244	830	13,410	783
Wisconsin	479	28	1,953	436	297	7,672	349
Grand Total	123,735	637	106,034	20,979	12,527	148,485	26,660

- In addition to plant closures, we included the effects of the Department of Justice Settlements and Consent Decrees on the non-EGU (ptnonipm) sector emissions. We also included estimated impacts of HAP standards per Section 112, 129 of the Clean Air Act on the non-EGU (ptnonipm) and nonpoint (nonpt) sector emissions, based on expected CAP co-benefits to sources in these sectors.

- Numerous controls have compliance dates beyond 2008; these include refinery and the Office of Compliance and Enforcement (OECA) consent decrees, Department of Justice (DOJ) settlements, as well as most national VOC MACT controls. Additional OECA consent decree information is provided in Appendix B of the Proposed Toxics Rule TSD: http://www.epa.gov/ttn/chief/emch/toxics/proposed_toxics_rule_appendices.pdf. The detailed data used are available at the website listed in Section 1. Several of these consent decrees and national NESHAP rules such as RICE and cement have compliance dates that are between 2012 and 2014; therefore, there are several differences in controls applied to the 2012 and 2014 base cases.
- Refinery consent decrees controls at the facility and SCC level (collected through internal coordination on refineries by the EPA).
- Fuel sulfur fuel limits were enforceable in 2014 (not 2012) for Maine and New York. These fuel limits were incremental and not applicable until after 2012. Because we only apply controls that are applicable before July 1, 2014, more stringent sulfur fuel controls and additional states with controls in later years were not applied.
- Criteria air pollutant (cap) reductions a cobenefit to RICE NESHAP controls. SO_2 RICE cobenefit controls are not applied in 2012.
- Most of the control programs were applied as replacement controls, which means that any existing percent reductions ("baseline control efficiency") reported in the NEI were removed prior to the addition of the percent reductions due to these control programs. Exceptions to replacement controls are "additional" controls, which ensure that the controlled emissions match desired reductions regardless of the baseline control efficiencies in the NEI. We used the "additional controls" approach for many permit limits, settlements and consent decrees where specific plant and multiple-plant-level reductions/targets were desired and at municipal waste landfills where VOC was reduced 75% via a MACT control using projection factors of 0.25.
- We applied New York State Implementation Plan available controls for the 1997 8-hour Ozone standard for non-EGU point and nonpoint NO_X and VOC sources based on NY State Department of Environmental Conservation February 2008 guidance. These reductions are found in Appendix J in: http://www.dec.ny.gov/docs/air_pdf/NYMASIP7final.pdf. See Section 3.2.6.

4.2.6.1 2014 base-case reductions from the Portland Cement NESHAP

As indicated in Table 4-1, the Industrial Sectors Integrated Solutions (ISIS) model (EPA, 2010) was used to project the cement industry component of the ptnonipm emissions modeling sector to 2014. This approach provided reductions of criteria and hazardous air pollutants, including mercury. The ISIS cement emissions were developed in support for the Portland Cement NESHAPs and the NSPS for the Portland cement manufacturing industry.

The ISIS model produced a Portland Cement NESHAP policy case of multi-pollutant emissions for individual cement kilns (emission inventory units) that were relevant for years 2013 through 2017. These ISIS-based emissions included information on new cement kilns, facility and unit-level closures, and updated policy case emissions at existing cement kilns. The units that opened or closed before 2010 were included in the 2012 base case. The ISIS-based policy case predictions of emissions reductions and activity growth were only included in the 2014 base case and not in the 2012 base case.

The ISIS model results for the future show a continuation of the recent trend in the cement sector of the replacement of lower capacity, inefficient wet and long dry kilns with bigger and more efficient preheater

and precalciner kilns. Multiple regulatory requirements such as the NESHAP and NSPS currently apply to the cement industry to reduce CAP and HAP emissions. Additionally, state and local regulatory requirements might apply to individual cement facilities depending on their locations relative to ozone and $PM_{2.5}$ nonattainment areas. The ISIS model provides the emission reduction strategy that balances: 1) optimal (least cost) industry operation, 2) cost-effective controls to meet the demand for cement, and 3) emission reduction requirements over the time period of interest. Table 4-6 shows the magnitude of the ISIS-based cement industry reductions in the future-year emissions that represent 2014, and the impact that these reductions have on total stationary non-EGU point source (ptnonipm) emissions.

Table 4-6. Future-year ISIS-based cement industry annual reductions (tons/yr) for the non-EGU (ptnonipm) sector

Pollutant	Cement Industry emissions in 2005	Decrease in cement industry emissions in 2014 vs 2005	% decrease in ptnonipm from cement reduction
NO_X	193,000	56,740	2.4%
$PM_{2.5}$	14,400	7,840	1.8%
SO_2	128,400	106,000	5.0%
VOC	6,900	5,570	0.4%
HCl	2,900	2,220	4.5%

4.2.6.2 Boiler reductions not associated with the MACT rule

The Boiler MACT ICR collected data on existing controls. We used an early version of a data base developed for that rulemaking entitled "survey_database_2008_results2.mdb" (EPA-HQ-OAR-2002-0058-0788) which is posted under the Technical Information for the Boiler MACT major source rule (http://www.epa.gov/ttn/atw/boiler/boilerpg.html). We extracted all controls that were installed after 2005, determined a percent reduction, and verified with source owners that these controls were actively in use. In many situations we learned that the controls were on site but were not in use. A summary of the plant-unit specific reductions that were verified to be actively in use are summarized in Table 4-7.

Table 4-7. State-level non-MACT Boiler Reductions from ICR Data Gathering

State	Pollutant	Pre-controlled Emissions (tons)	Controlled Emissions (tons)	Reductions (tons)	Percent Reduction %
Michigan	NO_X	907	544	363	40
North Carolina	SO_2	652	65	587	90
Virginia	SO_2	3379	338	3041	90
Washington	SO_2	639	383	256	40
North Carolina	HCl	31	3	28	90

4.2.6.3 RICE NESHAP

There are three rulemakings for National Emission Standards for Hazardous Air Pollutants (NESHAP) for Reciprocating Internal Combustion Engines (RICE). These rules reduce HAPs from existing and new RICE

sources. In order to meet the standards, existing sources with certain types of engines will need to install controls. In addition to reducing HAPs, these controls also reduce CAPs, specifically, CO, NO_X, VOC, PM, and SO_2. In 2014 and beyond, compliance dates have passed for all three rules; thus all three rules are included in the emissions projection. In 2012 only the earliest rule's compliance date has passed so only one rule is included.

The rules can be found at http://www.epa.gov/ttn/atw/rice/ricepg.html and are listed below:

- National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines; Final Rule (69 FR 33473) published 06/15/04

- National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines; Final Rule (FR 9648) published 03/03/10

- National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines; Final Rule (75 FR 51570) published 08/20/2010

The difference among these three rules is that they focus on different types of engines, different facility types (major for HAPs, versus area for HAPs) and different engine sizes based on horsepower (HP). In addition, they have different compliance dates. We project CAPs from the 2005 NEI RICE sources, based on the requirements of the rule for existing sources only because the inventory includes only existing sources and the current projection approach does not estimate emissions from new sources.

A complete discussion on the methodology to estimate year 2012 and year 2014 RICE controls is provided in Appendix F in the Proposed Toxics Rule TSD: http://www.epa.gov/ttn/chief/emch/toxics/proposed_toxics_rule_appendices.pdf. Impacts of the RICE controls on stationary non-EGU emissions (nonpt and ptnonipm sectors), excluding WRAP, Texas, and Oklahoma oil and gas emissions (see Section 4.2.7) are provided in Table 4-8.

Table 4-8. National Impact of RICE Controls on 2012 and 2014 Non-EGU Projections

Pollutant	2012 Reductions	2014 Reductions
CO	18,987	124,516
NOX	30,250	123,662
PM2.5	0	1,368
PM10	0	1,595
SO2	0	23,368
VOC	1,069	15,934

4.2.6.4 Fuel sulfur rules

Fuel sulfur rules that were signed and implemented by June 30, 2014 are limited to Maine and New York. No fuel sulfur rule reductions were available in other states and compliance dates for 2012. As standard practice we have used June 30th as the cut-off date for all control programs to be included in a calendar year. For example, a control program with a compliance (effective) date of June 30, 2012 would be included in the 2012 projected emissions; however, a control program effective July 1, 2012 would not be included in 2012 projections. Several other states have fuel sulfur rules that were in development but not finalized prior to

Transport Rule emissions processing:
http://www.ilta.org/LegislativeandRegulatory/MVNRLM/NEUSASulfur%20Rules_09.2010.pdf.

The fuel sulfur content for all home heating oil SCCs in 2005 is assumed to by 3000 part per million (ppm). Effective July 1, 2012, New York requires all heating oil sold in New York to contain no more than 15ppm of sulfur, thus reducing SO_2 emissions by 99.5% for 2014 projections (and no reduction for 2012). These New York sulfur content reductions are further discussed here:
http://switchboard.nrdc.org/blogs/rkassel/governor_paterson_signs_new_la.html.

The Maine fuel sulfur rule effective January 1, 2014 reduces sulfur to 500ppm, resulting in an 83.33% reduction from 3000 ppm. These Maine sulfur content reductions are discussed here:
http://www.mainelegislature.org/legis/bills/bills_124th/billpdfs/SP062701.pdf.

Further reductions in NY, ME, and other states effective after June 30, 2014 are not included. The impact of these fuel sulfur content reductions on SO2 is shown in Table 4-9.

Table 4-9. Impact of Fuel Sulfur Controls on 2014 Non-EGU Projections

State	SO_2 Reductions
Maine	7,053
New York	54,431

4.2.7 Oil and gas projections in TX, OK, and non-California WRAP states (nonpt)

For the 2005v4.2 platform, we incorporated updated 2005 oil and gas emissions from Texas and Oklahoma. For Texas oil and gas production, we used 2012 and 2014 estimates from the Texas Commission of Environmental Quality (TCEQ) and used them as described in:
http://www.tceq.state.tx.us/assets/public/implementation/air/am/contracts/reports/ei/5820783985FY0901-20090715-ergi-Drilling_Rig_EI.pdf.

We also received 2008 data for Oklahoma that we used as the best available data to represent 2012 and 2014. As with the 2005 v4 platform, the v4.2 platform utilizes the Phase II WRAP oil and gas emissions data for the non-California Western Regional Air Partnership (WRAP) states for 2005. WRAP 2018 Phase II emissions were also available but determined to be inappropriate for use in 2012 and 2014. Consequently, we started with the base year emissions for Oklahoma and the WRAP states and applied these additional reductions related to the RICE NESHAP.

For Oklahoma and WRAP oil and gas emissions, we applied CO, NO_X, and VOC emissions reductions from the Stationary Reciprocating Internal Combustion Engine (RICE) NESHAP, which we assumed has some applicability to this industry (see Appendix F in the Proposed Toxics Rule TSD:
http://www.epa.gov/ttn/chief/emch/toxics/proposed_toxics_rule_appendices.pdf). SO_2 reductions associated with the RICE NESHAP were also included for these same data for the year 2014 projection. Table 4-10 shows the 2005, 2012, and 2014 NOX and SO2 emissions including RICE reductions for Oklahoma and the WRAP states.

Table 4-10. Oil and Gas NO_X and SO_2 Emissions for 2005, 2012, and 2014 including additional reductions due to the RICE NESHAP

	NOX (tons)			SO2 (tons)		
State	**2005**	**2012**	**2014**	**2005**	**2012**	**2014**
Alaska	836	811	732	62	62	31
Arizona	13	12	12			
Colorado	32,188	31,806	30,625	350	350	176
Montana	10,617	10,456	9,957	640	640	321
Nevada	71	69	62	1	1	0
New Mexico	61,674	60,317	56,119	369	369	188
North Dakota	6,040	5,861	5,306	688	688	355
Oklahoma	39,668	44,362	42,402	1,014	2	2
Oregon	61	60	55			
South Dakota	566	550	502	43	43	21
Texas	42,854	46,251	39,462	5,977	43	38
Utah	6,896	6,777	6,409	149	149	75
Wyoming	36,172	35,505	33,442	541	541	272
Grand Total	**237,656**	**242,837**	**225,085**	**9,834**	**2,888**	**1,479**

4.2.8 Future-year VOC Speciation for gasoline-related sources (ptnonipm, nonpt)

To account for the future projected increase in the ethanol content of fuels, we used different future-year VOC speciation for certain gasoline-related emission sources. Such sources include gasoline stage II (refueling vehicles), portable fuel containers (PFCs), and finished fuel storage and transport-related sources related to bulk terminals (where the ethanol may be mixed) and downstream to the pump. We identified this last group of sources as "btp" (from bulk terminals to pumps). While most of these sources are in the nonpt sector, there are also some in the ptnonipm sector. In the 2005 base year, we used zero percent ethanol (E0) fuel profiles. For the 2012 and 2014 profiles, we used combinations of E0 and ten percent ethanol (E10) fuel profiles. The fuel type fraction was developed based on the Department of Energy Annual Energy Outlook (AEO) 2007 projections of ethanol fuels for the year 2022. In the AEO 2007 data, the proportions of E0 and E10 fuels are the same for 2012 and years beyond (even though the quantities of the two fuels change over these years). The national level proportions were allocated to counties across the country using fuel modeling at the EPA Office of Transportation and Air Quality. All gasoline stage II and "btp" sources used the same combination of E0 and E10 headspace profiles as were used for exhaust and evaporative profiles.

4.3 Mobile source projections

Mobile source monthly inventories of onroad and nonroad mobile emissions were created for 2012 and 2014 using a combination of the NMIM and MOVES2010 models. Future-year emissions reflect onroad mobile control programs including the Light-Duty Vehicle Tier 2 Rule, the Onroad Heavy-Duty Rule, and the Mobile Source Air Toxics (MSAT2) final rule. Nonroad mobile emissions reductions for these years include reductions to locomotives, various nonroad engines including diesel engines and various marine engine types, fuel sulfur content, and evaporative emissions standards.

Onroad mobile sources are comprised of several components and are discussed in the next subsection (4.3.1). Monthly nonroad mobile emission projections are discussed in subsection 4.3.2. Locomotives and Class 1

and Class 2 commercial marine vessel (C1/C2 CMV) projections are discussed in subsection 4.3.3, and Class 3 (C3) CMV projected emissions are discussed in subsection 4.3.4.

4.3.1 Onroad mobile (on_noadj, on_moves_runpm, on_moves_startpm)

The onroad emissions were primarily based on the 2010 version of the Motor Vehicle Emissions Simulator (MOVES2010) – the same version as was used for 2005. The same MOVES-based $PM_{2.5}$ temperature adjustment factors were applied as were used in 2005 for running mode emissions; however, cold start emissions used year-specific temperature adjustment factors. The temperature adjustments have the minor limitation that they were based on the use of MOVES national default inputs rather than county-specific inputs. This was because a county-specific database for input to MOVES was not available at the time this approach was needed. However, the $PM_{2.5}$ temperature adjustments are fairly insensitive to the county-specific inputs, which is why this is only a minor limitation.

<u>California onroad</u> (on_noadj)

Like year 2005 emissions, future-year California NH_3 emissions are from MOVES runs for California, disaggregated to the county level using NMIM. For all other pollutants, we did not use MOVES to generate future-year onroad emissions for California, because the 2005 base year emissions were provided by CARB's Emission Factors mobile model (EMFAC), outputs of which CARB submitted for the 2005 NEI. For California, we chose an approach that would maintain consistency between the 2005 and 2012 and 2014 emissions. This approach involved computing projection factors from a consistent set of future and 2005-year data provided by CARB based on the EMFAC2007 model. For 2012 emissions, we generated projection factors by dividing the EMFAC2007-based emissions for 2012 (linearly interpolated between year 2009 and year 2014) by the EMFAC2007-based emissions for 2005. These EMFAC-based emissions were provided in March 2007. California does not specify road types, so we first used NMIM California ratios to break out vehicle emissions to the match the more detailed NMIM level before projecting to 2012.

HAP emissions were computed as 2005v2-based HAP-CAP ratios applied to 2012 and 2014 CAP emissions at the pollutant and Level 3 SCC (first 7 characters). HAPs were scaled to either of three pollutants: exhaust $PM_{2.5}$ (e.g., metals), exhaust VOC (e.g., exhaust mode VOC HAPs such as acetaldehyde and formaldehyde), or evaporative VOC (e.g., evaporative mode VOC HAPs such as benzene).

<u>Onroad mobile sector with no adjustment for daily temperature</u> (on_noadj)

As discussed in Section 2, the MOVES2010 model was used for all vehicles, road types, and pollutants. Vehicle Miles Travelled (VMT) were projected using growth rates from the Department of Energy's AEO2009. We used MOVES2010 to create emissions by state, SCC, pollutant, emissions mode and month. We then allocated these emissions to counties using ratios based on 2012 and 2015 NMIM county-level data by state, SCC, pollutant, and emissions mode. 2014 NMIM data were not available for this effort, but the 2015 NMIM can reasonably be expected to be sufficient for 2014 state-county allocations for this purpose. While the EPA intends to replace this approach with a county-specific implementation of MOVES for use in future regulatory actions, this approach was the best approach available at the time of this modeling.

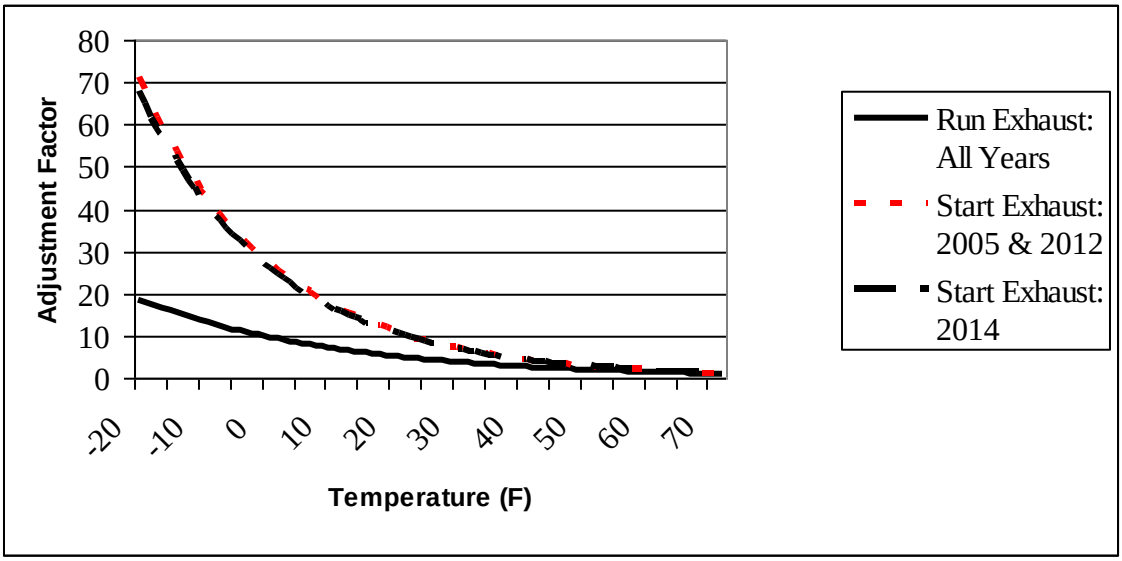
<u>Onroad PM gasoline running and cold start mode sectors</u> (on_moves_startpm and on_moves_runpm)

MOVES-based cold start and running mode emissions consist of gasoline exhaust speciated PM and naphthalene. These pre-temperature-adjusted emissions at 72°F are projected to years 2012 and 2014 from year 2005 inventories using the 2012- and 2014-specific runs of MOVES2010. VMT were projected using growth rates from the AEO2009. As with the on_noadj sector, the 2012 and 2014 MOVES2010 data were

created at the state-month level, and the 2012 and 2015 NMIM results were used to disaggregate the state level results to the county level.

MOVES-based temperature adjustment factors were applied to gridded, hourly emissions using gridded, hourly meteorology. As seen in Figure 4-1, for year 2012, we used the same temperature adjustment factors as the 2005 base case for both start and running modes. However, cold start temperature adjustment factors decrease slightly in future years, and for year 2014 processing, we updated the temperature adjustment curves for these cold start emissions. These have little impact, reducing cold-start mode temperature-adjusted PM and naphthalene by under 4% for temperatures down to 0 °F. Note that running exhaust temperature adjustment factors are the same for all years. Also, these running mode exhaust mode emissions are considerably larger than cold start mode emissions.

Figure 4-1. MOVES exhaust temperature adjustment functions for 2005, 2012, and 2014



4.3.2 Nonroad mobile (nonroad)

This sector includes monthly exhaust, evaporative and refueling emissions from nonroad engines (not including commercial marine, aircraft, and locomotives) derived from NMIM for all states except California. Like the onroad emissions, NMIM provides nonroad emissions for VOC by three emission modes: exhaust, evaporative and refueling. Unlike the onroad sector, nonroad refueling emissions for nonroad sources are not included in the nonpoint (nonpt) sector and so are retained in this sector.

With the exception of California, U.S. emissions for the nonroad sector (defined as the equipment types covered by NMIM) were created using a consistent NMIM-based approach as was used for 2005, but projected for 2012 and 2015. The 2012 and 2015 NMIM runs utilized the NR05d-Bond-final version of NONROAD (which is equivalent to NONROAD2008a). Similar to the onroad mobile NMIM inventories, year 2014 NMIM emissions were created by interpolating year 2012 and year 2015 NMIM inventories. These future-year emissions account for increases in activity (based on NONROAD model default growth estimates of future-year equipment population) and changes in fuels and engines that reflect implementation of national regulations and local control programs that impact each year differently due to engine turnover.

The national regulations incorporated in the modeling are those promulgated prior to December 2009, and beginning about 1990. Recent rules include:

- "Clean Air Nonroad Diesel Final Rule - Tier 4": (http://www.epa.gov/nonroaddiesel/2004fr.htm), published June 29, 2004, and,
- Control of Emissions from Nonroad Large Spark-Ignition Engines, and Recreational Engines (Marine and Land-Based), November 8, 2002 ("Pentathalon Rule").
- OTAQ's Locomotive Marine Rule: (http://www.epa.gov/otaq/regs/nonroad/420f08004.htm)
- OTAQ's Small Engine Spark Ignition ("Bond") Rule: (http://www.epa.gov/otaq/equip-ld.htm)

We have not included voluntary programs such as programs encouraging either no refueling or evening refueling on Ozone Action Days and diesel retrofit programs. NMIM version 20071009, with county database NCD20070912, and NONROAD model version NONROAD2008a (see http://www.epa.gov/otaq/nonrdmdl.htm#model) was used to create NMIM inventories for 2012 and 2015.

California nonroad emissions

Similar to onroad mobile, NMIM was not used to generate future-year nonroad emissions for California, other than for NH_3. We used NMIM for California future nonroad NH_3 emissions because CARB did not provide these data for any nonroad vehicle types. As we did for onroad emissions, we chose a projection approach that would maintain consistency between the base year and future-year emissions for nonroad emissions in California.

California year 2014 nonroad CAP emissions are similar to those used in the 2002v3 projected inventory. However, similar to onroad mobile, California nonroad HAPs were computed as ratios to select CAPs using 2005 NMIM CAP-HAP ratios.

California year 2012 nonroad CAP emissions were computed by linearly interpolating year 2009 and 2014 inventories. And 2012 HAP emissions were also computed using the same 2005-based CAP-HAP ratios used to create 2014 HAP emissions.

4.3.3 Locomotives and Class 1 & 2 commercial marine vessels (alm_no_c3)

Future locomotive and Class 1 and Class 2 commercial marine vessel (CMV) emissions were calculated using projection factors that were computed based on national, annual summaries of locomotive emissions in 2002 and future years. These national summaries were used to create national by-pollutant, by-SCC projection factors; these factors include final locomotive-marine controls and are provided in Table 4-11.

Table 4-11. Factors applied to year 2005 emissions to project locomotives and Class 1 and Class 2 Commercial Marine Vessel Emissions

SCC	SCC Description	Pollutant	Projection Factor 2012	Projection Factor 2014
2280002X00	Marine Vessels, Commercial;Diesel;Underway & port emissions	CO	0.972	0.968
2280002X00	Marine Vessels, Commercial;Diesel;Underway & port emissions	NH_3	1.094	1.114
2280002X00	Marine Vessels, Commercial;Diesel;Underway & port emissions	NO_X	0.851	0.792
2280002X00	Marine Vessels, Commercial;Diesel;Underway & port emissions	PM_{10}	0.875	0.762
2280002X00	Marine Vessels, Commercial;Diesel;Underway & port emissions	$PM_{2.5}$	0.890	0.775
2280002X00	Marine Vessels, Commercial;Diesel;Underway & port emissions	SO_2	0.531	0.278
2280002X00	Marine Vessels, Commercial;Diesel;Underway & port emissions	VOC	0.951	0.897
2285002006	Railroad Equipment;Diesel;Line Haul Locomotives: Class I Operations	CO	1.232	1.272
2285002006	Railroad Equipment;Diesel;Line Haul Locomotives: Class I Operations	NH_3	1.223	1.262
2285002006	Railroad Equipment;Diesel;Line Haul Locomotives: Class I Operations	NO_X	0.732	0.711

SCC	SCC Description	Pollutant	Projection Factor 2012	Projection Factor 2014
2285002006	Railroad Equipment;Diesel;Line Haul Locomotives: Class I Operations	PM_{10}	0.768	0.696
2285002006	Railroad Equipment;Diesel;Line Haul Locomotives: Class I Operations	$PM_{2.5}$	0.778	0.705
2285002006	Railroad Equipment;Diesel;Line Haul Locomotives: Class I Operations	SO_2	0.166	0.005
2285002006	Railroad Equipment;Diesel;Line Haul Locomotives: Class I Operations	VOC	0.839	0.748
2285002007	Railroad Equipment;Diesel;Line Haul Locomotives: Class II / III Operations	CO	0.303	0.313
2285002007	Railroad Equipment;Diesel;Line Haul Locomotives: Class II / III Operations	NH_3	1.223	1.262
2285002007	Railroad Equipment;Diesel;Line Haul Locomotives: Class II / III Operations	NO_X	0.339	0.350
2285002007	Railroad Equipment;Diesel;Line Haul Locomotives: Class II / III Operations	PM_{10}	0.283	0.286
2285002007	Railroad Equipment;Diesel;Line Haul Locomotives: Class II / III Operations	$PM_{2.5}$	0.286	0.288
2285002007	Railroad Equipment;Diesel;Line Haul Locomotives: Class II / III Operations	SO_2	0.038	0.001
2285002007	Railroad Equipment;Diesel;Line Haul Locomotives: Class II / III Operations	VOC	0.291	0.300
2285002008	Railroad Equipment;Diesel;Line Haul Locomotives: Passenger Trains (Amtrak)	CO	1.030	1.046
2285002008	Railroad Equipment;Diesel;Line Haul Locomotives: Passenger Trains (Amtrak)	NH_3	1.223	1.262
2285002008	Railroad Equipment;Diesel;Line Haul Locomotives: Passenger Trains (Amtrak)	NO_X	0.667	0.598
2285002008	Railroad Equipment;Diesel;Line Haul Locomotives: Passenger Trains (Amtrak)	PM_{10}	0.660	0.576
2285002008	Railroad Equipment;Diesel;Line Haul Locomotives: Passenger Trains (Amtrak)	$PM_{2.5}$	0.662	0.578
2285002008	Railroad Equipment;Diesel;Line Haul Locomotives: Passenger Trains (Amtrak)	SO_2	0.156	0.005
2285002008	Railroad Equipment;Diesel;Line Haul Locomotives: Passenger Trains (Amtrak)	VOC	0.738	0.633
2285002009	Railroad Equipment;Diesel;Line Haul Locomotives: Commuter Lines	CO	1.015	1.032
2285002009	Railroad Equipment;Diesel;Line Haul Locomotives: Commuter Lines	NH_3	1.223	1.262
2285002009	Railroad Equipment;Diesel;Line Haul Locomotives: Commuter Lines	NO_X	0.658	0.590
2285002009	Railroad Equipment;Diesel;Line Haul Locomotives: Commuter Lines	PM_{10}	0.650	0.568
2285002009	Railroad Equipment;Diesel;Line Haul Locomotives: Commuter Lines	$PM_{2.5}$	0.651	0.568
2285002009	Railroad Equipment;Diesel;Line Haul Locomotives: Commuter Lines	SO_2	0.155	0.005
2285002009	Railroad Equipment;Diesel;Line Haul Locomotives: Commuter Lines	VOC	0.728	0.625
2285002010	Railroad Equipment;Diesel;Yard Locomotives	CO	1.239	1.279
2285002010	Railroad Equipment;Diesel;Yard Locomotives	NH_3	1.223	1.262
2285002010	Railroad Equipment;Diesel;Yard Locomotives	NO_X	1.133	1.127
2285002010	Railroad Equipment;Diesel;Yard Locomotives	PM_{10}	0.942	0.919
2285002010	Railroad Equipment;Diesel;Yard Locomotives	$PM_{2.5}$	0.962	0.938
2285002010	Railroad Equipment;Diesel;Yard Locomotives	SO_2	0.183	0.005
2285002010	Railroad Equipment;Diesel;Yard Locomotives	VOC	1.548	1.526

The future-year locomotive emissions account for increased fuel consumption based on Energy Information Administration (EIA) fuel consumption projections for freight rail, and emissions reductions resulting from emissions standards from the Final Locomotive-Marine rule (EPA, 2009). This rule lowered diesel sulfur content and tightened emission standards for existing and new locomotives and marine diesel emissions to lower future-year PM, SO_2, and NO_X, and is documented at: http://www.epa.gov/otaq/regs/nonroad/420f08004.htm. Voluntary retrofits under the National Clean Diesel Campaign (http://www.epa.gov/otaq/diesel/index.htm) are not included in our projections.

We applied HAP factors for VOC HAPs by using the VOC projection factors to obtain 1,3-butadiene, acetaldehyde, acrolein, benzene, and formaldehyde.

Class 1 and 2 CMV gasoline emissions (SCC = 2280004000) were not changed for future-year processing. C1/C2 diesel emissions (SCC = 2280002100 and 2280002200) were projected based on the Final Locomotive Marine rule national-level factors provided in Table 4-11. Similar to locomotives, VOC HAPs were projected based on the VOC factor.

Delaware provided updated future-year NO_X, SO_2, and PM emission estimates for C1/C2 CMV as part of the Transport Rule comments. These updated emissions were applied to the 2012 and 2014 inventories and override the C1/C2 projection factors in Table 4-11.

4.3.4 Class 3 commercial marine vessels (seca_c3)

The seca_c3 sector emissions data were provided by OTAQ in an ASCII raster format used since the SO_2 Emissions Control Area-International Marine Organization (ECA-IMO) project began in 2005. The (S)ECA Category 3 (C3) commercial marine vessel 2002 base-case emissions were projected to year 2005 for the 2005 base case and to years 2012 and 2014 for the future base cases. Both future base cases include ECA-IMO controls. An overview of the ECA-IMO project and future-year goals for reduction of NO_X, SO_2, and PM C3 emissions can be found at: http://www.epa.gov/oms/regs/nonroad/marine/ci/420f09015.htm

The resulting coordinated strategy, including emission standards under the Clean Air Act for new marine diesel engines with per-cylinder displacement at or above 30 liters, and the establishment of Emission Control Areas is at: http://www.epa.gov/oms/oceanvessels.htm

These projection factors vary depending on geographic region and pollutant; where VOC HAPs are assigned the same growth rates as VOC. The projection factors used to create the 2012 and 2014 seca_c3 sector emissions are provided in Table 4-12. Note that these factors are relative to 2002. Factors relative to 2005 can be computed from the 2002-2005 factors.

The geographic regions are described in the ECA Proposal technical support document: http://www.epa.gov/oms/regs/nonroad/marine/ci/420r09007-chap2.pdf. These regions extend up to 200 nautical miles offshore, though less at international boundaries. North and South Pacific regions are divided by the Oregon-Washington border, and East Coast and Gulf Coast regions are divided east-west by roughly the upper Florida Keys just southwest of Miami.

Delaware provided updated future-year NO_X, SO_2, and PM emission estimates for the C3 CMV as part of the Transport Rule comments. These updated emissions were applied to the 2012 and 2014 inventories and override the C3 projection factors in Table 4-12**.**

The factors to compute HAP emission are based on emissions ratios discussed in the 2005v4 documentation. As with the 2005 base case, this sector uses CAP-HAP VOC integration.

Table 4-12. NO_X, SO_2, and $PM_{2.5}$ Factors to Project Class 3 Commercial Marine Vessel emissions to 2012 and 2014

	NO_X		**SO_2**		**$PM_{2.5}$**	
	2012	**2014**	**2012**	**2014**	**2012**	**2014**
Alaska East	1.26234	1.32620	0.52912	0.56462	0.52433	0.55951
Alaska West	1.28461	1.35119	1.33532	1.42491	1.33555	1.42515
East Coast	1.33102	1.39686	0.55987	0.61140	0.51862	0.56635
Gulf Coast	1.12285	1.14364	0.47456	0.50248	0.43526	0.46087
Hawaii East	1.37239	1.45513	0.61127	0.67392	0.54920	0.60550
Hawaii West	1.45767	1.54847	1.59605	1.75964	1.59408	1.75748
North Pacific	1.19916	1.23653	0.54159	0.57792	0.47330	0.50506
South Pacific	1.40836	1.49931	0.64318	0.71344	0.54825	0.60797
Great Lakes	1.08304	1.10302	0.42239	0.43687	0.39684	0.41045
Outside ECA	1.37211	1.44085	1.52102	1.65818	1.52102	1.65818

4.3.5 Future-year VOC Speciation (on_noadj, nonroad)

We used speciation profiles for VOC in the nonroad and on_noadj sectors that account for the increase in ethanol content of fuels in future years. The same future-year profiles were used for 2012 and 2014. The combination profiles use proportions of E0 and E10 expected in the future based on AEO 2007 projections of E10 and E0 fuel use. The proportions of E0 and E10 are the same for 2012 and years beyond (even though the quantities of the two fuels change over these years). The national proportions were allocated to counties across the country using the same fuel modeling done for the stationary source gasoline speciation, as discussed in Section 4.2.8.

The speciation of onroad exhaust VOC additionally accounts for a portion of the vehicle fleet meeting Tier 2 standards; different exhaust profiles are available for pre-Tier 2 versus Tier 2 vehicles. Thus for exhaust VOC, a combination of pre-Tier 2 E0, pre-Tier 2 E10, Tier 2 E0 and Tier 2 E10 profiles are used. Figure 4-2 shows the Tier 2 fraction of Light Duty Vehicles for different future years in terms of different metrics. For previous modeling applications, we based the fraction on the population of vehicles. However, since these vehicles emit a smaller portion of VOC, a more appropriate metric for use in weighting the speciation profiles is the fraction of exhaust total hydrocarbons (THC) which is used in the 2012 case described here. The fraction of Tier 2 emissions used here for 2012 is 0.182. We erroneously used this same fraction for 2014; the correct fraction of Tier 2 emissions for 2014 should have been 0.261.

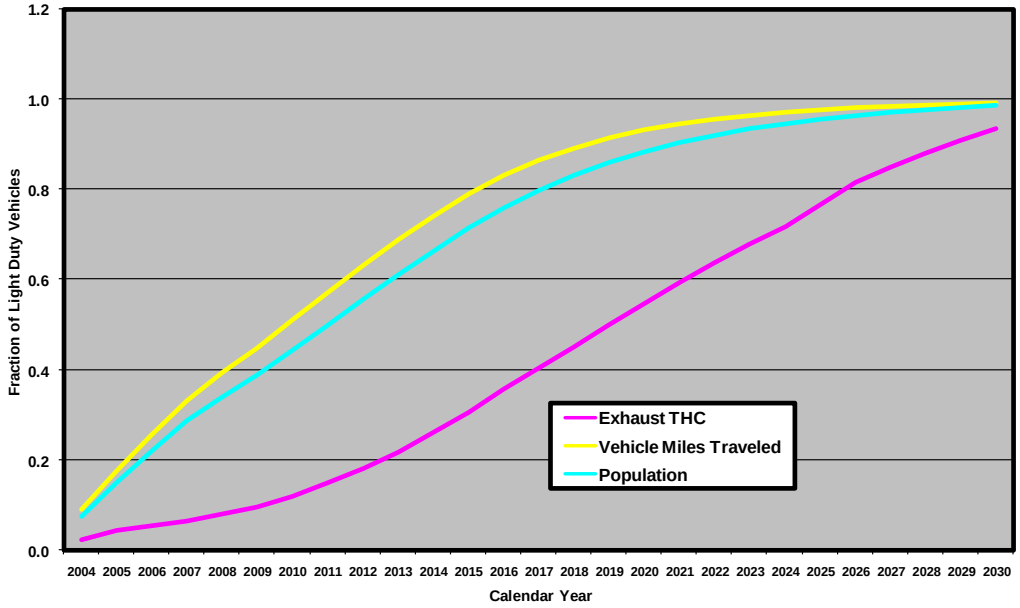
Table 4-13 summarizes the profiles combined for the source categories and VOC emission modes used.

Table 4-13. Future-year Profiles for Mobile Source Related Sources

Sector	Type of profile	Profile Codes Combined for the Future-year Speciation
Stationary	headspace	**8762**: Composite Profile - Gasoline Headspace Vapor using 0% Ethanol **8763**: Composite Profile - Gasoline Headspace Vapor using 10% Ethanol
Nonroad exhaust	Pre-Tier 2 vehicle exhaust	**8750**: Gasoline Exhaust - Reformulated gasoline **8751**: Gasoline Exhaust - E10 ethanol gasoline
Onroad and Nonroad evap*	Evaporative	**8753**: Gasoline Vehicle - Evaporative emission - Reformulated gasoline **8754**: Gasoline Vehicle - Evaporative emission - E10 ethanol gasoline
Nonroad refueling	headspace	Same as Stationary
Onroad exhaust	Pre-Tier 2 vehicle exhaust and Tier 2 vehicle exhaust	**8750**: Gasoline Exhaust - Reformulated gasoline **8751**: Gasoline Exhaust - E10 ethanol gasoline **8756**: Composite Profile - Gasoline Exhaust - Tier 2 light-duty vehicles using 0% Ethanol **8757**: Composite Profile - Gasoline Exhaust - Tier 2 light-duty vehicles using 10% Ethanol

- E0 and E10 combinations are based on AEO2007 projections of E0 and E10 fuel
- Tier 2 and pre-Tier 2 combinations are based on the 2012 contribution of Tier 2 exhaust emissions

Figure 4-2. Tier 2 Fraction of Light Duty Vehicles



4.4 Canada, Mexico, and Offshore sources (othar, othon, and othpt)

Emissions for Canada, Mexico, and offshore sources were not projected to future years, and are therefore the same as those used in the 2005 base case. Therefore, the Mexico emissions are based on year 1999, offshore oil is based on year 2005, and Canada is based on year 2006. For both Mexico and Canada, their responsible agencies did not provide future-year emissions that were consistent with the base year emissions.

5 Source Apportionment

The EPA prepared special emissions inputs for the CAM_X model to allow CAM_X to be used for source apportionment modeling. Source apportionment modeling was used to quantify the impact of emissions in specific upwind states on projected downwind nonattainment and maintenance receptors for both $PM_{2.5}$ and 8-hour ozone. To prepare these emissions, the EPA prepared special tagging input files called GSTAG files for the SMOKE speciation processor.

The tagging input files and custom SMOKE scripts implemented tagging by state of all source emissions except for biogenic and wildfire emissions for all ozone and $PM_{2.5}$ precursors. Separate tagging runs were done for ozone and $PM_{2.5}$ precursors. Biogenic and wildfire emissions were not tagged by state because they are generally considered not feasible for emissions controls, but these were tagged as "other sources" and their contributions could be tracked in total without association with individual states. Prescribed burning and agricultural burning *were* included in the tagged emissions. The states the EPA analyzed using source apportionment for ozone and for $PM_{2.5}$ are: Alabama, Arkansas, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Vermont, Virginia, West Virginia, Washington D.C., and Wisconsin. There were also several other states that are only partially contained within the 12 km modeling domain (i.e., Colorado, Montana, New Mexico, and Wyoming). However, the EPA did not individually track the emissions or assess the contribution from emissions in these states

6 Remedy Case

The 2014 Remedy Case for the Transport Rule represents the implementation of SO_2, annual NO_X, and ozone-season NO_X emission reductions to address upwind state emissions that contribute significantly to nonattainment in, or interfere with maintenance by downwind states with respect to the existing ozone and $PM_{2.5}$ NAAQS standards in the eastern U.S. The final Transport Rule requires SO_2 and/or NO_X reductions from EGUs in 27 states starting in 2012. For the remedy case modeling, the emissions for all sectors were unchanged from the base-case modeling except for those from EGUs (the ptipm sector). The EPA used the IPM model to project the 2014 remedy case EGU emissions. The changes in EGU SO_2 and NO_X emissions as a result of the control case for the lower 48 states are summarized in Section 7. Section 7 also provides state-specific summaries of EGU NO_X and SO_2 for the lower 48 states. Additional details on the changes that resulted from the remedy case are provided in the Transport Rule Final Regulatory Impact Analysis (RIA), Chapter 7 (Cost, Economic, and Energy Impacts), which describes the modeling conducted to estimate the cost, economic, and energy impacts to the power sector.

The 23 states covered by the annual SO_2 and NO_X reduction requirements for the annual and/or 24-hour $PM_{2.5}$ standards in the remedy case are colored in blue and green in Figure 6-1. Figure 6-2 distinguishes between the "Group 1" states (in red) and the "Group 2" states (in orange); the Group 1 states are subject to a second, more stringent phase of SO_2 reductions starting in 2014 (sections VI and VII of the preamble to the final Transport Rule discuss the SO_2 groups in detail). All states covered for the annual and/or 24-hour $PM_{2.5}$ standards are in one annual NO_X tier with uniform stringency beginning in 2012. Table 6-1 shows the groups in which each state is included, including whether the state is included in the Eastern modeling domain. Section 7 provides annual SO_2 and NO_X summaries for these selected groups/tiers of states.

The 20 states required to make ozone-season NO_X reductions to address the 8-hour ozone standard in the final Transport Rule are shown in green and yellow in Figure 6-1. In these states ozone-season NO_X reductions begin with the 2012 ozone season. As discussed in section III of the preamble, the EPA issued a supplemental proposal to provide the opportunity for public comment on inclusion of six additional states in the Transport Rule ozone-season program: Iowa, Kansas, Michigan, Missouri, Oklahoma, and Wisconsin. These six states are also shown in green or yellow in Figure 6-1. Section 7 provides ozone-season NO_X emissions summaries for the states required in the final Transport Rule to make ozone-season NO_X reductions and the six additional states addressed in the supplemental proposal. Figure 6-1 shows for each of the contiguous 48 states the components of the rule they fall under, and whether they are included in the Eastern modeling domain. Tribal land emissions are not associated with particular states; those few tribal emissions in the eastern domain are very small and are not associated with existing units covered by the Transport Rule.

The emissions, cost, air quality, and benefits analyses done for the Transport Rule are from a modeling scenario that requires annual SO_2 and NO_x reductions in the 23 states covered for the $PM_{2.5}$ standards, and ozone season NO_X requirements in the 20 states covered for the ozone standard and the six states addressed by the supplemental proposal (26 states total) as shown in Figure 6-1.

Figure 6-1. States Covered by the Final Transport Rule

(Figure 6-1 includes six states--IA, KS, MI, MO, OK, and WI--not covered for ozone-season requirements in the final rule, for which the EPA issued a supplemental proposal to require ozone-season reductions.)

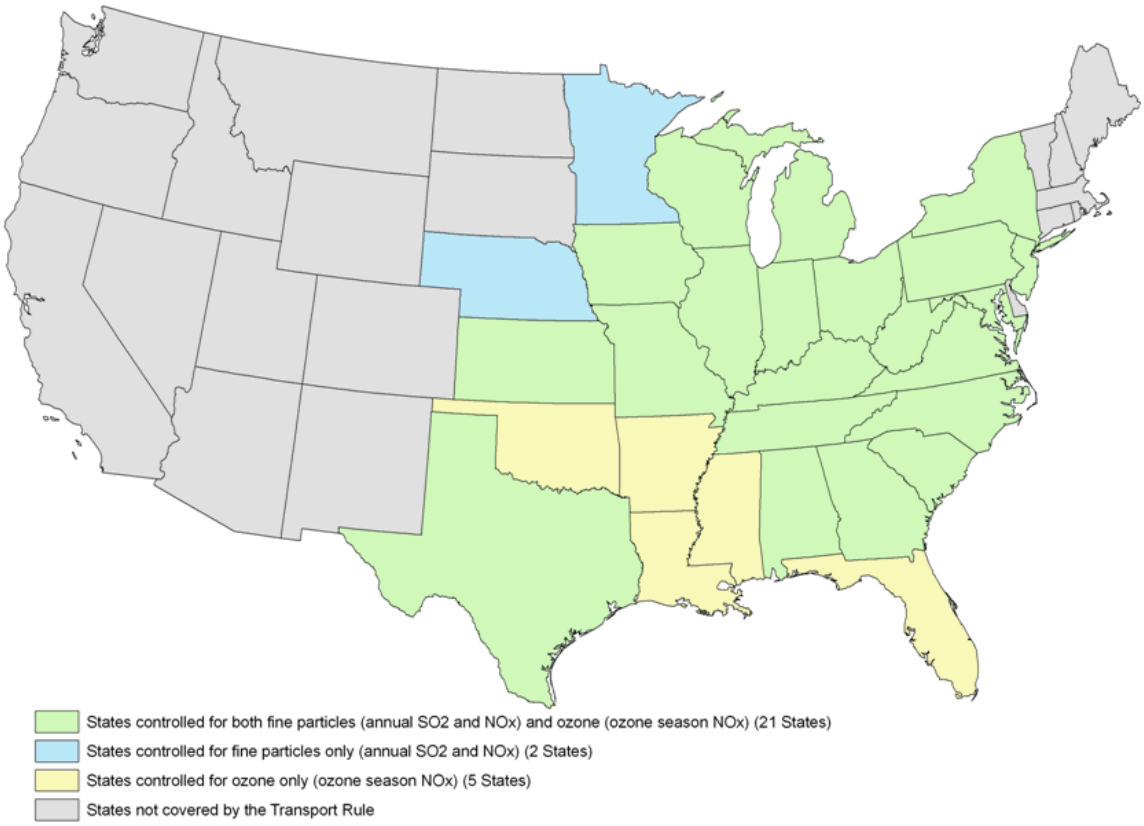


Figure 6-2. Group 1 and Group 2 States Covered by the Annual PM Component of the Final Transport Rule

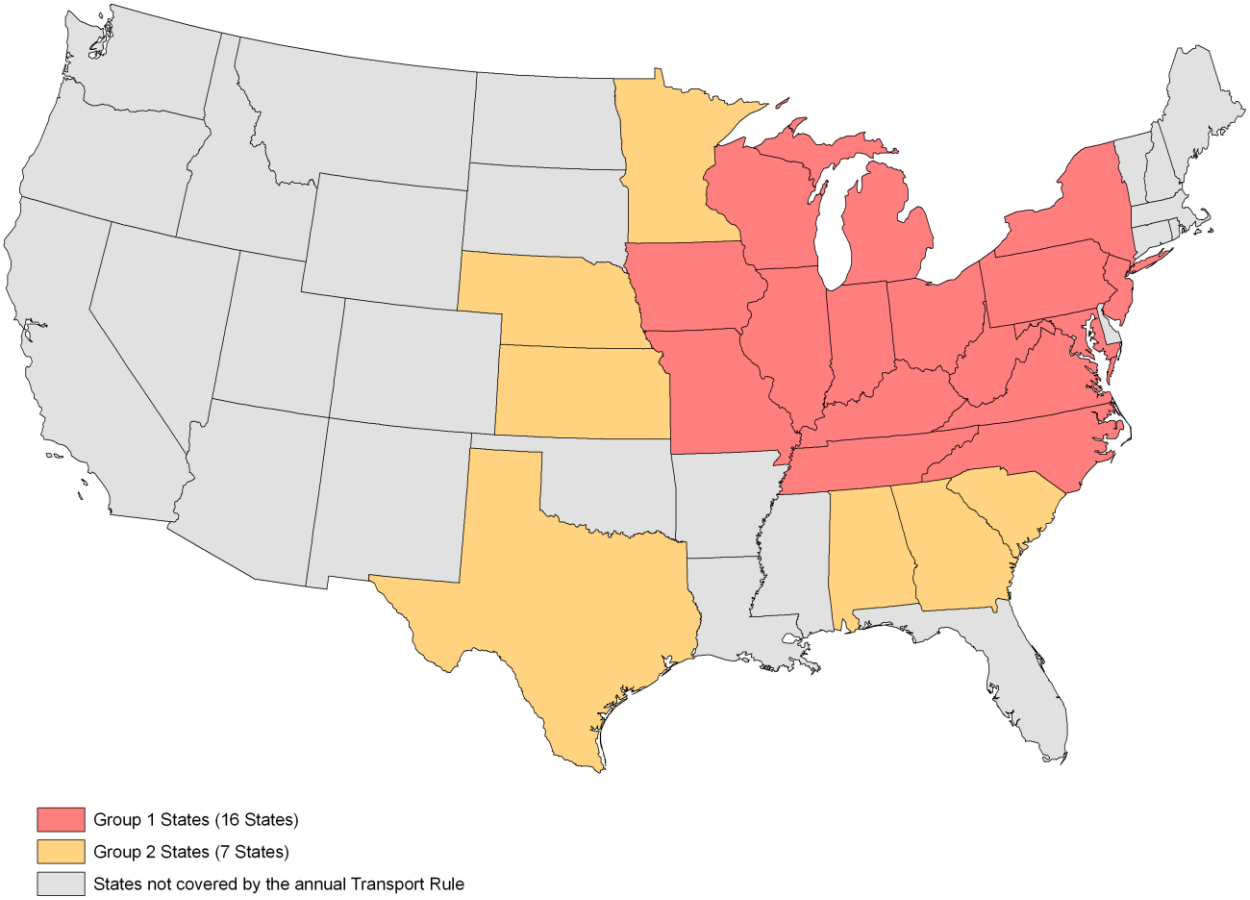


Table 6-1. Transport Rule Status of States

State	State	EPA Region	Covered for $PM_{2.5}$ – Group 1 SO_2	Covered for $PM_{2.5}$ – Group 2 SO_2	Covered for Ozone in Transport Rule	Covered for Ozone in Supplemental Proposal	Total State Coverage	In Eastern Domain	Western State
ALABAMA	AL	4	0	1	1	0	1	1	0
ARIZONA	AZ	9	0	0	0	0	0	0	1
ARKANSAS	AR	6	0	0	1	0	1	1	0
CALIFORNIA	CA	9	0	0	0	0	0	0	1
COLORADO	CO	8	0	0	0	0	0	0	1
CONNECTICUT	CT	1	0	0	0	0	0	1	0
DELAWARE	DE	3	0	0	0	0	0	1	0
DISTRICT OF COLUMBIA	DC	3	0	0	0	0	0	1	0
FLORIDA	FL	4	0	0	1	0	1	1	0
GEORGIA	GA	4	0	1	1	0	1	1	0
IDAHO	ID	10	0	0	0	0	0	0	1

State	State	EPA Region	Covered for $PM_{2.5}$ – Group 1 SO_2	Covered for $PM_{2.5}$ – Group 2 SO_2	Covered for Ozone in Transport Rule	Covered for Ozone in Supplemental Proposal	Total State Coverage	In Eastern Domain	Western State
ILLINOIS	IL	5	1	0	1	0	1	1	0
INDIANA	IN	5	1	0	1	0	1	1	0
IOWA	IA	7	1	0	0	1	1	1	0
KANSAS	KS	7	0	1	0	1	1	1	0
KENTUCKY	KY	4	1	0	1	0	1	1	0
LOUISIANA	LA	6	0	0	1	0	1	1	0
MAINE	ME	1	0	0	0	0	0	1	0
MARYLAND	MD	3	1	0	1	0	1	1	0
MASSACHUSETTS	MA	1	0	0	0	0	0	1	0
MICHIGAN	MI	5	1	0	0	1	1	1	0
MINNESOTA	MN	5	0	1	0	0	1	1	0
MISSISSIPPI	MS	4	0	0	1	0	1	1	0
MISSOURI	MO	7	1	0	0	1	1	1	0
MONTANA	MT	8	0	0	0	0	0	0	1
NEBRASKA	NE	7	0	1	0	0	1	1	0
NEVADA	NV	9	0	0	0	0	0	0	1
NEW HAMPSHIRE	NH	1	0	0	0	0	0	1	0
NEW JERSEY	NJ	2	1	0	1	0	1	1	0
NEW MEXICO	NM	6	0	0	0	0	0	0	1
NEW YORK	NY	2	1	0	1	0	1	1	0
NORTH CAROLINA	NC	4	1	0	1	0	1	1	0
NORTH DAKOTA	ND	8	0	0	0	0	0	1	0
OHIO	OH	5	1	0	1	0	1	1	0
OKLAHOMA	OK	6	0	0	0	1	1	1	0
OREGON	OR	10	0	0	0	0	0	0	1
PENNSYLVANIA	PA	3	1	0	1	0	1	1	0
RHODE ISLAND	RI	1	0	0	0	0	0	1	0
SOUTH CAROLINA	SC	4	0	1	1	0	1	1	0
SOUTH DAKOTA	SD	8	0	0	0	0	0	1	0
TENNESSEE	TN	4	1	0	1	0	1	1	0
TEXAS	TX	6	0	1	1	0	1	1	0
TRIBAL			0	0	0	0	0	1	0
UTAH	UT	8	0	0	0	0	0	0	1
VERMONT	VT	1	0	0	0	0	0	1	0
VIRGINIA	VA	3	1	0	1	0	1	1	0
WASHINGTON	WA	10	0	0	0	0	0	0	1
WEST VIRGINIA	WV	3	1	0	1	0	1	1	0
WISCONSIN	WI	5	1	0	0	1	1	1	0
WYOMING	WY	8	0	0	0	0	0	0	1

State	State	EPA Region	Covered for $PM_{2.5}$ – Group 1 SO_2	Covered for $PM_{2.5}$ – Group 2 SO_2	Covered for Ozone in Transport Rule	Covered for Ozone in Supplemental Proposal	Total State Coverage	In Eastern Domain	Western State
TOTAL COUNT			**16**	**7**	**26**	**6**	**28**	**39**	**11**

7 Emission Summaries

The following tables summarize emissions differences between the 2005 base case, 2012 base case, 2014 base case, and 2014 EGU control case at various levels of geographic, temporal, and emission sector resolution.

Table 7-1 and

Table 7-2 provide NO_X and SO_2 emissions, respectively (including average fire emissions and excluding biogenic emissions) by state for the 2005 base case, 2012 base case, 2014 base case, and 2014 EGU control cases, as well as differences and percent differences between these cases. Note that the average fire emissions are the same for all emissions cases. Table 7-3 and Table 7-4 provide EGU sector (ptipm) NO_X and SO_2 emissions (respectively) by state for the 2005 base case, 2012 base case, 2014 base case, and 2014 EGU control cases, as well as differences and percent differences between these cases.

Table 7-5 and Table 7-6 provide NO_X and SO_2 emissions, respectively (including average fire emissions and excluding biogenic emissions) for the "group 1" states, "group 2" states, and cumulative totals for all states included in the Transport Rule for PM. See Figure 6-2 for a map of the group 1 and group 2 states. Emissions are provided for the 2005 base case, 2012 base case, 2014 base case, and 2014 EGU remedy cases, as well as differences and percent differences between these cases. We also provide summaries for all "Eastern Modeling Domain" states and "All Western States". The western states are defined as Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. States in the eastern modeling domain are defined as the rest of the contiguous (lower 48 states) U.S. plus the District of Columbia.

Table 7-7 and Table 7-8 provide EGU sector only (ptipm) NO_X and SO_2 emissions (respectively) for the "group 1" states, "group 2" states, and cumulative totals for all states included in the Transport Rule for PM. See Figure 6-2 for a map of the group 1 and group 2 states. Emissions are provided for the 2005 base case, 2012 base case, 2014 base case, and 2014 EGU remedy case, as well as differences and percent differences between these cases. Summaries for the eastern modeling domain states and western states are also provided.

Table 7-9 provides summer (defined as May through September) EGU and Total Anthropogenic NO_X for the states that the Transport Rule covers for ozone. See Figure 6-2 for a map of these states. Emissions are provided for the 2005 base case, 2012 base case, 2014 base case, and 2014 EGU control ("remedy") cases, as well as differences and percent differences between these cases.

Additional information and pollutants are provided in the accompanying workbook: TransportRuleFinal_EmissionsSummaries.xls.

Table 7-1. State-level Total NO_X Emissions for each Transport Rule Modeling Case in 48 States and Washington, D.C.

State	2005 Base	2012 Base	2014 Base	2014 Remedy	2012 Base minus 2005 Base		2014 Base minus 2012 Base		2014 Remedy minus 2014 Base	
					Difference	% Diff.	Difference	% Diff	Difference	% Diff.
Alabama	484,282	343,206	321,975	315,155	-141,076	-29.1%	-21,231	-6.2%	-6,820	-2.1%
Arizona	400,774	274,608	248,574	248,570	-126,166	-31.5%	-26,034	-9.5%	-4	0.0%
Arkansas	264,979	205,673	193,670	194,964	-59,306	-22.4%	-12,002	-5.8%	1,293	0.7%
California	1,333,571	1,030,864	942,254	942,157	-302,706	-22.7%	-88,610	-8.6%	-97	0.0%
Colorado	334,635	253,291	237,296	237,246	-81,344	-24.3%	-15,995	-6.3%	-50	0.0%
Connecticut	129,736	88,660	80,787	80,793	-41,076	-31.7%	-7,873	-8.9%	6	0.0%
Delaware	58,486	35,549	31,729	31,744	-22,936	-39.2%	-3,820	-10.7%	15	0.0%
District of Columbia	16,802	11,040	9,773	9,773	-5,762	-34.3%	-1,267	-11.5%	0	0.0%
Florida	1,056,174	683,733	638,227	616,154	-372,441	-35.3%	-45,506	-6.7%	-22,073	-3.5%
Georgia	662,673	456,393	403,691	395,764	-206,280	-31.1%	-52,702	-11.5%	-7,927	-2.0%
Idaho	122,228	105,888	101,710	101,710	-16,340	-13.4%	-4,178	-3.9%	0	0.0%
Illinois	865,139	583,602	546,467	540,361	-281,537	-32.5%	-37,135	-6.4%	-6,107	-1.1%
Indiana	673,669	455,325	431,342	424,250	-218,344	-32.4%	-23,983	-5.3%	-7,092	-1.6%
Iowa	331,034	238,425	223,390	217,221	-92,608	-28.0%	-15,036	-6.3%	-6,169	-2.8%
Kansas	387,554	271,578	248,692	240,384	-115,976	-29.9%	-22,886	-8.4%	-8,308	-3.3%
Kentucky	482,262	318,048	294,262	286,806	-164,214	-34.1%	-23,786	-7.5%	-7,456	-2.5%
Louisiana	626,542	494,774	466,089	466,098	-131,768	-21.0%	-28,686	-5.8%	9	0.0%
Maine	86,094	66,633	61,657	61,657	-19,461	-22.6%	-4,975	-7.5%	0	0.0%
Maryland	312,230	197,441	181,909	181,533	-114,789	-36.8%	-15,533	-7.9%	-375	-0.2%
Massachusetts	283,638	189,620	175,275	175,316	-94,018	-33.1%	-14,345	-7.6%	41	0.0%
Michigan	718,454	481,684	449,343	442,544	-236,770	-33.0%	-32,341	-6.7%	-6,798	-1.5%
Minnesota	506,905	364,052	345,483	338,438	-142,853	-28.2%	-18,568	-5.1%	-7,045	-2.0%
Mississippi	324,595	232,009	216,438	216,224	-92,587	-28.5%	-15,571	-6.7%	-214	-0.1%
Missouri	563,356	374,298	357,846	352,631	-189,059	-33.6%	-16,451	-4.4%	-5,216	-1.5%
Montana	149,429	97,575	92,723	92,627	-51,854	-34.7%	-4,852	-5.0%	-96	-0.1%
Nebraska	263,714	197,887	186,408	169,571	-65,827	-25.0%	-11,479	-5.8%	-16,836	-9.0%
Nevada	151,905	86,487	81,041	81,017	-65,418	-43.1%	-5,446	-6.3%	-24	0.0%
New Hampshire	73,325	50,415	47,637	47,482	-22,910	-31.2%	-2,778	-5.5%	-156	-0.3%

State	2005 Base	2012 Base	2014 Base	2014 Remedy	2012 Base minus 2005 Base		2014 Base minus 2012 Base		2014 Remedy minus 2014 Base	
New Jersey	341,376	230,816	210,127	209,841	-110,559	-32.4%	-20,690	-9.0%	-286	-0.1%
New Mexico	343,139	281,341	264,414	264,502	-61,798	-18.0%	-16,926	-6.0%	88	0.0%
New York	688,109	491,308	459,087	457,927	-196,800	-28.6%	-32,221	-6.6%	-1,160	-0.3%
North Carolina	554,183	352,649	321,544	317,230	-201,534	-36.4%	-31,106	-8.8%	-4,314	-1.3%
North Dakota	182,289	133,332	127,125	127,127	-48,956	-26.9%	-6,207	-4.7%	2	0.0%
Ohio	906,327	560,718	522,450	508,054	-345,609	-38.1%	-38,268	-6.8%	-14,396	-2.8%
Oklahoma	434,284	344,447	328,683	305,859	-89,837	-20.7%	-15,764	-4.6%	-22,823	-6.9%
Oregon	240,218	189,886	179,324	179,371	-50,332	-21.0%	-10,563	-5.6%	48	0.0%
Pennsylvania	781,647	565,051	529,673	514,563	-216,596	-27.7%	-35,378	-6.3%	-15,110	-2.9%
Rhode Island	28,381	20,756	18,808	18,808	-7,625	-26.9%	-1,948	-9.4%	0	0.0%
South Carolina	314,276	216,883	204,389	202,118	-97,393	-31.0%	-12,494	-5.8%	-2,271	-1.1%
South Dakota	91,336	70,618	65,498	65,500	-20,717	-22.7%	-5,121	-7.3%	3	0.0%
Tennessee	527,027	338,047	302,103	293,339	-188,980	-35.9%	-35,944	-10.6%	-8,764	-2.9%
Texas	2,006,916	1,501,170	1,372,735	1,368,612	-505,746	-25.2%	-128,435	-8.6%	-4,123	-0.3%
Tribal	13,400	13,304	13,137	13,137	-96	-0.7%	-167	-1.3%	0	0.0%
Utah	216,810	179,535	170,840	170,840	-37,275	-17.2%	-8,696	-4.8%	0	0.0%
Vermont	25,696	23,142	22,824	22,824	-2,554	-9.9%	-318	-1.4%	0	0.0%
Virginia	488,263	359,907	334,720	333,985	-128,355	-26.3%	-25,187	-7.0%	-735	-0.2%
Washington	357,674	268,870	249,322	249,322	-88,804	-24.8%	-19,548	-7.3%	0	0.0%
West Virginia	308,655	172,143	166,094	155,245	-136,512	-44.2%	-6,049	-3.5%	-10,849	-6.5%
Wisconsin	401,226	279,465	262,201	254,989	-121,760	-30.3%	-17,264	-6.2%	-7,212	-2.8%
Wyoming	236,894	191,051	183,726	184,297	-45,843	-19.4%	-7,325	-3.8%	571	0.3%
Grand Total	**21,152,309**	**14,973,199**	**13,924,510**	**13,725,678**	**-6,179,110**	**-29.2%**	**-1,048,689**	**-7.0%**	**-198,832**	**-1.4%**

Table 7-2. State-level Total SO_2 Emissions for each Transport Rule Modeling Case in 48 States and Washington, D.C.

State	2005 Base	2012 Base	2014 Base	2014 Remedy	2012 Base minus 2005 Base		2014 Base minus 2012 Base		2014 Remedy minus 2014 Base	
					Difference	% Diff.	Difference	% Diff.	Difference	% Diff.
Alabama	589,408	574,045	534,700	290,925	-15,363	-2.6%	-39,345	-6.9%	-243,775	-45.6%
Arizona	92,231	65,046	65,792	65,792	-27,185	-29.5%	746	1.1%	0	0.0%

State	2005 Base	2012 Base	2014 Base	2014 Remedy	2012 Base minus 2005 Base		2014 Base minus 2012 Base		2014 Remedy minus 2014 Base	
Arkansas	115,087	129,337	139,599	146,873	14,250	12.4%	10,262	7.9%	7,274	5.2%
California	164,217	136,846	119,268	119,268	-27,371	-16.7%	-17,579	-12.8%	0	0.0%
Colorado	82,213	63,748	72,227	83,980	-18,465	-22.5%	8,479	13.3%	11,753	16.3%
Connecticut	34,576	24,455	24,618	24,727	-10,121	-29.3%	163	0.7%	109	0.4%
Delaware	71,449	10,703	9,311	9,311	-60,746	-85.0%	-1,392	-13.0%	0	0.0%
District of Columbia	3,961	2,289	2,230	2,230	-1,672	-42.2%	-59	-2.6%	0	0.0%
Florida	596,729	247,550	280,233	284,700	-349,179	-58.5%	32,683	13.2%	4,468	1.6%
Georgia	744,119	511,422	274,332	197,251	-232,697	-31.3%	-237,090	-46.4%	-77,080	-28.1%
Idaho	27,166	24,326	24,248	24,248	-2,840	-10.5%	-79	-0.3%	0	0.0%
Illinois	518,531	608,867	260,031	251,073	90,336	17.4%	-348,835	-57.3%	-8,959	-3.4%
Indiana	1,040,947	929,162	863,923	331,182	-111,785	-10.7%	-65,239	-7.0%	-532,740	-61.7%
Iowa	225,451	206,314	198,747	149,491	-19,136	-8.5%	-7,567	-3.7%	-49,256	-24.8%
Kansas	196,515	116,861	117,050	92,971	-79,654	-40.5%	189	0.2%	-24,078	-20.6%
Kentucky	573,604	580,849	547,085	176,007	7,244	1.3%	-33,764	-5.8%	-371,078	-67.8%
Louisiana	307,340	249,655	261,579	282,552	-57,685	-18.8%	11,924	4.8%	20,973	8.0%
Maine	35,129	27,598	20,642	20,642	-7,531	-21.4%	-6,956	-25.2%	0	0.0%
Maryland	371,166	128,360	120,089	107,531	-242,806	-65.4%	-8,271	-6.4%	-12,558	-10.5%
Massachusetts	138,551	53,866	57,914	57,913	-84,686	-61.1%	4,049	7.5%	-1	0.0%
Michigan	492,106	362,718	364,035	257,233	-129,388	-26.3%	1,317	0.4%	-106,802	-29.3%
Minnesota	155,736	109,940	112,099	90,784	-45,796	-29.4%	2,158	2.0%	-21,315	-19.0%
Mississippi	121,397	63,330	64,156	65,293	-58,066	-47.8%	825	1.3%	1,137	1.8%
Missouri	423,253	483,607	511,664	308,275	60,354	14.3%	28,057	5.8%	-203,388	-39.8%
Montana	39,518	25,621	26,678	34,058	-13,897	-35.2%	1,057	4.1%	7,379	27.7%
Nebraska	100,026	87,120	85,799	84,065	-12,906	-12.9%	-1,321	-1.5%	-1,734	-2.0%
Nevada	73,018	29,694	30,112	30,112	-43,325	-59.3%	418	1.4%	0	0.0%
New Hampshire	63,614	13,401	16,391	16,680	-50,213	-78.9%	2,990	22.3%	289	1.8%
New Jersey	91,898	49,252	61,455	28,841	-42,646	-46.4%	12,203	24.8%	-32,614	-53.1%
New Mexico	50,755	25,254	26,507	28,575	-25,501	-50.2%	1,253	5.0%	2,068	7.8%
New York	386,707	232,727	163,302	135,575	-153,980	-39.8%	-69,425	-29.8%	-27,727	-17.0%
North Carolina	609,652	231,489	208,652	151,982	-378,163	-62.0%	-22,837	-9.9%	-56,670	-27.2%
North Dakota	160,082	118,490	119,385	119,375	-41,592	-26.0%	895	0.8%	-9	0.0%

State	2005 Base	2012 Base	2014 Base	2014 Remedy	2012 Base minus 2005 Base		2014 Base minus 2012 Base		2014 Remedy minus 2014 Base	
Ohio	1,274,427	999,536	966,938	294,714	-274,890	-21.6%	-32,598	-3.3%	-672,224	-69.5%
Oklahoma	167,918	178,504	175,459	175,550	10,586	6.3%	-3,045	-1.7%	91	0.1%
Oregon	44,438	36,494	37,175	37,175	-7,945	-17.9%	681	1.9%	0	0.0%
Pennsylvania	1,172,555	638,071	645,278	261,173	-534,483	-45.6%	7,207	1.1%	-384,105	-59.5%
Rhode Island	7,366	6,391	6,385	6,385	-975	-13.2%	-6	-0.1%	0	0.0%
South Carolina	275,871	231,565	258,231	145,737	-44,306	-16.1%	26,666	11.5%	-112,494	-43.6%
South Dakota	29,083	42,688	42,453	42,453	13,605	46.8%	-235	-0.6%	0	0.0%
Tennessee	378,676	419,588	378,878	159,131	40,912	10.8%	-40,710	-9.7%	-219,747	-58.0%
Texas	927,857	712,582	704,311	517,627	-215,275	-23.2%	-8,271	-1.2%	-186,685	-26.5%
Tribal	1,515	1,510	677	677	-4	-0.3%	-833	-55.2%	0	0.0%
Utah	53,893	46,929	45,947	46,417	-6,965	-12.9%	-981	-2.1%	469	1.0%
Vermont	7,078	6,631	6,614	6,614	-446	-6.3%	-18	-0.3%	0	0.0%
Virginia	337,752	181,472	162,611	136,499	-156,280	-46.3%	-18,861	-10.4%	-26,112	-16.1%
Washington	57,580	38,581	38,062	38,062	-18,999	-33.0%	-519	-1.3%	0	0.0%
West Virginia	534,392	585,385	546,702	132,539	50,993	9.5%	-38,683	-6.6%	-414,163	-75.8%
Wisconsin	264,315	204,473	198,795	118,394	-59,842	-22.6%	-5,678	-2.8%	-80,401	-40.4%
Wyoming	123,503	74,547	80,419	87,133	-48,956	-39.6%	5,872	7.9%	6,714	8.3%
Grand Total	**14,354,370**	**10,928,889**	**10,078,786**	**6,275,795**	**-3,425,481**	**-23.9%**	**-850,103**	**-7.8%**	**-3,802,991**	**-37.7%**

Table 7-3. State-level Electric Generating Unit Sector NO_X Emissions for each Transport Rule Modeling Case in 48 States and Washington, D.C.

State	2005 Base	2012 Base	2014 Base	2014 Remedy	2012 Base minus 2005 Base		2014 Base minus 2012 Base		2014 Remedy minus 2014 Base	
					Difference	% Diff.	Difference	% Diff.	Difference	% Diff.
Alabama	133,051	83,037	76,012	69,192	-50,014	-37.6%	-7,025	-8.5%	-6,820	-9.0%
Arizona	79,776	40,365	35,616	35,613	-39,412	-49.4%	-4,748	-11.8%	-4	0.0%
Arkansas	35,407	33,540	36,347	37,640	-1,867	-5.3%	2,807	8.4%	1,293	3.6%
California	6,925	25,101	26,874	26,776	18,176	262.5%	1,773	7.1%	-97	-0.4%
Colorado	73,909	48,464	49,381	49,331	-25,445	-34.4%	917	1.9%	-50	-0.1%
Connecticut	6,865	2,603	2,854	2,860	-4,262	-62.1%	251	9.7%	6	0.2%

State	2005 Base	2012 Base	2014 Base	2014 Remedy	2012 Base minus 2005 Base		2014 Base minus 2012 Base		2014 Remedy minus 2014 Base	
Delaware	11,917	2,639	1,701	1,717	-9,278	-77.9%	-937	-35.5%	15	0.9%
District of Columbia	492	0	0	0	-492	-100.0%	0		0	
Florida	217,282	91,072	100,581	78,508	-126,210	-58.1%	9,509	10.4%	-22,073	-21.9%
Georgia	111,281	67,682	49,411	41,484	-43,599	-39.2%	-18,271	-27.0%	-7,927	-16.0%
Idaho	19	608	608	608	589	3062.5%	0	0.0%	0	0.0%
Illinois	127,940	52,481	55,269	49,162	-75,459	-59.0%	2,788	5.3%	-6,107	-11.0%
Indiana	213,588	120,593	117,832	110,740	-92,995	-43.5%	-2,761	-2.3%	-7,092	-6.0%
Iowa	72,806	46,105	48,400	42,231	-26,701	-36.7%	2,295	5.0%	-6,169	-12.7%
Kansas	90,220	37,240	32,637	24,328	-52,981	-58.7%	-4,603	-12.4%	-8,308	-25.5%
Kentucky	164,783	88,195	83,544	76,088	-76,588	-46.5%	-4,651	-5.3%	-7,456	-8.9%
Louisiana	64,987	30,453	31,573	31,582	-34,534	-53.1%	1,120	3.7%	9	0.0%
Maine	1,100	4,864	5,402	5,402	3,764	342.2%	538	11.1%	0	0.0%
Maryland	62,574	16,706	17,566	17,190	-45,868	-73.3%	860	5.1%	-375	-2.1%
Massachusetts	25,134	4,954	6,992	7,033	-20,181	-80.3%	2,038	41.1%	41	0.6%
Michigan	120,026	63,266	67,705	60,907	-56,761	-47.3%	4,440	7.0%	-6,798	-10.0%
Minnesota	84,304	39,400	41,474	34,429	-44,904	-53.3%	2,074	5.3%	-7,045	-17.0%
Mississippi	45,166	23,655	26,294	26,080	-21,510	-47.6%	2,639	11.2%	-214	-0.8%
Missouri	127,431	55,633	57,318	52,103	-71,798	-56.3%	1,685	3.0%	-5,216	-9.1%
Montana	39,858	18,302	19,399	19,303	-21,555	-54.1%	1,096	6.0%	-96	-0.5%
Nebraska	52,426	44,496	45,047	28,211	-7,930	-15.1%	551	1.2%	-16,836	-37.4%
Nevada	47,297	13,294	14,074	14,050	-34,003	-71.9%	780	5.9%	-24	-0.2%
New Hampshire	8,827	4,068	5,126	4,971	-4,759	-53.9%	1,059	26.0%	-156	-3.0%
New Jersey	30,142	7,534	8,006	7,720	-22,608	-75.0%	472	6.3%	-286	-3.6%
New Mexico	75,483	64,264	64,745	64,833	-11,220	-14.9%	481	0.7%	88	0.1%
New York	63,315	20,909	21,689	20,528	-42,406	-67.0%	779	3.7%	-1,160	-5.4%
North Carolina	111,576	54,463	49,322	45,008	-57,113	-51.2%	-5,141	-9.4%	-4,314	-8.7%
North Dakota	76,381	52,968	53,265	53,267	-23,414	-30.7%	297	0.6%	2	0.0%
Ohio	258,944	103,192	104,149	89,753	-155,751	-60.1%	957	0.9%	-14,396	-13.8%
Oklahoma	86,204	66,365	66,966	44,143	-19,839	-23.0%	601	0.9%	-22,823	-34.1%
Oregon	9,383	8,875	9,584	9,632	-508	-5.4%	709	8.0%	48	0.5%
Pennsylvania	176,891	130,738	134,092	118,981	-46,153	-26.1%	3,354	2.6%	-15,110	-11.3%

State	2005 Base	2012 Base	2014 Base	2014 Remedy	2012 Base minus 2005 Base		2014 Base minus 2012 Base		2014 Remedy minus 2014 Base	
Rhode Island	545	449	442	442	-96	-17.6%	-7	-1.6%	0	0.0%
South Carolina	52,657	35,395	39,018	36,747	-17,262	-32.8%	3,623	10.2%	-2,271	-5.8%
South Dakota	15,650	14,269	14,270	14,273	-1,381	-8.8%	1	0.0%	3	0.0%
Tennessee	102,934	37,694	29,276	20,512	-65,240	-63.4%	-8,418	-22.3%	-8,764	-29.9%
Texas	176,170	137,128	142,087	137,964	-39,043	-22.2%	4,960	3.6%	-4,123	-2.9%
Tribal	78	32	11	11	-46	-58.6%	-21	-64.9%	0	0.0%
Utah	65,261	67,429	67,434	67,434	2,168	3.3%	5	0.0%	0	0.0%
Vermont	297	379	455	455	82	27.6%	76	20.2%	0	0.0%
Virginia	62,793	38,820	40,469	39,734	-23,973	-38.2%	1,649	4.2%	-735	-1.8%
Washington	17,634	12,565	13,322	13,322	-5,069	-28.7%	757	6.0%	0	0.0%
West Virginia	159,947	62,434	64,824	53,975	-97,513	-61.0%	2,390	3.8%	-10,849	-16.7%
Wisconsin	72,170	40,062	40,750	33,537	-32,108	-44.5%	687	1.7%	-7,212	-17.7%
Wyoming	89,315	69,911	70,207	70,778	-19,404	-21.7%	296	0.4%	571	0.8%
Grand Total	**3,729,161**	**2,084,689**	**2,089,422**	**1,890,590**	**-1,644,472**	**-44.1%**	**4,733**	**0.2%**	**-198,832**	**-9.5%**

Table 7-4. State-level Electric Generating Unit Sector SO_2 Emissions for each Transport Rule Modeling Case in 48 States and Washington, D.C.

State	2005 Base	2012 Base	2014 Base	2014 Remedy	2012 Base minus 2005 Base		2014 Base minus 2012 Base		2014 Remedy minus 2014 Base	
					Difference	% Diff.	Difference	% Diff.	Difference	% Diff.
Alabama	460,123	455,825	417,340	173,566	-4,298	-0.9%	-38,485	-8.4%	-243,775	-58.4%
Arizona	52,733	34,734	35,601	35,601	-17,999	-34.1%	867	2.5%	0	0.0%
Arkansas	66,384	87,241	99,411	106,685	20,857	31.4%	12,170	13.9%	7,274	7.3%
California	601	6,763	7,350	7,350	6,162	1025.3%	587	8.7%	0	0.0%
Colorado	64,174	52,963	62,105	73,858	-11,211	-17.5%	9,143	17.3%	11,753	18.9%
Connecticut	10,356	3,355	3,774	3,883	-7,001	-67.6%	419	12.5%	109	2.9%
Delaware	32,378	3,641	2,172	2,172	-28,738	-88.8%	-1,468	-40.3%	0	0.0%
District of Columbia	1,082	0	0	0	-1,082	-100.0%	0		0	
Florida	417,321	110,687	143,601	148,069	-306,634	-73.5%	32,914	29.7%	4,468	3.1%

State	2005 Base	2012 Base	2014 Base	2014 Remedy	2012 Base minus 2005 Base		2014 Base minus 2012 Base		2014 Remedy minus 2014 Base	
Georgia	616,063	406,279	170,288	93,208	-209,784	-34.1%	-235,991	-58.1%	-77,080	-45.3%
Idaho	0	182	182	182	182	106823.2%	0	0.0%	0	0.0%
Illinois	330,382	489,140	141,606	132,647	158,758	48.1%	-347,534	-71.0%	-8,959	-6.3%
Indiana	878,979	789,116	727,786	195,046	-89,863	-10.2%	-61,330	-7.8%	-532,740	-73.2%
Iowa	130,264	127,102	133,083	83,827	-3,162	-2.4%	5,981	4.7%	-49,256	-37.0%
Kansas	136,520	68,541	69,819	45,740	-67,978	-49.8%	1,277	1.9%	-24,078	-34.5%
Kentucky	502,731	520,546	488,005	116,927	17,815	3.5%	-32,541	-6.3%	-371,078	-76.0%
Louisiana	109,875	103,835	118,230	139,204	-6,040	-5.5%	14,395	13.9%	20,973	17.7%
Maine	3,887	2,203	2,355	2,355	-1,684	-43.3%	152	6.9%	0	0.0%
Maryland	283,205	49,942	42,926	30,368	-233,263	-82.4%	-7,016	-14.0%	-12,558	-29.3%
Massachusetts	84,234	8,581	13,364	13,363	-75,653	-89.8%	4,783	55.7%	-1	0.0%
Michigan	349,877	255,038	269,434	162,632	-94,840	-27.1%	14,396	5.6%	-106,802	-39.6%
Minnesota	101,678	67,816	70,937	49,622	-33,862	-33.3%	3,121	4.6%	-21,315	-30.0%
Mississippi	75,047	29,336	30,972	32,109	-45,711	-60.9%	1,636	5.6%	1,137	3.7%
Missouri	284,384	383,313	390,287	186,899	98,930	34.8%	6,973	1.8%	-203,388	-52.1%
Montana	19,715	13,641	15,447	22,826	-6,074	-30.8%	1,806	13.2%	7,379	47.8%
Nebraska	74,955	71,904	73,073	71,339	-3,050	-4.1%	1,169	1.6%	-1,734	-2.4%
Nevada	53,363	13,486	14,416	14,416	-39,876	-74.7%	930	6.9%	0	0.0%
New Hampshire	51,445	3,332	6,453	6,742	-48,113	-93.5%	3,121	93.7%	289	4.5%
New Jersey	57,044	26,346	38,856	6,243	-30,698	-53.8%	12,511	47.5%	-32,614	-83.9%
New Mexico	30,628	9,895	11,857	13,926	-20,734	-67.7%	1,963	19.8%	2,068	17.4%
New York	180,847	56,461	42,887	15,160	-124,386	-68.8%	-13,574	-24.0%	-27,727	-64.7%
North Carolina	512,231	148,606	126,048	69,377	-363,625	-71.0%	-22,558	-15.2%	-56,670	-45.0%
North Dakota	137,371	101,946	103,633	103,624	-35,425	-25.8%	1,688	1.7%	-9	0.0%
Ohio	1,116,095	882,559	851,199	178,975	-233,536	-20.9%	-31,359	-3.6%	-672,224	-79.0%
Oklahoma	110,081	135,972	137,981	138,072	25,891	23.5%	2,009	1.5%	91	0.1%
Oregon	12,304	10,197	11,336	11,336	-2,107	-17.1%	1,139	11.2%	0	0.0%
Pennsylvania	1,002,203	495,463	509,649	125,545	-506,740	-50.6%	14,186	2.9%	-384,105	-75.4%
Rhode Island	176	0	0	0	-176	-100.0%	0	#DIV/0!	0	
South Carolina	218,781	186,355	213,281	100,788	-32,426	-14.8%	26,927	14.4%	-112,494	-52.7%
South Dakota	12,215	29,711	29,711	29,711	17,495	143.2%	0	0.0%	0	0.0%

State	2005 Base	2012 Base	2014 Base	2014 Remedy	2012 Base minus 2005 Base		2014 Base minus 2012 Base		2014 Remedy minus 2014 Base	
Tennessee	266,148	324,377	284,468	64,721	58,229	21.9%	-39,909	-12.3%	-219,747	-77.2%
Texas	534,949	446,006	453,332	266,648	-88,944	-16.6%	7,326	1.6%	-186,685	-41.2%
Tribal	3	0	0	0	-3	-100.0%	0	#DIV/0!	0	
Utah	34,813	33,828	33,498	33,968	-985	-2.8%	-330	-1.0%	469	1.4%
Vermont	9	219	263	263	209	2218.6%	44	20.2%	0	0.0%
Virginia	220,287	92,468	77,256	51,144	-127,819	-58.0%	-15,212	-16.5%	-26,112	-33.8%
Washington	3,409	3,225	3,430	3,430	-183	-5.4%	205	6.3%	0	0.0%
West Virginia	469,456	536,695	498,507	84,344	67,239	14.3%	-38,188	-7.1%	-414,163	-83.1%
Wisconsin	180,200	135,827	130,538	50,137	-44,373	-24.6%	-5,290	-3.9%	-80,401	-61.6%
Wyoming	89,874	45,112	51,817	58,530	-44,762	-49.8%	6,705	14.9%	6,714	13.0%
Grand Total	**10,380,883**	**7,859,810**	**7,159,569**	**3,356,577**	**-2,521,072**	**-24.3%**	**-700,242**	**-8.9%**	**-3,802,991**	**-53.1%**

Table 7-5. Group 1 and Group 2 States NO_X Total Emissions for each Transport Rule Modeling Case

	2005 Base Year	2012 Base Case	2014 Base Case	2014 Remedy	2014 Remedy - 2012 Base Case	Percent Change: 2014 Remedy vs 2012 Base Case	2014 Remedy - 2014 Base Case	Percent Change: 2014 Remedy vs 2014 Base Case
Annual Total NO_X Emissions for States in Group 1	8,942,956	5,998,929	5,592,557	5,490,517	-508,412	-8.5%	-102,039	-1.8%
Annual Total NO_X Emissions for States in Group 2	4,626,321	3,351,169	3,083,373	3,030,042	-321,127	-9.6%	-53,331	-1.7%
Annual Total NO_X for all States included for PM	13,569,277	9,350,098	8,675,929	8,520,559	-829,539	-8.9%	-155,370	-1.8%
Annual Total NO_X Emissions for All States Fully within the Eastern Modeling Domain	17,265,033	12,013,803	11,173,286	10,974,018	-1,039,784	-8.7%	-199,268	-1.8%
Annual Total NO_X Emissions for All Western States	3,887,276	2,959,396	2,751,224	2,751,659	-207,737	-7.0%	435	0.0%
Total NO_X	21,152,309	14,973,199	13,924,510	13,725,678	-1,247,521	-8.3%	-198,832	-1.4%

Table 7-6. Group 1 and Group 2 States SO_2 Total Emissions for each Transport Rule Modeling Case

	2005 Base Year	2012 Base Case	2014 Base Case	2014 Remedy	2014 Remedy - 2012 Base Case	Percent Change: 2014 Remedy vs 2012 Base Case	2014 Remedy - 2014 Base Case	Percent Change: 2014 Remedy vs 2014 Base Case
Annual Total SO2 Emissions for States in Group 1	8,695,431	6,841,869	6,198,185	2,999,641	-3,842,228	-56.2%	-3,198,544	-51.6%
Annual Total SO2 Emissions for States in Group 2	2,989,533	2,343,536	2,086,522	1,419,361	-924,175	-39.4%	-667,161	-32.0%
Annual Total SO2 for all States included for PM	11,684,964	9,185,405	8,284,707	4,419,002	-4,766,403	-51.9%	-3,865,705	-46.7%
Annual Total SO2 Emissions for All States Fully within the Eastern Modeling Domain	13,545,837	10,361,804	9,512,351	5,680,977	-4,680,826	-45.2%	-3,831,374	-40.3%
Annual Total SO2 Emissions for All Western States	808,533	567,085	566,435	594,818	27,733	4.9%	28,383	5.0%
Total SO2	14,354,370	10,928,889	10,078,786	6,275,795	-4,653,094	-42.6%	-3,802,991	-37.7%

Table 7-7. Group 1 and Group 2 States NO_X EGU Sector Emissions for each Transport Rule Modeling Case

	2005 Base Year	2012 Base Case	2014 Base Case	2014 Remedy	2014 Remedy - 2012 Base Case	Percent Change: 2014 Remedy vs 2012 Base Case	2014 Remedy - 2014 Base Case	Percent Change: 2014 Remedy vs 2014 Base Case
Annual EGU NO_X Emissions for States in Group 1	1,927,858	938,824	940,211	838,171	-100,653	-10.7%	-102,039	-10.9%
Annual EGU NO_X Emissions for States in Group 2	700,110	444,377	425,686	372,355	-72,022	-16.2%	-53,331	-12.5%
Annual EGU NO_X for all States included for PM	2,627,967	1,383,201	1,365,897	1,210,527	-172,674	-12.5%	-155,370	-11.4%
Annual EGU NO_X Emissions for All States Fully within the Eastern Modeling Domain	3,224,300	1,715,510	1,718,178	1,518,910	-196,600	-11.5%	-199,268	-11.6%
Annual EGU NO_X Emissions for All Western States	504,861	369,180	371,244	371,680	2,500	0.7%	435	0.1%
Total EGU NO_X	3,729,161	2,084,689	2,089,422	1,890,590	-194,099	-9.3%	-198,832	-9.5%

Table 7-8. Group 1 and Group 2 States SO_2 EGU Sector Emissions for each Transport Rule Modeling Case

	2005 Base Year	2012 Base Case	2014 Base Case	2014 Remedy	2014 Remedy - 2012 Base Case	Percent Change: 2014 Remedy vs 2012 Base Case	2014 Remedy - 2014 Base Case	Percent Change: 2014 Remedy vs 2014 Base Case
Annual EGU SO2 Emissions for States in Group 1	6,764,335	5,313,000	4,752,537	1,553,993	-3,759,007	-70.8%	-3,198,544	-67.3%
Annual EGU SO2 Emissions for States in Group 2	2,143,069	1,702,727	1,468,071	800,910	-901,816	-53.0%	-667,161	-45.4%
Annual EGU SO2 for all States included for PM	8,907,403	7,015,726	6,220,608	2,354,903	-4,660,823	-66.4%	-3,865,705	-62.1%
Annual EGU SO2 Emissions for All States Fully within the Eastern Modeling Domain	10,019,270	7,635,785	6,912,529	3,081,155	-4,554,630	-59.6%	-3,831,374	-55.4%
Annual EGU SO2 Emissions for All Western States	361,613	224,026	247,039	275,422	51,397	22.9%	28,383	11.5%
EGU SO2	10,380,883	7,859,810	7,159,569	3,356,577	-4,503,233	-57.3%	-3,802,991	-53.1%

Table 7-9. 26-State Total and Electric Generating Unit Sector Summer NO_X Emissions for each Transport Rule Modeling Case

	2005 Base Year	2012 Base Case	2014 Base Case	2014 Remedy	2014 Remedy - 2012 Base Case	Percent Change: 2014 Remedy vs 2012 Base Case	2014 Remedy - 2014 Base Case	Percent Change: 2014 Remedy vs 2014 Base Case
Summer EGU NO_x Emissions for States Included for Ozone	1,001,600	671,939	668,513	593,833	-78,106	-11.6%	-74,680	-11.2%
Summer Total NO_x Emissions for States Included for Ozone	6,153,473	4,455,600	4,128,792	4,054,111	-401,489	-9.0%	-74,680	-1.8%

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Transport Rule Final

Docket No. EPA-HQ-OAR-2009-0491

Emissions Inventory Final Rule Technical Support Document (TSD)

Appendices

Appendix A: Revisions to 2005 Inventories from Version 4 to Version 4.2
Appendix B: Ancillary Input Data and Parameter Differences between 2005 and Future-year Scenarios
Appendix C: SMOKE Input Inventory Data Files Used for each Transport Rule Modeling Case
Appendix D: Summary of Future Base Case Transport Rule Non-EGU Control Programs, Closures and Projections

Appendix A: Revisions to 2005 Inventories from Version 4 to Version 4.2

This Appendix provides details on some of the changes made between the inventories used for versions 4 and 4.2 of the modeling platform. Table A-1 provides information about facilities that had one or more units moved from the non-EGU (ptnonipm) to the EGU (ptipm) inventory in version 4.2. This prevents double-counting of EGU emissions in future years, when IPM estimates are used for EGUs. Table A-2 provides information about facilities that had one or more units closed between versions 4 and 4.2 of the modeling platform. Table A-3 provides information on updates to the nonpoint inventories that were implemented in response to comments, including: i) replacing Delaware fuel combustion, residential wood burning, and open burning, ii) removing South Carolina residual oil emissions from industrial boilers, iii) replacing Nebraska industrial fuel combustion emissions with those from the 2005 Central Regional Air Planning Association (CENRAP) dataset, and iv) updating diesel fuel commercial marine vessel emissions in Delaware.

Table A-1. Facilities with one More Units Moved from the non-EGU to the EGU Inventory

State	Plant Name	FIPS	Plant ID
California	AESPLACERITA INC	06037	19102642676
Florida	WALT DISNEY WORLD COMPANY	12095	0950111
Georgia	Effingham County Power, LLC	13103	10300012
Georgia	McIntosh Combined-Cyc	13103	10300014
Illinois	PPL University Park LLC	17197	197899AAC
Indiana	PSEQ LAWRENCEBURG ENERGYFACILTY	18029	00033
Indiana	LAWRENCE GENERATING STATION	18093	00028
Kentucky	Riverside Generating Co LLC	21127	00040
Kentucky	KENTUCKY UTILITIES COMPANY EWBROWN STAT	21167	2116700001
Louisiana	PPG INDUSTRIES INC / LAKE CHARLES COMPLEX	22019	05200004
Louisiana	AEPCORP / VENTURES LEASE CO / PLAQUE MINECO	22047	12800096
Louisiana	Taft Cogeneration Facility	22089	25200007
Michigan	FIRST ENERGY CORP	26163	M4854
Minnesota	NSP dba Xcel Energy - Inver Hills	27037	2703700015
Minnesota	Hutchinson Utilities Commission -Plant	27085	2708500002
Minnesota	Lakefield Junction Station	27091	2709100058
Minnesota	Great River Energy - Pleasant Valley	27099	2709900048
Minnesota	LSP Cottage Grove Cogeneration Facility	27163	2716300087
New Jersey	COASTAL EAGLE POINT OIL COMPANY	34015	55781
Ohio	CLEVELAND ELECTRIC ILLUMINATING CO., ASH	39007	0204010000
Ohio	Madison	39017	1409000896
Ohio	Dicks Creek	39017	1409010078

Ohio	AMPO Galion	39033	0317030060
Ohio	AMPO Napoleon	39069	0335010056
Ohio	Hanging Rock Energy Facility	39087	0744000150
Ohio	Darby Electric Generating Station	39129	0165000132
Ohio	Robert P Mone Plant	39161	0381000043
Ohio	Rolling Hills Generating	39163	0682000057
Ohio	Duke Washington Energy	39167	0684000212
Ohio	Waterford Plant	39167	0684000213
Ohio	Troy Energy, LLC	39173	0387000377
Ohio	AMPO Bowling Green	39173	0387020374
Ohio	OMEGA Bowling Green Peaking	39173	0387020378
Pennsylvania	CINCINNATI GAS & ELEC / FAYETTE FAC	42051	420510122
Virginia	Buchanan Generation	51027	00148
Virginia	ODEC MARSH RUN	51061	00063
Virginia	Tensaska	51065	00021
Virginia	Darby Town	51087	00156
Virginia	Old Dominion Electric Cooperative Louisa	51109	00050

Table A-2. Facilities with one More Units Closed

State	Plant Name	FIPS	Plant ID
Florida	CARGILL FERTILIZER INC	12105	1050048
Georgia	INLAND PAPERBOARD & PACKAGING INC	13115	11500021
Georgia	Lafarge N.A.	13121	12100401
Georgia	MoHawk Industries – South Hamilton Stree	13313	31300087
Illinois	PPL University Park LLC*	17197	197899AAB
Indiana	AUBURN FOUNDRY PLANT1	18033	00002
Indiana	Indianapolis RRF	18097	LMWC-22
Kentucky	Riverside Generating Co LLC*	21127	2112700040
Louisiana	SOUTH LA SUGARS COOP / GLENWOOD FACTORY	22007	0007
Louisiana	IBERIA SUGAR COOPERATIVE INC	22045	0006
Louisiana	JEANERETTE SUGAR CO INC	22045	0057
Louisiana	GEORGIAPACIFIC / URANIA	22059	0001
Louisiana	ENTERPRISE GAS PROC LLC / TOCA PLANT	22087	0017
New York	Iskilar Brick Inc	36001	BSCP177NR
Maine	REGIONAL WASTE SYSTEMS INC	23005	LMWC-23
New Hampshire	WHEELABRATOR CONCORD COMPANY LP	33013	LMWC-40
Ohio	CLEVELAND ELECTRIC ILLUMINATINGCO., ASH*	39007	0204010000
Ohio	EDGEWATER PLANT	39093	0247080049
West Virginia	FMC CORPORATION - STEAMPLANT	54039	0002
West Virginia	FLEXSYS AMERICA LP	54079	0001

* Units were removed from the EGU inventory and replaced with matching units from the non-EGU inventory

Table A-3. Changes to the Nonpoint Inventory as a Result of Transport Rule Comments

	Sector	Pollutantutant	2005cs (v4.2)	2012cs (v4.2)	2014cs (v4.2)	2005ck (v4)	2012ck (v4)	2014ck2 (v4)	2012cs - 2005cs	2014cs - 2012cs	2012cs - 2012ck	2014cs - 2014ck2
Delaware	Nonpoint	SO2	1,030	1,028	1,024	5,859	5,858	5,857	-1	-5	-4,829	-4,834
Delaware	Loc-marine	SO2	267	110	109	1,215	622	129	-157	-1	-512	-20
Delaware	Nonpoint	NOx	2,274	2,255	2,194	3,259	3,248	3,245	-19	-62	-993	-1,051
Delwaware	Loco-marine	NOx	2,956	3,298	3,395	5,158	4,516	4,148	342	97	-1,218	-754
Nebraska	Nonpoint	SO2	7,659	7,655	7,615	29,575	29,571	29,570	-4	-40	-21,916	-21,955
Nebraska	Nonpoint	NOx	14,749	14,572	14,117	13,820	13,788	13,779	-177	-455	784	339
South Carolina	Nonpoint	SO2	13,489	13,478	13,275	30,016	30,005	30,002	-11	-203	-16,527	-16,727
South Carolina	Nonpoint	NOx	17,706	17,634	17,433	20,281	20,273	20,271	-72	-200	-2,639	-2,837

Appendix B: Ancillary Input Data and Parameter Differences between 2005 and Future-year Scenarios

Table B-1 documents the ancillary input datasets and versions used for the 2005 base case and the future-year cases. The datasets are referenced by name and version number. For example, 'afdust_2002ad_xportfrac [v0]' corresponds to version 0 of the dataset named afdust_2002ad_xportfrac. The files released for the v4.2 platform are named using the convention: *dataset_name_changedate*_v*version#*.txt. The folders / subdirectories in which the files are located vary based on the type of data, although many of the ancillary datasets can be found beneath the ge_dat subdirectory.

Note that the remedy case is not listed in Table B-1 because it has the same settings as the 2014cs_05b case, except for the inventory datasets for the ptipm sector, as shown in Appendix C. The inputs that change between base and future years have an 'F' (for False) in the Match columns, while those that do not change have a 'T' (for True) in the Match column. The contents of Table B-1 reveal that the ancillary input data in the future-year scenarios are very similar to those used in the 2005 base case except for the speciation profiles and cross references used for gasoline-related sources, which change in the future to account for increased ethanol usage in gasoline. Other datasets that changed between the cases are the following:

- Grid Description List: the version of this dataset changed because additional grids were added for other projects. This change does not impact the results of the modeling.
- List of sectors for mrggrid: This dataset controls the reuse of data between runs (for example the biogenic emissions for 2005 are reused in all future years). It is standard practice to develop a separate list of sectors for each case, as is shown here.
- Onroad temperature adjustments: The dataset used here changes because the temperature adjustments for PM emissions in 2014 are not the same as those needed for the earlier years.

Table B-2 provides configuration settings for various SMOKE programs. Note that the values of these settings are the same for all four cases, so the values are only listed once.

Table B-1. Datasets and Versions used for the Transport Rule Final Cases

Input Name	Program	Match	Dataset and version for 2005cs_05b	Dataset and version for 2012cs_05b	Dataset and version for 2014cs_05b
BEIS3 emission factors	Tmpbeis3	T	beis3_efac_v3.14 [v0]	beis3_efac_v3.14 [v0]	beis3_efac_v3.14 [v0]
Biogenic gridding surrogate for reports 12EUS1	Smkmerge	T	bgpro_12EUS1 (/orchid/share) [v0]	copied from 2005	copied from 2005
Biogenic gridding surrogate for reports 36US1	Smkmerge	T	bgpro_36US1 (/orchid/share) [v0]	copied from 2005	copied from 2005

Biogenic land use, file A, 12EUS1	Normbeis3	T	LANDA_EUS12_279X240 [v0]	copied from 2005	copied from 2005
Biogenic land use, file A, 36US1	Normbeis3	T	LANDA_US36_148X112 [v0]	copied from 2005	copied from 2005
Biogenic land use, file B, 12EUS1	Normbeis3	T	LANDB_EUS12_279X240 [v0]	copied from 2005	copied from 2005
Biogenic land use, file B, 36US1	Normbeis3	T	LANDB_US36_148X112 [v0]	copied from 2005	copied from 2005
Biogenic land use, totals, 12EUS1	Normbeis3	T	LAND_TOTALS_EUS12_279X240 [v0]	copied from 2005	copied from 2005
Biogenic land use, totals, 36US1	Normbeis3	T	LAND_TOTALS_US36_148X112 [v0]	copied from 2005	copied from 2005
Bioseasons file 12EUS1	Tmpbeis3	T	bioseason.cmaq.2005b_12km [v0]	copied from 2005	copied from 2005
Bioseasons file 36US1 mcip v3.4 beta4 b	Tmpbeis3	T	bioseason.cmaq.2005b_36km [v0]	copied from 2005	copied from 2005
Combination profiles base year	Spcmat	F	gspro_combo_2005 [v2]		
Combination profiles for nonpt future	Spcmat	F		gspro_combo_2022aeo2_nonroadrfl_stationary [v2]	gspro_combo_2022aeo2_nonroadrfl_stationary [v2]
Combination profiles for nonroad exh-evp future	Spcmat	F		gspro_combo_2022aeo2_nonroad_exhevp [v0]	gspro_combo_2022aeo2_nonroad_exhevp [v0]
Combination profiles for nonroad rfl future	Spcmat	F		gspro_combo_2022aeo2_nonroadrfl_stationary [v2]	gspro_combo_2022aeo2_nonroadrfl_stationary [v2]
Combination profiles for onroad future	Spcmat	F		gspro_combo_2012_onroad_exhevp [v1]	gspro_combo_2012_onroad_exhevp [v1]
Combination profiles for ptnonipm future	Spcmat	F		gspro_combo_2022aeo2_nonroadrfl_stationary [v2]	gspro_combo_2022aeo2_nonroadrfl_stationary [v2]
Elevation Configuration File for Point Sources	Laypoint	T	pelvconfig_inline_allpts [v1]	pelvconfig_inline_allpts [v1]	pelvconfig_inline_allpts [v1]
Elevation Configuration File for seca_c3 sector	Laypoint	T	pelvconfig_seca_c3 [v1]	pelvconfig_seca_c3 [v1]	pelvconfig_seca_c3 [v1]
emf job header	All programs	T	emf_jobheader_generic [v0]	emf_jobheader_generic [v0]	emf_jobheader_generic [v0]
Grid Description List	Grdmat	F	griddesc_lambertonly [v26]	griddesc_lambertonly [v33]	griddesc_lambertonly [v33]

Gridding surrogates CAN-MEX 12km	Grdmat	T	Canada_12km_revised [v0]	Canada_12km_revised [v0]	Canada_12km_revised [v0]
Gridding surrogates CAN-MEX 36km	Grdmat	T	Canada_36km_revised [v0]	Canada_36km_revised [v0]	Canada_36km_revised [v0]
Gridding surrogates USA 12km	Grdmat	T	USA-CAN-MEX_12km [v0]	USA-CAN-MEX_12km [v0]	USA-CAN-MEX_12km [v0]
Gridding surrogates USA 36km	Grdmat	T	USA-CAN-MEX_36km [v0]	USA-CAN-MEX_36km [v0]	USA-CAN-MEX_36km [v0]
GSCNV - pollutant to pollutant conversions	Spcmat	T	gscnv_cmaq_cb05_tx_pf4 [v3]	gscnv_cmaq_cb05_tx_pf4 [v3]	gscnv_cmaq_cb05_tx_pf4 [v3]
GSCNV - pollutant to pollutant conversions 8762/8763 toxics	Spcmat	T	gscnv_cmaq_cb05_hspace_toxic [v0]	gscnv_cmaq_cb05_hspace_toxic [v0]	gscnv_cmaq_cb05_hspace_toxic [v0]
GSCNV - pollutant to pollutant conversions for 8762/8763 BAF	Spcmat	T	gscnv_cmaq_cb05_hspace_BAF [v0]	gscnv_cmaq_cb05_hspace_BAF [v0]	gscnv_cmaq_cb05_hspace_BAF [v0]
GSPRO speciated 8762/8763 BAF	Spcmat	T	gspro_cmaq_cb05_hspace_BAF [v1]	gspro_cmaq_cb05_hspace_BAF [v1]	gspro_cmaq_cb05_hspace_BAF [v1]
GSPRO speciated 8762/8763 NONHAPTOG	Spcmat	T	gspro_cmaq_cb05_hspace_toxic [v0]	gspro_cmaq_cb05_hspace_toxic [v0]	gspro_cmaq_cb05_hspace_toxic [v0]
GSPRO speciated 8762/8763 TOG	Spcmat	T	gspro_cmaq_cb05_hspace_nontoxic [v0]	gspro_cmaq_cb05_hspace_nontoxic [v0]	gspro_cmaq_cb05_hspace_nontoxic [v0]
GSPRO speciated MOVES PM	Spcmat	T	gspro_speciated_pm [v3]	gspro_speciated_pm [v3]	gspro_speciated_pm [v3]
GSREF speciated PM	Spcmat	T	gsref_speciated_pm [v2]	gsref_speciated_pm [v2]	gsref_speciated_pm [v2]
Holidays table	Temporal	T	holidays [v0]	holidays [v0]	holidays [v0]
List of sectors for mrggrid	Mrggrid	F	sectorlist_2005cs_05b [v4]	sectorlist_2012cs_05b [v0]	sectorlist_2014cs_05b [v0]
MACT Description	Smkreport	T	mactdesc_2002v3 [v1]	mactdesc_2002v3 [v1]	mactdesc_2002v3 [v1]
NAICS descriptions	Smkreport	T	naicsdesc [v0]	naicsdesc [v0]	naicsdesc [v0]
nonpoint & nonroad surrogate xref	Grdmat	T	amgref_us_can_mex_revised [v10]	amgref_us_can_mex_revised [v10]	amgref_us_can_mex_revised [v10]
onroad surrogate xref default	Grdmat	T	amgref_us_can_mex_revised [v10]	amgref_us_can_mex_revised [v10]	amgref_us_can_mex_revised [v10]

Onroad temperature adjustments	All programs for sector	F	MOVESPmOcEcTempAdjFactors 2005 [v1]	MOVESPmOcEcTempAdjFactors 2005 [v1]	MOVESPmOcEcTempAdjFactors_2014_JAN2010 [v1]
SIC descriptions	Smkreport	T	sic_desc [v0]	sic_desc [v0]	sic_desc [v0]
Smkmerge representative dates files	Run script	T	merge_dates_2005 [v0]	merge_dates_2005 [v0]	merge_dates_2005 [v0]
Speciation profiles Canada PM	Spcmat	T	gspro_pm25_canada_2006_point [v0]	gspro_pm25_canada_2006_point [v0]	gspro_pm25_canada_2006_point [v0]
Speciation profiles for biogenics	Spcmat	T	gspro_biogenics [v1]	gspro_biogenics [v1]	gspro_biogenics [v1]
Speciation profiles for HG	Spcmat	T	gspro_hg [v2]	gspro_hg [v2]	gspro_hg [v2]
Speciation profiles for INTEGRATE HAPS	Spcmat	T	gspro_integratehaps_cb05_tx_pf4 [v1]	gspro_integratehaps_cb05_tx_pf4 [v1]	gspro_integratehaps_cb05_tx_pf4 [v1]
Speciation profiles for NONHAPTOG	Spcmat	T	gspro_nonhaptog_cb05_tx_pf4_pretier2 [v1]	gspro_nonhaptog_cb05_tx_pf4_pretier2 [v1]	gspro_nonhaptog_cb05_tx_pf4_pretier2 [v1]
Speciation profiles for NONHAPTOG - tier 2 mobile profiles for future only	Spcmat	T		gspro_cmaq_cb05_tier2_toxic [v0]	gspro_cmaq_cb05_tier2_toxic [v0]
Speciation profiles for NOX	Spcmat	T	gspro_nox_hono_pf4 [v0]	gspro_nox_hono_pf4 [v0]	gspro_nox_hono_pf4 [v0]
Speciation profiles for PM2.5	Spcmat	T	gspro_pm25 [v2]	gspro_pm25 [v2]	gspro_pm25 [v2]
Speciation profiles for SO2-SULF	Spcmat	T	gspro_sulf [v1]	gspro_sulf [v1]	gspro_sulf [v1]
Speciation profiles for TOG	Spcmat	T	gspro_tog_cb05_soa_pf4_pretier2 [v1]	gspro_tog_cb05_soa_pf4_pretier2 [v1]	gspro_tog_cb05_soa_pf4_pretier2 [v1]
Speciation profiles for TOGBAF - tier 2 mobile profiles used for future year only	Spcmat	F		gspro_cmaq_cb05_tier2_BAF [v2]	gspro_cmaq_cb05_tier2_BAF [v2]
Speciation profiles for TOG -noBAF- tier 2 mobile profiles used for future year only	Spcmat	F		gspro_cmaq_cb05_tier2_nontoxic [v1]	gspro_cmaq_cb05_tier2_nontoxic [v1]
Speciation profiles speciated VOC	Spcmat	T	gspro_speciated_voc [v0]	gspro_speciated_voc [v0]	gspro_speciated_voc [v0]
Speciation profiles static	Spcmat	T	gspro_static_cmaq [v9]	gspro_static_cmaq [v9]	gspro_static_cmaq [v9]
Speciation xref CAP static	Spcmat	T	gsref_static_cap_pf4 [v0]	gsref_static_cap_pf4 [v0]	gsref_static_cap_pf4 [v0]
Speciation xref for Canada PM	Spcmat	T	gsref_pm25_canada_2006_point [v3]	gsref_pm25_canada_2006_point [v3]	gsref_pm25_canada_2006_point [v3]
Speciation xref for Integrate-HAPs static	Spcmat	T	gsref_static_integratehap_emv4 [v2]	gsref_static_integratehap_emv4 [v2]	gsref_static_integratehap_emv4 [v2]

Speciation xref for NONHAPVOC, not year-specific	Spcmat	F	gsref_nonhapvoc_general_ldghg_cr_update [v6]		
Speciation xref for NONHAPVOC, not year-specific	Spcmat	F		gsref_nonhapvoc_general_ldghg_cr_update [v6]	gsref_nonhapvoc_general_ldghg_cr_update [v6]
Speciation xref for NONHAPVOC, year-specific	Spcmat	F	gsref_nonhapvoc_2005_ldghg_cr_update [v6]		
Speciation xref for NONHAPVOC, year-specific, mobile records	Spcmat	F		gsref_nonhapvoc_future_cr_mobile [v1]	gsref_nonhapvoc_future_cr_mobile [v1]
Speciation xref for NONHAPVOC, year-specific, stationary records	Spcmat	F		gsref_nonhapvoc_future_cr_nomobile [v1]	gsref_nonhapvoc_future_cr_nomobile [v1]
Speciation xref for PM2.5 diesel SCCs but do not produce diesel	Spcmat	T	gsref_no_dieselpm [v3]	gsref_no_dieselpm [v3]	gsref_no_dieselpm [v3]
Speciation xref for PM2.5 non-diesel SCCs	Spcmat	T	gsref_pm25_pf4_nondiesel [v13]	gsref_pm25_pf4_nondiesel [v13]	gsref_pm25_pf4_nondiesel [v13]
Speciation xref for SO2-SULF	Spcmat	T	gsref_sulf [v0]	gsref_sulf [v0]	gsref_sulf [v0]
Speciation xref for speciated VOC	Spcmat	T	gsref_speciated_voc [v1]	gsref_speciated_voc [v1]	gsref_speciated_voc [v1]
Speciation xref for VOC, not year-specific	Spcmat	T	gsref_voc_general_ldghg [v6]	gsref_voc_general_ldghg [v6]	gsref_voc_general_ldghg [v6]
Speciation xref for VOC, year-specific	Spcmat	F	gsref_voc_2005_ldghg [v5]		
Speciation xref for VOC, year-specific, mobile records	Spcmat	F		gsref_voc_future_cr_mobile [v1]	gsref_voc_future_cr_mobile [v1]
Speciation xref for VOC, year-specific, stationary records	Spcmat	F		gsref_voc_future_cr_nomobile [v1]	gsref_voc_future_cr_nomobile [v1]
Speciation xref HG	Spcmat	T	gsref_hg [v8]	gsref_hg [v8]	gsref_hg [v8]
Speciation xref static NOX -- HONO for mobile sources	Spcmat	T	gsref_static_nox_hono_pf4 [v6]	gsref_static_nox_hono_pf4 [v6]	gsref_static_nox_hono_pf4 [v6]
surrogate descriptions (works for all grids)	Grdmat	T	srgdesc_36km_revised [v1]	srgdesc_36km_revised [v1]	srgdesc_36km_revised [v1]
surrogate descriptions (works for all grids)	Grdmat	T	srgdesc_12km [v2]	srgdesc_12km [v2]	srgdesc_12km [v2]
surrogate descriptions (works for all grids)	Grdmat	T	srgdesc_36km_revised [v1]	srgdesc_36km_revised [v1]	srgdesc_36km_revised [v1]
Temporal profiles, all nonpoint and nonroad	Temporal	T	amptpro_2005_us_can_revised [v2]	amptpro_2005_us_can_revised [v2]	amptpro_2005_us_can_revised [v2]

Temporal profiles, all point	Temporal	T	amptpro_2005_us_can_revised [v2]	amptpro_2005_us_can_revised [v2]	amptpro_2005_us_can_revised [v2]
Temporal profiles, onroad default	Temporal	T	amptpro_2005_us_can_revised [v2]	amptpro_2005_us_can_revised [v2]	amptpro_2005_us_can_revised [v2]
Temporal xref, all nonpoint and nonroad	Temporal	T	amptref_v3_3_revised [v11]	amptref_v3_3_revised [v11]	amptref_v3_3_revised [v11]
Temporal xref, onroad mobile default	Temporal	T	amptref_v3_3_revised [v11]	amptref_v3_3_revised [v11]	amptref_v3_3_revised [v11]
Temporal xref, othpt	Temporal	T	ptref_othpt [v4]	ptref_othpt [v4]	ptref_othpt [v4]
Temporal xref, point default	Temporal	T	amptref_v3_3_revised [v11]	amptref_v3_3_revised [v11]	amptref_v3_3_revised [v11]
Temporal xref, ptipm only	Temporal	T	ptref_ptipm_us [v0]	ptref_ptipm_us [v0]	ptref_ptipm_us [v0]

Table B-2. Parameter Settings for All Transport Rule Final Cases

Parameter Name	Environment Variable	Sector	Program	Value
Archive sectors from older cases	ARCHIVE_ALL_SECTORS	asm_backup	Run script	N
BEIS3 version	BEIS3_VERSION	beis	Run script	3.14
Biogenics land area surrogate	AREA_SURROGATE_NUM	beis	Smkmerge	340
Check for duplicate sources	RAW_DUP_CHECK		Smkinven	Y
Check for duplicate sources	RAW_DUP_CHECK	othar	Smkinven	N
Check for duplicate sources	RAW_DUP_CHECK	othon	Smkinven	N
Check for duplicate sources	RAW_DUP_CHECK	othpt	Smkinven	N
Check for duplicate sources	RAW_DUP_CHECK	othpt_hg	Smkinven	N
Check for duplicate sources	RAW_DUP_CHECK	ptfire	Smkinven	N
Check for duplicate sources	RAW_DUP_CHECK	ptipm	Smkinven	N
Check for duplicate sources	RAW_DUP_CHECK	ptnonipm	Smkinven	N
Check stack parameters for missing	CHECK_STACKS_YN	ptfire	Smkinven	N
Convective rainfall variable for Pleim-Xiu	RC_VAR	beis	Tmpbeis3	RC
Count of underscores for Daily data prefix	NAMEBREAK_DAILY	ptipm	Run script	8
Default surrogate code	SMK_DEFAULT_SRGID		Grdmat	100

Default surrogate code	SMK_DEFAULT_SRGID	afdust	Grdmat	340
Don't use day-specific emission	DAY_SPECIFIC_YN	ptipm	Smkinven	N
EGU daily type	EGU_TYPE		Run script	model_performance
Fill annual values	FILL_ANNUAL		Smkinven	N
Fill annual values	FILL_ANNUAL	nonroad	Smkinven	Y
Fill annual values	FILL_ANNUAL	on_moves_runpm	Smkinven	Y
Fill annual values	FILL_ANNUAL	on_moves_startpm	Smkinven	Y
Fill annual values	FILL_ANNUAL	on_noadj	Smkinven	Y
Fire-specific plume rise calculations	FIRE_PLUME_YN	ptfire	Laypoint	Y
Formula for Smkinven	SMKINVEN_FORMULA		Smkinven	PMC=PM10-PM2_5
Formula for Smkinven	SMKINVEN_FORMULA	nonroad	Smkinven	EXH__PMC=EXH__PM10-EXH__PM2_5
Formula for Smkinven	SMKINVEN_FORMULA	on_noadj	Smkinven	EXH__PMC=EXH__PM10-EXH__PM2_5; BRK__PMC=BRK__PM10-BRK__PM2_5; TIR__PMC=TIR__PM10-TIR__PM2_5
Grid abbreviation, grid 1	GRID_1		All programs	36US1
I/O API grid name, grid 1	IOAPI_GRIDNAME_1		All programs	36US1_148X112
I/O API Sphere type	IOAPI_ISPH		Grdmat	19
Include market penetration	MRG_MARKETPEN_YN		Smkmerge	N
Laypoint uses Elevpoint to set sources for plume rise calc	SMK_SPECELEV_YN		Laypoint	Y
Match full SCCs	FULLSCC_ONLY		All programs	Y
Maximum errors printed	SMK_MAXERROR		All programs	10000
Maximum warnings printed	SMK_MAXWARNING		All programs	10
MCIP name abbreviation	MCIPNAME		All programs	MCIP_v3.4beta4

Merge by day	MRG_BYDAY	othpt	Smkmerge	P
Merge by day	MRG_BYDAY	othpt_hg	Smkmerge	P
Merge by day	MRG_BYDAY	ptnonipm	Smkmerge	P
Merge by day	MRG_BYDAY	seca_c3	Smkmerge	P
Merge type	M_TYPE		Run script	mwdss
Merge type	M_TYPE	afdust	Run script	week
Merge type	M_TYPE	ag	Run script	aveday
Merge type	M_TYPE	avefire	Run script	aveday
Merge type	M_TYPE	beis	Run script	all
Merge type	M_TYPE	nonptfire	Run script	aveday
Merge type	M_TYPE	on_moves_runpm	Run script	week
Merge type	M_TYPE	on_moves_startpm	Run script	week
Merge type	M_TYPE	on_noadj	Run script	week
Merge type	M_TYPE	othon	Run script	week
Merge type	M_TYPE	othpt	Run script	mwdss
Merge type	M_TYPE	othpt_hg	Run script	mwdss
Merge type	M_TYPE	ptfire	Run script	all
Merge type	M_TYPE	ptipm	Run script	all
Merge type	M_TYPE	ptnonipm	Run script	mwdss
Merge type	M_TYPE	seca_c3	Run script	aveday
Model output format	OUTPUT_FORMAT		Run script	$EMF_AQM
Nonhap Type	NONHAP_TYPE	alm_no_c3	All for sector	VOC
Nonhap Type	NONHAP_TYPE	avefire	All for sector	VOC
Nonhap Type	NONHAP_TYPE	nonpt	All for sector	VOC
Nonhap Type	NONHAP_TYPE	nonroad	All for sector	VOC
Nonhap Type	NONHAP_TYPE	on_noadj	All for sector	VOC
Nonhap Type	NONHAP_TYPE	ptnonipm	All for sector	VOC

Nonhap Type	NONHAP_TYPE	seca_c3	All for sector	VOC
Number of emissions layers	SMK_EMLAYS		All programs	10
Output county biogenic totals	BIO_COUNTY_SUMS	beis	Run script	Y
Output county totals	MRG_REPCNY_YN		Smkmerge	N
Output state biogenic totals	BIO_STATE_SUMS	beis	Run script	Y
Output state totals	MRG_REPSTA_YN		Smkmerge	Y
Output time zone	OUTZONE		All programs	0
Platform name	PLATFORM		All programs	v4
Pleim-Xiu land surface used?	PX_VERSION	beis	Tmpbeis3	Y
Plume-in-grid method	SMK_PING_METHOD		All for sector	0
Pressure variable name	PRES_VAR	beis	Tmpbeis3	PRSFC
Radiation/cloud variable name	RAD_VAR	beis	Tmpbeis3	RGRND
Run holidays	RUN_HOLIDAYS		Run script	Y
Run holidays	RUN_HOLIDAYS	afdust	Run script	Y
Run holidays	RUN_HOLIDAYS	ag	Run script	N
Run holidays	RUN_HOLIDAYS	alm_no_c3	Run script	N
Run holidays	RUN_HOLIDAYS	avefire	Run script	N
Run holidays	RUN_HOLIDAYS	nonptfire	Run script	N
Run holidays	RUN_HOLIDAYS	othar	Run script	N
Run holidays	RUN_HOLIDAYS	othar_hg	Run script	N
Run holidays	RUN_HOLIDAYS	othon	Run script	N
Run holidays	RUN_HOLIDAYS	othpt	Run script	N
Run holidays	RUN_HOLIDAYS	othpt_hg	Run script	N
Run holidays	RUN_HOLIDAYS	seca_c3	Run script	N
Run in inline mode	INLINE_MODE		Run script	both
Run in inline mode SECA_C3	INLINE_MODE	seca_c3	Run script	only
Run script for Smkmerge annual totals	RUN_PYTHON_ANNUAL		Run script	Y
Soil moisture variable for Pleim-Xiu	SOIM1_VAR	beis	Tmpbeis3	SOIM1

Soil temperature variable for Pleim-Xiu	SOILT_VAR	beis	Tmpbeis3	SOIT1
Soil type variable for Pleim-Xiu	ISLTYP_VAR	beis	Tmpbeis3	SLTYP
Sort inventory EVs by letter	SORT_LIST_EVS	avefire	Run script	Y
Sort inventory EVs by letter	SORT_LIST_EVS	othpt	Run script	Y
Sort inventory EVs by letter	SORT_LIST_EVS	ptipm	Run script	Y
Speciation type name	SPC		All programs	$EMF_SPC
Spinup duration	REGION_SPINUP		Run script	3
Spinup duration	REGION_SPINUP		Run script	10
Temperature variable name	TMPR_VAR	beis	Tmpbeis3	TEMP2
Temporal type	L_TYPE		Run script	mwdss
Temporal type	L_TYPE	afdust	Run script	week
Temporal type	L_TYPE	ag	Run script	aveday
Temporal type	L_TYPE	avefire	Run script	aveday
Temporal type	L_TYPE	beis	Run script	all
Temporal type	L_TYPE	nonptfire	Run script	aveday
Temporal type	L_TYPE	on_moves_runpm	Run script	week
Temporal type	L_TYPE	on_moves_startpm	Run script	week
Temporal type	L_TYPE	on_noadj	Run script	week
Temporal type	L_TYPE	othon	Run script	week
Temporal type	L_TYPE	ptfire	Run script	all
Temporal type	L_TYPE	ptipm	Run script	all
Temporal type	L_TYPE	seca_c3	Run script	aveday
Use area-to-point	SMK_ARTOPNT_YN	alm_no_c3	Smkinven	Y
Use area-to-point	SMK_ARTOPNT_YN	nonpt	Smkinven	Y
Use area-to-point	SMK_ARTOPNT_YN	nonroad	Smkinven	Y
Use average day emissions	SMK_AVEDAY_YN		Smkinven	N
Use day-specific emission	DAY_SPECIFIC_YN	ptfire	Smkinven	Y
Use day-specific emission	DAY_SPECIFIC_YN	ptipm	Smkinven	Y
Use hourly plume rise data	HOURLY_FIRE_YN	ptfire	Laypoint	Y
Use pollutant conversion	POLLUTANT_CONVERSION		Spcmat	Y
Western hemisphere?	WEST_HSPHERE		Smkinven	Y

Write lat/lon to STACK_GROUPS	ELEV_WRITE_LATLON	othpt_hg	Elevpoint	N
Write zero emissions	WRITE_ANN_ZERO	ptfire	Smkinven	Y
Write zero emissions	WRITE_ANN_ZERO	ptipm	Smkinven	Y

Appendix C: SMOKE Input Inventory Data Files Used for each Transport Rule Modeling Case

Table C-1 provides a list of inventory datasets and supporting datasets used by the Smkinven program for all four Transport Rule Final cases: 2005cs_05b, 2012cs_05b, 2015cs_05b, and 2014cs_tr1remedy_05b. The datasets are referenced by name and version number. For example, 'afdust_2002ad_xportfrac [v0]' means version 0 of the dataset named afdust_2002ad_xportfrac. The files released for the v4.2 platform are named using the convention: *dataset_name_changedate*_v*version#*.txt. The folders / subdirectories in which the files are located vary based on the type of data, although many of the inventory datasets can be found beneath a subdirectory named for the case (e.g., 2012cs_05b), and then within a subdirectory for the sector (e.g., nonpt). In Table C-1, the value in the column 'Match' is T when the exact same dataset and version are used for all four cases, and 'F' otherwise.

Table C-1. Input Inventories and Supporting Datasets for Transport Rule Final Cases

Input Name	Match	Dataset and version for 2005cs_05b	Dataset and version for 2012cs_05b	Dataset and version for 2014cs_05b	Dataset and version for 2014cs_tr1remedy_05b
Area-to-point data	T	artopnt_2002detroit [v0]	artopnt_2002detroit [v0]	artopnt_2002detroit [v0]	artopnt_2002detroit [v0]
CEM annually summed data	T	cemsum_ptipm_2005 (/orchid/share) [v0]	cemsum_ptipm_2005 (/orchid/share) [v0]	cemsum_ptipm_2005 (/orchid/share) [v0]	cemsum_ptipm_2005 (/orchid/share) [v0]
Country, State, County Information	F	costcy_for_2002 [v5]	costcy_for_2002 [v5]	costcy_for_2002 [v5]	costcy_for_2002 [v5]
Inventory afdust CAP	F	afdust_2002ad_xportfrac [v0]	afdust_2012cr [v0]	afdust_2014cr [v0]	afdust_2014cr [v0]
Inventory ag CAP	F	ag_cap2002nei [v0]	ag_cap2012cr [v0]	ag_cap2014cr [v0]	ag_cap2014cr [v0]
Inventory alm_no_c3 CAP	F	lm_no_c3_cap2002v3 [v1]	lm_no_c3_cap2012cs [v0]	lm_no_c3_cap2014cs [v0]	lm_no_c3_cap2014cs [v0]
Inventory alm_no_c3 HAP	F	lm_no_c3_hap2002v4 [v0]	lm_no_c3_hap2012cr [v0]	lm_no_c3_hap2014cs [v0]	lm_no_c3_hap2014cs [v0]
Inventory avefire CAP	T	avefire_2002ce [v0]	avefire_2002ce [v0]	avefire_2002ce [v0]	avefire_2002ce [v0]
Inventory avefire HAP	T	avefire_2002_hap [v0]	avefire_2002_hap [v0]	avefire_2002_hap [v0]	avefire_2002_hap [v0]
Inventory daily fires 01 jan, CAP/HAP	T	ptfire_jan_2005ag_tox_nonhapvoc [v0]	ptfire_jan_2005ag_tox_nonhapvoc [v0]	ptfire_jan_2005ag_tox_nonhapvoc [v0]	ptfire_jan_2005ag_tox_nonhapvoc [v0]
Inventory daily fires 01 Jan, last day CAP/HAP	T	ptfire_dec_lastdayonly_2005ag_tox_nonhapvoc [v1]	ptfire_dec_lastdayonly_2005ag_tox_nonhapvoc [v1]	ptfire_dec_lastdayonly_2005ag_tox_nonhapvoc [v1]	ptfire_dec_lastdayonly_2005ag_tox_nonhapvoc [v1]
Inventory daily fires 02 Feb, CAP/HAP	T	ptfire_feb_2005ag_tox_nonhapvoc [v0]	ptfire_feb_2005ag_tox_nonhapvoc [v0]	ptfire_feb_2005ag_tox_nonhapvoc [v0]	ptfire_feb_2005ag_tox_nonhapvoc [v0]

Input Name	Match	Dataset and version for 2005cs_05b	Dataset and version for 2012cs_05b	Dataset and version for 2014cs_05b	Dataset and version for 2014cs_tr1remedy_05b
Inventory daily fires 02 Feb, CAP/HAP last day	T	ptfire_jan_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_jan_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_jan_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_jan_lastdayonly_2005ag_tox_nonhapvoc [v0]
Inventory daily fires 03 Mar, CAP/HAP	T	ptfire_mar_2005ag_tox_nonhapvoc [v0]	ptfire_mar_2005ag_tox_nonhapvoc [v0]	ptfire_mar_2005ag_tox_nonhapvoc [v0]	ptfire_mar_2005ag_tox_nonhapvoc [v0]
Inventory daily fires 03 Mar, CAP/HAP last day	T	ptfire_feb_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_feb_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_feb_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_feb_lastdayonly_2005ag_tox_nonhapvoc [v0]
Inventory daily fires 04 Apr, CAP/HAP	T	ptfire_apr_2005ag_tox_nonhapvoc [v0]	ptfire_apr_2005ag_tox_nonhapvoc [v0]	ptfire_apr_2005ag_tox_nonhapvoc [v0]	ptfire_apr_2005ag_tox_nonhapvoc [v0]
Inventory daily fires 04 Apr, CAP/HAP last day	T	ptfire_mar_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_mar_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_mar_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_mar_lastdayonly_2005ag_tox_nonhapvoc [v0]
Inventory daily fires 05 May, CAP/HAP	T	ptfire_may_2005ag_tox_nonhapvoc [v0]	ptfire_may_2005ag_tox_nonhapvoc [v0]	ptfire_may_2005ag_tox_nonhapvoc [v0]	ptfire_may_2005ag_tox_nonhapvoc [v0]
Inventory daily fires 05 May, CAP/HAP last day	T	ptfire_apr_lastdayonly_2005ag_tox_nonhapvoc.txt [v0]	ptfire_apr_lastdayonly_2005ag_tox_nonhapvoc.txt [v0]	ptfire_apr_lastdayonly_2005ag_tox_nonhapvoc.txt [v0]	ptfire_apr_lastdayonly_2005ag_tox_nonhapvoc.txt [v0]
Inventory daily fires 06 Jun, CAP/HAP	T	ptfire_jun_2005ag_tox_nonhapvoc [v0]	ptfire_jun_2005ag_tox_nonhapvoc [v0]	ptfire_jun_2005ag_tox_nonhapvoc [v0]	ptfire_jun_2005ag_tox_nonhapvoc [v0]
Inventory daily fires 06 Jun, CAP/HAP last day	T	ptfire_may_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_may_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_may_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_may_lastdayonly_2005ag_tox_nonhapvoc [v0]
Inventory daily fires 07 Jul, CAP/HAP	T	ptfire_jul_2005ag_tox__nonhapvoc [v0]	ptfire_jul_2005ag_tox__nonhapvoc [v0]	ptfire_jul_2005ag_tox__nonhapvoc [v0]	ptfire_jul_2005ag_tox__nonhapvoc [v0]
Inventory daily fires 07 Jul, CAP/HAP last day	T	ptfire_jun_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_jun_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_jun_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_jun_lastdayonly_2005ag_tox_nonhapvoc [v0]
Inventory daily fires 08 Aug, CAP/HAP	T	ptfire_aug_2005ag_tox_nonhapvoc [v0]	ptfire_aug_2005ag_tox_nonhapvoc [v0]	ptfire_aug_2005ag_tox_nonhapvoc [v0]	ptfire_aug_2005ag_tox_nonhapvoc [v0]
Inventory daily fires 08 Aug, CAP/HAP last day	T	ptfire_jul_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_jul_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_jul_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_jul_lastdayonly_2005ag_tox_nonhapvoc [v0]
Inventory daily fires 09 Sep, CAP/HAP	T	ptfire_sep_2005ag_tox_nonhapvoc [v0]	ptfire_sep_2005ag_tox_nonhapvoc [v0]	ptfire_sep_2005ag_tox_nonhapvoc [v0]	ptfire_sep_2005ag_tox_nonhapvoc [v0]
Inventory daily fires 09 Sep, CAP/HAP last day	T	ptfire_aug_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_aug_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_aug_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_aug_lastdayonly_2005ag_tox_nonhapvoc [v0]
Inventory daily fires 10 Oct, CAP/HAP	T	ptfire_oct_2005ag_tox_nonhapvoc [v0]	ptfire_oct_2005ag_tox_nonhapvoc [v0]	ptfire_oct_2005ag_tox_nonhapvoc [v0]	ptfire_oct_2005ag_tox_nonhapvoc [v0]

Input Name	Match	Dataset and version for 2005cs_05b	Dataset and version for 2012cs_05b	Dataset and version for 2014cs_05b	Dataset and version for 2014cs_tr1remedy_05b
Inventory daily fires 10 Oct, CAP/HAP last day	T	ptfire_sep_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_sep_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_sep_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_sep_lastdayonly_2005ag_tox_nonhapvoc [v0]
Inventory daily fires 11 Nov, CAP/HAP	T	ptfire_nov_2005ag_tox_nonhapvoc [v0]	ptfire_nov_2005ag_tox_nonhapvoc [v0]	ptfire_nov_2005ag_tox_nonhapvoc [v0]	ptfire_nov_2005ag_tox_nonhapvoc [v0]
Inventory daily fires 11 Nov, CAP/HAP last day	T	ptfire_oct_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_oct_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_oct_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_oct_lastdayonly_2005ag_tox_nonhapvoc [v0]
Inventory daily fires 12 Dec, CAP/HAP	T	ptfire_dec_2005ag_tox_nonhapvoc [v0]	ptfire_dec_2005ag_tox_nonhapvoc [v0]	ptfire_dec_2005ag_tox_nonhapvoc [v0]	ptfire_dec_2005ag_tox_nonhapvoc [v0]
Inventory daily fires 12 Dec, CAP/HAP last day	T	ptfire_nov_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_nov_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_nov_lastdayonly_2005ag_tox_nonhapvoc [v0]	ptfire_nov_lastdayonly_2005ag_tox_nonhapvoc [v0]
Inventory fire list	T	ptfire_2005ag_tox [v0]	ptfire_2005ag_tox [v0]	ptfire_2005ag_tox [v0]	ptfire_2005ag_tox [v0]
Inventory nonpt CAP and HAP (PFC only)	F	pfc_2002_caphap [v0]	pfc_caphap2012 [v0]	pfc_caphap2014 [v0]	pfc_caphap2014 [v0]
Inventory nonpt CAP (no PFC)	F	nonpt_pf4_cap_nopfc [v5]	nonpt_2012cs_pf4_cap_nopfc [v0]	nonpt_2014cs_pf4_cap_nopfc [v0]	nonpt_2014cs_pf4_cap_nopfc [v0]
Inventory nonpt CAP: TX and OK Oil and Gas	F	nonpt_cap_2005_TCEQ_Oklahoma_OilGas [v0]	nonpt_2012cs_from_cap_2008_TCEQ_Oklahoma_OilGas [v0]	nonpt_2014cs_from_cap_2008_TCEQ_Oklahoma_OilGas [v0]	nonpt_2014cs_from_cap_2008_TCEQ_Oklahoma_OilGas [v0]
Inventory nonpt CAP: WRAP Oil and Gas	F	nonpt_cap_2005_WRAP_OilGas [v0]	nonpt_2012cs_from_cap_2005_WRAP_OilGas [v0]	nonpt_2014cs_from_cap_2005_WRAP_OilGas [v0]	nonpt_2014cs_from_cap_2005_WRAP_OilGas [v0]
Inventory nonpt HAP (no PFC)	F	nonpt_pf4_hap_nopfc_nobafmpesticidesplus [v3]	nonpt_2012cs_pf4_hap_nopfc_nobafmpesticidesplus [v0]	nonpt_2014cs_pf4_hap_nopfc_nobafmpesticidesplus [v0]	nonpt_2014cs_pf4_hap_nopfc_nobafmpesticidesplus [v0]
Inventory nonroad Calif CAPHAP 01 January	F	nonroad_calif_caphap_2005v2_revised_jan [v0]	nonroad_calif_caphap_2012_revised_jan [v0]	nonroad_calif_caphap_2014_revised_jan [v0]	nonroad_calif_caphap_2014_revised_jan [v0]
Inventory nonroad Calif CAPHAP 02 February	F	nonroad_calif_caphap_2005v2_revised_feb [v0]	nonroad_calif_caphap_2012_revised_feb [v0]	nonroad_calif_caphap_2014_revised_feb [v0]	nonroad_calif_caphap_2014_revised_feb [v0]
Inventory nonroad Calif CAPHAP 03 March	F	nonroad_calif_caphap_2005v2_revised_mar [v0]	nonroad_calif_caphap_2012_revised_mar [v0]	nonroad_calif_caphap_2014_revised_mar [v0]	nonroad_calif_caphap_2014_revised_mar [v0]
Inventory nonroad Calif CAPHAP 04 April	F	nonroad_calif_caphap_2005v2_revised_apr [v0]	nonroad_calif_caphap_2012_revised_apr [v0]	nonroad_calif_caphap_2014_revised_apr [v0]	nonroad_calif_caphap_2014_revised_apr [v0]
Inventory nonroad Calif CAPHAP 05 May	F	nonroad_calif_caphap_2005v2_revised_may [v0]	nonroad_calif_caphap_2012_revised_may [v0]	nonroad_calif_caphap_2014_revised_may [v0]	nonroad_calif_caphap_2014_revised_may [v0]

Input Name	Match	Dataset and version for 2005cs_05b	Dataset and version for 2012cs_05b	Dataset and version for 2014cs_05b	Dataset and version for 2014cs_tr1remedy_05b
Inventory nonroad Calif CAPHAP 06 June	F	nonroad_calif_caphap_2005v2_revised_jun [v0]	nonroad_calif_caphap_2012_revised_jun [v0]	nonroad_calif_caphap_2014_revised_jun [v0]	nonroad_calif_caphap_2014_revised_jun [v0]
Inventory nonroad Calif CAPHAP 07 July	F	nonroad_calif_caphap_2005v2_revised_jul [v0]	nonroad_calif_caphap_2012_revised_jul [v0]	nonroad_calif_caphap_2014_revised_jul [v0]	nonroad_calif_caphap_2014_revised_jul [v0]
Inventory nonroad Calif CAPHAP 08 August	F	nonroad_calif_caphap_2005v2_revised_aug [v0]	nonroad_calif_caphap_2012_revised_aug [v0]	nonroad_calif_caphap_2014_revised_aug [v0]	nonroad_calif_caphap_2014_revised_aug [v0]
Inventory nonroad Calif CAPHAP 09 September	F	nonroad_calif_caphap_2005v2_revised_sep [v0]	nonroad_calif_caphap_2012_revised_sep [v0]	nonroad_calif_caphap_2014_revised_sep [v0]	nonroad_calif_caphap_2014_revised_sep [v0]
Inventory nonroad Calif CAPHAP 10 October	F	nonroad_calif_caphap_2005v2_revised_oct [v0]	nonroad_calif_caphap_2012_revised_oct [v0]	nonroad_calif_caphap_2014_revised_oct [v0]	nonroad_calif_caphap_2014_revised_oct [v0]
Inventory nonroad Calif CAPHAP 11 November	F	nonroad_calif_caphap_2005v2_revised_nov [v0]	nonroad_calif_caphap_2012_revised_nov [v0]	nonroad_calif_caphap_2014_revised_nov [v0]	nonroad_calif_caphap_2014_revised_nov [v0]
Inventory nonroad Calif CAPHAP 12 December	F	nonroad_calif_caphap_2005v2_revised_dec [v0]	nonroad_calif_caphap_2012_revised_dec [v0]	nonroad_calif_caphap_2014_revised_dec [v0]	nonroad_calif_caphap_2014_revised_dec [v0]
Inventory nonroad US, not Calif CAP April	F	nonroad_caps_2005v2_apr_revised [v0]	nonroad_caphap_2012_apr [v0]	nonroad_caphap_2014ck_apr [v0]	nonroad_caphap_2014ck_apr [v0]
Inventory nonroad US, not Calif CAP August	F	nonroad_caps_2005v2_aug_revised [v0]	nonroad_caphap_2012_aug [v0]	nonroad_caphap_2014ck_aug [v0]	nonroad_caphap_2014ck_aug [v0]
Inventory nonroad US, not Calif CAP December	F	nonroad_caps_2005v2_dec_revised [v0]	nonroad_caphap_2012_dec [v0]	nonroad_caphap_2014ck_dec [v0]	nonroad_caphap_2014ck_dec [v0]
Inventory nonroad US, not Calif CAP February	F	nonroad_caps_2005v2_feb_revised [v0]	nonroad_caphap_2012_feb [v0]	nonroad_caphap_2014ck_feb [v0]	nonroad_caphap_2014ck_feb [v0]
Inventory nonroad US, not Calif CAP January	F	nonroad_caps_2005v2_jan_revised [v0]	nonroad_caphap_2012_jan [v0]	nonroad_caphap_2014ck_jan [v0]	nonroad_caphap_2014ck_jan [v0]
Inventory nonroad US, not Calif CAP July	F	nonroad_caps_2005v2_jul_revised [v0]	nonroad_caphap_2012_jul [v0]	nonroad_caphap_2014ck_jul [v0]	nonroad_caphap_2014ck_jul [v0]
Inventory nonroad US, not Calif CAP June	F	nonroad_caps_2005v2_jun_revised [v0]	nonroad_caphap_2012_jun [v0]	nonroad_caphap_2014ck_jun [v0]	nonroad_caphap_2014ck_jun [v0]
Inventory nonroad US, not Calif CAP March	F	nonroad_caps_2005v2_mar_revised [v0]	nonroad_caphap_2012_mar [v0]	nonroad_caphap_2014ck_mar [v0]	nonroad_caphap_2014ck_mar [v0]
Inventory nonroad US, not Calif CAP May	F	nonroad_caps_2005v2_may_revised [v0]	nonroad_caphap_2012_may [v0]	nonroad_caphap_2014ck_may [v0]	nonroad_caphap_2014ck_may [v0]

Input Name	Match	Dataset and version for 2005cs_05b	Dataset and version for 2012cs_05b	Dataset and version for 2014cs_05b	Dataset and version for 2014cs_tr1remedy_05b
Inventory nonroad US, not Calif CAP November	F	nonroad_caps_2005v2_nov_revised [v0]	nonroad_caphap_2012_nov [v0]	nonroad_caphap_2014ck_nov [v0]	nonroad_caphap_2014ck_nov [v0]
Inventory nonroad US, not Calif CAP October	F	nonroad_caps_2005v2_oct_revised [v0]	nonroad_caphap_2012_oct [v0]	nonroad_caphap_2014ck_oct [v0]	nonroad_caphap_2014ck_oct [v0]
Inventory nonroad US, not Calif CAP September	F	nonroad_caps_2005v2_sep_revised [v0]	nonroad_caphap_2012_sep [v0]	nonroad_caphap_2014ck_sep [v0]	nonroad_caphap_2014ck_sep [v0]
Inventory nonroad US, not Calif HAP April	F	nonroad_haps_2005v2_apr_revised [v0]	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.
Inventory nonroad US, not Calif HAP August	F	nonroad_haps_2005v2_aug_revised [v0]	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.
Inventory nonroad US, not Calif HAP December	F	nonroad_haps_2005v2_dec_revised [v0]	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.
Inventory nonroad US, not Calif HAP February	F	nonroad_haps_2005v2_feb_revised [v0]	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.
Inventory nonroad US, not Calif HAP January	F	nonroad_haps_2005v2_jan_revised [v0]	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.
Inventory nonroad US, not Calif HAP July	F	nonroad_haps_2005v2_jul_revised [v0]	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.
Inventory nonroad US, not Calif HAP June	F	nonroad_haps_2005v2_jun_revised [v0]	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.
Inventory nonroad US, not Calif HAP March	F	nonroad_haps_2005v2_mar_revised [v0]	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.
Inventory nonroad US, not Calif HAP May	F	nonroad_haps_2005v2_may_revised [v0]	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.
Inventory nonroad US, not Calif HAP November	F	nonroad_haps_2005v2_nov_revised [v0]	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.
Inventory nonroad US, not Calif HAP October	F	nonroad_haps_2005v2_oct_revised [v0]	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.
Inventory nonroad US, not Calif HAP September	F	nonroad_haps_2005v2_sep_revised [v0]	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.	See CAPHAP file for future year emissions.

Input Name	Match	Dataset and version for 2005cs_05b	Dataset and version for 2012cs_05b	Dataset and version for 2014cs_05b	Dataset and version for 2014cs_tr1remedy_05b
Inventory onroad Calif CAPHAP 01 January	F	onroad_calif_caphap_2005 v2_revised_jan [v0]	onroad_calif_caphap_2012 _revised_jan [v0]	onroad_calif_caphap_2014 _revised_jan [v0]	onroad_calif_caphap_2014 _revised_jan [v0]
Inventory onroad Calif CAPHAP 02 February	F	onroad_calif_caphap_2005 v2_revised_feb [v0]	onroad_calif_caphap_2012 _revised_feb [v0]	onroad_calif_caphap_2014 _revised_feb [v0]	onroad_calif_caphap_2014 _revised_feb [v0]
Inventory onroad Calif CAPHAP 03 March	F	onroad_calif_caphap_2005 v2_revised_mar [v0]	onroad_calif_caphap_2012 _revised_mar [v0]	onroad_calif_caphap_2014 _revised_mar [v0]	onroad_calif_caphap_2014 _revised_mar [v0]
Inventory onroad Calif CAPHAP 04 April	F	onroad_calif_caphap_2005 v2_revised_apr [v0]	onroad_calif_caphap_2012 _revised_apr [v0]	onroad_calif_caphap_2014 _revised_apr [v0]	onroad_calif_caphap_2014 _revised_apr [v0]
Inventory onroad Calif CAPHAP 05 May	F	onroad_calif_caphap_2005 v2_revised_may [v0]	onroad_calif_caphap_2012 _revised_may [v0]	onroad_calif_caphap_2014 _revised_may [v0]	onroad_calif_caphap_2014 _revised_may [v0]
Inventory onroad Calif CAPHAP 06 June	F	onroad_calif_caphap_2005 v2_revised_jun [v0]	onroad_calif_caphap_2012 _revised_jun [v0]	onroad_calif_caphap_2014 _revised_jun [v0]	onroad_calif_caphap_2014 _revised_jun [v0]
Inventory onroad Calif CAPHAP 07July	F	onroad_calif_caphap_2005 v2_revised_jul [v0]	onroad_calif_caphap_2012 _revised_jul [v0]	onroad_calif_caphap_2014 _revised_jul [v0]	onroad_calif_caphap_2014 _revised_jul [v0]
Inventory onroad Calif CAPHAP 08 August	F	onroad_calif_caphap_2005 v2_revised_aug [v0]	onroad_calif_caphap_2012 _revised_aug [v0]	onroad_calif_caphap_2014 _revised_aug [v0]	onroad_calif_caphap_2014 _revised_aug [v0]
Inventory onroad Calif CAPHAP 09 September	F	onroad_calif_caphap_2005 v2_revised_sep [v0]	onroad_calif_caphap_2012 _revised_sep [v0]	onroad_calif_caphap_2014 _revised_sep [v0]	onroad_calif_caphap_2014 _revised_sep [v0]
Inventory onroad Calif CAPHAP 10 October	F	onroad_calif_caphap_2005 v2_revised_oct [v0]	onroad_calif_caphap_2012 _revised_oct [v0]	onroad_calif_caphap_2014 _revised_oct [v0]	onroad_calif_caphap_2014 _revised_oct [v0]
Inventory onroad Calif CAPHAP 11 November	F	onroad_calif_caphap_2005 v2_revised_nov [v0]	onroad_calif_caphap_2012 _revised_nov [v0]	onroad_calif_caphap_2014 _revised_nov [v0]	onroad_calif_caphap_2014 _revised_nov [v0]
Inventory onroad Calif CAPHAP 12 December	F	onroad_calif_caphap_2005 v2_revised_dec [v0]	onroad_calif_caphap_2012 _revised_dec [v0]	onroad_calif_caphap_2014 _revised_dec [v0]	onroad_calif_caphap_2014 _revised_dec [v0]
Inventory onroad MOVES no-adjust CAPHAP 01 January	F	on_noadj_MOVES_2005cr_ jan_06MAY2010 [v0]	on_noadj_MOVES_2012cs_ jan_29DEC2010 [v0]	on_noadj_MOVES_2014cs_ jan_27JAN2011 [v0]	on_noadj_MOVES_2014cs_ jan_27JAN2011 [v0]
Inventory onroad MOVES no-adjust CAPHAP 02 February	F	on_noadj_MOVES_2005cr_ feb_06MAY2010 [v0]	on_noadj_MOVES_2012cs_ feb_29DEC2010 [v0]	on_noadj_MOVES_2014cs_ feb_27JAN2011 [v0]	on_noadj_MOVES_2014cs_ feb_27JAN2011 [v0]
Inventory onroad MOVES no-adjust CAPHAP 03 March	F	on_noadj_MOVES_2005cr_ mar_06MAY2010 [v0]	on_noadj_MOVES_2012cs_ mar_29DEC2010 [v0]	on_noadj_MOVES_2014cs_ mar_27JAN2011 [v0]	on_noadj_MOVES_2014cs_ mar_27JAN2011 [v0]

Input Name	Match	Dataset and version for 2005cs_05b	Dataset and version for 2012cs_05b	Dataset and version for 2014cs_05b	Dataset and version for 2014cs_tr1remedy_05b
Inventory onroad MOVES no-adjust CAPHAP 04 April	F	on_noadj_MOVES_2005cr_apr_06MAY2010 [v0]	on_noadj_MOVES_2012cs_apr_29DEC2010 [v0]	on_noadj_MOVES_2014cs_apr_27JAN2011 [v0]	on_noadj_MOVES_2014cs_apr_27JAN2011 [v0]
Inventory onroad MOVES no-adjust CAPHAP 05 May	F	on_noadj_MOVES_2005cr_may_06MAY2010 [v0]	on_noadj_MOVES_2012cs_may_29DEC2010 [v0]	on_noadj_MOVES_2014cs_may_27JAN2011 [v0]	on_noadj_MOVES_2014cs_may_27JAN2011 [v0]
Inventory onroad MOVES no-adjust CAPHAP 06 June	F	on_noadj_MOVES_2005cr_jun_06MAY2010 [v0]	on_noadj_MOVES_2012cs_jun_29DEC2010 [v0]	on_noadj_MOVES_2014cs_jun_27JAN2011 [v0]	on_noadj_MOVES_2014cs_jun_27JAN2011 [v0]
Inventory onroad MOVES no-adjust CAPHAP 07 July	F	on_noadj_MOVES_2005cr_jul_06MAY2010 [v0]	on_noadj_MOVES_2012cs_jul_29DEC2010 [v0]	on_noadj_MOVES_2014cs_jul_27JAN2011 [v0]	on_noadj_MOVES_2014cs_jul_27JAN2011 [v0]
Inventory onroad MOVES no-adjust CAPHAP 08 August	F	on_noadj_MOVES_2005cr_aug_06MAY2010 [v0]	on_noadj_MOVES_2012cs_aug_29DEC2010 [v0]	on_noadj_MOVES_2014cs_aug_27JAN2011 [v0]	on_noadj_MOVES_2014cs_aug_27JAN2011 [v0]
Inventory onroad MOVES no-adjust CAPHAP 09 September	F	on_noadj_MOVES_2005cr_sep_06MAY2010 [v0]	on_noadj_MOVES_2012cs_sep_29DEC2010 [v0]	on_noadj_MOVES_2014cs_sep_27JAN2011 [v0]	on_noadj_MOVES_2014cs_sep_27JAN2011 [v0]
Inventory onroad MOVES no-adjust CAPHAP 10 October	F	on_noadj_MOVES_2005cr_oct_06MAY2010 [v0]	on_noadj_MOVES_2012cs_oct_29DEC2010 [v0]	on_noadj_MOVES_2014cs_oct_27JAN2011 [v0]	on_noadj_MOVES_2014cs_oct_27JAN2011 [v0]
Inventory onroad MOVES no-adjust CAPHAP 11 November	F	on_noadj_MOVES_2005cr_nov_06MAY2010 [v0]	on_noadj_MOVES_2012cs_nov_29DEC2010 [v0]	on_noadj_MOVES_2014cs_nov_27JAN2011 [v0]	on_noadj_MOVES_2014cs_nov_27JAN2011 [v0]
Inventory onroad MOVES no-adjust CAPHAP 12 December	F	on_noadj_MOVES_2005cr_dec_06MAY2010 [v0]	on_noadj_MOVES_2012cs_dec_29DEC2010 [v0]	on_noadj_MOVES_2014cs_dec_27JAN2011 [v0]	on_noadj_MOVES_2014cs_dec_27JAN2011 [v0]
Inventory onroad US, not Calif , on_moves_runpm, April	F	on_moves_runpm_2005cr_apr_06MAY2010 [v0]	on_moves_runpm_2012cs_apr_29DEC2010 [v1]	on_moves_runpm_2014cs_apr_27JAN2011 [v1]	on_moves_runpm_2014cs_apr_27JAN2011 [v1]
Inventory onroad US, not Calif , on_moves_runpm, August	F	on_moves_runpm_2005cr_aug_06MAY2010 [v0]	on_moves_runpm_2012cs_aug_29DEC2010 [v1]	on_moves_runpm_2014cs_aug_27JAN2011 [v1]	on_moves_runpm_2014cs_aug_27JAN2011 [v1]

Input Name	Match	Dataset and version for 2005cs_05b	Dataset and version for 2012cs_05b	Dataset and version for 2014cs_05b	Dataset and version for 2014cs_tr1remedy_05b
Inventory onroad US, not Calif , on_moves_runpm, December	F	on_moves_runpm_2005cr_dec_06MAY2010 [v0]	on_moves_runpm_2012cs_dec_29DEC2010 [v1]	on_moves_runpm_2014cs_dec_27JAN2011 [v1]	on_moves_runpm_2014cs_dec_27JAN2011 [v1]
Inventory onroad US, not Calif , on_moves_runpm, February	F	on_moves_runpm_2005cr_feb_06MAY2010 [v0]	on_moves_runpm_2012cs_feb_29DEC2010 [v1]	on_moves_runpm_2014cs_feb_27JAN2011 [v1]	on_moves_runpm_2014cs_feb_27JAN2011 [v1]
Inventory onroad US, not Calif , on_moves_runpm, January	F	on_moves_runpm_2005cr_jan_06MAY2010 [v0]	on_moves_runpm_2012cs_jan_29DEC2010 [v1]	on_moves_runpm_2014cs_jan_27JAN2011 [v1]	on_moves_runpm_2014cs_jan_27JAN2011 [v1]
Inventory onroad US, not Calif , on_moves_runpm, July	F	on_moves_runpm_2005cr_jul_06MAY2010 [v0]	on_moves_runpm_2012cs_jul_29DEC2010 [v1]	on_moves_runpm_2014cs_jul_27JAN2011 [v1]	on_moves_runpm_2014cs_jul_27JAN2011 [v1]
Inventory onroad US, not Calif , on_moves_runpm, June	F	on_moves_runpm_2005cr_jun_06MAY2010 [v0]	on_moves_runpm_2012cs_jun_29DEC2010 [v1]	on_moves_runpm_2014cs_jun_27JAN2011 [v1]	on_moves_runpm_2014cs_jun_27JAN2011 [v1]
Inventory onroad US, not Calif , on_moves_runpm, March	F	on_moves_runpm_2005cr_mar_06MAY2010 [v0]	on_moves_runpm_2012cs_mar_29DEC2010 [v1]	on_moves_runpm_2014cs_mar_27JAN2011 [v1]	on_moves_runpm_2014cs_mar_27JAN2011 [v1]
Inventory onroad US, not Calif , on_moves_runpm, May	F	on_moves_runpm_2005cr_may_06MAY2010 [v0]	on_moves_runpm_2012cs_may_29DEC2010 [v1]	on_moves_runpm_2014cs_may_27JAN2011 [v1]	on_moves_runpm_2014cs_may_27JAN2011 [v1]
Inventory onroad US, not Calif , on_moves_runpm, November	F	on_moves_runpm_2005cr_nov_06MAY2010 [v0]	on_moves_runpm_2012cs_nov_29DEC2010 [v1]	on_moves_runpm_2014cs_nov_27JAN2011 [v1]	on_moves_runpm_2014cs_nov_27JAN2011 [v1]
Inventory onroad US, not Calif , on_moves_runpm, October	F	on_moves_runpm_2005cr_oct_06MAY2010 [v0]	on_moves_runpm_2012cs_oct_29DEC2010 [v1]	on_moves_runpm_2014cs_oct_27JAN2011 [v1]	on_moves_runpm_2014cs_oct_27JAN2011 [v1]
Inventory onroad US, not Calif , on_moves_runpm, September	F	on_moves_runpm_2005cr_sep_06MAY2010 [v0]	on_moves_runpm_2012cs_sep_29DEC2010 [v1]	on_moves_runpm_2014cs_sep_27JAN2011 [v1]	on_moves_runpm_2014cs_sep_27JAN2011 [v1]
Inventory onroad US, not Calif , on_moves_startpm, April	F	on_moves_startpm_2005cr_apr_06MAY2010 [v0]	on_moves_startpm_2012cs_apr_29DEC2010 [v0]	on_moves_startpm_2014cs_apr_27JAN2011 [v0]	on_moves_startpm_2014cs_apr_27JAN2011 [v0]

Input Name	Match	Dataset and version for 2005cs_05b	Dataset and version for 2012cs_05b	Dataset and version for 2014cs_05b	Dataset and version for 2014cs_tr1remedy_05b
Inventory onroad US, not Calif , on_moves_startpm, August	F	on_moves_startpm_2005cr_aug_06MAY2010 [v0]	on_moves_startpm_2012cs_aug_29DEC2010 [v0]	on_moves_startpm_2014cs_aug_27JAN2011 [v0]	on_moves_startpm_2014cs_aug_27JAN2011 [v0]
Inventory onroad US, not Calif , on_moves_startpm, December	F	on_moves_startpm_2005cr_dec_06MAY2010 [v0]	on_moves_startpm_2012cs_dec_29DEC2010 [v0]	on_moves_startpm_2014cs_dec_27JAN2011 [v0]	on_moves_startpm_2014cs_dec_27JAN2011 [v0]
Inventory onroad US, not Calif , on_moves_startpm, February	F	on_moves_startpm_2005cr_feb_06MAY2010 [v0]	on_moves_startpm_2012cs_feb_29DEC2010 [v0]	on_moves_startpm_2014cs_feb_27JAN2011 [v0]	on_moves_startpm_2014cs_feb_27JAN2011 [v0]
Inventory onroad US, not Calif , on_moves_startpm, January	F	on_moves_startpm_2005cr_jan_06MAY2010 [v0]	on_moves_startpm_2012cs_jan_29DEC2010 [v0]	on_moves_startpm_2014cs_jan_27JAN2011 [v0]	on_moves_startpm_2014cs_jan_27JAN2011 [v0]
Inventory onroad US, not Calif , on_moves_startpm, July	F	on_moves_startpm_2005cr_jul_06MAY2010 [v0]	on_moves_startpm_2012cs_jul_29DEC2010 [v0]	on_moves_startpm_2014cs_jul_27JAN2011 [v0]	on_moves_startpm_2014cs_jul_27JAN2011 [v0]
Inventory onroad US, not Calif , on_moves_startpm, June	F	on_moves_startpm_2005cr_jun_06MAY2010 [v0]	on_moves_startpm_2012cs_jun_29DEC2010 [v0]	on_moves_startpm_2014cs_jun_27JAN2011 [v0]	on_moves_startpm_2014cs_jun_27JAN2011 [v0]
Inventory onroad US, not Calif , on_moves_startpm, March	F	on_moves_startpm_2005cr_mar_06MAY2010 [v0]	on_moves_startpm_2012cs_mar_29DEC2010 [v0]	on_moves_startpm_2014cs_mar_27JAN2011 [v0]	on_moves_startpm_2014cs_mar_27JAN2011 [v0]
Inventory onroad US, not Calif , on_moves_startpm, May	F	on_moves_startpm_2005cr_may_06MAY2010 [v0]	on_moves_startpm_2012cs_may_29DEC2010 [v0]	on_moves_startpm_2014cs_may_27JAN2011 [v0]	on_moves_startpm_2014cs_may_27JAN2011 [v0]
Inventory onroad US, not Calif , on_moves_startpm, November	F	on_moves_startpm_2005cr_nov_06MAY2010 [v0]	on_moves_startpm_2012cs_nov_29DEC2010 [v0]	on_moves_startpm_2014cs_nov_27JAN2011 [v0]	on_moves_startpm_2014cs_nov_27JAN2011 [v0]

Input Name	Match	Dataset and version for 2005cs_05b	Dataset and version for 2012cs_05b	Dataset and version for 2014cs_05b	Dataset and version for 2014cs_tr1remedy_05b
Inventory onroad US, not Calif , on_moves_startpm, October	F	on_moves_startpm_2005cr_oct_06MAY2010 [v0]	on_moves_startpm_2012cs_oct_29DEC2010 [v0]	on_moves_startpm_2014cs_oct_27JAN2011 [v0]	on_moves_startpm_2014cs_oct_27JAN2011 [v0]
Inventory onroad US, not Calif , on_moves_startpm, September	F	on_moves_startpm_2005cr_sep_06MAY2010 [v0]	on_moves_startpm_2012cs_sep_29DEC2010 [v0]	on_moves_startpm_2014cs_sep_27JAN2011 [v0]	on_moves_startpm_2014cs_sep_27JAN2011 [v0]
Inventory othar_hg	T	area_canada_hg_2000_no duplicates [v0]	area_canada_hg_2000_no duplicates [v0]	area_canada_hg_2000_no duplicates [v0]	area_canada_hg_2000_no duplicates [v0]
Inventory othar nonpoint CAP Mexico border states	T	nonpt mexico border1999 [v0]	nonpt mexico border1999 [v0]	nonpt mexico border1999 [v0]	nonpt mexico border1999 [v0]
Inventory othar nonpoint CAP Mexico interior states	T	nonpt mexico interior1999 [v0]	nonpt mexico interior1999 [v0]	nonpt mexico interior1999 [v0]	nonpt mexico interior1999 [v0]
Inventory othar nonroad CAP Mexico border states	T	nonroad mexico border1999 [v0]	nonroad mexico border1999 [v0]	nonroad mexico border1999 [v0]	nonroad mexico border1999 [v0]
Inventory othar nonroad CAP Mexico interior states	T	nonroad mexico interior1999 [v0]	nonroad mexico interior1999 [v0]	nonroad mexico interior1999 [v0]	nonroad mexico interior1999 [v0]
Inventory othon CAP Mexico border states	T	onroad mexico border1999 [v0]	onroad mexico border1999 [v0]	onroad mexico border1999 [v0]	onroad mexico border1999 [v0]
Inventory othon CAP Mexico interior states	T	onroad mexico interior1999 [v0]	onroad mexico interior1999 [v0]	onroad mexico interior1999 [v0]	onroad mexico interior1999 [v0]
Inventory othon CAP onroad Canada	T	canada_onroad_cap_2006 [v0]	canada_onroad_cap_2006 [v0]	canada_onroad_cap_2006 [v0]	canada_onroad_cap_2006 [v0]
Inventory othpt CAP Mexico border states	T	mexico_border99 [v1]	mexico_border99 [v1]	mexico_border99 [v1]	mexico_border99 [v1]
Inventory othpt CAP Mexico interior states	T	mexico_interior99 [v0]	mexico_interior99 [v0]	mexico_interior99 [v0]	mexico_interior99 [v0]
Inventory othpt CAP	T	ptnonipm_offshore_oil_ca	ptnonipm_offshore_oil_ca	ptnonipm_offshore_oil_ca	ptnonipm_offshore_oil_ca

Input Name	Match	Dataset and version for 2005cs_05b	Dataset and version for 2012cs_05b	Dataset and version for 2014cs_05b	Dataset and version for 2014cs_tr1remedy_05b
offshore		p2005v2_20nov2008 [v0]	p2005v2_20nov2008 [v0]	p2005v2_20nov2008 [v0]	p2005v2_20nov2008 [v0]
Inventory othpt_hg	T	point_canada_hg_2000 [v1]	point_canada_hg_2000 [v1]	point_canada_hg_2000 [v1]	point_canada_hg_2000 [v1]
Inventory ptipm CAP	F	ptipm_2005cs_cap_27dec2010.txt [v1]			
Inventory ptipm CAP+ Hg Summer	F		PTINV_EPA410FINAL_BC_2n_summer_2012_21DEC2010_ORL [v1]	PTINV_EPA410FINAL_BC_2n_summer_2015_12JAN2010_ORL [v0]	PTINV_EPA410FINAL_BC_58_summer_2015_06APR2011_ORL [v0]
Inventory ptipm daily data (CEM sources)	F	ptday_ptipm_caphap_cem_2005cs_05b [v0]	ptday_ptipm_capclhg_cem_2012cs_05b [v0]	ptday_ptipm_capclhg_cem_2014cs_05b [v0]	ptday_ptipm_caphap_cem_2014cs_tr1remedy_05b [v0]
Inventory ptipm daily data (nonCEM sources)	F	ptday_ptipm_caphap_noncem_2005cs_05b [v0]	ptday_ptipm_capclhg_noncem_2012cs_05b [v0]	ptday_ptipm_capclhg_noncem_2014cs_05b [v0]	ptday_ptipm_caphap_noncem_2014cs_tr1remedy_05b [v0]
Inventory ptipm HAP	F	ptipm_2005cs_hap_27dec2010.txt [v0]			
Inventory ptnonipm CAP	F	ptnonipm_xportfrac_cap2005v2_2005cs_orl [v4]	ptnonipm_xportfrac_cap2012cs_with_TR1_closures [v1]	ptnonipm_xportfrac_cap2014cs [v0]	ptnonipm_xportfrac_cap2014cs [v0]
Inventory ptnonipm CAPHAP ethanol plant additions for V2NEI	T	ptnonipm_caphap_ethanol_plant_additions_2005 [v3]	ptnonipm_caphap_ethanol_plant_additions_2005 [v3]	ptnonipm_caphap_ethanol_plant_additions_2005 [v3]	ptnonipm_caphap_ethanol_plant_additions_2005 [v3]
Inventory ptnonipm CAP ND plant from V1NEI	T	ptnonipm_xportfrac_2005cap_v1_from_2005ai_ND_ADM_plant [v0]	ptnonipm_xportfrac_2005cap_v1_from_2005ai_ND_ADM_plant [v0]	ptnonipm_xportfrac_2005cap_v1_from_2005ai_ND_ADM_plant [v0]	ptnonipm_xportfrac_2005cap_v1_from_2005ai_ND_ADM_plant [v0]
Inventory ptnonipm cement capHg	F			ptnonipm_capHG_cementISIS_2016cr_16AUG2010 [v0]	ptnonipm_capHG_cementISIS_2016cr_16AUG2010 [v0]
Inventory ptnonipm HAP	F	ptnonipm_hap2005v2_2005cs_orl [v2]	ptnonipm_hap2012cs_with_TR1_closures [v1]	ptnonipm_hap2014cs [v0]	ptnonipm_hap2014cs [v0]
Inventory ptnonipm HAP ND plant from V1NEI	T	ptnonipm_2005hap_v1_from_2005ai_ND_ADM_plant [v0]	ptnonipm_2005hap_v1_from_2005ai_ND_ADM_plant [v0]	ptnonipm_2005hap_v1_from_2005ai_ND_ADM_plant [v0]	ptnonipm_2005hap_v1_from_2005ai_ND_ADM_plant [v0]
Inventory ptnonipm	F		ptnonipm_cornproducts17	ptnonipm_cornproducts17	ptnonipm_cornproducts17

Input Name	Match	Dataset and version for 2005cs_05b	Dataset and version for 2012cs_05b	Dataset and version for 2014cs_05b	Dataset and version for 2014cs_tr1remedy_05b
NEI27297 corn products			031_hap_cap_2008t [v0]	031_hap_cap_2008t [v0]	031_hap_cap_2008t [v0]
Inventory seca_c3 BAF HAPs Canada	F	eca_imo_CANADA_SCC_fix_vochaps_2005_09DEC2010 [v0]	eca_imo_CANADA_SCC_fix_vochaps_2012_09DEC2010 [v0]	eca_imo_CANADA_SCC_fix_vochaps_2014_09DEC2010 [v0]	eca_imo_CANADA_SCC_fix_vochaps_2014_09DEC2010 [v0]
Inventory seca_c3 BAF HAPs US + EEZ + Offshore non-Canada	F	eca_imo_fixFIPS_US_andSCC_fix_vochaps_2005_09DEC2010 [v0]	eca_imo_fixFIPS_US_andSCC_fix_vochaps_2012_09DEC2010 [v0]	eca_imo_fixFIPS_US_andSCC_fix_vochaps_2014_09DEC2010 [v0]	eca_imo_fixFIPS_US_andSCC_fix_vochaps_2014_09DEC2010 [v0]
Inventory seca_c3 CAP Canada	F	eca_imo_CANADA_SCC_fix_caps_2005_09DEC2010 [v0]	eca_imo_CANADA_SCC_fix_caps_2012_09DEC2010 [v0]	eca_imo_CANADA_SCC_fix_caps_2014_09DEC2010 [v0]	eca_imo_CANADA_SCC_fix_caps_2014_09DEC2010 [v0]
Inventory seca_c3 CAP US + EEZ + Offshore non-Canada	F	eca_imo_fixFIPS_US_wDE_andSCC_fix_caps_2005_09DEC2010 [v0]	eca_imo_fixFIPS_US_wDE_andSCC_fix_caps_2012_09DEC2010 [v0]	eca_imo_fixFIPS_US_wDE_andSCC_fix_caps_2014_09DEC2010 [v0]	eca_imo_fixFIPS_US_wDE_andSCC_fix_caps_2014_09DEC2010 [v0]
Inventory Table - HAPCAP integration but no toxics	T	invtable_hapcapintegate_cb05soa_nomp_nohg [v3]	invtable_hapcapintegate_cb05soa_nomp_nohg [v3]	invtable_hapcapintegate_cb05soa_nomp_nohg [v3]	invtable_hapcapintegate_cb05soa_nomp_nohg [v3]
Inventory Table - noHAPuse sectors, no toxics	F	invtable_hapcapnohapuse_cb05soa_nomp_nohg [v1]	invtable_hapcapnohapuse_cb05soa_nomp [v4]	invtable_hapcapnohapuse_cb05soa_nomp [v4]	invtable_hapcapnohapuse_cb05soa_nomp [v4]
Inventory Table - noHAPuse sectors, no toxics, no Hg	T	invtable_hapcapnohapuse_cb05soa_nomp_nohg [v1]	invtable_hapcapnohapuse_cb05soa_nomp_nohg [v1]	invtable_hapcapnohapuse_cb05soa_nomp_nohg [v1]	invtable_hapcapnohapuse_cb05soa_nomp_nohg [v1]
Inventory Table - noHAPuse sectors, no toxics, no Hg	T	invtable_hapcapnohapuse_cb05soa_nomp_nohg [v1]	invtable_hapcapnohapuse_cb05soa_nomp_nohg [v1]	invtable_hapcapnohapuse_cb05soa_nomp_nohg [v1]	invtable_hapcapnohapuse_cb05soa_nomp_nohg [v1]
Inventory Table - noHAPuse sectors, no toxics, no Hg	F		invtable_hapcapintegate_cb05soa_nomp_nohg [v3]	invtable_hapcapintegate_cb05soa_nomp_nohg [v3]	invtable_hapcapintegate_cb05soa_nomp_nohg [v3]
Mobile codes file default	T	mcodes [v1]	mcodes [v1]	mcodes [v1]	mcodes [v1]
NHAPEXCLUDE alm_no_c3	T	nhapexclude_alm_no_c3_pf4 [v1]	nhapexclude_alm_no_c3_pf4 [v1]	nhapexclude_alm_no_c3_pf4 [v1]	nhapexclude_alm_no_c3_pf4 [v1]
NHAPEXCLUDE avefire	T	nhapexclude_everything [v0]	nhapexclude_everything [v0]	nhapexclude_everything [v0]	nhapexclude_everything [v0]

Input Name	Match	Dataset and version for 2005cs_05b	Dataset and version for 2012cs_05b	Dataset and version for 2014cs_05b	Dataset and version for 2014cs_tr1remedy_05b
NHAPEXCLUDE nonpt	T	nhapexclude_nonpt_pf4_addpesticides [v3]	nhapexclude_nonpt_pf4_addpesticides [v3]	nhapexclude_nonpt_pf4_addpesticides [v3]	nhapexclude_nonpt_pf4_addpesticides [v3]
NHAPEXCLUDE NONROAD	T	nhapexclude_nonroad_pf4 [v1]	nhapexclude_nonroad_pf4 [v1]	nhapexclude_nonroad_pf4 [v1]	nhapexclude_nonroad_pf4 [v1]
NHAPEXCLUDE on_noadj	T	nhapexclude_nothing [v0]	nhapexclude_nothing [v0]	nhapexclude_nothing [v0]	nhapexclude_nothing [v0]
NHAPEXCLUDE ptnonipm	T	nhapexclude_everything [v0]	nhapexclude_everything [v0]	nhapexclude_everything [v0]	nhapexclude_everything [v0]
NHAPEXCLUDE seca_c3	T	nhapexclude_nothing [v0]	nhapexclude_nothing [v0]	nhapexclude_nothing [v0]	nhapexclude_nothing [v0]
ORIS Description	T	orisdesc [v0]	orisdesc [v0]	orisdesc [v0]	orisdesc [v0]
ORL Nonpoint Inventory - Afdust Canada 2006	T	canada_afdust_xportfrac_cap_2006 [v0]	canada_afdust_xportfrac_cap_2006 [v0]	canada_afdust_xportfrac_cap_2006 [v0]	canada_afdust_xportfrac_cap_2006 [v0]
ORL Nonpoint Inventory - Ag Canada 2006	T	canada_ag_cap_2006 [v0]	canada_ag_cap_2006 [v0]	canada_ag_cap_2006 [v0]	canada_ag_cap_2006 [v0]
ORL Nonpoint Inventory - Aircraft Canada 2006	T	canada_aircraft_cap_2006 [v0]	canada_aircraft_cap_2006 [v0]	canada_aircraft_cap_2006 [v0]	canada_aircraft_cap_2006 [v0]
ORL Nonpoint Inventory - Commercial Marine Canada 2006	T	canada_marine_cap_2006 [v0]	canada_marine_cap_2006 [v0]	canada_marine_cap_2006 [v0]	canada_marine_cap_2006 [v0]
ORL Nonpoint Inventory - Nonroad Canada 2006	T	canada_offroad_cap_2006 [v0]	canada_offroad_cap_2006 [v0]	canada_offroad_cap_2006 [v0]	canada_offroad_cap_2006 [v0]
ORL Nonpoint Inventory - Oarea Canada 2006	T	canada_oarea_cap_2006 [v3]	canada_oarea_cap_2006 [v3]	canada_oarea_cap_2006 [v3]	canada_oarea_cap_2006 [v3]
ORL Nonpoint Inventory - Rail Canada 2006	T	canada_rail_cap_2006 [v0]	canada_rail_cap_2006 [v0]	canada_rail_cap_2006 [v0]	canada_rail_cap_2006 [v0]
ORL Point Inventory - Point 2006	T	canada_point_2006_orl [v2]	canada_point_2006_orl [v2]	canada_point_2006_orl [v2]	canada_point_2006_orl [v2]
ORL Point Inventory - Point CB5 2006	T	canada_point_cb5_2006_orl [v0]	canada_point_cb5_2006_orl [v0]	canada_point_cb5_2006_orl [v0]	canada_point_cb5_2006_orl [v0]
ORL Point Inventory - Upstream Oil & Gas 2006	T	canada_point_uog_2006_orl [v0]	canada_point_uog_2006_orl [v0]	canada_point_uog_2006_orl [v0]	canada_point_uog_2006_orl [v0]
SCC descriptions	F	sccdesc_pf31 [v10]	sccdesc_pf31 [v11]	sccdesc_pf31 [v11]	sccdesc_pf31 [v11]
Stack replacement	T	pstk [v0]	pstk [v0]	pstk [v0]	pstk [v0]

Appendix D: Summary of Future Base Case Transport Rule Non-EGU Control Programs, Closures and Projections

Lists of control, closure, projection packet datasets used to create Transport Rule 2012 and 2014 future year base-case scenario inventories from the 2005 base case are provided in Tables D-1 through D-4. The datasets listed in Tables D-1 and D-3 were applied to the following non-EGU point source inventories to create 2012 and 2014 emissions, respectively:

- ptnonipm_hap2005v2_2005cs_orl
- ptnonipm_xportfrac_cap2005v2_2005cs_orl

The datasets listed in Tables D-2 and D-4 were applied to the following nonpoint source inventories to create 2012 and 2014 emissions, respectively:

- nonpt_cap_2008_TCEQ_Oklahoma_OilGas
- nonpt_cap_2005_WRAP_OilGas
- nonpt_pf4_cap_nopfc
- nonpt_pf4_hap_nopfc_nobafmpesticidesplus

National summaries of the impacts of the control programs on each of the inventories are shown in Tables D-5 through D-10. State and plant level summaries that were too large to include in this Appendix are provided in accompanying spreadsheet workbooks: **TransportRuleFinal_2012_Projection_info.xlsx** and **TransportRuleFinal_2014_Projection_info.xlsx**.

Table D-1. Datasets used to Create Transport Rule Final 2012 Inventories for Non-EGU Point Sources

Name	Type	Dataset	Dataset Version	Description
CLOSURES LotusNotes, ABCG, plus Timin 2016cr	Plant Closure	CLOSURES_LotusNotes_Linda_Timin_2016cr_23AUG2010	1	Plant and unit closures identified through EPA review.
CLOSURES TR1 comments and consent decrees 2012cs	Plant Closure	CLOSURES_TR1_2012cs_01FEB2011	0	Plant and unit closures through 2012 identified as a result of Transport Rule comments.
CLOSURES cement ISIS 2013 policy	Plant Closure	CLOSURES_cementISIS_2016cr_17AUG2010	1	Cement plant and unit closures identified via the ISIS 2013 policy case.
CONTROL ADDITIONAL OECA 2005cr to 2016cr	Control	CONTROLS_additional_NEIpf4_OECA_2005cr_2016cr_29JUL2010	1	Controls that implement OECA consent decrees.
CONTROL REPLACE DOJ 2005cr to 2016cr	Control	CONTROLS_replacement_NEIpf4_DOJ_2005cr_2016cr_02AUG2010.txt	0	Controls resulting from the 2002v3 DOJ Texas settlement.
CONTROL REPLACE HWI 2005cr to 2016cr	Control	CONTROLS_replacement_NEIpf4_HWI_2005cr_2016cr_02AUG2010.txt	1	Hazardous Waste Incinerator controls for CAPs and Haps carried over from 2002v31.
CONTROL REPLACE IndustrialBoiler nonMACT 2005cr to 2016cr	Control	CONTROLS_replacement_IndBoilers_nonMACT_by2008_20AUG2010	0	Industrial boiler controls not related to application of the MACT but derived from the Boiler MACT ICR database dated 4/30/10.
CONTROL REPLACE LMWC 2005cr to 2016cr	Control	CONTROLS_replacement_NEIpf4_LMWC_2005cr_2016cr_02AUG2010.txt	0	Controls for large municipal combustors carried over from 2002v31.
CONTROL REPLACE MACT 2005cr to 2012cr	Control	CONTROLS_replacement_NEIpf4_MACT_2005cr_2012cr_07OCT2010	0	MACT controls carried over from 2002v3 and updated as appropriate.
CONTROL REPLACE NY SIP 2005cr to 2016cr	Control	CONTROLS_replacement_NYSIP_O3_SCC_2016cr_26AUG2010	0	Controls that reflect enforceable controls for NOx and VOC from the New York ozone SIP.
CONTROL REPLACE Refineries 2005cr to 2012cr	Control	CONTROLS_replacement_NEIpf4_refineries_2005cr_2012cr_07OCT2010	0	Controls for refineries specified by EPA expert refinery staff.
CONTROL RICE 2012cr_05b	Control	CONTROLS_replacement_RICE_2012cr_07OCT2010	1	Controls for 2012 that represent three separate RICE NESHAPs
CONTROL St Gobain and LaFarge 2012	Control	CONTROLS_rep_Lafarge_StGobain_2012cs_25JAN2011.txt	0	Controls for NOx, SO2, PM., and HCl resulting from Saint Gobain and Lafarge consent decrees

CONTROL TR1 Final CONTROL packet: 2012cs	Control	CONTROLS_TR1_2012cs_24JAN2011	0	Controls for TCEQ oil and gas and non-ISIS related cement controls.
CONTROL TR1 Final consent decrees 2012	Control	CONTROLS_additional_TR1final_consent_decrees_2005cs_to_2012cs	1	Controls related to consent decrees identified during the Transport Rule comment period.
PROJECTION LMWC 2005cr to 2016cr	Projection	PROJECTION_2005cr_2016cr_LMWC_29JUL2010	0	Projection factors for Solid and Liquid Municipal Waste Combustors.
PROJECTION TR1 comments 2005cs to 20XXcs -ptnonipm	Projection	PROJECTION_2005cs_20XX_TR1_ptnonipm_01FEB2011	0	Projection factors derived from Transport Rule comments.
PROJECTION aircraft 2005cr to 2012cr	Projection	PROJECTION_2005cr_2012cr_aircraft_06OCT2010	0	Projection factors for aircraft derived from the FAA Terminal Area Forecast System.
PROJECTION refueling 2005cs to 2012cs	Projection	PROJECTION_2005cs_2012cs_onroad_refueling_04JAN2011	0	Projection factors for gasoline stage 2 refueling.
closures: 2005 to 2012ck	Plant Closure	CLOSURES_2005ck_to_2012ck_CoST_format	0	Plant or unit closures identified 2008 or before.

Table D-2. Datasets used to Create Transport Rule Final 2012 Inventories for Nonpoint Sources

Name	Type	Dataset	Dataset Version	Description
CONTROL REPLACE NY SIP 2005cr to 2016cr	Control	CONTROLS_replacement_NYSIP_O3_SCC_2016cr_26AUG2010	0	Controls that reflect enforceable controls for NOx and VOC from the New York ozone SIP.
CONTROL RICE 2012cr_05b	Control	CONTROLS_replacement_RICE_2012cr_07OCT2010	1	Controls for 2012 that represent three separate RICE NESHAPs
CONTROL TR1 Final CONTROL packet: 2012cs	Control	CONTROLS_TR1_2012cs_24JAN2011	0	Controls for TCEQ oil and gas and non-ISIS related cement controls.
PROJECTION 2005cr to 2012cr ag sector	Projection	PROJECTION_2005cr_2012cr_ag_06OCT2010	0	Projection factors for agriculture based on animal population stats.
PROJECTION RWC and landfills 2005cr to 2012cs	Projection	PROJECTION_2005cr_2012cr_RWC_landfills_06OCT2010	1	Projection factors for residential wood combustion and landfills.
PROJECTION refueling 2005cs to 2012cs	Projection	PROJECTION_2005cs_2012cs_onroad_refueling_04JAN2011	0	Projection factors for gasoline stage 2 refueling.

Table D-3. Datasets used to Create Transport Rule Final 2014 Inventories for Non-EGU Point Sources

Name	Type	Dataset	Dataset Version	Description
CLOSURES cement ISIS 2013 policy	Plant Closure	CLOSURES_cementISIS_2016cr_17AUG2010	1	Cement plant and unit closures identified via the ISIS 2013 policy case.
CLOSURES LotusNotes, ABCG, plus Timin 2016cr	Plant Closure	CLOSURES_LotusNotes_Linda_Timin_2016cr_23AUG2010	1	Plant and unit closures identified through EPA review.
CLOSURES TR1 comments and consent decrees 2014cs	Plant Closure	CLOSURES_TR1_2014cs_01FEB2011	0	Plant and unit closures through 2014 identified as a result of Transport Rule comments.
closures: 2005 to 2012ck	Plant Closure	CLOSURES_2005ck_to_2012ck_CoST_format	0	Plant and unit closures identified 2008 or before.
CONTROL ADDITIONAL OECA 2005cr to 2016cr	Control	CONTROLS_additional_NEIpf4_OECA_2005cr_2016cr_29JUL2010	1	Controls that implement OECA consent decrees.
CONTROL cement ISIS 2013 policy	Control	CONTROLS_replacement_cementISIS_2016cr_17AUG2010	0	Cement plant and unit closures identified via the ISIS 2013 policy case.
CONTROL REPLACE DOJ 2005cr to 2016cr	Control	CONTROLS_replacement_NEIpf4_DOJ_2005cr_2016cr_02AUG2010.txt	0	Controls resulting from the 2002v3 DOJ Texas settlement.
CONTROL REPLACE HWI 2005cr to 2016cr	Control	CONTROLS_replacement_NEIpf4_HWI_2005cr_2016cr_02AUG2010.txt	1	Hazardous Waste Incinerator controls for CAPs and Haps carried over from 2002v31.
CONTROL REPLACE IndustrialBoiler nonMACT 2005cr to 2016cr	Control	CONTROLS_replacement_IndBoilers_nonMACT_by2008_20AUG2010	0	Industrial boiler controls not related to application of the MACT but derived from the Boiler MACT ICR database dated 4/30/10.
CONTROL REPLACE LMWC 2005cr to 2016cr	Control	CONTROLS_replacement_NEIpf4_LMWC_2005cr_2016cr_02AUG2010.txt	0	Controls for large municipal combustors carried over from 2002v31.
CONTROL REPLACE MACT 2005cr to 2016cr	Control	CONTROLS_replacement_NEIpf4_MACT_2005cr_2016cr_02AUG2010.txt	0	MACT controls carried over from 2002v3 and updated as appropriate.
CONTROL REPLACE NY SIP 2005cr to 2016cr	Control	CONTROLS_replacement_NYSIP_O3_SCC_2016cr_26AUG2010	0	Controls that reflect enforceable controls for NOx and VOC from the

				New York ozone SIP.
CONTROL REPLACE Refineries 2005cr to 2014cr	Control	CONTROLS_replacement_NEIpf4_refineries_2005cr_2014cr_07OCT2010	0	Controls for refineries specified by EPA expert refinery staff.
CONTROL RICE 2016cr_05b	Control	CONTROLS_replacement_RICE_2016cr_21SEP2010	1	Controls for 2014 and 2016 that represent three separate RICE NESHAPs
CONTROL RICE SO2 2014cs_05b	Control	CONTROLS_replacement_RICE_SO2_2014cs_05JAN2011	0	SO2 reductions from the Ultra-low Sulfur Diesel requirement for CI engines
CONTROL St Gobain and LaFarge 2014	Control	CONTROLS_rep_Lafarge_StGobain_2014cs_25JAN2011.txt	0	Controls for NOx, SO2, PM., and HCl resulting from Saint Gobain and Lafarge consent decrees
CONTROL SULF rules: ME and NY 2014 through 2016	Control	control_ny_and_me_fuel_sulfur_rule	0	SO2 reductions due to state sulfur content rules for fuel oil.
CONTROL TR1 Final consent decrees 2014	Control	CONTROLS_additional_TR1final_consent_decrees_2005cs_to_2014cs	1	Controls related to consent decrees identified during the Transport Rule comment period.
CONTROL TR1 Final CONTROL packet: 2014cs	Control	CONTROLS_TR1_2014cs_24JAN2011	0	Controls for TCEQ oil and gas and non-ISIS related cement controls.
PROJECTION aircraft 2005cr to 2014cr	Projection	PROJECTION_2005cr_2014cr_aircraft_06OCT2010	0	Projection factors for aircraft derived from the FAA Terminal Area Forecast System.
PROJECTION cement ISIS 2013 policy	Projection	PROJECTION_cementISIS_2016cr_17AUG2010	0	Projection factors that implement the 2013 ISIS policy case for cement.
PROJECTION LMWC 2005cr to 2016cr	Projection	PROJECTION_2005cr_2016cr_LMWC_29JUL2010	0	Projection factors for Solid and Liquid Municipal Waste Combustors.
PROJECTION refueling 2005cs to 2014cs	Projection	PROJECTION_2005cs_2014cs_onroad_refueling_04JAN2011	0	Projection factors for gasoline stage 2 refueling.
PROJECTION TR1 comments 2005cs to 20XXcs -ptnonipm	Projection	PROJECTION_2005cs_20XX_TR1_ptnonipm_01FEB2011	0	Projection factors derived from Transport Rule comments.

Table D-4. Datasets used to Create Transport Rule Final 2014 Inventories for Nonpoint Sources

Name	Type	Dataset	Dataset Version	Description
CONTROL REPLACE NY SIP 2005cr to 2016cr	Control	CONTROLS_replacement_NYSIP_O3_SCC_2016cr_26AUG2010	0	Controls that reflect enforceable controls for NOx and VOC from the New York ozone SIP.
CONTROL RICE 2016cr_05b	Control	CONTROLS_replacement_RICE_2016cr_21SEP2010	1	Controls for 2014 and 2016 that represent three separate RICE NESHAPs
CONTROL RICE SO2 2014cs_05b	Control	CONTROLS_replacement_RICE_SO2_2014cs_05JAN2011	0	SO2 reductions from the Ultra-low Sulfur Diesel requirement for CI engines
CONTROL SULF rules: ME and NY 2014 through 2016	Control	control_ny_and_me_fuel_sulfur_rule	0	SO2 reductions due to state sulfur content rules for fuel oil.
CONTROL TR1 Final CONTROL packet: 2014cs	Control	CONTROLS_TR1_2014cs_24JAN2011	0	Controls for TCEQ oil and gas and non-ISIS related cement controls.
PROJECTION 2005cr to 2014cr ag sector	Projection	PROJECTION_2005cr_2014cr_ag_06OCT2010	0	Projection factors for agriculture based on animal population stats.
PROJECTION RWC and landfills 2005cr to 2014cs	Projection	PROJECTION_2005cr_2014cr_RWC_landfills_06OCT2010	1	Projection factors for residential wood combustion and landfills.
PROJECTION refueling 2005cs to 2014cs	Projection	PROJECTION_2005cs_2014cs_onroad_refueling_04JAN2011	0	Projection factors for gasoline stage 2 refueling.

Table D-5. Impacts of Control Programs on 2012 U.S. Non-EGU Point Source CAPs

Control Program	Pollutant	Inventory Emissions	Final Emissions	Emissions Reduction	Percent Reduction
closures: 2005 to 2012ck	CO	4154	0	4154	100
closures: 2005 to 2012ck	NH3	7	0	7	100
closures: 2005 to 2012ck	NOX	2112	0	2112	100
closures: 2005 to 2012ck	PM10	352	0	352	100
closures: 2005 to 2012ck	PM2_5	225	0	225	100
closures: 2005 to 2012ck	SO2	5549	0	5549	100
closures: 2005 to 2012ck	VOC	3392	0	3392	100
CLOSURES cement ISIS 2013 policy	CO	42781	0	42781	100
CLOSURES cement ISIS 2013 policy	NH3	121	0	121	100
CLOSURES cement ISIS 2013 policy	NOX	77030	0	77030	100
CLOSURES cement ISIS 2013 policy	PM10	10768	0	10768	100
CLOSURES cement ISIS 2013 policy	PM2_5	5107	0	5107	100
CLOSURES cement ISIS 2013 policy	SO2	46192	0	46192	100
CLOSURES cement ISIS 2013 policy	VOC	3260	0	3260	100
CLOSURES LotusNotes, ABCG, plus Timin 2016cr	CO	15787	0	15787	100
CLOSURES LotusNotes, ABCG, plus Timin 2016cr	NH3	414	0	414	100
CLOSURES LotusNotes, ABCG, plus Timin 2016cr	NOX	15716	0	15716	100
CLOSURES LotusNotes, ABCG, plus Timin 2016cr	PM10	5582	0	5582	100
CLOSURES LotusNotes, ABCG, plus Timin 2016cr	PM2_5	4051	0	4051	100
CLOSURES LotusNotes, ABCG, plus Timin 2016cr	SO2	68993	0	68993	100
CLOSURES LotusNotes, ABCG, plus Timin 2016cr	VOC	15297	0	15297	100
CLOSURES TR1 comments and consent decrees 2012cs	CO	61288	0	61288	100
CLOSURES TR1 comments and consent decrees 2012cs	NH3	94	0	94	100
CLOSURES TR1 comments and consent decrees 2012cs	NOX	10335	0	10335	100
CLOSURES TR1 comments and consent decrees 2012cs	PM10	4011	0	4011	100
CLOSURES TR1 comments and consent decrees 2012cs	PM2_5	3065	0	3065	100
CLOSURES TR1 comments and consent decrees 2012cs	SO2	27235	0	27235	100
CLOSURES TR1 comments and consent decrees 2012cs	VOC	4526	0	4526	100

CONTROL ADDITIONAL OECA 2005cr to 2016cr	CO	10968	262	10706	98
CONTROL ADDITIONAL OECA 2005cr to 2016cr	NOX	41507	21991	19516	47
CONTROL ADDITIONAL OECA 2005cr to 2016cr	PM10	5307	3652	1655	31
CONTROL ADDITIONAL OECA 2005cr to 2016cr	PM2_5	3926	2842	1084	28
CONTROL ADDITIONAL OECA 2005cr to 2016cr	SO2	32174	13540	18634	58
CONTROL ADDITIONAL OECA 2005cr to 2016cr	VOC	2761	1639	1122	41
CONTROL REPLACE DOJ 2005cr to 2016cr	NOX	7469	5535	1934	26
CONTROL REPLACE DOJ 2005cr to 2016cr	SO2	51109	7104	44005	86
CONTROL REPLACE HWI 2005cr to 2016cr	PM10	4573	1638	2934	64
CONTROL REPLACE HWI 2005cr to 2016cr	PM2_5	2735	941	1793	66
CONTROL REPLACE IndustrialBoiler nonMACT 2005cr to 2016cr	NOX	907	544	363	40
CONTROL REPLACE IndustrialBoiler nonMACT 2005cr to 2016cr	SO2	4670	787	3884	83
CONTROL REPLACE LMWC 2005cr to 2016cr	PM10	126	83	43	34
CONTROL REPLACE LMWC 2005cr to 2016cr	PM2_5	108	72	37	34
CONTROL REPLACE MACT 2005cr to 2012cr	NOX	300	240	60	20
CONTROL REPLACE MACT 2005cr to 2012cr	PM10	11041	6900	4141	38
CONTROL REPLACE MACT 2005cr to 2012cr	PM2_5	6915	4429	2486	36
CONTROL REPLACE MACT 2005cr to 2012cr	SO2	24529	20152	4377	18
CONTROL REPLACE MACT 2005cr to 2012cr	VOC	219089	129202	89887	41
CONTROL REPLACE NY SIP 2005cr to 2016cr	NOX	1925	577	1347	70
CONTROL REPLACE Refineries 2005cr to 2012cr	NOX	23900	13841	10059	42
CONTROL REPLACE Refineries 2005cr to 2012cr	PM10	1246	452	794	64
CONTROL REPLACE Refineries 2005cr to 2012cr	PM2_5	1181	118	1062	90
CONTROL REPLACE Refineries 2005cr to 2012cr	SO2	84613	7214	77399	91
CONTROL RICE 2012cr_05b	CO	156860	150766	6093	4
CONTROL RICE 2012cr_05b	NOX	321981	308058	13924	4
CONTROL RICE 2012cr_05b	VOC	25959	25206	754	3
CONTROL St Gobain and LaFarge 2012	CO	110	0	110	100
CONTROL St Gobain and LaFarge 2012	NOX	15489	6745	8745	56
CONTROL St Gobain and LaFarge 2012	PM10	14	0	14	100

CONTROL St Gobain and LaFarge 2012	PM2_5	4	0	4	100
CONTROL St Gobain and LaFarge 2012	SO2	3342	917	2425	73
CONTROL St Gobain and LaFarge 2012	VOC	6	0	6	100
CONTROL TR1 Final consent decrees 2012	CO	1871	1059	812	43
CONTROL TR1 Final consent decrees 2012	NOX	10124	6157	3967	39
CONTROL TR1 Final consent decrees 2012	PM10	541	76	466	86
CONTROL TR1 Final consent decrees 2012	PM2_5	541	76	466	86
CONTROL TR1 Final consent decrees 2012	SO2	92042	30863	61179	66
CONTROL TR1 Final consent decrees 2012	VOC	32	6	26	82
CONTROL TR1 Final CONTROL packet: 2012cs	NOX	42918	21573	21346	50
CONTROL TR1 Final CONTROL packet: 2012cs	PM10	831	80	751	90
CONTROL TR1 Final CONTROL packet: 2012cs	PM2_5	821	79	742	90
CONTROL TR1 Final CONTROL packet: 2012cs	SO2	50782	5969	44813	88
PROJECTION aircraft 2005cr to 2012cr	CO	496341	475573	20769	4
PROJECTION aircraft 2005cr to 2012cr	NH3	0	0	0	3
PROJECTION aircraft 2005cr to 2012cr	NOX	74102	75170	-1068	-1
PROJECTION aircraft 2005cr to 2012cr	PM10	12567	12180	387	3
PROJECTION aircraft 2005cr to 2012cr	PM2_5	10048	9800	248	2
PROJECTION aircraft 2005cr to 2012cr	SO2	6691	6784	-93	-1
PROJECTION aircraft 2005cr to 2012cr	VOC	31114	30344	770	2
PROJECTION LMWC 2005cr to 2016cr	CO	58	88	-30	-52
PROJECTION LMWC 2005cr to 2016cr	NH3	4	7	-2	-53
PROJECTION LMWC 2005cr to 2016cr	NOX	2263	3428	-1165	-51
PROJECTION LMWC 2005cr to 2016cr	PM10	21	32	-11	-51
PROJECTION LMWC 2005cr to 2016cr	PM2_5	11	17	-6	-51
PROJECTION LMWC 2005cr to 2016cr	SO2	18	27	-9	-52
PROJECTION LMWC 2005cr to 2016cr	VOC	18	27	-9	-50
PROJECTION refueling 2005cs to 2012cs	VOC	12476	8047	4428	35
PROJECTION TR1 comments 2005cs to 20XXcs -ptnonipm	NOX	13265	22293	-9027	-68
PROJECTION TR1 comments 2005cs to 20XXcs -ptnonipm	PM10	404	878	-474	-117
PROJECTION TR1 comments 2005cs to 20XXcs -ptnonipm	PM2_5	335	579	-244	-73

PROJECTION TR1 comments 2005cs to 20XXcs -ptnonipm	SO2	5292	3447	1844	35

Table D-6. Impacts of Control Programs on 2012 U.S. Nonpoint Source CAPs

Control Program	Pollutant	Inventory Emissions	Final Emissions	Emissions Reduction	Percent Reduction
CONTROL REPLACE NY SIP 2005cr to 2016cr	VOC	139818	102664	37154	27
CONTROL RICE 2012cr_05b	CO	438582	427245	11337	3
CONTROL RICE 2012cr_05b	NOX	528691	515907	12784	2
CONTROL RICE 2012cr_05b	VOC	18400	18193	207	1
CONTROL TR1 Final CONTROL packet: 2012cs	VOC	42596	30807	11788	28
PROJECTION 2005cr to 2012cr ag sector	PM10	3104	3104	0	0
PROJECTION 2005cr to 2012cr ag sector	PM2_5	310	310	0	0
PROJECTION 2005cr to 2012cr ag sector	VOC	42192	44821	-2629	-6
PROJECTION refueling 2005cs to 2012cs	VOC	268798	160342	108455	40
PROJECTION RWC and landfills 2005cr to 2012cs	CO	2856851	2593073	263778	9
PROJECTION RWC and landfills 2005cr to 2012cs	NH3	7238	6772	466	6
PROJECTION RWC and landfills 2005cr to 2012cs	NOX	38292	35127	3165	8
PROJECTION RWC and landfills 2005cr to 2012cs	PM10	388632	352351	36281	9
PROJECTION RWC and landfills 2005cr to 2012cs	PM2_5	381362	344925	36437	10
PROJECTION RWC and landfills 2005cr to 2012cs	SO2	5302	4899	403	8
PROJECTION RWC and landfills 2005cr to 2012cs	VOC	569950	483994	85956	15

Table D-7. Impacts of Control Programs on 2012 U.S. Oil and Gas Inventory CAPs

Control Program	Pollutant	Inventory	Inventory Emissions	Final Emissions	Emissions Reduction	Percent Reduction
CONTROL RICE 2012cr_05b	CO	nonpt_cap_2005_WRAP_OilGas	40694	39359	1335	3
CONTROL RICE 2012cr_05b	NOX	nonpt_cap_2005_WRAP_OilGas	95065	92156	2909	3
CONTROL RICE 2012cr_05b	VOC	nonpt_cap_2005_WRAP_OilGas	5300	5216	83	2
CONTROL RICE 2012cr_05b	CO	nonpt_cap_2008_TCEQ_Oklahoma_OilGas	6776	6554	222	3
CONTROL RICE 2012cr_05b	NOX	nonpt_cap_2008_TCEQ_Oklahoma_OilGas	20698	20065	633	3
CONTROL RICE 2012cr_05b	VOC	nonpt_cap_2008_TCEQ_Oklahoma_OilGas	1631	1605	26	2
CONTROL TR1 Final CONTROL packet: 2012cs	CO	nonpt_cap_2008_TCEQ_Oklahoma_OilGas	16721	14748	1973	12
CONTROL TR1 Final CONTROL packet: 2012cs	NOX	nonpt_cap_2008_TCEQ_Oklahoma_OilGas	55238	46251	8987	16
CONTROL TR1 Final CONTROL packet: 2012cs	PM10	nonpt_cap_2008_TCEQ_Oklahoma_OilGas	2543	2263	280	11
CONTROL TR1 Final CONTROL packet: 2012cs	PM2_5	nonpt_cap_2008_TCEQ_Oklahoma_OilGas	2467	2195	271	11
CONTROL TR1 Final CONTROL packet: 2012cs	SO2	nonpt_cap_2008_TCEQ_Oklahoma_OilGas	956	43	913	96
CONTROL TR1 Final CONTROL packet: 2012cs	VOC	nonpt_cap_2008_TCEQ_Oklahoma_OilGas	4326	3665	661	15

Table D-8. Impacts of Control Programs on 2014 U.S. Non-EGU Point Source CAPs

Control Program	Pollutant	Inventory Emissions	Final Emissions	Emissions Reduction	Percent Reduction
closures: 2005 to 2012ck	CO	4154	0	4154	100
closures: 2005 to 2012ck	NH3	7	0	7	100
closures: 2005 to 2012ck	NOX	2112	0	2112	100
closures: 2005 to 2012ck	PM10	352	0	352	100
closures: 2005 to 2012ck	PM2_5	225	0	225	100
closures: 2005 to 2012ck	SO2	5549	0	5549	100
closures: 2005 to 2012ck	VOC	3392	0	3392	100
CLOSURES cement ISIS 2013 policy	CO	42781	0	42781	100
CLOSURES cement ISIS 2013 policy	NH3	121	0	121	100
CLOSURES cement ISIS 2013 policy	NOX	77030	0	77030	100
CLOSURES cement ISIS 2013 policy	PM10	10768	0	10768	100
CLOSURES cement ISIS 2013 policy	PM2_5	5107	0	5107	100
CLOSURES cement ISIS 2013 policy	SO2	46192	0	46192	100
CLOSURES cement ISIS 2013 policy	VOC	3260	0	3260	100
CLOSURES LotusNotes, ABCG, plus Timin 2016cr	CO	15787	0	15787	100
CLOSURES LotusNotes, ABCG, plus Timin 2016cr	NH3	414	0	414	100
CLOSURES LotusNotes, ABCG, plus Timin 2016cr	NOX	15716	0	15716	100
CLOSURES LotusNotes, ABCG, plus Timin 2016cr	PM10	5582	0	5582	100
CLOSURES LotusNotes, ABCG, plus Timin 2016cr	PM2_5	4051	0	4051	100
CLOSURES LotusNotes, ABCG, plus Timin 2016cr	SO2	68993	0	68993	100
CLOSURES LotusNotes, ABCG, plus Timin 2016cr	VOC	15297	0	15297	100
CLOSURES TR1 comments and consent decrees 2014cs	CO	62419	0	62419	100
CLOSURES TR1 comments and consent decrees 2014cs	NH3	94	0	94	100
CLOSURES TR1 comments and consent decrees 2014cs	NOX	14355	0	14355	100
CLOSURES TR1 comments and consent decrees 2014cs	PM10	4414	0	4414	100
CLOSURES TR1 comments and consent decrees 2014cs	PM2_5	3196	0	3196	100
CLOSURES TR1 comments and consent decrees 2014cs	SO2	28155	0	28155	100
CLOSURES TR1 comments and consent decrees 2014cs	VOC	4799	0	4799	100

CONTROL ADDITIONAL OECA 2005cr to 2016cr	CO	10968	262	10706	98
CONTROL ADDITIONAL OECA 2005cr to 2016cr	NOX	41507	21991	19516	47
CONTROL ADDITIONAL OECA 2005cr to 2016cr	PM10	5307	3652	1655	31
CONTROL ADDITIONAL OECA 2005cr to 2016cr	PM2_5	3926	2842	1084	28
CONTROL ADDITIONAL OECA 2005cr to 2016cr	SO2	32174	13540	18634	58
CONTROL ADDITIONAL OECA 2005cr to 2016cr	VOC	2761	1639	1122	41
CONTROL cement ISIS 2013 policy	NOX	52174	21306	30868	59
CONTROL cement ISIS 2013 policy	PM10	5352	133	5219	98
CONTROL cement ISIS 2013 policy	PM2_5	2427	52	2375	98
CONTROL cement ISIS 2013 policy	SO2	44392	8809	35584	80
CONTROL cement ISIS 2013 policy	VOC	3059	322	2738	89
CONTROL REPLACE DOJ 2005cr to 2016cr	NOX	7469	5535	1934	26
CONTROL REPLACE DOJ 2005cr to 2016cr	SO2	51109	7104	44005	86
CONTROL REPLACE HWI 2005cr to 2016cr	PM10	4573	1638	2934	64
CONTROL REPLACE HWI 2005cr to 2016cr	PM2_5	2735	941	1793	66
CONTROL REPLACE IndustrialBoiler nonMACT 2005cr to 2016cr	NOX	907	544	363	40
CONTROL REPLACE IndustrialBoiler nonMACT 2005cr to 2016cr	SO2	4670	787	3884	83
CONTROL REPLACE LMWC 2005cr to 2016cr	PM10	126	83	43	34
CONTROL REPLACE LMWC 2005cr to 2016cr	PM2_5	108	72	37	34
CONTROL REPLACE MACT 2005cr to 2016cr	NOX	300	240	60	20
CONTROL REPLACE MACT 2005cr to 2016cr	PM10	11041	6900	4141	38
CONTROL REPLACE MACT 2005cr to 2016cr	PM2_5	6915	4429	2486	36
CONTROL REPLACE MACT 2005cr to 2016cr	SO2	24529	20152	4377	18
CONTROL REPLACE MACT 2005cr to 2016cr	VOC	222176	131456	90720	41
CONTROL REPLACE NY SIP 2005cr to 2016cr	NOX	1925	577	1347	70
CONTROL REPLACE Refineries 2005cr to 2014cr	NOX	25803	14393	11411	44
CONTROL REPLACE Refineries 2005cr to 2014cr	PM10	1354	462	891	66
CONTROL REPLACE Refineries 2005cr to 2014cr	PM2_5	1288	129	1159	90
CONTROL REPLACE Refineries 2005cr to 2014cr	SO2	88745	7845	80901	91
CONTROL RICE 2016cr_05b	CO	189218	148168	41050	22

CONTROL RICE 2016cr_05b	NOX	321525	264672	56853	18
CONTROL RICE 2016cr_05b	PM10	2115	1797	318	15
CONTROL RICE 2016cr_05b	PM2_5	1979	1681	298	15
CONTROL RICE 2016cr_05b	VOC	34756	25459	9297	27
CONTROL RICE SO2 2014cs_05b	SO2	3708	1907	1801	49
CONTROL St Gobain and LaFarge 2014	CO	110	0	110	100
CONTROL St Gobain and LaFarge 2014	NOX	22256	9042	13214	59
CONTROL St Gobain and LaFarge 2014	PM10	272	3	269	99
CONTROL St Gobain and LaFarge 2014	PM2_5	221	11	210	95
CONTROL St Gobain and LaFarge 2014	SO2	18869	2600	16270	86
CONTROL St Gobain and LaFarge 2014	VOC	6	0	6	100
CONTROL SULF rules: ME and NY 2014 through 2016	SO2	789	70	719	91
CONTROL TR1 Final consent decrees 2014	CO	2257	1326	931	41
CONTROL TR1 Final consent decrees 2014	NOX	14289	7199	7090	50
CONTROL TR1 Final consent decrees 2014	PM10	541	76	466	86
CONTROL TR1 Final consent decrees 2014	PM2_5	541	76	466	86
CONTROL TR1 Final consent decrees 2014	SO2	61354	13095	48259	79
CONTROL TR1 Final consent decrees 2014	VOC	32	6	26	82
CONTROL TR1 Final CONTROL packet: 2014cs	NOX	34805	16362	18443	53
CONTROL TR1 Final CONTROL packet: 2014cs	PM10	831	80	751	90
CONTROL TR1 Final CONTROL packet: 2014cs	PM2_5	821	79	742	90
CONTROL TR1 Final CONTROL packet: 2014cs	SO2	50782	5969	44813	88
PROJECTION aircraft 2005cr to 2014cr	CO	496341	486383	9959	2
PROJECTION aircraft 2005cr to 2014cr	NH3	0	0	0	3
PROJECTION aircraft 2005cr to 2014cr	NOX	74102	78489	-4387	-6
PROJECTION aircraft 2005cr to 2014cr	PM10	12567	12510	57	0
PROJECTION aircraft 2005cr to 2014cr	PM2_5	10048	10087	-38	0
PROJECTION aircraft 2005cr to 2014cr	SO2	6691	7083	-392	-6
PROJECTION aircraft 2005cr to 2014cr	VOC	31114	31237	-123	0
PROJECTION cement ISIS 2013 policy	NOX	21483	38769	-17285	-80
PROJECTION LMWC 2005cr to 2016cr	CO	58	88	-30	-52

PROJECTION LMWC 2005cr to 2016cr	NH3	4	7	-2	-53
PROJECTION LMWC 2005cr to 2016cr	NOX	2263	3428	-1165	-51
PROJECTION LMWC 2005cr to 2016cr	PM10	21	32	-11	-51
PROJECTION LMWC 2005cr to 2016cr	PM2_5	11	17	-6	-51
PROJECTION LMWC 2005cr to 2016cr	SO2	18	27	-9	-52
PROJECTION LMWC 2005cr to 2016cr	VOC	18	27	-9	-50
PROJECTION refueling 2005cs to 2014cs	VOC	12476	6953	5522	44
PROJECTION TR1 comments 2005cs to 20XXcs -ptnonipm	NOX	13589	22449	-8860	-65
PROJECTION TR1 comments 2005cs to 20XXcs -ptnonipm	PM10	404	878	-474	-117
PROJECTION TR1 comments 2005cs to 20XXcs -ptnonipm	PM2_5	335	579	-244	-73
PROJECTION TR1 comments 2005cs to 20XXcs -ptnonipm	SO2	5292	3447	1844	35

Table D-9. Impacts of Control Programs on 2014 U.S. Nonpoint Source CAPs

Control Program	Pollutant	Inventory Emissions	Final Emissions	Emissions Reduction	Percent Reduction
CONTROL REPLACE NY SIP 2005cr to 2016cr	VOC	139818	102664	37154	27
CONTROL RICE 2016cr_05b	CO	475358	401325	74033	16
CONTROL RICE 2016cr_05b	NOX	528691	476388	52303	10
CONTROL RICE 2016cr_05b	PM10	16404	15127	1277	8
CONTROL RICE 2016cr_05b	PM2_5	13687	12617	1070	8
CONTROL RICE 2016cr_05b	VOC	24195	19227	4969	21
CONTROL RICE SO2 2014cs_05b	SO2	235410	215253	20156	9
CONTROL SULF rules: ME and NY 2014 through 2016	SO2	62379	1614	60765	97
CONTROL TR1 Final CONTROL packet: 2014cs	VOC	42596	30807	11788	28
PROJECTION 2005cr to 2014cr ag sector	PM10	3104	3104	0	0
PROJECTION 2005cr to 2014cr ag sector	PM2_5	310	310	0	0
PROJECTION 2005cr to 2014cr ag sector	VOC	42192	45347	-3155	-7
PROJECTION refueling 2005cs to 2014cs	VOC	268798	136025	132773	49
PROJECTION RWC and landfills 2005cr to 2014cs	CO	2856851	2540317	316534	11
PROJECTION RWC and landfills 2005cr to 2014cs	NH3	7238	6679	559	8
PROJECTION RWC and landfills 2005cr to 2014cs	NOX	38292	34486	3806	10
PROJECTION RWC and landfills 2005cr to 2014cs	PM10	388632	345064	43568	11
PROJECTION RWC and landfills 2005cr to 2014cs	PM2_5	381362	337606	43756	11
PROJECTION RWC and landfills 2005cr to 2014cs	SO2	5302	4818	484	9
PROJECTION RWC and landfills 2005cr to 2014cs	VOC	569950	470793	99157	17

Table D-10. Impacts of Control Programs on 2014 U.S. Oil and Gas Inventory CAPs

Control Program	Pollutant	Inventory	Inventory Emissions	Final Emissions	Emissions Reduction	Percent Reduction
CONTROL RICE 2016cr_05b	CO	nonpt_cap_2005_WRAP_OilGas	40694	32612	8082	20
CONTROL RICE 2016cr_05b	NOX	nonpt_cap_2005_WRAP_OilGas	95065	83153	11912	13
CONTROL RICE 2016cr_05b	VOC	nonpt_cap_2005_WRAP_OilGas	5300	4035	1265	24
CONTROL RICE SO2 2014cs_05b	SO2	nonpt_cap_2005_WRAP_OilGas	2835	1425	1411	50
CONTROL RICE 2016cr_05b	CO	nonpt_cap_2008_TCEQ_Oklahoma_OilGas	6776	5430	1346	20
CONTROL RICE 2016cr_05b	NOX	nonpt_cap_2008_TCEQ_Oklahoma_OilGas	20698	18105	2593	13
CONTROL RICE 2016cr_05b	VOC	nonpt_cap_2008_TCEQ_Oklahoma_OilGas	1631	1241	389	24
CONTROL TR1 Final CONTROL packet: 2014cs	CO	nonpt_cap_2008_TCEQ_Oklahoma_OilGas	16721	11946	4776	29
CONTROL TR1 Final CONTROL packet: 2014cs	NOX	nonpt_cap_2008_TCEQ_Oklahoma_OilGas	55238	39462	15776	29
CONTROL TR1 Final CONTROL packet: 2014cs	PM10	nonpt_cap_2008_TCEQ_Oklahoma_OilGas	2543	1372	1171	46
CONTROL TR1 Final CONTROL packet: 2014cs	PM2_5	nonpt_cap_2008_TCEQ_Oklahoma_OilGas	2467	1331	1136	46
CONTROL TR1 Final CONTROL packet: 2014cs	SO2	nonpt_cap_2008_TCEQ_Oklahoma_OilGas	956	38	918	96
CONTROL TR1 Final CONTROL packet: 2014cs	VOC	nonpt_cap_2008_TCEQ_Oklahoma_OilGas	4326	3392	934	22

E-6: Comparison of EGU Emissions

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Comparison of EGU Emissions

This section provides a comparison of EGU SO_2 and NO_x emissions, based on the following:

- CAIR 2015 Final Modeling (Parsed), developed in 2005
  - http://www.epa.gov/airmarkets/progsregs/epa-ipm/cair/index.html
- CSAPR 2014 TR1 Remedy Case, developed in 2011
  - ftp://ftp.epa.gov/EmisInventory/2005v4_2/2014emis
- CAMD Reported 2012 Emissions, downloaded Feb. 2013
  - http://ampd.epa.gov/ampd/
- CAMD Reported 2012 Emissions, revised for expected reductions by mid-2015
  - http://www.pjm.com/~/media/planning/gen-retire/generator-deactivations.ashx
  - http://www.pjm.com/~/media/planning/gen-retire/pending-deactivation-requests.ashx

This comparison provides a look at projected CAIR and CSPAR along with real-world reported and future expected emissions.

CSAPR 2014 was used for the modeling as described in Sections 3.1 and 5.3.5 of the SIP. This section provides details by state emissions totals nationwide, by CSAPR states, and by PA and surrounding states (OH, WV, and MD). Facility totals are also given for PA and surrounding states.

The current deactivated EGUs (as of Jan. 2013) and proposed deactivations (as of Mar. 2013) from PJM Interconnection, along with the Homer City 2012 Plan Approval from PA DEP, are also included as supplemental information.

Projected and Reported EGU Emissions by State (U.S.), in tons/year

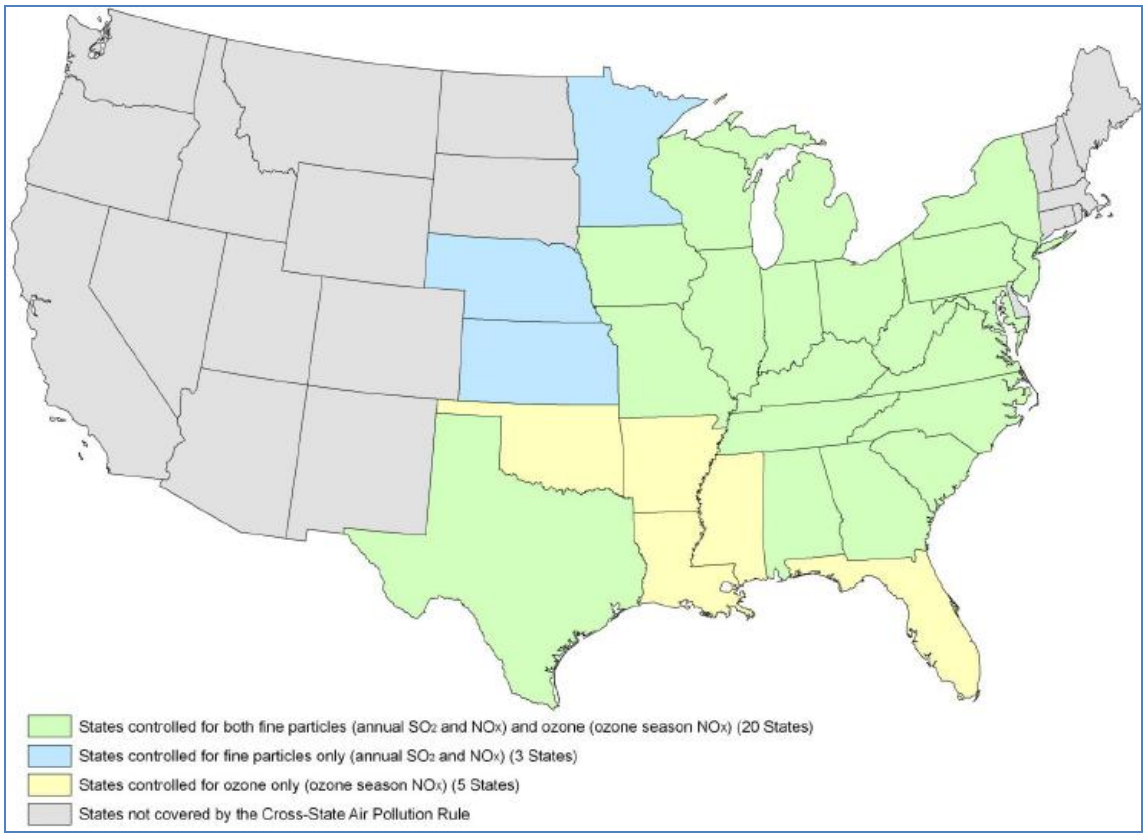
	CAIR 2015 Final Parsed		CSAPR 2014 TR1 Remedy		CAMD 2012		2012 CAMD w/ Expected by mid-2015	
State	SO2	NOx	SO2	NOx	SO2	NOx	SO2	NOx
Alabama	255322	49081	173566	69192	128828	45793	128828	45793
Arizona	60308	80405	35601	35613	20023	48137	20023	48137
Arkansas	82416	31896	106685	37640	76326	34847	76326	34847
California	5066	22405	7350	26776	220	3771	220	3771
Colorado	91817	69198	73858	49331	39702	45162	39702	45162
Connecticut	6437	7026	3883	2860	333	1091	333	1091
Delaware	46869	11435	2172	1717	2659	2145	2659	2145
Florida	167154	61453	148069	78508	84384	60931	84384	60931
Georgia	248669	66325	93208	41484	101074	34892	101074	34892
Idaho	0	587	182	608	4	122	4	122
Illinois	244283	65259	132647	49162	151543	55062	145592	53674
Indiana	377292	86216	195046	110740	268424	93296	261982	90355
Iowa	161590	43276	83827	42231	80772	34747	80772	34747
Kansas	80071	90262	45740	24328	32472	33091	32472	33091
Kentucky	277845	79715	116927	76088	183102	79647	163403	77580
Louisiana	62034	29722	139204	31582	85858	43947	85858	43947
Maine	5338	1786	2355	5402	342	502	342	502
Maryland	23813	12718	30368	17190	22884	15559	22325	15392
Massachusetts	17567	19285	13363	7033	11049	3040	11049	3040
Michigan	390998	87122	162632	60907	194702	66709	176357	60213
Minnesota	84505	39313	49622	34429	25286	24353	25286	24353
Mississippi	80957	12095	32109	26080	37213	19799	37213	19799
Missouri	268604	62024	186899	52103	138833	69814	138833	69814
Montana	22474	38421	22826	19303	12600	16496	12600	16496
Nebraska	72333	49378	71339	28211	62389	26902	62389	26902
Nevada	31096	46905	14416	14050	4691	5832	4691	5832
New Hampshire	7426	2862	6742	4971	1854	2480	1854	2480
New Jersey	35626	19137	6243	7720	2979	5368	2979	5368
New Mexico	52884	73563	13926	64833	16561	59939	16561	59939
New York	51964	36481	15160	20528	17635	17976	17635	17976
North Carolina	145199	50686	69377	45008	58295	48877	58295	48877
North Dakota	99997	71709	103624	53267	85607	48302	85607	48302
Ohio	239210	86055	178975	89753	331401	82532	123664	58179
Oklahoma	115526	78531	138072	44143	76273	63947	76273	63947
Oregon	10034	10606	11336	9632	11499	3342	11499	3342
Pennsylvania	150093	79813	125545	118981	249626	129853	130517	124723
Rhode Island	0	504	0	442	19	633	19	633
South Carolina	104446	35888	100788	36747	44971	18132	44971	18132

	CAIR 2015 Final Parsed		CSAPR 2014 TR1 Remedy		CAMD 2012		2012 CAMD w/ Expected by mid-2015	
State	**SO2**	**NOx**	**SO2**	**NOx**	**SO2**	**NOx**	**SO2**	**NOx**
South Dakota	12085	14543	29711	14273	12290	10646	12290	10646
Tennessee	159744	27159	64721	20512	66258	22614	66258	22614
Texas	352064	159714	266648	137964	338840	127793	338840	127793
Utah	53108	60784	33968	67434	20062	48960	20062	48960
Vermont	0	31	263	455	1	90	1	90
Virginia	117933	39381	51144	39734	31487	22640	31487	22640
Washington	9754	25008	3430	13322	1246	4880	1246	4880
West Virginia	118209	44179	84344	53975	83265	50491	45515	43478
Wisconsin	151010	38614	50137	33537	61565	24841	61565	24841
Wyoming	71874	81173	58530	70778	39368	46419	39368	46419
TOTALS	**5223044**	**2199729**	**3356577**	**1890578**	**3316811**	**1706442**	**2901220**	**1656886**

Projected and Reported EGU Emissions by CSAPR-Controlled States, in tons/year

	CAIR 2015 Final Parsed		CSAPR 2014 TR1 Remedy		CAMD 2012		2012 CAMD w/ Expected by mid-2015	
State	**SO2**	**NOx**	**SO2**	**NOx**	**SO2**	**NOx**	**SO2**	**NOx**
Alabama	255322	49081	173566	69192	128828	45793	128828	45793
Arkansas	82416	31896	106685	37640	76326	34847	76326	34847
Florida	167154	61453	148069	78508	84384	60931	84384	60931
Georgia	248669	66325	93208	41484	101074	34892	101074	34892
Illinois	244283	65259	132647	49162	151543	55062	145592	53674
Indiana	377292	86216	195046	110740	268424	93296	261982	90355
Iowa	161590	43276	83827	42231	80772	34747	80772	34747
Kansas	80071	90262	45740	24328	32472	33091	32472	33091
Kentucky	277845	79715	116927	76088	183102	79647	163403	77580
Louisiana	62034	29722	139204	31582	85858	43947	85858	43947
Maryland	23813	12718	30368	17190	22884	15559	22325	15392
Michigan	390998	87122	162632	60907	194702	66709	176357	60213
Minnesota	84505	39313	49622	34429	25286	24353	25286	24353
Mississippi	80957	12095	32109	26080	37213	19799	37213	19799
Missouri	268604	62024	186899	52103	138833	69814	138833	69814
Nebraska	72333	49378	71339	28211	62389	26902	62389	26902
New Jersey	35626	19137	6243	7720	2979	5368	2979	5368
New York	51964	36481	15160	20528	17635	17976	17635	17976
North Carolina	145199	50686	69377	45008	58295	48877	58295	48877
Ohio	239210	86055	178975	89753	331401	82532	123664	58179
Oklahoma	115526	78531	138072	44143	76273	63947	76273	63947
Pennsylvania	150093	79813	125545	118981	249626	129853	130517	124723
South Carolina	104446	35888	100788	36747	44971	18132	44971	18132
Tennessee	159744	27159	64721	20512	66258	22614	66258	22614
Texas	352064	159714	266648	137964	338840	127793	338840	127793
Virginia	117933	39381	51144	39734	31487	22640	31487	22640
West Virginia	118209	44179	84344	53975	83265	50491	45515	43478
Wisconsin	151010	38614	50137	33537	61565	24841	61565	24841
TOTALS	**4618909**	**1561493**	**2919042**	**1428480**	**3036681**	**1354453**	**2621090**	**1304897**

CSAPR-Controlled States



Projected and Reported EGU Emissions by PA and Surrounding States, in tons/year

	CAIR 2015 Final Parsed		CSAPR 2014 TR1 Remedy		CAMD 2012		2012 CAMD w/ Expected by mid-2015	
State	**SO2**	**NOx**	**SO2**	**NOx**	**SO2**	**NOx**	**SO2**	**NOx**
Maryland	23813	12718	30368	17190	22884	15559	22325	15392
Ohio	239210	86055	178975	89753	331401	82532	123664	58179
Pennsylvania	150093	79813	125545	118981	249626	129853	130517	124723
West Virginia	118209	44179	84344	53975	83265	50491	45515	43478
TOTALS	**531325**	**222766**	**419233**	**279901**	**687176**	**278436**	**322020**	**241772**

Reported w/Expected EGU Emissions by Facility (PA and Surrounding), in tons/year

PENNSYLVANIA	REPORTED 2012		COMMENTS	REPORTED 2012 w/EXPECTED 2013-2015	
FACILITY	SO2	NOx		SO2	NOx
AES Beaver Valley LLC	3205	2960		3205	2960
Allegheny Energy Units 1 & 2	0	12		0	12
Allegheny Energy Units 3, 4 & 5	7	96		7	96
Allegheny Energy Units 8 & 9	0	13		0	13
Armstrong Energy Ltd Partnership, LLP	1	33		1	33
Armstrong Power Station	5184	605	Deactivate all units	0	0
Bethlehem Power Plant	14	157		14	157
Bruce Mansfield	19082	9518		19082	9518
Brunner Island	12254	11321		12254	11321
Brunot Island Power Station	0	11		0	11
Cambria Cogen	1755	986		1755	986
Chambersburg Units 12 & 13	0	20		0	20
Cheswick	1911	4484		1911	4484
Colver Power Project	2547	878		2547	878
Conemaugh	6312	16456		6312	16456
Croydon Generating Station	6	19		6	19
Duke Energy Fayette, II LLC	10	110		10	110
Ebensburg Power Company	2003	316		2003	316
Eddystone Generating Station	124	97		124	97
Elrama	250	273	Deactivate all units	0	0
Fairless Energy, LLC	18	228		18	228
Fairless Hills Generating Station	76	89		76	89
FPL Energy Marcus Hook, LP	10	278		10	278
Gilberton Power Company	930	119		930	119
Grays Ferry Cogen Partnership	13	201		13	201
Handsome Lake Energy	0	54		0	54
Hatfield's Ferry Power Station	3791	23589		3791	23589
Hazleton Generation	0	3		0	3
Homer City	99774	10291	Install FGD Units 1-2	15036	10291
Hunlock Creek Energy Center	1	31		1	31
Hunlock Unit 4	0	2		0	2
Hunterstown Combined Cycle	9	111		9	111
Keystone	29420	17455		29420	17455
Kimberly-Clark Tissue Company		127		0	127
Liberty Electric Power Plant	8	159		8	159
Lower Mount Bethel Energy	7	122		7	122
Martins Creek	162	1905		162	1905

PENNSYLVANIA	REPORTED 2012		COMMENTS	REPORTED 2012 w/EXPECTED 2013-2015	
FACILITY	**SO2**	**NOx**		**SO2**	**NOx**
Mitchell Power Station	1570	1971		1570	1971
Montour	15137	15115		15137	15115
Mountain	5	29		5	29
Mt. Carmel Cogeneration	465	304		465	304
New Castle	4995	856	Deactivate Units 3-5	0	0
Northampton Generating Plant	474	383		474	383
Northeastern Power Company	700	101		700	101
Ontelaunee Energy Center	7	88		7	88
Panther Creek Energy Facility	556	543		556	543
PEI Power Corporation	0	7		0	7
Piney Creek Power Plant	1086	264		1086	264
Portland	2382	319	Deactivate Units 1-2	0	1
PPL Ironwood, LLC	10	228		10	228
Procter & Gamble Paper Products		352		0	352
Richmond	2	7		2	7
Schuylkill	2	1		2	1
Scrubgrass Generating Plant	1807	757		1807	757
Seward	4333	953		4333	953
Shawville	20483	2889	Deactivate Units 1-4	0	0
St. Nicholas Cogeneration Project	1939	240		1939	240
Sunbury	2956	328		2956	328
Titus	1078	189	Deactivate Units 1-3	0	0
Tolna	1	5		1	5
Warren	3	40		3	40
Wheelabrator - Frackville	476	446		476	446
WPS Westwood Generation, LLC	272	230		272	230
York Energy Center	8	82		8	82
TOTAL w/EXPECTED				**130517**	**124723**

OHIO	REPORTED 2012		COMMENTS	REPORTED 2012 w/EXPECTED 2013-2015	
FACILITY	SO2	NOx		SO2	NOx
AMP-Ohio Gas Turbines Bowling Green	0	0		0	0
AMP-Ohio Gas Turbines Galion	0	0		0	0
AMP-Ohio Gas Turbines Napoleon	0	0		0	0
Ashtabula	6289	529	Deactivate Unit 5	0	0
Avon Lake Power Plant	38308	4581	Deactivate Units 7, 9	1262	162
Bay Shore	4252	1310	Deactivate Units 2-4	2555	411
Cardinal	15583	3506		15583	3506
Conesville	12881	8463	Deactivate Unit 3	4983	7700
Darby Electric Generating Station	0	97		0	97
Dicks Creek Station	0	0		0	0
Dresden Energy Facility	4	77		4	77
Duke Energy Hanging Rock, II LLC	19	289		19	289
Duke Energy Washington, II LLC	9	163		9	163
Eastlake	54856	7132	Deactivate Units 1-5	5	12
Frank M Tait Station	0	16		0	16
Fremont Energy Center	7	145		7	145
Gen J M Gavin	31269	7250		31269	7250
Greenville Electric Gen Station	0	29		0	29
Hamilton Municipal Power Plant	420	156		420	156
J M Stuart	8864	7839		8864	7839
Killen Station	5362	5822		5362	5822
Kyger Creek	4989	4579		4989	4579
Lake Shore	777	332	Deactivate Unit 18	0	0
Madison Generating Station	1	37		1	37
Miami Fort Generating Station	26407	6853		26407	6853
Muskingum River	36137	2653	Deactivate Units 1-4	5864	221
Niles	1364	291	Deactivate Units 1-2	4	9
O H Hutchings	411	132	Deactivate Units 1-6	0	1
Omega JV2 Bowling Green	0	3		0	3
Omega JV2 Hamilton	0	2		0	2
Picway	67	11	Deactivate Units 5	0	0
Richland Peaking Station	1	88		1	88
Robert P Mone	0	15		0	15
Rolling Hills Generating LLC	0	33		0	33
Tait Electric Generating Station	0	30		0	30
Troy Energy, LLC	0	17		0	17
W H Sammis	4064	5756		4064	5756
W H Zimmer Generating Station	11975	6581		11975	6581
Walter C Beckjord Generating Station	67069	7440	Deactivate Units 1-6	0	5

OHIO	REPORTED 2012		COMMENTS	REPORTED 2012 w/EXPECTED 2013-2015	
FACILITY	**SO2**	**NOx**		**SO2**	**NOx**
Waterford Plant	11	187		11	187
West Lorain	2	69		2	69
Woodsdale	0	18		0	18
TOTAL w/EXPECTED				**123664**	**58179**

WEST VIRGINIA	REPORTED 2012		COMMENTS	REPORTED 2012 w/EXPECTED 2013-2015	
FACILITY	**SO2**	**NOx**		**SO2**	**NOx**
Albright Power Station	2489	344	Deactivate Units 1-3	0	0
Big Sandy Peaker Plant	0	18		0	18
Ceredo Generating Station	0	5		0	5
Fort Martin Power Station	3422	7962		3422	7962
Grant Town Power Plant	2094	1513		2094	1513
Harrison Power Station	12049	15609		12049	15609
John E Amos	3133	3240		3133	3240
Kammer	19717	3854	Deactivate Units 1-3	0	0
Kanawha River	7259	1498	Deactivate Units 1-2	0	0
Longview Power	955	1179		955	1179
Mitchell (WV)	3455	1869		3455	1869
Morgantown Energy Facility	909	907		909	907
Mount Storm Power Station	5449	3693		5449	3693
Mountaineer (1301)	1151	2264		1151	2264
Phil Sporn	8078	1225	Deactivate Units 1-4	0	0
Pleasants Energy, LLC	0	15		0	15
Pleasants Power Station	12897	5203		12897	5203
Rivesville Power Station	22	25	Deactivate Units 5-6	0	0
Willow Island Power Station	186	66	Deactivate Units 1-2	0	0
TOTAL w/EXPECTED				**45515**	**43478**

MARYLAND	REPORTED 2012		COMMENTS	REPORTED 2012 w/EXPECTED 2013-2015	
FACILITY	**SO2**	**NOx**		**SO2**	**NOx**
AES Warrior Run	1235	580		1235	580
Brandon Shores	2848	4140		2848	4140
C P Crane	2173	1817		2173	1817
Chalk Point	4743	4689		4743	4689
Dickerson	818	1488		818	1488
Gould Street	0	23		0	23
Herbert A Wagner	7514	1558		7514	1558
Morgantown	2944	818		2944	818
Panda Brandywine	2	84		2	84
Perryman	2	62		2	62
R. Paul Smith Power Station	559	167	Deactivate Units 3-4	0	0
Riverside	1	37		1	37
Rock Springs Generating Facility	1	70		1	70
Vienna	42	10		42	10
Westport	0	17		0	17
TOTAL w/EXPECTED				**22325**	**15392**

GENERATOR DEACTIVATIONS[1]
(as of January 10, 2013)

Unit	Capacity	Trans Zone	Age (Years)	Official Owner Request	Requested Deactivation Date	Actual Deactivation Date	PJM Reliability Status
Warren 1	41	PN	54		9/27/2002	9/28/2002	No Reliability Issues
Warren 2	41	PN	53		9/27/2002	9/28/2002	No Reliability Issues
Hudson 3 CT	129	PS	36	10/16/2003	10/16/2003	10/17/2003	No Reliability Issues
Seward 4	60	PN	53	11/19/2003	11/19/2003	11/20/2003	No Reliability Issues
Seward 5	136	PN	47	11/19/2003	11/19/2003	11/20/2003	No Reliability Issues
Sayreville 4	114	JC	49	11/1/2003	2/14/2004	2/19/2004	Reliability Issues Identified and Resolved
Sayreville 5	115	JC	45	11/1/2003	2/14/2004	2/19/2004	Reliability Issues Identified and Resolved
Delaware 7	126	PE	50	12/12/2003	3/1/2004	3/5/2004	No Reliability Issues
Delaware 8	124	PE	51	12/12/2003	3/1/2004	3/5/2004	No Reliability Issues
Burlington 101-104	208	PS	10	1/8/2004	4/4/2004	4/4/2004	No Reliability Issues
Burlington 105	52	PS	31	1/8/2004	4/4/2004	4/4/2004	No Reliability Issues
Wayne CT	56	PN	31	2/12/2004	As soon as possible	5/5/2004	No Reliability Issues
Sherman VCLP	46.6	AE	9	2/2/2004	3/15/2004	6/25/2004	No Reliability Issues
Calumet 31	56	CE	36	10/12/2004	Currently Mothballed - ASAP	7/1/2004	No Reliability Issues
Calumet 33	42	CE	36	10/12/2004	Currently Mothballed - ASAP	7/1/2004	No Reliability Issues
Calumet 34	51	CE	35	10/12/2004	Currently Mothballed - ASAP	7/1/2004	No Reliability Issues
Joliet 31	59	CE	36	10/12/2004	Currently Mothballed - ASAP	7/1/2004	No Reliability Issues
Joliet 32	57	CE	36	10/12/2004	Currently Mothballed - ASAP	7/1/2004	No Reliability Issues
Bloom 33	24	CE	33	10/12/2004	Currently Mothballed - ASAP	n/a - never a PJM capacity resource	No Reliability Issues
Bloom 34	26	CE	33	10/12/2004	Currently Mothballed - ASAP	n/a - never a PJM capacity resource	No Reliability Issues
Collins 1	554	CE	26	6/2/2004	12/31/2004	1/1/2005	No Reliability Issues
Collins 2	554	CE	27	6/2/2004	3rd/4th Quarter 2004	1/1/2005	No Reliability Issues
Collins 3	530	CE	27	6/2/2004	12/31/2004	1/1/2005	No Reliability Issues
Collins 4	530	CE	26	6/2/2004	Currently Mothballed - ASAP	1/1/2005	No Reliability Issues
Collins 5	530	CE	25	6/2/2004	Currently Mothballed - ASAP	1/1/2005	No Reliability Issues

GENERATOR DEACTIVATIONS[1]
(as of January 10, 2013)

Unit	Capacity	Trans Zone	Age (Years)	Official Owner Request	Requested Deactivation Date	Actual Deactivation Date	PJM Reliability Status
Riegel Paper NUG (Milford Power LP)	27	JC	33	6/11/2004	Planned to retire 6/30/04, request delayed until 12/31/04	1/1/2005	No Reliability Issues
STI 3 & 4 (Cat Tractor)	20	ME	15	9/29/2004	1/1/2005	1/1/2005	No Reliability Issues
Electric Junction 31	59	CE	34	10/12/2004	12/31/04 - when contract is complete	1/1/2005	No Reliability Issues after 1/1/05
Electric Junction 32	59	CE	34	10/12/2004	12/31/04 - when contract is complete	1/1/2005	No Reliability Issues after 1/1/05
Electric Junction 33	59	CE	34	10/12/2004	12/31/04 - when contract is complete	1/1/2005	No Reliability Issues after 1/1/05
Lombard 32	31	CE	35	10/12/2004	Currently Mothballed - ASAP	1/1/2005	No Reliability Issues
Lombard 33	32	CE	35	10/12/2004	Currently Mothballed - ASAP	1/1/2005	No Reliability Issues
Sabrooke 31	25	CE	35	10/12/2004	12/31/04 - when contract is complete	1/1/2005	No Reliability Issues
Sabrooke 32	25	CE	35	10/12/2004	12/31/04 - when contract is complete	1/1/2005	No Reliability Issues
Sabrooke 33	24	CE	34	10/12/2004	12/31/04 - when contract is complete	1/1/2005	No Reliability Issues after 1/1/05
Sabrooke 34	13	CE	34	10/12/2004	12/31/04 - when contract is complete	1/1/2005	No Reliability Issues after 1/1/05
Madison St. CT	10	DPL	41	10/13/2004	12/31/2004	1/7/2005	No Reliability Issues
Crawford 31	59	CE	36	10/12/2004	ASAP	3/1/2005	Reliability issue identified and resolved
Crawford 32	58	CE	36	10/12/2004	ASAP	3/1/2005	Reliability issue identified and resolved
Crawford 33	59	CE	36	10/12/2004	ASAP	3/1/2005	Reliability issue identified and resolved
Deepwater CT A	19	AE	37	10/13/2004	4/1/2005	5/1/2005	Reliability Issue resolved (Blackstart)
Kearny 7	150	PS	51	9/8/2004	12/7/2004	6/1/2005	Reliability issue identified and resolved
Kearny 8	150	PS	50	9/8/2004	12/7/2004	6/1/2005	Reliability issue identified and resolved
Howard M. Down (Vineland) Unit 7	8	AE	53	2/24/2005	5/31/2005	6/17/2005	No Reliability Issues
DSM (Hoffman LaRoche)	9	JC	7	9/1/2005	10/1/2005	10/6/2005	No Reliability Issues
Newark Boxboard	52	PS	15	7/6/2005	10/5/2005	10/11/2005	Reliability issue identified and expected to be resolved by 6/2007
Conesville 1	115	AEP	46	9/20/2005	12/31/2005	1/1/2006	Reliability issue (black start) identified and resolved

GENERATOR DEACTIVATIONS[1]
(as of January 10, 2013)

Unit	Capacity	Trans Zone	Age (Years)	Official Owner Request	Requested Deactivation Date	Actual Deactivation Date	PJM Reliability Status
Conesville 2	115	AEP	48	9/20/2005	12/31/2005	1/1/2006	Reliability issue (black start) identified and resolved
Gude Landfill 1&2	2.2	PEP	20	8/12/2004	3/25/2006	3/25/2006	No Reliability Issues
Bayonne CT1	21	PS	35	3/30/2006	As soon as possible	5/20/2006	No Reliability Issues
Bayonne CT2	21	PS	35	3/30/2006	As soon as possible	5/20/2006	No Reliability Issues
Delaware Diesel	2.7	PE	39	8/30/2006	As soon as possible	10/24/2006	No Reliability Issues
Buzzard Point East Bank 3	16	PEP	39	2/28/2007	5/31/2007	5/31/2007	Reliability Issues Identified
Martins Creek 1	140	PPL	53	3/19/2004	9/15/2007	9/15/2007	No Reliability Issues
Martins Creek 2	140	PPL	51	3/19/2004	9/15/2007	9/15/2007	No Reliability Issues
Martins Creek D1-D2	5	PPL	40	9/1/2005	9/15/2007	9/15/2007	Reliability issue (black start) identified and resolved
Waukegan 6	100	CE	55	1/3/2007	9/1/2007	12/31/2007	No Reliability Issues
Howard M. Down (Vineland) Unit 8	11	AE	53	5/6/2009	5/7/2009	6/5/2009	No Reliability Issues
Indian River 2	89	DPL	48	9/28/2007	5/1/2010	5/1/2010	Reliability issue identified and resolved
Howard M. Down (Vineland) Unit 9	17	ACE	49	5/28/2010	8/28/2010	8/28/2010	Reliability analysis complete - impacts identified - generator has elected to deactivate as requested
INGENCO Richmond Plant	3	DOM	18	2/9/2010	8/31/2010	8/31/2010	Reliability analysis complete - no impacts identified
North Branch	74	DOM	18	5/11/2010	7/5/2010	8/1/2010	Reliability analysis complete - no impacts identified
Hall Branch (aka Altavista)	63	DOM	19	6/8/2010	9/6/2010	10/13/2010	Reliability analysis complete - impacts identified - generator has elected to deactivate as requested
Gorsuch	189	AEP	59	5/28/2010	12/15/2010	11/11/2010	Reliability analysis complete - impacts identified - generator has elected to deactivate as requested
Baleville Landfill	3.8	PSEG	9	11/24/2010	2/22/2011	12/22/2010	Reliability analysis complete - no impacts identified
Kingsland Landfill	2.8	PSEG	11	11/24/2010	2/22/2011	12/22/2010	Reliability analysis complete - no impacts identified
Will County 1	151	CE	55	6/4/2007	9/1/2010	12/30/2010	Potential reliability issues identified - can be resolved by summer 2011
Will County 2	148	CE	55	6/4/2007	9/1/2010	12/30/2010	Potential reliability issues identified - can be resolved by summer 2011
Kitty Hawk GT1	18	DOM	39	1/19/2011	4/19/2011	3/15/2011	Reliability analysis complete - no impacts identified
Kitty Hawk GT2	16	DOM	39	1/19/2011	4/19/2011	3/15/2011	Reliability analysis complete - no impacts identified
Chesapeake 8	17.5	DOM	41	1/19/2011	4/19/2011	3/15/2011	Reliability analysis complete - no impacts identified
Chesapeake 9	16.9	DOM	41	1/19/2011	4/19/2011	3/15/2011	Reliability analysis complete - no impacts identified
Chesapeake 10	16.9	DOM	41	1/19/2011	4/19/2011	3/15/2011	Reliability analysis complete - no impacts identified
Chesapeake 7	16	DOM	40	7/28/2010	7/28/2012	4/8/2011	Reliability analysis complete - no impacts identified
Indian River 1	90	DPL	50	9/28/2007	5/1/2011	5/1/2011	Reliability issues identified and expected to be resolved by 5/1/2011
Brunot Island 1B	15	DUQ	39	4/20/2011	7/19/2011	6/1/2011	Reliability analysis complete - no impacts identified. Interconnection request submitted to re-start unit in 4th quarter 2015.

GENERATOR DEACTIVATIONS[1]
(as of January 10, 2013)

Unit	Capacity	Trans Zone	Age (Years)	Official Owner Request	Requested Deactivation Date	Actual Deactivation Date	PJM Reliability Status
Brunot Island 1C	15	DUQ	39	4/20/2011	7/19/2011	6/1/2011	Reliability analysis complete - no impacts identified. Interconnection request submitted to re-start unit in 4th quarter 2015.
Cromby 1	144	PE	55	12/2/2009	5/31/2011	5/31/2011	Reliability analysis complete - Reliability Impacts identified - Results posted - Necessary upgrades completed
Eddystone 1	279	PE	49	12/2/2009	5/31/2011	5/31/2011	Reliability analysis complete - Reliability Impacts identified - Results posted - Necessary upgrades completed
Cromby Diesel	2.7	PE	43	5/27/2010	5/31/2011	5/31/2011	Reliability analysis complete - no impacts identified
Burger 3	94	ATSI	61	6/3/2011	9/1/2011	9/1/2011	Reliability Analysis complete. Impacts identified. TO plans to complete all required upgrades by June 1, 2013. Gen owner elected to deactivate unit as requested on 9/1/2011.
Cromby 2	201	PE	54	12/2/2009	5/31/2011	12/31/2011	Reliability analysis complete - Reliability Impacts identified - Results posted - Necessary upgrades completed
Hudson 1	383	PS	39	9/8/2004	12/7/2004	12/8/2011	PJM has determined that Hudson 1 is no longer needed for reliability purposes effective December 7, 2011.
Sporn 5	440	AEP	49	10/1/2010	12/31/2010	2/13/2012	Reliability analysis complete - no impacts identified. AEP received approval from Ohio PUC to deactivate unit. AEP informed PJM on 2/13/2012. Unit deactivated.
Hunlock 3	45	UGI	48	1/16/2008	6/1/2010	6/1/2010	Capacity rights from Hunlock 3 re-used as part of interconnection project T117. T117 is in-service.
State Line 3	197	ComEd	55	8/25/2011	4/1/2012	3/25/2012	Reliability Analysis complete for April 1, 2012 deactivation date - no impacts identified.
State Line 4	318	ComEd	49	8/25/2011	4/1/2012	3/25/2012	Reliability Analysis complete for April 1, 2012 deactivation date - no impacts identified.
Viking Energy NUG	16	PPL	21	7/2/2011	3/1/2012	3/31/2012	Reliability Analysis complete - no impacts identified
Walter C Beckjord 1	94	DEOK	59	2/1/2012	5/1/2012	5/1/2012	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by May 1, 2012
Buzzard Point East Banks 1, 2, 4-8	112	PEP	39	2/28/2007	5/31/2012	5/31/2012	Reliability issues identified and expected to be resolved by 5/31/2012.
Buzzard Point West Banks 1-8	128	PEP	39	2/28/2007	5/31/2012	5/31/2012	Reliability issues identified and expected to be resolved by 5/31/2012.
Eddystone 2	309	PE	49	12/2/2009	5/31/2011	5/31/2012	Reliability analysis complete - Reliability Impacts identified - Results posted
Niles 2	108	ATSI	58	2/29/2012	6/1/2012	6/1/2012	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2014. Unit deactivated on June 1, 2012.
Elrama 1	93	DUQ	59	2/29/2012	6/1/2012	6/1/2012	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2014. Unit deactivated on June 1, 2012.
Elrama 2	93	DUQ	59	2/29/2012	6/1/2012	6/1/2012	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2014. Unit deactivated on June 1, 2012.
Elrama 3	103	DUQ	57	2/29/2012	6/1/2012	6/1/2012	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2014. Unit deactivated on June 1, 2012.
Kearny 10	122	PSEG	39	4/22/2009	6/1/2012	6/1/2012	Kearny 10 deactivated and capacity rights re-used on new interconnection project
Kearny 11	128	PSEG	40	4/22/2009	6/1/2012	6/1/2012	Kearny 11 deactivated and capacity rights re-used on new interconnection project
Benning 15	275	PEP	39	2/28/2007	5/31/2012	7/17/2012	Benning 15 deactivated - required system upgrades completed.

GENERATOR DEACTIVATIONS[1]
(as of January 10, 2013)

Unit	Capacity	Trans Zone	Age (Years)	Official Owner Request	Requested Deactivation Date	Actual Deactivation Date	PJM Reliability Status
Benning 16	275	PEP	35	2/28/2007	5/31/2012	7/17/2012	Benning 16 deactivated - required system upgrades completed.
Crawford 8	319	ComEd	50	3/8/2012	12/31/2014 (no later than)	8/24/2012	Reliability Analysis Complete. No impacts identified.
Fisk Street 19	326	ComEd	52	3/8/2012	12/31/2012 (no later than)	8/30/2012	Reliability Analysis Complete. No impacts identified.
Crawford 7	213	ComEd	53	3/8/2012	12/31/2014 (no later than)	8/28/2012	Reliability Analysis Complete. No impacts identified.
Vineland 10	23	AE	41	6/13/2011	9/1/2012	9/1/2012	Reliability Analysis complete - no impacts for deactivation Sept. 2012. Previously identified baseline upgrade completed as scheduled (summer 2012).
Armstrong 1	172	AP	53	1/26/2012	9/1/2012	9/1/2012	Reliability analysis complete. Impacts identified and expected to be resolved by June 2016. Further refinement of the reliability analysis, required upgrades, and generator deactivation schedule continues. Unit will deactivate as scheduled. See posting - FE Generator Deactivation Study Results and Required Upgrades.
Armstrong 2	171	AP	52	1/26/2012	9/1/2012	9/1/2012	Reliability analysis complete. Impacts identified and expected to be resolved by June 2016. Further refinement of the reliability analysis, required upgrades, and generator deactivation schedule continues. Unit will deactivate as scheduled. See posting - FE Generator Deactivation Study Results and Required Upgrades.
Bay Shore 2	138	ATSI	53	1/26/2012	9/1/2012	9/1/2012	Reliability analysis complete. Impacts identified and expected to be resolved by June 2016. Further refinement of the reliability analysis, required upgrades, and generator deactivation schedule continues. Unit will deactivate as scheduled. See posting - FE Generator Deactivation Study Results and Required Upgrades.
Bay Shore 3	142	ATSI	48	1/26/2012	9/1/2012	9/1/2012	Reliability analysis complete. Impacts identified and expected to be resolved by June 2016. Further refinement of the reliability analysis, required upgrades, and generator deactivation schedule continues. Unit will deactivate as scheduled. See posting - FE Generator Deactivation Study Results and Required Upgrades.
Bay Shore 4	215	ATSI	43	1/26/2012	9/1/2012	9/1/2012	Reliability analysis complete. Impacts identified and expected to be resolved by June 2016. Further refinement of the reliability analysis, required upgrades, and generator deactivation schedule continues. Unit will deactivate as scheduled. See posting - FE Generator Deactivation Study Results and Required Upgrades.
Eastlake 4	240	ATSI	55	1/26/2012	9/1/2012	9/1/2012	Reliability analysis complete. Impacts identified and expected to be resolved by June 2016. Further refinement of the reliability analysis, required upgrades, and generator deactivation schedule continues. Unit will deactivate as scheduled. See posting - FE Generator Deactivation Study Results and Required Upgrades.

GENERATOR DEACTIVATIONS[1]
(as of January 10, 2013)

Unit	Capacity	Trans Zone	Age (Years)	Official Owner Request	Requested Deactivation Date	Actual Deactivation Date	PJM Reliability Status
Eastlake 5	597	ATSI	39	1/26/2012	9/1/2012	9/1/2012	Reliability analysis complete. Impacts identified and expected to be resolved by June 2016. Further refinement of the reliability analysis, required upgrades, and generator deactivation schedule continues. Unit will deactivate as scheduled. See posting - FE Generator Deactivation Study Results and Required Upgrades.
R Paul Smith 3	28	AP	64	1/26/2012	9/1/2012	9/1/2012	Reliability analysis complete. Impacts identified and expected to be resolved by June 2016. Further refinement of the reliability analysis, required upgrades, and generator deactivation schedule continues. Unit will deactivate as scheduled. See posting - FE Generator Deactivation Study Results and Required Upgrades.
R Paul Smith 4	87	AP	43	1/26/2012	9/1/2012	9/1/2012	Reliability analysis complete. Impacts identified and expected to be resolved by June 2016. Further refinement of the reliability analysis, required upgrades, and generator deactivation schedule continues. Unit will deactivate as scheduled. See posting - FE Generator Deactivation Study Results and Required Upgrades.
Albright 1	73	APS	59	2/8/2012	9/1/2012	9/1/2012	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by May 2013. Thus generator can be allowed to deactivate as scheduled on 9/1/2012 assuming all upgrades are still on track to be completed as scheduled.
Albright 2	73	APS	59	2/8/2012	9/1/2012	9/1/2012	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by May 2013. Thus generator can be allowed to deactivate as scheduled on 9/1/2012 assuming all upgrades are still on track to be completed as scheduled.
Albright 3	137	APS	57	2/8/2012	9/1/2012	9/1/2012	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by May 2013. Thus generator can be allowed to deactivate as scheduled on 9/1/2012 assuming all upgrades are still on track to be completed as scheduled.
Rivesville 5	35	APS	68	2/8/2012	9/1/2012	9/1/2012	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by May 2013. Thus generator can be allowed to deactivate as scheduled on 9/1/2012 assuming all upgrades are still on track to be completed as scheduled.
Rivesville 6	86	APS	60	2/8/2012	9/1/2012	9/1/2012	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by May 2013. Thus generator can be allowed to deactivate as scheduled on 9/1/2012 assuming all upgrades are still on track to be completed as scheduled.

GENERATOR DEACTIVATIONS[1]
(as of January 10, 2013)

Unit	Capacity	Trans Zone	Age (Years)	Official Owner Request	Requested Deactivation Date	Actual Deactivation Date	PJM Reliability Status
Willow Island 1	51	APS	63	2/8/2012	9/1/2012	9/1/2012	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by May 2013. Thus generator can be allowed to deactivate as scheduled on 9/1/2012 assuming all upgrades are still on track to be completed as scheduled.
Willow Island 2	138	APS	51	2/8/2012	9/1/2012	9/1/2012	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by May 2013. Thus generator can be allowed to deactivate as scheduled on 9/1/2012 assuming all upgrades are still on track to be completed as scheduled.
Niles 1	109	ATSI	58	2/29/2012	6/1/2012	10/1/2012	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2014. Evaluating options. Unit to be kept in service until October 1, 2012, pending analysis of outages required to implement required system upgrades. Unit deactivated on Oct. 1, 2012.
Elrama 4	171	DUQ	51	2/29/2012	6/1/2012	10/1/2012	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2014. Evaluating options. Unit to be kept in service until October 1, 2012, pending analysis of outages required to implement required system upgrades. Unit deactivated on Oct. 1, 2012.
Potomac River 1-5	482	PEP	62	8/30/2011	10/1/2012	10/1/2012	Reliability Analysis complete - no impacts identified. Units deactivated on Oct. 1, 2012.
SMART Paper	25	DEOK	50	5/14/2012	8/10/2012	10/8/2012	Reliability Analysis Complete. No impacts identified. Unit deactivated.
Conesville 3	165	AEP	49	3/22/2012	12/31/2012	12/31/2012	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2014. Generator has deactivated as planned on December 31, 2012.
Schuylkill 1	166	PECO	54	10/31/2012	2/1/2013	1/1/2013	Reliability analysis complete - no impacts identified. Unit deactivated on 1/1/13.
Schuylkill Diesel	3	PECO	45	10/31/2012	2/1/2013	1/1/2013	Reliability analysis complete - no impacts identified. Unit deactivated on 1/1/13.
Total Deactivated:	**15205.1**						

NOTE (1): This list includes retirements addressed as part of the PJM retirement process started in 2003. The list does not include generators

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FUTURE DEACTIVATIONS
(as of March 11, 2013)

Unit	Capacity	Trans Zone	Age (Years)	Official Owner Request	Requested Deactivation Date	Projected Deactivation Date	PJM Reliability Status[1]
Kearny9	21	PSEG	43	4/21/2010 12/1/2011	6/1/2013 5/1/2015	6/1/2013 5/1/2015	Reliability Analysis complete - impacts identified, however impacts resolved with the interconnection of projects T41 and T42 which are in-service.
Ingenco Petersburg Plant	2.9	DOM	20	7/16/2010	5/31/2013	5/31/2013	Reliability analysis complete - no impacts identified
Indian River 3	169.7	DPL	40	8/13/2010	12/31/2013	12/31/2013	Reliability analysis complete - reliability impacts identified and expected to be resolved before unit is deactivated
Chesapeake 1	111	DOM	58	11/15/2011	12/31/2014	12/31/2014	Reliability Analysis complete. Impacts identified. Upgrades expected to be completed by June 2015.
Chesapeake 2	111	DOM	56	11/15/2011	12/31/2014	12/31/2014	Reliability Analysis complete. Impacts identified. Upgrades expected to be completed by June 2015.
Chesapeake 3	147	DOM	52	11/15/2011 10/11/12	12/31/2015 12/31/14	12/31/2015 12/31/14	Reliability Analysis complete. Impacts identified. Upgrades expected to be completed by June 2016. On 10/11/12 generator submitted an updated deactivation request changing the deactivation date to 12/31/14. Reliability analysis complete. Previously identified baseline upgrades are still needed to be completed by June 2015. In addition a new reliability issue was identified and a previously identified baseline upgrade will need to be accelerated and completed by June 2015. It is expected that the Chesapeake 3 generating unit will deactivate on December 31, 2014.
Chesapeake 4	207	DOM	49	11/15/2011 10/11/12	12/31/2015 12/31/14	12/31/2015 12/31/14	Reliability Analysis complete. Impacts identified. Upgrades expected to be completed by June 2016. On 10/11/12 generator submitted an updated deactivation request changing the deactivation date to 12/31/14. Reliability analysis complete. Previously identified baseline upgrades are still needed to be completed by June 2015. In addition a new reliability issue was identified and a previously identified baseline upgrade will need to be accelerated and completed by June 2015. It is expected that the Chesapeake 4 generating unit will deactivate on December 31, 2014.
Yorktown 1	159	DOM	54	11/15/2011	12/31/2014	12/31/2014	Reliability Analysis complete. Impacts identified. Upgrades expected to be completed by June 2015.
Bergen 3	21	PSEG	44	12/1/2011	6/1/2015	6/1/2015	Reliability Analysis Complete. Impacts identified and expected to be resolved in three - four years. Working with affected TO to finalize upgrade schedule.
Burlington 8	21	PSEG	44	12/1/2011	6/1/2015	6/1/2015	Reliability Analysis Complete. Impacts identified and expected to be resolved in three - four years. Working with affected TO to finalize upgrade schedule.
National Park 1	21	PSEG	42	12/1/2011	6/1/2015	6/1/2015	Reliability Analysis Complete. Impacts identified and expected to be resolved in three - four years. Working with affected TO to finalize upgrade schedule.
Mercer 3	115	PSEG	44	12/1/2011	6/1/2015	6/1/2015	Reliability Analysis Complete. Impacts identified and expected to be resolved in three - four years. Working with affected TO to finalize upgrade schedule.
Sewaren 6	111	PSEG	46	12/1/2011	6/1/2015	6/1/2015	Reliability Analysis Complete. Impacts identified and expected to be resolved in three - four years. Working with affected TO to finalize upgrade schedule.

Unit	Capacity	Trans Zone	Age (Years)	Official Owner Request	Requested Deactivation Date	Projected Deactivation Date	PJM Reliability Status[1]
Ashtabula 5	244	ATSI	53	1/26/2012	9/1/2012	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 2016. Further refinement of the reliability analysis, required upgrades, and generator deactivation schedule continues. Unit will continue to operate as upgrades to transmission system are constructed - estimated till June 1, 2015. See posting - FE Generator Deactivation Study Results and Required Upgrades.
Eastlake 1	132	ATSI	58	1/26/2012	9/1/2012	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 2016. Further refinement of the reliability analysis, required upgrades, and generator deactivation schedule continues. Unit will continue to operate as upgrades to transmission system are constructed - estimated till June 1, 2015. See posting - FE Generator Deactivation Study Results and Required Upgrades.
Eastlake 2	132	ATSI	58	1/26/2012	9/1/2012	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 2016. Further refinement of the reliability analysis, required upgrades, and generator deactivation schedule continues. Unit will continue to operate as upgrades to transmission system are constructed - estimated till June 1, 2015. See posting - FE Generator Deactivation Study Results and Required Upgrades.
Eastlake 3	132	ATSI	57	1/26/2012	9/1/2012	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 2016. Further refinement of the reliability analysis, required upgrades, and generator deactivation schedule continues. Unit will continue to operate as upgrades to transmission system are constructed - estimated till June 1, 2015. See posting - FE Generator Deactivation Study Results and Required Upgrades.
Lake Shore 18	245	ATSI	49	1/26/2012	9/1/2012	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 2016. Further refinement of the reliability analysis, required upgrades, and generator deactivation schedule continues. Unit will continue to operate as upgrades to transmission system are constructed - estimated till June 1, 2015. See posting - FE Generator Deactivation Study Results and Required Upgrades.
Walter C Beckjord 2	94	DEOK	58	2/1/2012 4/2/2012	5/1/2012 4/1/2015	5/1/2012 4/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by May 1, 2012. On April 2, 2012 Duke submitted a updated notice to PJM indicating the Deactivation Date for Beckjord 2 and 3 would now be April 1, 2015.
Walter C Beckjord 3	128	DEOK	57	2/1/2012 4/2/2012	5/1/2012 4/1/2015	5/1/2012 4/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by May 1, 2012. On April 2, 2012 Duke submitted a updated notice to PJM indicating the Deactivation Date for Beckjord 2 and 3 would now be April 1, 2015.
Walter C Beckjord 4	150	DEOK	53	2/1/2012	4/1/2015	4/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2014
Walter C Beckjord 5	238	DEOK	49	2/1/2012	4/1/2015	4/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2014
Walter C Beckjord 6	414	DEOK	42	2/1/2012	4/1/2015	4/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2014
New Castle 3	93	ATSI	59	2/29/2012	4/16/2015	4/16/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015. Thus generator can be allowed to deactivate as scheduled.

Unit	Capacity	Trans Zone	Age (Years)	Official Owner Request	Requested Deactivation Date	Projected Deactivation Date	PJM Reliability Status[1]
New Castle 4	93	ATSI	53	2/29/2012	4/16/2015	4/16/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015. Thus generator can be allowed to deactivate as scheduled.
New Castle 5	140	ATSI	47	2/29/2012	4/16/2015	4/16/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015. Thus generator can be allowed to deactivate as scheduled.
New Castle Diesels A and B	5.5	ATSI	43	2/29/2012	4/16/2015	4/16/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015. Thus generator can be allowed to deactivate as scheduled.
Portland 1	158	MetEd	53	2/29/2012	1/7/2015	1/7/2015	Reliability Analysis complete - impacts identified - upgrades and operating procedures expected to be in place by May 2015 to allow generators to deactivate as scheduled.
Portland 2	243	MetEd	49	2/29/2012	1/7/2015	1/7/2015	Reliability Analysis complete - impacts identified - upgrades and operating procedures expected to be in place by May 2015 to allow generators to deactivate as scheduled.
Glen Gardner CT 1	20	JCPL	40	2/29/2012	5/1/2015	5/1/2015	Reliability Analysis complete - impacts identified - upgrades and operating procedures expected to be in place by May 2015 to allow generators to deactivate as scheduled.
Glen Gardner CT 2	20	JCPL	40	2/29/2012	5/1/2015	5/1/2015	Reliability Analysis complete - impacts identified - upgrades and operating procedures expected to be in place by May 2015 to allow generators to deactivate as scheduled.
Glen Gardner CT 3	20	JCPL	40	2/29/2012	5/1/2015	5/1/2015	Reliability Analysis complete - impacts identified - upgrades and operating procedures expected to be in place by May 2015 to allow generators to deactivate as scheduled.
Glen Gardner CT 4	20	JCPL	40	2/29/2012	5/1/2015	5/1/2015	Reliability Analysis complete - impacts identified - upgrades and operating procedures expected to be in place by May 2015 to allow generators to deactivate as scheduled.
Glen Gardner CT 5	20	JCPL	40	2/29/2012	5/1/2015	5/1/2015	Reliability Analysis complete - impacts identified - upgrades and operating procedures expected to be in place by May 2015 to allow generators to deactivate as scheduled.
Glen Gardner CT 6	20	JCPL	40	2/29/2012	5/1/2015	5/1/2015	Reliability Analysis complete - impacts identified - upgrades and operating procedures expected to be in place by May 2015 to allow generators to deactivate as scheduled.
Glen Gardner CT 7	20	JCPL	40	2/29/2012	5/1/2015	5/1/2015	Reliability Analysis complete - impacts identified - upgrades and operating procedures expected to be in place by May 2015 to allow generators to deactivate as scheduled.
Glen Gardner CT 8	20	JCPL	40	2/29/2012	5/1/2015	5/1/2015	Reliability Analysis complete - impacts identified - upgrades and operating procedures expected to be in place by May 2015 to allow generators to deactivate as scheduled.
Shawville 1	122	PenElec	57	2/29/2012	4/16/2015	4/16/2015	Reliability Analysis complete - impacts identified - upgrades and operating procedures expected to be in place by May 2015 to allow generators to deactivate as scheduled.

Unit	Capacity	Trans Zone	Age (Years)	Official Owner Request	Requested Deactivation Date	Projected Deactivation Date	PJM Reliability Status[1]
Shawville 2	125	PenElec	58	2/29/2012	4/16/2015	4/16/2015	Reliability Analysis complete - impacts identified - upgrades and operating procedures expected to be in place by May 2015 to allow generators to deactivate as scheduled.
Shawville 3	175	PenElec	52	2/29/2012	4/16/2015	4/16/2015	Reliability Analysis complete - impacts identified - upgrades and operating procedures expected to be in place by May 2015 to allow generators to deactivate as scheduled.
Shawville 4	175	PenElec	51	2/29/2012	4/16/2015	4/16/2015	Reliability Analysis complete - impacts identified - upgrades and operating procedures expected to be in place by May 2015 to allow generators to deactivate as scheduled.
Titus 1	81	MetEd	61	2/29/2012	4/16/2015	4/16/2015	Reliability Analysis complete - impacts identified - upgrades and operating procedures expected to be in place by May 2015 to allow generators to deactivate as scheduled.
Titus 2	81	MetEd	60	2/29/2012	4/16/2015	4/16/2015	Reliability Analysis complete - impacts identified - upgrades and operating procedures expected to be in place by May 2015 to allow generators to deactivate as scheduled.
Titus 3	81	MetEd	58	2/29/2012	4/16/2015	4/16/2015	Reliability Analysis complete - impacts identified - upgrades and operating procedures expected to be in place by May 2015 to allow generators to deactivate as scheduled.
Clinch River 3	230	AEP	50	3/22/2012	6/1/2015	6/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015.
Glen Lyn 5	90	AEP	67	3/22/2012	6/1/2015	6/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015.
Glen Lyn 6	235	AEP	54	3/22/2012	6/1/2015	6/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015.
Kammer 1	200	AEP	53	3/22/2012	6/1/2015	6/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015.
Kammer 2	200	AEP	53	3/22/2012	6/1/2015	6/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015.
Kammer 3	200	AEP	53	3/22/2012	6/1/2015	6/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015.
Kanawha River 1	200	AEP	58	3/22/2012	6/1/2015	6/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015.
Kanawha River 2	200	AEP	58	3/22/2012	6/1/2015	6/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015.

Unit	Capacity	Trans Zone	Age (Years)	Official Owner Request	Requested Deactivation Date	Projected Deactivation Date	PJM Reliability Status[1]
Muskingum River 1	190	AEP	58	3/22/2012	6/1/2015	6/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015.
Muskingum River 2	190	AEP	57	3/22/2012	6/1/2015	6/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015.
Muskingum River 3	205	AEP	54	3/22/2012	6/1/2015	6/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015.
Muskingum River 4	205	AEP	53	3/22/2012	6/1/2015	6/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015.
Picway 5	95	AEP	56	3/22/2012	6/1/2015	6/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015.
Sporn 1	145	AEP	62	3/22/2012	6/1/2015	6/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015.
Sporn 2	145	AEP	61	3/22/2012	6/1/2015	6/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015.
Sporn 3	145	AEP	60	3/22/2012	6/1/2015	6/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015.
Sporn 4	145	AEP	60	3/22/2012	6/1/2015	6/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015.
Tanner Creek 1	145	AEP	61	3/22/2012	6/1/2015	6/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015.
Tanner Creek 2	145	AEP	59	3/22/2012	6/1/2015	6/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015.
Tanner Creek 3	198	AEP	57	3/22/2012	6/1/2015	6/1/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by June 2015.
Avon Lake 7	95	ATSI	63	3/30/2012	4/16/2015	4/16/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by May 2015.
Avon Lake 9	640	ATSI	42	3/30/2012	4/16/2015	4/16/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by May 2015.

Unit	Capacity	Trans Zone	Age (Years)	Official Owner Request	Requested Deactivation Date	Projected Deactivation Date	PJM Reliability Status[1]
Sewaren 1	104	PSEG	63	3/21/2012	6/1/2015	6/1/2015	Reliability Analysis complete. No impacts expected with PSEG contemplating re-use of Capacity Rights for a new generation project
Sewaren 2	118	PSEG	63	3/21/2012	6/1/2015	6/1/2015	Reliability Analysis complete. No impacts expected with PSEG contemplating re-use of Capacity Rights for a new generation project
Sewaren 3	107	PSEG	62	3/21/2012	6/1/2015	6/1/2015	Reliability Analysis complete. No impacts expected with PSEG contemplating re-use of Capacity Rights for a new generation project
Sewaren 4	124	PSEG	60	3/21/2012	6/1/2015	6/1/2015	Reliability Analysis complete. No impacts expected with PSEG contemplating re-use of Capacity Rights for a new generation project
Cedar 1	44	AE	39	4/5/2012	5/31/2015	5/31/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by May 2015.
Cedar 2	22	AE	39	4/5/2012	5/31/2015	5/31/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by May 2015.
Deepwater 1	78	AE	53	4/5/2012	5/31/2015	5/31/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by May 2015.
Deepwater 6	80	AE	57	4/5/2012	5/31/2015	5/31/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by May 2015.
Missouri Ave CT B	20	AE	42	4/5/2012	5/31/2015	5/31/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by May 2015.
Missouri Ave CT C	20	AE	43	4/5/2012	5/31/2015	5/31/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by May 2015.
Missouri Ave CT D	20	AE	43	4/5/2012	5/31/2015	5/31/2015	Reliability Analysis complete - impacts identified - upgrades scheduled to be completed by May 2015.
Hutchings 1	53	Dayton	63	5/3/2012	6/1/2015	6/1/2015	Reliability Analysis Complete. No impacts identified.
Hutchings 2	50	Dayton	63	5/3/2012	6/1/2015	6/1/2015	Reliability Analysis Complete. No impacts identified.
Hutchings 4	62	Dayton	61	6/28/2012	6/1/2013	6/1/2013	Reliability Analysis Complete. No impacts identified.
Burlington 9 GT	184	PSEG	40	9/10/2012	6/1/2014	6/1/2014	Reliability Analysis complete. Impacts identified and not expected to be completed till June 2015. Upgrades identified are already identified baseline upgrades with a June 2015 expected in-service date. Transmission owners cannot commit to completing these upgrades by June 2014. In addition, generator is affected by the conversion of the interconnect sub to 230 kV which is a required baseline upgrade and scheduled to be completed by June 2014.
Warren County Landfill	1.9	JCPL	7	10/11/2012	1/9/2013	1/9/2013	Reliability Analysis complete. No impacts identified. Also requested to re-use capacity rights for interconnection project Y2-018.
Yorktown 2	165	Dom	53	10/11/2012	12/31/2014	12/31/2014	Reliability analysis complete. No new reliability impacts identified. Previously identified baseline upgrades are still needed to be completed prior to June 2015. Yorktown 2 is expected to deactivate as scheduled on December 31, 2014.
Riverside 6	118	BGE	42	10/31/2012	6/1/2014	6/1/2014	Reliability Analysis complete. No impacts identified.
Essex 12 (#121)	46	PSEG	41	11/20/2012	5/31/2015	5/31/2015	Reliability analysis complete. No impacts with Capacity Interconnection rights re-used in interconnection project(s) T107, X3-004, and / or Y2-019.
Essex 12 (#122)	46	PSEG	41	11/20/2012	5/31/2015	5/31/2015	Reliability analysis complete. No impacts with Capacity Interconnection rights re-used in interconnection project(s) T107, X3-004, and / or Y2-019.
Essex 12 (#123)	46	PSEG	41	11/20/2012	5/31/2015	5/31/2015	Reliability analysis complete. No impacts with Capacity Interconnection rights re-used in interconnection project(s) T107, X3-004, and / or Y2-019.
Essex 12 (#124)	46	PSEG	41	11/20/2012	5/31/2015	5/31/2015	Reliability analysis complete. No impacts with Capacity Interconnection rights re-used in interconnection project(s) T107, X3-004, and / or Y2-019.

Unit	Capacity	Trans Zone	Age (Years)	Official Owner Request	Requested Deactivation Date	Projected Deactivation Date	PJM Reliability Status[1]
BL England Diesel(s) {IC1, IC2, IC3, IC4}	8	AE	51	1/7/2013	10/1/2015	10/1/2015	No reliability impacts - with request to transfer CIRs to Y1-001.
Hutchings 3	59	Dayton	62	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Hutchings 5	58	Dayton	60	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Hutchings 6	57	Dayton	59	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Burlington 11 #111	46	PSEG	40	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Burlington 11 #112	46	PSEG	40	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Burlington 11 #113	46	PSEG	40	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Burlington 11 #114	46	PSEG	40	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Edison 1 #11	42	PSEG	41	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Edison 1 #12	42	PSEG	41	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Edison 1 #13	42	PSEG	41	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Edison 1 #14	42	PSEG	41	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Edison 2 #21	42	PSEG	41	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Edison 2 #22	42	PSEG	41	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Edison 2 #23	42	PSEG	41	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Edison 2 #24	42	PSEG	41	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Edison 3 #31	42	PSEG	41	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Edison 3 #32	42	PSEG	41	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Edison 3 #33	42	PSEG	41	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Edison 3 #34	42	PSEG	41	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Essex 10 #101	42	PSEG	41	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Essex 10 #102	42	PSEG	41	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Essex 10 #103	42	PSEG	41	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.

Unit	Capacity	Trans Zone	Age (Years)	Official Owner Request	Requested Deactivation Date	Projected Deactivation Date	PJM Reliability Status[1]
Essex 10 #104	42	PSEG	41	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Essex 11 #111	46	PSEG	41	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Essex 11 #112	46	PSEG	41	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Essex 11 #113	46	PSEG	41	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Essex 11 #114	46	PSEG	41	1/11/2013	6/1/2015	6/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by June 1, 2015.
Middle Energy Center 1	19	AE	42	1/11/2013	5/31/2015	5/31/2015	Reliability analysis complete. Impacts identified and expected to be resolved by May 2015.
Middle Energy Center 2	20	AE	42	1/11/2013	5/31/2015	5/31/2015	Reliability analysis complete. Impacts identified and expected to be resolved by May 2015.
Middle Energy Center 3	36	AE	41	1/11/2013	5/31/2015	5/31/2015	Reliability analysis complete. Impacts identified and expected to be resolved by May 2015.
Werner CT C1	53	JCPL	40	1/22/2013	5/1/2015	5/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by May 2015.
Werner CT C2	53	JCPL	40	1/22/2013	5/1/2015	5/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by May 2015.
Werner CT C3	53	JCPL	40	1/22/2013	5/1/2015	5/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by May 2015.
Werner CT C4	53	JCPL	40	1/22/2013	5/1/2015	5/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by May 2015.
Gilbert CT C1	23	JCPL	42	1/22/2013	5/1/2015	5/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by May 2015.
Gilbert CT C2	25	JCPL	42	1/22/2013	5/1/2015	5/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by May 2015.
Gilbert CT C3	25	JCPL	42	1/22/2013	5/1/2015	5/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by May 2015.
Gilbert CT C4	25	JCPL	42	1/22/2013	5/1/2015	5/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by May 2015.
Gilbert 8	90	JCPL	35	1/22/2013	5/1/2015	5/1/2015	Reliability analysis complete. Impacts identified and expected to be resolved by May 2015.
TOTAL:	**12354**						

Note (1): PJM Reliability Status column also contains links to additional information for requests with reliability issues posted to the PJM website.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
AIR QUALITY PROGRAM

PLAN APPROVAL

Issue Date: April 2, 2012 Effective Date: April 2, 2012
Expiration Date: October 2, 2014

In accordance with the provisions of the Air Pollution Control Act, the Act of January 8, 1960, P.L. 2119, as amended, and 25 Pa. Code Chapter 127, the Owner, [and Operator if noted] (hereinafter referred to as permittee) identified below is authorized by the Department of Environmental Protection (Department) to construct, install, modify or reactivate the air emission source(s) more fully described in the site inventory list. This Facility is subject to all terms and conditions specified in this plan approval. Nothing in this plan approval relieves the permittee from its obligations to comply with all applicable Federal, State and Local laws and regulations.

The regulatory or statutory authority for each plan approval condition is set forth in brackets. All terms and conditions in this permit are federally enforceable unless otherwise designated as "State-Only" requirements.

Plan Approval No. 32-00055H

Federal Tax Id - Plant Code: 06-1637163-1

Owner Information

Name: HOMER CITY OL1- OL8 LLC
Mailing Address: 1750 POWER PLANT RD
HOMER CITY, PA 15748-8009

Plant Information

Plant: EME HOMER CITY GEN LP/ CENTER TWP
Location: 32 Indiana County 32912 Center Township
SIC Code: 4911 Trans. & Utilities - Electric Services

Operator

Name: EME HOMER CITY GENERATION LP [If different from owner]
Mailing Address: 1750 POWER PLANT RD
HOMER CITY, PA 15748-8009

Responsible Official

Name: BOBBY O DUEY
Title: STATION MANAGING DIRECTOR
Phone: (724) 479 - 6142

Plan Approval Contact Person

Name: GARY CLINE
Title: ENVIRONMENTAL MANAGER
Phone: (724) 479 - 6255

[Signature] _____
MARK A. WAYNER, SOUTHWEST REGION AIR PROGRAM MANAGER

Plan Approval Description
This Plan Approval is to allow the installation and temporary operation of dry flue gas desulfurization ("FGD") systems with fabric filters and associated support equipment for the control of SOx emissions from Unit 1 and 2 by EME Homer City Generation, LP at its Homer City Generating Station located in Black Lick & Center Townships, Indiana County. Steam turbine efficiency upgrades for Unit 1 & 2 are also allowed under this Plan Approval.

SECTION A. Table of Contents

Section A. Facility/Source Identification

Table of Contents
Plan Approval Inventory List

Section B. General Plan Approval Requirements

#001 Definitions
#002 Future Adoption of Requirements
#003 Plan Approval Temporary Operation
#004 Content of Applications
#005 Public Records and Confidential Information
#006 Plan Approval terms and conditions.
#007 Transfer of Plan Approvals
#008 Inspection and Entry
#009 Plan Approval Changes for Cause
#010 Circumvention
#011 Submissions
#012 Risk Management
#013 Compliance Requirement

Section C. Site Level Plan Approval Requirements

C-I: Restrictions
C-II: Testing Requirements
C-III: Monitoring Requirements
C-IV: Recordkeeping Requirements
C-V: Reporting Requirements
C-VI: Work Practice Standards
C-VII: Additional Requirements
C-VIII: Compliance Certification
C-IX: Compliance Schedule

Section D. Source Level Plan Approval Requirements

D-I: Restrictions
D-II: Testing Requirements
D-III: Monitoring Requirements
D-IV: Recordkeeping Requirements
D-V: Reporting Requirements
D-VI: Work Practice Standards
D-VII: Additional Requirements

Note: These same sub-sections are repeated for each source!

Section E. Source Group Restrictions

E-I: Restrictions
E-II: Testing Requirements
E-III: Monitoring Requirements
E-IV: Recordkeeping Requirements
E-V: Reporting Requirements
E-VI: Work Practice Standards
E-VII: Additional Requirements

Section F. Alternative Operating Scenario(s)

F-I: Restrictions
F-II: Testing Requirements
F-III: Monitoring Requirements

SECTION A. Table of Contents

F-IV: Recordkeeping Requirements
F-V: Reporting Requirements
F-VI: Work Practice Standards
F-VII: Additional Requirements

Section G. Emission Restriction Summary

Section H. Miscellaneous

SECTION A. Plan Approval Inventory List

Source ID	Source Name	Capacity/Throughput	Fuel/Material
031	BOILER NO.1 (UNIT 1)	6,792.000 MMBTU/HR	
032	BOILER NO.2 (UNIT 2)	6,792.000 MMBTU/HR	
110	LIME & BYPRODUCT STORAGE & HANDLING SYSTEMS		
C01	ESP UNIT 1 W/ SO3 & NH3 CONDITIONING		
C02	ESP UNIT 2 W/ SO3 & NH3 CONDITIONING		
C04	SCR - UNIT 1 (SELECTIVE CATALYTIC REDUCTION)		
C05	SCR - UNIT 2 (SELECTIVE CATALYTIC REDUCTION)		
C08	ACI - UNIT 1 (ACTIVATED CARBON INJECTION)		
C09	ACI - UNIT 2 (ACTIVATED CARBON INJECTION)		
C10	NID - UNIT 1 (NOVEL INTEGRATED DESULFURIZATION SYSTEM)		
C109	BIN VENT FILTERS		
C11	NID - UNIT 2 (NOVEL INTEGRATED DESULFURIZATION SYSTEM)		
S01	UNIT 1 STACK		
S02	UNIT 2 STACK		
S110	LIME & BYPRODUCT STORAGE SILO EMISSION POINTS		

PERMIT MAPS

CU 031 → CNTL C04 → CNTL C01 → CNTL C08 → CNTL C10 → STAC S01

CU 032 → CNTL C05 → CNTL C02 → CNTL C09 → CNTL C11 → STAC S02

PROC 110 → CNTL C109 → STAC S110

SECTION B. General Plan Approval Requirements

#001 [25 Pa. Code § 121.1]

Definitions

Words and terms that are not otherwise defined in this plan approval shall have the meanings set forth in Section 3 of the Air Pollution Control Act (35 P.S. § 4003) and 25 Pa. Code § 121.1.

#002 [25 Pa. Code § 127.12b (a) (b)]

Future Adoption of Requirements

The issuance of this plan approval does not prevent the future adoption by the Department of any rules, regulations or standards, or the issuance of orders necessary to comply with the requirements of the Federal Clean Air Act or the Pennsylvania Air Pollution Control Act, or to achieve or maintain ambient air quality standards. The issuance of this plan approval shall not be construed to limit the Department's enforcement authority.

#003 [25 Pa. Code § 127.12b]

Plan Approval Temporary Operation

This plan approval authorizes temporary operation of the source(s) covered by this plan approval provided the following conditions are met.

(a) When construction, installation, modification, or reactivation is being conducted, the permittee shall provide written notice to the Department of the completion of the activity approved by this plan approval and the permittee's intent to commence operation at least five (5) working days prior to the completion of said activity. The notice shall state when the activity will be completed and when the permittee expects to commence operation. When the activity involves multiple sources on different time schedules, notice is required for the commencement of operation of each source.

(b) Pursuant to 25 Pa. Code § 127.12b (d), temporary operation of the source(s) is authorized to facilitate the shakedown of sources and air cleaning devices, to permit operations pending the issuance of a permit under 25 Pa. Code Chapter 127, Subchapter F (relating to operating permits) or Subchapter G (relating to Title V operating permits) or to permit the evaluation of the air contaminant aspects of the source.

(c) This plan approval authorizes a temporary operation period not to exceed 180 days from the date of commencement of operation, provided the Department receives notice from the permittee pursuant to paragraph (a), above.

(d) The permittee may request an extension of the 180-day shakedown period if further evaluation of the air contamination aspects of the source(s) is necessary. The request for an extension shall be submitted, in writing, to the Department at least 15 days prior to the end of the initial 180-day shakedown period and shall provide a description of the compliance status of the source, a detailed schedule for establishing compliance, and the reasons compliance has not been established. This temporary operation period will be valid for a limited time and may be extended for additional limited periods, each not to exceed 180 days.

(e) The notice submitted by the permittee pursuant to subpart (a) above, prior to the expiration of the plan approval, shall modify the plan approval expiration date on Page 1 of this plan approval. The new plan approval expiration date shall be 180 days from the date of commencement of operation.

#004 [25 Pa. Code § 127.12(a) (10)]

Content of Applications

The permittee shall maintain and operate the sources and associated air cleaning devices in accordance with good engineering practice as described in the plan approval application submitted to the Department.

#005 [25 Pa. Code §§ 127.12(c) and (d) & 35 P.S. § 4013.2]

Public Records and Confidential Information

(a) The records, reports or information obtained by the Department or referred to at public hearings shall be available to the public, except as provided in paragraph (b) of this condition.

(b) Upon cause shown by the permittee that the records, reports or information, or a particular portion thereof, but not emission data, to which the Department has access under the act, if made public, would divulge production or sales figures or methods, processes or production unique to that person or would otherwise tend to affect adversely the

SECTION B. General Plan Approval Requirements

competitive position of that person by revealing trade secrets, including intellectual property rights, the Department will consider the record, report or information, or particular portion thereof confidential in the administration of the act. The Department will implement this section consistent with sections 112(d) and 114(c) of the Clean Air Act (42 U.S.C.A. § § 7412(d) and 7414(c)). Nothing in this section prevents disclosure of the report, record or information to Federal, State or local representatives as necessary for purposes of administration of Federal, State or local air pollution control laws, or when relevant in a proceeding under the act.

#006 [25 Pa. Code § 127.12b]

Plan Approval terms and conditions.

[Additional authority for this condition is derived from 25 Pa. Code Section 127.13]

(a) This plan approval will be valid for a limited time, as specified by the expiration date contained on Page 1 of this plan approval. Except as provided in § § 127.11a and 127.215 (relating to reactivation of sources; and reactivation), at the end of the time, if the construction, modification, reactivation or installation has not been completed, a new plan approval application or an extension of the previous approval will be required.

(b) If construction has commenced, but cannot be completed before the expiration of this plan approval, an extension of the plan approval must be obtained to continue construction. To allow adequate time for departmental action, a request for the extension shall be postmarked at least thirty (30) days prior to the expiration date. The request for an extension shall include the following:

(i) A justification for the extension,
(ii) A schedule for the completion of the construction

If construction has not commenced before the expiration of this plan approval, then a new plan approval application must be submitted and approval obtained before construction can commence.

(c) If the construction, modification or installation is not commenced within 18 months of the issuance of this plan approval or if there is more than an 18-month lapse in construction, modification or installation, a new plan approval application that meets the requirements of 25 Pa. Code Chapter 127, Subchapter B (related to plan approval requirements), Subchapter D (related to prevention of significant deterioration of air quality), and Subchapter E (related to new source review) shall be submitted. The Department may extend the 18-month period upon a satisfactory showing that an extension is justified.

#007 [25 Pa. Code § 127.32]

Transfer of Plan Approvals

(a) This plan approval may not be transferred from one person to another except when a change of ownership is demonstrated to the satisfaction of the Department and the Department approves the transfer of the plan approval in writing.

(b) Section 127.12a (relating to compliance review) applies to a request for transfer of a plan approval. A compliance review form shall accompany the request.

(c) This plan approval is valid only for the specific source and the specific location of the source as described in the application.

#008 [25 Pa. Code § 127.12(4) & 35 P.S. § 4008 & § 114 of the CAA]

Inspection and Entry

(a) Pursuant to 35 P.S. § 4008, no person shall hinder, obstruct, prevent or interfere with the Department or its personnel in the performance of any duty authorized under the Air Pollution Control Act.

(b) The permittee shall also allow the Department to have access at reasonable times to said sources and associated air cleaning devices with such measuring and recording equipment, including equipment recording visual observations, as the Department deems necessary and proper for performing its duties and for the effective enforcement of the Air Pollution Control Act and regulations adopted under the act.

SECTION B. General Plan Approval Requirements

(c) Nothing in this plan approval condition shall limit the ability of the Environmental Protection Agency to inspect or enter the premises of the permittee in accordance with Section 114 or other applicable provisions of the Clean Air Act.

#009 [25 Pa. Code 127.13a]

Plan Approval Changes for Cause

This plan approval may be terminated, modified, suspended or revoked and reissued if one or more of the following applies:

(a) The permittee constructs or operates the source subject to the plan approval in violation of the act, the Clean Air Act, the regulations promulgated under the act or the Clean Air Act, a plan approval or permit or in a manner that causes air pollution.

(b) The permittee fails to properly or adequately maintain or repair an air pollution control device or equipment attached to or otherwise made a part of the source.

(c) The permittee fails to submit a report required by this plan approval.

(d) The Environmental Protection Agency determines that this plan approval is not in compliance with the Clean Air Act or the regulations thereunder.

#010 [25 Pa. Code §§ 121.9 & 127.216]

Circumvention

(a) The permittee, or any other person, may not circumvent the new source review requirements of 25 Pa. Code Chapter 127, Subchapter E by causing or allowing a pattern of ownership or development, including the phasing, staging, delaying or engaging in incremental construction, over a geographic area of a facility which, except for the pattern of ownership or development, would otherwise require a permit or submission of a plan approval application.

(b) No person may permit the use of a device, stack height which exceeds good engineering practice stack height, dispersion technique or other technique which, without resulting in reduction of the total amount of air contaminants emitted, conceals or dilutes an emission of air contaminants which would otherwise be in violation of this plan approval, the Air Pollution Control Act or the regulations promulgated thereunder, except that with prior approval of the Department, the device or technique may be used for control of malodors.

#011 [25 Pa. Code § 127.12c]

Submissions

Reports, test data, monitoring data, notifications shall be submitted to the:

Regional Air Program Manager
PA Department of Environmental Protection
(At the address given on the plan approval transmittal letter or otherwise notified)

#012 [25 Pa. Code § 127.12(9) & 40 CFR Part 68]

Risk Management

(a) If required by Section 112(r) of the Clean Air Act, the permittee shall develop and implement an accidental release program consistent with requirements of the Clean Air Act, 40 CFR Part 68 (relating to chemical accident prevention provisions) and the Federal Chemical Safety Information, Site Security and Fuels Regulatory Relief Act (P.L. 106-40).

(b) The permittee shall prepare and implement a Risk Management Plan (RMP) which meets the requirements of Section 112(r) of the Clean Air Act, 40 CFR Part 68 and the Federal Chemical Safety Information, Site Security and Fuels Regulatory Relief Act when a regulated substance listed in 40 CFR § 68.130 is present in a process in more than the listed threshold quantity at the facility. The permittee shall submit the RMP to the Environmental Protection Agency according to the following schedule and requirements:

(1) The permittee shall submit the first RMP to a central point specified by the Environmental Protection Agency no later than the latest of the following:

SECTION B. General Plan Approval Requirements

(i) Three years after the date on which a regulated substance is first listed under § 68.130; or,
(ii) The date on which a regulated substance is first present above a threshold quantity in a process.

(2) The permittee shall submit any additional relevant information requested by the Department or the Environmental Protection Agency concerning the RMP and shall make subsequent submissions of RMPs in accordance with 40 CFR § 68.190.

(3) The permittee shall certify that the RMP is accurate and complete in accordance with the requirements of 40 CFR Part 68, including a checklist addressing the required elements of a complete RMP.

(c) As used in this plan approval condition, the term "process" shall be as defined in 40 CFR § 68.3. The term "process" means any activity involving a regulated substance including any use, storage, manufacturing, handling, or on-site movement of such substances or any combination of these activities. For purposes of this definition, any group of vessels that are interconnected, or separate vessels that are located such that a regulated substance could be involved in a potential release, shall be considered a single process.

#013 [25 Pa. Code § 127.25]

Compliance Requirement

A person may not cause or permit the operation of a source subject to § 127.11 (relating to plan approval requirements), unless the source and air cleaning devices identified in the application for the plan approval and the plan approval issued to the source, are operated and maintained in accordance with specifications in the application and conditions in the plan approval issued by the Department. A person may not cause or permit the operation of an air contamination source subject to this chapter in a manner inconsistent with good operating practices.

SECTION C. Site Level Plan Approval Requirements

I. RESTRICTIONS.

No additional requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements).

II. TESTING REQUIREMENTS.

No additional testing requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements).

III. MONITORING REQUIREMENTS.

No additional monitoring requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements).

IV. RECORDKEEPING REQUIREMENTS.

 # 001 [25 Pa. Code §127.12b]

Plan approval terms and conditions.

The Owner/Operator shall maintain on site the following comprehensive and accurate records for the air contamination sources and air cleaning devices authorized under this Plan Approval:

* Amount of lime delivered to the Facility per month by rail, by truck, and in total.
* Amount of lime used in Unit 1 & 2 each month.
* Amount of byproduct disposal per month.
* Results of visible stack, fugitive, and malodor emission inspections.
* The developed maintenance schedule for, and all maintenance activities performed on, the NID systems.
* The developed maintenance schedule for, and all maintenance activities performed on, each bin vent collector.

 # 002 [25 Pa. Code §127.12b]

Plan approval terms and conditions.

All logs and required records shall be maintained on site for a minimum of five years and shall be made available to the Department upon request.

V. REPORTING REQUIREMENTS.

 # 003 [25 Pa. Code §127.12b]

Plan approval terms and conditions.

The Owner/Operator of each stationary source emitting greenhouse gases (GHG) in the form of CO2 equivalent (CO2e), and GHG on a mass-basis shall add actual emissions of GHG in the form of CO2e and GHG on a mass basis to the calendar year source report currently required under TV-32-00055. A description of the method used to calculate the emissions and the time period over which the calculation is based shall be included. The statement shall also contain a certification by a company officer or the plant manager that the information contained in the statement is accurate.

 # 004 [25 Pa. Code §127.12b]

Plan approval terms and conditions.

Malfunction reporting shall be conducted as follows:

a. The Owner/Operator shall report each malfunction that occurs at this facility that poses an imminent and substantial danger to the public health and safety or the environment or which it should reasonably believe may result in citizen complaints to the Department. For purposes of this condition a malfunction is defined as any sudden, infrequent, and not reasonably preventable failure of air pollution control equipment or a process to operate in a normal or usual manner that may result in an increase in the emission of air contaminants.

b. When the malfunction poses an imminent and substantial danger to the public health and safety or to the environment, the notification shall be submitted to the Department no later than one hour after the incident.

i. The report shall describe the:

a) Name and location of the facility;

SECTION C. Site Level Plan Approval Requirements

b) Nature and cause of the malfunction;

c) Time when the malfunction or breakdown was first observed;

d) Expected duration of increased emissions; and

e) Estimated rate of emissions.

ii. The Owner/Operator shall notify the Department immediately when corrective measures have been accomplished.

iii. Subsequent to the malfunction, the owner or operator shall submit a full report on the malfunction to the Department within 15 days, if requested.

iv. The owner or operator shall submit reports on the operation and maintenance of the source to the Regional Air Program Manager at such intervals and in such form and detail as may be required by the Department. Information required in the reports may include, but is not limited to, process weight rates, firing rates, hours of operation, and maintenance schedules.

c. Malfunctions shall be reported to the Department at the following address:

PA DEP
Office of Air Quality
400 Waterfront Drive
Pittsburgh, PA 15222-4745
(412) 442-4000

VI. WORK PRACTICE REQUIREMENTS.

 # 005 [25 Pa. Code §127.12b]
Plan approval terms and conditions.

The Owner/Operator shall develop an operation and maintenance (O&M) plan for the NID systems and submit the information to the Department for approval within 180 days of completion of optimization each NID system as verified by the EPC contractor.

 # 006 [25 Pa. Code §127.25]
Compliance requirement.

All air contamination sources and air cleaning devices authorized under this Plan Approval shall be operated according to the developed operating procedures and maintained according to the developed maintenance schedule.

VII. ADDITIONAL REQUIREMENTS.

 # 007 [25 Pa. Code §127.12b]
Plan approval terms and conditions.

This Plan Approval is to allow the installation and temporary operation of dry flue gas desulfurization ("FGD") systems with fabric filters and associated support equipment for the control of SOx emissions from Unit 1 and 2 by EME Homer City Generation, LP at its Homer City Generating Station ("Homer City GS") located in Black Lick & Center Townships, Indiana County. Steam turbine efficiency upgrades for Unit 1 & 2 are also allowed under this Plan Approval.

 # 008 [25 Pa. Code §127.12b]
Plan approval terms and conditions.

New air contamination sources and air cleaning devices authorized to be installed at the Facility under this Plan Approval are as follows:

* One (1) lime unloading and handling system.
* One (1) byproduct handling system.
* Two (2) Alstom, Novel Integrated Desulfurization ("NID") systems, including Alstom pulse jet fabric filters, capable of controlling emissions from Unit 1 and 2.

SECTION C. Site Level Plan Approval Requirements

 # 009 [25 Pa. Code §127.12b]
Plan approval terms and conditions.

This approval does not authorize the Owner/Operator to increase the permitted heat input to Unit 1 & 2 as a result of the steam turbine efficiency upgrades (to offset pressure drop and parasitic loss due to the NID systems) associated with this project.

 # 010 [25 Pa. Code §127.12b]
Plan approval terms and conditions.

The Owner/Operator shall perform air dispersion modeling for the Facility prior to start-up of the NID systems in order to demonstrate that the Facility will not cause an exceedance of the SO2 NAAQS.

 # 011 [25 Pa. Code §127.12b]
Plan approval terms and conditions.

The Owner/Operator shall submit an air dispersion modeling protocol to the Department for review and approval prior to performing the modeling required under Section C Condition #010. Results of the air dispersion modeling shall also be submitted to the Department.

The protocol and results shall be submitted to the Department at the following addresses:

PA DEP Air Quality Modeling RCSOB 400 Market Street Harrisburg, PA 17105	PA DEP Office of Air Quality 400 Waterfront Drive Pittsburgh, PA 15222

 # 012 [25 Pa. Code §127.12b]
Plan approval terms and conditions.

Upon determination by the Owner/Operator that the source(s) covered by this Plan Approval are in compliance with all conditions of the Plan Approval the Owner/Operator shall contact the Department's reviewer for this authorization and schedule the Initial Operating Permit Inspection.

 # 013 [25 Pa. Code §127.12b]
Plan approval terms and conditions.

Upon completion of the Initial Operating Permit Inspection and determination by the Department that the source(s) covered by this Plan Approval are in compliance with all conditions of the Plan Approval, and at least 60 days prior to the expiration date of the Plan Approval, the Owner/Operator shall either submit a revision to a pending Title V Operating Permit ("TVOP") renewal application, or submit a TVOP administrative amendment application for this Facility.

 # 014 [25 Pa. Code §127.12b]
Plan approval terms and conditions.

If the Department has cause to believe that air contaminant emissions from the sources listed in this Plan Approval may be in excess of the limitations specified in, or established pursuant to this plan approval or the permittee's operating permit, the permittee may be required to conduct test methods and procedures deemed necessary by the Department to determine the actual emissions rate. Such testing shall be conducted in accordance with 25 Pa. Code Chapter 139, where applicable, and in accordance with any restrictions or limitations established by the Department at such time as it notifies the company that testing is required.

 # 015 [25 Pa. Code §127.12b]
Plan approval terms and conditions.

The Owner/Operator shall submit a Compliance Assurance Monitoring ("CAM") plan for the operation of each of the NID systems. The CAM plan shall be submitted with the revision to the Facility's pending TVOP renewal application or with the application for an administrative amendment to the Facility's TVOP to incorporate changes authorized under this Plan Approval.

VIII. COMPLIANCE CERTIFICATION.

No additional compliance certifications exist except as provided in other sections of this plan approval including Section B (relating to Plan Approval General Requirements).

SECTION C. Site Level Plan Approval Requirements

IX. COMPLIANCE SCHEDULE.

No compliance milestones exist.

SECTION D. Source Level Plan Approval Requirements

Source ID: 031 Source Name: BOILER NO.1 (UNIT 1)

Source Capacity/Throughput: 6,792.000 MMBTU/HR

Conditions for this source occur in the following groups: G01

CU 031 → CNTL C04 → CNTL C01 → CNTL C08 → CNTL C10 → STAC S01

I. RESTRICTIONS.

No additional requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements) and/or Section E (Source Group Restrictions).

II. TESTING REQUIREMENTS.

No additional testing requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements) and/or Section E (Source Group Restrictions).

III. MONITORING REQUIREMENTS.

No additional monitoring requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements) and/or Section E (Source Group Restrictions).

IV. RECORDKEEPING REQUIREMENTS.

No additional record keeping requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements) and/or Section E (Source Group Restrictions).

V. REPORTING REQUIREMENTS.

No additional reporting requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements) and/or Section E (Source Group Restrictions).

VI. WORK PRACTICE REQUIREMENTS.

No additional work practice requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements) and/or Section E (Source Group Restrictions).

VII. ADDITIONAL REQUIREMENTS.

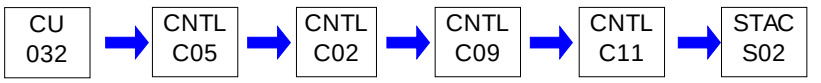
No additional requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements) and/or Section E (Source Group Restrictions).

SECTION D. Source Level Plan Approval Requirements

Source ID: 032 Source Name: BOILER NO.2 (UNIT 2)

Source Capacity/Throughput: 6,792.000 MMBTU/HR

Conditions for this source occur in the following groups: G01



I. RESTRICTIONS.

No additional requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements) and/or Section E (Source Group Restrictions).

II. TESTING REQUIREMENTS.

No additional testing requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements) and/or Section E (Source Group Restrictions).

III. MONITORING REQUIREMENTS.

No additional monitoring requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements) and/or Section E (Source Group Restrictions).

IV. RECORDKEEPING REQUIREMENTS.

No additional record keeping requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements) and/or Section E (Source Group Restrictions).

V. REPORTING REQUIREMENTS.

No additional reporting requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements) and/or Section E (Source Group Restrictions).

VI. WORK PRACTICE REQUIREMENTS.

No additional work practice requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements) and/or Section E (Source Group Restrictions).

VII. ADDITIONAL REQUIREMENTS.

No additional requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements) and/or Section E (Source Group Restrictions).

SECTION D. Source Level Plan Approval Requirements

Source ID: 110 Source Name: LIME & BYPRODUCT STORAGE & HANDLING SYSTEMS

Source Capacity/Throughput:

PROC 110 → CNTL C109 → STAC S110

I. RESTRICTIONS.

Emission Restriction(s).

 # 001 [25 Pa. Code §127.12b]

Plan approval terms and conditions.

Visible emissions from each lime and NID byproduct storage silo shall not equal or exceed 10% opacity at any time.

Throughput Restriction(s).

 # 002 [25 Pa. Code §127.12b]

Plan approval terms and conditions.

Lime deliveries to the Facility shall not exceed 476,544 tons in any consecutive 12-month period.

 # 003 [25 Pa. Code §127.12b]

Plan approval terms and conditions.

Lime deliveries to the Facility by truck shall not exceed 47,654.4 tons in any consecutive 12-month period.

II. TESTING REQUIREMENTS.

No additional testing requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements).

III. MONITORING REQUIREMENTS.

 # 004 [25 Pa. Code §127.12b]

Plan approval terms and conditions.

Once during each week that lime is delivered to the Facility, the Owner/Operator shall conduct an inspection during daylight hours while the sources covered in this plan approval are in operation for the presence of any visible stack emissions, and also any fugitive emissions or malodors from those same sources. If visible stack emissions, fugitive emissions, or malodors are apparent, the Owner/Operator shall take corrective action. Records of each inspection shall be maintained in a log and at the minimum include the date, time, name and title of the observer, along with any corrective action taken as a result.

IV. RECORDKEEPING REQUIREMENTS.

No additional record keeping requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements).

V. REPORTING REQUIREMENTS.

No additional reporting requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements).

VI. WORK PRACTICE REQUIREMENTS.

 # 005 [25 Pa. Code §127.25]

Compliance requirement.

Lime may be delivered to the Facility by the following methods:

SECTION D. Source Level Plan Approval Requirements

* Railcar with transfer to underground hoppers followed by transfer to the railcar storage silos equipped with bin vent filters; or,
* Enclosed trucks with transfer to the underground rail load-out hoppers or enclosed transfer to the storage silos equipped with bin vent filters.

 # 006 [25 Pa. Code §127.25]

Compliance requirement.

Lime and byproduct storage silos shall not be loaded unless the enclosed transfer equipment and bin vent filters are operating properly.

 # 007 [25 Pa. Code §127.25]

Compliance requirement.

Material handling conveyors shall be enclosed and all transfer points controlled by bin vent or exhaust filters.

VII. ADDITIONAL REQUIREMENTS.

 # 008 [25 Pa. Code §127.12b]

Plan approval terms and conditions.

The Owner/Operator shall submit vendor-supplied bin vent filter specifications to the Department at least 60 days prior to installing the bin vent filters at the Facility. These specifications shall include a guaranteed maximum concentration of particulate matter not in excess of 0.004 gr/dscf.

SECTION E. Source Group Plan Approval Restrictions.

Group Name: G01

Group Description:

Sources included in this group

ID	Name
031	BOILER NO.1 (UNIT 1)
032	BOILER NO.2 (UNIT 2)

I. RESTRICTIONS.

Emission Restriction(s).

 # 001 [25 Pa. Code §127.12b]

Plan approval terms and conditions.

Emissions of SO2 from Unit 1 & 2 shall not exceed the following:

* 0.20 lb/MMBtu from each Unit on a 30-day rolling average (excluding periods of startup or shutdown), and the emission rate demonstrated by air dispersion modeling required by Section C. Conditions #010 and #011 showing that the Facility will not cause an exceedance of the SO2 NAAQS; and
* 5,950 tons from each Unit in a consecutive 12-month period beginning after 1 year of operation of each NID system, and the emission rate demonstrated by air dispersion modeling required by Section C. Conditions #010 and #011 showing that the Facility will not cause an exceedance of the SO2 NAAQS.

Startup for Unit 1 & 2 is defined as beginning upon firing fuel in a boiler after a shutdown event for any purpose and ending when any of the steam from the boiler is used to generate electricity for sale over the grid or for any other purpose (including on-site use). Startup duration may not exceed the time necessary to reach the minimum effective operating temperature of the NID system.

Shutdown for Unit 1 & 2 is defined as beginning when none of the steam from the boiler is used to generate electricity for sale over the grid or for any other purpose (including on-site use), or when no fuel is being fired in the boiler, and when the flue gas temperature entering the NID system drops below the minimum effective operating temperature. Shutdown ends when all three conditions are met.

 # 002 [25 Pa. Code §127.12b]

Plan approval terms and conditions.

Emissions of PM (filterable + condensable) from Unit 1 & 2 shall not exceed 0.10 lb/MMBtu from each Unit. Compliance with this condition shall be determined by stack testing for filterable PM in accordance with EPA Method 5 or 5B; and for condensable PM by stack testing in accordance with EPA Method 202 or other Department approved methods.

 # 003 [25 Pa. Code §127.12b]

Plan approval terms and conditions.

Emissions of filterable particulate matter from Unit 1 & 2 shall not exceed 0.050 lb/MMBtu from each Unit. Compliance with this condition shall be determined by stack testing for filterable particulate matter in accordance with EPA Method 5, 5B, or other Department approved methods.

II. TESTING REQUIREMENTS.

 # 004 [25 Pa. Code §127.12b]

Plan approval terms and conditions.

The Owner/Operator shall perform EPA Method stack testing for PM, PM10, PM2.5, HCl, VOC, H2SO4 (including H2SO4 mist and SO3), fluorides, lead, and mercury on the Unit 1 & 2 stacks at the Facility within 60 days of completion of optimization of each NID system as verified by the EPC contractor. Other test methods may be used if approved by the Department in writing prior to testing. Department-approved CEMS may be used in lieu of stack tests for any particular air contaminant.

 # 005 [25 Pa. Code §127.12b]

Plan approval terms and conditions.

Performance testing shall be conducted as follows:

a. The Owner/Operator shall submit three copies of a pre-test protocol to the Department for review at least 60 days prior to

SECTION E. Source Group Plan Approval Restrictions.

the performance of any EPA reference method stack test. All proposed performance test methods shall be identified in the pre-test protocol and approved by the Department prior to testing.

b. The Owner/Operator shall notify the Regional Air Quality Manager at least 15 days prior to any performance test so that an observer may be present at the time of the test. Notification shall also be sent to the Division of Source Testing and Monitoring. Notification shall not be made without prior receipt of a protocol acceptance letter from the Department.

c. All relevant operating parameters as identified in the Department-approved pre-test protocol (e.g boiler steam flow, air flow, gross megawatts, and O2; CEMS heat input and stack flue gas volumetric flow rate; and NID hydrated lime feed flow rate, pressure differential, and temperature) shall be recorded during the duration of the stack tests. Operating data recorded shall be sufficient to establish that the units and the air cleaning devices are operating at maximum routine operating conditions. A discussion of the recorded operating parameters and values shall be included in the test report.

d. Three (3) copies of complete test reports shall be submitted to the Department no later than 60 calendar days after completion of the on-site testing portion of an emission test program.

e. Pursuant to 25 Pa. Code Section 139.53(b) a complete test report shall include a summary of the emission results on the first page of the report indicating if each pollutant measured is within permitted limits and a statement of compliance or non-compliance with all applicable permit conditions. The summary results will include, at a minimum, the following information:

1. A statement that the owner or operator has reviewed the report from the emissions testing body and agrees with the findings.
2. Permit number(s) and condition(s) which are the basis for the evaluation.
3. Summary of results with respect to each applicable permit condition.
4. Statement of compliance or non-compliance with each applicable permit condition.

f. Pursuant to 25 Pa. Code § 139.3 all submittals shall meet all applicable requirements specified in the most current version of the Department's Source Testing Manual.

g. All testing shall be performed in accordance with the provisions of Chapter 139 of the Rules and Regulations of the Department of Environmental Protection.

h. Pursuant to 25 Pa. Code Section 139.53(a)(1) and 139.53(a)(3) all submittals, besides notifications, shall be accomplished through PSIMS*Online available through https://www.depgreenport.state.pa.us/ecomm/Login.jsp when it becomes available. If internet submittal can not be accomplished, three copies of the submittal shall be sent to the Pennsylvania Department of Environmental Protection, Bureau of Air Quality, Division of Source Testing and Monitoring, 400 Market Street, 12th Floor Rachael Carson State Office Building, Harrisburg, PA 17105-8468 with deadlines verified through document postmarks.

III. MONITORING REQUIREMENTS.

No additional monitoring requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements).

IV. RECORDKEEPING REQUIREMENTS.

 # 006 [25 Pa. Code §127.12b]

Plan approval terms and conditions.

The Owner/Operator shall continuously monitor and record the following NID system and fabric filter parameters for both Unit 1 and 2:

* Flue gas temperature at the inlet to the NID system and outlet of the fabric filters;
* Combined pressure differential across the NID system absorbers and fabric filters; and
* Hydrated lime/byproduct mixture injection rate.

SECTION E. Source Group Plan Approval Restrictions.

V. REPORTING REQUIREMENTS.

No additional reporting requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements).

VI. WORK PRACTICE REQUIREMENTS.

No additional work practice requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements).

VII. ADDITIONAL REQUIREMENTS.

No additional requirements exist except as provided in other sections of this plan approval including Section B (Plan Approval General Requirements).

SECTION F. Alternative Operation Requirements.

No Alternative Operations exist for this Plan Approval facility.

SECTION G. Emission Restriction Summary.

No emission restrictions listed in this section of the permit.

SECTION H. Miscellaneous.

****** End of Report ******

$PM_{2.5}$ SIP

Appendix F

Inventory Revisions

F-1: Liberty-Clairton Emission Inventories and Source Assessment Analysis

F-2: Local Inventory Revisions 2007/2014

F-3: Regional 2014 Interpolations/Projections

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F-1: Liberty-Clairton Emission Inventories and Source Assessment Analysis

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2007 AND 2014 LIBERTY-CLAIRTON $PM_{2.5}$ NONATTAINMENT AREA EMISSION INVENTORIES AND SOURCE ASSESSMENT ANALYSIS

COUNTY OF ALLEGHENY CONTRACT NUMBER 130103

CONSULTANT TECHNICAL SUPPORT FOR AIR POLLUTANT AREA AND MOBILE SOURCES ANALYSIS

Prepared for:

Allegheny County Health Department
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January 17, 2012

CONTENTS

Page

ACRONYMS AND ABBREVIATIONS vii

ACKNOWLEDGEMENTS ix

CHAPTER I. INTRODUCTION 1
A. REPORT ORGANIZATION 1

CHAPTER II. AREA SOURCES 3
A. 2007 MID-ATLANTIC NORTHEAST VISIBILITY UNION (MANE-VU) EMISSIONS INVENTORY SUMMARY 3
B. IDENTIFICATION OF PRIORITY SOURCE CATEGORIES 3
C. EMISSIONS INVENTORY REFINEMENTS 3
1. Residential Wood Combustion 3
2. Construction Dust 6
3. Industrial and Commercial/Institutional (ICI) Fuel Combustion 7
4. Commercial Cooking 9
5. Open Burning 9
6. Natural Gas Exploration 10
7. All Other Area Sources 12
D. 2007 AND 2014 LIBERTY-CLAIRTON EMISSIONS INVENTORY SUMMARY 12

CHAPTER III. OFF-ROAD SOURCES 15
A. 2007 MANE-VU EMISSIONS INVENTORY SUMMARY 15
B. IDENTIFICATION OF PRIORITY SOURCE CATEGORIES 15
C. EMISSIONS INVENTORY REFINEMENTS 15
1. Locomotives 16
2. Commercial Marine Vessels 17
3. Diesel Construction (NMIM) 19
D. 2007 AND 2014 LIBERTY-CLAIRTON EMISSIONS INVENTORY SUMMARY 20

CHAPTER IV. ON-ROAD SOURCES 21
A. ANALYSIS METHODOLOGY 21
B. ANALYSIS TOOLS 22
C. DATA SOURCES 23
1. Base Traffic Data/Fleet Data Inputs 24
2. I/M and Fuel Parameters 26
3. Meteorology Data 26
4. Vehicle Technology/Programs 27
5. Traffic Growth Assumptions 27
6. Vehicle Population Growth Assumption 28

7. Final Results 29

CHAPTER V. SOURCE IMPACT ANALYSIS FOR THE LIBERTY MONITOR 31
A. EXISTING DATA AND ANALYSES 31
B. LIMITATIONS OF EXISTING DATA AND ANALYSES 33
C. MICROINVENTORY OF LOCAL SOURCES IN LIBERTY BOROUGH AND INVESTIGATION OF OPERATIONAL IRREGULARITIES, TRENDS, DAILY AND DIURNAL EMISSIONS VARIABILITY 37
D. SOURCE IDENTIFICATION, LOCATION, AND EMISSIONS TABULATION 40
E. CONCENTRATION SPIKES POTENTIALLY INDICATING UPSETS AND EQUIPMENT MALFUNCTION 44
1. Upsets and Malfunctions 44
2. Operating Patterns 45
F. DATA SYNTHESIS 45
1. Potassium - Residential Wood Combustion, Cooking, and Open Biomass Burning 46
2. Crustal Materials and Fugitive Dust 47
3. Elemental and Organic Carbon 47
4. Ammonium Sulfate, Nitrate, and Secondary Organic $PM_{2.5}$ 48
5. Chlorine 50
6. Overall Source Contributions 51

CHAPTER VI. REFERENCES 53

TABLES AND FIGURES

Page

Table II-1. 2007 Allegheny County Area Source Emissions (tons per year) 3
Table II-2. RWC Source Categories 4
Table II-3. Comparison of EPA RWC Tool Appliance Profiles and NAA Appliance Profiles 5
Table II-4. Residential Wood Combustion Growth Rates 6
Table II-5. Area Source Categories for which Point Source Subtractions Were Performed 8
Table II-6. Area Source Categories for which Point Source Subtractions Were Not Performed 8
Table II-7. Emission Factor Source by Emissions Process and Pollutant 12
Table II-8. 2007 Area Source Emission Estimates (tons/year) 12
Table II-9. 2014 Area Source Emission Estimates (tons/year) 13
Table III-1. 2007 Off-Road Emissions for Allegheny County (tons per year) 15
Table III-2. Tug and Loaded Barge Trips and Tons of Coal for Locks 2 and 3 of the Monongahela River 17
Table III-3. 2007 Commercial Marine Vessel Emission Factors (lbs/gallons fuel) 18
Table III-4. County to NAA Allocation for Construction Equipment 19
Table III-5. Modeled Diesel Sulfur Levels for NONROAD (ppm) 20
Table III-6. 2007 Off-Road Emissions for Liberty-Clairton Area (tons/year) 20
Table III-7. 2014 Off-Road Emissions for Liberty-Clairton Area (tons/year) 20
Table IV-1. Summary of Analysis Tools 22
Table IV-2. Summary of Data Parameters for Liberty-Clairton 24
Table IV-3. Base and Forecasted Vehicle Miles of Travel (Millions) 28
Table IV-4. Vehicle Population Estimated Classified by MOVES Source Type 28

Table IV-5. Liberty-Clairton $PM_{2.5}$ NAA – On-Road Emissions Summary by Road Type (tons/year) 29
Table IV-6. Liberty-Clairton $PM_{2.5}$ NAA On-Road Emissions Summary by Fuel Type (tons/year) 29
Table V-1. Measured Composition of 20 Highest $PM_{2.5}$ Days at Liberty Monitor 31
Table V-2. Comparison of Species Concentrations on Average and High Mass Concentration Days (μg/m³) 33
Table V-3. PMF Results for Highest 20 Days Measured at Liberty Site, Liberty - Clairton NAA 35
Table V-4. Comparison of Species Concentrations at Hillman, Liberty and Lawrenceville Sites (μg/m³) 36
Table V-5. Point Source Facilities Believed to Contribute to Liberty-Clairton $PM_{2.5}$ Nonattainment[(a)] 41
Table V-6. 2007 Emissions Summary for Liberty-Clairton $PM_{2.5}$ NAA 42
Table V-7. 2007 Emissions Summary for Sources in Allegheny County, PA - Outside the Liberty-Clairton $PM_{2.5}$ NAA 43
Table V-8. Measured Species at Liberty Site for High and Low Days 44
Table V-9. Monthly Variability in Measured K and PMF Factors 2 and 9 46
Table V-10. PMF Results at Liberty Site for All Days with Measured Speciation Data (2005 - 2010) 48

Figure IV-1. PPSUITE Process 23
Figure V-1. Enrichment of Species Measured at Liberty Site Compared to Lawrenceville Site (μg/m³) 32
Figure V-2. Excess $PM_{2.5}$ (Liberty - Lawrenceville) Using PMF Analysis (μg/m³) 32
Figure V-3. Location of Monitors in Areas Upwind of Liberty (SAHS) Air Monitoring Site 36
Figure V-4. Liberty-Clairton Tour Routing for October 5 and 6, 2011 39
Figure V-5. Sulfate, Nitrate and Ammonium at Liberty Monitoring Station 49
Figure V-6. Comparison of Measured Chlorine at Liberty and Lawrenceville, by Month 50

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ACRONYMS AND ABBREVIATIONS

$\mu g/m^3$	microgram per cubic meter
ACHD	Allegheny County Health Department
ACS	American Community Survey
AHS	American Housing Survey
BPR	Bureau of Public Roads
Btus	British thermal units
CA LEVII	California Low Emission Vehicle Program
CPF	Conditional Probability Function
EC	elemental carbon
EGU	electricity-generating unit
EPA	U.S. Environmental Protection Agency
ERTAC	Eastern Regional Technical Advisory Committee
FHWA	Federal Highway Administration
FRA	Federal Railroad Association
FRM	Federal Reference Method
GIS	Geographic Information System
GTM	gross ton-mile
GVWR	gross vehicle weight rating
HPMS	Highway Performance Monitoring System
I/M	inspection/maintenance
ICI	industrial, commercial, and institutional
K	potassium
LPG	liquefied petroleum gas
MANE-VU	Mid-Atlantic Northeast Visibility Union
MOVES	MOtor Vehicle Emissions Simulator
MPOs	metropolitan planning organizations
MSA	metropolitan statistical area
NAA	nonattainment area
NAAQS	National Ambient Air Quality Standards
NEI	National Emissions Inventory
NH_3	ammonia
NH_4	ammonium
NLEV	National Low Emission Vehicle Program
NMIM	National Mobile Inventory Model
NO_3	Nitrate
NO_x	oxides of nitrogen
NS	Norfolk Southern
NTD	National Transit Database
OBD	on-board diagnostics
OC	organic carbon
ORV	Ohio River Valley
PA DEP	Pennsylvania Department of Environmental Protection
PCV	Pennsylvania Clean Vehicles
PennDOT	Pennsylvania Department of Transportation
PM_{10}	particulate matter with an aerodynamic diameter of 10 microns or less
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 microns or less
PMF	Positive Matrix Factorization
ppm	parts per million

RMS	Roadway Management System
RVP	Reid vapor pressure
RWC	residential wood combustion
SAHS	Southwest Allegheny High School
SCCs	Source Classification Codes
SIP	State Implementation Plan
SO_2	sulfur dioxide
SO_4	sulfate
TS|Pechan	TranSystems|E.H. Pechan
URR	Union Railroad Company
US ACE	U.S. Army Corps of Engineers
VMT	vehicle miles traveled
VOC	volatile organic compounds

ACKNOWLEDGEMENTS

This acknowledges the valuable assistance provided by Allegheny County Health Department (ACHD) staff with surveying the key sources in the Liberty-Clairton $PM_{2.5}$ nonattainment area and gathering data used to develop improved emission estimates. Tony Sadar was the ACHD project manager for this effort. Jason Maranche provided the positive matrix factorization analyses used in the source impact analysis. Tony Sadar, Jason Maranche, and Shaun Vozar led the site visits to the nonattainment area. Jayme Graham provided overall direction to the project team.

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CHAPTER I. INTRODUCTION

The Liberty-Clairton nonattainment area (NAA), consisting of Glassport, Liberty, Lincoln, and Port Vue boroughs and the City of Clairton, is located about 10 miles southeast of the City of Pittsburgh. The area is made up of complex river valley terrain, approximately three miles wide by five miles long. It includes a 4 mile winding portion of the Monongahela River and is bordered by the Youghiogheny River to the east. The area includes rural land, densely populated residential areas, and industrial facilities. About 21 thousand people live in the NAA, which is one percent of the metropolitan statistical area (MSA) population. The Pittsburgh MSA consists of seven counties: Allegheny, Armstrong, Beaver, Butler, Fayette, Washington, and Westmoreland.

The Liberty-Clairton particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$) NAA was designated a separate NAA from the surrounding Pittsburgh-Beaver Valley NAA because, in addition to the regional air quality problem, there is a localized air quality issue in the local sources and the specific geologic and meteorological features of the area. Large industry is located along the river sides in the valley. The sharp differences in elevation between the industrial and residential areas and the high hillsides surrounding them create a significant river basin, and spikes in localized $PM_{2.5}$ concentrations coincide with temperature inversions.

The Liberty-Clairton area has many inversions each year, with the least favorable dispersion conditions occurring from July through November. These inversions usually break up just before noon, and on average may set up as early as sunset of the previous day (Sadar, 2011a; 2011b). Air quality is often much poorer during the months with the most inversions. The 2010 $PM_{2.5}$ State Implementation Plan (SIP) contains an analysis of 2002 continuous $PM_{2.5}$ data and inversion characterization. It shows a dramatic increase in $PM_{2.5}$ concentrations when inversions are present (ACHD, 2011a).

A. REPORT ORGANIZATION

This report documents the 2007 and 2014 $PM_{2.5}$ and $PM_{2.5}$ precursor emission inventories that were developed by TranSystems Corporation|E.H. Pechan & Associates (TS|Pechan) and Michael Baker Jr. Inc. for the Liberty-Clairton $PM_{2.5}$ NAA. This report is organized in four major sections, or chapters (besides this Introduction). This analysis focuses on mobile and area source emissions in this NAA. Point source emissions are estimated each year by the Allegheny County Health Department (ACHD) staff, so point source emissions were not part of this contract effort.

Chapter II. Area Sources
Chapter III. Off-road Sources
Chapter IV. On-road Sources
Chapter V. Source Impact Analysis for Liberty Monitor

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CHAPTER II. AREA SOURCES

A. 2007 MID-ATLANTIC NORTHEAST VISIBILITY UNION (MANE-VU) EMISSIONS INVENTORY SUMMARY

Table II-1 presents a summary of the source categories that the 2007 MANE-VU inventory indicates as the major contributors to $PM_{2.5}$, sulfur dioxide (SO_2), and ammonia (NH_3) emissions in Allegheny County (MARAMA, 2011). In each case, two source categories are responsible for a majority of total area source emissions. In the case of $PM_{2.5}$-PRI emissions, the Residential Wood and Fugitive Dust categories account for 80 percent of total area source emissions. The Industrial and Commercial Coal Combustion categories are estimated to contribute 87 percent of total SO_2 emissions. Fertilizer Application and Residential Wood Combustion (RWC) are responsible for 71 percent of NH_3 emissions in Allegheny County.

Table II-1. 2007 Allegheny County Area Source Emissions (tons per year)

Source Category	$PM_{2.5}$-PRI	SO_2	NH_3
Residential Wood Combustion (Stoves, Fireplaces, Furnaces)	1,533.0	32.8	89.9
Fugitive Dust (Construction, Paved/Unpaved Roads)	1,291.0	0.0	0.0
Commercial Cooking	289.0	0.0	0.0
Residential Heating - Gas, Oil and Coal	169.0	17.1	12.3
Industrial Coal Combustion	117.4	7,499.3	2.4
Commercial/Institutional Coal Combustion	58.0	3,702.4	1.2
Fertilizer Application	0.0	0.0	134.2
Open Burning	0.0	0.0	0.0
All Other Area Source Categories	73.8	1,669.6	75.1
TOTAL	3,531.0	12,921.2	315.1

B. IDENTIFICATION OF PRIORITY SOURCE CATEGORIES

Based on the information supplied in Table II-1, additional information gathered from visits to the NAA, and the feasibility of implementing improved methods, TS|Pechan prioritized the following source categories for emissions estimation refinements: Residential Wood Combustion; Construction Dust; Industrial Coal Combustion; Commercial/Institutional Coal Combustion; Commercial Cooking; and Open Burning. For each of these source categories, the sections that follow describe our understanding of how the current Allegheny County 2007 MANE-VU emission estimates were developed, our approach to developing refined NAA-level emission estimates for 2007; and our methods for estimating 2014 NAA emissions. In addition, ACHD directed TS|Pechan to develop 2014 emission projections for natural gas exploration, reflecting assumed development of Marcellus Shale gas reserves.

C. EMISSIONS INVENTORY REFINEMENTS

1. Residential Wood Combustion

a. Background

Allegheny County RWC emissions are categorized in the nine Source Classification Codes (SCCs) displayed in Table II-2. The bulk of the $PM_{2.5}$ emissions from these sources are from three SCCs:

- SCC 2104008100 – Fireplace: general;

- SCC 2104008210 – Woodstoves: fireplace inserts, non-U.S. Environmental Protection Agency (EPA) certified; and
- SCC 2104008310 – Woodstoves: freestanding, non-EPA certified.

The base year emissions from this category were developed by PADEP from a 2007 run of EPA's RWC emissions estimation tool (EPA, 2008a).

Table II-2. RWC Source Categories

SCC	Description1	Description2	Description3	Description4
2104008100	Stationary Source Fuel Combustion	Residential	Wood	Fireplace: general
2104008210	Stationary Source Fuel Combustion	Residential	Wood	Woodstove: fireplace inserts; non-EPA certified
2104008220	Stationary Source Fuel Combustion	Residential	Wood	Woodstove: fireplace inserts; EPA certified; non-catalytic
2104008230	Stationary Source Fuel Combustion	Residential	Wood	Woodstove: fireplace inserts; EPA certified; catalytic
2104008310	Stationary Source Fuel Combustion	Residential	Wood	Woodstove: freestanding, non-EPA certified
2104008320	Stationary Source Fuel Combustion	Residential	Wood	Woodstove: freestanding, EPA certified, non-catalytic
2104008330	Stationary Source Fuel Combustion	Residential	Wood	Woodstove: freestanding, EPA certified, catalytic
2104008400	Stationary Source Fuel Combustion	Residential	Wood	Woodstove: pellet-fired, general (freestanding or fireplace insert)
2104008510	Stationary Source Fuel Combustion	Residential	Wood	Furnace: Indoor, cordwood-fired, non-EPA certified
2104008610	Stationary Source Fuel Combustion	Residential	Wood	Hydronic heater: outdoor

b. Base Year Estimation Method

To estimate emissions for the Liberty-Clairton NAA, TS|Pechan performed a new 2007 run of the RWC tool with the following tool input refinements:

(1) Replaced Allegheny County occupied housing units data with the number of occupied housing units in the NAA – the tool estimates the number of wood-burning appliances by multiplying appliance profiles (representing the percentage of wood-burning appliances per occupied housing unit, e.g., 10.7 percent of occupied housing units are assumed to have a wood-burning fireplace) by the number of occupied housing units;
(2) Replaced the current appliance profiles that are based on 2004 American Housing Survey (AHS) data for the Pittsburgh MSA with sub-MSA profiles developed from 2004 AHS data specifically representing the non-Pittsburgh portion of Allegheny County (Census, 2005);
(3) Adjusted the current appliance profiles to remove the estimated proportion of appliances that are burning fuels other than wood (e.g., natural gas); and
(4) Updated the tool's estimates of the Allegheny County number of pellet stoves, indoor furnaces, and outdoor hydronic heaters (otherwise known as outdoor wood boilers) based on revisions to the data that are used to spatially allocate the estimated regional/state population of each appliance type.

For item (1), we incorporated the Bureau of the Census' American Community Survey (ACS) estimates of average occupied housing units over the 2005-2009 time-frame for the NAA (i.e., summed the number of units reported for Clairton City and each of the four boroughs of interest [Glassport, Liberty, Lincoln, and Port Vue]) (Census, 2011).

The RWC tool reports 544,711 occupied housing units in Allegheny County; the ACS reports 9,604 occupied units for the NAA.

For item (2), we updated the wood appliance profiles with data that are more geographically specific to the NAA. In particular, the AHS provides separate data for the non-Pittsburgh portion of Allegheny County that can be used to calculate appliance profiles. Table II-3 presents a comparison of the appliance profiles in the EPA's RWC tool and the updated appliance profiles. In addition to the above, the updated appliance profiles incorporate an additional tool refinement noted as item (3) above. Whereas the EPA tool assumes that all fireplaces and stoves burn wood, we used the ACS reported count of housing units that burn wood for main heating and the count that burn wood for other heating to estimate the proportion of total fireplaces and stoves that burn wood. These adjustments are incorporated in the updated appliance profiles presented in the last column of Table II-3.

Table II-3. Comparison of EPA RWC Tool Appliance Profiles and NAA Appliance Profiles

SCC	SCC Description	Burn Type	% of Occupied Housing Units with Appliance	
			EPA	Updated
2104008100	Fireplace: general	Main Heating	0	0
		Secondary Heating	2.48	1.14
		Pleasure	4.10	10.57
2104009000	Residential Firelog Total: All Combustor Types	Main Heating	0	0
		Secondary Heating	0.39	0.18
		Pleasure	0.64	1.65
2104008210	Woodstove: fireplace inserts; non-EPA certified	Main Heating	0.02	0
		Secondary Heating	2.50	1.35
		Pleasure	0	0
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	Main Heating	0.01	0
		Secondary Heating	1.01	0.55
		Pleasure	0	0
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	Main Heating	0.002	0
		Secondary Heating	0.34	0.18
		Pleasure	0	0
2104008310	Woodstove: freestanding, non-EPA certified	Main Heating	0.12	0
		Secondary Heating	2.64	1.28
		Pleasure	0	0
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	Main Heating	0.05	0
		Secondary Heating	1.07	0.52
		Pleasure	0	0
2104008330	Woodstove: freestanding, EPA certified, catalytic	Main Heating	0.02	0
		Secondary Heating	0.36	0.17
		Pleasure	0	0

For item (4), the EPA's RWC tool estimates the number of the three other types of wood burning appliances in each county by allocating regional or state total estimates of pellet stoves, indoor furnaces, and outdoor wood boilers. For indoor furnaces and outdoor wood boilers, the tool performs the allocation based on the ratio of the estimated county number of woodstoves that are used for main heating as estimated by the tool to the estimated state number of these units estimated by the tool. As noted by main heating woodstove entries in Table II-3, applying the proposed updated appliance profiles will yield an estimate of zero woodstoves used for main heating in the NAA. Based on personal observations, TS|Pechan identified more than one outdoor wood boiler in the NAA. Therefore, we estimated the number of wood boilers in the NAA by multiplying the state wood boiler estimate by the proportion of the NAA number of total woodstoves as estimated by the updated tool to the state number of these units estimated

by the updated tool. For consistency, we used the same procedure to allocate the state number of indoor furnaces to the NAA.

The procedure to estimate the number of pellet stoves is similar to that used for outdoor wood boilers and indoor furnaces. Because separate burn rates are incorporated into the tool for pellet stoves used for main heating, pellet stoves used for secondary heating, and pellet stoves used for pleasure burning, the spatial allocation procedure was performed using the estimated state and NAA counts of each of these three pellet stove uses.

TS|Pechan evaluated information provided by ACHD on the impact of the Southwest Pennsylvania Great American Woodstove Change-out Program (ACHD, 2011b). This information indicates that the program's impact was less than expected. We calculated an estimate that less than 0.3 percent of the total cords of wood burned in Allegheny County was burned in the lower-emitting woodstoves attributed to the change-out program, and that only 15 annual cords of wood are burned in lower-emitting replaced woodstoves in the NAA. Given these small impacts, we did not adjust the RWC tool to try account for the effect of the wood stove change-out program.

c. 2014 Estimation Method

To estimate the change in emissions activity for this category, we applied residential wood combustion growth rate assumptions developed by EPA (EPA, 2008b). The growth rates displayed in Table II-4 represent the EPA's estimates for the combined effect of activity growth and Federal New Source Performance Standards for wood heating units.

Table II-4. Residential Wood Combustion Growth Rates

SCC	Description	Growth Rate Assumption*
2104008100	Fireplace: General	+1%/year
2104008210	Woodstove: Fireplace Inserts; Non-EPA Certified	-2%/year
2104008220	Woodstove: Fireplace Inserts; EPA Certified; Non-catalytic	+2%/year
2104008230	Woodstove: Fireplace Inserts; EPA Certified; Catalytic	+2%/year
2104008310	Woodstove: Freestanding, Non-EPA Certified	-2%/year
2104008320	Woodstove: Freestanding, EPA Certified, Non-Catalytic	+2%/year
2104008330	Woodstove: Freestanding, EPA Certified, Catalytic	+2%/year
2104008400	Woodstove: Pellet-fired, General (freestanding or fireplace insert)	+2%/year
2104008510	Furnace: Indoor, Cordwood-fired, Non-EPA Certified	-2%/year
2104008610	Hydronic Heater: Outdoor	+1%/year

* Represents estimated combined effect of activity growth and emissions control (where applicable).

2. Construction Dust

a. Background

The 2007 MANE-VU inventory indicates that the Fugitive Dust category is the second largest contributor to total Allegheny County area source $PM_{2.5}$ emissions. This category includes dust from multiple activities including travel on paved roads and unpaved roads, construction activity, and agricultural tilling. Approximately 77 percent of total Allegheny County Fugitive Dust $PM_{2.5}$ emissions are attributed to Construction, with Nonresidential Construction accounting for the majority of these emissions. The Construction Fugitive Dust emissions in the 2007 MANE-VU inventory were taken from the 2008 National Emissions Inventory (NEI) Version 1. The main emissions activity data input used to calculate 2008 NEI estimates is the number of acres of land disturbed. This source category is further disaggregated into three SCCs:

- SCC 2311010000 – Residential Construction;
- SCC 2311020000 – Nonresidential Construction; and
- SCC 2311030000 – Road Construction.

The NEI estimates the number of acres of nonresidential construction in each county by allocating national annual dollar value of nonresidential construction data, after converting to acres of construction using an assumed 1.301 acres per million dollars conversion factor, to counties based on non-residential construction (NAICS Code 2362) employment from the Bureau of the Census' County Business Patterns. Similar approaches are used to estimate construction acreage for the other two categories.

b. Base Year Estimation Method

Our approach to estimating Construction Fugitive Dust emissions for the NAA was to replace the NEI's estimated construction acreage values for Allegheny County with NAA-specific acreage estimates. The Southwestern Pennsylvania Commission provided TS|Pechan with land cover acreage data by land use type for years 2000/2001 and 2006 (SPC, 2011a). TS|Pechan computed the average annual increase in urban built-up land cover from these data for the land use types associated with each Construction Dust SCC. The information below displays the following for each SCC: land use cover types that were assumed to match each SCC, Allegheny County's acreage estimates from the NEI; the NAA acreage estimates derived by allocating Allegheny County's NEI acreage estimates based on the ratio of NAA to County population; and acreage estimates derived from the annual average change in urban land cover from the available 2000/2001-2006 period.

SCC	Assumed Land Use Cover Type(s)	Estimated Construction Acreage		
		MANE-VU Inventory		Estimates Derived from Annual Change in Land Cover
		Allegheny County	Allocated to NAA*	
Residential	Residential	301.5	4.9	1.8
Non Residential	Commercial and Services plus Industrial	3,482.8	57.1	0.7
Road Construction	Transportation Communication and Utilities	382.4	5.4	0.1

*Based on ratio of NAA population to Allegheny County Population.

c. 2014 Estimation Method

To estimate the change in emissions activity for this category, we multiplied the acreage estimates noted above by a factor of 1.007. This factor represents the ratio of the projected population growth rate between 2013 and 2014 (1.000) and the population growth rate between 2006 and 2007 (0.993). We used the most recent set of population projections for each NAA municipality as obtained from the Southwest Pennsylvania Commission (SPC, 2011b). We are not aware of any control programs that would affect 2014 emissions for this source category.

3. Industrial and Commercial/Institutional (ICI) Fuel Combustion

a. Background

We understand that the Pennsylvania Department of Environmental Protection (PA DEP) did not perform point source subtractions as part of developing area source emission estimates for Allegheny County. Therefore, categories that have both a point and area source component, would be overrepresented in MANE-VU's area source emissions inventory for Allegheny County to the extent that there are point source emissions reported for a given source category. Of source categories with a point source component, the Industrial Coal Combustion and Commercial Coal Combustion categories warrant particular attention due to the magnitude of their SO_2 emissions.

Because the extra effort was not prohibitive, we developed updated 2007 Allegheny County area source emission estimates for all ICI fuel combustion categories by performing point source subtractions for these categories.

b. Base Year Estimation Method

TS|Pechan performed point source subtractions on all pollutants reported for the ICI fuel combustion area source categories in the 2007 MANE-VU inventory for Allegheny County. Table II-5 displays the list of source categories for which one or more related point source categories appear in Allegheny County's point source emissions inventory. Table II-6 presents the list of area source categories for which no related point source categories were identified in Allegheny County's point inventory. We updated the Allegheny County area source emission estimates by first subtracting the current emissions reported for ICI fuel combustion categories in the MANE-VU inventory by the emissions reported in the county's point source inventory. After performing the point source subtractions, we allocated the resulting Allegheny County area source emission estimates to the NAA using the NAA to county population ratio (0.0164).

Table II-5. Area Source Categories for which Point Source Subtractions Were Performed

SCC	Description1	Description2	Description3	Description4
2102002000	Stationary Source Fuel Combustion	Industrial	Bituminous/ Subbituminous Coal	Total: All Boiler Types
2102004000	Stationary Source Fuel Combustion	Industrial	Distillate Oil	Total: Boilers and IC Engines
2102006000	Stationary Source Fuel Combustion	Industrial	Natural Gas	Total: Boilers and IC Engines
2102007000	Stationary Source Fuel Combustion	Industrial	Liquified Petroleum Gas (LPG)	Total: All Boiler Types
2103002000	Stationary Source Fuel Combustion	Commercial/Institutional	Bituminous/ Subbituminous Coal	Total: All Boiler Types
2103004000	Stationary Source Fuel Combustion	Commercial/Institutional	Distillate Oil	Total: Boilers and IC Engines
2103006000	Stationary Source Fuel Combustion	Commercial/Institutional	Natural Gas	Total: Boilers and IC Engines
2103007000	Stationary Source Fuel Combustion	Commercial/Institutional	LPG	Total: All Combustor Types

Table II-6. Area Source Categories for which Point Source Subtractions Were Not Performed

SCC	Description1	Description2	Description3	Description4
2102005000	Stationary Source Fuel Combustion	Industrial	Residual Oil	Total: All Boiler Types
2102011000	Stationary Source Fuel Combustion	Industrial	Kerosene	Total: All Boiler Types
2103005000	Stationary Source Fuel Combustion	Commercial/Institutional	Residual Oil	Total: All Boiler Types
2103011000	Stationary Source Fuel Combustion	Commercial/Institutional	Kerosene	Total: All Combustor Types

It was necessary to use emissions data to perform the point source subtractions because we did not have access to point source throughput data (note that sources often do not report these data due to confidentiality concerns). Due to a lack of control information in the point source data that we were provided, we were unable to back-out the effect of any point source controls before performing the point source subtractions. This limitation results in overstating area source ICI fuel combustion emission estimates to the extent that ICI fuel combustion emissions in Allegheny County's point source inventory incorporates the effects of emission controls.

c. *2014 Estimation Method*

To estimate 2014 ICI Fuel Combustion area source emissions for the NAA, we assumed that the rate of change in emissions activity between 2007 and 2014 equals the projected change in NAA population between these years (SPC, 2011b). We are not aware of any control programs that would affect 2014 emissions for this source category.

4. Commercial Cooking

a. *Background*

The 2007 MANE-VU inventory for Commercial Cooking reflects the 2008 NEI emission estimates for this category. The emissions activity data for this category is the mass of meat and french fries cooked on each of five equipment types (e.g., under-fired charbroiling).

b. *Base Year Estimation Method*

We are not aware of the availability of NAA-level emissions activity data for this source category. However, we refined the default county allocation procedure that relies on the ratio of NAA to county population to estimate NAA emissions from Allegheny County emissions. The ACHD provided TS|Pechan with a list of establishments in Allegheny that undergo food inspections (ACHD, 2011c). After removing out-of-county entries on this list, TS|Pechan estimated the total count of restaurants in Allegheny County at 6,982. Based on the "Municipality" entries on this list, we estimate that 98 restaurants are located in the NAA. We used the ratio of NAA to County restaurants to allocate MANE-VU's Allegheny County Commercial Cooking emissions to the NAA. This resulted in smaller NAA emissions than use of the default population approach due to the lower percentage represented by the restaurant data (1.42 percent) than the population data (1.64 percent).

c. *2014 Estimation Method*

We assumed that the rate of change in emissions activity between 2007 and 2014 for this category will equal the projected change in NAA population between these years. We used the most recent set of population projections for each NAA municipality as obtained from the Southwest Pennsylvania Commission (SPC, 2011b). We are not aware of any control programs that would affect 2014 emissions for this source category.

5. Open Burning

a. *Background*

The 2007 MANE-VU inventory, which is derived from the 2008 NEI, does not report any emissions from Open Burning. The Open Burning source category is comprised of the following SCCs:

- SCC 2610000100 – Open Burning, Yard Waste-Leaves;
- SCC 2610000400 – Open Burning, Yard Waste-Brush;
- SCC 2610000500 – Open Burning, Land Clearing Debris; and
- SCC 2610030000 – Open Burning, Household Waste.

Because the Bureau of the Census categorized at least 80 percent of Allegheny County's total population as located in urbanized areas in 2000 (last year available), the 2008 NEI assumed that an open burning ban would be in place that would be 100 percent effective at eliminating emissions from this source category.

b. Base Year Estimation Method

TS|Pechan assumed 97 percent compliance with the open burning ban in the NAA based on the rule effectiveness rate we applied in a 2002 MANE-VU inventory effort. We also replaced the acreage estimates used in the 2008 NEI to estimate the emissions activity for Land Clearing Debris with the estimates described in the Construction Dust category described earlier. For the other three Open Burning SCCs, we estimated NAA emissions activity by allocating the NEI's Allegheny County activity data to the NAA using the ratio of NAA population to county population. After applying the 97 percent rule effectiveness adjustment, the estimated volume of waste burned for each of these three categories is as follows: Yard Waste-Leaves: 146 pounds; Yard Waste-Brush: 146 pounds; and Household Waste: 3,280 pounds.

c. 2014 Estimation Method

To estimate 2014 Open Burning emissions for the NAA, we assumed that the rate of change in emissions activity between 2007 and 2014 will equal the projected change in NAA population between these years (SPC, 2011b). We are not aware of any additional control programs that would affect 2014 emissions for this source category.

6. Natural Gas Exploration

a. Background

The MANE-VU area source inventory does not report any natural gas exploration emissions. A review of the Allegheny County point source inventory identified emissions in one related SCC (31000299—Natural Gas Production; Other Not Classified). Because the emissions record for this SCC is listed as "USS - CLAIRTON WORKS" and the UNITDESC = "COG VENTING" and the PROCDESC = "ACCIDENTAL VENT," we do not believe that these emissions are associated with natural gas production.

Below is a short primer on potential criteria pollutant emission sources from Marcellus Shale natural gas exploration taken from a report prepared for the New York State Energy Research and Development Authority (ICF, 2009).

1. Particulate Matter (PM): The most common sources of particulate matter from natural gas operations are dust or soil entering the air during pad construction or from traffic on access roads, and diesel exhaust from vehicles and engines used to power machinery at natural gas facilities. Particulate matter can also be emitted during venting and flaring operations.
2. Sulfur Dioxide: SO_2 is formed during the combustion of fossil fuels that contain sulfur, such as diesel or raw natural gas. Flares and machinery that run on diesel and natural gas emit sulfur dioxide at natural gas drilling operations.
3. Nitrogen Oxides: NO_x is emitted from the combustion of fossil fuels. NO_x is emitted in exhaust from construction and other vehicles used at well sites, from flaring at natural gas operations, and also as part of exhaust from diesel and natural gas engines that power machinery such as compressor engines and other heavy equipment.
4. Carbon Monoxide: Carbon monoxide is emitted during flaring, and from the operation of machinery at natural gas development sites.
5. Volatile Organic Compounds (VOC): VOC emissions depend to a significant degree on gas composition.

b. Base Year Estimation Method

There are no base year emissions in the NAA for Marcellus Shale gas exploration.

c. 2014 Estimation Method

ACHD directed TS|Pechan to develop 2014 emission estimates for natural gas exploration associated with development of Marcellus Shale gas reserves. TS|Pechan reviewed 2007-2011 information from PA DEP's "Permits Issued by County with Location Information" to identify the number of Marcellus Shale well permits in the NAA (PADEP, 2011). The first year with any Marcellus Shale well permits in Allegheny County was 2008—one Marcellus Shale permit was listed in Fawn and the other in Frazier. Over the entire 2008-2011 period, 16 Marcellus Shale wells have been permitted in Allegheny County (besides Fawn and Frazier, the other two municipalities listed with permits are Forward and Plum). Of these 16 permits, only 3 have produced gas to date (all in Fawn). It is important to note that typically many fewer wells are actually drilled than are permitted.

Although available information does not indicate that any Marcellus Shale gas exploration will occur in the NAA by 2014, it is not possible to be certain. Therefore, we developed NAA emission estimates for 2014 by multiplying estimates of NAA production in 2014 by emission factors originating from the only identified study (Armendariz, 2009) that estimated criteria pollutant emissions from shale gas exploration.

We estimated NAA production by allocating projected shale gas production in Pennsylvania to the NAA using oil and gas lease acreage data. Based on municipality-level data on oil and gas leases in Allegheny County and a recent Associated Press survey of 37 companies that appear on Pennsylvania's list of active Marcellus Shale operators, we estimate that the NAA accounts for approximately 0.01 percent of total state-level leased acreage (University of Pittsburgh, 2011; AP, 2011). A recent Penn State University study projects 6.5 billion cubic feet of Marcellus shale natural gas production in year 2014 (Considine, Watson, and Blumsack, 2010).

Next, we calculated VOC and NO_x emission factors per million cubic feet of natural gas production for the following natural gas exploration processes from a 2009 study performed in the Barnett shale region in Texas:

- Compressor engine exhaust;
- Condensate and oil tanks;
- Production fugitives;
- Well drilling, hydraulic fracturing, and well completions;
- Natural gas processing; and
- Natural gas transmission fugitives (Armendariz, 2009).

To develop emission estimates for $PM_{2.5}$, SO_2, and NH_3, we identified the processes with the potential to emit these pollutants. Table II-7 displays a list of pollutants for which emissions were developed for each process, and the source used to calculate each emission factor. Entries of "Nonroad ratio" in this table indicate that we estimated an emission factor for that pollutant by multiplying the NO_x emission factors computed from the Barnett shale study by the ratio of the NO_x and the other pollutant's emission factor as reported in EPA's NONROAD model for compressor engines and drilling equipment engines . Note that although SO_2 emissions are associated with gas processing plants (specifically from gas sweetening and sulfur recovery units), these plants are large-scale operations that are few in number (Pennsylvania has less than 10 gas processing plants—all of which are located in Northern Pennsylvania). Because there are no plans to locate such a plant in the NAA, we did not estimate SO_2 emissions from this process.

Table II-7. Emission Factor Source by Emissions Process and Pollutant

Emission Process	VOC	NO_X	$PM_{2.5}$	SO_2	NH_3
Compressor engines	Barnett study	Barnett study	NONROAD ratio	NONROAD ratio	NONROAD ratio
Condensate and oil tanks	Barnett study				
Production fugitives	Barnett study				
Well drilling and completions	Barnett study	Barnett study	NONROAD ratio	NONROAD ratio	NONROAD ratio
Gas processing	Barnett study				
Transmission fugitives	Barnett study				

7. All Other Area Sources

a. Background

The base year and 2014 projected emissions for all other non-priority area source categories were estimated as described below.

b. Base Year Estimation Method

For all other area source categories, TS|Pechan used the 2007 MANE-VU emission estimates for Allegheny County, and allocated these emissions to the NAA assuming 1.64 percent of these county emissions are from the NAA – based on the percentage of county population in the NAA.

c. 2014 Estimation Method

To project 2014 emissions for all other source categories, we assumed that the rate of change in emissions activity between 2007 and 2014 will equal the projected change in NAA population between these years (SPC, 2011b). We did not model any additional control programs that would affect 2014 emissions for these source categories.

D. 2007 AND 2014 LIBERTY-CLAIRTON EMISSIONS INVENTORY SUMMARY

Tables II-8 and II-9 summarize the 2007 and 2014 area source emission estimates for the Liberty-Clairton nonattainment area.

Table II-8. 2007 Area Source Emission Estimates (tons/year)

Source Category	$PM_{2.5}$-PRI	SO_2	NH_3	VOC	NO_X	CO
Residential Wood Combustion (Stoves, Fireplaces, Furnaces)	15.738	0.403	0.947	18.595	1.873	110.357
Fugitive Dust (Construction, Paved/Unpaved Roads)	5.151	0.000	0.000	0.000	0.000	0.000
Commercial Cooking	4.104	0.000	0.000	0.626	0.000	1.646
Residential Heating - Gas, Oil and Coal	3.049	0.280	0.201	3.145	33.945	18.114
Industrial Coal Combustion	0.000	31.419	0.040	0.000	0.000	0.000
Commercial/Institutional Coal Combustion	0.000	0.000	0.020	0.000	0.000	0.549
Fertilizer Application	0.000	0.000	2.200	0.000	0.000	0.000
Open Burning	1.023	0.001	0.000	0.888	0.384	12.893
All Other Area Source Categories	0.598	16.536	0.841	232.678	2.601	0.323
Total Area	29.66	48.64	4.25	255.93	38.80	143.88

Table II-9. 2014 Area Source Emission Estimates (tons/year)

Source Category	$PM_{2.5}$-PRI	SO_2	NH_3	VOC	NO_X	CO
Residential Wood Combustion (Stoves, Fireplaces, Furnaces)	15.114	0.398	0.915	16.986	1.883	105.070
Fugitive Dust (Construction, Paved/Unpaved Roads)	5.325	0.000	0.000	0.000	0.000	0.000
Commercial Cooking	4.062	0.000	0.000	0.620	0.000	1.629
Residential Heating - Gas, Oil and Coal	3.018	0.277	0.199	3.114	33.605	17.933
Industrial Coal Combustion	0.000	31.105	0.040	0.000	0.000	0.000
Commercial/Institutional Coal Combustion	0.000	0.000	0.020	0.000	0.000	0.544
Fertilizer Application	0.000	0.000	2.178	0.000	0.000	0.000
Open Burning	1.013	0.001	0.000	0.879	0.381	12.764
Natural Gas Exploration / Production	0.001	0.000	0.000	0.027	0.015	0.000
All Other Area Source Categories	0.593	16.370	0.833	230.351	2.575	0.320
Total Area	29.13	48.15	4.18	251.98	38.46	138.26

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CHAPTER III. OFF-ROAD SOURCES

A. 2007 MANE-VU EMISSIONS INVENTORY SUMMARY

Table III-1 provides a summary of 2007 county-level off-road emissions for $PM_{2.5}$, SO_2, and NH_3, as calculated by MANE-VU for Allegheny County.

Table III-1. 2007 Off-Road Emissions for Allegheny County (tons per year)

Offroad Category	$PM_{2.5}$-PRI	SO_2	NH_3
Locomotives	63.6	21	1
Commercial Marine Vessels	111.6	64	4
Off-Road Diesel	281.2	253.4	2.8
Off-Road Gas	114.4	6.6	2.1
Aircraft	26.5	74.0	NA
Total Offroad	597.4	419.0	9.4

NA = Not available.

Locomotive category emissions are comprised of Class I and smaller Class II/III line haul operations, as well as passenger operations. Commercial Marine Vessel emissions account for tug and passenger vessel traffic along Allegheny County waterways serving the Port of Pittsburgh. Off-Road Diesel and Off-Road Gasoline categories correspond to off-road engines as modeled by EPA's National Mobile Inventory Model (NMIM). NMIM includes categories such as lawn and garden, commercial, industrial, farm, and construction equipment, among others. Of the approximately 280 tons $PM_{2.5}$ from diesel offroad equipment modeled by NMIM, 68 percent is due to diesel construction equipment.

Aircraft emissions correspond primarily to operations at Pittsburgh International Airport, as well as other general aviation airports in the county. However, no airports operate within the Liberty-Clairton NAA. The nearest airport to the Liberty-Clairton area is the Allegheny County Airport in West Mifflin. As such, emission contributions from aircraft will not be considered further for this study. In addition, since no passenger rail lines operate in the NAA, this category is excluded from the base year inventory.

B. IDENTIFICATION OF PRIORITY SOURCE CATEGORIES

TS|Pechan identified Class I and II/III line haul locomotives, commercial marine vessels, and diesel construction equipment to be the most significant contributing categories to off-road $PM_{2.5}$ emissions in the Liberty-Clairton NAA. As such, these are the priority categories with respect to making improvements to the base year SIP emissions inventory. As stated earlier, passenger rail does not operate in the NAA boundary and no airports are in the NAA boundary; therefore emissions for these categories are not included in the base year and forecast year SIP inventories. Other non-priority source categories accounted for in the Allegheny County off-road inventory (i.e., all NMIM gasoline, and all NMIM diesel excepting construction) are allocated from the county level to the NAA using population as the surrogate indicator.

C. EMISSIONS INVENTORY REFINEMENTS

The following sections provide a discussion of revisions made to 2007 base year emissions for priority source categories, as well as a description of methods used for estimating 2014 emissions.

1. Locomotives

a. Background

Current emission estimates for Allegheny County Class I and Class II/III line haul locomotives are based on a 2007 emissions inventory developed by the Eastern Regional Technical Advisory Committee (ERTAC). Base year emissions for locomotives are reported for the following SCCs:

- 2285002006 – Diesel Class I Line Haul; and
- 2285002007 – Diesel Class II/III Line Haul.

For both of these classes of locomotives, we relied on the county-level estimates developed by ERTAC, and allocated county-level emissions to the NAA based on rail track mileage. Emissions associated with switch locomotive activity at railyards (SCC 2285002010) are not accounted for by ERTAC in Allegheny County. As such, an effort was made to obtain activity data to characterize railyards in or near the NAA. The following provides more details for each class of railroad.

b. Base Year Estimation Method

For the Class I rail lines, link-level traffic density (expressed as gross ton-mile [GTM]) available from the Federal Railroad Association (FRA), were used in developing county-level ERTAC estimates. The link-level GTM data are confidential, so the relevant Class I rail lines operating in the area must grant permission to release these data. TS|Pechan made an information request through ERTAC to the Class I rail lines operating in the area, namely CSX and Norfolk Southern (NS), to obtain the link-level inventory that comprises Allegheny County. Both CSX and NS were not responsive to this request. As such, we allocated county-level Class I rail emissions to the NAA using the ratio of NAA to county-wide track miles. Of the 362 miles of active rail track miles in Allegheny County, 14.2 are in the Liberty-Clairton area, resulting in an allocation of 3.92 percent (SPC, 2011c).

For the Class II/III rail lines, ERTAC prepared county emissions for Class II/III rail lines (ERTAC, 2011). It was confirmed through the Southwestern Pennsylvania Commission that Union Railroad Company (URR) is the only active Class II rail line operating in the Liberty-Clairton area. Fuel use for most rail lines, including URR, were estimated by ERTAC assuming a fuel consumption factor of 2,814 gallons/mile (calculated based on total industry fuel use from the American Shortline and Regional Railroad Association and Class II/III route miles available from the FRA). ERTAC estimated that URR consumes 93,758 gallons of diesel fuel in Allegheny County. Of the 33.3 miles of URR track miles in Allegheny County, 3.5 miles occur within the Liberty-Clairton area (SPC, 2011c). Using track miles as a surrogate, fuel use in the Liberty-Clairton area was estimated.

Although ERTAC developed a yard inventory for many larger railyards in the nation, switchyard activity in Allegheny County was not characterized. TS|Pechan contacted companies that operate switch locomotives within or near the NAA, including the McKeesport Connecting Railroad Company, and Dura-Bond Industries. Dura-Bond Industries owns a pipe coating plant near Elg Metals in Port Vue, and operates a Turtle Creek switcher on the property. The McKeesport Connecting Railroad Company is located just outside the northern border of the NAA, where the Monongahela and Youghiogheny rivers meet. Dura-Bond provided information on the operating schedule and fuel consumption rate of the switcher, resulting in a fuel consumption estimate of 2,496 gallons/yr. No response was obtained from the McKeesport Connecting Railroad Company (owned by Transtar). Since ERTAC had listed the McKeesport Connecting Railroad Company as a shortline rail, and developed a fuel consumption estimate of 2,556 gallons/yr, this value was used as the default activity.

c. *2014 Estimation Method*

For rail line haul and switchyard operations, TS|Pechan developed estimates of 2014 emissions based on freight rail sector fuel consumption forecasts published by the Energy Information Administration. Table 67 of the Energy Information Administration's *Annual Energy Outlook, 2011* provides national-level forecasts of freight rail distillate oil (diesel) consumption [in trillion British thermal units [Btus]) out to 2035 (EIA, 2011). In addition, expected reductions for NO_x, particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}), $PM_{2.5}$, VOC, as well as SO_2 were modeled. Control factors were based on the change in fleet-average emission factors published by EPA between 2007 and 2014 (EPA, 2009). For SO_2, reductions were calculated based on a 2007 base year diesel fuel sulfur content of 300 parts per million (ppm), and an estimated 2014 diesel fuel sulfur content of 20 ppm.

2. Commercial Marine Vessels

a. *Background*

The current inventory for Allegheny County is based on the PA DEP's Port of Pittsburgh inventory, which was prepared using procedures from EPA's guidance, "Commercial Marine Activity for Great Lake and Inland River Ports in the United States, 1999." Emissions were allocated from the entire Port of Pittsburgh area to Allegheny County based on the relative number of piers, wharves, and docks. This resulted in an allocation of approximately 50 percent of total Port of Pittsburgh emissions to Allegheny County. Emissions were reported for both diesel in-port and underway vessel activity (SCC 2280002100 and 2280002200) (Trostle, 2011).

b. *Base Year Estimation Method*

Vessels moving within inland river ports have two primary modes of operation, river cruise and maneuvering. River cruise is considered to be the speed when traveling on the river which varies due to weather and river conditions, congestion in the river, and load on the tug. River cruise speeds are also adjusted for the river current. When calculating river cruise time-in-mode, river current is added to the tug speed for downbound traffic and subtracted from the tug speed for upbound traffic to derive the overall speed. Maneuvering is calculated to take place when a tug maneuvers a barge into a dock or fleeting area or when a tow maneuvers through a lock. Activity for this category accounted for time spent in each of these two operating modes, combined with the number of trips and an assumed fuel consumption rate for each size (i.e., horsepower) category of tugboat.

TS|Pechan calculated emissions using the same general methodology as used for the entire Pittsburgh area, but using local trip data that represents an approximate 12-mile segment of the waterway that overlaps with the NAA. Trip data were provided in a 2007 report obtained from the Port of Pittsburgh Commission, as recorded by two locks on the Monongahela River surrounding the area of interest (Brinza, 2011). Lock 2 is located within the NAA, upstream of the Clairton Coke Works at Elizabeth, while Lock 3 is downstream of Clairton at Braddock, north of the junction where the Youghiogheny meets the Monongahela River. The report provided the number of tug trips traveling upbound and downbound through each of these locks. A summary of the data obtained is provided in Table III-2.

Table III-2. Tug and Loaded Barge Trips and Tons of Coal for Locks 2 and 3 of the Monongahela River

	Tugs		Loaded Barges		Tons of Coal	
Lock #	Upbound	Downbound	Upbound	Downbound	Upbound	Downbound
Lock 2	1,626	1,628	6,808	7,186	7,722,400	7,958,200
Lock 3	2,814	2,857	3,548	8,172	3,074,600	9,136,200

Barges in the Port of Pittsburgh are mostly loaded in the downbound direction and unloaded in the upbound direction. The dry cargo barges are non self-propelled and therefore do not contribute to emissions. Information on the number of loaded/empty barges and the amount of coal transported was used to assist in characterizing the reported tug trips as either calling or passing traffic. An indication that a tug has stopped or called can be made by making note of commodities passing through Lock 2 and 3. For example, Table III-2 shows that 7.7 million tons of coal moved upbound through Lock 2. Lock 3 shows that only 3.1 million tons of coal moved upbound through that lock. As such, 4 million tons of coal was unloaded at some point between those two locks (likely the terminal at Clairton Coke Works).

The lock data give an indication of the number of tugs passing, but do not provide information on vessel origin/destination, or trip paths between the locks. In the absence of field or survey data to characterize the tug traffic patterns, simplifying assumptions were made of tug travel upstream and downstream. Within the 12-mile waterway segment, we considered Clairton Coke Works to be a primary destination (similar to a port). In the downbound direction, we estimated that 1,229 tugs are calling and 1,628 are passing. This was estimated by subtracting Lock 2 downbound traffic (1,628) from Lock 3 downbound traffic (2,857); 1,229 are assumed to "call" on Clairton Coke Works; the remaining 1,628 tugs passes. The 1,229 calling tugs originating from Lock 3 are then assumed to turn around and go back upbound through Lock 3 (~4 miles roundtrip). The 1,626 moving upbound through Lock 2 are assumed to be "calling," and travel the entire length of waterway. Upbound passing traffic is assumed to be zero.

TS|Pechan used the same river cruise and maneuvering speeds and associated time-in-mode assumed by PA DEP in their Port of Pittsburgh calculations, and a river current of 3.5 miles per hour. We also used the same horsepower distribution and load factors assumed by PA DEP for the tug fleet. Tugboats are estimated to run at close to maximum power, 75 percent load, for calculating fuel usage, since they push cargo downstream and empty barges upstream against a strong current.

TS|Pechan reviewed the emission factors applied by PA DEP to the fuel consumption to calculate emissions. Revisions were made to emission rates for some pollutants to ensure that values were consistent with EPA baseline emission rates (EPA, 2008c). Table III-3 lists the fuel-based emission factors applied to the fuel consumption estimates.

Table III-3. 2007 Commercial Marine Vessel Emission Factors (lbs/gallons fuel)

$PM_{2.5}$	SO_2	NH_3	NO_x	HC
0.009	0.037	0.018	0.419	0.009

Passenger vessel traffic in the NAA was determined to be negligible. Passenger vessel trips amounting to an average of 4 upbound/downbound trips were included in the 2007 Monongahela Lock 2 and Lock 3 report, but since this is such a small fraction of the tug traffic in the area, passenger vessel traffic and associated emissions were not estimated.

c. 2014 Estimation Method

Commercial marine activity is comprised largely of tugboats pushing barges loaded with coal to Clairton Coke Works, with some traffic passing through to other terminals. As such, TS|Pechan estimated 2014 commercial marine activity based on a linear extrapolation of historical estimates of tons of coal transported along the Ohio River System, as published by the U.S. Army Corps of Engineers (US ACE). Historical data for the time period 1984 through 2009 is available from the US ACE's publication, "Waterborne Commerce of the United States" (USACE, 2011). Reductions due to Federal commercial marine rulemakings were also reflected in the 2014 emissions inventory. Control factors were developed based on emission reductions calculated from national base case and control case inventories for

Category 1 & 2 engines (EPA, 2008c). For SO_2, reductions were calculated based on an estimated 2014 diesel fuel sulfur content of 52 ppm.

3. Diesel Construction (NMIM)

a. Background

2007 emissions for diesel construction equipment are based on EPA's NMIM (which incorporates EPA's predecessor NONROAD model). NMIM estimates emissions for many off-road categories, including construction, farm, industrial, commercial, among others, but excludes locomotive, commercial marine and aircraft engine emissions. NMIM was run using all EPA default activity inputs with a few exceptions, including adjustments to fuel parameter and temperature data.

County-wide, diesel construction equipment contributes to approximately 50 percent of total NMIM $PM_{2.5}$ emissions, and 33 percent of total nonroad emissions. However, current construction activity levels in the Liberty-Clairton area are believed to be relatively low. As such, improvements to base year emissions for this category were limited to refining the county to NAA allocation procedures. TS|Pechan also compiled 2007 in-use diesel construction equipment populations and model year distributions assumed by EPA's NONROAD model for Allegheny County, and provided these to the Constructor's Association of Western Pennsylvania for a reasonableness review. However, the association was not able to provide feedback in the necessary time frame, and believed that an extensive survey of the contractor community would be needed to compile meaningful information and make valid comparisons to the default data.

b. Base Year Estimation Method

Construction equipment emissions representing Allegheny County were allocated to the Liberty-Clairton area based on the ratio of land disturbed in the NAA relative to the land disturbed in the county, obtained from the Southwestern Pennsylvania Commission (SPC). In addition, TS|Pechan compiled data from the SPC on agricultural land use in the Liberty-Clairton area to allocate emissions from farm equipment. All other NMIM equipment types were allocated to the Liberty-Clairton NAA based on population. Table III-4 lists the fractions applied for construction and farm equipment.

Table III-4. County to NAA Allocation for Construction Equipment

		Acres, 2006		
Equipment	Land Use	Allegheny County	Liberty-Clairton NAA	Fraction
Construction	Urban Built-Up	238,539	3,557	0.0149
Farm	Agricultural	23,815	65	0.0027

c. 2014 Estimation Method

2014 emissions for NONROAD (NMIM) categories were estimated using the change in emissions between a national-level model run for 2007 and 2014. It was determined that the effort to replicate the MANE-VU 2007 Allegheny County NMIM results, and then run using comparable inputs at the county level for 2014 was not warranted, given than Liberty-Clairton area emissions are estimated to be less than 2 percent of total Allegheny county emissions. The chosen approach was also used since growth and control assumptions in NONROAD do not vary by county (i.e., relative growth rates and emission reductions specific to equipment types/pollutants calculated at a national level would be equivalent). Fuel sulfur levels used in the base year and 2014 national model runs are

provided in Table III-5. NONROAD assumes a higher fuel sulfur level for recreational marine engines compared to land-based equipment.

Table III-5. Modeled Diesel Sulfur Levels for NONROAD (ppm)

Year	Land	Marine
2007	351	435
2014	20	52

D. 2007 AND 2014 LIBERTY-CLAIRTON EMISSIONS INVENTORY SUMMARY

Tables III-6 and III-7 provide a summary of 2007 and 2014 off-road emissions for the Liberty-Clairton area, as calculated using the refinements discussed in Section C of this chapter. With the exception of NH_3, emissions for all pollutants decrease between 2007 and 2014, due to the continued phase-in of nonroad engine standards and fuel sulfur limitations.

Table III-6. 2007 Off-Road Emissions for Liberty-Clairton Area (tons/year)

Nonroad Category	PM25-PRI	SO_2	NH_3	VOC	NO_x
Nonroad Diesel	4.30	3.87	0.04	5.52	50.06
Nonroad Gas	1.87	0.11	0.04	70.55	22.69
Locomotive	2.44	0.80	0.04	3.95	75.57
CMV	6.36	12.44	0.05	6.55	289.62
Total Nonroad	14.96	17.22	0.16	86.57	437.94

Table III-7. 2014 Off-Road Emissions for Liberty-Clairton Area (tons/year)

Nonroad Sector	PM25-PRI	SO_2	NH_3	VOC	NO_x
Nonroad Diesel	3.08	0.24	0.05	3.85	36.78
Nonroad Gas	1.98	0.12	0.04	45.46	10.78
Locomotive	1.32	0.13	0.03	2.47	55.18
CMV	6.06	5.50	0.05	6.70	284.36
Total Nonroad	12.44	5.99	0.17	58.47	387.10

CHAPTER IV. ON-ROAD SOURCES

This chapter outlines the approach used to develop the highway mobile source inventory, including a discussion of the data sources, parameters and overall analysis approach. The highway inventory utilizes EPA's new emission model, the Motor Vehicle Emissions Simulator (MOVES). MOVES2010a, the most recent version of the software, represents a significant departure from the previous MOBILE6.2 model including new vehicle emission rates reflecting the latest regulations pertaining to fuel efficiency and vehicle emission standards. The analysis approach and data assumptions are consistent with EPA technical guidance and other statewide inventories conducted by PA DEP). This includes the use of roadway and traffic count data from the Pennsylvania Department of Transportation (PennDOT), accepted post processing software to estimate hourly speeds, and traffic and vehicle population growth rates utilizing available PennDOT and regional data sources. Other traffic, environmental, vehicle fleet, fuel and control strategy inputs have been prepared using the latest local-specific planning assumptions.

The analysis methodologies and data sources have undergone review from multiple agencies. The *Pennsylvania Air Quality Workgroup*, a state-wide interagency consultation group including Federal (EPA, FHWA), state (PennDOT, PA DEP) and regional [metropolitan planning organizations (MPOs)] agencies has played a key role in reviewing the MOVES emission calculation process, local data sources, and methods in determining future growth for vehicle miles of travel (VMT) and vehicle population.

A. ANALYSIS METHODOLOGY

Guidance documents from EPA were used to develop the base and future year emissions inventories for the Liberty-Clairton $PM_{2.5}$ NAA and include:

- Policy Guidance on the Use of MOVES2010 for SIP Development, Transportation Conformity, and Other Purposes, EPA Office of Air and Radiation, EPA-420-B-09-046, December 2009 (EPA, 2009).
- Technical Guidance on the Use of MOVES2010 for Emission Inventory Preparation in State Implementation Plans and Transportation Conformity, EPA Office of Air and Radiation, and Office of Transportation and Air Quality, EPA-420-B-10-023, April 2010 (EPA, 2010a).
- Motor Vehicle Emission Simulator, User Guide for MOVES2010a, EPA-420-B-10-036, August 2010 (EPA, 2010b).

The highway mobile source emission inventory was developed using available travel data and EPA's MOVES2010a emission model. The methodologies used in the development of this inventory conform to the recommendations provided in EPA's Technical Guidance. A mix of local data and national data (internal to MOVES2010a) has been used for this submission. Local data was used for the more significant inputs into the process and include:

- Vehicle type vehicle miles traveled (VMT).
- Average speed distribution.
- Vehicle type mixes.
- Source type population (for light-duty vehicles).
- Vehicle age distribution.
- Hourly distributions.
- Meteorology data.
- Inspection/Maintenance (I/M) program.
- Fuel supply.

The data used reflects the latest planning assumptions and is primarily based on data assembled from PennDOT, the Department of Motor Vehicles, the local MPO (SPC) and other local/national sources. Where available 2007 data

was used, however 2008 data already been vetted by stakeholders (projected back to 2007) was also used as appropriate.

The analysis methodology is consistent with past statewide inventory efforts including the 2008 NEI submission. This includes the use of custom post processing software to calculate hourly speeds and prepare key traffic input files to the MOVES2010a emission model.

B. ANALYSIS TOOLS

The mobile vehicle emissions inventory analysis utilizes several key software/programs for producing the county emissions totals. These tools are outlined in Table IV-1.

Table IV-1. Summary of Analysis Tools

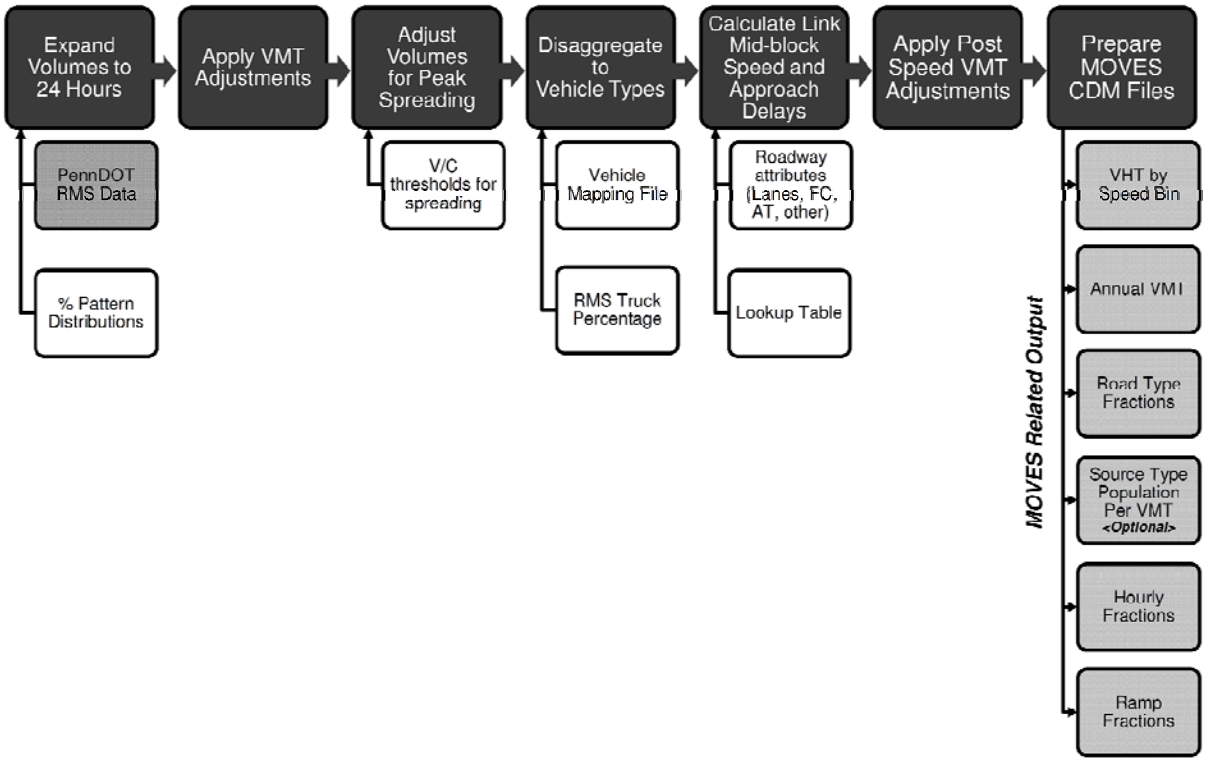
Tool	Purpose
MOVES2010a	Produces emission rates for each ozone precursor, VOC and NO_X.
PPSUITE	Processes the highway data; calculates hourly congested speeds for each state roadway segment; prepares MOVES2010a input files; processes MOVES2010a output files into a summary report.
CENTRAL	Provides a batch menu driven process to execute PPSUITE, MOVES2010a, and other MYSQL steps.

The Liberty-Clairton $PM_{2.5}$ on-road inventory was developed using EPA's MOVES2010a emission model. EPA's MOVES model was officially released on March 2, 2010 and was followed with a revised version (MOVES2010a) in August 2010. The MOVES2010a model provides a more robust estimate of emissions as compared to its predecessor MOBILE6.2. MOVES2010a has been integrated with local traffic, vehicle fleet, environmental, fuel, and control strategy data to estimate emissions.

PPSUITE is an enhanced version of the Post Processor for Air Quality software system that has been used for previous inventory and conformity submissions in Pennsylvania. The software has undergone significant revisions to ensure consistency with the MOVES2010a. PPSUITE was used to calculate hourly congested speeds for each roadway link, apply vehicle type fractions, aggregate VMT, prepare MOVES2010a traffic-related input files, and process MOVES2010a outputs. The PPSUITE software and process methodologies are consistent with that used for state inventories and transportation conformity analyses throughout Pennsylvania. Figure IV-1 summarizes the key functions of PPSUITE.

CENTRAL is a menu-driven software platform that executes the PPSUITE and MOVES2010a processes in batch mode. The software allows users to execute runs with a variety of input options and integrates custom MYSQL steps into the process. CENTRAL provides important quality control and assurance steps including file naming and storage automation.

Figure IV-1. PPSUITE Process



C. DATA SOURCES

The latest planning assumptions were used in preparing inputs to the MOVES emission model. The data includes Allegheny County specific parameters regarding temperatures, fuel, and fleet age. Specific traffic conditions and vehicle population have been prepared for the Liberty Clairton nonattainment area. Much of the data has been prepared as part of inventory efforts in support of statewide analyses for the PA DEP; and has undergone review and acceptance by the Pennsylvania Air Quality Workgroup, the interagency consultation group that consists of EPA, FHWA, PennDOT, PA DEP, and MPOs (SPC in this case).

Table IV-2 outlines all of the major data sources and processes proposed for this effort. The subsequent sections expand on these in greater detail. Details of the MOVES input files generated by PPSUITE can be found in Appendices A and B (provided separately).

Table IV-2. Summary of Data Parameters for Liberty-Clairton

Parameter	Source
Analysis Years	2007, 2014
Season	Annual – 12 Month Approach – 1 representative day per month
MOVES Domain / Calculation type	County / Inventory Mode
Pollutants	$PM_{2.5}$, NO_x, SO_2, NH_3, VOC
Emission Calculation Method	Inventory Mode
Area	Liberty Clairton
Traffic Inputs	
VMT Data Source	2008 PennDOT Roadway Management System (RMS) "Snapshot" Integrated with PennDOT BHSTE GIS Signal Locations
VMT Adjustments	For 2008-2007: Highway Performance Monitoring System (HPMS) County by Functional Class VMT For 2008-2014: Functional Class VMT & Growth Rates based on SPC Regional Travel Demand Model
Local VMT Adjustments	Using GIS, The portion of TIGER local roadway mileage in the nonattainment-maintenance area vs. county total – Apply ratio to the total HPMS local VMT reported for the county
Seasonal Adjustments	Traffic Data Report PennDOT Bureau of Public Roads (BPR) (2008 Data)
Hourly Patterns	Traffic Data Report PennDOT BPR (2008 Data)
Annual VMT	Calculated by PPSUITE
Hourly Speeds	Calculated by PPSUITE (Minimum Speed = 2.5 miles per hour)
Road Type Distribution	Calculated by PPSUITE; User assigned Road Type to RMS links
MOVES Inputs	
Vehicle Age Distribution	2010 registration data for light-duty vehicles from PennDOT's Bureau of Motor Vehicles Registration Database; MOVES Defaults for Heavy-Duty Vehicles
Fuel Parameters (Gasoline/Diesel)	MOVES2010a default data (except for gasohol market penetration and Reid vapor pressure (RVP) values which were updated)
I/M Parameters	PAOBDII & Idle (Changes made to default I/M Program Parameters)
Temperatures	10-year monthly average hourly airport temperatures - humidity from WeatherBank, Inc. (www.weatherbank.com)
Month VMT Fractions	Calculated based on seasonal adjustment factors
Day VMT Fractions	Calculated based on seasonal adjustment factors
Hour VMT Fractions	Calculated by PPSUITE
Ramp Fraction	MOVES Defaults (8% of vehicle hours traveled)
Source Type Population	2007 - Based on 2008 registration data and MOVES default VMT and population. 2014 - Based on projected household growth from Woods and Poole Inc. (Methodology approved by PA Air Quality Work Group consisting of EPA, FHWA, DEP, DOT)
Early NLEV/PCV/CALLEVII	EPA provided MOVES override database files
Stage II	MOVES Default Process
Alternative Vehicle Technology	MOVES Default (no input file provided)

1. Base Traffic Data/Fleet Data Inputs

a. Baseline Traffic Volumes

The 2008 PennDOT RMS database serves as the primary source for the county and functional class VMT estimates and roadway volumes for the baseline traffic data. The RMS has been updated to provide a "snapshot" of the regional roadway system and traffic volumes in 2008 and also includes traffic signal locations. As 2007 RMS data was not readily available, HPMS data was used to factor the 2008 volumes back to 2007 levels with individual

adjustment factors calculated for each of the functional classes as they exist in the RMS database and are represented in the NAA. Note that there are no limited access freeways or expressways within the Liberty-Clairton NAA and as such growth factors were not developed for these roadway classifications.

The RMS database only includes roadways maintained by PennDOT. As a result, a significant number of local roadways are not fully represented in the database. PennDOT has procedures to estimate county local VMT as part of the HPMS reporting system. For the Liberty-Clairton inventory, local VMT was estimated as a percentage of the Allegheny County total. Using GIS, the portion of TIGER local roadway mileage in the nonattainment area was calculated and compared to the total county mileage to estimate the relative portion.

b. Seasonal Adjustments

The PPSuite framework developed for this analysis calculates annual emissions by running MOVES for a single representative day for each month of the year (12 runs). Per the MOVES technical guidance option, monthly analyses were conducted only for the weekday option and factored to represent monthly/annual totals. The daily and monthly seasonal adjustment factors were developed from data contained in the document: *2008 Pennsylvania Traffic Data* prepared by PennDOT's BPR (PennDOT, 2008). The seasonal and daily factors are based on statistical analyses of 2008 traffic counts taken at permanent and in-pavement automatic traffic recorders.

c. Congested Speeds

PPSUITE calculates congested speeds by hour of the day for each roadway segment and provides the information as input to the MOVES2010a software. The speed calculations found in PPSUITE are a variation of the BPR speed-flow formula and are fully consistent with the guidance provided by EPA and FHWA. To disaggregate the daily RMS volumes to hourly values, auto and truck hourly pattern data from PennDOT's 2008 Pennsylvania Traffic Data Report was used to develop distributions of traffic by hour, which in turn is used to create an input file used by PPSUITE in its internal calculations.

d. Vehicle Population

Vehicle population is a key component in the calculation of start and evaporative emissions. MOVES2010a requires vehicle population by 13 source types in order to determine evaporative emissions. Data from the Department of Motor Vehicles was first used to estimate county-specific values. Allegheny County 2008 vehicle registration data was used to estimate vehicle population for light-duty vehicles and school buses. For transit buses, data from PennDOT and the National Transit Database (NTD) was used to estimate transit bus populations for the county. Next the county information was factored to represent the Liberty-Clairton portion of the region. These adjustment factors were based on the proportion of population in the nonattainment area as compared to the county total. For all other heavy-duty vehicles, MOVES2010a national default vehicle mileage accumulation rates were applied to regional heavy-duty VMT to estimate heavy-duty vehicle population.

e. VMT by Source Type

For input to the MOVES emission model, total VMT must be disaggregated into the six HPMS vehicle groups (passenger cars, other 2-axle light trucks, buses, single-unit trucks, combination trucks, motorcycles) This input is done internally by PPSUITE based on the vehicle mix patterns provided as input to the software. For this inventory the vehicle mix patterns were calculated utilizing a combination of the following sources:

- 2008 RMS truck percentages;
- PennDOT and 2008 NTD transit data;
- 2008 school bus registration data; and

- EPA's MOVES2010a default distribution for all other source types.

The functional class groupings used in PPSUITE are necessary for HPMS reporting, however they are not compatible with MOVES2010a. As a final step, PPSUITE re-aggregates the VMT into MOVES2010a's roadway classifications. This step is somewhat redundant as all roadways in the Liberty-Clairton $PM_{2.5}$ NAA are classified in MOVES2010a as urban, non-restricted.

f. Vehicle Age Distribution

Vehicle age distributions for each of the 13 source types are a required input into MOVES2010a and PPSUITE. The distributions reflect the percentage of vehicles in the fleet up to 31 years old and must total 100 percent. Recent 2010 registration data from PennDOT's Bureau of Motor Vehicles Registration database has indicated a substantially older fleet than recorded in the 2002-2008 period. As such the 2010 vehicle age distributions have been used for this inventory. Due to insufficient data, only data for light-duty vehicles are used; heavy-duty vehicle age distributions are based on the MOVES2010a defaults for Allegheny County. As the registration data downloaded was based on MOBILE6.2 vehicle categories, the data was converted to source types using the EPA convertor spreadsheets provided with the MOVES2010a emission model.

2. I/M and Fuel Parameters

a. I/M Program

The I/M program inputs to the MOVES2010a model are based on past and current programs at the county level (all Pennsylvania I/M programs are based on county boundaries). The MOVES2010a model has simplified the I/M program input parameters compared to MOBILE6.2. The default I/M program parameters included in MOVES2010a were examined and changes made to the defaults to match the actual local program.

The Pennsylvania I/M program was upgraded and expanded throughout the state with a phase-in period starting in September 2003 and was fully implemented by June 2004. The program requirements vary by region and include on-board diagnostics (OBD) technology. The program, named PAOBDII, has been implemented in the Pittsburgh Region, including Allegheny County. The program consists of the OBDII program along with tailpipe tests (idle in this region) and gas cap tests.

b. Fuel Assumptions

The MOVES2010a default fuel formulation and fuel supply data was reviewed and updated based on available local volumetric fuel property information provided by PA DEP. The gasohol market penetration and RVP values was also updated, with MOVES2010a default data used for the remaining parameters. Updated assumptions included:

- 0.00 percent ethanol (for summer RVP months);
- 6.78 percent ethanol (for winter months); and
- 7.8 RVP during summer months.

3. Meteorology Data

Updated weather information was obtained from WeatherBank, Inc. (www.weatherbank.com) using the 10-year average minimum and maximum monthly temperature and relative humidity values obtained at the Pittsburgh International Airport. The MOVES2010a model requires temperature and relative humidity data for each hour of the day. EPA's data converters were used to convert minimum and maximum daily temperatures to an hourly

temperature profile that could be input to MOVES2010a. These assumptions are consistent with recent inventory efforts.

4. Vehicle Technology/Programs

a. Federal Programs

Current Federal vehicle emissions control and fuel programs are incorporated into the MOVES2010a software. These include the National Program standards covering model year vehicles through 2016. Modifications of default emission rates were required to reflect the early implementation of the National Low Emission Vehicle Program (NLEV) program in Pennsylvania. To reflect these impacts, EPA has released instructions and input files that can be used to model these impacts (EPA, 2010c). This inventory utilized the August 2010 version of the files (http://www.epa.gov/oms/models/moves/tools.htm).

b. State Programs

The Pennsylvania Clean Vehicles (PCV) Program, adopted in 1998, incorporated the California Low Emission Vehicle Program (CA LEVII) by reference, although it allowed automakers to comply with the NLEV program as an alternative to this Pennsylvania program until model year 2008. Beginning with model year 2008, "new" passenger cars and light-duty trucks with a gross vehicle weight rating (GVWR) of 8,500 pounds or less that are sold or leased and titled in Pennsylvania must be certified by the California Air Resources Board or be certified for sale in all 50 states. For this program, a "new" vehicle is a qualified vehicle with an odometer reading less than 7,500 miles. PA DEP and PennDOT worked with the automobile manufacturers, dealers and other interested business partners and finalized procedures for complying with these new requirements.

The impacts of this program were modeled for all analysis years beyond 2008 using the same EPA guidance and tools as downloaded for the early NLEV analysis. EPA has also provided input files that reflect the CAL LEVII program. Modifications were made to these files to reflect the 2008 start date in Pennsylvania.

5. Traffic Growth Assumptions

Traffic growth forecasting plays a pivotal role in estimating future year emissions for the region. There are many uncertainties affecting projections of traffic growth including the current economic conditions, future growth in population and employment, etc. Growth rates for this emissions inventory were based on an assessment of available data sources.

All SIP mobile source highway inventories include the review and assessment of county-specific growth rates from a PennDOT study originally completed in 2005 and documented in the report, Statistical Evaluation of Projected Traffic Growth, Traffic Growth Forecasting System: Final Report, March 14, 2005 (Baker, 2005). As part of that study, a statewide traffic growth forecasting system was developed that incorporates traffic data from PennDOT's Traffic Information System and socioeconomic forecasts. That forecasting system is maintained by the PennDOT BPR and is updated on a periodic basis. This system was last updated in December of 2009 to develop new statistical relationships between historic VMT growth and population (through 2008). The forecast population was estimated from the Woods and Poole data "2010 State Profile". The results of the study have been shared between PennDOT, PA DEP, and other Interagency Consultation Group members, including the PA Conformity Work Group.

The growth rates from the PennDOT BPR forecasting system were evaluated against other available data including the SPC travel model. For the development of motor vehicle emissions budgets, upper estimates of the VMT growth range are used for the forecast analyses. From an air quality perspective, the use of the upper boundary is

conservative, and provides for factors outside the agency's control (e.g., potential socio-economic growth above current forecasts, fleet age distributions, vehicle type distribution) that influence motor vehicle emissions.

For the Liberty-Clairton $PM_{2.5}$ NAA, the PennDOT BPR Growth Rate forecasting system was used to convert 2008 volumes to 2007, while growth rates from 2007-2014 are based on the SPC regional travel demand model. Of the multiple sources reviewed, these yielded the highest estimates of traffic volumes and in turn the highest estimate of the on-road emissions. Resulting VMT estimates are shown in Table IV-3.

Table IV-3. Base and Forecasted Vehicle Miles of Travel (Millions)

VMT (Millions)*		% Change
2007	2014	
94.701	107.171	13.2%

* All VMT is classified as Urban, Unrestricted in MOVES for Liberty-Clairton.

6. Vehicle Population Growth Assumption

Vehicle population growth forecasting plays an important key role in determining emissions for future years for the region. For this inventory, the vehicle population was forecasted by considering county-specific household and population growth. Liberty-Clairton area vehicle population estimates by MOVES source types are shown in Table IV-4.

The household and population data was obtained from the PennDOT study documented in the reports discussed above as well as the *Statistical Evaluation of Projected Traffic Growth, Traffic Growth Forecasting System: Final Report, March 14, 2005*. The forecast household and population were estimated from the Woods and Poole data "2010 State Profile." The highest growth between household and population data was obtained for the county. The household growth rate yielded the higher value and did not exceed VMT growth. This value was ultimately used to project the 2007 vehicle population to 2014.

Table IV-4. Vehicle Population Estimated Classified by MOVES Source Type

MOVES Source Type ID	Vehicle Population	
	2007	2014
11	443	488
21	6,572	6,626
31	4,625	4,749
32	1,545	1,586
41	2	3
42	14	14
43	20	21
51	1	2
52	94	105
53	11	13
54	21	24
61	23	25
62	26	29
Total	13,397	13,685

7. Final Results

Table IV-5 summarizes the 2007 and 2014 on-road vehicle estimates for the Liberty-Clairton NAA by MOVES road type.

Table IV-5. Liberty-Clairton $PM_{2.5}$ NAA – On-Road Emissions Summary by Road Type (tons/year)

	2007						
Road Type	Annual VMT (millions)	Speed (miles/hour)	$PM_{2.5}$	VOC	NO_X	SO_2	NH_3
Off-Road	-	-	1.82	121.60	75.43	0.16	0.00
Urban Unrestricted	94.701	29.1	8.09	50.92	198.86	1.99	4.66
Area Total	94.701	-	9.91	172.52	274.29	2.15	4.66
	2014						
Road Type	Annual VMT (millions)	Speed (miles/hour)	$PM_{2.5}$	VOC	NO_X	SO_2	NH_3
Off-Road	-	-	1.16	72.74	51.72	0.07	0.00
Urban Unrestricted	107.171	29.1	5.02	22.32	99.31	0.84	3.36
Area Total	107.171	-	6.18	95.06	151.03	0.90	3.36

Table IV-6 provides an on-road emissions summary by fuel type for the Liberty-Clairton NAA as well as the expected change in VMT and emissions between 2007 and 2014.

Table IV-6. Liberty-Clairton $PM_{2.5}$ NAA On-Road Emissions Summary by Fuel Type (tons/year)

	2007						
Fuel Type	Annual VMT (millions)	Speed (miles/hour)	$PM_{2.5}$	VOC	NO_x	SO_2	NH_3
Gasoline	88.717	29.1	4.17	164.42	175.63	1.80	4.51
Diesel Fuel	5.985	29.1	5.74	8.10	98.66	0.35	0.15
Area Total	*94.701*	*29.1*	*9.91*	*172.52*	*274.29*	*2.15*	*4.66*
	2014						
Fuel Type	Annual VMT (millions)	Speed (miles/hour)	$PM_{2.5}$	VOC	NO_x	SO_2	NH_3
Gasoline	100.203	29.1	3.34	89.91	93.23	0.81	3.18
Diesel Fuel	6.968	29.1	2.84	5.15	57.80	0.09	0.18
Area Total	*107.171*	*29.1*	*6.18*	*95.06*	*151.03*	*0.90*	*3.36*
	Change in VMT and Total Emissions: 2007-2014						
Fuel Type	Annual VMT (millions)	Speed (miles/hour)	$PM_{2.5}$	VOC	NO_x	SO_2	NH_3
Gasoline	11.486	-	-0.83	-74.51	-82.39	-0.99	-1.33
Diesel Fuel	0.983	-	-2.89	-2.95	-40.86	-0.26	0.02
Area Total	*12.469*	*-*	*-3.73*	*-77.46*	*-123.26*	*-1.24*	*-1.31*

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CHAPTER V. SOURCE IMPACT ANALYSIS FOR THE LIBERTY MONITOR

A. EXISTING DATA AND ANALYSES

The Liberty-Clairton NAA has extensive speciated $PM_{2.5}$ monitoring data at both the Liberty site, situated on South Allegheny High School (SAHS) in the NAA, and at the ACHD offices in Lawrenceville 11 miles to the north-northwest (bearing 333˚). The Liberty site also collects wind speed and direction data, a Federal Reference Method (FRM) and an hourly $PM_{2.5}$ sampler. As tabulated above, the ACHD compiles extensive emissions data on criteria and hazardous air pollutants.

Preliminary Findings – It is important to note that the Liberty and Lawrenceville locations are influenced by somewhat different sources. The $PM_{2.5}$ concentrations and species concentrations for the 20 highest sites days at the Liberty site from 2005-2010 are shown in Table V-1. Figure V-1 shows how selected species are enriched at the Liberty Borough site. Figure V-2 shows which Positive Matrix Factorization (PMF) factors for Liberty Borough are enriched over similar factors from the Lawrenceville PMF analysis. In general, the factors in Liberty Borough are larger (especially the ones with high carbon concentrations), owing to its proximity to Clairton Works. The species concentrations for all days and the highest 25 percent of the $PM_{2.5}$ daily measurements for both Liberty and Lawrenceville are shown in Table V-2 (ACHD, 2011d).

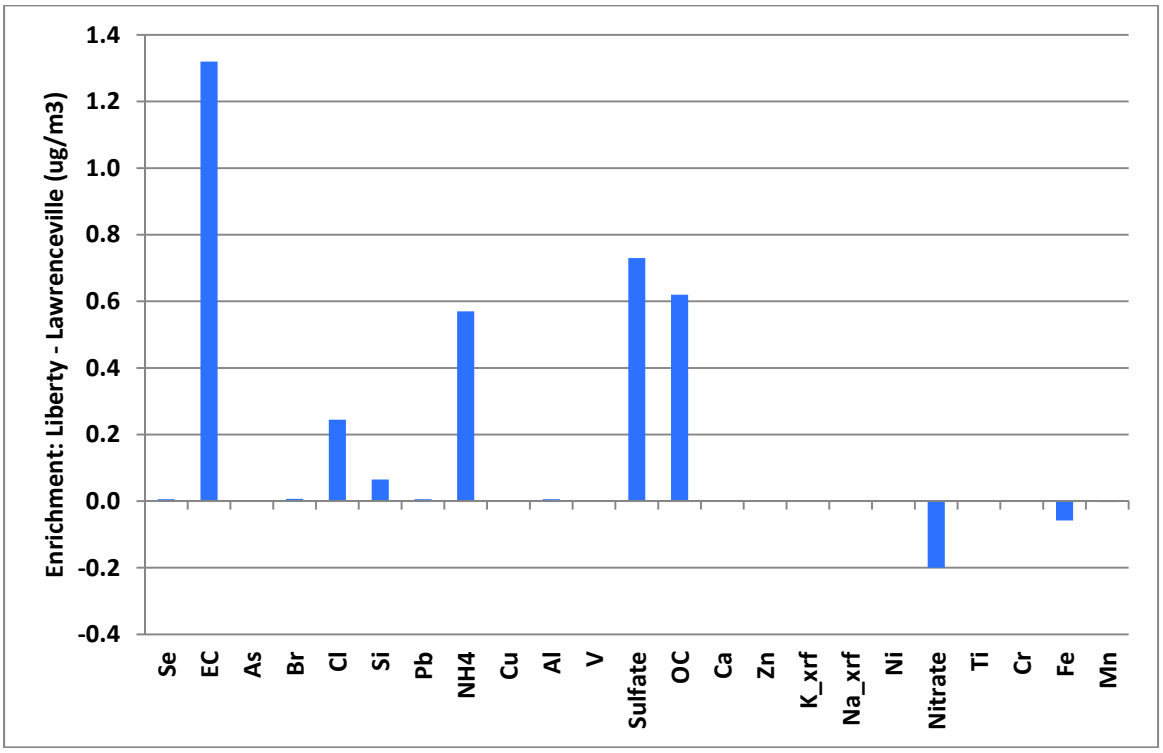
Table V-1. Measured Composition of 20 Highest $PM_{2.5}$ Days at Liberty Monitor

Date	$PM_{2.5}$ by FRM at Liberty Monitor (POC1)	Total of Measured (incl. Trace)	Ammonium $(NH_4)+$	Nitrate (NO_3)	Sulfate (SO_4)	Organic Carbon (OC)	Elemental Carbon (EC)
9/13/2005	89.0	71.4	10.6	2.1	29.3	17.8	11.0
10/31/2005	83.1	77.9	10.0	1.4	13.3	27.7	16.7
8/4/2007	62.6	34.1	5.6	1.4	16.9	6.8	2.7
4/18/2008	56.0	50.4	8.0	1.8	11.5	13.4	8.5
2/17/2007	54.1	54.6	9.8	3.3	10.6	14.4	8.0
5/29/2006	54.1	50.1	7.3	2.6	14.9	16.8	7.0
11/12/2005	48.8	40.8	4.6	1.4	5.0	13.3	12.6
8/28/2007	47.3	42.4	7.5	1.0	23.6	6.3	3.3
7/7/2010	47.1	40.4	5.3	1.2	15.5	10.6	6.6
7/17/2008	45.1	40.3	6.5	1.5	17.3	7.9	6.1
7/10/2006	45.1	38.3	6.8	0.8	18.4	8.6	3.0
9/3/2008	45.0	45.0	6.6	2.1	15.0	11.6	8.3
2/22/2006	44.7	44.1	6.4	3.6	8.2	16.2	6.0
9/8/2006	44.4	47.1	7.7	1.7	16.9	12.9	5.5
7/29/2008	44.4	38.6	5.6	1.7	13.8	11.5	5.2
9/21/2008	43.8	44.6	7.8	2.2	15.2	11.0	6.0
9/19/2005	43.0	41.7	6.8	1.3	16.6	8.4	7.8
7/21/2005	42.7	39.5	6.2	1.5	14.7	10.9	5.3
8/30/2010	41.8	36.1	4.8	1.3	13.9	9.1	6.0
4/2/2010	41.2	35.3	3.9	1.0	5.8	13.4	7.2
Average	51.2	45.6	6.9	1.7	14.8	12.4	7.1

SOURCE: ACHD, 2011d.

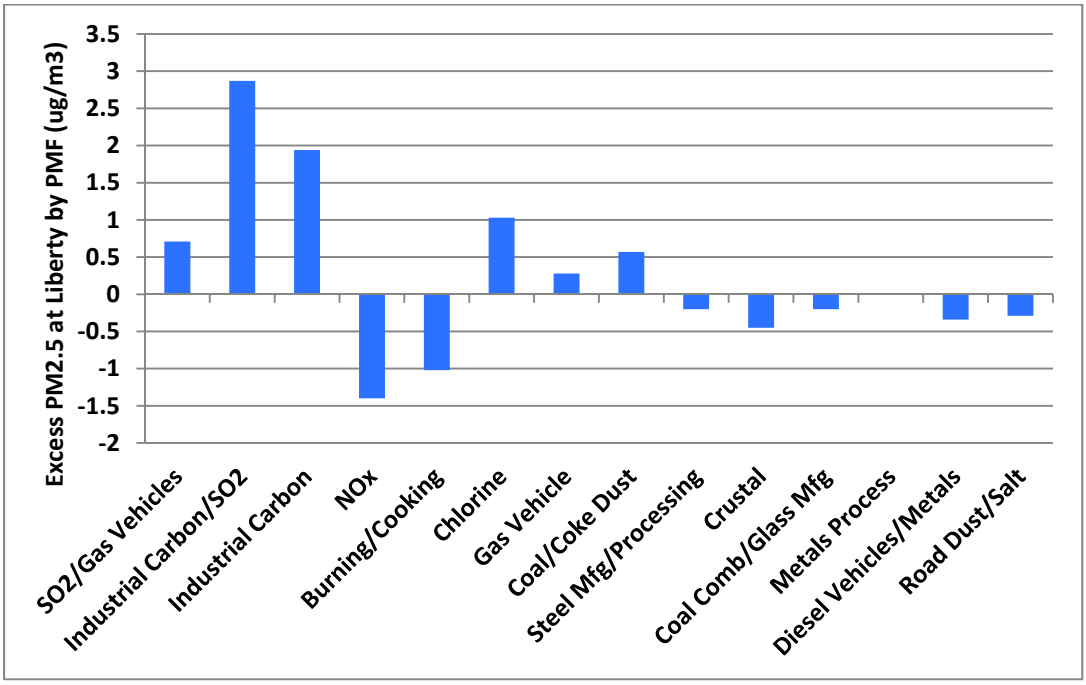
NOTE: See Section B for discussion of the difference between FRM and "measured" mass.

Figure V-1. Enrichment of Species Measured at Liberty Site Compared to Lawrenceville Site (µg/m³)



SOURCE: ACHD, 2011d.

Figure V-2. Excess $PM_{2.5}$ (Liberty - Lawrenceville) Using PMF Analysis (µg/m³)



SOURCE: ACHD, 2011d.

Table V-2. Comparison of Species Concentrations on Average and High Mass Concentration Days (µg/m³)

	Average All Days 2005-10		Average High 25% of Days	
	Liberty	Lawrenceville	Liberty	Lawrenceville
Total of Measured Species	18.8	15.2	34.7	26.2
NH_4+	2.4	1.87	4.8	3.42
NO_3^-	1.3	1.57	1.5	2.38
SO_4^{--}	5.3	4.44	10.2	8.41
OC	4.4	3.80	8.8	5.53
EC	2.15	0.80	4.99	1.14
Al	0.035	0.027	0.059	0.039
As	0.0047	0.0020	0.011	0.0027
Br	0.011	0.0045	0.025	0.0068
Ca	0.044	0.041	0.074	0.059
Cl	0.25	0.024	0.78	0.048
Cr	0.0022	0.0035	0.0021	0.0052
Cu	0.0071	0.0056	0.0098	0.0082
Fe	0.099	0.16	0.14	0.22
Pb	0.017	0.010	0.039	0.014
Mn	0.0030	0.0060	0.0036	0.0088
Ni	0.0016	0.0019	0.0015	0.0029
K_xrf	0.066	0.066	0.10	0.098
K_ion	0.050	0.056	0.089	0.090
Se	0.0099	0.0036	0.024	0.0048
Si	0.14	0.071	0.29	0.097
Na_xrf	0.048	0.049	0.086	0.072
Na_ion	0.086	0.082	0.122	0.110
Ti	0.0027	0.0031	0.0049	0.0053
V	0.0012	0.0010	0.0017	0.0014
Zn	0.033	0.033	0.059	0.043

SOURCE: ACHD, 2011d.

Existing Data Analyses by ACHD - The ACHD has performed significant ambient and meteorological monitoring in the county, including both the Lawrenceville and Liberty Borough areas. They have analyzed this monitoring data by performing a PMF analysis of measured concentrations of ambient speciated data collected at the Liberty Borough site, also known as the SAHS site and at the ACHD's Lawrenceville office site. The details of the PMF analysis will not be repeated here since they are well documented in the report (ACHD, 2011d).

The PMF is a multivariate factor analysis that analyzes a set of speciated ambient data and develops a set of factor species profiles and their associated factor concentrations. An analyst then uses wind direction data, measured source species profiles and emission inventories to interpret which sources are represented by the factors. The PMF tool is described in the PMF users manual (EPA, 2008d). The ACHD also performed a Conditional Probability Function (CPF) of the wind direction data at the monitor atop the SAHS. It shows the frequency of wind directions associated with the highest factor sums for each factor category in the PMF performed at the SAHS site. The analysis shows more detail on the wind directions associated with high concentrations than could be learned from a wind rose. The PMF and CPF analysis is summarized in the ACHD report and the details will not be repeated here.

B. LIMITATIONS OF EXISTING DATA AND ANALYSES

The speciation measurements, PMF analysis and emissions inventory estimates offer a rich data and analysis set to support "first order" estimates of the impacts of important source types on air quality in the NAA. However, as

discussed below, there are limitations to these analyses that limit attempts to provide quantitative source impact estimates based on data measurements and emissions estimates alone.

Measured Data - It is important to recognize the origin and status of the measured data used in these analyses. ACHD conducted the PMF analysis with speciation data from the $PM_{2.5}$ Speciation Network. The data was not adjusted using the SANDWICH technique to account for the numerous biases and idiosyncrasies that are known to create differences between the FRM-measured $PM_{2.5}$ mass and the analyzed components reported in the $PM_{2.5}$ Speciation Network. The sum of measured species is almost always less than a co-located FRM instrument due to the net effect of these biases and the fact that non carbon organic matter and oxide-related oxygen are not measured. The SANDWICH technique uses the speciation data to provide estimates of $PM_{2.5}$ components as they might be measured by the $PM_{2.5}$ FRM (Frank, 2006). The implication is that the sum of the species for unadjusted data cannot be quantitatively compared to a FRM-measured concentration since the mass and relative amounts of each species and their totals would likely change after the adjustment. The unadjusted mass averaged about 10 percent less than the $PM_{2.5}$ mass at the Liberty site during the 2005-10 timeframe.

PMF Analysis - The PMF analysis indicates likely sources and their relative importance to the average $PM_{2.5}$ concentrations because it groups species into source-related "factors" that tend to cluster together across a number of sampling days. It provides an indication of the relative importance of these groups to average $PM_{2.5}$ air quality. However, an important limitation of this PMF analysis affects its use to help understand the source contributions on the specific days with the highest $PM_{2.5}$ FRM-measured mass concentration.

The ACHD's PMF analysis was run on all days (not just the high days). Table V-3 shows that PMF only accounts (on average) for about 60 percent of the measured mass at the Liberty Site on the high $PM_{2.5}$ days. While the source types will not likely change drastically, their relative contributions to the sum of the measured species will likely change. Therefore, it is not advisable to attempt to relate PMF factors (and their inferred source characteristics) to $PM_{2.5}$ FRM concentrations on high days in a quantitative way.

Note also that the PMF was run on all data, but the CPF was run on the 25 percent highest days only. There are likely some differences in the wind direction between the "typical" and "high" days. Note that the average measured species and PMF-modeled species concentrations are very close in value since the PMF provides a good fit to the measured data "on average." TS|Pechan used unadjusted speciation data in this analysis to maintain consistency with the PMF analyses. (Note: ACHD has recently rerun some of the PMF analyses on high days, by season and during periods of lower industrial activity. These expanded analyses have not shown any large differences in the conclusions identified in the September PMF report (ACHD, 2011b)).

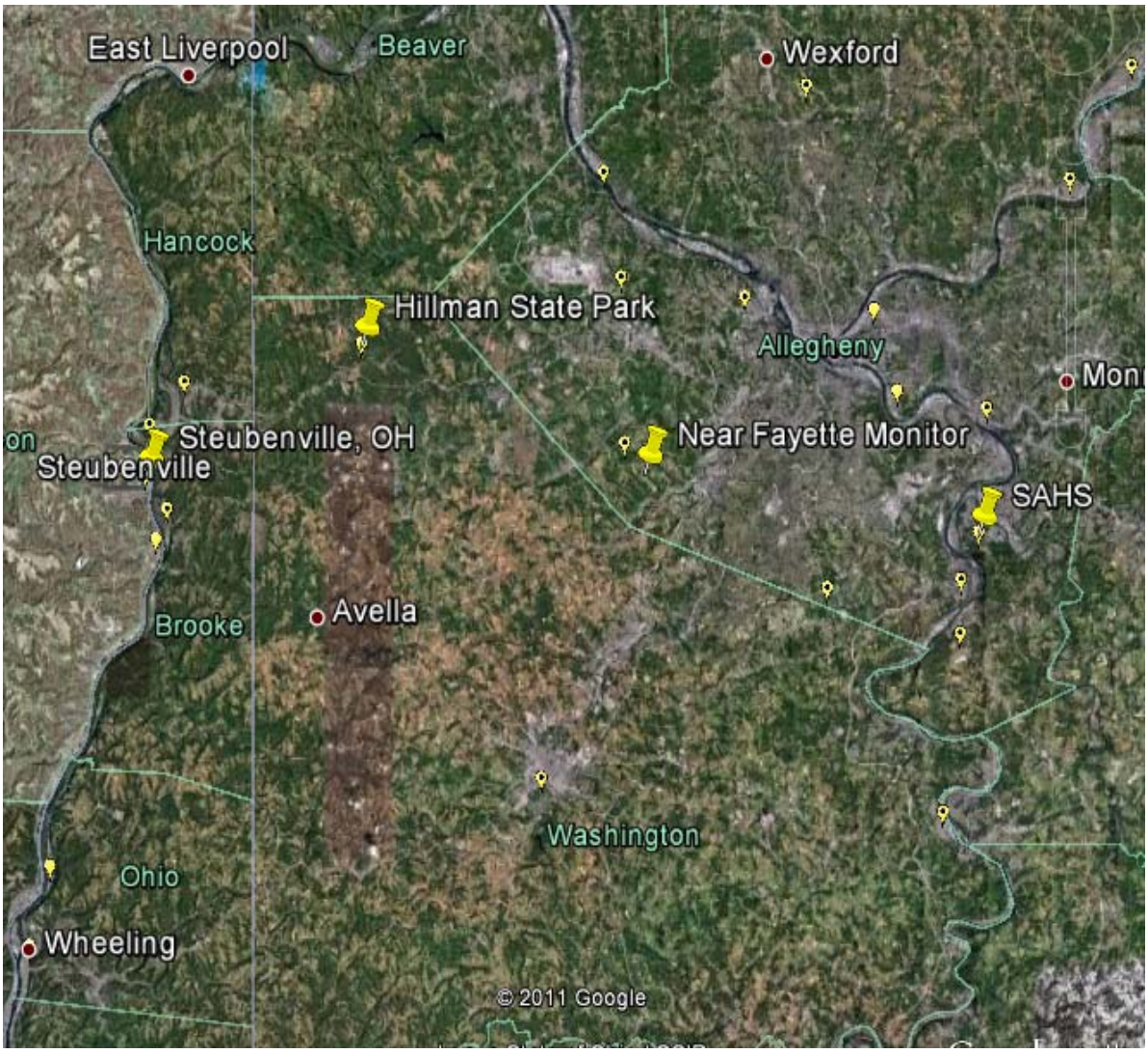
Speciated Background Data - PMF accounts for essentially all of the speciated mass when averaged over all data points - low as well as high. For example, the PMF tool "groups" measured species into "factors". These factors may reflect only local sources, but may also include transported mass from similar sources upwind of the local source(s) with which they are associated. There is no way for the PMF analysis to distinguish among local and transported mass from similar sources if they are chemically similar and if the transport plume crosses over the local source. TS|Pechan identified an upwind monitor with speciation data at Hillman State Park, located about 30 miles west-northwest of the Liberty monitor. It is in a sparsely populated wooded area with active farms about 1 mile west. However, it may be influenced by sources in the Steubenville, OH area, including steelmaking facilities about 13 miles to the west-southwest or sources farther away in Wheeling, WV. The relative locations of the ambient monitoring sites and sources in areas downwind of the Liberty site are illustrated in Figure V-3. The levels at Hillman (a.k.a. Florence) are similar to data at the S. Fayette site in western Allegheny County. Selected 2005-8 speciation data from the Hillman site is tabulated in Table V-4 along with corresponding data from Liberty (aka SAHS) and Lawrenceville sites. As expected, $PM_{2.5}$ and many of the species are highly enriched above values at the Hillman site, because of the close proximity of industrial sources to the Liberty site. The Lawrenceville data are roughly mid-range between the Liberty and Hillman values.

Table V-3. PMF Results for Highest 20 Days Measured at Liberty Site, Liberty - Clairton NAA

	PMF Results for Liberty Site Factors and Their Key Species (Highest Days in 2005-2010)													
Date	$PM_{2.5}$ (POC1)	Factor Sum	Cr Ni (#1)	OC EC SO_4 (#2)	Se (#3)	OC EC Cu (#4)	NO_3 (#5)	EC OC S (#6)	$S0_4$ OC EC (#7)	EC Si (#8)	K (#9)	Chlorine (#10)	Fe Mn Zn (#11)	Al Ca Fe Ti (#12)
9/13/2005	89.0	30	6.44	3.60	1.80	1.76	1.65	5.82	6.44	-0.20	-0.20	-0.20	2.50	0.50
10/31/2005	83.1	71	1.54	11.69	17.03	1.81	-0.20	2.56	1.54	5.37	-0.20	29.86	-0.04	-0.20
8/4/2007	62.6	20	3.64	0.51	0.87	0.84	1.06	1.51	3.64	2.10	1.65	0.02	1.85	2.53
4/18/2008	56.0	42	1.00	0.43	1.12	1.64	1.16	3.59	1.00	2.63	3.45	22.36	1.59	2.26
2/17/2007	54.1	50	1.30	2.11	3.05	0.20	3.14	-0.20	1.30	3.34	2.34	32.82	-0.20	0.75
5/29/2006	54.1	29	2.73	6.69	1.50	1.73	1.24	4.87	2.73	1.06	2.82	1.13	2.83	-0.20
11/12/2005	48.8	32	0.32	5.58	4.19	1.90	0.49	1.65	0.32	3.33	1.50	12.17	0.32	0.16
8/28/2007	47.3	21	5.53	1.30	0.34	2.45	0.64	0.94	5.53	0.97	0.56	-0.02	1.02	1.61
7/7/2010	47.1	23	2.50	2.95	1.70	2.04	0.25	4.42	2.50	1.36	3.08	0.15	1.08	1.27
7/17/2008	45.1	21	3.78	2.18	1.28	1.06	1.14	2.80	3.78	1.16	0.86	0.43	1.45	1.25
7/10/2006	45.1	19	4.29	2.90	0.59	0.72	0.28	1.59	4.29	1.48	1.35	0.03	-0.06	1.30
9/3/2008	45.0	25	2.51	3.93	0.75	1.55	1.58	5.87	2.51	2.82	0.11	0.50	2.34	0.99
2/22/2006	44.7	31	0.84	3.53	1.04	2.73	3.09	2.99	0.84	1.15	2.18	11.95	0.69	0.42
9/8/2006	44.4	30	3.10	3.92	1.62	2.21	1.02	3.97	3.10	5.95	0.39	3.53	0.95	-0.18
7/29/2008	44.4	21	3.06	3.88	1.30	1.78	0.76	2.31	3.06	1.03	2.48	0.17	1.12	0.47
9/21/2008	43.8	29	2.68	1.73	0.40	1.43	1.60	4.06	2.68	5.33	2.96	4.11	2.39	-0.20
9/19/2005	43.0	29	3.69	3.98	9.94	1.10	0.75	2.30	3.69	1.77	-0.10	0.10	1.18	0.47
7/21/2005	42.7	21	3.36	2.62	1.21	1.11	1.16	2.64	3.36	3.03	0.39	0.07	1.22	1.21
8/30/2010	41.8	20	1.94	2.91	1.02	1.42	0.64	5.18	1.94	1.19	1.14	0.15	2.28	-0.17
4/2/2010	41.2	33	-0.17	3.08	1.68	2.87	-0.20	4.44	-0.17	1.78	3.24	10.52	1.59	4.71
Average	51.2	29.9	2.7	3.5	2.6	1.6	1.1	3.2	2.7	2.3	1.5	6.5	1.3	0.9
2 Std Dev	26.29	24.85	3.32	4.91	7.98	1.34	1.76	3.32	3.32	3.31	2.49	20.82	1.78	2.40

SOURCE: ACHD, 2011d.

Figure V-3. Location of Monitors in Areas Upwind of Liberty (SAHS) Air Monitoring Site



SOURCE: EPA, 2011a

Table V-4. Comparison of Species Concentrations at Hillman, Liberty and Lawrenceville Sites (µg/m³)

	2005-2008 $PM_{2.5}$ Speciation and FRM			Enrichment
	Hillman	Lawrenceville	Liberty	Lib-Hill
$PM_{2.5}$ Mass (FRM)	13.0	15.1	19.4	6.4
Ammonium	1.53	2.10	2.72	1.2
Nitrate	0.84	1.58	1.42	0.58
Sulfate	4.82	5.22	5.91	1.1
Elemental Carbon	0.68	0.80	2.44	1.8
Organic Carbon	2.46	3.80	4.24	1.8
arsenic	0.0015	0.0021	0.0053	0.004
aluminum	0.019	0.028	0.0371	0.018
bromine	0.0036	0.0048	0.011	0.007
calcium	0.028	0.045	0.046	0.019

	2005-2008 $PM_{2.5}$ Speciation and FRM			Enrichment
	Hillman	Lawrenceville	Liberty	Lib-Hill
chromium	0.0022	0.0043	0.0023	0.000
chlorine	0.0081	0.016	0.29	0.286
iron	0.065	0.16	0.11	0.044
lead	0.0048	0.010	0.017	0.012
manganese	0.0028	0.0064	0.0032	0.000
nickel	0.0009	0.0020	0.0018	0.001
magnesium	0.0051	0.0054	0.0083	0.003
selenium	0.0024	0.0033	0.0085	0.006
titanium	0.0028	0.0045	0.0038	0.001
vanadium	0.0015	0.0016	0.0019	0.000
silicon	0.065	0.082	0.16	0.090
zinc	0.018	0.036	0.034	0.016
potassium	0.050	0.084	0.077	0.026
Total Measured	10.6	14.0	17.5	6.9

EC and OC at Lawrenceville are 2005-10.
S. Fayette FRM (12.6 microgram per cubic meter ($\mu g/m^3$) average for 2005-2008), consistent with the Hillman State Forest (Florence) FRM (13 $\mu g/m^3$).

SOURCE: EPA, 2011a.

The relatively high $PM_{2.5}$ and species concentrations for $PM_{2.5}$ and species mass at the Hillman site (upwind of the Liberty site) suggests that there is a non negligible "background" impacting the Liberty-Clairton area. A rough approximation based on Table V-4 is that the average $PM_{2.5}$ excess at Liberty is 6-7 $\mu g/m^3$ over the Hillman and S. Fayette areas. Similarly, NH_4, SO_4, and NO_3 combined are enriched 3 $\mu g/m^3$ and EC and OC combined are enriched 3.5 $\mu g/m^3$ at Liberty over the Hillman area. The enrichment could be more if NH_4, SO_4, NO_3 or carbon transported from the Ohio River Valley (ORV) impacts Hillman more than Liberty. Qualitatively, it is likely that any impact of transport from Steubenville (or industrial areas to its south) on Liberty-Clairton will be less compared to its impact on Hillman, since for example Steubenville is over 40 miles from Liberty Borough, but only 13 miles from Hillman State Forest. Thus, the background coming into Liberty is likely to be lower and the impact of local sources higher than the enrichment in Table V-4 suggests.

Thus, the concentration at the Liberty site (compared to Hillman State Forest) is enriched by an average of *at least* 6.9 $\mu g/m^3$ over this 4 year period due to local sources. An analysis of background concentrations, incoming wind flow, and transport patterns from upwind sources is needed if measured air quality alone is used to estimate background.

C. MICROINVENTORY OF LOCAL SOURCES IN LIBERTY BOROUGH AND INVESTIGATION OF OPERATIONAL IRREGULARITIES, TRENDS, DAILY AND DIURNAL EMISSIONS VARIABILITY

Point, area and mobile sources in the immediate vicinity and upwind of the Liberty Monitor are more likely to impact that monitor than similar sources located several boroughs distant. Therefore a “microinventory” in the Liberty Borough monitoring site vicinity was conducted to tabulate land use, terrain and 2007 Emissions Inventory data spatially.

A microinventory is a compilation of sources in the vicinity of an air monitoring station, spatially allocated into small grids. This microinventory conducted in this study is based loosely on the microinventory concept used by EPA and others for total suspended particulate and PM_{10}. Its size and shape correspond to the NAA for area and mobile sources but point sources up to 10miles distant are considered. For high priority source categories of interest, the

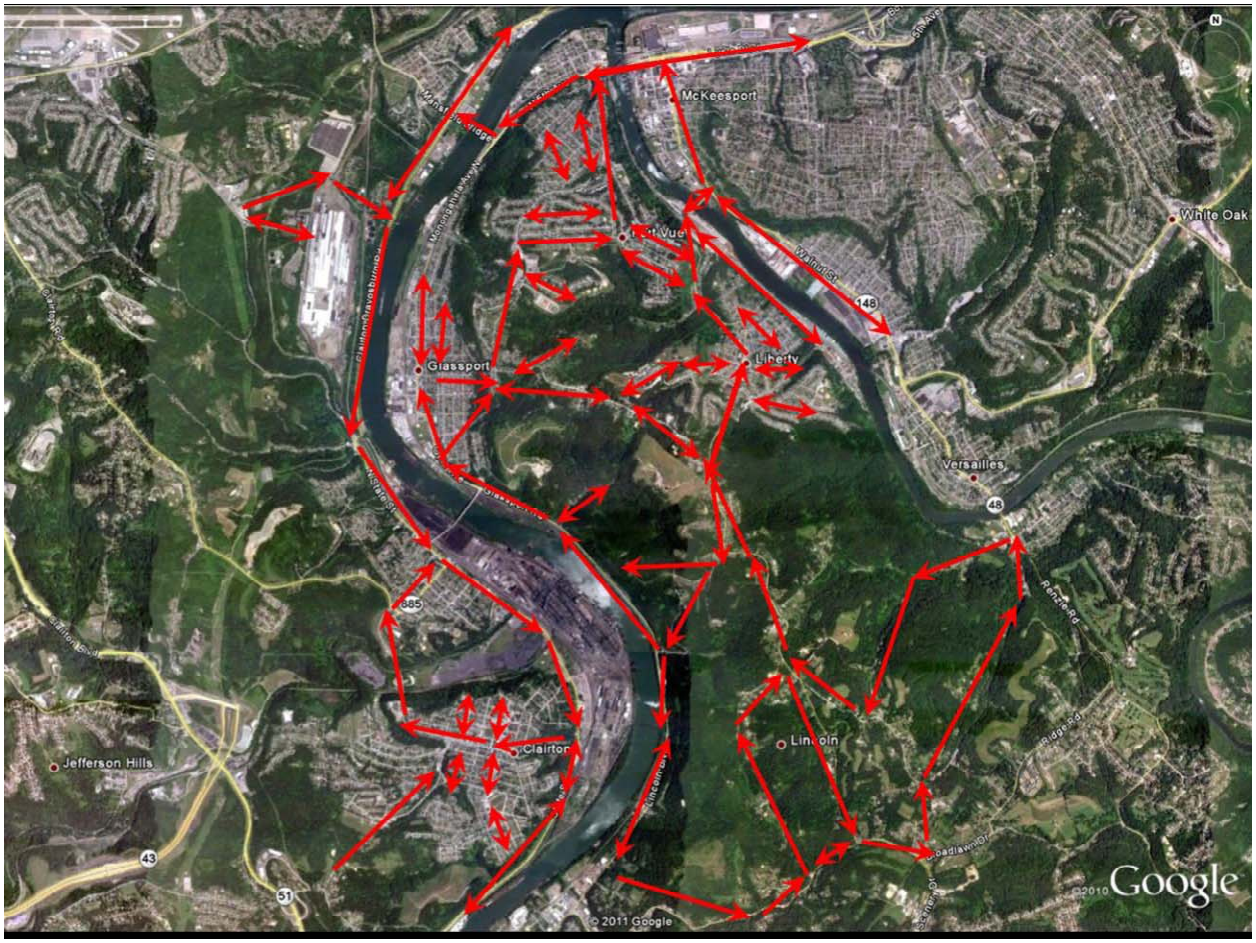
microinventory may include information on source operating patterns and day-to-day emissions variability due to upsets/malfunctions and intermittent operation. This microinventory facilitates comparison of the 2007 inventory to PMF and other receptor-based analyses to support evaluation the sources' potential to impact $PM_{2.5}$ air quality and setting priorities for evaluating the 2007 emissions (Pace, et al., 1978).

Google Earth and other databases were used to locate sources, assign land use and describe terrain. The microinventory utilizes the 2008 inventory, visual inspection of the selected areas near the Liberty monitor and interviews with ACHD staff. TS|Pechan has recorded and summarized results in spreadsheets and maps. Although this is an area and mobile source review, point sources, especially those source types that were implicated in the PMF analysis are included in the microinventory. The microinventory began with an intensive driving tour to inspect the Liberty NAA and perimeter. Results of the driving tour are below.

Inspection of the Liberty-Clairton NAA - On October 5 and 6, 2011, TS|Pechan Senior Associate & Vice President, Jim Wilson, and Tom Pace, Consultant to TS|Pechan, accompanied Tony Sadar, Jason Maranche, and Shaun Vozar of the ACHD on an extensive driving tour of the area. A map of the main routing covered is shown in Figure V-4. The purpose of the tour was to view as much of the area as possible to observe sources in and near the NAA and to observe the neighborhood around the monitor to identify sources that might be unduly influencing the measured $PM_{2.5}$ or selected species. Specifically, we attempted to augment Google Earth views to clarify the types of land cover, terrain and potential point, area and mobile sources. In this tour, activities and sources that we did not observe were as important as what we did observe. For example, we looked for:

- Signs or indications of open burning (household waste, yardwaste, agricultural waste);
- Firewood stored and ready to burn this winter;
- Small sources (asphalt batch, cement);
- Traffic levels and proximity to the Liberty site;
- Truck stops and areas where trucks could gather or idle;
- Rail switchyards;
- Unpaved roads and parking areas, cropland;
- Signs of logging or fires for resource management;
- General characterization of types and availability of restaurants; and
- Proximity of above to the monitor and unusual activities around the monitor.

Figure V-4. Liberty-Clairton Tour Routing for October 5 and 6, 2011



SOURCE: Maranche, 2011.

Tour Observations- Important Sources and Emphasis in the Emissions Inventory

- The diesel truck and tugboat operation in Clairton Works is under-represented in their inventory.
- There is much less commercial/residential/agricultural diesel equipment operating in the Liberty-Clairton area than observed in other areas of the county.
- Observed little land disturbance or other nonindustrial fugitive dust generation.
- Observed less commercial charbroiling in the area than in other parts of Allegheny County.
- Open burning was likely low but not "zero".
- Residential wood burning is a significant source, based on observed wood storage at homes.
- County-level allocation to grids in the NAA by the current population approach must be reviewed: cooking, open burning, fugitive dust, agricultural lands, quarries, etc., would likely be overestimated in the area if allocations were made on population.
- Clairton Works is a point source and is thus not included in the review; however, it is obviously the most important source affecting the NAA and the Liberty air quality monitoring site by far.
- Above conclusions are based on the site tour and preliminary review of the emissions inventory.

D. SOURCE IDENTIFICATION, LOCATION, AND EMISSIONS TABULATION

Source Emissions, Locations – Tables V-5, V-6, and V-7 summarize the microinventory for point, area and mobile source emissions. Note that the site tour was a part of the microinventory. Table V-5 describes the important point sources and tabulates their distance and direction from the Liberty monitor. Tables V-6 and V-7 tabulate these source emissions as well as important area and mobile source categories. Table V-6 includes only those sources within the NAA and Table V-7 includes those in the rest of the county, but outside of the NAA. Only point sources within 10 miles (16 kilometers) are included as they are the ones most likely to impact the Liberty Monitor. The large SO_2 emissions outside of the 10 mile cutoff come almost entirely from the Orion Cheswick electricity-generating unit (EGU) which is almost always downwind of the Liberty area. It is clear from the microinventory that the Clairton Works is by far the most important source, but other sources just outside the NAA (US Steel's Irvin Plant and USS Corporation's Edgar Thompson Plant) may be relevant to air quality at the Liberty monitor as well.

Land Use/Cover – "The Liberty-Clairton Area is made up of complex river valley terrain, approximately 3 miles wide by 5 miles long. It includes a 4-mile winding portion of the Monongahela River and is bordered by the Youghiogheny River to the east. The area includes rural land, densely populated residential areas, and industrial facilities. River valleys lie at 718 feet in elevation (mean sea level), while adjacent hilltops can be greater than 1,250 feet" (ACHD, 2011d).

Land use in the area - mixed, a combination of wooded/grassland/water, residential/strip commercial and industrial. Using Google Earth, TS|Pechan tabulated the land use into the above categories:

Wooded, grassland, water	48 percent
Residential, Strip Commercial	42 percent
Industrial	10 percent

Industry was located at least 1.5 miles from the SAHS monitor.

Terrain - Clairton Works stretches several miles along the Monongahela River at an elevation of 740-760 feet above mean sea level. Everything else in the NAA is on terrain above it, except several industries (e.g., Koppers, Guardian, Eastman) also along the river bank. Clairton City rises to the west to an elevation of just over 1,000 feet. Across the river, the land rises rapidly to a shelf with elevations ranging from over 1,150 feet in Lincoln Borough (to the East), 1,050 feet at the Liberty Monitoring site, 950 feet in Liberty Borough (to the Northeast), 860 feet in Glassport (to the north) and almost 1,200 feet in Port Vue (to the north). There are two cuts in the escarpment that facilitate the transport of Clairton Works' emissions onto the upper shelf and the monitoring site.

Table V-5. Point Source Facilities Believed to Contribute to Liberty-Clairton $PM_{2.5}$ Nonattainment[(a)]

Plant ID	Facility Name	Processes	Degrees from North	Kilometers from Liberty Monitor	Miles from Liberty Monitor	Latitude	Longitude
4200300027	Koppers Inc. - Clairton Plant	Crudes, Carbon Black, Tar fr Coke Waste	218	2.4	1.5	40.30675	-79.885586
4200300032	USS - Clairton Works	Coke Batteries, Quench Towers	205	2.7	1.7	40.30807	-79.883093
4200300265	Eastman Chemical Resins, Inc.	Plastics and Resin Mfg	204	7.5	4.7	40.26189	-79.905138
4200300342	Guardian Industries Corp. Floreffe	Glass Melt Furnace	207	8.7	5.5	40.25388	-79.915850
4200300228	Precoat Metals, Div of Sequa Coatings	Metals Coating	85	2.2	1.4	40.32525	-79.842907
4200300203	US Steel Corporation - Irvin Plant	Steel Reheat Furnace, annealing	290	3.0	2.1	40.33293	-79.901283
4200300202	USS Corporation - Edgar Thompson Plant	Steel Making - BOP, Finishing	7	7.8	5.1	40.39295	-79.856477
4200300144	Bellefield Boiler Plant	Steam Boiler - Coal	332	14.7	9.2	40.43978	-79.949421
4200300009	Pittsburgh (Iron City) Brewing	Brewery	331	17.1	10.7	40.45912	-79.966221
4200300073	Pittsburgh Allegheny County Thermal, Ltd.	EGU	319	17.4	10.9	40.44152	-80.003868
4200300024	Bay Valley Foods, LLC	Coal-fired Boiler	325	17.4	10.9	40.45181	-79.985791
4200300389	NRG Energy Center, Pittsburgh	Steam Boiler - Coal	319	18.2	11.4	40.44841	-80.009427
4200300164	GE Consumer Products, Lighting	Glass Fixture Mfg, Simplex Furnace	283	19.8	12.4	40.36444	-80.096635
4200300003	Universal Stainless and Alloy Products	EAF, Steel Alloy Mfg	281	20.8	13.0	40.35985	-80.108591
4200300158	Orion Power Midwest - Brunot Plant	EGU - Gas	316	21.6	13.5	40.46313	-80.044596

[(a)]ACHD, 2011e.

Table V-6. 2007 Emissions Summary for Liberty-Clairton $PM_{2.5}$ NAA

Point Source Facilities Inside the Liberty-Clairton NAA[a]	$PM_{2.5}$- PRI	SO_2	NH_3	HCl	Cl	Ni	Pb	Se	As	Cr	Mn
Koppers Inc. - Clairton Plant	6.1	0.3	0.0								
USS - Clairton Works	1,950.0	1,740	200	94.1[b]	1.3	.3				2.7	
Eastman Chemical Resins, Inc.	16.8	4.4	0.1	4.6							
Guardian Industries Corp. Floreffe	6.1	83	0.0					0.2		0.1	
Total Point Source Emissions Inside the Liberty-Clairton NAA (a)	1,993	1,827	200	96.0	1.3	.3	0.0	0.2	0.0	2.8	0.0
Area Source Emissions Inside the Liberty-Clairton NAA[c]											
Residential Wood Comb. (Stoves, Fireplaces, Boilers)	15.7	0.4	0.9								
Industrial Coal Combustion	0.0	31.4	0.0								
Commercial Coal Combustion	0.0	0.0	0.0								
Open Burning	1.0	0.0	0.0								
Commercial Cooking	4.1	0.0	0.0								
Residential Heating - Gas, Oil and Coal	3.0	0.3	0.2								
Fugitive Dust (paved, unpaved, construction)	5.2	0.0	0.0								
Fertilizer Application	0.0	0.0	2.2								
Other Area Source Emissions	0.6	16.5	0.8								
Total Area Source Emissions Inside the Liberty-Clairton NAA	29.7	48.6	4.3								
Mobile Sources Inside the Liberty-Clairton NAA [c]											
HDDV	5.7	0.3	0.2								
Railroads	2.4	0.8	0.0								
CMV	6.4	12.4	0.0								
Non Road Diesel	4.3	3.9	0.0								
Highway Gas Vehicles	4.2	1.8	4.5								
Non Road Gas	1.9	0.1	0.0								
Other Mobile Source Emissions	0.0	0.0	0.2								
Total Mobile Source Emissions Inside the Liberty-Clairton NAA	24.9	19.4	4.8								
Total Emissions Inside the Liberty-Clairton NAA	2,048	1,895	209								

[a]ACHD, 2010.
[b]HCl for Clairton Works is "adjusted 0.0" since 2004.
[c]ACHD, 2011e.

Table V-7. 2007 Emissions Summary for Sources in Allegheny County, PA - Outside the Liberty-Clairton $PM_{2.5}$ NAA

Facilities w/in 16 km (10 miles) of SAHS Monitor, but Outside the Liberty-Clairton $PM_{2.5}$ NAA*	$PM_{2.5}$-PRI	SO_2	NH_3	HCl*	Cl*	Ni*	Pb*	Se*	As*	Cr*	Mn*
Precoat Metals, Div of Sequa Coatings	0.8	0.1									
US Steel Corporation - Irvin Plant	51	456	0.8	23.3	0.33						
USS Corporation - Edgar Thompson Plant	881	1,689	0.5	13.3	0.19	0.1	0.4				0.8
Bellefield Boiler Plant	77	707		31.1							
Pittsburgh (Iron City) Brewing	2.4	15.4		0.7							
Pittsburgh Allegheny County Thermal, Ltd.	2.8	0.2									
Bay Valley Foods, LLC	60	543		22.9			0.0				
NRG Energy Center, Pittsburgh	2.6	0.2									
GE Consumer Products, Lighting	20	0.1					1.7				
Universal Stainless and Alloy Products	18	13				0.2	0.0			0.4	
Orion Power Midwest - Brunot Plant	2.3	3.9	0.2								
McConway and Torley	16	4.6				0.1		0.0	0.0	0.1	0.4
Total Point Source Emissions Outside the Liberty-Clairton NAA (< 10 miles from SAHS)*	1,066	3,434	1.5	91.2	0.5	0.4	2.1	0.0	0.0	0.5	1.2
Total Point Source Emissions Outside the Liberty-Clairton NAA (> 10 miles from SAHS)*	1,188	35,010	362	1,409	2.5	4.0	2.5	0.8	0.4	4.4	2.4
Area Source Emissions Outside the Liberty-Clairton NAA											
Residential Wood Comb. (Stoves, Fireplaces, Furnaces)	1,517	32	89								
Industrial Coal Combustion	117	7,467	2.4								
Commercial Coal Combustion	58	3,702	1.2								
Open Burning	0	0.0	0.0								
Commercial Cooking	54	0.0	12.3								
Residential Heating - Gas, Oil and Coal	166	17	12.1								
Fugitive Dust (paved, unpaved, construction)	1,286	0.0	0.0								
Fertilizer Application	0	0.0	132								
Other Area Source Emissions	304	1,672	62								
Total Area Source Emissions Outside the Liberty-Clairton NAA (**)	3,500	12,890	311								
Mobile Source Emissions Outside the Liberty-Clairton NAA											
HDDV	na	na	na								
Railroads	61	20	1								
CMV	105	51	4								
Non Road Diesel	277	249	2.8								
Highway Gas Vehicles	na	na	na								
Non Road Gas	112	6.5	2.1								
Other Mobile Source Emissions	27	74	na								
Total Mobile Source Emissions Outside the Liberty-Clairton NAA (**)	582	401	10								
Total Emissions Outside the Liberty-Clairton NAA	6,336	51,735	685								

*ACHD, 2010.
**ACHD, 2011e.

E. CONCENTRATION SPIKES POTENTIALLY INDICATING UPSETS AND EQUIPMENT MALFUNCTION

1. Upsets and Malfunctions

Inspection of the data shows that many of the days with highest concentrations are associated with a large increase in a relatively few species. This is especially true for chlorine as previously discussed. Days with a spike in one or a few species may be related to a process upset or equipment malfunction instead of atmospheric conditions conducive to poor dispersion. A simple screening tool is suggested to identify the species which tend to have the most very high values. The presumption is the species with the highest ratios of "highest 25 percent of days" to "lowest 75 percent of days" would be most likely to be having upsets or malfunctions on the days with high ratios and the upsets/malfunctions would be occurring in the processes emitting those species. Based on Table V-8, the most likely species associated with upsets, malfunctions or intermittent sources are: chlorine, arsenic, EC, lead, bromine, selenium, OC, NH_4, and silicon. Sorting the species concentration database can help identify specific days or time periods when one or more of these species is high. Note, a review of breakdown reports on hand at ACHD failed to show any strong indications of process breakdowns associated with the high 20 days, but other high days or a detailed investigation may provide additional data (Sadar, 2011a; 2011b). Likely sources (not an exhaustive list), based on the emissions inventory, wind vectors from CPF and SPECIATE (EPA, 2011b) are as follows:

Ammonia - Solid Waste Combustion, Gas Vehicle Exhaust, Residential Gas, Coal & Wood Combustion
Arsenic - Coke, Steelmaking, Sintering Furnace, Coal Burning, Glass Furnace
Bromine - EAF, Sintering, Municipal Waste Combustion, Residential Natural Gas, Coal Combustion, Coke
Chlorine - Muni Waste, Sintering, Open Biomass Fires, Res. Nat Gas, Wood, EAF, Foundries
Elemental Carbon - Diesels, Coke, Nat. Gas Comb., Res Coal, Oil, Wood Comb. Charbroiling
Lead - Muni Waste, EAF, Steel Mfg, Foundries, Glass Furnace, Sintering, Coal Comb.
Organic Carbon - Cooking, Res Wood Comb, Gas Vehicle High Emitters, Open Biomass Fires, Diesels, Natural Gas Comb., Charbroiling, Steelmaking, Coke, EAF
Selenium - Coal Comb., Residential Nat Gas, Sintering, EAF, Glass Furnace
Silicon - Crustal Dust, Coal Comb., Coke, Solid Waste Comb., Steelmaking, EAF, Nat Gas

Table V-8. Measured Species at Liberty Site for High and Low Days

	High 25% (µg/m³)	Low 75% (µg/m³)	Ratio High 25% to Low 75% (µg/m³)
Total of Measured Species	32.06	14.22	2.3
Cl	0.80	0.074	10.7
Se	0.025	0.005	4.8
Pb	0.040	0.009	4.5
As	0.011	0.003	4.5
Elem Carbon	5.19	1.16	4.5
Br	0.027	0.006	4.3
Si	0.31	0.085	3.6
Organic Carbon	8.91	3.02	3.0
Zn	0.066	0.023	2.9
NH_4+	4.72	1.73	2.7
K_ion	0.094	0.037	2.5
Na_xrf	0.089	0.035	2.5
Ti	0.005	0.002	2.5
SO4	9.55	3.94	2.4
Al	0.063	0.026	2.4

	High 25% (µg/m³)	Low 75% (µg/m³)	Ratio High 25% to Low 75% (µg/m³)
Ca	0.078	0.034	2.3
K_xrf	0.11	0.053	2.0
Na_ion	0.13	0.072	1.8
V	0.002	0.001	1.7
Fe	0.14	0.085	1.7
Cu	0.010	0.006	1.6
Mn	0.004	0.003	1.5
NO3-	1.68	1.17	1.4
Ni	0.002	0.002	1.0
Cr	0.002	0.002	0.9

SOURCE: ACHD, 2011d.

2. Operating Patterns

No sources having unusual seasonal or day-to-day operating patterns were identified. Weekday - weekend patterns were an output of the PMF analysis. Of the 12 factors, the ones with weekend - weekday patterns at the Liberty site are:

PMF - 4 (Gas Vehicles and Metals Processing) slightly lower on weekends;
PMF - 5 (Nitrate) slightly lower on weekends;
PMF - 7 (Sulfates) slightly lower on weekends;
PMF - 8 (Coal/Coke) slightly lower on weekends;
PMF - 9 (Burning) higher on weekends;
PMF - 11 (Steel Mfg) slightly lower on weekends; and
PMF - 12 (Crustal) slightly lower on weekends.

F. DATA SYNTHESIS

TS|Pechan has compared and contrasted the micro-inventory of the area near the Liberty air monitoring site with the measured speciation data and results of the PMF at the Liberty monitoring site. The PMF results and species at Liberty and Lawrenceville were examined along with species concentrations at the upwind Hillman State Forest site. TS|Pechan also considers source locations, transport times and secondary pollutant formation rates along with PMF analyses and secondary particle concentrations at Liberty, Hillman, and Lawrenceville to infer the likelihood that precursor emissions in the NAA are important contributors to $PM_{2.5}$ nonattainment.

The analysis emphasizes those categories and sources that have the most influence on $PM_{2.5}$ concentrations, with particular emphasis on e.g., carbon emitting sources, ammonia, SO_2, and chlorine. This section of the report is organized to facilitate discussion of the important sources and indicator species.

TS|Pechan will estimate the impacts of major source groups and local versus regionally transported impacts to the extent possible using these data. Unusual seasonal patterns and concentration spikes by a particular species provide clues that some upset/malfunction conditions exist in the area. TS|Pechan also investigated the $PM_{2.5}$ concentrations on the highest days to determine what types of sources are responsible for those high $PM_{2.5}$ concentrations.

This analysis is limited in the firmness of its conclusions for several reasons. First, secondary SO_4, NO_3, and OC particle formation is complex and should be modeled using a chemical transport model such as CAMX; also, there is

no way to distinguish between primary and secondary ambient carbon. Modeling is needed to distinguish between primary and secondary ambient carbon as well as the relative contributions of locally-emitted and transported particles. Second, an unambiguous background site with speciation data is not available. Third, the PMF, while excellent work, was run on all data (not just the high days) and it was run on unadjusted $PM_{2.5}$ species data. Thus, a full quantitative estimate of local source impacts must include the atmospheric modeling (using CAMX) that will be conducted by others later in this overall project.

1. Potassium - Residential Wood Combustion, Cooking, and Open Biomass Burning

Potassium (K) is the most commonly used tracer specie for wood smoke. Other tracers do exist but they require special analyses and some require special sampling. Table V-9 suggests that the measured K has no discernable seasonal pattern, whereas wood burning would be expected to have a strong wintertime pattern. The PMF analysis does suggest a strong wintertime pattern in its burning factor (PMF - 9) and 60 percent of the measured K is associated with PMF - 9. This K is very likely from wood burning. However, other sources (with a stronger summertime influence) may be responsible for the additional K. Possibilities for this K source include the Industrial Carbon Factor (PMF - 2), which has a strong summertime pattern and is the second highest K component in the PMF run, and transport. PMF - 2 is associated with winds from the direction of the Clairton Works and coke dust is also a source of K. Also, it is noted that PMF - 9 was slightly higher on weekends, suggesting recreational fireplace usage.

Table V-9. Monthly Variability in Measured K and PMF Factors 2 and 9

Month	Potassium, K (Measured)	Burning Factor (PMF - 9)	Industrial Carbon Factor (PMF - 2)
January	0.069	1.34	0.70
February	0.065	1.21	1.03
March	0.065	1.15	0.70
April	0.067	1.06	0.82
May	0.068	0.85	1.17
June	0.062	0.74	1.12
July	0.082	0.70	1.30
August	0.052	0.70	0.95
September	0.057	0.70	1.04
October	0.064	0.79	1.35
November	0.079	1.34	0.94
December	0.067	1.21	0.67

SOURCE: ACHD, 2011d.

The CPF wind analysis confirms that an area source like wood burning is very much involved with Factor 9, since it showed the high Factor 9 days to be associated with winds from all directions. Cooking is also a source of K, but the emissions inventory and site tour both suggest that cooking is not a significant source. This suggests that much of the K is likely related to local wood burning. Coal burning is also a source of K but there is no evidence of significant residential coal use.

Another K source could be transport. Table V-4 showed that the concentration of K at the Hillman site (which is a rough indicator of the characteristics of air coming into the Liberty area from the west to southwest) was roughly two-thirds (66 percent) the value of the K concentration at Liberty from 2005-2008. Some of this K is likely to transport into Allegheny County. Another point of note, there are virtually no very high K measurements in the speciation data (after July fireworks data were purged), suggesting that the K is not coming from occasional process upsets or equipment malfunctions. This would also seem to rule out impacts from wildfires and managed burning.

Tentatively, it is likely that transport from outside Allegheny County, industry and/or other sources comprise no more than 40 percent of the measured K because PMF- 9 accounts for 60 percent of the measured K and there is no consistent wind vector associated with PMF - 9. It appears from the review of the K found in other PMF factors and other species in PMF - 9 (~ 0.4 SO_4 and NH_3) that the portion of PMF - 9 related to local wood burning is probably 0.8 μg/m^3 on average. The remaining K that was associated with factors other than wood smoke (PMF - 2 and others) may be partly transport. We saw *very little* evidence of open burning of logging, yard waste or land clearing debris to suggest that this might contribute to the biomass combustion. Thus, it appears that the local wood burning is due to woodstoves, fireplaces, recreational fires and a few outdoor hydronic furnaces.

2. Crustal Materials and Fugitive Dust

Several species are often found in ambient air (Al, Ca, Fe, Si, Ti) that are associated with crustal matter. This crustal matter is usually emitted locally as fugitive dust from sources such as unpaved roads, construction and agricultural tilling which disturb the earth, and to a lesser extent dust from parking lots, paved roads, and off road recreational vehicles. In the Liberty-Clairton area, traditional sources of fugitive dust are not abundant owing to lack of farming and construction and a mature road system. However, in addition to fugitive dust, these elements can be emitted from other sources - Titanium is a paint pigment and is used in high performance alloys, calcium comes from mining and cement manufacturing, coal combustion and electric arc furnaces, aluminum can come from smelting operations, Fe is emitted in steelmaking and Si is abundant in coal.

Table V-2 shows there is about twice as much Si measured at Liberty as Lawrenceville, but Lawrenceville is a more active area and appeared to have more fugitive dust sources. Silicon is also enriched at Liberty (compared to Lawrenceville) by twice as much as the enrichment of other crustal elements. Since silicon was identified in PMF- 8 in the Liberty PMF analysis and was attributed to coke/coal dust, the PMF - 8 wind vector (from the CPF analysis) is from the south-southwest, Si is enriched at Liberty (over Lawrenceville) and Si is abundant in coke dust, it is reasonable to conclude likely that the excess Si at Liberty is associated with the Clairton Works.

3. Elemental and Organic Carbon

A summary of the composition of all the Liberty PMF factors is shown in Table V-10. Elemental and organic carbon combined account for almost 40 percent of the measured species, so they are clearly important. This is just slightly less than the average contribution of $(NH_4)_2SO_4$. In the PMF analysis, 8 of the 12 Factors (2, 4, 5, 6, 7, 8, 9 and 10) are associated with almost all of the carbon and SO_4 at the Liberty site. Five of these factors, [2, 6, 7, 8 and 10) are associated at least in part with emissions from the Clairton Works. Also, as shown in Tables V-5, V-6, and V-7, Clairton Works emits all of the local SO_2 in the wind sector associated with the SO_4 factor so PMF-7 may be partly due to Clairton Works' emissions.

The factors (2, 6, 8 and 10) are clearly related to Clairton Works because of the CPF wind directions associated with these factors and the composition of the factors. The PMF μg/m^3 for factors 2, 6, 8, and 10 are 1.9, 2.9, 0.6 and 1.0 μg/m^3, respectively, for a total 6.4 μg/m^3 mostly attributable to Clairton Works. Of this, 4.6 μg/m^3 is EC, OC, and trace (1.8 is NH_4, SO_4, and NO_3). PMF-7 is also from the Clairton Works direction but it is almost all ammonium sulfate. Note some portion of these sources' impacts may be from long range transport from the direction of the Clairton Works.

From Table V-4, the EC at Liberty is mostly local since EC at the Hillman site is only 30 percent of the EC measured at Liberty. However, OC at Liberty may be significantly affected by transport since the OC at Hillman is 60 percent as high as the OC at Liberty.

Table V-10. PMF Results at Liberty Site for All Days with Measured Speciation Data (2005 - 2010)

Liberty Site PMF Factors (2005-2010)	EC, OC, Trace (Mainly Primary)	NH_4 NO_3 SO_4	Wind Direction	OC	EC	Trace Elements	NH_4	NO_3	SO_4
Ind Carbon (2)	1.81	0.12	150-225	1.35	0.43	0.03	0.00	0.12	0.00
Gas Vehicle (4)	0.48	0.25	0-225	0.39	0.05	0.04	0.00	0.08	0.17
Nitrate (5)	0.12	1.17	all	0.12	0.00	0.00	0.31	0.87	0.00
Ind Carb & Sulf (6)	1.67	1.20	165-225	0.72	0.89	0.05	0.49	0.00	0.71
Sulfate (7)	0.72	5.18	165-225	0.55	0.15	0.01	1.27	0.00	3.91
Coal/Coke (8)	0.45	0.12	150-225	0.10	0.23	0.12	0.12	0.00	0.00
Burning (9)	0.74	0.40	0-255	0.68	0.04	0.02	0.00	0.14	0.26
Chlorine (10)	0.67	0.36	150-240	0.24	0.20	0.24	0.21	0.00	0.15
Coal/Glass (3)	0.02	0.05	150-240	0.00	0.01	0.01	0.01	0.00	0.04
Metals (1)	0.04	0.03	0-165	0.01	0.01	0.02	0.00	0.03	0.00
Steel (11)	0.21	0.07	0-105	0.12	0.03	0.07	0.00	0.04	0.03
Crustal (12)	0.08	0.01	0-225	0.00	0.00	0.08	0.01	0.00	0.00
Sum (1-12)	7.00	8.96		4.28	2.04	0.68	2.42	1.28	5.26

SOURCE: ACHD, 2011d.

4. Ammonium Sulfate, Nitrate, and Secondary Organic $PM_{2.5}$

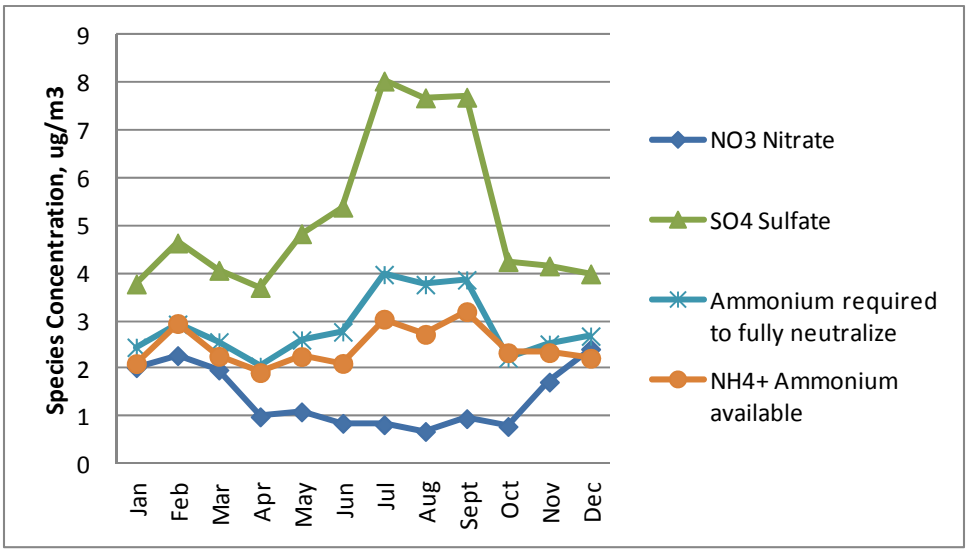
SO_4 and NO_3 are formed in the atmosphere from SO_2 and NO_x, respectively. They are both almost always found in the form of NH_4, SO_4, and NO_3. The sum of ammonium sulfate and nitrate at Hillman is 7.2 µg/m^3 compared to 10.1 at Liberty. This suggests that perhaps 70 percent of the ammonium sulfate and nitrate combined at Liberty is from transport. However, as much as half of the nitrate may be local and as much as 80 percent of the sulfate may be transported.

SO_4 is usually formed in the summer and NO_3 is usually higher in the winter. However, Figure V-5 shows a surprising amount of $(NH_4)_2SO_4$ in the winter at Liberty. If there is enough ammonia present, the SO_4 and NO_3 will be fully neutralized, but the sulfur and nitrogen can exist in the form of ammonium bisulfate, or sulfuric or nitric acid if there is a shortage of ammonia. Figure V-5 shows the seasonality of these pollutants at the Liberty site. It also shows that there is enough ammonia present to fully neutralize the SO_4 and NO_3 for much of the year, but there may be about a 10-20 percent shortage of ammonia in the summer and in December and January to fully neutralize the SO_4. Clairton Works emits about 30 percent of the SO_2 and 70 percent of the NO_x emitted in or near the NAA. The source emitting 85 percent of the SO_2 in Allegheny County in 2007, Orion Power's Cheswick EGU, is 15 miles north (upwind). The 2007 emissions reported were prior to the installation of an SO2 scrubber at Cheswick (Post-Gazette, 2009).

Ammonium nitrate and secondary organic particles can form quickly if there is sufficient dilution to promote oxidation. Even ammonium sulfate can form quickly in a cloud. An example is given of secondary organic aerosol formation during a wood smoke episode in Houston (Nocmongcol, et al., 2007). Organic particles can form rapidly in the presence of chloride, toluene, and oxygen (Rune, et al., 2001) and in the presence of sulfuric acid aerosol catalysts (Limbeck, et al., 1996). Salcedo discusses the rate of nitrate formation in Mexico City (Salcedo, et al., 2006). Also, inversions in the Liberty-Clairton area are often associated with light winds and stagnated air masses that provide longer times for secondary aerosol formation. The presence of ammonia, SO_2, NO_x, organic gases, and chlorine emissions from the Clairton works (which is "long and thin" in shape, somewhat aiding dilution) into an often foggy and stagnant environment makes this a complex system to evaluate. Detailed photochemical modeling may help resolve the various interactions and the amount of secondary formation versus transport of secondary particles into the area. However, the light winds and fog occurring on many inversion days, coupled with the mix of pollutants emitted certainly makes it plausible that there is significant secondary particle formation from Clairton works emissions, adding to those transported into the area.

Factors 2, 6, 7, 8 and 10 are associated with S or SW winds and combined account for 3/4 (3 μg/m³) of OC (the other 1.2 μg/m³ is not associated with S or SW winds). OC presents an interesting challenge. Secondarily formed OC is chemically identical to directly emitted (primary) OC (at least in terms of the commonly used sample analytical methods). There is significant VOC emitted by Clairton Works (583 tons/year) and 178 tons/year from Eastman, so there seems to be sufficient VOC emissions nearby, coupled with acidic gases and chlorides, to support some rapid formation of secondary OC from VOC. However, much of this OC is likely to be primary and some of it is likely from transport (Liberty is only 1.8 μg/m³ enriched above Hillman). Unfortunately, there is no way to resolve the source of secondary OC (or even how much of the OC is secondary) until appropriate photochemical modeling is performed.

Figure V-5. Sulfate, Nitrate and Ammonium at Liberty Monitoring Station



SOURCE: ACHD, 2011d.

Table V-10 shows most of the SO_4 (3.9 out of 5.3 μg/m³) and over half of the NH_4 (1.3 out of 2.4 μg/m³) in the PMF Liberty analysis is found in PMF-7, which is associated with winds from 165 to 225 degrees - the direction of Clairton Works. Thus, $(NH_4)_2SO_4$, comprising 5.2 μg/m³ in this Factor 7 (or about 70 percent of the total fully neutralized NH_4SO_4 measured at the Liberty site), appears to be strongly associated with Clairton Works. Clairton Works is shown in Table V-6 to emit 1,740 tons/year of SO_2. Table V-7 shows that another 3,400 tons/year of SO_2 is emitted from nearby sources in the west to north wind direction, but the CPF and PMF analysis indicates that these are not as important to Liberty's SO_4 as SO_2 from the direction of the Clairton emissions. Table V-6 shows that Clairton is the source of over 97 percent of the ammonia emissions in the NAA.

About 4.6 μg/m³ of $(NH_4)_2SO_4$ is found at the Lawrenceville site and some of this may be coming from the NAA. It is 13 miles north-northeast of the Clairton Works and the CPF analysis shows significant transport from the south and southwest. Note that a significant portion of the sulfate could be transported from beyond the NAA. In fact, there is significant sulfate found at the Hillman site which supports the notion that a significant part of the sulfate may be due to long range transport. Modeling can help estimate the role of transport on Liberty's PM2.5 air quality.

About two-thirds of the NH_4NO_3 is represented by PMF-5. It contains 0.87 μg/m³ of NO_3 and 0.31 μg/m³ of NH_4, suggesting fully neutralized NH_4NO_3 of 1.18 μg/m³. Clairton Works emits over 70 percent of the point source NO_x emitted within 10 miles of the Liberty site (ACHD, 2011c). However, the CPF analysis shows that while much of the NH_4NO_3 is associated with winds from the direction of Clairton, other wind directions are associated with some NO_3 formation. Nitrate can form relatively quickly and locally, as seen by the higher nitrate in Lawrenceville than at Liberty

and much lower values at Hillman. But, while NO_x emitted by Clairton Works is likely responsible for much of the nitrate measured at Liberty, transport and other sources are also involved. The higher nitrate at Lawrenceville is likely due to a combination of additional formation during transport and from precursors near Lawrenceville.

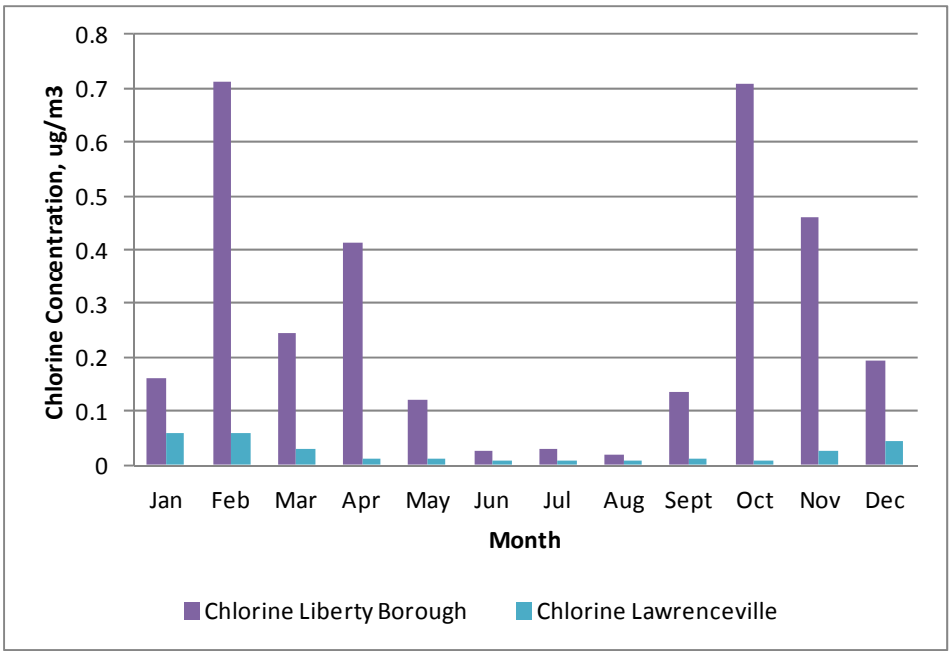
The remaining NH_4, SO_4, and NO_3 (2.5 $\mu g/m^3$) is associated mainly with Industrial Carbon/Sulfates (PMF-6), Burning (K - PMF-9) and Chlorine (PMF-10). PMF-6 and 10 are strongly affected by winds from the direction of Clairton Works.

5. Chlorine

Figure V-6 shows that the chlorine is much higher at the Liberty site than at the nearby Lawrenceville site. This would seem to rule out a ubiquitous source of chlorine or long range transport that would likely create elevated chlorine concentrations at both sites. Table V-8 shows that chlorine has the highest concentration ratio "high days" to "low days" of any measured specie. It is also much higher than the ratio of $PM_{2.5}$ mass on the "high" versus "low" days. The apparent absence of high Chlorine on summer days may be due to instability of the Chlorine on the samples collected during warm weather. However, the high concentrations are seen in moderate weather months so it is unlikely the events are due to road salt applications. Another possibility is cooking or another source at the SAHS. The CPF analyses showed the Chlorine "source" was associated strongly with winds from the direction of Clairton Works.

Together, this suggests that chlorine is likely associated with a sporadic source, intermittent process upsets or equipment malfunctions in the south - southwest wind vector. Also, it is possible that the chlorine is associated with specific meteorological conditions. In the previous section on upsets, ACHD was not able to identify significant breakdowns associated with these days. Regardless of whether the high Chlorine is readily attributable to a malfunction, it is still associated with some of the highest measured $PM_{2.5}$ concentrations at the Liberty monitor. Identification of the responsible sources should be pursued through further analysis and investigation.

Figure V-6. Comparison of Measured Chlorine at Liberty and Lawrenceville, by Month



SOURCE: ACHD, 2011d.

6. Overall Source Contributions

a. Source Contributions based on Emissions Inventory (2007 revised)

Within the NAA, Clairton Works' emissions of $PM_{2.5}$, SO_2, and ammonia far exceeds those of any other point source or mobile or area source category. For NO_x, it emits 6 times as much as Guardian Industries.

Near, but outside of the NAA, USS' Irvin and Edgar Thompson Plants and the Bellefield Boiler Plant (coal-fired) all emit significant $PM_{2.5}$, SO_2 and NO_x (but not nearly the amount of emissions as Clairton Works). The Bay Valley Foods coal-fired boiler also emits significant $PM_{2.5}$ and SO_2. The Bayfield and Bellefield Boiler Plants are about 10 miles away from the Liberty Monitor, but the Irvin and Thompson USS facilities are 2 and 5 miles away, respectively. All these sources are west to north of the monitor and could impact it, but wind vectors show they would have much less impact on the Liberty site than Clairton Works' emissions.

b. Source Contributions based on Measurements (Speciation at Liberty (2005-10) and Hillman Forest (2005-8)

Primary versus Secondary

7.5 $\mu g/m^3$ is EC OC and trace (EC 2.2, OC 4.5, trace 0.8)
(an undetermined but likely small of the OC is secondary)

9 $\mu g/m^3$ is NH_4 SO_4 NO_3 (NH_4 2.4, SO_4 5.3, NO_3 1.3)
(55 percent of the $PM_{2.5}$ at Liberty is ammonium sulfate and nitrate and all of this is assumed to be secondary. Some OC will also be secondary).

Note, on the 20 highest days, about 52 percent of the measured $PM_{2.5}$ is ammonium sulfate and nitrate (see Table V-1), compared to 55 percent on "average" days.

Local versus Transport from outside NAA

EC OC Trace ~ 7.5 $\mu g/m^3$
(The EC at Liberty is mostly local since EC at the Hillman site is only 30 percent of the EC measured at Liberty. However, OC at Liberty is more affected by transport since the OC at Hillman is 60 percent as high as the OC at Liberty.)

NH_4, SO_4, and NO_3 ~ 9 $\mu g/m^3$
The data in Table V-4 suggests that perhaps 70 percent of the ammonium sulfate and nitrate combined at Liberty is from transport. However, as much as half of the nitrate may be local and as much as 80 percent of the sulfate may be transported.

Overall, we estimate the long term average $PM_{2.5}$ at Liberty is about 38 percent local and 62 percent transport, based on measurement data.

c. Source Contributions based on PMF (2005-2010)

Factors 2, 6, 8, 10: "From Clairton Works Wind Vector - 6-7 $\mu g/m^3$
(Source is Clairton Works (or beyond) ~ none of these sources located between Clairton and Liberty Monitor

EC OC Trace ~ 4.6 μg/m^3
NH_4, SO_4, and NO_3 ~ 1.8 μg/m^3

Factors 2 (Industry - 1.9 μg/m^3) - likely local
Factor 6 (Industry - 2.9 μg/m^3) – 40 percent $(NH_4)_2SO_4$-likely local
Factor 8 (Coal/Coke - 0.6 μg/m^3) - likely local
Factor 10 (Chlorine - 1 μg/m^3) - possibly upsets, malfunction

Factors 4, 5, 9: "Mostly local - not Clairton Works-related" ~ 3 μg/m^3
EC OC Trace ~ 1.3 μg/m^3
NH_4, SO_4, and NO_3 ~ 1.8 μg/m^3

Factor 4 (Gas Vehicles - 0.7 μg/m^3) ~ believed to be mostly locally emitted
Factor 5 (NO_3 - 1.3 μg/m^3) is associated with all wind directions which suggests mostly local origin
Factor 9 (Burning - 1.14 μg/m^3) ~ best guess ~ 0.8 μg/m^3 local wood burning (0.8 μg/m^3). The PMF suggests that some of the remaining K (not in PMF-9) is from other sources, including transport.

Factor 7: "Transport - related" ~ 6 μg/m^3
NH_4SO_4 - 5.2 μg/m^3, 0.7 EC OC ~ NH_4SO_4 likely transport

Minor Factors

Factor 1 (Metals - < 0.1 μg/m^3)
Factor 3 (Coal/Glass - < 0.1 μg/m^3)
Factor 11 (Steel Mfg - < 0.3 μg/m^3)
Factor 12 (Crustal - < 0.3 μg/m^3)

Overall Estimates from PMF Analyses
Transport-related: 7 μg/m^3 (~44 percent)
Local origin: 9 μg/m^3 (~56 percent)

Overall, by averaging the transport vs. local estimates based on measurement data and PMF analyses, more than half of the long-term average $PM_{2.5}$ at the Liberty monitoring site is of local origin (60 percent local emissions ~ 40 percent transport).

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F-2: Local Inventory Revisions 2007/2014

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Summary of Local Inventory Revisions

Allegheny County and SWPA inventories for the $PM_{2.5}$ SIP were based on the MANE-VU Version 3.3 inventory, as developed for MARAMA for Mid-Atlantic and Northeastern states (see Appendix E). The base year was 2007, while projected years were 2017/2020. For future case year 2014, interpolations were developed by TS|Pechan based on the MANE-VU 2007 and 2017 inventories (see section F-3 of this appendix).

ACHD revised or corrected specific local point sources in the MANE-VU 2007 and 2014 inventories based on location of sources, emissions/controls, monitored data, and source apportionment analysis (see Appendix C). Sources examined were within approximately 10 km of the Liberty monitor, and also included some Washington County sources.

Minor sources potentially impacting Liberty-Clairton that were not included in the MANE-VU point inventory (and not accounted for as part of the SCC categories included in area source inventory) were added as new sources to the local inventory. Emissions from these sources are relatively small.

Area and nonroad emissions for 2007 and 2014 were developed separately for Liberty-Clairton by TS|Pechan, and Allegheny County emissions were revised accordingly to subtract Liberty-Clairton emissions. Point source subtractions were done to Allegheny County and Liberty-Clairton area sources to avoid double-counting of commercial/institutional/industrial fuel combustion sources. Additionally, for future case 2014, surrounding SWPA counties were revised by ACHD to include Marcellus shale gas area emissions estimates.

ACHD also revised the future case 2014 Transport Rule emissions (June 2011) for GenOn Elrama and Allegheny Energy Mitchell power plants using the final CSAPR allocations (June 2012) for SO_2 and NO_x along with calculated heat inputs to derive other pollutant emissions. All other emissions used for modeling were unchanged from the developed inventories, as given in Tables 5-2 and 5-3 of the SIP.

This section contains specific revisions to the modeling inventories, along with a listing of the point source emissions totals for 2007 and 2014 for Allegheny and Washington County facilities. The consent order and agreement (as amended in July 2011) with U. S. Steel is also provided as supplemental information.

2007 Point Source Revisions

Below are descriptions of the point source revisions/corrections for baseline 2007.

US Steel Mon Valley Works – Clairton Plant

- All Sources: Coordinates corrected, based on aerial maps.

- Quench Towers: Revised based on newer stack test data. Includes revised PM emissions, revised stack parameters. $PM_{2.5}$ data is given in the table below:

Quench Tower Calculations, $PM_{2.5}$	Tower 1, Batteries 1-3	Tower 3, Batteries 7-9	Tower 5, Batteries 13-15	Tower 7, Batteries 19-20	Tower B, B Battery
2007 Tons Coal Charged	995133	1039563	1284574	1305929	819673
2007 Quenches	74631	76263	82521	67276	24513
lbs/quench (tested)	1.75	1.75	0.60	1.94	2.72
tons/year (quench factor)	65.46	66.90	24.88	65.26	33.34
non-compliance factor	--	--	1.1	1.5	2.0
2007 lbs/quench (scaled)	3.00	3.00	0.66	2.91	5.44
2007 tons/year (scaled, averaged)	112.11	114.56	27.37	97.89	66.68

Notes:

- Use updated quench-based factors from 2010-2011 stack tests
- 2010-2011 stack tests for 5, 7, B
- Scale calculated values to 2007 based on non-compliance factors
- lbs/quench for 1, 3 is average of 5, 7, & B

- Coke Oven Batteries: Stack heights corrected to 126 ft for all battery fugitives, based on the EPA 2005 National Air Toxics Assessment (NATA) method used for buoyant coke battery emissions.[1]

- Coke Oven Batteries, PEC System Fugitives: Stack parameters corrected to 126 ft height, 0 ft diameter, 0 ft/s velocity, and 72 °F temp.

- Material Handling: Screening, loading/unloading, pulverizing, and boom conveying temperatures corrected to 72 °F.

- Cooling Tower: Revised based on stack test data. Includes an increase in PM emissions, revised stack parameters.

- Aeration Basin, Wastewater Treatment: Revised based on newer calculations, reducing NH_3 emissions that were previously overestimated.

[1] http://www.epa.gov/ttn/atw/nata2005/05pdf/nata_tmd.pdf

US Steel Mon Valley Works – Edgar Thomson Plant

- All Sources (except BOP Operations and Continuous Caster): Coordinates corrected, based on aerial maps.
- Blast Furnace 1 & 3 Casthouses: SO_2 emissions decreased by a factor of 10. These emissions were erroneously calculated in the reported 2007 inventory. Temperatures also corrected to 72 °F.
- BOP Flux: Temperature corrected to 72 °F.
- Blast Furnace Breakdown: Temperature corrected to 72 °F.

US Steel Mon Valley Works – Irvin Plant

- Cooling Tower: Coordinates corrected, based on aerial maps.
- Annealing, Terne Line, COG Flaring: Temperature corrected to 72 °F.

Eastman Chemical Resins

- All Sources: Coordinates corrected, based on aerial maps.
- Plant Fugitives: VOCs increased by 3 tons, based on updated reporting methodology.
- LTC Units: Scrubbers and baghouses, temperature corrected to 72 °F.

Guardian Industries

- All Sources (except Raw Material Receiving): Coordinates corrected, based on aerial maps.

Koppers Industries

- All Sources: Coordinates corrected, based on aerial maps.
- Cooling Tower: Stack parameters corrected, based on permit application values.

Laurel Mountain Whirlpools

- All Sources: Coordinates corrected, based on aerial maps. Temperature corrected to 72 °F.

Liberty Pultrusions

- All Sources: Coordinates corrected, based on aerial maps.

Precoat Metals

- All Sources: Coordinates corrected, based on aerial maps.
- 48 Coating Line: Prime coater, temperature corrected to 72 °F.

Minor Sources

The following Allegheny County minor sources were added to the 2007 inventory:

AKJ Industries
Bekavac Funeral Home
Braddock Recovery
Chambers Development Co
Clairton Slag
Consol Coal
CP Industries
Dura-Bond Industries
ELG Metals
Gardner Denver Nash
GE Apparatus
GM Metal Stamping
Jefferson Crematory
Kelly Run Sanitation
Kinder-Morgan Liquids Terminal
Marathon Ashland West Eliz
Mid-Continent Coal & Coke
Mon Valley Transportation
Pennsylvania Electric Coil
Ryan Metals
Sanyo
Tech Met
Tube City IMS Braddock
Tube City IMS Clairton
Tube City IMS West Mifflin
TYK Refractories

The following Washington County minor sources were added to the 2007 inventory:

Equitrans LP/Hartson
Therm-O-Rock New Eagle
USA South Hills Landfill

2007 Area Source Revisions

Below are descriptions of the area source revisions/corrections for baseline 2007.

Liberty-Clairton

- Liberty-Clairton area emissions were developed by TS|Pechan (see section F-1 of this appendix). ACHD corrected the residential distillate oil SO_2 emissions, which were previously underreported by a factor of 100. ACHD also applied fugitive dust transport factors (FDTF=0.23 for Allegheny County) to PM emissions for the following SCCs:

SCC	SCC Short Name
2294000000	Paved Roads /All Paved Roads /Total: Fugitives
2296000000	Unpaved Roads /All Unpaved Roads /Total: Fugitives
2311010000	Construction: SIC 15 - 17 /Residential /Total
2311020000	Construction: SIC 15 - 17 /Industrial/Commercial/Institutional /Total
2311030000	Construction: SIC 15 - 17 /Road Construction /Total
2801000003	Agric - Crops /Tilling

Allegheny County

- Liberty-Clairton area emissions were subtracted from Allegheny County, by SCC. (If result was <0, emissions were set to 0.)

- Point source emissions with similar SCCs were subtracted from the SCCs given below. This eliminated double-counting for several large commercial/institutional/industrial combustion sources.

SCC	SCC Short Name
2102004000	Stationary Fuel Comb /Industrial /Distillate Oil /Total: Boilers and IC Engines
2102006000	Stationary Fuel Comb /Industrial /Natural Gas /Total: Boilers and IC Engines
2102007000	Stationary Fuel Comb /Industrial /Liquified Petroleum Gas /Total: All Boiler Types
2103002000	Stationary Fuel Comb /Commercial/Institutional /Bituminous/Subbituminous Coal /Total: All Boiler Types
2103004000	Stationary Fuel Comb /Commercial/Institutional /Distillate Oil /Total: Boilers and IC Engines
2103006000	Stationary Fuel Comb /Commercial/Institutional /Natural Gas /Total: Boilers and IC Engines
2103007000	Stationary Fuel Comb /Commercial/Institutional /Liquified Petroleum Gas /Total: All Combustor Types

2007 Nonroad Source Revisions

Below are descriptions of the nonroad source revisions/corrections for baseline 2007.

Liberty-Clairton

- Liberty-Clairton area emissions were developed by TS|Pechan (see section F-1 of this appendix).

Allegheny County

- Liberty-Clairton area emissions were subtracted from Allegheny County, by SCC. (If result was <0, emissions were set to 0.)

2014 Point Source Revisions

Below are descriptions of the point source revisions/corrections for future case 2014. TS|Pechan interpolated 2014 non-EGU MANE-VU emissions based on 2007 and 2017 data (see section F-3 of this appendix). Transport Rule (CSAPR) 2014 data was used for EGU sources.

Unless modified as described below, sources revised in the baseline 2007 case were held constant to 2014, replacing the interpolated 2014 MANE-VU data. I.e., growth/control factors used in the MANE-VU inventory were not used for the local sources of interest, focusing on the known modifications only. This mainly affects the US Steel boilers, which were projected to increase in emissions using the MANE-VU growth factors.

All other MANE-VU sources were based on the interpolated 2014 data unless mentioned below. Likewise, all EGUs were based on the modeled Transport Rule (CSAPR) 2014 inventory unless mentioned below. Minor sources added to the 2007 case were also added to the 2014 case, unless listed below as a shutdown.

US Steel Mon Valley Works – Clairton Plant

- Batteries 7-9 and associated processes: Shutdown, includes sources below:

BATTERY 7 FUGITIVES, BATTERY 7, CHARGING

BATTERY 7 FUGITIVES, BATTERY 7, DOOR LEAKS

BATTERY 7 FUGITIVES, BATTERY #7, TOPSIDE LEAKS

BATTERY 7 FUGITIVES, BATTERY 7, SOAKING

BATTERY 7 FUGITIVES, BATTERY 7, DECARBONIZING

BATTERY 8 FUGITIVES, BATTERY 8, CHARGING

BATTERY 8 FUGITIVES, BATTERY 8, DOOR LEAKS

BATTERY 8 FUGITIVES, BATTERY #8, TOPSIDE LEAKS

BATTERY 8 FUGITIVES, BATTERY #8, SOAKING

BATTERY 8 FUGITIVES, BATTERY 8, DECARBONIZING

BATTERY 9 FUGITIVES, BATTERY 9, CHARGING

BATTERY 9 FUGITIVES, BATTERY 9, DOOR LEAKS

BATTERY 9 FUGITIVES, BATTERY #9, TOPSIDE LEAKS

BATTERY 9 FUGITIVES, BATTERY #9, SOAKING

BATTERY 9 FUGITIVES, BATTERY 9, DECARBONIZING

QUENCH TOWER #3

BATTERY 7, UNDERFIRING

BATTERY 8, UNDERFIRING

BATTERY 9, UNDERFIRING

PEC SYSTEM, BATTERIES 7-9, PEC BAGHOUSE STACK

PEC SYSTEM, BATTERIES 7-9, TRAVELING HOT CAR

PEC SYSTEM, BATTERIES 7-9, PEC FUGITIVES

PEC SYSTEM, BATTERIES 7-9, PRE PUSH

PEC SYSTEM, BATTERIES 7-9, UNCONTROLLED PUSHING

PEC SYSTEM, BATTERIES 7-9, BALL MILL

- Screening Station B (3): Shutdown, includes sources below:

SCREENING STATION B, SCREENING STATION B BAGHS

SCREENING STATION B, SCREEN STATION B LOADOUT

SCREENING STATION B, SCREENING FUGITIVES - B

- Quench Towers: Revised based on new configuration. Includes revised PM emissions, three new stacks. $PM_{2.5}$ data is given in the table below:

Quench Tower Projections, $PM_{2.5}$	Tower 1, Batteries 1-3	Tower 5A, Batteries 13-15	Tower 7A, Batteries 19-20	Tower B, B Battery	Tower C, C Battery
2014 tons/year	65.46	8.75	38.00	33.34	9.00

Notes:

- Based on updated stack tests 2010-2011 for 1, B
- Based on US Steel projections for 5A, 7A, C

- Batteries 19 & B, Fugitive Door Leaks: Emissions revised based on battery rebuilds. Scaled by factor of 0.537.

- Batteries 19 & B, Underfiring: Emissions revised based on battery rebuilds. Scaled by factor of 0.537.

- PEC System B, Fugitives & Baghouse Stack: Emissions revised based on battery rebuilds. Scaled by factor of 0.621.

- Coal Unloading, Transfer, Pulverizing: Revised based on new configuration. Small increases in PM.

- Screening Station 1 (1-3): Revised based on new configuration. Minor decrease in PM.

- Coke Pile Erosion, Coke Transfer: Revised based on new configuration. Minor increases in PM.

- C Battery and associated processes: New coke battery added to inventory, includes sources below:

BATTERY C FUGITIVES, BATTERY C CHARGING

BATTERY C FUGITIVES, BATTERY C DOOR LEAKS

BATTERY C FUGITIVES, BATTERY C OFFTAKES, LIDS

BATTERY C FUGITIVES, BATTERY C SOAKING

BATTERY C FUGITIVES, BATTERY C DECARBONIZING

BATTERY C UNDERFIRING

PEC SYSTEM, BATTERY C, PEC BAGHOUSE STACK

PEC SYSTEM, BATTERY C, TRAVELING HOT CAR

PEC SYSTEM, BATTERY C, PEC FUGITIVES

PEC SYSTEM, BATTERY C, PRE PUSH

PEC SYSTEM, BATTERY C, UNCONTROLLED PUSHING

PEC SYSTEM, BATTERY C, BALL MILL

QUENCH TOWER C

SCREEN STN 4

Koppers Industries

- Tar Refining Fugitives, Liquid Loading: Revised based on newer configuration.
- Type A Pitch Tanks, RCO Tanks: Revised based on newer configuration.
- Direct-Fired Thermal Oxidizer (4 MMBtu/hr): New source, added to inventory.

Bellefield Boiler Plant

- All sources: Boilers 1, 3, and 5 switched from coal to natural gas in 2009. However, due to emission reduction credits (ERCs, or "banked emissions") that have not been transferred, all sources for Bellefield were held constant at 2007 emissions.

Laurel Mountain Whirlpools

- All Sources: Shutdown.

Precoat Metals

- All Sources: Shutdown.

Iron City Brewing

- All Sources: Shutdown.

Minor Sources

The following Allegheny County minor sources were shut down by 2014 (without banked emissions) and not added to the 2014 inventory as a minor source:

GM Metal Stamping

Ryan Metals

GenOn Elrama

- Electric Generating Units: Elrama boilers were revised to the final June 2012 CSAPR allocations for SO_2 and NO_x. Emissions per heat input (based on 2007 levels) were then used to scale the other pollutant emissions per boiler.

Allegheny Energy Mitchell

- Electric Generating Units: Mitchell boilers were revised to the final June 2012 CSAPR allocations for SO_2 and NO_x. Emissions per heat input (based on 2007 levels) were then used to scale the other pollutant emissions per boiler.

2014 Area Source Revisions

Below are descriptions of the area source revisions/corrections for future case 2014. For all area source emissions outside Liberty-Clairton, TS|Pechan interpolated 2014 MANE-VU emissions based on 2007 and 2017 data (see section F-3 of this appendix).

Liberty-Clairton

- Liberty-Clairton area emissions were developed by TS|Pechan (see section F-1 of this appendix). ACHD corrected the residential distillate oil SO_2 emissions, which were previously underreported by a factor of 100. ACHD also applied fugitive dust transport factors (0.23 for Allegheny County) to PM emissions for the following SCCs:

SCC	SCC Short Name
2294000000	Paved Roads /All Paved Roads /Total: Fugitives
2296000000	Unpaved Roads /All Unpaved Roads /Total: Fugitives
2311010000	Construction: SIC 15 - 17 /Residential /Total
2311020000	Construction: SIC 15 - 17 /Industrial/Commercial/Institutional /Total
2311030000	Construction: SIC 15 - 17 /Road Construction /Total
2801000003	Agric - Crops /Tilling

Allegheny County

- Liberty-Clairton area emissions were subtracted from Allegheny County, by SCC. (If result was <0, emissions were set to 0.)

- Point source emissions with similar SCCs were subtracted from the SCCs given below. This eliminated double-counting for several large commercial/institutional/industrial combustion sources.

SCC	SCC Short Name
2102004000	Stationary Fuel Comb /Industrial /Distillate Oil /Total: Boilers and IC Engines
2102006000	Stationary Fuel Comb /Industrial /Natural Gas /Total: Boilers and IC Engines
2102007000	Stationary Fuel Comb /Industrial /Liquified Petroleum Gas /Total: All Boiler Types
2103002000	Stationary Fuel Comb /Commercial/Institutional /Bituminous/Subbituminous Coal /Total: All Boiler Types
2103004000	Stationary Fuel Comb /Commercial/Institutional /Distillate Oil /Total: Boilers and IC Engines
2103006000	Stationary Fuel Comb /Commercial/Institutional /Natural Gas /Total: Boilers and IC Engines
2103007000	Stationary Fuel Comb /Commercial/Institutional /Liquified Petroleum Gas /Total: All Combustor Types

Surrounding Counties

For Washington, Westmoreland, Greene, and Fayette Counties, ACHD developed future case 2014 area source estimates to account for increases in Marcellus shale gas production. The methodology and estimates are described below.

- Background: The exploration, development, and production of gas from the Marcellus Shale formation are expected to result in substantial increases in air pollutants in the region. This memo provides an explanation of the methodology taken to estimate several of those pollutants for the Allegheny County Health Department (ACHD) 2014 emissions inventory prepared for the county's $PM_{2.5}$ State Implementation Plan (SIP) modeling work. The SIP modeling base year was 2007, which was assumed to have insignificant levels of emissions from Marcellus Shale wells.

- Estimate of Wells Drilled in 2014: Estimates of the total number of wells expected in Washington, Greene, Fayette, and Westmoreland counties in 2014 were derived from projections given in a June 2011 Penn State Cooperative Extension report.[1] Table 1 of this report gives a total of 892 projected Marcellus Shale wells drilled in 2014 for southwest Pennsylvania. This total was distributed to the individual southwestern PA counties by assuming that the proportion in each county would be the same as reported by the PA DEP for 2011.[2] For example, 31.2% of total wells in southwest PA were in Washington County (159 in Washington County versus a total of 509 in southwest PA). Assuming this same percentage will hold through 2014, the expectation for Washington County is for **278** wells to be drilled in 2014 (31.2% of 892 projected wells). Similar calculations were carried out for the other counties (Greene was 24.0% or **214** wells; Fayette, 10.6% or **95** wells; and Westmoreland, 11.8% or **105** wells).

- Estimate of Existing Wells in Operation in 2014: Besides the 2014 new well totals, we must determine the total number of wells expected to already be operating in each county in 2014. Thus, for example, according to PA DEP,[2] 560 wells were drilled in Washington County from January 1, 2005 through December 31, 2011. And projections provided in the Penn State Cooperative Extension report[1] for wells drilled in 2012 and 2013 show 430 wells are expected. So, a total of **990** wells are anticipated to be operating in Washington County in 2014. (Similarly, for Greene County, **740** total wells are expected; for Fayette, **332**; and for Westmoreland, **349**.)

- Wet Versus Dry Wells: Based on the geology of the counties,[3] we have assumed that 40% of the wells are producing dry gas and 60% wet gas for Washington County, 70% dry gas / 30% wet gas for Greene County wells, and 100% dry gas for Fayette and Westmoreland wells.

- Air Emission Factors: The "Emissions Per Well" provided in the table below are based on a Marcellus Shale operations analysis found in "An emissions inventory for the development and production of Marcellus Shale" by Anirban A. Roy, Peter J. Adams, and Allen L. Robinson of Carnegie Mellon University, 2012.[4] In this draft report, mean values are given for 2009 and 2020. A number that is roughly the average of the two annual mean values was selected for the estimates given here. Furthermore, for the midstream (processing) emissions, a typical gas flow of 5 million cubic feet per day (mmcf/day) from new wells was assumed (a magnitude derived from a statement made by Penn State geologist Terry Engelder[5] and from a PA DCNR presentation titled "The Marcellus Shale Play in Pennsylvania" by John A. Harper and Jaime Kostelnik.[6] Therefore, for example, the yearly flow for new wells will be:

  Annual Flow = (5 mmcf/day/new well) (365 days/yr) = 1.825 billion cubic feet (Bcf)/new well/yr.

Furthermore, the midstream NO_x emissions per new well will be:

Midstream NO_x Emissions = (2.4 tons NO_x/Bcf/new well) (1.825 Bcf/yr) = 4.39 tons NO_x/new well/yr.

It was assumed that midstream (and production) emissions during the start-up year (2014) would only be one-half, assuming that site preparation and initial production will be distributed rather evenly throughout the year. Thus, for example, midstream NO_x emissions per new well would be **2.20 TPY**.

For wells already in operation in 2014, assuming a steady average production rate of 1 mmcf/day per well based on production decline curves reported in "The Marcellus Shale Play in Pennsylvania,"[6] the total gas flow from Washington County existing wells during 2014 will be 0.365 Bcf, and the corresponding midstream NO_x emissions per existing well in 2014 is estimated to be about **0.90 TPY**.

- Caveats on This Estimation Approach: Development is frequently seasonal and refracking of existing locations can occur. Neither of these two conditions were considered in the emission estimates.

- Results: Marcellus Shale air emission estimates for Washington, Greene, Fayette, and Westmoreland Counties in southwestern Pennsylvania are given in the table **Estimated Marcellus Shale 2014 Air Emissions (TPY)** on the following page.

References

1. "Pennsylvania Marcellus Shale Economic Impact Study" by the Marcellus Shale Education & Training Center, a collaboration of the Pennsylvania College of Technology and the Penn State Cooperative Extension, June 2011. See Figure 4 and Table 1 in study, available at: http://marcelluscoalition.org/wp-content/uploads/2011/08/PennsylvaniaStatewideWorkforceAssessmentv1_Final_for_web.pdf

2. PA DEP Office of Oil and Gas Management Wells Drilled by County accessed June 28, 2012. Available at: http://www.depreportingservices.state.pa.us/ReportServer/Pages/ReportViewer.aspx?/Oil_Gas/Wells_Drilled_By_County

3. Derived by Jason Maranche of ACHD from geological map of Marcellus Shale dry/wet gas demarcation and distribution of wells drilled in 2007 through 3/19/2012 from Marcellus Center for Outreach and Research (see www.marcellus.psu.edu).

4. "An emissions inventory for the development and production of Marcellus Shale" by Anirban A. Roy, Peter J. Adams, and Allen L. Robinson of Carnegie Mellon University, 2012 – DRAFT.

5. Penn State University geologist Terry Engelder online interview, June 2010 (see http://www.youtube.com/watch?v=0uNzwFkrcqg&feature=relmfu.)

6. PA DCNR presentation titled "The Marcellus Shale Play in Pennsylvania" by John A. Harper and Jaime Kostelnik (www.marcellus.psu.edu/resources/PDFs/DCNR.pdf, see slide 64, et al.).

Estimated Marcellus Shale 2014 Air Emissions (TPY)

DRILLED IN 2014 (i.e., NEW WELLS)			Wash	Wash	Greene	Greene	Fayette	Westm
			Dry (40%)	Wet (60%)	Dry (70%)	Wet (30%)	Dry	Dry
	Number of wells ->		111	167	150	64	95	105
	Emissions per Well * (TPY)							
Development	NOx	6.00	666	1002	900	384	570	630
	PM2.5	0.30	33	50	45	19	29	32
	VOC dry	3.00	333		450		285	315
	VOC wet	14.00		2338		896		
Production	NOx	0.45	50	75	68	29	43	47
(Assumed at 50%)	PM2.5	0.01	1	1	1	0	0	1
	VOC dry	0.26	29		39		25	27
	VOC wet	1.25		209		80		
Midstream*	NOx	2.20	244	367	330	141	209	231
(Assumed at 50%)	PM2.5	0.05	6	8	8	3	5	5
	VOC	4.75	527	793	713	304	451	499
EXISTING IN 2014 (i.e., 2007-2013)			Wash	Wash	Greene	Greene	Fayette	Westm
			Dry (40%)	Wet (60%)	Dry (70%)	Wet (30%)	Dry	Dry
	Number of wells ->		396	594	518	222	332	349
	Emissions per well * (TPY)							
Production	NOx	0.90	356	535	466	200	299	314
	PM2.5	0.01	4	6	5	2	3	3
	VOC dry	0.53	210		275		176	185
	VOC wet	2.50		1485		555		
Midstream*	NOx	0.90	356	535	466	200	299	314
	PM2.5	0.01	4	6	5	2	3	3
	VOC	1.90	752	1129	984	422	631	663
TOTALS				Wash		Greene	Fayette	Westm
			NOx	**4187**		**3183**	**1419**	**1536**
			PM2.5	**118**		**91**	**40**	**44**
			VOC	**7805**		**4717**	**1568**	**1689**

***** Midstream emission factors, based on Reference 4, are: NOx = 2.4 tons/Bcf, $PM_{2.5}$ = 0.03 tons/Bcf, and VOCs = 5.2 tons/Bcf.

2014 Nonroad Source Revisions

Below are descriptions of the nonroad source revisions/corrections for future case 2014. For all nonroad source emissions outside Liberty-Clairton, TS|Pechan interpolated 2014 MANE-VU emissions based on 2007 and 2017 data (see section F-3 of this appendix).

Liberty-Clairton

- Liberty-Clairton area emissions were developed by TS|Pechan (see section F-1 of this appendix).

Allegheny County

- Liberty-Clairton area emissions were subtracted from Allegheny County, by SCC. (If result was <0, emissions were set to 0.)

2007 Point Source Emissions Totals for Allegheny and Washington County Facilities

Facility	SO2	NOx	CO	VOC	NH3	PM10	PM2_5
Allegheny							
ACN-PITTSBURGH, LLC	0.052	3.070	1.760	66.267	0.000	8.790	7.870
ALLEGHENY LUDLUM CORP - BRACKENRIDGE	37.031	246.261	196.567	73.216	0.000	328.363	274.060
ALLIED WASTE SERVICES OF PENNSYLVANIA	8.740	63.050	12.390	7.200	0.000	43.360	42.480
ASHLAND INC	0.076	18.583	36.510	17.153	0.090	1.325	1.246
BAY VALLEY FOODS, LLC	543.033	208.090	49.500	4.060	0.000	70.680	59.990
BELLEFIELD BOILER PLANT	707.402	253.800	27.417	3.233	0.000	108.235	77.685
Braddock Recovery	1.660	4.882	1.123	0.073	0.000	1.698	1.696
CALGON CARBON CORPORATION	2.939	4.458	5.218	1.948	458.500	2.862	2.281
Chambers Development Co	5.065	52.118	12.580	8.886	0.000	16.897	9.352
Clairton Slag	0.773	10.946	9.157	1.149	0.000	3.039	2.748
Consol Coal	0.680	0.170	0.038	0.020	0.000	0.660	0.660
CP Industries	0.006	1.066	0.895	1.019	0.000	8.702	0.943
EASTMAN CHEMICAL RESINS, INC.	4.399	73.230	29.750	177.747	0.120	22.029	17.569
Gardner Denver Nash	0.017	2.155	1.795	1.915	0.000	0.186	0.186
GE Apparatus	0.005	0.751	0.631	0.072	0.000	0.115	0.115
GE CONSUMER PRODUCTS, LIGHTING	0.066	66.764	9.970	0.738	0.000	19.842	19.840
GM Metal Stamping	0.946	6.481	2.981	1.813	0.000	3.184	1.283
GUARDIAN INDUSTRIES CORP. FLOREFFE	82.429	686.632	10.340	13.881	0.000	26.970	19.972
GULF OIL L.P.	0.310	4.100	9.700	28.065	0.000	3.557	2.037
IRON CITY BREWING CO.	15.390	7.480	6.120	1.558	0.000	4.704	2.372
Jefferson Crematory	0.170	0.060	0.002	0.001	0.000	0.060	0.060
Kelly Run Sanitation	1.689	15.810	13.192	1.649	0.000	6.727	4.984
Kinder-Morgan Liquids Terminal	0.192	2.671	2.033	1.779	0.000	0.210	0.202
LAUREL MOUNTAIN WHIRLPOOLS, INC.	0.000	0.080	0.080	5.037	0.000	0.008	0.008
LIBERTY PULTRUSIONS	0.003	0.480	0.400	11.260	0.000	0.089	0.050
Marathon Ashland West Eliz	0.030	4.850	4.070	2.000	0.063	0.370	0.370
NEVILLE CHEMICAL COMPANY	3.150	22.734	11.894	116.587	0.505	5.320	4.187
NRG ENERGY CENTER PITTSBURGH	0.160	40.510	24.480	1.590	0.000	2.590	2.590
PITT PENN OIL COMPANY	0.004	1.740	1.180	6.117	0.000	0.075	0.075
PITTSBURGH ALLEGHENY COUNTY THERMAL, LTD	0.200	74.330	30.780	2.004	0.000	2.730	2.730
PITTSBURGH TERMINALS CORP NEVILLE ISLAND	0.030	0.465	0.290	27.401	0.000	0.030	0.030
PITTSBURGH TERMINALS CORP. - CORAOPOLIS	0.000	0.070	0.050	35.837	0.000	0.005	0.005
PORT GLENSHAW GLASS, LLC	48.800	59.910	19.823	6.743	0.000	16.211	13.861
PPG INDUSTRIES, INC. - SPRINGDALE	0.025	4.190	3.510	86.326	0.000	2.050	2.050
PRECOAT METALS, DIV. OF SEQUA COATINGS	0.058	11.080	9.320	16.640	0.000	0.757	0.757
PRESSURE CHEMICAL COMPANY	0.003	0.550	0.460	11.400	0.000	0.040	0.040
Ryan Metals	0.360	0.050	0.000	0.010	0.000	7.100	7.100

Facility	SO2	NOx	CO	VOC	NH3	PM10	PM2_5
Sanyo	0.000	0.000	0.000	8.603	0.000	1.726	1.726
SHENANGO INC.	295.477	770.247	428.271	71.792	1.894	203.743	182.557
SUN REFINING AND MARKETING, BLAWNOX	0.141	0.110	0.390	3.268	0.000	0.009	0.009
SUNOCO PARTNERS MARKETING & TERMINALS	0.001	0.080	0.060	24.835	0.000	0.006	0.006
Tube City IMS Braddock	0.000	0.000	0.000	0.000	0.000	27.865	3.072
Tube City IMS West Mifflin	0.001	0.167	0.140	0.012	0.000	1.025	0.522
TYK Refractories	0.047	7.974	6.693	4.581	0.000	0.478	0.478
UNIVERSAL STAINLESS & ALLOY PRODUCTS	13.060	58.099	99.590	25.377	0.000	24.115	18.100
US AIRWAYS MAINTENANCE BASE	0.018	3.000	2.440	19.430	0.000	0.268	0.259
US STEEL CORP - EDGAR THOMSON PLANT	1868.628	318.115	1300.948	68.643	0.450	874.041	803.292
US STEEL CORP - IRVIN PLANT	455.995	694.540	193.980	71.826	0.734	56.843	51.120
Allegheny Total	**4099.262**	**3805.999**	**2578.519**	**1040.760**	**462.356**	**1909.689**	**1644.625**
Liberty-Clairton							
AKJ Industries	0.000	0.000	0.000	0.030	0.000	0.000	0.030
Bekavac Funeral Home	0.004	0.007	0.006	0.000	0.000	0.006	0.006
Dura-Bond Industries	0.689	12.366	3.959	1.077	0.000	4.596	3.600
ELG Metals	0.000	0.481	0.007	0.002	0.000	1.931	1.931
KOPPERS INC. CLAIRTON PLANT	0.325	13.580	13.840	15.229	0.000	7.371	5.961
Mid-Continent Coal & Coke	0.376	5.722	1.233	0.454	0.000	3.983	1.794
Mon Valley Transportation	0.000	0.000	0.000	0.000	0.000	8.120	3.758
Pennsylvania Electric Coil	0.003	0.340	0.284	2.040	0.000	0.026	0.026
Tech Met	0.000	2.030	0.000	1.140	0.000	0.000	0.000
Tube City IMS Clairton	0.000	0.001	0.000	0.000	0.000	0.310	0.310
US STEEL CORP - CLAIRTON PLANT	1739.948	4807.357	3559.262	570.576	18.419	1110.587	929.175
Liberty-Clairton Total	**1741.345**	**4841.884**	**3578.590**	**590.548**	**18.419**	**1136.930**	**946.591**
Washington							
DOMINION PEOPLES/GIBSON STA	0.010	40.400	3.180	1.170	0.000	0.100	0.100
DYNO NOBEL INC/DONORA	0.000	244.300	11.300	0.700	10.800	59.899	47.982
Equitrans LP/Hartson	0.016	6.540	4.376	0.860	0.000	0.812	0.812
FLEXSYS AMER LTD PAR/MONONGAHELA	4.229	13.670	11.240	18.558	0.000	1.414	1.350
JESSOP STEEL CO/WASHINGTON	0.165	55.379	20.610	8.504	1.046	18.994	13.744
LANGELOTH METALLURGICAL/LANGELOTH	187.400	1.824	0.500	0.000	0.000	3.630	2.554
REGAL IND CORP/DONORA PLT	0.000	0.000	0.000	30.490	0.000	0.000	0.000
SEVERSTAL WHEELING/ALLENPORT	0.190	25.510	26.990	18.341	1.027	8.156	6.980
Therm-O-Rock New Eagle	0.009	1.440	1.230	0.090	0.000	5.301	3.884
UNION ELEC STEEL CORP/HARMON CREEK	1.737	52.280	81.198	14.372	0.000	12.514	10.922
USA South Hills Landfill	1.440	8.050	1.090	2.090	0.000	3.780	1.730
WORLD KITCHEN LLC/CHARLEROI	21.900	96.900	9.700	1.800	0.000	41.767	21.100
Washington Total	**217.096**	**546.293**	**171.414**	**96.975**	**12.873**	**156.367**	**111.158**

Facility	SO2	NOx	CO	VOC	NH3	PM10	PM2_5
EGUs							
ALLEGHENY ENERGY SUPPLY - SPRINGDALE	1.550	69.160	354.290	25.310	11.740	23.620	23.620
ALLEGHENY ENERGY SUPPLY CO/MITCHELL POWER STA	637.901	1495.639	31.350	11.700	0.000	152.450	79.850
ORION POWER MIDWEST - BRUNOT ISLAND	3.860	33.840	34.290	19.869	0.490	2.240	2.240
ORION POWER MIDWEST LP/ELRAMA POWER STA	4267.420	6027.450	230.930	22.420	6.930	1015.040	512.824
ORION POWER MIDWEST, CHESWICK STATION	34088.963	4455.162	297.582	10.367	0.629	601.352	501.181
EGU Total	**38999.694**	**12081.251**	**948.442**	**89.666**	**19.789**	**1794.702**	**1119.715**

2014 Point Source Emissions Totals for Allegheny and Washington County Facilities

Facility	SO2	NOx	CO	VOC	NH3	PM10	PM2_5
Allegheny							
ACN-PITTSBURGH, LLC	0.053	3.210	1.860	68.149	0.000	9.020	8.070
ALLEGHENY LUDLUM CORP - BRACKENRIDGE	36.987	263.370	210.900	73.890	0.000	329.298	275.024
ALLIED WASTE SERVICES OF PENNSYLVANIA	8.870	63.340	10.990	6.320	0.000	43.720	42.830
ASHLAND INC	0.086	22.832	36.230	16.783	0.090	1.582	1.505
BAY VALLEY FOODS, LLC	543.034	218.980	51.860	4.220	0.000	32.180	27.910
BELLEFIELD BOILER PLANT	707.402	253.800	27.417	3.233	0.000	108.235	77.685
Braddock Recovery	1.660	4.882	1.123	0.073	0.000	1.698	1.696
CALGON CARBON CORPORATION	2.953	4.900	5.610	1.964	461.350	2.877	2.293
Chambers Development Co	5.065	52.118	12.580	8.886	0.000	16.897	9.352
Clairton Slag	0.773	10.946	9.157	1.149	0.000	3.039	2.748
Consol Coal	0.680	0.170	0.038	0.020	0.000	0.660	0.660
CP Industries	0.006	1.066	0.895	1.019	0.000	8.702	0.943
EASTMAN CHEMICAL RESINS, INC.	4.399	73.230	29.750	177.747	0.120	22.029	17.569
Gardner Denver Nash	0.017	2.155	1.795	1.915	0.000	0.186	0.186
GE Apparatus	0.005	0.751	0.631	0.072	0.000	0.115	0.115
GE CONSUMER PRODUCTS, LIGHTING	0.077	69.545	12.292	0.870	0.000	20.003	19.993
GUARDIAN INDUSTRIES CORP. FLOREFFE	82.429	686.632	10.340	13.881	0.000	26.970	19.972
GULF OIL L.P.	0.310	4.200	9.960	28.805	0.000	3.540	2.020
Jefferson Crematory	0.170	0.060	0.002	0.001	0.000	0.060	0.060
Kelly Run Sanitation	1.689	15.810	13.192	1.649	0.000	6.727	4.984
Kinder-Morgan Liquids Terminal	0.192	2.671	2.033	1.779	0.000	0.210	0.202
LIBERTY PULTRUSIONS	0.003	0.480	0.400	11.260	0.000	0.089	0.050
Marathon Ashland West Eliz	0.030	4.850	4.070	2.000	0.063	0.370	0.370
NEVILLE CHEMICAL COMPANY	3.151	23.574	12.604	117.008	0.505	5.329	4.189
NRG ENERGY CENTER PITTSBURGH	0.160	42.660	25.760	1.660	0.000	2.690	2.690
PITT PENN OIL COMPANY	0.004	1.610	1.030	6.108	0.000	0.075	0.075
PITTSBURGH ALLEGHENY COUNTY THERMAL, LTD	0.200	78.260	32.400	2.094	0.000	2.860	2.860
PITTSBURGH TERMINALS CORP NEVILLE ISLAND	0.030	0.465	0.290	28.161	0.000	0.030	0.030
PITTSBURGH TERMINALS CORP. - CORAOPOLIS	0.000	0.070	0.050	36.807	0.000	0.005	0.005
PORT GLENSHAW GLASS, LLC	48.800	59.960	19.862	6.743	0.000	16.203	13.853
PPG INDUSTRIES, INC. SPRINGDALE	0.030	5.240	4.390	86.856	0.000	2.110	2.110
PRESSURE CHEMICAL COMPANY	0.004	0.690	0.570	11.470	0.000	0.050	0.050
Sanyo	0.000	0.000	0.000	8.603	0.000	1.726	1.726
SHENANGO INC.	325.580	781.417	429.951	71.862	1.894	206.001	184.441
SUN REFINING AND MARKETING, BLAWNOX	0.171	0.130	0.480	4.080	0.000	0.010	0.010
SUNOCO PARTNERS MARKETING $ TERMINALS L.	0.001	0.080	0.060	25.505	0.000	0.006	0.006
Tube City IMS Braddock	0.000	0.000	0.000	0.000	0.000	27.865	3.072

Facility	SO2	NOx	CO	VOC	NH3	PM10	PM2_5
Tube City IMS West Mifflin	0.001	0.167	0.140	0.012	0.000	1.025	0.522
TYK Refractories	0.047	7.974	6.693	4.581	0.000	0.478	0.478
UNIVERSAL STAINLESS & ALLOY PRODUCTS	13.060	58.639	100.050	25.397	0.000	24.128	18.113
US AIRWAYS MAINTENANCE BASE	0.020	3.660	3.040	19.642	0.000	0.295	0.286
US STEEL CORP - EDGAR THOMSON PLANT	1868.628	318.115	1300.948	68.643	0.450	874.041	803.292
US STEEL CORP - IRVIN PLANT	455.995	694.540	193.980	71.826	0.734	56.843	51.120
Allegheny Total	**4112.772**	**3837.250**	**2585.424**	**1022.743**	**465.206**	**1859.977**	**1605.163**
Liberty-Clairton							
AKJ Industries	0.000	0.000	0.000	0.030	0.000	0.000	0.030
Bekavac Funeral Home	0.004	0.007	0.006	0.000	0.000	0.006	0.006
Dura-Bond Industries	0.689	12.366	3.959	1.077	0.000	4.596	3.600
ELG Metals	0.000	0.481	0.007	0.002	0.000	1.931	1.931
KOPPERS INC. CLAIRTON PLANT	1.831	15.599	17.872	11.769	0.000	7.505	6.095
Mid-Continent Coal & Coke	0.376	5.722	1.233	0.454	0.000	3.983	1.794
Mon Valley Transportation	0.000	0.000	0.000	0.000	0.000	8.120	3.758
Pennsylvania Electric Coil	0.003	0.340	0.284	2.040	0.000	0.026	0.026
Tech Met	0.000	2.030	0.000	1.140	0.000	0.000	0.000
Tube City IMS Clairton	0.000	0.001	0.000	0.000	0.000	0.310	0.310
US STEEL CORP - CLAIRTON PLANT	1717.620	4312.803	4197.691	443.540	17.554	827.180	645.103
Liberty-Clairton Total	**1720.523**	**4349.349**	**4221.051**	**460.052**	**17.554**	**853.657**	**662.653**
Washington							
DOMINION PEOPLES/GIBSON STA	0.010	41.600	2.870	1.020	0.000	0.100	0.100
DYNO NOBEL INC/DONORA	0.000	248.630	13.030	0.800	10.850	60.360	48.370
Equitrans LP/Hartson	0.016	6.540	4.376	0.860	0.000	0.812	0.812
FLEXSYS AMER LTD PAR/MONONGAHELA	4.251	15.044	12.401	18.729	0.000	1.444	1.384
JESSOP STEEL CO/WASHINGTON	0.143	59.960	25.670	8.750	1.180	19.130	13.900
LANGELOTH METALLURGICAL/LANGELOTH	187.400	1.820	0.500	0.000	0.000	3.630	2.540
REGAL IND CORP/DONORA PLT	0.000	0.000	0.000	30.490	0.000	0.000	0.000
SEVERSTAL WHEELING/ALLENPORT	0.204	27.070	29.710	18.480	1.090	8.180	7.012
Therm-O-Rock New Eagle	0.009	1.440	1.230	0.090	0.000	5.301	3.884
UNION ELEC STEEL CORP/HARMON CREEK	1.720	52.260	81.160	14.350	0.000	12.480	10.890
USA South Hills Landfill	1.440	8.050	1.090	2.090	0.000	3.780	1.730
WORLD KITCHEN LLC/CHARLEROI	21.910	35.920	12.090	1.940	0.000	41.990	21.310
Washington Total	**217.103**	**498.334**	**184.127**	**97.599**	**13.120**	**157.207**	**111.932**
EGUs							
ALLEGHENYENERGYSUPPLYCO/MITCHELL	948.097	1335.000	44.054	17.311	0.000	181.931	102.098
ALLEGHENYENERGYSUPPLY-SPRINGDALE	0.000	40.131	86.190	2.155	7.121	0.446	0.320
ORIONPOWERMIDWEST,CHESWICKSTATION	2914.592	2825.813	319.295	25.553	19.457	716.111	697.418
ORIONPOWERMIDWEST/ELRAMA	1846.000	1943.000	99.725	9.682	2.991	438.450	221.481

Facility	SO2	NOx	CO	VOC	NH3	PM10	PM2_5
ORIONPOWERMIDWEST-BRUNOTISLAND	4.430	14.269	5.259	0.217	0.394	0.299	0.292
EGUs Total	**5713.119**	**6158.212**	**554.523**	**54.918**	**29.964**	**1337.236**	**1021.608**

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In the Matter of:

United States Steel Corporation
600 Grant St.
Pittsburgh, PA 15219-2800

CONSENT ORDER and AGREEMENT

THIRD AMENDMENT

This CONSENT ORDER and AGREEMENT (Agreement) was entered into on March 17, 2008 by and between the Allegheny County Health Department (ACHD) and United States Steel Corporation (U. S. Steel), collectively referred to as "Parties." The First Amendment to the Agreement was entered into and effective on November 19, 2008. The Second Amendment to the Agreement (Second Amendment to the 2008 COA) was entered and effective on September 30, 2010. In addition, a separate COA for B Battery was entered and effective on June 1, 2007. This Third Amendment to the 2008 COA supersedes and replaces the Agreement entered on March 17, 2008 in its entirety, the First Amendment to the Agreement in its entirety; the Second Amendment to the Agreement in its entirety, and the June 1, 2007 COA in its entirety; and, as such, the above referenced March 17, 2008 Agreement, the First Amendment to the Agreement, the Second Amendment to the 2008 COA, and the June 1, 2007 COA are all hereby terminated in their entirety.

The ACHD has found and determined the following:

A. The Director of the ACHD has been delegated authority pursuant to the federal Clean Air Act, 42 U.S.C. §§ 7401 *et seq.*, and the Pennsylvania Air Pollution Control Act, 35 P.S. §§ 4001 et seq., and the ACHD is a local health agency organized under Local Health Administration Law, Act 315 of August 24, 1951, P.L. 1304, as amended, 16 Pa.C.S. §12001 *et seq.*, whose powers and duties include the enforcement of laws relating to public health within Allegheny County, including the Allegheny County Health Department's Rules and Regulations, Article XXI, Air Pollution Control (Article XXI).

B. U. S. Steel operates coke oven batteries 1, 2, 3, 13, 14, 15, 19, 20, and B (Batteries) located in Clairton, PA.

C. U. S. Steel is currently constructing C Battery pursuant to Installation Permit 0052-I011.

D. U.S. Steel has been submitting monthly Continuous Opacity Monitoring (COM) reports concerning the Batteries' combustion stacks to the ACHD pursuant to ACHD Enforcement Order No. 161 dated July 23, 1990 and ACHD letter dated February 26, 2007.

E. The COM reports indicate that between October 1, 2007 and December 31, 2007 U.S. Steel has had 713 clock hours that had at least 3 minutes of 20 percent or greater opacity and 246 clock hours that contained at least one 10 second reading of 60 percent or greater opacity.

F. Such emissions constitute violations of Article XXI §2105.21(f) and subject U.S. Steel to civil penalty liability under Article XXI § 2109.06(a).

G. U.S. Steel has also been submitting Semi-annual Deviation Reports concerning the Batteries' coke pushing operations pursuant to the reporting requirements of Installation Permit Nos. 0052-I005a, 0052-I006, 0052-I007, and 0052-I008.

H. The January 21, 2008 report indicates that between July 1, 2007, and December 31, 2007, U.S. Steel has had 67 instances where pushing emissions exceeded 20 percent opacity and 1 instance where visible emissions from the transport of hot coke in the open atmosphere exceeded 10 percent opacity.

I. Such emissions constitute violations of Article XXI §2105.21(e)(4) and (e)(5) respectively and subject U.S. Steel to civil penalty liability under Article XXI § 2109.06(a).

J. U. S. Steel cannot certify that the emissions from the Number 3 Screening Station at the U. S. Steel Clairton facility continuously meet the particulate emission limitations required by Article XXI §2104.02(f) and Installation Permit No. 0052-I003.

K. Emissions at the Number 3 Screening Station exceeding the standards required by Article XXI §2104.02(f) are considered violations of Article XXI §2104.02(f) and Installation Permit No. 0052-I003.

L. U.S. Steel operates the Edgar Thomson Plant (ET Plant) located in Braddock Pennsylvania.

M. On or about November 11, 2004 the ACHD observed visible emissions coming from ET Plant's Basic Oxygen Process (BOP) facility.

N. Such emissions constitute violations of Article XXI §2104.01 and subject U.S. Steel to civil penalty liability under Article XXI § 2109.06(a).

O. U. S. Steel cannot certify that emissions from the ET Plant's BOP scrubber stacks continuously meet the opacity limitations required by Article XXI §2104.01.

P. Emissions at the BOP scrubber stacks exceeding the standards required by Article XXI §2104.01 are considered violations of Article XXI §2104.01.

Q, U. S. Steel cannot certify that emission from the ET Plant's Ladle Metallurgical Facility (LMF) continuously meet the opacity limitations required by Article XXI §2104.01 and Permit No. 90-I-003-P.

R. Emissions at the LMF exceeding the standards required by Article XXI §2104.01 are considered violations of Article XXI §2104.01 and Permit No. 90-I-003-P.

S. The Department has determined that "allowable emissions," as defined in Article XXI §2101.20, for SO2 from the Blast Furnace No. 1 stoves, Blast Furnace No. 3 stoves, Blast Furnace No. 1 Casthouse and Blast Furnace No. 3 Casthouse exceed 100 tons for each of these four sources individually.

T. U. S. Steel has not conducted emissions testing for SO2 from the Blast Furnace No. 1 stoves, Blast Furnace No. 3 stoves, Blast Furnace No. 1 Casthouse and Blast Furnace No. 3 Casthouse as required by Article XXI §2108.02(b).

U. Failure to conduct emissions testing as required by Article XXI §2108.02(b) constitutes a violation pursuant to Article XXI §2108.02(f).

WHEREAS, after a full and complete negotiation of all matters set forth in this Agreement and upon mutual exchange of covenants contained herein, the Parties agree that settlement of this matter without protracted litigation is in the best interest of the Parties and the public; and

NOW, THEREFORE, without any final determination of fact or law, and intending to be legally bound hereby, the Parties hereto agree as follows:

I. JURISDICTION

Solely for the purposes of this Agreement and the underlying alleged violations, U. S. Steel waives all objections and defenses that it may have to jurisdiction or venue. U. S. Steel shall not challenge ACHD's jurisdiction to enter into or to enforce this Agreement.

II. APPLICABILITY

a. The provisions of this Agreement shall apply to, be binding upon, and inure to the benefit of ACHD and U. S. Steel and upon their respective officers, directors, agents, contractors, employees, servants, successors, and assigns.

b. The duties and obligations under this Agreement shall not be modified, diminished, terminated, or otherwise altered by the transfer of any legal or equitable interest in the Plants or any part thereof.

   1. In the event that U. S. Steel proposes to sell or transfer the Plants or any part thereof, U. S. Steel shall provide written notice to ACHD of such purchaser or transferee at least thirty (30) days prior to the sale or transfer. U. S. Steel shall also provide a copy of this Agreement to any person or entity U. S. Steel intends to make any such sale or transfer at least thirty (30) days prior thereto.

   2. ACHD may, upon U. S. Steel's request, agree to modify or terminate U. S. Steel's duties and obligations under this Agreement upon transfer of the Plants. U. S. Steel reserves the right to challenge any decision by ACHD in response to U. S. Steel's request under ACHD's Rules and Regulations for Hearings and Appeals, Article XI.

c. The undersigned representative of U. S. Steel certifies that he or she is fully authorized to execute this Agreement on behalf of U. S. Steel, and to legally bind U. S. Steel to this Agreement.

III. GENERAL TERMS

a. This Agreement addresses and is intended to resolve all outstanding issues between the Parties relating to the violations alleged in of this Agreement.

b. The Parties do not authorize any other persons to use the findings in this Agreement in any matter or proceeding.

c. Nothing herein is intended to limit the authority of ACHD with respect to violations that may have occurred prior to the date of this Agreement, if any, that are not intended to be the subject of resolution hereunder, or to limit the authority of ACHD to seek further enforcement of this Agreement in the event that U. S. Steel fails to successfully comply with its terms and conditions.

IVA. RESTRICTIONS

a. Clairton Plant – Batteries 1-3

1. At no time shall the soaking emissions from the standpipe cap opening exceed twenty percent (20%) opacity. An exclusion from this opacity limit shall be allowed for two (2) minutes after that standpipe is opened. Soaking emissions from the standpipe cap shall be defined as uncombusted emissions from an open standpipe which has been dampered off in preparation of pushing the coke mass out of the oven and shall end when pushing begins, i.e., when the coke side door is removed. Compliance with this standard shall be determined through observing the standpipe from a position where the observer can note the time the oven is dampered off and, following the two minute exclusion, read the uncombusted emissions from the open standpipe in accordance with Method 9.
2. For each of the three batteries, the coking time shall not be less than 21.75 hours. If the coking time for any oven on any of these three batteries is less than 21.75 hours, U. S. Steel shall record the oven, coking time and justification of the coking time. This information shall be provided to ACHD on a quarterly basis. Coking times of less than 21.75 hours shall be considered in compliance with this Third Amendment to the COA if caused by or related to a Start-Up, Shutdown, Breakdown, or Malfunction or if caused by extraordinary circumstances as supported by appropriate justification.
3. If U. S. Steel determines that compliance can be maintained at a coking time of less than 21.75 hours for any of the three batteries, U. S. Steel can propose to ACHD a compliance demonstration for the shorter coking time. If the compliance demonstration is successful, ACHD shall authorize a shorter coking time as agreed to by the parties. In addition, if a shorter coking time is authorized, at any time subsequent to such authorization, if U. S. Steel shows a statistically significantly decrease in compliance, ACHD may require that U. S. Steel begin another compliance demonstration within thirty (30) days notice from the ACHD to determine if U. S. Steel can continue to demonstrate compliance under the shorter coking time. If U. S. Steel is unable to demonstrate compliance under such demonstration, the coking time shall revert to the previously approved coking time.

4. U. S. Steel shall maintain records of coking times for these three batteries for five years from the date of each push. Such records shall be available for review and copying by the Department upon request. Such information shall be treated as Confidential Business Information.
5. U. S. Steel shall perform four (4) soaking observations on each of the three batteries per day, in accordance with Method 9, except that if it is an overcast day or if the plume is in a shadow, the reader need not position himself with his back to the sun. U. S. Steel shall notify ACHD in the event that four soaking observations could not be obtained in the event of an outage, malfunction, breakdown, unacceptable conditions to conduct observations or other extraordinary circumstances as supported by appropriate justification.
6. U. S. Steel shall observe at least eight (8) pushes per day per each of the three batteries, of which at least four (4) pushes must be consecutive. The observations must be conducted in accordance with Method 9 as provided in 40 CFR § 63, Subpart CCCCC. U. S. Steel shall notify ACHD in the event that the required number of observations could not be obtained in the event of an outage, shutdown, malfunction, breakdown, unacceptable conditions to conduct observations, or other extraordinary circumstances as supported by appropriate justification.

IVB. CORRECTIVE ACTIONS

a. **Clairton Plant - Batteries 7, 8, and 9.**

1. U.S. Steel permanently shut down batteries 7, 8, and 9 on April 16, 2009.

b. **Clairton Plant - Batteries 1, 2, and 3**

1. U.S. Steel completed automation of reversing rooms by July 31, 2008.
2. U.S. Steel has implemented and will continue to implement for these batteries the following:
   i. Advanced Patching Plan outlined in Appendix A;
   ii. Flue Nozzle Repair Plan outlined in Appendix B;
   iii. Regenerator Repair Plan outlined in Appendix C; and
   iv. Gas Gun Improvement Plan outlined in Appendix D.

3. U. S. Steel has completed an oven wall inspection report for Batteries 1, 2, and 3; and submitted a report, supplements and schedule to complete appropriate repairs to ACHD, detailing the findings of the oven wall inspection..

4. U. S. Steel has submitted a protocol outlining an evaluation with a timeline for evaluating the No. 1 quench tower for Batteries 1-3. U. S. Steel will conduct the evaluation of the No. 1 quench tower for Batteries 1, 2, and 3 for potential PM2.5 emission reductions. The evaluation may include but not be limited to PM2.5 emission quantification and evaluation of the effectiveness of the double baffle system and improvement to the baffle washing system.

5. If the ACHD or U.S. Steel determines that one or more of the Plans referenced in paragraph IV.B.b.2 is inadequate to prevent fugitive emissions from Batteries 1, 2, and 3, the ACHD may require, or U.S. Steel may submit at its own initiative for ACHD approval, revisions to the above plans, which could include plans to rehabilitate the endflues and/or throughwalls.

6. With respect to Batteries 1, 2 and 3, by December 31, 2013, U.S. Steel shall achieve compliance with all applicable standards of Article XXI, including but not limited to Article XXI, Part E, Subpart C.

7. If the compliance deadline established by paragraph IV.B.b.6 above is missed, U. S. Steel shall incur stipulated penalties as provided by paragraph VII.c, of this Consent Order and Agreement in lieu of any penalties that would have been incurred by paragraph VII.a.

c. **Clairton Plant - Battery 15**

1. U.S. Steel has completed one round of the Enhanced Preventive Maintenance Refractory Repair Plan outlined in Appendix E on Battery 15 prior to the original Agreement. U.S. Steel also completed a second round of the Plan in Appendix E on Battery 15 by June 30, 2008 and a third round by December 31, 2008.

2. With respect to Battery 15, U.S. Steel has implemented and will continue to implement the Advanced Patching Plan outlined in Appendix A.

d. **Clairton Plant - Battery 19**

1. U.S. Steel has replaced 20 heating walls on Battery 19 and shall replace an additional 5 heating walls on Battery 19 by October 31, 2012.
2. With respect to Battery 19, U.S. Steel shall achieve compliance with the opacity standards set forth in Article XXI §2105.21(f) by December 31, 2012.
3. If the compliance deadline established by paragraph IV.d.2 above is missed, U. S. Steel shall incur stipulated penalties as provided by paragraph VII.c, of this Consent Order and Agreement in lieu of any penalties that would have been incurred by paragraph VII.a.
4. Until Battery 19 achieves compliance with Article XXI §2105.21(f), U.S. Steel shall implement for Battery 19 the Advanced Patching Plan outlined in Appendix A.
5. If the ACHD or U.S. Steel determines that the Advanced Patching Plan is inadequate to prevent fugitive emissions from Battery 19, the ACHD may require, or U.S. Steel may submit at its own initiative for ACHD approval, revisions to the Advanced Patching Plan, which could include plans to rehabilitate the endflues and/or throughwalls.

e. **Clairton Plant - Battery 20**

1. U.S. Steel installed WOBBE stabilizer by April 30, 2008.
2. U.S. Steel has replaced 6 heating walls and shall replace an additional 82 heating walls on Battery 20 by October 31, 2014.
3. With respect to Battery 20, U.S. Steel shall achieve compliance with the opacity standards set forth in Article XXI §2105.21(f) by December 31, 2014.
4. If the compliance deadline established by paragraph IV.e.2 above is missed, U. S. Steel shall incur stipulated penalties as provided by paragraph VII.c, of this Consent Order and Agreement in lieu of any penalties that would have been incurred by paragraph VII.a.
5. Until Battery 20 achieves compliance with Article XXI §2105.21(f), U.S. Steel shall implement for Battery 20 the following:

i. Advanced Patching Plan outlined in Appendix A; and

ii. Revitalization Plan of Battery Heating System outlined in Appendix F.

6. If the ACHD or U.S. Steel determines that the Advanced Patching Plan or Revitalization Plan is inadequate to prevent fugitive emissions from Battery 20, the ACHD may require, or U.S. Steel may submit at its own initiative for ACHD approval, revisions to the Advanced Patching Plan or Revitalization Plan, which could include plans to rehabilitate the endflues and/or throughwalls..

f. **Clairton Plant - Number 3 Screening Station**

1. U. S. Steel shall replace the No. 3 Screening Station with the No. 4 Screening Station.
2. U. S. Steel received an installation permit for the No. 4 Screening Station from ACHD on December 2, 2008, and began construction on May 19, 2010. The No. 4 Screening Station will begin operation upon completion and startup of C Battery which is targeted for September 30, 2013.

g. **Clairton Plant – Installation of New Low Emission Quench Towers**

1. Within 30 days of the effective date of the Second Amendment to the 2008 COA, U. S. Steel shall submit applications to ACHD for permit modifications to the C Battery installation permit that was issued on July 24, 2008 and the D battery installation permit that was issued on September 4, 2009, to include the Second Amendment to the 2008 COA and any subsequent revisions. ACHD shall issue revised permits incorporating such changes as revisions or amendments to such permits.
2. In order to reduce PM2.5 emissions required for the PM2.5 State Implementation Plan (SIP), U. S. Steel shall install two new Low Emission Quench Towers to replace the existing No. 5 and No. 7 Quench Traditional Towers at the Clairton Plant. Coke from Batteries 13, 14 and 15 is currently quenched in No. 5 Tower and coke from Batteries 19 and 20 is currently quenched in No. 7 Tower.
3. On August 30, 2010, U. S. Steel submitted a permit application and installation schedules to ACHD for the new Low Emission Quench Towers.
4. U. S. Steel will complete the installation and begin operation of the two new Low Emission Quench Towers no later than December 31, 2013 provided that the required installation permit(s) and the revisions to C and D Battery installation permits are

obtained in a reasonable time and not appealed. In the Second Amendment to the COA, a reasonable time was defined as installation permit(s) and permit revisions issued without appeal by March 31, 2011. On March 10, 2011 ACHD issued the installation permit for the LEQTs. On March 20, 2011, U. S. Steel appealed the installation permit. The parties resolved U. S. Steel's appeal of the installation permit by ACHD issuing a revised draft permit for public comment on April 21, 2011; and U. S. Steel agreeing that it would not pursue extending the December 31, 2013 deadline to install and begin operating the two new Low Emission Quench Towers pursuant to the provisions below as it pertains to the Appeal filed by U. S. Steel on March 20, 2011; but U. S. Steel reserved the right to extend the deadline should any subsequent appeal be filed regarding the revised permit, or if ACHD fails to issue a final revised installation permit by June 17, 2011. Any appeal will be considered resolved when it is either withdrawn or a final judgment is entered upon it by the ACHD's Hearing Officer or, if the Hearing Officer's judgment is appealed or if the appeal is pursued in another tribunal, by the presiding court. If the permits are not issued without appeal by March 31, 2011, U.S. Steel shall notify the ACHD in writing of its desire to extend the date as authorized in this paragraph by April 15, 2011; and shall provide ACHD with an updated schedule to construct the LEQTs within thirty (30) days of the appeal's resolution. On April 14, 2011, U. S. Steel provided notice that it would not pursue an extension of the schedule pursuant to the Appeal filed on March 20, 2011, but reserved the right to extend the deadline should any subsequent appeal be filed regarding the revised installation permit; or if ACHD fails to issue a final revised installation permit by June 17, 2011. In any case, while U. S. Steel shall use all reasonable efforts to meet the original deadline of December 31, 2013, in no case shall the revised schedule result in an extension of the December 31, 2013 deadline beyond one (1) day for every day that elapses between the date any "subsequent" appeal may be filed and the date that any such appeal is resolved.

h. Clairton Plant – PM2.5 Emission Evaluations

1. On May 16, 2011, U. S. Steel submitted a test protocol and proposed test schedule to ACHD for approval for a PM2.5 emission test of the Keystone Cooling Tower.

2. Within 60 days of completion of the PM2.5 emission test on the Keystone Cooling Tower, U. S. Steel will submit the test report to ACHD.

3. Within 60 days of completion of the PM2.5 emission test on the Keystone Cooling Tower, U. S. Steel will submit a test protocol and proposed test schedule to ACHD for approval for a PM2.5 emission test on the Aeration Basins.

4. Within 60 days of completion of the PM2.5 emission test on the Aeration Basin, U. S. Steel will submit the test report to ACHD.

i. Clairton Plant – Installation of SODAR

1. U. S. Steel installed a Sonic Detection And Ranging meteorological device (SODAR). Beginning July 1, 2011, U. S. Steel shall continue maintaining and operating the SODAR for three years. U. S. Steel will provide, at a minimum, quarterly quality assurance reviews of the meteorological site and the data. U. S. Steel and ACHD will maintain joint ownership of the data collected from the SODAR.

j. Clairton Plant – B Battery

1. U. S. Steel completed its corrective actions and supplemental environmental project; and paid its civil penalty as required by the Consent Order and Agreement, entered on June 1, 2007.

k. **Edgar Thomson Plant - BOP**

1. U.S. Steel retained a consultant to conduct engineering study of the mixer baghouse (Mixer Baghouse Study) and the gas cleaning system (Gas Cleaning Study) within five (5) business days of the execution of this Agreement.
2. U.S. Steel developed, implemented, and submitted to the ACHD a copy of an Enhanced Operating and Maintenance Plan for the mixer baghouse on February 29, 2008 .
3. U.S. Steel developed, implemented, and submitted to the ACHD a copy of an Enhanced Operating and Maintenance Plan for the gas cleaning system by March 31, 2008.

4. U.S. Steel completed and submitted to the ACHD a summary of the Mixer Baghouse Study by May 31, 2008.
5. Based upon engineering recommendations for the Mixer Baghouse Study, U. S. Steel implemented additional maintenance practices and has achieved compliance.
6. On June 30, 2009, U.S. Steel certified compliance at the BOP roof monitor for its traditional product mix. On September 30, 2010, U. S. Steel certfied compliance at the BOP roof monitor for the new CalSil skim heats.
7. U.S. Steel completed and submitted to the ACHD a summary of the Gas Cleaning Study by August 31, 2008.
8. On November 26, 2008, U. S. Steel submitted a revised Compliance Plan (Schedule M) to ACHD for the Gas Cleaning System. As required by the Compliance Plan, U. S. Steel completed conceptual design of process modifications, determined permits were required and submitted permit applications to ACHD and PaDEP as required. Four months after required permits are issued without appeal by ACHD and PaDEP, U. S. Steel will finalize the capital appropriation and update the Compliance Plan with detailed information for project construction, including beginning of construction, end of construction, shakedown period and a final compliance date. U. S. Steel has submitted an NPDES permit application to PADEP for the upgrade on May 1, 2009, but PADEP has not yet acted on the application.
9. In order to improve performance of the Gas Cleaning System, U. S. Steel installed an upgraded fan for the gas cleaning system. Based upon a permit applicability request submitted by U. S. Steel, ACHD determined that a permit was not required for the installation of the fan.

l. **Edgar Thomson Plant – LMF**

1. U.S. Steel developed, implemented, and submitted to the ACHD a copy of an Enhanced Operating and Maintenance Plan for the LMF by March 31, 2008.
2. U. S. Steel obtained Installation Permit No. 0051-I005 for upgrades to the LMF baghouse from ACHD on March 13, 2009. U. S. Steel has completed the installation of the upgrades to the LMF baghouse and completed the necessary shakedown. U. S. Steel achieved compliance with Article XXI, § 2104.01, Installation Permit 90-I-003-P and IP No. 0051-I005 at the LMF in September 2010.

m. Edgar Thomson - Emissions Testing

1. U. S. Steel completed emissions testing for SO_2 from the Blast Furnace No. 1 stoves, Blast Furnace No. 3 stoves, Blast Furnace No. 1 Casthouse, and Blast Furnace No. 3 Casthouse, consistent with and as required by the First Amendment to the COA.

n. Clairton Plant – Quench Tower No. 1 and PM2.5 Contingency Measures

1. Within thirty months after receiving notice from the ACHD that the United States Environmental Protection Agency is requiring implementation of the contingency measures found in the PM2.5 SIP for the Liberty-Clairton Area, U.S. Steel shall cease operation of Quench Tower No. 1 as the primary quench tower for Batteries 1, 2 and 3 or implement at the Clairton Plant PM2.5 emission reductions (not already included in the PM2.5 SIP modeling demonstration) equal to or greater than 90 tons per year, unless a lesser amount is needed to demonstrate attainment with the annual PM2.5 NAAQS. The contingency measure schedule provided herein assumes that any necessary permits are applied for and obtained in a reasonable time and not appealed.

V. REPORTING

a. U. S. Steel shall submit a written quarterly reports (Quarterly Reports) within thirty (30) days after the close of each calendar quarter to ACHD. The first Quarterly Reports are due within thirty (30) days after the close of the first calendar quarter that begins following the entry date of this Agreement. The Quarterly Reports shall contain, at a minimum, the following information:

1. A list of every clock hour in the calendar quarter that compliance is not achieved for Article XXI opacity limits applicable to the Batteries' combustion stacks as measured by the combustion stacks' continuous opacity monitor (COM). U.S. Steel shall indicate the date, time, root cause, and ovens that are believed to have contributed to the exceedance;

2. For Batteries 19 and 20, a list of heating walls that have been replaced along with the corresponding completion dates;
3. For Batteries 19 and 20, a list of heating walls currently out of service for replacement;
4. For Batteries 19 and 20, a list of heating walls planned to be taken out of service for replacement during the subsequent calendar quarter;
5. Status of milestone activities completed in accordance Section IV of this Agreement;
6. Any update to the status of the Gas Cleaning Upgrade at the ET Plant pursuant to Paragraph IVB.k.8, above; and
7. A list of all items in Section IV for which U.S. Steel anticipates not meeting the compliance deadline as well as a summary for why the deadline will be missed.
8.. U.S. Steel shall submit a Semi-annual Deviation Report for all deviations from Article XXI §2105.21(e)(4) and (e)(5) for all Batteries.

b. The Quarterly Reports, and written notices required in this Section shall be mailed to the individuals in Section XII(d).

VI. CIVIL PENALTY

a. U. S. Steel consents to the assessment of a civil penalty three-hundred-one-thousand-eight-hundred ($301,800) dollars in full settlement of all issues and alleged violations arising under or related to those described in this Agreement, within thirty (30) days of the date of this Agreement. U. S. Steel paid this civil penalty on March 27, 2008.

b. The ACHD has determined that the penalty amount stated above is in accordance with Article XXI, §2109.06.b, reflecting relevant factors including: the nature, severity, and frequency of the alleged violations; the maximum amount of civil and criminal penalties authorized by law; the willfulness of such violations; the impact of such violations on the public and the environment; the actions taken by U. S. Steel to minimize such violations and to prevent future violations; and U. S. Steel's compliance history. The ACHD hereby releases and forever discharges U. S. Steel from liability for any and all issues and alleged violations arising under or related to those described in this Agreement, including, but not

limited to those arising under Article XXI, U. S. Steel's Operating Permit(s), or state and federal law.

VII. STIPULATED CIVIL PENALTIES

a. Should U. S. Steel fail to complete any of the Corrective Actions provided in Section IV of this Agreement, including those actions outline in the referenced Appendices, by the deadlines agreed to by the Parties pursuant to this Agreement, each day following a missed deadline shall be considered a violation of this Agreement. With the exception of the deadlines within the Appendices, the following Stipulated Civil Penalties shall be due and owing automatically within 30-days after the close of each quarter containing the missed deadline:

Days Delay in Completion	Daily Stipulated Penalty
1-30	$500.00
31-90	$1000.00
91+	$2000.00

All Stipulated Civil Penalties described herein shall be assessed per violation, per day.

b. For violations of missed deadlines within the Appendices of this Agreement, the following Stipulated Civil Penalties shall be due and owing within thirty days of ACHD's demand for stipulated penalties:

Days Delay in Completion	Daily Stipulated Penalty
1-30	$500.00
31-90	$1000.00
91+	$2000.00

All Stipulated Civil Penalties described herein shall be assessed per violation, per day. U.S. Steel agrees to maintain current recording system associated with its programs referenced in the Appendices and make such records available to ACHD upon demand.

c. In addition to the penalties above, U. S. Steel consents to payment of the following stipulated civil penalties for each clock hour that compliance for the Batteries' combustion stacks are not achieved for opacity limits, as determined by the combustion stack COM, as described in Article XXI 2105.21(f)(3) and 2105.21(f)(4), respectively:

Date of COM Violation.	Stipulated Penalty
Date of Execution of Third Amendment to the 2008 COA – December 31, 2012	$300.00
January 1, 2013 – Termination of the Corresponding Corrective Action	$500.00

The first thirty-three (33) clock hour opacity limit violations of each Battery stack in any calendar quarter shall not be subject to Stipulated Civil Penalties. For ovens with completely replaced throughwalls, said Stipulated Penalties shall be assessed beginning the eighth coking cycle following the first charge after final heating wall replacement. The Civil Penalties shall be due and owing automatically within 30-days after the close of each quarter in which the COM violation(s) occurred.

d. In addition to the penalties above, U. S. Steel consents to the payment of a stipulated civil penalty of five-hundred ($500) dollars for each push where compliance for the Batteries', pushing and transport emissions are not achieved for opacity limits, as described in Article XXI 2105.21(e)(4) and 2105.21(e)(5)respectively, whether observed by U.S. Steel or the ACHD. The Civil Penalties shall be due and owing automatically within 30-days after the close of each quarter in which the pushing violation(s) occurred.

e. U.S. Steel shall submit a Stipulated Civil Penalty of fifty-thousand dollars ($50,000) for each calendar quarter that the COM availability is less than 90%. These Stipulated Civil Penalties shall be due and owing automatically within 30-days after the close of each quarter in which the COM availability is less than 90%. The requirements for payment of stipulated penalties shall continue until termination of the corresponding Corrective Action occurs.

f. In addition to the penalties above, U. S. Steel consents to the payment of the following stipulated penalties for each day where compliance with soaking emissions for Batteries 1-3, as specified and provided by Condition IV.A.a.1, is not achieved. The Civil Penalties shall be due and owing automatically within 30-days after the close of each quarter.

Date of Soaking Violation.	**Stipulated Penalty**
Date of Execution of Third Amendment to the 2008 COA – December 31, 2011	$400.00
January 1, 2012 – December 31, 2013	$600.00
January 1, 2014 – Termination of the Order or Condition	$800.00

g. Stipulated penalties, required by paragraphs VII.a through f, above, may be offset, in whole or part, by approved supplemental projects. Such supplemental projects could include, but not necessarily be limited to, additional emissions evaluations and testing, and/or emission reduction projects. The approval of supplemental projects to offset the otherwise required stipulated penalties shall be at the discretion of ACHD

VIII. REOPENING

a. In the event that any condition contained within Section IV of this Agreement or within the installation permits of C Battery or D Battery issued by the ACHD is modified or declared void by the ACHD's Hearing Officer or a presiding court so as to create a substantial burden on U.S. Steel to comply with the dates set forth in Sections IV, V, and VIII of this Agreement, such dates may be extended for a time as agreed to by the Parties.

b. U.S. Steel shall notify the ACHD in writing of its desire to extend the dates in Sections IV, V, VIII as permitted in paragraph a of this Section within thirty (30) business days after the condition is modified or declared void.

c. Failure by U. S. Steel to comply with the notice requirements in paragraph b of this Section shall constitute a waiver of U. S. Steel's right to invoke the provisions of paragraph a of this Section.

d. In the event that the Parties can not agree as to the length of extension permitted in paragraph a of this Section within ninety (90) days after the condition is modified or declared void, the ACHD shall set a date and notify U.S. Steel in writing of its position. The ACHD's position shall control unless U.S. Steel invokes the Dispute Resolution procedures outlined in Section XI of this Agreement.

IX. FORCE MAJEURE

a. For the purposes of this Agreement, "Force Majeure" as applied to U. S. Steel or to any entity or person controlled by U. S. Steel, is defined as any event arising from circumstances or causes beyond the control of U. S. Steel or any entity or person controlled by U. S. Steel, including but not limited to its officers, directors, employees, agents, representatives, contractors, subcontractors, or consultants, that may delay or prevent performance of an obligation under this Agreement, despite U.S. Steel's diligent efforts to fulfill the obligation. Such Force Majeure events must not have been potentially foreseen, mitigated or prevented through the performance of reasonable due diligence; and include, but are not limited to, events such as floods, fires, tornadoes, other natural disasters, labor disputes, and unavailability of necessary equipment beyond the reasonable control of U. S. Steel. The requirement to exercise "diligent efforts to fulfill the obligation" includes using

diligent efforts to mitigate any delay caused by a potential Force Majeure event, either as it is occurring, and or following such an event, so that the delay or non-performance is minimized to the greatest extent reasonably possible.

b. If U. S. Steel is prevented from complying with any requirement of this Agreement due to a potential Force Majeure event, U. S. Steel may claim that such an event constitutes Force Majeure, and may petition the ACHD for relief by notifying ACHD in the following manner:

1. by telephone within seventy-two (72) hours, and by U.S. Mail or the equivalent in writing within ten (10) working days of the date U. S. Steel becomes aware, or with reasonable care should have become aware, of the potential Force Majeure event impeding performance. Written notice shall include:

   i. a description of the event and a rationale for attributing the event to Force Majeure; and

   ii. a description of efforts that have been made to prevent, and efforts that are being made to mitigate, the effects of the event and to minimize the length of delay or non-performance; and

   iii. an estimate of the duration of the delay or non-performance; and

   iv. a description of and proposed timetable for implementing measures to bring U.S. Steel back into compliance with this Agreement; and

   v. available documentation, which to the best knowledge and belief of U. S. Steel, supports its claim that the delay or non-performance was attributable to a Force Majeure event.

2. Failure by U. S. Steel to comply with the notice requirements above shall constitute a waiver of U. S. Steel's right to invoke the provisions of this Force Majeure provision as a basis for delay or non-performance under this Agreement for the particular event.

c. ACHD shall determine whether to grant all or part of a requested extension of time to perform obligations under this Agreement, necessary due to a delay caused by a Force Majeure event, on the basis of all documentation submitted by U. S. Steel and other information available to ACHD at the time of the determination. Any extension or excuse period granted shall not exceed the actual delay resulting from such an event. An extension of one compliance date shall not result automatically in the extension of subsequent

compliance dates, unless specifically agreed by ACHD. U. S. Steel must make a separate showing of proof regarding each delayed incremental step or other requirement for which an extension is sought.

d. If ACHD determines that a delay or nonperformance was not caused by a Force Majeure event, or if the Parties are unable to agree on a stipulated extension of time, ACHD will notify U. S. Steel in writing of its position after its receipt of U. S. Steel's written notice hereunder. ACHD's position shall control unless U. S. Steel invokes the Dispute Resolution procedures under Section XI of this Agreement. ACHD shall provide U. S. Steel with written notice of its Force Majeure determination prior to issuing an enforcement demand for the nonperformance or delay in performance of any obligation contained in this Agreement, for which U. S. Steel has made a claim of Force Majeure.

e. If U. S. Steel elects to invoke Dispute Resolution, it shall do so no later than ten (10) days after receipt of ACHD's notice of determination regarding a claim of Force Majeure. U. S. Steel shall have the burden of demonstrating by a preponderance of the evidence that:

1. the delay or nonperformance has been caused by a Force Majeure event;
2. diligent efforts were exercised to avoid and mitigate the effects of the Force Majeure event;
3. U. S. Steel complied with each of the notice requirements;
4. the requested period for delay or nonperformance is appropriate.

f. If ACHD determines that U. S. Steel has carried this burden of demonstrating that a delay in performance was due to Force Majeure, the failure to meet a deadline subsequent to the delay or nonperformance at issue shall not be deemed a violation of this Agreement.

X. DISPUTE RESOLUTION

a. Unless otherwise expressly provided for in this Agreement, the dispute resolution procedures of this Section shall be the exclusive procedure for resolution of disputes arising between the Parties regarding matters arising included in this Agreement.

b. If, in one Party's opinion, there is a dispute between the Parties with respect to implementation of this Agreement or the implementation of any provision of this

Agreement, that Party may send a written Notice of Dispute to the other Party, outlining the nature of the dispute and requesting informal negotiations to resolve the dispute. The Parties shall make reasonable efforts to informally and in good faith resolve all disputes or differences of opinion regarding the implementation of this Agreement. Such period of informal negotiations shall not extend beyond thirty (30) days from the date when the Notice of Dispute was received unless the period is extended by written agreement of the Parties. The dispute shall be considered to have arisen when one Party receives the other Party's Notice of Dispute.

c. In the event that the Parties cannot resolve a dispute by informal negotiations under this Section, the position advanced by ACHD shall govern, control and be binding unless, within twenty (20) days after the conclusion of the informal negotiation period, U. S. Steel invokes the formal dispute resolution procedures of this Section by mailing to ACHD a written statement of position on the matter in dispute, including any available factual data, analysis, or opinion supporting that position, and including any supporting affidavits and/or documentation relied upon by U. S. Steel. Within twenty (20) days following receipt of U. S. Steel's statement of position submitted pursuant to this paragraph, ACHD shall issue a written statement of position (ACHD's Position) on the matter in dispute, including available factual data, analysis, opinion and/or legal arguments supporting ACHD's position along with any supporting affidavits and/or documents relied upon by ACHD.

d. The position of ACHD shall be binding upon U. S. Steel unless U. S. Steel, within thirty (30) days of receipt of the ACHD's written statement of position, files with the Director and serves upon ACHD a petition for dispute resolution (Petition). This Petition shall set forth the matter in dispute, the efforts made by the Parties to resolve it, the relief U. S. Steel requests, and any factual data analysis, opinion, affidavits, legal argument and documentation supporting U. S. Steel's position. The Petition and ACHD's Position shall constitute the initial record for purposes of resolving the dispute. Either Party may request of the hearing officer (or Director, if there is no hearing officer assigned,) the opportunity to supplement the record with appropriate additional information, provided that such information could not reasonably have been obtained or discovered prior to filing the Petition. The hearing officer or Director shall render his or her final decision

on the basis of the full record, including any supplemental materials received. The final decision of the Director or hearing officer shall be appealable by either Party to the Court of Common Pleas of Allegheny County.

e. Judicial and administrative review of any dispute governed by this Section shall be governed by applicable provisions of law.

f. Except as provided in Section IX, the invocation of informal or formal Dispute Resolution procedures under this Section shall not of itself extend, postpone, or affect in any way any obligation of U. S. Steel under this Agreement.

g. Whenever service, process, or notice is required of any dispute pursuant to this Section, such service, notice or process shall be directed to the individual at the addresses specified in paragraphs d and e of Section XII below, unless those individuals or their successors give notice in writing to the other Parties that another individual or address has been designated.

XI. GENERAL PROVISIONS

a. In the event that U. S. Steel fails to comply with any provision of this Agreement, and the ACHD believes that such failure has created an emergency which may lead to the immediate and irreparable harm to the environment or community, ACHD may, in addition to the remedies prescribed herein, pursue any remedy available for a violation of an Order of ACHD, including an action to enforce this Agreement, or any other option available to it under the Clean Air Act, Pennsylvania Air Pollution Control Act, or the Local Health Administration Law.

b. ACHD reserves the right to require additional measures to achieve compliance with this Agreement. U. S. Steel reserves the right to challenge any action that ACHD may take to require those measures.

c. U. S. Steel shall be liable for any violations of this Agreement, including those caused by, contributed to, or allowed by its officers, agents, employees, or contractors.

d. All correspondence with the ACHD concerning this Agreement shall be addressed to:

Mr. Ed Peresie Section Chief, Enforcement	with a copy (not including reports) to: Michael A. Parker, Assistant Solicitor

Allegheny County Health Department
Air Quality Division
301 39th Street, Bldg. #7
Pittsburgh, PA 15201-1891

Allegheny County Health Department
Legal Section
301 39th Street, Bldg. #7
Pittsburgh, PA 15201-1891

e. All correspondence with U. S. Steel concerning this Agreement shall be addressed to:

Mark Jeffrey
Director -Environmental Control
Mon Valley Works
400 State Street
Clairton, PA 15025

David W. Hacker
Attorney-Environmental
600 Grant Street, Room 1500
Pittsburgh, PA 15219

f. U. S. Steel shall notify ACHD whenever there is a change in the contact person's name, title, or address. Service of any notice or any legal process for any purpose under this Agreement, including its enforcement, may be made by mailing an original or true and correct copy by first class mail to the above addresses.

g. The Paragraphs of this Agreement are severable, and should any part hereof be declared invalid or unenforceable, the remainder shall remain in full force and effect between the Parties.

h. This Agreement shall constitute the entire integrated Agreement of the Parties. No prior or contemporaneous communications or prior drafts shall be relevant or admissible for the purposes of determining the meaning or intent of any provisions herein in any litigation or other proceeding.

i. The Parties shall bear their respective attorneys fees, expenses, and other costs with regard to the prosecution or defense of this matter or any related matters arising prior to the execution of this agreement.

j. This Agreement may be modified only by written agreement of the Parties.

XII. EFFECTIVE AND TERMINATION DATES

a. This Agreement shall be effective immediately upon the date of the last signature.

b. It is the intention of the parties that this Consent Order and Agreement may terminate separately by required Corrective Action and Restrictions as set forth below for each Corrective Action and Restriction as required by Sections IV.A and IV.B of this Consent

Order and Agreement. U. S. Steel has completed the Corrective Actions for Clairton Plant Batteries 7, 8, and 9 and Edgar Thomson Plant BOP Mixer Baghouse. For purposes of this termination paragraph, the Corrective Actions are as follows: (1) Clairton Plant Batteries 1, 2, and 3; (2) Clairton Plant Battery 15; (3) Clairton Plant Battery 19; (4) Clairton Plant Battery 20; (5) Clairton Plant Number 3 Screening Station; (6) Clairton – Installation of New Low Emission Quench Towers; (7) Clairton – PM2.5 Emission Evaluations; (8) Clairton Plant – Installation of SODAR; (9) Edgar Thomson Plant BOP Roof Monitor; (10) Edgar Thomson Plant BOP Gas Cleaning; and (11) Edgar Thomson Plant LMF; and (12) Edgar Thomson Plant – Emissions Testing. For purposes of this termination paragraph, the Restrictions are as follows: (1) Clairton Batteries 1-3 - Coking Time pursuant to paragraphs IVA.a.2 through IV.a.4; (2) Clairton Batteries 1-3 Soaking Observation requirements pursuant to paragraph IVA.a.5 and (3) Clairton Batteries 1-3 – Pushing Observation requirements pursuant to paragraph IVA.a.6. Each Corrective Action or Restriction shall terminate, in whole or in part, if each of the following are met:

1. U. S. Steel has completed and complied with the provisions contained in the Consent Order and Agreement for the Corrective Action for which termination is sought;
2. U. S. Steel has paid the Civil Penalty required by Section VI;
3. U. S. Steel has paid any stipulated penalties due and owing to ACHD associated with the Corrective Action for which termination is sought;
4. U. S. Steel submits a written request to ACHD indicating that it has completed and complied with the provisions for the Corrective Action for which termination is sought; and
5. ACHD, within 60-days of receiving such a request from U. S. Steel, has not contested in writing that such compliance has been achieved. If ACHD disputes U. S. Steel's compliance with Corrective Action for which termination is sought, ACHD shall provide written notice to U. S. Steel within sixty (60) days of the date of the request and the Dispute Resolution provisions of the Consent Order and Agreement shall be invoked and the Consent Order and Agreement remain in effect for that Corrective Action for which termination is sought pending the resolution of the dispute by the parties or the Court.

c. It is the intention of the parties that restriction regarding the soaking standard applicable to Clairton Batteries 1-3, as provided in paragraph IVA.a.1, shall be superseded and terminated when the Department promulgates a soaking standard rule, pursuant to its rulemaking authority.

IN WITNESS WHEREOF, the Parties hereto have caused this Agreement to be executed by their duly authorized representatives. The undersigned representative of U. S. Steel certify under penalty of law, as provided by 18 Pa.C.S. §4909 that he is authorized to execute this Agreement on behalf of U. S. Steel; that U. S. Steel consents to the entry of this Agreement as a final ORDER of ACHD; and that, except as otherwise provided herein, U. S. Steel hereby knowingly waives its rights to appeal this Agreement and to challenge its content or validity, which rights may be available under Article XI, and Pennsylvania Administrative Agency Law, 2 Pa.C.S. §103(a), or any other applicable provision of law. Signature by U. S. Steel's attorney certifies only that this Agreement has been signed after consulting with counsel.

FOR ACHD

7/6/11
Date

Bruce W. Dixon, M.D.
Director

7/6/11
Date

Henry Miller, III
Solicitor

7/6/11
Date

Michael A. Parker
Assistant Solicitor

FOR U.S. Steel

6/27/2011
Date

MS Williams
Michael S. Williams
Senior Vice President
North American Flat-Roll Division

6/27/2011
Date

David W. Hacker
Attorney – Environmental

Appendix A

Advanced Patching Plan

1. Track stack exceedances and corrective actions electronically along with the date that repairs (wet slurry patching, dry gunning, or ceramic welding or the equivalent to these techniques) were completed.
2. Repairs will be completed based on the following schedule:
   - wet slurry patching completed within 10 days of exceedance root cause identification;
   - dry gunning repair completed within 21 days of exceedance root cause identification;
   - ceramic welding repair completed within 30 days of exceedance root cause identification.

   Days where the oven is taken out of service will not be counted.
3. Charts of the magnitude and duration of opacities will be used along with oven wall inspections to prioritize oven repair
4. A procedure for Identifying Ovens for Repair will be maintained in the Environmental Management System.
5. Equivalent techniques will be approved by ACHD.

Appendix B

Flue Nozzle Repair and Replacement Plan

1. Track exceedances and corrective actions electronically along with the date that repairs were completed.
2. Repairs will be completed based on the following schedule:
   - Flue cleanout will be completed within 10 days of exceedance root cause identification;
   - Flue nozzle replacement will be completed within 21 days of exceedance root cause identification.

   Days where the oven is taken out of service will not be counted.
3. Flue inspections including cross wall inspections (or equivalent technique) will be performed monthly and the results maintained electronically.
4. A procedure for prioritizing repairs will be maintained in the Environmental Management System.
5. Equivalent techniques will be approved by ACHD.

Appendix C

Regenerator Repair Plan

1. When a combustion issue arises based on the review of COM data and cross wall data, the regenerators are inspected and the results are documented electronically.
2. Repairs are identified and prioritized based on a procedure to be maintained in the Environmental Management System.
3. Equivalent techniques will be approved by ACHD.

Appendix D

Gas Gun Improvement Plan

1. Cross wall data are used to identify potential gas gun issues.
2. Repairs will be completed based on the following schedule:
   - Gas gun cleanout will be completed within 10 days of exceedance root cause identification;
   - Gas gun weld will be completed within 21 days of exceedance root cause identification:
3. Repairs are documented electronically.
4. Follow-up cross wall temperatures are taken and documented electronically to track effectiveness.
5. Equivalent techniques will be approved by ACHD.

Appendix E

Enhanced Preventive Maintenance Refractory Repair Plan

1. Perform dry gunning all oven ends.
2. Perform dry gunning all standpipe interiors.
3. Perform dry gunning all charging holes.
4. Perform ceramic welding and replace standpipes where dry gunning is not sufficient.
5. Equivalent techniques will be approved by ACHD.

Appendix F

Revitalization Plan of Battery Heating System

1. COM data is used to identify potential issues.
2. Track exceedances and corrective actions electronically along with the date that repairs were completed.
3. Repairs will be completed based on the following schedule:
   - Gas riser grouting completed within 30 days of exceedance root cause identification. Days where the oven is taken out of service will not be counted.
4. Flue inspections including cross wall inspections (or equivalent technique) will be performed monthly and the results maintained electronically.
5. A procedure for prioritizing repairs will be maintained in the Environmental Management System.
6. Equivalent techniques will be approved by ACHD.

F-3: Regional 2014 Interpolations/Projections

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LIBERTY-CLAIRTON $PM_{2.5}$ SIP
LOCAL AND ADDITIONAL PROJECTIONS 2014

COUNTY OF ALLEGHENY CONTRACT NUMBER 130103

CONSULTANT TECHNICAL SUPPORT FOR AIR POLLUTANT AREA AND MOBILE SOURCES ANALYSIS

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SUMMARY

This appendix describes the methods that were used to estimate 2014 emissions for regions whose emissions have the potential to affect particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$) concentrations in the Liberty-Clairton area. The regions covered here include the Lake Michigan states and the Mid-Atlantic and Northeast states. TranSystems developed a non-electricity generating point source emissions file for 2014 for the Lake Michigan states. For the Mid-Atlantic and Northeast states, TranSystems developed 2014 emission files for non-electricity generating unit (EGU) point sources, area sources, and nonroad mobile sources (including marine aircraft and railroad locomotive emissions).

I. LAKE MICHIGAN STATES NON-EGU POINT SOURCES

For the Lake Michigan states, while that region had sponsored a contractor study that developed growth and control factors for the region from a 2008 base year, at the time of this analysis (June 2012) the Lake Michigan Air Directors Consortium (LADCO) had not used the growth and control factor data files to generate any future year emission files. Therefore, in order to generate a 2014 non-EGU point source emission file for the Lake Michigan states, it was necessary to use the growth and control factor files from the LADCO-sponsored study (TranSystems, 2011) to generate a best estimate of 2014 non-EGU emissions for the LADCO states.

Because the National Emissions Inventory (NEI) 2008 emissions file was used by the Allegheny County Health Department (ACHD) to represent base year emissions, that file rather than the point source file that was supplied by the LADCO states for the 2011 TranSystems study was used as the base year emissions file for developing the 2014 emission forecast file. The LADCO state non-EGU inventories were developed according to LADCO methods for Illinois, Indiana, Michigan, Ohio, and Wisconsin. While the LADCO-sponsored growth and control factor development project also examined Minnesota, the 2014 emission estimates for Minnesota were from the U.S. Environmental Protection Agency (EPA) files developed for the Cross State Air Pollution Rule analysis.

The information that follows is from the report describing how the control factors were originally developed for LADCO. This explains the key regulations that were captured in the non-EGU point source analysis. While the analysis for LADCO included regulations and standards that have a potential effect on emissions through 2030, this analysis only incorporates the control factors that are expected to affect emissions in the period from 2008 to 2014.

A. LADCO NON-EGU POINT SOURCES CONTROL FACTOR DEVELOPMENT

1. NO_x SIP Call

All states in the LADCO region affected by the oxides of nitrogen (NO_x) State Implementation Plan (SIP) Call requirements (Ohio, Indiana, Illinois, Michigan) indicated that their sources were complying in 2008. Therefore, no control factors are applied post-2008 to NO_x SIP Call affected sources.

2. Maximum Achievable Control Technology (MACT) Standards

After considering the list of EPA MACT standards affecting point sources with compliance dates after 2008, it was decided that the LADCO states would apply control factors only to those source categories to which control factors were applied in the comparable Mid-Atlantic Regional Air Management Association (MARAMA) Mid-Atlantic Northeast Visibility Union (MANE-VU) projections analysis. This decision was reached in part because the additional interim pollutant emission reductions from the newest set of MACT standards is expected to be modest, plus there has been no EPA guidance to states on how to estimate the volatile organic compound (VOC), NO_x, and particulate matter (PM) benefits of these national emission standards for hazardous air pollutants (NESHAPs).

Reciprocating Internal Combustion Engine (RICE) Rules
EPA has prepared Source Classification Code (SCC)-level percentage reduction estimates from uncontrolled emission levels for their recent RICE MACT rules. Because LADCO expressed a preference for reflecting incremental reductions relative to baseline emissions in this project's control factor files, TranSystems reviewed the technical supporting documents for the RICE MACT rules for relevant information. For the RICE MACT rules for spark-ignition (SI) engines, EPA reports both baseline and post-control emission estimates for carbon monoxide (CO), NO_x, and VOC (EPA, 2010). This information was used to develop the overall SI engine MACT reductions for each pollutant that were incorporated into the LADCO control factor files. Because analogous information was not available for the compression ignition (CI) engine MACT rule, it was necessary to rely on EPA's estimates of CO, PM, and VOC reductions relative to uncontrolled emissions (we do not expect that affected CI engines are controlled in the baseline to a significant degree, however). To identify the SCC/pollutant combinations to which the RICE MACT rules apply, the SCC/pollutant information incorporated into EPA's most recent emissions modeling files was used – control factor files prepared in support of version 4.1 of EPA's 2005-based air quality modeling platform (EPA, 2011). In keeping with EPA statements, the control factor files assume compliance with the CI engine standards by May 3, 2013, and the SI engine standards by October 19, 2013.

3. Best Available Retrofit Technology (BART)/Consent Decree Sources

The control information for BART and Consent Decree sources is based on information provided by the state air pollution control agencies in the Midwest and is shown in Table 1. For this analysis, BART and Consent Decree requirements were considered together because some states examined what the consent decrees require for potential BART sources, and then make judgments about whether the reductions required by the consent decree are equal to or more stringent than BART.

4. Control Technique Guidelines

The Ohio EPA expects to revise its VOC emission regulations in the Cleveland-Akron-Lorain ozone nonattainment area in response to the new control technique guidelines (CTGs) issued by EPA between 2006 and 2008, and that agency estimated the effects of their expected revised regulations on VOC emissions. A summary of the key source categories and associated future year emission reductions is described below.

Miscellaneous Industrial Adhesives: Ohio EPA provided separate tables identifying counties affected by "Adhesive Processes" and "Industrial Adhesives" controls. However, they only provided compliance date information for "Miscellaneous Industrial Adhesives" (May 1, 2012), and the "Adhesive Processes" information table cites a state rule that regulates miscellaneous industrial adhesives. To address the overlaps in the Ohio EPA list of affected SCC/counties, TranSystems applied the 50 percent VOC emission reduction that Ohio EPA provided for Miscellaneous Industrial Adhesives only to records for which there was not an overlapping SCC/county reported in the "Adhesives Processes" table. In keeping with Ohio EPA guidance, TranSystems applied a 40 percent VOC emission reduction for all SCC/county combinations in the "Adhesive Processes" table. The 50 and 40 percent reductions reflect the estimates reported in Ohio EPA's "probable reductions" columns in each table.

Automobile and Light-Duty Truck (LDT) Coating processes: Ohio EPA estimates a probable 15 percent additional VOC emission reduction attributable to VOC RACT regulations implementing the new CTG for this source category. The Ohio EPA provided a list of SCC/county combinations in the Cleveland-Akron-Lorain ozone nonattainment area affected by this CTG. In some cases these SCC/county combinations were listed as affected by other CTGs. TranSystems applied the 15 percent VOC reduction to only those SCC/county combinations for which a CTG with a higher percentage reduction was not also identified by Ohio.

Table 1. Lake Michigan State BART Eligible Non-EGU Sources

State	State ID	Source Name	County	County ID	Source ID	BART Emission Unit ID	Description	Stack ID	Estimated Emission Reduction (%)		Estimated Compliance Dates	
									Sulfur Dioxide (SO_2)	NO_x	SO_2	NO_x
ILLINOIS	17	Conoco Phillips	Madison	119	119090AAA		FCCU1 (Wood River)		90	50	121708	121708
							FCCU 2 (Wood River)		90	50	121510	121510
ILLINOIS	17	Exxon Mobil	Will	197	197800AAA		FCCU	15		90		123111
ILLINOIS	17	CITGO	Will	197	197090AAI		FCCU Catalyst Regeneration 112D-1	7		90		123111
ILLINOIS	17	Marathon	Crawford	033	033808AAB					50		123108
INDIANA	18	AGC DIVISION-ALCOA POWER GENERATING	Warrick	173	00002	Boiler #2	Dry Bottom, pulverized coal-fired boiler	241-242	95	5	010109	010109
						Boiler #3	Dry Bottom pulverized coal-fired boiler	242	95	5	010109	010109
						Boiler #4	Dry Bottom, pulverized coal-fired boiler	243	95	5	010109	010109
MICHIGAN	26	Lafarge Midwest Inc.	Alpena	007	B1477	EU-KILNS 19, 20, 21, 22, & 23	Three Portland Cement kilns (KG 5)	SV0031, 32, 33	90	34	031212	031212
								19	90	34	120112	031212
								20	90	34	120112	031212
								21	90	34	120112	031212
								22	90	34	030114	031212
								23	90	34	030114	031212
OHIO	39	P.H. Glatfelter	Ross	067	0671010028	B002	Please see description in text (above).	SV-5001	90		123114	
						B003	Please see description in text (above).	SV-5001			123114	

Miscellaneous Metal Coating: A 10 percent VOC emission reduction was applied to the SCCs and counties identified by Ohio EPA as affected by revised VOC RACT rules for miscellaneous metal coating processes. As with the Automobile and LDT Coating CTG, TranSystems applied this reduction to only those SCC/county combinations for which Ohio did not identify another CTG with a higher percentage emissions reduction.

5. NO_x RACT

Ohio EPA provided estimates of the expected post-2008 NO_x emission reductions for four facilities in the Cleveland-Akron-Lorain ozone nonattainment area. These emission reductions are listed in Table 2 along with the affected facility and source identifiers provided by Ohio. We were not able to identify complete matches to this information in the LADCO base year inventory -- we assumed that the U.S. Steel facility was associated with SITE ID 02470780961

(note addition of leading zero), and we included all base year NO_x emission records for Alcoa SITE ID 1318170314 because we were unable to identify POINT ID B004 and B005 records in the inventory.

B. EMISSIONS ACTIVITY GROWTH DATA

The LADCO region non-EGU point source emission estimates for 2014 used growth factors developed for LADCO during 2011 (TranSystems, 2011). The growth factor file used included growth factors for every forecast year after the base year, so for this assessment, the growth factor applied was the 2008 to 2014 growth factor. Growth factors are organized by EPA SCC.

For the LADCO state non-EGU projections, the general approaches used to develop emissions activity growth data were derived from data or projection methods used to support EPA efforts to improve non-EGU stationary source emission forecasts (Pechan, 2010 and Chappell, 2010).

With two major exceptions, TranSystems developed stationary source growth factors for LADCO by interpolating growth factors for the LADCO years of interest from the EPA growth factors, which represented emissions activity changes from a 2005 base year to each fifth year over the period 2010-2030. To the extent that source categories in the LADCO inventory did not match those available from the EPA project, a growth factor was assigned to the growth indicator that was applied to the most closely related SCC in the EPA database.

The first major exception to the general growth factor development approach was to update the EPA growth factors that were based on forecasts from the Energy Information Administration (EIA)'s *Annual Energy Outlo*ok (AEO) to reflect projections from the latest (2011) AEO. Many of the EPA stationary source categories growth rates are based on AEO energy or socioeconomic forecasts. The majority of the AEO-based projections used reflected regional forecasts – i.e., the same growth rate is applied to each LADCO state because these states comprise the East North Central division.

For the following non-combustion priority stationary point source categories, EPA developed projections data using a variety of methods and data sources: 1) Carbon Black; 2) Cement Manufacturing; 3) Copper Production; 4) Glass Manufacturing; 5) Iron and Steel Manufacturing; 6) Petroleum Refining; 7) Primary Aluminum Manufacturing; 8) Pulp and Paper Manufacturing; 9) Secondary Aluminum Production; and 10) Sulfuric Acid Production. These methods/data sources included:

- Regression analysis of historical NEI emissions with US Bureau of Census production and factor of production data;
- Industry output forecasts;
- EGAS Version 5.0 projections;
- EMPAX-CGE industry growth projections;
- Chemical Economics Handbook information;

Table 2. Lake Michigan State NO_x RACT Summary

Facility Name	Facility ID	Point ID	NO_x Emissions 2008 (tons)	Future Reductions w/controls (tons)	NO_x Reduction Percentage
Emerald Performance	1677010029	B008	233	70	30
U.S. Steel	247080961	P039	178	120	67
Alcoa	1318170314	B004 & B005	96	73	76
NASA	1318001169	B005	54	40	74

- US Bureau of Census data;
- Department of Energy, *Annual Energy Outlo*ok 2010 forecasts; and
- Consultation with EPA industry sector experts.

More details on the priority stationary point source category emissions activity projection methods/data sources are provided in an EPA memorandum (Chappell, 2010).

C. RESULTS

Using the LADCO state growth factor file and control factor file for non-EGU point sources, the 2014 emissions were estimated as:

*2014 emissions = 2008 emissions * GF (2008 to 2014) * (1-CF)*

where:

GF = growth factor by county and SCC
CF = control factor by county and SCC

Table 3 provides state-level non-EGU point source emission summaries for the five Lake Michigan states. This table shows the estimated 2008 non-EGU emissions in these states followed by the 2014 estimates developed using growth and control factors. Percentage differences between 2008 and 2014 emissions are also provided. The most significant expected non-EGU point source emission reductions are for NO_x and SO_2, and are observed in Illinois and Michigan.

Table 3. Lake Michigan State Non-EGU Point Source Emission Estimates (tons per year) 2008 versus 2014

2008 Non-EGU							
State	**VOC**	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**Ammonia (NH_3)**
Illinois	51,489	82,101	93,090	106,750	19,424	10,948	1,296
Indiana	37,405	65,015	335,738	70,690	33,284	24,791	781
Michigan	27,833	72,612	76,461	56,941	19,246	11,311	711
Ohio	30,898	58,549	246,343	106,893	22,919	19,080	2,982
Wisconsin	30,420	39,720	62,937	60,013	9,047	1,088	424
Region Totals	**178,044**	**317,997**	**814,569**	**401,287**	**103,920**	**67,218**	**6,193**
2014 Non-EGU							
State	**VOC**	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**NH_3**
Illinois	52,777	80,260	76,562	86,031	19,696	11,115	1,407
Indiana	37,697	72,837	393,114	64,362	36,070	26,672	859
Michigan	28,141	74,518	70,262	42,936	19,325	11,547	782
Ohio	31,573	61,308	255,859	92,201	24,297	20,472	3,288
Wisconsin	27,789	37,916	33,898	46,993	8,698	894	444
Region Totals	**177,977**	**326,838**	**829,695**	**332,523**	**108,086**	**70,699**	**6,779**
Percentage Difference							
State	**VOC**	**NO_x**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**NH_3**
Illinois	2.5%	-2.2%	-17.8%	-19.4%	1.4%	1.5%	8.6%
Indiana	0.8%	12.0%	17.1%	-9.0%	8.4%	7.6%	10.0%
Michigan	1.1%	2.6%	-8.1%	-24.6%	0.4%	2.1%	9.9%
Ohio	2.2%	4.7%	3.9%	-13.7%	6.0%	7.3%	10.3%
Wisconsin	-8.6%	-4.5%	-46.1%	-21.7%	-3.9%	-17.9%	4.8%
Region Totals	**0.0%**	**2.8%**	**1.9%**	**-17.1%**	**4.0%**	**5.2%**	**9.5%**

SO_2 emission declines in Wisconsin are attributable to expected reduced activity for the sectors with the most significant SO_2 emissions (rather than control programs). The SO_2 emission reductions estimated for 2014 in Illinois are attributable both to activity declines and expected control programs. The effects of activity declines and control programs are about equal. SO_2 emission reductions estimated for this sector in Ohio (a 13.7 percent reduction) and Indiana (a 9 percent reduction) are all from expected declines in economic activity. The expected SO_2 emission reductions in Michigan are mostly attributable to controls at BART eligible cement kilns.

II. MID-ATLANTIC STATES AND NEW ENGLAND STATES

A. REGIONAL EMISSION INVENTORIES

MARAMA coordinated the development of regional emission inventories for air quality modeling. The inventory includes emissions from Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia. Version 2 of the 2007 Emission Inventory and Version 2 of the Future Years Emission Inventories were used in this analysis (Vickers et al., 2011).

The focus of the effort for the MARAMA/MANE-VU states was on using the available 2017 forecast year emission estimates by sector along with 2007 base year emission estimates for these sectors to interpolate to estimate 2014 emissions. This interpolation was used to estimate 2014 emissions for the following sectors:

1. Non-EGU Point
2. Area
3. Nonroad (including marine, aircraft, and rail)

The general formula for performing the interpolations was as follows:

*2014 Emissions = ((2017 Emis – 2007 Emis) / (2017-2007)) * (2014-2007) + 2007 Emis*

The 2017 Existing Controls file was used to estimate 2017 emissions.

B. ALLEGHENY COUNTY EMISSION INVENTORIES

The MARAMA/MANE-VU emission estimates for Allegheny County were reviewed to understand where transport factors needed to be applied in order to estimate PM_{10} and $PM_{2.5}$ emissions for regional modeling. This was done by comparing NEI Information Format (NIF) and Sparse Matrix Operator Kernel Emissions Model (SMOKE) format files. It was found that the transport factor for Allegheny County, Pennsylvania was 0.2308 for all of the fugitive dust SCCs to which it is applied. Those SCCs include:

Fugitive Dust Source Type	SCCs
1. Paved Roads	2294000000
2. Unpaved Roads	2296000000
3. Construction Activity	2311010000, 2311020000, 2311030000
4. Agricultural Tilling	2801000003

These PM transport factors were applied to the PM_{10} and $PM_{2.5}$ emission estimates for the above SCCs in order to provide the appropriate emission files for use in regional modeling of the Allegheny County emissions contribution.

C. RESULTS

Tables 4, 5, and 6 summarize the MARAMA/MANE-VU state-level 2014 emission estimates that were developed for the region using the interpolation methods described above.

Table 4. MARAMA/MANE-VU State 2014 Emission Estimates – Area Sources (tons per year)

State	CO	NH_3	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Connecticut	39,161	4,442	11,497	15,444	8,077	13,885	49,631
Delaware	7,996	14,378	2,218	7,459	2,431	1,005	8,886
District of Columbia	5,319	186	1,556	2,494	1,118	1,069	5,397
Maine	48,235	6,063	6,169	19,943	8,359	8,453	27,869
Maryland	73,098	26,058	10,757	40,368	15,082	2,959	59,260
Massachusetts	76,605	13,876	19,365	58,100	18,258	17,155	72,091
Michigan	38,087	1,520	4,328	10,656	5,655	4,508	21,329
New Jersey	74,800	16,183	23,584	25,275	14,804	3,138	92,417
New York	214,378	46,062	66,213	147,081	48,898	29,169	187,781
Pennsylvania	207,566	75,939	46,411	139,341	49,798	59,090	168,439
Rhode Island	14,641	628	3,352	5,691	2,901	3,425	21,464
Vermont	47,918	8,013	3,748	18,535	9,000	3,336	12,850
Virginia	130,265	45,122	18,604	78,050	29,303	15,546	137,431
Area Total	**978,071**	**258,470**	**217,802**	**568,437**	**213,684**	**162,738**	**864,844**

Table 5. MARAMA/MANE-VU State 2014 Emission Estimates – Nonroad Mobile Sources (tons per year)

State	CO	NH_3	NO_x	PM_{10}-PRI	$PM_{2.5}$-PRI	SO_2	VOC
Connecticut	155,055	19	10,941	1,107	1,048	262	14,478
Delaware	44,684	6	3,667	353	335	85	4,869
District of Columbia	11,468	3	1,911	169	163	61	922
Maine	103,816	14	5,883	913	853	136	22,476
Maryland	262,786	33	18,468	2,027	1,919	456	25,406
Massachusetts	266,007	32	18,316	1,856	1,758	442	25,060
Michigan	78,247	11	6,440	670	631	144	12,853
New Jersey	387,029	45	25,403	2,656	2,516	610	33,457
New York	774,851	94	52,125	5,397	5,116	1,270	81,547
Pennsylvania	589,514	68	37,935	4,289	4,062	950	61,887
Rhode Island	41,312	5	2,960	270	256	68	4,036
Vermont	40,934	6	2,777	374	351	65	7,802
Virginia	359,400	50	28,958	3,125	2,964	748	39,039
Nonroad Total	**3,115,101**	**386**	**215,783**	**23,204**	**21,972**	**5,297**	**333,831**

Table 6. MARAMA/MANE-VU State 2014 Emission Estimates – Non-EGU Point Sources (tons per year)

State	CO	NH_3	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Connecticut	2,904	0	7,207	609	540	3,221	1,505
Delaware	7,191	58	3,720	1,010	913	6,635	2,827
District of Columbia	318	0	751	32	31	377	59
Maine	18,861	590	19,348	4,488	3,624	13,342	4,900
Maryland	71,027	137	22,627	5,287	3,523	30,055	4,841
Massachusetts	5,521	357	13,806	2,941	2,511	8,346	3,886
Michigan	4,159	34	3,178	1,223	1,136	2,678	1,284
New Jersey	7,061	214	12,012	3,246	2,467	2,769	9,733
New York	54,115	1,077	30,017	4,321	2,355	42,741	9,802
Pennsylvania	82,389	2,099	65,979	21,304	12,926	54,429	28,555
Rhode Island	924	14	883	174	124	1,441	938
Vermont	1,080	0	686	134	103	268	333
Virginia	64,558	1,673	51,556	12,568	9,913	52,401	35,294
Point Total	**320,108**	**6,252**	**231,770**	**57,338**	**40,167**	**218,705**	**103,955**

In the MARAMA 2007 and 2017 file organization, the emission estimates for the commercial marine vessel, aircraft, and railroad locomotive emissions are computed and stored separately from the nonroad mobile emission estimates computed using EPA's National Mobile Inventory Model (NMIM). Table 7 provides state-level estimates of 2014 marine, aircraft, and locomotive emissions, along with comparisons with 2007 emissions.

Table 7. MARAMA/MANE-VU State Nonroad Mobile-Marine/Aircraft/Rail Emissions (tons per year)

2007 State Totals							
State	**CO**	**NH_3**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
Connecticut	5,921	3	8,964	423	387	1,538	744
Delaware	2,253	0	6,283	369	339	2,140	806
District of Columbia	88	0	512	12	12	38	35
Maine	33,589	0	3,162	506	450	295	445
Maryland	13,760	7	22,704	897	783	2,481	2,006
Massachusetts	17,615	2	12,570	769	651	983	1,924
Michigan	2,266	0	1,441	72	60	544	192
New Jersey	24,162	10	22,259	951	865	7,273	3,354
New York	23,939	2	55,852	2,419	2,253	10,637	4,588
Pennsylvania	30,820	22	35,790	1,623	1,429	3,694	4,505
Rhode Island	2,277	1	3,263	138	128	667	184
Vermont	2,493	0	839	64	49	17	232
Virginia	28,444	17	45,599	2,402	2,074	4,673	4,312
Regional Totals	**187,627**	**66**	**219,236**	**10,645**	**9,479**	**34,980**	**23,328**
2014 State Totals							
State	**CO**	**NH_3**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
Connecticut	5,504	3	6,824	274	247	629	663
Delaware	2,154	0	4,893	203	185	838	766
District of Columbia	89	0	404	9	8	12	28
Maine	33,459	0	2,691	325	284	111	397
Maryland	13,301	8	17,594	585	501	1,075	1,761
Massachusetts	16,824	2	10,138	602	499	498	1,714
Michigan	2,104	0	1,339	60	49	220	179
New Jersey	24,503	12	20,948	639	577	2,838	3,383
New York	24,446	2	44,206	1,570	1,466	4,332	4,203
Pennsylvania	30,464	22	28,766	1,144	989	1,667	4,110
Rhode Island	2,578	1	2,516	105	94	267	207
Vermont	2,273	0	866	58	45	14	217
Virginia	28,557	17	36,268	1,843	1,547	2,378	3,891
Regional Totals	**186,255**	**68**	**177,453**	**7,414**	**6,491**	**14,880**	**21,519**

Percentage Difference							
State	**CO**	**NH_3**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
Connecticut	-7.0%	1.7%	-23.9%	-35.2%	-36.0%	-59.1%	-10.9%
Delaware	-4.4%	1.3%	-22.1%	-45.0%	-45.5%	-60.9%	-5.0%
District of Columbia	1.0%	-1.8%	-21.1%	-30.7%	-30.9%	-69.5%	-21.7%
Maine	-0.4%	0.0%	-14.9%	-35.8%	-36.9%	-62.2%	-10.8%
Maryland	-3.3%	0.7%	-22.5%	-34.8%	-36.0%	-56.7%	-12.2%
Massachusetts	-4.5%	5.3%	-19.3%	-21.8%	-23.3%	-49.3%	-10.9%
Michigan	-7.2%	0.0%	-7.1%	-17.4%	-18.6%	-59.6%	-6.8%
New Jersey	1.4%	17.8%	-5.9%	-32.8%	-33.3%	-61.0%	0.9%
New York	2.1%	-0.9%	-20.9%	-35.1%	-34.9%	-59.3%	-8.4%
Pennsylvania	-1.2%	0.6%	-19.6%	-29.5%	-30.8%	-54.9%	-8.8%
Rhode Island	13.2%	2.0%	-22.9%	-24.3%	-26.6%	-60.0%	12.8%
Vermont	-8.8%	5.6%	3.2%	-9.2%	-9.0%	-14.9%	-6.8%
Virginia	0.4%	1.0%	-20.5%	-23.3%	-25.4%	-49.1%	-9.8%
Regional Totals	**-0.7%**	**3.6%**	**-19.1%**	**-30.4%**	**-31.5%**	**-57.5%**	**-7.8%**

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$PM_{2.5}$ SIP

Appendix G

Modeling Documentation

G-1: Modeling Protocol for Liberty-Clairton Area

G-2: Baseline Case 2007 Model Performance

G-3: Air Quality Modeling TSD

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G-1: Modeling Protocol for Liberty-Clairton Area

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$PM_{2.5}$ Modeling Protocol

2006 $PM_{2.5}$ Standards

Liberty-Clairton Nonattainment Area

Allegheny County Health Department
Air Quality Program

November 23, 2011
(Updated December 6, 2012)

TABLE OF CONTENTS

1 OVERVIEW 1

1.1 $PM_{2.5}$ Designations 1

1.2 Stakeholders 2

2 PROBLEM STATEMENT 4

2.1 Geographic Situation 4

2.2 Monitoring Data 5

3 SELECTION CRITERIA 7

3.1 Model Selection 7

3.1.1 Meteorological Model Selection 7

3.1.2 Emissions Model Selection 9

3.1.3 Air Quality Model Selection 10

3.2 $PM_{2.5}$ Components 11

3.3 Modeling Years 11

4 MODELING PROCEDURE 12

4.1 Horizontal Modeling Domains 12

4.2 Vertical Layer Structure 22

4.3 Geophysical Data 23

4.4 Meteorological Inputs 24

4.4.1 WRF Meteorological Modeling 24

4.4.2 Meteorological Inputs for AERMOD 25

4.5 Emissions Inputs 26

4.6 Receptor Grids 27

4.7 CAMx Configuration 28

5 EVALUATION OF RESULTS 31

5.1 Meteorological Model Performance Evaluation 31

5.1.1 Components of the ACHD WRF Evaluation 31

5.1.2 Data Supporting Meteorological Model Evaluation 31

5.1.3 Meteorological Model Evaluation Tools 31

5.2 Air Quality Model Performance Evaluation 32

5.2.1 Context for the Liberty-Clairton Model Performance Evaluation 32

5.2.2 Multi-Layered Model Testing Process 33

5.2.3 Development of Consistent Evaluation Data Sets 33

5.2.4 Air Quality Model Evaluation Tools 34

5.3 Attainment Tests 38

5.3.1 Speciation of FRM $PM_{2.5}$ Mass Measurements 38

5.3.2 Speciated Modeled Attainment Test (SMAT) 39

5.3.3 Special Considerations for Local-Scale Primary $PM_{2.5}$ Impacts 39
5.4 Weight of Evidence Analyses 40
6 REFERENCES 42
APPENDIX A – Maps of Affected Areas A1
APPENDIX B – Monitored Sites and Data A4
APPENDIX C – Meteorological Sites A10
APPENDIX D – Facilities Potentially Affecting Liberty-Clairton A11
APPENDIX E – Application of CAMx to the St. Louis area using Plume-in-Grid (PiG) to treat local source contributions. A12

LIST OF TABLES

Table 1-1. Members of the Liberty-Clairton $PM_{2.5}$ Modeling Workgroup and key participants in the $PM_{2.5}$ modeling. 3

Table 4-1. WRF 37 and CAMx 25 vertical layers structure and potential strategy for layer collapsing. Final CAMx vertical layer structure will depend on CAMx sensitivity tests with and without layer collapsing in the lower 4,000 m of the atmosphere. 23

Table 4-2. WRF Version 3.3.1 physics options. 25

Table 4-3. Science options selected for the CAMx Liberty-Clairton $PM_{2.5}$ modeling. 30

Table 5-1. Core statistical measures to be used in the Liberty-Clairton air quality model evaluation with ground-level data. 37

LIST OF FIGURES

Figure 2-1. Source categories contributing to $PM_{2.5}$ concentrations at Liberty using the Positive Matrix Factorization (PMF) receptor model. 5

Figure 2-2. Excess $PM_{2.5}$ concentrations at the Liberty monitoring site compared to regional sites. 6

Figure 4-1. Definitions of the 36/12/4/0.8 km domain structure to be used for the WRF meteorological (dotted lines) and CAMx (solid lines) photochemical grid modeling. 13

Figure 4-2. 12/4/0.8 km domain structure to be used for the WRF meteorological (dotted lines) and CAMx (solid lines) photochemical grid modeling. 13

Figure 4-3. 4 km and 800 m domain structure to be used for the CAMx photochemical grid modeling. 14

Figure 4-4. Annual total point source emissions of NO_X from the EPA 2006 modeling database along with the proposed 12 km (blue rectangle), 4 km (green rectangle) and 0.8 km (red rectangle) modeling domains. 15

Figure 4-5. Annual total point source emissions of SO_2 from the EPA 2006 modeling database along with the proposed 12 km (blue rectangle), 4 km (green rectangle) and 0.8 km (red rectangle) modeling domains. 16

Figure 4-6. Annual total point source emissions of $PM_{2.5}$ from the EPA 2006 modeling database along with the proposed 12 km (blue rectangle), 4 km (green rectangle) and 0.8 km (red rectangle) modeling domains. 17

Figure 4-7. Annual total area source emissions of NO_X from the EPA 2006 modeling database along with the proposed 12 km (blue rectangle), 4 km (green rectangle) and 0.8 km (red rectangle) modeling domains. 18

Figure 4-8. Annual total area source emissions of SO_2 from the EPA 2006 modeling database along with the proposed 12 km (blue rectangle), 4 km (green rectangle) and 0.8 km (red rectangle) modeling domains. 19

Figure 4-9. Annual total area source emissions of $PM_{2.5}$ from the EPA 2006 modeling database along with the proposed 12 km (blue rectangle), 4 km (green rectangle) and 0.8 km (red rectangle) modeling domains. 20

Figure 4-10. Liberty-Clairton nonattainment area and relationship between 0.8 km grid and monitoring sites, terrain features and source locations. 21

Figure 4-11. Receptors with 100 m spacing located within 500 m of the Liberty and Clairton FRM monitoring sites. 28

1 OVERVIEW

Modeling is a tool used to simulate real-world conditions. For air-quality studies, "air-dispersion modeling," as described by the U.S. Environmental Protection Agency (EPA), "uses mathematical formulations to characterize the atmospheric processes that disperse a pollutant emitted by a source. Based on emissions and meteorological inputs, a dispersion model can be used to predict concentrations at selected downwind receptor locations."[1] Thus, an atmospheric model incorporates the three components of the air-pollution system, namely, the sources, dispersion, and receptors of atmospheric contaminants.

An air quality modeling *protocol* is a plan prepared to help assure the most scientifically grounded estimates of future air-quality levels from atmospheric models. Such a plan is used to demonstrate attainment of air-quality goals. For Allegheny County, a particular condition of concern addressed in this $PM_{2.5}$ Modeling Protocol is the Liberty–Clairton nonattainment area in the southern portion of the county.

As discussed in more detail herein, following are the primary models used in the attainment demonstration: the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system,[2] the Motor Vehicle Emissions Simulator (MOVES) model,[3] the Weather Research and Forecasting (WRF) meteorological model,[4] and the Comprehensive Air Quality Model with extensions (CAMx),[5] which includes a Plume-in-Grid (PiG) option for local source impacts, and a Particulate Source Apportionment Technology (PSAT) that will be important for obtaining the separate contributions of local sources. Together these models along with additional models and techniques are used to show that the emission control strategy proposed by Allegheny County will lead to attainment of the annual and 24-hour national ambient air quality standards (NAAQS) for $PM_{2.5}$ by December 2014.

This section explains the official designations for particulate matter that is 2.5 microns or less in diameter ($PM_{2.5}$) in Allegheny County and the need to carry out an attainment demonstration for the Liberty-Clairton Nonattainment Area according to this protocol. Stakeholders, including contractors, for the $PM_{2.5}$ protocol are also discussed.

1.1 $PM_{2.5}$ Designations

EPA strengthened the NAAQS for $PM_{2.5}$ in 2006, lowering the 24-hour standard from 65 µg/m³ to 35 µg/m³. The 2006 revision also retained the annual standard of 15 µg/m³. Final $PM_{2.5}$ area designations for the 2006 $PM_{2.5}$ standards were issued on October 8, 2009.

Designations for $PM_{2.5}$ were based on several factors, including 2006-2008 monitored data, proximity to metropolitan areas, census populations, types of emissions, and others. Five counties in the Pittsburgh metropolitan area (MSA)[6] and portions of adjacent counties were designated as the Pittsburgh-Beaver Valley nonattainment area. Additionally, the Liberty-Clairton area was designated as a separate area within Allegheny County. These areas are identical to the nonattainment areas designated in 2005 for the 1997 $PM_{2.5}$ NAAQS.

[1] http://www.epa.gov/scram001/dispersionindex.htm
[2] http://www.smoke-model.org/index.cfm
[3] http://www.epa.gov/otaq/models/moves/index.htm
[4] http://www.wrf-model.org/index.php
[5] http://www.camx.com
[6] The Pittsburgh Metropolitan Statistical Area (MSA) includes Allegheny, Armstrong, Beaver, Butler, Fayette, Washington, and Westmoreland counties, according to the U.S. Census Bureau.

The Liberty-Clairton Area includes the Boroughs of Glassport, Liberty, Lincoln, Port Vue, and the City of Clairton. Appendix A provides maps of the Southwestern PA designation areas, including close-ups of the Liberty-Clairton Area.

1.2 Stakeholders

The Pennsylvania Department of Environmental Protection (DEP) is responsible for the attainment of the Pittsburgh-Beaver Valley nonattainment area, while the Allegheny County Health Department (ACHD) is responsible for demonstrating attainment in the Liberty-Clairton nonattainment area. A final attainment demonstration for the Liberty-Clairton Area will be submitted to the DEP, on behalf of the ACHD, for submittal to the U.S. Environmental Protection Agency (EPA) Region 3 office as part of the Pennsylvania State Implementation Plan (SIP).

The ACHD have selected three contractors to assists them in the Liberty-Clairton $PM_{2.5}$ attainment demonstration modeling: (1) TranSystems|E.H. Pechan and Associates (TS|Pechan) have been selected to assist with the emissions inventory development; (2) Alpine Geophysics, LLC is the lead contractor for the meteorological modeling; and (3) ENVIRON International Corporation was selected to lead the air quality modeling.

ACHD staff, the $PM_{2.5}$ Modeling Workgroup and ENVIRON and Alpine have participated in the development of the $PM_{2.5}$ modeling procedures that are documented in this Modeling Protocol. The Modeling Workgroup includes persons from air quality agencies, local industry, environmental advocacy groups, environmental consulting companies, universities, and the general public. Table 1-1 summarizes the members of the Liberty-Clairton $PM_{2.5}$ SIP Modeling Workgroup and the key personnel involved in $PM_{2.5}$ modeling.

Table 1-1. Members of the Liberty-Clairton $PM_{2.5}$ Modeling Workgroup and key participants in the $PM_{2.5}$ modeling.

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Joe Osborne	Group Against Smog and Pollution (GASP). Pittsburgh, PA	http://gasp-pgh.org
Robert J. Paine	AECOM Environment, Westford, MA	www.aecom.com
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Tim Leon-Guerrero	EPA Region 3, Philadelphia, PA	http://www.epa.gov/aboutepa/region3.html
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2 PROBLEM STATEMENT

This section explains the nature of the $PM_{2.5}$ problem and provides a conceptual design for the Liberty-Clairton area. Monitored data results are also given.

2.1 Geographic Situation

The Liberty-Clairton area is made up of complex river valley terrain, approximately 3 miles wide by 5 miles long. It includes a 4-mile winding portion of the Monongahela River and is bordered by the Youghiogheny River to the east. The area includes rural land, densely populated residential areas, and industrial facilities.

The base of the river valley lies at 718 feet in elevation above mean sea level (MSL), while adjacent hilltops can be greater than 1,250 feet MSL. Large temperature differences can be seen between hilltop and valley floor observations (e.g., 2 to 7°F) during clear, low-wind, nighttime conditions. Strong nighttime drainage flows can cause differences of up to 180° in wind direction with 3-4 mph downward flows. Also, strong nighttime inversions can lead to poor dispersion scenarios on several days of the year (Sullivan, 1996).

Data analysis has shown that the Liberty-Clairton area is impacted by both regional and localized $PM_{2.5}$. Source apportionment results based on speciated data can be found in the report *Allegheny County $PM_{2.5}$ Source Apportionment using the Positive Matrix Factorization Model (PMF Version 3.0), 2005-2010 Results.*[7] Figure 2-1 displays the $PM_{2.5}$ source contributions calculated by the PMF receptor model using 2005-2010 observations at Liberty. Secondary sulfate is the largest contributor (36%) that is believed primarily from regional transport. The second largest contributor is a PMF category that is believed to be mainly due to local sources and includes industrial carbon, primary sulfate and diesel vehicles. Secondary nitrate is the next largest contributor (9%) followed by burning/cooking (7%). There are numerous other categories associated with local sources that also contribute to $PM_{2.5}$ concentrations at Liberty.

[7] Report in preparation

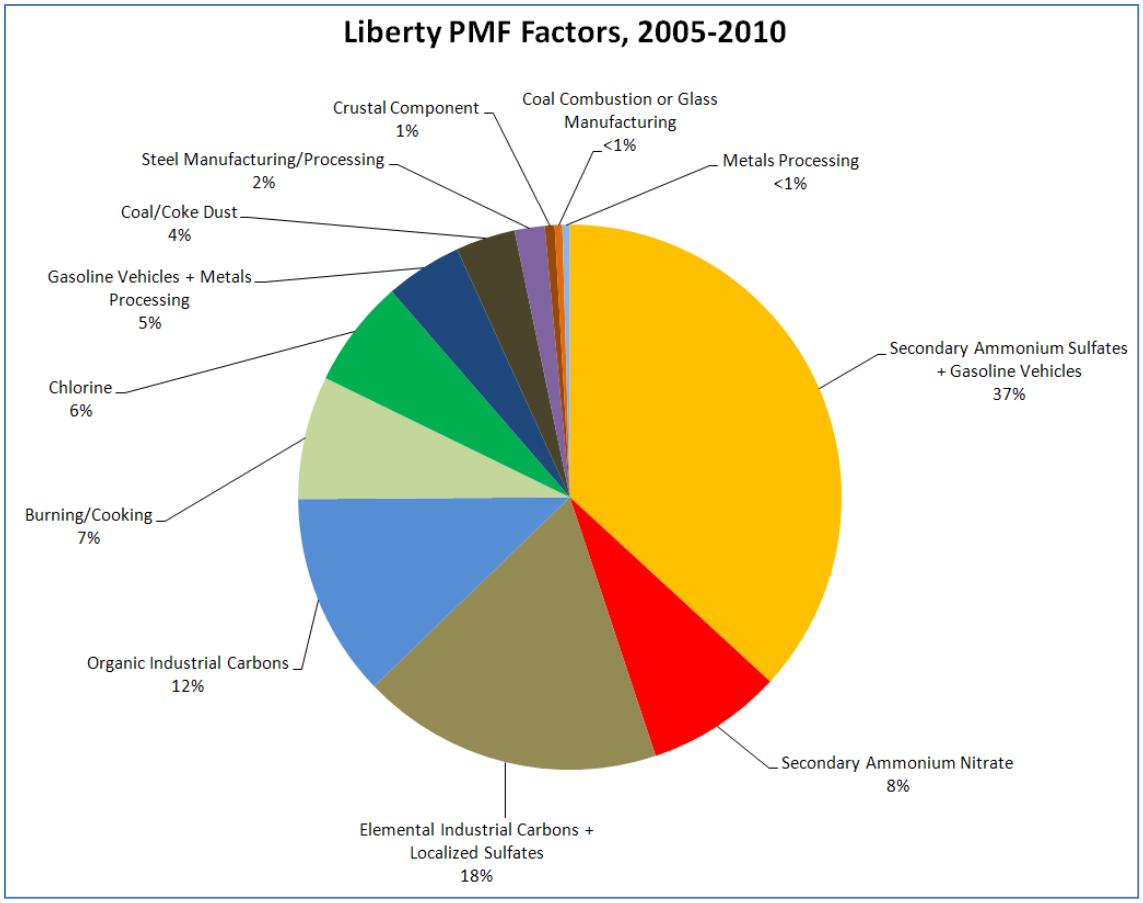


Figure 2-1. Source categories contributing to $PM_{2.5}$ concentrations at Liberty using the Positive Matrix Factorization (PMF) receptor model.

2.2 Monitoring Data

The Federal Reference Method (FRM) $PM_{2.5}$ monitor at Liberty is located atop a school at relatively higher elevation near the center of the Liberty-Clairton area. The FRM monitor at Clairton is located atop a school at relatively lower elevation in the western portion of the area. Recent data shows that Clairton is in attainment of the 2006 $PM_{2.5}$ NAAQS, while Liberty monitor is in violation of the 24-hour standard of 35 µg/m³. Appendix B contains details of recent data.

Results from the Liberty $PM_{2.5}$ speciation monitor show that organic and elemental carbon, ammonium, sulfate, and some trace elements are higher in the Liberty-Clairton area than in other monitored areas by up to 6 µg/m³ (Figure 2-2). An in-depth analysis of speciated $PM_{2.5}$ components in Allegheny County can be found in the report *$PM_{2.5}$ Chemical Speciation Analysis for the Liberty-Clairton Area, 2005-2009.*[8]

[8] Report in preparation by ACHD.

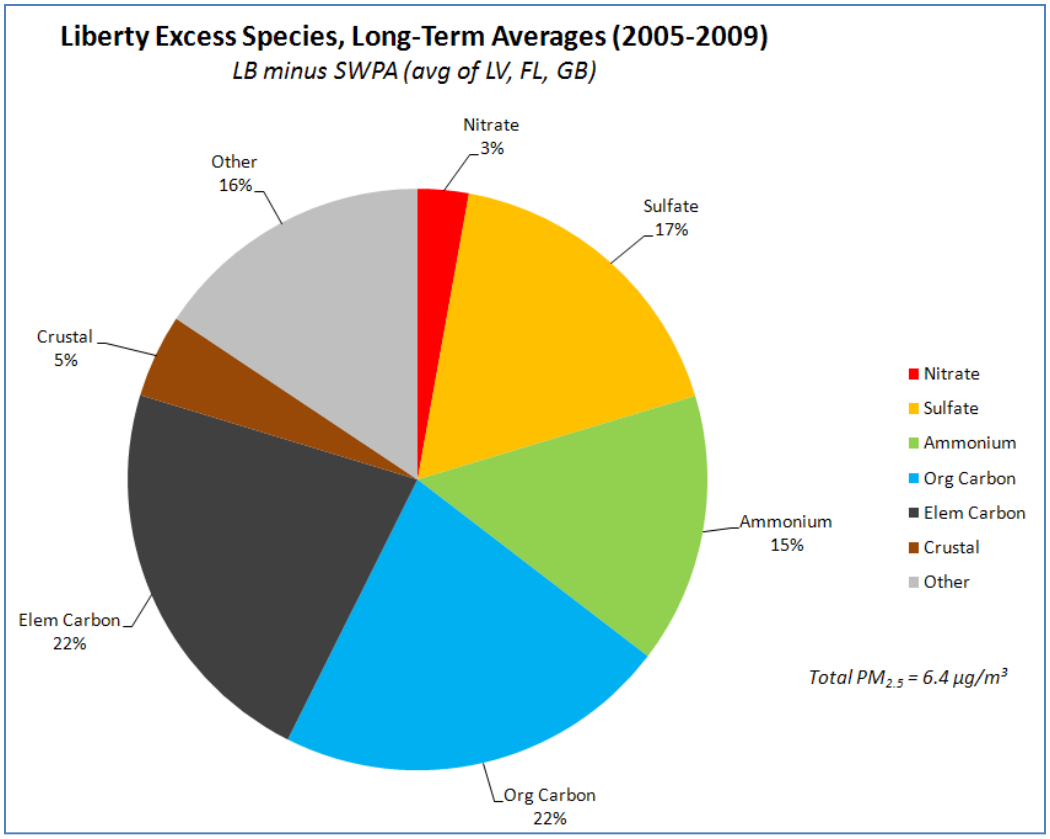


Figure 2-2. Excess $PM_{2.5}$ concentrations at the Liberty monitoring site compared to regional sites.

3 SELECTION CRITERIA

This section outlines the models, the species of $PM_{2.5,}$ and the years to be modeled for the Liberty-Clairton Area $PM_{2.5}$ attainment demonstration modeling. The current EPA $PM_{2.5}$ Modeling Guidance for $PM_{2.5}$ attainment demonstrations modeling was released in April 2007 (EPA, 2007). EPA has since updated the 24-hour attainment demonstration test methodology (Fox, 2011). EPA has also developed a Modeled Attainment Test Software (MATS) that implements the recommended annual and 24-hour $PM_{2.5}$ Design Value projection approach from their guidance (EPA, 2007). However, MATS does not currently perform the updated 24-hour $PM_{2.5}$ attainment demonstration test. Updated MATS and potentially EPA Modeling Guidance for the 2006 standard is expected to be released in 2012.

3.1 Model Selection

Three types of models will be used in the Liberty-Clairton $PM_{2.5}$ attainment demonstration modeling to simulate emissions, meteorology and air quality.

3.1.1 Meteorological Model Selection

There are two meteorological models that are currently used extensively for air quality modeling, the fifth generation Mesoscale Model (MM5) and the Weather Research and Forecasting (WRF) model[9]. WRF is a next-generation mesoscale numerical weather prediction (NWP) system designed to serve both operational forecasting and atmospheric research needs (Skamarock, 2004; 2006; Skamarock et al., 2005). WRF is suitable for a broad spectrum of applications across scales ranging from meters to thousands of kilometers. The effort to develop WRF has been a collaborative partnership, principally among the National Center for Atmospheric Research (NCAR), the National Oceanic and Atmospheric Administration (NOAA), the National Centers for Environmental Prediction (NCEP) and the Forecast Systems Laboratory (FSL), the Air Force Weather Agency (AFWA), the Naval Research Laboratory, the University of Oklahoma, and the Federal Aviation Administration (FAA). WRF allows researchers the ability to conduct simulations reflecting either real data or idealized configurations. WRF provides an operational forecasting model that is flexible and efficient computationally, while offering the advances in physics, numerics, and data assimilation contributed by the research community. WRF is maintained and supported as a community model to facilitate wide use internationally, for research, operations, and teaching. It is suitable for a broad span of applications across scales ranging from large-eddy to global simulations. Such applications include real-time NWP, data assimilation development and studies, parameterized-physics research, regional climate simulations, air quality modeling, atmosphere-ocean coupling, and idealized simulations. The number of registered WRF users has exceeded 6,000, and WRF is in operational and used in researches around the world.

The Advanced Research WRF (ARW) version of WRF was selected for the Liberty-Clairton $PM_{2.5}$ attainment demonstration modeling. The major features of the ARW system are as follows:

<u>ARW Solver</u>

- Equations: Fully compressible, Euler nonhydrostatic with a run-time hydrostatic option available. Conservative for scalar variables.
- Prognostic Variables: Velocity components *u* and *v* in Cartesian coordinate, vertical velocity *w*, perturbation potential temperature, perturbation geopotential, and perturbation surface pressure of dry air. Optionally, turbulent kinetic energy and any number of scalars such as water vapor mixing ratio, rain/snow mixing ratio, cloud water/ice mixing ratio, and chemical species and tracers.

[9] http://www.wrf-model.org/index.php

- Vertical Coordinate: Terrain-following, dry hydrostatic-pressure, with vertical grid stretching permitted. Top of the model is a constant pressure surface.
- Horizontal Grid: Arakawa C-grid staggering.
- Time Integration: Time-split integration using a 2nd- or 3rd-order Runge-Kutta scheme with smaller time step for acoustic and gravity-wave modes. Variable time step capability.
- Spatial Discretization: 2nd- to 6th-order advection options in horizontal and vertical.
- Turbulent Mixing and Model Filters: Sub-grid scale turbulence formulation in both coordinate and physical space. Divergence damping, external-mode filtering, vertically implicit acoustic step off-centering. Explicit filter option.
- Initial Conditions: Three dimensional for real-data, and one-, two- and three-dimensional for idealized data. Digital filtering initialization (DFI) capability available (real-data cases).
- Lateral Boundary Conditions: Periodic, open, symmetric, and specified options available.
- Top Boundary Conditions: Gravity wave absorbing (diffusion, Rayleigh damping, or implicit Rayleigh damping for vertical velocity). Constant pressure level at top boundary along a material surface. Rigid lid option.
- Bottom Boundary Conditions: Physical or free-slip.
- Earth's Rotation: Full Coriolis terms included.
- Mapping to Sphere: Four map projections are supported for real-data simulation: polar stereographic, Lambert conformal, Mercator, and latitude-longitude (allowing rotated pole). Curvature terms included.
- Nesting: One-way interactive, two-way interactive, and moving nests. Multiple levels and integer ratios.
- Nudging: Grid (analysis) and observation nudging capabilities available.
- Global Grid: Global simulation capability using polar Fourier filter and periodic east-west conditions.

<u>Model Physics</u>

- Microphysics: Schemes ranging from simplified physics suitable for idealized studies to sophisticated mixed-phase physics suitable for process studies and NWP.
- Cumulus parameterizations: Adjustment and mass-flux schemes for mesoscale modeling.
- Surface physics: Multi-layer land surface models ranging from a simple thermal model to full vegetation and soil moisture models, including snow cover and sea ice.
- Planetary boundary layer physics: Turbulent kinetic energy prediction or non-local K schemes.
- Atmospheric radiation physics: Longwave and shortwave schemes with multiple spectral bands and a simple shortwave scheme suitable for climate and weather applications. Cloud effects and surface fluxes are included.

<u>WRF Software Framework</u>

- Highly modular, single-source code for maintainability.
- Two-level domain decomposition for parallel and shared-memory generality.
- Portable across a range of available computing platforms.
- Support for multiple dynamics solvers and physics modules.
- Separation of scientific codes from parallelization and other architecture-specific issues.
- Input/Output Application Program Interface (API) enabling various external packages to be installed with WRF, thus allowing WRF to easily support various data formats.
- Efficient execution on a range of computing platforms (distributed and shared memory, vector and scalar types). Support for accelerators (e.g., GPUs).
- Use of Earth System Modeling Framework (ESMF) and interoperable as an ESMF component.
- Model coupling API enabling WRF to be coupled with other models such as ocean, and land models using ESMF, MCT, or MCEL.

The WRF meteorological model was developed as a replacement to MM5 and MM5 is no longer supported. The previous Allegheny County SIP used CMAQ results based on the MM5 meteorological model because at that time the WRF model was new and didn't have all the capabilities that are needed to support meteorological modeling for air quality applications (e.g., full data assimilation) as well as a limited history of applications and evaluations. However, WRF is now routinely used in air quality model applications and has been obtaining model performance that is as good as or better than MM5. EPA has also adopted the WRF meteorological model for their regulatory air quality model applications. For these reasons the WRF meteorological model was selected for the ACHD $PM_{2.5}$ modeling.

3.1.2 Emissions Model Selection

A series of emissions models will be used to generate the hourly gridded speciated emissions needed for photochemical grid modeling. The Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system[10] is an emissions processing system that generates hourly gridded speciated emission inputs (Coats, 1995; Houyoux et al., 2000). SMOKE is principally an emission processing system and not a true emissions modeling system in which emissions estimates are simulated from "first principles". This means that, with the exception of mobile and biogenic sources, its purpose is to provide an efficient tool for converting emissions inventory data into the formatted emission files required by an air quality simulation model. For mobile sources, SMOKE actually simulates emissions rates based on input mobile-source activity data, emission factors and sometimes output from transportation travel-demand models.

SMOKE was originally designed to allow emissions data processing methods to utilize emergent high-performance-computing (HPC) as applied to sparse-matrix algorithms. Indeed, SMOKE is the fastest emissions processing tool currently available to the air quality modeling community. The sparse matrix approach utilized throughout SMOKE permits both rapid and flexible processing of emissions data. The processing is rapid because SMOKE utilizes a series of matrix calculations instead of less efficient algorithms used in previous systems such as EPS and EMS. The processing is flexible because the steps of temporal projection, controls, chemical speciation, temporal allocation, and spatial allocation are separated into independent operations wherever possible. The results from these steps are merged together at a final stage of processing. SMOKE has been available since 1996, and it has been used for emissions processing in a number of regional air quality modeling applications. Continuing model development activities with SMOKE now occur at the University of North Carolina (UNC) Institute for the Environment.

Notable features of SMOKE from an applications standpoint include: (a) control strategies can include changes in the reactivity of emitted pollutants, a useful capability, for example, when a solvent is changed in an industrial process; (b) no third party software is required to run SMOKE, although some input file preparation may require other software; (c) support of various air quality model emissions input formats (e.g., CMAQ and CAMx); and (d) enhanced quality assurance pre- and post-processing.

SMOKE supports area, mobile, fire and point source emission processing and also includes biogenic emissions modeling through a rewrite of the Biogenic Emission Inventory System, Version 3 (BEIS3). SMOKE (and SMOKE-BEIS3) will be used to process emissions for the Liberty-Clairton $PM_{2.5}$ modeling.

Emission factors for the on-road mobile source emissions will be generated using the Motor Vehicle Emissions Simulator (MOVES) model[11]. The MOVES model was designed by EPA's Office of Transportation and Air Quality (OTAQ) to provide an accurate estimate of emissions

[10] http://www.smoke-model.org/index.cfm
[11] http://www.epa.gov/otaq/models/moves/index.htm

from mobile sources under a wide range of user-defined conditions. In the modeling process, the user specifies vehicle types, time periods, geographical areas, pollutants, vehicle operating characteristics, and road types to be modeled. The model then performs a series of calculations, which have been carefully developed to accurately reflect vehicle operating processes, such as cold start or extended idle, and provide estimates of bulk emissions or emission rates. Specifying the characteristics of the particular scenario to be modeled is done by creating a Run Specification, or *RunSpec*.

The MOVES model includes a "default" database that summarizes emission relevant information for the entire U.S. The data for this database comes from many sources including EPA research studies, Census Bureau vehicle surveys, Federal Highway Administration travel data, and other federal, state, local, industry and academic sources. The MOVES team continually works to improve this database, but, for many uses, up-to-date local inputs will be more appropriate, especially for analyses supporting State Implementation Plans (SIPs) and conformity determinations.

MOVES2010a is the latest version of the MOVES emissions modeling tool and will be used for this modeling study. EPA now recommends that the MOVES model should be used for generating on-road mobile source emissions in future SIPs.

3.1.3 Air Quality Model Selection

Two photochemical grid models have been used in recent $PM_{2.5}$ attainment demonstration SIP modeling: (1) the Community Multiscale Air Quality (CMAQ) modeling system[12] (Byun and Ching, 1999); and (2) the Comprehensive Air Quality Model with extensions (CAMx[13]; ENVIRON, 2011). Both models are publicly available and have been used in numerous ozone and $PM_{2.5}$ SIPs that have been approved by EPA.

CAMx was developed with all new code during the late 1990s using modern and modular coding practices. This has made the model an ideal platform for the extension to treat a variety of air quality issues including ozone, particulate matter (PM), visibility, acid deposition, and air toxics. The flexible CAMx framework has also made it a convenient and robust host model for the implementation of a variety of mass balance and sensitivity analysis techniques including Process Analysis (PA), Decoupled Direct Method (DDM), and the Ozone/Particulate Source Apportionment Technology (OSAT/PSAT).

ACHD will utilize CAMx Version 5.4 (released in October 2011) for modeling of the Liberty-Clairton area. This will include regional and localized $PM_{2.5}$ impacts, formed by both primary and secondary mechanisms. Model performance will be examined for comparison to monitored results. CAMx was selected over CMAQ because it includes several features not included in CMAQ that are important for $PM_{2.5}$ modeling of the Liberty-Clairton area:

- CAMx supports two-way grid nesting that will allow the modeling of regional- as well as local-scale impacts within the same simulation.
- CAMx includes a subgrid-scale Plume-in-Grid (PiG) module that includes an ability for subgrid-scale sampling of the puffs that can better represent the contributions of local sources.
- CAMx includes the CB6 chemical mechanism that represents the latest understanding of photochemistry.
- CAMx includes Particulate Source Apportionment Technology (PSAT) that will be important for obtaining the separate the contributions of local sources.

[12] http://www.cmaq-model.org
[13] http://www.camx.com

If CAMx model performance shows a tendency toward underestimation for total $PM_{2.5}$ (sum of all species) in the baseline year 2007, local modeling for near-field primary $PM_{2.5}$ may be performed using EPA's AERMOD model version 11103 or later. If needed, the AERMOD local modeling will be performed for both baseline and future year cases.

3.2 $PM_{2.5}$ Components

Analysis of speciated $PM_{2.5}$ data in Southwestern PA for 2005-2010 indicates that the Liberty-Clairton excess is composed of both primary components and secondary components of $PM_{2.5}$ (see Figure 2-2). Therefore, emission inputs for CAMx will include all $PM_{2.5}$ precursor pollutants (sulfur dioxide, nitrogen oxides, volatile organic compounds, ammonia) along with primary filterable and condensable $PM_{2.5}$.

If additional local plume modeling is necessary, AERMOD modeling will be performed for primary filterable and condensable $PM_{2.5}$ for selected near-field sources. The AERMOD results would be combined in post-processing with CAMx results with the contribution of primary emissions from local sources eliminated. This would be done by using the PSAT source apportionment modeling of local sources so their contributions can be eliminated in the current and future year CAMx modeling so that local sources are not double counted.

3.3 Modeling Years

The 2007 calendar year was selected for the baseline modeling and model performance evaluation. The emissions inventories will be based on Mid-Atlantic/Northeast Visibility Union (MANE-VU[14]) (Vickers et al., 2011), Lake Michigan Air Directors Consortium (LADCO[15]), and Southeastern Modeling, Analysis, and Planning (SEMAP[16]) 2007 inventories. In cases where the 2007 data is unavailable, U.S. EPA's 2008 National Emissions Inventory (NEI[17]) will be back-casted.

The 2014 future year will be used for the projected case and attainment demonstration modeling. The 2014 data sources include MANE-VU, LADCO, and EPA's Transport Rule (CSAPR[18]) inventories.

Local emissions from selected Allegheny County sources may be revised based on more recent data or proposed control scenarios using data from ACHD or their contractor.

Weighted monitored data for 2005-2009 will be used for the attainment tests. Weighted base-year design values used in the attainment tests are provided in Appendix B.

[14] http://www.marama.org/
[15] http://www.ladco.org/
[16] http://www.metro4-sesarm.org/SEMAPAbout.asp
[17] http://www.epa.gov/ttn/chief/net/2008inventory.html
[18] http://www.epa.gov/ttn/chief/emch/index.html#final

4 MODELING PROCEDURE

This section delineates the procedures for the model simulations and post-processing required for the Liberty-Clairton modeling demonstration.

4.1 Horizontal Modeling Domains

WRF and CAMx will be run for a 36/12/4/0.8 km domain structure as shown in Figure 4-1 to Figure 4-3. The four domains will use a Lambert Conic Conformal (LCC) projection. The LCC grid projection will have a pole of projection of 40 degrees North, -97 degrees East and standard parallels of 33 and 45 degrees, the so-called RPO projection. The four domains are defined as given in Figure 4-1 and are as follows:

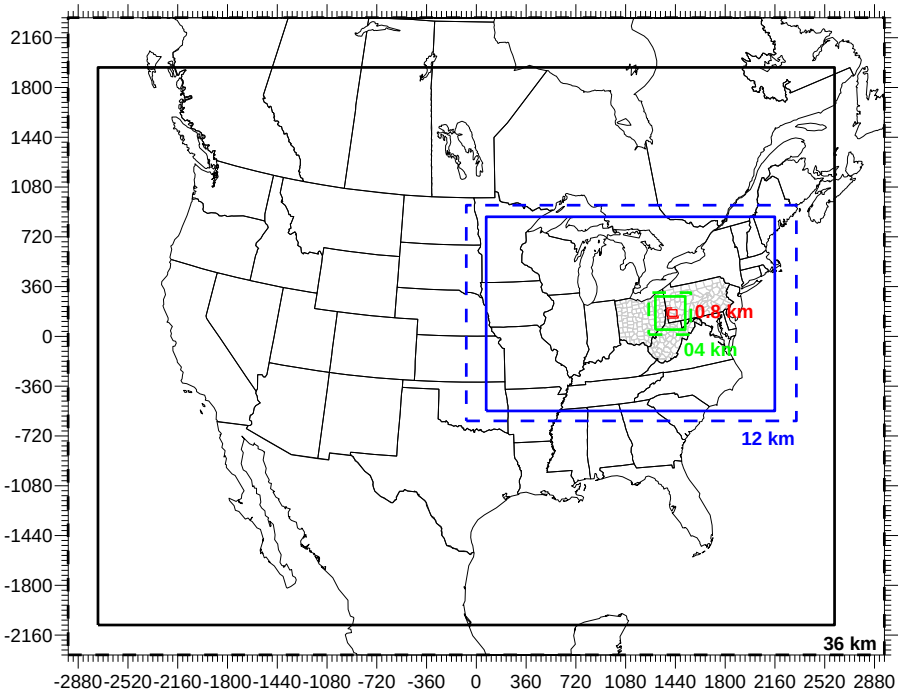
- A 36 km continental U.S. (CONUS) domain is defined to be the standard RPO domain and will be run as a stand-alone simulation and the results post-processed to define Boundary Conditions (BCs) for the 12 km North East U.S. (NEUS) domain (i.e., one-way grid nesting between the 36 km CONUS and 12 km NEUS domains).
- A 12 km NEUS domain that includes states in the Midwestern and Northeastern U.S. that the Cross State Air Pollution Rule (CSAPR) identified as contributing significantly to $PM_{2.5}$ at Liberty.
- A 4 km domain that covers southwestern Pennsylvania (SWPA) and adjacent areas in West Virginia and Ohio.
- A nested grid of 0.8 km (800 m) for the area within and surrounding the Liberty-Clairton area

The proposed modeling domains were carefully devised to include all the major area and point sources of NO_X, SO_2 and $PM_{2.5}$ emissions in the corresponding regions (see Figure 4-4 to Figure 4-9).

The WRF domains are defined to be slightly larger than the CAMx domains to eliminate any boundary artifacts in the WRF simulations from influencing the CAMx meteorological inputs. WRF can sometimes produce modeling artifacts near its boundaries as the meteorological variables from the boundary conditions come into dynamic balance with WRF's numerical algorithms. By specifying a few grid cell buffers between the WRF and CAMx boundaries we can be sure that no artifacts are in the CAMx meteorological inputs. WRF domains are defined with at least a 5-grid cell buffer in all directions from the CAMx domains.

The initial intent is to run CAMx using one-way grid nesting between the 36 km CONUS and 12 km NEUS domains and then use two-way grid nesting between the 12 km NEUS, 4 km SWPA and 0.8 km Liberty-Clairton domains. However, depending on applications, the 4/0.8 km or 0.8 km domains may also be run with one-way grid nesting from the, respectively, 12 km and 4 km domains.

Figure 4-10 displays the relationship between the 0.8 km grid cells and the Liberty and Clairton monitoring sites, terrain features and source locations in the Liberty-Clairton nonattainment area.



ACHD Proposed Domains

	CAMx			WRF		
☐	36 km	148 x 112	(-2736, -2088) to (2592, 1944)	36 km	164 x 128	(-2952, -2304) to (2952, 2304)
☐	12 km	174 x 117	(72, -540) to (2160, 864)	12 km	199 x 130	(-72, -612) to (2316, 948)
☐	04 km	54 x 60	(1296, 48) to (1512, 288)	04 km	76 x 76	(1248, 12) to (1552, 316)
☐	0.8 km	75 x 60	(1392, 144) to (1452, 192)	0.8 km	101 x 91	(1380, 132) to (1460.8, 204.8)

Figure 4-1. Definitions of the 36/12/4/0.8 km domain structure to be used for the WRF meteorological (dotted lines) and CAMx (solid lines) photochemical grid modeling.

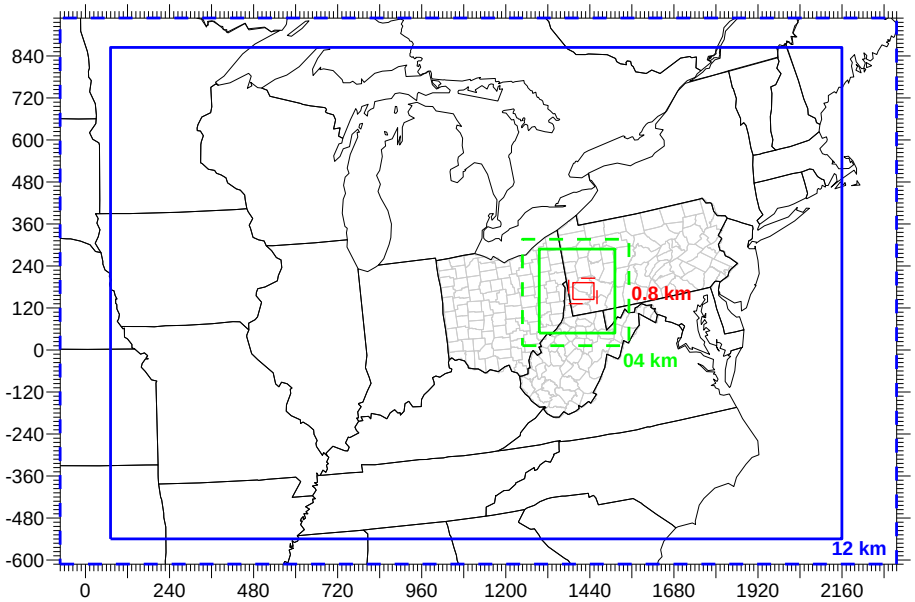


Figure 4-2. 12/4/0.8 km domain structure to be used for the WRF meteorological (dotted lines) and CAMx (solid lines) photochemical grid modeling.

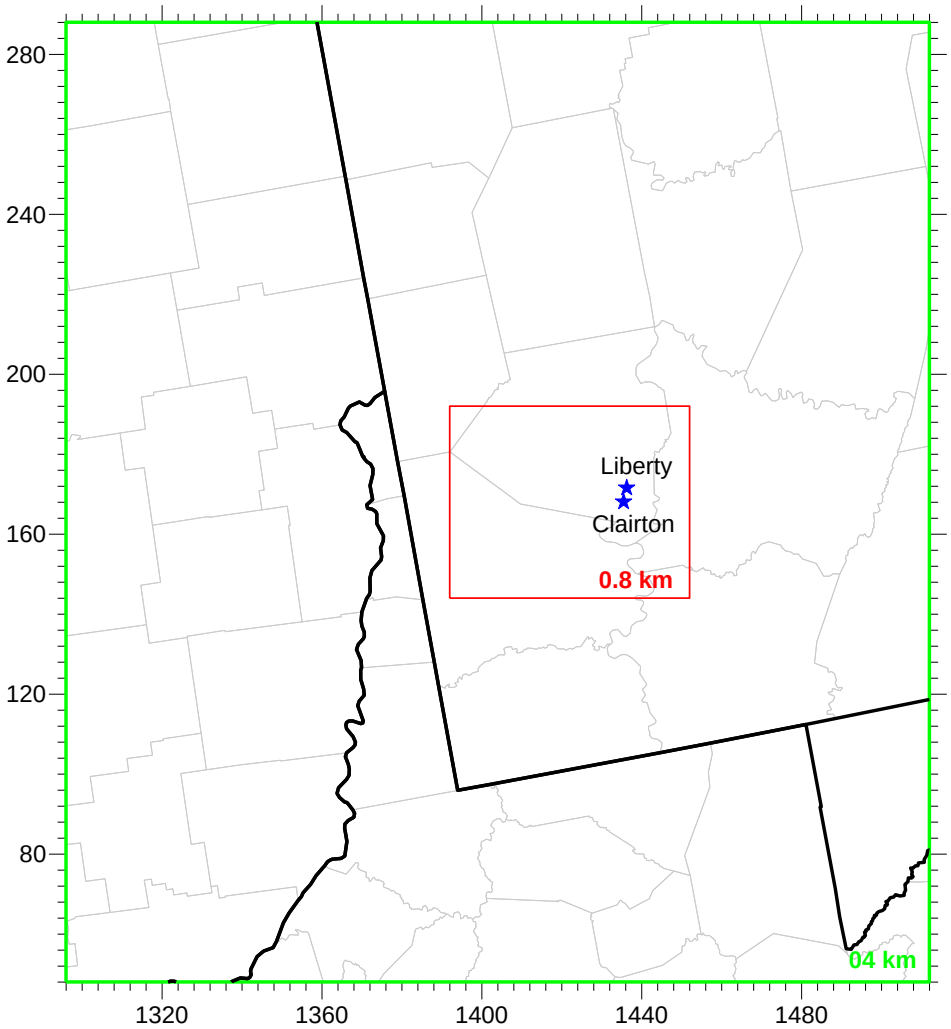


Figure 4-3. 4 km and 800 m domain structure to be used for the CAMx photochemical grid modeling.

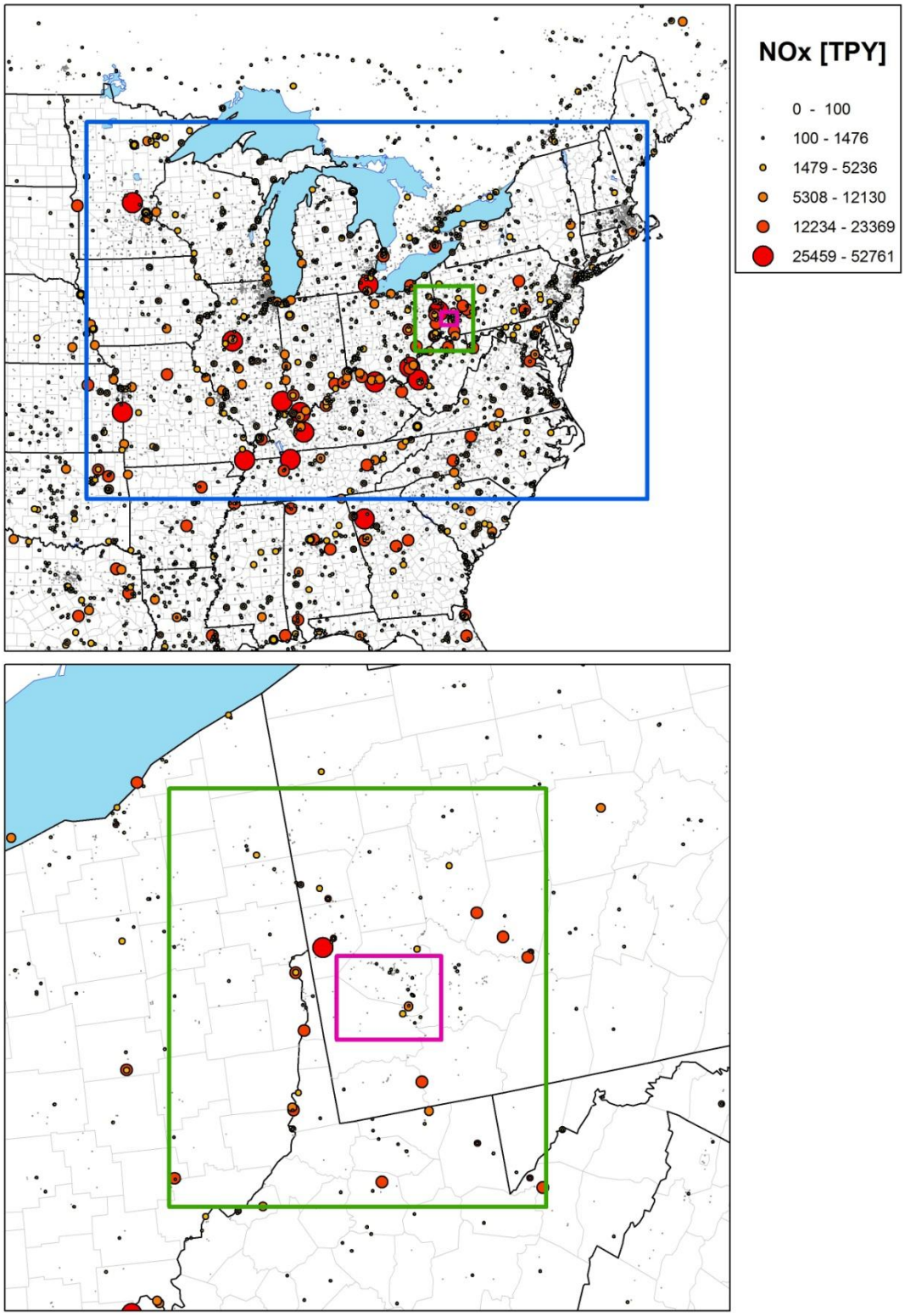


Figure 4-4. Annual total point source emissions of NO_X from the EPA 2006 modeling database along with the proposed 12 km (blue rectangle), 4 km (green rectangle) and 0.8 km (red rectangle) modeling domains.

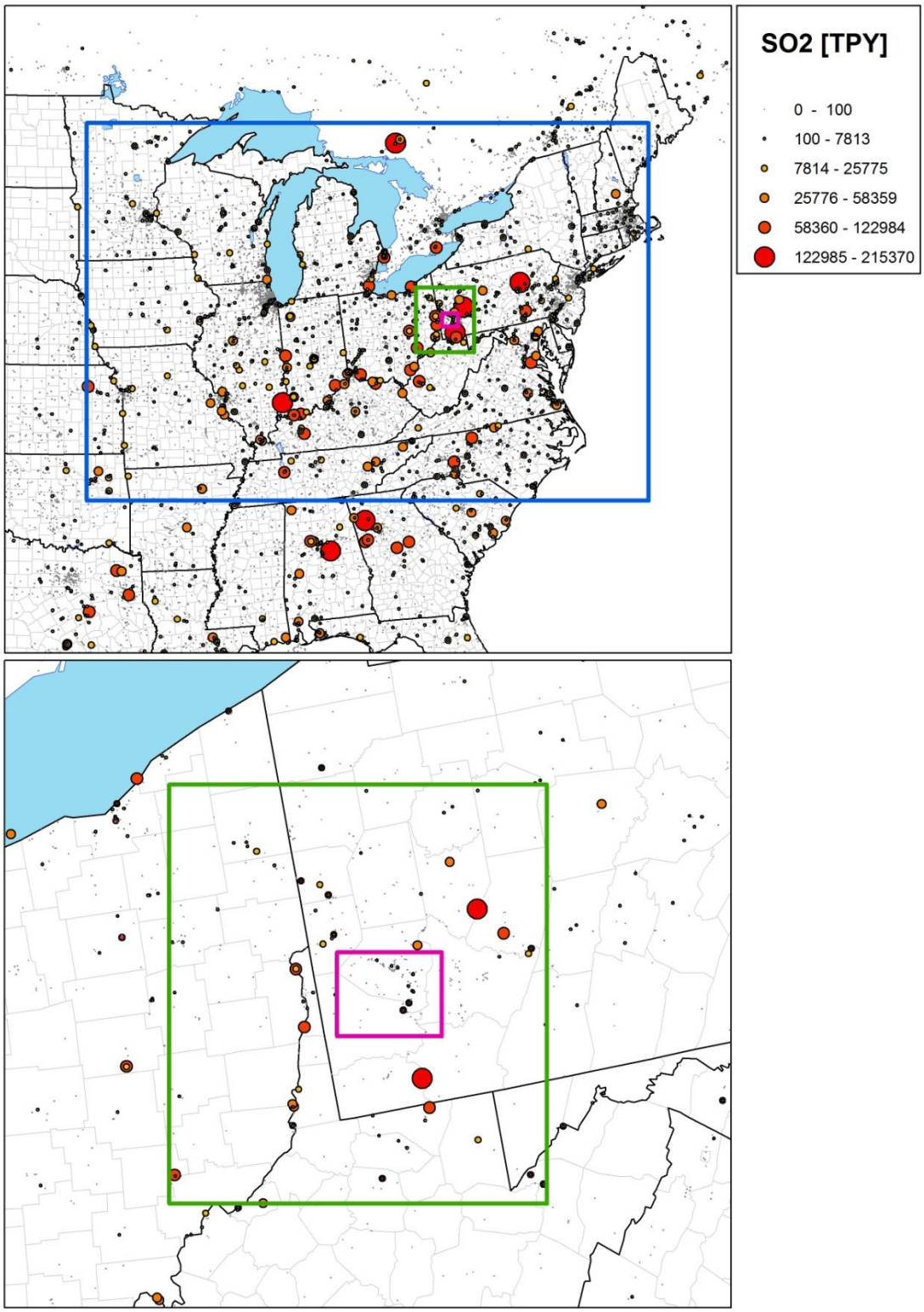


Figure 4-5. Annual total point source emissions of SO_2 from the EPA 2006 modeling database along with the proposed 12 km (blue rectangle), 4 km (green rectangle) and 0.8 km (red rectangle) modeling domains.

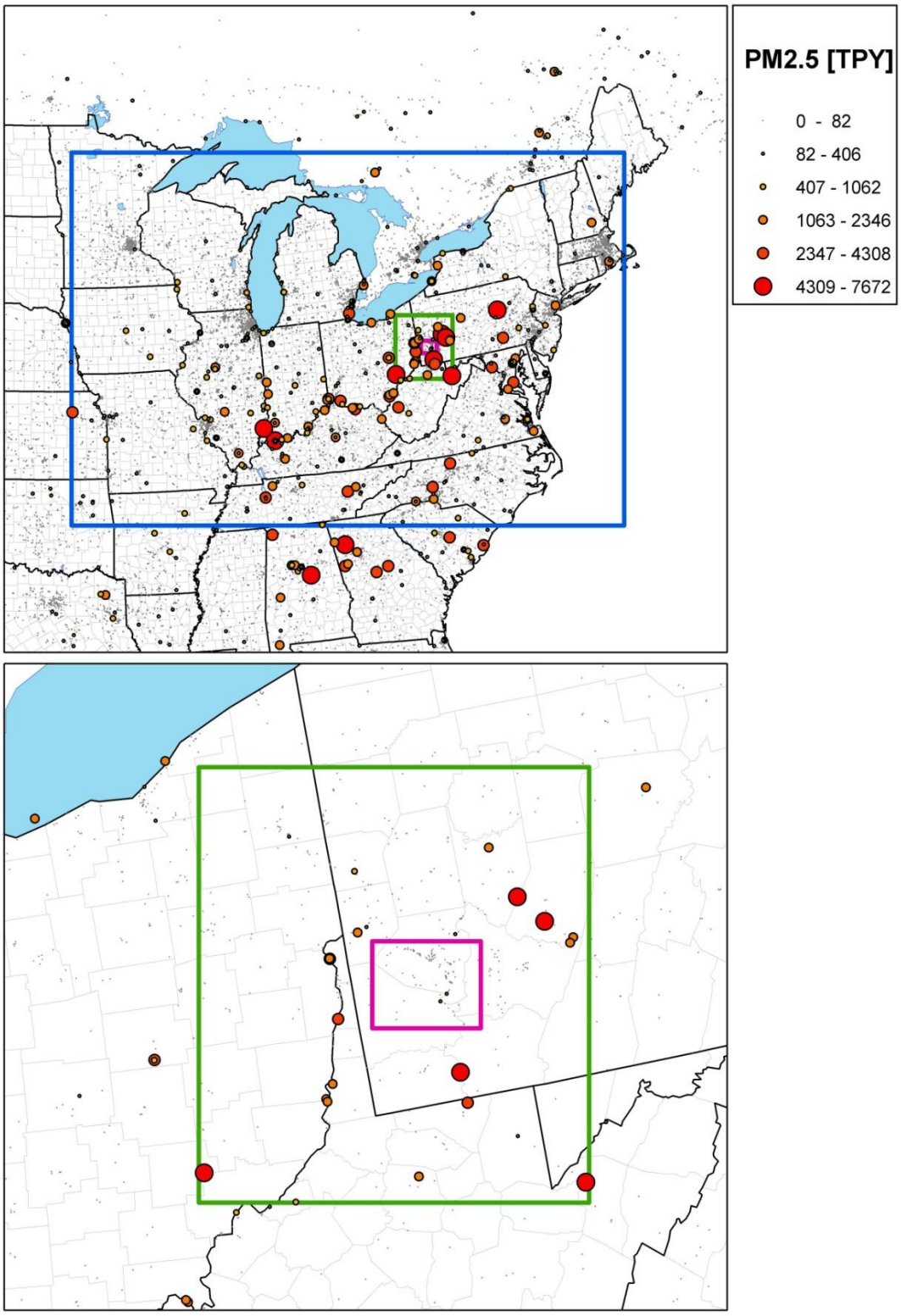


Figure 4-6. Annual total point source emissions of $PM_{2.5}$ from the EPA 2006 modeling database along with the proposed 12 km (blue rectangle), 4 km (green rectangle) and 0.8 km (red rectangle) modeling domains.

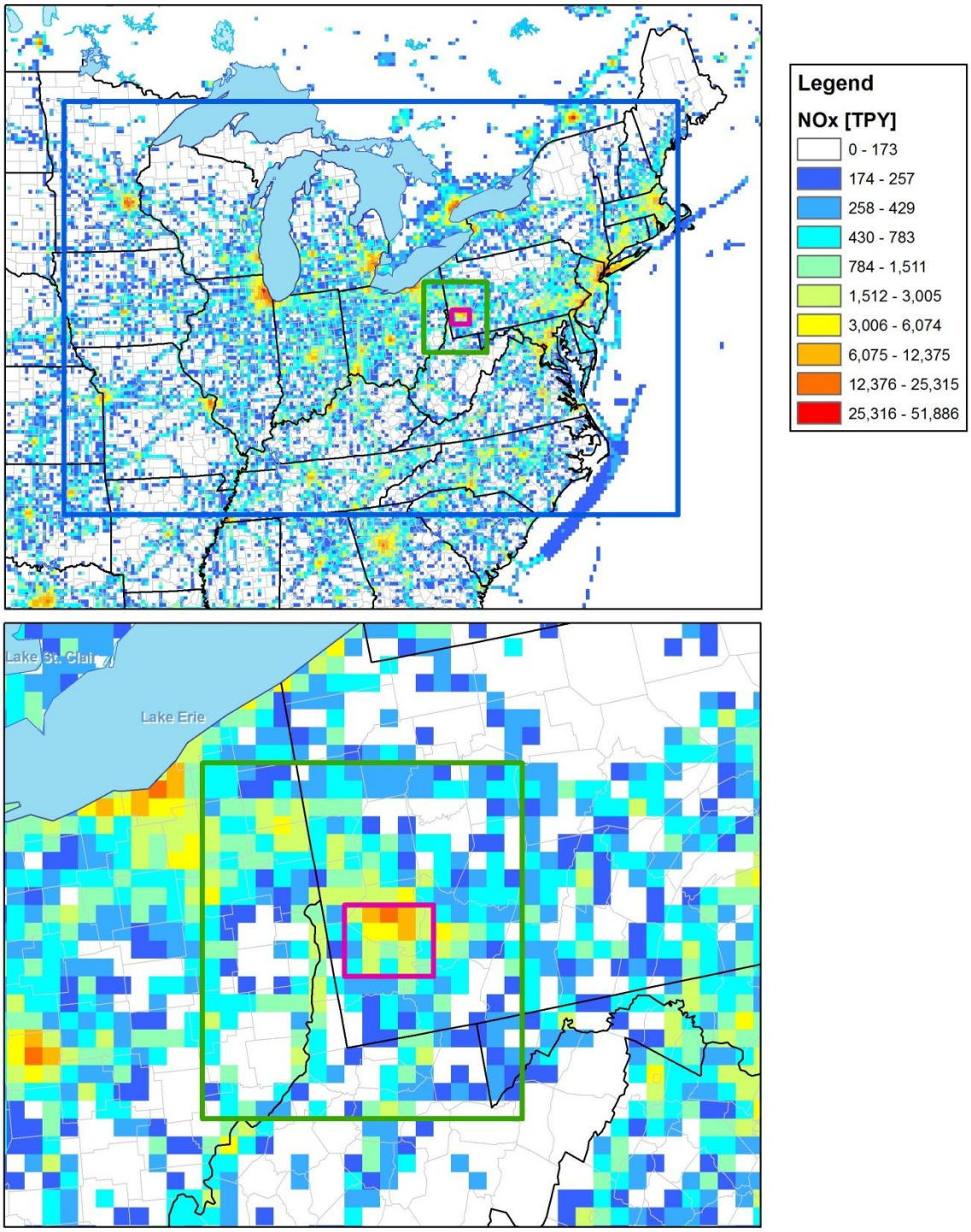


Figure 4-7. Annual total area source emissions of NO_X from the EPA 2006 modeling database along with the proposed 12 km (blue rectangle), 4 km (green rectangle) and 0.8 km (red rectangle) modeling domains.

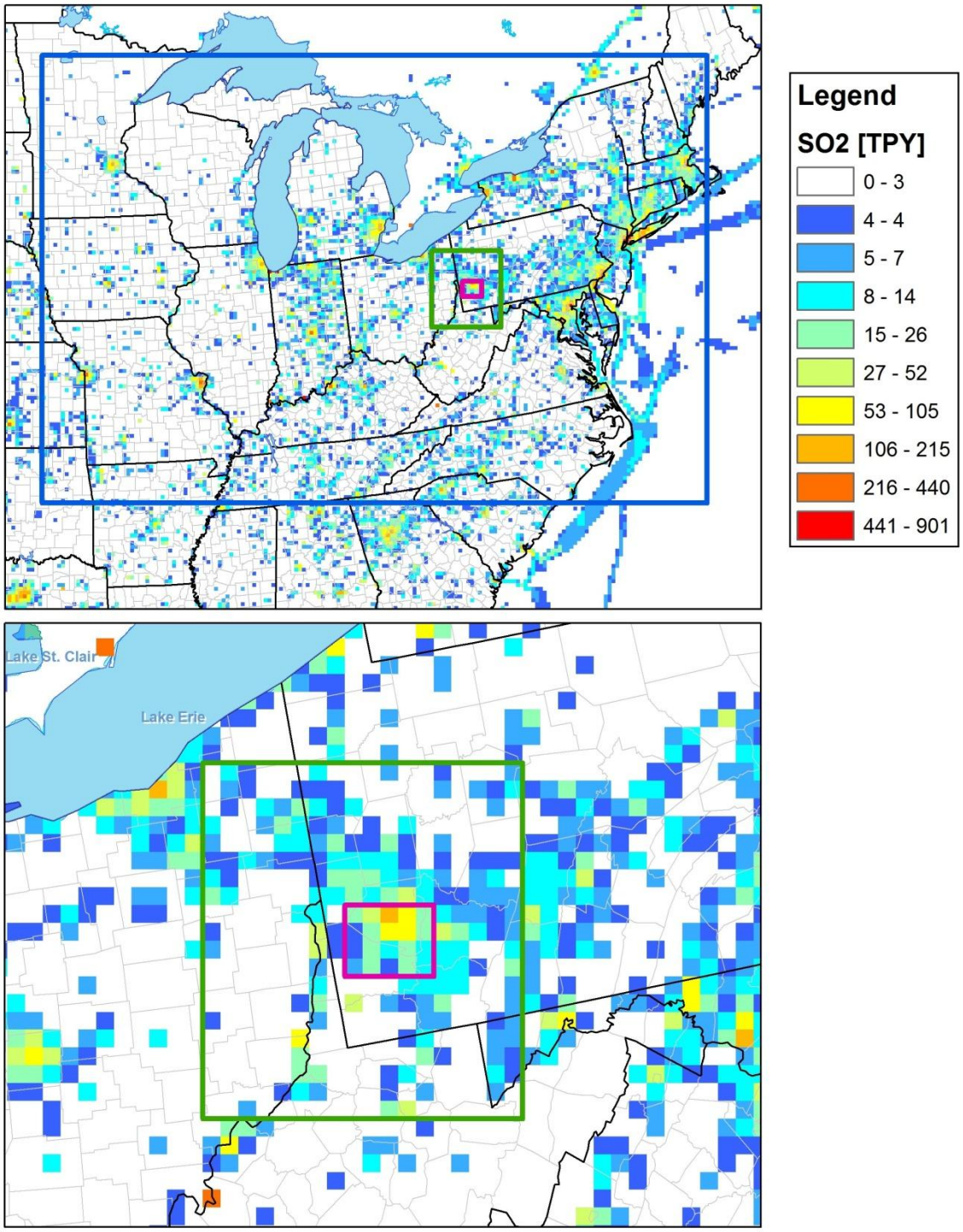


Figure 4-8. Annual total area source emissions of SO_2 from the EPA 2006 modeling database along with the proposed 12 km (blue rectangle), 4 km (green rectangle) and 0.8 km (red rectangle) modeling domains.

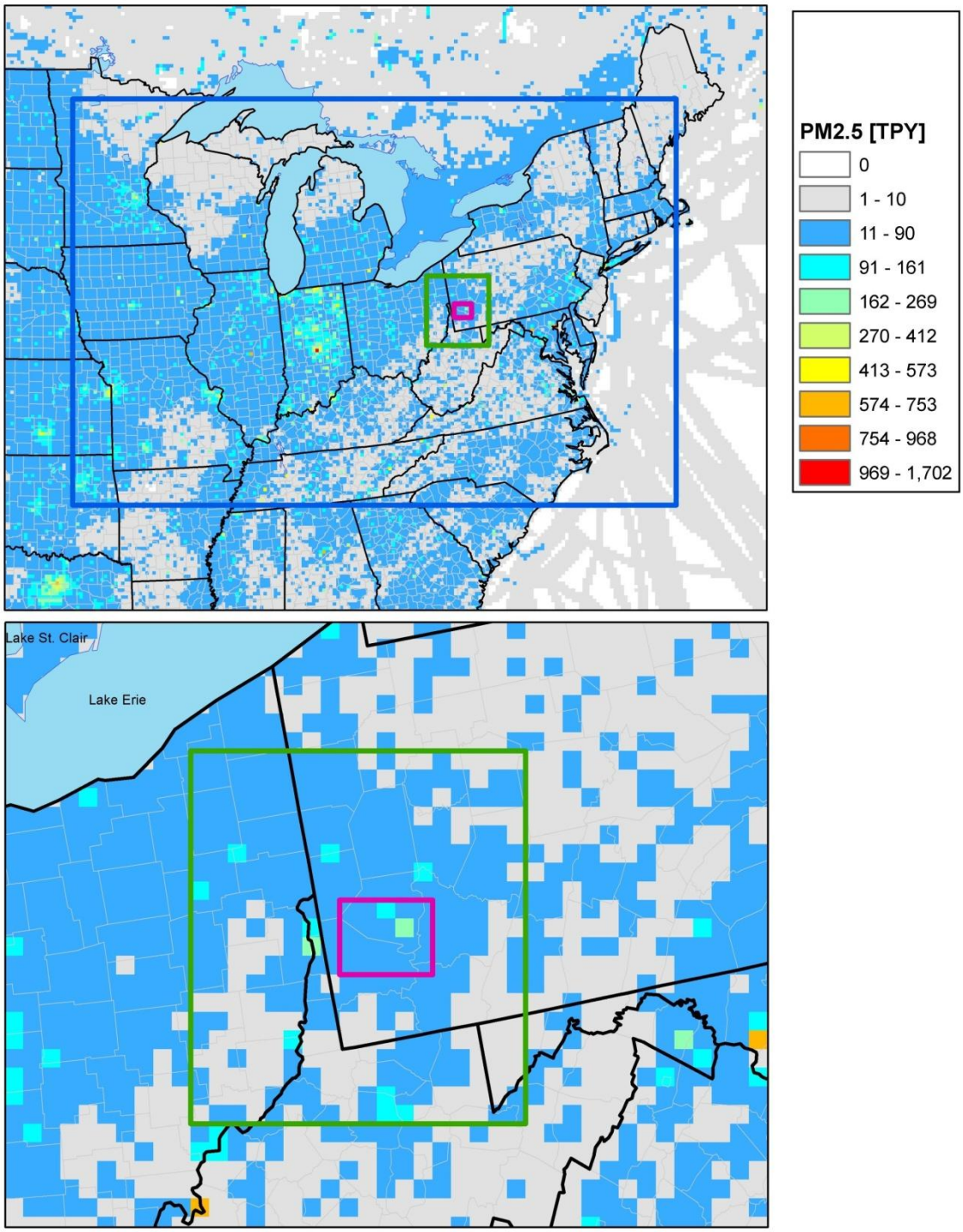


Figure 4-9. Annual total area source emissions of $PM_{2.5}$ from the EPA 2006 modeling database along with the proposed 12 km (blue rectangle), 4 km (green rectangle) and 0.8 km (red rectangle) modeling domains.

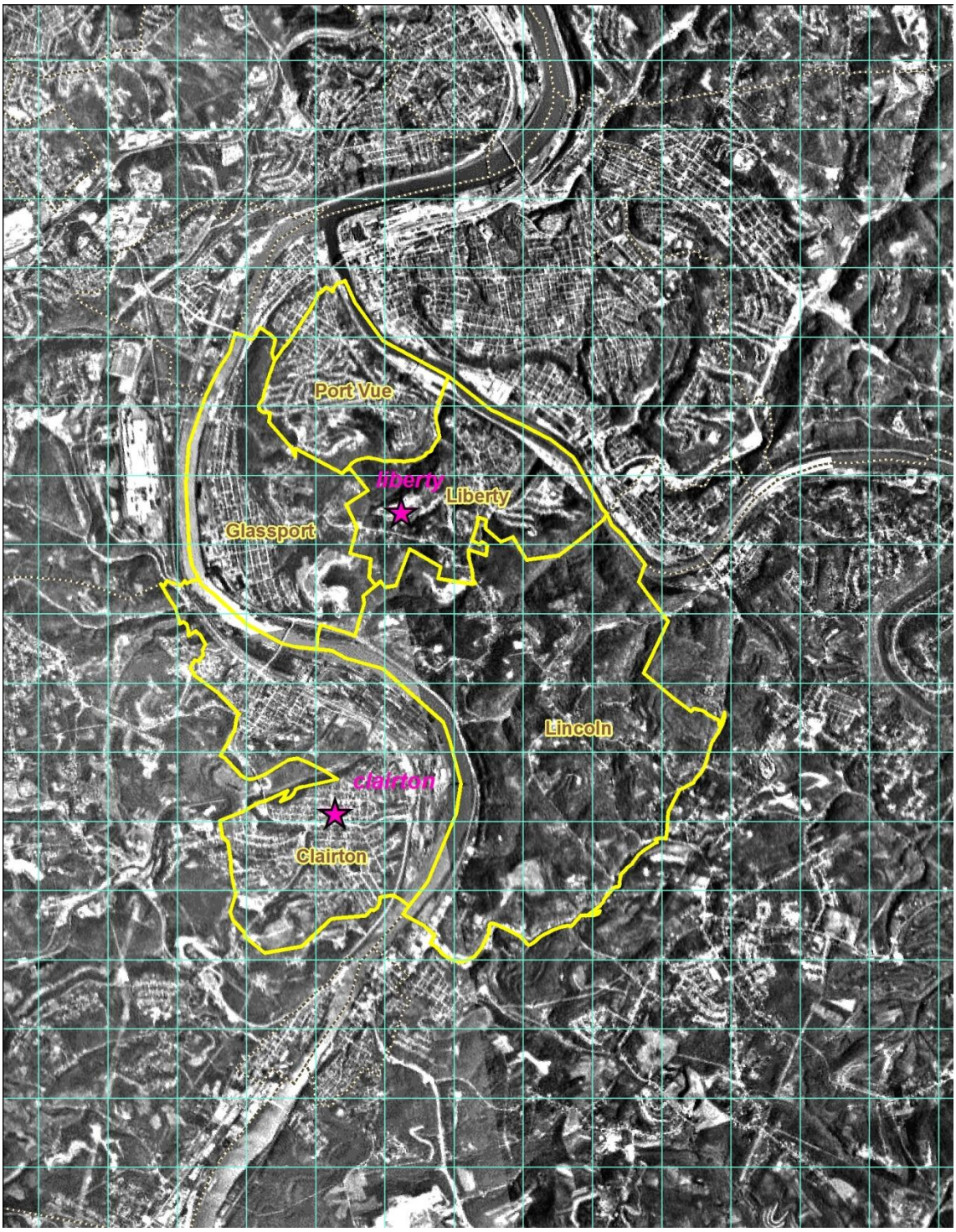


Figure 4-10. Liberty-Clairton nonattainment area and relationship between 0.8 km grid and monitoring sites, terrain features and source locations.

4.2 Vertical Layer Structure

WRF will be run with 37 vertical layers from the surface to 50 mb (approximately 19 km above MSL). The WRF output will be processed using the WRFCAMx processor to generate CAMx meteorological inputs. WRFCAMx can perform layer collapsing to reduce the 37 vertical layers in WRF to less vertical layers for the CAMx modeling to reduce the CAMx computational requirements. Table 4-1 displays a potential approach for collapsing the 37 vertical layers in WRF to 25 vertical layers for the CAMx modeling. This approach would combine the two lowest 12 m layers in WRF to one 24 m thick layer in CAMx. Although the layer collapsing approach in Table 4-1 seems reasonable for the regional-scale modeling, it may sacrifice some of the needed vertical resolution of the meteorology for the Monongahela river valley. Thus, we intend to examine the WRF vertical layers structure and perform CAMx sensitivity modeling using the layer collapsing in Table 4-1 as well as not layer collapsing in the lowest ~4,000 m of the atmosphere. The final vertical layer structure will depend on the results of the WRF model evaluation and CAMx vertical layer sensitivity tests.

Table 4-1. WRF 37 and CAMx 25 vertical layers structure and potential strategy for layer collapsing. Final CAMx vertical layer structure will depend on CAMx sensitivity tests with and without layer collapsing in the lower 4,000 m of the atmosphere.

WRF Meteorological Model					CAMx Air Quality Model		
WRF Layer	Sigma	Pressure (mb)	Height (m)	Thickness (m)	CAMx Layer	Height (m)	Thickness (m)
37	0.0000	50.00	19260	2055	25	19260.0	3904.9
36	0.0270	75.65	17205	1850			
35	0.0600	107.00	15355	1725	24	15355.1	3425.4
34	0.1000	145.00	13630	1701			
33	0.1500	192.50	11930	1389	23	11929.7	2569.6
32	0.2000	240.00	10541	1181			
31	0.2500	287.50	9360	1032	22	9360.1	1952.2
30	0.3000	335.00	8328	920			
29	0.3500	382.50	7408	832	21	7407.9	1591.8
28	0.4000	430.00	6576	760			
27	0.4500	477.50	5816	701	20	5816.1	1352.9
26	0.5000	525.00	5115	652			
25	0.5500	572.50	4463	609	19	4463.3	609.2
24	0.6000	620.00	3854	461	18	3854.1	460.7
23	0.6400	658.00	3393	440	17	3393.4	439.6
22	0.6800	696.00	2954	421	16	2953.7	420.6
21	0.7200	734.00	2533	403	15	2533.1	403.3
20	0.7600	772.00	2130	388	14	2129.7	387.6
19	0.8000	810.00	1742	373	13	1742.2	373.1
18	0.8400	848.00	1369	271	12	1369.1	271.1
17	0.8700	876.50	1098	177	11	1098.0	176.8
16	0.8900	895.50	921	174	10	921.2	173.8
15	0.9100	914.50	747	171	9	747.5	170.9
14	0.9300	933.50	577	84	8	576.6	168.1
13	0.9400	943.00	492	84			
12	0.9500	952.50	409	83	7	408.6	83.0
11	0.9600	962.00	326	82	6	325.6	82.4
10	0.9700	971.50	243	82	5	243.2	81.7
9	0.9800	981.00	162	41	4	161.5	64.9
8	0.9850	985.75	121	24			
7	0.9880	988.60	97	24	3	96.6	40.4
6	0.9910	991.45	72	16			
5	0.9930	993.35	56	16	2	56.2	32.2
4	0.9950	995.25	40	16			
3	0.9970	997.15	24	12	1	24.1	24.1
2	0.9985	998.58	12	12			
1	1.0000	1000	0			0	

4.3 Geophysical Data

Terrain and land use processing will include the most recent data available for use in CAMx and, if necessary, AERMOD. This includes:

- USGS NED terrain data, 0.3-1.0 arc-second resolution
- USGS NLCD land cover data, 1992 or 2001

CAMx also requires grid array of albedo and ozone column data. The albedo will be land use dependent. Ozone column data will come from the Total Ozone Mapping Spectrometer (TOMS) satellite data[19]. The TOMS data are used in the Tropospheric, Ultraviolet and Visible (TUV) radiation model[20] to calculate photolysis rates. Frequently TOMS ozone column data are missing for extended periods so data needs to be filled. The CAMx TUV processor allows for the use of episode average data. If there are large periods of missing TOMS data during the modeling period, then we may use monthly or episode average TOMS data to work around the missing data.

4.4 Meteorological Inputs

For CAMx, the WRF model will be used to generate three-dimensional grid meteorological inputs. If needed, AERMOD meteorological inputs will also be generated based on local surface and upper-air meteorological observations.

4.4.1 WRF Meteorological Modeling

Meteorological inputs for the ACHD $PM_{2.5}$ modeling will be generated using Advanced Research WRF (ARW) core of WRF modeling system. The WRF model configuration will be based on recent modeling research and sensitivity testing carried out by Alpine and ENVIRON for the Denver Regional Air Quality Council (RAQC) and the Wyoming Department of Environmental Quality (DEQ) to investigate procedures for improving our ability to simulate the meteorological process associated with ozone formation (McNally et al., 2011).

A brief summary of the WRF input data preparation procedures that we will use is listed below and provided in Table 4-2.

Model Selection: WRF Version 3.3.1 (September 21, 2011 release) will be used for the ACHD WRF meteorological modeling. The justification for using the WRF meteorological model was previously provided.

Horizontal Domain Definition: The computational domain on which WRF will be applied will be sufficiently sized to accommodate the air quality and emissions modeling grids as presented in Figure 4-1. The WRF 36/12/4/0.8 km domains are defined with at least a 5 grid cell buffer in all directions from the air quality modeling domains to minimize any potential numeric noise along domain boundaries. The grid projection will be Lambert Conformal with a pole of projection of 40 degrees North, -97 degrees East and standard parallels of 33 and 45 degrees, the so-called RPO projection.

Vertical Domain Definition: The WRF modeling will employ 37 vertical layers from the surface to 50 mb pressure level (approximately 19 km above the surface). Table 4-1 displays the definitions of the 37 layers used in WRF.

Application Methodology: The WRF model will be executed in 5-day blocks initialized at 12Z every 5 days with a 90 second time step. Model results will be output every 60 minutes and output files were split at 24 hour intervals. Twelve (12) hours of spin-up will be included in each 5-day block before the data were used in the subsequent evaluation. The model will be run from December 15, 2006 through January 2, 2008.

[19] http://toms.gsfc.nasa.gov/eptoms/ep.html
[20] http://cprm.acd.ucar.edu/Models/TUV/

A collection of programs known as the WRF Preprocessing System (WPS) is used to generate inputs for the WRF modeling system. The *geogrid*, *ungrib*, *metgrid*, and *real* programs will be used to generate WRF inputs. The *geogrid* program defines the size and location of the model domain and interpolates static terrestrial fields (elevation, land use, soil type, vegetation fraction, etc.) to the model domain. The *ungrib* program extracts meteorological fields from GRIB files. The *metgrid* program horizontally interpolates the variables from *ungrib* to the model domains. The *real* program vertically interpolates the output from *metgrid* to the model domain.

The WRF will be run on the 36/12/4/0.8 km grid domains using the no feedback option; that is the finer grid results will not affect the coarser grid simulations. Analysis nudging will be used on the 36, 12 and 4 km grids. Surface observation nudging will also be used to improve the WRF performance on the 4 and 0.8 km nested domain. This process will utilize surface observation data from the Meteorological Assimilation Data Ingest System (MADIS). Table 4-2 summarizes the physics options that will be used in the WRF simulation.

Table 4-2. WRF Version 3.3.1 physics options.

WRF Treatment	Option Selected	Notes
Microphysics	WRF Single Moment -3 (WSM-3)	A simple efficient scheme with ice and snow processes suitable for mesoscale grid sizes.
Longwave Radiation	RRTMG	Rapid Radiative Transfer Model for GCMs includes random cloud overlap and improved efficiency over RRTM.
Shortwave Radiation	RRTMG	Same as above, but for shortwave radiation.
LSM	NOAH	Two-layer scheme with vegetation and sub-grid tiling.
PBL scheme	YSU	Asymmetric Convective Model with non-local upward mixing and local downward mixing.
Cumulus parameterization	Kain Frisch II for 36/12 km None for 4/0.8 km domains	4 and 0.8 km small enough so that cumulus clouds can be modeled explicitly
Analysis nudging	Nudging applied to winds, temperature and moisture in the 36km and 12km domains	Temperature and moisture nudged above PBL only
Observation Nudging	Nudging applied to wind only in the 4km domain	
Initialization Dataset	12 km North American Model (NAM)	

4.4.2 Meteorological Inputs for AERMOD

If AERMOD modeling is needed, Liberty surface meteorological data will be used as onsite surface data, merged with Pittsburgh International Airport (PIT, WBAN: 94823) upper-air data. At a distance of about 23 miles to the northwest, the PIT balloon-borne radiosonde launch site

provides the nearest representative upper-air data for the Liberty-Clairton area. PIT surface data will also be substituted for missing onsite data. All airport hourly or minute data is available from the National Climatic Data Center (NCDC[21]). Photographs of key meteorological sites can be found in Appendix C. If AERMOD is used, Appendix W guidance, et al., will be followed in the justification of the use of PIT weather data. For AERSURFACE processing, a 1 km radius will be used for surface characteristics.

4.5 Emissions Inputs

Hourly gridded speciated emission inputs for the 36/12/4/0.8 km domains and the CAMx model will be generated using the SMOKE emissions model. Source categories that need to be addressed include the following:

- Major point sources with continuous emissions monitoring systems (CEMS). Hourly SO_2 and NO_X emissions for electrical generating units of 25 MWe or greater are available from the EPA Clean Air Markets Division (CAMD) website. They will be processed to obtain day-specific hourly emissions for CAMx. For primary PM emissions, the annual values can be processed to hourly values using the CEM heat input observations.
- Other point source emissions can be processed by SMOKE using the default speciation and temporal allocation assumptions that are based on Source Classification Code (SCC).
- Area sources are processed by SMOKE using spatial surrogates for allocation to the grids and default speciation and temporal allocation based on SCC.
- Non-road emissions can be treated similarly to area source.
- On-road mobile source emissions will be based on the MOVES model. There are various levels of treatment of MOVES, from detailed link-based processing using CONCEPT-MV and day-specific meteorological conditions from WRF, to running the SMOKE-MOVES tool to allocate the county level MOVES emissions to the modeling grids.
- Biogenic emissions can be generated using the SMOKE-BEIS processor with the hourly day-specific WRF meteorological conditions.
- Wildfires and prescribed burns are not expected to be a large contributor.

2007 emissions for the MANE-VU+VA (CT, DL, DC, ME, MD, MA, NH, NJ, NY, PA, RI, VT and VA), LADCO (IL, IN, MI, OH and WI) and SEMAP (AL, FL, GA, KY, MS, NC, SC, TN and VA)) states will be obtained from MANE-VU[22], LADCO[23] and SEMAP[24]. 2007 emissions for the remainder of the states will be back-cast from the 2008 NEI[25].

For local sources in the Liberty-Clairton area, emissions inputs will be based on actual emissions data as reported for 2007. Types of sources should be modeled include:

- Stacks: point sources
- Quench Towers: point sources
- Ambient-Temperature Fugitives: area or volume sources
- Coke Oven Batteries: elevated point or volume sources

[21] http://www.ncdc.noaa.gov/oa/ncdc.html
[22] http://www.marama.org/technical-center/emissions-inventory/2007-emissions-and-projections/2007-emissions-inventory
[23] http://www.ladco.org/tech/emis/round5/index.php
[24] http://www.metro4-sesarm.org/SEMAPAbout.asp
[25] http://www.epa.gov/ttn/chief/net/2008inventory.html

In CAMx, local point sources close to the Liberty and Clairton receptors will be modeled using the Plume-In-Grid (PiG) option. Local sources will also be flagged for treatment using the PSAT source apportionment technology.

If AERMOD is needed for local modeling, sources that contribute excess $PM_{2.5}$ in the Liberty-Clairton area will be identified using the speciation and PMF analysis. The primary $PM_{2.5}$ component for these sources will be tagged for treatment by PSAT or removed from the CAMx modeling input (or, "zeroed-out") and modeled with AERMOD. Appendix D lists sources potentially affecting the Liberty-Clairton $PM_{2.5}$ Nonattainment Area, lying within the nonattainment area or adjacent municipalities.

The SMOKE emissions model will be used to process the emissions to generate CAMx emissions inputs separately for each major source category. In addition to spatially allocating to the grids and performing chemical speciation for the CB6 chemical mechanism, SMOKE also performs temporal allocation to month, day-of-week and to hour of day.

Emissions for the 2014 future year will also be generated for the Liberty-Clairton $PM_{2.5}$ attainment demonstration modeling. The most recent emissions projection techniques will be used at the time of the future year modeling that includes the effects of both growth and controls. Right now, the 2014 emissions from the Cross State Air Pollution Rule (CSAPR[26]) appears to be the most appropriate source of 2014 emission projections available. If the CSAPR stays in effect, then the CSAPR 2014 Remedy (control) scenario would be the future year 2014 base case for the Liberty-Clairton $PM_{2.5}$ attainment demonstration modeling.

4.6 Receptor Grids

If AERMOD is used, EPA modeling guidance recommends modeling concentrations at "nearby receptors," receptors close to the $PM_{2.5}$ monitors in the Liberty/Clairton area. Similar to the SIP for the 1997 standards, nearby receptors have been defined by ACHD as receptors spaced at 100 meter resolution up to a 500 meter radius from the FRM site and located at an elevation no less or greater than 40 feet of the FRM monitor elevation (Figure 4-11).

For impacts at the Liberty or Clairton sites, the average AERMOD impacts for the group of receptors would be added to the hourly results from the corresponding 0.8 km grid cells from the CAMx results.

The same receptor locations will also be used for the subgrid-scale sampling of the CAMx PiG plume module.

[26] http://www.epa.gov/airtransport/

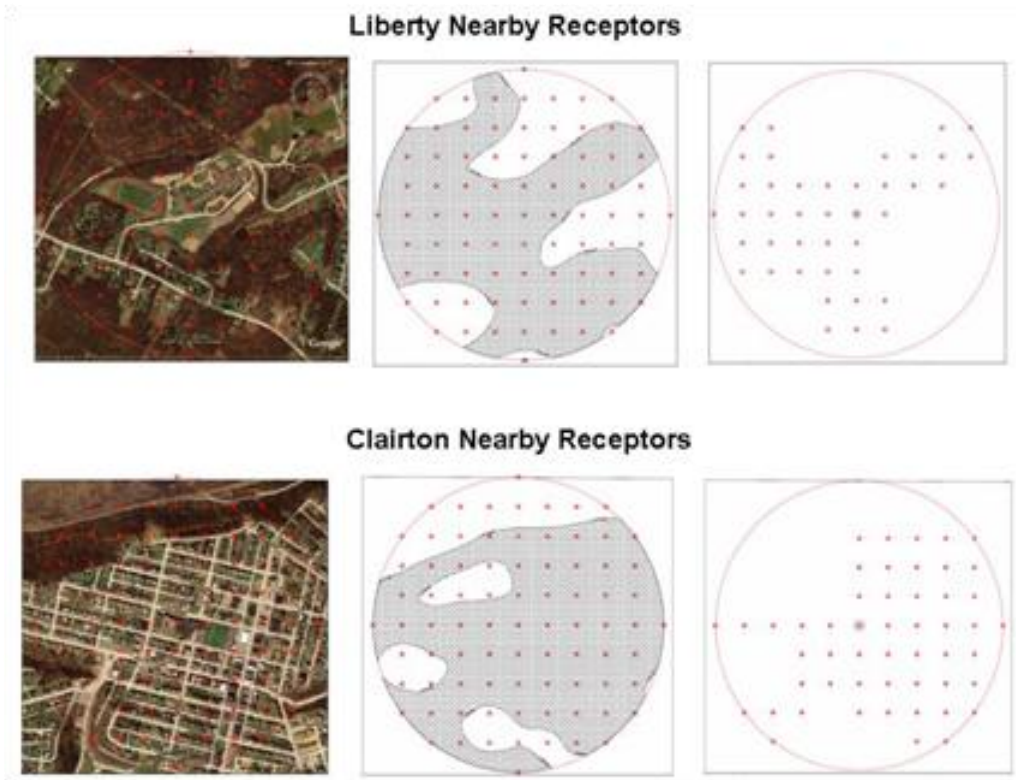


Figure 4-11. Receptors with 100 m spacing located within 500 m of the Liberty and Clairton FRM monitoring sites.

4.7 CAMx Configuration

Table 4-3 summarizes the CAMx configuration to be used in the Liberty-Clairton $PM_{2.5}$ attainment demonstration modeling. The latest version of CAMx (Version 5.4 released in October 2011) will be used in the modeling. CAMx V5.4 includes the latest CB6 chemical mechanism. If a newer version of CAMx is released in time for the study, it would be used. The model will be configured to predict both ozone and PM species.

CAMx will be set up initially to perform one-way grid nesting between the 36 km and 12 km domains and full two-way grid nesting on the 12/4/0.8 km domains. We also intend to configure CAMx to perform one-way grid nesting on just the 4/0.8 km and 0.8 km domains, so that we can cost-effectively conduct sensitivity tests and evaluate the effects of emission control strategies that are limited to southwestern Pennsylvania or the Liberty-Clairton area without having to carry the extra domains.

The PPM advection solver will be used for horizontal transport along with the spatially varying horizontal diffusion approach based on the method of Smagorinsky (1963). A simple eddy viscosity (or “K-theory”) first-order closure approach will be used for vertical diffusion. The CB6 gas-phase chemical mechanism is selected because it includes the very latest chemical kinetic rates and represents improvements over the CB05 and SAPRC chemical mechanisms. Additional CAMx inputs will be as follows:

> Meteorological Inputs: The WRF-derived meteorological fields will be prepared for CAMx using WRFCAMx Version 3.2. The CMAQ-Kv method along with the KVPATCH

adjustment will be used to generate vertical diffusivity for CAMx. Several alternative vertical diffusivity options (TKE, ACM2, etc.) may be evaluated in sensitivity tests.

Initial/Boundary Conditions: The boundary conditions (BCs) for the 36 km CONUS domain simulation would be based on the latest available information. Boundary conditions will be extracted from a global chemistry model, such as MOZART or GEOS-Chem. Existing programs will be used to interpolate from the MOZART/GEOS-Chem horizontal and vertical coordinate system to the CAMx LCC coordinate system and vertical layer structure and to map the MOZART/GEOS-Chem chemical species to the CB6 chemical mechanism.

Photolysis Rates: The modeling team will prepare the photolysis inputs as well as albedo/haze/ozone/snow inputs for CAMx based on the Total Ozone Mapping Spectrometer (TOMS) data. For CAMx the TUV processor will be used. If there are periods of more than a couple of days where daily TOMS data are unavailable, monthly average TOMS data will be used. CAMx will also be configured to use the in-line TUV to adjust for cloud cover.

Landuse: The team will generate landuse fields based on USGS GIRAS data and local-specific landuse data provided by ACHD.

Spin-Up Initialization: At least ten days of model spin up (December 21-31, 2006) will be used on the 36 km continental U.S. configuration. A shorter spin up (~5 days) will be used for the 12/4/0.8 km two-way nesting simulations.

Plume-in-Grid: The Plume-in-Grid (PiG) subgrid-scale plume module would be turned on for all identified local sources in the Liberty-Clairton area as well as for major stationary point sources in the SWPA 4 km domain.

PSAT: The Particulate Source Apportionment Technology (PSAT) would be turned on for the identified local sources in the Liberty-Clairton area. The PiG sources would be sampled using the receptors defined in Section 4.6. If AERMOD is used for local source contributions, the effects of the local sources can be removed from the CAMx modeling by subtracting out the PSAT contributions for the local sources.

Sensitivity tests will be conducted to help define the optimal CAMx model configuration for simulating $PM_{2.5}$ in the Liberty-Clairton region. Although not all sensitivity tests can be defined ahead of time, the effects of vertical resolution and vertical mixing will be investigated for portions of the 2007 year. In particular, the use of layer collapsing versus no layer collapsing near the surface will be investigated. Alternative approaches for calculating vertical diffusion coefficient (Kv) as well as the minimum Kv value will also be examined.

Table 4-3. Science options selected for the CAMx Liberty-Clairton $PM_{2.5}$ modeling.

Science Options	Configuration	Notes
Model Codes	CAMx Version 5.4 (October 2011)	CB6 chemical mechanism update. Newer version if available at time of modeling
Horizontal Grid Mesh	36/12/4/0.8 km	
36 km grid	148 x 112 grid cells	36 to 12 km one-way grid nesting
12 km grid	174 x 117 grid cells	12/4/0.8 km two-way grid nesting
4 km grid	54 x 60 grid cells	Also set up 4/0.8 km domains with a one-way nesting between 12 and 4 km and 4 and 0.8 km
0.8 km grid	75 x 60 grid cells	Also set up 0.8 km domain as one-way nest
Vertical Grid Mesh	25-37 vertical layers, defined by WRF	Number of vertical layers and layer collapsing to be determined based on sensitivity tests
Grid Interaction	36/12 km one-way nesting 12/4/0.8 km two-way nesting	4/0.8 km and 0.8 km also set up as standalone configurations
Initial Conditions	~10 day spin-up on 36 km grid	Clean initial conditions
Boundary Conditions	36 km from global chemistry model	Evaluate MOZART and GEOS-Chem global chemistry models
Emissions		
Baseline Emissions Processing	SMOKE, MOVES, SMOKE-BEIS	2007 MANE-VU, LADCO and SEMAP and 2008 NEI
Sub-grid-scale Plumes	Plume-in-Grid for local sources in Liberty-Clairton area and for major NO_X sources	GREASD-PiG NO_X chemistry plume model
Chemistry		
Gas Phase Chemistry	CB6	Latest chemical reactions and kinetic rates (Yarwood et al., 2010)
Meteorological Processor	WRFCAMx Version 3.2	Compatible with CAMx V5.4
Horizontal Diffusion	Spatially varying	K-theory with Kh grid size dependence
Vertical Diffusion	CMAQ-Kv	Similar to CMAQ's integration methodology
Diffusivity Lower Limit	Kv-min = 0.1 m^2/s	KVPATCH to set landuse-dependent minimum Kv for layers below 100 m
Deposition Schemes		
Dry Deposition	Zhang dry deposition scheme	LAI-based algorithm using 26 landuse categories (Zhang et al., 2001)
Wet Deposition	Scavenging model for gases and aerosols	Deposition by rain/snow/graupel
Numerics		
Gas Phase Chemistry Solver	EBI Fast Solver	Based on Euler Backward Iterative scheme (Hertel et al., 1993)
Vertical Advection Scheme	Implicit scheme w/ vertical velocity update	
Horizontal Advection Scheme	Piecewise Parabolic Method (PPM) scheme	Piecewise Parabolic Method (PPM) scheme (Colella and Woodward,1984)
Integration Time Step	Wind speed dependent	~20-60 sec (0.8 km); ~0.5-1 min (4 km), 1-5 min (12 km), 5-15 min (36 km)

5 EVALUATION OF RESULTS

This section delineates the procedures for post-processing modeled results and testing for attainment.

5.1 Meteorological Model Performance Evaluation

Meteorological inputs required by the CAMx model include hourly estimates of the three-dimensional distribution of winds, temperatures, mixing ratio, pressure, clouds, and precipitation, and other physical parameters or diagnosed quantities such as turbulent mixing rates (i.e., eddy diffusivities or Kv) that define planetary boundary layer heights. Accordingly, the objective of the WRF performance evaluation is to assess the adequacy of the surface and aloft meteorological fields for the Allegheny County $PM_{2.5}$ modeling episodes.

5.1.1 Components of the ACHD WRF Evaluation

The WRF modeling system is now well-established with a development and refinement history of almost a decade and over 6,000 registered users world-wide. The model has seen extensive use worldwide by many agencies, consultants, university scientists and research groups. Thus, the current version of the model, as well as its predecessor versions, has been extensively "peer-reviewed" and considerable algorithm development and module testing has been carried out with all of the important process components. Given that the WRF model code and algorithms have already undergone significant peer review, performance testing of the WRF model in this study will be focused on an operational evaluation for the specific ACHD modeling year.

Typically, the scope of the scientific evaluation is limited by the availability of special meteorological observations (radar profiler winds, turbulence measurements, PBL heights, precipitation and radiation measurements, inert tracer diffusion experiments, and so on). Unfortunately, since these types of measurements may be limited over the Pennsylvania region during the modeling episode, a meaningful scientific evaluation of the WRF may not be possible in this study. However, if the operational evaluation is performed thoroughly, they are expected to be sufficient to serve as the basis for judging whether the WRF model is operating with sufficient reliability over the domain to be used in the photochemical modeling portion of this study.

5.1.2 Data Supporting Meteorological Model Evaluation

Hourly surface and upper-air meteorological observations will be obtained from the Meteorological Assimilation Data Ingest System (MADIS)[27] and other sources to support the evaluation of WRF surface temperature, water vapor, and wind fields. The MADIS system includes surface and upper-air meteorological data from numerous networks, including the surface airways, Mesonet and RAWS networks and includes numerous Mesonet sites across the county. For precipitation we will use the NOAA National Weather Service Climate Prediction Center (CPC) daily precipitation amounts[28].

5.1.3 Meteorological Model Evaluation Tools

The primary tool used for evaluating the WRF meteorological model in air quality modeling studies is the *METSTAT* program developed by ENVIRON. *METSTAT* calculates a suite of

[27] http://madis.noaa.gov/
[28] http://www.cpc.ncep.noaa.gov/products/precip/realtime/

model performance statistics using surface wind speed, wind direction, temperature and water vapor mixing ratio for use specified sub-domains. Model performance evaluation metrics to be used in evaluating the WRF model include temperature and water mixing ration bias and error, wind direction bias and error and wind speed root-mean-square error (RMSE). We will use both regional as well as local sub-domains in the *METSTAT* analysis. The WRF model performance will be compared against meteorological model performance benchmarks (Emery et al., 2001) and other applications in order to put the WRF performance in context. The spatial pattern of the WRF daily precipitation fields will be compared against the CPC data. Additional comparisons of the spatial patterns of precipitation and clouds may also be made using satellite and radar-based data.

5.2 Air Quality Model Performance Evaluation

This section describes a range of model testing methodologies potentially available to the modeling team in its efforts to adequately evaluate the performance of the air quality modeling system for the 2007 annual period. Model performance for CAMx (or combined CAMx/AERMOD) results will be based on the methodology given in the latest EPA Modeling Guidance (EPA, 2007), which essentially calls for an operational evaluation of the model focusing on a specific set of gas phase and PM chemical species and a suite of statistical metrics for quantifying model response over the annual cycle. The emphasis is on assessing: (a) how accurately the model predicts observed concentrations; and (b) how accurately the model predicts responses of predicted air quality to changes in inputs.

5.2.1 Context for the Liberty-Clairton Model Performance Evaluation

When designing a model performance evaluation, it is important to understand how the modeling results will ultimately be used. EPA has published a final guidance document that encompasses ozone, fine particulate, and regional haze/visibility modeling (EPA, 2007). That document not only provides a framework for the Liberty-Clairton model performance evaluation approach, but just as importantly describes the methodology by which to project base-year pollutant levels to target years. A key concept in EPA's guidance is that the modeling projections are used in a relative sense to scale or roll back the observed individual PM species concentrations. The model-derived ratios of future-year to current-year concentrations are called Relative Response Factors (RRFs). Since the model is used to project future year $PM_{2.5}$ species components rather than total $PM_{2.5}$ mass, then the model performance for each of the components is actually more important than for total $PM_{2.5}$ mass for which the standard was written. These components are:

- Sulfate (SO4);
- Nitrate (NO3);
- Ammonium (NH4);
- Organic Aerosol (OA);
- Elemental Carbon (EC); and
- Other Inorganic fine Particulate (IP or Soil).

Therefore, the Liberty-Clairton model testing will concentrate on an operational evaluation of the model predictions for those PM components listed above as well as total $PM_{2.5}$ mass. Where feasible and supported by sufficient measurement data, we will also evaluate the modeling system for its ability to accurately estimate coarse PM mass (CM) and other gas-phase precursor, product and indicator species. The correct simulation of gas-phase oxidant species is needed for PM since correct, unbiased simulation of gas-phase photochemistry is a necessary element of reliable secondary PM predictions. This evaluation will be carried out across the Liberty-Clairton focus area for the entire year and also on a month-by-month to daily basis to help build confidence that the modeling system is operating correctly.

The Liberty-Clairton $PM_{2.5}$ modeling will be based on either CAMx alone or a hybrid modeling system using CAMx and AERMOD. If both CAMx and AERMOD are used, the model performance evaluation for the 2007 Base Year will include analyses of both CAMx and AERMOD predictions against available measurements at monitors throughout the 4 km and 0.8 km modeling domains. Performance will be assessed in two ways: (1) CAMx alone, simulating all sources; and (2) CAMx and AERMOD combined, where the CAMx PSAT source apportionment is used to remove the contributions of the local sources in the CAMx run, and the results will be added to AERMOD results at specific receptor locations to yield a sum of urban/regional and local source impacts.

5.2.2 Multi-Layered Model Testing Process

EPA's final modeling guidance (EPA, 2007) affirms the recommendations of numerous modeling scientists over the past decade (see, for example, Dennis et al., 1990; Tesche et al., 1990, 1994; Seigneur et al., 2000; Russell and Dennis, 2000; Arnold et al., 2003; Boylan et al., 2003; Tonnesen et al., 2003) that a comprehensive, multi-layered approach to model performance testing should be performed, consisting of the four components: operational, diagnostic, mechanistic (or scientific) and probabilistic. As applied to $PM_{2.5}$ modeling, this multi-layered framework may be viewed conceptually as follows:

> Operational Evaluation: Tests the ability of the model to estimate total and component PM concentrations. This evaluation examines whether the measurements are properly represented by the model predictions but does not necessarily ensure that the model is getting "the right answer for the right reason";
>
> Diagnostic Evaluation: For $PM_{2.5}$, this step tests the ability of the model to predict PM chemical composition including PM precursors (e.g., SO_X, NO_X, and NH_3) and associated oxidants (e.g., ozone and nitric acid), PM size distribution, temporal variation, spatial variation, and mass fluxes;
>
> Mechanistic Evaluation: Tests the ability of the model to predict the response of PM to changes in variables such as emissions and meteorology; and
>
> Probabilistic Evaluation: Takes into account the uncertainties associated with the model predictions and observations of PM.

Within the constraints of the Liberty-Clairton schedule and resources, the model evaluation effort will attempt to include elements of each of these components. The operational evaluation will obviously receive the greatest attention since this is the primarily thrust of EPA's final modeling guidance. However, we will consider, where feasible and appropriate, diagnostic and mechanistic tests (e.g., use of probing tools, indicator species and ratios, aloft model evaluations, urban vs. rural performance analyses), traditional sensitivity simulations to explore uncertainty, and comparison of the model performance of this study with those from other groups.

5.2.3 Development of Consistent Evaluation Data Sets

The ground-level model evaluation database will be developed using several routine and research-grade databases. The first is the routine gas-phase concentration measurements for ozone, NO, NO_2 and CO archived in EPA's Aerometric Information Retrieval System/Air Quality System (AIRS/AQS) database[29]. Other sources of information come from the various PM monitoring networks in the U.S. These include: IMPROVE[30], CASTNet[31], SEARCH[32], FRM[33],

[29] http://www.epa.gov/air/data/
[30] http://vista.cira.colostate.edu/improve/Data/IMPROVE/improve_data.htm

CSN[34] and NADP[35] networks. Typically, these networks provide ozone, other gas phase precursors and product species, PM mass and species, deposition, and visibility measurements. Of key importance for the Liberty-Clairton modeling will be the AIRS/AQS, FRM, and CSN sites that measure ozone (and some precursors), total $PM_{2.5}$ mass, and speciated $PM_{2.5}$ components, respectively.

An important consideration in evaluating PM models is that each monitoring network employs a unique measurement approach that "measures" a different amount of a given species. For example, the IMPROVE network only speciates $PM_{2.5}$, so any sulfate or nitrate in the coarse mode ($PM_{10-2.5}$) is included in the coarse mass (CM) "measurement". Thus, CAMx will be evaluated separately for each monitoring network. Additionally, there is often ambiguity in the mapping of modeled PM species to measurements. For example, PM monitors measure only the carbon component of OC, whereas in the model the entire mass of organics (OA or Organic Aerosol) is simulated, which includes carbon and the other elements attached to the carbon (e.g., hydrogen and oxygen). Thus, a factor is assumed to adjust the measured OC to OA. In the past an OA/OC factor of 1.4 has been used based on urban scale measurements of fresh OC emissions, and this has been the factor used in the IMPROVE reconstructed mass equation (Malm et al., 2000). However, this OA/OC factor is likely too low, especially for aged OC compounds where ratios of 1.4 to 2.2 have been observed (Turpin and Lim, 2001). A recent study has shown that summertime OA/OC ratios are larger than wintertime values across the U.S. and that winter values are larger in the eastern U.S. than in the West (Simon et al., 2011). Currently an average OA/OC ratio value of 1.8 has been adopted for revised IMPROVE reconstructed mass equation. However, in the urban Liberty-Clairton area where we expect there to be fresh OA emissions an OA/OC ratio closer to 1.4 may be more appropriate.

Within the Liberty-Clairton area FRM $PM_{2.5}$ monitoring sites are operated at Liberty and Clairton monitoring sites. A $PM_{2.5}$ speciation CSN site is also operated at Liberty as well as SO_2, H_2S, HAPS and meteorological measurements. Liberty and Clairton also have continuous $PM_{2.5}$ measurements that are also measured at Lincoln and Glassport within the Liberty-Clairton area[36].

5.2.4 Air Quality Model Evaluation Tools

The current modeling guidance document (EPA, 2007) focuses more on a holistic model evaluation approach compared to the original 1-hour ozone and draft PM guidance (EPA, 1991; 2001). Not only should we assess how well the model matches the observation, but we also need to determine whether the model is correctly simulating the processes that produce the elevated concentrations, which includes comparing against a conceptual model. Table 5-1 lists a standard set of statistical performance measures that can be used to evaluate fine particulate models. These performance measures will be calculated using several model performance evaluation software tools, including:

> UCR Analysis Tool: Operates on a Linux platform, performs species and temporal matching of the predictions and observations and generates statistical performance measures, scatter plots and time series plots for user specified sub-domains and across all sites and all days, for each site and all days, and for each day across all sites.
>
> Alpine Geophysics MAPS Software: Also operates on a Linux platform generating statistical measures, scatter plots, time series plots and spatial comparisons of

[31] http://java.epa.gov/castnet/
[32] http://www.atmospheric-research.com
[33] http://www.epa.gov/ttnamti1/pmfrm.html
[34] http://www.epa.gov/ttn/amtic/amticpm.html
[35] http://nadp.sws.uiuc.edu/
[36] http://www.achd.net/air/annualreports/2007_final_AQ.pdf

predictions and observations. MAPS also produces spatially averaged performance summaries (e.g., time series of bias and error) that are useful for synthesizing model performance.

PAVE/VERDI: Used on a Linux platform to generate spatial maps (tile plots) of model predictions with super imposed observations as colored symbols. PAVE is no longer supported so we anticipate that VERDI[37] will be used for spatial maps.

AMET: The Atmospheric Model Evaluation Tool (AMET[38]) can generate graphical displays of model performance as well as statistics performance metrics.

ENVIRON Performance Software: Calculates performance statistics and exports them along with the predictions and observations to be used with macros operating standard Windows software such as Excel and SURFER to generate graphical displays of model performance that can be customized by the user where the data are also available for further analysis if desired.

The Liberty-Clairton PM evaluation of the 2007 CAMx base case simulation will use the most appropriate of these evaluation packages to elucidate model performance. Procedures for evaluating PM models, however, are much less established and research is ongoing.

The Liberty-Clairton operational evaluation will utilize numerous graphical displays to facilitate quantitative and qualitative comparisons between CAMx predictions and measurements. Together with the statistical metrics listed in Table 5-1, the graphical procedures are intended to help determine whether the CAMx 2007 base case simulation is performing well enough to make reliable future year $PM_{2.5}$ projections. The core graphical displays to be considered for use include the following:

- Spatial mean concentration time series plots;
- Time series plots at monitoring locations;
- Ground-level gas-phase and particulate concentration maps (i.e., tile plots);
- Concentration scatter plots stratified by station, by time, and by network;
- Bias and error stratified by concentration;
- Bias and error stratified by time;
- Histogram plots of the statistical metrics, stratified by day, by pollutant, by subregion, and by monitoring network; and
- Quantile-Quantile (Q-Q) plots.

These graphical displays will be generated, where appropriate for the full annual cycle as well as for monthly and seasonal periods. The displays will be generated with a consistent suite of products including the UCR analysis tools, AMET, Alpine MAPS software and ENVIRON evaluation software.

Ideally, the operational evaluation described above will confirm that the modeling system is performing consistent with its scientific formulation, technical implementation, and at a level that is at least as reliable as other current state-of-science methods. Should unforeseen model performance problems arise in the 2007 base case simulation, it may be necessary to draw into the evaluation supplemental diagnostic tools to aid in model testing. These diagnostic techniques are loosely referred to as “probing tools”. The actual need for their use, if any, can only be determined once the initial 2007 CAMx operational evaluation is completed. Should such diagnostic methods actually be needed, their usage would require additional resources. Below,

[37] http://www.verdi-tool.org/
[38] http://www.cmascenter.org/help/model_docs/amet/1.0/AMET_Users_Guide_v1.0.pdf

we identify the types of probing tools that could be brought to bear under should their use become necessary.

Current “one-atmosphere” models such as CAMx have been outfitted with a number of “probing tools” that have proven to be very useful in testing and improving model performance and in evaluating emission control strategies. Among the probing tools available in CAMx are: (a) ozone and particulate source apportionment technology (OSAT and PSAT), (b) process analysis (PA), and (c) the decoupled direct method (DDM) of sensitivity analysis.

Because application of all these probing tools—source apportionment, DDM, and Process Analysis—are computational intensive and require a fair amount of analysis time to reap the benefits of using the methods, they do not lend themselves directly to the full simulation period. However, each method has potential for use in addressing key episodic periods or geographical locations in the Liberty-Clairton area where performance in the base case simulation may present a problem or where particular attention needs to be focused on emissions controls (a specific $PM_{2.5}$ violation monitor). In such focused applications, one or more of these probing tools may indeed serve a purpose and will be considered where appropriate.

Table 5-1. Core statistical measures to be used in the Liberty-Clairton air quality model evaluation with ground-level data.

Statistical Measure	Mathematical Expression	Notes
Accuracy of paired peak (***A_p***)	$\frac{P - O_{peak}}{O_{peak}}$	P_{peak} = paired (in both time and space) peak prediction
Coefficient of determination (***r^2***)	$\frac{\left[\sum_{i=1}^{N}(P_i - \overline{P})(O_i - \overline{O})\right]^2}{\sum_{i=1}^{N}(P_i - \overline{P})^2 \sum_{i=1}^{N}(O_i - \overline{O})^2}$	P_i = prediction at time and location *i*; O_i = observation at time and location *i*; $\overline{P}$ = arithmetic average of P_i, i=1,2,…,N; $\overline{O}$ = arithmetic average of O_i, i=1,2,…,N
Normalized Mean Error (***NME***)	$\frac{\sum_{i=1}^{N}\lvert P_i - O_i\rvert}{\sum_{i=1}^{N} O_i}$	Reported as %
Root Mean Square Error (***RMSE***)	$\left[\frac{1}{N}\sum_{i=1}^{N}(P_i - O_i)^2\right]^{1/2}$	Reported as %
Fractional Gross Error (***F_E***)	$\frac{2}{N}\sum_{i=1}^{N}\left\lvert\frac{P_i - O_i}{P_i + O_i}\right\rvert$	Reported as %
Mean Absolute Gross Error (***MAGE***)	$\frac{1}{N}\sum_{i=1}^{N}\lvert P_i - O_i\rvert$	Reported as concentration (e.g., µg/m^3)
Mean Normalized Gross Error (***MNGE***)	$\frac{1}{N}\sum_{i=1}^{N}\frac{\lvert P_i - O_i\rvert}{O_i}$	Reported as %
Mean Bias (***MB***)	$\frac{1}{N}\sum_{i=1}^{N}(P_i - O_i)$	Reported as concentration (e.g., µg/m^3)
Mean Normalized Bias (***MNB***)	$\frac{1}{N}\sum_{i=1}^{N}\frac{(P_i - O_i)}{O_i}$	Reported as %
Mean Fractionalized Bias (Fractional Bias, ***MFB***)	$\frac{2}{N}\sum_{i=1}^{N}\left(\frac{P_i - O_i}{P_i + O_i}\right)$	Reported as %
Normalized Mean Bias **(*NMB*)**	$\frac{\sum_{i=1}^{N}(P_i - O_i)}{\sum_{i=1}^{N} O_i}$	Reported as %
Bias Factor (***BF***)	$\frac{1}{N}\sum_{i=1}^{N}\left(\frac{P_i}{O_i}\right)$	Reported as BF:1 or 1:BF or in fractional notation (BF/1 or 1/BF).

5.3 Attainment Tests

This section provides a summary of how the modeling results will be used to demonstrate attainment of the $PM_{2.5}$ National Ambient Air Quality Standard (NAAQS) in the Liberty-Clairton area. It is expected that at least three CAMx simulations (or hybrid CAMx/AERMOD simulations) will be simulated:

- 2007 Base Case representing current emission conditions.
- 2014 "Base Case" where emission reflect growth, shut-downs, and "on-the-books" controls.
- 2014 "Control Case" that includes additional or revised controls.

The procedures for demonstrating attainment of the $PM_{2.5}$ NAAQS are given in EPA's final modeling guidance dated April 2007 (EPA, 2007) with the procedure for the 24-hour $PM_{2.5}$ attainment demonstration approach updated in June 2011 (Fox, 2011). The EPA guidance (EPA, 2007) approach for making future year $PM_{2.5}$ Design Value (DV) projections has been codified in the Modeled Attainment Test Software (MATS). We expect MATS to be updated with the updated 24-hour $PM_{2.5}$ DV projection approach (Fox, 2011) in time for this study. These procedures use the Speciated Model Attainment Test (SMAT; Timin, 2005; 2007) that was first used to project future year $PM_{2.5}$ Design Values (DVs) for the Clean Air Interstate Rule (CAIR)[39]. The SMAT procedure uses the modeling results in a relative sense to scale the observed $PM_{2.5}$ DVs from the current- to future-year. The scaling factors are called Relative Response Factors (RRFs) and are monitor- and PM species-specific and are based on the ratio of the future-year to current-year modeling results. The starting point for the $PM_{2.5}$ DV projections is a site-specific baseline design value (DVB) that is calculated by averaging three design value periods centered on the base year under study, which is 2007 for the Liberty-Clairton $PM_{2.5}$ DV projections. Thus, the DVB will be based on three $PM_{2.5}$ DVs (three year average of annual mean $PM_{2.5}$ concentrations for the annual standard or three year average of the 98th percentile 24-hour average $PM_{2.5}$ concentrations for the 24-hour standard) of the 2005-2007, 2006-2008, and 2007-2009 periods. In this averaging scheme, $PM_{2.5}$ concentrations from 2007 is "weighted" three times, 2006 and 2008 are weighted twice, and 2005 and 2009 are weighted once.

The SMAT procedures consists of two components: (1) the combination of total $PM_{2.5}$ mass measurements from the Federal Reference Method (FRM) with speciated $PM_{2.5}$ measurements such as those from the Chemical Speciation Network (CSN); and (2) the combination of the modeling results with the speciated FRM $PM_{2.5}$ DVs to obtain future-year projected $PM_{2.5}$ DVs.

One advantage to using the CAMx/PiG modeling system for making future year $PM_{2.5}$ DV projections is that the CAMx modeling results can be used directly with the MATS tool. However, if the hybrid CAMx and AERMOD modeling approach is used, then special procedures must be utilized to account for the local source contributions and differences in the two modeling systems.

5.3.1 Speciation of FRM $PM_{2.5}$ Mass Measurements

$PM_{2.5}$ attainment/nonattainment can only be determined from the FRM (or FRM-equivalent) $PM_{2.5}$ measurements, which measure just total $PM_{2.5}$ mass. The FRM $PM_{2.5}$ measurements are used to develop the $PM_{2.5}$ DVs that determine an area's attainment classification, and are used as the starting point for projecting future-year $PM_{2.5}$ DVs to demonstrate attainment. Thus, representative speciated $PM_{2.5}$ measurements need to be mapped to the FRM total mass measurements for the modeled attainment test. For most areas there is either a co-located speciated $PM_{2.5}$ site, or such a site in the vicinity that can be used in the mapping. However, in

[39] http://www.epa.gov/cair/

some cases there is no nearby speciated $PM_{2.5}$ site so speciation must be developed from all available data in the region and interpolated to the FRM monitoring site.

Speciated $PM_{2.5}$ measurements are routinely collected on the same 1-in-3 day sampling schedule as used by the FRM network. Two routine speciated PM monitoring networks are available across the U.S.: the Chemical Speciation Network (CSN) and the Interagency Monitoring of Protected Visual Environments (IMPROVE) networks. The FRM, CSN, and IMPROVE networks use different measurement technologies and each exhibits its own measurement artifacts. As the FRM is the de-facto regulatory definition of $PM_{2.5}$, EPA has developed procedures for adjusting the CSN and IMPROVE speciated $PM_{2.5}$ measurements to account for the measurement artifacts of the different networks and to make the speciated PM measurements consistent with the FRM $PM_{2.5}$ mass measurements. These adjustments include the following:

- Adjust nitrates downward to account for volatilization off of the FRM nylon filter;
- Add particle-bound water (PBW) that is assumed to be associated with nitrate and sulfate in the FRM measurements (hydroscopic species); and
- Estimate total carbonaceous mass accounting for the lack of blank-correction in the speciated $PM_{2.5}$ measurements.

The resultant fine particle chemical speciation approach has been named the "sulfates, adjusted nitrates, derived water, inferred carbonaceous material balance approach" or SANDWICH. Details on the SANDWICH procedures are given in Frank (2006a,b) and in EPA (2007).

As noted previously, for the Liberty-Clairton area CSN speciated $PM_{2.5}$ measurements are available at the Liberty monitoring site.

5.3.2 Speciated Modeled Attainment Test (SMAT)

EPA has developed the Model Attainment Test Software (MATS) tool[40] to address attainment demonstrations for the 8-hour ozone and $PM_{2.5}$ NAAQS and for demonstrating progress toward visibility goals as part of the Regional Haze Rule (RHR). The MATS tool has been populated with air quality monitoring data to facilitate making 8-hour ozone and $PM_{2.5}$ projections. Once we have the FRM and associated SANDWICH $PM_{2.5}$ speciation data for the 2005-2009 period, there are several steps in the SMAT procedures using current year 2007 base case and future year 2014 modeling results as described in EPA's modeling guidelines (EPA, 2007). The MATS software will also be used for an unmonitored area analysis (UAA), indicating that no areas without FRM sites will show nonattainment of the NAAQS.

5.3.3 Special Considerations for Local-Scale Primary $PM_{2.5}$ Impacts

There are several local industrial and other sources that contribute to $PM_{2.5}$ concentrations at the Liberty and Clairton FRM monitors. The contributions of these local sources will be evaluated either using the CAMx model with PiG and high resolution grids, or with the AERMOD steady-state Gaussian plume model. If the CAMx PiG is used to simulate the local source contributions then the standard EPA SMAT procedure in MATS can be used to make 2014 $PM_{2.5}$ DV projections. However, if a hybrid CAMx/AERMOD modeling approach is used, then special considerations must be made and MATS cannot be used. Section 5.3 of EPA's modeling guidance (EPA, 2007, pp. 63-74) addresses an approach for dealing with the local-scale $PM_{2.5}$ contributions including how to combine regional photochemical grid modeling results with local-scale Gaussian plume modeling results. In this approach, the current year observed $PM_{2.5}$ Design Value (DV) is split into local and regional components. Relative Response Factors (RRFs) that consist of the ratio of 2014 to 2007 modeling results are developed using AERMOD

[40] http://www.epa.gov/scram001/modelingapps_mats.htm

and CAMx and they are used to project the local and regional components of the current year DV to the future year (2014). The two components are then combined to obtain the projected 2014 $PM_{2.5}$ DV. MATS does not treat this approach, but ENVIRON has developed tools for making the hybrid $PM_{2.5}$ projection approach that have been used for both Birmingham and St. Louis.

5.4 Weight of Evidence Analyses

EPA's guidance recommends several options for supplemental analyses when making a "weight of evidence" (WOE) determination. These options are based on the results of the modeled attainment test, specifically how far above the standard the modeled future year concentrations are projected to be. Furthermore, there are three general types of WOE analyses in support of the attainment demonstration: (a) use of air quality model output; (b) examination of air quality and emissions trends; and (c) the use of corroborative modeling. We will consider the use of these methods in conducting the CAMx modeling because it could significantly strengthen the credibility and reliability of the modeling available to the states for their subsequent use. The exact details of the WOE analyses must wait until the Liberty-Clairton modeling study evolves further. It is premature to prescribe which, if any, of the WOE analyses would be performed since the model's level of performance with the base case modeling is obviously not known at this time. It is a good idea to perform WOE analysis to corroborate the modeled attainment demonstration. Many of the WOE analyses are independent of the photochemical modeling being conducted by the study team and can potentially be performed by the project sponsors or interested stakeholders. Below are thoughts regarding what would likely be considered as part of the WOE analyses.

Use of Emissions and Air Quality Trends: Emissions and air quality trend analysis is always an important component of a WOE analysis. When combined with meteorological analysis of the yearly ozone formation potential, it can be used to determine whether actual trends can corroborate the model projected determination of whether future-year air quality goals are achieved. Traditionally, these types of analyses are performed by the lead agency's own staff as part of their SIP development.

Use of Corroborative Observational Modeling: While regulatory modeling studies for ozone attainment demonstrations have traditionally relied upon photochemical models to evaluate ozone control strategies, there has recently been growing emphasis on the use of data-driven models to corroborate the findings of air quality models. As noted, EPA's guidance (EPA, 2007) now encourages the use of such observation-based (OBM) or observation-driven (OBD) models. These include receptor models such as Chemical Mass Balance (CMB) model and the Positive Matrix Factorization (PMF) model. We will consider the merits of using these techniques as supportive WOE. While the OBD/OBM models cannot predict future year air quality levels, they do provide useful corroborative information on the extent to which ozone formation in specific sub-regions may be VOC-limited or NOx-limited, for example, or where controls on ammonia or SO_2 emissions might be most influential in reducing $PM_{2.5}$. Information of this type, together with results of DDM, PA, OSAT and PSAT as well as traditional "brute-force" sensitivity simulations, can be helpful in postulating emissions control scenarios since it helps focus on which pollutant(s) to control.

Use of Corroborative Photochemical Modeling: Noteworthy in EPA's ozone, PM, and regional haze guidance documents is the encouragement of the use of alternative modeling methods to corroborate the performance findings and control strategy response of the primary air quality simulation model (EPA, 2007). This endorsement of the use of corroborative methodologies stems from the common understanding that no single photochemical modeling system can be expected to provide exact predictions of the observed ozone and PM species concentrations, especially over time scales spanning 1-hour to 1 year. Although the photochemical/PM models identified in EPA's modeling guidance document possess many up-to-date science and computational features, there still can be important differences in modeled gas-phase and aerosol predictions when alternative models are exercised with identical and/or similar inputs.

Use of alternative air quality modeling system (e.g., CMAQ) will permit the more explicit identification the expected range of model uncertainty and to corroborate the general effectiveness of the pollutant control strategies.

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APPENDICES

APPENDIX A – Maps of Affected Areas

Pittsburgh – Beaver Valley Area: includes all of Allegheny, Beaver, Butler, Washington, and Westmoreland Counties, and parts of Armstrong Co. (Washington Twp., Plumcreek Twp., and Elderton Borough), Greene Co. (Monongahela Twp.), and Lawrence Co. (Taylor Twp. south of New Castle)

Liberty – Clairton Area: includes Glassport, Liberty, Lincoln and Port Vue Boroughs, and City of Clairton

Figure A-1. PM2.5 Southwestern PA Designation Areas.

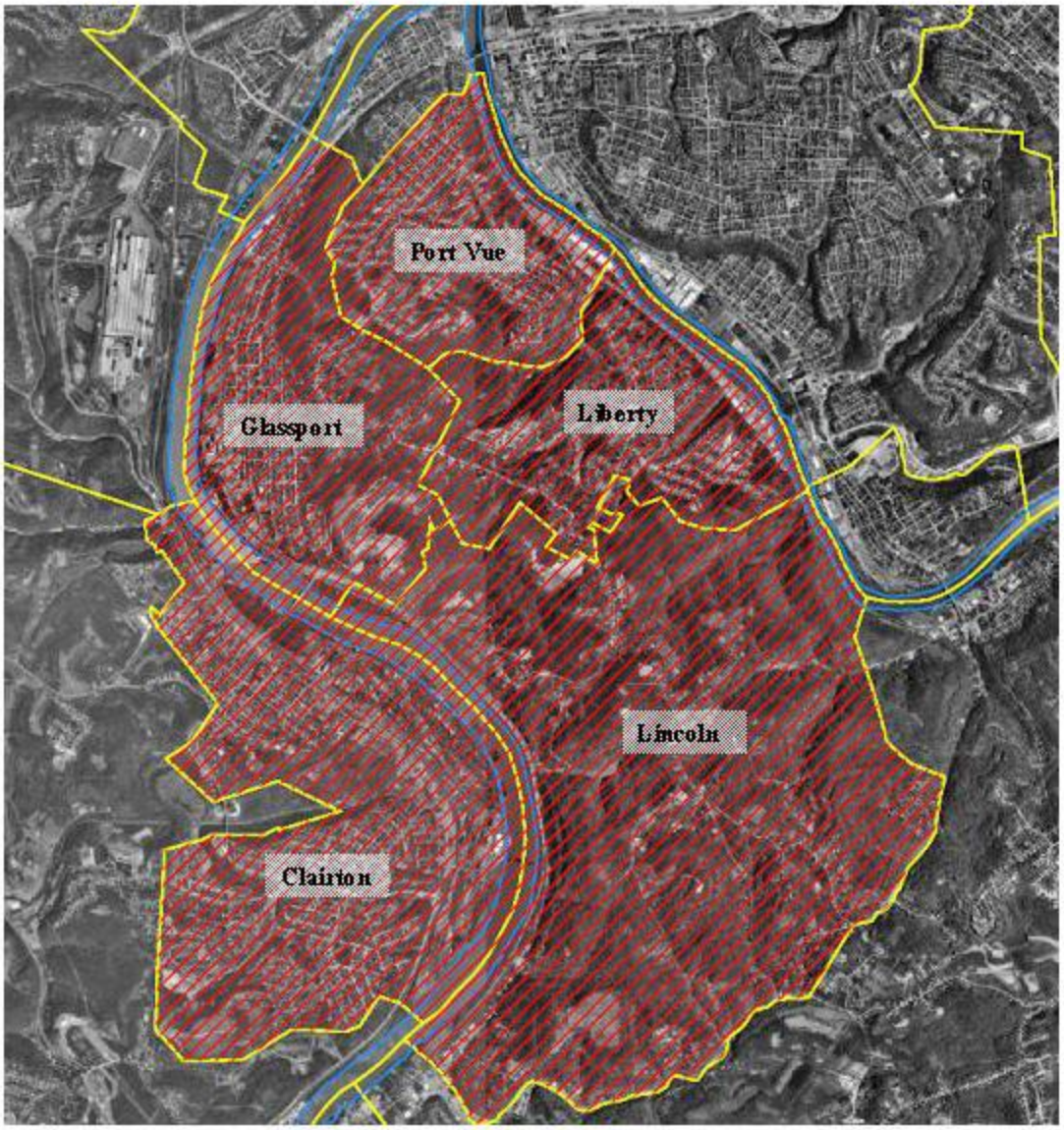

Figure A-2. Liberty-Clairton Area – Aerial Close-Up (with Municipalities).

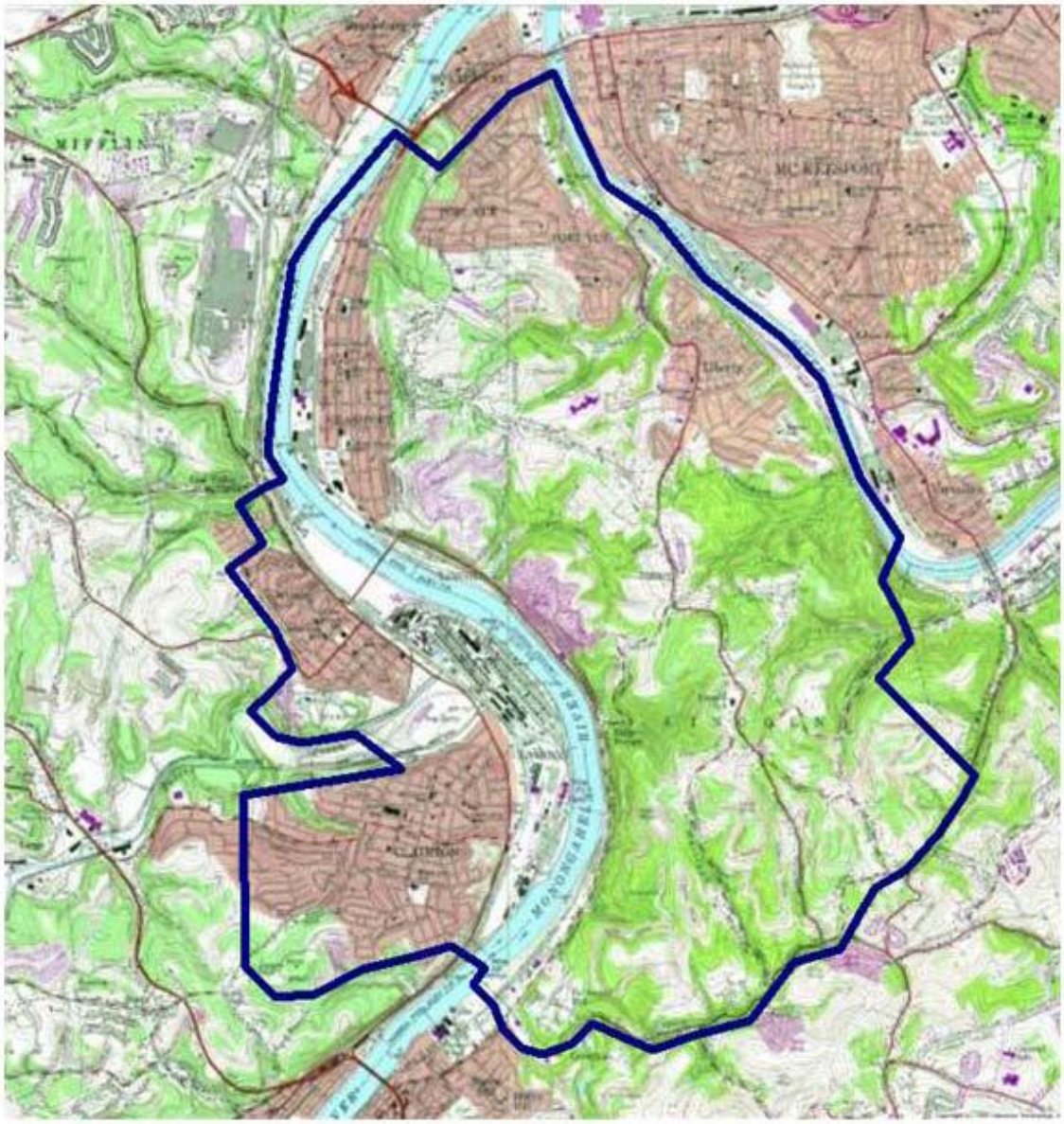

Figure A-3. Liberty-Clairton Area – Topographic Close-Up.

APPENDIX B – Monitored Sites and Data

Two sites have monitored $PM_{2.5}$ (FRM monitors) within the Liberty-Clairton Area:

Liberty: Located on a plateau near the center of the Liberty-Clairton Area at an elevation of 1069 ft. (MSL). Recent data shows that Liberty is attaining the annual standard but not the 24-hour standard. Liberty also contains continuous (TEOM) and speciation (STN) monitors. [AQS# 42-003-0064]

Clairton: Located within the Monongahela River valley in the western portion of the area at an elevation of 953 ft. (MSL). Recent data shows that Clairton is attaining the NAAQS. [AQS# 42-003-3007]

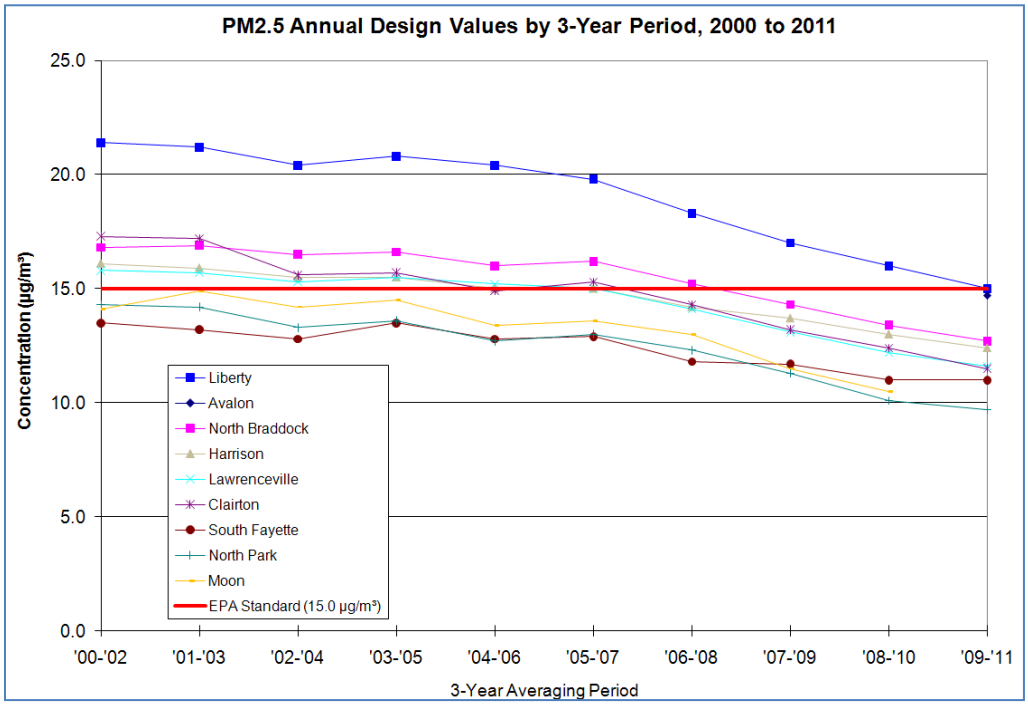

Figure B-1. Annual Design Values of PM2.5 FRM/FEM measurement data from 2000 to 2011.

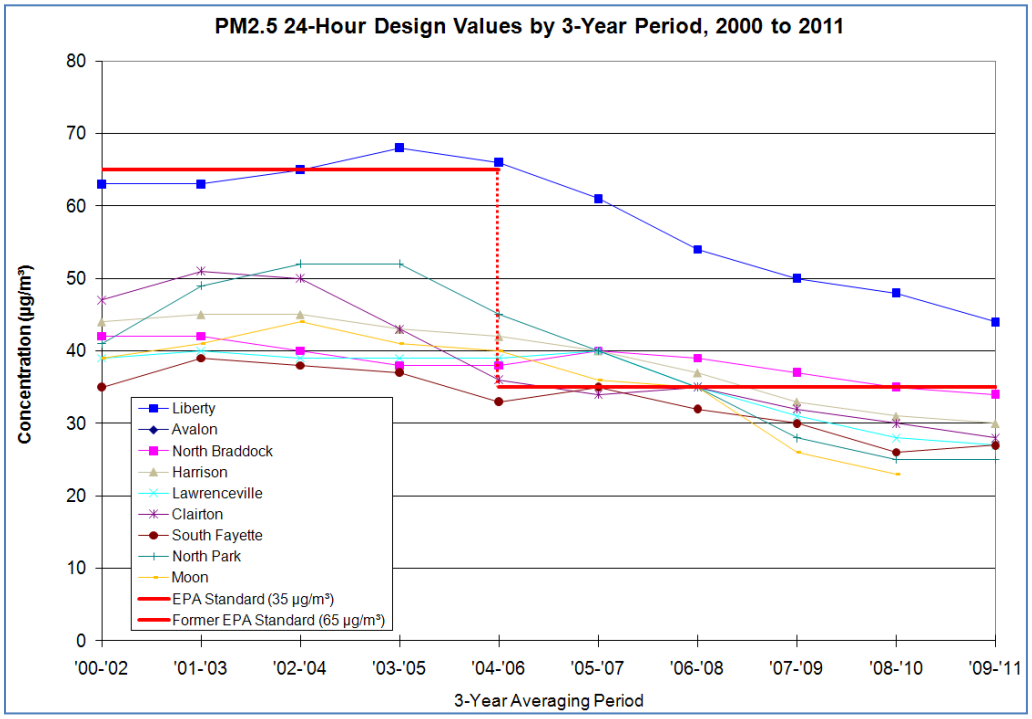

Figure B-2. 24-Hour Design Values of PM2.5 FRM/FEM measurement data from 2000 to 2011.

Table B-1. Liberty Weighted Baseline Values, 2005-2009, Annual Standard

Liberty FRM Quarterly Calculations

FRM Quarterly Avgs			Quarterly Avgs (3-Year)			Weighted Quarterly Avgs	
Year	**Qtr**	**Avg**	**3-Year Period**	**Qtr**	**Avg**	**Qtr**	**Avg**
2005	**1Q**	16.284	**2005-2007**	**1Q**	15.102	**1Q**	14.637
2005	**2Q**	22.264	**2005-2007**	**2Q**	19.598	**2Q**	18.051
2005	**3Q**	25.941	**2005-2007**	**3Q**	24.627	**3Q**	22.600
2005	**4Q**	21.101	**2005-2007**	**4Q**	19.880	**4Q**	18.186
						AVG	**18.368**
Year	**Qtr**	**Avg**	**3-Year Period**	**Qtr**	**Avg**		
2006	**1Q**	14.864	**2006-2008**	**1Q**	14.395		
2006	**2Q**	17.893	**2006-2008**	**2Q**	17.970		
2006	**3Q**	22.783	**2006-2008**	**3Q**	22.874		
2006	**4Q**	20.967	**2006-2008**	**4Q**	18.103		
Year	**Qtr**	**Avg**	**3-Year Period**	**Qtr**	**Avg**		
2007	**1Q**	14.158	**2007-2009**	**1Q**	14.415		
2007	**2Q**	18.637	**2007-2009**	**2Q**	16.585		
2007	**3Q**	25.158	**2007-2009**	**3Q**	20.297		
2007	**4Q**	17.571	**2007-2009**	**4Q**	16.573		
Year	**Qtr**	**Avg**					
2008	**1Q**	14.163					
2008	**2Q**	17.379					
2008	**3Q**	20.682					
2008	**4Q**	15.772					
Year	**Qtr**	**Avg**					
2009	**1Q**	14.924					
2009	**2Q**	13.740					
2009	**3Q**	15.051					
2009	**4Q**	16.377					

Table B-2. Liberty Weighted Baseline Values, 2005-2009, 24-Hour Standard

Liberty FRM Observed High Days

Methodology:

- Identify official 98th percentile value for each year
- Rounded to nearest integer

FRM High Days

	2005	2006	2007	2008	2009
98th-Percentile	69.6	55.7	54.7	50.0	45.3

3-Year Design Values

3-Year Period	Avg
2005-2007	60.0
2006-2008	53.5
2007-2009	50.0

5-Year Weighted Average

5-Year Period	Avg
2005-2009	54

Table B-3. Clairton Weighted Baseline Values, 2005-2009, Annual Standard

Clairton FRM Quarterly Calculations

FRM Quarterly Avgs			Quarterly Avgs (3-Year)			Weighted Quarterly Avgs	
Year	**Qtr**	**Avg**	**3-Year Period**	**Qtr**	**Avg**	**Qtr**	**Avg**
2005	**1Q**	14.133	**2005-2007**	**1Q**	13.141	**1Q**	12.489
2005	**2Q**	14.246	**2005-2007**	**2Q**	13.594	**2Q**	12.797
2005	**3Q**	24.357	**2005-2007**	**3Q**	21.567	**3Q**	19.594
2005	**4Q**	12.713	**2005-2007**	**4Q**	12.973	**4Q**	12.261
						AVG	**14.285**
Year	**Qtr**	**Avg**	**3-Year Period**	**Qtr**	**Avg**		
2006	**1Q**	12.927	**2006-2008**	**1Q**	12.642		
2006	**2Q**	13.507	**2006-2008**	**2Q**	12.747		
2006	**3Q**	19.157	**2006-2008**	**3Q**	19.637		
2006	**4Q**	12.360	**2006-2008**	**4Q**	12.198		
Year	**Qtr**	**Avg**	**3-Year Period**	**Qtr**	**Avg**		
2007	**1Q**	12.364	**2007-2009**	**1Q**	11.683		
2007	**2Q**	13.029	**2007-2009**	**2Q**	12.050		
2007	**3Q**	21.186	**2007-2009**	**3Q**	17.577		
2007	**4Q**	13.846	**2007-2009**	**4Q**	11.611		
Year	**Qtr**	**Avg**					
2008	**1Q**	12.636					
2008	**2Q**	11.707					
2008	**3Q**	18.567					
2008	**4Q**	10.387					
Year	**Qtr**	**Avg**					
2009	**1Q**	10.050					
2009	**2Q**	11.415					
2009	**3Q**	12.980					
2009	**4Q**	10.600					

Table B-4. Clairton Weighted Baseline Values, 2005-2009, 24-Hour Standard

Clairton FRM Observed High Days

Methodology:

- Identify official 98th percentile value for each year
- Rounded to nearest integer

FRM High Days

	2005	2006	2007	2008	2009
98th-Percentile	30.9	35.8	35.0	34.6	25.9

3-Year Design Values

3-Year Period	Avg
2005-2007	33.9
2006-2008	35.1
2007-2009	31.8

5-Year Weighted Average

5-Year Period	Avg
2005-2009	34

APPENDIX C – Meteorological Sites

Liberty

PIT

Figure C-1. Photographs for key meteorological sites: Liberty (at South Allegheny High School, where surface observations are recorded) and PIT airport (left, where surface observations are made) and PIT forecasting office (right, where sounding balloon is launched).

APPENDIX D – Facilities Potentially Affecting Liberty-Clairton

Below are facilities potentially affecting the Liberty-Clairton $PM_{2.5}$ nonattainment area, lying within the nonattainment area or in nearby municipalities.

Major Sources
Eastman Chemical, *Jefferson Hills*
Guardian, *Jefferson Hills*
Koppers, *Clairton*
US Steel Mon Valley Works – Clairton, *Clairton*
US Steel Mon Valley Works – Edgar Thomson, *Braddock*
US Steel Mon Valley Works – Irvin, *W. Mifflin*

Minor Sources
AKJ Industries, *Clairton*
Braddock Recovery, *Braddock*
Clairton Slag, *W. Elizabeth*
CP Industries, *McKeesport*
Consol Coal, *W. Elizabeth*
Durabond, *Liberty*
ELG Metals, *Liberty*
Gardner Denver Nash, *Elizabeth*
GM Stamping, *W. Mifflin*
Kelly Run Sanitation, *Forward*
Kinder Morgan, *Dravosburg*
Liberty Pultrusions, *W. Mifflin*
Marathon Ashland, *W. Elizabeth*
Mid-Continent Coal & Coke, *Clairton*
Mon Valley Transportation Center, *Glassport*
PA Electric Coil, *Glassport*
Precoat, *McKeesport*
Ryan Metals, *McKeesport*
Sanyo Chemical, *Jefferson Hills*
Tech Met, *Glassport*
Tube City – Clairton, *Clairton*
Tube City – Braddock, *Braddock*
TYK Refractories, *Clairton*

Power Plants (PA DEP sources)
GenOn Energy – Elrama, *Union Twp., Wash. Co.*
Allegheny Energy – Mitchell, *Union Twp., Wash. Co.*

APPENDIX E – Application of CAMx to the St. Louis area using Plume-in-Grid (PiG) to treat local source contributions.

Use of Hybrid Plume/Grid Modeling and the St. Louis Super Site Data to Model $PM_{2.5}$ Concentrations in the St. Louis Area

Presented at 6th Annual Community Modeling and Analysis System (CMAS) Conference
October 1-3, 2007
Chapel Hill, North Carolina

http://www.cmascenter.org/conference/2007/blank.cfm?CONF_PRES_ID=288

http://www.cmascenter.org/conference/2007/abstracts/morris_session8_2007.pdf

http://www.cmascenter.org/conference/2007/ppt/morris_session8_2007.ppt

G-2: Baseline Case 2007 Model Performance

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Revised 2007 Base Case Modeling and Model Performance Evaluation for the Allegheny County $PM_{2.5}$ State Implementation Plan

Final Report

Prepared for:
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Air Quality Program
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CONTENTS

1.0 INTRODUCTION 1

1.1 Updates in the Revised 2007 Base Case Modeling 1

1.2 Liberty-Clairton $PM_{2.5}$ Nonattainment Area 2

1.3 Purpose 3

2.0 PROBLEM STATEMENT 4

2.1 Geographic Situation 4

2.2 Air Quality Situation 5

2.3 Local Monitoring Data 7

2.4 Conclusions 10

3.0 MODELS, DOMAINS AND EPISODES 11

3.1 Episode Selection 11

3.2 Model Selection 11

3.3 Domain Definition 11

3.3.1 Horizontal Modeling Domains 11

3.3.2 Vertical Layer Structure 15

4.0 METEROLOGICAL MODELING 17

4.1 WRF Model Application 17

4.2 WRF Model Evaluation Summary 19

4.2.1 Model Performance Benchmarks 20

4.2.2 Surface WRF Meteorological Model Performance 21

4.2.3 WRF Precipitation Model Performance 27

4.2.4 Comparisons with Other Studies 30

4.3 Conclusions Meteorological Model Performance 30

5.0 EMISSIONS MODELING 31

5.1 SMOKE Model Set-up 31

5.2 Emissions Inputs 32

5.3 Area and Non-Road Source Emissions 34

5.4 Point Source Emissions 34

5.5 On-Road Mobile Source Emissions 34

5.6 Biogenic Source Emissions 35

5.7 Wildfires 36
5.8 Summary of Emission Results.....36

6.0 AIR QUALITY MODELING 44

6.1 CAMx Model Options 44
6.2 CAMx Model Inputs 44
6.3 CAMx Application Methodology for the Revised 2007 Base Case 48

7.0 MODEL PERFORMANCE EVALUATION.....50

7.1 Monitoring Networks 50
7.2 Species for Model Performance Evaluation 53
7.3 Model Performance Statistics and Performance Goals and Criteria 54
7.4 Model Performance Evaluation.....56
7.4.1 Total $PM_{2.5}$ Mass 56
7.4.2 $PM_{2.5}$ Performance at Liberty.....64
7.4.3 Overview of Speciated $PM_{2.5}$ Model Performance 68
7.4.4 Sulfate (SO4) Model Performance 69
7.4.5 Nitrate (NO3) Model Performance 75
7.4.6 Ammonium (NH4) Model Performance.....81
7.4.7 Total Carbon Mass (TCM) Model Performance 85
7.4.8 Other $PM_{2.5}$ (OPM2.5) Model Performance 89
7.5 Wet SO4, NO3 and NH4 Deposition 93
7.6 Comparison of Model Performance with the Previous Liberty-Clairton $PM_{2.5}$ SIP 99
7.6.1 Comparison with the Previously Liberty-Clairton $PM_{2.5}$ SIP Modeling 99
7.6.2 Local Source Contribution from the Model and from Observations.....103
7.7 Model Performance Evaluation Conclusions 105

8.0 REFERENCES 106

Tables

Table 3-1. WRF 37 and CAMx 25 vertical layer structure. 16
Table 4-1: WRF Version 3.3.1 physics options. 19
Table 4-2. Meteorological model benchmarks for temperature, water vapor mixing ratio, wind speed and wind direction. 21
Table 5-1. Data sources for 0.8 km fine grid emissions. 33

Table 5-2. Data sources for 36/12/4 km outer grid emissions. 33

Table 5-3. Summary of total 2007 emissions within the 0.8 km Liberty-Clairton domain for an average day (tons per day). 36

Table 5-4a. Summary of total area source emissions by state within the 12 km NEUS domain for an average day (tons per day). 37

Table 5-4b. Summary of total non-road mobile source emissions by state within the 12 km NEUS domain for an average day (tons per day).....38

Table 5-4c. Summary of total on-road mobile source emissions by state within the 12 km NEUS domain for an average day (tons per day).....39

Table 5-4d. Summary of total non-CEM point source emissions by state within the 36 km CONUS domain for an average day (tons per day).....40

Table 5-2e. Summary of total CEM point source emissions by state within the 36 km CONUS domain for an average day (tons per day).....42

Table 6-1. Science options selected for the CAMx Liberty-Clairton $PM_{2.5}$ modeling. 45

Table 7-1. Species and sampling times for ambient air quality monitoring networks.....50

Table 7-2. Species used in the CAMx model performance evaluation. 53

Table 7-3. PM model performance goals and criteria. 55

Table 7-4. Definition of model performance evaluation statistical measures used to evaluate photochemical grid models. 55

Table 7-5. Comparisons of annual FRM $PM_{2.5}$ fractional bias and error performance statistics with the PM Performance Goals and Criteria for the 12, 4 and 0.8 km domains and the CAMx revised 2007 base case simulation.....57

Table 7-6. Comparisons of annual CSN and IMPROVE $PM_{2.5}$ fractional bias and error performance statistics for the CAMx revised 2007 base case simulation with the PM Performance Goals and Criteria for the 12, 4 and 0.8 km domains. 57

Table 7-7. Summary of CAMx speciated $PM_{2.5}$ model performance statistics across the CSN sites in the 0.8, 4 and 12 km domains. 68

Table 7-8. Summary of CAMx speciated $PM_{2.5}$ model performance statistics at the Liberty CSN monitoring sites for the 0.8, 4 and 12 km CAMx modeling results.....69

Table 7-9. Summary of annual and quarterly fractional bias and error for wet deposition of SO4, NO3 and NH4 and 102 NADP sites in the 12 km NEUS domain using the CAMx 12 km modeling results. 94

Table 7-10. Comparison of predicted and observed annual total wet deposition (kg/ha/yr) at the OH49 NADP monitoring site for SO4, NO3 and NH4 and the CAMx 4 km revised 2007 base case modeling results. 96

Table 7-11. Comparison of the FB and FE annual and quarterly $PM_{2.5}$ model performance statistics at the Liberty FRM monitor from the previous Liberty-Clairton $PM_{2.5}$ SIP using 2002 CMAQ/CALPUFF modeling and the CAMx 0.8 km revised 2007 base case modeling results. 100

Table 7-12. Comparison of the FB and FE annual and quarterly $PM_{2.5}$ model performance statistics at the Liberty TEOM monitor from the previous Liberty-Clairton $PM_{2.5}$ SIP using 2002 CMAQ/CALPUFF and the current 2007 CAMx 0.8 km modeling results. 100

Table 7-13. Comparison of modeled and estimated observed annual excess $PM_{2.5}$ concentrations at Liberty due to local sources using the CSN 1:6 day sampling frequency. 104

Figures

Figure 2-1. Relationship between the Liberty-Clairton NAA and the Pittsburgh-Beaver Valley NAA (gray area). 4

Figure 2-2. Definition of the Liberty-Clairton NAA (yellow outline) and locations of the Liberty and Clairton FRM $PM_{2.5}$ monitoring sites. 6

Figure 2-3. Best guess of source categories contributing to $PM_{2.5}$ concentrations at Liberty using the Positive Matrix Factorization (PMF) receptor model (Source: ACHD, 2012a).....7

Figure 2-4. Locations of the Liberty (A) and Clairton (B) FRM $PM_{2.5}$ monitoring sites and local sources in the Liberty-Clairton area. 8

Figure 2-5. Trends in annual $PM_{2.5}$ concentrations between 2000-2010 at 8 monitoring sites in and near the Liberty-Clairton NAA. 9

Figure 2-6. Analysis of the excess $PM_{2.5}$ concentrations at the Liberty monitoring site (Source: ACHD). 10

Figure 3-1. Definitions of the 36/12/4/0.8 km domain structure to be used for the WRF meteorological (dotted lines) and CAMx (solid lines) photochemical grid modeling (note: 12, 4 and 0.8 km grid definitions do not include buffer cells that are needed when using two-way grid nesting). 13

Figure 3-2. 12/4/0.8 km domain structure for the WRF meteorological (dotted lines) and CAMx photochemical grid (solid lines) modeling. 13

Figure 3-3. 4 km SWPA and original proposed 800 m Liberty-Clairton domain structure for SMOKE emissions and CAMx photochemical grid modeling. 14

Figure 3-4. Comparison of the original proposed 75 x 60 0.8 km modeling domain with the final 45 x 45 0.8 km modeling domain (red) used in the CAMx modeling. Also shown are the locations of FRM and CSN monitoring sites (black and blue symbols) and local sources (red symbols) that are treated by the CAMx Plume-in-Grid (PiG) subgrid-scale puff module (note: 12, 4 and 0.8 km grid definitions do not include buffer cells that are needed when using two-way grid nesting). 15

Figure 4-1. Temperature monthly bias and error soccer plot for the 4 km SWPA domain. 22

Figure 4-2. Temperature monthly bias and error soccer plot for the 0.8 km Liberty-Clairton domain. 22

Figure 4-3. Mixing Ratio monthly bias and error soccer plot for the 4 km SWPA domain. 23

Figure 4-4. Mixing Ratio monthly bias and error soccer plot for the 0.8 km Liberty-Clairton domain. 24

Figure 4-5. Wind Speed monthly bias and RMSE soccer plot for the 4 km SWPA domain. 25

Figure 4-6. Wind Speed monthly bias and RMSE soccer plot for the 0.8 km Liberty-Clairton domain. 25

Figure 4-7. Wind Direction monthly bias and error soccer plot for the 4 km SWPA domain. 26

Figure 4-8. Wind Direction monthly bias and error soccer plot for the 0.8 km Liberty-Clairton domain. 27

Figure 4-9. January 2007 monthly total precipitation (mm) in the 12 km NEUS modeling domain for the CPC analysis field based on observations (top) and WRF model estimates (bottom). 28

Figure 4-10. July 2007 monthly total precipitation (mm) in the 12 km NEUS modeling domain for the CPC analysis field based on observations (top) and WRF model estimates (bottom). 29

Figure 6-1. Receptor networks for sampling PiG live puffs at 100 m resolution within 500 m of the Liberty (top) and Clairton (bottom) monitoring sites. 48

Figure 7-1. Locations of the FRM (top) and IMPROVE, CSN and CASTNet (bottom) monitoring sites within the 12 km NEUS domain. 51

Figure 7-2. Locations of the FRM (left) and IMPROVE, CSN and CASTNet (right) monitoring sites within the 4 km SWPA domain. 52

Figure 7-3. Locations of the FRM (left) and CSN (right) monitoring sites within the 0.8 km Liberty-Clairton domain. 52

Figure 7-4. Scatter plots of predicted and observed 24-hour $PM_{2.5}$ concentrations across the 12 km NEUS domain for the CAMx 12 km (red) and 36 km (blue) 2007 base case simulations using the FRM (top left), CSN (top right) and IMPROVE (bottom) monitoring networks. 58

Figure 7-5. Scatter plots of predicted and observed 24-hour $PM_{2.5}$ concentrations across the 4 km SWPA domain for the CAMx 12 km (red) and 4 km (blue) 2007 base case simulations using the FRM (top left), CSN (top right) and IMPROVE (bottom) monitoring networks. 59

Figure 7-6. Scatter plots of predicted and observed 24-hour $PM_{2.5}$ concentrations across the 0.8 km Liberty-Clairton domain for the CAMx 4 km (red) and 0.8 km (blue) 2007 base case simulations using the FRM (left) and CSN (right) monitoring networks. 60

Figure 7-7. Soccer Plots comparing FRM $PM_{2.5}$ monthly FB and FE with the PM Performance Goals and Criteria for the 12 km (top), 4 km (middle) and 0.8 km (bottom) domains. 61

Figure 7-8. Soccer Plots comparing CSN $PM_{2.5}$ monthly FB and FE with the PM Performance Goals and Criteria for the 12 km (top), 4 km (middle) and 0.8 km (bottom) domains. 62

Figure 7-9. Soccer Plots comparing IMPROVE $PM_{2.5}$ monthly FB and FE with the PM Performance Goals and Criteria for the 12 km (top) and 4 km (bottom) domains. 63

Figure 7-10. Annual 2007 scatter plots of predicted and observed $PM_{2.5}$ concentrations and model performance statistics for the Liberty monitor using the FRM (24-hour, top left), CSN (24-hour, top right) and TEOM (hourly, bottom) monitoring technologies. 64

Figure 7-11. Monthly soccer plot for TEOM hourly $PM_{2.5}$ concentrations at the Liberty monitor using the CAMx 0.8 km revised 2007 base case modeling results. 65

Figure 7-12a. Time series of predicted and observed 24-hour $PM_{2.5}$ concentrations at the Liberty FRM monitor for January through June 2007 and the CAMx 0.8 km (purple) and 4 km (blue) revised 2007 base case modeling results. 66

Figure 7-12b. Time series of predicted and observed 24-hour $PM_{2.5}$ concentrations at the Liberty FRM monitor for July through December 2007 and the CAMx 0.8 km (purple) and 4 km (blue) revised 2007 base case modeling results. 67

Figure 7-13. Scatter plots of predicted and observed SO4 concentrations for CSN (top), IMPROVE (middle) and CASTNet (bottom) monitoring networks across the 12 km (left) and 4 km (right) modeling domains. 71

Figure 7-14. Soccer plots of monthly SO4 fractional bias and error for CSN across the 12 km (top), 4 km (middle) and 0.8 km (bottom) modeling domains. 72

Figure 7-15. Scatter plots of predicted and observed 24-hour SO4 (top), SO2 (middle) and ozone (bottom) concentrations at CASTNet monitoring sites across the 12 km (left) and 4 km (right) modeling domains. 73

Figure 7-16. Scatter plots of 24-hour SO4 concentrations at Liberty CSN site for annual (top), and quarters 1 (middle left), 2 (middle right), 3 (bottom left) and 4 (bottom right) and CAMx 4 km and 0.8 km modeling results. 74

Figure 7-17. Scatter plots of predicted and observed NO3 concentrations for CSN (top), IMPROVE (middle) and CASTNet (bottom) monitoring networks across the 12 km (left) and 4 km (right) modeling domains. 76

Figure 7-18. Scatter plots of predicted and observed NO3 (top), HNO3 (middle) and total NO3 (bottom) concentrations for the CASTNet monitoring network across the 12 km (left) and 4 km (right) modeling domains. 77

Figure 7-19. Soccer plots of monthly NO3 fractional bias and error for CSN sites across the 12 km (top), 4 km (middle) and 0.8 km (bottom) modeling domains (revised 2007 base case). 78

Figure 7-20. Soccer plots of monthly fractional bias and error for NO3 (top), HNO3 (middle) and Total NO3 (NO3+HNO3) for CASTNet sites across the 12 km (left) and 4 km (right) modeling domains (revised 2007 base case). 79

Figure 7-21. Scatter plots of 24-hour NO3 concentrations at Liberty CSN site for annual (top), and quarters 1 (middle left), 2 (middle right), 3 (bottom left) and 4 (bottom right) and CAMx 4 km and 0.8 km revised 2007 base case modeling results. 80

Figure 7-22. Scatter plots of predicted and observed NH4 concentrations for CSN (top), IMPROVE (middle) and CASTNet (bottom) monitoring networks across the 12 km (left) and 4 km (right) modeling domains. 82

Figure 7-23. Soccer plots of monthly NH4 fractional bias and error for CSN (left) and CASTNet (right) sites across the 12 km (top), 4 km (middle) and 0.8 km (bottom) modeling domains (note: no CASTNet sites in the 0.8 km modeling domain). 83

Figure 7-24. Scatter plots of 24-hour NH4 concentrations at Liberty CSN site for annual (top), and quarters 1 (middle left), 2 (middle right), 3 (bottom left) and 4 (bottom right) and CAMx 4 km and 0.8 km modeling results. 84

Figure 7-25. Scatter plots of predicted and observed TCM concentrations for CSN (top), and IMPROVE (middle) monitoring networks across the 12 km (left) and 4 km (right) modeling domains. Also shown in bottom panels

are EC (left) and OA (right) performance for IMPROVE in the 12 km domain. 86

Figure 7-26. Soccer plots of monthly fractional bias and error for TCM across CSN (left) and IMPROVE (right) monitoring sites in the 12 km (top), 4 km (middle) and 0.8 km (bottom) modeling domains. 87

Figure 7-27. Scatter plots of 24-hour TCM concentrations at Liberty CSN site for annual (top), and quarters 1 (middle left), 2 (middle right), 3 (bottom left) and 4 (bottom right) and CAMx 4 km and 0.8 km modeling results. 88

Figure 7-28. Scatter plots of predicted and observed OPM2.5 concentrations for CSN (top), and IMPROVE (bottom) monitoring networks across the 12 km (left) and 4 km (right) modeling domains. 90

Figure 7-29. Soccer plots of monthly fractional bias and error for OPM2.5 across CSN (left) and IMPROVE (right) monitoring sites in the 12 km (top), 4 km (middle) and 0.8 km (bottom) modeling domains (revised 2007 base case). 91

Figure 7-30. Scatter plots of 24-hour OPM2.5 concentrations at Liberty CSN site for annual (top), and quarters 1 (middle left), 2 (middle right), 3 (bottom left) and 4 (bottom right) and CAMx 4 km and 0.8 km modeling results. 92

Figure 7-31. Locations of NADP wet deposition monitoring sites in the eastern U.S (also shown is 2007 spatial distribution of wet SO4 deposition in mg/L). 93

Figure 7-32. Annual scatter plots of weekly average SO4 (top left), NO3 (top right) and NH4 (bottom) wet deposition (kg/ha/week) across the NADP network in the 12 km domain for the CAMx 12 km modeling results. 95

Figure 7-33. Annual scatter plots of weekly SO4 (top left), NO3 (top right) and NH4 (bottom) wet deposition (kg/ha/week) at the OH49 NADP site in Noble County, Ohio for the CAMx 4 km (blue) and 12 km (red) revised 2007 base case modeling results. 97

Figure 7-34. Time series of predicted and observed weekly wet deposition(kg/ha/wk) at the OH49 NADP monitoring site for the CAMx 4 km (purple) and 12 km (blue) revised 2007 base case modeling results and SO4 (top), NO3 (middle) and NH4 (bottom). 98

Figure 7-35. Comparison of annual average diurnal varying observed TEOM $PM_{2.5}$ concentrations with modeled values from 2002 CMAQ, CMAQ/CALPUFF and CMAQ/AERMOD from the previous Liberty-Clairton $PM_{2.5}$ SIP modeling (ACHD, 2011) and from the CAMx 0.8 km revised 2007 base case from this study using two scales. 102

1.0 INTRODUCTION

This document presents the revised 2007 base case modeling and model performance evaluation to support $PM_{2.5}$ attainment demonstration modeling of the Liberty-Clairton nonattainment area (NAA) in Allegheny County, Pennsylvania. The Comprehensive Air-quality Model with extensions (CAMx) photochemical grid model (PGM) was applied for the 2007 calendar year on a 36/12/4/0.8 km resolution nested grid structure with the 0.8 km domain focused on the Liberty-Clairton NAA and the 4 km domain focused on southwestern Pennsylvania (SWPA), eastern Ohio and northern West Virginia. The modeled total $PM_{2.5}$ mass, speciated $PM_{2.5}$ and other concentrations were compared against concurrent observations as part of a model performance evaluation (MPE). The differences in observed and modeled concentrations were compared with accepted model performance goals and criteria as well as the previous Liberty-Clairton $PM_{2.5}$ State Implementation Plan (SIP) modeling to aid in the interpretation of the suitability and reliability of the model for use in making future year $PM_{2.5}$ projections.

1.1 Updates in the Revised 2007 Base Case Modeling

A preliminary 2007 base case simulation and MPE was conducted using CAMx that was documented in a July 2012 draft report (Morris et al., 2012a). The revised 2007 base case modeling and MPE presented in this report had the following updates over the preliminary 2007 base case modeling:

- Local Source FDTF: Unlike all of the other emissions sources (e.g., 2008 NEI), for the preliminary 2007 base case emissions scenario emissions for the local sources in the Liberty-Clairton were provided without applying a Fugitive Dust Transport Factor (FDTF). The FDTF is used to reduce fugitive dust emissions that are deposited locally within the canopy so are not transported downwind. The revised 2007 base case emissions scenario applied FDTFs to the local sources.

- Snow Cover Land Use Inputs: Although daily snow cover land use was provided as input to CAMx in the preliminary 2007 base case simulation, the CAMx control file did identify snow cover as input so it was not used. The CAMx revised 2007 base simulation used daily snow cover input data when WRF indicated snow was on the ground.

- Corrected in-Line TUV Photolysis Rate Adjustments: CAMx has an option to make adjustments to the Tropospheric, Ultraviolet and Visible (TUV) Radiation Model photolysis rates based on the model estimated $PM_{2.5}$ concentrations that is known as in-line TUV adjustments. This is in contrast to the user specifying a $PM_{2.5}$ concentration loading outside of the model simulation (off-line TUV). However, there was an indexing coding error in the CAMx in-line TUV adjustment so that it the model was accessing data other than $PM_{2.5}$ concentrations. This coding error was corrected in the revised 2007 base case simulation.

The addition of the FDTFs on local sources should result in slight reductions in the other $PM_{2.5}$ (OPM2.5) species concentrations in the Liberty-Clairton area, which should improve model performance given that OPM2.5 was overestimated. The addition of snow cover data will decrease dry deposition in the winter months that will either improve or degrade model performance depending on when a species is underestimated or overestimated, respectively. Finally, the correction to the in-line TUV algorithm will increase photochemical production and result in more formation of secondary $PM_{2.5}$ species such as sulfate, nitrate and secondary organic aerosol (SOA).

1.2 Liberty-Clairton $PM_{2.5}$ Nonattainment Area

In 1997, the United States Environmental Protection Agency (EPA) for the first time established National Ambient Air Quality Standards (NAAQS) for fine particulate matter (i.e., particulate matter with a diameter of 2.5 micrometers or less, $PM_{2.5}$). The 1997 $PM_{2.5}$ NAAQS had an annual average threshold of 15 µg/m^3 and a 24-hour average threshold of 65 µg/m^3. In 2005, the EPA designated the Liberty-Clairton area, a 12 km^2 area completely contained within the borders of the Pittsburgh-Beaver Valley $PM_{2.5}$ nonattainment area (NAA), to be a separate $PM_{2.5}$ NAA due to unique features of the region.

The Liberty-Clairton NAA, which consists of Glassport, Liberty, Lincoln and Port Vue Boroughs and the City of Clairton, is located approximately 10 miles southeast of the city of Pittsburgh. The topography in the area is characterized by complex river-valley terrain features that are approximately 3 miles wide and 5 miles long with a population of approximately 25,000. The area is home to numerous industrial sources, including the U.S. Steel Clairton Plant that is the largest coke plant in the United States. There are two Federal Reference Method (FRM) $PM_{2.5}$ monitors in the area (Liberty and Clairton). The Liberty monitoring site exhibits higher $PM_{2.5}$ concentrations than surrounding monitors due to contributions of local sources whose emissions are influenced by the river-valley topography making the Liberty-Clairton NAA quite different than the remainder of the Pittsburg-Beaver Valley NAA. Consequently, the Liberty-Clairton area was designated a separate $PM_{2.5}$ NAA from the Pittsburgh-Beaver Valley NAA.

Both the Liberty-Clairton and Pittsburgh-Beaver Valley areas were designated as nonattainment of the 1997 $PM_{2.5}$ NAAQS based on 2001-2003 measured air quality. The Pittsburgh-Beaver Valley NAA prepared a $PM_{2.5}$ SIP that demonstrated the area would achieve the 1997 $PM_{2.5}$ NAAQS by 2010 (PDEP, 2009). Whereas, the Liberty-Clairton $PM_{2.5}$ SIP demonstrated that the area would achieve the 1997 $PM_{2.5}$ NAAQS by 2015 (ACHD, 2011a). However, in fact based on 2009-2011 measured air quality data the Liberty-Clairton actually attained the 1997 $PM_{2.5}$ NAAQS by 2011[1].

In 2006, EPA lowered the 24-hour $PM_{2.5}$ NAAQS from 65 to 35 µg/m^3 and retained the 15.0 µg/m^3 annual threshold. In October 2008 EPA designated the Liberty-Clairton area as an NAA due to a measured violation of the 2006 24-hour $PM_{2.5}$ NAAQS based on 2006-2008 monitoring data with a 24-hour Design Value of 53 µg/m^3 occurring at the Liberty monitoring site. Thus,

[1] http://www.achd.net/air/pubs/EcoCurrents/2012_Jan-March.pdf

the Allegheny County Health Department (ACHD) needs to prepare a $PM_{2.5}$ SIP for the Liberty-Clairton area that demonstrates the area will achieve the 2006 $PM_{2.5}$ NAAQS by 2014.

1.3 Purpose

The Allegheny County Health Department (ACHD) is required to prepare a $PM_{2.5}$ State Implementation Plan (SIP) and submit to the U.S. EPA by the end of 2012 that demonstrates attainment of the 24-hour $PM_{2.5}$ NAAQS by 2014. ACHD is using a photochemical grid model to demonstrate attainment of the 24-hour $PM_{2.5}$ NAAQS. One of the first steps in a photochemical grid model application is the development of model inputs and performing a meteorological base year base case simulation and model performance evaluation. This report documents the ACHD Liberty-Clairton NAA $PM_{2.5}$ SIP revised 2007 base case modeling and model performance evaluation to address attainment of the 2006 $PM_{2.5}$ NAAQS. This report updates a previous report on the preliminary 2007 base case simulation (Morris et al., 2012a) using the updates identified in Section 1.1.

2.0 PROBLEM STATEMENT

This Chapter explains the nature of the $PM_{2.5}$ problem in the Liberty-Clairton area. A Conceptual Model of $PM_{2.5}$ exceedances is provided, including the analysis of monitoring data in the region.

2.1 Geographic Situation

The Liberty-Clairton nonattainment area (NAA) is made up of complex river valley terrain, approximately 3 miles wide by 5 miles long. It includes a 4-mile winding portion of the Monongahela River and is bordered by the Youghiogheny River to the east. The area includes rural land, densely populated residential areas and industrial facilities. The Liberty-Clairton NAA is completely contained within, but not part of, the Pittsburgh-Beaver Valley NAA as shown in Figure 2-1.

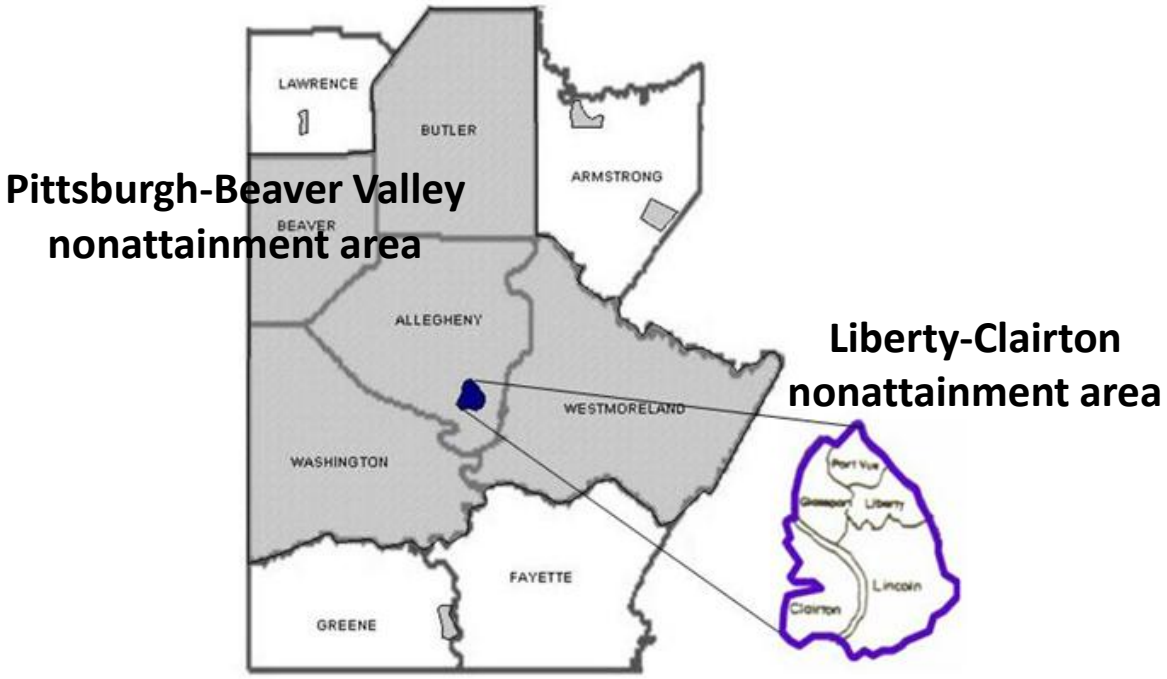


Figure 2-1. Relationship between the Liberty-Clairton NAA and the Pittsburgh-Beaver Valley NAA (gray area).

The base of the river valley lies at 718 feet in elevation above mean sea level (MSL), while adjacent hilltops can be greater than 1,250 feet MSL. Large temperature differences can occur between hilltop and valley floor during clear, low-wind, nighttime conditions (e.g., differences of from 2 to 7°F). Strong nighttime drainage flows can cause differences of up to 180° in wind direction with 3-4 mph downslope flows. Also, strong nighttime inversions can lead to poor dispersion scenarios on several days of the year resulting in high hourly and 24-hour $PM_{2.5}$ concentrations due to local sources.

2.2 Air Quality Situation

The Liberty-Clairton NAA is made up of the Boroughs of Lincoln, Liberty, Glassport and Port Vue and the City of Clairton and there are two Federal Reference Method (FRM) $PM_{2.5}$ monitoring sites in the NAA (Liberty and Clairton) as shown in Figure 2-2. Data analysis has shown that the Liberty-Clairton area is impacted by both regional and localized $PM_{2.5}$ concentrations. ACHD has performed two rounds of $PM_{2.5}$ source apportionment using the Positive Matrix Factorization (PMF) receptor model and the Liberty Chemical Speciation Network (CSN) monitoring data. The first report used observations from 2003-2005 timeframe (ACHD, 2006) that was updated using observed from the 2005-2010 timeframe (ACHD, 2011c). Figure 2-3 displays the $PM_{2.5}$ source contributions calculated by the PMF receptor model using 2005-2010 observations at the Liberty monitoring site. Secondary sulfate is the largest contributor (36%) that is believed primarily from regional transport. The second largest contributor is a PMF category that is believed to be mainly due to local sources and includes industrial carbon, primary sulfate and diesel vehicles. Secondary nitrate is the next largest contributor (9%) followed by burning/cooking (7%). There are numerous other categories associated with local industrial sources that also contribute to $PM_{2.5}$ concentrations at Liberty (e.g., coke productions, metals and steel processing, coal/coke dust, etc.).

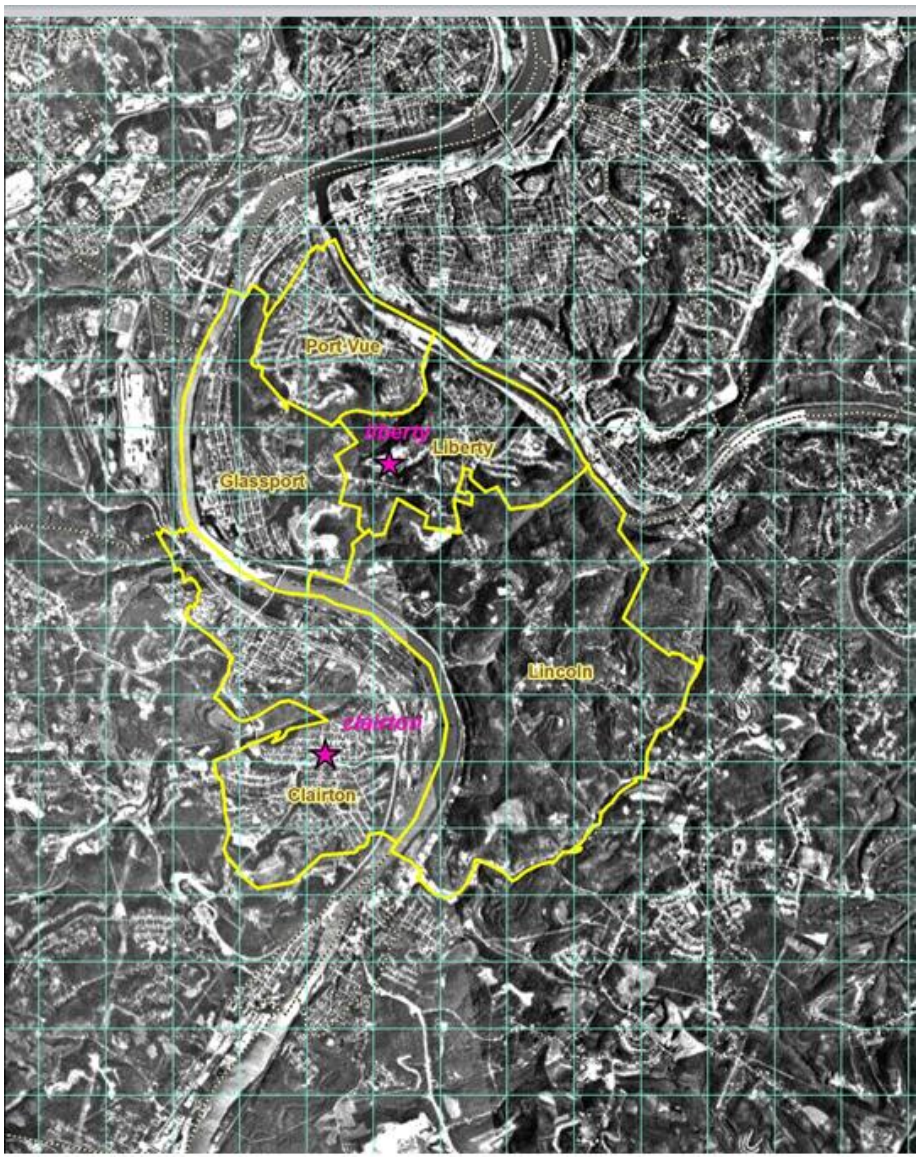


Figure 2-2. Definition of the Liberty-Clairton NAA (yellow outline) and locations of the Liberty and Clairton FRM $PM_{2.5}$ monitoring sites.

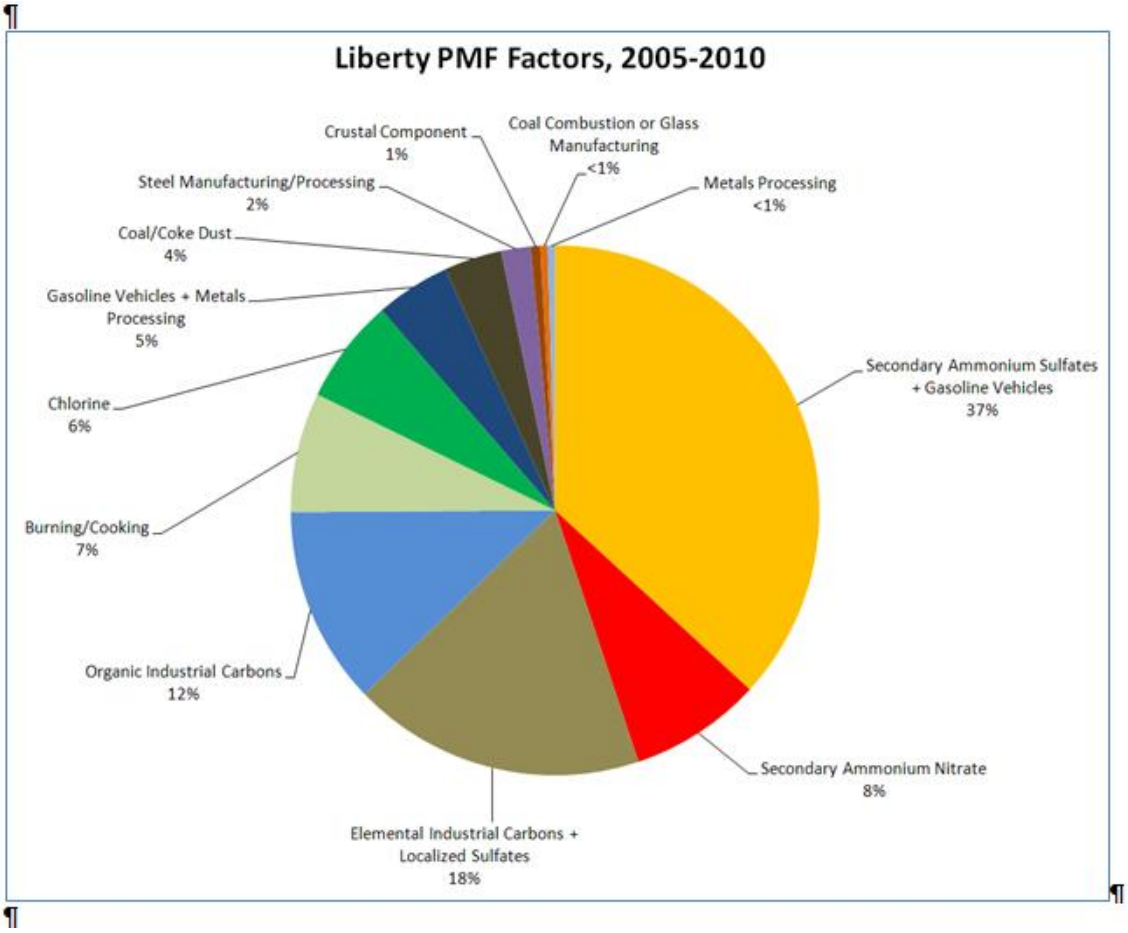


Figure 2-3. Best guess of source categories contributing to $PM_{2.5}$ concentrations at Liberty using the Positive Matrix Factorization (PMF) receptor model (Source: ACHD, 2012).

2.3 Local Monitoring Data

The FRM $PM_{2.5}$ monitor at Liberty is located atop a school at relatively higher elevation near the center of the Liberty-Clairton area to the northeast of the Monongahela River. The FRM monitor at Clairton is located atop a school at relatively lower elevation in the western portion of the area west of the Monongahela River. In the Liberty-Clairton area there are numerous industrial sources with many located adjacent to the Monongahela River. Figure 2-4 displays the locations of the Liberty and Clairton FRM monitoring sites, the 100 m receptor network around the monitors used in the modeling and industrial sources in the region. Figure 2-4 highlights 5 high emitting local industrial facilities including US Steel Clairton and Koppers that are located to the southwest of Liberty so are aligned with the predominate wind direction from the southwest so that emissions from these sources are advected toward the Liberty monitor. Recent observations from 2008-2010 shows that the Clairton monitor is in attainment of the 2006 $PM_{2.5}$ NAAQS, while Liberty monitor is in violation of both the annual standard of 15 $\mu g/m^3$ and the 24-hour standard of 35 $\mu g/m^3$. Other FRM monitors located near the Liberty-

Clairton area have monitored attainment of both standards. This is shown in Figure 2-5 that displays the trends in annual $PM_{2.5}$ concentrations at 8 monitoring sites in and near the Liberty-Clairton NAA from 2000 to 2010.

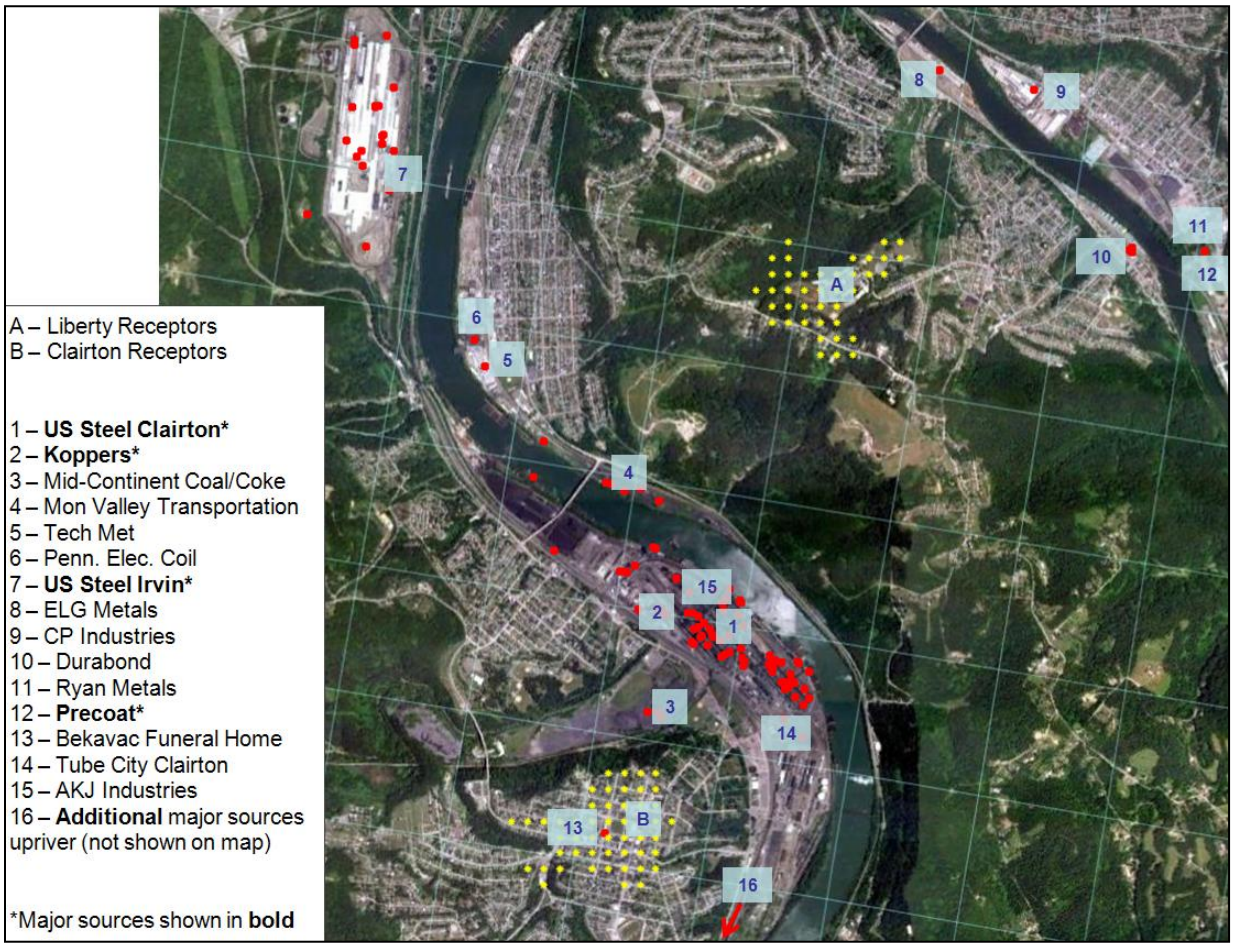


Figure 2-4. Locations of the Liberty (A) and Clairton (B) FRM $PM_{2.5}$ monitoring sites and local sources in the Liberty-Clairton area.

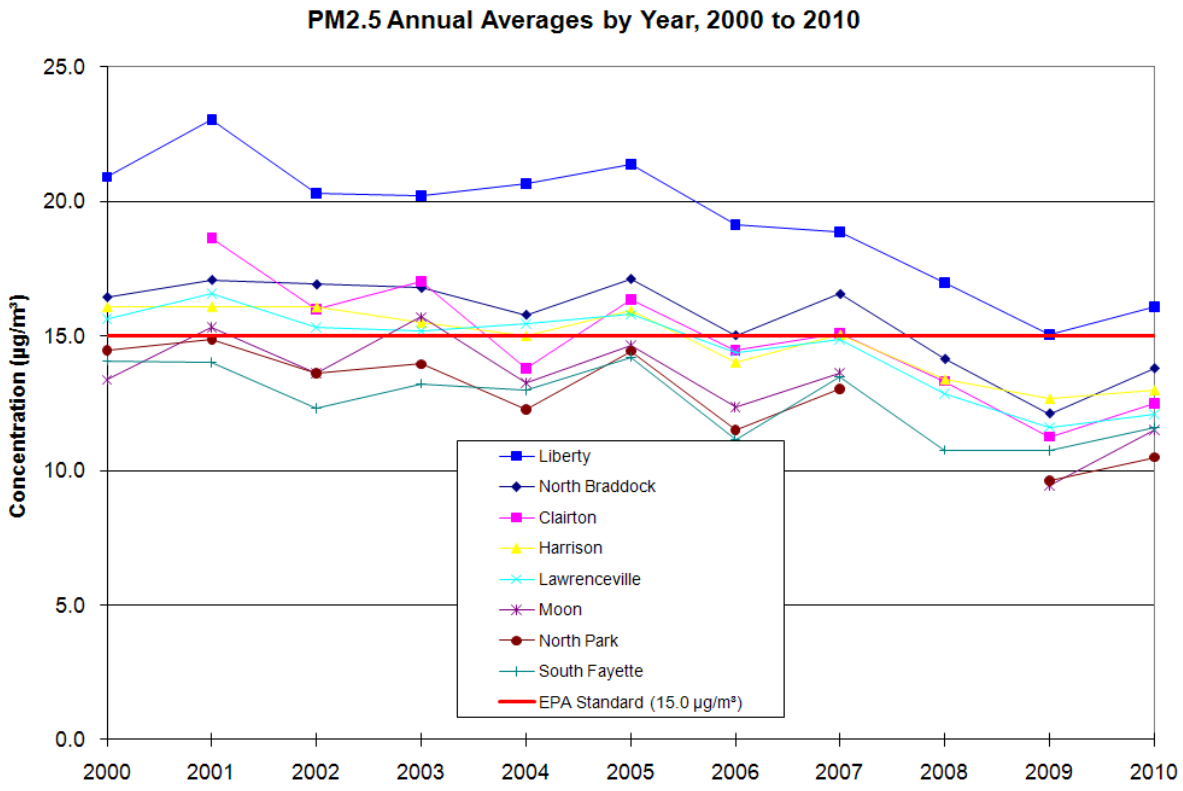


Figure 2-5. Trends in annual $PM_{2.5}$ concentrations between 2000-2010 at 8 monitoring sites in and near the Liberty-Clairton NAA.

As seen in the trends in annual $PM_{2.5}$ concentrations at 8 monitoring sites in Figure 2-5, $PM_{2.5}$ concentrations at the Liberty monitoring site are substantially higher than at the surrounding monitoring sites. ACHD analyzed the results from the Liberty $PM_{2.5}$ speciation monitor and found that organic and elemental carbon, ammonium, sulfate, and some trace elements are higher in the Liberty-Clairton Area than at other nearby monitoring sites with an annual average $PM_{2.5}$ concentration of approximately 4.6 µg/m³ attributed to local sources as shown in Figure 2-6.

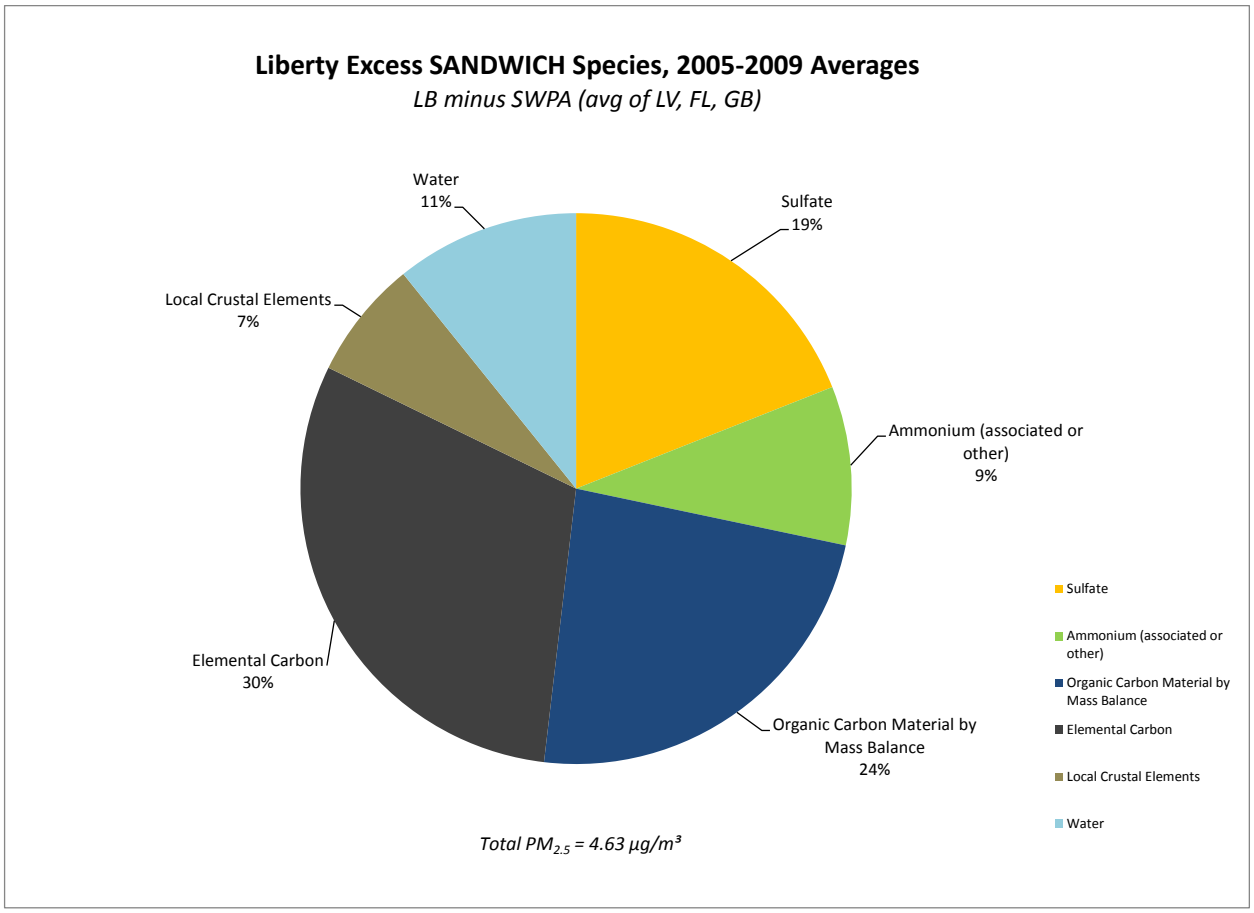


Figure 2-6. Analysis of the excess $PM_{2.5}$ concentrations at the Liberty monitoring site (Source: ACHD).

2.4 Conclusions

The $PM_{2.5}$ problem in the Liberty-Clairton NAA is a combination of regional transport from outside of the region, which includes a large sulfate component, and local source contributions, which includes excess ammonium sulfate, carbonaceous species and other fine particulate species (e.g., metals). The local sources can be as close as ~2 km to the Liberty monitoring site. Thus, $PM_{2.5}$ modeling of the Liberty-Clairton NAA needs to account for regional sources that may be 1,000s of km away, as well as the effects of nearby local source plume impacts of primary $PM_{2.5}$ at the Liberty monitoring site.

3.0 MODELS, DOMAINS AND EPISODES

Below we present the selection of the modeling episode, models and domain definitions for the Liberty-Clairton attainment demonstration modeling. Details on the rationale and justification for their selection are provided in the Liberty-Clairton attainment demonstration Modeling Protocol (ACHD, 2011a).

3.1 Episode Selection

The 2007 calendar year was selected for the Liberty-Clairton nonattainment area (NAA) $PM_{2.5}$ attainment demonstration modeling.

3.2 Model Selection

Three types of models are used in the Liberty-Clairton attainment demonstration modeling: meteorological, emissions and air quality models.

- The Weather Research and Forecasting (WRF[3]) meteorological model was selected to generate the 2007 three dimensional winds, temperature and other meteorological variables needed for air quality and emissions modeling (Skamarock, 2004; 2005; 2006; 2008).
- Emissions modeling was performed using the Sparse Matrix Operator Kernel Emissions (SMOKE[4]) modeling system (Coats, 1995; Houyoux, et al., 2000). For on-road mobile sources the Motor Vehicle Emissions Simulator (MOVES[5]) model was used. Biogenic emissions were generated using the Biogenic Emissions Inventory System (BEIS[6]).
- The Comprehensive Air-quality Model with extensions (CAMx[7]) Photochemical Grid Model (PGM) was selected for the Liberty-Clairton attainment demonstration modeling (ENVIRON, 2011). The AERMOD[8] Gaussian plume model may also be used to obtain near-source impacts of the local sources.

3.3 Domain Definition

3.3.1 Horizontal Modeling Domains

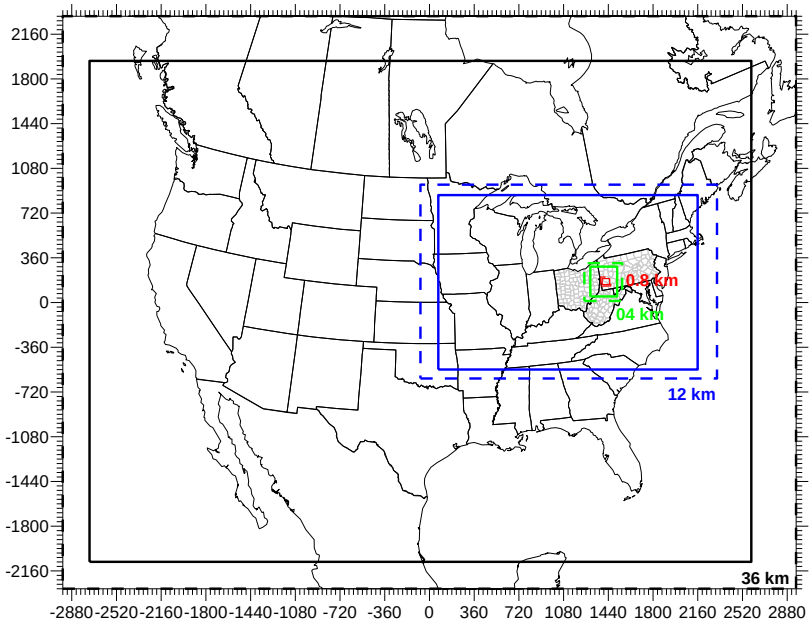
A preliminary 36/12/4/0.8 km domain structure was selected for the WRF and SMOKE/CAMx modeling as shown in Figures 3-1 through 3-3 (ACHD, 2011b). The four domains use a Lambert Conic Conformal (LCC) projection. The LCC grid projection has a pole of projection of 40 degrees North, -97 degrees East and standard parallels of 33 and 45 degrees, the so-called RPO projection. The four domains are defined as given in Figure 3-1 and are as follows:

[3] http://www.wrf-model.org/index.php
[4] http://www.smoke-model.org/index.cfm
[5] http://www.epa.gov/otaq/models/moves/index.htm
[6] http://www.epa.gov/AMD/biogen.html
[7] http://www.camx.com/home.aspx
[8] http://www.epa.gov/scram001/7thconf/aermod/aermod_mfd.pdf

- A 36 km continental U.S. (CONUS) domain that is defined to be the standard RPO domain that is routinely used in many photochemical modeling studies.
- A 12 km NEUS domain that includes states in the Midwestern and Northeastern U.S. that the Cross State Air Pollution Rule (CSAPR[9]) identified as contributing significantly to $PM_{2.5}$ nonattainment at Liberty. The CAMx revised 2007 base case simulation for the 36 km CONUS 12 km NEUS domains was performed using two-way grid nesting with the results post-processed to generate BCs for the 4 km SWPA domain. Note that in the preliminary 2007 base case simulation the 12 km NEUS CAMx simulation was performed using one-way grid nesting between the 36 and 12 km domains. This change should have little if any effect on the model predictions in the Liberty-Clairton NAA.
- A 4 km domain that covers southwestern Pennsylvania (SWPA) and adjacent areas in West Virginia and Ohio.
- A nested grid of 0.8 km (800 m) for the area within and surrounding the Liberty-Clairton area. The 4 km and 0.8 km domains are run linked together using two-way grid nesting.

The WRF domains are defined to be slightly larger than the CAMx/SMOKE domains to eliminate any boundary artifacts in the WRF simulations from influencing the CAMx meteorological inputs. WRF can sometimes produce modeling artifacts near its boundaries as the meteorological variables from the boundary conditions come into dynamic balance with WRF's numerical algorithms. By specifying a few grid cell buffers between the WRF and CAMx boundaries we can be sure that no artifacts are in the CAMx meteorological inputs. WRF domains are defined with at least a 5-grid cell buffer in all directions from the CAMx domains.

[9] http://www.epa.gov/airtransport/



ACHD Proposed Domains

CAMx				WRF			
36 km	148 x 112	(-2736, -2088) to (2592, 1944)		36 km	164 x 128	(-2952, -2304) to (2952, 2304)	
12 km	174 x 117	(72, -540) to (2160, 864)		12 km	199 x 130	(-72, -612) to (2316, 948)	
04 km	54 x 60	(1296, 48) to (1512, 288)		04 km	76 x 76	(1248, 12) to (1552, 316)	
0.8 km	75 x 60	(1392, 144) to (1452, 192)		0.8 km	101 x 91	(1380, 132) to (1460.8, 204.8)	

Figure 3-1. Definitions of the 36/12/4/0.8 km domain structure to be used for the WRF meteorological (dotted lines) and CAMx (solid lines) photochemical grid modeling (note: 12, 4 and 0.8 km grid definitions do not include buffer cells that are needed when using two-way grid nesting).

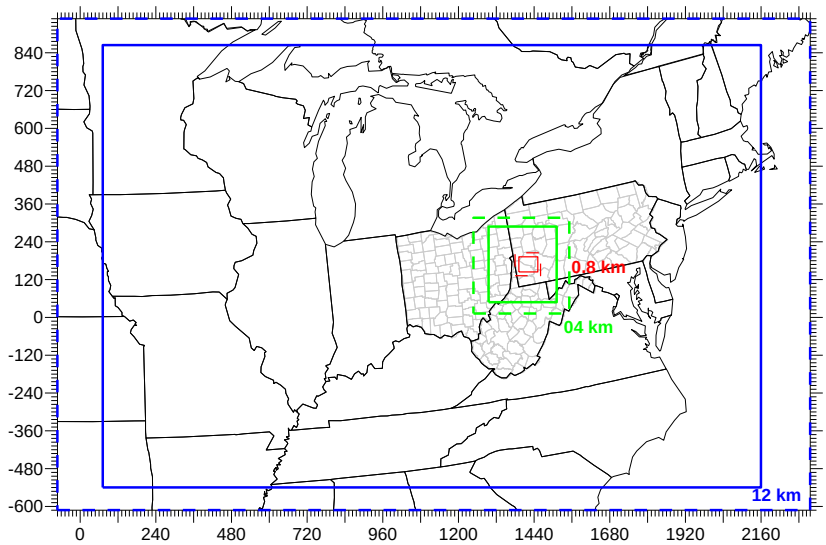


Figure 3-2. 12/4/0.8 km domain structure for the WRF meteorological (dotted lines) and CAMx photochemical grid (solid lines) modeling.

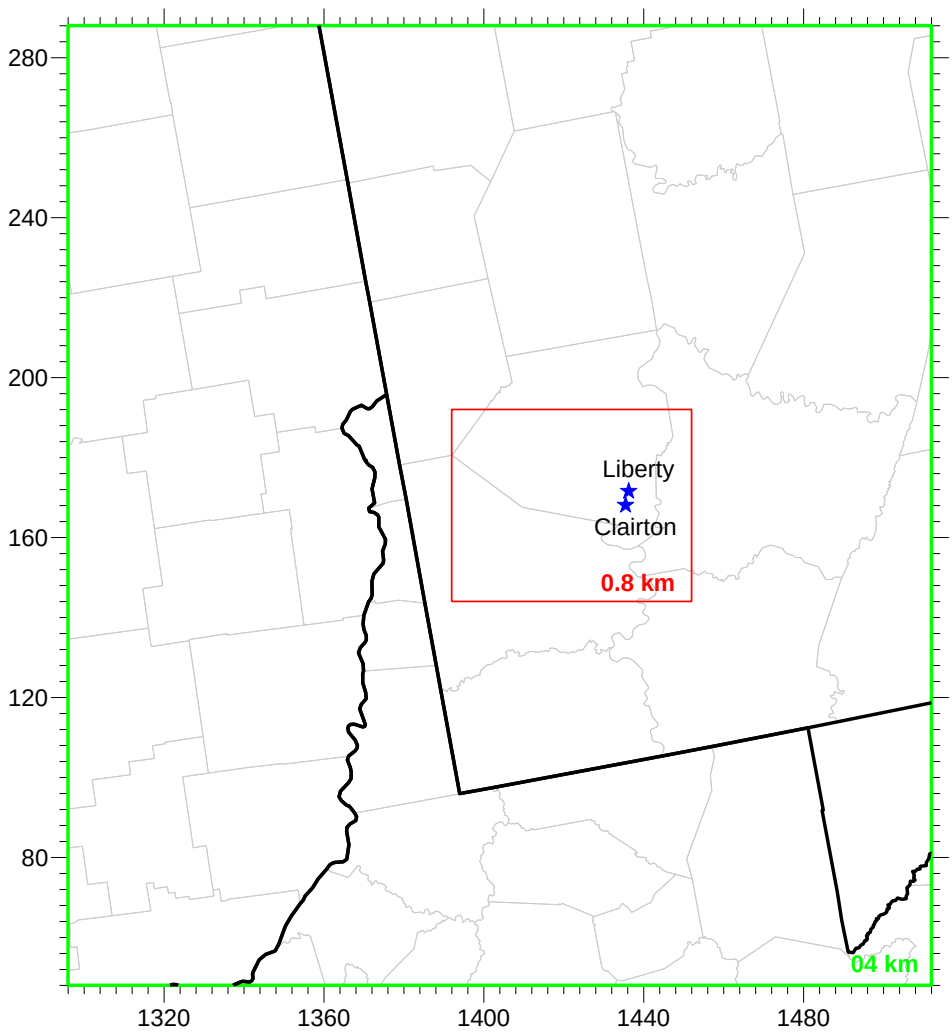


Figure 3-3. 4 km SWPA and original proposed 800 m Liberty-Clairton domain structure for SMOKE emissions and CAMx photochemical grid modeling.

Initial tests of CAMx using the 4/0.8 km two-way grid nesting configuration found the model run times for the 2007 calendar year simulation would be excessively long. To reduce the run time, the 0.8 km domain proposed in the Modeling Protocol (ACHD, 2012b) was reduced by approximately a factor of 2. Figure 4-4 displays the original proposed 75 x 60 0.8 km domain and the final 45 x 45 0.8 km domain used in the CAMx modeling. Also shown in Figure 3-4 are the locations of the Liberty, Clairton and two other FRM $PM_{2.5}$ monitoring sites (blue) and the local sources (red symbols). The new 0.8 km domain still completely contains the Liberty-Clairton NAA and all monitoring sites and local sources of interest so does not in any way compromise the purpose for using the 0.8 km fine grid domain.

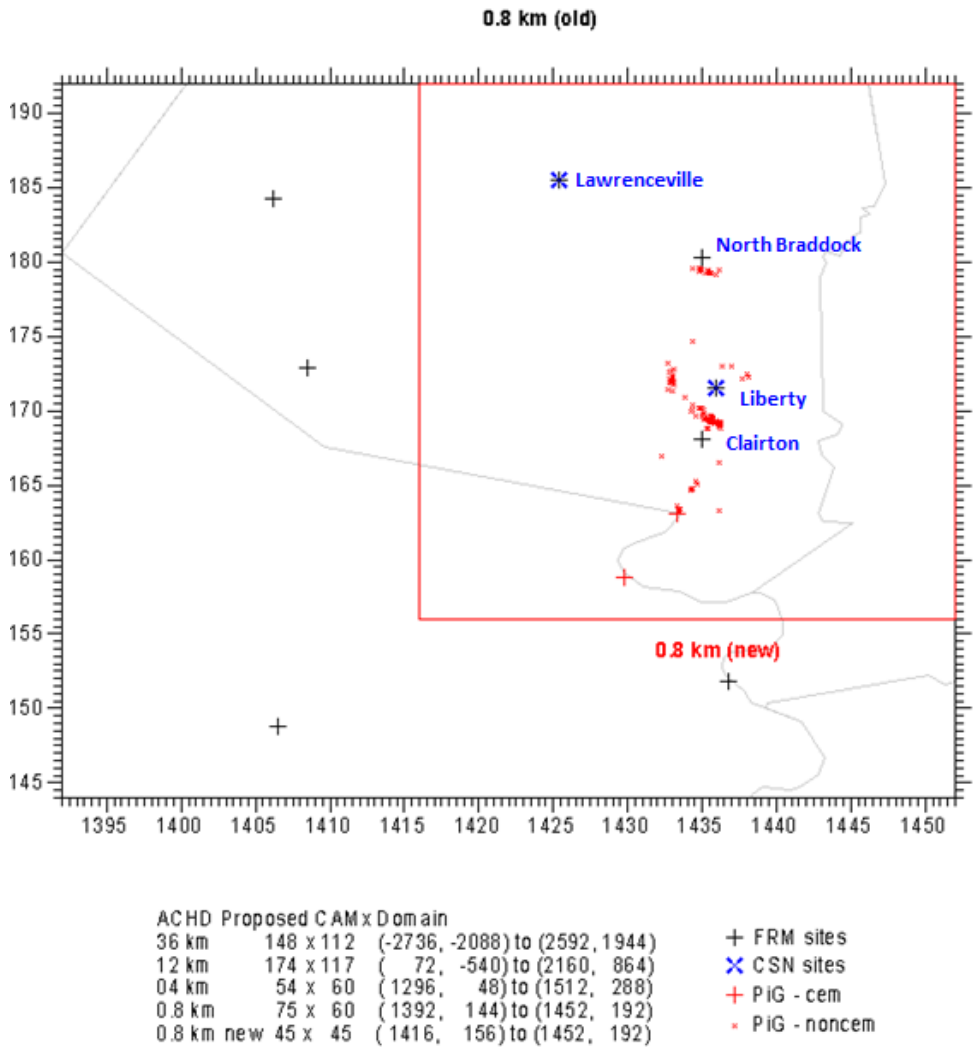


Figure 3-4. Comparison of the original proposed 75 x 60 0.8 km modeling domain with the final 45 x 45 0.8 km modeling domain (red) used in the CAMx modeling. Also shown are the locations of FRM and CSN monitoring sites (black and blue symbols) and local sources (red symbols) that are treated by the CAMx Plume-in-Grid (PiG) subgrid-scale puff module (note: 12, 4 and 0.8 km grid definitions do not include buffer cells that are needed when using two-way grid nesting).

3.3.2 Vertical Layer Structure

WRF was configured with 37 vertical layer interfaces (36 vertical layers using CAMx definition) from the surface to 50 mb (approximately 19 km above MSL). The WRF output was processed using the WRFCAMx processor to generate CAMx meteorological inputs. WRFCAMx can perform layer collapsing to reduce the 37 vertical layers in WRF to less vertical layers for the CAMx modeling that results in faster CAMx run times. Table 3-1 displays how the 37 vertical layers in WRF were collapsed to 25 vertical layers for the CAMx modeling. This approach combines the two lowest 12 m layers in WRF to one 24 m thick layer in CAMx.

Table 3-1. WRF 37 and CAMx 25 vertical layer structure.

WRF Meteorological Model					CAMx Air Quality Model		
WRF Layer	Sigma	Pressure (mb)	Height (m)	Thickness (m)	CAMx Layer	Height (m)	Thickness (m)
37	0.0000	50.00	19260	2055	25	19260.0	3904.9
36	0.0270	75.65	17205	1850			
35	0.0600	107.00	15355	1725	24	15355.1	3425.4
34	0.1000	145.00	13630	1701			
33	0.1500	192.50	11930	1389	23	11929.7	2569.6
32	0.2000	240.00	10541	1181			
31	0.2500	287.50	9360	1032	22	9360.1	1952.2
30	0.3000	335.00	8328	920			
29	0.3500	382.50	7408	832	21	7407.9	1591.8
28	0.4000	430.00	6576	760			
27	0.4500	477.50	5816	701	20	5816.1	1352.9
26	0.5000	525.00	5115	652			
25	0.5500	572.50	4463	609	19	4463.3	609.2
24	0.6000	620.00	3854	461	18	3854.1	460.7
23	0.6400	658.00	3393	440	17	3393.4	439.6
22	0.6800	696.00	2954	421	16	2953.7	420.6
21	0.7200	734.00	2533	403	15	2533.1	403.3
20	0.7600	772.00	2130	388	14	2129.7	387.6
19	0.8000	810.00	1742	373	13	1742.2	373.1
18	0.8400	848.00	1369	271	12	1369.1	271.1
17	0.8700	876.50	1098	177	11	1098.0	176.8
16	0.8900	895.50	921	174	10	921.2	173.8
15	0.9100	914.50	747	171	9	747.5	170.9
14	0.9300	933.50	577	84	8	576.6	168.1
13	0.9400	943.00	492	84			
12	0.9500	952.50	409	83	7	408.6	83.0
11	0.9600	962.00	326	82	6	325.6	82.4
10	0.9700	971.50	243	82	5	243.2	81.7
9	0.9800	981.00	162	41	4	161.5	64.9
8	0.9850	985.75	121	24			
7	0.9880	988.60	97	24	3	96.6	40.4
6	0.9910	991.45	72	16			
5	0.9930	993.35	56	16	2	56.2	32.2
4	0.9950	995.25	40	16			
3	0.9970	997.15	24	12	1	24.1	24.1
2	0.9985	998.58	12	12			
1	1.0000	1000	0			0	

4.0 METEROLOGICAL MODELING

The Weather Research and Forecasting (WRF[10]) model (Skamarock et al., 2008), more specifically, the Advanced Research WRF dynamic core (WRF-ARW, henceforth simply called WRF), was used to simulate three-dimensional meteorological conditions for the 2007 modeling year. Details on the results of the WRF model application and evaluation are contained in McNally and Loomis (2012) and are briefly discussed below. WRF is a next-generation mesoscale numerical weather prediction system designed to serve both operational forecasting and atmospheric research needs (Skamarock et al., 2004; 2005; 2006; 2008). WRF contains separate modules to compute different physical processes such as surface energy budgets and soil interactions, turbulence, cloud microphysics, and atmospheric radiation. Within WRF, the user has many options for selecting the different schemes for each type of physical process. There is a WRF Preprocessing System (WPS) that generates the initial and boundary conditions used by WRF, based on topographic datasets, land use information, and larger-scale atmospheric and oceanic models.

4.1 WRF Model Application

The following procedures and options were used in the WRF application to the 2007 calendar year for developing meteorological inputs for the Liberty-Clairton $PM_{2.5}$ attainment demonstration modeling.

Model Selection: The publicly available version of WRF (version 3.3.1) was used in the modeling study. The WPS preprocessor programs including GEOGRID, UNGRIB, and METGRID were used to develop model inputs.

Horizontal Domain Definition: The computational domain on which WRF will be applied will be sufficiently sized to accommodate the air quality and emissions modeling grids as described in Chapter 3 and presented in Figures 3-1 through 3-3.

Vertical Domain Definition: The WRF modeling was based on 37 vertical layers with an approximately 12 meter deep surface layer. The vertical domain is presented in both sigma and height coordinates in Table 3-1.

Topographic Inputs: Topographic information for the WRF was developed using the standard WRF terrain databases. The 36 km grid was based on the 10 min. (18 km) global data. The 12 km grid was based on the 2 min. (~4 km) data. The 4 km and 800 m grids were based on the 30 sec. (~900 m) data.

Vegetation Type and Land Use Inputs: Vegetation type and land use information was developed using the most recently released WRF databases provided with the WRF distribution. Standard WRF surface characteristics corresponding to each land use category were employed.

[10] http://www.wrf-model.org/index.php

Atmospheric Data Inputs: The first guess fields were taken from the 12 km (Grid #218) North American Model (NAM) archives available from the National Climatic Data Center (NCDC) NOMADS server.

Time Integration: Third-order Runge-Kutta integration was used with a fixed time step of 90 seconds for 36 km CONUS domain, 30 seconds for 12 km NEUS domain, 10 seconds for the 4 km SWPA domain, and 2 seconds for the 800 m Liberty-Clairton domain.

Diffusion Options: Horizontal Smagorinsky first-order closure with sixth-order numerical diffusion and suppressed up-gradient diffusion was used.

Lateral Boundary Conditions: Lateral boundary conditions were specified from the initialization dataset on the 36 km CONUS domain with continuous updates nested from the 36 km domain to the 12 km domain and continuous updates nested from the 12 km domain to the 4 km domain and from the 4 km domain to the 800 m domain.

Top and Bottom Boundary Conditions: The top boundary condition was selected as an implicit Rayleigh dampening for the vertical velocity. Consistent with the model application for non-idealized cases, the bottom boundary condition was selected as physical, not free-slip.

Water Temperature Inputs: The water temperature data were taken from the NCEP RTG global one-twelfth degree analysis[11].

FDDA Data Assimilation: The WRF model was run with a combination of analysis and observation nudging. Analysis nudging was used on the 36 km and 12 km domains. For winds and temperature, analysis nudging coefficients of $5x10^{-4}$ and $3.0x10^{-4}$ were used on the 36 km and 12 km grids, respectively. For mixing ratio, an analysis nudging coefficient of $1.0x10^{-5}$ was used for both the 36 km and 12 km grids. The nudging used both surface and aloft nudging with nudging for temperature and mixing ratio excluded in the boundary layer. Observation nudging was performed on the 4 km grid using the Meteorological Assimilation Data Ingest System (MADIS)[12] observation archive. The MADIS archive includes the National Climatic Data Center (NCDC)[13] observations and the National Data Buoy Center (NDBC) Coastal-Marine Automated Network C-MAN[14] stations. The observational nudging coefficients for winds, temperatures and mixing ratios were $1.0x10^{-4}$, $1.0x10^{-4,}$ and $1.0x10^{-5}$, respectively and the radius of influence was set to 50 km. No data assimilation was performed on the 800 m domain.

Physics Options: The WRF model contains many different physics options. The physics options chosen for this application are presented in Table 4-1.

[11] Real-time, global, sea surface temperature (RTG-SST) analysis. http://polar.ncep.noaa.gov/sst/oper/Welcome.html
[12] Meteorological Assimilation Data Ingest System. http://madis.noaa.gov/
[13] National Climatic Data Center. http://lwf.ncdc.noaa.gov/oa/ncdc.html
[14] National Data Buoy Center. http://www.ndbc.noaa.gov/cman.php

Application Methodology: The WRF model was executed in 5-day blocks initialized at 12Z every 5 days with a 90 second time step. Model results were output every 60 minutes and output files were split at 24 hour intervals. Twelve (12) hours of spin-up was included in each 5-day block before the data were used in the subsequent evaluation and CAMx modeling. The model was run at both the 36 km and 12 km resolution from December 15, 2006 through January 4, 2008. WRF was configured to run in distributed memory parallel mode and was executed using 8 MPICH2 processes per segment on a Linux cluster using Intel Xeon processors. The model calculation required approximately 25,000 core hours.

Table 4-1: WRF Version 3.3.1 physics options.

WRF Treatment	Option Selected	Notes
Microphysics	WRF Single Moment -3 (WSM-3)	A simple efficient scheme with ice and snow processes suitable for mesoscale grid sizes.
Longwave Radiation	RRTMG	Rapid Radiative Transfer Model for GCMs includes random cloud overlap and improved efficiency over RRTM.
Shortwave Radiation	RRTMG	Same as above, but for shortwave radiation.
LSM	NOAH	Two-layer scheme with vegetation and sub-grid tiling.
PBL scheme	YSU	Asymmetric Convective Model with non-local upward mixing and local downward mixing.
Cumulus parameterization	Kain-Fritsch in the 36 km and 12 km grids. None in the 4 km and 800 m grids.	
Analysis nudging	Nudging applied to winds, temperature and moisture in the 36 km and 12 km domains	Temperature and moisture nudged above PBL only
Observation Nudging	Nudging applied to wind only in the 4 km domain	
Initialization Dataset	12 km North American Model (NAM)	

4.2 WRF Model Evaluation Summary

The model evaluation approach was based on a combination of qualitative and quantitative analyses. The qualitative approach was to compare the model estimated monthly total precipitation with the monthly Center for Prediction of Climate (CPC) precipitation analysis fields using graphical outputs. The statistical approach was to examine tabulations of the model bias and error for temperature, wind direction and mixing ratio and wind speed RMSE using surface meteorological observations and compare the model performance statistics to model performance benchmarks and similar simulations.

Interpretation of bulk statistics over a continental or regional scale domain is problematic and it is difficult to detect if the model is missing important sub-regional features. McNally and Loomis (2012) analyzed the WRF performance statistics on a state by state basis, a Regional Planning Organization (RPO) region basis (i.e., the WRAP, CENRAP, MWRPO, VISTAS and MANE-VU regions), and on a domain-wide basis for the 36 km CONUS domain, the regional 12 km NEUS domain, 4 km SWPA domain and 0.8 km Liberty-Clairton domain. The observed database for winds, temperature, and water mixing ratio used in this analysis was the National Oceanic and Atmospheric Administration (NOAA), Earth System Research Laboratory (ESRL) Meteorological Assimilation Data Ingest System (MADIS). The rain observations are taken from the NOAA Climate Prediction Center (CPC) retrospective rainfall archives[15].

4.2.1 Model Performance Benchmarks

To evaluate the performance of the WRF 2007 simulation for the U.S., a number of performance benchmarks for comparison were used. Emery and co-workers (2001) derived and proposed a set of daily performance "benchmarks" for typical meteorological model performance. These benchmarks were based upon the evaluation of about 30 MM5 and RAMS meteorological simulations of *multi-day episodes* in support of air quality modeling study applications performed over several years. Most of these studies were for ozone modeling of major cities so represent fairly *simple* terrain conditions and *simple* meteorological conditions (e.g., stationary high pressure). These benchmarks have been adopted for use in *annual* meteorological modeling studies in which some include more *complex* meteorological and terrain conditions; and therefore, they must be viewed as being applied as *guideline* and not *bright-line* numbers. That is, the purpose of these benchmarks is not to give a passing or failing grade to any one particular meteorological model application, but rather to put its results into the proper context of other models and meteorological data sets. Recognizing that these simple episodic benchmarks may not be appropriate for longer term simulations with complex meteorological conditions McNally (2009) analyzed multiple annual runs and suggested an alternative set of benchmarks for temperature, namely a guideline of ±1.0 K for bias and 3.0 K for error. These simple/episodic and complex/annual meteorological model benchmarks are given in Table 4-2.

[15] http://www.cpc.ncep.noaa.gov/products/precip/realtime/retro.shtml.

Table 4-2. Meteorological model benchmarks for temperature, water vapor mixing ratio, wind speed and wind direction.

Meteorological Variable	Episode/Simple	Annual/Complex
Temperature		
Bias	≤±0.5 °K	≤±1.0 °K
Error	≤2.0 °K	≤3.0 °K
Mixing Ratio		
Bias	≤±1.0 g/kg	
Error	≤2.0 g/kg	
Wind Speed		
Bias	≤±0.5 m/s	
RMSE	≤2.0 m/s	
Wind Direction		
Bias	≤±10 degrees	
Error	≤30 degrees	

4.2.2 Surface WRF Meteorological Model Performance

The WRF meteorological model evaluation using surface meteorological observations is evaluated monthly using soccer plots. A soccer plot for temperature displays the WRF temperature bias versus temperature error along with boxes representing the episode/simple and annual/complex performance benchmarks. When the temperature bias/error symbol lands within the box (i.e. scores a goal), the WRF model performance achieves the performance benchmark. The soccer plots for other meteorological variables are similar. Below we present the soccer plots for the 4 km SWPA and 0.8 km Liberty-Clairton domains, the WRF model performance for the other domains, by State and by RPO region is contained in McNally and Loomis (2012).

The WRF temperature model performance soccer plots for the 4 km and 0.8 km domains are shown in Figures 4-1 and 4-2. The WRF temperature bias and error performance achieves the episode/simple performance benchmark in the 4 km domain for all months except February. The February 4 km domain temperature performance falls outside of the episode/simple benchmark due to a too cool bias, although it does achieve the annual/complex performance benchmark. Similar results are seen within the 0.8 km domain (Figure 4-2) with all months but February achieving the episode/simple performance benchmark with February being too cool. The 0.8 km temperature performance has more monthly temperature bias values closer to the episode/simple performance benchmark than seen in the 4 km runs where the monthly bias symbols are closer to zero. No seasonal trend in temperature performance is identified.

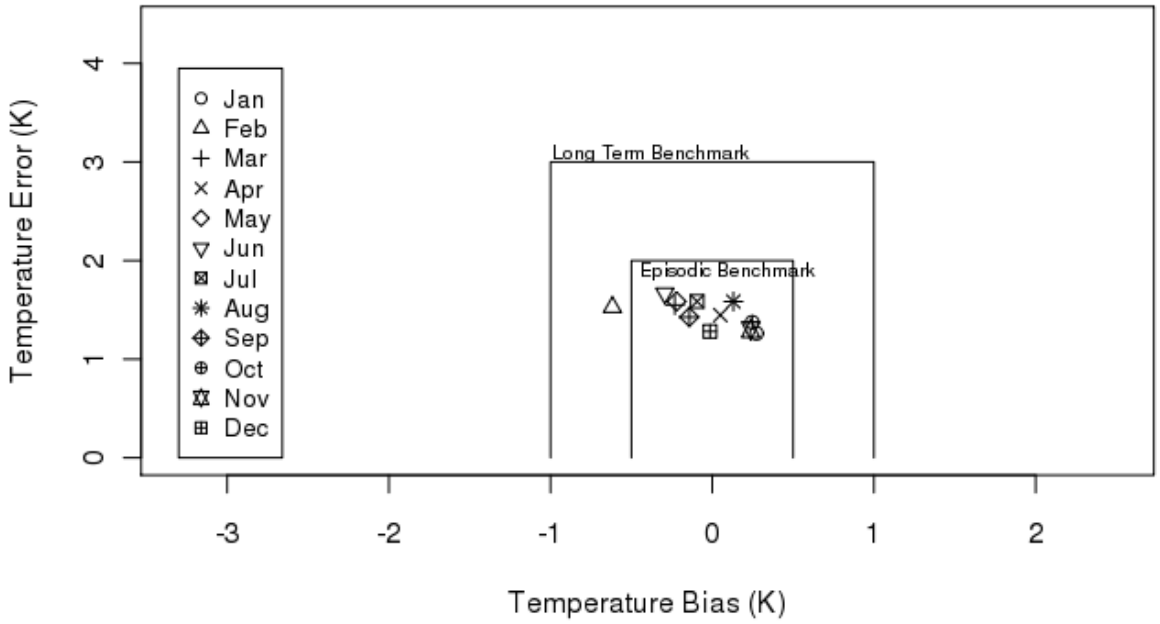


Figure 4-1. Temperature monthly bias and error soccer plot for the 4 km SWPA domain.

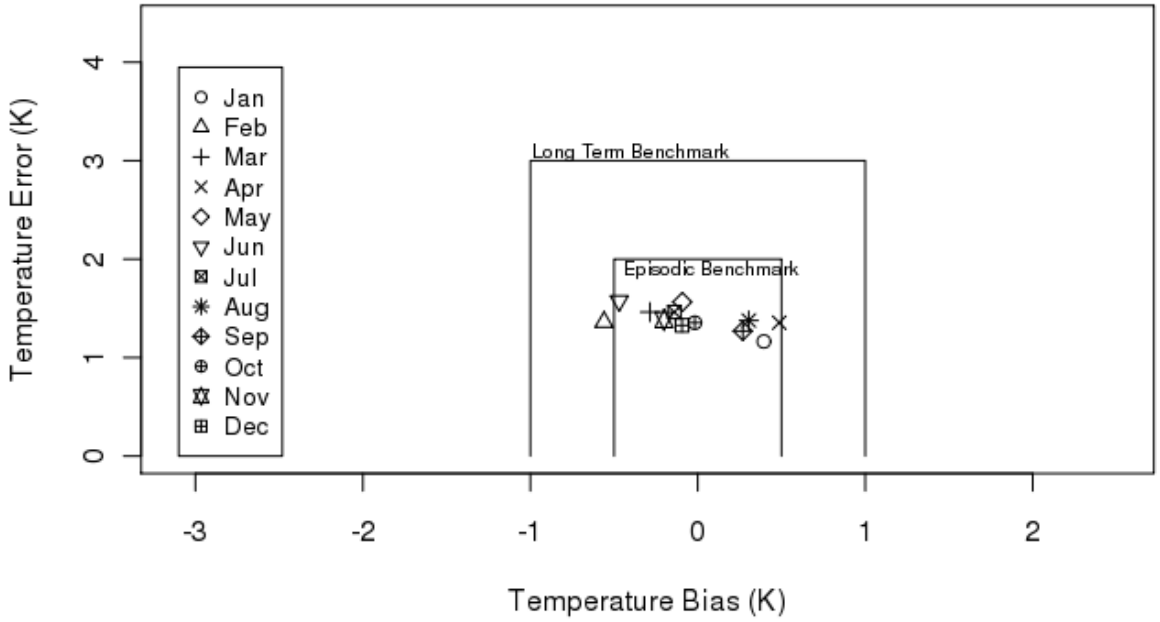


Figure 4-2. Temperature monthly bias and error soccer plot for the 0.8 km Liberty-Clairton domain.

The water vapor mixing ratio soccer plot for the 4 km domain is shown in Figure 4-3. The WRF 4 km predictions achieve the mixing ratio performance benchmark for all months of the year. Most months have a wet bias with the March through June mixing ratios having a bias that exceeds 0.5 g/kg. The months of August and September are the only two months with a wet bias of approximately -0.4 g/kg, with October having a zero bias. Similar results are seen in the 0.8 km domain with all months having a wet bias except for August and September. Only for the 0.8 km domain the June wet bias is so great (1.3 g/kg) that it fails to achieve the performance benchmark (≤±1.0 g/kg); for all other months the mixing ratio performance statistics achieve the performance benchmark in the 0.8 km domain.

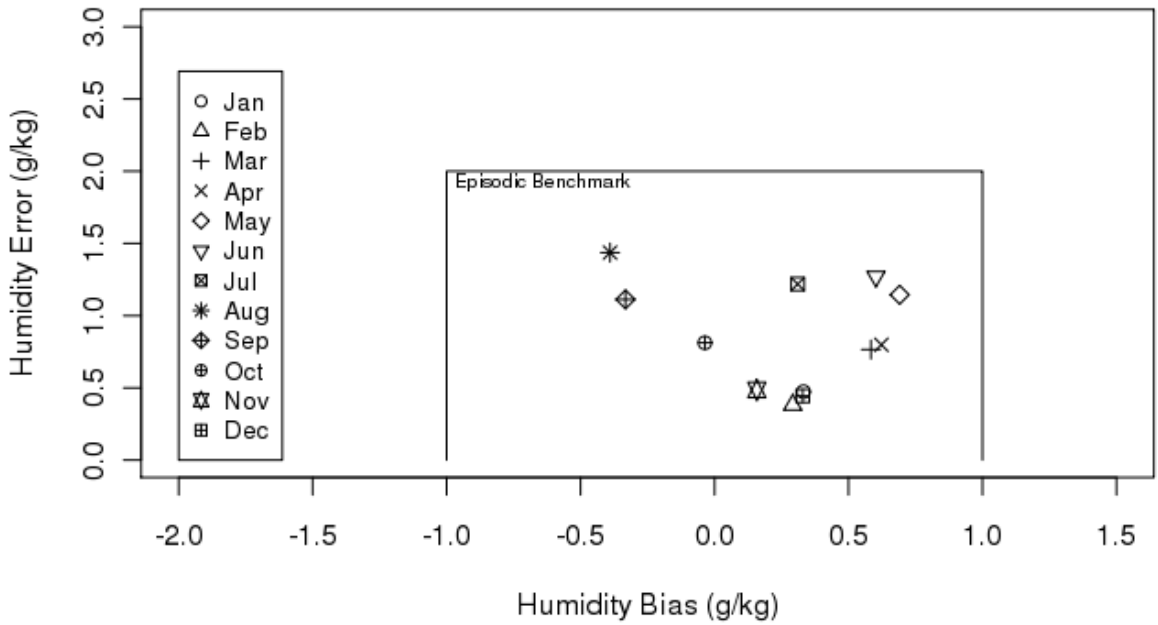


Figure 4-3. Mixing Ratio monthly bias and error soccer plot for the 4 km SWPA domain.

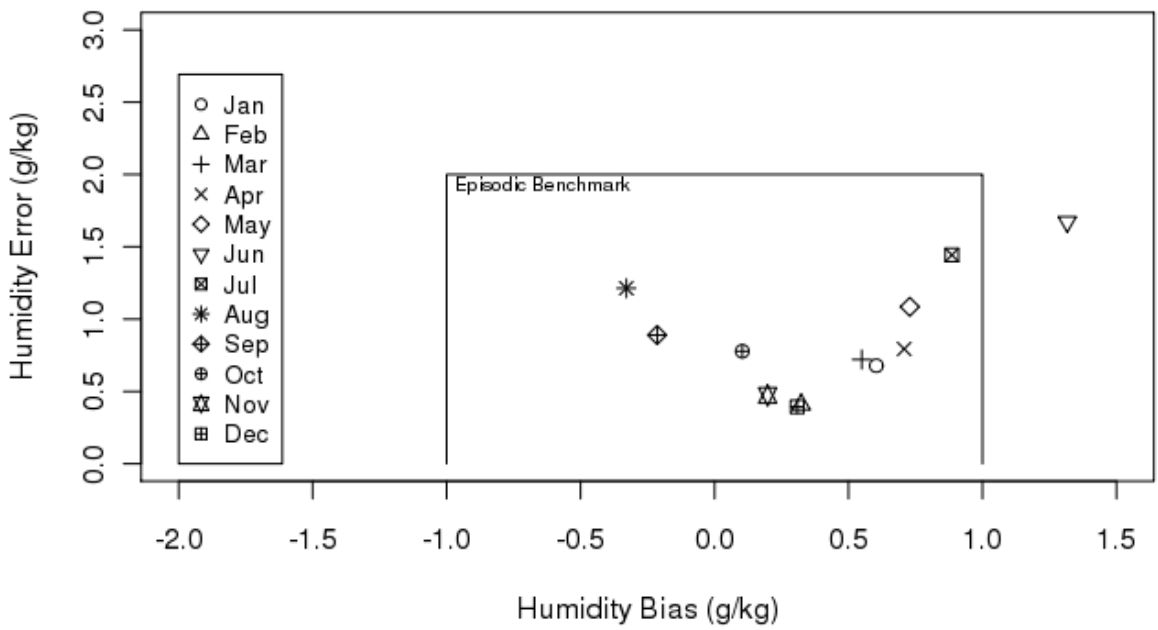


Figure 4-4. Mixing Ratio monthly bias and error soccer plot for the 0.8 km Liberty-Clairton domain.

The wind speed monthly bias and root mean squared error (RMSE) soccer plots for the 4 and 0.8 km domains are shown in Figures 4-5 and 4-6, respectively. WRF has a positive wind speed bias for all months except February, with most of the months clustered around the 0.5 m/s performance benchmark for the 4 km domain; approximately 4 of the months having a wind speed bias above the 0.5 m/s performance benchmark. The wind speed overestimation bias is even greater in the 0.8 km domain with only February bias achieving the ≤±0.5 m/s performance benchmark and the other months having a wind speed bias in the 0.5 to 1.0 m/s range. The WRF wind speed performance across the 36 km CONUS and 12 km NEUS domains is similar with a positive bias that is sufficiently high that many months do not achieve the wind speed bias performance benchmark (see McNally and Loomis, 2012).

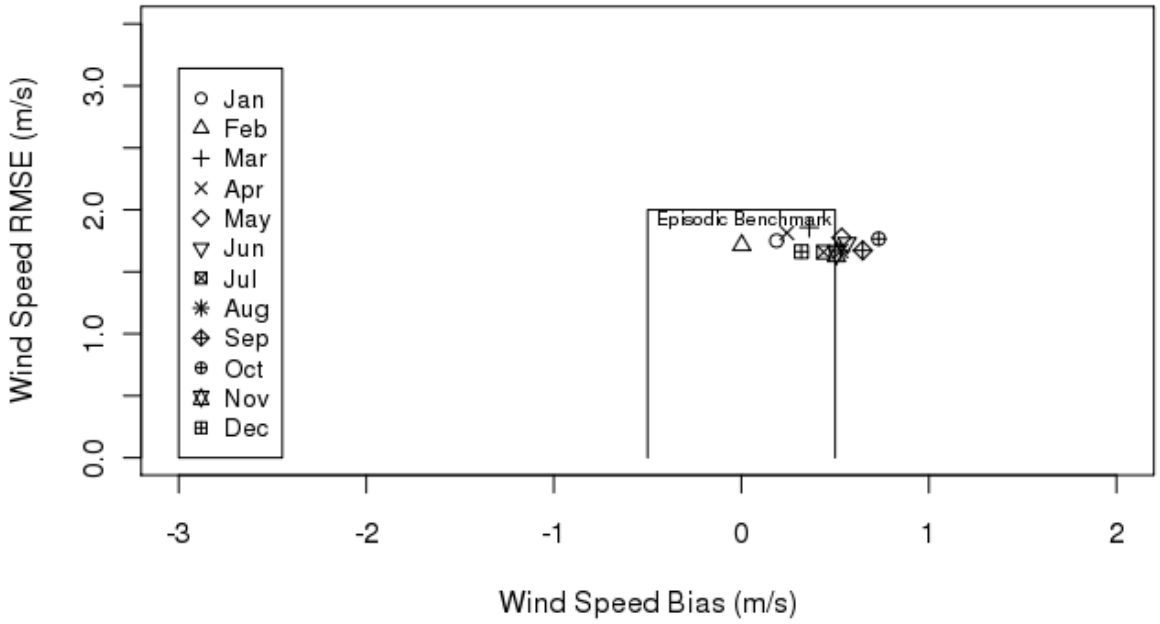


Figure 4-5. Wind Speed monthly bias and RMSE soccer plot for the 4 km SWPA domain.

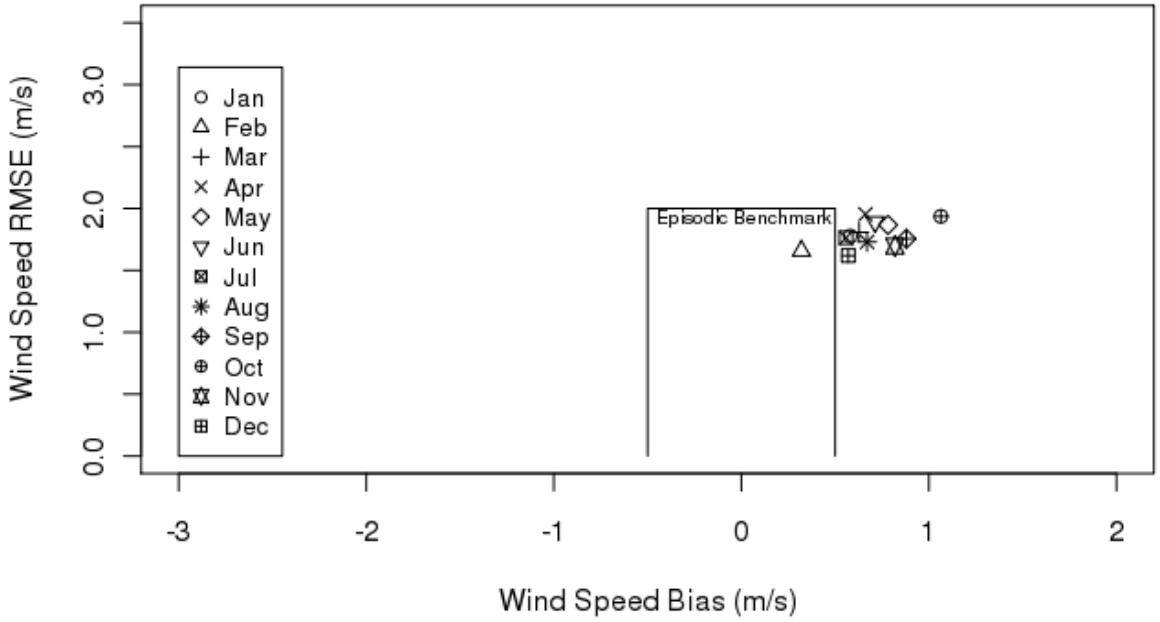


Figure 4-6. Wind Speed monthly bias and RMSE soccer plot for the 0.8 km Liberty-Clairton domain.

The WRF wind direction bias achieves the performance benchmark in the 4 km domain for all months (Figure 4-7). However, the WRF wind direction error performance benchmark is only achieved for 7 months in the 4 km domain with the other 5 months exhibiting wind direction error in the 30-40 degree range that exceeds the ≤30 degree benchmark. The wind direction bias indicates an average 5 degree positive (clockwise) bias in the 4 km domain. Within the 0.8 km domain (Figure 4-8), the WRF wind direction performance is worse with bias values of approximately 7 to 17 degrees and error in the 20 to 40 degree range; only three months achieve both of the performance benchmarks. The wind direction performance across the 12 km NEUS domain is better with all months achieving the performance benchmarks (see McNally and Loomis, 2012).

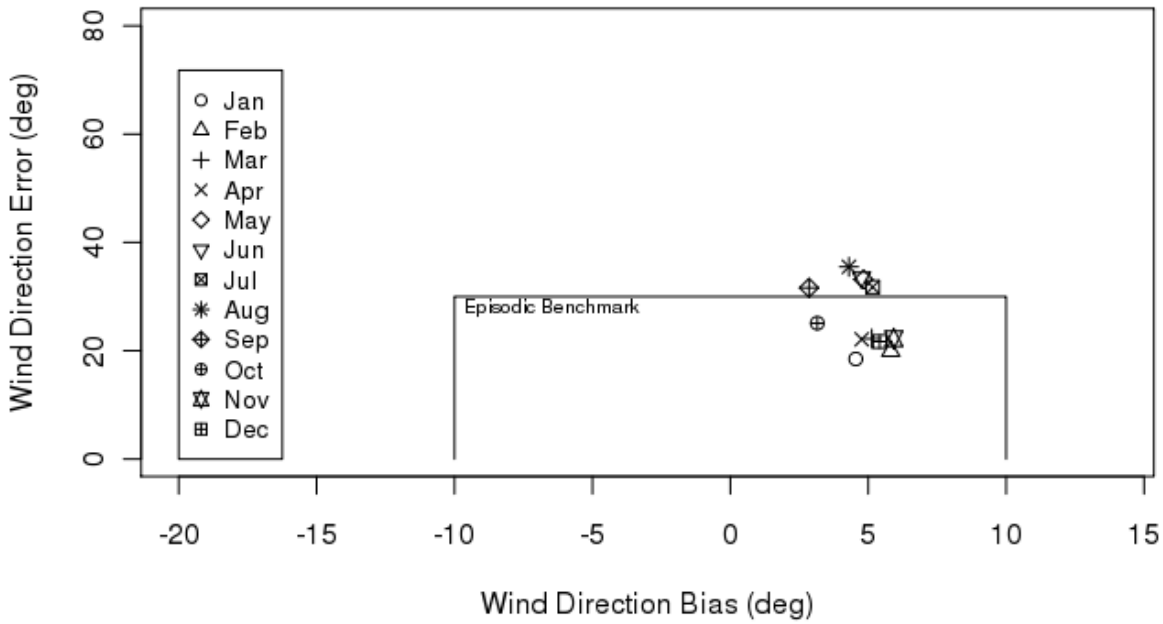


Figure 4-7. Wind Direction monthly bias and error soccer plot for the 4 km SWPA domain.

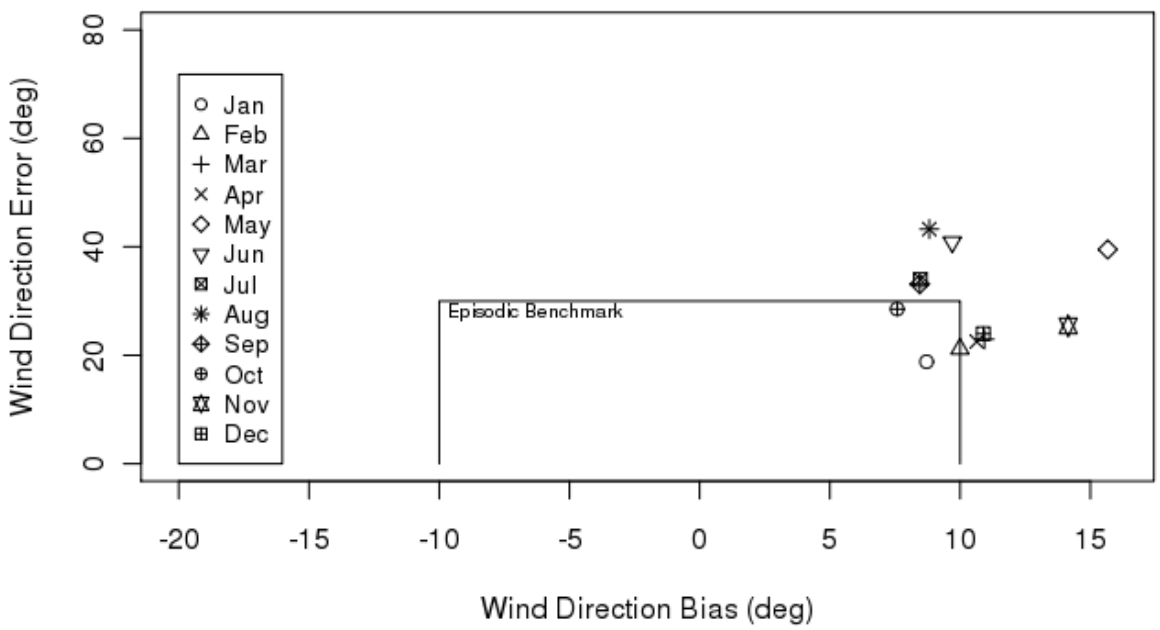


Figure 4-8. Wind Direction monthly bias and error soccer plot for the 0.8 km Liberty-Clairton domain.

4.2.3 WRF Precipitation Model Performance

McNally and Loomis (2012) also performed a qualitative evaluation of the WRF model by comparing monthly total precipitation amounts estimated by WRF with precipitation analysis fields generated using observations prepared by the Climate Prediction Center (CPC). Figures 4-9 and 4-10 contain example comparisons of the CPC and WRF monthly average precipitation amounts for January and July, respectively, and the 12 km NEUS modeling domain. Comparisons for other months and modeling domains are contained in McNally and Loomis (2012). The January WRF and CPC precipitation fields are very similar with both estimating enhanced levels of precipitation occurring along a diagonal from Arkansas to western New York. The patterns of January precipitation are very similar, except the WRF estimates much higher precipitation offshore over the Atlantic Ocean. However, this seeming difference is due to an artifact in the CPC analysis fields that are generating using land based observations and provide no information over the ocean. There are similarities in the patterns and magnitudes of the CPC and WRF July monthly precipitation fields, but the WRF patterns are more spotty due in part to the higher resolution used in WRF than used in the CPC analysis fields. July precipitation will be dominated by convective activity that can be very spotty in nature. It appears that WRF may be overstating July precipitation somewhat, but that is difficult to tell due to the wide variations in precipitation amounts across neighboring grid cells. As expected, due to the challenge of modeling convective precipitation, the WRF precipitation performance in July is not as good as seen in January.

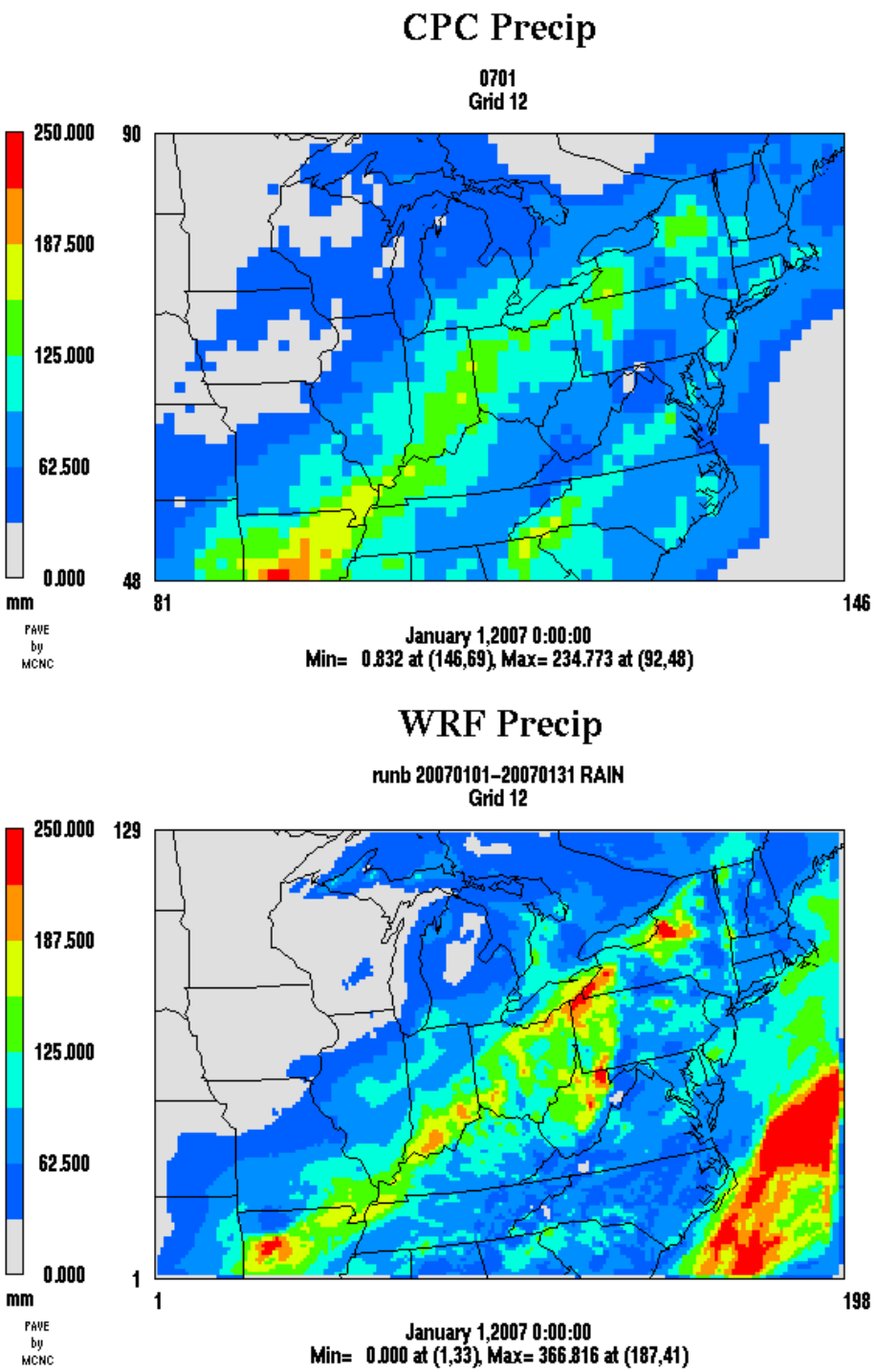


Figure 4-9. January 2007 monthly total precipitation (mm) in the 12 km NEUS modeling domain for the CPC analysis field based on observations (top) and WRF model estimates (bottom).

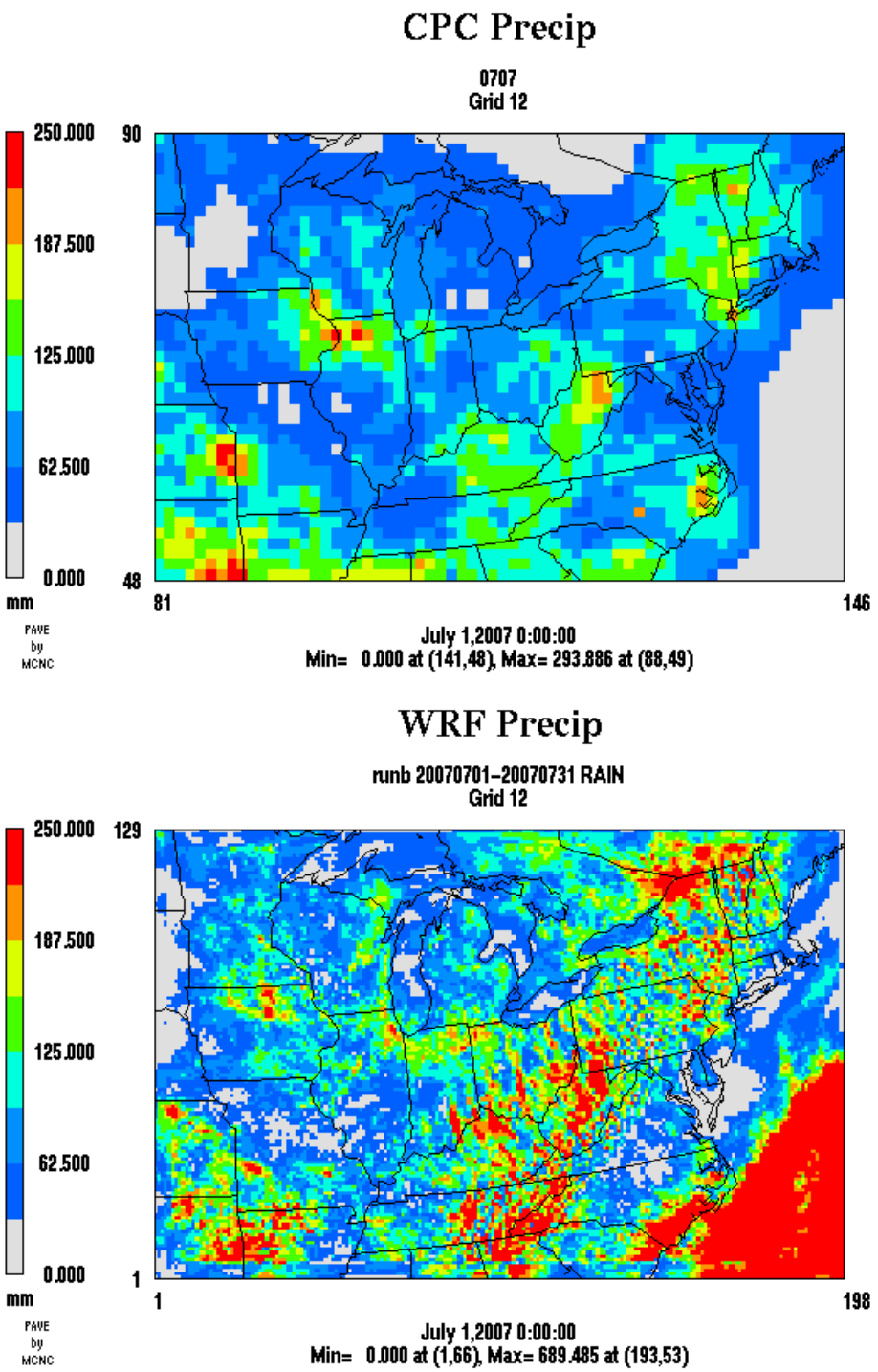


Figure 4-10. July 2007 monthly total precipitation (mm) in the 12 km NEUS modeling domain for the CPC analysis field based on observations (top) and WRF model estimates (bottom).

4.2.4 Comparisons with Other Studies

McNally and Loomis (2012) compared the WRF 36 km CONUS 2007 model performance from this study with nine other 36 km meteorological model performance evaluation conducted in other studies. As is often seen in meteorological model inter-comparisons, individual simulation often have strengths when looking at one variable or metric, and the same simulation may have weaknesses looking at another variable or metric. In regards to the 36 km domain, the current WRF 2007 simulation has the best performance characteristics for temperature and mixing ratio compared to the nine prior studies. The WRF 2007 simulation is performing at par or better than other simulations that were or are currently being used for air quality planning so the overall performance of the model is judged to be adequate.

4.3 Conclusions Meteorological Model Performance

The WRF 2007 36/12/4/0.8 km simulation achieved most of the model performance benchmarks. The biggest concerns were a wind speed overestimation bias and a wind direction bias. The wind speed positive bias appears to be greater in the Liberty-Clairton area, which is of some concern for modeling the impacts of the local sources. The 2007 WRF model performance was compared with the performance of meteorological models from nine other studies whose data are or have been used for air quality assessments and found that this 2007 WRF application had better performance for temperature and mixing ratio than all of the other nine studies and had wind performance that was comparable to the meteorological models in the other nine studies. Given these results, the 2007 WRF simulation was deemed suitable for use in the Liberty-Clairton $PM_{2.5}$ attainment demonstration modeling.

5.0 EMISSIONS MODELING

CAMx-ready emissions were generated by the SMOKE, BEIS and MOVES suite of emissions models. This section provides details of the SMOKE model setup, the emissions input data sources, source specific data handling and summaries of emissions data by source category and state.

5.1 SMOKE Model Set-up

Emissions inventory development for input into CAMx must address several source categories including: (a) stationary point sources; (b) area sources; (c) on-road mobile sources; (d) non-road mobile sources; (e) biogenic sources; and (f) fire sources. For this analysis, these estimates were developed for a 2007 annual period and for 36, 12, 4 and 0.8 km grid resolution domains.

CAMx requires two emission input files: (1) low-level gridded emissions that are emitted directly into the first layer of the model from sources at the surface with no plume rise or insufficient plume rise to carry the emissions above the first layer; and (2) elevated point sources (stacks) with plume rise calculated from stack parameters and meteorological conditions whose emissions are injected in an appropriate vertical layer of the model. For ozone modeling alone, hourly emissions are required for NO, NO_2, CO, several classes of VOCs and other pollutants as available. CAMx was operated using the CB6 chemical mechanism that will define the VOC classes to be used in the modeling. CAMx will also be configured to provide particulate matter (PM) estimates from which visibility and deposition can also be estimated. Thus, additional PM precursor species are needed as emissions input which includes SO_2, NH_3, SO_4, NO_3, EC, OA, other primary $PM_{2.5}$ and coarse PM ($PM_{2.5-10}$).

The parameters for the SMOKE runs are as follows:

Episodes: 2007 Calendar Base Year (Actual)

Output Time Zone: Greenwich Mean Time (zone 0)

Projection: Lambert Conformal with Alpha=33, Beta=45, Gamma=-97, and center at (-97, 40).

Domains: The definitions of the four domains used in the emissions modeling are provided below. For the 12, 4 and 0.8 km domains these definitions include a buffer cell so that two-way grid nesting can be invoked if desired.

- 36 Kilometer Grid: Origin at (-2736, -2088) kilometers with 148 rows by 112 columns and 36 km square grid cells.
- 12 Kilometer Grid: Origin at (60, -552) kilometers with 176 rows by 119 columns and 12 km square grid cells.
- 4 Kilometer Grid: Origin at (1292, 44) kilometers with 56 rows by 62 columns and 4 km square grid cells.
- 0.8 Kilometer Grid: Origin at (1391.2, 143.2) kilometers with 77 rows by 62 columns and 0.8 km square grid cells.

CAMx Model Species: The CAMx configuration is for the CB6 chemical mechanism with PM. The model species in the emission input files are: CO, NO, NO2, HONO, ACET, ALD2, AKDX, BENZ, CH4, ETH, ETHA, ETHY, FORM, IOLE, ISOP,KET, MEOH, NVOL, OLE, PAR, PRPA, TERP, TOL, UNK, UNR, XYL, NH3, SO2, SULF, PEC, PMFINE, PNO3, POC, PSO4, and PMC.

Elevated Sources:

- Point Sources were run with 20 m plume rise cutoff (i.e., any point source whose maximum plume rise was less than 20 m was added to the two-dimensional surface layer emissions input file).
- No plume-in-grid sources were modeled in SMOKE. PIG selection was performed outside of SMOKE
- Wildfire emissions were handled as elevated point sources.

5.2 Emissions Inputs

The emissions databases used for the 2007 base year were provided by a variety of sources. The emissions data for the 0.8 km fine grid was developed and provided for modeling by ACHD. Emissions data for areas outside of the 0.8 km grid were provided by MARAMA, SEMAP, LADCO, and EPA. The emissions data were then processed with SMOKE to provide the hourly, gridded, speciated files required by CAMx. Table 5-1 lists the data sources for the 0.8 km fine grid and Table 5-2 lists data sources for the larger grids.

State emissions databases were provided by the following groups:

- MARAMA – Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts , New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia.
- SEMAP/SESARM – Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and West Virginia.
- Midwest RPO (LADCO) States – Illinois, Indiana, Michigan, Ohio and Wisconsin.
- EPA 2008 NEIv1.5 was used for all other states

Table 5-1. Data sources for 0.8 km fine grid emissions.

Source Category	Liberty-Clairton Area	Allegheny County/SWPA
Area	TS|Pechan 2007	MARAMA 2007v3 Final
Non-Road	TS|Pechan 2007	MARAMA 2007v3 Final
On-Road Mobile	MOVES 2010a	LADCO 2007BaseCv8
Non-EGU Point	TS|Pechan 2007	ACHD 2007/ MARAMA 2007v3 Final
EGU Point	NA	MARAMA 2007v3 Final
Fires	2007 BlueSky Fire Emissions EPA, 2010	2007 BlueSky Fire Emissions EPA, 2010
Biogenics	Day Specific SMOKE-BEIS	Day Specific SMOKE-BEIS

Table 5-2. Data sources for 36/12/4 km outer grid emissions.

Source Category	MARAMA States	SEMAP/SESARM States	MidWest RPO (LADCO)	Other States
Area	MARAMA 2007v3 Final	EPA 2008 NEIv1.5	EPA 2008 NEIv1.5	EPA 2008 NEIv1.5
Non-Road	MARAMA 2007v3 Final	SEMAP 2007 Draft	EPA 2008 NEIv1.5	EPA 2008 NEIv1.5
On-Road Mobile	LADCO 2007BaseCv8	LADCO 2007BaseCv8	LADCO 2007BaseCv8	LADCO 2007BaseCv8
Non-EGU Point	MARAMA 2007v3 Final	SEMAP 2007 Draft	LADCO 2007BaseCv8	EPA 2008 NEIv1.5
EGU Point	MARAMA 2007v3 Final	SEMAP 2007 Draft	2007 day-specific hourly CEM	2007 day-specific hourly CEM
Fires	2007 BlueSky Fire Emissions EPA, 2010	SEMAP 2007 Draft	2007 BlueSky Fire Emissions EPA, 2010	2007 BlueSky Fire Emissions EPA, 2010
Biogenics	Day Specific SMOKE-BEIS	Day Specific SMOKE-BEIS	Day Specific SMOKE-BEIS	Day Specific SMOKE-BEIS

5.3 Area and Non-Road Source Emissions

Area and non-road mobile source emissions were provided as county-level emission estimates by source classification codes (SCCs). The area sources were provided as annual emissions, and temporally allocated by month and by hour of day using source-specific temporal allocation factors. Non-road emissions were supplied as monthly emissions and were temporally allocated using day-of-week and hour of day allocation factors. Temporal allocation factors were provided by MARAMA and these factors were used for the MARAMA supplied states. For all other states, the temporal allocation factors provided with the 2008 NEIv1.5 were used. Area and non-road sources are modeled using one representative week per month (84 modeled days per year).

The area and non-road sources were spatially allocated to the grids using an appropriate surrogate distribution (e.g., population for home heating, etc.). The U.S. EPA Office of Air Quality Planning and Standards (OAQPS) has recently developed new spatial surrogates for allocating county-level emissions to modeling grids using more recent information (e.g., 2010 census data). These new surrogates are replacing the spatial data used by OAQPS for modeling studies completed over the past 10 years and is distributed with the 2008NEIv2. These newest surrogates were used for the spatial allocation of the area and non-road emissions.

5.4 Point Source Emissions

2007 point source emissions were modeled using datasets provided by ACHD, MARAMA, SEMAP and EPA. Point source emissions were developed for two source categories: (1) point sources with Continuous Emissions Monitors (CEM); and (2) non-CEM point sources. For point sources with CEM data, actual, day-specific hourly NO_X and SO_2 emission measurements are incorporated into the emission estimates. For the other emissions species (e.g., $PM_{2.5}$), the 2007 annual emissions estimates were allocated to the hourly of year using the CEM hourly heat input value. The CEM point sources are modeled as day-specific.

For point source emissions without CEM data, the 2007 emissions inventory was modeled using SMOKE2.7 temporal profiles. Temporal profiles were supplied by MARAMA and SEMAP along with emissions data and these RPO specific profiles were applied to RPO specific data. Temporal profiles from the 2008 NEIv1.5 were applied to areas outside of the MARAMA/SEMAP states. Non-CEM point sources are modeled using one representative week per month.

Point source emissions were assigned to the modeling grids using the location information supplied in the emissions databases. Stack parameters were also provided and CAMx internally calculates plume rise using hourly meteorological conditions.

5.5 On-Road Mobile Source Emissions

The MOtor Vehicle Emissions Simulator (MOVES2010) is EPA's current tool to construct on-road mobile source emissions estimates for national, state, and county level inventories of criteria air pollutants, greenhouse gas emissions, and some mobile source air toxics from highway vehicles. MOVES2010 can be configured to either estimate emissions directly (i.e., emissions

inventory mode) or estimate emissions factors by vehicle type and other parameters (i.e., emissions factor mode).

For the 2007 on-road mobile source emissions, two data sources were used. For all areas of the modeling domain outside southwestern Pennsylvania, the LADCO 2007 BaseCv8 emissions datasets were used. LADCO generated 2007 emissions for all of the U.S. using MOVES2010a. These emissions are for an average weekday and weekend day, by month, and were generated using the MOVES 2010a model run in the inventory mode, using the national default settings and default meteorology.

For the southwestern Pennsylvania on-road mobile sources inside of the 0.8 km grid, MOVES2010a was run specifically for each county (Allegheny, Beaver, Fayette, Washington, and Westmoreland) using the local modeled meteorology data. MOVES2010a was configured to produce hourly emissions estimates, reflecting the meteorology of the local area.

A modified version of MET4MOVES was run to prepare representative, average meteorology for 2007 by month, hour, and county that is suitable for use by MOVES2010a. These new hourly estimates of temperature and relative humidity, based on the 2007 WRF simulation, replaced the current default meteorology that exists in MOVES2010a. MOVES2010a was run using the existing MOVES2010a default data sets, with the replacement meteorology, to estimate emissions (tons per hour) for all PM and OZONE pollutants by county/month/weekend day-weekday/hour by appropriate SCC and MOVES2010a process (e.g., extended idle, running exhaust). The resulting emissions estimates were converted to SMOKE-ready area source, hourly data sets suitable for processing by SMOKE/SMKINVEN. The resulting emissions were used in the 0.8 km fine grid.

Note that after the MOVES modeling was performed for this study, in April 2012 EPA released a new version of MOVES, MOVES2010b. According to EPA's documentation the main changes between MOVES2010a and MOVES2010b are related to performance enhancements (e.g., computer run times) and the changes in emissions are very small[16]. In fact, EPA states that because the differences in the MOVES2010a and MOVES2010b emissions are so small, that any study that started with MOVES2010a can complete the study with MOVES2010a[17]. They just won't reap the benefits of the faster MOVES2010b model.

5.6 Biogenic Source Emissions

Biogenic emissions were generated using the BEIS3.14 biogenic emissions model included in the SMOKE2.7 emissions modeling package. The BEIS3.14 model uses high-resolution (1 km horizontal resolution) land use data for 230 land use types. This land use data is combined with hourly-specific, gridded meteorology data produced by the WRF meteorological model (see Chapter 4) to calculate hourly, gridded biogenic emission estimates. Biogenic emissions are modeled as day-specific (365 modeled days per year).

[16] http://www.epa.gov/otaq/models/moves/documents/420f12014.pdf
[17] http://www.epa.gov/otaq/models/moves/documents/420b12028.pdf

5.7 Wildfires

Wildfire emissions were modeled using 2007 data provided by SEMAP, and the 2007 Bluesky Framework fire emissions data base from the EPA. For SMOKE modeling, wildfires are treated as elevated point sources. Emissions for wildfires are day-specific, and are located in the modeling domain based on location coordinates in the input data files.

5.8 Summary of Emission Results

Table 5-3 summarizes the anthropogenic emissions within the 0.8 km domain by major source category for an average day. Most of the CO emissions in the 0.8 km domain come from on-road mobile sources (70%); non-road mobile sources (24%) provide most of the remainder of the CO emissions. On-road mobile also contributes the majority of the NO_X emissions (73%) in the 0.8 km domain, with area and non-road making up the rest (10% to 12% each). Area (46%) and on-road (41%) are the largest two contributors to VOC emissions in the 0.8 km domain with non-road mobile (13%) contributing most of the rest. Area sources contributes the most SO_2 (72%) and $PM_{2.5}$ (65%) emissions in the 0.8 km domain with point sources (22%) and on-road mobile (20%) being the next largest SO_2 and $PM_{2.5}$ contributor, respectively.

Table 5-3. Summary of total 2007 emissions within the 0.8 km Liberty-Clairton domain for an average day (tons per day).

Source Category[1]	CO	NO_X	VOC	SO_2	$PM_{2.5}$
Area Source	48.84	16.46	49.35	19.49	11.67
Non-Road	178.67	14.13	13.52	0.78	1.18
Point Source	3.43	7.48	1.52	5.89	1.64
On-Road Mobile	526.60	101.95	43.80	0.94	3.58

[1]There were no fire emissions or CEM point sources within the 0.8 km domain.

Table 5-4 summarizes the CO, NO_X, VOC, SO_2 and $PM_{2.5}$ emissions for area, non-road mobile, non-road mobile, non-CEM point and CEM point sources within the 12 km NEUS and 36 km CONUS domains. Tables 5-4a, 5-4b and 5-4c summarize the total area, non-road and non-road mobile source emissions within the 12 km NEUS domain, respectively. Whereas, the non-CEM and CEM point sources are summarized in, respectively, Table 5-4d and 5-4e for the 36 km CONUS domain. The point sources were processed for just the entire 36 km CONUS domain. If the CAMx model is run for a smaller domain (e.g., 12 km NEUS or 4 km SWPA), it just doesn't use the emissions for point sources located outside of the domain it is simulating.

Table 5-4a. Summary of total area source emissions by state within the 12 km NEUS domain for an average day (tons per day).

State	CO	NOX	VOC	SO2	PM2.5
MARAMA States					
Connecticut	129.91	58.59	158.90	48.28	24.06
Delaware	28.82	23.34	28.19	9.00	7.52
District of Columbia	15.28	5.64	15.35	3.50	3.10
Maine	134.51	16.28	62.41	19.06	16.87
Maryland	240.95	90.45	182.01	23.13	42.44
Massachusetts	251.63	88.72	235.22	56.16	50.48
New Hampshire	114.91	16.93	61.74	15.97	16.14
New Jersey	279.04	127.22	278.01	44.07	43.31
New York	627.35	350.41	549.43	221.03	135.00
Pennsylvania	668.59	208.07	494.61	190.11	146.07
Rhode Island	48.48	18.44	66.84	12.51	8.45
Vermont	146.85	13.25	39.29	10.33	25.98
Virginia	439.82	177.13	401.41	59.64	86.58
NEI States					
Alabama	28.86	10.91	28.49	0.39	15.51
Arkansas	98.75	48.16	106.66	2.47	52.16
Georgia	94.16	23.58	57.20	9.07	54.57
Illinois	440.04	279.28	576.83	21.39	377.41
Indiana	325.58	146.74	420.78	44.21	124.05
Iowa	132.44	85.09	119.44	6.99	71.60
Kansas	59.05	85.07	104.87	11.68	59.09
Kentucky	227.62	105.21	161.97	5.85	68.16
Michigan	680.38	213.72	499.47	58.23	175.56
Minnesota	395.84	138.02	282.90	25.35	161.55
Mississippi	13.83	4.81	11.05	0.16	6.84
Missouri	254.09	178.64	302.55	124.62	210.78
Nebraska	17.17	14.19	25.34	0.24	13.92
North Carolina	700.96	105.85	489.83	41.88	207.39
Ohio	657.52	255.63	474.78	44.51	178.37
Oklahoma	70.93	55.48	94.57	5.79	68.68
South Carolina	153.58	35.56	170.96	2.61	76.49
Tennessee	278.15	148.78	274.85	180.01	98.11
West Virginia	159.25	86.61	71.41	15.77	44.74
Wisconsin	610.46	122.59	336.88	20.88	131.08

Table 5-4b. Summary of total non-road mobile source emissions by state within the 12 km NEUS domain for an average day (tons per day).

State	CO	NO_X	VOC	SO_2	$PM_{2.5}$
MARAMA States					
Connecticut	296.16	34.22	32.93	1.69	2.72
Delaware	54.85	8.61	6.46	0.50	0.73
District of Columbia	23.54	6.32	2.43	0.45	0.53
Maine	257.56	8.99	80.91	0.51	2.37
Maryland	411.18	49.09	49.08	2.90	4.62
Massachusetts	535.76	47.77	70.53	2.41	4.40
New Hampshire	250.66	14.11	81.38	0.68	2.64
New Jersey	738.47	77.96	76.80	4.07	6.50
New York	1905.10	129.45	335.06	2.09	15.35
Pennsylvania	1384.60	134.49	199.68	6.51	12.09
Rhode Island	81.27	8.86	7.62	0.43	0.65
Vermont	184.89	6.68	58.67	0.36	1.70
Virginia	631.52	79.37	67.78	4.80	7.18
SEMAP States					
Alabama	66.18	19.02	0.49	0.71	1.07
Georgia	92.94	18.83	0.43	0.69	1.28
Kentucky	372.83	140.13	3.36	6.06	7.36
Mississippi	15.86	7.08	0.17	0.31	0.36
North Carolina	839.03	161.04	2.00	12.13	11.49
South Carolina	286.99	55.22	0.82	2.48	3.76
Tennessee	555.11	143.46	5.06	6.38	8.69
West Virginia	167.66	94.33	2.79	4.22	4.17
NEI States					
Arkansas	305.96	81.22	50.71	2.89	4.99
Illinois	1825.80	513.70	244.89	12.33	29.87
Indiana	1016.60	270.32	133.08	7.76	15.22
Iowa	624.70	227.05	103.10	6.22	15.48
Kansas	230.88	93.06	26.24	3.36	4.73
Michigan	1929.60	225.11	369.91	5.24	18.90
Minnesota	1008.90	253.57	216.51	7.40	17.20
Missouri	1025.30	301.30	146.75	10.39	16.80
Nebraska	95.16	25.92	9.70	0.81	1.59
Ohio	1975.30	411.52	226.40	12.53	22.43
Oklahoma	274.32	43.91	37.63	1.41	2.74
Wisconsin	1196.70	186.83	267.99	4.76	14.22

Table 5-4c. Summary of total on-road mobile source emissions by state within the 12 km NEUS domain for an average day (tons per day).

State	CO	NO_X	VOC	SO_2	$PM_{2.5}$
Alabama	291.66	46.55	25.54	0.38	1.62
Arkansas	730.35	134.03	61.82	0.92	4.55
Connecticut	1219.20	149.72	112.29	1.01	6.79
Delaware	434.15	68.97	31.33	0.53	2.35
District of Columbia	111.30	23.40	10.18	0.22	1.08
Georgia	418.08	71.01	29.01	0.47	2.43
Illinois	5451.10	819.41	430.62	6.50	34.03
Indiana	4338.50	595.03	325.53	4.53	23.20
Iowa	1804.70	251.76	131.00	2.25	10.23
Kansas	2.01	0.65	0.20	0.01	0.02
Kentucky	2531.30	387.70	169.19	3.30	14.10
Maine	532.54	72.64	35.99	0.69	3.20
Maryland	2003.40	326.15	168.87	3.00	12.18
Massachusetts	2055.00	204.22	164.87	1.97	9.48
Michigan	4905.70	705.88	414.45	7.35	31.68
Minnesota	3263.70	402.47	237.22	3.49	19.84
Mississippi	102.92	17.79	8.72	0.13	0.60
Missouri	2928.80	564.23	257.04	5.73	20.86
Nebraska	325.97	37.36	25.56	0.34	1.71
New Hampshire	710.85	93.87	48.16	0.69	4.40
New Jersey	2350.60	377.08	224.84	2.44	15.24
New York	6997.80	847.74	507.68	5.58	44.33
North Carolina	3975.00	641.48	312.20	5.48	22.63
Ohio	6446.80	880.84	415.66	9.34	33.73
Oklahoma	13.57	4.03	0.68	0.04	0.13
Pennsylvania	6529.20	991.71	484.48	6.45	38.05
Rhode Island	506.56	52.78	34.15	0.42	2.40
South Carolina	1390.10	244.01	108.99	1.91	8.07
Tennessee	3413.10	498.39	243.43	4.14	17.90
Vermont	407.24	50.11	31.18	0.46	2.37
Virginia	3809.60	544.84	291.88	3.55	19.67
West Virginia	1027.00	186.34	147.70	1.62	6.56
Wisconsin	3402.30	418.44	282.94	3.43	21.31

Table 5-4d. Summary of total non-CEM point source emissions by state within the 36 km CONUS domain for an average day (tons per day).

State	CO	NO_X	VOC	SO_2	$PM_{2.5}$
MARAMA States					
Connecticut	7.08	17.27	3.97	8.73	1.57
Delaware	19.25	14.03	9.33	22.48	2.97
District of Columbia	0.82	2.01	0.16	1.29	0.12
Maine	38.42	46.71	13.66	42.66	10.21
Maryland	212.53	64.31	12.60	85.41	10.62
Massachusetts	12.58	35.27	11.22	24.82	7.05
New Hampshire	6.18	7.36	2.21	7.49	2.91
New Jersey	18.93	37.03	27.69	9.32	6.60
New York	144.87	97.49	26.77	121.39	6.62
Pennsylvania	206.64	177.47	74.61	146.18	28.88
Rhode Island	2.88	2.60	2.53	4.11	0.34
Vermont	1.92	1.21	1.02	0.87	0.31
Virginia	171.76	135.83	95.84	148.99	28.11
SEMAP States					
Alabama	332.57	199.47	106.05	187.12	51.36
Florida	354.04	180.34	99.21	172.94	40.71
Georgia	269.10	140.81	103.87	132.49	43.36
Kentucky	216.69	102.88	129.27	88.04	33.26
Mississippi	115.02	141.26	94.83	53.30	20.71
North Carolina	197.99	119.61	136.53	131.99	32.99
South Carolina	174.08	82.99	81.06	95.80	18.74
Tennessee	160.93	97.22	133.60	62.10	40.82
West Virginia	160.23	91.50	31.63	95.17	9.14
NEI States					
Arizona	71.09	43.67	7.85	95.49	7.79
Arkansas	108.32	94.72	74.71	38.34	14.80
California	290.59	218.26	112.86	70.92	56.35
Colorado	132.41	144.78	199.47	17.83	19.07
Idaho	69.16	29.35	2.90	20.50	5.56
Illinois	255.04	224.93	141.07	292.46	29.99
Indiana	919.83	178.12	102.48	193.67	67.92
Iowa	77.97	97.31	58.92	120.74	12.23
Kansas	65.58	140.49	48.90	19.97	8.69
Louisiana	279.86	396.25	184.74	378.07	109.92
Michigan	209.48	198.94	76.25	156.00	30.99
Minnesota	77.28	157.60	61.16	66.98	37.82
Missouri	212.17	99.95	44.64	207.12	8.95

State	CO	NO_X	VOC	SO_2	$PM_{2.5}$
Montana	75.62	35.74	11.45	14.09	4.56
Nebraska	19.90	28.23	9.57	9.77	4.38
Nevada	31.91	31.58	9.00	4.94	3.97
New Mexico	56.73	76.93	24.07	30.03	2.08
North Dakota	27.11	28.00	8.45	22.73	5.81
Ohio	674.91	160.41	84.65	292.85	52.27
Oklahoma	112.81	166.07	67.67	80.49	12.58
Oregon	96.04	31.35	22.25	12.36	19.59
South Dakota	6.26	0.45	0.27	0.06	0.03
Texas	713.14	648.21	326.16	332.72	75.98
Utah	47.50	61.78	18.45	20.69	5.85
Washington	176.22	67.07	34.17	36.55	9.64
Wisconsin	172.43	108.81	83.34	164.42	2.98
Wyoming	90.28	108.22	48.22	62.60	35.47

Table 5-2e. Summary of total CEM point source emissions by state within the 36 km CONUS domain for an average day (tons per day).

State	CO	NO_X	VOC	SO_2	$PM_{2.5}$
MARAMA States					
Connecticut	5.40	13.41	0.69	18.93	2.27
Delaware	3.79	35.42	0.32	101.57	6.81
District of Columbia	0.23	0.49	0.02	0.39	0.05
Maine	1.26	1.91	0.09	4.59	0.34
Maryland	11.80	149.83	1.11	806.65	34.07
Massachusetts	15.42	30.79	1.30	149.65	6.47
New Hampshire	2.49	13.03	0.30	116.50	1.65
New Jersey	10.09	48.20	1.20	102.56	12.27
New York	40.73	162.29	6.80	377.47	10.33
Pennsylvania	62.90	530.05	2.36	2697.70	53.97
Rhode Island	1.65	1.35	0.13	0.04	0.04
Vermont	3.96	1.01	0.06	0.02	0.00
Virginia	25.34	195.83	2.11	546.60	13.76
SEMAP States					
Alabama	34.88	344.10	2.90	1255.80	17.50
Florida	107.90	499.70	6.93	869.74	39.26
Georgia	34.00	294.26	4.32	1741.40	26.24
Kentucky	41.14	479.23	3.87	1037.00	25.00
Mississippi	18.72	128.33	1.75	206.98	3.53
North Carolina	46.65	164.99	2.75	1020.90	59.80
South Carolina	21.78	141.13	1.71	496.51	46.03
Tennessee	24.01	310.50	2.63	727.00	20.47
West Virginia	28.36	425.45	3.33	1078.40	74.70
NEI States					
Arizona	24.53	116.23	1.42	119.86	8.59
Arkansas	12.26	103.87	1.45	200.80	3.65
California	50.33	28.64	3.46	4.73	7.66
Colorado	19.48	179.00	2.07	161.70	3.30
Illinois	47.32	337.38	4.81	742.01	20.51
Indiana	45.10	542.00	5.58	1648.70	278.71
Iowa	75.46	142.67	1.90	320.07	18.26
Kansas	23.21	145.13	2.10	262.78	5.03
Louisiana	94.73	118.76	2.94	241.86	13.81
Michigan	38.92	303.41	3.40	911.46	8.44
Minnesota	22.29	166.38	1.94	204.93	9.69
Missouri	61.06	261.52	4.47	799.97	18.56
Montana	8.01	77.57	1.20	59.01	0.72

State	CO	NO_X	VOC	SO_2	$PM_{2.5}$
Nebraska	9.23	114.69	1.18	201.29	4.99
Nevada	4.52	43.41	1.42	26.02	1.95
New Mexico	44.36	79.45	0.91	32.62	2.55
North Dakota	20.57	185.65	2.04	366.58	1.18
Ohio	45.17	664.27	3.85	2060.50	123.83
Oklahoma	35.69	224.92	2.95	295.11	10.36
Oregon	2.80	26.41	0.75	31.23	2.16
South Dakota	1.57	37.95	0.35	37.09	0.63
Texas	611.48	430.38	10.80	1322.20	35.06
Utah	11.74	168.26	0.96	56.85	3.24
Washington	10.76	32.60	0.29	6.62	1.90
Wisconsin	36.95	136.83	3.20	366.05	1.16
Wyoming	37.62	201.93	2.35	230.43	19.68

6.0 AIR QUALITY MODELING

An updated version of the latest version of CAMx (Version 5.4 released in October 2011, ENVIRON, 2011) was used for the revised 2007 base case modeling. The update consisted of a correction to the CAMx in-line TUV photolysis rate adjustments as discussed in Section 1.1. The CAMx revised 2007 base case also used snow cover and applied fugitive dust transport factors (FDTF) to local sources over what was used in the preliminary 2007 base case (Morris et al., 2012a) that is also described in Section1.1.

6.1 CAMx Model Options

CAMx was run using two-way grid nesting between the 36 km and 12 km domains and one-way grid nesting between the 12 km and 4 km domains. Two-way grid nesting was also used on the 4/0.8 km domains. Table 6-1 summarizes the CAMx model options and application methodology with more details provided below.

The CB6 gas-phase chemical mechanism was used in the CAMx 2007 base case modeling. CB6 contains the very latest chemical kinetics (Yarwood et al., 2010). The CAMx 2 size section (fine and coarse) particulate matter module was used along with the ISORROPIA aerosol thermodynamic module and RADMAQ aqueous-phase module. The PPM advection solver was used for horizontal transport (Colella and Woodward, 1984) along with the spatially varying horizontal diffusion approach based on the method of Smagorinsky (1963). An eddy viscosity (or "K-theory") first-order closure approach will be used for vertical diffusion using the CMAQ-like vertical diffusion coefficient parameterization in WRFCAMx pre-processor.

6.2 CAMx Model Inputs

The following CAMx inputs were used in the 2007 base case simulation.

Meteorological Inputs: The WRF-derived meteorological fields were prepared for CAMx using WRFCAMx Version 3.2. The CMAQ-Kv method along with the KVPATCH adjustment was used to generate vertical diffusivity for CAMx.

Initial/Boundary Conditions: The boundary conditions (BCs) for the 36 km CONUS domain simulation were extracted from the MOZART[18] global chemistry model simulation for 2007. Existing programs were updated to map the MOZART species to the CB6 species and were used to interpolate from the MOZART horizontal and vertical coordinate system to the CAMx LCC coordinate system and vertical layer structure.

Photolysis Rates: Photolysis rates as well as albedo/haze/ozone/snow inputs for CAMx were based on the Total Ozone Mapping Spectrometer (TOMS), land cover and other data. The TUV[19] photolysis rates processor was used to generate the photolysis rate lookup table input to

[18] http://web3.acd.ucar.edu/gctm/
[19] http://cprm.acd.ucar.edu/Models/TUV/

CAMx. CAMx was configured to use the in-line TUV to adjust photolysis rates for cloud cover and model estimated aerosol loadings using the corrected CAMX version 5.4.

Landuse: Landuse fields were based on USGS GIRAS data and local-specific landuse data provided by ACHD.

Table 6-1. Science options selected for the CAMx Liberty-Clairton $PM_{2.5}$ modeling.

Science Options	Configuration	Notes
Model Codes	CAMx Version 5.4 (October 2011)	Corrected in-line TUV. (ENVIRON, 2011; www.camx.com)
Horizontal Grid Mesh	36/12/4/0.8 km	
36 km grid	148 x 112 grid cells	36/12 km domains two-way grid nesting
12 km grid	174 x 117 grid cells	12 to 4 km domains one-way grid nesting
4 km grid	54 x 60 grid cells	4/0.8 km domains with two-way grid nesting
0.8 km grid	45 x 45 grid cells	Reduced size by factor of ~2 from Modeling Protocol
Vertical Grid Mesh	25 vertical layers	Collapse 37 WRF vertical layers to 25 CAMx vertical layers
Grid Interaction	36/12 km two-way nesting 4/0.8 km two-way nesting	One-way nesting between 36/12 and 12/4 km domains
Initial Conditions	~10 day spin-up on 36 km grid and 5 day initialization on 12/4/0.8 km domains	Clean initial conditions
Boundary Conditions (BCs)	36 km BCs from MOZART global chemistry model	4/0.8 km BCs from 36/12 km results
Emissions		
Baseline Emissions Processing	SMOKE, MOVES, SMOKE-BEIS	2007 MARAMA, LADCO and SEMAP and 2008 NEI
Sub-grid-scale Plumes	Plume-in-Grid (PiG) for local sources in Liberty-Clairton area	Sample PiG live puffs using 100 m receptor network around Liberty-Clairton monitors
Chemistry		
Gas Phase Chemistry	CB6	Latest chemical reactions and kinetic rates (Yarwood et al., 2010)
Meteorological Processor	WRFCAMx Version 3.2	Compatible with CAMx V5.4
Horizontal Diffusion	Spatially varying	K-theory with Kh grid size dependence using method of Smagorinsky (1963)
Vertical Diffusion	CMAQ-Kv	Similar to CMAQ's integration methodology
Diffusivity Lower Limit	Kv-min = 0.1 m^2/s	
Deposition Schemes		
Dry Deposition	Zhang dry deposition scheme (Zhang et al., 2001)	Snow cover adjustments based on WRF output
Wet Deposition	Scavenging model for gases and aerosols	Deposition by rain/snow/graupel
Numerics		
Gas Phase Chemistry Solver	EBI Fast Solver	Based on Euler Backward Iterative scheme (Hertel et al., 1993)
Vertical Advection Scheme	Implicit scheme w/ vertical velocity update	

Science Options	Configuration	Notes
Horizontal Advection Scheme	Piecewise Parabolic Method (PPM) scheme	Piecewise Parabolic Method (PPM) scheme (Colella and Woodward,1984)
Integration Time Step	Wind speed dependent	~20-60 sec (0.8/4 km); 1-5 min (12 km), 5-15 min (36 km)

Spin-Up Initialization: At least ten days of model spin up (December 21-31, 2006) was used on the 36 km continental U.S. configuration. A shorter spin up (5 days) was used for the 12/4/0.8 km two-way nesting simulations.

Plume-in-Grid: The Plume-in-Grid (PiG) subgrid-scale plume module was used to model all emissions from specific local sources in the Liberty-Clairton area identified by ACHD. The PiG sources active puffs were sampled using 100 m resolution receptors around the Liberty and Clairton monitoring sites as shown in Figure 6-1.

PSAT: The Particulate Source Apportionment Technology (PSAT) was used for the local sources in the Liberty-Clairton area identified by ACHD. If AERMOD is used for local source contributions, the effects of the local sources can be removed from the CAMx modeling by subtracting out the PSAT contributions for the local sources and ignoring the PiG active puff sampling on the 100 m resolution receptor network around the two monitors. The SO4, NO3/NH4 and primary PM families of PSAT source apportionment tracers were used to track the contributions of local sources once their emissions are released from the PiG puff module to the grid model. Note that the SOA family of PSAT tracers was not used to separately track the local source SOA contributions. However, because the local source have small VOC emissions of SOA precursors and there is insufficient time to form SOA between the local sources and the Liberty monitoring site this will introduce any uncertainties in the analysis.

Total and Local Source Contribution: The total $PM_{2.5}$ concentrations due to all sources is obtained by combining the CAMx 0.8 km grid cell model prediction with the average of the contributions from all the live puffs in the PiG across the 100 m receptors contained within the same 0.8 km grid cell (0.8k_puffs). The $PM_{2.5}$ without the local sources is obtained by taking the CAMx 0.8 km grid cell prediction without the PiG live puffs and subtracting the PSAT contributions of the local sources for the same 0.8 km grid cell (0.8k_nolocal). The difference of these two results provides an estimate of the local sources (0.8k_puffs – 0.8k_nolocal). However, since only the PSAT primary PM family of source contributions tracers were used, then the modeled local contribution could be missing some of the local source contributions due to SO4, NO3 and NH4.

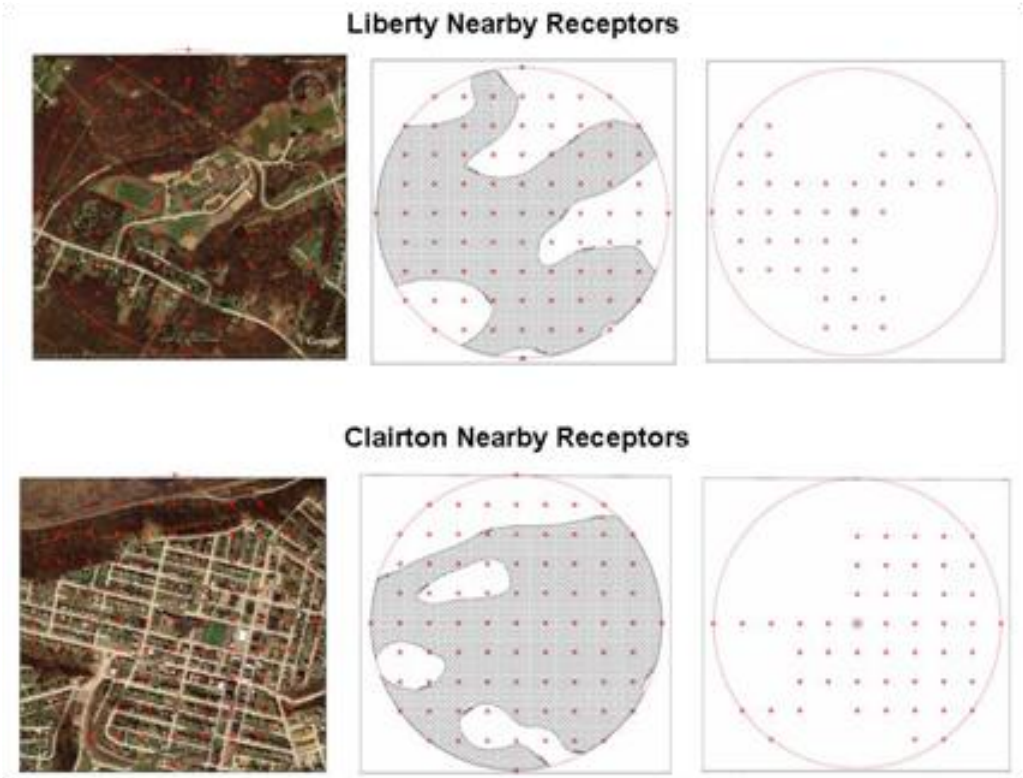


Figure 6-1. Receptor networks for sampling PiG live puffs at 100 m resolution within 500 m of the Liberty (top) and Clairton (bottom) monitoring sites.

6.3 CAMx Application Methodology for the Revised 2007 Base Case

The Modeling Protocol (ACHD, 2011b) proposed to first operate CAMx for the 36 km CONUS domain and process the output to generate boundary conditions for the 12 km NEUS domain (i.e., one-way nesting between the 36 and 12 km domains) and then run CAMx with the 12/4/0.8 km domains using two-way grid nesting. However, benchmarks using the CAMx 12/4/0.8 km configuration found that an annual simulation would require several months to complete. This is was due to the number of grid cells and the model integration time step (Δt) that is defined by the grid cell size and the maximum wind speed (WS) in the east-west (U) or north-south (V) direction.

$$\Delta t = 0.5 \times \text{Grid Size}/\text{Maximum WS}$$

Thus, for a 10 m/s Maximum WS and a 12 km grid resolution the integration time step would be 600 s or 10 minutes. However, when running a 12/4/0.8 km two-way nest the integration time step will be defined by the finest grid resolution so the same 10 m/s Maximum WS would produce a 40 s (0.67 minute) integration time step based on a 0.8 km grid resolution. So due to the integration time step it takes 15 times longer to run CAMx for the 12 km domain alone when doing 12/4/0.8 two-way nesting versus running the 12 km domain as a standalone CAMx run.

For the revised 2007 base case CAMx was exercised for the 36/12 km domains using two-way grid nesting and the results processed to generate BCs for the 4 km domain and the 4/0.8 km domains was operated using two-way nesting. However, even the initial test runs of CAMx using the 4/0.8 km two-way nesting indicated that the model would take approximately two-months to complete the 2007 base case. So the 0.8 km domain was reduced by a factor of ~2 (see Figure 3-4) and several multi-processing strategies were investigated. CAMx supports two types of multi-processing capabilities: (1) the Message Passing Interface (MPI) where the CAMx modeling domains are decomposed into N subdomains and the MPI main node passes the N subdomain solutions to N other CPUs that solves each subdomain and sends the results back to the main MPI CPU , which pieces the domain back together again; and (2) Open Multiprocessing (OpenMP) that uses compiler directives in the code and an OpenMP compatible compiler to perform internal multiprocessing in the code (e.g., collapsing loops with loop independent variables). We initially tried using MPI with more CPUs to speed up the CAMx 4/0.8 km run time but found that because the number of grid cells in the 4 and 0.8 km domains were fairly small, the overhead associated with the domain decomposition and reconstruction negated the speed up from adding more CPUs. After testing different MPI/OpenMP configurations we settled on running the 2007 4/0.8 km two-way nest run as six 2-month segments each with a 5-day initialization using 8 CPUs with OpenMP multi-processing. Each of these 2-month simulation required approximately 3-4 weeks to complete so using 48 CPUs the CAMx 2007 annual 4/0.8 km run could be completed in approximately 25-30 days (3-4 weeks).

7.0 MODEL PERFORMANCE EVALUATION

The CAMx revised 2007 base case modeling results were evaluated using surface ambient observations for several species and across several monitoring networks as well as for sulfur and nitrogen wet deposition.

7.1 Monitoring Networks

The CAMx model was evaluated using ambient observation data from six separate monitoring networks as follows:

- Federal Reference Method (FRM[20]) total $PM_{2.5}$ Mass;
- Chemical Speciation Network (CSN[21]) speciated $PM_{2.5}$;
- Clean Air Status and Trends Network (CASTNet[22]) partial speciated $PM_{2.5}$ and hourly ozone;
- Interagency Monitoring of Visually Protected Environments (IMPROVE[23]) network of total $PM_{2.5}$ mass, speciated $PM_{2.5}$ and PM_{10};
- ACHD Liberty TEOM $PM_{2.5}$; and
- National Atmospheric Deposition Program (NADP[24]) wet deposition of sulfur and nitrogen.

Table 7-1 lists the species collected in each network and the sampling times.

Table 7-1. Species and sampling times for ambient air quality monitoring networks.

Network	Species	Sampling Time
FRM	Total $PM_{2.5}$ Mass	1:3 days (1:1 day at Liberty)
CSN	$PM_{2.5}$, SO4, NO3, NH4, EC, OC, elements	1:3 days
CASTNet weekly	SO4, SO2, NO3, HNO3, NH4	weekly
CASTNet Hourly	Ozone	hourly
IMPROVE	PM_{10}, $PM_{2.5}$, SO4, NO3, EC, OC, elements	1:3 days
ACHD TEOM	$PM_{2.5}$	hourly
NADP	Wet deposition of SO4, NO3 and NH4	weekly

Figure 7-1 displays the locations of the monitoring sites within the 12 km NEUS domain. There are 536 FRM, 110 CSN, 40 IMPROVE and 46 CASTNet monitoring sites within the 12 km NEUS domain. The locations of the monitoring sites in the 4 km SWPA domain are shown in Figure 7-2 where there are 30 FRM, 8 CSN and 3 IMPROVE and CASTNet monitoring sites. The 4 FRM sites in the 0.8 km Liberty-Clairton domain listed from bottom to top in Figure 7-3 are Clairton, Liberty, North Braddock and Lawrenceville with Liberty and Lawrenceville also having CSN monitoring sites. The TEOM hourly $PM_{2.5}$ monitor is located at Liberty and there are no

[20] http://www.epa.gov/ttnamti1/pmfrm.html
[21] http://www.epa.gov/ttnamti1/speciepg.html
[22] http://epa.gov/castnet/javaweb/index.html
[23] http://vista.cira.colostate.edu/improve/
[24] http://nadp.sws.uiuc.edu/

IMPROVE or CASTNet sites located within the 0.8 km domain. There were 102 and 1 NADP wet deposition sites within the 12 and 4 km modeling domains, with no NADP sites in the 0.8 km domain.

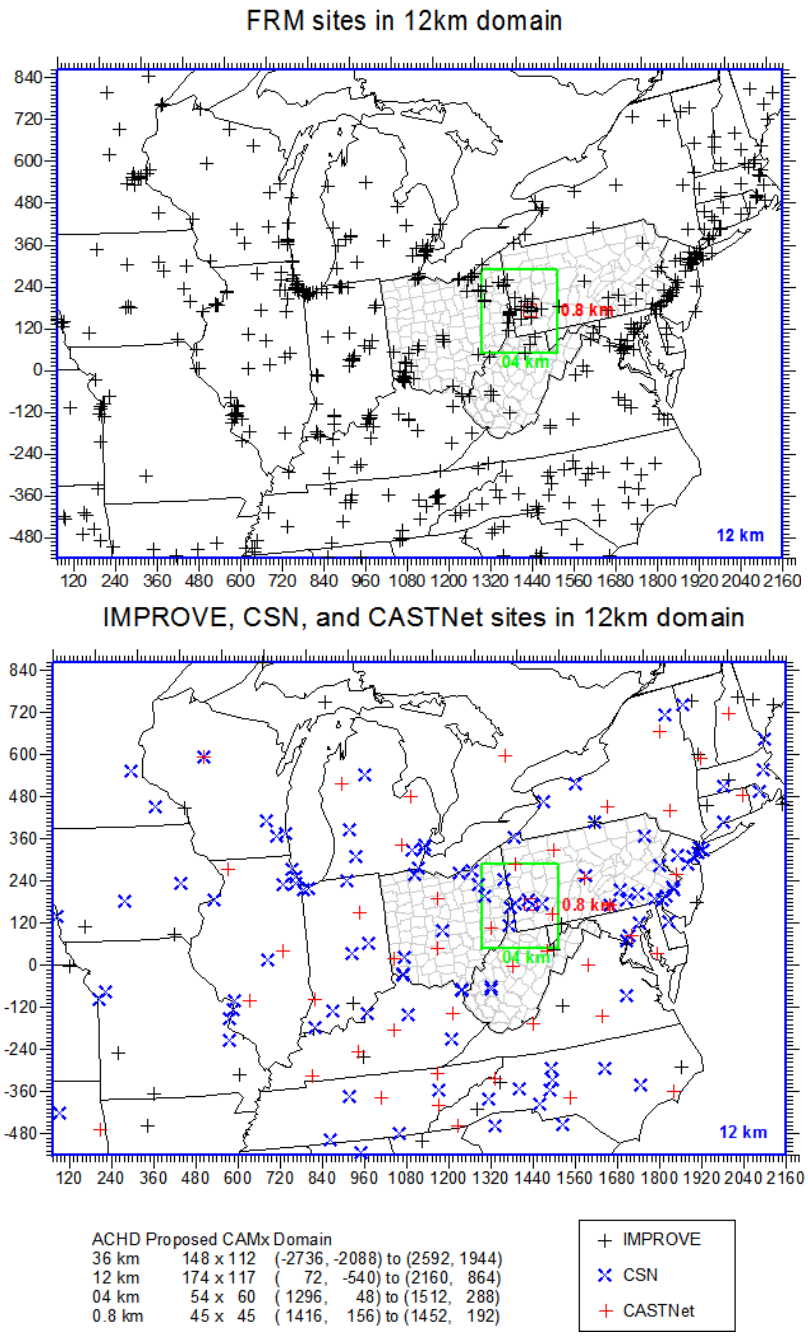


Figure 7-1. Locations of the FRM (top) and IMPROVE, CSN and CASTNet (bottom) monitoring sites within the 12 km NEUS domain.

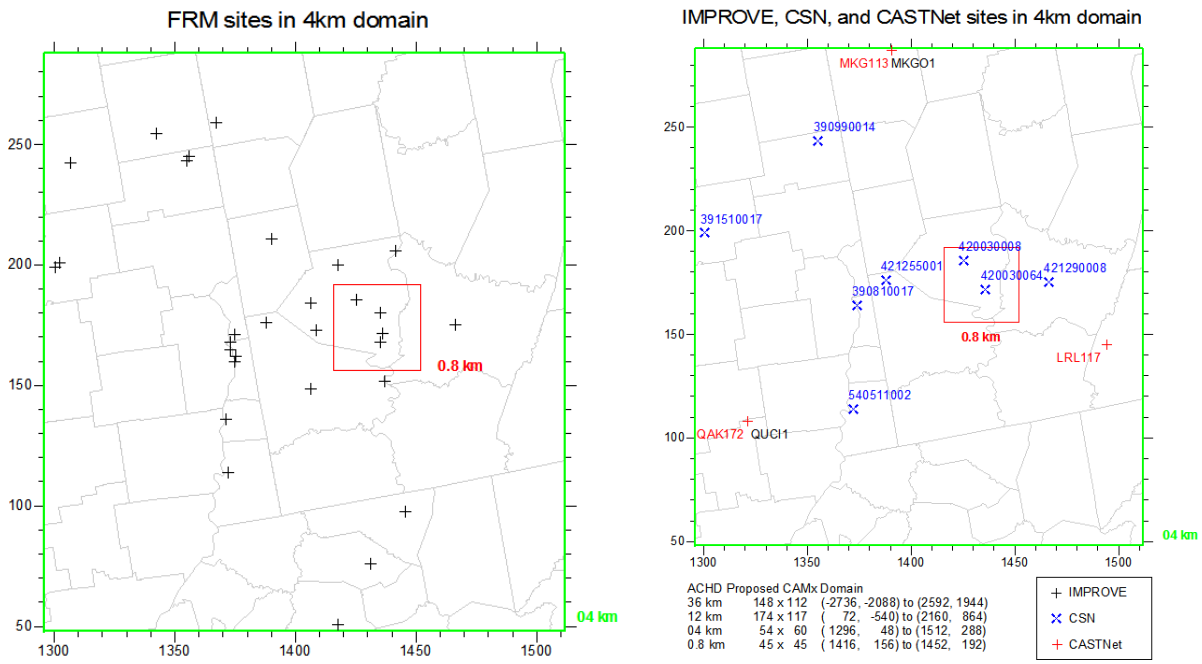


Figure 7-2. Locations of the FRM (left) and IMPROVE, CSN and CASTNet (right) monitoring sites within the 4 km SWPA domain.

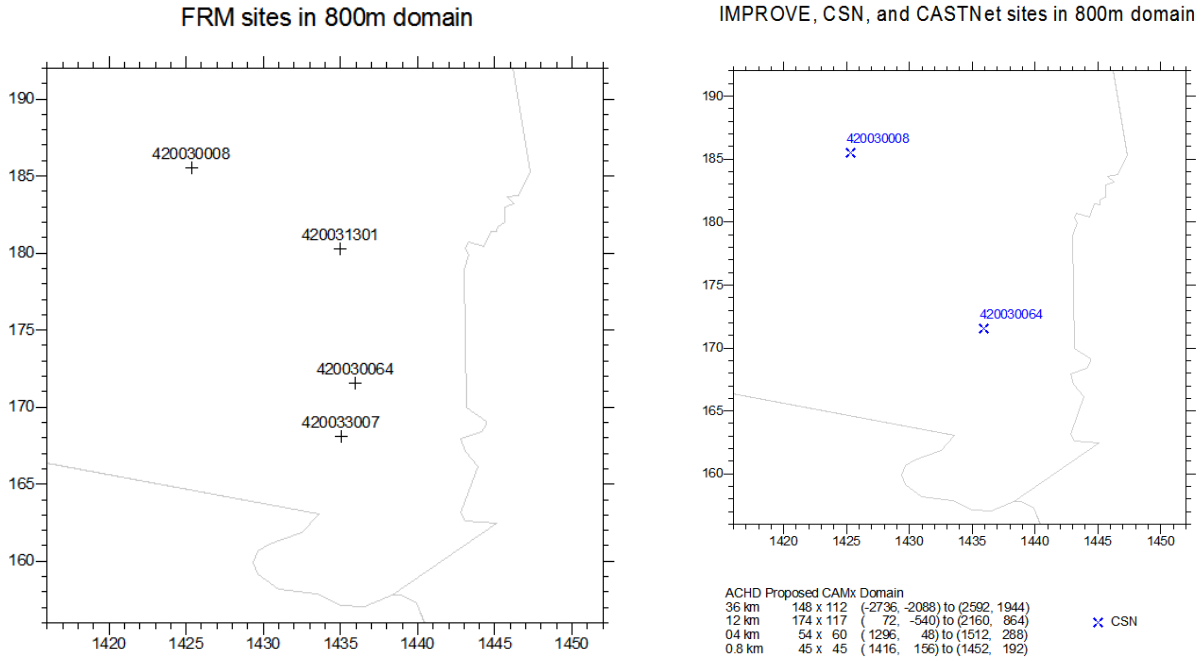


Figure 7-3. Locations of the FRM (left) and CSN (right) monitoring sites within the 0.8 km Liberty-Clairton domain.

7.2 Species for Model Performance Evaluation

Because $PM_{2.5}$ consists of numerous different compounds that can be measured numerous different ways then its de facto definition is determined by the measurement technology used to measure it. For example, at one point the IMPROVE and STN/CSN networks were using different technologies for measuring $PM_{2.5}$ Carbon (TOR and NIOSH respectively) that could produce EC and OC observations for the same air mass that varied considerably (e.g., 30%). The measured $PM_{2.5}$ species can be very different from what is in the model. So unlike ozone, where the modeled and measured representations are consistent, there can be inconsistencies between the modeled and measured definitions of $PM_{2.5}$ species that could cause a perfect model to produce poor model performance evaluation statistics. The CAMx model was evaluated for the species in Table 7-2.

Table 7-2. Species used in the CAMx model performance evaluation.

Name	Species	Networks (Definition)
PM2.5	Total PM2.5 Mass	FRM, CSN, IMPROVE and TEOM
SO4	Sulfate	CSN, CASTNet, IMPROVE and NADP
NO3	Nitrate	CSN, CASTNet, IMPROVE and NADP
NH4	Ammonium	CSN, CASTNet and NADP
EC	Elemental Carbon	CSN and IMPROVE
OA (OC)	Organic Aerosol	CSN and IMPROVE (measurements use OA/OC=1.4 ratio)
TCM	Total Carbon Mass	CSN and IMPROVE (TCM = OA + EC)
OPM2.5	Other PM2.5	CSN and IMPROVE (OPM2.5 = PM2.5-SO4-NO3-NH4-TCM)
HNO3	Nitric Acid	CASTNet
TNO3	Total Nitrate	CASTNet (TNO3 = NO3 + HNO3)
O3	Ozone	CASTNet
SO2	Sulfur Dioxide	CASTNet

The species mappings between the CAMx species and each of the species listed above is fairly straight forward, with the OPM2.5 being the difference between the total $PM_{2.5}$ mass and the speciated $PM_{2.5}$ (OPM2.5 = PM2.5 – SO4 – NO3 – NH4 – EC – OA). Note that for the IMPROVE network that does not measure ammonium, a derived estimate of ammonium is used (NH4d) that assumes that SO4 and NO3 are completely neutralized by ammonium (NH4d = 0.375 * SO4 + 0.29 * NO3). Because different measurement technologies are used to measure total $PM_{2.5}$ mass and the speciated $PM_{2.5}$ species then the OPM2.5 species also includes measurement artifacts and can go negative. Negative OPM2.5 values were set to zero.

7.3 Model Performance Statistics and Performance Goals and Criteria

For over two decades, ozone model performance has been compared against EPA's 1991 ozone modeling guidance performance goals as follows (EPA, 1991):

- Unpaired Peak Accuracy (UPA) ≤ ±20%
- Mean Normalized Bias (MNB) ≤ ±15%
- Mean Normalized Gross Error (MNGE) ≤ 35%

In EPA's 1991 ozone modeling guidance, these performance metrics were calculated for hourly ozone concentrations. The UPA compares the daily maximum 1-hour predicted and observed ozone concentration that was matched by day, but not necessarily by location and by hour of the day. The MNB and MNGE are defined as the difference between the predicted and the observed hourly ozone divided by the observed hourly ozone concentrations averaged over all predicted/observed pairs matched by time and location within a given region and for a given time period (e.g., by day, month or modeling period). As the MNB/MNGE performance metrics divide by the observed hourly ozone concentration, the metric is calculated using just the predicted and observed hourly ozone pairs for which the observed hourly ozone concentration is above a threshold concentration. In the 1991 EPA modeling guidance an observed hourly ozone threshold concentrations of 60 ppb is suggested. Because of the reductions in ozone over the last two decades and the application of these ozone performance goals to 8-hour ozone concentrations, lower observed threshold have been used in more recent applications (e.g., 40 ppb).

For PM species, a separate set of model performance statistics and performance goals and criteria have been developed as part of the regional haze modeling performed by several Regional Planning Organizations (RPOs). EPA's modeling guidance notes that PM models might not be able to achieve the same level of model performance as ozone models. Indeed, $PM_{2.5}$ species definitions are defined by the measurement technology used to measure them and different measurement technologies can produce very different $PM_{2.5}$ concentrations. Given this, several researchers have developed PM model performance goals and criteria that are less stringent than the ozone goals as shown in Table 7-3 (e.g., Boylan, 2004; Morris et al., 2009a,b). However, unlike the 1991 ozone model performance goals that use the MNB and MNGE performance metrics, for PM species the Fractional Bias (FB) and Fractional Error (FE) are utilized with no observed concentration threshold screening. The FB/FE differ from the MNB/MNGE in that the difference in the predicted and observed concentrations are divide by the average of the predicted and observed values, rather than just the observed value as in the MNB/MNGE. This results in the FB being bounded by -200% and +200% and the FE being bounded by 0% to +200%. A full suite of model performance metrics will be calculated for all species as given in Table 7-4.

Table 7-3. PM model performance goals and criteria.

Fractional Bias (FB)	Fractional Error (FE)	Comment
≤±15%	≤35%	Ozone model performance goal that would be considered very good model performance for PM species
≤±30%	≤50%	PM model performance Goal, considered good PM performance
≤±60%	≤75%	PM model performance Criteria, considered average PM performance. Exceeding this level of performance for PM species with significant mass may be cause for concern.

It should be pointed out that these model performance goals and criteria are not used to assign passing or failing grades to a model base case simulation, but rather to help interpret the model performance and intercompare across locations, species, time periods and model applications. As noted in EPA's current modeling guidance "By definition, models are simplistic approximations of complex phenomena" (EPA, 2007, pg. 98). The model inputs to the air quality models vary hourly, but tend to represent average conditions that do not account for unusual or extreme conditions. For example, an accident or large event could cause significant increases in congestion and motor vehicle emissions that are not accounted for in the average emissions inputs used in the model. This is seen in PM modeling at some monitoring sites that fail to capture the high PM concentrations on July 4 due to fireworks and other activities associated with this holiday (traffic and BBQ) that increase PM emissions.

Table 7-4. Definition of model performance evaluation statistical measures used to evaluate photochemical grid models.

Statistical Measure	Mathematical Expression	Notes
Accuracy of paired peak (Ap)	$\frac{P - O_{peak}}{O_{peak}}$	Comparison of the peak observed value (O_{peak}) with the predicted value at same time and location
Coefficient of determination (r2)	$\frac{\left[\sum_{i=1}^{N}(P_i - \overline{P})(O_i - \overline{O})\right]^2}{\sum_{i=1}^{N}(P_i - \overline{P})^2 \sum_{i=1}^{N}(O_i - \overline{O})^2}$	Pi = prediction at time and location i; Oi = observation at time and location i; $\overline{P}$ = arithmetic average of Pi, i=1,2,…, N; $\overline{O}$ = arithmetic average of Oi, i=1,2,…,N
Normalized Mean Error (NME)	$\frac{\sum_{i=1}^{N}\lvert P_i - O_i \rvert}{\sum_{i=1}^{N} O_i}$	Reported as %
Root Mean Square Error (RMSE)	$\left[\frac{1}{N}\sum_{i=1}^{N}(P_i - O_i)^2\right]^{1/2}$	Reported as %

Statistical Measure	Mathematical Expression	Notes
Fractional Gross Error (FE)	$\frac{2}{N}\sum_{i=1}^{N}\left\lvert\frac{P_i - O_i}{P_i + O_i}\right\rvert$	Reported as % and bounded by 0% to 200%
Mean Absolute Gross Error (MAGE)	$\frac{1}{N}\sum_{i=1}^{N}\lvert P_i - O_i\rvert$	Reported as concentration (e.g., µg/m^3)
Mean Normalized Gross Error (MNGE)	$\frac{1}{N}\sum_{i=1}^{N}\frac{\lvert P_i - O_i\rvert}{O_i}$	Reported as %
Mean Bias (MB)	$\frac{1}{N}\sum_{i=1}^{N}(P_i - O_i)$	Reported as concentration (e.g., µg/m^3)
Mean Normalized Bias (MNB)	$\frac{1}{N}\sum_{i=1}^{N}\frac{(P_i - O_i)}{O_i}$	Reported as %
Mean Fractionalized Bias (Fractional Bias, FB)	$\frac{2}{N}\sum_{i=1}^{N}\left(\frac{P_i - O_i}{P_i + O_i}\right)$	Reported as %, bounded by -2005 to +200%
Normalized Mean Bias (NMB)	$\frac{\sum_{i=1}^{N}(P_i - O_i)}{\sum_{i=1}^{N}O_i}$	Reported as %
Bias Factor (BF)	$\frac{1}{N}\sum_{i=1}^{N}\left(\frac{P_i}{O_i}\right)$	Reported as BF:1 or 1: BF or in fractional notation (BF/1 or 1/BF).

7.4 Model Performance Evaluation

The CAMx revised 2007 base case model performance is evaluated for each network within the 12 km NEUS, 4 km SWPA and 0.8 km Liberty-Clairton domains.

7.4.1 Total $PM_{2.5}$ Mass

Total $PM_{2.5}$ mass is evaluated using data from the FRM, CSN and IMPROVE networks and at the Liberty TEOM monitoring site. Table 7-5 displays the annual fractional bias and error performance statistics across the FRM network in the 12, 4 and 0.8 km domains using the 24-hour total $PM_{2.5}$ mass measurements and compares them with the PM Performance Goals and Criteria. CAMx is exhibiting very low fractional bias (FB) for FRM $PM_{2.5}$ with FB values of +10.5%, +4.6%, and +4.1% for the 12 , 4 and 0.8 km domains, respectively, that not only achieves the PM Performance Goal for bias (≤±30%) but also achieves the more stringent ozone Performance Goal (≤±15%) for bias. The FRM $PM_{2.5}$ fractional error is between 35% and 40% across the three domains, which achieves the PM Performance Goal by a fair margin (≤50%),

although it is slightly above the more stringent ozone Performance Goal (≤35%). Similar good annual $PM_{2.5}$ model performance statistics are seen across the CSN and IMPROVE monitoring network with FB (-10% to +4%) and FE (38% to 43%) that achieves the PM Performance Goals by a wide margin (Table 7-6).

Table 7-5. Comparisons of annual FRM $PM_{2.5}$ fractional bias and error performance statistics with the PM Performance Goals and Criteria for the 12, 4 and 0.8 km domains and the CAMx revised 2007 base case simulation.

Domain	Number Sites	Fractional Bias	Fractional Error
Performance Criteria		≤±30%	≤50%
Performance Criteria		≤±60%	≤75%
12 km Domain	536	+10.5%	38.5%
4 km Domain	30	+4.6%	36.2%
0.8 km Domain	4	+4.1%	37.8%

Table 7-6. Comparisons of annual CSN and IMPROVE $PM_{2.5}$ fractional bias and error performance statistics for the CAMx revised 2007 base case simulation with the PM Performance Goals and Criteria for the 12, 4 and 0.8 km domains.

Domain	Number Sites	Fractional Bias	Fractional Error
Performance Criteria		≤±30%	≤50%
Performance Criteria		≤±60%	≤75%
CSN			
12 km Domain	110	+3.2%	38.7%
4 km Domain	8	-9.5%	39.1%
0.8 km Domain	2	-8.9%	40.0%
IMPROVE			
12 km Domains	40	+4.1%	43.2%
4 km Domain	3	+3.1%	38.3%

Figure 7-4 displays scatter plots of predicted and observed 24-hour $PM_{2.5}$ concentrations across the 12 km NEUS domain using the FRM, CSN and IMPROVE data and for the CAMx 36 km and 12 km revised 2007 base case simulation. Across the FRM network in the 12 km domain, the observed 24-hour $PM_{2.5}$ concentrations never exceed 100 $\mu g/m^3$, whereas the modeled values have numerous 24-hour $PM_{2.5}$ concentrations above 100 $\mu g/m^3$. Not surprising due to less artificial numerical dispersion, the CAMx 12 km $PM_{2.5}$ concentrations tend to be higher than the 36 km estimates. The high modeled values in excess of 100 $\mu g/m^3$ occur primarily on one day in February 2007 across several monitors in IL, IN and MI. The reasons for these high values are not known at this time. Although there is some scatter, with the exception of the one day of very high modeled values the predicted and observed scatter plot is centered on the 1:1 line of perfect agreement. The correlation coefficients (r^2) tend to range between 0.3 and 0.4, indicating a positive correlation between the predicted and observed $PM_{2.5}$ concentrations. Note that the CAMx 36 km performance statistics are not a number (nan), which could be due to an occurrence of zero observed and predicted value that produces a divide by zero in the

calculations. Since we are more interested in the 12 km modeling results we felt it was unnecessary to rerun the statistics with a minimum threshold to prevent this occurrence. The $PM_{2.5}$ scatter plots for the 4 km and 0.8 km domains are shown in Figures 7-5 and 7-6, respectively. Some of these scatter plots exhibit a bifurcation in the scatter to above and below the 1:1 line (e.g., FRM network in Figure 7-5). This results in lower correlation coefficients and higher error than seen across the 12 km domain. The occurrence of modeled $PM_{2.5}$ values above 100 µg/m^3 is almost completely nonexistent in the 4 and 0.8 km domains due to the fact that they do not include the sites in IN, IL and MI that had the high modeled $PM_{2.5}$ values on that one day in February.

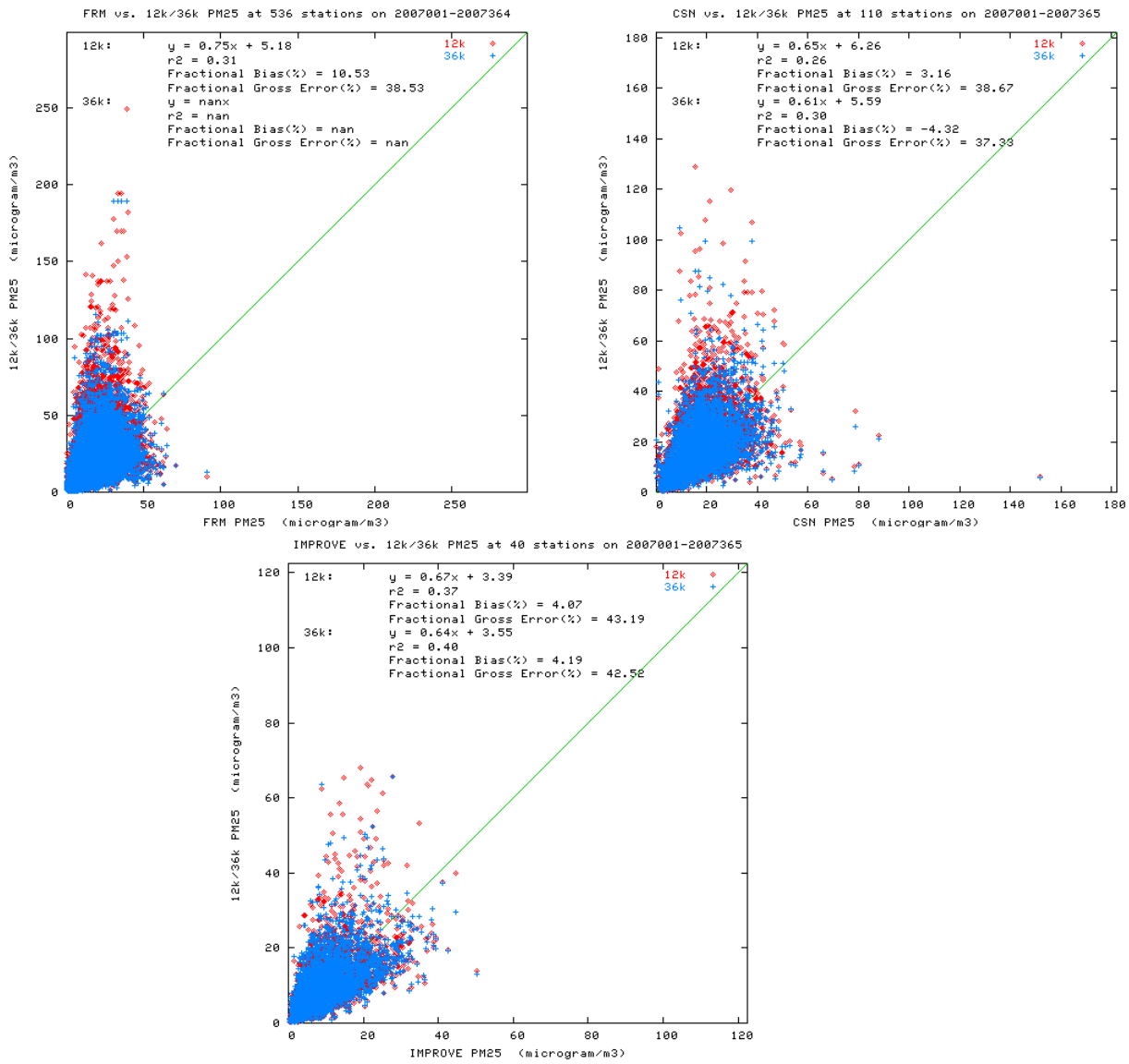


Figure 7-4. Scatter plots of predicted and observed 24-hour $PM_{2.5}$ concentrations across the 12 km NEUS domain for the CAMx 12 km (red) and 36 km (blue) 2007 base case simulations using the FRM (top left), CSN (top right) and IMPROVE (bottom) monitoring networks.

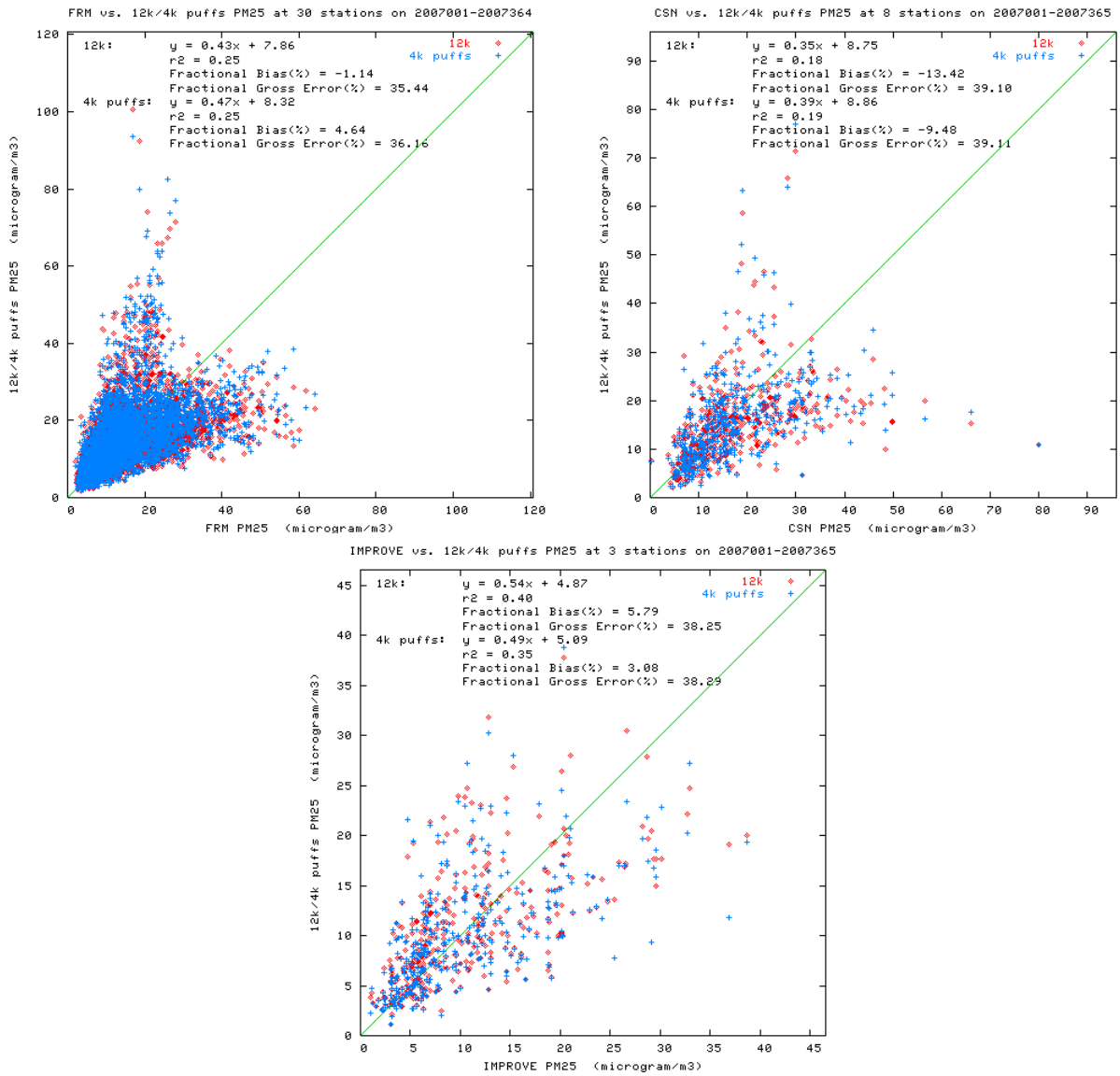


Figure 7-5. Scatter plots of predicted and observed 24-hour $PM_{2.5}$ concentrations across the 4 km SWPA domain for the CAMx 12 km (red) and 4 km (blue) 2007 base case simulations using the FRM (top left), CSN (top right) and IMPROVE (bottom) monitoring networks.

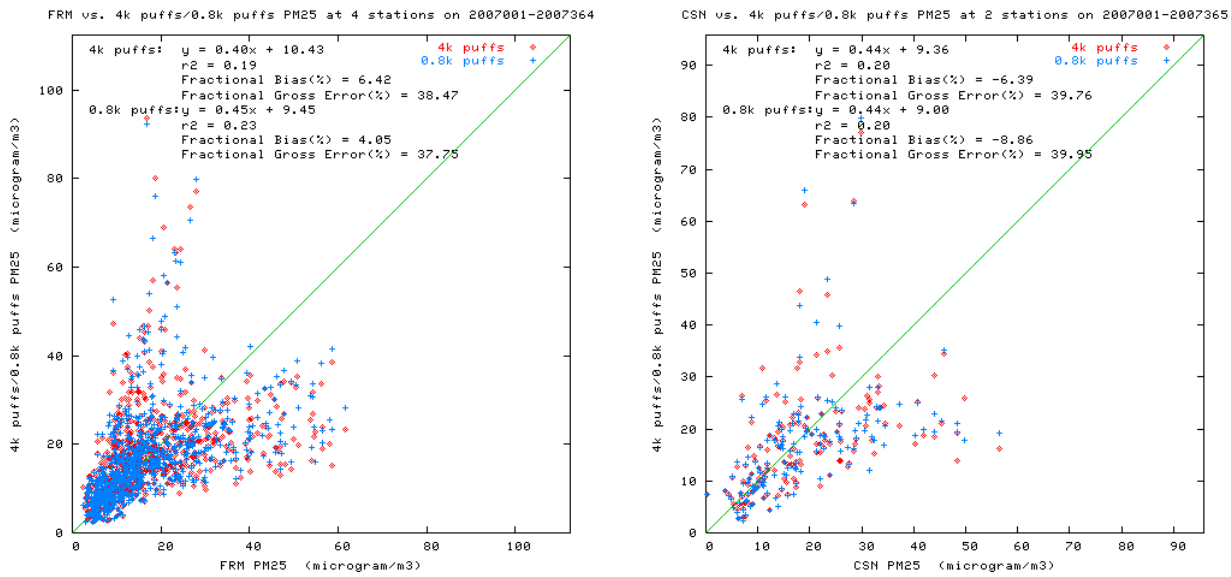


Figure 7-6. Scatter plots of predicted and observed 24-hour $PM_{2.5}$ concentrations across the 0.8 km Liberty-Clairton domain for the CAMx 4 km (red) and 0.8 km (blue) 2007 base case simulations using the FRM (left) and CSN (right) monitoring networks.

Soccerplots, which display monthly FB versus FE performance metrics along with the PM Performance Goals and Criteria, for the FRM, CSN and IMPROVE networks are shown in Figures 7-7 through 7-9, respectively. The CAMx $PM_{2.5}$ monthly modeling performance across the FRM sites in the 12, 4 and 0.8 km domains (Figure 7-7) achieves the PM Performance Criteria for all months and domains except for December within the 0.8 km domain whose error just barely exceeds the 75% Performance Criteria. Across the 12 km domain, the FRM $PM_{2.5}$ monthly performance exhibits a slight summer underestimation and winter overestimation bias with 10 out of the 12 months achieving the PM Performance Goals; the two months that the CAMx 12 km FRM performance foals to achieve the PM performance goal are December and January that exhibit an overestimate bias such that they fall between the PM Performance Goals and Criteria. Similar performance across the FRM monitors is seen for the CAMx 4 km modeling results with all months achieving the PM Performance Criteria and 10 of 12 months achieving the PM Performance Goal with again January and December being the two months whose performance statistics fall between the PM Performance Goals and Criteria. The CAMx FRM $PM_{2.5}$ performance degrades a little bit across the 0.8 km domain with 8 out of 12 months achieving the PM Performance Goals. The summer underestimation bias increases in the 0.8 km domain modeling so that one month (August) falls just outside of the PM Performance Goal and the winter overestimation bias increases so that the three winter months falling outside of the PM Performance Goal with the overestimation bias for December being so large that it falls just out of the PM Performance Criterion for Fractional Bias. Very similar $PM_{2.5}$ monthly model performance results to the FRM network are seen across the CSN (Figure 7-8) and IMPROVE (Figure 7-9) monitoring networks. Again there is a summer underestimation and winter

overestimation bias with the performance best for the 12 km domain and degrading as the grid resolution in the domains get finer.

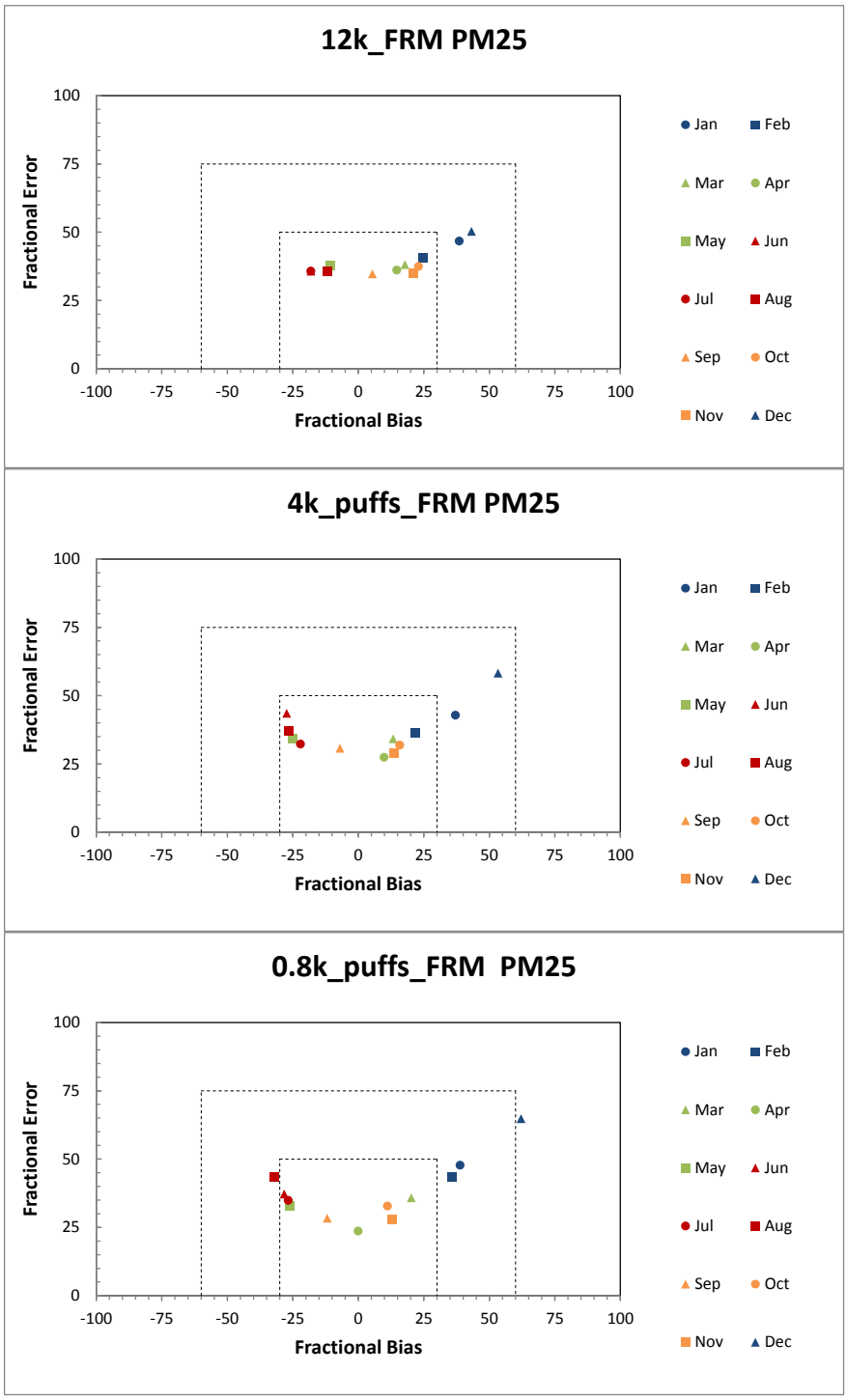


Figure 7-7. Soccer Plots comparing FRM $PM_{2.5}$ monthly FB and FE with the PM Performance Goals and Criteria for the 12 km (top), 4 km (middle) and 0.8 km (bottom) domains.

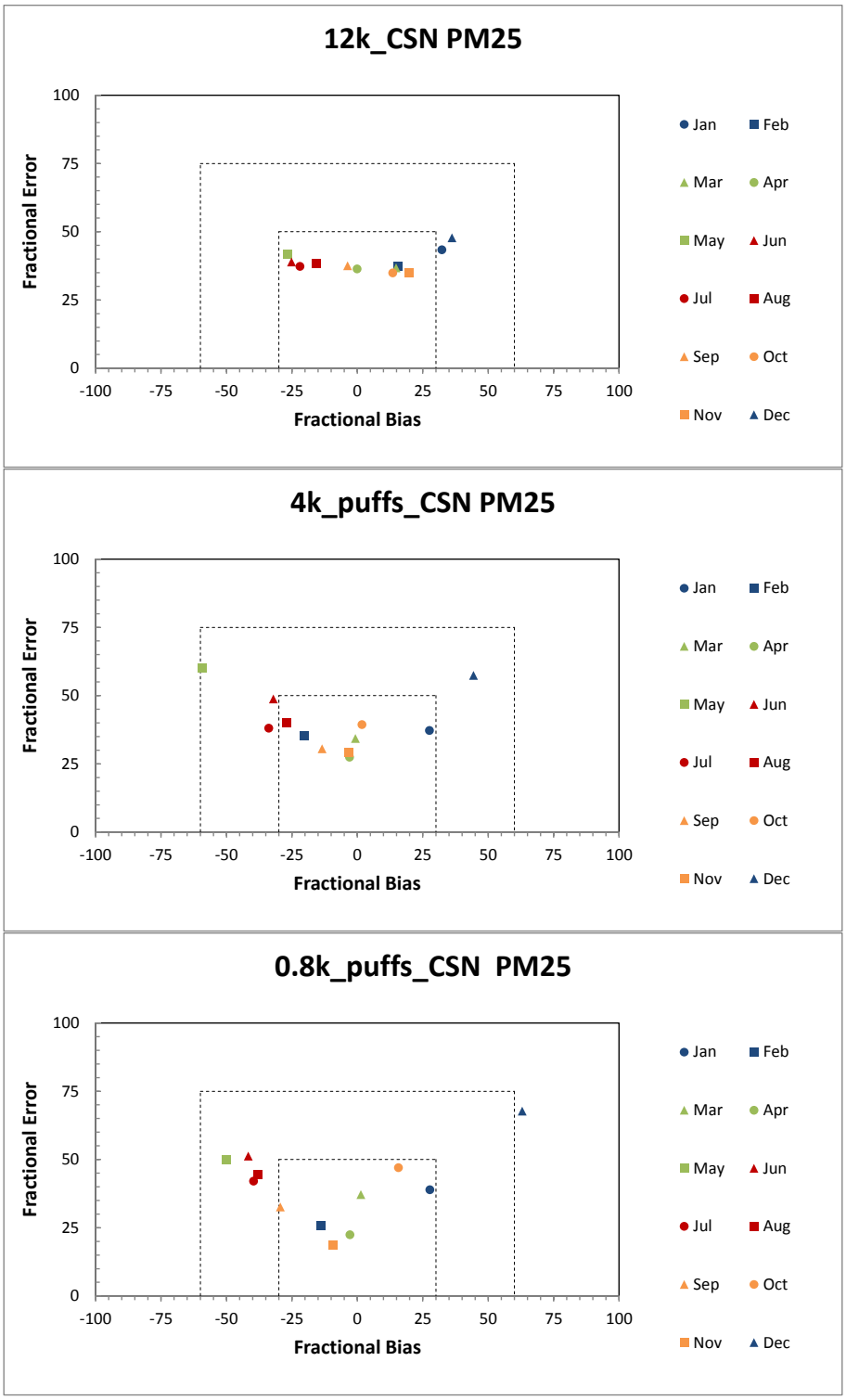


Figure 7-8. Soccer Plots comparing CSN $PM_{2.5}$ monthly FB and FE with the PM Performance Goals and Criteria for the 12 km (top), 4 km (middle) and 0.8 km (bottom) domains.

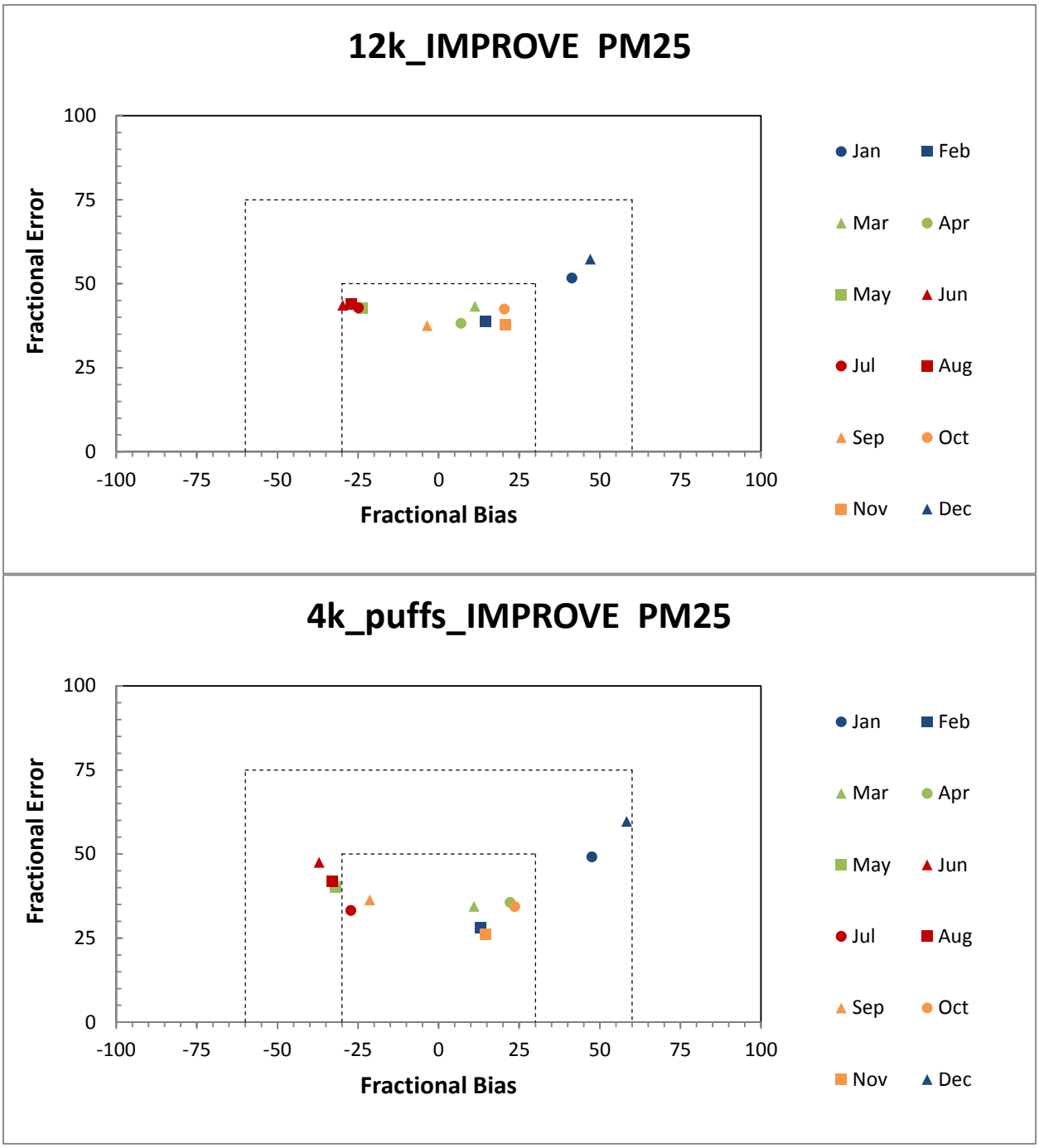


Figure 7-9. Soccer Plots comparing IMPROVE $PM_{2.5}$ monthly FB and FE with the PM Performance Goals and Criteria for the 12 km (top) and 4 km (bottom) domains.

7.4.2 $PM_{2.5}$ Performance at Liberty

At the Liberty monitoring site, $PM_{2.5}$ is measured at 24-hour averages using the FRM and CSN monitoring devices and at hourly averages using the TEOM measurement technology. Figure 7-10 displays the annual $PM_{2.5}$ scatter plots for the Liberty monitoring site using the three measurement technologies and the CAMx 0.8 km and 4 km modeling results. The CAMx 4 km and 0.8 km annual $PM_{2.5}$ performance statistics at Liberty achieves the PM Performance Criteria using all three types of monitoring technology with the 0.8 km CAMx results also achieving the PM Performance Goal at Liberty for the FRM and CSN measurements. Although the FB using the TEOM data exhibits near zero bias (0.4% for 0.8 and -1.6% for 4 km modeling results), the error is 59% so does not achieve the PM Performance Goal for FE (≤±50%). However, it should be noted that the PM Performance Goal was developed for 24-hour PM concentrations and one would expect higher errors using hourly measurements as used by the TEOM.

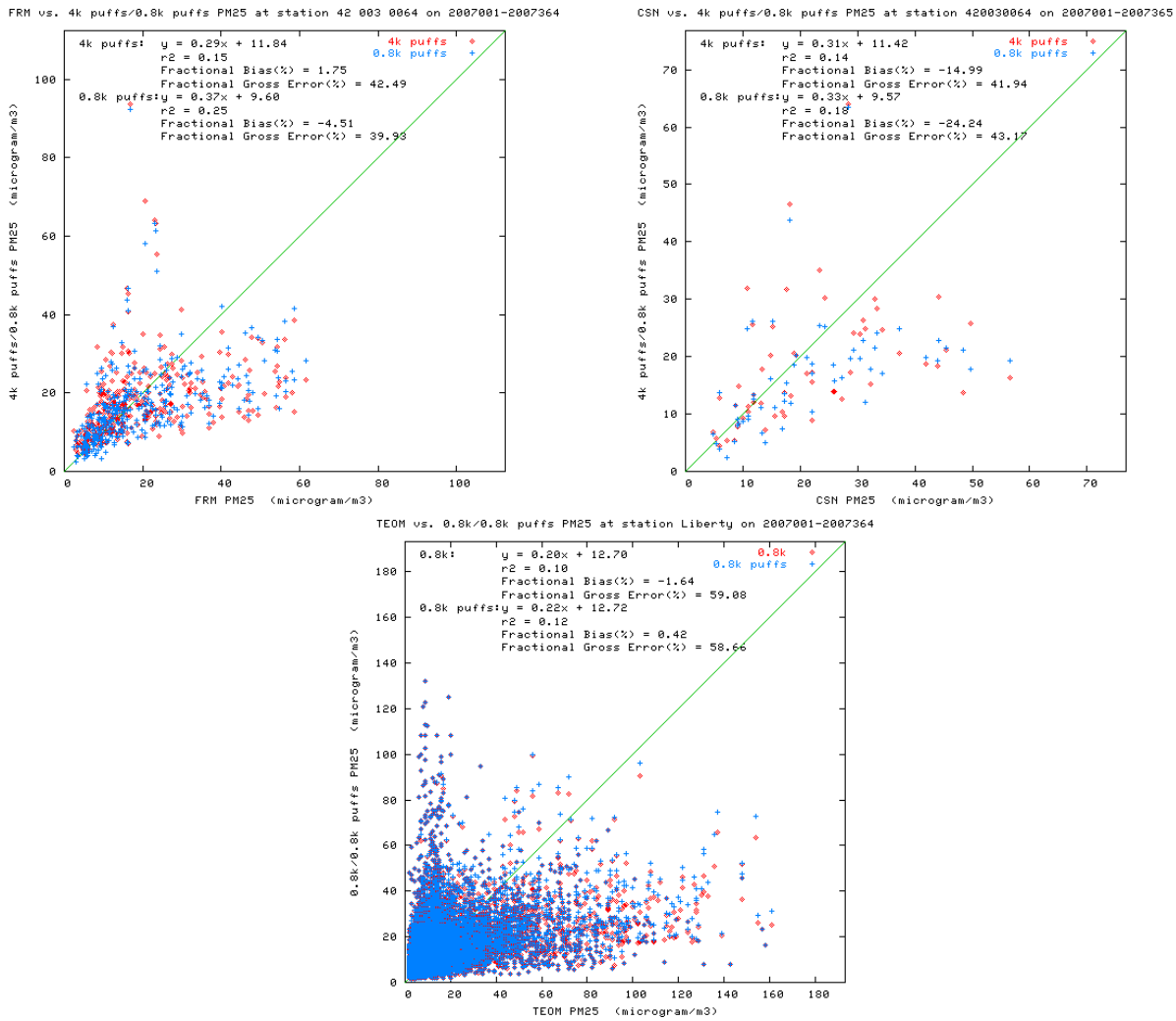


Figure 7-10. Annual 2007 scatter plots of predicted and observed $PM_{2.5}$ concentrations and model performance statistics for the Liberty monitor using the FRM (24-hour, top left), CSN (24-hour, top right) and TEOM (hourly, bottom) monitoring technologies.

As seen in the soccer plot of monthly FB and FE using the TEOM hourly $PM_{2.5}$ data at Liberty, the Liberty monitoring site $PM_{2.5}$ exhibits the same summer underestimation and winter overestimation bias as seen across all sites in the three modeling domains. The Liberty TEOM $PM_{2.5}$ FB/FE meets the PM Performance Criteria for all months but December, which fails to achieve the PM Performance Criteria due to a too high overestimation bias and too high of an error. The FB for the transition months of March, April, October and November achieves the PM Performance Goal with the FE right at the PM Performance Goal. The warmer months of May through September have an FB underestimation that falls between the PM Performance Goal and Criterion. Whereas the cooler months of December, January and February have an FB overestimation that fails to achieve the PM Performance Goal.

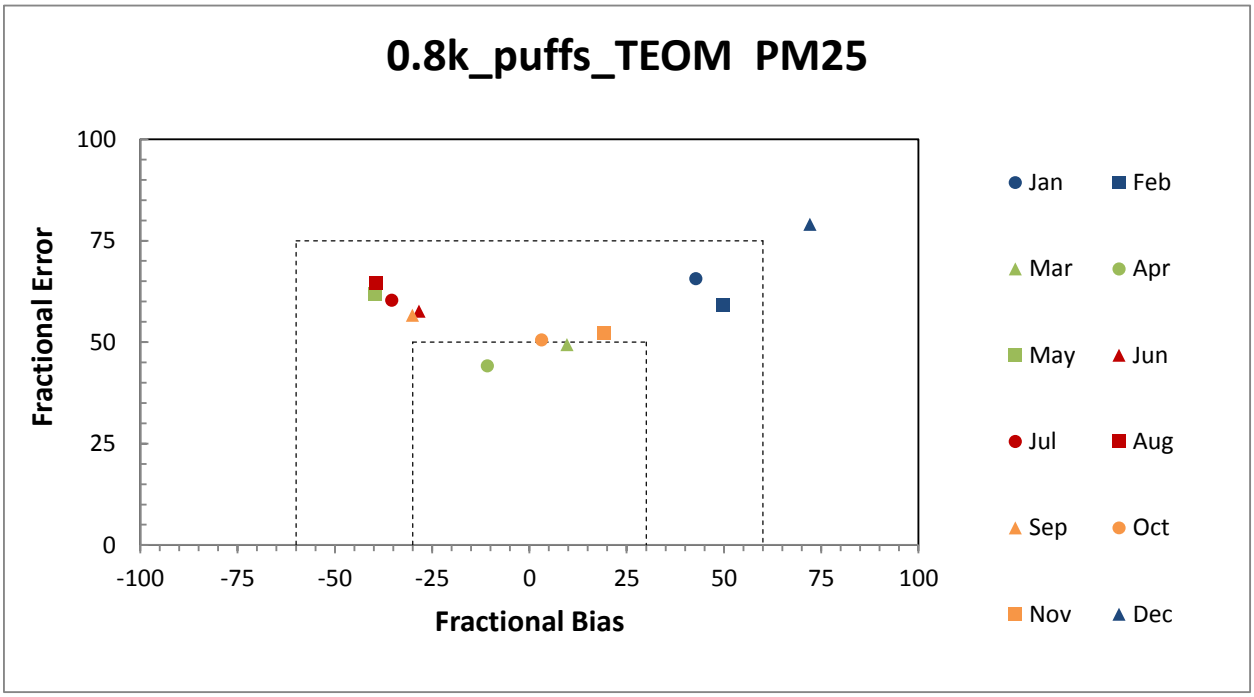


Figure 7-11. Monthly soccer plot for TEOM hourly $PM_{2.5}$ concentrations at the Liberty monitor using the CAMx 0.8 km revised 2007 base case modeling results.

Time series of predicted and observed 24-hour $PM_{2.5}$ concentrations at the Liberty FRM monitor for the 2007 year are given in Figure 7-12. These time series are very spikey with both observed and modeled $PM_{2.5}$ spikes occurring throughout the year. The model tends to have more spikes than observed in the winter and vice versa in the summer leading to the summer under- and winter over-estimation bias. The 0.8 km CAMx results tend to perform better than the 4 km results by reproducing the observed $PM_{2.5}$ spikes better. High (> 50 $\mu g/m^3$) modeled $PM_{2.5}$ concentrations occur at the Liberty monitoring site over two multiday periods, one in early January and the other in early December. The causes of these high $PM_{2.5}$ concentrations are not known, but they do seem to be spread across several species so are likely due to meteorological conditions.

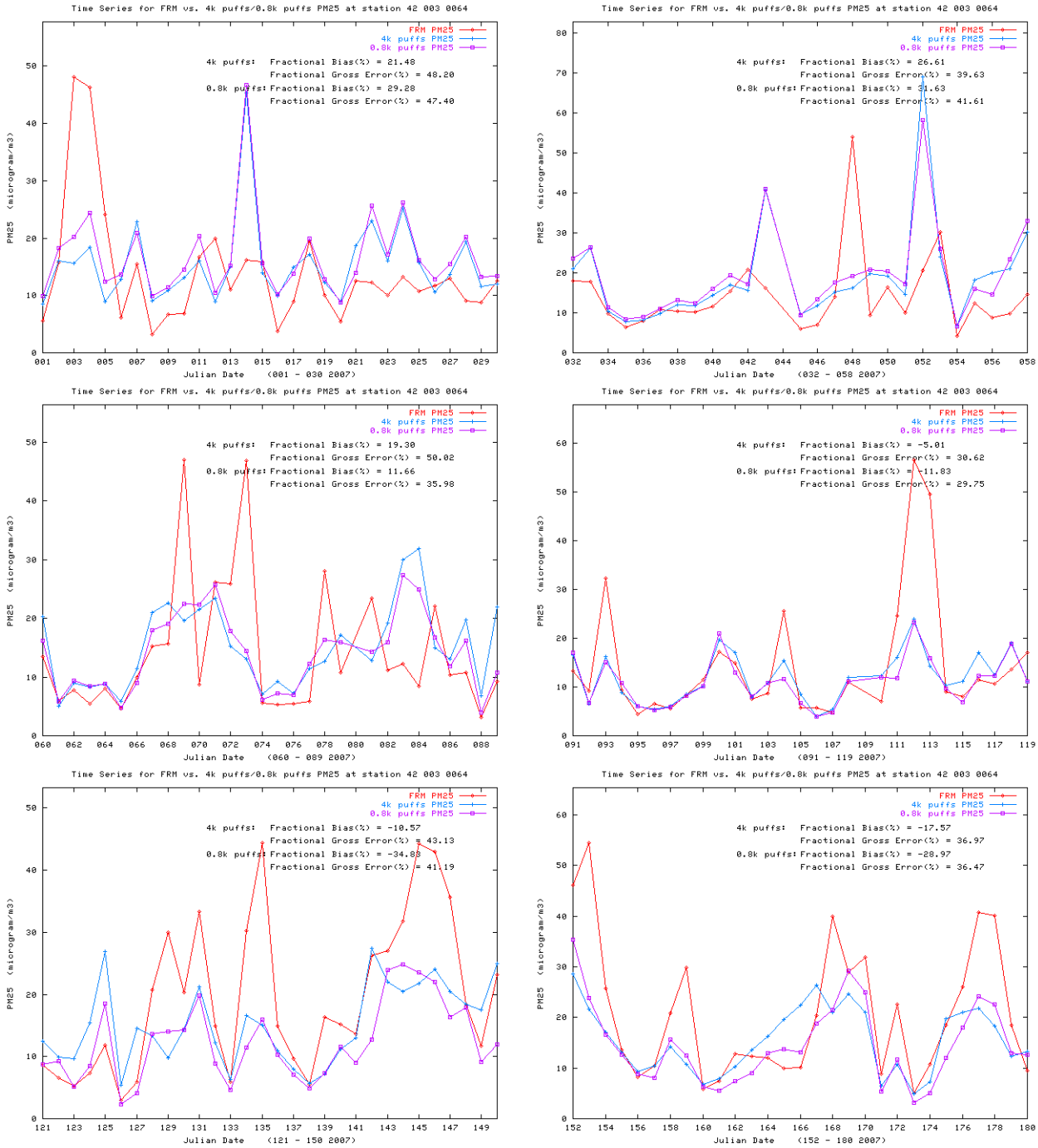


Figure 7-12a. Time series of predicted and observed 24-hour $PM_{2.5}$ concentrations at the Liberty FRM monitor for January through June 2007 and the CAMx 0.8 km (purple) and 4 km (blue) revised 2007 base case modeling results.

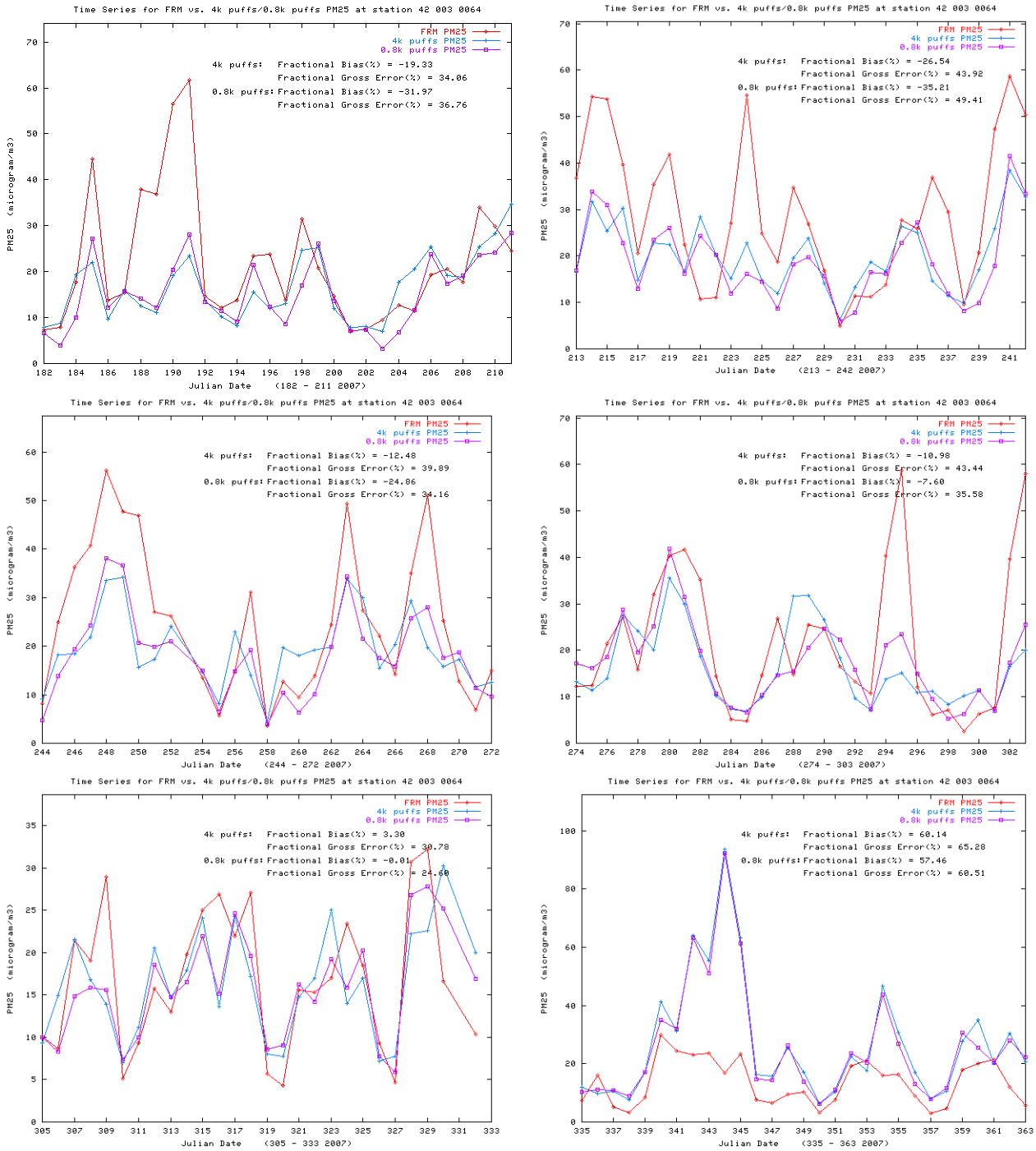


Figure 7-12b. Time series of predicted and observed 24-hour $PM_{2.5}$ concentrations at the Liberty FRM monitor for July through December 2007 and the CAMx 0.8 km (purple) and 4 km (blue) revised 2007 base case modeling results.

7.4.3 Overview of Speciated $PM_{2.5}$ Model Performance

Table 7-7 lists the 2007 annual fractional bias (FB) and fractional error (FE) for the CSN monitoring sites along with the PM Performance Goals and Criteria for the 0.8 km CAMx results in the 0.8 km domain, the 4 km CAMx results in the 4 km domain, the 12 km CAMx results in the 12 km domain and the 36 km CAMx results in the 12 km domain. FB and FE performance statistics that fail to achieve the PM Performance Criteria are highlighted in yellow. NO3 and OPM2.5 are the two species that, on occasion, fail to achieve the PM Performance Criteria; NO3 due to an underestimation bias and high error across all four CAMx simulations/domains and OPM2.5 due to an overestimation bias and high error for just the 12 km NEUS domain. As discussed in Section 7.4.1, the CSN total $PM_{2.5}$ mass performance achieves the PM Performance Goals and Criteria across all domains. SO4 performance achieves the PM Performance Goal across all of the domains and even achieves the much more stringent Ozone Performance Goals for bias (≤±15%) across all domains and the error achieves or just barely fails to achieve the Ozone Performance Goal (≤35%) across all domains (33.9% to 38.3%). The CAMx revised 2007 base case exhibits much better SO4 performance than the preliminary 2007 base case simulation whose SO4 performance failed to achieve the PM Performance Goals, although it did achieve the PM Performance Criteria (Morris et al., 2012a). The NH4 achieves the PM Performance Goals in all domains except for FB in the 0.8 km domain (-35.3%) that falls right outside of the goal (≤±30%). TCM exhibits an underestimation bias that sometimes achieves the PM Performance Goal and always achieves the PM Performance Criteria. OPM2.5 has an overestimation tendency with the FE failing to achieve the PM Performance Criteria for the CAMx 12 km and 36 km modeling results across the 12 km domain, and the OPM2.5 FB usually achieving the PM Performance Criteria with the one exception for the CAMx 12 km results in the 12 km domains (61.6%) that just barely fails to achieve the FB PM Performance Criteria (+61.6%).

Table 7-7. Summary of CAMx speciated $PM_{2.5}$ model performance statistics across the CSN sites in the 0.8, 4 and 12 km domains.

All CSN Sites	0.8 km Domain (2 Sites)		4 km Domain (8 Sites)		12 km Domain (110 Sites)		36 km Results (12 km Domain)	
CSN Species	**FB**	**FE**	**FB**	**FE**	**FB**	**FE**		
Performance Goal	≤±30%	≤50%	≤±30%	≤50%	≤±30%	≤50%	≤±30%	≤50%
Performance Criteria	≤±60%	≤75%	≤±60%	≤75%	≤±60%	≤75%	≤±60%	≤75%
$PM_{2.5}$ Mass	-8.9%	40.0%	-9.5%	39.1%	+3.2%	38.7%	-4.3%	37.3%
Sulfate (SO4)	-14.5%	33.9%	-14.0%	36.1%	-8.0%	37.6%	-11.8%	38.3%
Nitrate (NO3)	-91.7%	111.1%	-52.2%	90.9%	-37.8%	88.2%	-23.7%	79.8%
Ammonium (NH4)	-35.3%	48.8%	-20.7%	40.4%	0.6%	37.1%	-0.2%	36.9%
Total Carbon Mass (TCM)	-23.8%	56.4%	-38.8%	57.8%	-31.2%	58.5%	-45.5%	63.3%
Other OPM2.5	33.3%	73.2%	32.5%	73.9%	61.6%	94.6%	53.4%	91.8%

The speciated $PM_{2.5}$ performance statistics for the Liberty CSN monitor are shown in Table 7-8. The performance results are somewhat similar to the statistics across all of the monitors in Table 7-7 only there are larger underestimation biases for all species but OPM2.5 whose

overestimation bias is reduced. All species but NO3 achieve the PM Performance Criteria. However, total PM2.5 mass and SO4 are the only species that achieve the PM Performance Goals at Liberty CSN monitoring site. Again the SO4 performance at Liberty is much improved in the revised 2007 base case simulation compared to the preliminary 2007 base case whose SO4 performance failed to achieve the PM Performance Goal.

Table 7-8. Summary of CAMx speciated $PM_{2.5}$ model performance statistics at the Liberty CSN monitoring sites for the 0.8, 4 and 12 km CAMx modeling results.

Liberty (420030064)	0.8k_puffs		4k_puffs		12k Results	
CSN Species	FB	FE	FB	FE	FB	FE
PM Performance Goal	≤±30%	≤50%	≤±30%	≤50%	≤±30%	≤50%
PM Performance Criteria	≤±60%	≤75%	≤±60%	≤75%	≤±60%	≤75%
Total $PM_{2.5}$ Mass	-24.2%	43.2%	-15.0%	41.9%	-31.6%	49.6%
Sulfate (SO4)	-22.8%	41.4%	-17.4%	40.0%	-28.9%	43.7%
Nitrate (NO3)	-103.8%	121.5%	-103.0%	121.6%	-99.3%	118.7%
Ammonium (NH4)	-52.8%	60.3%	-48.8%	57.1%	-53.0%	59.5%
Total Carbon Mass (TCM)	-39.0%	66.0%	-30.4%	60.4%	-47.5%	70.0%
Other OPM2.5	13.0%	60.9%	28.3%	62.3%	1.5%	69.0%

7.4.4 Sulfate (SO4) Model Performance

Scatter plots of predicted and observed 24-hour SO4 concentrations for the CSN, IMPROVE and CASTNet monitoring networks across the 12 km and 4 km modeling domains are shown in Figure 7-13. Across the 12 km domain, SO4 is underestimated by approximately -10% across the CSN monitors but exhibits a near zero bias across the IMPROVE and CASTNet monitoring sites. There is fairly good correlation between the predicted and observed SO4 concentrations across the 12 km domain with r^2 values of 0.6 to 0.7. The SO4 performance across the 4 km domain has bias that ranges from -18% to +2% with correlation coefficients ranging from 0.65 to 0.8.

The SO4 monthly soccer plots for the 12, 4 and 0.8 km domains and the CSN network are shown in Figure 7-14. With one exception, the CAMx monthly SO4 performance across CSN monitoring sites in the 12 km NEUS, 4 km SWPA and 0.8 km Liberty-Clairton domains achieve the PM Performance Goals. The exception is for February due to an underestimation bias that either achieves (12 km domain) or just barely fails to achieve the PM Performance Criteria.

Figure 7-15 displays the SO4, SO2 and ozone model performance in the 12 and 4 km domains across the CASTNet network using scatter plots with model performance statistics. SO4 exhibits a slight underestimation tendency with FBs of approximately -9% (12 km) and -4% (4 km) while SO2 exhibits an overestimation tendency with FBs of approximately +60% (12 km) and +40% (4 km). The CAMx 2007 base case simulation had a SO4 underestimation bias of -30% to -40% and SO2 overestimation bias of +70% to +46% that suggested that the conversion of SO2 to SO4 may be understated in the model (Morris et al., 2012a). In fact, the error in the TUV in-line photolysis rate adjustment in the preliminary 2007 base case depressed the

photolysis rates too much resulting in too low conversion of SO2 to SO4 that was corrected in this revised 2007 base case simulation. The addition of snow cover in the revised 2007 base case should also increase SO4 in the winter due to lower dry deposition rates, although this should no effect on the highest summer SO4 concentrations. An examination of the ozone performance (bottom panels in Figure 7-15) reveals lots of scatter resulting in high FE (50% to 60%) and an overestimations bias (~35% FB). However, there appears to be a lot of zero ozone observations in the CASTNet monitoring data that needs to be reviewed and corrected as this would be unexpected for this rural monitoring network.

The SO4 model performance at the Liberty monitoring site is shown using annual and quarterly scatter plots and performance statistics in Figure 7-16. On the annual basis the Liberty SO4 model performance achieves the PM Performance Goal albeit with an underestimation bias (FBs of -17% and -23% for 4 km and 0.8 km modeling results). The quarterly SO4 model performance reveals that the SO4 underestimation is greatest in the winter (-45% in Q1) and lowest in the summer (-2% and -8% in Q3) with the spring and fall FBs falling in between with FBs from -8% to -20%; the winter quarter is the only quarter that SO4 performance at Liberty fails to achieve the PM Performance Goals with SO4 performance in all quarters achieving the PM Performance Criteria.

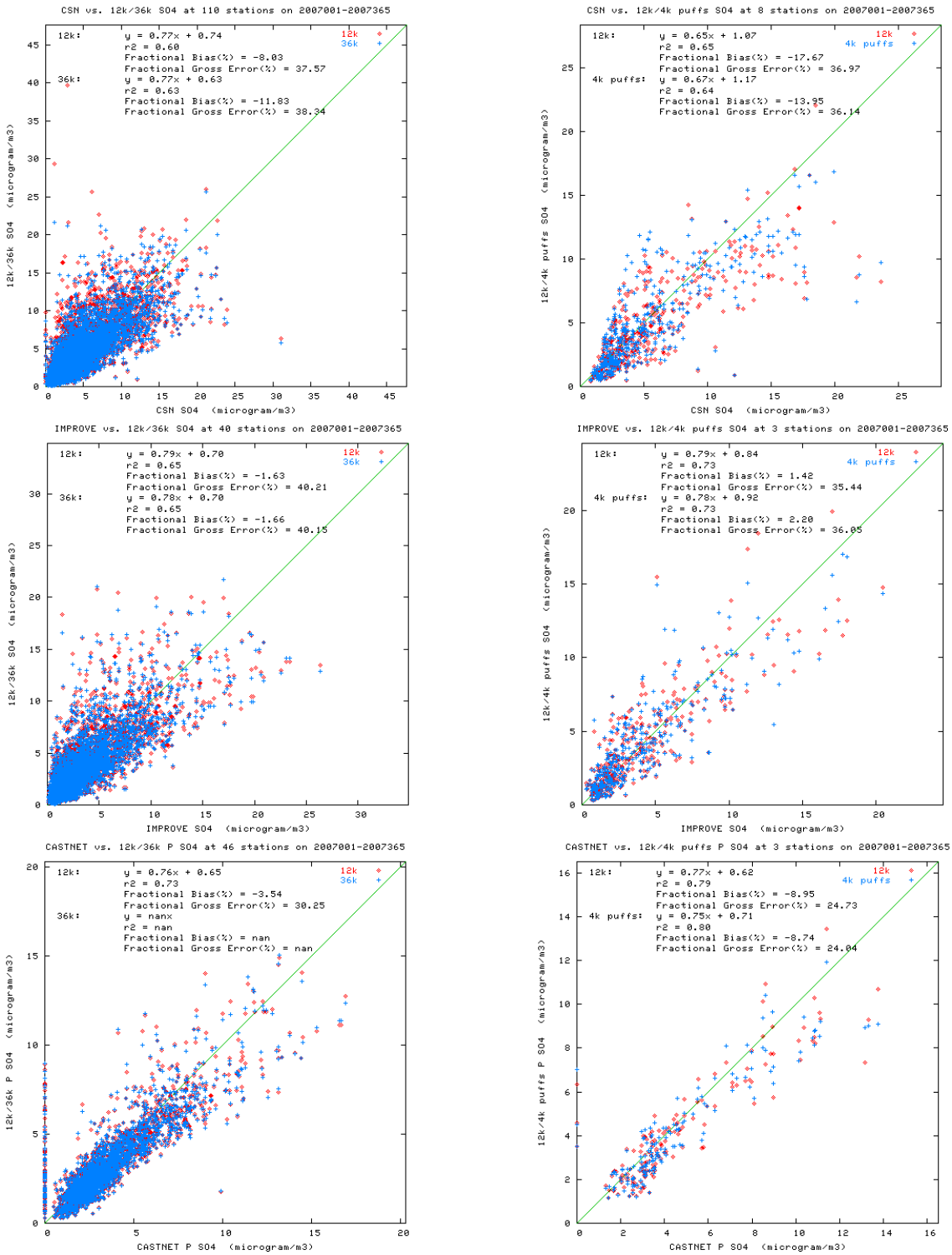


Figure 7-13. Scatter plots of predicted and observed SO4 concentrations for CSN (top), IMPROVE (middle) and CASTNet (bottom) monitoring networks across the 12 km (left) and 4 km (right) modeling domains.

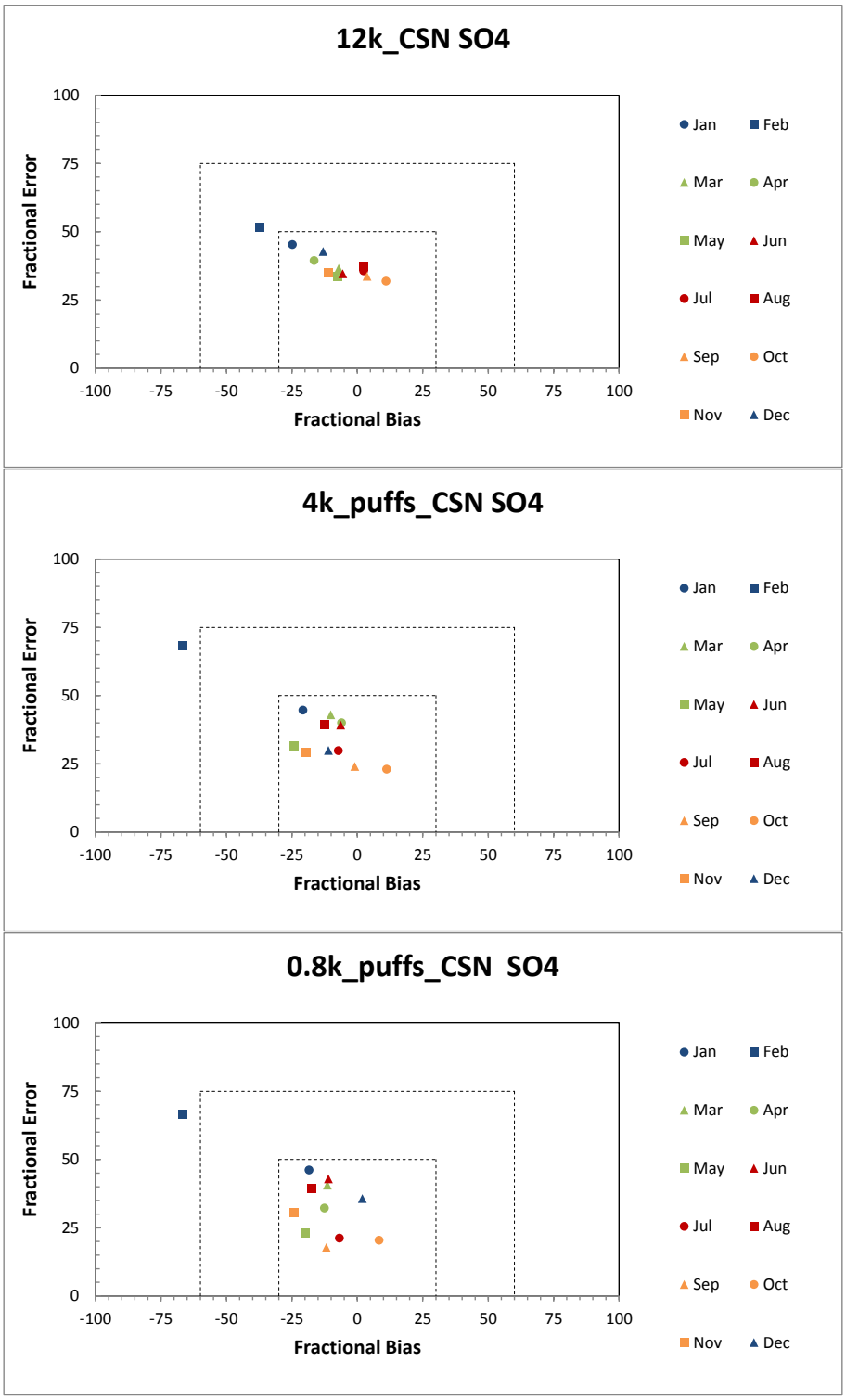


Figure 7-14. Soccer plots of monthly SO4 fractional bias and error for CSN across the 12 km (top), 4 km (middle) and 0.8 km (bottom) modeling domains.

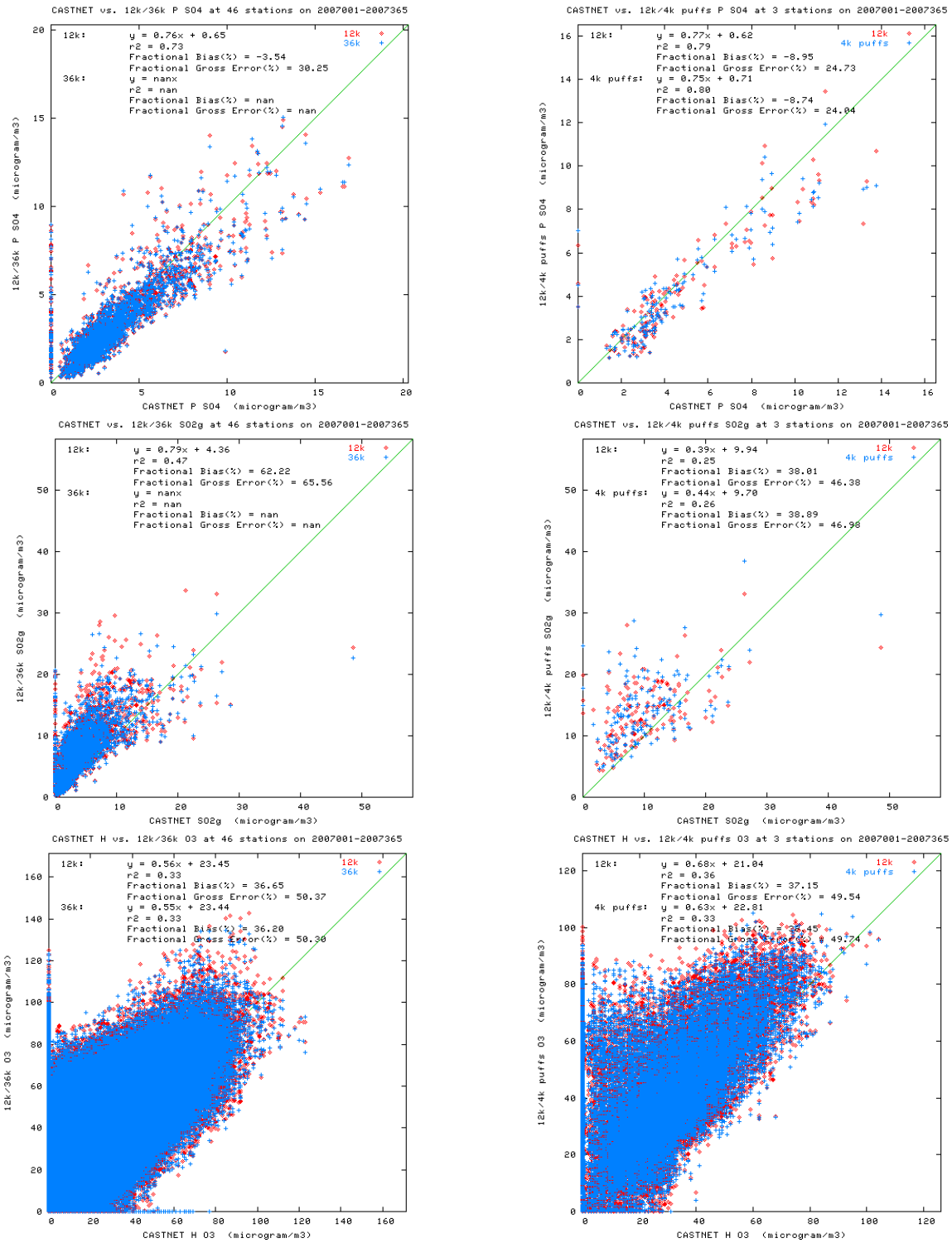


Figure 7-15. Scatter plots of predicted and observed 24-hour SO4 (top), SO2 (middle) and ozone (bottom) concentrations at CASTNet monitoring sites across the 12 km (left) and 4 km (right) modeling domains.

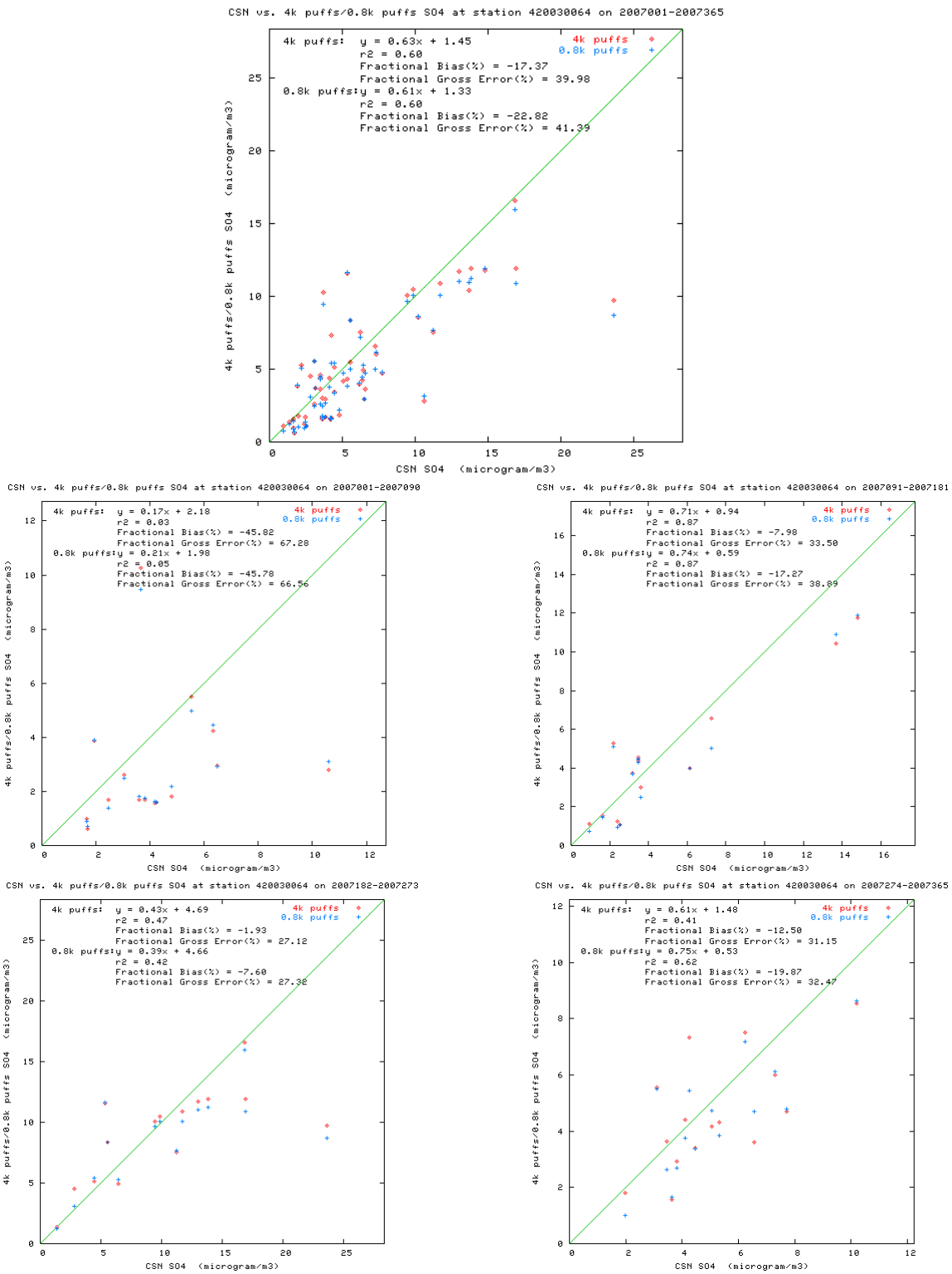


Figure 7-16. Scatter plots of 24-hour SO4 concentrations at Liberty CSN site for annual (top), and quarters 1 (middle left), 2 (middle right), 3 (bottom left) and 4 (bottom right) and CAMx 4 km and 0.8 km modeling results.

7.4.5 Nitrate (NO3) Model Performance

The annual NO3 model performance for the CSN, IMPROVE and CASTNet networks across the 12 km and 4 km modeling domains is shown in Figure 7-17. The bias is quite different using the three monitoring networks, although the networks all agree that there is lots of scatter resulting in errors in the 80% to 100% range that mostly exceed the ≤75% PM Performance Criterion for FE. The CAMx 12 km and 36 km modeling results NO3 FB performance indicates an underestimation tendency using the CSN network across the 12 km domain (-38% and -24%). However the NO3 underestimation tendency is much smaller across the IMPROVE network in the 12 km domain (-9% and -5%). And across the CASTNet network in the 12 km domain the CAMx 12 km modeling results exhibits a 39% FB overestimation for NO3. All of the NO3 FBs achieve the PM Performance Criterion but most of the NO3 FEs fail to achieve the PM Performance Criterion. Similar NO3 performance results are seen across the 4 km domain for the CAMx 12 km and 4 km modeling results with the CSN network indicating a large FB underestimation bias (-49% and -52%), the IMPROVE network indicating near zero NO3 bias (7% and -6%) and the CASTNet network exhibiting an overestimation bias (72% and 51%).

Figure 7-18 displays the NO3, HNO3 and total NO3 (TNO3 = NO3 + HNO3) model performance across the CASTNet network in the 12 km and 4 km modeling domains. Like the particulate NO3, the gaseous HNO3 performance is overestimated with FBs of approximately 55% and FEs of approximately 60%. This results in the total nitrate also being overestimated (FBs of 55% to 63%). However, the NO3 and HNO3 are likely not all captured by the CASTNet monitoring sites; for example NO3 can volatilize off of the CASTNet filter. Thus, it is not surprising that the model overestimates NO3 and HNO3 at the CASTNet sites.

Soccer plots of monthly NO3 model performance for the CSN network across the 12, 4 and 0.8 km domains are shown in Figure 7-19 with the NO3, HNO3 and TNO3 monthly model performance across the 12 and 4 km domains using the CASTNet data shown in Figure 7-20. The CSN NO3 performance results show a NO3 under-prediction bias and high error during the warmer months (May through October) that fails to achieve the PM Performance Criteria, but the cooler months achieve the PM Performance Criteria and sometimes even the PM Performance Goals (Figure 7-19). The evaluation across the CASTNet network, on the other hand, indicates a general NO3 overestimation bias and high error that, at least for the 4 km domain, is greatest for the warmer months. HNO3 and TNO3 also exhibits and overestimation bias that is greatest for the warmer months. We would expect there to be more volatilization of the NO3 off of the CASTNet filter in warmer months that is contributing to the seemingly underestimation bias.

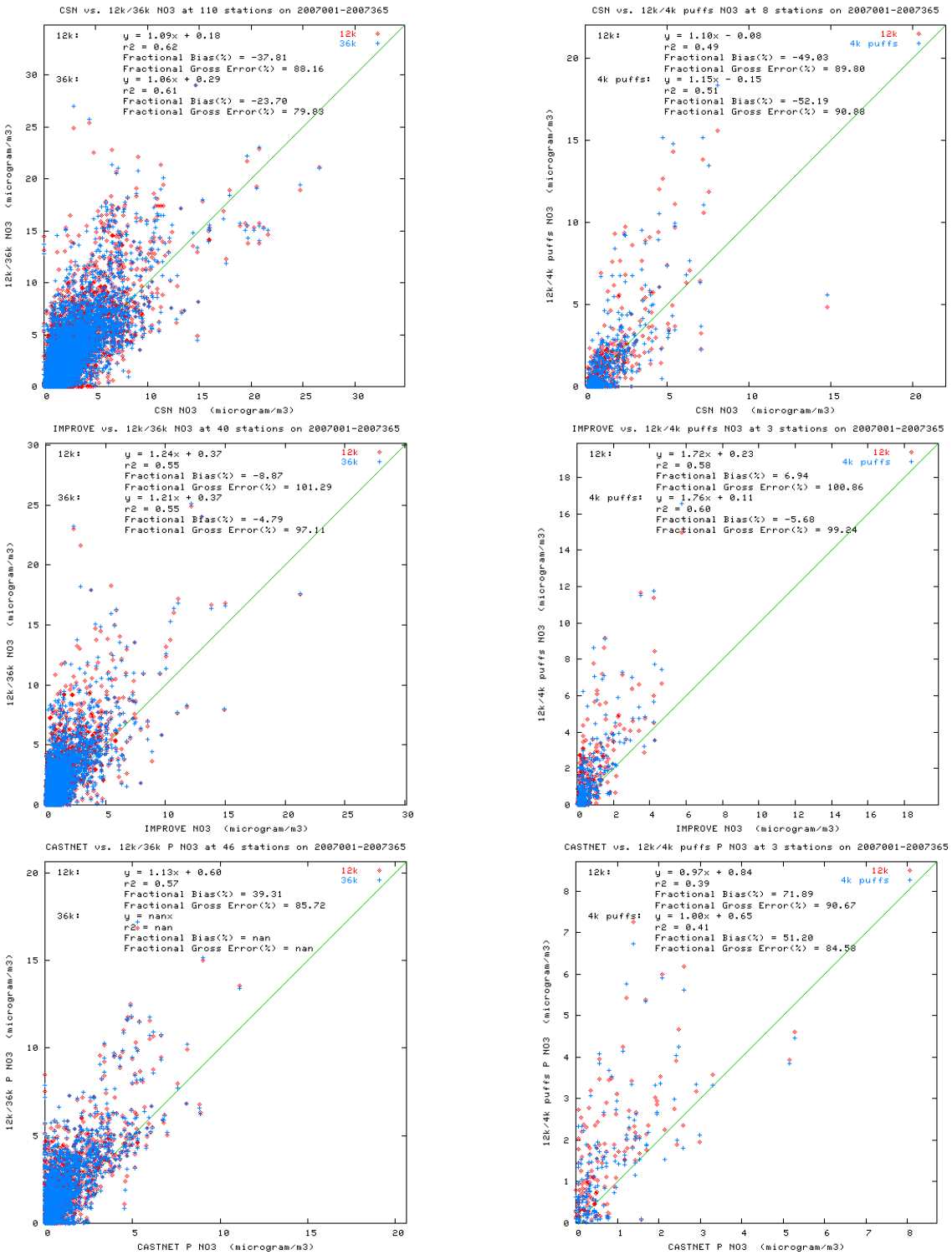


Figure 7-17. Scatter plots of predicted and observed NO3 concentrations for CSN (top), IMPROVE (middle) and CASTNet (bottom) monitoring networks across the 12 km (left) and 4 km (right) modeling domains.

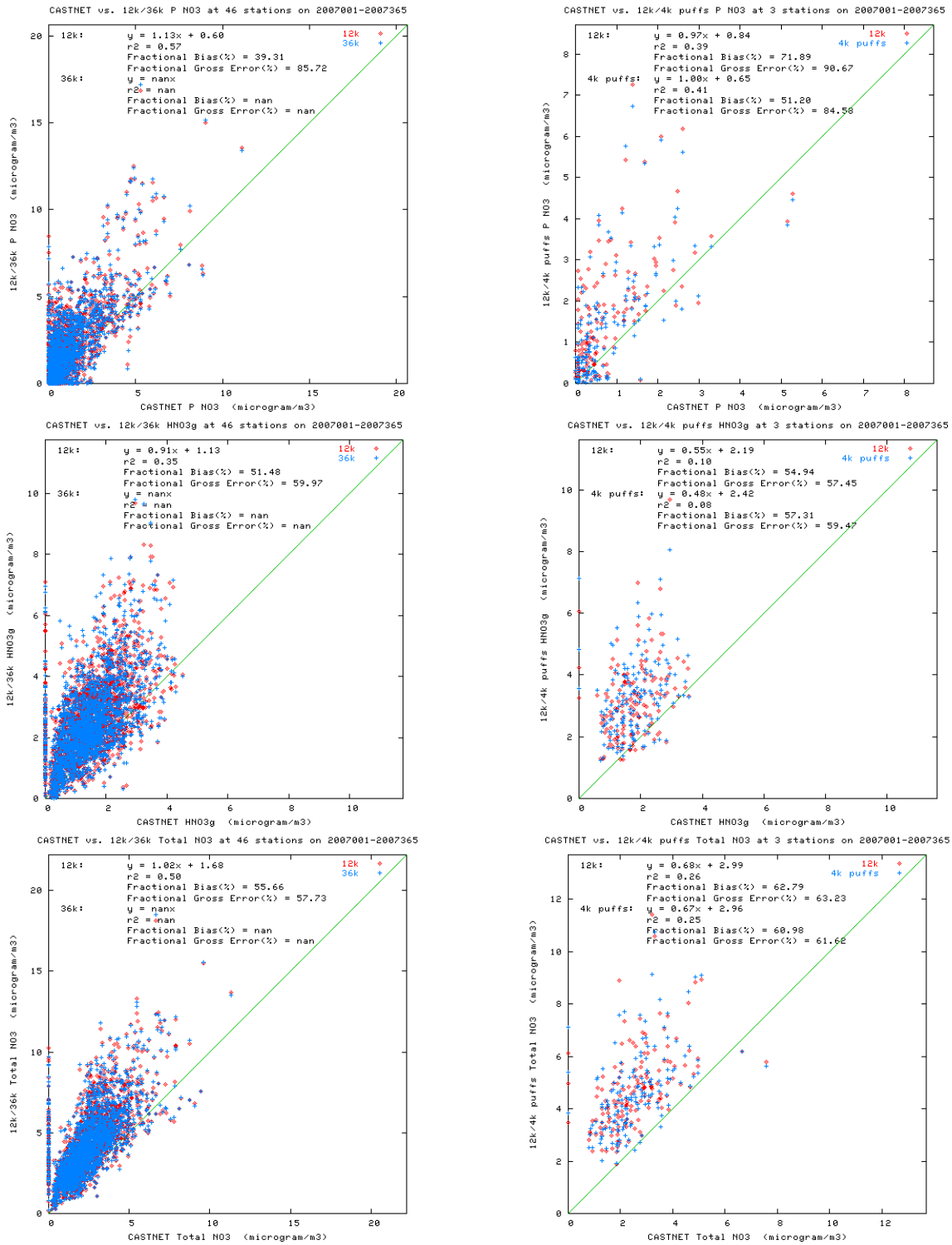


Figure 7-18. Scatter plots of predicted and observed NO3 (top), HNO3 (middle) and total NO3 (bottom) concentrations for the CASTNet monitoring network across the 12 km (left) and 4 km (right) modeling domains.

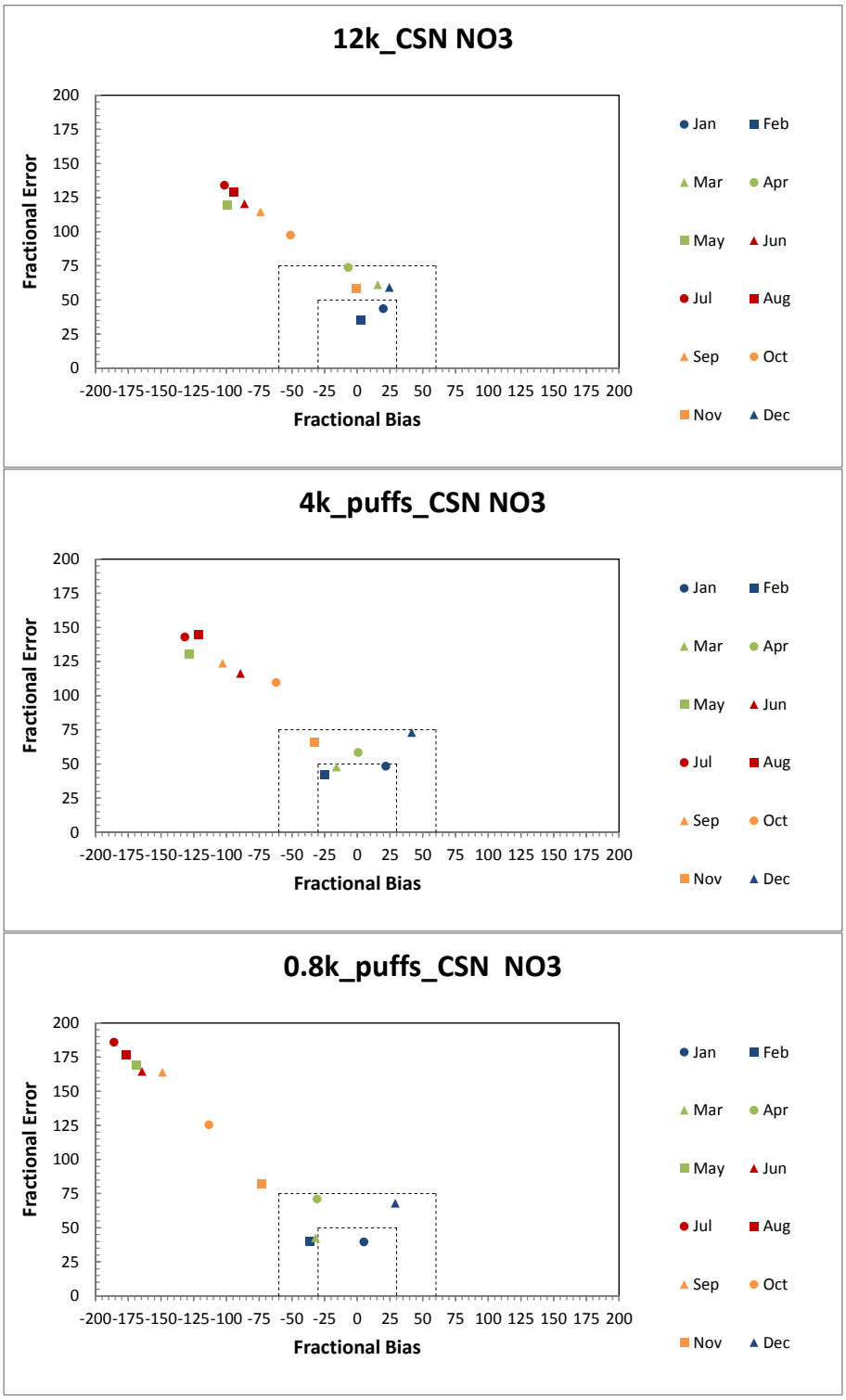


Figure 7-19. Soccer plots of monthly NO3 fractional bias and error for CSN sites across the 12 km (top), 4 km (middle) and 0.8 km (bottom) modeling domains (revised 2007 base case).

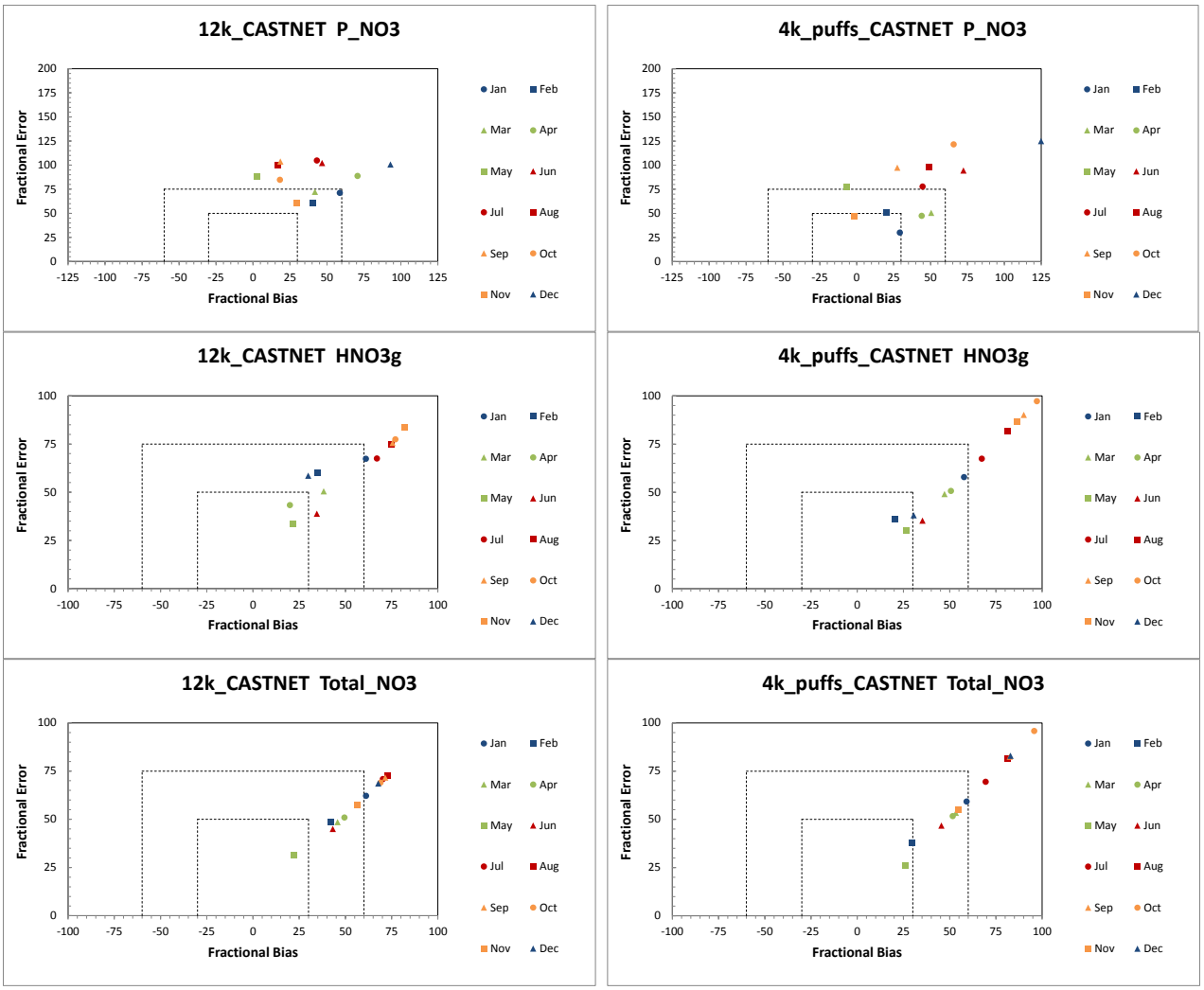


Figure 7-20. Soccer plots of monthly fractional bias and error for NO3 (top), HNO3 (middle) and Total NO3 (NO3+HNO3) for CASTNet sites across the 12 km (left) and 4 km (right) modeling domains (revised 2007 base case).

Figure 7-21 displays the annual and quarterly NO3 model performance at the Liberty CSN monitoring site. As was seen across all CSN sites, the NO3 model performance at Liberty is characterized by an underestimation bias that is greatest for the warmer months, such as quarters 2 and 3 (-130% in Q2 and -186% in Q3). However, during Q2 and Q3 the observed NO3 concentrations are fairly small (always < 2 µg/m^3) and the modeled concentrations are near zero. During the cooler times of year, when the observed NO3 concentrations are higher, the CAMx NO3 model performance is better. For example during Q1 the CAMx NO3 performance achieves or almost achieves the PM Performance Goal at Liberty. It appears that during the warmer months the model is volatilizing most of the particulate ammonium nitrate into gaseous HNO3 and NH3. One possible explanation for this is the lack of mineral (e.g., sodium and calcium) nitrate in the model which is nonvolatile. With just a little mineral nitrate the NO3 model performance during the warm months would look remarkably better.

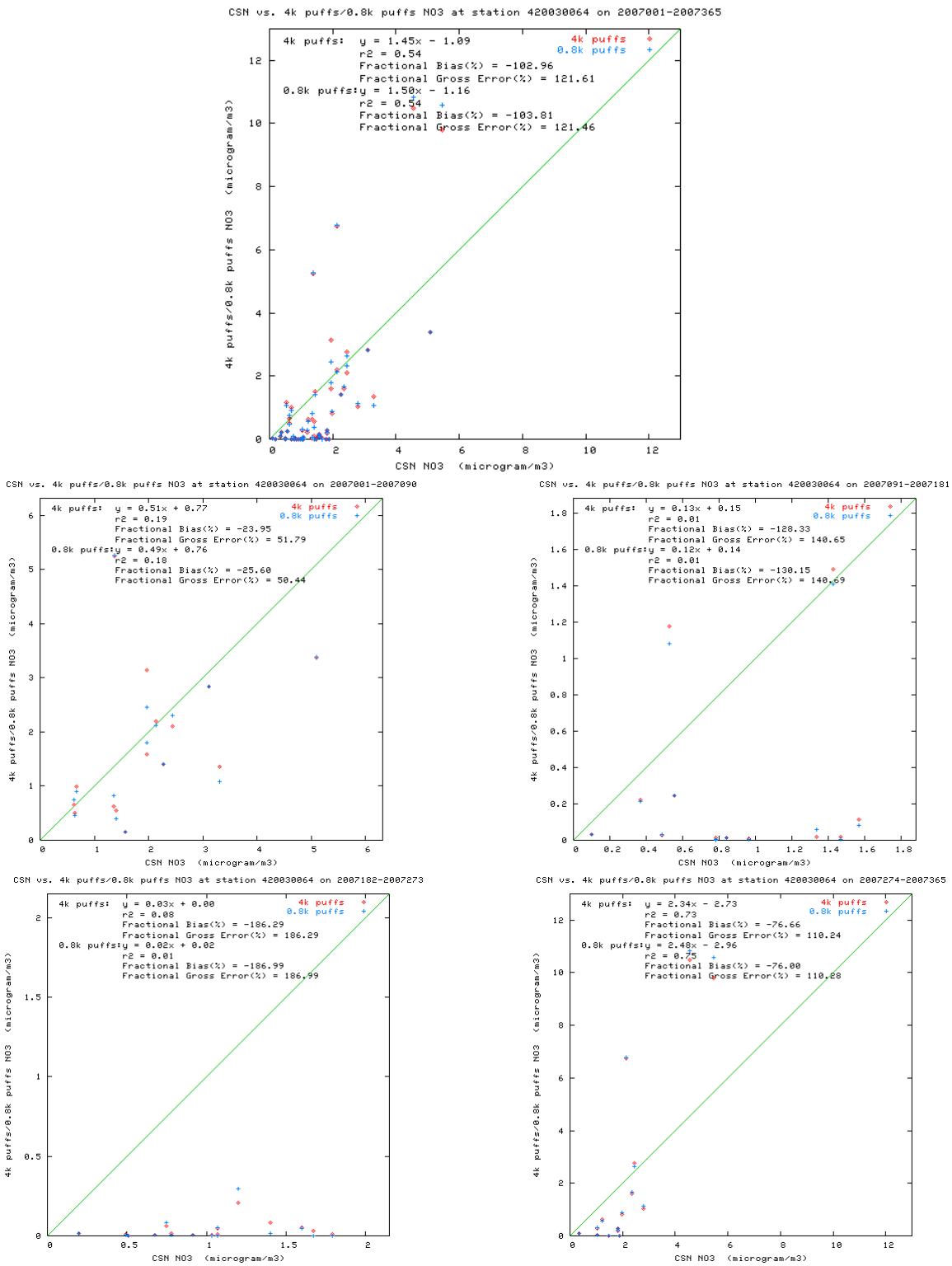


Figure 7-21. Scatter plots of 24-hour NO3 concentrations at Liberty CSN site for annual (top), and quarters 1 (middle left), 2 (middle right), 3 (bottom left) and 4 (bottom right) and CAMx 4 km and 0.8 km revised 2007 base case modeling results.

7.4.6 Ammonium (NH4) Model Performance

Scatter plots of the NH4 model performance across CSN, IMPROVE and CASTNet monitoring sites in the 12 km and 4 km domains are given in Figure 7-22 and show that NH4 performance achieves the PM Performance Goals across all domains and networks. For the CSN network and the 12 km domain the CAMx revised 2007 base case has a zero bias and low error (37%). For CSN sites in the 4 km domain the NH4 bias is -20% and error is 40%. The NH4 bias is also low across the IMPROVE sites in the 12 km (-9%) and 4 km (-13% and -17%) domains with low errors in the 40% to 43% range. NH4 performance across CASTNet monitors exhibit bias with a slight overestimation tendency (2% to 16%) and low error (31% to 35%).

The monthly NH4 model performance for the CSN and CASTNet networks across the 12 km, 4 km and 0.8 km (CSN only) are shown in Figure 7-23 using soccer plots. Across the 12 km domain, the NH4 monthly NH4 FB/FE always achieves the PM Performance Criteria and almost always achieves the PM Performance Goals with the CASTNet December FB falling just outside the PM Performance Goal. The NH4 performance always achieves the PM Performance Criteria in the 4 domain for both networks with most months also achieving the PM Performance Goals. 4 and 10 months achieve the PM Performance Goals and Criteria, respectively, for the two CSN sites in the 0.8 km domain, although the warmer months have an underestimation tendency that is greatest for May and July whose FB falls right outside the PM Performance Criterion.

The Liberty CSN NH4 annual and quarterly NH4 performance for the CAMx 0.8 and 4 km results is shown in Figure 7-24. The Liberty FB/FE NH4 performance achieves the PM Performance Criteria except for quarters 3 and 4 that are right outside of the PM Performance Criteria due to an underestimation bias. The NH4 FB underestimation bias tends to run between -35% and -62%,

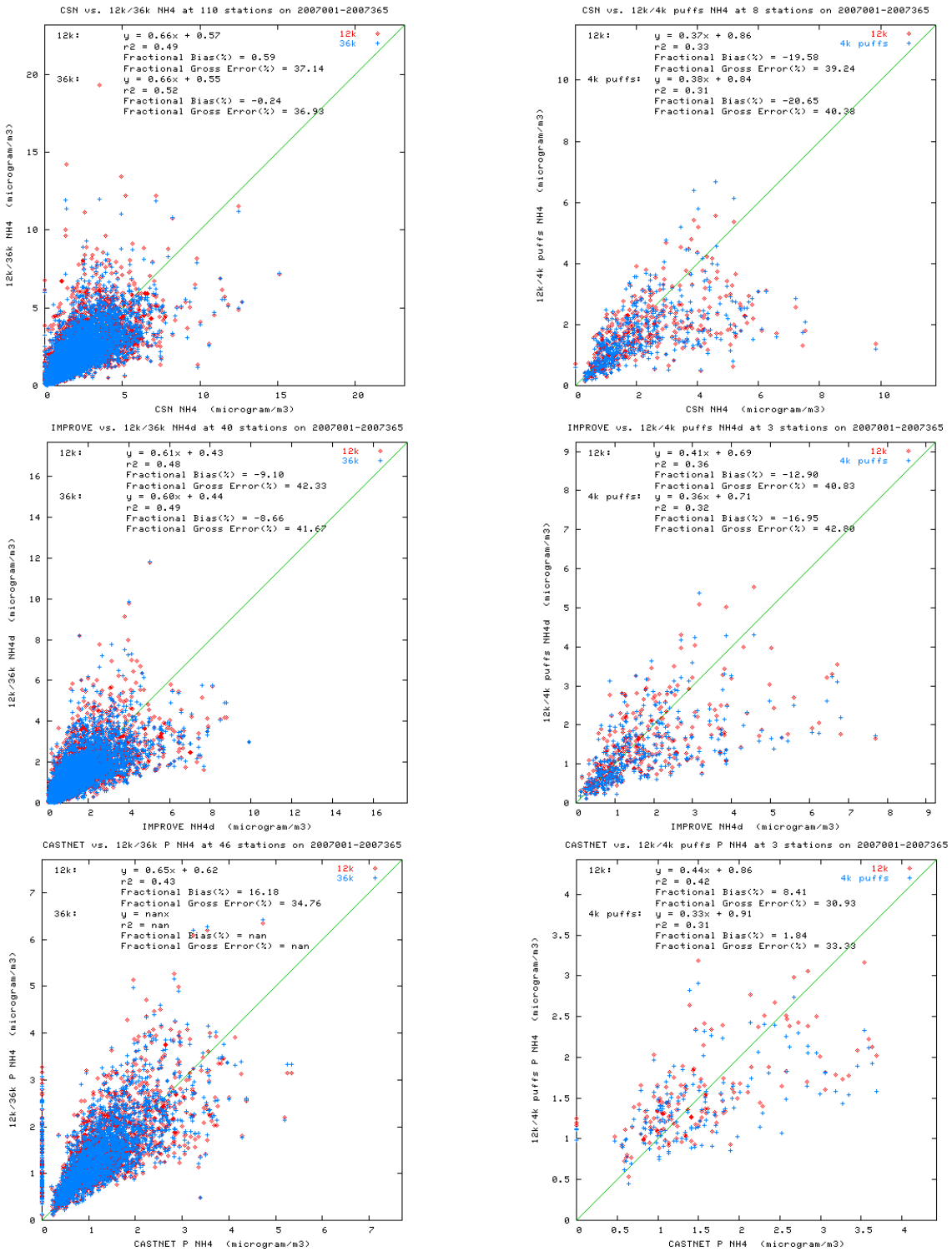


Figure 7-22. Scatter plots of predicted and observed NH4 concentrations for CSN (top), IMPROVE (middle) and CASTNet (bottom) monitoring networks across the 12 km (left) and 4 km (right) modeling domains.

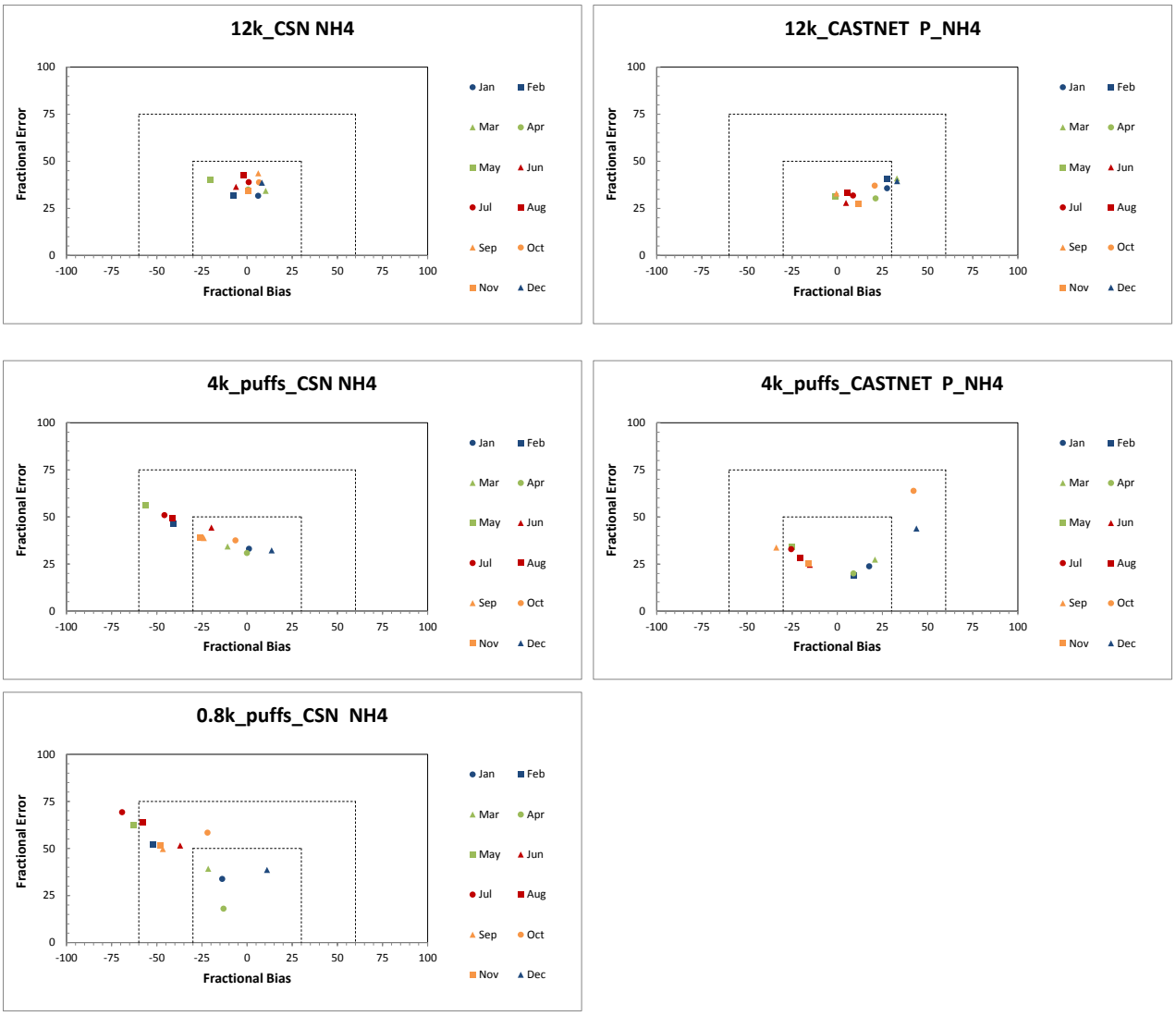


Figure 7-23. Soccer plots of monthly NH4 fractional bias and error for CSN (left) and CASTNet (right) sites across the 12 km (top), 4 km (middle) and 0.8 km (bottom) modeling domains (note: no CASTNet sites in the 0.8 km modeling domain).

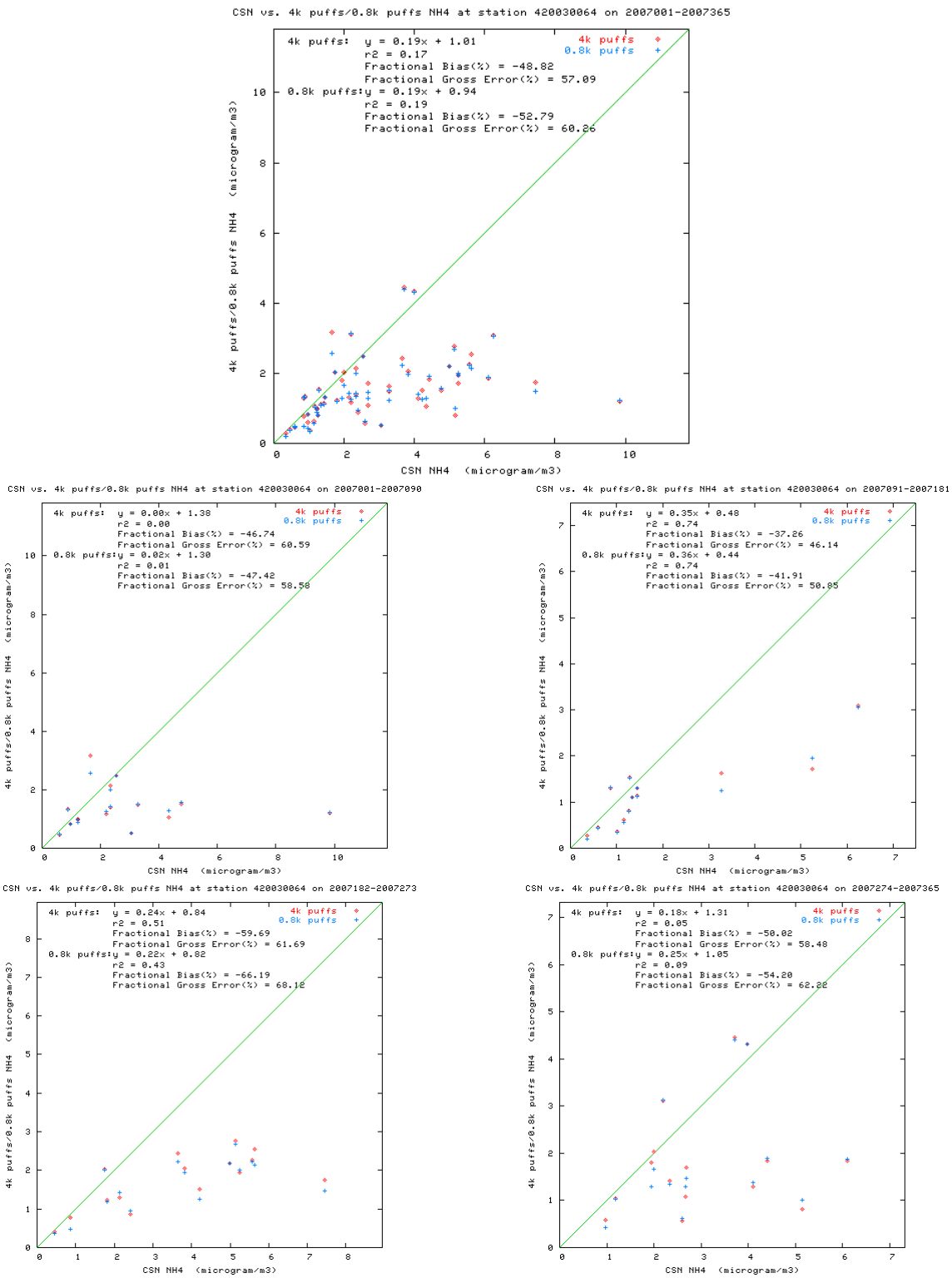


Figure 7-24. Scatter plots of 24-hour NH4 concentrations at Liberty CSN site for annual (top), and quarters 1 (middle left), 2 (middle right), 3 (bottom left) and 4 (bottom right) and CAMx 4 km and 0.8 km modeling results.

7.4.7 Total Carbon Mass (TCM) Model Performance

Particulate carbon is measured at the CSN and IMPROVE monitoring sites and are reported as elemental carbon (EC) and organic carbon (OC). As noted previously, in the past the CSN/IMPROVE monitors have used different measurement techniques (NIOSH and TOR) that provide different splits between EC/OC so we report model performance mainly for total carbon mass (TCM) that combined the EC and OC measurements. The model predicts EC and organic aerosol (OA) with OA including additional compounds (e.g., oxygen) beyond carbon. Thus, the measured OC needs to be converted to OA for comparison with the model. OA/OC ratios typically range between 1.2 to 2.2 with lower OA/OC ratios for fresh OC emissions and higher ratios for aged OA (Turpin and Lim, 2001). In our model performance we have used an OA/OC ratio of 1.4 reflecting our focus on model performance in the Liberty-Clairton area that would include fresh OA emissions. Note that there may be some discrepancies in the model with primary OA emissions that are split from PM in the emissions modeling. More recent information suggests that some of these PM speciation profiles maybe allocating the non-carbon portions of the OA to the other $PM_{2.5}$ (OPM2.5) species, which would contribute to a seemingly model underestimation of TCM and overestimation of OPM2.5.

Figure 7-25 displays the TCM model performance across the CSN and IMPROVE monitoring networks in the 12 and 4 km domains and the EC and OA model performance using the IMPROVE observations in the 12 km domain. TCM is underestimated by the model with FBs of -30% to -50% using the CSN observations and -9% to -17% using the IMPROVE observations. The TCM underestimation bias is due to underestimating the OA component of the TCM as EC is overestimated, although OA concentrations are much higher than EC so dominate the TCM. EC comes primarily from combustion (e.g., diesel particulate), whereas OA can be emitted directly or be formed in the atmosphere as secondary organic aerosols (SOA) from VOC emissions. OA is an active area of research and there are many uncertainties in their emissions and atmospheric processes. In fact, there is an entire class of compounds known as semi-volatile organic compounds (SVOC) that are OA precursors not accounted for in current inventories and models. Thus, the OA and TCM underestimation is prevalent in most current PM modeling studies.

The monthly TCM model performance for the CSN monitors across the 12, 4 and 0.8 km domains (Figure 7-26) shows that the underestimation is greater for the warmer months, suggesting that secondary organic aerosol (SOA), including those from SVOC, are likely under-represented in the model. In fact, some of the cold months even show a TCM overestimation tendency, especially in the 0.8 km domain. The TCM performance at Liberty for the CAMx 0.8 km and 4 km modeling results is shown in Figure 7-27. The TCM annual underestimation FB is-30% and -39% with FBs of 60% and 66% using the 4 km and 0.8 km results so are right at, but slightly outside, the PM Performance Goals, but well within the PM Performance Criteria. The TCM FB for the warmer Q2 and Q3 quarters at Liberty range from -41% to -73% with FEs of 52% to 77%, so do not always achieve the PM Performance Criteria. However, better TCM performance is seen for the cooler quarters (Q1 and Q4) with FBs of -2% to -23% and FEs of 47% to 72% that always achieves the PM Performance Criteria and sometimes achieves the PM Performance Goals.

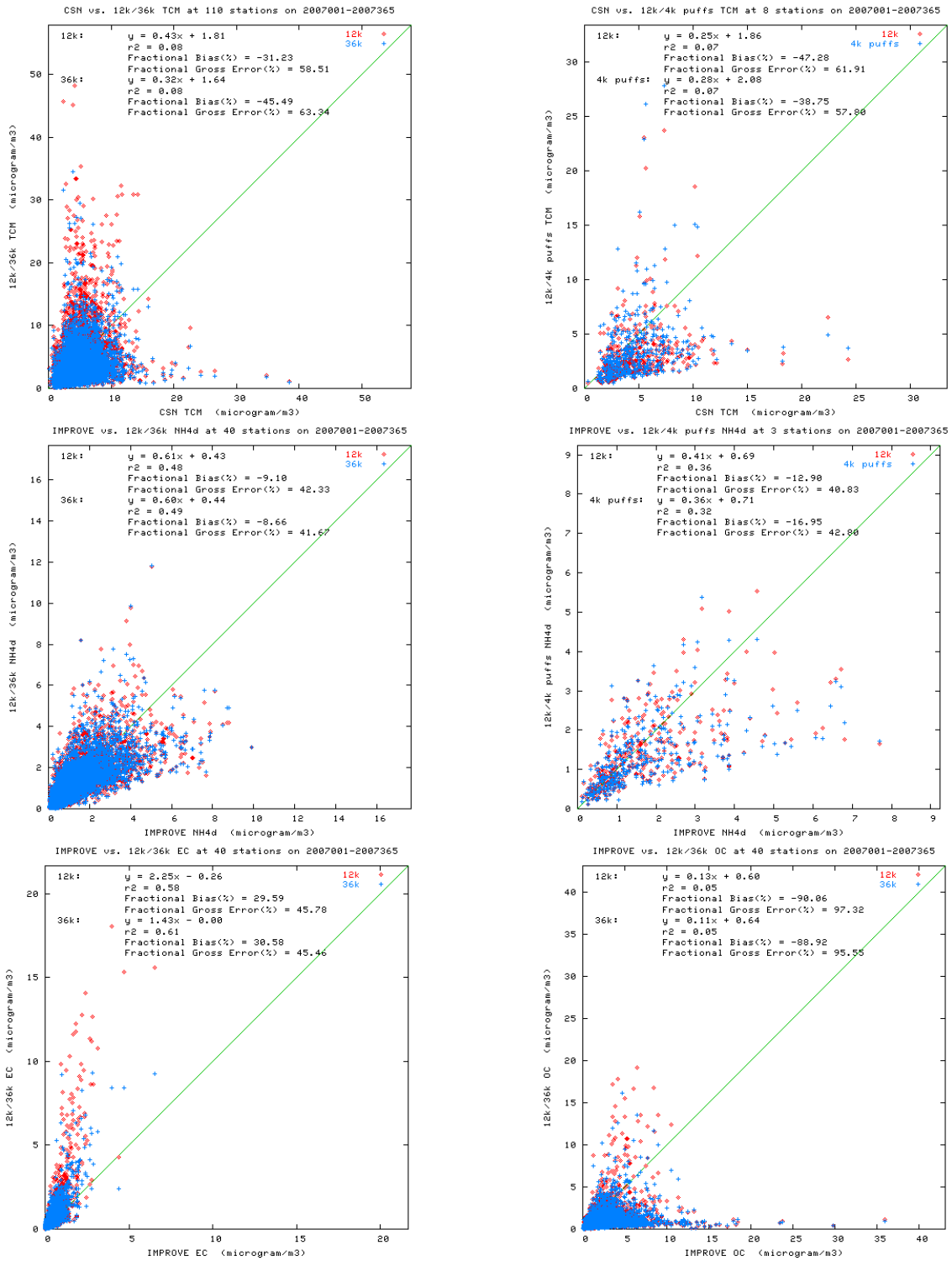


Figure 7-25. Scatter plots of predicted and observed TCM concentrations for CSN (top), and IMPROVE (middle) monitoring networks across the 12 km (left) and 4 km (right) modeling domains. Also shown in bottom panels are EC (left) and OA (right) performance for IMPROVE in the 12 km domain.

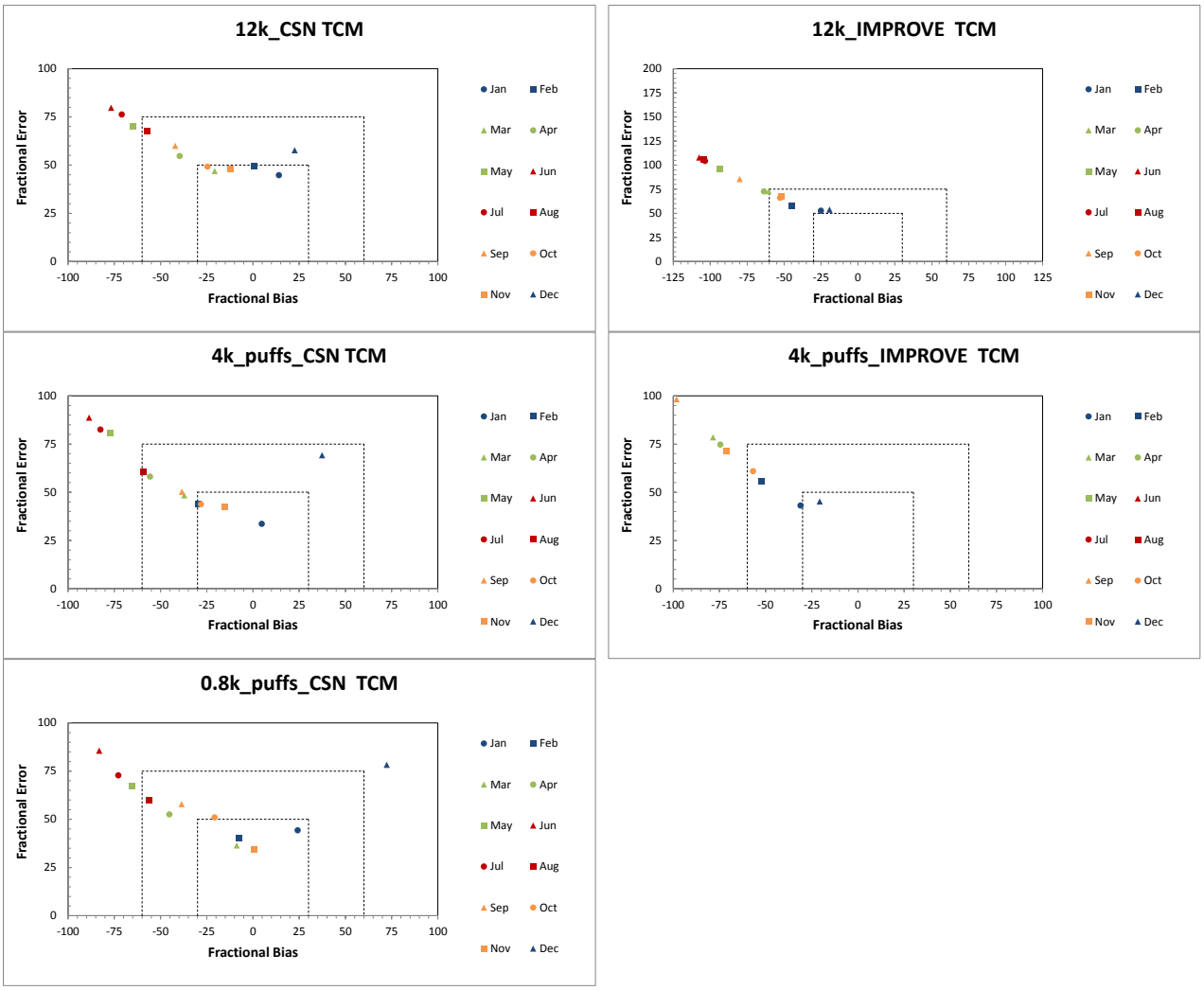


Figure 7-26. Soccer plots of monthly fractional bias and error for TCM across CSN (left) and IMPROVE (right) monitoring sites in the 12 km (top), 4 km (middle) and 0.8 km (bottom) modeling domains.

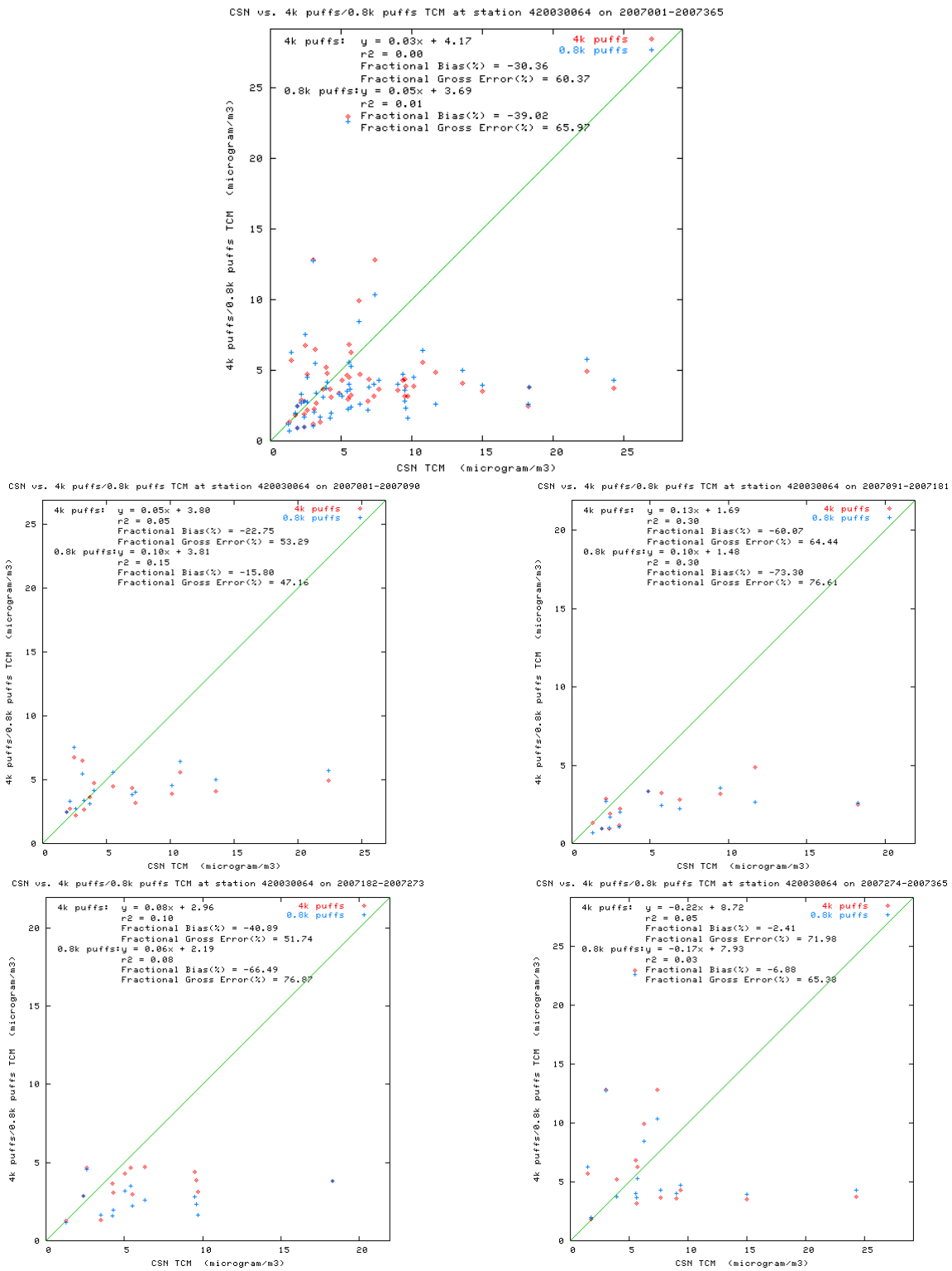


Figure 7-27. Scatter plots of 24-hour TCM concentrations at Liberty CSN site for annual (top), and quarters 1 (middle left), 2 (middle right), 3 (bottom left) and 4 (bottom right) and CAMx 4 km and 0.8 km modeling results.

7.4.8 Other $PM_{2.5}$ (OPM2.5) Model Performance

The OPM2.5 species likely represents different things in the measurements and model. In both cases it includes the crustal (soil) component, but it may also include other compounds, such as water, the non-carbon component of OA, etc.. In the model, OPM2.5 includes all the $PM_{2.5}$ in the emissions that has not been explicitly speciated as either SO4, NO3, NH4, EC, OA, NA or CL. However, in the measurements we have defined OPM2.5 as the difference between the total PM2.5 mass measurement and the SO4, NO3, NH4, EC, and OC*1.4 speciated $PM_{2.5}$ measurements that use several different measurement technologies each with their own measurement artifacts. So not only does the measured OPM2.5 include compounds like crustal species, sea salt and particle bound water (PBW), but it also has measurement artifacts and uncertainties embedded in it. Note that when the measured OPM2.5 calculation produced a negative value it was set to zero.

Scatter plots and performance statistics for predicted and observed OPM2.5 concentrations across the CSN and IMPROVE monitoring site in the 12 km and 4 km modeling domains are shown in Figure 7-28. The model tends to overestimate OPM2.5 with FB values ranging from 30% to 109% and the overestimation bias being greater across the IMPROVE than CSN networks, which may represent different measurement technology artifacts. There are more zero observed values in the IMPROVE comparisons that may be another reason why there is a higher overestimation bias. Note that the IMPROVE network does not measure NH4 so we have used a derived estimate of NH4 (NH4d) that assumes that SO4 and NO3 are completely neutralized by NH4 that represents an upper bound of NH4 (since SO4 is not always fully neutralized) resulting in the IMPROVE OPM2.5 “measurements” being underrepresented leading to a modeled overestimation bias. The OPM2.5 overestimation bias is greater in the cooler months with the warm months mostly achieving the PM Performance Criteria (Figure 7-29).

At Liberty, the OPM2.5 performance is actually better than seen across the CSN and IMPROVE sites in the 12 and 4 km domains (Figure 7-30). The CAMx 4 and 0.8 km annual OPM2.5 modeling results achieves the PM Performance Criteria at Liberty and it almost achieves the PM Performance Goals. The OPM2.5 is greatest in Q1 with FBs of ~70% and FEs of ~90% that fall outside of the PM Performance Criteria. The OPM2.5 performance is better in the other quarters with Q2 and Q3 mostly achieving the PM Performance Goals and Q4 mostly achieving the PM Performance Criteria..

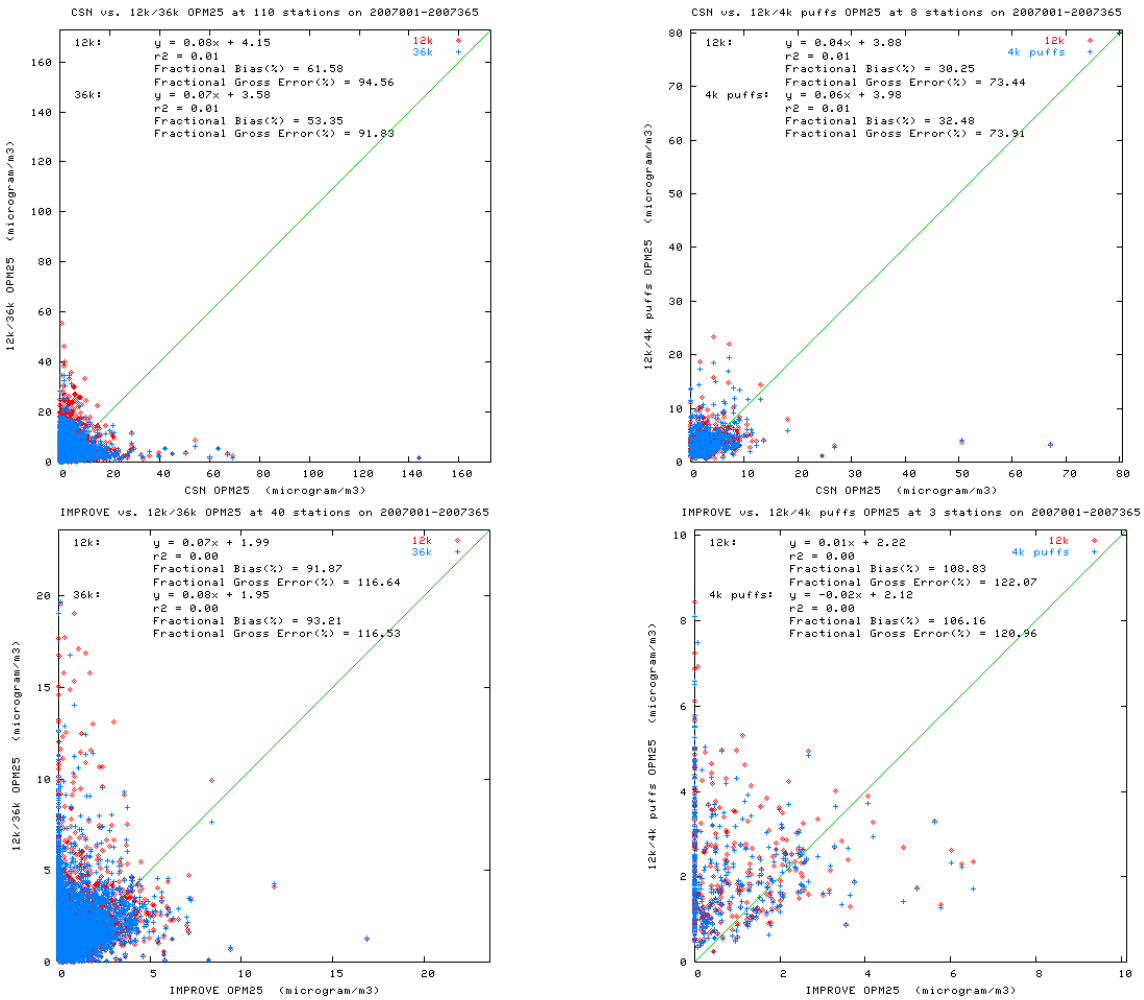


Figure 7-28. Scatter plots of predicted and observed OPM2.5 concentrations for CSN (top), and IMPROVE (bottom) monitoring networks across the 12 km (left) and 4 km (right) modeling domains.

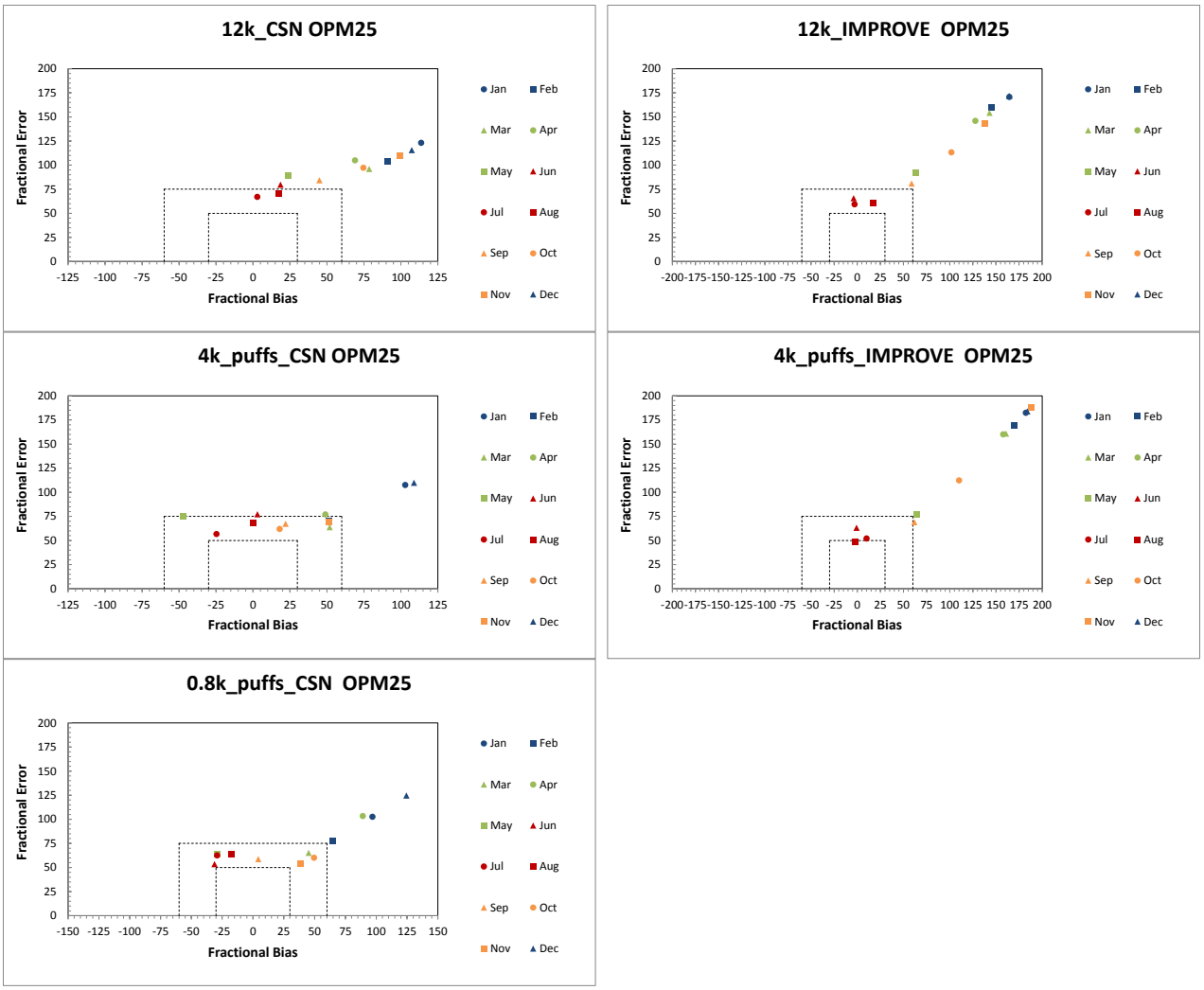


Figure 7-29. Soccer plots of monthly fractional bias and error for OPM2.5 across CSN (left) and IMPROVE (right) monitoring sites in the 12 km (top), 4 km (middle) and 0.8 km (bottom) modeling domains (revised 2007 base case).

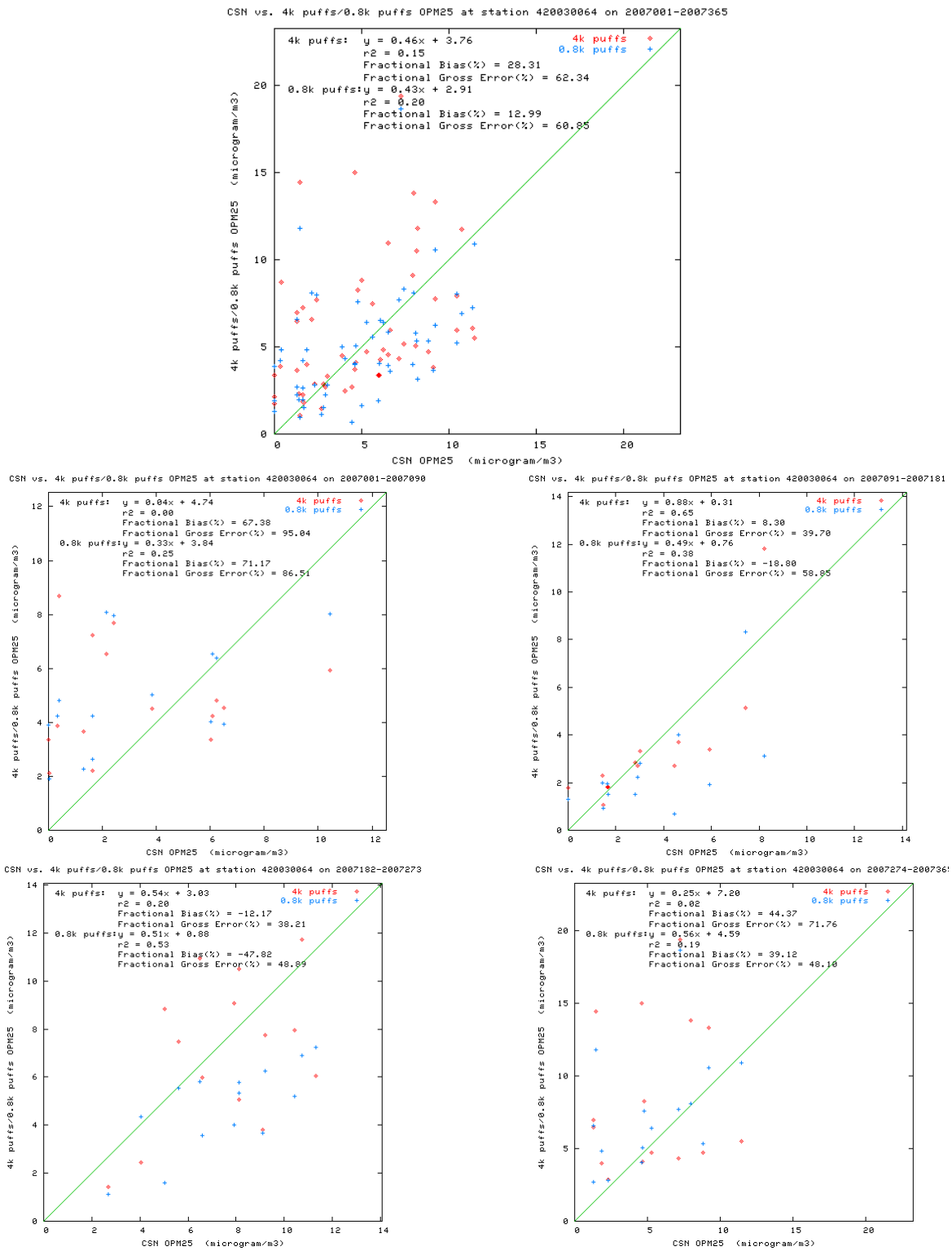


Figure 7-30. Scatter plots of 24-hour OPM2.5 concentrations at Liberty CSN site for annual (top), and quarters 1 (middle left), 2 (middle right), 3 (bottom left) and 4 (bottom right) and CAMx 4 km and 0.8 km modeling results.

7.5 Wet SO4, NO3 and NH4 Deposition

The National Atmospheric Deposition Program (NADP[25]) measures weekly wet deposition of SO4, NO3 and NH4 at sites across the U.S. with 102 sites located within the 12 km NEUS domain and one site located within the 4 km SWPA domain (Figure 7-31). The CAMx 12 km and 4 km modeling results were evaluated against the NADP wet deposition measurements. We assumed that the wet SO4 measurement included both particulate sulfate (SO4) as well as gaseous sulfuric acid (SULF). Similarly, the NO3 wet deposition measurements is assumed to include both particulate nitrate (NO3) and gaseous nitric acid (HNO3) and the NH4 wet deposition measurement is assumed to include both particulate ammonium (NH4) and gaseous ammonia (NH3). This results in the following model species mappings for the wet deposition model evaluation:

- TSO4 = SO4 + SULF
- TNO3 = NO3 + HNO3
- TNH4 = NH4 + NH3

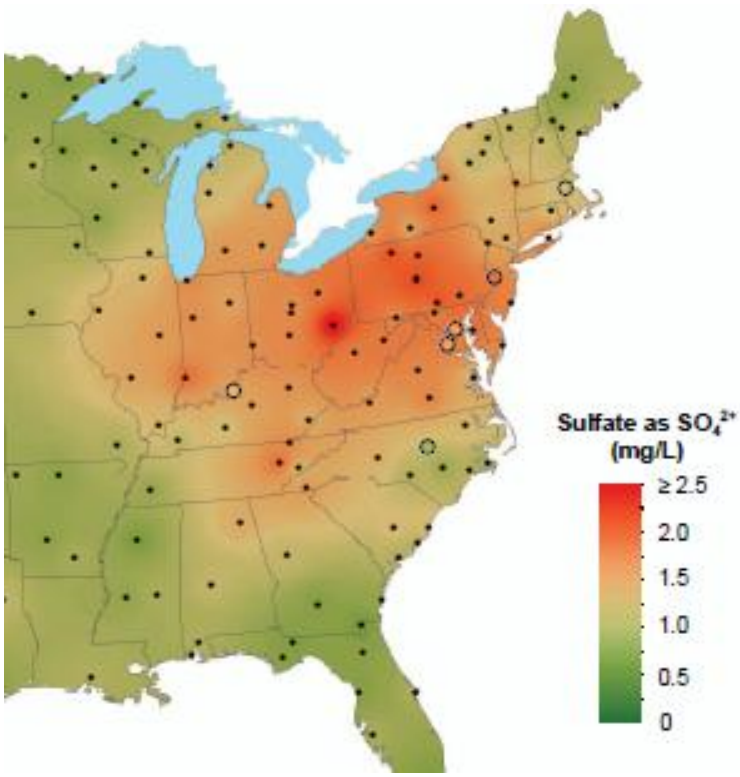


Figure 7-31. Locations of NADP wet deposition monitoring sites in the eastern U.S (also shown is 2007 spatial distribution of wet SO4 deposition in mg/L).

[25] http://nadp.sws.uiuc.edu/

The modeled and measured TSO4, TNO3 and TNH4 are evaluated using a weekly accumulation time in units of kg per hectare as SO4, NO3 or NH4. Figure 7-32 displays a scatter plot and performance statistics for weekly wet deposition of SO4, NO3 and NH4 across the 12 km domain for the 2007 CAMx 12 km base case simulation. The annual FB for SO4 (-17%), NO3 (-4%) and NH4 (-18%) indicate an underestimation tendency but are reasonably low, which is consistent with the underestimation of these species in the ambient concentration evaluation. However, there is a lot of scatter resulting in high FE values (~130%) and poor correlation. The CAMx 12 km weekly SO4 and NO3 wet deposition estimates never get above 1 and 2 kg/ha/week, respectively, whereas the observed values do get higher than these values and many times when that occurs there is no modeled SO4 and NO3 wet deposition.

Table 7-9 summarizes the fractional bias and error for SO4, NO3 and NH4 wet depositions across the 12 km domain on an annual basis and for each quarter. Quarter 3 (Q3) is by far the worst performing period of the year, which is not surprising given that its rainfall will be dominated by convective precipitation which is very spotty and more difficult for WRF to simulate than precipitation from a large weather system as occurs in the winter. For example, the SO4 wet deposition FB for Q3 is -36% compared to -10%, -4% and -9% for Q1, Q2 and Q4.

The correct reproduction of the weekly observed wet deposition requires the model to accurately simulate the occurrence, amount and type of precipitation, the presence of the correct concentration of pollutants in the atmosphere at the time of the precipitation and the correct scavenging algorithm rate in the model. Thus, it is not surprising that the errors in the SO4, NO3 and NH4 wet deposition are greater than see for atmospheric concentrations of the same species. On an annual basis the observed wet depositions is approximately double what was estimated by the CAMx 12 km modeling results.

Table 7-9. Summary of annual and quarterly fractional bias and error for wet deposition of SO4, NO3 and NH4 and 102 NADP sites in the 12 km NEUS domain using the CAMx 12 km modeling results.

	Wet SO4		Wet NO3		Wet NH4	
	FB	FE	FB	FE	FB	FE
Annual	-17%	132%	-4%	128%	-18%	132%
Quarter 1	-10%	130%	-5%	129%	-8%	130%
Quarter 2	-4%	133%	0%	131%	-9%	135%
Quarter 3	-36%	138%	-16%	130%	-36%	138%
Quarter 4	-9%	127%	8%	126%	-11%	128%

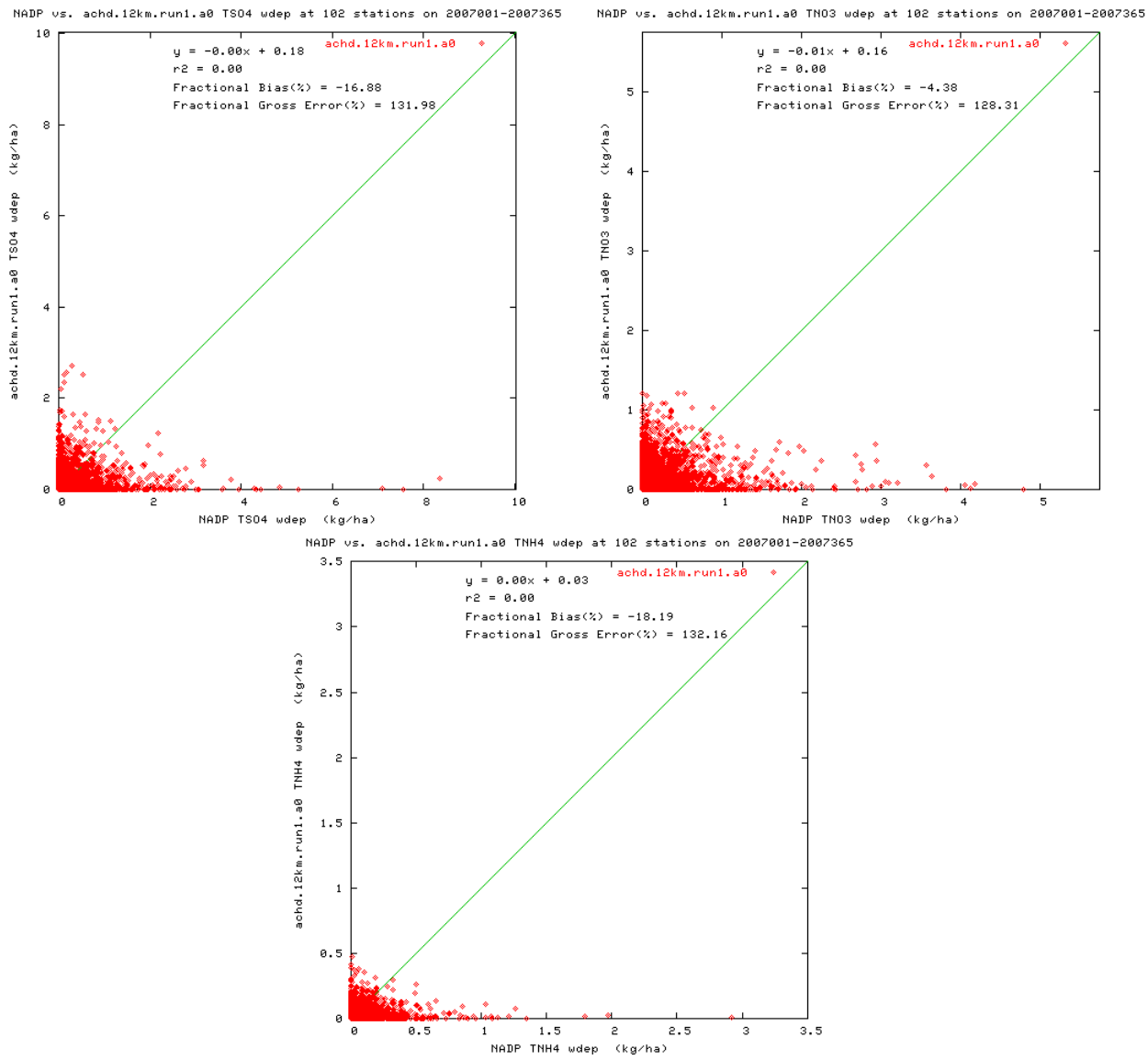


Figure 7-32. Annual scatter plots of weekly average SO4 (top left), NO3 (top right) and NH4 (bottom) wet deposition (kg/ha/week) across the NADP network in the 12 km domain for the CAMx 12 km modeling results.

There is one NADP monitoring site (OH49) in the 4 km SWPA domain that resides in Nobel County, Ohio that is in the southwest corner of the 4 km SWPA modeling domain. The location is shown in Figure 7-31 with the OH49 NADP site being the site in the southeast corner of Ohio that looks like it had the highest observed wet SO4 deposition in 2007. Figure 7-33 displays the SO4, NO3 and NH4 wet deposition model performance at the OH49 NADP monitoring site using the CAMx 4 km and 12 km modeling results. As seen previously across all monitors in the 12 km domain, there is a lot of scatter in the weekly wet deposition predicted and observed comparisons at the OH49 monitor with FEs in excess of 100%. The CAMx 4 km estimates higher

wet deposition values than the CAMx 12 km estimates that generally results in the 4 km results being overestimates and the 12 km results being underestimates. The SO4 annual wet depositions FB is 8% and -41% for the 4 km and 12 km CAMx modeling results, respectively, with the CAMx 4 km modeling results also estimating lower FE 113% versus 132%). Similar FB values for NO3 wet depositions are 24% (4 km) and -12% (12 km) and for NH4 wet deposition the FB values are 20% (4 km) and -33% (12 km). Time series of predicted and observed weekly wet deposition at the OH49 NADP monitor for the CAMx 4 km and 12 km modeling results are shown in Figure 7-34 which indicates that, except for some weeks in the summer, the 4 km modeling results are matching the observed values more often than the 12 km modeling results that tend to underestimate. In the summer the CAMx 4 km wet SO4 deposition estimates has several weeks with values in excess of 1.5 kg/ha/week, whereas the observed values never get above this value. The CAMx 4 km and 12 km wet depositions modeling results are very different. Presumably this is due to the differences between the WRF 4 km and 12 km precipitation fields. In addition to the differences in the grid resolution in the WRF 4 km and 12 km simulations that can affect the WRF precipitation, there were also differences in the way convective precipitation was treated in the two WRF runs. For the WRF 12 km and 4 km simulations where in the WRF 12 km modeling the Kain-Fritsch cumulative parameterization was used to treat convective precipitation because the 12 km grid resolution is too large to explicitly simulate convective activity. However, in the WRF 4 km simulation the 4 km grid resolution is believed to be fine enough so that the model physics can explicitly treat convective precipitation so no cumulus parameterization is used. This can result in some very different precipitation amounts. For example, during the high summer wet deposition events in the CAMx 4 km results looks like there were major explicit convective precipitation events the end of June and beginning of July 2007 (Julian Days 166-187) at the OH49 NADP monitor that produced high SO4 and NH4 wet depositions in the CAMx 4 km results (peak of 3.5 kg/ha/week), whereas the CAMx 12 km results were less than 0.5 kg/ha/week with observed values of ~1 kg/ha/week (Figure 7-34).

Table 7-10 compares the annual total predicted and observed wet deposition at the OH49 monitoring site. The CAMx 4 km annual total wet depositions amounts are greater than observed, which is consistent with the WRF having higher precipitation than observed (McNally and Loomis, 2012). The CAMx 4 km annual total wet SO4 deposition at OH49 NADP site are 50% higher (28 kg/ha/yr) than the observed value (18 kg/ha/yr).

Table 7-10. Comparison of predicted and observed annual total wet deposition (kg/ha/yr) at the OH49 NADP monitoring site for SO4, NO3 and NH4 and the CAMx 4 km revised 2007 base case modeling results.

Species	Observed	Predicted	Difference	Percent
SO4	18.47	27.95	9.48	51.3%
NO3	13.93	16.62	2.69	19.3%
NH4	3.04	4.35	1.30	42.8%

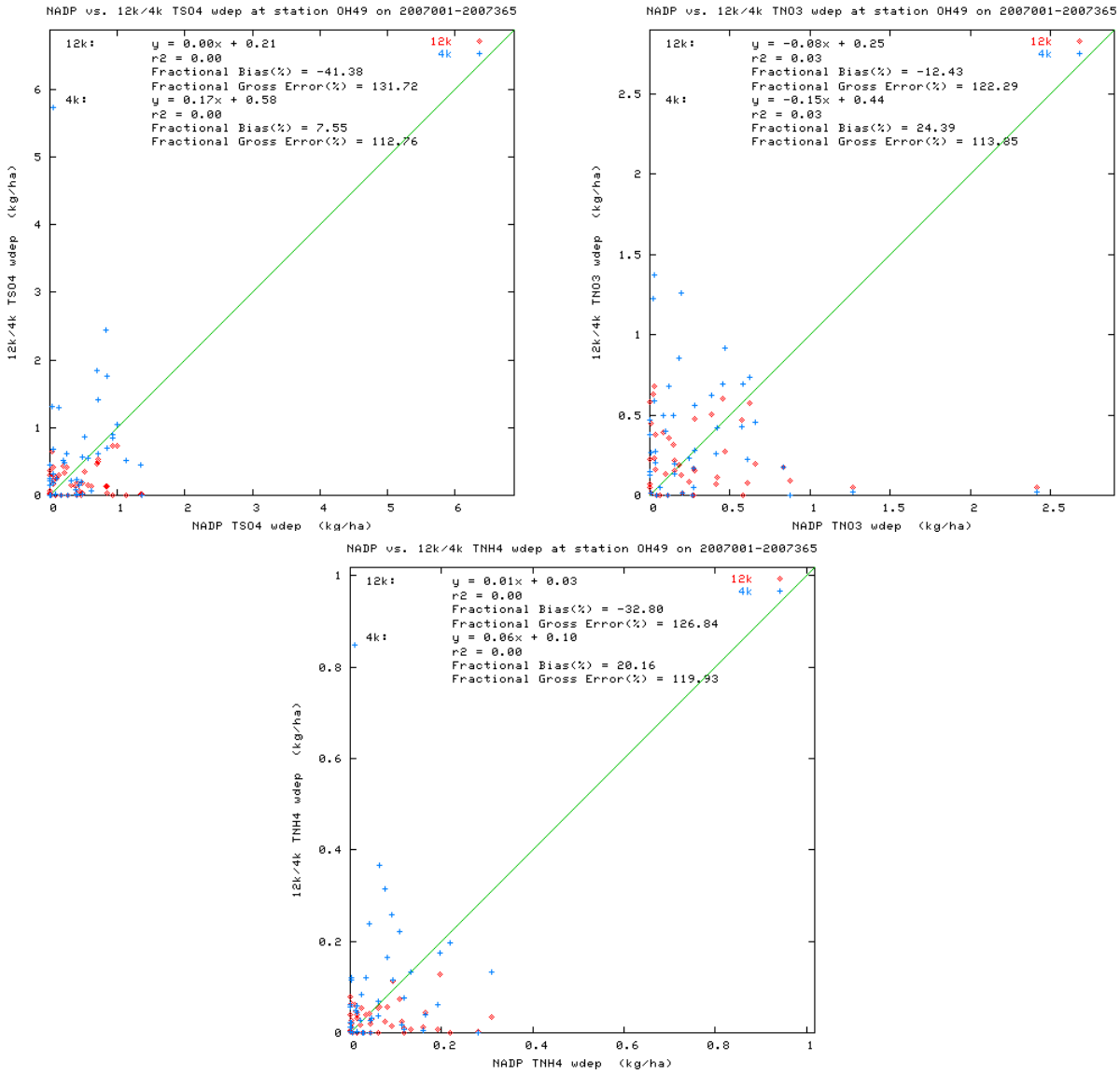


Figure 7-33. Annual scatter plots of weekly SO4 (top left), NO3 (top right) and NH4 (bottom) wet deposition (kg/ha/week) at the OH49 NADP site in Noble County, Ohio for the CAMx 4 km (blue) and 12 km (red) revised 2007 base case modeling results.

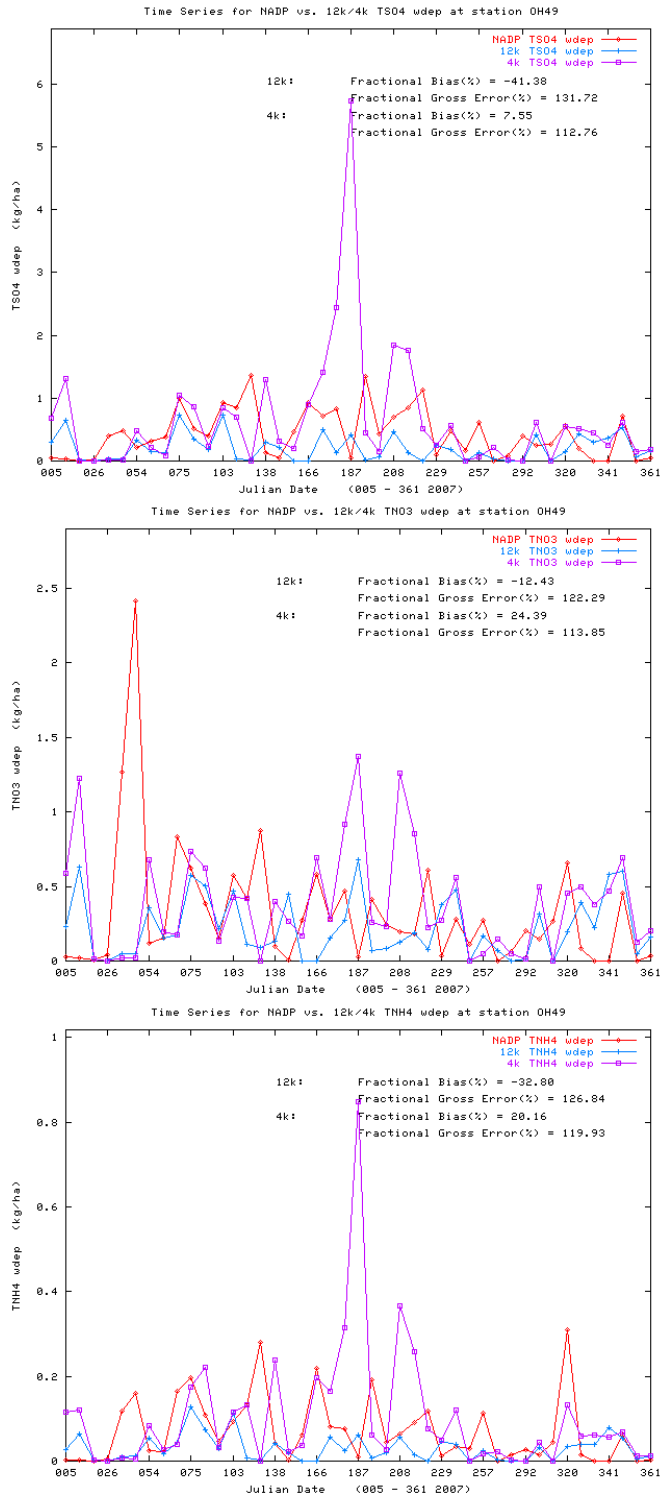


Figure 7-34. Time series of predicted and observed weekly wet deposition(kg/ha/wk) at the OH49 NADP monitoring site for the CAMx 4 km (purple) and 12 km (blue) revised 2007 base case modeling results and SO4 (top), NO3 (middle) and NH4 (bottom).

7.6 Comparison of Model Performance with the Previous Liberty-Clairton $PM_{2.5}$ SIP

In order to put the current CAMx revised 2007 base case model performance evaluation into context, we compare its performance with the performance of model used in the previous Liberty-Clairton $PM_{2.5}$ SIP (ACHD, 2011a). We also compare the CAMx revised 2007 base case contribution of local source contributions to $PM_{2.5}$ concentrations at Liberty with the local source contribution derived through analyzing the observed $PM_{2.5}$ concentration excess at Liberty (ACHD, 2012a).

7.6.1 Comparison with the Previously Liberty-Clairton $PM_{2.5}$ SIP Modeling

The previous $PM_{2.5}$ SIP for the Liberty-Clairton NAA addressed attainment demonstration modeling for the 1997 annual $PM_{2.5}$ NAAQS (ACHD, 2011a). A hybrid modeling approach was used based on the CMAQ photochemical grid model at 20 km resolution for the regional/urban sources and the CALPUFF Gaussian puff model for the local sources, where the local sources were eliminated from the CMAQ modeling to avoid double counting. The ACHD evaluated the hybrid CMAQ/CALPUFF modeling system using the FRM $PM_{2.5}$ observations at Liberty on an annual and quarterly basis using the FB and FE statistical performance metrics that are reproduced in Table 7-11 and compared against the CAMx revised 2007 base case results for Liberty. For the 5 comparison periods (annual and four quarters) the previous PM2.5 SIP modeling failed to achieve the PM Performance Goals in 2 of the cases (40% of the time) due to an FB overestimation bias of 36.0% for Q1 and 45.9% for Q4. The current CAMx revised 2007 base case failed to achieve the Pm Performance Goal in one of the cases (20% of the time) due to an FB in Q3 (30.7%) that is just barely over the FB PM Performance Goal (≤±30%). Both the 2002 and 2007 modeling always achieves the PM Performance Criteria. The seasonal $PM_{2.5}$ performance for the two models is different with the current CAMx 2007 modeling having a summer underestimation and winter overestimation bias, whereas the previous SIP 2002 CMAQ/CALPUFF modeling having a year-round overestimation bias. This results in the 2007 CAMx having a much lower annual $PM_{2.5}$ FB (-4.5%) than 2002 CMAQ/CALPUFF (25.4%). The 2007 CAMx error is better (lower) than 2002 CMAQ FE for 4 out of the 5 comparisons with the 2007 CAMx FE values ranging from 37% to 41% and the 2002 CMAQ FE values ranging from 31% to 51%.

Table 7-11. Comparison of the FB and FE annual and quarterly $PM_{2.5}$ model performance statistics at the Liberty FRM monitor from the previous Liberty-Clairton $PM_{2.5}$ SIP using 2002 CMAQ/CALPUFF modeling and the CAMx 0.8 km revised 2007 base case modeling results.

	Fractional Bias (FB)		Fractional Error (FE)	
	2002 CAMQ/ CALPUFF	Rev 2007 CAMx 0.8 km	2002 CAMQ/ CALPUFF	Rev 2007 CAMx 0.8 km
PM Performance Goal	≤±30%	≤±30%	≤60%	≤60%
PM Performance Criteria	≤±60%	≤±60%	≤75%	≤75
Annual	25.4%	-4.5%	41.7%	39.9%
Quarter 1	36.0%	25.1%	45.8%	42.4%
Quarter 2	7.6%	-26.4%	39.6%	36.6%
Quarter 3	12.3%	30.7%	30.5%	40.6%
Quarter 4	45.9%	15.6%	51.1%	40.9%

Table 7-12 compares the annual and quarterly FB/FE $PM_{2.5}$ model performance statistics for the 2002 CMAQ/CALPUFF and 2007 CAMx 0.8 km base cases using the hourly TEOM measurements at Liberty. The current 2007 CAMx annual and quarterly FB/FE model performance statistics always meet the PM Performance Criteria, whereas the 2002 CMAQ/CALPUFF Q4 FB/FE $PM_{2.5}$ performance fails to achieve the PM Performance Criteria due to too high of an error (FE = 83.6%) at Liberty using the TEOM observations. The 2007 CAMx annual statistics has a much lower bias (0.4%) than 2002 CMAQ (28.6%) and its annual FB/FE statistics achieve the PM Performance Goal, whereas 2002 CMAQ annual $PM_{2.5}$ statistics do not achieve the PM Performance Goal due to too high of an error (63.7%). Of the five periods analyzed in Table 7-12, both the 2007 CAMx and 2002 CMAQ/CALPUFF fail to achieve the PM Performance Goals in three of the cases.

Table 7-12. Comparison of the FB and FE annual and quarterly $PM_{2.5}$ model performance statistics at the Liberty TEOM monitor from the previous Liberty-Clairton $PM_{2.5}$ SIP using 2002 CMAQ/CALPUFF and the current 2007 CAMx 0.8 km modeling results.

	Fractional Bias (FB)		Fractional Error (FE)	
	2002 CAMQ/ CALPUFF	Rev 2007 CAMx 0.8 km	2002 CAMQ/ CALPUFF	Rev 2007 CAMx 0.8 km
PM Performance Goal	≤±30%	≤±30%	≤60%	≤60%
PM Performance Criteria	≤±60%	≤±60%	≤75%	≤75
Annual	28.6%	0.4%	63.7%	58.7%
Quarter 1	44.7%	34.2%	69.6%	58.2%
Quarter 2	4.9%	-26.5%	52.9%	54.8%
Quarter 3	16.7%	-35.0%	48.8%	60.5%
Quarter 4	43.4%	32.7%	83.6%	61.1%

The previous Liberty-Clairton $PM_{2.5}$ SIP also compared the annual average diurnal variation of the hourly $PM_{2.5}$ concentrations from the Liberty TEOM monitor to be sure that the model was picking up higher concentrations at night that are associated with the trapping of $PM_{2.5}$ concentrations from local sources in shallow nighttime inversions. Figure 7-35 compares the annual average diurnal variations in $PM_{2.5}$ concentrations from the previous Liberty-Clairton SIP modeling (top panel) and the current 2007 CAMx base case modeling (bottom two panels), where the bottom two panels in Figure 7-25 showing the results using two different scales one to match the results from the 2002 CMAQ/CALPUFF modeling the other to see more distinction from the 2007 modeling results. The first item of note in Figure 7-35 is that the observed annual average diurnal varying $PM_{2.5}$ concentrations from the Liberty TEOM are approximately half in 2007 of what they were in 2002. Both models estimate higher $PM_{2.5}$ concentrations at night than during the day. The 2002 TEOM $PM_{2.5}$ concentrations range from approximately 13 $\mu g/m^3$ during the mid-day to a maximum of approximately 25 $\mu g/m^3$ at night, a 12 $\mu g/m^3$ difference. The 2002 CMAQ/CALPUFF model have a daytime minimum value of approximately 17 $\mu g/m^3$ with a nighttime maximum value of approximately 36 $\mu g/m^3$, a 19 $\mu g/m^3$ differences. The difference in the 2007 observed TEOM daytime minimum to nighttime maximum average hourly $PM_{2.5}$ concentrations (~6 to ~16 $\mu g/m^3$) is approximately 10 $\mu g/m^3$. Whereas the 2007 CAMx range between daytime minimum and nighttime maximum annual average hourly $PM_{2.5}$ concentrations (~9 to ~16 $\mu g/m^3$) is approximately 7 $\mu g/m^3$.

The previously Liberty-Clairton $PM_{2.5}$ SIP (ACHD, 2011a) contained an evaluation of the CMAQ model across monitoring sites in the northeastern U.S. for both $PM_{2.5}$ mass and speciated $PM_{2.5}$[26]. However, rather than calculating the performance statistics across all the sites and days as is typically done, and as was done in this study and by ACHD at the Liberty monitor, in the previous SIP the CMAQ performance statistics were calculated separately at each monitoring site and the maximum, minimum and median performance statistics were reported across the individual sites. As these performance metrics for the 2002 CMAQ run are not comparable with the ones calculated for the current 2007 CAMx run, then no comparisons of these performance statistics could be made.

The comparison of the CAMx revised 2007 base case simulation model performance with the performance of the 2002 CMAQ/CALPUFF model performance used in the previously Liberty-Clairton $PM_{2.5}$ SIP reveals that the 2007 CAMx model performance is comparable. The 2007 CAMx performance appears better during the winter period (i.e., Q1 and Q4), whereas the CMAQ/CALPUFF performance is better during the summer (e.g., Q3). Overall, 2007 CAMx is usually exhibiting lower error and definitely lower annual bias when compared to the 2002 CMAQ/CALPUFF model performance. Thus, the 2007 CAMx $PM_{2.5}$ model performance is comparable and even arguably better than what was used in the previous $PM_{2.5}$ SIP.

[26] http://www.achd.net/air/publichearing/PM2.5%20SIP/Appendix%20K.pdf

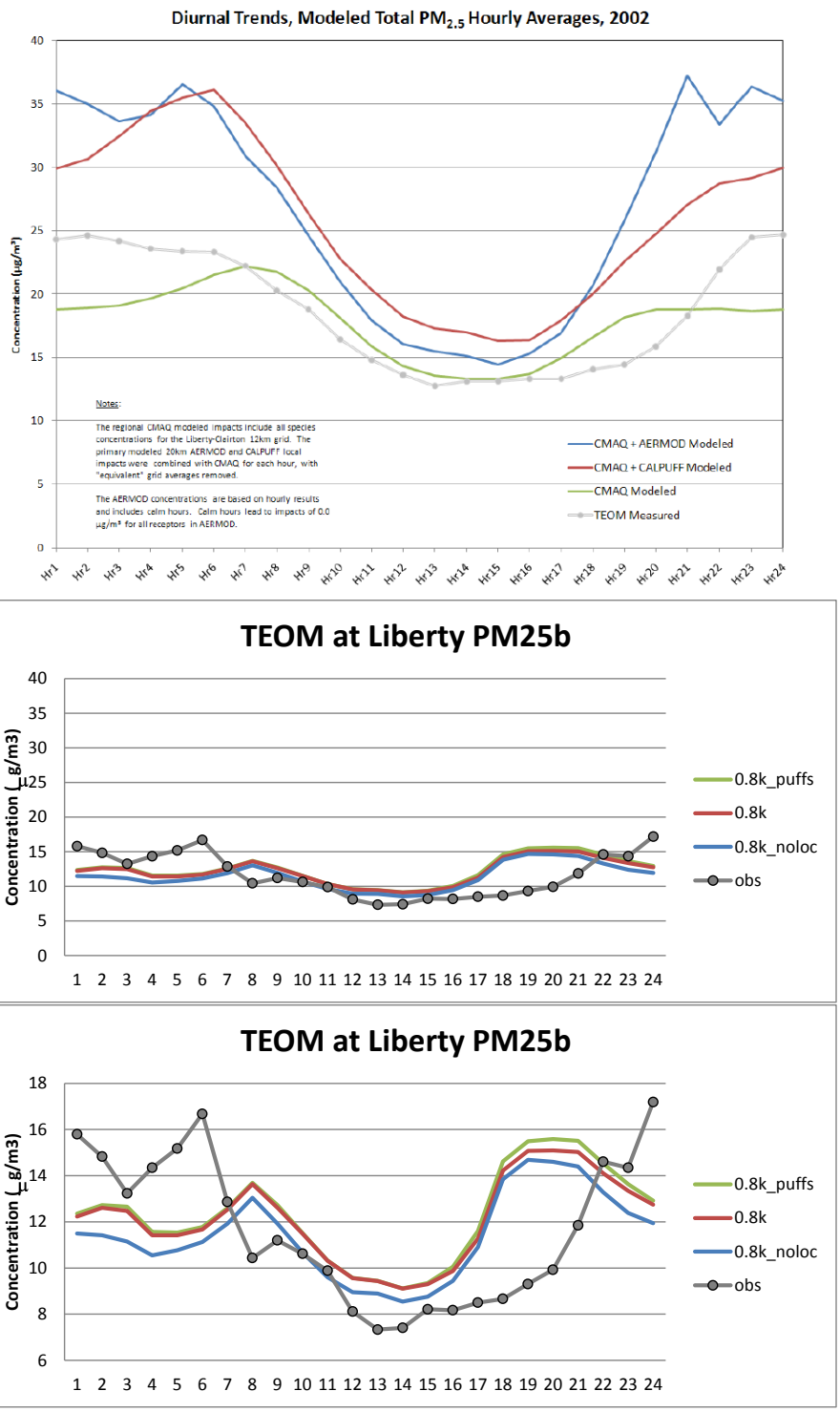


Figure 7-35. Comparison of annual average diurnal varying observed TEOM $PM_{2.5}$ concentrations with modeled values from 2002 CMAQ, CMAQ/CALPUFF and CMAQ/AERMOD from the previous Liberty-Clairton $PM_{2.5}$ SIP modeling (ACHD, 2011) and from the CAMx 0.8 km revised 2007 base case from this study using two scales.

7.6.2 Local Source Contribution from the Model and from Observations

The ACHD analyzed speciated $PM_{2.5}$ observations at four CSN sites in southwest Pennsylvania to determine the composition of the excess $PM_{2.5}$ at the Liberty monitoring site compared to surrounding sites that is assumed to be the contributions due to local sources. More specifically, the difference in the SANDWICH processed (Frank, 2006a,b) speciated $PM_{2.5}$ observations from the Liberty CSN site and the average of the Florence, Lawrenceville and Greensburg CSN sites from 2005-2009 was used to define the contributions of local sources to $PM_{2.5}$ at Liberty. Using this approach, ACHD found that on average local sources contributed 4.6 $\mu g/m^3$ of the $PM_{2.5}$ at Liberty (see Figure 2-6). The 2007 CAMx model was run tracking the $PM_{2.5}$ contributions associate with local sources using the PiG subgrid-scale Gaussian puff module and, when the mass is released from the PiG puffs to the grid model, by the PSAT source apportionment tool for most species (exceptions are Cl, Na, SOA and water). The total CAMx $PM_{2.5}$ concentrations at Liberty were obtained by adding in the average of the $PM_{2.5}$ concentrations across the Liberty 100 m receptor network from the PiG live puffs to the CAMx concentration estimate for the 0.8 km grid cell containing Liberty. The CAMx results without the local sources were obtained by subtracting the PSAT $PM_{2.5}$ concentrations due to the local sources from the CAMx 0.8 km grid cell average model estimate. Note that the ACHD local source excess $PM_{2.5}$ analysis includes 11 percent as Particle Bound Water (PBW) calculated using the SO4, NO3 and NH4 concentrations and the SANDWICH technique (Figure 2-6). Although PBW is included in the CAMx model through the ISORROPIA aerosol thermodynamics module, it is not included in the PSAT source apportionment tool that traces the PM back to its primary precursor (e.g., SO4 is traced back to SO2 and SO4 emissions). Also note that the SANDWICH observed local source contribution uses the Degree of Neutralization (DON) to estimate NH4 from the excess SO4 and NO3 concentrations. Again, the CAMx PSAT local source contributions will trace the NH4 back to its primary precursor (NH3). Since ammonia (NH3) emissions come primarily from livestock and fertilizer application, we would expect very little PSAT NH4 from local sources. Thus, the CAMx local source $PM_{2.5}$ contribution was calculated two ways: (1) using the PSAT NH4 contribution from local sources; and (2) using a derived NH4 (NH4d) using the SO4 contribution and the average of the DON value in the Liberty SANDWICH analysis (i.e., DON = 0.356).

Table 7-13 compares the SANDWICH observed local source $PM_{2.5}$ contributions at Liberty with the modeled values. The "observed" annual total $PM_{2.5}$ value due to local sources without PBW is 4.1 $\mu g/m^3$ with corresponding modeled values using the CSN 1:6 day sampling frequency of 2.5 and 2.6 $\mu g/m^3$ depending on whether PSAT NH4 or derived NH4 is used. The modeled local source $PM_{2.5}$ contributions are almost 40% below the observed value. Using the TEOM everyday sampling frequency the modeled local source contribution is 3.1 $\mu g/m^3$, which is 24% below the observed value. Note that the comparison on an individual species basis are not as good with the observed values having much higher OC and the modeled values having much higher OPM2.5. This is not surprising given the SANDWICH technique to obtain OC using mass balance and the CAMx emission inputs that speciates all of the $PM_{2.5}$ to OPM2.5 that is not explicitly speciated to SO4, NO3, NH4, EC or OC. However, the analysis does suggest that there

may be issues with the $PM_{2.5}$ speciation profiles of the local sources used in the emissions modeling.

Table 7-13. Comparison of modeled and estimated observed annual excess $PM_{2.5}$ concentrations at Liberty due to local sources using the CSN 1:6 day sampling frequency.

	SO4	NO3	NH4	NH4d	EC	OC	OPM2.5	$PM_{2.5}$
SANDWICH Observed	0.88	0.00	0.42	(0.42)	1.39	1.11	0.32	4.12
CAMx Total All Sources	5.09	1.14	1.50	--	1.44	2.60	5.01	16.73
CAMx No Local Source	4.75	1.13	1.41	--	1.22	2.41	3.31	14.20
CAMx Local Source#1	0.34	0.01	0.09	--	0.22	0.19	1.70	2.54
CAMx Local Source#2	0.34	0.01	--	0.12	0.22	0.19	1.70	2.59

7.7 Model Performance Evaluation Conclusions

The CAMx revised 2007 base case $PM_{2.5}$ model performance is reasonably good and almost always achieves the PM Performance Goals across the 12, 4 and 0.8 km domains and at the Liberty monitoring site. The $PM_{2.5}$ model performance is generally characterized by a summer underestimation and winter overestimation bias. The performance for speciated $PM_{2.5}$ concentrations is not as good as was seen for total $PM_{2.5}$ mass with good SO4 and NH4 model performance, an underestimation bias for NO3 and TCM and an overestimation bias for OPM2.5. Part of these performance attributes are due to differences in how species are defined in the modeling and observations.

The CAMx revised 2007 base case $PM_{2.5}$ model performance was compared with the 2002 CMAQ/CALPUFF model performance used in the previous Liberty-Clairton $PM_{2.5}$ SIP modeling and found that their $PM_{2.5}$ model performance was comparable. The 2007 CAMx exhibited superior $PM_{2.5}$ performance than 2002 CMAQ/CALPUFF on an annual basis and for the colder months, whereas 2002 CMAQ/CALPUFF $PM_{2.5}$ model performance was superior for the warmer months. Looking at all time periods the 2007 CAMx base case $PM_{2.5}$ model performance was comparable or arguably better than that exhibited by the 2002 CMAQ/CALPUFF modeling from the previous SIP.

The ACHD (2012a) estimate of the SANDWICH $PM_{2.5}$ contributions of local sources without PBW was 4.1 $\mu g/m^3$. The 2007 CAMx base case local contribution using the everyday TEOM measurements was 3.1 $\mu g/m^3$, which agrees within -24% albeit underestimating the local source contribution.

Comparing the CAMx revised 2007 base case modeling performance with the CAMx preliminary 2007 base case (Morris et al., 2012a) reveals that the revised run exhibits much better performance for $PM_{2.5}$, SO4 and NH4, comparable performance for TCM and OPM2.5, and slightly degraded performance for NO3.

The EPA attainment demonstration modeling methodology for projecting future year $PM_{2.5}$ Design Values is to use the model in a relative basis to scale the observed speciated $PM_{2.5}$ concentrations from the current to future year using relative response factors (RRFs) (EPA, 2007; Timin, 2005; 2007). RRFs are defined as the ratio of the future to current year speciated $PM_{2.5}$ concentrations at a monitoring site Thus, any underestimation or overestimation bias in the 2007 base year modeling would also be present in the future year modeling so taking their ratio would cancel out some of those effects. EPA has also developed special procedures for using the CSN speciated $PM_{2.5}$ data to speciate the FRM total $PM_{2.5}$ mass measurements that accounts for the measurement technology artifacts (Frank, 2006a,b).

Based on this analysis we conclude that the current CAMx revised 2007 base case is suitable for making future year $PM_{2.5}$ projections and performing $PM_{2.5}$ attainment demonstration modeling at the Liberty monitoring site. However, we recommend that additional weight of evidence analysis be performed to support and corroborate the model based attainment demonstration modeling.

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G-3: Air Quality Modeling TSD

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Air Quality Technical Support Document (AQTSD) for the Proposed Revision to the Allegheny County Portion of the Pennsylvania State Implementation Plan (SIP)

Draft Final Report

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ENVIRON

CONTENTS

1.0 INTRODUCTION 1

1.1 Background 1
1.2 Purpose 1

2.0 OVERVIEW OF APPROACH 3

2.1 Episode Selection 3
2.2 Model Selection 3
2.3 Domain Selection 3
2.4 Vertical Layer Structure 7
2.5 Meteorological Modeling 8
2.6 Emissions Modeling 8
2.7 CAMx 2007 Base Case Modeling 8
2.8 Model Performance Evaluation 9
2.9 Vertical Layer Sensitivity Test 13
2.10 Local Source Contribution 15
2.11 2014 CAMx Modeling 15
2.12 Local Source AERMOD Modeling 15
2.13 2014 Attainment Demonstration Modeling 18

3.0 ATTAINMENT DEMONSTRATION MODELING 19

3.1 2007 and 2014 Base Case Modeling 19
3.2 Modeled Attainment Demonstration Approach 20
3.2.1 Current Year Design Values 21
3.2.2 Monitoring Data Assumptions 21
3.2.3 Annual $PM_{2.5}$ Design Value Projection Approach 22
3.2.4 24-Hour $PM_{2.5}$ Design Value Projection Approach 25
3.3 $PM_{2.5}$ Design Value Projections at Liberty and Clairton 26
3.3.1 Annual $PM_{2.5}$ Projections at Liberty and Clairton 26
3.3.2 24-Hour $PM_{2.5}$ Projections at Liberty and Clairton 27
3.4 Annual and 24-Hour $PM_{2.5}$ Projections using MATS 28
3.4.1 MATS Annual $PM_{2.5}$ Projections 28
3.4.2 MATS 24-Hour $PM_{2.5}$ Projections 30
3.4.3 MATS Unmonitored Area Analysis 32
3.5 Modeled Attainment Test Conclusions 36

4.0 REFERENCES 37

Tables

Table 2-1. WRF 37 and CAMx 25 vertical layer structure. 7

Table 2-2. Comparisons of annual FRM $PM_{2.5}$ fractional bias and error performance statistics with the PM Performance Goals and Criteria for the 12, 4 and 0.8 km domains and the CAMx revised 2007 base case simulation. 10

Table 2-3. Comparisons of annual CSN and IMPROVE $PM_{2.5}$ fractional bias and error performance statistics for the CAMx revised 2007 base case simulation with the PM Performance Goals and Criteria for the 12, 4 and 0.8 km domains. 10

Table 3-1a. 2007 and 2014 emissions in the Liberty-Clairton region in tons per year (TPY) and their percent differences by major source category. 19

Table 3-1b. 2007 and 2014 emissions in the Liberty-Clairton region in tons per year (TPY) and their percent differences by major source category. 19

Table 3-2. 2005 and 2014 total NO_X and SO_2 emissions and their differences in six states from the CSAPR 2005 base and 2014 remedy cases (Source: EPA, 2011a). 20

Table 3-3. Calculation of current year 24-hour $PM_{2.5}$ Design Value (DVC) at Liberty used in making future year 2014 Design Value projections. 21

Table 3-4. Annual $PM_{2.5}$ Design Value projections at Liberty using the Total Species approach. 26

Table 3-5. Annual $PM_{2.5}$ Design Value projections at Liberty using the Regional/Local Species approach. 27

Table 3-6. Current year (DVC) and projected 2014 future year (DVF) annual $PM_{2.5}$ Design Values at FRM monitoring sites in the 0.8 km modeling domain ($\mu g/m^3$) using the MATS. 29

Table 3-7. Current year (DVC) and projected 2014 future year (DVF) annual $PM_{2.5}$ Design Values at FRM monitoring sites in the 4 km modeling domain ($\mu g/m^3$) using the MATS. 30

Table 3-8. Current year (DVC) and projected 2014 future year (DVF) 24-Hour $PM_{2.5}$ Design Values at FRM monitoring sites in the 0.8 km modeling domain ($\mu g/m^3$) using the MATS. 31

Table 3-9. Current year (DVC) and projected 2014 future year (DVF) 24-Hour $PM_{2.5}$ Design Values at FRM monitoring sites in the 4 km modeling domain ($\mu g/m^3$) using the MATS. 32

Figures

Figure 2-1. Definitions of the 36/12/4/0.8 km domain structure proposed for the WRF meteorological (dotted lines) and CAMx (solid lines) photochemical grid modeling (note: 12, 4 and 0.8 km grid definitions do not include buffer cells that are needed when using two-way grid nesting). 5

Figure 2-2. 4 km SWPA and original proposed 800 m Liberty-Clairton domain structure for SMOKE emissions and CAMx photochemical grid modeling. 5

Figure 2-3. Comparison of the original proposed 75 x 60 0.8 km modeling domain with the final 45 x 45 0.8 km modeling domain (red) used in the CAMx modeling. Also shown are the locations of FRM and CSN monitoring sites (black and blue symbols) and local sources (red symbols) that are treated by the CAMx Plume-in-Grid (PiG) subgrid-scale puff module (note: 12, 4 and 0.8 km grid definitions do not include buffer cells that are needed when using two-way grid nesting). 6

Figure 2-4. Soccer Plots comparing FRM $PM_{2.5}$ monthly FB and FE with the PM Performance Goals and Criteria for the 12 km (top), 4 km (middle) and 0.8 km (bottom) domains. 11

Figure 2-5. Monthly soccer plot for TEOM hourly $PM_{2.5}$ concentrations at the Liberty monitor using the CAMx 0.8 km revised 2007 base case modeling results. 12

Figure 2-6. Comparison of the predicted and observed 24-hour (top) and hourly (bottom) $PM_{2.5}$ time series and model performance statistics for the CAMx 2007 base case using 25 vertical layers and the no layer collapsing sensitivity case using 36 vertical layers. 14

Figure 2-7. Soccer plot of 24-hour $PM_{2.5}$ model performance at Liberty for the CAMx regional (CAMx no local) estimates without local sources and CAMx treating local sources with PiG (CAMx+PiG) and CAMx regional plus AERMOD local source contributions (CAMx+AERMOD). 16

Figure 2-8. Q-Q plot of 24-hour $PM_{2.5}$ model performance at Liberty for the CAMx regional (CAMx no local) estimates without local sources and CAMx treating local sources with PiG (CAMx+PiG) and CAMx regional plus AERMOD local source contributions (CAMx+AERMOD).....17

Figure 3-1. MATS Unmonitored Area Analysis (UAA) for annual $PM_{2.5}$ Design Values in the 0.8 km Liberty-Clairton modeling domain and the current year DVC (left) and projected 2014 future year DVF (right).....34

Figure 3-2. MATS Unmonitored Area Analysis (UAA) for annual $PM_{2.5}$ Design Values in the 4 km SWPA modeling domain and the current year DVC (left) and projected 2014 future year DVF (right). 35

Figure 3-3. Differences in current and future (2014) year annual $PM_{2.5}$ Design Values (DVF-DVC) in the 0.8 km Liberty-Clairton (left) and 4 km SWPA (right) modeling domains using the MATS Unmonitored Area Analysis (UAA). 36

1.0 INTRODUCTION

This document presents details on the $PM_{2.5}$ attainment demonstration modeling for the Liberty-Clairton nonattainment area to address the 2006 $PM_{2.5}$ National Ambient Air Quality Standard (NAAQS).

1.1 Background

In 1997, the United States (U.S.) Environmental Protection Agency (EPA) promulgated a fine particulate matter ($PM_{2.5}$) National Ambient Air Quality Standard (NAAQS) with thresholds of 15 $\mu g/m^3$ on an annual basis and 65 $\mu g/m^3$ on a 24-hour basis. The annual $PM_{2.5}$ NAAQS is based on a three-year average, whereas the 24-hour $PM_{2.5}$ NAAQS is based on the three-year average of the 98th percentile (8th highest with complete daily capture) 24-hour $PM_{2.5}$ concentrations. Most of the Pittsburgh Metropolitan Statistical Area (MSA) was designated a $PM_{2.5}$ nonattainment area (NAA) called the Pittsburgh-Beaver Valley NAA. One portion of southwestern Allegheny County within the Pittsburgh-Beaver Valley NAA was designated a separate $PM_{2.5}$ NAA (the Liberty-Clairton NAA) because of its unique combination of local as well as regional source contributions to $PM_{2.5}$ exceedances not seen at the other monitors in the Pittsburgh-Beaver Valley NAA. On April 2011 Allegheny County Health Department (ACHD) released a $PM_{2.5}$ attainment demonstration for the Liberty-Clairton NAA that demonstrated the region would achieve the 1997 $PM_{2.5}$ NAAQS by 2012 (ACHD, 2011a[1]). The ACHD April 2011 $PM_{2.5}$ attainment demonstration modeling used the Community Multiscale Air Quality (CMAQ) photochemical grid model to address the regional and the CALPUFF Gaussian puff model to address the local source components of the $PM_{2.5}$ problem in the Liberty-Clairton NAA.

On December 18, 2006 EPA revised the $PM_{2.5}$ NAAQS by keeping the annual NAAQS the same but lowering the 24-hour $PM_{2.5}$ NAAQS from 65 to 35 $\mu g/m^3$. Based on 2006-2008 monitoring data, in December 2009 the Liberty-Clairton area was designated a $PM_{2.5}$ NAA due to violations of both the annual (18.3 $\mu g/m^3$) and 24-hour (54 $\mu g/m^3$) 2006 $PM_{2.5}$ NAAQS so that a $PM_{2.5}$ SIP is due by December 2012 that demonstrates the region will attain the 2006 NAAQS by 2014.

1.2 Purpose

This document is the Air Quality Technical Support Document (AQTSD) for the Liberty-Clairton $PM_{2.5}$ SIP that presents the attainment demonstration modeling for the 2006 $PM_{2.5}$ NAAQS. The Comprehensive Air-quality Model with extensions (CAMx) photochemical grid model (PGM) was applied for the 2007 calendar year on a 36/12/4/0.8 km resolution nested grid structure with the 0.8 km domain focused on the Liberty-Clairton NAA and the 4 km domain focused on southwestern Pennsylvania (SWPA). The modeled total $PM_{2.5}$ mass, speciated $PM_{2.5}$ and other concentrations were compared against concurrent observations as part of a model performance evaluation (MPE) whose details are presented in another report (Morris et al., 2012). Local sources were treated by a subgrid-scale Plume-in-Grid (PiG) module that uses a Gaussian puff model to simulate the plume impacts of local sources until the size of the plume is big enough to be resolved by the 0.8 km grid size used. Once released into the grid model,

[1] http://www.achd.net/airqual/Liberty-Clairton_PM2.5_SIP-Apr2011.pdf

the contributions of the local sources were tracked using the Particulate Source Apportionment Technology (PSAT) source apportionment tool. CAMx was also applied for a 2014 emissions scenario that reflected the effects of growth and emission controls on the local and regional sources (e.g., the Cross State Air Pollution Rule, CASPR[2]). The CAMx 2007 and 2014 modeling results were used to project future year annual and 24-hour $PM_{2.5}$ Design Values for comparison with the 2006 $PM_{2.5}$ NAAQS.

[2] http://www.epa.gov/airtransport/

2.0 OVERVIEW OF APPROACH

Below we present an overview of the approach used for the Liberty-Clairton $PM_{2.5}$ attainment demonstration modeling to address the 2006 $PM_{2.5}$ NAAQS. More details on the approach are provided in the Liberty-Clairton attainment demonstration Modeling Protocol (ACHD, 2011b) and the 2007 base case modeling and model performance evaluation (Morris et al., 2012) reports.

2.1 Episode Selection

The 2007 year was selected for the Liberty-Clairton $PM_{2.5}$ attainment demonstration modeling because it was the most appropriate year for modeling during the 2006-2008 three-year period used to designate the Liberty-Clairton as a $PM_{2.5}$ NAA.

2.2 Model Selection

Three types of models were used in the Liberty-Clairton attainment demonstration modeling: meteorological, emissions and air quality models.

- The Weather Research and Forecasting (WRF[3]) meteorological model was selected to generate the 2007 three dimensional winds, temperature and other meteorological variables needed for air quality and emissions modeling (Skamarock, 2004; 2005; 2006; 2008).
- Emissions modeling was performed using the Sparse Matrix Operator Kernel Emissions (SMOKE[4]) modeling system (Coats, 1995; Houyoux, et al., 2000). For on-road mobile sources the Motor Vehicle Emissions Simulator (MOVES[5]) model was used. Biogenic emissions were generated using the Biogenic Emissions Inventory System (BEIS[6]).
- The Comprehensive Air-quality Model with extensions (CAMx[7]) Photochemical Grid Model (PGM) was selected for the Liberty-Clairton attainment demonstration modeling (ENVIRON, 2011).

2.3 Domain Selection

A preliminary 36/12/4/0.8 km domain structure was selected for the WRF and SMOKE/CAMx modeling as shown in Figures 2-1 and 2-2. The four domains use a Lambert Conic Conformal (LCC) projection. The LCC grid projection has a pole of projection of 40 degrees North, -97 degrees East and standard parallels of 33 and 45 degrees, the so-called RPO projection. The four domains are defined as given in Figure 2-1 and are as follows:

- A 36 km continental U.S. (CONUS) domain that is defined to be the standard RPO domain that is routinely used in many photochemical modeling studies.

[3] http://www.wrf-model.org/index.php
[4] http://www.smoke-model.org/index.cfm
[5] http://www.epa.gov/otaq/models/moves/index.htm
[6] http://www.epa.gov/AMD/biogen.html
[7] http://www.camx.com/home.aspx

- A 12 km NEUS domain that includes states in the Midwestern and Northeastern U.S. that the Cross State Air Pollution Rule (CSAPR[8]) identified as contributing significantly to $PM_{2.5}$ nonattainment at Liberty. The CAMx revised 2007 base case simulation for the 36 km CONUS 12 km NEUS domains was performed using two-way grid nesting with the results post-processed to generate BCs for the 4 km SWPA domain.
- A 4 km domain that covers southwestern Pennsylvania (SWPA) and adjacent areas in West Virginia and Ohio.
- A nested grid of 0.8 km (800 m) for the area within and surrounding the Liberty-Clairton area. The 4 km and 0.8 km domains are run linked together using two-way grid nesting.

The WRF domains are defined to be slightly larger than the CAMx/SMOKE domains to eliminate any boundary artifacts in the WRF simulations from influencing the CAMx meteorological inputs. WRF can sometimes produce modeling artifacts near its boundaries as the meteorological variables from the boundary conditions come into dynamic balance with WRF's numerical algorithms. By specifying a few grid cell buffers between the WRF and CAMx boundaries we can be sure that no artifacts are in the CAMx meteorological inputs. WRF domains are defined with at least a 5-grid cell buffer in all directions from the CAMx domains.

[8] http://www.epa.gov/airtransport/

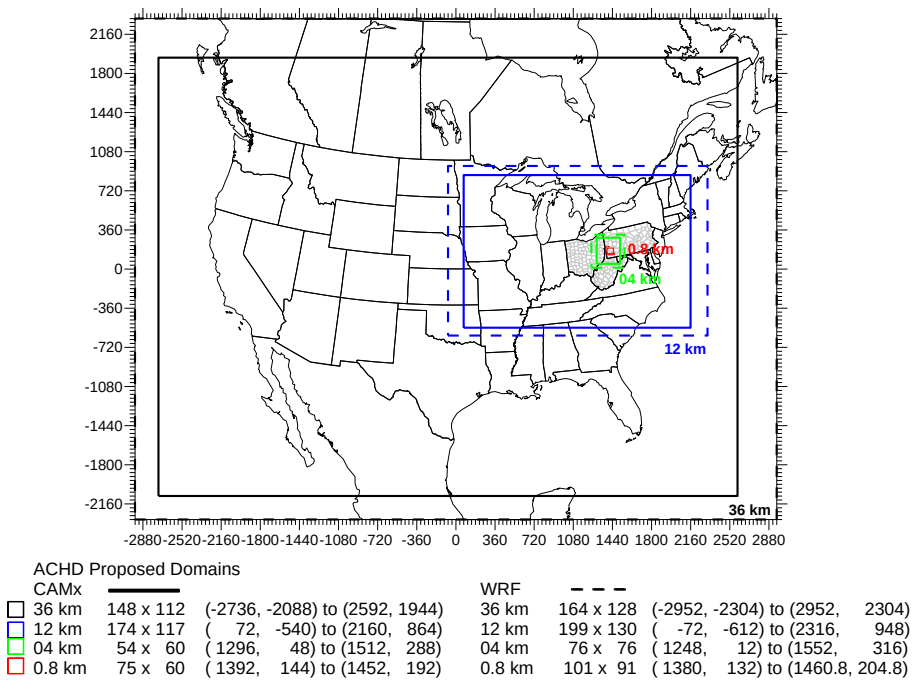


Figure 2-1. Definitions of the 36/12/4/0.8 km domain structure proposed for the WRF meteorological (dotted lines) and CAMx (solid lines) photochemical grid modeling (note: 12, 4 and 0.8 km grid definitions do not include buffer cells that are needed when using two-way grid nesting).

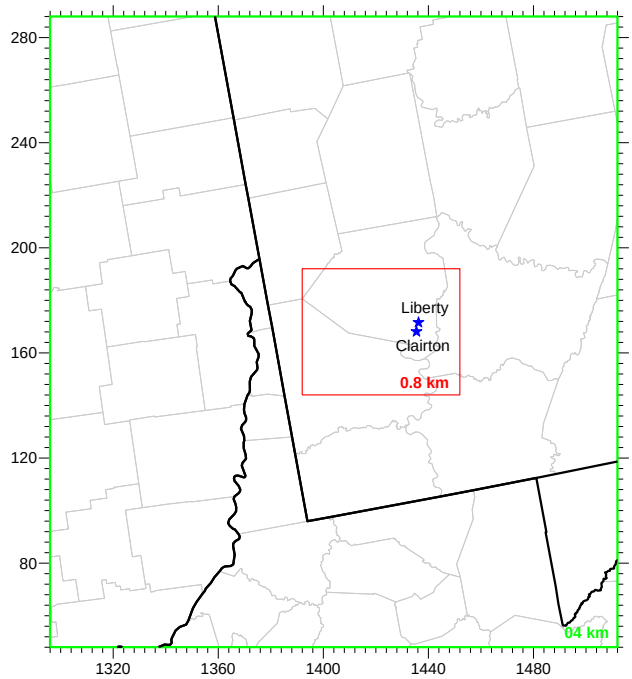


Figure 2-2. 4 km SWPA and original proposed 800 m Liberty-Clairton domain structure for SMOKE emissions and CAMx photochemical grid modeling.

Initial tests of CAMx using the 4/0.8 km two-way grid nesting configuration found the model run times for the 2007 calendar year simulation would be excessively long. To reduce the run time, the 0.8 km domain proposed in the Modeling Protocol (ACHD, 2011b) was reduced by approximately a factor of 2. Figure 2-3 displays the original proposed 75 x 60 0.8 km domain and the final 45 x 45 0.8 km domain used in the CAMx modeling. Also shown in Figure 2-3 are the locations of the Liberty, Clairton and two other FRM $PM_{2.5}$ monitoring sites (blue) and the local sources (red symbols). The new 0.8 km domain still completely contains the Liberty-Clairton NAA and all monitoring sites and local sources of interest so does not in any way compromise the purpose for using the 0.8 km fine grid domain.

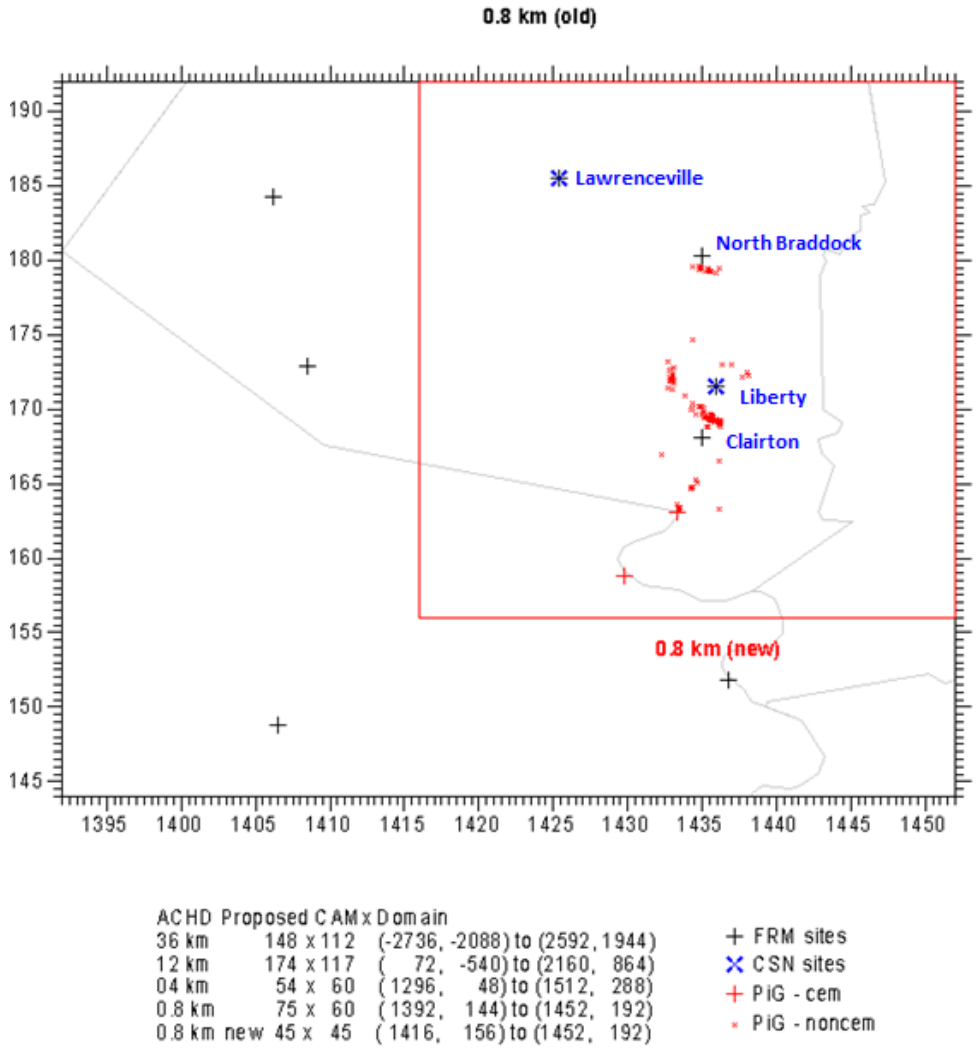


Figure 2-3. Comparison of the original proposed 75 x 60 0.8 km modeling domain with the final 45 x 45 0.8 km modeling domain (red) used in the CAMx modeling. Also shown are the locations of FRM and CSN monitoring sites (black and blue symbols) and local sources (red symbols) that are treated by the CAMx Plume-in-Grid (PiG) subgrid-scale puff module (note: 12, 4 and 0.8 km grid definitions do not include buffer cells that are needed when using two-way grid nesting).

2.4 Vertical Layer Structure

WRF was configured with 37 vertical layer interfaces (36 vertical layers using CAMx definition) from the surface to 50 mb (approximately 19 km above MSL). The WRF output was processed using the WRFCAMx collapsing the 37 WRF layers to 25 for CAMx modeling (Table 2-1).

Table 2-1. WRF 37 and CAMx 25 vertical layer structure.

WRF Meteorological Model					CAMx Air Quality Model		
WRF Layer	Sigma	Pressure (mb)	Height (m)	Thickness (m)	CAMx Layer	Height (m)	Thickness (m)
37	0.0000	50.00	19260	2055	25	19260.0	3904.9
36	0.0270	75.65	17205	1850			
35	0.0600	107.00	15355	1725	24	15355.1	3425.4
34	0.1000	145.00	13630	1701			
33	0.1500	192.50	11930	1389	23	11929.7	2569.6
32	0.2000	240.00	10541	1181			
31	0.2500	287.50	9360	1032	22	9360.1	1952.2
30	0.3000	335.00	8328	920			
29	0.3500	382.50	7408	832	21	7407.9	1591.8
28	0.4000	430.00	6576	760			
27	0.4500	477.50	5816	701	20	5816.1	1352.9
26	0.5000	525.00	5115	652			
25	0.5500	572.50	4463	609	19	4463.3	609.2
24	0.6000	620.00	3854	461	18	3854.1	460.7
23	0.6400	658.00	3393	440	17	3393.4	439.6
22	0.6800	696.00	2954	421	16	2953.7	420.6
21	0.7200	734.00	2533	403	15	2533.1	403.3
20	0.7600	772.00	2130	388	14	2129.7	387.6
19	0.8000	810.00	1742	373	13	1742.2	373.1
18	0.8400	848.00	1369	271	12	1369.1	271.1
17	0.8700	876.50	1098	177	11	1098.0	176.8
16	0.8900	895.50	921	174	10	921.2	173.8
15	0.9100	914.50	747	171	9	747.5	170.9
14	0.9300	933.50	577	84	8	576.6	168.1
13	0.9400	943.00	492	84			
12	0.9500	952.50	409	83	7	408.6	83.0
11	0.9600	962.00	326	82	6	325.6	82.4
10	0.9700	971.50	243	82	5	243.2	81.7
9	0.9800	981.00	162	41	4	161.5	64.9
8	0.9850	985.75	121	24			
7	0.9880	988.60	97	24	3	96.6	40.4
6	0.9910	991.45	72	16			
5	0.9930	993.35	56	16	2	56.2	32.2
4	0.9950	995.25	40	16			
3	0.9970	997.15	24	12	1	24.1	24.1
2	0.9985	998.58	12	12			
1	1.0000	1000	0			0	

2.5 Meteorological Modeling

The Weather Research and Forecasting (WRF[9]) model (Skamarock et al., 2008), more specifically, the Advanced Research WRF dynamic core (WRF-ARW, henceforth simply called WRF), was used to simulate three-dimensional meteorological conditions for the 2007 modeling year. Details on the results of the WRF model application and evaluation are contained in McNally and Loomis (2012). The WRF model output was processed using the WRFCAMx processor to generate the hourly meteorological fields used by CAMx for the 2007 year and the 36/12/4/0.8 km modeling domains.

2.6 Emissions Modeling

The Sparse Matrix Operator Kernel Emissions (SMOKE; Coats, 1995; Houyoux et al., 2000) modeling system was used to generate the hourly gridded speciated emissions inputs for the CAMx model, the 2007 year and the 36/12/4/0.8 km domains. Biogenic emissions were generated using the SMOKE-BEIS model and on-road mobile sources were based on the Motor Vehicle Emissions Simulator (MOVES) model.

The emissions databases used for the 2007 base year were provided by a variety of sources. The emissions data for the 0.8 km fine grid was developed and provided for modeling by ACHD. Emissions data for areas outside of the 0.8 km grid were provided by MARAMA, SEMAP, LADCO, and EPA. The emissions data were then processed with SMOKE to provide the hourly, gridded, speciated files required by CAMx. State emissions databases were provided by the following groups:

- MARAMA – Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts , New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia.
- SEMAP/SESARM – Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and West Virginia.
- Midwest RPO (LADCO) States – Illinois, Indiana, Michigan, Ohio and Wisconsin.
- EPA 2008 NEIv1.5 was used for all other states
- ACHD and Transsystems|Pechan provided emissions inventories for the local sources.

2.7 CAMx 2007 Base Case Modeling

An updated version of the CAMx Version 5.4 (released in October 2011, ENVIRON, 2011) was used for the 2007 base case modeling. The update consisted of a correction to the CAMx in-line Tropospheric Ultraviolet and Visible (TUV) photolysis rate adjustment that attenuates photolysis rates based on the model estimated particulate matter concentrations. CAMx was first run for the 36/12 km domains using Boundary Conditions (BCs) for the 36 km CONUS domain based on the MOZART global chemistry model. The CAMx 36/12 km model output was post-processed to generate BCs for the 4 km SWPA domain. CAMx was then exercised for the

[9] http://www.wrf-model.org/index.php

2007 base case using two-way grid nesting with the 4/0.8 km modeling domains. Local sources were treated using the subgrid-scale Plume-in-Grid (PiG) module. The PiG module treats the early chemistry and dispersion of point source plumes using a Gaussian puff model. When the size of the PiG puff is commensurate with the size of the 0.8 km grid cell the mass from the puff is released to the photochemical grid model. The local sources were also tagged to be treated by the Particulate Source Apportionment Technology (PSAT) that tracked the contributions of the local sources to all particulate species except secondary organic aerosol (SOA) (e.g., sulfate, nitrate, ammonium and primary PM). SOA was not tracked due to the small amount of SOA precursors from the local sources, the short distance from the local sources to the Liberty monitor so there would be little time for SOA formation and the expense due to the many tracers needed to account for the SOA formation pathways in the PSAT source apportionment tool. The CAMx PiG puffs were sampled at 100 m receptors surrounding the Liberty and Clairton monitoring sites. The total concentrations in each CAMx 0.8 km grid cell were obtained by averaging the live puffs sampling across all the receptors in a grid cell with the CAMx grid model estimate (0.8k_puffs). The CAMx concentration estimates without the local source contributions are obtained by subtracting the PSAT local source contribution from the CAMx grid model estimate (without live puff receptor contributions) (0.8k_nolocal). The local source $PM_{2.5}$ contribution can then be obtained by taking the difference between the 0.8k_puffs and 0.8k_nolocal concentration estimates.

2.8 Model Performance Evaluation

The CAMx 36/12/4/0.8 km modeling results were compared against measured ambient concentrations as part of a model performance evaluation. CAMx was evaluated for total $PM_{2.5}$ mass, speciated $PM_{2.5}$, ozone and $PM_{2.5}$ precursor and product species (e.g., NO_X, SO_2, HNO_3 and wet sulfate, nitrate and ammonium deposition). Details of the CAMx 2007 base case model performance evaluation is presented in Morris et al., 2012, with a summary for total $PM_{2.5}$ mass model performance given below.

Total $PM_{2.5}$ mass is evaluated using data from the FRM, CSN and IMPROVE networks and at the Liberty TEOM monitoring site. Table 2-2 displays the annual fractional bias and error performance statistics across the FRM network in the 12, 4 and 0.8 km domains using the 24-hour total $PM_{2.5}$ mass measurements and compares them with the PM Performance Goals and Criteria. CAMx is exhibiting very low fractional bias (FB) for FRM $PM_{2.5}$ with FB values of +10.5%, +4.6%, and +4.1% for the 12 , 4 and 0.8 km domains, respectively, that not only achieves the PM Performance Goal for bias (≤±30%) but also achieves the more stringent ozone Performance Goal (≤±15%) for bias (EPA, 1991). The FRM $PM_{2.5}$ fractional error is between 35% and 40% across the three domains, which achieves the PM Performance Goal by a fair margin (≤50%), although it is slightly above the more stringent ozone Performance Goal (≤35%). Similar good annual $PM_{2.5}$ model performance statistics are seen across the CSN and IMPROVE monitoring network with FB (-10% to +4%) and FE (38% to 43%) that achieves the PM Performance Goals by a wide margin (Table 2-3).

Table 2-2. Comparisons of annual FRM $PM_{2.5}$ fractional bias and error performance statistics with the PM Performance Goals and Criteria for the 12, 4 and 0.8 km domains and the CAMx revised 2007 base case simulation.

Domain	Number Sites	Fractional Bias	Fractional Error
Performance Goal		≤±30%	≤50%
Performance Criteria		≤±60%	≤75%
12 km Domain	536	+10.5%	38.5%
4 km Domain	30	+4.6%	36.2%
0.8 km Domain	4	+4.1%	37.8%

Table 2-3. Comparisons of annual CSN and IMPROVE $PM_{2.5}$ fractional bias and error performance statistics for the CAMx revised 2007 base case simulation with the PM Performance Goals and Criteria for the 12, 4 and 0.8 km domains.

Domain	Number Sites	Fractional Bias	Fractional Error
Performance Goal		≤±30%	≤50%
Performance Criteria		≤±60%	≤75%
CSN			
12 km Domain	110	+3.2%	38.7%
4 km Domain	8	-9.5%	39.1%
0.8 km Domain	2	-8.9%	40.0%
IMPROVE			
12 km Domains	40	+4.1%	43.2%
4 km Domain	3	+3.1%	38.3%

Soccer plots, which display monthly fractional bias (FB) versus fractional error (FE) performance metrics along with the PM Performance Goals and Criteria, for the FRM network in the 12, 4 and 0.8 km domains are shown in Figure 2-4. The CAMx $PM_{2.5}$ monthly modeling performance across the FRM sites in the 12, 4 and 0.8 km domains achieves the PM Performance Criteria for all months and domains except for December within the 0.8 km domain whose error just barely exceeds the 75% Performance Criteria. Across the 12 km domain, the FRM $PM_{2.5}$ monthly performance exhibits a slight summer underestimation and winter overestimation bias with 10 out of the 12 months achieving the PM Performance Goals; the two months that the CAMx 12 km FRM performance fails to achieve the PM performance goal are December and January that exhibit an overestimation bias such that they fall between the PM Performance Goals and Criteria. Similar performance across the FRM monitors is seen for the CAMx 4 km modeling results with all months achieving the PM Performance Criteria and 10 of 12 months achieving the PM Performance Goal with again January and December being the two months whose performance statistics fall between the PM Performance Goals and Criteria. The CAMx FRM $PM_{2.5}$ performance degrades a little bit across the 0.8 km domain with 8 out of 12 months achieving the PM Performance Goals. The summer underestimation bias increases in the 0.8 km domain modeling so that one month (August) falls just outside of the PM Performance Goal and the winter overestimation bias increases so that the three winter months falling outside of the PM Performance Goal with the overestimation bias for December being so large that it falls just out of the PM Performance Criterion for Fractional Bias.

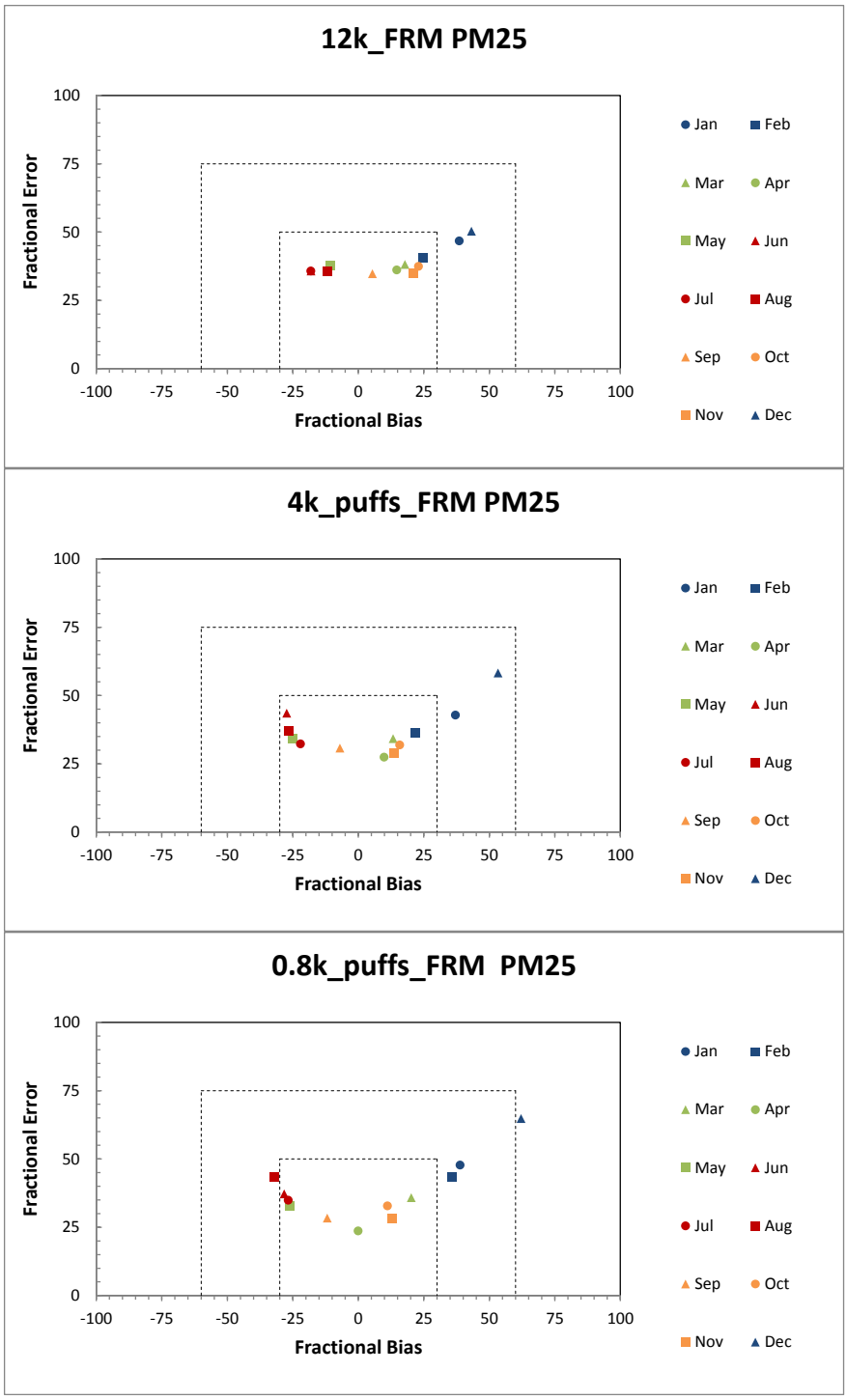


Figure 2-4. Soccer Plots comparing FRM $PM_{2.5}$ monthly FB and FE with the PM Performance Goals and Criteria for the 12 km (top), 4 km (middle) and 0.8 km (bottom) domains.

$PM_{2.5}$ is measured at the Liberty monitoring site using the FRM, CSN and TEOM measurement technology. The CAMx 0.8k_puffs annual performance for 24-hour $PM_{2.5}$ concentrations achieves the PM Performance Goals using the FRM and CSN monitors. The CAMx annual bias (FB) performance for hourly $PM_{2.5}$ using TEOM is near zero and achieves the PM Performance Goal. However, the TEOM hourly $PM_{2.5}$ annual error (FE) exceeds the PM Performance Goal, although the TEOM FE at Liberty it does achieve the PM Performance Criterion. It should be pointed out that the PM Performance Goals and Criteria were developed for 24-hour $PM_{2.5}$ concentrations and one would expect higher error when examining hourly $PM_{2.5}$ concentrations.

Figure 2-5 displays a soccer plot of monthly FB and FE using the TEOM hourly $PM_{2.5}$ data at Liberty. The Liberty monitoring site $PM_{2.5}$ exhibits the same summer underestimation and winter overestimation bias as seen across all sites in the three modeling domains (Figure 2-4). The Liberty TEOM $PM_{2.5}$ FB/FE meets the PM Performance Criteria for all months but December, which fails to achieve the PM Performance Criteria due to a too high overestimation bias and too high of an error. The FB for the transition months of March, April, October and November achieves the PM Performance Goal with the FE right at the PM Performance Goal. The warmer months of May through September have an FB underestimation that falls between the PM Performance Goal and Criterion. Whereas the cooler months of December, January and February have an FB overestimation that fails to achieve the PM Performance Goal.

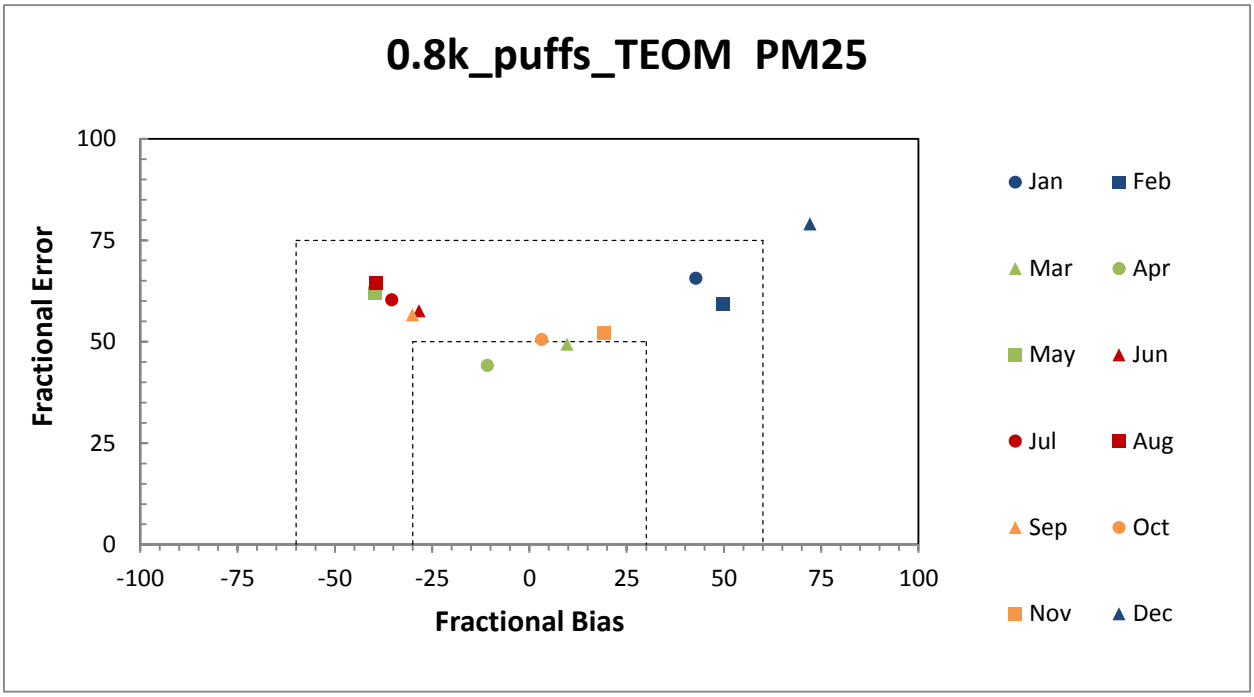
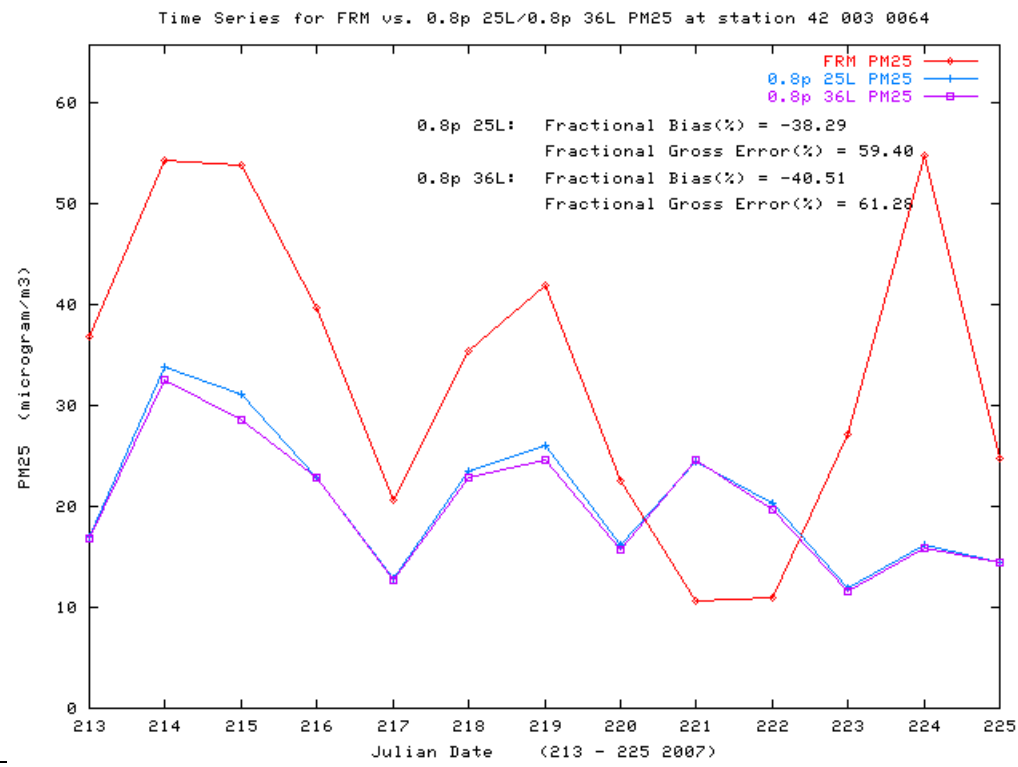


Figure 2-5. Monthly soccer plot for TEOM hourly $PM_{2.5}$ concentrations at the Liberty monitor using the CAMx 0.8 km revised 2007 base case modeling results.

Performance for the speciated $PM_{2.5}$ concentrations tended to be not as good as seen for total $PM_{2.5}$ mass. Sulfate and ammonium model performance was generally good. Nitrate and carbon $PM_{2.5}$ exhibited an underestimation bias, whereas other $PM_{2.5}$ exhibited an overestimation bias. A partial cause for some of these performance issues is due to incommensurability between the measured and modeled species, such as some non-carbon components that are part of the modeled Organic Aerosol species may be in the measured other $PM_{2.5}$ species. In general, the CAMx $PM_{2.5}$ model performance was as good as and even arguably better than the model performance of the previous Liberty-Clairton $PM_{2.5}$ SIP modeling (ACHD, 2011a).

2.9 Vertical Layer Sensitivity Test

One comment received during the review of the Liberty-Clairton $PM_{2.5}$ attainment demonstration Modeling Protocol (ACHD, 2011b) was a concern raised in collapsing the 37 vertical layers in WRF to 25 vertical layers in CAMx (see Table 2-1). In particular, concerns were raised regarding the collapsing of the lower layers in WRF for CAMx modeling because it may inhibit CAMx's ability to simulate the trapping of pollutants in shallow inversion layers as occurs during the highest $PM_{2.5}$ events in the Liberty-Clairton region. A two week no layer collapsing sensitivity test was performed for July 2007 when high observed hourly and 24-hour $PM_{2.5}$ concentrations were observed at Liberty indicating the presence of a nocturnal inversion trapping pollutants. The no layer collapsing sensitivity test directly mapped the WRF 37 vertical layer interfaces to generate 36 vertical layer depths for the CAMx simulation (see Table 2-1). Figure 2-6 compares the hourly and 24-hour $PM_{2.5}$ concentration time series model performance at Liberty for the CAMx 2007 base case with 25 layers and layer collapsing and the 36 layer sensitivity case with no layer collapsing. CAMx exhibits essentially identical $PM_{2.5}$ model performance at Liberty for the two simulations. Thus, there is no benefit from using no layer collapsing in the CAMx modeling. However, there are adverse data processing effects as the no layer collapsing sensitivity test took 20-30% more computer resources.



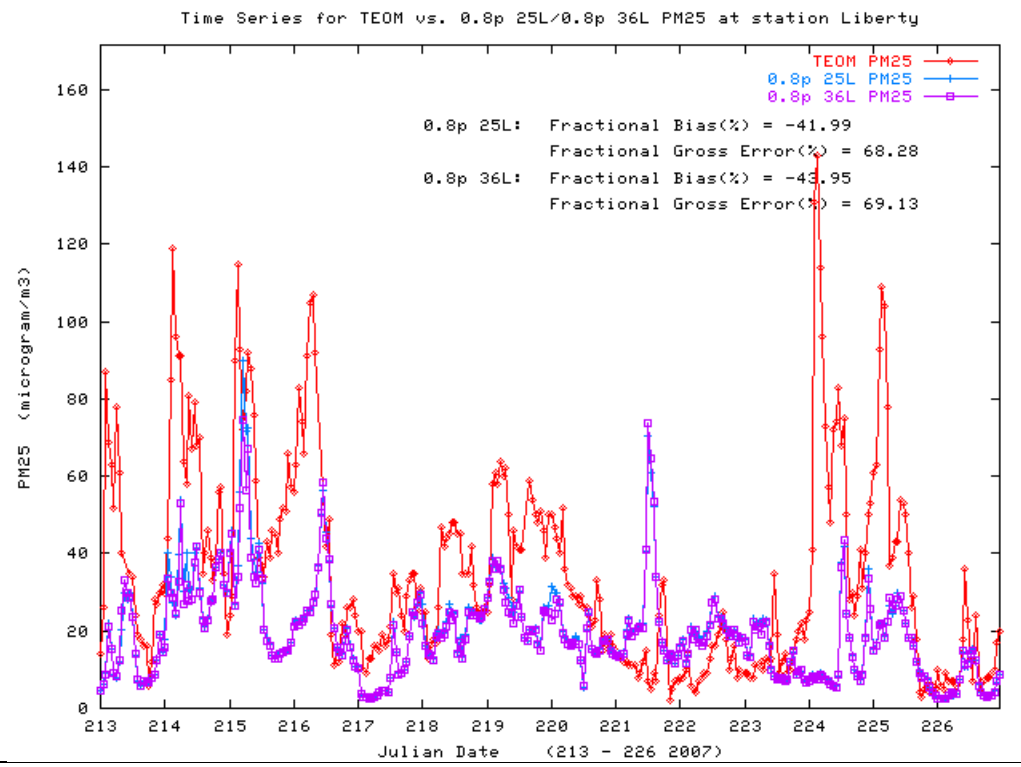


Figure 2-6. Comparison of the predicted and observed 24-hour (top) and hourly (bottom) $PM_{2.5}$ time series and model performance statistics for the CAMx 2007 base case using 25 vertical layers and the no layer collapsing sensitivity case using 36 vertical layers.

2.10 Local Source Contribution

The ACHD performed an analysis to estimate the excess $PM_{2.5}$ concentrations at Liberty compared to surround monitoring sites and found that Liberty was on average 4.1 µg/m^3 higher than the surrounding sites (without accounting for particle bound water, PBW, which they attributed to local sources (ACHD, 2011c). The CAMx annual average $PM_{2.5}$ concentrations due to local sources in 2007 was obtained by the sampling of the local sources PiG live puffs at receptors near Liberty and the local source PSAT contributions at Liberty and found CAMx estimated 2.6-3.1 µg/m^3 $PM_{2.5}$ contribution due to local sources at Liberty; which is ~25-35% lower than the ACHD estimate based on analysis of observations. Thus, the CAMx 0.8 km modeling results with PiG and PSAT is providing a reasonable estimate of the contributions of local sources to annual average $PM_{2.5}$ concentrations at Liberty, albeit with an underestimation bias. We expect CAMx to underestimate the local source contribution because PSAT will not account for the ammonium associated with the local source sulfate and nitrate contributions unless it is due to local source ammonia emissions and due to the numerical diffusion of local source emissions across the 0.8 km grid cell after their emissions are released from the PiG module. However, it should be noted that CAMx underestimates the very highest $PM_{2.5}$ concentrations at Liberty during the warmer months that are due to inversions trapping local emissions (e.g., see Figure 2-6).

2.11 2014 CAMx Modeling

CAMx was exercised for a 2014 base case emissions scenario using the same model configuration as the 2007 base case (i.e., use of 36/12 km and 4/0.8 km two-way grid nests and treating local sources using the PiG module and PSAT tool). The 2014 remedy scenario from the Cross State Air Pollution Rule (CSAPR[10]) was the basis for the 2014 base case emissions scenario with local source updates provided by ACHD. In addition to the CAMx model configuration, several inputs to CAMx were held constant between the 2007 and 2014 base case simulations: MOZART 2007 BCs for the 36 km CONUS domain; WRF 2007 meteorological conditions; biogenic emissions from SMOKE-BEIS; sea salt emissions; and emissions from fires (wildfires, prescribed burns and agricultural burning).

2.12 Local Source AERMOD Modeling

The AERMOD Gaussian plume model was also used to simulate the effects of primary $PM_{2.5}$ emissions from local sources on $PM_{2.5}$ concentrations at Liberty. As discussed in the Modeling Protocol (ACHD, 2011b), the AERMOD model may be used if there are model performance problems for CAMx and the use of the PiG/PSAT treatment to obtain the contributions of local sources. However, the following discussion indicates that CAMx+PiG yielded better performance than CAMx+AERMOD for local source contributions.

The AERMOD model was applied for the local sources and the 2007 base case emissions scenarios. AERMOD meteorological inputs were generated using AERMET and local on-site surface meteorological observations from Liberty and upper-air meteorological observations

[10] http://www.epa.gov/airtransport/

from the Pittsburgh airport. Surface meteorological data from Pittsburgh was used to substitute for the Liberty data when it was missing.

The AERMOD local source contributions were combined with the CAMx regional source contributions (0.8k_nolocal) to provide total concentration estimate (i.e., using AERMOD results to replace the CAMx PiG/PSAT local source contributions). The CAMx regional plus AERMOD local $PM_{2.5}$ concentrations estimates at Liberty were compared against the Liberty FRM measurements and the CAMx+AERMOD model performance was compared against the CAMx estimates using PiG/PSAT for the local sources. Figure 2-7 compares soccer plots of annual FB and FE for 24-hour $PM_{2.5}$ performance at Liberty for CAMx without any local sources contributions (i.e., CAMx regional contribution), CAMx using PiG/PSAT for local sources (CAMx+PiG) and the combined CAMx regional plus AERMOD local source contributions (CAMx+AERMOD). CAMx+PiG is exhibiting better $PM_{2.5}$ model performance than CAMx+AERMOD at Liberty with lower bias and lower error. Figure 2-8 compares quantile-quantile (Q-Q) cumulative frequency distributions plots of predicted and observed 24-hour $PM_{2.5}$ concentrations at Liberty. CAMx+PiG is closer to the 1:1 line of perfect agreement than CAMx+AERMOD indicating better $PM_{2.5}$ performance by CAMx+PiG.

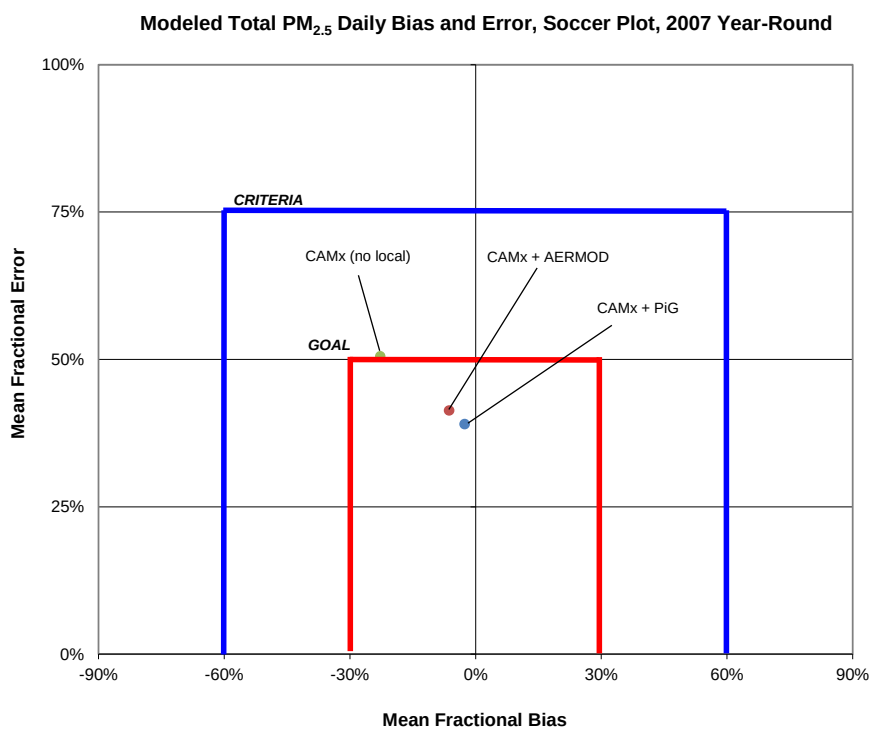


Figure 2-7. Soccer plot of 24-hour $PM_{2.5}$ model performance at Liberty for the CAMx regional (CAMx no local) estimates without local sources and CAMx treating local sources with PiG (CAMx+PiG) and CAMx regional plus AERMOD local source contributions (CAMx+AERMOD).

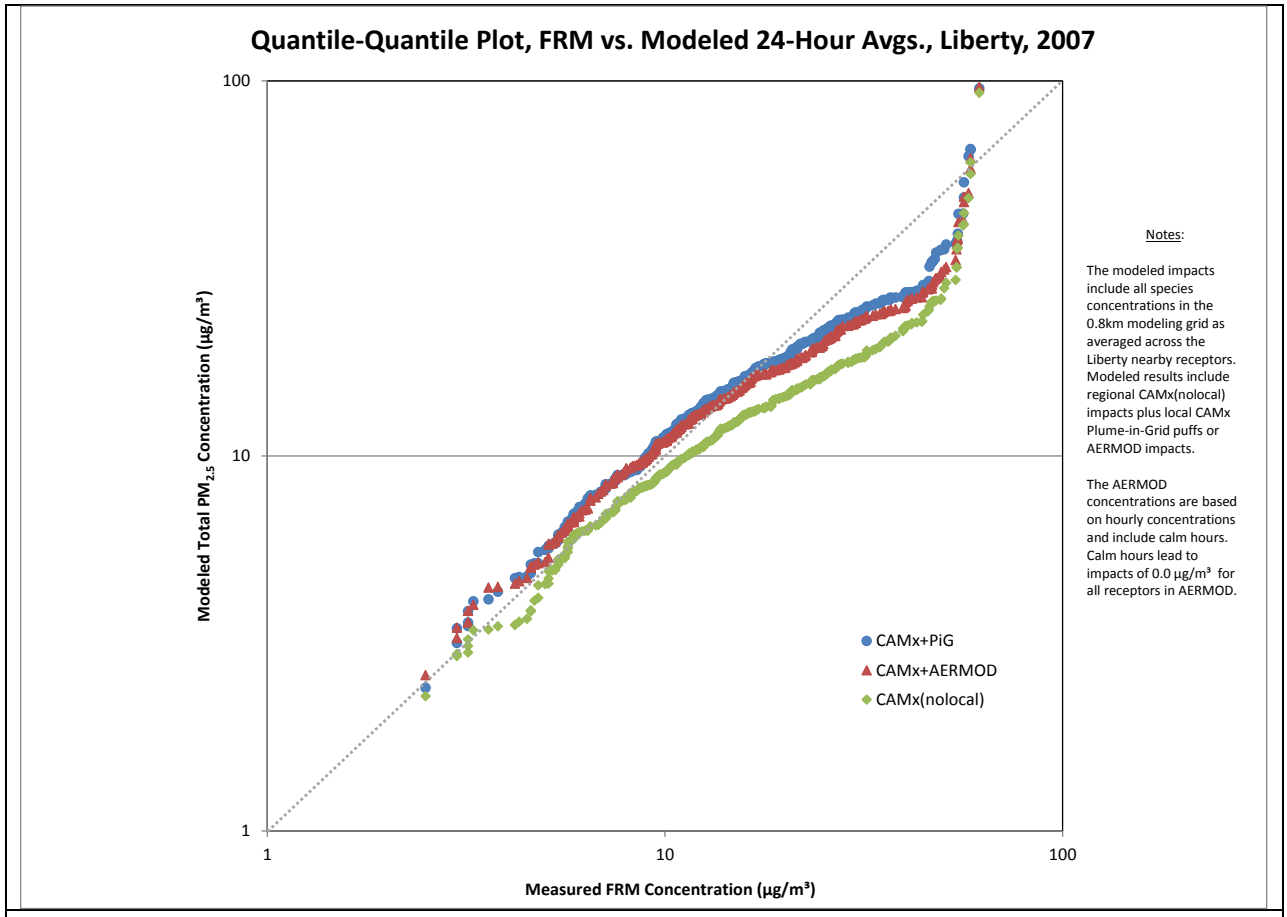


Figure 2-8. Q-Q plot of 24-hour $PM_{2.5}$ model performance at Liberty for the CAMx regional (CAMx no local) estimates without local sources and CAMx treating local sources with PiG (CAMx+PiG) and CAMx regional plus AERMOD local source contributions (CAMx+AERMOD).

The ACHD (2011c) found that the Liberty monitoring site had on average 4.1 µg/m^3 higher $PM_{2.5}$ concentration compared to surrounding sites that is attributed to local sources (not accounting for PBW). The CAMx+PiG modeling found that local sources contributed from 2.6 to 3.1 µg/m^3 depending on whether the 1:6 day CSN sampling or everyday sampling frequencies are used. AERMOD estimated that local sources contributed 2.5 µg/m^3 at Liberty for the 2007 annual period.

The AERMOD local sources modeling was initiated as a backup plan in case there were issues with the CAMx PiG/PSAT local source contributions. However, the CAMx-PiG is not only performing better than CAMx+AERMOD for $PM_{2.5}$ at Liberty, the PiG/PSAT local source $PM_{2.5}$ contributions are closer to the estimate based on observations than estimated by AERMOD. Given the better performance of CAMx+PiG than CAMx+AERMOD, then the use of AEMOD

model for local source contributions is not needed. So the Allegheny County 2014 attainment demonstration modeling was based solely on the CAMx modeling results.

2.13 2014 Attainment Demonstration Modeling

The CAMx 2007 and 2014 base case modeling results were used to make 2014 $PM_{2.5}$ Design Values (DV) projections at the Liberty monitoring site three ways:

1. Total Species Approach: Use of the CAMx grid model 2007 and 2014 concentration estimates for the grid cell containing the Liberty monitoring site plus the CAMx PiG live puff concentrations at the receptor located at the Liberty monitoring site to make projections at Liberty using spreadsheets;
2. Regional/Local Species Approach: Use of the CAMx grid model 2007 and 2014 concentration estimates for the grid cell containing the Liberty monitoring site with the PSAT local source contributions removed to projected the regional component of the DV and the 2007 and 2014 CAMx PiG plus PSAT estimates at the Liberty monitoring site to project the local component of the DV at Liberty and combining the two using spreadsheets; and
3. MATS Approach: Use of the CAMx grid plus average live PiG puff receptor (0.8k_puffs and 4k_puffs) modeling results to project $PM_{2.5}$ DVs at all FRM monitoring sites using the Modeled Attainment Test Software (MATS) version 2.5.1.

All three methods used the EPA recommended (EPA, 2007) Speciated Modeled Attainment Test (SMAT) to project observed current year $PM_{2.5}$ DV to 2014 using the relative changes in the CAMx modeling results between 2007 and 2014. The observed $PM_{2.5}$ DVs based on the FRM observations were speciated using the SANDWICH (sulfate, adjusted nitrate, derived water, inferred carbonaceous material balance approach) observed $PM_{2.5}$ speciation data. The first two modeled attainment demonstration methods above were performed for the Liberty and Clairton sites using the FRM DVs at the two sites and the Liberty CSN $PM_{2.5}$ speciation data. The third approach applied MATS to all FRM monitoring sites in the 0.8 km and 4 km modeling domains using default MATS options and data, except for removal of Liberty CSN data for two quarters when there were data capture issues and capping the Liberty Sea Salt concentrations at 0.1 $\mu g/m^3$ to remove anomalous values. MATS was also used to perform an unmonitored area analysis (UAA) for annual $PM_{2.5}$ DVs; note that MATS does not contain a capability to perform a UAA for 24-hour $PM_{2.5}$ DVs.

Using the three methods, the projected 2014 24-hour $PM_{2.5}$ DV at Liberty were in the 31-35 $\mu g/m^3$ range that is right below the 2006 24-hour $PM_{2.5}$ NAAQS. The projected 2014 24-hour $PM_{2.5}$ DVs at all other monitoring sites, as well as projected 2014 annual $PM_{2.5}$ DVs, were all even further below the NAAQS than seen at Liberty. Details on the 2014 $PM_{2.5}$ DV projections are provided in Section 3 of this AQTSD.

3.0 ATTAINMENT DEMONSTRATION MODELING

This section presents the procedures and results of the 2014 $PM_{2.5}$ Design Values projections using the three approaches discuss in Section 2.13. The 2014 $PM_{2.5}$ Design Value projections were performed following the procedures recommended by EPA (EPA, 2007; Timin, 2005; 2007) including recent revisions to the 24-hour $PM_{2.5}$ projection procedures (Fox, 2011).

3.1 2007 and 2014 Base Case Modeling

The CAMx 2007 base case simulation is described in Sections 2.7 and 2.8 with details contained in Morris and co-workers (2012). The CAMx 2014 base case simulation was performed in a consistent fashion to the 2007 base case only using regional emissions for the CSAPR 2014 remedy scenario and updating local sources using 2014 emissions from ACHD. Table 3-1 displays the 2007 and 2014 $PM_{2.5}$, PM_{10}, SO_2, NO_X, VOC and NH_3 emissions in the Liberty-Clairton area and the percent changes in emissions from 2007 to 2014. Primary $PM_{2.5}$ emissions in the Liberty-Clairton area are dominated (95%) by point sources that are estimated to be reduced 30% from 2007 to 2014. Similar results are estimated for coarse PM (PM_{10}). SO_2 emissions in the Liberty-Clairton area are also dominated (96%) by point sources whose emissions are estimated to be fairly flat going from 2007 to 2014 (-2%). Although large (-45%) reductions in on-road mobile source NO_X emissions are estimated to occur in the Liberty-Clairton area, because most of the NO_X comes from point sources that make up a majority (86%) of the NO_X emissions in the region the total reduction in NO_X emissions is only -12%. VOC and NH_3 emissions in the Liberty-Clairton area are estimated to be reduced -22% and -8%, respectively, between 2007 and 2014.

Table 3-1a. 2007 and 2014 emissions in the Liberty-Clairton region in tons per year (TPY) and their percent differences by major source category.

Liberty-Clairton	$PM_{2.5}$ (TPY)			PM_{10} (TPY)			SO_2 (TPY)		
Source Category	**2007**	**2014**	(%)	**2007**	**2014**	(%)	**SO_2**	**SO_2**	
Point Sources	946.6	662.7	-30.0%	1136.9	853.7	-24.9%	1741.3	1720.5	-1.2%
Area Sources	26.3	25.6	-2.7%	50.5	49.5	-2.0%	50.1	49.6	-1.0%
Non-Road Mobile	15	12.4	-17.3%	15.9	12.7	-20.1%	17.2	6	-65.1%
On-Road Mobile	9.9	6.2	-37.4%	10.4	6.6	-36.5%	2.1	0.9	-57.1%
Total	997.8	706.8	-29.2%	1213.8	922.4	-24.0%	1810.9	1777.1	-1.9%

Table 3-1b. 2007 and 2014 emissions in the Liberty-Clairton region in tons per year (TPY) and their percent differences by major source category.

Liberty-Clairton	NO_X (TPY)			VOC (TPY)			NH_3 (TPY)		
Source Category	**2007**	**2014**	(%)	**2007**	**2014**	(%)	**SO_2**	**SO_2**	
Point Sources	4841.9	4349.3	-10.2%	590.5	460.1	-22.1%	18.4	17.6	-4.3%
Area Sources	38.8	38.5	-0.8%	255.9	252	-1.5%	4.2	4.2	0.0%
Non-Road Mobile	437.9	387.1	-11.6%	86.6	58.5	-32.4%	0.2	0.2	0.0%
On-Road Mobile	274.3	151	-45.0%	172.5	95.1	-44.9%	4.7	3.4	-27.7%
Total	5592.9	4925.9	-11.9%	1105.6	865.6	-21.7%	27.5	25.3	-8.0%

Table 3-2 displays the total NO_X and SO_2 emissions in Pennsylvania and five other nearby states from the Cross State Air Pollution Rule (CSAPR; EPA, 2011a,b) 2005 base case and 2014 remedy control case (CSAPR used a 2005 base case). Total NO_X emissions are estimated to be reduced from -34% to -50% between the 2005 and 2014 cases across these states with a six-state average reduction of -39%. The reduction in SO_2 emissions between 2005 and 2014 is even greater ranging from -60% to -77% with a six-state average of -73%. Although the NO_X and SO_2 reductions between 2007 and 2014 remedy scenario will not be as great as between 2005 and 2014, it is clear that the regional NO_X and SO_2 emission reductions are much greater than seen for the local sources.

Table 3-2. 2005 and 2014 total NO_X and SO_2 emissions and their differences in six states from the CSAPR 2005 base and 2014 remedy cases (Source: EPA, 2011a).

	NO_X (TPY)			SO_2 (TPY)		
State	**2005**	**2014**	(%)	**2005**	**2014**	(%)
Pennsylvania	781,647	514,563	-34.2%	1,172,555	261,173	-77.7%
Ohio	906,327	508,054	-43.9%	1,274,427	294,714	-76.9%
West Virginia	308,655	155,245	-49.7%	534,392	132,539	-75.2%
Indiana	673,669	424,250	-37.0%	1,040,947	331,182	-68.2%
Kentucky	482,262	286,806	-40.5%	573,604	176,007	-69.3%
Virginia	488,263	333,985	-31.6%	337,752	136,499	-59.6%
6-State Total	3,640,823	2,222,903	-38.9%	4,933,677	1,332,114	-73.0%

3.2 Modeled Attainment Demonstration Approach

As discussed in Section 2.13, three approaches were used to make annual and 24-hour $PM_{2.5}$ Design Value (DV) projections at Liberty using the CAMx 2007 and 2014 modeling results.

1. Total Species Approach: Use of the CAMx+PiG modeling results at the Liberty monitoring site;
2. Regional/Local Species Approach: Use of the CAMx no local sources and CAMx PiG/PSAT modeling results at the Liberty monitoring site to separate project the regional and local components of the current year PM2.5 DVs to 2014; and
3. MATS Approach: Use of the CAMx grid plus average live PIG puff receptor (0.8k_puffs and 4k_puffs) modeling results to project $PM_{2.5}$ DVs at all FRM monitoring sites using the Modeled Attainment Test Software (MATS) version 2.5.1.

The Speciated Modeled Attainment Test (SMAT) approach was used to make the 2014 DV projections as recommended by EPA (2007). SMAT uses the relative changes in the CAMx 2014 and 2007 modeling results for each major $PM_{2.5}$ component (e.g., SO_4, NO_3, etc.) to scale the current year observed Design Value (DVC) $PM_{2.5}$ components to obtain future year $PM_{2.5}$ components that are summed to obtained the projected future year (2014) $PM_{2.5}$ Design Value (DVF). The model derived scaling factors are referred to as Relative Response Factors (RRFs) and are the ratio of the 2014 to 2007 modeling results (in simple terms, DVF = DVC x RRF).

All three future year $PM_{2.5}$ Design Value projection methods listed above were used to make annual and 24-hour $PM_{2.5}$ DV projections at the Liberty and Clairton monitoring sites. Note that the CAMx total species modeling results for the first and third methods differed slightly on how the local source contributions from live PiG puffs were treated. Whereas the first Total Species Approach used the live PiG puff concentrations at the single receptor at the location of the Liberty and Clairton monitoring sites that was added to the corresponding 0.8 km grid cell CAMx result, the third MATS Approach used the PiG live puff average concentration across all receptors in a 0.8 km grid cell that was added to the corresponding 0.8 km grid cell CAMx result (i.e., 0.8k_puffs). Also note that the MATS Approach was also applied to obtain 2014 $PM_{2.5}$ DV projections at all FRM sites in and nearby southwest Pennsylvania using the 4 km CAMx results (4k_puffs).

3.2.1 Current Year Design Values

The current year $PM_{2.5}$ Design Values (DVC) were based on the three year average of Design Values from 2005-2009 using 24-hour Federal Reference Method (FRM) $PM_{2.5}$ monitoring data as suggested in EPA's modeling guidance for a 2007 modeling year (EPA, 2007). As annual and 24-hour $PM_{2.5}$ DVs are defined as the three year average of the, respectively, annual average and 98th percentile 24-hour average $PM_{2.5}$ concentrations, then this has an effect of weighting the annual or 98th percentile 24-hour $PM_{2.5}$ concentrations for the years 2005-2009 by weighting factors of 1, 2, 3, 2 and 1 giving the observed $PM_{2.5}$ data for the 2007 center modeling year the greatest weight. For example, Table 3-3 displays the 98th percentile 24-hour $PM_{2.5}$ concentrations at Liberty for the years 2005-2007, the corresponding 3-year average 24-hour $PM_{2.5}$ Design Values (DVs) and the 5-year weighted DVC that is used in making 2014 DV projections.

Table 3-3. Calculation of current year 24-hour $PM_{2.5}$ Design Value (DVC) at Liberty used in making future year 2014 Design Value projections.

Parameter	2005	2006	2007	2008	2009
98th Percentile	69.6	55.7	54.7	50.0	45.3
24-Hour $PM_{2.5}$ DVs			60.0	53.5	50.0
DVC			54.4		

3.2.2 Monitoring Data Assumptions

The FRM 24-hour $PM_{2.5}$ measurements are used to define the current year Design Value (DVC) used in making the 2014 future year Design Value projections (DVF) as described above. However, to apply SMAT speciated $PM_{2.5}$ data are used that was based on speciated $PM_{2.5}$ measurements from the Chemical Speciation Network (CSN). For the Total Species and Regional/Local Species projection approaches, CSN data from Liberty was used for making future year $PM_{2.5}$ projections at Liberty and Clairton monitoring sites. The MATS projection approach uses CSN data at other sites as well (e.g., Lawrenceville) and at IMPROVE sites. The measured speciated $PM_{2.5}$ data are processed using the SANDWICH (sulfate, adjusted nitrate, derived water, inferred carbonaceous material balance approach) method outlined by EPA

Modeling Guidance reconstructs $PM_{2.5}$ species to better represent FRM monitored data (Frank, 2006a,b). Using this technique, species are adjusted as follows:

- Nitrate is based on retained estimations
- Indirect ammonium is dependent on sulfate, nitrate, and degree of neutralization (DON) values
- Organic carbon is calculated by mass balance from all other species
- Water is calculated from sulfate, nitrate, and ammonium values

Assumptions are made with the monitored data handling to ensure that all species are accounted for and that the speciation data are correctly used for each FRM site. Assumptions for the CSN speciation at Liberty and FRM data for Liberty and Clairton are listed below:

- Organic carbon mass by mass balance accounts for all differences between the FRM and other species and can include trace elements or other species that may be associated with organic carbon.
- Indirect ammonium best accounts for the ammonium and the calculated particle-bound water species. Any measured excess of ammonium may or may not be retained on the FRM filter and is accounted for in the organic carbon mass by mass balance. Furthermore, the ammonium generated by the CAMx model is based on associated sulfate and nitrate.
- "Other" component represents unknown mass from the speciation monitor. The SANDWICH technique recalculates most of the "other" component as particle-bound water associated with hygroscopic compounds.
- Liberty speciation data is assumed to be representative of both the Liberty and Clairton monitoring sites. That is, the Liberty species compositions are representative of Clairton but at smaller overall concentrations. Liberty species compositions are therefore used with Clairton weighted FRM values in the design value calculation.
- No exceptional events or anomalies are evident in the FRM or speciation data. However, species mass balance problems led to the exclusion of two quarters of Liberty CSN speciation data in the attainment test calculations (2008 Q4 and 2009 Q1).
- Degrees of Neutralization (DON) of sulfate are held constant for baseline to future case. DON has been supplied with the pre-calculated EPA speciation SMAT/MATS data set.

The SANDWICH species reconstructions are shown in detail in Appendix H (Attainment Tests) of the ACHD $PM_{2.5}$ SIP.

Similar procedures are used in applying the SANDWICH technique to the CSN and IMPROVE data in the MATS tool only it is performed for all sites not just Liberty.

3.2.3 Annual $PM_{2.5}$ Design Value Projection Approach

Details on the SMAT methodology for the annual $PM_{2.5}$ NAAQS is given in the EPA Modeling Guidance (EPA, 2007). Species reconstruction is based on the SANDWICH technique described above. The steps for the annual $PM_{2.5}$ SMAT are as follows:

Calculate 5-year weighted FRM quarterly averages: This is the average of the 2005-2007, 2006-2008, and 2007-2009 3-year quarterly averages as described in Section 3.2.1. This is done for the Liberty and Clairton FRM monitored values.

Calculate retained nitrate ($NO3_r$) by speciation sample: This has been provided as part of the SMAT/MATS data set, pre-calculated by EPA. The formula used for retained nitrate is shown below, as given in the EPA Modeling Guidance:

$$\text{delta NO3 (ug/m3)} = 745.7/T_R * 1/24 * \sum_{i=1}^{24} (K_i^{1/2})$$

delta NO3 is the amount of volatilized nitrate

T_R is the reference temperature

K_i is the dissociation constant for ammonium nitrate

Calculate quarterly averages of non-dependent species: Averages for nitrate, sulfate, carbons, other primary $PM_{2.5}$ (OPP), and concurrent FRM values are calculated. Quarterly averages for measured organic carbon are used for comparison to an organic carbon minimum (or OC_{floor}). Quarterly averages for DON are also calculated for use in the retained ammonium calculation.

Calculate quarterly averages of retained ammonium ($NH4_r$): Averages for retained ammonium are calculated from quarterly sulfate, nitrate, and DON averages. The formula is given below, as given in the EPA Modeling Guidance:

$$NH4_r = DON*SO4 + 0.29*NO3_r$$

Calculate quarterly averages of particle bound water (PBW): Averages for PBW are calculated from quarterly sulfate, retained nitrate, and indirect ammonium averages. The formula is given below for low acidity (DON >= 0.225), as given in the MATS User's Guide (Abt, 2012):

S = SO4 / (SO4 + NO3r + NH4r)

N = NO3r / (SO4 + NO3r + NH4r)

A = NH4r / (SO4 + NO3r + NH4r)

PBW = {202048.975 - 391494.647 *S - 390912.147 *N + 442.435 *(S**1.5)

- 155.335 *(N**1.5) - 293406.827 *(A**1.5) + 189277.519 *(S**2)

+ 377992.610 *N*S + 188636.790 *(N**2) - 447.123 *(S**2.5)

- 507.157 *(S**1.5)*N - 12.794 *(S**3) + 146.221 *(N**1.5)*S

+ 217.197 *(N**2.5) + 29.981 *(N**1.5)*(S**1.5) - 18.649 *(N**3)

+ 216266.951 *(A**1.5)*S + 215419.876 *(A**1.5)*N

- 621.843 *(A**1.5)*(S**1.5) + 239.132 *(A**1.5)*(N**1.5)

+ 95413.122 *(A**3)} * (SO4+NO3r+NH4r)

Calculate quarterly averages of organic carbon mass by mass balance (OCM_{mb}): Averages for OCM_{mb} are calculated from the concurrent FRM quarterly averages minus the sum of the other species. This accounts for material associated with organics and/or uncertainties in the measured species. The calculated organic mass is compared to the OC_{floor} to ensure that the mass balance method does not lead to lower concentrations than measured.

Calculate quarterly species compositions; apply to weighted quarterly FRM averages: This is done by calculating fractions of the total (minus 0.5 passive blank mass) by individual species. For this step, the data was calculated twice to examine results by both total and by regional and local species. The species fractions are then applied to the weighted FRM values.

Calculate quarterly Relative Response Factors (RRFs) from modeling: Direct RRFs are calculated from baseline and future CAMx modeling for sulfate, nitrate, OCMmb, elemental carbon, and (OPP). For the total and regional/local options, this step is done twice.

Calculate future quarterly species averages from RRFs, re-calculate ammonium and PBW: The RRFs reduce the sulfate, nitrate, carbons, and OPP from the weighted baseline case values. Future case ammonium and PBW is calculated from the new quarterly averages. This step was performed twice to examine by both total and by regional and local species.

Calculate the future design value: This is done by adding the future case species by quarter (plus 0.5 blank) and averaging the quarterly future FRM values, rounded to the nearest tenth for comparison to the annual standard. For an area with strong concentration gradients such as Liberty-Clairton, ACHD followed EPA Modeling Guidance by using a one-cell (single-site) analysis in place of a spatially-averaged array for the design values at Liberty and Clairton.

The MATS annual $PM_{2.5}$ projections were done in a similar fashion only for all FRM monitoring and using default MATS configuration. The default MATS configuration includes basing the modeled RRFs using an average across a 7 x 7 array of 0.8 km or 4 km grid cells centered on the monitoring site, rather than the single grid cell containing the Liberty site as used in the Total Species and Regional/Local Species projection approaches.

3.2.4 24-Hour $PM_{2.5}$ Design Value Projection Approach

The SMAT for the 24-hour standard uses the same methodology as the annual standard for reconstruction of species and RRFs. But, modeled and observed concentrations are based on specific high-days instead of quarterly averages. For the Total Species and Regional/Local projection approaches the following steps were undertaken to make future year 24-hour $PM_{2.5}$ projections.

Identify observed (monitored) high days in baseline timeframe: This is done by selecting the 8 highest days in each quarter for each FRM monitor over the 2005-2009 timeframe. This method focuses on high days that represent seasonal highs rather than overall maximums.

Calculate quarterly species compositions for speciation high days*:* This is done using the same technique as the annual species compositions, but the quarterly averages are based on the highest 10% (3 samples were used per quarter) of speciation samples by overall concentration.

Calculate weighted species compositions for baseline high days*:* This is done by using the quarterly species fractions for each of the high observed days. The end results are 8 species compositions per quarter for each year (2005-2009). Similar to the annual test, this step was done twice to examine the results by total and regional/local options.

Calculate quarterly Relative Response Factors (RRFs) for high days from modeling: The high modeled days are identified after summing all components. Regional OPP is excluded from the total in this ranking method, due to overestimation of the modeled OPP.[11] The top 10% (10 days) by quarter are then averaged for sulfate, nitrate, carbons, and OPP. RRFs are calculated from the baseline and future modeled results. For the total and regional/local options, this step is done twice.

Calculate future high days from RRFs; re-calculate ammonium and PBW for each future high day: Using the same methodology as the annual test, high day species are reduced for the future case by the quarterly RRFs, and ammonium and PBW concentrations are re-calculated from the future sulfate, nitrates. This step was performed twice to examine by both total and by regional and local species.

Calculate future design value: The future projected high days are re-ranked by year, and the 98th-percentile value is identified. The weighted 98th-percentile average is the average of the 2005-2007, 2006-2008, and 2007-2009 3-year averages, rounded to the nearest integer for comparison to the 24-hour $PM_{2.5}$ NAAQS.

The MATS 24-hour $PM_{2.5}$ projections were done in a similar fashion only for all FRM sites and using 7 x 7 rather than a single grid cell modeling results for the RRFs

[11] This method was used in the Transport Rule (CSAPR) modeling.

3.3 $PM_{2.5}$ Design Value Projections at Liberty and Clairton

Below we present the results of the annual and 24-hour $PM_{2.5}$ future year 2014 Design Value projections at Liberty and Clairton using the Total Species and Regional/Local Species projection approaches. Results of the MATS $PM_{2.5}$ Design Value projections are discussed in Section 3.4.

3.3.1 Annual $PM_{2.5}$ Projections at Liberty and Clairton

Tables 3-4 and 3-5 display the 2014 annual $PM_{2.5}$ Design Value projections at Liberty using the, respectively, Total Species and Regional/Local Species projection approaches. The observed current year annual $PM_{2.5}$ Design Value at Liberty is 18.36 µg/m^3. The Regional/Local Species approach splits the current year annual DV as 5.08 µg/m^3 due to local sources and 12.78 µg/m^3 due to regional sources (the remainder 0.5 µg/m^3 is the blank mass). The 2014 projected annual DVFs using the Total and Regional/Local Species approaches are, respectively, 11.6 and 12.1 µg/m^3, which are both well below the 15.0 µg/m^3 annual $PM_{2.5}$ NAAQS.

The current year annual $PM_{2.5}$ DVC for Clairton is 14.28 µg/m^3, so already attains the annual $PM_{2.5}$ NAAQS. Using procedures similar to Table 3-4, the 2014 projected annual $PM_{2.5}$ DVF for Clairton using the Total Species approach is 8.93 µg/m^3. The Clairton annual DVC is split 3.08 µg/m^3 due to local sources and 9.98 µg/m^3 due to regional sources. The projected total 2014 annual $PM_{2.5}$ DVC at Clairton using the Regional/Local Sources approach is 9.12 µg/m^3.

Table 3-4. Annual $PM_{2.5}$ Design Value projections at Liberty using the Total Species approach.

QTR	FRM	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
Current Year Baseline $PM_{2.5}$ Components (DVC)										
1Q	14.637	0.5	14.137	3.814	1.508	3.793	1.352	0.679	1.765	1.227
2Q	18.051	0.5	17.551	4.888	2.014	5.336	0.065	0.99	1.962	2.295
3Q	22.6	0.5	22.1	4.689	2.262	8.018	0	0.966	2.721	3.444
4Q	18.186	0.5	17.686	5.647	2.631	4.426	0.545	0.789	1.753	1.894
DVC	**18.369**	0.5	17.869	4.760	2.104	5.393	0.491	0.856	2.050	2.215
Relative Response Factors (RRFs)										
1Q				0.804	0.501	0.69	0.893	0.851		
2Q				0.746	0.531	0.5	0.956	0.827		
3Q				0.721	0.545	0.45	1.304	0.816		
4Q				0.817	0.513	0.605	0.766	0.83		
2014 Future Year Design Value Projections (DVF) for Total Species Approach										
1Q	10.85	0.5	10.35	3.067	0.756	2.618	1.208	0.578	1.298	0.825
2Q	10.9	0.5	10.4	3.647	1.069	2.667	0.062	0.819	0.989	1.146
3Q	12.28	0.5	11.78	3.382	1.233	3.604	0	0.789	1.223	1.548
4Q	12.44	0.5	11.94	4.611	1.35	2.679	0.417	0.655	1.086	1.141
DVF	**11.618**	0.5	11.118	3.677	1.102	2.892	0.422	0.710	1.149	1.165

Table 3-5. Annual $PM_{2.5}$ Design Value projections at Liberty using the Regional/Local Species approach.

QTR	FRM	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
Current Year Baseline Local Sources $PM_{2.5}$ Components (DVC)										
1Q				0.821	0.904	0.881	0.124	0.284	0.445	0.329
2Q				1.273	1.37	0.48	0.014	0.297	0.329	0.299
3Q				0	1.548	0.96	0	0.372	0.554	0.803
4Q				2.756	1.993	1.698	0	0.413	0.625	0.765
DVC_{loc}	**5.08**			1.213	1.454	1.005	0.035	0.342	0.488	0.549
Local Sources Relative Response Factors (RRFs)										
1Q				0.811	0.811	0.821	1.209	0.811		
2Q				0.837	0.837	0.851	1.815	0.837		
3Q				0.827	0.814	0.802	2.396	0.814		
4Q				0.8	0.8	0.802	1.379	0.8		
Current Year Baseline Regional $PM_{2.5}$ Components (DVC)										
1Q				2.993	0.604	2.912	1.228	0.395	1.319	0.898
2Q				3.615	0.644	4.857	0.051	0.693	1.633	1.996
3Q				4.689	0.714	7.058	0	0.594	2.168	2.641
4Q				2.892	0.638	2.728	0.545	0.376	1.128	1.129
DVC_{reg}	**12.78**			3.547	0.65	4.389	0.456	0.515	1.562	1.666
Regional Relative Response Factors (RRFs)										
1Q				0.798	0.437	0.674	0.891	0.878		
2Q				0.704	0.386	0.47	0.939	0.849		
3Q				0.665	0.394	0.42	1.264	0.858		
4Q				0.811	0.434	0.581	0.761	0.86		
2014 Future Year Design Value Projections (DVF) for Regional/Local Species Approach										
1Q	11.236	0.5	10.736	3.054	0.997	2.686	1.244	0.577	1.333	0.846
2Q	11.265	0.5	10.765	3.61	1.397	2.69	0.074	0.837	1.001	1.156
3Q	12.576	0.5	12.076	3.119	1.541	3.733	0	0.812	1.267	1.603
4Q	13.377	0.5	12.877	4.55	1.872	2.946	0.415	0.654	1.182	1.258
DVF	**12.114**	0.5	11.614	3.583	1.452	3.014	0.433	0.72	1.196	1.216

3.3.2 24-Hour $PM_{2.5}$ Projections at Liberty and Clairton

Details on the 2014 24-hour $PM_{2.5}$ DVF projections are provided in Appendix H of the ACHD $PM_{2.5}$ SIP. The Liberty 24-hour $PM_{2.5}$ DVC is 54.4 µg/m^3 that is projected to be 33.69 and 35.20 µg/m^3 using the Total Species and Regional/Local Species approaches, respectively. As these values are below 35.5 µg/m^3, then both projection approaches pass the modeled attainment demonstration test. The values at Clairton are lower with both methods projecting a 24-hour $PM_{2.5}$ DVF of 18 µg/m^3.

3.4 Annual and 24-Hour $PM_{2.5}$ Projections using MATS

The Modeled Attainment Test Software (MATS Version 2.5.1; Abt, 2012) was applied using the CAMx 2007 and 2014 0.8 km and 4 km modeling results to obtain an alternative estimate of projected 2014 future year annual and 24-hour $PM_{2.5}$ DVFs at Liberty, Clairton, Lawrenceville and North Braddock FRM sites in the 0.8 km domain as well as at other sites in the greater Pittsburgh area, southwestern Pennsylvania, southeastern Ohio, and northern West Virginia in the 4 km domain. MATS Version 2.5.1 was applied using default options and data that includes using FRM $PM_{2.5}$ mass measurements from 2005 through 2009 and quarterly $PM_{2.5}$ speciation data from CSN and IMPROVE monitors from 2006-2008. The following changes were made to the MATS input speciation data at the Liberty monitoring site: (1) like was done for the Total Species and Regional/Local Species projection approaches, the Liberty CSN speciated $PM_{2.5}$ data for 2008 Quarter 4 and 2009 Quarter 1 were removed from MATS due to poor data capture and mass balance issues; and (2) the Liberty CSN Sea Salt concentrations were capped at 0.01 $\mu g/m^3$. There were some anomalously high sea salt concentrations at Liberty that didn't seem realistic given how far Allegheny County is from the ocean.

3.4.1 MATS Annual $PM_{2.5}$ Projections

The Modeled Attainment Test Software (MATS) was used with the CAMx 2007 and 2014 0.8k_puffs and 4k_puffs modeling results to obtain current year (DVC) and projected 2014 future year (DVF) annual $PM_{2.5}$ Design Values at all of the FRM monitoring sites within the 0.8 km and 4 km modeling domains. MATS was run in default mode, with the only changes being the removal of Liberty CSN speciation data for two quarters and capping the Liberty CSN sea salt concentrations at 0.01 $\mu g/m^3$ as discussed previously. Table 3-6 displays the MATS results for annual $PM_{2.5}$ in the 0.8 km domain. There are four FRM monitoring sites in the 0.8 km domain: Lawrenceville (420030008), Liberty (420030064), North Braddock (420031301) and Clairton (420033007). Based on 2005-2009 FRM data, the Liberty site (18.36 $\mu g/m^3$) has the highest DVC that exceeds the annual $PM_{2.5}$ NAAQS, although the North Braddock annual DVC also barely exceeds the annual NAAQS as well (15.24 $\mu g/m^3$). MATS estimates that the projected 2014 DVF at all four FRM sites in the 0.8 km domain will be below the 2006 annual $PM_{2.5}$ NAAQS (i.e., less than 15.05 $\mu g/m^3$); the maximum projected 2014 DVF at any site in the 0.8 km domain is 11.53 $\mu g/m^3$ at Liberty.

Table 3-6. Current year (DVC) and projected 2014 future year (DVF) annual $PM_{2.5}$ Design Values at FRM monitoring sites in the 0.8 km modeling domain (µg/m^3) using the MATS.

FRM ID#	Lat	Long	DV	Blank	OPP	EC	NH_4	OC_{mb}	SO_4	NO_3	PBW	NaCl
Current Year DVC (µg/m^3)												
420030008	40.465	-79.961	**14.06**	0.5	0.746	0.796	1.867	2.977	4.806	0.680	1.654	0.042
420030064	40.324	-79.868	**18.36**	0.5	0.805	2.102	2.117	4.872	5.480	0.539	1.943	0.010
420031301	40.402	-79.861	**15.24**	0.5	0.731	1.483	1.920	3.314	4.968	0.561	1.746	0.021
420033007	40.294	-79.885	**14.28**	0.5	0.620	1.572	1.657	3.674	4.310	0.414	1.530	0.009
Model Relative Response Factors (RRFs)												
420030008	40.465	-79.961			0.801	0.209	0.571	0.610	0.547	0.741	0.540	1
420030064	40.324	-79.868			0.812	0.521	0.559	0.758	0.534	0.846	0.523	1
420031301	40.402	-79.861			0.840	0.339	0.564	0.669	0.540	0.797	0.531	1
420033007	40.294	-79.885			0.809	0.545	0.553	0.753	0.527	0.854	0.517	1
2014 Future Year DVF (µg/m^3)												
420030008	40.465	-79.961	**8.21**	0.5	0.597	0.166	1.065	1.816	2.628	0.504	0.893	0.042
420030064	40.324	-79.868	**11.53**	0.5	0.654	1.096	1.183	3.692	2.924	0.456	1.016	0.010
420031301	40.402	-79.861	**8.99**	0.5	0.614	0.503	1.083	2.216	2.681	0.447	0.927	0.021
420033007	40.294	-79.885	**8.96**	0.5	0.502	0.856	0.916	2.768	2.273	0.354	0.790	0.009

The CAMx 2007 and 2014 4k_puffs modeling results were used with MATS to estimate projected 2014 annual $PM_{2.5}$ Design Values (DVF) for all FRM sites in the 4 km domain (Table 3-7). There are 27 FRM sites in the 4 km domain with five of them having annual $PM_{2.5}$ DVCs above the NAAQS with the highest value being 18.36 µg/m^3 at Liberty. The MATS projected 2014 DVFs are below the annual $PM_{2.5}$ NAAQS for all 27 FRM monitors in the 4 km domain. The highest projected 2014 DVF using MATS and the CAMx 4 km modeling results is 10.80 µg/m^3 at Liberty. Note that the Liberty annual DVF using the CAMx 4 km modeling results is slightly lower than when the 0.8 km CAMx results are used.

Table 3-7. Current year (DVC) and projected 2014 future year (DVF) annual $PM_{2.5}$ Design Values at FRM monitoring sites in the 4 km modeling domain (µg/m^3) using the MATS.

FRM ID#	State	County	Lat	Long	DVC	DVF
390810017	Ohio	Jefferson	40.366	-80.615	14.80	9.35
390811001	Ohio	Jefferson	40.322	-80.606	14.83	9.31
390990005	Ohio	Mahoning	41.111	-80.645	13.62	8.53
390990014	Ohio	Mahoning	41.096	-80.658	13.79	8.51
391330002	Ohio	Portage	41.164	-81.235	12.82	7.89
391510017	Ohio	Stark	40.787	-81.394	16.11	9.71
391550007	Ohio	Trumbull	41.214	-80.788	13.90	8.63
420030008	Pennsylvania	Allegheny	40.465	-79.961	14.06	8.26
420030064	Pennsylvania	Allegheny	40.324	-79.868	18.36	10.80
420030067	Pennsylvania	Allegheny	40.376	-80.170	12.13	7.12
420030095	Pennsylvania	Allegheny	40.487	-80.188	13.55	7.96
420031008	Pennsylvania	Allegheny	40.617	-79.728	14.29	8.74
420031301	Pennsylvania	Allegheny	40.402	-79.861	15.24	8.78
420033007	Pennsylvania	Allegheny	40.294	-79.885	14.28	8.42
420070014	Pennsylvania	Beaver	40.748	-80.316	15.19	9.82
420850100	Pennsylvania	Mercer	41.215	-80.485	12.31	7.95
421250005	Pennsylvania	Washington	40.147	-79.902	14.52	8.63
421250200	Pennsylvania	Washington	40.171	-80.261	13.06	7.94
421255001	Pennsylvania	Washington	40.445	-80.421	12.41	7.82
421290008	Pennsylvania	Westmoreland	40.305	-79.506	14.45	8.62
540090005	West Virginia	Brooke	40.341	-80.597	15.40	9.71
540090011	West Virginia	Brooke	40.395	-80.612	15.00	9.45
540291004	West Virginia	Hancock	40.422	-80.581	14.31	8.89
540490006	West Virginia	Marion	39.481	-80.135	14.44	9.33
540511002	West Virginia	Marshall	39.916	-80.734	14.27	8.69
540610003	West Virginia	Monongalia	39.649	-79.921	13.58	7.75
540690010	West Virginia	Ohio	40.115	-80.701	13.81	8.28

3.4.2 MATS 24-Hour $PM_{2.5}$ Projections

The MATS 2014 projections for 24-hour $PM_{2.5}$ using the CAMx 0.8 km 2007 and 2014 modeling results are given in Table 3-8. The Liberty (54.4 µg/m^3), North Braddock (38.8 µg/m^3) and Lawrenceville (35.8 µg/m^3) FRM sites all have current year DVCs that exceed the 2006 24-hour $PM_{2.5}$ NAAQS. The MATS projects that all four sites will have 2014 DVFs that are below the 24-hour $PM_{2.5}$ NAAQS with the highest projected 2014 DVF occurring at Liberty (34.0 µg/m^3).

Table 3-8. Current year (DVC) and projected 2014 future year (DVF) 24-Hour $PM_{2.5}$ Design Values at FRM monitoring sites in the 0.8 km modeling domain (µg/m^3) using the MATS.

FRM ID#	Lat	Long	DV	Blank	OPP	EC	NH_4	OC_{mb}	SO_4	NO_3	PBW	NaCl
Current Year DVC (µg/m^3)												
420030008	40.465	-79.961	**35.8**	0.5	1.106	1.134	4.393	10.586	13.258	0.254	4.521	0.068
420030064	40.324	-79.868	**54.4**	0.5	1.905	6.628	5.685	18.278	15.727	0.000	5.755	0.011
420031301	40.402	-79.861	**38.8**	0.5	1.217	3.190	5.141	8.193	14.874	0.270	5.378	0.038
420033007	40.294	-79.885	**33.6**	0.5	1.011	3.089	4.133	8.877	11.682	0.000	4.321	0.009
Model Relative Response Factors (RRFs)												
420030008	40.465	-79.961			0.742	0.255	0.534	0.541	0.427	5.158	0.401	2.293
420030064	40.324	-79.868			0.849	0.590	0.379	0.983	0.369	-9.0	0.363	0.974
420031301	40.402	-79.861			0.908	0.450	0.406	0.715	0.408	0.249	0.409	1.015
420033007	40.294	-79.885			0.763	0.675	0.324	1.005	0.304	-9.0	0.294	0.972
2014 Future Year DVF (µg/m^3)												
420030008	40.465	-79.961	**18.6**	0.5	0.821	0.289	2.346	5.726	5.663	1.310	1.812	0.156
420030064	40.324	-79.868	**34.0**	0.5	1.618	3.908	2.153	17.967	5.809	0.000	2.087	0.011
420031301	40.402	-79.861	**19.3**	0.5	1.106	1.435	2.087	5.858	6.068	0.067	2.201	0.038
420033007	40.294	-79.885	**18.5**	0.5	0.771	2.084	1.338	8.921	3.546	0.132	1.268	0.008

Table 3-9 shows the DVCs and projected 2014 DVFs for 24-hour $PM_{2.5}$ and FRM monitoring sites in the 4 km domain using MATS and the CAMx 2007 and 2014 4 km modeling results. Of the 27 FRM sites in the 4 km modeling domain, almost half (13) have DVCs that exceed the 2006 24-hour $PM_{2.5}$ NAAQS. The MATS 2014 projections using the CAMx 4 km modeling results estimates that all sites would have 24-hour $PM_{2.5}$ DVFs that are below the NAAQS. The highest projection 2014 DVF of any site is Liberty that has a DVF value of 31.1 µg/m^3. As seen for the annual DVFs, the Liberty projected DVF using MATS and the 4 km CAMx results is lower than when MATS and the 0.8 km CAMx results are used. We believe this may be due in part to a relatively larger regional and lower local contribution in the 4 km compared to 0.8 km DVF projections and the larger regional than local emission reductions (see Tables 3-1 and 3-2).

Table 3-9. Current year (DVC) and projected 2014 future year (DVF) 24-Hour $PM_{2.5}$ Design Values at FRM monitoring sites in the 4 km modeling domain (µg/m^3) using the MATS.

FRM ID#	State	County	Lat	Long	DVC	DVF
390810017	Ohio	Jefferson	40.366	-80.615	37.0	22.1
390811001	Ohio	Jefferson	40.322	-80.606	34.3	20.5
390990005	Ohio	Mahoning	41.111	-80.645	32.3	17.3
390990014	Ohio	Mahoning	41.096	-80.658	32.8	19.2
391330002	Ohio	Portage	41.164	-81.235	30.9	16.8
391510017	Ohio	Stark	40.787	-81.394	36.0	19.2
391550007	Ohio	Trumbull	41.214	-80.788	33.2	19.3
420030008	Pennsylvania	Allegheny	40.466	-79.961	35.8	18.5
420030064	Pennsylvania	Allegheny	40.324	-79.868	54.4	31.1
420030067	Pennsylvania	Allegheny	40.382	-80.186	32.4	15.1
420030093	Pennsylvania	Allegheny	40.607	-80.021	40.2	18.7
420030095	Pennsylvania	Allegheny	40.487	-80.188	35.5	17.5
420031008	Pennsylvania	Allegheny	40.619	-79.727	38.1	20.1
420031301	Pennsylvania	Allegheny	40.403	-79.860	38.8	18.2
420033007	Pennsylvania	Allegheny	40.294	-79.885	33.6	16.8
420070014	Pennsylvania	Beaver	40.748	-80.316	37.0	22.1
420850100	Pennsylvania	Mercer	41.215	-80.485	29.8	17.7
421250005	Pennsylvania	Washington	40.147	-79.902	33.9	18.6
421250200	Pennsylvania	Washington	40.171	-80.261	29.6	16.5
421255001	Pennsylvania	Washington	40.445	-80.421	37.7	20.1
421290008	Pennsylvania	Westmoreland	40.305	-79.506	35.2	19.4
540090005	West Virginia	Brooke	40.341	-80.597	36.0	20.7
540090011	West Virginia	Brooke	40.395	-80.612	40.4	23.6
540291004	West Virginia	Hancock	40.422	-80.581	38.0	20.5
540490006	West Virginia	Marion	39.481	-80.135	31.1	15.8
540511002	West Virginia	Marshall	39.916	-80.734	33.2	17.5
540610003	West Virginia	Monongalia	39.649	-79.921	33.3	14.5

3.4.3 MATS Unmonitored Area Analysis

MATS was applied using its Unmonitored Area Analysis (UAA) feature to spatially interpolate current year annual $PM_{2.5}$ DVCs and project 2014 annual $PM_{2.5}$ DVFs throughout the 0.8 km and 4 km modeling domains using the CAMx 0.8 and 4 km modeling results, respectively. Note that MATS does not contain a UAA capability for 24-hour $PM_{2.5}$. The MATS UAA interpolates the FRM DVCs and CSN speciation to each grid cell in the modeling domain and then performs the 2014 DVF projections in a similar manner that MATS uses at a monitor. Only instead of using model RRFs averaged across a 7 x 7 array of grid cells surrounding the grid cell in question, it uses the modeling results within the single grid cell. The MATS spatial interpolation of the DVCs at the monitors uses the model estimated concentration gradients in the interpolation process. Thus, there can be interpolated DVCs away from the monitoring sites that are higher than any of the DVCs at the monitoring sites.

Figure 3-1 displays the UAA for annual $PM_{2.5}$ DVC and DVF using the CAMx 0.8 km modeling results. The annual $PM_{2.5}$ NAAQS is 15.0 µg/m^3 and the transition from below to above the NAAQS occurs when the color scale switches from green to yellow. The MATS UAA estimates that DVCs in the Liberty-Clairton area exceed the annual $PM_{2.5}$ NAAQS, with DVC values above NAAQS also occurring north of the Liberty-Clairton area stretching west into Pittsburgh (Figure 3-1, left panel). There are even several 0.8 km grid cells with MATS UAA interpolated DVCs in excess of 20 µg/m^3 (red color), since the maximum DVC at any monitor is 18.36 µg/m^3 at Liberty this must be due to the effect of using modeled concentration gradients in the spatial interpolation procedure. The highest MATS UAA interpolated DVC is 24.83 µg/m^3.

The right panel of Figure 3-1 displays the MATS UAA projected 2014 annual $PM_{2.5}$ DVFs in the 0.8 km modeling domain. There are large reductions in the annual $PM_{2.5}$ DVs going from 2007 to 2014 with the reductions ranging from -5 to -14 µg/m^3 (see left panel of Figure 3-3). There are two grid cells in the 0.8 km modeling domain where the 2014 DVFs approach the 2006 annual $PM_{2.5}$ NAAQS with DVFs in the 14-15 µg/m^3 range: one in the southeastern part of the Liberty-Clairton area and one in Pittsburgh. The maximum projected 2014 annual $PM_{2.5}$ DVFs anywhere in the 0.8 km modeling domain is 14.67 µg/m^3, which is below the NAAQS.

Figure 3-2 displays the MATS UAA for annual $PM_{2.5}$ DVCs and DVFs in the 4 km domain. There are numerous grid cells with MATS UAA current year DVCs above the NAAQS including in the Pittsburgh area, an isolated grid cell on the eastern border of the 4 km domain east of Pittsburgh, along the Ohio River in eastern Ohio, and following I-79 south of Pittsburgh into West Virginia. The MATS UAA projected 2014 DVFs in the 4 km domain are much lower with almost all grid cells below the annual $PM_{2.5}$ NAAQS (Figure 3-2, right panel). There do appear to be a few isolated 4 km grid cells in the 4 km modeling domain with MATS UAA DVFs above the NAAQS, but all of the DVFs within the Liberty-Clairton NAA are below the NAAQS.

EPA's modeling guidance has the following discussion regarding using the results of an Unmonitored Area Analysis (EPA, 2007, pp. 32):

> *"It should be stressed that due to the lack of measured data, the examination of ozone and $PM_{2.5}$ concentrations as part of the unmonitored area analysis is more uncertain than the monitor based attainment test. As a result, the unmonitored area analysis should be treated as a separate test from the monitored based attainment test. The results of the unmonitored area analysis should, at a minimum, be included as supplemental analysis. While it is expected that additional emissions controls are needed to eliminate predicted violations of the monitored based test, the same requirement may not be appropriate in unmonitored areas."*

Given that the few isolated grid cells with estimated MATS UAA projected 2014 DVFs above the NAAQS in the 4 km modeling domain occur far away from the Liberty-Clairton NAA, and even far away from Allegheny County, they are not a cause of concern for the Liberty-Clairton $PM_{2.5}$ attainment demonstration modeling.

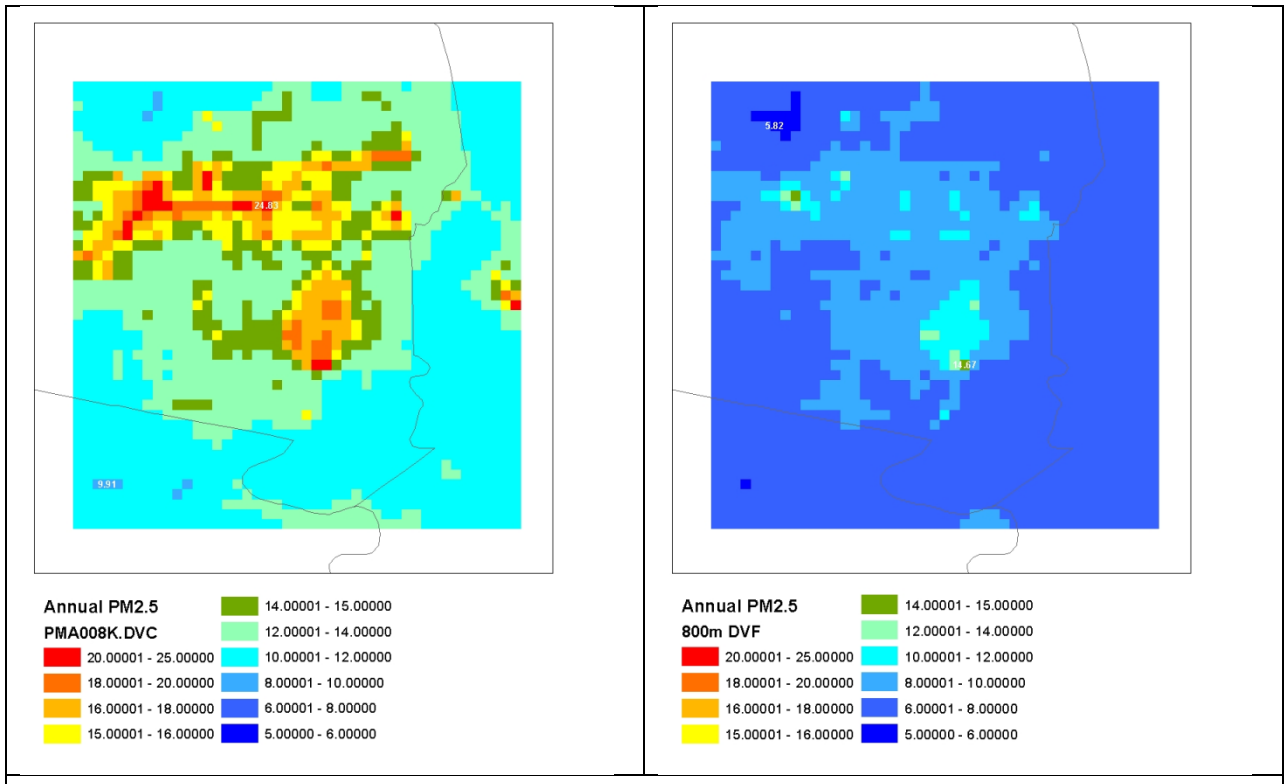


Figure 3-1. MATS Unmonitored Area Analysis (UAA) for annual $PM_{2.5}$ Design Values in the 0.8 km Liberty-Clairton modeling domain and the current year DVC (left) and projected 2014 future year DVF (right).

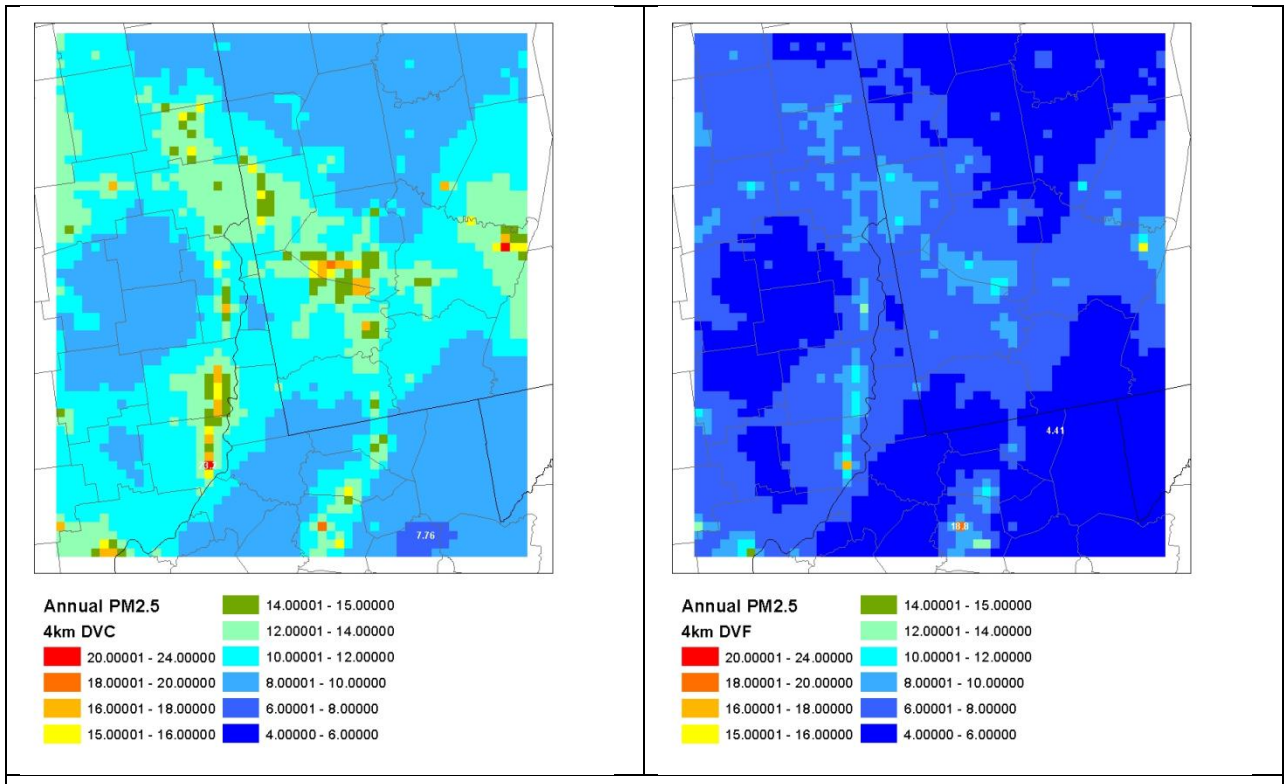


Figure 3-2. MATS Unmonitored Area Analysis (UAA) for annual $PM_{2.5}$ Design Values in the 4 km SWPA modeling domain and the current year DVC (left) and projected 2014 future year DVF (right).

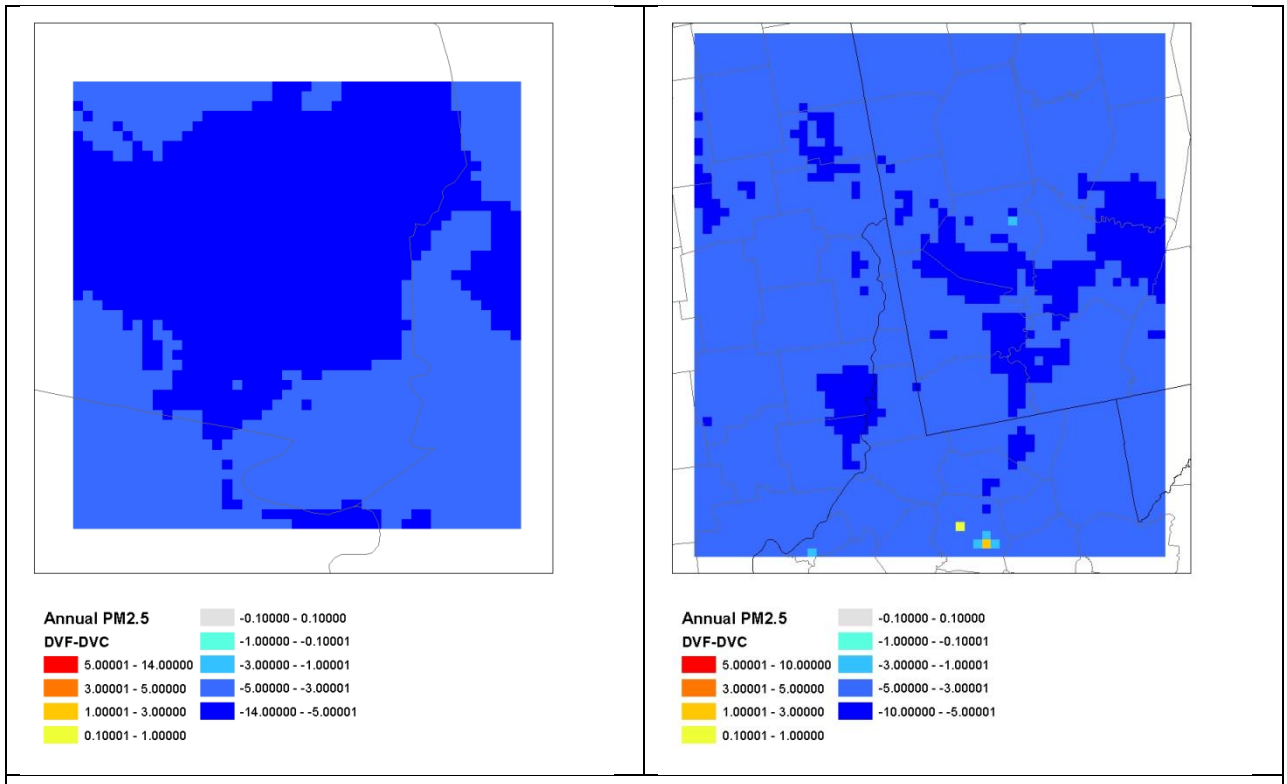


Figure 3-3. Differences in current and future (2014) year annual $PM_{2.5}$ Design Values (DVF-DVC) in the 0.8 km Liberty-Clairton (left) and 4 km SWPA (right) modeling domains using the MATS Unmonitored Area Analysis (UAA).

3.5 Modeled Attainment Test Conclusions

The main focus of the Liberty-Clairton $PM_{2.5}$ attainment demonstration modeling is to demonstrate that the Liberty FRM monitor would achieve attainment of the 2006 24-hour $PM_{2.5}$ NAAQS by 2014. The Liberty FRM monitor has the highest current annual and 24-hour $PM_{2.5}$ levels as well as the highest projected $PM_{2.5}$ levels in 2014. Future year 2014 $PM_{2.5}$ Design Value (DVF) projections were made at the Liberty FRM monitoring site four ways: (1) Total Species approach; (2) Regional/Local Species approach; (3) MATS using 0.8 km modeling results; and (4) MATS using 4 km modeling results. Starting with a current year annual $PM_{2.5}$ DVC of 18.4 µg/m^3, the four projections methods estimate future year 2014 DVFs in the 10.8 to 12.1 µg/m^3 range (11.6, 12.1, 11.5 and 10.8 µg/m^3, respectively). The current 24-hour $PM_{2.5}$ DVC at Liberty is 54.4 µg/m^3. The projected 2014 24-hour $PM_{2.5}$ DVF at Liberty ranges from 31 to 35 µg/m^3 (33.6, 35.2, 34.0 and 31.1 µg/m^3, respectively). Thus, the modeled attainment demonstration test is passed and the Liberty FRM monitor should achieve attainment of the 2006 $PM_{2.5}$ NAAQS by 2014.

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$PM_{2.5}$ SIP

Appendix H

Attainment Tests

H-1: Annual Standard Attainment Tests

H-2: 24-Hour Standard Attainment Tests

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H-1: Annual Standard Attainment Tests

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Annual Attainment Tests Summary

The calculations used in the annual Speciated Modeled Attainment Tests (SMAT) for Liberty and Clairton are given here. The reconstruction of species using the SANDWICH method and calculation of design values using SMAT are taken from EPA Modeling Guidance.

Chemical Speciation Network (CSN) speciation data was taken from EPA MATS 2.5.1 software package, with values from AQS substituted for some missing values. Calculated values for retained nitrate (NO3r) and degree of neutralization of sulfate (DON) are calculated by EPA.

Attainment tests were calculated according to 2 methods:

1) On a total species basis, using the monitored species combined with the modeled species from CAMx as prescribed by EPA modeling guidance. E.g., total measured elemental carbon at Liberty is scaled using the RRF of total modeled elemental carbon.

2) On a regional/local species basis, using a regional and local split of monitored and modeled species. Local monitored excess is calculated by subtracting the quarterly average of the other Pittsburgh MSA sites (Lawrenceville, Florence, and Greensburg) from the Liberty quarterly average for each quarter. CAMx RRFs by regional and local impacts are then applied accordingly. E.g., local measured elemental carbon is scaled using the modeled local impacts, and regional (Pittsburgh MSA) elemental carbon is scaled using the modeled regional impacts. Using the regional/local basis, local primary material (LPM) is also reapportioned for local impacts in order to better represent monitored compositions and to reduce overestimation of crustal material (OPP).

Attainment tests calculations are given in the order below for Liberty and Clairton:

- FRM Baseline Values
- CSN Quarterly Averages
- Quarterly SANDWICH Averages
- Attainment Tests
  - Total Species
  - Regional/Local Species

Glossary of CSN and SANDWICH Terms

SO4	Sulfate (measured or modeled)
NO3r	Retained Nitrate, calculated by EPA using PIT temp and relative humidity
NO3	Nitrate (measured or modeled)
NH4	Ammonium (measured)
NH4r	Retained (Indirect) Ammonium, calculated as (DON*SO4)+(0.29*NO3r)
OC	Organic Carbon (measured)
OCMmb	Organic Carbon Mass by mass balance (FRM minus other species)
OCfloor	Minimum for OCMmb (equal to OC)
EC	Elemental Carbon (measured or modeled)
CRUST	Crustal Component, calculated from Si, Ti, Ca, Al, and Fe
CRUSTalt	Crustal Component, calculated from Si, Ti, Ca, and Fe, w/o Al (newer technique)
DON	Degree of Neutralization of SO4, calculated as (NH4-0.29*NO3r)/SO4
H2O_AIM	Particle Bound Water, generated by AIM model using SO4, NO3r, NH4 (not used)
PBWcalc	Particle Bound Water, calculated by polynomial fitted to AIM
FRMc (or FRM_MASS)	FRM concentration, concurrent with speciation samples
FRMw	FRM weighted average concentration
CFM	Corrected Fine Material (used when OCMmb<OCfloor)
Blank	Passive blank mass (constant)
Non-Blank	Sum of all species except passive blank
OPP	Other Primary PM2.5 (analogous to crustal component, regionally)
OTHER	Other Primary PM2.5 (modeled by CAMx)
LPM	Local Primary Material measured (OCMmb+EC+OPP)
LPMm	Local Primary Material modeled (POA+EC+OTHER)
FRMf	FRM future projected concentration
TOA	Total Organic Aerosol, primary and secondary (POA+SOA)
POA	Primary Organic Aerosol
SOA	Secondary Organic Aerosol

Liberty FRM Quarterly Calculations

FRM Quarterly Avgs

Year	Qtr	Avg
2005	**1Q**	16.284
2005	**2Q**	22.264
2005	**3Q**	25.941
2005	**4Q**	21.101

Year	Qtr	Avg
2006	**1Q**	14.864
2006	**2Q**	17.893
2006	**3Q**	22.783
2006	**4Q**	20.967

Year	Qtr	Avg
2007	**1Q**	14.158
2007	**2Q**	18.637
2007	**3Q**	25.158
2007	**4Q**	17.571

Year	Qtr	Avg
2008	**1Q**	14.163
2008	**2Q**	17.379
2008	**3Q**	20.682
2008	**4Q**	15.772

Year	Qtr	Avg
2009	**1Q**	14.924
2009	**2Q**	13.740
2009	**3Q**	15.051
2009	**4Q**	16.377

Quarterly Avgs (3-Year)

3-Year Period	Qtr	Avg
2005-2007	**1Q**	15.102
2005-2007	**2Q**	19.598
2005-2007	**3Q**	24.627
2005-2007	**4Q**	19.880

3-Year Period	Qtr	Avg
2006-2008	**1Q**	14.395
2006-2008	**2Q**	17.970
2006-2008	**3Q**	22.874
2006-2008	**4Q**	18.103

3-Year Period	Qtr	Avg
2007-2009	**1Q**	14.415
2007-2009	**2Q**	16.585
2007-2009	**3Q**	20.297
2007-2009	**4Q**	16.573

Weighted Quarterly Avgs

Qtr	Avg
1Q	14.637
2Q	18.051
3Q	22.600
4Q	18.186

Liberty CSN Notes

- Measured carbons switched from TOT to TOR for Liberty on 5/12/07
- Some EC/OC not included with MATS data after TOT/TOR switch; substituted from AQS
- Missing concurrent FRM mass was substituted with CSN total mass
- All CSN species are submitted to EPA AQS by RTI, reviewed by ACHD
- Calculated species taken from EPA MATS 2.5.1 species-for-fractions
- Winter samples with mass balance errors, removed from this analysis

    11/14/08 - 3/2/09

    12/9/09 - 12/27/09

Liberty CSN Quarterly Averages

DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20050104	2.09	1.25	1.43	1.02	1.86	0.44	0.32	0.32	0.314	0.63	7.3
20050110	5.27	0.62	1.33	2.77	4.51	1.71	0.22	0.25	0.375	1.82	15.7
20050116	2.26	1.96	2.19	1.26	2.90	0.53	0.13	0.15	0.306	0.71	10.7
20050122	2.92	2.00	2.14	1.48	3.69	0.48	0.26	0.32	0.308	0.88	12.4
20050203	4.15	5.56	6.21	3.19	5.15	1.21	0.96	1.03	0.375	1.49	22.2
20050209	4.16	2.25	2.38	2.19	3.31	1.12	0.26	0.26	0.369	1.28	14.4
20050215	4.39	0.00	1.70	2.85	7.89	4.86	1.58	2.26	0.375	1.57	21.0
20050221	6.38	1.06	1.55	2.99	3.35	1.39	0.30	0.29	0.375	2.16	17.7
20050227	1.75	0.61	1.10	0.76	2.30	0.39	0.15	0.14	0.333	0.56	6.4
20050305	4.27	3.56	4.02	2.50	4.34	0.84	0.51	0.56	0.343	1.37	16.9
20050317	4.92	5.86	6.98	3.96	5.75	2.43	0.50	0.52	0.375	1.67	26.0
20050323	4.12	1.18	1.56	1.82	2.07	0.38	0.24	0.27	0.359	1.39	11.5
20050329	3.61	0.00	1.12	2.04	5.54	2.92	1.15	1.64	0.375	1.29	15.0
AVG	3.87	1.99	2.59	2.22	4.05	1.44	0.51	0.62	0.352	1.29	15.2

DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20050404	2.21	0.00	0.50	1.77	6.02	3.50	0.73	0.92	0.375	0.79	14.6
20050410	4.04	0.00	0.67	1.59	5.11	0.97	0.77	0.94	0.375	1.45	14.1
20050416	1.93	0.00	1.67	1.80	6.66	2.52	0.48	0.54	0.375	0.69	13.0
20050422	4.41	0.00	1.05	2.02	3.70	1.82	0.47	0.48	0.375	1.58	14.1
20050428	3.67	0.00	1.67	1.76	1.91	0.39	0.31	0.36	0.375	1.31	8.8
20050504	5.26	1.46	3.23	3.06	3.77	1.85	0.55	0.54	0.375	1.71	15.6
20050510	13.70	0.00	1.55	6.67	14.60	6.11	2.70	3.17	0.375	4.91	43.9
20050516	2.80	0.00	0.79	1.03	1.91	0.30	0.24	0.24	0.368	1.03	6.4
20050522	5.40	0.00	1.53	3.75	10.70	4.84	1.37	1.77	0.375	1.93	26.9
20050528	3.48	0.87	1.77	1.91	4.15	1.96	0.33	0.38	0.375	1.14	14.2
20050603	1.48	0.00	0.48	0.52	1.96	0.29	0.10	0.10	0.351	0.55	4.1
20050609	8.90	0.00	0.41	2.87	5.54	1.22	0.66	0.67	0.322	3.08	21.8
20050615	3.66	0.00	0.38	0.99	3.45	0.09	0.09	0.09	0.270	0.88	9.8
20050621	14.60	0.00	0.81	4.48	8.01	3.33	0.55	0.63	0.307	4.67	34.5
20050627	9.86	0.00	0.68	3.21	8.79	2.03	0.96	0.96	0.326	3.46	34.7
AVG	5.69	0.16	1.15	2.50	5.75	2.08	0.69	0.79	0.355	1.95	18.4

DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20050703	10.10	0.00	0.77	3.01	5.45	1.26	0.14	0.14	0.298	3.05	27.7	
20050709	4.92	0.00	0.98	1.51	4.62	1.31	0.24	0.24	0.307	1.58	14.4	
20050715	7.80	0.00	0.47	2.48	4.74	1.10	0.52	0.56	0.318	2.65	19.8	
20050721	14.70	0.00	1.50	6.18	10.90	5.30	1.51	1.79	0.375	5.27	42.7	
20050727	4.41	0.00	0.71	1.69	4.96	1.98	0.49	0.59	0.375	1.58	16.2	
20050802	8.37	0.00	0.80	2.89	10.90	6.34	0.89	1.03	0.345	3.09	33.4	
20050808	7.70	0.00	0.92	2.93	3.55	1.16	0.25	0.25	0.375	2.76	17.8	
20050814	10.00	0.00	0.84	3.13	4.26	0.89	1.36	1.70	0.313	3.31	24.0	
20050820	8.57	0.00	0.72	2.85	4.01	1.48	0.97	0.62	0.333	3.07	20.2	
20050826	9.35	0.00	0.31	3.02	4.67	0.83	0.53	0.58	0.323	3.24	25.5	
20050901	7.62	0.00	2.28	4.42	6.89	5.96	1.58	2.21	0.375	2.73	28.9	
20050913	29.30	0.00	2.10	10.60	17.80	11.00	0.58	0.58	0.362	10.84	84.9	
20050919	16.60	0.00	1.25	6.82	8.39	7.83	0.93	1.19	0.375	5.95	43.0	
20050925	14.10	0.00	0.37	4.19	3.73	1.01	1.87	1.88	0.297	4.24	27.4	
AVG	10.97	0.00	1.00	3.98	6.78	3.39	0.85	0.95	0.341	3.81	30.4	

DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20051001	7.95	0.00	1.28	4.56	10.80	5.51	0.90	1.00	0.375	2.85	34.3	
20051007	1.72	0.00	0.39	0.49	1.87	0.50	0.33	0.34	0.285	0.46	4.7	
20051013	8.06	0.00	0.11	1.09	1.28	0.52	0.26	0.26	0.135	4.07	13.8	
20051019	5.66	0.00	0.96	3.97	8.52	7.82	3.17	4.17	0.375	2.03	32.7	
20051026	0.62	0.00	0.30	0.17	1.38	0.21	0.19	0.15	0.274	0.15	4.7	
20051031	13.30	0.00	1.37	10.00	27.70	16.70	2.56	3.53	0.375	4.77	83.1	
20051106	6.28	0.00	0.71	3.17	6.66	7.23	0.95	1.32	0.375	2.25	27.5	
20051112	5.02	0.00	1.44	4.60	13.30	12.60	1.49	2.02	0.375	1.80	48.8	
20051118	4.14	2.31	2.75	2.36	3.03	0.93	0.68	0.76	0.375	1.25	13.0	FRM_MASS = CSN
20051124	1.17	0.50	0.80	0.59	1.49	0.49	0.09	0.09	0.375	0.36	4.1	
20051130	3.56	0.00	0.43	1.19	1.93	0.29	0.34	0.23	0.334	1.28	7.5	
20051206	4.62	3.03	3.30	2.24	3.19	0.37	0.25	0.27	0.294	1.34	14.7	
20051212	1.96	1.44	1.74	1.09	2.90	0.41	0.30	0.35	0.343	0.62	7.3	
20051230	6.78	0.11	0.60	2.02	2.51	0.42	0.22	0.22	0.293	1.97	12.9	
AVG	5.06	0.53	1.16	2.68	6.18	3.86	0.84	1.05	0.327	1.80	22.1	

DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20060105	1.64	0.20	0.59	0.73	1.22	0.56	0.18	0.24	0.375	0.57	4.7
20060111	5.40	0.00	0.89	2.09	3.21	1.07	0.42	0.45	0.375	1.93	14.1
20060117	2.39	0.00	0.78	0.92	4.04	1.09	0.30	0.35	0.375	0.86	10.9
20060123	3.33	1.91	2.29	2.07	4.62	1.67	0.63	0.67	0.375	1.00	15.7
20060129	4.01	0.00	0.97	2.66	8.45	5.01	1.07	1.44	0.375	1.44	26.2
20060204	3.69	0.06	0.71	1.47	2.46	0.57	0.24	0.25	0.375	1.32	10.6
20060210	3.10	2.88	3.37	2.09	3.48	0.96	0.43	0.56	0.375	0.97	13.4
20060216	5.63	0.00	1.55	3.39	8.38	4.37	1.25	1.44	0.375	2.02	25.3
20060222	8.20	2.70	3.60	6.38	16.20	5.99	1.16	1.22	0.375	2.61	44.7
20060228	1.98	1.50	1.85	1.14	2.21	0.36	0.32	0.38	0.356	0.62	8.0
20060306	0.97	0.72	1.44	0.65	3.61	0.55	0.34	0.39	0.375	0.29	6.6
20060312	4.93	0.71	1.85	3.38	6.94	3.90	0.61	0.61	0.375	1.68	26.6
20060318	1.55	0.39	0.95	0.71	2.03	0.19	0.12	0.12	0.375	0.51	5.3
20060324	5.38	2.61	3.22	2.80	4.31	0.80	0.59	0.57	0.375	1.64	16.9
20060330	8.90	0.00	1.45	3.99	7.08	2.81	0.67	0.90	0.375	3.19	27.2
AVG	4.07	0.91	1.70	2.30	5.22	1.99	0.56	0.64	0.374	1.38	17.1

DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20060405	2.13	0.00	0.46	0.81	1.38	0.20	0.21	0.24	0.375	0.76	4.8
20060411	7.08	0.00	1.56	3.94	11.20	5.56	1.50	1.85	0.375	2.54	34.1
20060417	1.92	0.00	0.23	0.72	2.66	0.54	0.45	0.55	0.375	0.69	6.4
20060423	3.08	0.00	1.15	1.34	2.64	0.91	0.38	0.40	0.375	1.10	9.2
20060429	1.40	0.00	0.42	0.53	3.84	0.72	0.45	0.54	0.375	0.50	10.6
20060505	4.06	0.00	1.46	1.57	3.59	0.73	0.92	1.08	0.375	1.45	12.6
20060517	5.73	0.00	0.65	2.12	2.55	0.58	0.46	0.46	0.370	2.09	12.4
20060523	2.00	0.00	0.68	0.77	2.35	0.57	0.64	0.56	0.375	0.72	6.7
20060529	14.90	0.00	2.62	7.25	16.80	7.03	1.20	1.33	0.375	5.34	54.1
20060604	1.75	0.00	1.19	0.82	2.36	0.31	0.22	0.19	0.375	0.63	7.8
20060610	2.03	0.00	0.19	0.59	2.27	0.29	0.28	0.31	0.291	0.59	6.1
20060616	8.12	0.00	1.04	3.88	15.00	6.08	1.18	1.49	0.375	2.91	34.9
20060622	6.31	0.00	0.80	2.54	4.94	1.26	0.71	0.70	0.375	2.26	18.8
20060628	9.65	0.00	1.14	3.82	4.52	1.77	0.57	0.55	0.375	3.46	22.8
AVG	5.01	0.00	0.97	2.19	5.44	1.90	0.66	0.73	0.369	1.79	17.2

DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20060704	8.77	0.00	0.78	3.31	5.19	0.68	0.38	0.31	0.375	3.14	26.3
20060710	18.40	0.00	0.83	6.84	8.58	3.04	0.80	1.03	0.372	6.67	45.1
20060716	7.07	0.00	0.95	3.12	11.60	5.01	1.85	2.20	0.375	2.53	32.4
20060728	6.58	0.00	0.46	1.91			5.15	5.18	0.290	1.88	20.3
20060803	11.30	0.00	0.82	3.27	4.36	1.19	0.88	1.07	0.289	3.20	25.2
20060809	10.30	0.00	0.45	2.63	7.41	2.00	0.71	0.93	0.255	2.10	25.4
20060815	6.62	0.00	0.92	1.89	3.52	0.68	0.58	0.51	0.285	1.82	15.3
20060821	3.86	0.00	0.53	1.25	3.35	0.69	0.34	0.35	0.324	1.34	10.7
20060827	11.50	0.00	0.61	4.37	5.00	0.86	0.59	0.56	0.375	4.12	28.2
20060902	0.94	0.00	0.17	0.24	1.53	0.15	0.25	0.17	0.255	0.19	2.9
20060908	16.90	0.00	1.65	7.74	12.90	5.47	2.62	3.21	0.375	6.06	44.4
20060914	6.85	0.00	1.01	3.13	2.21	0.65	0.30	0.30	0.375	2.45	13.0
20060920	1.90	0.00	0.32	0.74	1.79	0.33	0.16	0.16	0.375	0.68	4.9
20060926	5.76	0.00	1.56	3.91	5.38	2.52	1.01	1.05	0.375	2.06	18.3
AVG	8.34	0.00	0.79	3.17	5.60	1.79	1.12	1.22	0.335	2.73	22.3

DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20061002	7.07	0.00	1.15	3.72	7.36	3.79	0.87	0.81	0.375	2.53	23.1
20061008	3.62	0.00	0.57	2.61	8.44	5.00	1.28	1.67	0.375	1.30	22.7
20061014	2.60	0.00	0.65	1.74	5.45	2.79	0.55	0.66	0.375	0.93	12.5
20061020	1.38	0.00	0.20	0.43	1.68	0.45	0.29	0.33	0.312	0.46	3.6
20061026	2.45	0.00	0.79	1.03	3.23	0.69	0.47	0.50	0.375	0.88	7.9
20061101	3.15	2.67	4.14	2.31	4.18	0.14	0.82	0.78	0.375	0.96	15.0
20061107	2.24	0.00	0.75	0.91	4.74	1.09	0.52	0.56	0.375	0.80	11.0
20061113	5.03	0.28	0.78	1.94	2.58	1.20	0.26	0.29	0.370	1.80	11.7
20061119	3.48	1.88	2.48	1.79	3.43	0.63	0.15	0.14	0.358	1.10	12.3
20061125	6.79	0.00	1.48	5.82	17.60	9.61	1.00	0.92	0.375	2.43	50.7
20061201	2.33	0.00	0.27	0.74	2.04	0.78	0.15	0.12	0.318	0.79	6.2
20061207	1.92	1.40	2.00	1.15	1.86	0.36	0.30	0.35	0.375	0.58	8.3
20061213	5.05	0.09	2.24	3.49	8.06	3.52	1.16	1.37	0.375	1.80	23.2
20061219	3.08	3.17	3.79	2.49	5.77	1.81	0.91	1.03	0.375	0.99	19.4
20061225	2.33	0.59	1.28	1.01	2.79	0.93	0.10	0.13	0.360	0.79	9.9
20061231	4.62	0.70	2.13	2.37	5.24	1.78	0.41	0.40	0.375	1.57	18.5
AVG	3.57	0.67	1.54	2.10	5.28	2.16	0.58	0.63	0.365	1.23	16.0

DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20070106	1.94	0.00	0.68	0.88	1.57	0.59	0.22	0.24	0.375	0.70	6.1
20070112	4.17	0.13	1.57	3.06	4.66	2.63	1.02	1.16	0.375	1.48	19.9
20070118	3.60	1.88	2.44	2.20	7.98	2.83	0.93	1.05	0.375	1.09	19.5
20070124	6.48	0.99	1.38	2.53	2.37	0.11	0.20	0.25	0.346	2.27	13.2
20070130	3.81	2.78	3.11	2.33	2.89	0.35	0.54	0.57	0.375	1.14	12.5
20070205	1.69	2.07	2.13	0.97	2.52	0.07	0.19	0.20	0.218	0.67	8.0
20070211	4.24	4.87	5.09	3.27	4.36	1.19	0.33	0.44	0.375	1.42	20.9
20070217	10.60	3.06	3.31	9.84	14.40	8.01	1.86	2.42	0.375	3.43	54.1
20070223	1.65	0.28	0.62	0.61	1.49	0.41	0.23	0.27	0.320	0.53	4.2
20070301	5.54	0.07	1.36	2.33	3.34	0.70	0.40	0.44	0.375	1.98	13.5
20070307	2.47	1.99	2.27	1.24	2.93	0.78	0.49	0.42	0.268	0.73	9.9
20070313	6.34	0.00	1.41	4.75	8.33	5.25	1.62	1.87	0.375	2.27	25.9
20070319	4.80	1.50	1.96	4.33	5.80	4.33	1.06	1.25	0.375	1.54	28.0
20070325	3.66	0.00	1.96	1.66	2.46	0.68	0.36	0.38	0.375	1.31	8.4
20070327	3.05	0.00	0.64	1.22	5.53	1.47	3.61	3.73	0.375	1.09	10.3
AVG	4.27	1.31	2.00	2.75	4.71	1.96	0.87	0.98	0.352	1.44	17.0

DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20070406	2.54	0.90	1.43	1.26	1.68	0.22	0.36	0.42	0.375	0.80	6.5
20070412	3.16	0.00	0.37	1.44	1.57	0.81	0.38	0.39	0.375	1.13	7.5
20070418	6.14	0.00	0.53	1.34	1.95	0.21	0.67	0.67	0.218	1.22	10.9
20070424	3.47	0.00	1.57	1.45	2.68	0.40	1.38	1.38	0.375	1.24	9.0
20070506	0.94	0.00	0.10	0.36	1.19	0.16	0.44	0.44	0.375	0.34	3.0
20070518	1.62	0.00	0.78	0.60	1.23	0.35	0.56	0.53	0.370	0.59	5.5
20070524	13.70	0.00	1.34	5.24	6.06	2.75	2.04	2.17	0.375	4.91	31.8
20070530	7.25	0.00	0.96	3.28	7.40	4.07	1.43	1.56	0.375	2.60	23.2
20070605	3.49	0.00	0.56	1.28	1.88	0.64	0.36	0.46	0.367	1.28	8.2
20070611	3.60	0.00	0.49	1.15	3.11	0.78	1.44	1.49	0.319	1.23	12.8
20070617	14.80	0.00	1.47	6.24	9.79	4.87	1.60	1.74	0.375	5.30	40.0
20070623	2.40	0.00	0.78	1.02	3.43	2.16	1.10	1.18	0.375	0.86	10.7
20070629	2.19	0.00	0.84	0.87	2.84	0.83	0.76	0.87	0.375	0.78	9.4
AVG	5.02	0.07	0.86	1.96	3.45	1.40	0.96	1.02	0.358	1.71	13.7

DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20070705	6.45	0.00	0.91	2.41	2.20	0.74	0.70	0.82	0.374	2.32	13.8
20070711	5.52	0.00	0.68	1.81			0.98	0.96	0.328	1.95	14.6
20070717	11.70	0.00	0.78	4.22	5.74	3.95	1.36	1.77	0.361	4.33	31.4
20070723	2.78	0.00	0.51	0.86	3.04	1.20	1.25	1.39	0.309	0.90	12.7
20070729	16.80	0.00	0.49	5.13	3.29	0.99	0.78	0.70	0.305	5.33	29.8
20070804	16.90	0.00	1.40	5.57	6.79	2.71	1.23	1.57	0.330	6.01	39.7
20070810	5.36	0.00	0.75	1.74	1.86	0.50	0.34	0.41	0.325	1.87	11.0
20070816	9.86	0.00	1.07	3.66	4.23	1.26	1.12	1.11	0.371	3.58	26.8
20070822	13.80	0.00	1.20	4.99	3.66	1.73	1.61	2.04	0.362	5.11	27.7
20070828	23.60	0.00	1.03	7.45	6.30	3.30	1.12	1.08	0.316	7.93	47.3
20070903	11.20	0.00	1.07	5.24	8.93	9.35	1.34	1.44	0.375	4.01	36.4
20070909	9.42	0.00	1.79	3.83	3.66	1.38	0.61	0.75	0.375	3.38	26.2
20070915	1.37	0.00	0.20	0.45	0.95	0.34	0.34	0.36	0.328	0.49	3.6
20070921	13.00	0.00	1.67	5.63	3.97	2.34	1.47	1.64	0.375	4.66	27.4
20070927	4.43	0.00	1.60	2.14	1.70	0.91	2.54	2.65	0.375	1.59	12.7
AVG	10.15	0.00	1.01	3.68	4.02	2.19	1.12	1.25	0.347	3.56	24.1

DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20071003	5.05	0.00	1.47	2.67	5.70	3.66	1.75	2.07	0.375	1.81	21.5
20071009	10.20	0.00	1.87	6.10	7.09	7.91	3.77	4.44	0.375	3.65	35.2
20071015	4.26	0.00	1.21	1.94	3.53	2.05	1.29	1.45	0.375	1.53	14.8
20071021	6.55	0.00	1.05	5.15	13.81	10.46	2.75	3.51	0.375	2.35	40.3
20071027	3.09	0.00	0.34	1.18	1.21	0.58	0.11	0.13	0.375	1.11	6.3
20071102	1.99	0.00	1.05	0.97	2.75	1.18	0.54	0.60	0.375	0.71	8.7
20071108	3.80	1.30	2.37	2.34	3.66	2.07	1.04	1.29	0.375	1.21	15.8
20071114	7.30	0.10	2.79	4.41	5.01	4.00	0.78	0.91	0.375	2.60	27.1
20071120	7.73	0.00	1.81	4.11	4.36	3.31	0.96	1.04	0.375	2.77	23.4
20071126	4.11	1.08	1.99	2.68	3.64	2.64	0.58	0.62	0.375	1.34	16.6
20071202	3.64	0.88	1.83	2.60	3.24	2.36	0.74	0.87	0.375	1.20	15.9
20071208	6.24	4.81	5.47	3.98	4.03	1.45	0.59	0.70	0.375	1.88	23.2
20071214	4.47	1.31	2.14	2.19	1.20	0.29	0.22	0.26	0.375	1.44	9.6
20071220	5.33	3.85	4.54	3.72	2.37	0.66	0.48	0.58	0.375	1.60	16.1
20071226	3.47	1.68	2.44	1.99	5.24	2.18	0.88	0.95	0.375	1.06	20.1
AVG	5.15	1.00	2.16	3.07	4.46	2.99	1.10	1.29	0.375	1.75	19.6

DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20080101	4.25	2.15	2.84	2.53	2.19	0.92	0.20	0.25	0.375	1.29	11.8
20080107	5.63	0.00	1.35	2.83	3.63	3.15	0.61	0.71	0.375	2.02	14.8
20080113	6.01	2.05	2.78	3.02	3.20	1.57	0.53	0.65	0.375	1.91	17.3
20080119	5.00	4.04	4.39	3.56	1.94	1.31	1.06	1.02	0.375	1.52	15.6
20080125	3.23	4.86	5.05	3.02	2.62	0.80	0.55	0.62	0.375	1.23	13.7
20080131	2.11	1.85	2.24	1.20	1.95	0.79	0.42	0.50	0.314	0.67	8.5
20080206	2.74	0.00	0.45	1.19	1.86	1.33	0.40	0.50	0.375	0.98	7.5
20080212	3.87	2.86	3.12	2.24	4.04	1.10	1.26	1.40	0.364	1.20	15.6
20080218	3.15	0.00	0.82	1.35	1.16	0.68	0.28	0.22	0.375	1.13	7.7
20080224	11.60	4.90	5.31	7.40	5.53	2.90	0.75	0.78	0.375	3.59	35.7
20080301	3.12	1.49	2.12	1.66	1.32	0.25	0.14	0.15	0.375	0.95	8.3
20080307	6.40	2.27	2.82	2.97	3.01	1.19	0.88	0.97	0.361	2.10	19.3
20080313	4.15	0.00	2.14	2.45	2.94	1.77	1.79	2.09	0.375	1.49	12.1
20080319	4.76	0.23	1.10	2.25	2.35	1.76	0.76	0.69	0.375	1.68	12.7
20080325	5.63	2.09	3.35	4.39	8.77	0.17	0.99	1.24	0.375	1.77	21.5
20080331	2.86	0.00	0.55	1.19	1.93	1.38	0.64	0.79	0.375	1.02	8.3
AVG	4.66	1.80	2.53	2.70	3.03	1.32	0.70	0.79	0.370	1.53	14.4

DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20080406	4.10	0.00	0.43	1.55	1.95	0.38	0.09	0.12	0.375	1.47	9.1
20080412	2.39	0.00	0.38	0.75	1.13	0.15	0.27	0.28	0.314	0.79	4.7
20080418	11.50	0.00	1.77	7.97	13.36	8.52	1.97	2.28	0.375	4.12	56.0
20080424	3.32	0.00	0.54	1.32	2.32	1.04	1.28	1.45	0.375	1.19	11.2
20080430	4.17	1.09	3.02	2.32	2.15	0.93	0.50	0.57	0.375	1.36	12.4
20080506	7.65	0.00	2.05	4.95	12.39	4.66	2.06	2.64	0.375	2.74	35.6
20080512	1.89	0.00	0.19	0.62	0.87	0.31	0.13	0.09	0.328	0.67	4.2
20080518	2.71	0.00	0.90	1.48	2.30	1.28	0.38	0.42	0.375	0.97	9.1
20080524	1.74	0.00	0.80	0.69	1.62	0.57	0.22	0.22	0.375	0.62	6.1
20080530	6.95	0.00	1.29	3.62	7.78	5.91	1.51	1.62	0.375	2.49	27.7
20080605	6.78	0.00	1.45	2.79	3.74	2.61	0.60	0.73	0.375	2.43	19.2
20080611	4.88	0.00	1.50	2.59	8.71	4.64	1.10	1.27	0.375	1.75	23.6
20080617	0.00	0.00	0.05	0.00	1.70	0.61	0.33				10.2
20080623	3.73	0.00	1.39	1.79	1.94	0.94	0.38	0.45	0.375	1.34	10.6
20080629	4.74	0.00	1.01	2.25	2.54	1.38	0.83	0.85	0.375	1.70	12.5
AVG	4.44	0.07	1.12	2.31	4.30	2.26	0.78	0.93	0.367	1.69	16.8

DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20080705	11.80	0.00	3.43	2.79	4.09	1.10	0.68	0.46	0.236	2.15	28.8	
20080711	8.22	0.00	1.33	4.44	8.96	6.88	1.58	1.94	0.375	2.95	31.0	
20080717	17.30	0.00	1.54	6.51	7.93	6.13	1.08	1.11	0.375	6.20	45.1	
20080723	5.54	0.00	0.74	1.93	2.31	1.06	0.49	0.53	0.348	2.05	14.0	
20080729	13.80	0.00	1.70	5.60	11.47	5.20	0.92	1.02	0.375	4.94	44.4	
20080804	7.49	0.00	0.76	3.76	6.93	5.65	1.99	2.55	0.375	2.68	27.0	
20080810	0.02	0.00	0.03	0.00	1.41	0.34	0.00	0.00	0.000	0.02	9.0	
20080816	5.02	0.00	0.68	2.76	6.17	3.67	1.29	1.83	0.375	1.80	18.7	
20080822	5.93	0.00	0.25	1.78	2.47	0.59	0.32	0.35	0.300	1.82	15.8	
20080828	1.01	0.00	0.33	0.34	1.17	0.42	0.11	0.11	0.337	0.36	3.9	
20080903	15.00	0.00	2.14	6.59	11.57	8.26	1.73	2.00	0.375	5.37	45.0	
20080909	5.45	0.00	0.91	2.55	4.67	2.87	0.43	0.53	0.375	1.95	19.2	
20080915	1.79	0.00	0.13	0.53	0.96	0.31	0.19	0.18	0.296	0.53	5.8	FRM_MASS = CSN
20080921	15.20	0.00	2.19	7.84	10.99	5.98	2.14	2.92	0.375	5.45	43.8	
20080927	1.34	0.00	0.51	0.43	1.31	0.40	0.14	0.16	0.321	0.46	4.3	
AVG	7.66	0.00	1.11	3.19	5.49	3.26	0.87	1.05	0.323	2.58	23.7	

DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20081003	2.00	0.00	0.45	0.80	1.69	0.80	0.33	0.39	0.375	0.72	6.3	
20081009	5.09	0.00	1.32	3.34	5.32	3.37	1.50	1.76	0.375	1.82	17.1	
20081015	7.76	0.00	1.58	3.66	5.96	2.64	1.51	1.58	0.375	2.78	21.5	
20081021	2.41	0.00	0.64	1.39	1.99	1.28	0.74	0.95	0.375	0.86	11.2	
20081027	1.49	0.00	0.39	0.54	0.85	0.14	0.19	0.25	0.362	0.55	3.7	
20081102	5.88	0.00	1.88	2.92	4.35	1.13	1.66	1.79	0.375	2.11	20.1	
20081108	1.89	0.00	0.92	0.85	1.48	0.37	0.18	0.23	0.375	0.68	6.9	
AVG	3.79	0.00	1.03	1.93	3.09	1.39	0.87	0.99	0.373	1.36	12.4	Low recovery - not used

DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20090308	3.07	0.00	0.92	1.10	2.48	0.70	0.51	0.56	0.358	1.14	10.3	
20090314	5.35	1.07	2.58	2.43			0.69	0.81	0.375	1.79	16.4	
20090320	3.81	1.47	2.17	2.30	2.48	1.08	0.45	0.52	0.375	1.19	10.6	
20090326	2.20	0.39	1.78	1.50	1.88	0.89	0.31	0.37	0.375	0.74	10.2	
AVG	3.61	0.73	1.86	1.83	2.28	0.89	0.49	0.57	0.371	1.22	11.9	Low recovery - not used

DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20090401	3.64	0.00	0.77	1.65	3.09	0.89	0.63	0.73	0.375	1.30	11.5
20090407	2.15	0.00	0.36	0.82	0.59	0.16	0.12	0.12	0.375	0.77	5.2
20090413	1.84	0.00	0.42	0.74	1.04	0.38	0.47	0.46	0.375	0.66	6.5
20090419	8.34	0.00	1.56	4.47	7.07	4.27	0.32	0.38	0.375	2.99	28.8
20090425	3.34	0.00	0.71	1.65	4.80	3.00	0.65	0.72	0.375	1.20	14.8
20090501	2.65	0.00	0.60	1.06	1.80	0.55	0.94	0.99	0.375	0.95	8.5
20090507	5.08	0.00	0.50	2.00	2.03	0.86	1.09	1.03	0.375	1.82	12.9
20090513	4.60	0.00	0.63	1.68	2.01	0.67	1.26	1.43	0.365	1.69	12.5
20090519	3.42	0.00	1.22	2.39	6.04	3.09	2.10	2.39	0.375	1.23	18.3
20090525	6.79	0.00	1.21	2.68	2.64	0.90	1.81	2.08	0.375	2.43	18.6
20090531	2.38	0.00	0.77	1.33	6.36	2.60	0.79	0.86	0.375	0.85	12.2
20090606	7.22	0.00	1.51	3.41	5.58	2.74	1.25	1.23	0.375	2.59	22.1
20090612	4.36	0.00	1.84	2.06	2.32	0.77	0.41	0.49	0.375	1.56	11.8
20090618	4.89	0.00	1.11	1.97	1.38	0.50	0.74	0.76	0.375	1.75	11.7
20090624	3.02	0.00	0.84	1.30	5.89	2.50	2.23	2.34	0.375	1.08	16.3
20090630	2.07	0.00	0.42	0.71	1.49	0.45	0.51	0.55	0.343	0.76	6.5
AVG	4.11	0.00	0.90	1.87	3.38	1.52	0.96	1.04	0.372	1.48	13.6

DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20090706	5.48	0.00	1.12	2.81	9.41	4.00	1.26	1.32	0.375	1.96	25.0
20090712	3.35	0.00	0.32	1.14	2.01	0.51	0.96	1.00	0.340	1.22	10.2
20090718	1.84	0.00	0.71	0.86	1.66	0.73	0.13	0.16	0.375	0.66	6.8
20090724	6.88	0.00	0.75	3.11	3.23	1.73	0.24	0.25	0.375	2.47	17.3
20090730	7.00	0.00	0.91	2.90	1.61	0.79	0.31	0.34	0.375	2.51	15.8
20090805	4.04	0.00	0.48	1.35	2.11	0.71	0.38	0.46	0.334	1.46	11.7
20090811	5.52	0.00	0.90	3.31	1.82	1.52	0.52	0.56	0.375	1.98	14.5
20090817	9.40	0.00	0.86	3.78	5.33	2.66	0.64	0.75	0.375	3.37	28.4
20090823	2.85	0.00	0.37	0.97	1.52	0.53	0.31	0.33	0.340	1.04	7.7
20090829	3.46	0.00	0.45	1.42	3.10	1.21	1.47	1.50	0.375	1.24	12.2
20090904	13.00	0.00	1.02	4.02	3.82	2.01	1.13	1.17	0.309	4.22	28.4
20090910	1.78	0.00	0.33	0.59	2.22	0.54	0.34	0.33	0.331	0.64	8.1
20090916	1.80	0.00	0.18	0.50	1.39	0.42	0.33	0.37	0.278	0.47	7.1
20090922	4.39	0.00	0.48	1.54	1.54	0.68	0.26	0.31	0.351	1.63	10.5
20090928	4.62	0.00	0.36	1.66	1.78	0.82	0.36	0.38	0.359	1.71	9.8
AVG	5.03	0.00	0.62	2.00	2.84	1.26	0.58	0.62	0.351	1.77	14.2

DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20091004	1.71	0.00	0.27	0.68			0.13	0.15	0.375	0.61	7.9	
20091010	3.29	0.00	0.36	1.79			0.19	0.15	0.375	1.18	14.0	
20091016	0.88	0.00	0.57	0.42			0.14	0.13	0.375	0.32	4.5	FRM_MASS = CSN
20091022	15.10	0.00	1.08	9.96			2.36	2.74	0.375	5.41	55.7	
20091028	3.01	0.00	0.39	1.17			0.17	0.19	0.375	1.08	7.5	
20091103	6.05	0.38	2.14	3.71			0.63	0.62	0.375	2.13	21.4	
20091109	21.90	0.00	2.31	15.90			2.05	1.90	0.375	7.85	92.1	
20091115	10.50	0.00	2.20	6.79			0.68	0.55	0.375	3.76	45.3	
20091121	4.33	2.70	4.88	3.25			0.35	0.36	0.375	1.30	16.1	
20091127	1.27	0.00	0.37	0.46			0.03	0.04	0.362	0.47	3.0	
20091203	2.50	0.05	1.50	1.35			0.12	0.07	0.375	0.89	7.2	
AVG	6.41	0.28	1.46	4.13			0.62	0.63	0.374	2.27	25.0	

Liberty CSN Speciation Quarterly SANDWICH Averages

YEAR	QTR	FRMc	SO4	NO3r	NO3	NH4	OC	EC	CRUSTalt	DON	H2Oaim
2005	1Q	15.169	3.868	1.993	2.593	2.218	4.051	1.438	0.616	0.352	1.294
2005	2Q	18.433	5.693	0.155	1.146	2.495	5.752	2.081	0.786	0.355	1.945
2005	3Q	30.421	10.967	0.000	1.001	3.980	6.776	3.389	0.954	0.341	3.811
2005	4Q	22.078	5.060	0.528	1.156	2.681	6.183	3.857	1.051	0.327	1.800
2006	1Q	17.080	4.073	0.912	1.701	2.298	5.216	1.993	0.639	0.374	1.377
2006	2Q	17.236	5.011	0.000	0.971	2.193	5.436	1.896	0.732	0.369	1.789
2006	3Q	22.314	8.339	0.000	0.790	3.168	5.602	1.790	1.216	0.335	2.731
2006	4Q	16.000	3.571	0.674	1.544	2.097	5.278	2.161	0.629	0.365	1.232
2007	1Q	16.960	4.269	1.308	1.995	2.748	4.709	1.960	0.979	0.352	1.443
2007	2Q	13.731	5.023	0.069	0.863	1.964	3.447	1.404	1.023	0.358	1.714
2007	3Q	24.073	10.146	0.000	1.010	3.675	4.022	2.192	1.246	0.347	3.564
2007	4Q	19.640	5.149	1.001	2.158	3.069	4.457	2.987	1.295	0.375	1.751
2008	1Q	14.400	4.657	1.799	2.527	2.703	3.027	1.317	0.786	0.370	1.534
2008	2Q	16.813	4.437	0.073	1.118	2.313	4.300	2.262	0.928	0.367	1.689
2008	3Q	23.720	7.661	0.000	1.111	3.190	5.494	3.257	1.046	0.323	2.582
2008	4Q										
2009	1Q										
2009	2Q	13.638	4.112	0.000	0.904	1.870	3.383	1.520	1.035	0.372	1.477
2009	3Q	14.233	5.027	0.000	0.616	1.997	2.838	1.259	0.615	0.351	1.772
2009	4Q	24.977	6.413	0.285	1.461	4.135			0.627	0.374	2.273

AVGs	QTR	FRMc	SO4	NO3r	NO3	NH4	OC	EC	CRUSTalt	DON	H2Oaim	NH4r	PBWcalc	OCMmb
	1Q	15.902	4.217	1.503	2.204	2.492	4.251	1.677	0.755	0.362	1.412	1.962	1.364	3.924
	2Q	15.970	4.855	0.059	1.000	2.167	4.463	1.833	0.901	0.364	1.723	1.785	2.088	3.949
	3Q	22.952	8.428	0.000	0.906	3.202	4.946	2.377	1.016	0.339	2.892	2.861	3.620	4.150
	4Q	20.674	5.048	0.622	1.580	2.995	5.306	3.002	0.900	0.360	1.764	1.999	2.161	6.442

PBW Calculation	SO4	NO3r	NH4r
- Calculated from SO4, NO3r, and NH4r	4.217	1.503	1.962
- NH4r calculated from DON, SO4, NO3r	4.855	0.059	1.785
- DON > 0.225, low acidity equation	8.428	0.000	2.861
	5.048	0.622	1.999

S Term	N Term	A Term	Part 1	Part 2	Part 3	Sum	PBWcalc
0.549	0.196	0.255	-22192.417	-130.756	22323.350	0.178	1.364
0.725	0.009	0.266	-23361.248	-207.430	23568.991	0.312	2.088
0.747	0.000	0.253	-21877.209	-220.663	22098.192	0.321	3.620
0.658	0.081	0.261	-22740.190	-179.787	22920.259	0.282	2.161

Methodology:

- Use measured SO4 and EC
- Use retained nitrate (calculated)
- Use calculated indirect NH4 (retained) method for baseline and future
- Use crustal (alt) for other particulate PM2.5 (OPP)
- Use calculated particle bound water for baseline and future
- Degrees of Neutralization (DON) constant from base to future
- Minimum (floor) for OCMmb is equal to OC
- If OCMmb < OCfloor, then adjust species by FRMc/CFM
- Reconstructed CFM = SO4+NO3r+NH4r+H2O+EC+Cr+Pa+OCfloor

Reconstruction for Quarters with OCMmb < OCfloor

RFM	QTR	FRMc	SO4	NO3r	OC	EC	CRUSTalt	NH4r	PBWcalc	Pa	CFM	FRMc/CFM
	1Q	15.902	4.217	1.503	4.251	1.677	0.755	1.962	1.364	0.500	16.229	0.980
	2Q	15.970	4.855	0.059	4.463	1.833	0.901	1.785	2.088	0.500	16.485	0.969
	3Q	22.952	8.428	0.000	4.946	2.377	1.016	2.861	3.620	0.500	23.748	0.966
	4Q											

Adjusted Averages

Adjusted	QTR	FRMc	SO4	NO3r	OC	EC	CRUSTalt	NH4r	PBWcalc	Pa	OCMmb
AVGs	1Q	15.902	4.132	1.473	4.165	1.643	0.740	1.923	1.336	0.500	4.155
	2Q	15.970	4.704	0.058	4.324	1.776	0.873	1.729	2.023	0.500	4.308
	3Q	22.952	8.146	0.000	4.781	2.298	0.982	2.765	3.499	0.500	4.764
	4Q	20.674	5.048	0.622	5.306	3.002	0.900	1.999	2.161	0.500	6.442

Quarterly Averages

AVGs	QTR	FRMc	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	15.902	0.500	15.402	4.155	1.643	4.132	1.473	0.740	1.923	1.336
	2Q	15.970	0.500	15.470	4.308	1.776	4.704	0.058	0.873	1.729	2.023
	3Q	22.952	0.500	22.452	4.764	2.298	8.146	0.000	0.982	2.765	3.499
	4Q	20.674	0.500	20.174	6.442	3.002	5.048	0.622	0.900	1.999	2.161

Relative Compositions (fractions of Non-Blank)

FRACT	QTR	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	1.000	0.270	0.107	0.268	0.096	0.048	0.125	0.087
	2Q	1.000	0.278	0.115	0.304	0.004	0.056	0.112	0.131
	3Q	1.000	0.212	0.102	0.363	0.000	0.044	0.123	0.156
	4Q	1.000	0.319	0.149	0.250	0.031	0.045	0.099	0.107

Weighted Quarterly Compositions

WEIGHT	QTR	FRMw	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	14.637	0.500	14.137	3.814	1.508	3.793	1.352	0.679	1.765	1.227
	2Q	18.051	0.500	17.551	4.888	2.014	5.336	0.065	0.990	1.962	2.295
	3Q	22.600	0.500	22.100	4.689	2.262	8.018	0.000	0.966	2.721	3.444
	4Q	18.186	0.500	17.686	5.647	2.631	4.426	0.545	0.789	1.753	1.894
	AVG	18.368									

Liberty SMAT RRFs and Future Compositions, by Total Species

Baseline Total Quarterly Compositions

Baseline (2007)	QTR	FRMw	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc	DON
Avg	1Q	14.637	0.500	14.137	3.814	1.508	3.793	1.352	0.679	1.765	1.227	0.362
Avg	2Q	18.051	0.500	17.551	4.888	2.014	5.336	0.065	0.990	1.962	2.295	0.364
Avg	3Q	22.600	0.500	22.100	4.689	2.262	8.018	0.000	0.966	2.721	3.444	0.339
Avg	4Q	18.186	0.500	17.686	5.647	2.631	4.426	0.545	0.789	1.753	1.894	0.360
	AVG	18.368										

Methodology:

- Use measured SO4 and EC
- Use retained nitrate (calculated)
- Use calculated indirect NH4 (retained) method for baseline and future
- Use calculated particle bound water for baseline and future
- Degrees of Neutralization (DON) constant from base to future

CAMx Modeled Species -Total

Baseline (2007)	QTR		POA	SOA	TOA	EC	SO4	NO3	OTHER
Avg	1Q		3.647	0.053	3.700	1.587	2.785	2.057	5.747
Avg	2Q		1.229	0.023	1.251	1.098	5.198	0.410	3.732
Avg	3Q		1.279	0.029	1.308	1.399	7.871	0.053	5.426
Avg	4Q		3.867	0.039	3.905	1.811	3.981	1.646	6.945

Future Projected (2014)	QTR		POA	SOA	TOA	EC	SO4	NO3	OTHER
Avg	1Q		2.932	0.045	2.976	0.796	1.922	1.837	4.891
Avg	2Q		0.916	0.017	0.934	0.583	2.598	0.392	3.086
Avg	3Q		0.920	0.023	0.943	0.763	3.538	0.069	4.431
Avg	4Q		3.154	0.034	3.189	0.929	2.410	1.260	5.767

Regional RRFs (Future Projected divided by Baseline)

RRF	QTR				TOA	EC	SO4	NO3	OTHER
Ratio	1Q				0.804	0.501	0.690	0.893	0.851
Ratio	2Q				0.746	0.531	0.500	0.956	0.827
Ratio	3Q				0.721	0.545	0.450	1.304	0.816
Ratio	4Q				0.817	0.513	0.605	0.766	0.830

Total Future Projected Compositions

Future Projected (2014)	QTR	FRMf	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc	DON
Avg	**1Q**	10.850	0.500	10.350	3.067	0.756	2.618	1.208	0.578	1.298	0.825	0.362
Avg	**2Q**	10.900	0.500	10.400	3.647	1.069	2.667	0.062	0.819	0.989	1.146	0.364
Avg	**3Q**	12.280	0.500	11.780	3.382	1.233	3.604	0.000	0.789	1.223	1.548	0.339
Avg	**4Q**	12.440	0.500	11.940	4.611	1.350	2.679	0.417	0.655	1.086	1.141	0.360
	AVG	**11.618**										

PBW Calculation	**SO4**	**NO3r**	**NH4r**
- Calculated from SO4, NO3r, and NH4r	2.618	1.208	1.298
- NH4r calculated from DON, SO4, NO3r	2.667	0.062	0.989
- DON > 0.225, low acidity equation	3.604	0.000	1.223
	2.679	0.417	1.086

S Term	**N Term**	**A Term**	**Part 1**	**Part 2**	**Part 3**	**Sum**	**Total**
0.511	0.236	0.253	-21971.767	-113.415	22085.343	0.161	0.825
0.717	0.017	0.266	-23315.566	-204.382	23520.257	0.308	1.146
0.747	0.000	0.253	-21877.209	-220.663	22098.192	0.321	1.548
0.640	0.100	0.260	-22638.664	-171.981	22810.918	0.273	1.141

Liberty Design Values, by Total Species

Design Values

Case	Year	Value
Baseline	2007	**18.4**
Future Projected	2014	**11.6**

Liberty Regional/Local Split, based on SWPA sites

For the Liberty regional/local split fractions, the quarterly averages of Lawrenceville, Florence, and Greensburg were calculated as the regional component. The average of the regional site species compositions were subtracted from Liberty total compositions, then the regional/local fractions were applied to Liberty species compositions.

Lawrenceville CSN Notes

- Measured carbons switched from TOT to TOR for Lawrenceville on 10/1/09
- Some EC/OC not included with MATS data after TOT/TOR switch; substituted from AQS
- Missing concurrent FRM mass was substituted with CSN total mass
- All CSN species are submitted to EPA AQS by RTI, reviewed by ACHD
- Calculated species taken from EPA MATS 2.5.1 species-for-fractions

Florence CSN Notes

- Measured carbons switched from TOT to TOR for Florence on 5/12/07
- Some EC/OC not included with MATS data after TOT/TOR switch; substituted from AQS
- Missing concurrent FRM mass was substituted with CSN total mass
- All CSN species are submitted to EPA AQS by RTI, reviewed by PA DEP
- Calculated species taken from EPA MATS 2.5.1 species-for-fractions

Greensburg CSN Notes

- Measured carbons switched from TOT to TOR for Greensburg on 5/6/07
- Some EC/OC not included with MATS data after TOT/TOR switch; substituted from AQS
- Missing concurrent FRM mass was substituted with CSN total mass
- All CSN species are submitted to EPA AQS by RTI, reviewed by PA DEP
- Calculated species taken from EPA MATS 2.5.1 species-for-fractions

Lawrenceville CSN Quarterly Averages

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20050101	4.530	1.230	2.450	1.140	3.410	0.820	0.480	0.520	0.172	2.930	13.800
20050104	1.390	1.320	1.500	0.420	2.490	0.590	0.280	0.300	0.030	0.840	5.200
20050107	3.650	1.180	1.840	0.000			0.420	0.480	0.000	3.540	10.400
20050110	4.420	1.250	1.960	1.180	3.290	0.880	0.520	0.590	0.184	2.860	13.900
20050113	3.250	0.000	0.300	0.570	2.350	0.610	0.290	0.320	0.176	2.250	8.600
20050116	2.210	2.120	2.360	0.670	2.900	0.360	0.240	0.260	0.024	1.310	11.000
20050119	3.020	2.070	2.300	0.870	2.780	0.540	0.460	0.460	0.089	1.800	11.300
20050122	2.720	2.610	2.750	0.800	3.650	0.430	0.260	0.300	0.016	1.620	12.500
20050125	4.790	5.640	6.170	1.560	7.570	0.700	0.880	0.900	0.000	2.740	19.900
20050128	1.280	1.650	1.840	0.000			0.540	0.560	0.000	1.110	10.700
20050131	2.870	3.340	3.780	1.160	9.840	1.440	1.070	1.090	0.065	1.660	20.200
20050203	4.270	5.880	6.540	1.850	7.170	1.490	1.250	1.290	0.033	2.600	26.500
20050206	5.750	1.210	2.700	1.560	7.930	1.790	0.840	0.900	0.210	3.710	22.200
20050209	4.480	4.400	4.540	1.400	4.520	1.250	0.920	0.920	0.028	2.720	17.700
20050212	2.700	5.700	6.420	1.530	3.330	0.630	0.400	0.420	0.000	1.850	16.100
20050215	3.300	0.000	1.380	0.700	2.650	0.590	0.520	0.560	0.214	2.250	5.900
20050218	1.780	1.300	1.550	0.000			0.300	0.360	0.000	1.600	8.000
20050221	5.290	1.040	1.540	1.100	2.800	0.780	0.820	0.900	0.151	3.470	14.300
20050224	2.640	2.290	2.540	0.860	2.350	0.470	0.290	0.300	0.073	1.560	10.500
20050227	1.870	1.020	1.500	0.500	4.490	0.360	0.200	0.210	0.112	1.030	7.100
20050302	1.560	0.820	1.070	0.440	1.480	0.290	0.180	0.180	0.125	0.910	5.100
20050305	4.420	3.020	3.490	1.380	4.600	0.900	0.540	0.570	0.112	2.610	16.600
20050308	1.390	0.090	0.370	0.280	1.080	0.190	0.200	0.220	0.179	0.960	3.500
20050311	4.350	3.980	4.330	0.000			0.530	0.580	0.000	3.830	16.200
20050314	2.570	2.190	2.660	0.820	3.370	0.430	0.490	0.520	0.073	1.520	10.300
20050317	3.880	5.930	7.050	1.750	5.580	1.310	1.060	1.150	0.007	2.410	22.800
20050320	6.880	6.120	6.520	2.310	3.610	0.290	0.360	0.380	0.078	4.040	24.500
20050323	4.880	1.770	2.150	1.220	2.460	0.540	0.240	0.280	0.145	3.070	13.800
20050326	6.650	0.000	0.730	1.140	2.350	0.490	0.300	0.390	0.171	4.500	13.200
20050329	3.380	0.000	0.880	0.720	2.450	0.540	0.400	0.420	0.212	2.310	7.900
AVG	3.539	2.306	2.840	0.931	3.865	0.720	0.509	0.544	0.089	2.320	13.323

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20050401	3.290	0.000	0.900	0.000			0.390	0.430	0.000	3.380	7.900
20050404	1.440	0.000	0.450	0.240	3.020	0.590	0.590	0.620	0.170	0.980	6.100
20050407	5.050	0.000	1.240	1.020	6.410	1.850	1.420	1.600	0.202	3.480	19.700
20050410	4.150	0.000	0.750	0.840	5.770	1.090	2.440	2.790	0.204	2.840	14.600
20050413	1.460	0.000	0.520	0.320	2.120	0.480	0.950	0.990	0.215	1.000	4.900
20050416	1.470	0.000	1.530	0.430	4.790	0.940	1.660	1.820	0.293	1.000	8.700
20050419	10.860	0.000	1.700	2.290	8.710	2.370	2.150	2.270	0.211	7.450	28.800
20050422	3.670	0.060	1.420	0.860	3.330	1.080	1.020	1.120	0.231	2.500	12.100
20050425	2.010	0.000	0.550	0.000			0.320	0.340	0.000	2.060	4.100
20050428	3.500	0.170	2.060	0.920	2.780	0.370	0.510	0.540	0.248	2.400	9.300
20050501	4.120	2.020	3.860	1.210	3.370	0.200	0.460	0.520	0.150	2.580	12.700
20050504	4.860	1.420	3.190	1.380	3.720	0.690	1.180	1.290	0.199	3.140	14.100
20050507	10.470	0.000	2.950	2.410	6.810	1.170	1.190	1.360	0.230	7.220	26.100
20050510	10.710	0.000	0.720	0.000			2.150	2.330	0.000	11.020	24.500
20050513	3.490	0.000	0.290	0.000			0.900	0.980	0.000	3.590	9.600
20050516	2.830	0.000	0.860	0.570	2.310	0.490	0.440	0.480	0.201	2.010	6.800
20050519	4.220	0.000	0.770	0.780	3.240	0.590	0.600	0.660	0.186	3.020	10.800
20050522	4.160	0.000	1.580	0.820	5.660	0.900	0.700	0.760	0.198	2.960	14.900
20050525	1.270	0.000	0.550	0.180	2.590	0.300	0.450	0.450	0.142	0.940	4.800
20050528	3.170	1.250	2.150	1.490	5.290	0.360	0.350	0.370	0.356	1.030	9.700
20050603	1.560	0.000	0.480	0.280	3.620	0.410	0.240	0.260	0.183	1.080	5.100
20050606	9.870	0.000	0.550	0.000			1.040	1.180	0.000	10.150	25.600
20050609	9.560	0.000	0.530	1.490	5.640	1.460	0.780	0.880	0.156	6.530	23.900
20050612	7.700	0.000	1.000	1.320	5.600	0.740	0.500	0.570	0.172	5.380	19.200
20050615	3.790	0.000	0.330	0.540	2.740	0.430	0.370	0.410	0.143	2.470	8.900
20050618	1.620	0.000	0.540	0.250	6.650	0.710	0.240	0.240	0.154	1.100	7.600
20050621	13.670	0.000	0.520	2.060	5.550	1.210	0.940	1.010	0.151	9.060	28.900
20050624	19.040	0.000	0.660	0.000			1.650	1.860	0.000	19.580	41.000
20050627	15.160	0.000	0.740	2.640	11.000	1.390	1.190	1.300	0.174	10.550	39.400
20050630	11.630	0.000	1.280	2.500	4.790	1.380	1.040	1.200	0.215	7.500	27.300
AVG	5.993	0.164	1.156	0.895	4.813	0.883	0.929	1.021	0.159	4.600	15.903

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20050703	11.410	0.000	1.050	1.520	5.950	0.910	0.670	0.550	0.134	8.110	25.200
20050706	8.230	0.000	1.560	1.450	3.740	0.600	1.400	1.580	0.176	5.720	18.400

20050709	4.420	0.000	0.720	0.680	4.840	0.750	0.550	0.620	0.155	2.960	13.700
20050712	10.460	0.000	0.570	1.730	7.290	1.170	1.660	1.820	0.165	7.270	29.100
20050715	9.540	0.000	0.720	1.740	5.480	0.610	0.780	0.820	0.182	6.630	22.500
20050718	18.260	0.000	0.130	0.000			0.650	0.800	0.000	18.780	31.100
20050721	10.900	0.000	0.600	3.360	5.980	0.650	0.860	0.880	0.308	3.520	25.900
20050724	5.540	0.000	0.510	1.710	6.220	1.000	0.530	0.630	0.309	1.790	18.700
20050727	3.780	0.000	0.510	1.230	3.870	0.560	0.380	0.380	0.325	1.320	12.000
20050730	9.860	0.000	0.490	2.740	5.560	0.480	0.340	0.410	0.278	2.520	22.300
20050802	7.940	0.000	0.680	2.470	6.040	1.100	0.990	1.150	0.311	2.600	22.700
20050808	8.350	0.000	0.530	2.900	3.830	0.530	0.270	0.270	0.347	3.090	18.700
20050811	16.600	0.000	0.690	5.440	5.970	1.260	0.680	0.680	0.328	5.860	34.500
20050814	7.250	0.000	0.660	2.400	3.770	0.430	1.460	1.740	0.331	2.590	19.600
20050817	5.720	0.000	1.450	2.100	4.920	1.120	0.700	0.790	0.367	2.100	16.400
20050820	8.870	0.000	0.560	2.630	3.320	0.610	0.490	0.500	0.297	2.650	17.800
20050823	2.660	0.000	0.300	0.820	2.490	0.520	0.520	0.580	0.308	0.860	6.900
20050826	11.500	0.000	0.800	4.370	5.070	1.340	0.820	0.850	0.375	4.120	28.300
20050901	6.410	0.000	2.090	2.410	4.180	1.410	0.630	0.660	0.375	2.300	15.300
20050904	1.720	0.000	0.420	0.580	4.760	0.950	0.300	0.270	0.337	0.630	8.600
20050907	6.840	0.000	0.850	2.490	5.510	1.340	0.810	0.820	0.364	2.520	19.900
20050910	5.510	0.000	0.410	1.760	4.170	0.750	0.320	0.320	0.319	1.880	14.800
20050919	14.100	0.000	0.870	4.000	4.780	1.420	0.840	0.840	0.284	3.810	27.300
20050922	9.850	0.000	0.690	3.410	5.210	1.210	0.950	0.950	0.346	3.640	23.700
20050925	12.700	0.000	0.460	3.850	3.920	0.720	0.290	0.290	0.303	3.980	25.500
20050928	4.120	0.000	0.440	1.360	3.610	1.110	0.470	0.470	0.330	1.470	11.900
AVG	8.559	0.000	0.722	2.275	4.819	0.902	0.706	0.757	0.283	3.951	20.415

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20051001	8.230	0.000	0.960	3.010	6.440	1.190	0.480	0.480	0.366	3.030	21.200
20051004	13.300	0.000	1.430	4.610	6.590	1.540	1.220	1.240	0.347	4.910	32.100
20051007	1.900	0.000	0.350	0.620	1.560	0.620	0.330	0.260	0.326	0.660	5.700
20051013	6.130	0.000	0.130	1.450	3.720	0.420	0.180	0.180	0.237	1.120	10.200
20051016	1.310	0.000	0.280	0.430	2.190	0.280	0.170	0.170	0.328	0.460	4.500
20051019	3.120	0.000	0.730	1.090	6.900	1.420	1.830	1.900	0.349	1.160	13.200
20051022	1.510	0.490	0.780	0.610	3.850	0.260	0.180	0.180	0.310	0.440	4.800
20051025	0.570	0.000	0.260	0.130	1.100	0.400	0.310	0.300	0.228	0.110	2.300
20051031	6.830	0.000	0.910	2.610	8.480	2.610	1.970	2.150	0.375	2.450	23.400

20051103	4.020	0.000	0.950	1.640	3.470	0.770	0.580	0.620	0.375	1.440	11.500
20051106	4.270	0.000	0.310	1.400	2.820	0.530	0.340	0.250	0.328	1.510	11.000
20051109	4.300	0.000	1.040	1.620	4.300	1.160	0.710	0.840	0.375	1.540	13.700
20051112	2.900	0.000	1.090	1.220	7.360	1.940	0.980	1.060	0.375	1.040	16.600
20051115	4.260	0.000	1.420	1.750	3.520	1.210	0.770	0.790	0.375	1.530	12.700
20051118	3.610	2.470	2.910	2.080	2.630	0.650	0.500	0.480	0.375	1.080	11.100
20051124	1.440	0.600	0.900	0.740			0.170	0.200	0.375	0.450	4.200
20051127	2.290	0.000	1.350	1.080	6.070	1.680	0.910	1.010	0.375	0.820	14.900
20051130	3.320	0.460	1.250	1.640	3.170	0.490	0.280	0.310	0.375	1.140	9.100
20051203	2.600	2.940	3.260	1.840	2.730	0.550	0.260	0.290	0.375	0.860	10.700
20051206	4.920	4.440	4.710	3.010	3.440	0.700	0.400	0.340	0.350	1.600	16.900
20051209	5.810	3.490	3.780	3.010	3.460	0.580	0.430	0.520	0.344	1.830	15.600
20051215	2.110	3.700	4.030	1.790	4.360	0.990	0.400	0.420	0.339	0.920	13.400
20051218	4.210	3.890	4.240	2.760	8.170	1.560	0.510	0.540	0.375	1.310	21.600
20051227	8.120	0.860	1.360	2.910	2.340	0.730	0.300	0.270	0.328	2.760	14.900
AVG	4.212	0.973	1.601	1.794	4.290	0.969	0.592	0.617	0.346	1.424	13.138

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20060105	2.110	0.620	1.010	1.000	1.540	0.410	0.230	0.260	0.375	0.680	5.900
20060108	3.360	2.170	3.190	2.130	3.400	0.660	0.480	0.430	0.375	1.010	12.200
20060111	5.850	0.000	1.010	2.320	3.680	0.990	0.760	0.780	0.375	2.100	15.000
20060123	2.110	2.230	2.610	1.310	3.680	0.970	0.760	0.740	0.314	0.710	12.700
20060126	1.510	0.390	0.800	0.660	2.480	0.470	0.280	0.310	0.362	0.510	5.200
20060129	2.940	0.000	0.740	1.160	4.820	1.070	0.480	0.580	0.375	1.050	13.300
20060201	6.940	1.450	2.320	2.730	2.590	0.680	0.360	0.400	0.333	2.320	15.000
20060204	4.110	0.760	1.420	1.840	2.980	0.700	0.260	0.300	0.375	1.380	11.600
20060207	3.320	1.990	2.470	1.860	2.250	0.410	0.290	0.300	0.375	0.990	9.400
20060210	3.350	3.800	4.290	2.420	3.450	0.800	0.510	0.580	0.375	1.110	14.000
20060216	4.500	0.000	1.210	1.810	5.100	1.550	0.940	1.000	0.375	1.610	16.100
20060219	2.730	1.790	1.930	1.340	3.210	0.610	0.260	0.310	0.300	0.800	8.800
20060222	5.200	3.110	4.010	3.150	7.140	1.980	1.200	1.260	0.375	1.560	22.600
20060225	2.370	0.730	1.860	1.320	3.000	0.620	0.570	0.620	0.375	0.760	8.600
20060228	2.030	2.010	2.360	1.360	2.890	0.530	0.540	0.570	0.375	0.640	9.000
20060306	0.920	0.440	1.160	0.570	2.830	0.450	0.600	0.670	0.375	0.280	5.900
20060309	4.900	0.000	1.830	2.290	6.030	1.850	1.290	1.330	0.375	1.760	19.400
20060312	4.110	0.300	1.440	1.840	3.670	1.080	0.490	0.540	0.375	1.440	13.400

20060315	2.310	0.940	1.700	1.240	1.760	0.280	0.300	0.320	0.375	0.720	6.900	
20060318	1.680	0.690	1.260	0.860	1.860	0.230	0.680	0.680	0.375	0.520	5.500	
20060321	1.910	1.410	1.860	0.970	2.070	0.350	0.350	0.410	0.294	0.570	8.500	FRM_MASS = CSN
20060324	5.070	3.700	4.310	3.040	3.940	0.840	0.740	0.690	0.375	1.520	18.500	
20060330	8.730	0.000	1.650	3.690	6.070	1.410	0.950	1.090	0.375	3.130	22.500	
AVG	3.568	1.240	2.019	1.779	3.497	0.823	0.579	0.616	0.363	1.181	12.174	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20060402	5.130	0.150	2.240	2.450	2.830	0.510	0.250	0.200	0.375	1.820	11.500
20060405	1.970	0.000	0.760	0.870	1.510	0.360	0.230	0.270	0.375	0.710	5.200
20060408	2.130	0.000	0.770	0.880	1.750	0.270	0.390	0.450	0.375	0.760	5.700
20060411	5.090	0.000	1.130	2.030	5.270	1.500	1.470	1.720	0.375	1.820	16.000
20060417	1.630	0.000	0.130	0.620	1.810	0.230	0.700	0.740	0.375	0.580	4.900
20060420	1.810	0.000	0.510	0.650	4.810	0.880	1.620	1.790	0.359	0.670	10.400
20060423	2.820	0.000	1.280	1.170	2.650	0.030	0.160	0.180	0.375	1.010	7.600
20060426	1.990	0.510	2.380	1.080	3.080	0.550	1.350	1.460	0.375	0.650	8.400
20060429	1.210	0.000	0.430	0.470	3.630	0.560	0.410	0.500	0.375	0.430	6.900
20060502	4.000	0.000	2.100	1.860	4.200	0.940	1.420	1.590	0.375	1.430	15.600
20060505	4.200	0.000	2.020	1.490	3.870	0.740	1.290	1.360	0.355	1.560	14.900
20060511	5.830	0.000	0.510	2.150	2.860	0.450	0.420	0.520	0.369	2.130	13.400
20060514	3.950	0.000	0.810	1.650	3.700	0.460	0.380	0.440	0.375	1.420	11.500
20060517	4.770	0.000	1.040	1.880	2.440	0.550	0.390	0.420	0.375	1.710	11.400
20060520	2.570	0.000	1.430	1.210	2.670	0.550	0.530	0.600	0.375	0.920	7.600
20060523	1.910	0.000	0.820	0.770	3.900	0.460	0.680	0.800	0.375	0.680	6.900
20060529	14.700	0.000	1.350	5.120	8.790	1.530	0.950	1.130	0.348	5.440	36.200
20060601	11.300	0.000	1.500	4.490	5.130	0.900	1.030	1.070	0.375	4.050	26.100
20060604	1.520	0.000	0.920	0.660	2.520	0.310	0.270	0.240	0.375	0.540	6.000
20060607	5.960	0.000	1.580	2.450	6.090	1.140	1.120	1.270	0.375	2.140	20.300
20060610	1.450	0.000	0.180	0.490	2.390	0.020	0.230	0.280	0.338	0.520	5.100
20060616	5.170	0.000	0.690	1.950	7.890	1.310	1.160	1.240	0.375	1.850	20.500
20060622	6.260	0.000	0.510	2.000	3.540	0.450	0.600	0.620	0.319	2.140	16.400
20060625	3.570	0.000	0.960	1.450	4.780	0.470	0.350	0.370	0.375	1.280	13.100
20060628	6.930	0.000	0.730	2.370	3.580	0.920	0.810	0.830	0.342	2.540	16.100
AVG	4.315	0.026	1.071	1.688	3.828	0.644	0.728	0.804	0.367	1.552	12.708

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20060701	10.000	0.000	0.690	3.110	7.060	1.210	0.650	0.750	0.311	3.280	28.500
20060704	9.960	0.000	1.100	3.160	5.630	0.580	0.570	0.260	0.317	3.370	27.900
20060710	17.500	0.000	0.260	5.220	6.150	0.730	0.550	0.510	0.298	5.300	37.600
20060713	11.700	0.000	0.730	3.470	3.590	0.730	1.900	1.950	0.297	3.500	24.500
20060716	5.130	0.000	0.660	1.720	6.380	1.030	0.610	0.640	0.335	1.850	18.700
20060719	11.000	0.000	0.270	2.900	4.640	0.610	0.570	0.660	0.264	2.440	23.700
20060722	4.820	0.000	0.640	1.490	2.890	0.390	0.280	0.300	0.309	1.560	12.800
20060725	17.900	0.000	0.540	4.230	5.280	1.390	0.920	1.070	0.236	3.260	35.000
20060728	5.700	0.000	0.410	1.500	2.680	0.700	5.470	5.300	0.263	1.260	18.200
20060803	9.830	0.000	0.420	2.370	4.050	0.680	0.850	0.870	0.241	1.810	22.700
20060806	6.370	0.000	0.230	1.690	5.380	0.730	0.570	0.590	0.265	1.440	19.700
20060809	10.400	0.000	0.330	2.670	4.610	0.810	0.600	0.640	0.257	2.150	21.300
20060812	2.490	0.000	0.160	0.660	3.160	0.450	0.200	0.220	0.265	0.560	7.900
20060815	6.070	0.000	1.050	2.620	3.500	0.430	0.260	0.290	0.375	2.170	15.500
20060821	3.740	0.000	0.550	1.260	3.340	0.360	0.340	0.370	0.337	1.360	9.700
20060824	8.460	0.000	1.780	3.500	6.750	1.790	2.090	2.250	0.375	3.030	24.800
20060827	11.500	0.000	0.640	4.360	4.580	0.520	0.700	0.630	0.375	4.120	28.000
20060830	6.210	0.000	0.210	1.370	2.180	0.500	0.190	0.180	0.221	1.210	11.700
20060908	14.800	0.000	0.920	5.470	5.990	1.770	1.360	1.390	0.370	5.400	31.000
20060914	5.380	0.000	0.980	2.160	2.350	0.580	0.210	0.140	0.375	1.930	11.300
20060917	11.300	0.000	0.960	3.480	4.590	1.300	0.710	0.770	0.308	3.640	22.800
20060920	1.890	0.000	0.430	0.760	1.690	0.470	0.350	0.380	0.375	0.680	5.200
20060923	4.200	0.000	0.230	1.330	2.270	0.480	0.230	0.210	0.317	1.420	10.400
20060926	3.650	0.000	0.930	1.470	3.350	0.920	0.310	0.330	0.375	1.310	11.200
AVG	8.333	0.000	0.630	2.582	4.254	0.798	0.854	0.863	0.311	2.419	20.004

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20061002	5.450	0.000	0.830	2.590	5.150	1.720	0.820	0.860	0.375	1.950	16.000
20061005	1.270	0.000	0.120	0.360	1.420	0.500	0.170	0.170	0.283	0.350	3.700
20061008	2.570	0.000	0.650	0.880	3.160	0.570	0.300	0.320	0.342	0.940	7.800
20061011	8.540	0.000	0.860	3.090	3.660	1.150	0.720	0.720	0.362	3.160	18.700
20061014	1.840	0.000	0.470	0.680	2.540	1.670	0.440	0.460	0.370	0.670	6.300
20061017	2.120	0.000	0.520	0.750	2.190	0.740	0.450	0.450	0.354	0.790	6.200
20061020	1.560	0.000	0.360	0.420	1.080	0.400	0.270	0.280	0.269	0.360	3.200
20061026	2.220	0.000	0.960	0.940	2.750	0.700	0.460	0.470	0.375	0.800	7.300

20061029	1.090	0.000	0.620	0.440	2.760	0.510	0.230	0.250	0.375	0.390	5.500
20061101	2.820	2.600	4.070	2.070	3.330	0.780	0.760	0.800	0.375	0.880	12.700
20061104	3.040	3.680	4.390	2.410	5.070	1.270	0.430	0.480	0.375	1.040	17.500
20061107	2.830	0.000	1.260	1.180	6.840	2.160	1.960	1.990	0.375	1.010	17.500
20061113	4.560	1.010	1.510	2.050	2.750	0.840	0.340	0.340	0.375	1.510	12.700
20061116	3.370	0.000	0.620	1.200	3.120	0.870	0.420	0.400	0.356	1.250	9.200
20061119	3.340	2.230	2.830	1.880	3.440	0.670	0.210	0.230	0.369	1.020	13.000
20061122	1.670	0.000	0.970	0.830	5.120	1.470	1.060	0.990	0.375	0.600	10.700
20061125	3.340	0.000	1.570	1.420	9.710	2.240	0.780	0.840	0.375	1.200	19.900
20061128	4.890	0.000	1.640	2.100	7.750	2.350	1.500	1.450	0.375	1.750	22.600
20061204	2.940	2.320	2.700	1.690	2.420	0.550	0.390	0.440	0.346	0.940	11.300
20061207	2.010	2.110	2.710	1.380	1.860	0.600	0.220	0.240	0.375	0.650	8.700
20061210	1.580	0.000	0.590	0.650	3.430	0.870	0.490	0.480	0.375	0.570	7.000
20061213	3.250	0.000	2.120	1.720	4.790	0.930	0.690	0.690	0.375	1.160	14.100
20061216	3.050	1.170	2.320	1.740	3.510	0.930	0.500	0.540	0.375	0.950	11.400
20061219	2.720	3.170	3.790	2.020	5.010	1.560	1.240	1.290	0.375	0.910	17.000
20061225	2.490	1.190	1.880	1.260	3.070	0.380	0.210	0.190	0.367	0.780	10.900
20061228	4.290	0.020	1.130	1.810	3.600	1.170	0.630	0.570	0.375	1.530	11.700
20061231	4.660	1.490	2.920	2.600	6.250	1.530	0.310	0.340	0.375	1.490	19.100
AVG	3.093	0.777	1.645	1.487	3.918	1.079	0.593	0.603	0.363	1.061	11.915

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20070103	3.320	0.000	1.070	1.480	6.670	0.930	1.200	1.190	0.375	1.190	13.100
20070106	1.940	0.000	1.020	0.840	1.810	0.060	0.070	0.070	0.375	0.700	5.000
20070109	1.260	1.520	2.180	0.910	2.780	0.890	0.450	0.430	0.372	0.440	5.700
20070112	2.070	0.000	1.050	0.890	2.400	0.570	0.220	0.250	0.375	0.740	13.800
20070118	2.260	1.780	2.340	1.370	5.820	1.200	0.940	0.880	0.375	0.680	15.100
20070121	2.210	2.080	2.280	1.270	4.760	0.300	0.380	0.300	0.301	0.710	12.600
20070124	7.050	3.550	3.940	3.760	2.970	0.710	0.430	0.450	0.375	2.140	17.700
20070127	3.600	2.760	3.680	2.390	3.480	0.160	0.260	0.290	0.375	1.090	10.500
20070130	3.060	3.010	3.340	2.060	2.740	0.140	0.470	0.450	0.375	0.970	11.500
20070205	1.910	2.610	2.670	1.350	3.720	0.700	0.400	0.290	0.310	0.730	9.600
20070208	2.460	5.330	5.450	2.520	3.080	0.780	0.620	0.660	0.375	1.200	15.800
20070211	2.990	5.110	5.330	2.400	3.320	0.490	0.580	0.650	0.307	1.300	15.000
20070214	1.590	1.510	1.690	0.840	2.120	0.480	0.230	0.170	0.253	0.510	6.200
20070217	4.140	3.860	4.110	2.590	4.600	0.900	0.410	0.460	0.355	1.350	16.700

20070223	1.780	0.270	0.610	0.630	2.090	0.290	0.500	0.410	0.310	0.550	3.900
20070301	6.090	0.750	2.040	2.820	3.420	0.790	0.640	0.680	0.375	2.100	15.500
20070304	1.970	1.350	1.820	1.110	1.390	0.180	0.240	0.250	0.364	0.610	6.600
20070307	2.280	2.080	2.360	1.250	2.790	0.480	0.630	0.680	0.283	0.720	9.400
20070310	8.050	2.390	4.050	4.390	7.670	2.010	1.230	1.030	0.375	2.600	31.500
20070313	4.890	0.000	1.130	2.170	4.570	1.880	1.180	1.210	0.375	1.750	15.600
20070319	3.400	1.800	2.260	1.730	4.060	1.420	1.200	1.150	0.355	1.080	15.100
20070322	6.220	0.000	0.810	2.460	4.990	0.770	0.560	0.600	0.375	2.230	19.200
20070325	4.020	0.000	2.480	1.940			0.970	0.970	0.375	1.440	10.500
20070328	2.760	0.000	1.600	1.200	5.530	0.800	2.220	2.250	0.375	0.990	10.000
20070331	2.520	0.000	0.540	0.950	5.290	1.360	0.840	0.880	0.375	0.900	12.000
AVG	3.354	1.670	2.394	1.813	3.836	0.762	0.675	0.666	0.353	1.149	12.704

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20070403	4.050	0.000	0.800	1.560	4.140	1.540	2.470	2.500	0.375	1.450	14.000
20070406	2.850	1.010	1.540	1.490	1.670	0.140	0.220	0.260	0.375	0.900	7.100
20070412	3.530	0.000	0.650	1.200	1.730	0.490	0.280	0.320	0.340	1.290	7.600
20070415	1.740	0.450	0.990	0.680	4.620	0.130	0.200	0.120	0.316	0.540	3.600
20070418	3.160	0.000	0.800	1.150	1.840	0.440	0.430	0.440	0.364	1.170	6.900
20070424	3.320	0.000	1.400	1.460	2.650	0.520	0.670	0.710	0.375	1.190	8.900
20070430	1.680	0.000	0.210	0.600	2.310	0.660	0.760	0.770	0.357	0.620	6.300
20070503	1.850	0.000	0.190	0.720	2.250	0.350	0.380	0.380	0.375	0.660	5.800
20070506	1.800	0.000	0.110	0.650	2.110	0.320	0.370	0.390	0.361	0.670	5.000
20070509	4.300	0.000	0.790	1.540	5.320	1.370	3.600	3.520	0.358	1.600	14.300
20070512	4.290	0.000	0.660	1.630	4.920	0.720	0.650	0.680	0.375	1.540	14.500
20070515	10.800	0.000	0.500	4.150	6.630	1.060	1.460	1.550	0.375	3.870	27.800
20070518	1.330	0.000	0.510	0.560	2.240	0.480	0.340	0.330	0.375	0.480	5.100
20070524	14.800	0.000	1.050	5.410	6.840	1.070	1.700	1.710	0.366	5.450	32.500
20070527	9.870	0.000	2.820	4.220	6.520	0.570	0.860	0.830	0.375	3.540	23.100
20070530	5.490	0.000	0.620	1.990	5.080	1.160	1.110	1.180	0.362	2.030	16.900
20070602	17.200	0.000	0.910	5.810	11.300	0.900	1.010	1.210	0.338	6.250	45.900
20070605	3.330	0.000	0.460	1.220	2.140	0.300	0.360	0.350	0.366	1.220	7.300
20070611	2.610	0.000	0.300	0.920	5.560	0.510	0.550	0.640	0.352	0.970	10.800
20070614	6.430	0.000	1.100	2.050	4.070	0.750	0.810	0.830	0.319	2.190	15.100
20070617	12.900	0.000	0.820	4.390	6.060	1.090	0.580	0.710	0.340	4.720	30.700
20070620	2.280	0.000	0.650	0.820	3.550	0.420	0.560	0.550	0.360	0.850	8.200

20070623	1.410	0.000	0.550	0.550	4.570	0.590	0.380	0.380	0.375	0.510	8.300	
20070629	2.910	0.000	0.490	0.780	4.110	0.630	0.570	0.540	0.268	0.670	10.800	
AVG	5.164	0.061	0.788	1.898	4.260	0.675	0.847	0.871	0.356	1.849	14.021	
DATE	**SO4**	**NO3R**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**	
20070705	6.760	0.000	0.920	2.530	3.370	0.680	0.590	0.520	0.374	2.430	15.500	
20070708	8.090	0.000	0.910	2.460	6.650	0.900	0.710	0.630	0.304	2.550	23.700	
20070711	6.440	0.000	0.430	2.130	6.140	0.360	0.670	0.670	0.331	2.300	14.400	
20070714	8.430	0.000	0.710	2.680	3.880	0.510	0.460	0.470	0.318	2.860	18.000	
20070717	9.930	0.000	0.640	3.990	5.900	0.960	0.830	0.830	0.375	3.560	23.300	
20070723	4.020	0.000	0.480	1.440	5.070	0.960	0.750	0.800	0.358	1.490	15.400	
20070726	9.390	0.000	1.140	3.250	4.420	0.730	0.610	0.570	0.346	3.470	20.200	
20070729	18.000	0.000	0.570	4.740	5.050	0.640	0.420	0.420	0.263	3.980	30.900	
20070801	3.680	0.000	0.440	1.360	6.820	0.930	0.900	0.950	0.370	1.340	16.500	
20070804	13.600	0.000	0.620	4.230	6.540	0.770	0.710	0.770	0.311	4.460	29.800	
20070807	15.500	0.000	0.900	5.790	7.090	1.030	1.080	1.090	0.374	5.580	36.100	
20070810	5.120	0.000	1.250	1.750	2.890	0.580	0.390	0.390	0.342	1.880	12.200	FRM_MASS = CSN
20070816	9.700	0.000	0.670	3.270	5.730	0.840	1.290	1.360	0.337	3.520	25.100	
20070819	3.620	0.000	0.670	1.380	4.050	0.560	0.260	0.240	0.375	1.300	10.700	
20070822	12.500	0.000	1.550	4.340	4.060	1.200	0.860	0.850	0.347	4.620	23.400	
20070825	6.210	0.000	0.400	2.110	6.110	0.600	0.530	0.640	0.340	2.270	21.400	
20070828	21.700	0.000	0.730	6.600	4.420	1.040	1.060	1.180	0.304	6.840	39.300	
20070903	7.980	0.000	1.040	2.660	6.340	1.430	0.390	0.450	0.333	2.870	23.100	
20070906	19.900	0.000	1.400	7.210	7.540	1.730	1.540	1.610	0.362	7.360	45.900	FRM_MASS = CSN
20070909	8.440	0.000	1.670	3.760	5.080	0.900	0.400	0.480	0.375	3.020	23.200	
20070912	1.890	0.000	0.300	0.640	4.960	3.730	0.520	0.600	0.339	0.690	6.100	
20070915	1.260	0.000	0.190	0.410	1.840	0.280	0.060	0.060	0.325	0.440	3.600	
20070918	5.610	0.000	1.050	2.110	5.660	0.980	1.950	1.890	0.375	2.010	15.600	
20070921	15.100	0.000	1.550	5.540	4.770	1.480	2.040	2.070	0.367	5.540	29.300	
20070927	4.990	0.000	1.720	2.280	2.550	0.860	0.490	0.560	0.375	1.790	12.400	
20070930	5.180	0.000	0.620	1.830	4.180	0.880	0.480	0.530	0.353	1.920	13.900	
AVG	8.963	0.000	0.868	3.096	5.043	0.983	0.769	0.793	0.345	3.080	21.115	
DATE	**SO4**	**NO3R**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**	
20071003	4.580	0.000	0.580	1.630	3.730	0.970	1.000	1.030	0.356	1.700	13.000	
20071006	8.100	0.000	0.710	2.970	5.280	0.970	0.730	0.780	0.367	2.970	19.400	

20071015	3.610	0.000	1.060	1.700	4.680	1.390	1.200	1.300	0.375	1.290	14.100	
20071018	7.230	0.000	0.910	2.750	4.530	1.850	1.530	1.580	0.375	2.590	18.700	
20071021	2.930	0.000	0.330	1.050	3.410	0.710	0.650	0.730	0.358	1.090	9.400	
20071024	1.650	0.000	0.460	0.000	6.060	2.180	0.020	0.000	0.000	1.700	4.500	
20071027	2.760	0.000	0.450	1.000	1.580	0.510	0.120	0.140	0.362	1.020	6.700	
20071030	4.690	0.000	1.260	2.040	6.290	1.980	2.230	2.400	0.375	1.680	17.700	
20071102	2.010	0.000	0.980	0.860	6.170	1.070	1.390	1.430	0.375	0.720	9.100	
20071108	3.440	1.470	2.540	2.040	4.730	1.370	2.780	2.860	0.375	1.060	15.300	
20071111	8.430	4.010	4.690	4.040	6.760	1.850	1.060	0.980	0.341	2.680	28.600	
20071114	6.000	0.000	2.070	2.050	4.010	1.490	4.900	5.470	0.342	2.200	17.800	
20071117	3.540	3.130	3.890	2.400	3.120	0.770	0.280	0.290	0.375	1.090	14.800	
20071120	7.060	0.000	2.020	3.270	3.900	0.950	1.350	1.350	0.375	2.530	18.400	
20071126	3.620	1.030	1.940	1.910	3.560	1.500	0.920	0.920	0.375	1.170	14.600	
20071129	1.570	0.000	0.830	0.750	1.990	0.470	0.320	0.390	0.375	0.560	5.100	
20071202	1.890	0.720	1.670	1.090	3.600	0.580	0.310	0.280	0.375	0.590	9.300	
20071205	2.140	2.020	2.310	1.370	2.950	0.560	0.370	0.430	0.366	0.690	8.900	
20071208	6.040	6.870	7.530	4.600	6.060	1.250	0.680	0.820	0.375	2.010	27.900	
20071211	5.200	1.030	3.470	2.960	4.190	1.440	0.920	0.970	0.375	1.740	19.100	FRM_MASS = CSN
20071214	4.130	1.610	2.440	2.300	1.790	0.370	0.180	0.210	0.375	1.290	10.300	
20071220	5.320	6.460	7.150	4.020	3.840	0.970	0.320	0.350	0.375	1.820	20.900	
20071223	1.540	0.000	0.260	0.490	1.390	0.210	0.100	0.100	0.318	0.520	3.500	
20071226	3.090	1.440	2.200	1.720	8.180	1.960	1.070	1.140	0.375	0.950	20.300	
20071229	2.740	0.000	1.010	1.240	2.050	0.770	0.100	0.110	0.375	0.980	6.700	
AVG	4.132	1.192	2.110	2.010	4.154	1.126	0.981	1.042	0.352	1.466	14.164	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20080101	4.140	2.400	3.090	2.350	2.710	0.470	0.250	0.310	0.375	1.240	12.900
20080107	2.930	0.000	0.520	0.950	3.050	0.510	0.180	0.210	0.324	1.020	7.900
20080110	1.980	0.530	1.620	0.980	5.890	1.330	1.390	1.440	0.375	0.650	11.300
20080113	5.330	2.350	3.080	3.030	4.860	1.170	0.430	0.500	0.375	1.640	18.100
20080116	5.640	4.650	5.100	3.490	3.370	0.960	0.460	0.460	0.375	1.720	17.800
20080122	4.910	2.230	2.740	2.560	5.160	1.220	3.050	3.030	0.375	1.510	14.500
20080125	3.650	5.790	5.980	3.070	4.770	0.760	0.560	0.660	0.375	1.440	15.900
20080131	2.060	2.520	2.910	1.590	3.820	0.870	0.570	0.670	0.375	0.710	9.500
20080203	7.500	3.250	3.920	3.940	7.020	1.050	0.730	0.680	0.375	2.310	24.900
20080206	1.630	0.000	0.500	0.540	1.730	0.510	0.320	0.340	0.331	0.580	8.500

20080209	5.020	1.360	2.190	2.400	3.230	0.840	0.850	1.000	0.375	1.640	12.600
20080212	3.880	4.330	4.590	2.900	7.000	1.130	0.600	0.710	0.375	1.280	17.300
20080218	3.530	0.000	1.210	1.690	2.030	0.390	0.220	0.250	0.375	1.260	7.400
20080221	3.130	3.240	3.450	2.060	3.450	0.740	0.690	0.690	0.358	1.040	12.300
20080224	7.070	5.820	6.230	4.460	6.920	1.070	0.410	0.480	0.375	2.150	27.700
20080227	2.290	1.460	1.720	1.160	2.180	0.420	0.310	0.340	0.321	0.700	5.000
20080301	3.780	2.550	3.180	2.260	2.930	0.420	0.390	0.440	0.375	1.130	10.100
20080304	1.470	0.330	0.820	0.710	1.880	0.420	0.220	0.240	0.375	0.490	5.400
20080307	6.400	2.170	2.720	3.120	4.660	0.730	2.150	2.110	0.375	2.030	18.700
20080313	2.810	0.000	2.260	1.640	4.060	0.820	1.600	1.680	0.375	1.010	11.700
20080316	2.420	0.240	0.990	1.070	1.790	0.240	0.190	0.120	0.375	0.840	5.900
20080319	3.670	1.240	2.110	1.940	3.700	1.510	2.310	2.320	0.375	1.170	16.100
20080322	1.510	0.010	0.650	0.610	1.480	0.200	0.200	0.230	0.375	0.540	4.500
20080328	3.180	0.570	1.250	1.370	2.080	0.270	0.280	0.310	0.375	1.070	7.900
AVG	3.747	1.960	2.618	2.079	3.740	0.752	0.765	0.801	0.368	1.215	12.663

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20080403	2.090	0.000	1.240	0.980	3.230	0.870	2.060	2.110	0.375	0.750	9.800
20080406	4.130	0.000	0.680	1.690	2.630	0.320	0.150	0.180	0.375	1.480	9.600
20080409	4.310	0.000	0.760	1.660	2.880	0.550	1.030	0.820	0.375	1.540	10.200
20080412	2.290	0.000	0.500	0.920	1.440	0.210	0.380	0.300	0.375	0.820	4.800
20080415	1.450	0.000	1.220	0.770	3.040	0.670	0.660	0.750	0.375	0.520	6.500
20080421	4.290	0.000	0.720	1.440	2.270	0.220	0.410	0.500	0.336	1.550	9.100
20080424	3.620	0.000	0.420	1.380	4.390	0.660	0.980	1.040	0.375	1.300	11.300
20080427	3.330	0.000	1.250	1.500	3.760	0.670	0.690	0.670	0.375	1.190	10.500
20080430	3.950	1.260	3.190	2.280	3.270	0.500	1.080	1.080	0.375	1.260	12.300
20080504	2.110	0.000	0.410	0.820	2.500	0.260	0.420	0.440	0.375	0.760	6.400
20080506	5.600	0.000	1.160	2.230	5.680	0.960	2.890	3.060	0.375	2.010	17.800
20080509	6.570	0.000	1.360	2.610	4.610	0.560	1.060	1.140	0.375	2.350	14.400
20080515	2.630	0.000	0.880	0.890	2.600	0.410	0.580	0.500	0.338	0.960	8.000
20080518	2.200	0.000	1.190	1.030	2.380	0.290	0.450	0.490	0.375	0.790	7.000
20080521	2.810	0.000	1.890	1.440	2.740	0.640	0.580	0.630	0.375	1.010	8.800
20080524	1.620	0.000	0.650	0.630	3.170	0.490	0.300	0.350	0.375	0.580	6.200
20080530	4.950	0.000	0.620	1.830	6.040	0.890	2.180	2.190	0.370	1.800	16.400
20080605	6.180	0.000	0.720	2.070	4.030	0.680	0.930	0.920	0.335	2.230	15.800
20080608	4.890	0.000	0.350	1.320	5.340	0.350	0.480	0.400	0.270	1.160	16.500

20080611	3.390	0.000	0.670	1.200	5.620	0.910	1.510	1.570	0.354	1.260	12.500	
20080614	3.690	0.000	1.000	1.540	4.200	0.390	0.310	0.260	0.375	1.320	12.000	
20080617	1.980	0.000	0.280	0.610	3.370	0.240	0.330	0.330	0.308	0.640	6.600	
20080623	3.100	0.000	0.920	1.270	3.040	0.330	0.370	0.400	0.375	1.110	8.600	
20080626	6.810	0.000	0.410	2.140	3.920	0.770	0.550	0.540	0.314	2.270	18.800	FRM_MASS = CSN
20080629	3.610	0.000	0.240	1.200	2.660	0.100	0.950	0.640	0.332	1.290	8.600	
AVG	3.664	0.050	0.909	1.418	3.552	0.518	0.853	0.852	0.358	1.278	10.740	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20080702	4.920	0.000	0.470	1.560	4.610	0.990	0.830	0.840	0.317	1.660	15.700	
20080705	13.800	0.000	2.920	2.530	8.260	0.720	0.380	0.230	0.183	4.240	38.300	
20080708	7.670	0.000	0.390	2.320	4.050	0.570	1.400	1.430	0.302	2.390	18.200	
20080714	3.400	0.000	0.270	1.060	4.020	0.720	0.660	0.700	0.312	1.120	10.500	
20080717	13.400	0.000	0.640	4.280	6.670	1.210	1.040	1.010	0.319	4.580	32.300	
20080720	8.820	0.000	0.360	3.190	5.960	0.850	1.150	0.900	0.362	3.260	23.800	
20080723	4.650	0.000	0.440	1.390	3.380	0.390	0.390	0.390	0.299	1.420	11.400	
20080726	10.600	0.000	0.450	2.890	3.070	0.480	0.700	0.720	0.273	2.580	26.000	
20080729	10.700	0.000	0.950	3.400	9.730	1.590	1.100	1.140	0.318	3.630	34.600	
20080801	7.330	0.000	1.010	2.440	5.300	1.010	1.660	1.690	0.333	2.630	20.700	
20080807	2.880	0.000	0.450	0.860	4.390	0.430	0.860	0.810	0.299	0.870	11.200	
20080810	2.260	0.000	0.290	0.750	2.360	0.200	0.130	0.120	0.332	0.810	7.000	
20080813	4.740	0.000	0.440	1.480	4.480	1.250	0.970	0.970	0.312	1.560	14.100	
20080816	2.320	0.000	0.490	0.820	4.800	0.980	0.460	0.490	0.353	0.860	10.000	
20080819	4.080	0.000	0.470	1.220	4.330	0.880	0.690	0.760	0.299	1.240	14.400	FRM_MASS = CSN
20080825	2.740	0.000	0.310	0.780	3.640	0.450	0.450	0.470	0.285	0.740	8.100	
20080828	1.460	0.000	0.750	0.830	6.480	0.690	0.220	0.230	0.375	0.520	5.300	
20080831	4.360	0.000	0.350	1.350	4.860	0.920	0.350	0.360	0.310	1.420	12.700	
20080903	11.000	0.000	0.970	3.680	4.960	1.220	1.620	1.680	0.335	3.970	26.300	
20080906	4.430	0.000	0.410	1.460	4.150	0.830	0.620	0.610	0.330	1.570	13.000	
20080909	5.440	0.000	0.620	1.870	3.510	0.000	1.070	0.950	0.344	2.000	12.500	
20080912	3.670	0.000	0.620	1.350	2.310	0.680	0.370	0.390	0.368	1.340	11.600	FRM_MASS = CSN
20080918	2.020	0.000	0.480	0.580	4.140	0.890	0.910	0.980	0.287	0.560	10.400	
20080921	10.500	0.000	1.570	4.070	7.240	1.430	0.780	0.900	0.375	3.760	28.600	
20080924	4.750	0.000	0.670	1.560	3.880	1.060	1.960	1.720	0.328	1.680	14.200	
20080927	1.450	0.000	0.450	0.410	1.980	0.550	0.090	0.090	0.283	0.390	4.300	
20080930	6.550	0.000	0.670	2.350	2.860	0.750	0.490	0.470	0.359	2.430	15.300	

AVG	5.924	0.000	0.663	1.870	4.645	0.805	0.791	0.780	0.318	1.971	16.685

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20081006	2.160	0.000	0.560	0.760	3.730	0.840	4.150	4.170	0.352	0.800	11.900
20081009	4.260	0.000	1.630	1.860	3.370	0.640	0.430	0.490	0.375	1.530	11.200
20081012	2.280	0.000	0.710	0.880	6.070	0.990	0.810	0.880	0.375	0.820	12.500
20081015	5.740	0.000	1.420	2.420	4.480	1.100	0.820	0.910	0.375	2.060	15.500
20081018	0.750	0.000	0.380	0.270	3.100	0.760	0.100	0.110	0.360	0.280	5.100
20081021	1.810	0.000	0.330	0.640	2.190	0.280	0.370	0.200	0.354	0.670	5.500
20081024	1.880	0.000	0.860	0.850	3.630	1.030	0.510	0.550	0.375	0.670	6.900
20081030	1.750	0.000	1.160	0.950	3.870	0.830	0.630	0.610	0.375	0.630	8.200
20081102	6.060	0.000	2.370	2.980	6.180	0.980	0.650	0.700	0.375	2.170	21.400
20081105	6.060	0.000	1.300	2.460	4.490	1.320	1.290	1.380	0.375	2.170	16.200
20081108	1.750	0.000	0.790	0.760	2.330	0.360	0.240	0.290	0.375	0.630	6.000
20081111	4.660	1.980	2.900	2.540	3.080	0.680	0.960	1.020	0.375	1.440	13.900
20081117	2.130	1.250	1.710	1.200	2.230	0.460	0.330	0.320	0.375	0.640	7.200
20081120	1.780	1.680	2.370	1.310	2.220	0.430	0.270	0.320	0.375	0.560	8.200
20081123	1.810	3.350	3.800	1.700	6.090	1.110	0.520	0.600	0.375	0.790	15.200
20081126	2.430	1.680	2.240	1.560	2.790	0.470	0.230	0.230	0.375	0.730	10.000
20081129	1.750	3.810	4.450	1.980	5.740	1.060	0.390	0.400	0.375	0.850	15.500
20081202	3.750	0.460	1.040	1.590	1.670	0.310	0.330	0.240	0.375	1.290	7.600
20081205	2.820	3.290	3.700	2.170	2.060	0.450	0.430	0.370	0.375	0.950	10.700
20081211	3.570	1.360	1.660	1.890	7.000	0.880	0.600	0.660	0.375	1.120	12.300
20081214	2.790	0.850	2.110	1.510	4.260	0.850	0.440	0.490	0.375	0.900	11.700
20081217	3.420	0.970	1.380	1.660	2.230	0.460	0.400	0.400	0.375	1.110	9.800
20081220	4.320	1.050	1.480	1.550	2.390	0.440	0.550	0.610	0.288	1.150	10.000
20081223	4.490	3.240	3.550	2.620	5.630	1.190	0.740	0.830	0.374	1.350	16.500
20081226	3.430	2.420	3.140	1.990	3.530	0.980	0.500	0.540	0.375	1.030	14.100
AVG	3.106	1.096	1.882	1.604	3.774	0.756	0.668	0.693	0.369	1.054	11.324

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20090101	2.830	1.290	1.610	1.310	3.310	0.750	0.210	0.250	0.331	0.880	9.200
20090104	3.130	2.700	3.240	2.180	7.100	1.070	0.860	0.650	0.375	0.960	19.900
20090107	1.970	0.990	1.340	1.000	2.300	0.960	0.460	0.490	0.362	0.620	7.700
20090110	4.900	3.590	3.860	2.910	4.490	0.960	0.380	0.320	0.375	1.470	16.900
20090113	3.730	1.200	1.600	1.780	5.740	0.560	0.250	0.290	0.375	1.190	10.600

20090116	4.530	5.390	5.470	2.910	5.310	0.830	0.830	0.820	0.297	1.600	11.900	
20090122	5.890	3.930	4.470	3.590	6.720	0.820	0.460	0.540	0.375	1.760	24.700	FRM_MASS = CSN
20090125	2.690	3.190	3.360	1.910	5.120	0.630	0.250	0.290	0.366	0.930	19.300	
20090128	5.360	2.380	2.630	2.480	4.890	0.880	0.410	0.380	0.334	1.690	14.400	
20090131	3.050	4.930	5.200	2.540	3.110	0.520	0.150	0.180	0.364	1.240	12.400	
20090203	4.170	9.170	9.490	4.330	5.530	0.580	0.550	0.560	0.375	2.050	18.900	
20090206	3.870	2.820	3.350	2.300	5.760	0.780	1.160	1.170	0.375	1.160	14.700	
20090212	2.370	0.000	1.180	1.170	1.450	0.210	0.160	0.150	0.375	0.850	5.500	
20090215	2.680	0.680	1.190	1.270	8.310	4.000	0.250	0.300	0.375	0.880	5.700	
20090218	2.640	0.760	1.590	1.360	3.880	0.840	0.550	0.610	0.375	0.850	11.500	
20090221	3.970	4.030	4.600	2.920	5.400	1.060	0.600	0.700	0.375	1.270	14.400	
20090224	2.930	2.620	2.890	2.030	5.720	0.580	0.530	0.540	0.375	0.910	10.200	
20090302	1.910	1.090	1.290	0.950	1.880	0.280	0.460	0.450	0.332	0.590	5.500	
20090305	3.880	0.500	2.480	2.060	7.020	1.400	1.210	1.340	0.375	1.330	17.700	
20090308	2.840	0.000	1.110	1.170	3.660	0.280	0.440	0.400	0.375	1.020	10.200	
20090311	2.030	0.000	0.760	0.730	2.360	0.290	0.380	0.410	0.360	0.750	6.200	
20090314	4.910	0.260	1.770	2.320	5.630	0.740	0.750	0.750	0.375	1.730	16.300	
20090317	7.480	1.620	4.150	4.250	8.480	0.950	1.660	1.310	0.375	2.490	23.200	
20090320	3.140	0.970	1.670	1.450			0.750	0.700	0.372	1.020	8.100	
20090326	1.970	0.910	2.300	1.410	3.230	0.680	0.610	0.670	0.375	0.600	9.600	
20090329	1.410	0.000	0.210	0.490	1.220	0.120	0.090	0.110	0.348	0.520	3.400	
AVG	3.472	2.116	2.800	2.032	4.705	0.831	0.554	0.553	0.364	1.168	12.619	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20090401	3.520	0.000	0.570	1.330	3.710	0.570	0.770	0.830	0.375	1.260	11.200
20090404	1.700	0.000	0.590	0.730	1.890	0.160	0.100	0.120	0.375	0.610	4.600
20090413	1.930	0.000	0.510	0.710	2.410	0.510	0.350	0.440	0.368	0.710	6.500
20090416	1.620	0.000	1.240	0.630	3.050	0.580	0.600	0.660	0.375	0.580	5.400
20090419	7.340	0.000	1.860	3.190	8.590	1.210	2.140	2.310	0.375	2.630	23.000
20090422	1.660	0.000	0.350	0.640	1.190	0.210	0.150	0.160	0.375	0.590	3.600
20090425	2.410	0.000	0.410	0.920	5.610	0.900	0.620	0.670	0.375	0.860	10.600
20090428	2.470	0.000	0.550	0.980	4.550	0.800	1.240	1.200	0.375	0.880	9.000
20090501	2.520	0.000	0.650	1.100	8.360	0.530	0.670	0.640	0.375	0.900	7.600
20090507	4.910	0.000	0.560	1.640	3.120	0.000	0.580	0.650	0.334	1.770	11.400
20090510	2.580	0.000	0.500	0.930	2.680	0.260	0.600	0.680	0.360	0.960	7.200
20090513	5.010	0.000	0.740	1.840	4.040	0.900	0.690	0.830	0.367	1.840	14.500

20090516	4.220	0.000	0.400	1.470	3.650	0.520	0.430	0.530	0.348	1.560	12.200
20090519	2.680	0.000	0.930	1.150	4.540	0.790	1.240	1.320	0.375	0.960	11.000
20090525	4.890	0.000	0.610	1.810	6.490	0.000	1.340	1.460	0.370	1.780	17.000
20090528	3.240	0.000	0.370	1.160	2.950	0.460	0.330	0.390	0.358	1.200	11.300
20090531	1.620	0.000	0.520	0.540	4.950	0.000	0.410	0.400	0.333	0.580	8.200
20090603	2.360	0.000	0.970	1.010	3.030	0.520	0.790	0.900	0.375	0.850	9.300
20090606	5.700	0.000	1.210	2.380	6.250	0.390	0.760	0.820	0.375	2.040	16.800
20090609	6.640	0.000	0.490	2.390	6.110	0.000	0.880	0.960	0.360	2.460	20.000
20090612	3.990	0.000	1.710	1.830	3.950	0.620	0.340	0.370	0.375	1.430	12.200
20090618	4.450	0.000	1.430	1.980	3.380	0.000	0.440	0.450	0.375	1.590	10.900
20090621	1.230	0.000	0.200	0.370	2.620	0.300	0.160	0.200	0.301	0.380	4.600
20090624	1.510	0.000	0.490	0.440	6.430	0.000	1.410	1.450	0.291	0.430	9.700
20090627	1.710	0.000	0.420	0.590	6.040	0.960	0.660	0.720	0.345	0.630	12.000
20090630	1.180	0.000	0.310	0.440	3.530	0.630	0.330	0.390	0.373	0.430	5.700
AVG	3.196	0.000	0.715	1.238	4.351	0.455	0.693	0.752	0.361	1.150	10.596

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20090706	3.400	0.000	0.870	1.220	5.900	1.020	0.960	0.930	0.359	1.260	15.100
20090709	5.090	0.000	0.450	1.730	4.030	0.740	0.660	0.720	0.340	1.860	13.200
20090712	2.760	0.000	0.260	0.890	4.340	0.480	0.380	0.390	0.322	0.950	9.000
20090715	2.660	0.000	0.300	0.980	4.920	1.050	1.590	1.620	0.368	0.980	11.700
20090718	1.700	0.000	0.460	0.660	2.820	0.360	0.600	0.510	0.375	0.610	5.800
20090724	5.530	0.000	0.770	2.150	5.210	0.570	0.420	0.440	0.375	1.980	13.100
20090730	7.030	0.000	0.690	2.500	4.100	0.580	0.670	0.580	0.356	2.610	15.500
20090802	5.900	0.000	0.250	1.910	4.260	0.500	0.250	0.300	0.324	2.050	15.700
20090805	3.110	0.000	0.490	0.870	4.160	0.840	0.740	0.800	0.280	0.820	9.500
20090808	5.590	0.000	0.300	2.050	5.370	0.950	0.650	0.660	0.367	2.050	16.800
20090811	6.300	0.000	0.720	2.360	2.660	0.550	0.850	1.000	0.375	2.260	14.400
20090817	10.200	0.000	0.740	3.340	6.240	1.170	1.660	1.630	0.327	3.600	26.800
20090820	3.490	0.000	0.440	1.110	4.300	0.630	0.440	0.460	0.318	1.190	9.700
20090823	2.570	0.000	0.360	0.880	3.360	0.550	0.160	0.170	0.342	0.950	7.200
20090826	10.400	0.000	0.560	3.450	4.670	1.010	1.270	1.300	0.332	3.720	24.300
20090829	3.010	0.000	0.330	1.020	3.100	0.550	1.390	1.370	0.339	1.100	11.300
20090901	3.660	0.000	0.280	1.140	3.270	0.960	0.470	0.510	0.311	1.200	11.800
20090907	6.240	0.000	1.050	2.630	4.760	0.820	0.260	0.240	0.375	2.240	19.200
20090910	2.360	0.000	0.780	1.340	9.570	0.870	0.790	0.800	0.375	0.850	8.900

20090913	2.010	0.000	0.480	0.810	4.380	0.600	0.240	0.280	0.375	0.720	8.900	
20090916	1.690	0.000	0.200	0.520	2.360	0.580	0.630	0.670	0.308	0.550	7.000	
20090919	2.900	0.000	0.360	0.990	3.360	0.630	0.250	0.290	0.341	1.060	8.900	
20090922	5.300	0.000	0.980	2.130	3.580	1.080	0.720	0.780	0.375	1.900	14.400	
AVG	4.474	0.000	0.527	1.595	4.379	0.743	0.698	0.715	0.346	1.587	12.965	
DATE	**SO4**	**NO3R**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**	
20091001	2.780	0.000	1.130	1.250	1.639	0.738	0.750	0.710	0.375	1.000	8.300	
20091004	1.400	0.000	0.260	0.490	1.749	0.467	0.300	0.360	0.350	0.520	5.600	
20091007	1.070	0.000	0.130	0.300	0.718	0.208	0.150	0.170	0.280	0.270	2.900	
20091010	1.410	0.000	0.280	0.440	1.602	0.494	0.170	0.190	0.312	0.460	5.500	
20091016	0.830	0.000	0.440	0.250			0.120	0.130	0.301	0.260	3.700	FRM_MASS = CSN
20091022	4.200	0.000	0.780	1.660	3.935	1.661	1.850	1.940	0.375	1.500	16.300	
20091025	2.320	0.000	0.770	0.950	1.800	0.511	0.300	0.280	0.375	0.830	6.500	
20091028	1.840	0.000	0.680	0.750	1.179	0.463	0.250	0.260	0.375	0.660	5.700	
20091031	1.810	0.000	0.240	0.610	1.034	0.291	0.150	0.110	0.337	0.660	5.000	
20091103	3.190	0.180	1.940	1.660	2.317	0.733	0.550	0.520	0.375	1.120	10.900	
20091106	2.640	0.710	1.740	1.390	2.472	1.192	1.060	1.080	0.375	0.860	7.000	
20091112	0.870	0.000	0.250	0.320	1.300	0.413	0.520	0.520	0.368	0.320	4.200	
20091115	4.670	0.000	2.560	2.430	5.474	1.601	2.790	2.430	0.375	1.670	20.900	
20091118	2.280	0.000	0.880	0.920	1.309	0.504	0.250	0.260	0.375	0.820	7.000	
20091121	4.210	4.120	6.300	3.440	2.262	0.975	0.290	0.340	0.375	1.330	18.700	
20091124	3.450	1.580	3.060	2.140	2.034	0.917	0.550	0.500	0.375	1.060	11.600	
20091127	1.140	0.000	0.400	0.450	0.558	0.150	0.050	0.050	0.375	0.410	3.500	
20091203	1.700	0.280	1.730	1.050	1.170	0.364	0.150	0.120	0.375	0.580	6.500	
20091206	5.000	5.970	6.350	3.720	2.198	0.615	0.300	0.350	0.375	1.700	18.900	
20091209	1.410	0.000	0.290	0.460	0.879	0.239	0.320	0.330	0.326	0.490	3.400	
20091212	4.050	3.380	3.870	2.600	2.749	1.415			0.375	1.240	12.000	
20091215	2.350	1.730	2.620	1.620	1.109	0.435	0.320	0.360	0.375	0.710	7.700	
20091221	4.310	5.100	5.540	3.130	2.196	0.676	0.190	0.200	0.375	1.460	14.200	
20091224	3.300	1.310	1.760	1.570	2.891	0.830	0.420	0.390	0.361	1.070	10.200	
20091230	4.090	4.340	4.670	2.870					0.375	1.330	19.400	
AVG	2.653	1.148	1.947	1.459	1.938	0.691	0.513	0.504	0.360	0.893	9.424	

Lawrenceville CSN Speciation Quarterly SANDWICH Averages

YEAR	QTR	FRMc	SO4	NO3r	NO3	NH4	OC	EC	CRUSTalt	DON	H2Oaim
2005	**1Q**	13.323	3.539	2.306	2.840	0.931	3.865	0.720	0.544	0.089	2.320
2005	**2Q**	15.903	5.993	0.164	1.156	0.895	4.813	0.883	1.021	0.159	4.600
2005	**3Q**	20.415	8.559	0.000	0.722	2.275	4.819	0.902	0.757	0.283	3.951
2005	**4Q**	13.138	4.212	0.973	1.601	1.794	4.290	0.969	0.617	0.346	1.424
2006	**1Q**	12.174	3.568	1.240	2.019	1.779	3.497	0.823	0.616	0.363	1.181
2006	**2Q**	12.708	4.315	0.026	1.071	1.688	3.828	0.644	0.804	0.367	1.552
2006	**3Q**	20.004	8.333	0.000	0.630	2.582	4.254	0.798	0.863	0.311	2.419
2006	**4Q**	11.915	3.093	0.777	1.645	1.487	3.918	1.079	0.603	0.363	1.061
2007	**1Q**	12.704	3.354	1.670	2.394	1.813	3.836	0.762	0.666	0.353	1.149
2007	**2Q**	14.021	5.164	0.061	0.788	1.898	4.260	0.675	0.871	0.356	1.849
2007	**3Q**	21.115	8.963	0.000	0.868	3.096	5.043	0.983	0.793	0.345	3.080
2007	**4Q**	14.164	4.132	1.192	2.110	2.010	4.154	1.126	1.042	0.352	1.466
2008	**1Q**	12.663	3.747	1.960	2.618	2.079	3.740	0.752	0.801	0.368	1.215
2008	**2Q**	10.740	3.664	0.050	0.909	1.418	3.552	0.518	0.852	0.358	1.278
2008	**3Q**	16.685	5.924	0.000	0.663	1.870	4.645	0.805	0.780	0.318	1.971
2008	**4Q**	11.324	3.106	1.096	1.882	1.604	3.774	0.756	0.693	0.369	1.054
2009	**1Q**	12.619	3.472	2.116	2.800	2.032	4.705	0.831	0.553	0.364	1.168
2009	**2Q**	10.596	3.196	0.000	0.715	1.238	4.351	0.455	0.752	0.361	1.150
2009	**3Q**	12.965	4.474	0.000	0.527	1.595	4.379	0.743	0.715	0.346	1.587
2009	**4Q**	9.424	2.653	1.148	1.947	1.459	1.938	0.691	0.504	0.360	0.893

AVGs	QTR	FRMc	SO4	NO3r	NO3	NH4	OC	EC	CRUSTalt	DON	H2Oaim	NH4r	PBWcalc	OCMmb
	1Q	12.697	3.536	1.859	2.534	1.727	3.929	0.778	0.636	0.308	1.407	1.627	1.033	2.729
	2Q	12.794	4.466	0.060	0.928	1.427	4.161	0.635	0.860	0.320	2.086	1.448	1.806	3.018
	3Q	18.237	7.251	0.000	0.682	2.283	4.628	0.846	0.781	0.321	2.602	2.325	2.948	3.586
	4Q	11.993	3.439	1.037	1.837	1.671	3.615	0.924	0.692	0.358	1.179	1.532	1.444	2.425

PBW Calculation	SO4	NO3r	NH4r
- Calculated from SO4, NO3r, and NH4r	3.536	1.859	1.627
- NH4r calculated from DON, SO4, NO3r	4.466	0.060	1.448
- DON > 0.225, low acidity equation	7.251	0.000	2.325
	3.439	1.037	1.532

S Term	N Term	A Term	Part 1	Part 2	Part 3	Sum	PBWcalc
0.504	0.265	0.232	-19558.644	-111.119	19669.910	0.147	1.033
0.748	0.010	0.242	-20638.082	-224.520	20862.905	0.302	1.806
0.757	0.000	0.243	-20677.296	-228.637	20906.241	0.308	2.948
0.572	0.173	0.255	-22140.171	-141.599	22282.010	0.240	1.444

Methodology:

- Use measured SO4 and EC
- Use retained nitrate (calculated)
- Use calculated indirect NH4 (retained) method for baseline and future
- Use crustal (alt) for other particulate PM2.5 (OPP)
- Use calculated particle bound water for baseline and future
- Degrees of Neutralization (DON) constant from base to future
- Minimum (floor) for OCMmb is equal to OC
- If OCMmb < OCfloor, then adjust species by FRMc/CFM
- Reconstructed CFM = SO4+NO3r+NH4r+H2O+EC+Cr+Pa+OC

Reconstruction for Quarters with OCMmb < OCfloor

RFM	QTR	FRMc	SO4	NO3r	OC	EC	CRUSTalt	NH4r	PBWcalc	Pa	CFM	FRMc/CFM
	1Q	12.697	3.536	1.859	3.929	0.778	0.636	1.627	1.033	0.500	13.896	0.914
	2Q	12.794	4.466	0.060	4.161	0.635	0.860	1.448	1.806	0.500	13.936	0.918
	3Q	18.237	7.251	0.000	4.628	0.846	0.781	2.325	2.948	0.500	19.279	0.946
	4Q	11.993	3.439	1.037	3.615	0.924	0.692	1.532	1.444	0.500	13.183	0.910

Adjusted Averages

Adjusted AVGs	QTR	FRMc	SO4	NO3r	OC	EC	CRUSTalt	NH4r	PBWcalc	Pa	OCMmb
	1Q	12.697	3.231	1.698	3.590	0.710	0.581	1.486	0.943	0.500	3.547
	2Q	12.794	4.100	0.055	3.820	0.583	0.789	1.330	1.658	0.500	3.779
	3Q	18.237	6.859	0.000	4.378	0.801	0.739	2.199	2.789	0.500	4.351
	4Q	11.993	3.129	0.943	3.289	0.841	0.629	1.394	1.313	0.500	3.243

Quarterly Averages

AVGs	QTR	FRMc	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	12.697	0.500	12.197	3.547	0.710	3.231	1.698	0.581	1.486	0.943
	2Q	12.794	0.500	12.294	3.779	0.583	4.100	0.055	0.789	1.330	1.658
	3Q	18.237	0.500	17.737	4.351	0.801	6.859	0.000	0.739	2.199	2.789
	4Q	11.993	0.500	11.493	3.243	0.841	3.129	0.943	0.629	1.394	1.313

Florence CSN Quarterly Averages

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20050110	3.440	0.080	0.790	1.280	1.770	0.460	0.210	0.210	0.365	1.260	8.500
20050116	2.180	1.670	1.900	1.050	2.680	0.620	0.220	0.260	0.259	0.630	10.000
20050122	2.850	1.850	1.990	1.270	3.060	0.570	0.160	0.150	0.257	0.780	10.600
20050128	1.640	2.230	2.430	1.100	3.170	0.690	0.390	0.420	0.276	0.630	10.600
20050203	5.030	4.550	5.200	3.170	6.340	1.960	0.550	0.550	0.368	1.590	26.100
20050209	2.980	0.590	0.730	0.900	2.330	1.020	0.430	0.460	0.245	0.630	9.800
20050215	2.690	0.000	0.720	0.770	1.370	0.400	0.140	0.140	0.286	0.750	5.900
20050221	4.650	0.610	1.100	1.460	2.570	0.800	0.210	0.230	0.276	1.150	12.500
20050227	2.120	0.490	0.980	0.790	2.010	0.340	0.130	0.130	0.306	0.630	6.400
20050305	4.140	0.900	1.360	1.630	2.820	0.820	0.340	0.400	0.331	1.370	11.700
20050311	3.950	3.560	3.900	2.340	2.430	0.770	0.150	0.150	0.331	1.280	14.800
20050317	2.880	4.170	5.290	2.380	3.720	0.750	0.500	0.500	0.375	1.070	15.800
20050323	5.000	1.110	1.490	2.050	14.400	0.420	0.130	0.130	0.346	1.710	13.000
AVG	3.350	1.678	2.145	1.553	3.744	0.740	0.274	0.287	0.309	1.037	11.977

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20050404	1.340	0.000	0.210	0.460	1.740	0.580	0.140	0.170	0.343	0.490	5.100	
20050410	4.850	0.000	0.320	1.500	4.180	0.620	0.780	1.020	0.309	1.570	14.600	
20050416	1.500	0.000	1.010	0.670	3.190	0.610	0.590	0.670	0.375	0.540	7.400	
20050422	4.810	0.000	1.040	1.670	4.050	0.910	0.520	0.620	0.347	1.780	13.400	
20050428	3.000	0.000	1.170	1.330	1.890	0.410	0.150	0.150	0.375	1.070	8.200	
20050504	4.460	0.720	2.490	2.020	2.830	0.510	0.420	0.420	0.375	1.510	11.700	
20050510	6.180	0.000	0.470	1.880	3.840	0.460	0.950	1.130	0.304	1.950	17.700	FRM_MASS = CSN
20050516	2.410	0.000	0.620	0.850	1.680	0.210	0.180	0.220	0.353	0.890	6.400	
20050522	3.760	0.000	0.630	1.440	3.960	0.270	0.630	0.710	0.375	1.350	13.100	
20050528	2.070	0.000	0.430	0.530	2.810	0.290	0.150	0.170	0.256	0.420	9.400	
20050603	2.330	0.000	0.460	0.510	2.060	0.490	0.140	0.170	0.219	0.460	6.600	
20050609	10.300	0.000	0.330	2.350	4.450	0.370	0.520	0.590	0.228	1.910	24.100	
20050615	2.770	0.000	0.370	0.820	2.910	0.610	0.260	0.340	0.296	0.830	8.700	
20050621	13.500	0.000	0.300	3.180	5.050	0.690	0.720	0.730	0.236	2.460	27.900	
20050627	17.700	0.000	0.290	5.140	6.320	0.690	0.460	0.460	0.290	5.060	41.700	
AVG	5.399	0.048	0.676	1.623	3.397	0.515	0.441	0.505	0.312	1.486	14.400	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20050703	7.770	0.000	0.420	2.130	4.690	0.450	0.360	0.480	0.274	1.920	21.300	
20050709	3.790	0.000	0.530	0.900	3.520	0.340	0.170	0.170	0.237	0.690	18.900	
20050715	10.400	0.000	0.380	2.780	3.440	0.370	0.410	0.470	0.267	2.400	19.500	FRM_MASS = CSN
20050721	7.650	0.000	0.310	1.850	3.890	0.410	0.460	0.390	0.242	1.410	19.100	
20050727	3.210	0.000	0.370	0.790	2.880	0.380	0.410	0.410	0.246	0.610	10.500	
20050802	5.610	0.000	0.310	1.570	4.660	0.670	0.630	0.770	0.280	1.460	16.700	
20050808	8.960	0.000	0.280	2.610	2.890	0.430	0.170	0.170	0.291	2.580	20.300	
20050814	11.400	0.000	0.360	3.250	4.520	0.180	1.500	1.900	0.285	3.120	18.200	
20050826	11.200	0.000	0.340	3.430	3.860	0.680	0.190	0.190	0.306	3.570	27.900	
20050901	3.600	0.000	0.610	0.830	2.660	0.460	0.220	0.220	0.231	0.660	10.700	
20050907	6.170	0.000	0.210	1.310	3.020	0.360	0.590	0.590	0.212	1.310	15.800	
20050913	20.000	0.000	0.220	5.490	4.920	0.690	1.290	1.540	0.274	4.960	39.500	
20050919	10.700	0.000	0.180	2.180	2.620	0.730	0.700	0.830	0.204	2.520	20.900	
20050925	13.800	0.000	0.240	2.910	3.780	0.380	0.610	0.810	0.211	2.970	24.800	
AVG	8.876	0.000	0.340	2.288	3.668	0.466	0.551	0.639	0.254	2.156	20.293	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20051001	5.780	0.000	0.170	1.330	2.360	0.610	0.380	0.420	0.230	1.060	14.300
20051007	1.360	0.000	0.450	0.280	1.430	0.340	0.100	0.100	0.206	0.300	4.300
20051013	4.600	0.000	0.130	1.010	1.910	0.580	0.560	0.700	0.220	0.910	9.900
20051019	2.520	0.000	0.390	0.800	2.320	0.570	0.640	0.700	0.317	0.850	8.900
20051025	1.050	0.000	0.160	0.200	0.940	0.330	0.260	0.260	0.190	0.310	3.500
20051106	3.350	0.000	0.220	0.920	2.170	0.200	0.360	0.390	0.275	0.830	8.800
20051112	2.030	0.000	0.320	0.570	2.880	0.510	0.340	0.430	0.281	0.540	8.400
20051118	3.450	1.330	1.770	1.450	2.210	0.340	0.390	0.350	0.308	1.010	9.000
20051124	1.070	0.560	0.860	0.520	1.520	0.400	0.090	0.090	0.334	0.330	3.600
20051130	2.640	0.000	0.290	0.830	1.580	0.360	0.150	0.190	0.314	0.880	6.800
20051206	3.990	3.410	3.680	2.280	3.180	0.500	0.190	0.210	0.323	1.270	15.400
20051212	1.470	0.550	0.850	0.640	1.700	0.530	0.180	0.230	0.327	0.460	6.100
20051218	2.840	1.750	2.100	1.450	3.200	0.600	0.180	0.210	0.332	0.880	12.500
20051224	3.450	0.000	0.350	1.220	3.600	0.740	0.280	0.310	0.354	1.280	13.200
20051230	5.730	0.000	0.350	1.410	1.920	0.300	0.170	0.160	0.246	1.080	11.900
AVG	3.022	0.507	0.806	0.994	2.195	0.461	0.285	0.317	0.284	0.799	9.107

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20060105	1.340	0.230	0.620	0.590	1.430	0.670	0.100	0.120	0.375	0.450	5.900	FRM_MASS = CSN
20060111	4.910	0.000	0.380	1.640	3.040	0.380	0.470	0.500	0.334	1.770	13.500	
20060117	2.950	0.000	0.530	1.030	3.230	1.070	0.500	0.550	0.349	1.090	12.100	
20060123	1.890	0.970	1.350	0.900	2.190	0.570	0.230	0.270	0.327	0.580	8.600	
20060129	2.370	0.000	0.250	0.730	2.730	0.600	0.230	0.280	0.308	0.760	9.500	
20060204	3.330	0.000	0.620	1.030	1.630	0.400	0.100	0.110	0.309	1.080	8.700	FRM_MASS = CSN
20060210	2.280	2.010	2.500	1.390	2.640	0.550	0.300	0.370	0.354	0.740	11.500	FRM_MASS = CSN
20060216	2.940	0.000	0.650	1.030	3.810	0.780	0.510	0.580	0.350	1.090	13.700	FRM_MASS = CSN
20060222	4.370	0.590	1.490	1.830	3.600	0.940	0.600	0.580	0.375	1.500	17.400	FRM_MASS = CSN
20060306	0.920	0.360	1.080	0.480	2.500	0.420	0.360	0.420	0.375	0.290	7.700	FRM_MASS = CSN
20060312	2.960	0.000	0.390	1.070	2.410	0.440	0.260	0.310	0.361	1.100	9.500	
20060318	1.570	0.250	0.820	0.700	1.930	0.220	0.260	0.230	0.375	0.530	5.000	
20060324	4.800	1.300	1.910	1.990	3.200	0.680	0.380	0.400	0.336	1.590	15.000	
20060330	8.950	0.000	0.350	2.580	3.750	0.840	0.590	0.730	0.288	2.510	20.200	
AVG	3.256	0.408	0.924	1.214	2.721	0.611	0.349	0.389	0.344	1.077	11.307	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20060405	1.830	0.000	0.310	0.630	0.990	0.090	0.080	0.080	0.344	0.680	4.100	FRM_MASS = CSN
20060411	5.580	0.000	0.200	1.390	2.790	0.490	0.760	0.850	0.249	1.080	13.700	
20060417	1.560	0.000	0.180	0.520	2.550	0.020	0.540	0.640	0.333	0.560	2.800	
20060423	3.110	0.000	1.110	1.160	2.390	0.070	0.310	0.280	0.373	1.120	7.900	
20060429	1.360	0.000	0.340	0.400	3.910	0.040	0.610	0.760	0.294	0.400	6.700	
20060505	2.960	0.000	0.510	0.970	2.620	0.260	0.590	0.730	0.328	1.040	8.800	
20060511	4.470	0.000	0.230	1.510	2.210	0.090	0.370	0.400	0.338	1.630	11.800	
20060517	3.560	0.000	1.070	1.310	1.970	0.310	0.320	0.330	0.368	1.300	9.500	
20060523	1.980	0.000	0.380	0.580	1.880	0.290	0.520	0.490	0.293	0.580	6.500	
20060529	19.800	0.000	0.300	4.160	5.280	0.600	0.700	0.750	0.210	4.310	38.700	
20060604	1.490	0.000	0.450	0.500	1.800	0.240	0.310	0.360	0.336	0.530	5.800	
20060610	0.980	0.000	0.140	0.280	2.290	0.240	0.270	0.260	0.286	0.270	4.800	
20060616	6.060	0.000	0.230	1.770	4.490	0.380	0.900	1.080	0.292	1.750	20.300	FRM_MASS = CSN
20060622	5.510	0.000	0.210	1.370	2.840	0.210	0.430	0.420	0.249	1.060	14.200	
20060628	7.960	0.000	0.220	2.020	2.830	0.370	0.430	0.360	0.254	1.600	16.300	
AVG	4.547	0.000	0.392	1.238	2.723	0.247	0.476	0.519	0.303	1.194	11.460	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20060704	7.190	0.000	0.510	2.310	4.190	0.240	0.350	0.400	0.321	2.480	20.100	FRM_MASS = CSN
20060710	16.200	0.000	0.170	3.890	5.240	0.600	0.520	0.670	0.240	2.970	35.800	FRM_MASS = CSN
20060722	4.130	0.000	0.510	1.150	2.730	0.270	0.210	0.250	0.278	1.060	11.300	
20060728	4.850	0.000	0.350	1.180	2.290	0.360	4.020	4.670	0.243	0.900	16.800	FRM_MASS = CSN
20060803	8.320	0.000	0.440	2.030	3.330	0.620	0.890	1.100	0.244	1.550	21.300	FRM_MASS = CSN
20060809	8.130	0.000	0.200	1.620	3.640	0.470	1.360	1.580	0.199	2.030	20.200	FRM_MASS = CSN
20060815	5.800	0.000	0.620	1.680	3.270	0.280	0.460	0.420	0.290	1.650	15.300	
20060821	3.010	0.000	0.180	0.790	3.480	0.330	0.220	0.210	0.262	0.650	8.500	
20060824	13.300	0.000	0.300	4.460	5.860	0.640	0.380	0.380	0.335	4.810	19.900	
20060902	0.390	0.000	0.090	0.160	1.860	0.090	0.000	0.000	0.375	0.140	2.200	
20060908	10.000	0.000	0.170	2.030	3.440	0.480	0.360	0.360	0.203	2.380	21.800	
20060914	3.750	0.000	0.320	1.270	1.450	0.390	0.060	0.030	0.339	1.370	8.100	
20060920	1.570	0.000	0.260	0.490	1.490	0.200	0.100	0.120	0.312	0.520	4.700	
20060926	3.080	0.000	0.470	1.290	2.420	0.520	0.510	0.520	0.375	1.100	9.900	
AVG	6.409	0.000	0.328	1.739	3.192	0.392	0.674	0.765	0.287	1.686	15.421	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20061002	3.810	0.000	0.330	0.990	2.750	0.490	0.730	0.720	0.260	0.810	11.600	
20061008	3.280	0.000	0.420	1.000	2.170	0.500	0.290	0.330	0.305	1.040	16.200	
20061014	1.710	0.000	0.290	0.550	1.700	0.280	0.420	0.430	0.322	0.580	5.200	
20061020	1.280	0.000	0.120	0.360	1.790	0.250	0.150	0.110	0.281	0.340	2.900	
20061026	3.020	0.000	0.310	0.840	1.940	0.470	0.480	0.480	0.278	0.780	8.400	
20061101	2.330	1.430	2.900	1.510	2.470	0.540	0.300	0.330	0.375	0.700	11.500	
20061107	2.970	0.000	0.430	0.970	1.200	0.230	0.270	0.280	0.327	1.050	13.600	
20061113	6.650	0.090	0.590	1.130	1.940	0.340	0.180	0.180	0.166	2.500	15.700	
20061119	3.160	1.480	2.080	1.610	2.860	0.490	0.210	0.220	0.374	0.970	11.600	
20061125	3.080	0.000	0.220	0.930	3.790	0.940	0.410	0.390	0.302	0.950	11.800	
20061201	1.670	0.000	0.140	0.350	1.460	0.000	0.100	0.100	0.210	0.360	4.700	
20061207	1.590	1.490	2.090	1.040	1.610	0.210	0.130	0.140	0.375	0.500	5.900	FRM_MASS = CSN
20061213	2.650	0.000	0.830	1.000	3.230	0.460	0.240	0.280	0.375	0.950	10.800	
20061219	1.940	1.640	2.260	1.050	3.300	0.590	0.450	0.420	0.296	0.600	11.200	
20061225	2.610	0.640	1.330	1.150	2.330	0.600	0.100	0.100	0.369	0.870	10.600	
20061231	4.440	0.330	1.760	1.830	3.670	0.980	0.210	0.240	0.375	1.560	17.800	
AVG	2.887	0.444	1.006	1.019	2.388	0.461	0.292	0.297	0.312	0.910	10.594	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20070106	1.840	0.000	0.580	0.680	1.060	0.210	0.050	0.050	0.370	0.670	5.200	
20070112	2.550	0.000	0.210	0.650	1.870	0.380	0.300	0.290	0.255	0.520	8.100	
20070118	2.690	0.570	1.130	0.990	3.360	0.170	0.410	0.350	0.307	0.810	8.900	
20070124	5.860	1.250	1.640	2.160	2.220	0.400	0.180	0.220	0.307	1.750	14.300	
20070130	2.670	1.920	2.250	1.310	1.900	0.050	0.360	0.360	0.282	0.770	9.800	
20070205	1.650	2.290	2.350	0.990	1.860	0.380	0.110	0.110	0.197	0.730	8.700	
20070211	2.260	3.810	4.030	1.750	3.200	0.560	0.360	0.420	0.285	0.980	13.900	
20070217	3.240	1.410	1.660	1.240	2.660	0.580	0.410	0.340	0.256	0.790	11.900	
20070223	1.650	0.080	0.420	0.550	1.120	0.350	0.140	0.170	0.319	0.540	4.400	
20070301	5.560	0.130	1.420	2.180	2.420	0.990	0.500	0.550	0.375	1.980	14.400	FRM_MASS = CSN
20070307	2.490	1.750	2.030	1.120	2.300	0.460	0.480	0.480	0.246	0.710	10.600	FRM_MASS = CSN
20070313	4.960	0.000	0.470	1.900	2.970	0.660	0.580	0.600	0.375	1.780	14.900	
20070319	2.090	0.420	0.880	0.750	1.900	0.300	0.320	0.290	0.301	0.610	8.700	
20070325	3.060	0.000	0.910	1.020	2.230	0.450	0.330	0.380	0.333	1.100	7.800	
20070331	2.810	0.000	0.360	0.920	3.570	0.820	0.790	0.840	0.327	0.990	11.100	
AVG	3.025	0.909	1.356	1.214	2.309	0.451	0.355	0.363	0.302	0.982	10.180	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20070406	2.380	0.720	1.250	1.160	1.470	0.170	0.100	0.120	0.375	0.770	6.000	
20070412	2.910	0.000	0.220	0.850	1.170	0.320	0.370	0.420	0.292	0.840	6.100	
20070418	2.250	0.000	0.540	0.720	1.520	0.410	0.190	0.230	0.320	0.770	6.100	
20070424	2.820	0.000	0.740	0.880	1.950	0.380	0.550	0.620	0.312	0.930	6.500	
20070430	1.730	0.000	0.170	0.630	1.990	0.290	0.440	0.510	0.364	0.640	5.800	
20070506	1.300	0.000	0.080	0.370	1.640	0.020	0.360	0.400	0.285	0.350	4.200	FRM_MASS = CSN
20070512	3.790	0.000	0.570	1.360	2.670	0.745	0.750	0.770	0.359	1.410	12.500	
20070518	1.600	0.000	0.630	0.570	1.320	0.539	0.420	0.420	0.356	0.590	5.300	
20070524	15.800	0.000	0.500	4.620	4.930	1.070	1.020	1.000	0.292	4.580	32.800	
20070530	6.820	0.000	0.300	2.130	2.880	1.200	0.810	0.800	0.312	2.250	17.200	
20070605	2.460	0.000	0.320	0.850	1.080	0.199	0.090	0.100	0.346	0.910	6.000	
20070611	2.840	0.000	0.280	0.880	3.310	0.537	1.050	1.080	0.310	0.920	12.700	
20070617	10.600	0.000	0.300	3.160	4.780	0.800	0.850	1.010	0.298	3.210	28.400	
20070623	1.460	0.000	0.240	0.410	2.770	0.989	0.350	0.410	0.281	0.390	8.500	
AVG	4.197	0.051	0.439	1.328	2.391	0.548	0.525	0.564	0.322	1.326	11.293	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20070705	5.480	0.000	0.370	1.570	1.680	0.331	0.440	0.530	0.286	1.520	14.100
20070711	5.520	0.000	0.140	1.480	1.990	0.420	0.490	0.490	0.268	1.280	16.700
20070717	11.900	0.000	0.180	2.620	3.490	0.664	0.300	0.380	0.220	2.330	24.900
20070723	6.650	0.000	0.270	1.660	2.680	0.688	0.490	0.380	0.250	1.290	17.100
20070729	13.100	0.000	0.240	2.890	3.000	0.779	0.220	0.280	0.221	2.550	28.300
20070804	12.200	0.000	0.230	3.140	3.890	0.754	0.960	0.950	0.257	2.540	29.900
20070810	4.940	0.000	0.300	1.370	1.700	0.424	0.240	0.290	0.277	1.260	13.200
20070816	9.230	0.000	0.270	2.500	3.910	0.784	0.420	0.400	0.271	2.210	23.800
20070822	12.500	0.000	0.370	3.220	1.550	0.712	0.570	0.620	0.258	2.610	24.200
20070828	21.900	0.000	0.210	3.690	2.970	0.910	0.630	0.630	0.168	8.040	42.000
20070903	9.240	0.000	0.340	3.350	4.070	1.020	0.530	0.520	0.363	3.410	23.700
20070909	11.400	0.000	1.340	4.650	4.380	1.140	0.360	0.410	0.375	4.080	19.900
20070915	1.080	0.000	0.350	0.310	0.867	0.236	0.130	0.160	0.287	0.300	3.500
20070921	8.920	0.000	0.260	2.370	1.710	0.808	0.580	0.620	0.266	2.020	20.800
20070927	3.760	0.000	0.580	1.440	2.030	0.806	0.170	0.190	0.375	1.350	11.000
AVG	9.188	0.000	0.363	2.417	2.661	0.698	0.435	0.457	0.276	2.453	20.873

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20071003	4.000	0.000	0.360	1.290	2.090	0.446	0.610	0.750	0.322	1.380	12.600	FRM_MASS = CSN
20071009	7.510	0.000	0.420	2.340	2.130	0.790	0.780	0.710	0.312	2.470	17.800	
20071015	4.130	0.000	0.440	1.560	1.920	0.824	0.780	0.910	0.375	1.480	13.400	
20071021	2.060	0.000	0.130	0.550	1.070	0.270	0.560	0.610	0.267	0.470	6.200	
20071027	2.570	0.000	0.240	0.730	1.070	0.313	0.190	0.140	0.284	0.700	6.300	
20071102	1.830	0.000	0.780	0.620	1.770	0.655	0.270	0.310	0.339	0.670	7.100	
20071108	2.790	0.000	0.760	1.060	1.430	0.463	0.270	0.300	0.375	1.000	7.700	
20071114	6.010	0.000	1.330	2.680	2.100	0.754	0.240	0.280	0.375	2.150	15.400	
20071120	7.660	0.000	1.560	3.840	2.370	0.824	0.380	0.360	0.375	2.740	16.000	
20071126	2.350	0.340	1.250	0.980	1.920	0.559	0.190	0.230	0.375	0.810	9.000	
20071202	2.020	0.000	0.670	0.730	2.160	0.444	0.160	0.190	0.361	0.750	7.700	
20071208	5.690	2.800	3.460	2.900	3.640	1.070	0.270	0.350	0.367	1.780	20.100	
20071214	3.620	0.970	1.800	1.760	1.200	0.251	0.050	0.060	0.375	1.180	9.400	
20071220	4.570	4.050	4.740	3.450	2.230	0.682	0.310	0.310	0.375	1.410	14.800	
20071226	2.920	0.780	1.540	1.300	4.050	1.610	0.330	0.370	0.368	0.980	13.900	
AVG	3.982	0.596	1.299	1.719	2.077	0.664	0.359	0.392	0.350	1.331	11.827	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20080101	3.550	2.150	2.840	2.010	1.590	0.373	0.100	0.100	0.375	1.060	11.600	FRM_MASS = CSN
20080107	3.080	0.000	0.290	0.750	1.400	0.437	0.100	0.130	0.244	0.570	8.300	
20080113	5.150	1.030	1.760	2.330	2.840	0.958	0.200	0.230	0.375	1.720	10.600	
20080119	3.020	2.440	2.790	1.910	1.480	0.439	0.280	0.330	0.375	0.920	10.200	
20080125	2.290	3.930	4.120	1.980	2.220	0.783	0.210	0.250	0.366	0.960	13.300	
20080131	1.750	2.110	2.500	1.140	1.790	0.705	0.470	0.560	0.301	0.620	10.000	
20080206	1.610	0.000	0.590	0.750	0.702	0.205	0.210	0.250	0.375	0.580	3.900	
20080212	3.700	3.150	3.410	2.600	4.220	1.080	0.430	0.520	0.375	1.130	16.900	
20080218	2.810	0.000	0.620	1.030	0.677	0.182	0.130	0.060	0.367	1.030	6.100	
20080224	6.970	3.260	3.670	3.200	3.800	1.510	0.420	0.460	0.323	2.140	23.100	
20080301	3.120	1.700	2.330	1.680	1.280	0.225	0.070	0.080	0.375	0.940	8.000	
20080307	5.030	1.720	2.270	2.450			0.660	0.680	0.375	1.600	14.400	
20080313	2.770	0.000	1.470	1.240	1.630	0.522	0.340	0.360	0.375	0.990	8.400	
20080319	3.520	0.000	0.680	1.190	1.390	0.579	0.230	0.250	0.338	1.280	9.700	
20080325	3.710	0.000	0.690	1.270	1.660	0.483	0.690	0.610	0.342	1.360	9.500	
20080331	2.650	0.000	0.330	0.660	1.260	0.309	0.360	0.440	0.249	0.520	7.100	
AVG	3.421	1.343	1.898	1.637	1.863	0.586	0.306	0.332	0.346	1.089	10.694	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20080406	4.250	0.000	0.510	1.480	1.670	0.455	0.130	0.170	0.348	1.570	10.200	
20080412	2.220	0.000	0.240	0.710	0.561	0.085	0.180	0.210	0.320	0.760	4.300	
20080418	8.010	0.000	0.270	2.450	3.490	0.726	0.950	1.090	0.306	2.550	19.500	
20080424	2.480	0.000	0.240	0.870	1.460	0.420	0.930	0.970	0.351	0.920	7.600	
20080430	3.390	0.000	1.490	1.490	2.060	0.405	0.390	0.420	0.375	1.210	9.200	
20080506	4.850	0.000	0.770	1.840	2.130	0.629	1.070	1.160	0.375	1.740	14.000	
20080518	1.610	0.000	0.450	0.570	0.992	0.195	0.140	0.170	0.354	0.600	3.900	
20080524	1.530	0.000	0.370	0.430	1.270	0.272	0.190	0.220	0.281	0.410	7.000	FRM_MASS = CSN
20080530	5.790	0.000	0.190	1.590	2.540	0.745	1.000	1.020	0.275	1.440	17.200	
20080605	3.170	0.000	0.230	0.970	2.040	0.462	0.320	0.400	0.306	1.020	12.900	
20080611	4.020	0.000	0.390	1.240	3.170	0.730	0.370	0.440	0.308	1.300	14.100	
20080617	1.600	0.000	0.190	0.440	1.600	0.317	0.170	0.190	0.275	0.400	6.200	
20080623	2.390	0.000	0.520	0.790	1.470	0.581	0.240	0.210	0.331	0.860	7.600	
20080629	5.000	0.000	0.320	1.370	1.320	0.195	0.180	0.220	0.274	1.230	11.200	
AVG	3.594	0.000	0.441	1.160	1.841	0.444	0.447	0.492	0.320	1.144	10.350	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20080705	5.120	0.000	0.770	1.210	4.620	0.685	0.270	0.300	0.236	0.930	20.600	
20080711	4.990	0.000	0.160	1.330	1.970	0.530	0.220	0.190	0.267	1.140	12.700	
20080717	13.700	0.000	0.260	3.530	2.580	1.030	0.980	0.940	0.258	2.860	31.500	FRM_MASS = CSN
20080723	3.940	0.000	0.260	0.960	1.940	0.384	0.390	0.440	0.244	0.740	10.100	FRM_MASS = CSN
20080729	14.500	0.000	0.330	3.450	5.220	2.600	0.340	0.320	0.238	2.640	35.400	FRM_MASS = CSN
20080804	6.860	0.000	0.150	1.910	2.410	0.640	0.840	0.810	0.278	1.770	18.300	
20080822	6.430	0.000	0.190	1.600	2.870	0.712	0.730	0.700	0.249	1.240	19.500	
20080828	1.670	0.000	0.530	0.660	1.320	0.569	0.160	0.170	0.375	0.600	6.200	
20080903	11.900	0.000	0.360	3.530	2.970	0.846	0.680	0.670	0.297	3.560	25.900	
20080909	4.690	0.000	0.250	1.350	1.470	0.488	0.380	0.310	0.288	1.310	10.800	
20080921	9.930	0.000	0.310	2.890	3.230	0.761	1.070	1.200	0.291	2.850	25.400	
20080927	1.590	0.000	0.320	0.460	1.060	0.364	0.090	0.100	0.289	0.450	6.700	FRM_MASS = CSN
AVG	7.110	0.000	0.324	1.907	2.638	0.801	0.513	0.513	0.276	1.674	18.592	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20081003	1.500	0.000	0.230	0.450	1.220	0.299	0.210	0.250	0.300	0.460	5.700	FRM_MASS = CSN
20081009	3.080	0.000	0.610	1.260	1.010	0.369	0.160	0.170	0.375	1.100	7.300	
20081015	5.720	0.000	0.420	1.840	2.530	0.664	0.640	0.640	0.322	1.970	14.000	
20081021	1.680	0.000	0.190	0.490			0.130	0.100	0.292	0.480	6.400	
20081102	6.110	0.000	1.630	2.470	3.970	0.990	0.570	0.680	0.375	2.190	21.200	
20081108	1.570	0.000	0.500	0.600	1.310	0.273	0.900	0.750	0.375	0.560	5.200	
20081114	3.110	0.000	0.700	0.800	1.540	0.331	0.220	0.260	0.257	0.640	7.200	
20081120	1.510	1.140	1.830	0.980	1.070	0.261	0.100	0.120	0.375	0.460	6.500	
20081126	1.530	1.050	1.610	0.920	1.430	0.708	0.040	0.040	0.375	0.460	6.600	
20081202	3.100	0.000	0.530	1.030	0.659	0.104	0.060	0.080	0.332	1.110	6.500	
20081208	1.500	0.350	0.880	0.700	1.670	0.465	0.180	0.200	0.375	0.500	6.500	
20081214	1.910	0.000	0.720	0.660	1.490	0.465	0.080	0.100	0.346	0.710	5.000	
20081220	4.040	0.270	0.700	1.140	1.560	0.409	0.260	0.270	0.263	0.890	9.700	
20081226	2.760	1.790	2.510	1.620	1.970	0.693	0.350	0.390	0.375	0.830	10.000	
AVG	2.794	0.329	0.933	1.069	1.648	0.464	0.279	0.289	0.338	0.883	8.414	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20090101	2.120	0.280	0.600	0.680	1.470	0.428	0.110	0.090	0.282	0.550	6.900	
20090107	1.690	0.360	0.710	0.630	1.170	0.413	0.130	0.160	0.311	0.520	6.800	
20090113	2.910	0.280	0.680	1.040	1.220	0.247	0.120	0.150	0.329	1.000	8.400	FRM_MASS = CSN

20090125	2.120	1.900	2.070	1.230	2.250	0.515	0.130	0.140	0.320	0.680	11.000	
20090131	2.560	3.610	3.880	1.830	1.450	0.279	0.220	0.210	0.305	0.990	11.000	
20090206	3.260	0.590	1.120	1.180	2.140	0.525	0.340	0.310	0.309	1.000	10.100	
20090212	1.810	0.000	0.920	0.830	0.378	0.060	0.040	0.050	0.375	0.650	3.700	
20090218	1.990	0.000	0.530	0.630	1.430	0.397	0.290	0.280	0.317	0.660	7.000	
20090224	2.210	0.480	0.750	0.930	1.460	0.359	0.210	0.230	0.358	0.760	7.100	
20090302	1.450	0.540	0.740	0.570	0.703	0.153	0.210	0.210	0.285	0.380	4.200	
20090308	2.560	0.000	0.460	0.650	1.530	0.314	0.270	0.350	0.254	0.520	7.600	FRM_MASS = CSN
20090314	3.140	0.140	1.650	1.310	2.200	0.853	0.500	0.560	0.375	1.110	11.400	
20090320	2.580	0.070	0.770	0.970	1.100	0.184	0.520	0.570	0.368	0.940	7.000	
20090326	1.480	0.000	0.820	0.550	1.130	0.251	0.350	0.400	0.372	0.530	4.200	
AVG	2.277	0.589	1.121	0.931	1.402	0.356	0.246	0.265	0.326	0.735	7.600	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20090401	2.360	0.000	0.230	0.710	1.520	0.337	0.560	0.540	0.301	0.730	8.600	
20090407	1.880	0.000	0.370	0.580	0.548	0.131	0.110	0.140	0.309	0.610	7.300	
20090413	1.990	0.000	0.430	0.710	1.180	0.513	0.540	0.550	0.357	0.740	8.200	
20090419	7.790	0.000	0.860	2.870	2.970	0.761	0.790	0.840	0.368	2.850	19.600	
20090425	2.170	0.000	0.180	0.810	2.190	0.407	0.550	0.610	0.373	0.790	11.600	
20090501	2.170	0.000	0.310	0.590	1.220	0.238	0.440	0.510	0.272	0.510	7.400	
20090507	4.890	0.000	0.370	1.420	1.050	0.315	0.780	0.890	0.290	1.400	10.400	
20090513	4.370	0.000	0.250	1.250	1.870	0.500	0.680	0.690	0.286	1.200	12.500	
20090519	2.290	0.000	0.150	0.700	1.190	1.400	0.550	0.610	0.306	0.720	7.900	
20090525	3.880	0.000	0.640	1.150	2.600	0.600	0.640	0.730	0.296	1.160	14.100	
20090531	1.470	0.000	0.300	0.470	1.340	0.266	0.240	0.250	0.320	0.500	6.100	
20090606	3.760	0.000	0.370	1.280	1.920	0.498	0.600	0.670	0.340	1.370	12.400	
20090612	4.480	0.000	1.470	1.980	1.590	0.564	0.260	0.310	0.375	1.610	13.400	
20090618	4.140	0.000	0.980	1.550	1.660	0.249	0.170	0.150	0.374	1.490	9.800	
20090624	2.120	0.000	0.260	0.610	2.560	0.302	0.930	0.990	0.288	0.590	11.200	
20090630	1.110	0.000	0.210	0.260	1.130	0.217	0.130	0.150	0.234	0.200	3.200	
AVG	3.179	0.000	0.461	1.059	1.659	0.456	0.498	0.539	0.318	1.029	10.231	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20090706	4.050	0.000	0.230	1.180	1.960	0.548	0.420	0.460	0.291	1.170	15.800	FRM_MASS = CSN
20090712	2.520	0.000	0.230	0.770	1.660	0.287	0.830	0.920	0.306	0.800	14.500	
20090718	1.210	0.000	0.260	0.410	1.260	0.296	0.100	0.100	0.339	0.440	10.000	

20090724	4.290	0.000	0.680	1.390	1.460	0.414	0.130	0.160	0.324	1.490	15.200	
20090730	7.830	0.000	0.430	2.050	1.160	0.368	0.340	0.290	0.262	1.700	20.600	
20090805	3.680	0.000	0.240	0.670	1.610	0.359	0.360	0.460	0.182	1.140	16.800	
20090811	3.420	0.000	0.450	1.120	1.210	0.491	0.250	0.300	0.327	1.210	14.600	
20090817	10.100	0.000	0.260	2.870	2.740	1.220	0.450	0.350	0.284	2.740	25.500	
20090823	3.350	0.000	0.190	0.850	1.310	0.468	0.100	0.100	0.254	0.670	14.700	
20090829	2.750	0.000	0.210	0.750	1.350	0.276	1.190	1.230	0.273	0.660	15.000	
20090904	9.130	0.000	0.300	2.270	1.610	0.656	1.370	1.320	0.249	1.750	23.600	
20090910	2.480	0.000	0.230	0.800	2.030	0.591	0.380	0.360	0.323	0.850	15.000	
20090916	1.210	0.000	0.210	0.350	1.830	0.432	0.290	0.330	0.289	0.340	10.300	
20090922	2.920	0.000	0.190	0.800	1.240	0.419	0.140	0.150	0.274	0.710	11.600	
20090928	2.300	0.000	0.140	0.550	1.070	0.144	0.290	0.290	0.239	0.420	10.500	
AVG	4.083	0.000	0.283	1.122	1.567	0.465	0.443	0.455	0.281	1.073	15.580	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20091004	1.370	0.000	0.170	0.420	1.180	0.242	0.100	0.120	0.307	0.440	7.300	
20091010	1.130	0.000	0.100	0.270	0.823	0.151	0.130	0.180	0.239	0.210	6.200	
20091016	1.030	0.000	0.150	0.240	0.630	0.155	0.060	0.070	0.233	0.190	4.700	
20091022	4.190	0.000	0.190	1.200	2.370	0.524	0.480	0.450	0.286	1.160	15.200	
20091028	2.830	0.000	0.310	0.710	1.300	0.312	0.080	0.080	0.251	0.550	12.000	
20091103	3.200	0.000	1.250	1.340	1.890	0.484	0.290	0.270	0.375	1.150	15.800	
20091109	4.360	0.000	0.290	1.430	3.870	0.993	0.990	1.090	0.328	1.540	20.600	
20091115	3.830	0.000	1.710	1.850	3.200	0.889	0.550	0.590	0.375	1.370	19.600	
20091121	4.120	1.490	3.670	2.740	2.060	0.439	0.150	0.160	0.375	1.300	19.300	
20091127	0.970	0.000	0.320	0.350	0.627	0.109	0.050	0.050	0.361	0.360	6.800	
20091203	1.620	0.240	1.690	1.050	1.100	0.400	0.200	0.140	0.375	0.550	9.200	
20091209	1.240	0.000	0.290	0.360	0.592	0.104	0.140	0.100	0.290	0.360	6.300	
20091215	1.910	0.410	1.300	0.960	1.000	0.212	0.050	0.040	0.375	0.640	5.700	FRM_MASS = CSN
20091221	3.990	2.710	3.150	2.100	1.680	0.432	0.090	0.100	0.329	1.240	18.700	
20091227	1.370	0.000	0.210	0.430	1.340	0.250	0.450	0.370	0.314	0.460	8.600	
AVG	2.477	0.323	0.987	1.030	1.577	0.380	0.254	0.254	0.321	0.768	11.733	

Florence CSN Speciation Quarterly SANDWICH Averages

YEAR	QTR	FRMc	SO4	NO3r	NO3	NH4	OC	EC	CRUSTalt	DON	H2Oaim
2005	1Q	11.977	3.350	1.678	2.145	1.553	3.744	0.740	0.287	0.309	1.037
2005	2Q	14.400	5.399	0.048	0.676	1.623	3.397	0.515	0.505	0.312	1.486
2005	3Q	20.293	8.876	0.000	0.340	2.288	3.668	0.466	0.639	0.254	2.156
2005	4Q	9.107	3.022	0.507	0.806	0.994	2.195	0.461	0.317	0.284	0.799
2006	1Q	11.307	3.256	0.408	0.924	1.214	2.721	0.611	0.389	0.344	1.077
2006	2Q	11.460	4.547	0.000	0.392	1.238	2.723	0.247	0.519	0.303	1.194
2006	3Q	15.421	6.409	0.000	0.328	1.739	3.192	0.392	0.765	0.287	1.686
2006	4Q	10.594	2.887	0.444	1.006	1.019	2.388	0.461	0.297	0.312	0.910
2007	1Q	10.180	3.025	0.909	1.356	1.214	2.309	0.451	0.363	0.302	0.982
2007	2Q	11.293	4.197	0.051	0.439	1.328	2.391	0.548	0.564	0.322	1.326
2007	3Q	20.873	9.188	0.000	0.363	2.417	2.661	0.698	0.457	0.276	2.453
2007	4Q	11.827	3.982	0.596	1.299	1.719	2.077	0.664	0.392	0.350	1.331
2008	1Q	10.694	3.421	1.343	1.898	1.637	1.863	0.586	0.332	0.346	1.089
2008	2Q	10.350	3.594	0.000	0.441	1.160	1.841	0.444	0.492	0.320	1.144
2008	3Q	18.592	7.110	0.000	0.324	1.907	2.638	0.801	0.513	0.276	1.674
2008	4Q	8.414	2.794	0.329	0.933	1.069	1.648	0.464	0.289	0.338	0.883
2009	1Q	7.600	2.277	0.589	1.121	0.931	1.402	0.356	0.265	0.326	0.735
2009	2Q	10.231	3.179	0.000	0.461	1.059	1.659	0.456	0.539	0.318	1.029
2009	3Q	15.580	4.083	0.000	0.283	1.122	1.567	0.465	0.455	0.281	1.073
2009	4Q	11.733	2.477	0.323	0.987	1.030	1.577	0.380	0.254	0.321	0.768

AVGs	QTR	FRMc	SO4	NO3r	NO3	NH4	OC	EC	CRUSTalt	DON	H2Oaim	NH4r	PBWcalc	OCMmb
	1Q	10.352	3.066	0.985	1.489	1.310	2.408	0.549	0.327	0.325	0.984	1.283	0.963	2.678
	2Q	11.547	4.183	0.020	0.482	1.282	2.402	0.442	0.524	0.315	1.236	1.323	1.654	2.901
	3Q	18.152	7.133	0.000	0.328	1.895	2.745	0.564	0.565	0.275	1.808	1.960	2.148	5.280
	4Q	10.335	3.032	0.440	1.006	1.166	1.977	0.486	0.310	0.321	0.938	1.101	1.213	3.253

PBW Calculation	SO4	NO3r	NH4r
- Calculated from SO4, NO3r, and NH4r	3.066	0.985	1.283
- NH4r calculated from DON, SO4, NO3r	4.183	0.020	1.323
- DON > 0.225, low acidity equation	7.133	0.000	1.960
	3.032	0.440	1.101

S Term	N Term	A Term	Part 1	Part 2	Part 3	Sum	PBWcalc
0.575	0.185	0.241	-20515.636	-144.426	20660.242	0.181	0.963
0.757	0.004	0.239	-20304.076	-229.609	20533.984	0.299	1.654
0.784	0.000	0.216	-17643.723	-249.830	17893.789	0.236	2.148
0.663	0.096	0.241	-20487.204	-186.208	20673.676	0.265	1.213

Methodology:

- Use measured SO4 and EC
- Use retained nitrate (calculated)
- Use calculated indirect NH4 (retained) method for baseline and future
- Use crustal (alt) for other particulate PM2.5 (OPP)
- Use calculated particle bound water for baseline and future
- Degrees of Neutralization (DON) constant from base to future
- Minimum (floor) for OCMmb is equal to OC

Quarterly Averages

AVGs	QTR	FRMc	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	10.352	0.500	9.852	2.678	0.549	3.066	0.985	0.327	1.283	0.963
	2Q	11.547	0.500	11.047	2.901	0.442	4.183	0.020	0.524	1.323	1.654
	3Q	18.152	0.500	17.652	5.280	0.564	7.133	0.000	0.565	1.960	2.148
	4Q	10.335	0.500	9.835	3.253	0.486	3.032	0.440	0.310	1.101	1.213

Greensburg CSN Quarterly Averages

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20050104	6.800	0.360	0.540	1.250	1.400	0.430	0.170	0.180	0.168	2.460	12.900
20050110	3.900	0.820	1.530	1.870	2.580	0.820	0.220	0.220	0.375	1.300	12.100
20050116	2.140	2.390	2.620	1.400	3.520	0.590	0.180	0.200	0.330	0.740	12.800
20050122	2.770	2.400	2.540	1.530	3.580	0.450	0.130	0.130	0.301	0.870	11.800
20050128	1.170	1.650	1.850	0.820	4.620	1.560	0.430	0.500	0.291	0.450	11.500
20050203	3.880	5.350	6.000	3.180	4.490	1.140	0.330	0.330	0.375	1.410	21.200
20050209	3.530	2.410	2.540	1.980	3.020	1.040	0.400	0.400	0.363	1.100	15.000
20050215	2.720	0.000	1.180	1.260	3.000	0.740	0.350	0.390	0.375	0.970	8.100
20050221	4.950	0.710	1.200	1.900	2.600	0.630	1.160	0.930	0.342	1.730	13.600
20050227	1.650	0.780	1.270	0.820	2.390	0.500	0.140	0.140	0.360	0.520	7.200
20050305	4.460	3.740	4.200	2.680	4.090	0.860	0.330	0.370	0.357	1.420	18.200
20050311	3.890	4.210	4.550	2.680	2.450	0.530	0.160	0.160	0.375	1.270	16.400
20050317	4.060	5.310	6.430	3.360	5.960	1.020	0.710	0.830	0.375	1.440	23.300
20050323	3.610	0.780	1.160	1.430	2.060	0.390	0.190	0.170	0.333	1.210	10.000
20050329	2.810	0.000	0.800	1.160	2.850	0.650	0.270	0.270	0.375	1.010	8.400
AVG	3.489	2.061	2.561	1.821	3.241	0.757	0.345	0.348	0.340	1.193	13.500

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20050404	1.450	0.000	0.410	0.560	2.970	0.830	0.500	0.550	0.375	0.520	6.500	
20050410	3.990	0.000	0.620	1.590	5.290	0.780	0.700	0.880	0.375	1.430	13.800	
20050416	1.300	0.000	1.160	0.690	4.110	0.550	0.520	0.640	0.375	0.470	7.100	
20050422	2.260	0.000	1.130	1.090	3.000	0.640	0.440	0.540	0.375	0.810	8.300	
20050428	3.680	0.260	2.150	1.930	2.350	0.530	0.430	0.470	0.375	1.290	11.200	
20050504	5.050	1.130	2.900	2.580	3.450	0.660	0.690	0.760	0.375	1.670	14.900	
20050510	10.200	0.000	0.550	3.810	5.540	0.930	0.500	0.500	0.374	3.670	22.500	
20050516	2.730	0.000	0.880	1.080	2.590	0.300	0.230	0.230	0.375	0.980	14.200	
20050522	3.930	0.000	1.510	1.800	5.780	0.130	0.320	0.320	0.375	1.410	21.900	
20050528	2.730	0.390	1.290	1.100	3.020	0.320	0.170	0.170	0.361	0.960	9.300	
20050603	1.330	0.000	0.160	0.380	2.070	0.340	0.190	0.210	0.286	0.370	5.600	FRM_MASS = CSN
20050609	8.660	0.000	0.250	2.880	5.280	0.860	0.670	0.710	0.333	3.110	23.300	
20050615	4.050	0.000	0.370	1.220	3.630	0.700	0.250	0.310	0.301	1.250	11.600	
20050621	13.200	0.000	0.400	3.610	5.320	1.030	0.530	0.500	0.273	3.240	30.300	
20050627	8.990	0.000	0.500	3.420	7.360	0.980	0.950	1.010	0.375	3.220	28.700	

AVG	4.903	0.119	0.952	1.849	4.117	0.639	0.473	0.520	0.354	1.627	15.280	
DATE	**SO4**	**NO3R**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**	
20050703	8.980	0.000	0.520	2.930	5.640	0.700	0.400	0.500	0.326	3.160	23.900	
20050709	4.830	0.000	0.680	1.530	4.350	0.500	0.170	0.170	0.317	1.630	14.000	
20050715	8.480	0.000	0.220	2.760	4.000	0.660	0.250	0.250	0.325	2.970	20.600	
20050721	13.600	0.000	0.390	4.150	5.260	0.780	0.410	0.380	0.305	4.310	29.700	
20050727	4.860	0.000	0.450	1.480	5.070	0.400	0.480	0.560	0.305	1.530	16.800	
20050802	9.620	0.000	0.480	2.700	6.340	0.780	0.700	0.880	0.281	2.530	25.600	
20050808	6.820	0.000	0.400	2.360	4.210	0.600	0.190	0.190	0.346	2.520	17.300	
20050814	6.890	0.000	0.230	1.660	3.220	0.100	2.620	2.750	0.241	1.270	27.300	
20050820	7.600	0.000	0.410	2.170	3.610	0.540	0.320	0.370	0.286	2.090	17.400	
20050826	10.000	0.000	0.450	3.720	5.400	1.280	0.770	0.790	0.372	3.620	25.600	
20050901	10.600	0.000	2.670	3.920	3.840	1.190	0.520	0.540	0.370	3.860	22.900	
20050907	6.280	0.000	0.690	2.330	4.360	1.010	0.340	0.340	0.371	2.280	17.700	
20050913	25.100	0.000	0.810	7.380	7.160	1.680	1.100	1.420	0.294	7.370	49.800	FRM_MASS = CSN
20050919	10.800	0.000	0.590	3.250	4.320	1.230	0.590	0.610	0.301	3.330	23.400	
20050925	12.600	0.000	0.390	3.590	3.950	0.480	0.470	0.600	0.285	3.440	25.100	
AVG	9.804	0.000	0.625	3.062	4.715	0.795	0.622	0.690	0.315	3.061	23.807	
DATE	**SO4**	**NO3R**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**	
20051001	6.180	0.000	0.630	2.370	5.610	2.200	0.430	0.430	0.375	2.210	20.300	
20051007	1.460	0.000	0.260	0.400	2.030	0.490	0.170	0.170	0.274	0.370	5.300	
20051013	5.080	0.000	0.150	0.930	1.440	0.360	0.140	0.140	0.183	1.580	9.400	
20051025	0.350	0.000	0.250	0.060	1.370	0.630	0.100	0.100	0.171	0.130	3.200	FRM_MASS = CSN
20051031	5.660	0.000	0.720	2.270	4.830	1.980	0.670	0.710	0.375	2.030	17.800	
20051112	1.800	0.000	0.860	0.800	8.030	1.410	0.470	0.520	0.375	0.640	14.600	
20051118	3.230	2.340	2.780	2.080	3.070	0.800	0.430	0.440	0.375	0.970	12.100	
20051124	1.200	0.620	0.920	0.640	1.390	0.120	0.100	0.120	0.375	0.360	4.700	
20051130	3.680	0.510	1.300	1.640	2.770	0.550	0.440	0.450	0.375	1.260	10.500	
20051206	4.650	3.600	3.870	2.880	3.380	0.680	0.280	0.310	0.375	1.400	17.100	
20051212	2.120	1.530	1.830	1.290	2.740	0.700	0.290	0.330	0.375	0.640	9.700	
20051218	3.920	3.610	3.960	2.640	6.870	1.860	0.590	0.660	0.375	1.220	23.600	
20051224	2.700	0.090	1.370	1.320	4.970	0.850	0.490	0.580	0.375	0.960	13.300	
20051230	4.050	0.600	1.090	1.700	2.450	0.400	0.450	0.540	0.375	1.380	10.800	
AVG	3.291	0.921	1.428	1.501	3.639	0.931	0.361	0.393	0.340	1.082	12.314	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20060105	1.910	0.630	1.020	0.920	1.750	0.440	0.270	0.250	0.375	0.610	7.400	
20060111	4.590	0.000	0.710	1.930	3.260	0.500	0.300	0.360	0.375	1.640	13.300	
20060117	2.240	0.110	1.020	1.010	3.410	0.870	0.440	0.480	0.375	0.790	10.600	
20060123	2.060	1.580	1.960	1.200	2.660	0.710	0.400	0.470	0.360	0.650	10.500	
20060129	2.190	0.000	0.830	0.940	4.860	0.880	0.390	0.460	0.375	0.780	11.600	
20060204	3.460	0.110	0.770	1.360	2.320	0.450	0.200	0.210	0.375	1.230	10.100	
20060210	2.680	3.300	3.790	2.070	3.550	0.840	0.380	0.440	0.375	0.920	25.500	
20060216	2.930	0.000	0.270	0.760	3.570	0.490	0.310	0.370	0.259	0.620	12.000	
20060222	4.770	1.580	2.480	2.510	5.490	1.430	0.690	0.830	0.375	1.520	17.400	
20060228	1.880	1.630	1.980	1.160	2.710	0.410	0.310	0.350	0.365	0.590	9.000	
20060306	0.920	0.570	1.290	0.580	3.470	0.630	0.630	0.610	0.375	0.280	9.600	
20060312	2.880	0.000	1.110	1.100	3.100	0.550	0.430	0.420	0.375	1.030	10.100	
20060318	1.420	0.290	0.850	0.670	2.040	0.250	0.420	0.460	0.375	0.470	5.100	
20060324	5.060	3.540	4.150	2.950	4.200	0.690	0.550	0.670	0.375	1.520	18.900	
20060330	9.000	0.000	2.020	3.960	7.030	1.390	0.750	0.900	0.375	3.220	24.200	
AVG	3.199	0.889	1.617	1.541	3.561	0.702	0.431	0.485	0.366	1.058	13.020	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20060405	2.260	0.000	0.730	0.950	2.160	0.250	0.130	0.140	0.375	0.810	7.200	
20060411	4.700	0.000	0.680	1.850	4.920	1.080	1.680	1.740	0.375	1.680	15.200	
20060417	1.760	0.000	0.150	0.660	2.070	0.190	0.720	0.770	0.375	0.630	5.800	
20060423	2.760	0.000	1.370	1.160	3.050	0.330	0.370	0.370	0.375	0.990	7.700	
20060429	1.240	0.000	0.390	0.470	3.570	0.070	0.710	0.780	0.375	0.440	6.700	
20060505	5.910	0.000	1.720	2.270	6.000	1.430	1.550	1.870	0.375	2.120	19.200	
20060511	6.860	0.000	0.410	2.410	3.020	0.490	0.380	0.420	0.351	2.540	16.600	
20060517	6.340	0.000	0.890	2.480	2.230	0.560	0.380	0.360	0.375	2.270	12.800	
20060523	2.030	0.000	0.650	0.790	2.790	0.590	0.500	0.550	0.375	0.730	7.800	
20060529	14.200	0.000	0.570	4.360	6.490	0.800	0.720	0.720	0.307	4.550	32.900	
20060603	1.350	0.000	0.280	0.530	2.480	0.240	0.330	0.380	0.375	0.480	6.000	FRM_MASS = CSN
20060610	1.740	0.000	0.210	0.530	2.220	0.200	0.280	0.230	0.305	0.550	5.400	
20060616	8.790	0.000	0.480	2.760	5.330	0.710	0.580	0.710	0.314	2.930	20.800	
20060622	5.830	0.000	0.440	2.100	4.130	0.670	0.360	0.370	0.360	2.160	16.200	
20060628	8.110	0.000	0.520	2.930	3.410	1.100	0.240	0.270	0.361	3.000	20.000	
AVG	4.925	0.000	0.633	1.750	3.591	0.581	0.595	0.645	0.358	1.725	13.353	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20060704	10.800	0.000	0.890	3.960	6.330	0.480	0.370	0.480	0.367	3.970	29.900	
20060710	8.620	0.000	1.070	2.100	6.120	0.780	0.360	0.450	0.244	1.600	38.800	
20060716	5.030	0.000	0.510	1.730	7.040	0.420	0.290	0.350	0.344	1.850	16.600	
20060722	6.920	0.000	0.570	2.300	7.320	1.300	0.300	0.330	0.332	2.480	16.000	
20060728	5.740	0.000	0.450	1.670	3.010	0.520	4.360	4.940	0.291	1.650	19.400	
20060803	11.900	0.000	0.300	3.550	4.680	0.790	0.580	0.730	0.298	3.610	24.800	
20060809	9.150	0.000	0.280	2.890	4.950	0.670	0.380	0.470	0.316	3.080	21.000	
20060815	7.320	0.000	0.830	2.300	3.660	0.490	0.360	0.360	0.314	2.440	17.000	
20060821	6.760	0.000	0.480	2.050	3.070	0.490	0.340	0.290	0.303	2.120	15.400	
20060827	10.300	0.000	0.530	4.010	5.440	0.410	0.560	0.580	0.375	3.690	26.400	
20060902	1.160	0.000	0.330	0.390	1.090	0.100	0.000	0.000	0.336	0.420	4.000	FRM_MASS = CSN
20060908	18.000	0.000	0.620	6.470	5.100	1.470	0.470	0.460	0.359	6.670	33.500	
20060914	8.360	0.000	1.210	3.460	1.740	0.380	0.150	0.110	0.375	3.000	15.600	
20060920	2.150	0.000	0.460	0.780	2.050	0.420	0.260	0.260	0.363	0.790	5.700	
20060926	4.670	0.000	1.030	2.090	3.780	0.910	0.650	0.640	0.375	1.670	13.600	
AVG	7.792	0.000	0.637	2.650	4.359	0.642	0.629	0.697	0.333	2.603	19.847	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20061002	4.280	0.000	0.740	1.590	3.370	1.030	0.310	0.330	0.371	1.550	11.900
20061008	1.900	0.000	0.320	0.560	2.370	0.490	0.170	0.160	0.295	0.550	6.500
20061014	1.850	0.000	0.550	0.670	3.140	0.610	0.260	0.310	0.362	0.690	7.400
20061020	1.350	0.000	0.360	0.470	1.570	0.430	0.180	0.210	0.348	0.500	3.100
20061026	2.290	0.000	0.710	0.900	3.100	0.710	0.360	0.360	0.375	0.820	7.700
20061101	3.680	3.710	5.180	2.810	3.680	0.830	0.610	0.670	0.375	1.170	16.300
20061107	2.400	0.000	0.850	0.970	5.250	1.310	0.580	0.650	0.375	0.860	12.700
20061113	5.830	0.250	0.750	2.270	2.750	0.880	0.280	0.200	0.375	2.060	12.700
20061119	3.610	1.430	2.030	1.840	4.060	0.710	0.160	0.180	0.375	1.120	12.900
20061125	3.260	0.000	1.080	1.490	9.230	1.760	0.800	0.800	0.375	1.170	21.200
20061207	2.090	1.780	2.380	1.340	2.170	0.450	0.230	0.240	0.375	0.640	8.500
20061213	3.290	0.000	1.770	1.580	3.930	0.930	0.230	0.240	0.375	1.180	13.100
20061219	2.800	2.710	3.330	1.790	4.290	1.490	0.610	0.710	0.358	0.920	14.500
20061225	2.010	0.190	0.890	0.850	1.920	0.420	0.090	0.060	0.375	0.700	6.400
20061231	4.720	1.580	3.010	2.560	4.440	1.040	0.280	0.320	0.375	1.500	18.300
AVG	3.024	0.777	1.597	1.446	3.685	0.873	0.343	0.363	0.366	1.029	11.547

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20070106	2.040	0.000	0.840	0.860	1.850	0.360	0.190	0.180	0.375	0.730	5.200	
20070112	2.780	0.000	1.060	1.210	2.070	0.650	0.220	0.240	0.375	1.000	9.600	
20070118	2.480	1.540	2.100	1.370	5.200	0.570	0.380	0.430	0.372	0.750	13.300	FRM_MASS = CSN
20070124	7.440	3.130	3.520	3.800	3.090	0.960	0.420	0.270	0.375	2.300	17.800	
20070130	2.910	2.630	2.960	1.850	2.230	0.790	0.360	0.330	0.373	0.910	9.400	FRM_MASS = CSN
20070205	2.080	2.540	2.600	1.410	2.460	0.750	0.360	0.360	0.323	0.750	12.000	
20070211	2.800	4.860	5.080	2.440	3.750	0.610	0.270	0.260	0.368	1.180	15.400	
20070217	3.060	3.050	3.300	1.930	3.600	0.760	0.330	0.380	0.341	1.020	14.000	
20070223	1.350	0.050	0.390	0.480	1.750	0.230	0.150	0.150	0.345	0.490	4.000	
20070301	5.770	0.490	1.780	2.570	3.410	0.660	0.520	0.550	0.375	2.010	16.600	
20070307	2.610	1.520	1.800	1.220	2.840	0.570	0.280	0.330	0.298	0.750	9.700	
20070313	5.080	0.000	0.810	2.180	4.800	1.090	0.940	0.950	0.375	1.820	15.500	
20070319	2.260	1.200	1.660	1.170	3.150	0.980	0.410	0.400	0.364	0.710	10.700	
20070325	3.550	0.000	1.920	1.660	2.900	0.640	0.810	0.560	0.375	1.270	10.400	
20070331	2.420	0.000	0.810	1.070	3.950	0.950	0.590	0.650	0.375	0.870	10.400	
AVG	3.242	1.401	2.042	1.681	3.137	0.705	0.415	0.403	0.361	1.104	11.600	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20070406	3.060	1.190	1.720	1.640	1.710	0.380	0.130	0.150	0.375	0.960	8.800	
20070412	3.080	0.000	0.430	1.240	1.870	0.390	0.120	0.140	0.375	1.100	7.400	
20070418	5.840	0.000	0.830	1.910	1.850	0.480	0.190	0.210	0.327	2.060	3.100	
20070430	1.900	0.000	0.290	0.710	2.850	0.470	0.610	0.670	0.374	0.680	6.500	
20070506	0.890	0.000	0.100	0.340	0.999	0.208	0.250	0.230	0.375	0.320	2.700	
20070512	4.610	0.000	0.520	1.730	3.260	0.873	0.480	0.520	0.375	1.650	15.000	
20070518	2.150	0.000	0.830	0.940	1.620	0.615	0.270	0.290	0.375	0.770	7.200	
20070524	14.800	0.000	0.560	5.090	3.980	1.370	0.890	0.890	0.344	5.450	31.800	
20070530	12.200	0.000	0.440	4.020	2.710	1.550	0.760	0.780	0.330	4.330	24.100	
20070605	3.510	0.000	0.370	1.290	1.560	0.539	0.150	0.170	0.368	1.290	8.600	FRM_MASS = CSN
20070611	4.220	0.000	0.320	1.390			0.800	0.890	0.329	1.500	13.600	
20070617	13.500	0.000	0.600	4.960			0.490	0.500	0.367	4.950	30.200	
20070623	2.050	0.000	0.420	0.750	2.880	0.871	0.340	0.390	0.366	0.760	8.300	
20070629	2.650	0.000	0.630	1.090	2.390	0.670	0.290	0.350	0.375	0.950	10.000	
AVG	5.319	0.085	0.576	1.936	2.307	0.701	0.412	0.441	0.361	1.912	12.664	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20070705	5.060	0.000	0.760	1.760	1.610	0.708	0.210	0.270	0.348	1.870	11.600	
20070711	5.190	0.000	0.320	1.750	2.300	0.847	0.280	0.350	0.337	1.880	14.400	
20070717	14.300	0.000	0.320	3.670	3.550	1.350	0.410	0.490	0.257	2.950	29.000	
20070723	2.290	0.000	0.220	0.720	2.730	0.848	0.440	0.520	0.314	0.770	10.500	
20070729	14.700	0.000	0.270	4.310	3.740	0.892	0.190	0.230	0.293	4.290	29.000	
20070804	17.600	0.000	0.530	5.410	4.860	1.220	0.580	0.510	0.307	5.650	37.100	
20070810	6.300	0.000	1.230	2.320	2.180	0.899	0.370	0.370	0.368	2.310	15.100	
20070816					3.700	1.410	0.400				26.300	
20070822	11.800	0.000	0.930	4.190	2.360	1.330	0.800	0.790	0.355	4.380	24.500	
20070828	17.800	0.000	0.410	5.200	2.570	1.270	0.550	0.550	0.292	5.150	34.700	
20070903	12.800	0.000	0.730	4.330	3.470	1.060	0.360	0.410	0.338	4.660	28.400	
20070909	6.460	0.000	0.720	2.020	2.840	1.050	0.250	0.290	0.313	2.140	30.200	
20070915	1.350	0.000	0.210	0.440	0.910	0.408	0.080	0.090	0.326	0.470	3.800	
20070921	9.940	0.000	0.840	3.440	2.470	1.220	0.470	0.540	0.346	3.670	21.200	
20070927					1.680	0.897	0.340				10.500	
AVG	9.661	0.000	0.576	3.043	2.731	1.027	0.382	0.416	0.323	3.092	21.753	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20071003	3.350	0.000	0.430	1.200	2.050	0.970	0.390	0.480	0.358	1.240	10.600	
20071009	10.200	0.000	0.940	4.110	2.410	1.460	0.420	0.510	0.375	3.650	22.500	
20071015	3.680	0.000	0.860	1.640	2.560	1.080	0.450	0.510	0.375	1.320	12.600	
20071021	2.280	0.000	0.200	0.800	1.700	0.473	0.220	0.210	0.351	0.850	6.900	
20071027	2.690	0.000	0.470	1.010	1.140	0.278	0.250	0.160	0.375	0.960	6.700	
20071102	1.690	0.000	0.870	0.710	2.040	0.868	0.270	0.310	0.375	0.610	7.300	
20071108	3.140	1.010	2.080	1.710	2.300	1.660	0.350	0.400	0.375	1.000	12.400	
20071114	5.290	0.000	1.760	2.360	2.250	1.150	0.250	0.310	0.375	1.900	15.400	
20071119	7.260	0.740	2.070	3.170			0.290	0.350	0.375	2.520	21.700	FRM_MASS = CSN
20071120					2.340	1.340					17.800	
20071126	2.090	0.170	1.080	0.940	1.760	0.858	0.240	0.230	0.375	0.730	8.700	
20071202					2.120	0.534	0.320				8.600	
20071208	5.820	5.700	6.360	4.210	4.760	1.690	0.580	0.690	0.375	1.840	27.400	
20071214	4.430	1.600	2.430	2.450	1.320	0.429	0.150	0.170	0.375	1.400	11.800	
20071220	5.880	4.780	5.470	4.480	2.500	1.040	0.250	0.290	0.375	1.790	13.100	
20071226	2.590	1.030	1.790	1.380	3.940	2.200	0.340	0.330	0.375	0.810	14.100	
AVG	4.314	1.074	1.915	2.155	2.346	1.069	0.318	0.354	0.372	1.473	13.600	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20080101	3.340	1.720	2.410	2.050	1.500	0.333	0.200	0.150	0.375	1.010	10.400	
20080107	3.150	0.000	0.470	1.060	1.490	0.741	0.390	0.490	0.337	1.140	9.300	
20080113	4.650	1.920	2.650	2.660	2.830	0.850	0.200	0.240	0.375	1.440	15.700	
20080119	3.700	3.270	3.620	2.470	1.950	0.572	0.350	0.370	0.375	1.140	13.500	
20080125					2.940	1.090					16.400	
20080131	2.190	1.370	1.760	1.180	1.990	0.769	0.470	0.570	0.357	0.690	10.300	
20080206	1.460	0.000	0.320	0.440	0.932	0.365	0.170	0.200	0.301	0.440	4.000	
20080212	3.110	2.640	2.900	1.890	3.690	1.060	0.320	0.400	0.361	0.990	16.600	
20080218	3.660	0.270	1.510	1.710	1.080	0.453	0.180	0.180	0.375	1.280	10.400	
20080224	7.470	3.650	4.060	3.930	3.740	1.780	0.390	0.450	0.375	2.270	25.200	
20080301	3.490	2.080	2.710	2.030	1.410	0.428	0.200	0.230	0.375	1.050	10.700	
20080307	5.780	1.890	2.440	2.690	3.080	1.300	0.460	0.490	0.370	1.880	17.300	
20080313	3.050	0.000	1.910	1.620	2.760	1.270	0.570	0.620	0.375	1.090	12.000	
20080319	3.800	0.000	0.720	1.380	1.920	0.984	0.190	0.230	0.363	1.400	11.300	
20080325	4.070	0.260	1.520	1.780	2.060	0.895	0.410	0.490	0.375	1.430	10.700	
20080331	2.010	0.000	0.510	1.270	1.580	0.606	0.230	0.260	0.375	0.720	6.300	
AVG	3.662	1.271	1.967	1.877	2.185	0.844	0.315	0.358	0.364	1.198	12.506	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20080406	4.380	0.000	0.680	1.780	1.680	0.385	0.090	0.110	0.375	1.570	8.400	
20080412	2.650	0.000	0.420	0.920	1.040	0.276	0.270	0.280	0.347	0.980	5.200	
20080418	7.830	0.000	0.590	2.970	3.780	1.410	1.120	1.260	0.375	2.810	18.000	
20080424	2.830	0.000	0.610	1.150	2.530	1.270	0.800	0.890	0.375	1.010	9.700	
20080430	4.150	1.110	3.040	2.500	2.250	0.726	0.350	0.400	0.375	1.350	12.200	
20080506	6.170	0.000	1.000	2.480	2.510	1.100	0.920	1.030	0.375	2.210	17.000	
20080512	1.800	0.000	0.360	0.630	0.845	0.273	0.040	0.040	0.350	0.670	5.400	FRM_MASS = CSN
20080518	2.490	0.000	1.060	1.040	1.400	0.263	0.180	0.220	0.375	0.890	7.100	
20080524	1.880	0.000	0.730	0.990	1.640	0.447	0.090	0.100	0.375	0.670	5.700	
20080530					3.180	1.420					17.200	
20080605	4.810	0.000	0.750	1.870	2.370	0.926	0.370	0.460	0.375	1.720	13.100	
20080611	3.140	0.000	0.650	1.180	2.400	0.723	0.320	0.360	0.375	1.130	11.000	
20080617	2.380	0.000	0.320	0.980	1.680	0.534	0.340	0.370	0.375	0.850	7.500	
20080623					1.530	0.543					8.600	
20080629	5.380	0.000	0.290	1.720	1.640	0.296	1.490	1.520	0.320	1.840	11.700	
AVG	3.838	0.085	0.808	1.555	2.032	0.706	0.491	0.542	0.367	1.362	10.520	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20080705	9.450	0.000	1.820	2.700	2.780	0.593	0.210	0.160	0.286	2.600	21.500	
20080711	8.000	0.000	0.390	2.530	2.760	1.130	0.570	0.400	0.316	2.690	19.800	
20080717	14.800	0.000	0.430	4.790	3.870	1.160	0.840	0.930	0.324	5.150	32.700	
20080723	4.220	0.000	0.500	1.550	1.650	0.578	0.190	0.230	0.367	1.550	11.000	
20080728	11.000	0.000	0.710	3.540			0.460	0.510	0.322	3.800	34.100	FRM_MASS = CSN
20080729					7.080	1.410					35.400	
20080804	5.770	0.000	0.270	1.800	2.170	0.997	0.330	0.370	0.312	1.900	16.900	
20080810	3.620	0.000	0.360	1.120	1.860	0.391	0.310	0.280	0.309	1.180	10.300	
20080816	2.580	0.000	0.440	0.930	2.470	1.580	0.280	0.260	0.360	0.960	10.800	FRM_MASS = CSN
20080822	5.570	0.000	0.300	1.680	2.320	0.731	0.280	0.290	0.302	1.730	15.400	
20080828	1.010	0.000	0.120	0.280	1.080	0.387	0.110	0.070	0.277	0.250	3.500	
20080903	10.200	0.000	0.660	3.080	3.160	1.230	0.610	0.640	0.302	3.170	26.200	FRM_MASS = CSN
20080909	4.770	0.000	0.480	1.810	1.700	0.709	0.280	0.300	0.375	1.710	12.000	
20080915	1.520	0.000	0.130	0.420	1.020	0.370	0.130	0.140	0.276	0.380	2.700	
20080927	1.090	0.000	0.460	0.300	1.170	0.295	0.110	0.130	0.275	0.280	4.100	
AVG	5.971	0.000	0.505	1.895	2.506	0.826	0.336	0.336	0.315	1.954	17.093	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20081003	1.700	0.000	0.560	0.690	1.300	0.781	0.270	0.300	0.375	0.610	5.500
20081009	4.270	0.000	1.270	1.860	1.440	0.730	0.220	0.250	0.375	1.530	10.300
20081015	6.200	0.000	1.190	2.400	2.590	1.120	0.560	0.540	0.375	2.220	16.100
20081021	1.780	0.000	0.420	0.650	0.938	0.297	0.150	0.170	0.365	0.650	5.200
20081027	1.580	0.000	0.510	0.730	1.050	0.308	0.310	0.340	0.375	0.570	5.500
20081102	5.150	0.000	1.830	2.420	4.530	1.020	0.500	0.580	0.375	1.850	19.400
20081108	1.770	0.000	1.040	0.860	2.210	0.457	0.230	0.290	0.375	0.630	7.400
20081114	3.220	0.000	0.840	1.120	1.840	1.040	0.300	0.310	0.348	1.190	9.500
20081120	1.930	2.090	2.780	1.540	1.460	0.674	0.370	0.380	0.375	0.630	8.400
20081126	2.040	1.570	2.130	1.340	1.630	0.536	0.300	0.340	0.375	0.620	9.000
20081202	3.220	0.550	1.130	1.480	1.000	0.341	0.120	0.140	0.375	1.090	7.200
20081208	1.530	1.220	1.750	1.030	2.600	1.010	0.260	0.310	0.375	0.460	9.000
20081214	2.050	0.250	1.510	1.110	2.700	1.060	0.220	0.260	0.375	0.710	9.200
20081220	2.910	0.580	1.010	1.150	1.440	0.370	0.130	0.150	0.337	0.990	8.600
20081226	2.550	1.260	1.980	1.280	2.280	0.637	0.370	0.430	0.359	0.810	8.900
AVG	2.793	0.501	1.330	1.311	1.934	0.692	0.287	0.319	0.369	0.971	9.280

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20090101	1.710	0.890	1.210	0.880	1.350	0.545	0.130	0.090	0.364	0.540	6.500	
20090107	1.080	0.180	0.530	0.440			0.180	0.130	0.359	0.380	5.000	FRM_MASS = CSN
20090113	2.940	0.630	1.030	1.260			0.280	0.240	0.366	1.000	8.900	
20090125	3.000	3.160	3.330	2.020			0.350	0.330	0.368	0.990	15.300	
20090131	2.540	3.800	4.070	2.130			0.200	0.240	0.375	0.970	25.500	
20090206	2.690	1.950	2.480	1.510			0.830	0.830	0.351	0.850	13.200	FRM_MASS = CSN
20090212	2.170	0.000	0.730	0.960	0.789	0.204	0.100	0.110	0.375	0.780	5.600	FRM_MASS = CSN
20090218	1.920	0.340	1.170	0.830	1.860	0.641	0.320	0.260	0.375	0.650	7.300	
20090224	2.470	1.530	1.800	1.360	2.180	0.735	0.540	0.530	0.371	0.750	9.700	
20090302	1.540	0.500	0.700	0.640	0.785	0.192	0.260	0.300	0.321	0.480	3.700	
20090308	3.270	0.000	0.920	1.280	2.220	0.517	0.350	0.440	0.375	1.170	11.200	
20090314	5.270	0.860	2.370	2.790	4.330	1.230	0.440	0.530	0.375	1.790	19.200	
20090320	3.050	0.530	1.230	1.430	1.510	0.381	0.260	0.310	0.375	1.030	8.700	
20090326	1.520	0.000	1.120	0.660	1.360	0.674	0.180	0.200	0.375	0.540	10.900	
AVG	2.512	1.026	1.621	1.299	1.820	0.569	0.316	0.324	0.366	0.851	10.764	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20090401	3.200	0.000	0.560	1.320	2.260	0.787	0.470	0.470	0.375	1.150	10.500	
20090407	2.090	0.110	0.690	0.810	0.749	0.305	0.200	0.230	0.372	0.740	5.800	FRM_MASS = CSN
20090413	1.970	0.000	0.490	0.750	1.050	0.504	0.420	0.440	0.375	0.710	6.400	
20090419	6.840	0.000	1.090	2.750	4.170	2.050	0.470	0.530	0.375	2.450	22.200	
20090425	2.340	0.000	0.710	0.880	3.110	1.080	0.500	0.560	0.375	0.840	15.900	
20090501	2.580	0.000	0.610	1.080	1.930	0.484	0.540	0.610	0.375	0.920	9.000	
20090507					1.270	0.574	0.550				11.000	
20090513	4.650	0.000	0.550	1.800	2.120	0.632	0.610	0.580	0.375	1.670	11.900	
20090519	1.270	0.000	0.360	0.490	1.710	0.784	0.520	0.590	0.375	0.460	8.400	
20090525	9.650	0.000	0.980	3.420	3.800	0.924	0.750	0.840	0.354	3.580	24.300	
20090531	2.110	0.000	0.380	0.700	1.900	0.417	0.260	0.250	0.332	0.760	7.400	
20090606	6.100	0.000	0.900	2.380	3.860	0.993	0.310	0.350	0.375	2.190	16.700	
20090612	5.260	0.000	1.240	2.230	2.110	0.630	0.230	0.270	0.375	1.880	12.500	
20090618	4.550	0.000	0.870	1.790	1.470	0.643	0.270	0.240	0.375	1.630	11.300	
20090624	2.590	0.000	0.350	0.890	3.040	0.737	0.420	0.420	0.344	0.950	11.900	
20090630	1.990	0.000	0.370	0.800	1.530	0.689	0.290	0.340	0.375	0.710	11.900	
AVG	3.813	0.007	0.677	1.473	2.255	0.765	0.426	0.448	0.368	1.376	12.319	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20090706	3.340	0.000	0.390	1.200	2.450	0.848	0.390	0.350	0.359	1.240	16.700
20090712	3.100	0.000	0.280	1.070	1.930	0.404	0.420	0.360	0.345	1.140	12.900
20090718	2.340	0.000	1.100	1.110	1.720	0.630	0.150	0.170	0.375	0.840	12.500
20090724	6.340	0.000	0.500	2.480	1.850	0.915	0.280	0.260	0.375	2.270	16.800
20090730	7.930	0.000	1.090	3.710	1.730	0.950	0.420	0.370	0.375	2.840	22.000
20090805	5.530	0.000	0.830	2.170	2.650	1.240	0.320	0.380	0.375	1.980	20.600
20090811	5.220	0.000	0.670	2.310	1.170	0.863	0.270	0.280	0.375	1.870	17.800
20090817	7.600	0.000	0.130	1.800	2.310	0.782	0.590	0.470	0.237	1.380	33.000
20090823	3.420	0.000	0.320	1.160	1.610	0.328	0.160	0.080	0.339	1.250	14.400
20090829	3.460	0.000	0.270	1.210	1.980	0.475	1.540	1.570	0.350	1.280	20.400
20090904	8.030	0.000	0.590	2.730	2.480	0.990	0.550	0.460	0.340	2.930	21.100
20090910	1.800	0.000	0.340	0.610	1.970	0.544	0.230	0.270	0.339	0.650	11.500
20090916	1.830	0.000	0.180	0.530	1.620	0.500	0.270	0.280	0.290	0.510	9.700
20090922	3.250	0.000	0.380	1.140	1.960	1.250	0.270	0.260	0.351	1.200	15.900
20090928	2.330	0.000	0.200	0.720			0.270	0.300	0.309	0.750	11.300
AVG	4.368	0.000	0.485	1.597	1.959	0.766	0.409	0.391	0.342	1.475	17.107

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20091004	1.390	0.000	0.230	0.480	1.800	0.480	0.160	0.200	0.345	0.510	7.400
20091010	1.190	0.000	0.300	0.320	1.460	0.391	0.120	0.130	0.269	0.270	7.800
20091016	0.430	0.000	0.460	0.150	0.814	0.312	0.050	0.060	0.349	0.160	3.500
20091022	4.020	0.000	0.450	1.590	2.620	1.280	0.660	0.650	0.375	1.440	17.400
20091028	1.770	0.000	0.530	0.620			0.100	0.110	0.350	0.660	6.800
20091103	3.460	0.000	1.640	1.650	2.400	1.070	0.430	0.500	0.375	1.240	14.600
20091109	4.150	0.000	0.770	1.770	5.200	2.010	0.930	1.010	0.375	1.490	22.500
20091115	4.300	0.000	1.630	2.070	5.360	1.070	0.530	0.520	0.375	1.540	21.200
20091121	3.830	2.580	4.760	3.260	2.730	0.953	0.250	0.280	0.375	1.150	20.500
20091127	1.540	0.000	0.540	0.600	0.714	0.207	0.090	0.070	0.375	0.550	6.700
20091203	1.600	0.000	1.360	0.860	0.904	0.186	0.020	0.020	0.375	0.570	9.300
20091209	1.020	0.000	0.280	0.370	0.773	0.245	0.180	0.220	0.363	0.380	3.200
20091215	2.460	0.730	1.620	1.260	1.170	0.408	0.180	0.200	0.375	0.790	10.700
20091221	4.310	3.650	4.090	2.780	2.650	0.837	0.280	0.340	0.375	1.320	18.400
20091227	1.140	0.000	0.520	0.500	1.760	0.607	0.400	0.410	0.375	0.410	8.200
AVG	2.441	0.464	1.279	1.219	2.168	0.718	0.292	0.315	0.362	0.832	11.880

Greensburg CSN Speciation Quarterly SANDWICH Averages

YEAR	QTR	FRMc	SO4	NO3r	NO3	NH4	OC	EC	CRUSTalt	DON	H2Oaim
2005	1Q	13.500	3.489	2.061	2.561	1.821	3.241	0.757	0.348	0.340	1.193
2005	2Q	15.280	4.903	0.119	0.952	1.849	4.117	0.639	0.520	0.354	1.627
2005	3Q	23.807	9.804	0.000	0.625	3.062	4.715	0.795	0.690	0.315	3.061
2005	4Q	12.314	3.291	0.921	1.428	1.501	3.639	0.931	0.393	0.340	1.082
2006	1Q	13.020	3.199	0.889	1.617	1.541	3.561	0.702	0.485	0.366	1.058
2006	2Q	13.353	4.925	0.000	0.633	1.750	3.591	0.581	0.645	0.358	1.725
2006	3Q	19.847	7.792	0.000	0.637	2.650	4.359	0.642	0.697	0.333	2.603
2006	4Q	11.547	3.024	0.777	1.597	1.446	3.685	0.873	0.363	0.366	1.029
2007	1Q	11.600	3.242	1.401	2.042	1.681	3.137	0.705	0.403	0.361	1.104
2007	2Q	12.664	5.319	0.085	0.576	1.936	2.307	0.701	0.441	0.361	1.912
2007	3Q	21.753	9.661	0.000	0.576	3.043	2.731	1.027	0.416	0.323	3.092
2007	4Q	13.600	4.314	1.074	1.915	2.155	2.346	1.069	0.354	0.372	1.473
2008	1Q	12.506	3.662	1.271	1.967	1.877	2.185	0.844	0.358	0.364	1.198
2008	2Q	10.520	3.838	0.085	0.808	1.555	2.032	0.706	0.542	0.367	1.362
2008	3Q	17.093	5.971	0.000	0.505	1.895	2.506	0.826	0.336	0.315	1.954
2008	4Q	9.280	2.793	0.501	1.330	1.311	1.934	0.692	0.319	0.369	0.971
2009	1Q	10.764	2.512	1.026	1.621	1.299	1.820	0.569	0.324	0.366	0.851
2009	2Q	12.319	3.813	0.007	0.677	1.473	2.255	0.765	0.448	0.368	1.376
2009	3Q	17.107	4.368	0.000	0.485	1.597	1.959	0.766	0.391	0.342	1.475
2009	4Q	11.880	2.441	0.464	1.279	1.219	2.168	0.718	0.315	0.362	0.832

AVGs	QTR	FRMc	SO4	NO3r	NO3	NH4	OC	EC	CRUSTalt	DON	H2Oaim	NH4r	PBWcalc	OCMmb
	1Q	12.278	3.221	1.330	1.961	1.644	2.789	0.715	0.384	0.359	1.081	1.543	1.028	3.558
	2Q	12.827	4.560	0.059	0.729	1.712	2.860	0.678	0.519	0.362	1.600	1.666	1.966	2.879
	3Q	19.921	7.519	0.000	0.566	2.449	3.254	0.811	0.506	0.325	2.437	2.447	3.114	5.024
	4Q	11.724	3.173	0.747	1.510	1.526	2.754	0.856	0.349	0.362	1.077	1.364	1.337	3.398

PBW Calculation	SO4	NO3r	NH4r
- Calculated from SO4, NO3r, and NH4r	3.221	1.330	1.543
- NH4r calculated from DON, SO4, NO3r	4.560	0.059	1.666
- DON > 0.225, low acidity equation	7.519	0.000	2.447
	3.173	0.747	1.364

S Term	N Term	A Term	Part 1	Part 2	Part 3	Sum	PBWcalc
0.529	0.218	0.253	-21951.203	-121.566	22072.937	0.169	1.028
0.725	0.009	0.265	-23205.909	-208.173	23414.395	0.313	1.966
0.754	0.000	0.246	-20987.314	-226.556	21214.182	0.312	3.114
0.600	0.141	0.258	-22474.804	-154.057	22629.114	0.253	1.337

Methodology:

- Use measured SO4 and EC
- Use retained nitrate (calculated)
- Use calculated indirect NH4 (retained) method for baseline and future
- Use crustal (alt) for other particulate PM2.5 (OPP)
- Use calculated particle bound water for baseline and future
- Degrees of Neutralization (DON) constant from base to future
- Minimum (floor) for OCMmb is equal to OC

Quarterly Averages

AVGs	QTR	FRMc	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	12.278	0.500	11.778	3.558	0.715	3.221	1.330	0.384	1.543	1.028
	2Q	12.827	0.500	12.327	2.879	0.678	4.560	0.059	0.519	1.666	1.966
	3Q	19.921	0.500	19.421	5.024	0.811	7.519	0.000	0.506	2.447	3.114
	4Q	11.724	0.500	11.224	3.398	0.856	3.173	0.747	0.349	1.364	1.337

Liberty SANDWICH Averages, Local and Regional Split

CSN Quarterly Compositions, SWPA sites

Lawrenceville	**QTR**	**FRMc**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**
	1Q	12.697	0.500	12.197	3.547	0.710	3.231	1.698	0.581	1.486	0.943
	2Q	12.794	0.500	12.294	3.779	0.583	4.100	0.055	0.789	1.330	1.658
	3Q	18.237	0.500	17.737	4.351	0.801	6.859	0.000	0.739	2.199	2.789
	4Q	11.993	0.500	11.493	3.243	0.841	3.129	0.943	0.629	1.394	1.313

Florence	**QTR**	**FRMc**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**
	1Q	10.352	0.500	9.852	2.678	0.549	3.066	0.985	0.327	1.283	0.963
	2Q	11.547	0.500	11.047	2.901	0.442	4.183	0.020	0.524	1.323	1.654
	3Q	18.152	0.500	17.652	5.280	0.564	7.133	0.000	0.565	1.960	2.148
	4Q	10.335	0.500	9.835	3.253	0.486	3.032	0.440	0.310	1.101	1.213

Greensburg	**QTR**	**FRMc**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**
	1Q	12.278	0.500	11.778	3.558	0.715	3.221	1.330	0.384	1.543	1.028
	2Q	12.827	0.500	12.327	2.879	0.678	4.560	0.059	0.519	1.666	1.966
	3Q	19.921	0.500	19.421	5.024	0.811	7.519	0.000	0.506	2.447	3.114
	4Q	11.724	0.500	11.224	3.398	0.856	3.173	0.747	0.349	1.364	1.337

SWPA	**QTR**	**FRMc**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**
Avgs	**1Q**	11.775	0.500	11.275	3.261	0.658	3.172	1.338	0.431	1.437	0.978
	2Q	12.389	0.500	11.889	3.186	0.568	4.281	0.045	0.611	1.440	1.759
	3Q	18.770	0.500	18.270	4.885	0.725	7.170	0.000	0.604	2.202	2.684
	4Q	11.351	0.500	10.851	3.298	0.728	3.111	0.710	0.429	1.286	1.288

Liberty	**QTR**	**FRMc**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**
	1Q	15.902	0.500	15.402	4.155	1.643	4.132	1.473	0.740	1.923	1.336
	2Q	15.970	0.500	15.470	4.308	1.776	4.704	0.058	0.873	1.729	2.023
	3Q	22.952	0.500	22.452	4.764	2.298	8.146	0.000	0.982	2.765	3.499
	4Q	20.674	0.500	20.174	6.442	3.002	5.048	0.622	0.900	1.999	2.161

Liberty Local	QTR	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	4.127	0.894	0.985	0.960	0.135	0.309	0.485	0.358
	2Q	3.581	1.122	1.208	0.423	0.013	0.262	0.290	0.263
	3Q	4.182	-0.121	1.572	0.975	0.000	0.378	0.563	0.815
	4Q	9.323	3.143	2.274	1.937	-0.088	0.471	0.713	0.873

Liberty Local Adjusted (non-negative)	QTR	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	4.127	0.894	0.985	0.960	0.135	0.309	0.485	0.358
	2Q	3.581	1.122	1.208	0.423	0.013	0.262	0.290	0.263
	3Q	4.182	0.000	1.572	0.975	0.000	0.378	0.563	0.815
	4Q	9.323	3.143	2.274	1.937	0.000	0.471	0.713	0.873

Liberty Regional	QTR	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	11.275	3.261	0.658	3.172	1.338	0.431	1.437	0.978
	2Q	11.889	3.186	0.568	4.281	0.045	0.611	1.440	1.759
	3Q	18.270	4.764	0.725	7.170	0.000	0.604	2.202	2.684
	4Q	10.851	3.298	0.728	3.111	0.622	0.429	1.286	1.288

Local Fractions of Species	QTR	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	0.215	0.600	0.232	0.092	0.418	0.252	0.268
	2Q	0.261	0.680	0.090	0.221	0.300	0.168	0.130
	3Q	0.000	0.684	0.120	0.000	0.385	0.203	0.233
	4Q	0.488	0.758	0.384	0.000	0.523	0.357	0.404

Regional Fractions of Species	QTR	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	0.785	0.400	0.768	0.908	0.582	0.748	0.732
	2Q	0.739	0.320	0.910	0.779	0.700	0.832	0.870
	3Q	1.000	0.316	0.880	0.000	0.615	0.797	0.767
	4Q	0.512	0.242	0.616	1.000	0.477	0.643	0.596

Liberty Local	QTR	LPM	OCMmb	EC	OPP
LPM Fractions	**1Q**	2.189	0.408	0.450	0.141
	2Q	2.592	0.433	0.466	0.101
	3Q	1.950	0.000	0.806	0.194
	4Q	5.888	0.534	0.386	0.080

Liberty SMAT RRFs and Future Compositions, by Regional/Local

Baseline Total Quarterly Compositions

Baseline (2007)	QTR	FRMw	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc	DON
Avg	1Q	14.637	0.500	14.137	3.814	1.508	3.793	1.352	0.679	1.765	1.227	0.362
Avg	2Q	18.051	0.500	17.551	4.888	2.014	5.336	0.065	0.990	1.962	2.295	0.364
Avg	3Q	22.600	0.500	22.100	4.689	2.262	8.018	0.000	0.966	2.721	3.444	0.339
Avg	4Q	18.186	0.500	17.686	5.647	2.631	4.426	0.545	0.789	1.753	1.894	0.360
	AVG	18.368										

Local Fractions of Species

OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
0.215	0.600	0.232	0.092	0.418	0.252	0.268
0.261	0.680	0.090	0.221	0.300	0.168	0.130
0.000	0.684	0.120	0.000	0.385	0.203	0.233
0.488	0.758	0.384	0.000	0.523	0.357	0.404

Baseline Quarterly - Local Compositions, based on non-weighted Liberty-SWPA

Baseline (2007)	QTR				OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
Avg	1Q				0.821	0.904	0.881	0.124	0.284	0.445	0.329
Avg	2Q				1.273	1.370	0.480	0.014	0.297	0.329	0.299
Avg	3Q				0.000	1.548	0.960	0.000	0.372	0.554	0.803
Avg	4Q				2.756	1.993	1.698	0.000	0.413	0.625	0.765

Regional Fractions of Species

OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
0.785	0.400	0.768	0.908	0.582	0.748	0.732
0.739	0.320	0.910	0.779	0.700	0.832	0.870
1.000	0.316	0.880	0.000	0.615	0.797	0.767
0.512	0.242	0.616	1.000	0.477	0.643	0.596

Baseline Quarterly - Regional Compositions

Baseline (2007)	QTR				OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
Avg	**1Q**				2.993	0.604	2.912	1.228	0.395	1.319	0.898
Avg	**2Q**				3.615	0.644	4.857	0.051	0.693	1.633	1.996
Avg	**3Q**				4.689	0.714	7.058	0.000	0.594	2.168	2.641
Avg	**4Q**				2.892	0.638	2.728	0.545	0.376	1.128	1.129

Methodology:

- Use measured SO4 and EC
- Use retained nitrate (calculated)
- Use calculated indirect NH4 (retained) method for baseline and future
- Use calculated particle bound water for baseline and future
- Degrees of Neutralization (DON) constant from base to future
- Regional modeled OTHER is crustal; local OTHER is a mix of local primary material (LPM)
- For local RRFs, apportion modeled LPMm using monitored LPM fractions (OCMmb,EC,OPP)
- Modeled LPMm = POA+EC+OTHER

CAMx Modeled Species - Local Primary Material apportioned to POA, EC, OTHER

Ratio	QTR				OCMmb	EC			OPP
Species/LPM	**1Q**				0.408	0.450			0.141
Species/LPM	**2Q**				0.433	0.466			0.101
Species/LPM	**3Q**				0.000	0.806			0.194
Species/LPM	**4Q**				0.534	0.386			0.080

Baseline (2007)	QTR		LPMm		POA	EC			OTHER
Avg	**1Q**		1.928		0.788	0.868			0.273
Avg	**2Q**		2.514		1.088	1.171			0.254
Avg	**3Q**		3.789		0.000	3.055			0.734
Avg	**4Q**		2.868		1.531	1.108			0.229

Future Projected (2014)	QTR		LPMm		POA	EC			OTHER
Avg	1Q		1.563		0.638	0.704			0.221
Avg	2Q		2.105		0.911	0.981			0.213
Avg	3Q		3.083		0.000	2.486			0.598
Avg	4Q		2.296		1.226	0.887			0.184

CAMx Modeled Species - Local, with apportioned LPM

Baseline (2007)	QTR		POA	SOA	TOA	EC	SO4	NO3	OTHER
Avg	1Q		0.788	0.000	0.788	0.868	0.310	0.016	0.273
Avg	2Q		1.088	0.000	1.088	1.171	0.407	0.008	0.254
Avg	3Q		0.000	0.000	0.000	3.055	0.612	0.002	0.734
Avg	4Q		1.531	0.000	1.531	1.108	0.439	0.013	0.229

Future Projected (2014)	QTR		POA	SOA	TOA	EC	SO4	NO3	OTHER
Avg	1Q		0.638	0.000	0.639	0.704	0.254	0.020	0.221
Avg	2Q		0.911	0.000	0.912	0.981	0.347	0.014	0.213
Avg	3Q		0.000	0.000	0.000	2.486	0.491	0.004	0.598
Avg	4Q		1.226	0.000	1.226	0.887	0.352	0.019	0.184

Local RRFs (Future Projected divided by Baseline)

RRF	QTR				TOA	EC	SO4	NO3	OTHER
Ratio	1Q				0.811	0.811	0.821	1.209	0.811
Ratio	2Q				0.837	0.837	0.851	1.815	0.837
Ratio	3Q				0.827	0.814	0.802	2.396	0.814
Ratio	4Q				0.800	0.800	0.802	1.379	0.800

CAMx Modeled Species - Regional

Baseline (2007)	QTR		POA	SOA	TOA	EC	SO4	NO3	OTHER
Avg	1Q		3.478	0.053	3.531	1.386	2.475	2.040	4.190
Avg	2Q		1.008	0.022	1.030	0.823	4.791	0.402	1.714
Avg	3Q		0.997	0.029	1.026	1.026	7.259	0.051	2.293
Avg	4Q		3.664	0.039	3.703	1.531	3.542	1.632	4.560

Future Projected (2014)	QTR		POA	SOA	TOA	EC	SO4	NO3	OTHER
Avg	1Q		2.773	0.044	2.817	0.606	1.668	1.818	3.677
Avg	2Q		0.707	0.017	0.725	0.318	2.251	0.378	1.454
Avg	3Q		0.659	0.023	0.682	0.405	3.047	0.065	1.966
Avg	4Q		2.968	0.034	3.002	0.665	2.057	1.242	3.921

Regional RRFs (Future Projected divided by Baseline)

RRF	QTR				TOA	EC	SO4	NO3	OTHER
Ratio	1Q				0.798	0.437	0.674	0.891	0.878
Ratio	2Q				0.704	0.386	0.470	0.939	0.849
Ratio	3Q				0.665	0.394	0.420	1.264	0.858
Ratio	4Q				0.811	0.434	0.581	0.761	0.860

Total Local + Regional Future Projected Compositions

Future Projected (2014)	QTR	FRMf	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc	DON
Avg	1Q	11.236	0.500	10.736	3.054	0.997	2.686	1.244	0.577	1.333	0.846	0.362
Avg	2Q	11.265	0.500	10.765	3.610	1.397	2.690	0.074	0.837	1.001	1.156	0.364
Avg	3Q	12.576	0.500	12.076	3.119	1.541	3.733	0.000	0.812	1.267	1.603	0.339
Avg	4Q	13.377	0.500	12.877	4.550	1.872	2.946	0.415	0.654	1.182	1.258	0.360
	AVG	12.113										

PBW Calculation	SO4	NO3r	NH4r
- Calculated from SO4, NO3r, and NH4r	2.686	1.244	1.333
- NH4r calculated from DON, SO4, NO3r	2.690	0.074	1.001
- DON > 0.225, low acidity equation	3.733	0.000	1.267
	2.946	0.415	1.182

S Term	N Term	A Term	Part 1	Part 2	Part 3	Sum	Total
0.510	0.236	0.253	-21968.237	-113.136	22081.534	0.161	0.846
0.714	0.020	0.266	-23299.070	-203.270	23502.648	0.307	1.156
0.747	0.000	0.253	-21877.209	-220.663	22098.192	0.321	1.603
0.649	0.091	0.260	-22684.721	-175.533	22860.531	0.277	1.258

Liberty Design Values, by Regional/Local Species

Design Values

Case	Year	Value
Baseline	2007	**18.4**
Future Projected	2014	**12.1**

Clairton FRM Quarterly Calculations

FRM Quarterly Avgs

Year	Qtr	Avg
2005	**1Q**	14.133
2005	**2Q**	14.246
2005	**3Q**	24.357
2005	**4Q**	12.713

Year	Qtr	Avg
2006	**1Q**	12.927
2006	**2Q**	13.507
2006	**3Q**	19.157
2006	**4Q**	12.360

Year	Qtr	Avg
2007	**1Q**	12.364
2007	**2Q**	13.029
2007	**3Q**	21.186
2007	**4Q**	13.846

Year	Qtr	Avg
2008	**1Q**	12.636
2008	**2Q**	11.707
2008	**3Q**	18.567
2008	**4Q**	10.387

Year	Qtr	Avg
2009	**1Q**	10.050
2009	**2Q**	11.415
2009	**3Q**	12.980
2009	**4Q**	10.600

Quarterly Avgs (3-Year)

3-Year Period	Qtr	Avg
2005-2007	**1Q**	13.141
2005-2007	**2Q**	13.594
2005-2007	**3Q**	21.567
2005-2007	**4Q**	12.973

3-Year Period	Qtr	Avg
2006-2008	**1Q**	12.642
2006-2008	**2Q**	12.747
2006-2008	**3Q**	19.637
2006-2008	**4Q**	12.198

3-Year Period	Qtr	Avg
2007-2009	**1Q**	11.683
2007-2009	**2Q**	12.050
2007-2009	**3Q**	17.577
2007-2009	**4Q**	11.611

Weighted Quarterly Avgs

Qtr	Avg
1Q	12.489
2Q	12.797
3Q	19.594
4Q	12.261

Clairton CSN Speciation Quarterly SANDWICH Averages

- Based on Liberty species, applied to Clairton weighted FRM
- See Liberty SANDWICH averages for full calculations up to quarterly averages

Quarterly Averages

AVGs	QTR	FRMc	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	15.902	0.500	15.402	4.155	1.643	4.132	1.473	0.740	1.923	1.336
	2Q	15.970	0.500	15.470	4.308	1.776	4.704	0.058	0.873	1.729	2.023
	3Q	22.952	0.500	22.452	4.764	2.298	8.146	0.000	0.982	2.765	3.499
	4Q	20.674	0.500	20.174	6.442	3.002	5.048	0.622	0.900	1.999	2.161

Relative Compositions (fractions of Non-Blank)

FRACT	QTR	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	1.000	0.270	0.107	0.268	0.096	0.048	0.125	0.087
	2Q	1.000	0.278	0.115	0.304	0.004	0.056	0.112	0.131
	3Q	1.000	0.212	0.102	0.363	0.000	0.044	0.123	0.156
	4Q	1.000	0.319	0.149	0.250	0.031	0.045	0.099	0.107

Weighted Quarterly Compositions

WEIGHT	QTR	FRMw	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	12.489	0.500	11.989	3.234	1.279	3.216	1.146	0.576	1.496	1.040
	2Q	12.797	0.500	12.297	3.425	1.411	3.739	0.046	0.694	1.375	1.608
	3Q	19.594	0.500	19.094	4.051	1.954	6.927	0.000	0.835	2.351	2.976
	4Q	12.261	0.500	11.761	3.755	1.750	2.943	0.362	0.525	1.166	1.260
	AVG	14.285									

Clairton SMAT RRFs and Future Compositions, by Total Species

- Based on Liberty species

Baseline Total Quarterly Compositions

Baseline (2007)	QTR	FRMw	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc	DON
Avg	1Q	12.489	0.500	11.989	3.234	1.279	3.216	1.146	0.576	1.496	1.040	0.362
Avg	2Q	12.797	0.500	12.297	3.425	1.411	3.739	0.046	0.694	1.375	1.608	0.364
Avg	3Q	19.594	0.500	19.094	4.051	1.954	6.927	0.000	0.835	2.351	2.976	0.339
Avg	4Q	12.261	0.500	11.761	3.755	1.750	2.943	0.362	0.525	1.166	1.260	0.360
	AVG	14.285										

Methodology:

- Use measured SO4 and EC
- Use retained nitrate (calculated)
- Use calculated indirect NH4 (retained) method for baseline and future
- Use calculated particle bound water for baseline and future
- Degrees of Neutralization (DON) constant from base to future

CAMx Modeled Species -Total

Baseline (2007)	QTR		POA	SOA	TOA	EC	SO4	NO3	OTHER
Avg	1Q		3.046	0.051	3.097	1.651	2.836	2.054	5.718
Avg	2Q		1.282	0.023	1.304	1.409	5.440	0.427	4.901
Avg	3Q		1.337	0.029	1.366	1.757	8.038	0.049	6.394
Avg	4Q		3.263	0.037	3.300	1.957	3.892	1.630	5.974

Future Projected (2014)	QTR		POA	SOA	TOA	EC	SO4	NO3	OTHER
Avg	1Q		2.360	0.043	2.402	0.836	1.930	1.844	4.660
Avg	2Q		0.935	0.017	0.952	0.814	2.715	0.399	3.741
Avg	3Q		0.941	0.023	0.964	1.037	3.578	0.066	4.816
Avg	4Q		2.563	0.033	2.597	1.002	2.313	1.239	4.866

Regional RRFs (Future Projected divided by Baseline)

RRF	QTR				TOA	EC	SO4	NO3	OTHER
Ratio	1Q				0.776	0.507	0.681	0.897	0.815
Ratio	2Q				0.730	0.578	0.499	0.934	0.763
Ratio	3Q				0.706	0.590	0.445	1.340	0.753
Ratio	4Q				0.787	0.512	0.594	0.760	0.815

Total Future Projected Compositions

Future Projected (2014)	QTR	FRMf	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc	DON
Avg	**1Q**	9.123	0.500	8.623	2.509	0.648	2.189	1.029	0.469	1.091	0.689	0.362
Avg	**2Q**	7.747	0.500	7.247	2.500	0.815	1.866	0.043	0.530	0.692	0.802	0.364
Avg	**3Q**	10.596	0.500	10.096	2.860	1.153	3.084	0.000	0.629	1.047	1.325	0.339
Avg	**4Q**	8.258	0.500	7.758	2.954	0.896	1.749	0.276	0.428	0.710	0.745	0.360
	AVG	**8.931**										

PBW Calculation	**SO4**	**NO3r**	**NH4r**
- Calculated from SO4, NO3r, and NH4r	2.189	1.029	1.091
- NH4r calculated from DON, SO4, NO3r	1.866	0.043	0.692
- DON > 0.225, low acidity equation	3.084	0.000	1.047
	1.749	0.276	0.710

S Term	**N Term**	**A Term**	**Part 1**	**Part 2**	**Part 3**	**Sum**	**Total**
0.508	0.239	0.253	-21954.708	-112.068	22066.936	0.160	0.689
0.718	0.016	0.266	-23317.546	-204.516	23522.370	0.308	0.802
0.747	0.000	0.253	-21877.209	-220.663	22098.192	0.321	1.325
0.640	0.101	0.260	-22633.360	-171.571	22805.203	0.272	0.745

Clairton Design Values, by Total Species

Design Values

Case	Year	Value
Baseline	2007	**14.3**
Future Projected	2014	**8.9**

Clairton SMAT RRFs and Future Compositions, by Regional/Local

- Based on Liberty species
- See Liberty regional/local split calculations for regional/local fractions

Baseline Total Quarterly Compositions

Baseline (2007)	QTR	FRMw	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc	DON
Avg	1Q	12.489	0.500	11.989	3.234	1.279	3.216	1.146	0.576	1.496	1.040	0.362
Avg	2Q	12.797	0.500	12.297	3.425	1.411	3.739	0.046	0.694	1.375	1.608	0.364
Avg	3Q	19.594	0.500	19.094	4.051	1.954	6.927	0.000	0.835	2.351	2.976	0.339
Avg	4Q	12.261	0.500	11.761	3.755	1.750	2.943	0.362	0.525	1.166	1.260	0.360
	AVG	14.285										

Local Fractions of Species

OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
0.215	0.600	0.232	0.092	0.418	0.252	0.268
0.261	0.680	0.090	0.221	0.300	0.168	0.130
0.000	0.684	0.120	0.000	0.385	0.203	0.233
0.488	0.758	0.384	0.000	0.523	0.357	0.404

Baseline Quarterly - Local Compositions, based on non-weighted Liberty-SWPA

Baseline (2007)	QTR				OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
Avg	1Q				0.696	0.767	0.747	0.105	0.241	0.378	0.279
Avg	2Q				0.892	0.960	0.336	0.010	0.208	0.230	0.209
Avg	3Q				0.000	1.337	0.829	0.000	0.321	0.478	0.693
Avg	4Q				1.832	1.326	1.129	0.000	0.275	0.416	0.509

Regional Fractions of Species

OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
0.785	0.400	0.768	0.908	0.582	0.748	0.732
0.739	0.320	0.910	0.779	0.700	0.832	0.870
1.000	0.316	0.880	0.000	0.615	0.797	0.767
0.512	0.242	0.616	1.000	0.477	0.643	0.596

Baseline Quarterly - Regional Compositions

Baseline (2007)	QTR				OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
Avg	**1Q**				2.538	0.512	2.469	1.041	0.335	1.119	0.761
Avg	**2Q**				2.533	0.451	3.403	0.036	0.486	1.144	1.398
Avg	**3Q**				4.051	0.617	6.098	0.000	0.513	1.873	2.282
Avg	**4Q**				1.923	0.424	1.814	0.362	0.250	0.750	0.751

Methodology:

- Use measured SO4 and EC
- Use retained nitrate (calculated)
- Use calculated indirect NH4 (retained) method for baseline and future
- Use calculated particle bound water for baseline and future
- Degrees of Neutralization (DON) constant from base to future
- Regional modeled OTHER is crustal; local OTHER is a mix of local primary material (LPM)
- For local RRFs, apportion modeled LPMm using monitored LPM fractions (OCMmb,EC,OPP)
- Modeled LPMm = POA+EC+OTHER

CAMx Modeled Species - Local Primary Material apportioned to POA, EC, OTHER

Ratio	QTR				OCMmb	EC			OPP
Species/LPM	1Q				0.408	0.450			0.141
Species/LPM	2Q				0.433	0.466			0.101
Species/LPM	3Q				0.000	0.806			0.194
Species/LPM	4Q				0.534	0.386			0.080

Baseline (2007)	QTR		LPMm		POA	EC			OTHER
Avg	**1Q**		2.370		0.968	1.067			0.335
Avg	**2Q**		3.819		1.653	1.779			0.386
Avg	**3Q**		4.882		0.000	3.936			0.946
Avg	**4Q**		2.286		1.220	0.883			0.183

Future Projected (2014)	QTR		LPMm		POA	EC			OTHER
Avg	1Q		1.752		0.716	0.789			0.248
Avg	2Q		2.883		1.248	1.344			0.291
Avg	3Q		3.587		0.000	2.892			0.695
Avg	4Q		1.766		0.943	0.682			0.141

CAMx Modeled Species - Local, with apportioned LPM

Baseline (2007)	QTR		POA	SOA	TOA	EC	SO4	NO3	OTHER
Avg	1Q		0.968	0.000	0.968	1.067	0.338	0.021	0.335
Avg	2Q		1.653	0.000	1.654	1.779	0.560	0.008	0.386
Avg	3Q		0.000	0.000	0.000	3.936	0.732	0.002	0.946
Avg	4Q		1.220	0.000	1.220	0.883	0.333	0.014	0.183

Future Projected (2014)	QTR		POA	SOA	TOA	EC	SO4	NO3	OTHER
Avg	1Q		0.716	0.000	0.716	0.789	0.245	0.023	0.248
Avg	2Q		1.248	0.000	1.248	1.344	0.421	0.015	0.291
Avg	3Q		0.000	0.000	0.000	2.892	0.512	0.004	0.695
Avg	4Q		0.943	0.000	0.943	0.682	0.247	0.017	0.141

Local RRFs (Future Projected divided by Baseline)

RRF	QTR				TOA	EC	SO4	NO3	OTHER
Ratio	1Q				0.739	0.739	0.725	1.109	0.739
Ratio	2Q				0.755	0.755	0.752	1.804	0.755
Ratio	3Q				0.746	0.735	0.700	2.123	0.735
Ratio	4Q				0.773	0.773	0.743	1.235	0.773

CAMx Modeled Species - Regional

Baseline (2007)	QTR		POA	SOA	TOA	EC	SO4	NO3	OTHER
Avg	1Q		2.875	0.051	2.927	1.404	2.498	2.034	3.766
Avg	2Q		1.007	0.022	1.030	1.006	4.880	0.419	1.759
Avg	3Q		1.018	0.029	1.047	1.224	7.306	0.047	2.365
Avg	4Q		3.088	0.037	3.125	1.665	3.559	1.616	4.155

Future Projected (2014)	QTR		POA	SOA	TOA	EC	SO4	NO3	OTHER
Avg	1Q		2.206	0.043	2.249	0.603	1.685	1.821	3.295
Avg	2Q		0.688	0.017	0.705	0.432	2.294	0.385	1.486
Avg	3Q		0.660	0.023	0.683	0.530	3.066	0.062	2.016
Avg	4Q		2.403	0.033	2.436	0.721	2.066	1.222	3.542

Regional RRFs (Future Projected divided by Baseline)

RRF	QTR				TOA	EC	SO4	NO3	OTHER
Ratio	1Q				0.769	0.430	0.675	0.895	0.875
Ratio	2Q				0.685	0.429	0.470	0.918	0.845
Ratio	3Q				0.653	0.433	0.420	1.309	0.853
Ratio	4Q				0.779	0.433	0.580	0.756	0.852

Total Local + Regional Future Projected Compositions

Future Projected (2014)	QTR	FRMf	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc	DON
Avg	1Q	9.276	0.500	8.776	2.465	0.787	2.207	1.049	0.471	1.103	0.694	0.362
Avg	2Q	7.782	0.500	7.282	2.408	0.919	1.852	0.051	0.567	0.689	0.796	0.364
Avg	3Q	10.621	0.500	10.121	2.644	1.250	3.139	0.000	0.674	1.066	1.349	0.339
Avg	4Q	8.783	0.500	8.283	2.915	1.208	1.892	0.274	0.425	0.761	0.807	0.360
	AVG	9.116										

PBW Calculation	SO4	NO3r	NH4r
- Calculated from SO4, NO3r, and NH4r	2.207	1.049	1.103
- NH4r calculated from DON, SO4, NO3r	1.852	0.051	0.689
- DON > 0.225, low acidity equation	3.139	0.000	1.066
	1.892	0.274	0.761

S Term	N Term	A Term	Part 1	Part 2	Part 3	Sum	Total
0.506	0.241	0.253	-21944.735	-111.280	22056.175	0.159	0.694
0.714	0.020	0.266	-23298.994	-203.265	23502.566	0.307	0.796
0.747	0.000	0.253	-21877.209	-220.663	22098.192	0.321	1.349
0.646	0.094	0.260	-22671.939	-174.549	22846.764	0.276	0.807

Clairton Design Values, by Regional/Local Species

Design Values

Case	Year	Value
Baseline	2007	**14.3**
Future Projected	2014	**9.1**

H-2: 24-Hour Standard Attainment Tests

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24-Hour Attainment Tests Summary

The calculations used in the 24-Hour Speciated Modeled Attainment Tests (SMAT) for Liberty and Clairton are given here. The reconstruction of species using the SANDWICH method and calculation of design values using SMAT are taken from EPA Modeling Guidance.

Chemical Speciation Network (CSN) speciation data was taken from EPA MATS 2.5.1 software package, with values from AQS substituted for some missing values. Calculated values for retained nitrate (NO3r) and degree of neutralization of sulfate (DON) are calculated by EPA.

Attainment tests were calculated according to 2 methods:

1) On a total species basis, using the monitored species combined with the modeled species from CAMx as prescribed by EPA modeling guidance. E.g., total measured elemental carbon at Liberty is scaled using the RRF of total modeled elemental carbon.

2) On a regional/local species basis, using a regional and local split of monitored and modeled species. Local monitored excess is calculated by subtracting the quarterly average of the other Pittsburgh MSA sites (Lawrenceville, Florence, and Greensburg, concurrent with Liberty high days) from the Liberty quarterly high day average for each quarter. CAMx RRFs by regional and local impacts are then applied accordingly. E.g., local measured elemental carbon is scaled using the modeled local impacts, and regional (Pittsburgh MSA) elemental carbon is scaled using the modeled regional impacts. Using the regional/local basis, local primary material (LPM) is also reapportioned for local impacts in order to better represent monitored compositions and to reduce overestimation of crustal material (OPP).

Attainment tests calculations are given in the order below for Liberty and Clairton:

- FRM Baseline High Days
- CSN Quarterly High Day Averages
- Quarterly SANDWICH High Day Averages
- Attainment Tests
  - Total Species
  - Regional/Local Species

Glossary of CSN and SANDWICH Terms

SO4	Sulfate (measured or modeled)
NO3r	Retained Nitrate, calculated by EPA using PIT temp and relative humidity
NO3	Nitrate (measured or modeled)
NH4	Ammonium (measured)
NH4r	Retained (Indirect) Ammonium, calculated as (DON*SO4)+(0.29*NO3r)
OC	Organic Carbon (measured)
OCMmb	Organic Carbon Mass by mass balance (FRM minus other species)
OCfloor	Minimum for OCMmb (equal to OC)
EC	Elemental Carbon (measured or modeled)
CRUST	Crustal Component, calculated from Si, Ti, Ca, Al, and Fe
CRUSTalt	Crustal Component, calculated from Si, Ti, Ca, and Fe, w/o Al (newer technique)
DON	Degree of Neutralization of SO4, calculated as (NH4-0.29*NO3r)/SO4
H2O_AIM	Particle Bound Water, generated by AIM model using SO4, NO3r, NH4 (not used)
PBWcalc	Particle Bound Water, calculated by polynomial fitted to AIM
FRMc (or FRM_MASS)	FRM concentration, concurrent with speciation samples
FRMh	FRM baseline high day
FRMf	FRM future high day
CFM	Corrected Fine Material (used when OCMmb<OCfloor)
Blank	Passive blank mass (constant)
Non-Blank	Sum of all species except passive blank
OPP	Other Primary PM2.5 (analogous to crustal component, regionally)
OTHER	Other Primary PM2.5 (modeled by CAMx)
LPM	Local Primary Material measured (OCMmb+EC+OPP)
LPMm	Local Primary Material modeled (POA+EC+OTHER)
TOA	Total Organic Aerosol, primary and secondary (POA+SOA)
POA	Primary Organic Aerosol
SOA	Secondary Organic Aerosol

Liberty FRM Observed High Days

Methodology:

- Identify official 98th percentile value for each year
- Rounded to nearest integer

FRM High Days

	2005	2006	2007	2008	2009
98th-Percentile	69.6	55.7	54.7	50.0	45.3

3-Year Design Values

3-Year Period	Avg
2005-2007	60.0
2006-2008	53.5
2007-2009	50.0

5-Year Weighted Average

5-Year Period	Avg
2005-2009	54

Liberty Top 8 Days per Quarter

2005	DATE	1Q	DATE	2Q	DATE	3Q	DATE	4Q
	20050205	52.4	20050625	77.8	20050913	84.9	20051120	100.3
	20050207	44.7	20050418	73.4	20050914	70.4	20051031	83.1
	20050204	41.8	20050419	69.6	20050804	62.6	20051121	73.7
	20050304	37.8	20050626	67.0	20050912	61.7	20051030	68.2
	20050208	37.4	20050624	62.2	20050908	58.9	20051224	61.9
	20050201	33.4	20050417	60.3	20050915	58.7	20051003	51.2
	20050318	31.2	20050420	59.0	20050812	50.0	20051112	48.8
	20050315	31.0	20050406	58.8	20050813	47.8	20051113	48.3

2006	DATE	1Q	DATE	2Q	DATE	3Q	DATE	4Q
	20060128	60.6	20060530	60.1	20060717	54.7	20061126	100.7
	20060331	51.9	20060618	58.4	20060726	50.8	20061127	82.1
	20060113	47.9	20060529	54.1	20060826	49.9	20061124	68.0
	20060222	44.7	20060617	45.5	20060720	47.1	20061220	58.9
	20060329	40.4	20060531	41.8	20060814	45.4	20061110	55.7
	20060311	36.1	20060410	38.9	20060710	45.1	20061128	50.8
	20060124	33.5	20060427	38.6	20060908	44.4	20061125	50.7
	20060327	27.7	20060504	36.1	20060718	43.5	20061211	48.3

2007	DATE	1Q	DATE	2Q	DATE	3Q	DATE	4Q
	20070217	54.1	20070422	56.5	20070710	61.7	20071022	58.7
	20070103	48.1	20070602	54.5	20070829	58.7	20071030	58.0
	20070310	47.0	20070531	54.2	20070709	56.5	20071031	45.8
	20070314	46.9	20070423	49.5	20070905	56.2	20071008	41.7
	20070104	46.3	20070601	46.1	20070812	54.7	20071007	40.3
	20070222	30.2	20070515	44.4	20070802	54.3	20071021	40.3
	20070319	28.0	20070525	44.3	20070803	53.8	20071029	39.7
	20070312	26.1	20070526	43.0	20070925	51.0	20071009	35.2

2008	DATE	1Q	DATE	2Q	DATE	3Q	DATE	4Q
	20080203	47.7	20080417	66.9	20080718	50.0	20081013	70.8
	20080105	35.8	20080416	56.7	20080719	49.5	20081107	63.2
	20080224	35.7	20080418	56.0	20080904	47.1	20081020	62.7
	20080303	34.5	20080526	39.5	20080717	45.1	20081031	55.1
	20080128	30.4	20080507	38.2	20080903	45.0	20081014	40.2
	20080310	29.4	20080514	36.7	20080729	44.4	20081123	39.6
	20080311	29.2	20080606	36.5	20080921	43.8	20081106	37.4
	20080204	28.9	20080506	35.6	20080716	40.2	20081101	35.1

2009	DATE	1Q	DATE	2Q	DATE	3Q	DATE	4Q
	20090209	54.8	20090409	35.0	20090816	41.9	20091109	92.1
	20090210	42.2	20090418	33.6	20090813	33.5	20091108	59.2
	20090322	40.3	20090608	33.0	20090826	31.7	20091022	55.7
	20090207	35.1	20090625	32.4	20090914	31.1	20091110	49.9
	20090318	33.3	20090417	30.7	20090817	28.4	20091107	46.2
	20090206	32.5	20090607	29.3	20090904	28.4	20091115	45.3
	20090104	31.6	20090419	28.8	20090815	27.5	20091129	40.6
	20090202	27.4	20090610	27.4	20090809	26.9	20091104	35.9

Liberty CSN Notes

- Measured carbons switched from TOT to TOR for Liberty on 5/12/07
- Some EC/OC not included with MATS data after TOT/TOR switch; substituted from AQS
- Missing concurrent FRM mass was substituted with CSN total mass
- All CSN species are submitted to EPA AQS by RTI, reviewed by ACHD
- Calculated species taken from EPA MATS 2.5.1 species-for-fractions
- Winter samples with mass balance errors, removed from this analysis

    11/14/08 - 3/2/09

    12/9/09 - 12/27/09

Liberty CSN Quarterly Rankings

- Sorted high to low for each quarter, by concurrent FRM (FRM_MASS)

1Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20050317	4.92	5.86	6.98	3.96	5.75	2.43	0.50	0.52	0.375	1.67	26.0
	20050203	4.15	5.56	6.21	3.19	5.15	1.21	0.96	1.03	0.375	1.49	22.2
	20050215	4.39	0.00	1.70	2.85	7.89	4.86	1.58	2.26	0.375	1.57	21.0
	20050221	6.38	1.06	1.55	2.99	3.35	1.39	0.30	0.29	0.375	2.16	17.7
	20050305	4.27	3.56	4.02	2.50	4.34	0.84	0.51	0.56	0.343	1.37	16.9
	20050110	5.27	0.62	1.33	2.77	4.51	1.71	0.22	0.25	0.375	1.82	15.7
	20050329	3.61	0.00	1.12	2.04	5.54	2.92	1.15	1.64	0.375	1.29	15.0
	20050209	4.16	2.25	2.38	2.19	3.31	1.12	0.26	0.26	0.369	1.28	14.4
	20050122	2.92	2.00	2.14	1.48	3.69	0.48	0.26	0.32	0.308	0.88	12.4
	20050323	4.12	1.18	1.56	1.82	2.07	0.38	0.24	0.27	0.359	1.39	11.5
	20050116	2.26	1.96	2.19	1.26	2.90	0.53	0.13	0.15	0.306	0.71	10.7
	20050104	2.09	1.25	1.43	1.02	1.86	0.44	0.32	0.32	0.314	0.63	7.3
	20050227	1.75	0.61	1.10	0.76	2.30	0.39	0.15	0.14	0.333	0.56	6.4

2Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20050510	13.70	0.00	1.55	6.67	14.60	6.11	2.70	3.17	0.375	4.91	43.9
	20050627	9.86	0.00	0.68	3.21	8.79	2.03	0.96	0.96	0.326	3.46	34.7
	20050621	14.60	0.00	0.81	4.48	8.01	3.33	0.55	0.63	0.307	4.67	34.5
	20050522	5.40	0.00	1.53	3.75	10.70	4.84	1.37	1.77	0.375	1.93	26.9
	20050609	8.90	0.00	0.41	2.87	5.54	1.22	0.66	0.67	0.322	3.08	21.8
	20050504	5.26	1.46	3.23	3.06	3.77	1.85	0.55	0.54	0.375	1.71	15.6
	20050404	2.21	0.00	0.50	1.77	6.02	3.50	0.73	0.92	0.375	0.79	14.6
	20050528	3.48	0.87	1.77	1.91	4.15	1.96	0.33	0.38	0.375	1.14	14.2
	20050410	4.04	0.00	0.67	1.59	5.11	0.97	0.77	0.94	0.375	1.45	14.1
	20050422	4.41	0.00	1.05	2.02	3.70	1.82	0.47	0.48	0.375	1.58	14.1
	20050416	1.93	0.00	1.67	1.80	6.66	2.52	0.48	0.54	0.375	0.69	13.0
	20050615	3.66	0.00	0.38	0.99	3.45	0.09	0.09	0.09	0.270	0.88	9.8
	20050428	3.67	0.00	1.67	1.76	1.91	0.39	0.31	0.36	0.375	1.31	8.8
	20050516	2.80	0.00	0.79	1.03	1.91	0.30	0.24	0.24	0.368	1.03	6.4
	20050603	1.48	0.00	0.48	0.52	1.96	0.29	0.10	0.10	0.351	0.55	4.1

3Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20050913	29.30	0.00	2.10	10.60	17.80	11.00	0.58	0.58	0.362	10.84	84.9
	20050919	16.60	0.00	1.25	6.82	8.39	7.83	0.93	1.19	0.375	5.95	43.0
	20050721	14.70	0.00	1.50	6.18	10.90	5.30	1.51	1.79	0.375	5.27	42.7
	20050802	8.37	0.00	0.80	2.89	10.90	6.34	0.89	1.03	0.345	3.09	33.4
	20050901	7.62	0.00	2.28	4.42	6.89	5.96	1.58	2.21	0.375	2.73	28.9
	20050703	10.10	0.00	0.77	3.01	5.45	1.26	0.14	0.14	0.298	3.05	27.7
	20050925	14.10	0.00	0.37	4.19	3.73	1.01	1.87	1.88	0.297	4.24	27.4
	20050826	9.35	0.00	0.31	3.02	4.67	0.83	0.53	0.58	0.323	3.24	25.5
	20050814	10.00	0.00	0.84	3.13	4.26	0.89	1.36	1.70	0.313	3.31	24.0
	20050820	8.57	0.00	0.72	2.85	4.01	1.48	0.97	0.62	0.333	3.07	20.2
	20050715	7.80	0.00	0.47	2.48	4.74	1.10	0.52	0.56	0.318	2.65	19.8
	20050808	7.70	0.00	0.92	2.93	3.55	1.16	0.25	0.25	0.375	2.76	17.8
	20050727	4.41	0.00	0.71	1.69	4.96	1.98	0.49	0.59	0.375	1.58	16.2
	20050709	4.92	0.00	0.98	1.51	4.62	1.31	0.24	0.24	0.307	1.58	14.4

4Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20051031	13.30	0.00	1.37	10.00	27.70	16.70	2.56	3.53	0.375	4.77	83.1
	20051112	5.02	0.00	1.44	4.60	13.30	12.60	1.49	2.02	0.375	1.80	48.8
	20051001	7.95	0.00	1.28	4.56	10.80	5.51	0.90	1.00	0.375	2.85	34.3
	20051019	5.66	0.00	0.96	3.97	8.52	7.82	3.17	4.17	0.375	2.03	32.7
	20051106	6.28	0.00	0.71	3.17	6.66	7.23	0.95	1.32	0.375	2.25	27.5
	20051206	4.62	3.03	3.30	2.24	3.19	0.37	0.25	0.27	0.294	1.34	14.7
	20051013	8.06	0.00	0.11	1.09	1.28	0.52	0.26	0.26	0.135	4.07	13.8
	20051118	4.14	2.31	2.75	2.36	3.03	0.93	0.68	0.76	0.375	1.25	13.0
	20051230	6.78	0.11	0.60	2.02	2.51	0.42	0.22	0.22	0.293	1.97	12.9
	20051130	3.56	0.00	0.43	1.19	1.93	0.29	0.34	0.23	0.334	1.28	7.5
	20051212	1.96	1.44	1.74	1.09	2.90	0.41	0.30	0.35	0.343	0.62	7.3
	20051007	1.72	0.00	0.39	0.49	1.87	0.50	0.33	0.34	0.285	0.46	4.7
	20051026	0.62	0.00	0.30	0.17	1.38	0.21	0.19	0.15	0.274	0.15	4.7
	20051124	1.17	0.50	0.80	0.59	1.49	0.49	0.09	0.09	0.375	0.36	4.1

1Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20060222	8.20	2.70	3.60	6.38	16.20	5.99	1.16	1.22	0.375	2.61	44.7
	20060330	8.90	0.00	1.45	3.99	7.08	2.81	0.67	0.90	0.375	3.19	27.2
	20060312	4.93	0.71	1.85	3.38	6.94	3.90	0.61	0.61	0.375	1.68	26.6

	20060129	4.01	0.00	0.97	2.66	8.45	5.01	1.07	1.44	0.375	1.44	26.2
	20060216	5.63	0.00	1.55	3.39	8.38	4.37	1.25	1.44	0.375	2.02	25.3
	20060324	5.38	2.61	3.22	2.80	4.31	0.80	0.59	0.57	0.375	1.64	16.9
	20060123	3.33	1.91	2.29	2.07	4.62	1.67	0.63	0.67	0.375	1.00	15.7
	20060111	5.40	0.00	0.89	2.09	3.21	1.07	0.42	0.45	0.375	1.93	14.1
	20060210	3.10	2.88	3.37	2.09	3.48	0.96	0.43	0.56	0.375	0.97	13.4
	20060117	2.39	0.00	0.78	0.92	4.04	1.09	0.30	0.35	0.375	0.86	10.9
	20060204	3.69	0.06	0.71	1.47	2.46	0.57	0.24	0.25	0.375	1.32	10.6
	20060228	1.98	1.50	1.85	1.14	2.21	0.36	0.32	0.38	0.356	0.62	8.0
	20060306	0.97	0.72	1.44	0.65	3.61	0.55	0.34	0.39	0.375	0.29	6.6
	20060318	1.55	0.39	0.95	0.71	2.03	0.19	0.12	0.12	0.375	0.51	5.3
	20060105	1.64	0.20	0.59	0.73	1.22	0.56	0.18	0.24	0.375	0.57	4.7

2Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20060529	14.90	0.00	2.62	7.25	16.80	7.03	1.20	1.33	0.375	5.34	54.1
	20060616	8.12	0.00	1.04	3.88	15.00	6.08	1.18	1.49	0.375	2.91	34.9
	20060411	7.08	0.00	1.56	3.94	11.20	5.56	1.50	1.85	0.375	2.54	34.1
	20060628	9.65	0.00	1.14	3.82	4.52	1.77	0.57	0.55	0.375	3.46	22.8
	20060622	6.31	0.00	0.80	2.54	4.94	1.26	0.71	0.70	0.375	2.26	18.8
	20060505	4.06	0.00	1.46	1.57	3.59	0.73	0.92	1.08	0.375	1.45	12.6
	20060517	5.73	0.00	0.65	2.12	2.55	0.58	0.46	0.46	0.370	2.09	12.4
	20060429	1.40	0.00	0.42	0.53	3.84	0.72	0.45	0.54	0.375	0.50	10.6
	20060423	3.08	0.00	1.15	1.34	2.64	0.91	0.38	0.40	0.375	1.10	9.2
	20060604	1.75	0.00	1.19	0.82	2.36	0.31	0.22	0.19	0.375	0.63	7.8
	20060523	2.00	0.00	0.68	0.77	2.35	0.57	0.64	0.56	0.375	0.72	6.7
	20060417	1.92	0.00	0.23	0.72	2.66	0.54	0.45	0.55	0.375	0.69	6.4
	20060610	2.03	0.00	0.19	0.59	2.27	0.29	0.28	0.31	0.291	0.59	6.1
	20060405	2.13	0.00	0.46	0.81	1.38	0.20	0.21	0.24	0.375	0.76	4.8

3Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20060710	18.40	0.00	0.83	6.84	8.58	3.04	0.80	1.03	0.372	6.67	45.1
	20060908	16.90	0.00	1.65	7.74	12.90	5.47	2.62	3.21	0.375	6.06	44.4
	20060716	7.07	0.00	0.95	3.12	11.60	5.01	1.85	2.20	0.375	2.53	32.4
	20060827	11.50	0.00	0.61	4.37	5.00	0.86	0.59	0.56	0.375	4.12	28.2
	20060704	8.77	0.00	0.78	3.31	5.19	0.68	0.38	0.31	0.375	3.14	26.3
	20060809	10.30	0.00	0.45	2.63	7.41	2.00	0.71	0.93	0.255	2.10	25.4

	20060803	11.30	0.00	0.82	3.27	4.36	1.19	0.88	1.07	0.289	3.20	25.2
	20060728	6.58	0.00	0.46	1.91			5.15	5.18	0.290	1.88	20.3
	20060926	5.76	0.00	1.56	3.91	5.38	2.52	1.01	1.05	0.375	2.06	18.3
	20060815	6.62	0.00	0.92	1.89	3.52	0.68	0.58	0.51	0.285	1.82	15.3
	20060914	6.85	0.00	1.01	3.13	2.21	0.65	0.30	0.30	0.375	2.45	13.0
	20060821	3.86	0.00	0.53	1.25	3.35	0.69	0.34	0.35	0.324	1.34	10.7
	20060920	1.90	0.00	0.32	0.74	1.79	0.33	0.16	0.16	0.375	0.68	4.9
	20060902	0.94	0.00	0.17	0.24	1.53	0.15	0.25	0.17	0.255	0.19	2.9
4Q	**DATE**	**SO4**	**NO3r**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**
	20061125	6.79	0.00	1.48	5.82	17.60	9.61	1.00	0.92	0.375	2.43	50.7
	20061213	5.05	0.09	2.24	3.49	8.06	3.52	1.16	1.37	0.375	1.80	23.2
	20061002	7.07	0.00	1.15	3.72	7.36	3.79	0.87	0.81	0.375	2.53	23.1
	20061008	3.62	0.00	0.57	2.61	8.44	5.00	1.28	1.67	0.375	1.30	22.7
	20061219	3.08	3.17	3.79	2.49	5.77	1.81	0.91	1.03	0.375	0.99	19.4
	20061231	4.62	0.70	2.13	2.37	5.24	1.78	0.41	0.40	0.375	1.57	18.5
	20061101	3.15	2.67	4.14	2.31	4.18	0.14	0.82	0.78	0.375	0.96	15.0
	20061014	2.60	0.00	0.65	1.74	5.45	2.79	0.55	0.66	0.375	0.93	12.5
	20061119	3.48	1.88	2.48	1.79	3.43	0.63	0.15	0.14	0.358	1.10	12.3
	20061113	5.03	0.28	0.78	1.94	2.58	1.20	0.26	0.29	0.370	1.80	11.7
	20061107	2.24	0.00	0.75	0.91	4.74	1.09	0.52	0.56	0.375	0.80	11.0
	20061225	2.33	0.59	1.28	1.01	2.79	0.93	0.10	0.13	0.360	0.79	9.9
	20061207	1.92	1.40	2.00	1.15	1.86	0.36	0.30	0.35	0.375	0.58	8.3
	20061026	2.45	0.00	0.79	1.03	3.23	0.69	0.47	0.50	0.375	0.88	7.9
	20061201	2.33	0.00	0.27	0.74	2.04	0.78	0.15	0.12	0.318	0.79	6.2
	20061020	1.38	0.00	0.20	0.43	1.68	0.45	0.29	0.33	0.312	0.46	3.6
1Q	**DATE**	**SO4**	**NO3r**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**
	20070217	10.60	3.06	3.31	9.84	14.40	8.01	1.86	2.42	0.375	3.43	54.1
	20070319	4.80	1.50	1.96	4.33	5.80	4.33	1.06	1.25	0.375	1.54	28.0
	20070313	6.34	0.00	1.41	4.75	8.33	5.25	1.62	1.87	0.375	2.27	25.9
	20070211	4.24	4.87	5.09	3.27	4.36	1.19	0.33	0.44	0.375	1.42	20.9
	20070112	4.17	0.13	1.57	3.06	4.66	2.63	1.02	1.16	0.375	1.48	19.9
	20070118	3.60	1.88	2.44	2.20	7.98	2.83	0.93	1.05	0.375	1.09	19.5
	20070301	5.54	0.07	1.36	2.33	3.34	0.70	0.40	0.44	0.375	1.98	13.5
	20070124	6.48	0.99	1.38	2.53	2.37	0.11	0.20	0.25	0.346	2.27	13.2

	20070130	3.81	2.78	3.11	2.33	2.89	0.35	0.54	0.57	0.375	1.14	12.5
	20070327	3.05	0.00	0.64	1.22	5.53	1.47	3.61	3.73	0.375	1.09	10.3
	20070307	2.47	1.99	2.27	1.24	2.93	0.78	0.49	0.42	0.268	0.73	9.9
	20070325	3.66	0.00	1.96	1.66	2.46	0.68	0.36	0.38	0.375	1.31	8.4
	20070205	1.69	2.07	2.13	0.97	2.52	0.07	0.19	0.20	0.218	0.67	8.0
	20070106	1.94	0.00	0.68	0.88	1.57	0.59	0.22	0.24	0.375	0.70	6.1
	20070223	1.65	0.28	0.62	0.61	1.49	0.41	0.23	0.27	0.320	0.53	4.2
2Q	**DATE**	**SO4**	**NO3r**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**
	20070617	14.80	0.00	1.47	6.24	9.79	4.87	1.60	1.74	0.375	5.30	40.0
	20070524	13.70	0.00	1.34	5.24	6.06	2.75	2.04	2.17	0.375	4.91	31.8
	20070530	7.25	0.00	0.96	3.28	7.40	4.07	1.43	1.56	0.375	2.60	23.2
	20070611	3.60	0.00	0.49	1.15	3.11	0.78	1.44	1.49	0.319	1.23	12.8
	20070418	6.14	0.00	0.53	1.34	1.95	0.21	0.67	0.67	0.218	1.22	10.9
	20070623	2.40	0.00	0.78	1.02	3.43	2.16	1.10	1.18	0.375	0.86	10.7
	20070629	2.19	0.00	0.84	0.87	2.84	0.83	0.76	0.87	0.375	0.78	9.4
	20070424	3.47	0.00	1.57	1.45	2.68	0.40	1.38	1.38	0.375	1.24	9.0
	20070605	3.49	0.00	0.56	1.28	1.88	0.64	0.36	0.46	0.367	1.28	8.2
	20070412	3.16	0.00	0.37	1.44	1.57	0.81	0.38	0.39	0.375	1.13	7.5
	20070406	2.54	0.90	1.43	1.26	1.68	0.22	0.36	0.42	0.375	0.80	6.5
	20070518	1.62	0.00	0.78	0.60	1.23	0.35	0.56	0.53	0.370	0.59	5.5
	20070506	0.94	0.00	0.10	0.36	1.19	0.16	0.44	0.44	0.375	0.34	3.0
3Q	**DATE**	**SO4**	**NO3r**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**
	20070828	23.60	0.00	1.03	7.45	6.30	3.30	1.12	1.08	0.316	7.93	47.3
	20070804	16.90	0.00	1.40	5.57	6.79	2.71	1.23	1.57	0.330	6.01	39.7
	20070903	11.20	0.00	1.07	5.24	8.93	9.35	1.34	1.44	0.375	4.01	36.4
	20070717	11.70	0.00	0.78	4.22	5.74	3.95	1.36	1.77	0.361	4.33	31.4
	20070729	16.80	0.00	0.49	5.13	3.29	0.99	0.78	0.70	0.305	5.33	29.8
	20070822	13.80	0.00	1.20	4.99	3.66	1.73	1.61	2.04	0.362	5.11	27.7
	20070921	13.00	0.00	1.67	5.63	3.97	2.34	1.47	1.64	0.375	4.66	27.4
	20070816	9.86	0.00	1.07	3.66	4.23	1.26	1.12	1.11	0.371	3.58	26.8
	20070909	9.42	0.00	1.79	3.83	3.66	1.38	0.61	0.75	0.375	3.38	26.2
	20070711	5.52	0.00	0.68	1.81			0.98	0.96	0.328	1.95	14.6
	20070705	6.45	0.00	0.91	2.41	2.20	0.74	0.70	0.82	0.374	2.32	13.8
	20070723	2.78	0.00	0.51	0.86	3.04	1.20	1.25	1.39	0.309	0.90	12.7

	20070927	4.43	0.00	1.60	2.14	1.70	0.91	2.54	2.65	0.375	1.59	12.7
	20070810	5.36	0.00	0.75	1.74	1.86	0.50	0.34	0.41	0.325	1.87	11.0
	20070915	1.37	0.00	0.20	0.45	0.95	0.34	0.34	0.36	0.328	0.49	3.6
4Q	**DATE**	**SO4**	**NO3r**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**
	20071021	6.55	0.00	1.05	5.15	13.81	10.46	2.75	3.51	0.375	2.35	40.3
	20071009	10.20	0.00	1.87	6.10	7.09	7.91	3.77	4.44	0.375	3.65	35.2
	20071114	7.30	0.10	2.79	4.41	5.01	4.00	0.78	0.91	0.375	2.60	27.1
	20071120	7.73	0.00	1.81	4.11	4.36	3.31	0.96	1.04	0.375	2.77	23.4
	20071208	6.24	4.81	5.47	3.98	4.03	1.45	0.59	0.70	0.375	1.88	23.2
	20071003	5.05	0.00	1.47	2.67	5.70	3.66	1.75	2.07	0.375	1.81	21.5
	20071226	3.47	1.68	2.44	1.99	5.24	2.18	0.88	0.95	0.375	1.06	20.1
	20071126	4.11	1.08	1.99	2.68	3.64	2.64	0.58	0.62	0.375	1.34	16.6
	20071220	5.33	3.85	4.54	3.72	2.37	0.66	0.48	0.58	0.375	1.60	16.1
	20071202	3.64	0.88	1.83	2.60	3.24	2.36	0.74	0.87	0.375	1.20	15.9
	20071108	3.80	1.30	2.37	2.34	3.66	2.07	1.04	1.29	0.375	1.21	15.8
	20071015	4.26	0.00	1.21	1.94	3.53	2.05	1.29	1.45	0.375	1.53	14.8
	20071214	4.47	1.31	2.14	2.19	1.20	0.29	0.22	0.26	0.375	1.44	9.6
	20071102	1.99	0.00	1.05	0.97	2.75	1.18	0.54	0.60	0.375	0.71	8.7
	20071027	3.09	0.00	0.34	1.18	1.21	0.58	0.11	0.13	0.375	1.11	6.3
1Q	**DATE**	**SO4**	**NO3r**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**
	20080224	11.60	4.90	5.31	7.40	5.53	2.90	0.75	0.78	0.375	3.59	35.7
	20080325	5.63	2.09	3.35	4.39	8.77	0.17	0.99	1.24	0.375	1.77	21.5
	20080307	6.40	2.27	2.82	2.97	3.01	1.19	0.88	0.97	0.361	2.10	19.3
	20080113	6.01	2.05	2.78	3.02	3.20	1.57	0.53	0.65	0.375	1.91	17.3
	20080119	5.00	4.04	4.39	3.56	1.94	1.31	1.06	1.02	0.375	1.52	15.6
	20080212	3.87	2.86	3.12	2.24	4.04	1.10	1.26	1.40	0.364	1.20	15.6
	20080107	5.63	0.00	1.35	2.83	3.63	3.15	0.61	0.71	0.375	2.02	14.8
	20080125	3.23	4.86	5.05	3.02	2.62	0.80	0.55	0.62	0.375	1.23	13.7
	20080319	4.76	0.23	1.10	2.25	2.35	1.76	0.76	0.69	0.375	1.68	12.7
	20080313	4.15	0.00	2.14	2.45	2.94	1.77	1.79	2.09	0.375	1.49	12.1
	20080101	4.25	2.15	2.84	2.53	2.19	0.92	0.20	0.25	0.375	1.29	11.8
	20080131	2.11	1.85	2.24	1.20	1.95	0.79	0.42	0.50	0.314	0.67	8.5
	20080301	3.12	1.49	2.12	1.66	1.32	0.25	0.14	0.15	0.375	0.95	8.3
	20080331	2.86	0.00	0.55	1.19	1.93	1.38	0.64	0.79	0.375	1.02	8.3

	20080218	3.15	0.00	0.82	1.35	1.16	0.68	0.28	0.22	0.375	1.13	7.7
	20080206	2.74	0.00	0.45	1.19	1.86	1.33	0.40	0.50	0.375	0.98	7.5

2Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20080418	11.50	0.00	1.77	7.97	13.36	8.52	1.97	2.28	0.375	4.12	56.0
	20080506	7.65	0.00	2.05	4.95	12.39	4.66	2.06	2.64	0.375	2.74	35.6
	20080530	6.95	0.00	1.29	3.62	7.78	5.91	1.51	1.62	0.375	2.49	27.7
	20080611	4.88	0.00	1.50	2.59	8.71	4.64	1.10	1.27	0.375	1.75	23.6
	20080605	6.78	0.00	1.45	2.79	3.74	2.61	0.60	0.73	0.375	2.43	19.2
	20080629	4.74	0.00	1.01	2.25	2.54	1.38	0.83	0.85	0.375	1.70	12.5
	20080430	4.17	1.09	3.02	2.32	2.15	0.93	0.50	0.57	0.375	1.36	12.4
	20080424	3.32	0.00	0.54	1.32	2.32	1.04	1.28	1.45	0.375	1.19	11.2
	20080623	3.73	0.00	1.39	1.79	1.94	0.94	0.38	0.45	0.375	1.34	10.6
	20080617	0.00	0.00	0.05	0.00	1.70	0.61	0.33				10.2
	20080406	4.10	0.00	0.43	1.55	1.95	0.38	0.09	0.12	0.375	1.47	9.1
	20080518	2.71	0.00	0.90	1.48	2.30	1.28	0.38	0.42	0.375	0.97	9.1
	20080524	1.74	0.00	0.80	0.69	1.62	0.57	0.22	0.22	0.375	0.62	6.1
	20080412	2.39	0.00	0.38	0.75	1.13	0.15	0.27	0.28	0.314	0.79	4.7
	20080512	1.89	0.00	0.19	0.62	0.87	0.31	0.13	0.09	0.328	0.67	4.2

3Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20080717	17.30	0.00	1.54	6.51	7.93	6.13	1.08	1.11	0.375	6.20	45.1
	20080903	15.00	0.00	2.14	6.59	11.57	8.26	1.73	2.00	0.375	5.37	45.0
	20080729	13.80	0.00	1.70	5.60	11.47	5.20	0.92	1.02	0.375	4.94	44.4
	20080921	15.20	0.00	2.19	7.84	10.99	5.98	2.14	2.92	0.375	5.45	43.8
	20080711	8.22	0.00	1.33	4.44	8.96	6.88	1.58	1.94	0.375	2.95	31.0
	20080705	11.80	0.00	3.43	2.79	4.09	1.10	0.68	0.46	0.236	2.15	28.8
	20080804	7.49	0.00	0.76	3.76	6.93	5.65	1.99	2.55	0.375	2.68	27.0
	20080909	5.45	0.00	0.91	2.55	4.67	2.87	0.43	0.53	0.375	1.95	19.2
	20080816	5.02	0.00	0.68	2.76	6.17	3.67	1.29	1.83	0.375	1.80	18.7
	20080822	5.93	0.00	0.25	1.78	2.47	0.59	0.32	0.35	0.300	1.82	15.8
	20080723	5.54	0.00	0.74	1.93	2.31	1.06	0.49	0.53	0.348	2.05	14.0
	20080810	0.02	0.00	0.03	0.00	1.41	0.34	0.00	0.00	0.000	0.02	9.0
	20080915	1.79	0.00	0.13	0.53	0.96	0.31	0.19	0.18	0.296	0.53	5.8
	20080927	1.34	0.00	0.51	0.43	1.31	0.40	0.14	0.16	0.321	0.46	4.3
	20080828	1.01	0.00	0.33	0.34	1.17	0.42	0.11	0.11	0.337	0.36	3.9

4Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20081015	7.76	0.00	1.58	3.66	5.96	2.64	1.51	1.58	0.375	2.78	21.5
	20081102	5.88	0.00	1.88	2.92	4.35	1.13	1.66	1.79	0.375	2.11	20.1
	20081009	5.09	0.00	1.32	3.34	5.32	3.37	1.50	1.76	0.375	1.82	17.1
	20081021	2.41	0.00	0.64	1.39	1.99	1.28	0.74	0.95	0.375	0.86	11.2
	20081108	1.89	0.00	0.92	0.85	1.48	0.37	0.18	0.23	0.375	0.68	6.9
	20081003	2.00	0.00	0.45	0.80	1.69	0.80	0.33	0.39	0.375	0.72	6.3
	20081027	1.49	0.00	0.39	0.54	0.85	0.14	0.19	0.25	0.362	0.55	3.7

1Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20090314	5.35	1.07	2.58	2.43			0.69	0.81	0.375	1.79	16.4
	20090320	3.81	1.47	2.17	2.30	2.48	1.08	0.45	0.52	0.375	1.19	10.6
	20090308	3.07	0.00	0.92	1.10	2.48	0.70	0.51	0.56	0.358	1.14	10.3
	20090326	2.20	0.39	1.78	1.50	1.88	0.89	0.31	0.37	0.375	0.74	10.2

2Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20090419	8.34	0.00	1.56	4.47	7.07	4.27	0.32	0.38	0.375	2.99	28.8
	20090606	7.22	0.00	1.51	3.41	5.58	2.74	1.25	1.23	0.375	2.59	22.1
	20090525	6.79	0.00	1.21	2.68	2.64	0.90	1.81	2.08	0.375	2.43	18.6
	20090519	3.42	0.00	1.22	2.39	6.04	3.09	2.10	2.39	0.375	1.23	18.3
	20090624	3.02	0.00	0.84	1.30	5.89	2.50	2.23	2.34	0.375	1.08	16.3
	20090425	3.34	0.00	0.71	1.65	4.80	3.00	0.65	0.72	0.375	1.20	14.8
	20090507	5.08	0.00	0.50	2.00	2.03	0.86	1.09	1.03	0.375	1.82	12.9
	20090513	4.60	0.00	0.63	1.68	2.01	0.67	1.26	1.43	0.365	1.69	12.5
	20090531	2.38	0.00	0.77	1.33	6.36	2.60	0.79	0.86	0.375	0.85	12.2
	20090612	4.36	0.00	1.84	2.06	2.32	0.77	0.41	0.49	0.375	1.56	11.8
	20090618	4.89	0.00	1.11	1.97	1.38	0.50	0.74	0.76	0.375	1.75	11.7
	20090401	3.64	0.00	0.77	1.65	3.09	0.89	0.63	0.73	0.375	1.30	11.5
	20090501	2.65	0.00	0.60	1.06	1.80	0.55	0.94	0.99	0.375	0.95	8.5
	20090413	1.84	0.00	0.42	0.74	1.04	0.38	0.47	0.46	0.375	0.66	6.5
	20090630	2.07	0.00	0.42	0.71	1.49	0.45	0.51	0.55	0.343	0.76	6.5
	20090407	2.15	0.00	0.36	0.82	0.59	0.16	0.12	0.12	0.375	0.77	5.2

3Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20090817	9.40	0.00	0.86	3.78	5.33	2.66	0.64	0.75	0.375	3.37	28.4
	20090904	13.00	0.00	1.02	4.02	3.82	2.01	1.13	1.17	0.309	4.22	28.4
	20090706	5.48	0.00	1.12	2.81	9.41	4.00	1.26	1.32	0.375	1.96	25.0
	20090724	6.88	0.00	0.75	3.11	3.23	1.73	0.24	0.25	0.375	2.47	17.3
	20090730	7.00	0.00	0.91	2.90	1.61	0.79	0.31	0.34	0.375	2.51	15.8
	20090811	5.52	0.00	0.90	3.31	1.82	1.52	0.52	0.56	0.375	1.98	14.5
	20090829	3.46	0.00	0.45	1.42	3.10	1.21	1.47	1.50	0.375	1.24	12.2
	20090805	4.04	0.00	0.48	1.35	2.11	0.71	0.38	0.46	0.334	1.46	11.7
	20090922	4.39	0.00	0.48	1.54	1.54	0.68	0.26	0.31	0.351	1.63	10.5
	20090712	3.35	0.00	0.32	1.14	2.01	0.51	0.96	1.00	0.340	1.22	10.2
	20090928	4.62	0.00	0.36	1.66	1.78	0.82	0.36	0.38	0.359	1.71	9.8
	20090910	1.78	0.00	0.33	0.59	2.22	0.54	0.34	0.33	0.331	0.64	8.1
	20090823	2.85	0.00	0.37	0.97	1.52	0.53	0.31	0.33	0.340	1.04	7.7
	20090916	1.80	0.00	0.18	0.50	1.39	0.42	0.33	0.37	0.278	0.47	7.1
	20090718	1.84	0.00	0.71	0.86	1.66	0.73	0.13	0.16	0.375	0.66	6.8

4Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20091109	21.90	0.00	2.31	15.90			2.05	1.90	0.375	7.85	92.1
	20091022	15.10	0.00	1.08	9.96			2.36	2.74	0.375	5.41	55.7
	20091115	10.50	0.00	2.20	6.79			0.68	0.55	0.375	3.76	45.3
	20091103	6.05	0.38	2.14	3.71			0.63	0.62	0.375	2.13	21.4
	20091121	4.33	2.70	4.88	3.25			0.35	0.36	0.375	1.30	16.1
	20091010	3.29	0.00	0.36	1.79			0.19	0.15	0.375	1.18	14.0
	20091004	1.71	0.00	0.27	0.68			0.13	0.15	0.375	0.61	7.9
	20091028	3.01	0.00	0.39	1.17			0.17	0.19	0.375	1.08	7.5
	20091203	2.50	0.05	1.50	1.35			0.12	0.07	0.375	0.89	7.2
	20091016	0.88	0.00	0.57	0.42			0.14	0.13	0.375	0.32	4.5
	20091127	1.27	0.00	0.37	0.46			0.03	0.04	0.362	0.47	3.0

Liberty CSN Quarterly High Day Averages

- Identify highest 10% (or 20%, top 3 days for 1-in-6 monitor) of speciation days
- Calculate quarterly averages of high day species

1Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20050317	4.92	5.86	6.98	3.96	5.75	2.43	0.50	0.52	0.375	1.67	26.0
	20050203	4.15	5.56	6.21	3.19	5.15	1.21	0.96	1.03	0.375	1.49	22.2
	20050215	4.39	0.00	1.70	2.85	7.89	4.86	1.58	2.26	0.375	1.57	21.0
	AVG	4.49	3.81	4.96	3.33	6.26	2.83	1.01	1.27	0.375	1.58	23.1

2Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20050510	13.70	0.00	1.55	6.67	14.60	6.11	2.70	3.17	0.375	4.91	43.9
	20050627	9.86	0.00	0.68	3.21	8.79	2.03	0.96	0.96	0.326	3.46	34.7
	20050621	14.60	0.00	0.81	4.48	8.01	3.33	0.55	0.63	0.307	4.67	34.5
	AVG	12.72	0.00	1.01	4.79	10.47	3.82	1.40	1.59	0.336	4.35	37.7

3Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20050913	29.30	0.00	2.10	10.60	17.80	11.00	0.58	0.58	0.362	10.84	84.9
	20050919	16.60	0.00	1.25	6.82	8.39	7.83	0.93	1.19	0.375	5.95	43.0
	20050721	14.70	0.00	1.50	6.18	10.90	5.30	1.51	1.79	0.375	5.27	42.7
	AVG	20.20	0.00	1.62	7.87	12.36	8.04	1.01	1.19	0.371	7.35	56.9

4Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20051031	13.30	0.00	1.37	10.00	27.70	16.70	2.56	3.53	0.375	4.77	83.1
	20051112	5.02	0.00	1.44	4.60	13.30	12.60	1.49	2.02	0.375	1.80	48.8
	20051001	7.95	0.00	1.28	4.56	10.80	5.51	0.90	1.00	0.375	2.85	34.3
	AVG	8.76	0.00	1.36	6.39	17.27	11.60	1.65	2.18	0.375	3.14	55.4

1Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20060222	8.20	2.70	3.60	6.38	16.20	5.99	1.16	1.22	0.375	2.61	44.7
	20060330	8.90	0.00	1.45	3.99	7.08	2.81	0.67	0.90	0.375	3.19	27.2
	20060312	4.93	0.71	1.85	3.38	6.94	3.90	0.61	0.61	0.375	1.68	26.6
	AVG	7.34	1.14	2.30	4.58	10.07	4.23	0.81	0.91	0.375	2.49	32.8

2Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20060529	14.90	0.00	2.62	7.25	16.80	7.03	1.20	1.33	0.375	5.34	54.1
	20060616	8.12	0.00	1.04	3.88	15.00	6.08	1.18	1.49	0.375	2.91	34.9
	20060411	7.08	0.00	1.56	3.94	11.20	5.56	1.50	1.85	0.375	2.54	34.1
	AVG	10.03	0.00	1.74	5.02	14.33	6.22	1.29	1.56	0.375	3.60	41.0

3Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20060710	18.40	0.00	0.83	6.84	8.58	3.04	0.80	1.03	0.372	6.67	45.1
	20060908	16.90	0.00	1.65	7.74	12.90	5.47	2.62	3.21	0.375	6.06	44.4
	20060716	7.07	0.00	0.95	3.12	11.60	5.01	1.85	2.20	0.375	2.53	32.4
	AVG	14.12	0.00	1.14	5.90	11.03	4.51	1.76	2.15	0.374	5.09	40.6

4Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20061125	6.79	0.00	1.48	5.82	17.60	9.61	1.00	0.92	0.375	2.43	50.7
	20061213	5.05	0.09	2.24	3.49	8.06	3.52	1.16	1.37	0.375	1.80	23.2
	20061002	7.07	0.00	1.15	3.72	7.36	3.79	0.87	0.81	0.375	2.53	23.1
	AVG	6.30	0.03	1.62	4.34	11.01	5.64	1.01	1.03	0.375	2.25	32.3

1Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20070217	10.60	3.06	3.31	9.84	14.40	8.01	1.86	2.42	0.375	3.43	54.1
	20070319	4.80	1.50	1.96	4.33	5.80	4.33	1.06	1.25	0.375	1.54	28.0
	20070313	6.34	0.00	1.41	4.75	8.33	5.25	1.62	1.87	0.375	2.27	25.9
	AVG	7.25	1.52	2.23	6.31	9.51	5.86	1.51	1.85	0.375	2.41	36.0

2Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20070617	14.80	0.00	1.47	6.24	9.79	4.87	1.60	1.74	0.375	5.30	40.0
	20070524	13.70	0.00	1.34	5.24	6.06	2.75	2.04	2.17	0.375	4.91	31.8
	20070530	7.25	0.00	0.96	3.28	7.40	4.07	1.43	1.56	0.375	2.60	23.2
	AVG	11.92	0.00	1.26	4.92	7.75	3.90	1.69	1.82	0.375	4.27	31.7

3Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20070828	23.60	0.00	1.03	7.45	6.30	3.30	1.12	1.08	0.316	7.93	47.3
	20070804	16.90	0.00	1.40	5.57	6.79	2.71	1.23	1.57	0.330	6.01	39.7
	20070903	11.20	0.00	1.07	5.24	8.93	9.35	1.34	1.44	0.375	4.01	36.4
	AVG	17.23	0.00	1.17	6.09	7.34	5.12	1.23	1.36	0.340	5.98	41.1

4Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
	20071021	6.55	0.00	1.05	5.15	13.81	10.46	2.75	3.51	0.375	2.35	40.3	
	20071009	10.20	0.00	1.87	6.10	7.09	7.91	3.77	4.44	0.375	3.65	35.2	
	20071114	7.30	0.10	2.79	4.41	5.01	4.00	0.78	0.91	0.375	2.60	27.1	
	AVG	8.02	0.03	1.90	5.22	8.64	7.46	2.43	2.95	0.375	2.87	34.2	
1Q	**DATE**	**SO4**	**NO3r**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**	
	20080224	11.60	4.90	5.31	7.40	5.53	2.90	0.75	0.78	0.375	3.59	35.7	
	20080325	5.63	2.09	3.35	4.39	8.77	0.17	0.99	1.24	0.375	1.77	21.5	
	20080307	6.40	2.27	2.82	2.97	3.01	1.19	0.88	0.97	0.361	2.10	19.3	
	AVG	7.88	3.09	3.83	4.92	5.77	1.42	0.87	1.00	0.370	2.49	25.5	
2Q	**DATE**	**SO4**	**NO3r**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**	
	20080418	11.50	0.00	1.77	7.97	13.36	8.52	1.97	2.28	0.375	4.12	56.0	
	20080506	7.65	0.00	2.05	4.95	12.39	4.66	2.06	2.64	0.375	2.74	35.6	
	20080530	6.95	0.00	1.29	3.62	7.78	5.91	1.51	1.62	0.375	2.49	27.7	
	AVG	8.70	0.00	1.70	5.51	11.18	6.36	1.85	2.18	0.375	3.12	39.8	
3Q	**DATE**	**SO4**	**NO3r**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**	
	20080717	17.30	0.00	1.54	6.51	7.93	6.13	1.08	1.11	0.375	6.20	45.1	
	20080903	15.00	0.00	2.14	6.59	11.57	8.26	1.73	2.00	0.375	5.37	45.0	
	20080729	13.80	0.00	1.70	5.60	11.47	5.20	0.92	1.02	0.375	4.94	44.4	
	AVG	15.37	0.00	1.79	6.23	10.32	6.53	1.24	1.38	0.375	5.50	44.8	
4Q	**DATE**	**SO4**	**NO3r**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**	
	20081015	7.76	0.00	1.58	3.66	5.96	2.64	1.51	1.58	0.375	2.78	21.5	
	20081102	5.88	0.00	1.88	2.92	4.35	1.13	1.66	1.79	0.375	2.11	20.1	
	20081009	5.09	0.00	1.32	3.34	5.32	3.37	1.50	1.76	0.375	1.82	17.1	
	AVG	6.24	0.00	1.59	3.31	5.21	2.38	1.56	1.71	0.375	2.24	19.6	Low recovery - not used
1Q	**DATE**	**SO4**	**NO3r**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**	
	20090314	5.35	1.07	2.58	2.43			0.69	0.81	0.375	1.79	16.4	
	20090320	3.81	1.47	2.17	2.30	2.48	1.08	0.45	0.52	0.375	1.19	10.6	
	20090308	3.07	0.00	0.92	1.10	2.48	0.70	0.51	0.56	0.358	1.14	10.3	
	AVG	4.08	0.85	1.89	1.94	2.48	0.89	0.55	0.63	0.369	1.37	12.4	Low recovery - not used

2Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20090419	8.34	0.00	1.56	4.47	7.07	4.27	0.32	0.38	0.375	2.99	28.8
	20090606	7.22	0.00	1.51	3.41	5.58	2.74	1.25	1.23	0.375	2.59	22.1
	20090525	6.79	0.00	1.21	2.68	2.64	0.90	1.81	2.08	0.375	2.43	18.6
	AVG	7.45	0.00	1.43	3.52	5.10	2.63	1.13	1.23	0.375	2.67	23.2

3Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20090817	9.40	0.00	0.86	3.78	5.33	2.66	0.64	0.75	0.375	3.37	28.4
	20090904	13.00	0.00	1.02	4.02	3.82	2.01	1.13	1.17	0.309	4.22	28.4
	20090706	5.48	0.00	1.12	2.81	9.41	4.00	1.26	1.32	0.375	1.96	25.0
	AVG	9.29	0.00	1.00	3.54	6.19	2.89	1.01	1.08	0.353	3.18	27.3

4Q	DATE	SO4	NO3r	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
	20091109	21.90	0.00	2.31	15.90			2.05	1.90	0.375	7.85	92.1
	20091022	15.10	0.00	1.08	9.96			2.36	2.74	0.375	5.41	55.7
	20091115	10.50	0.00	2.20	6.79			0.68	0.55	0.375	3.76	45.3
	AVG	15.83	0.00	1.86	10.88			1.70	1.73	0.375	5.67	64.4

Liberty CSN Speciation Quarterly SANDWICH High Day Compositions

YEAR	QTR	FRMc	SO4	NO3r	NO3	NH4	OC	EC	CRUSTalt	DON	H2Oaim
2005	**1Q**	23.067	4.487	3.807	4.963	3.333	6.263	2.833	1.270	0.375	1.577
2005	**2Q**	37.700	12.720	0.000	1.013	4.787	10.467	3.823	1.587	0.336	4.347
2005	**3Q**	56.867	20.200	0.000	1.617	7.867	12.363	8.043	1.187	0.371	7.353
2005	**4Q**	55.400	8.757	0.000	1.363	6.387	17.267	11.603	2.183	0.375	3.140
2006	**1Q**	32.833	7.343	1.137	2.300	4.583	10.073	4.233	0.910	0.375	2.493
2006	**2Q**	41.033	10.033	0.000	1.740	5.023	14.333	6.223	1.557	0.375	3.597
2006	**3Q**	40.633	14.123	0.000	1.143	5.900	11.027	4.507	2.147	0.374	5.087
2006	**4Q**	32.333	6.303	0.030	1.623	4.343	11.007	5.640	1.033	0.375	2.253
2007	**1Q**	36.000	7.247	1.520	2.227	6.307	9.510	5.863	1.847	0.375	2.413
2007	**2Q**	31.667	11.917	0.000	1.257	4.920	7.748	3.898	1.823	0.375	4.270
2007	**3Q**	41.133	17.233	0.000	1.167	6.087	7.343	5.119	1.363	0.340	5.983
2007	**4Q**	34.200	8.017	0.033	1.903	5.220	8.637	7.457	2.953	0.375	2.867
2008	**1Q**	25.500	7.877	3.087	3.827	4.920	5.771	1.421	0.997	0.370	2.487
2008	**2Q**	39.767	8.700	0.000	1.703	5.513	11.175	6.361	2.180	0.375	3.117
2008	**3Q**	44.833	15.367	0.000	1.793	6.233	10.322	6.530	1.377	0.375	5.503
2008	**4Q**										
2009	**1Q**										
2009	**2Q**	23.167	7.450	0.000	1.427	3.520	5.095	2.634	1.230	0.375	2.670
2009	**3Q**	27.267	9.293	0.000	1.000	3.537	6.189	2.890	1.080	0.353	3.183
2009	**4Q**	64.367	15.833	0.000	1.863	10.883			1.730	0.375	5.673

AVGs	QTR	FRMc	SO4	NO3r	NO3	NH4	OC	EC	CRUSTalt	DON	H2Oaim	NH4r	PBWcalc	OCMmb
	1Q	29.350	6.738	2.388	3.329	4.786	7.904	3.588	1.256	0.374	2.243	3.211	2.137	9.533
	2Q	34.667	10.164	0.000	1.428	4.753	9.764	4.588	1.675	0.367	3.600	3.732	4.361	9.646
	3Q	42.147	15.243	0.000	1.344	5.925	9.449	5.418	1.431	0.363	5.422	5.527	6.585	7.443
	4Q	46.575	9.728	0.016	1.688	6.708	12.304	8.233	1.975	0.375	3.483	3.652	4.101	18.370

PBW Calculation	SO4	NO3r	NH4r
- Calculated from SO4, NO3r, and NH4r	6.738	2.388	3.211
- NH4r calculated from DON, SO4, NO3r	10.164	0.000	3.732
- DON > 0.225, low acidity equation	15.243	0.000	5.527
	9.728	0.016	3.652

S Term	N Term	A Term	Part 1	Part 2	Part 3	Sum	PBWcalc
0.546	0.194	0.260	-22746.319	-129.003	22875.495	0.173	2.137
0.731	0.000	0.269	-23601.783	-209.570	23811.667	0.314	4.361
0.734	0.000	0.266	-23320.332	-211.352	23532.002	0.317	6.585
0.726	0.001	0.273	-24067.466	-206.172	24273.945	0.306	4.101

Methodology:

- Use measured SO4 and EC
- Use retained nitrate (calculated)
- Use calculated indirect NH4 (retained) method for baseline and future
- Use crustal (alt) for other particulate PM2.5 (OPP)
- Use calculated particle bound water for baseline and future
- Degrees of Neutralization (DON) constant from base to future
- Minimum (floor) for OCMmb is equal to OC
- If OCMmb < OCfloor, then adjust species by FRMc/CFM
- Reconstructed CFM = SO4+NO3r+NH4r+H2O+EC+Cr+Pa+OCfloor

Reconstruction for Quarters with OCMmb < OCfloor

RFM	QTR	FRMc	SO4	NO3r	OC	EC	CRUSTalt	NH4r	PBWcalc	Pa	CFM	FRMc/CFM
	1Q											
	2Q	34.667	10.164	0.000	9.764	4.588	1.675	3.732	4.361	0.500	34.785	0.997
	3Q	42.147	15.243	0.000	9.449	5.418	1.431	5.527	6.585	0.500	44.153	0.955
	4Q											

Adjusted Averages

Adjusted AVGs	QTR	FRMc	SO4	NO3r	OC	EC	CRUSTalt	NH4r	PBWcalc	Pa	OCMmb
	1Q	29.350	6.738	2.388	7.904	3.588	1.256	3.211	2.137	0.500	9.533
	2Q	34.667	10.130	0.000	9.731	4.572	1.670	3.720	4.347	0.500	9.729
	3Q	42.147	14.551	0.000	9.020	5.171	1.366	5.276	6.286	0.500	8.997
	4Q	46.575	9.728	0.016	12.304	8.233	1.975	3.652	4.101	0.500	18.370

Quarterly Averages

AVGs	QTR	FRMc	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	29.350	0.500	28.850	9.533	3.588	6.738	2.388	1.256	3.211	2.137
	2Q	34.667	0.500	34.167	9.729	4.572	10.130	0.000	1.670	3.720	4.347
	3Q	42.147	0.500	41.647	8.997	5.171	14.551	0.000	1.366	5.276	6.286
	4Q	46.575	0.500	46.075	18.370	8.233	9.728	0.016	1.975	3.652	4.101

Relative Compositions (fractions of Non-Blank)

FRACT	QTR	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	1.000	0.330	0.124	0.234	0.083	0.044	0.111	0.074
	2Q	1.000	0.285	0.134	0.296	0.000	0.049	0.109	0.127
	3Q	1.000	0.216	0.124	0.349	0.000	0.033	0.127	0.151
	4Q	1.000	0.399	0.179	0.211	0.000	0.043	0.079	0.089

Liberty Quarterly SANDWICH High Day Concentrations, by Total Species

Relative Compositions (fractions of Non-Blank)

FRACT	QTR	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc	DON
	1Q	1.000	0.330	0.124	0.234	0.083	0.044	0.111	0.074	0.374
	2Q	1.000	0.285	0.134	0.296	0.000	0.049	0.109	0.127	0.367
	3Q	1.000	0.216	0.124	0.349	0.000	0.033	0.127	0.151	0.363
	4Q	1.000	0.399	0.179	0.211	0.000	0.043	0.079	0.089	0.375

Methodology:

- Apply quarterly relative compositions to each quarterly high day in 5-year period
- FRMh is FRM high day (8 per quarter)

YEAR	QTR	FRMh	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc	DON
2005	1Q	52.4	0.5	51.9	17.149	6.454	12.122	4.295	2.259	5.777	3.844	0.374
	1Q	44.7	0.5	44.2	14.604	5.497	10.324	3.658	1.924	4.920	3.274	0.374
	1Q	41.8	0.5	41.3	13.646	5.136	9.646	3.418	1.798	4.597	3.059	0.374
	1Q	37.8	0.5	37.3	12.325	4.638	8.712	3.087	1.624	4.152	2.763	0.374
	1Q	37.4	0.5	36.9	12.192	4.589	8.619	3.054	1.606	4.107	2.733	0.374
	1Q	33.4	0.5	32.9	10.871	4.091	7.684	2.723	1.432	3.662	2.437	0.374
	1Q	31.2	0.5	30.7	10.144	3.818	7.170	2.541	1.336	3.417	2.274	0.374
	1Q	31.0	0.5	30.5	10.078	3.793	7.124	2.524	1.328	3.395	2.259	0.374
2006	1Q	60.6	0.5	60.1	19.858	7.474	14.037	4.974	2.616	6.690	4.451	0.374
	1Q	51.9	0.5	51.4	16.983	6.392	12.005	4.254	2.237	5.722	3.807	0.374
	1Q	47.9	0.5	47.4	15.662	5.894	11.071	3.923	2.063	5.276	3.511	0.374
	1Q	44.7	0.5	44.2	14.604	5.497	10.324	3.658	1.924	4.920	3.274	0.374
	1Q	40.4	0.5	39.9	13.184	4.962	9.319	3.302	1.737	4.441	2.955	0.374
	1Q	36.1	0.5	35.6	11.763	4.427	8.315	2.946	1.550	3.963	2.637	0.374
	1Q	33.5	0.5	33.0	10.904	4.104	7.708	2.731	1.436	3.673	2.444	0.374
	1Q	27.7	0.5	27.2	8.987	3.382	6.353	2.251	1.184	3.028	2.015	0.374
2007	1Q	54.1	0.5	53.6	17.710	6.665	12.519	4.436	2.333	5.966	3.970	0.374
	1Q	48.1	0.5	47.6	15.728	5.919	11.118	3.939	2.072	5.299	3.525	0.374
	1Q	47.0	0.5	46.5	15.364	5.783	10.861	3.848	2.024	5.176	3.444	0.374
	1Q	46.9	0.5	46.4	15.331	5.770	10.837	3.840	2.020	5.165	3.437	0.374

	1Q	46.3	0.5	45.8	15.133	5.695	10.697	3.790	1.994	5.098	3.392	0.374
	1Q	30.2	0.5	29.7	9.813	3.693	6.937	2.458	1.293	3.306	2.200	0.374
	1Q	28.0	0.5	27.5	9.086	3.420	6.423	2.276	1.197	3.061	2.037	0.374
	1Q	26.1	0.5	25.6	8.459	3.184	5.979	2.119	1.114	2.850	1.896	0.374
2008	**1Q**	47.7	0.5	47.2	15.596	5.870	11.024	3.906	2.055	5.254	3.496	0.374
	1Q	35.8	0.5	35.3	11.664	4.390	8.245	2.921	1.537	3.929	2.614	0.374
	1Q	35.7	0.5	35.2	11.631	4.377	8.221	2.913	1.532	3.918	2.607	0.374
	1Q	34.5	0.5	34.0	11.234	4.228	7.941	2.814	1.480	3.785	2.518	0.374
	1Q	30.4	0.5	29.9	9.879	3.718	6.984	2.474	1.302	3.328	2.215	0.374
	1Q	29.4	0.5	28.9	9.549	3.594	6.750	2.392	1.258	3.217	2.140	0.374
	1Q	29.2	0.5	28.7	9.483	3.569	6.703	2.375	1.249	3.195	2.126	0.374
	1Q	28.9	0.5	28.4	9.384	3.532	6.633	2.350	1.236	3.161	2.103	0.374
2009	**1Q**	54.8	0.5	54.3	17.942	6.753	12.683	4.494	2.364	6.044	4.022	0.374
	1Q	42.2	0.5	41.7	13.778	5.186	9.740	3.451	1.815	4.642	3.088	0.374
	1Q	40.3	0.5	39.8	13.151	4.949	9.296	3.294	1.732	4.430	2.948	0.374
	1Q	35.1	0.5	34.6	11.432	4.303	8.081	2.863	1.506	3.851	2.563	0.374
	1Q	33.3	0.5	32.8	10.838	4.079	7.661	2.714	1.428	3.651	2.429	0.374
	1Q	32.5	0.5	32.0	10.573	3.979	7.474	2.648	1.393	3.562	2.370	0.374
	1Q	31.6	0.5	31.1	10.276	3.867	7.264	2.574	1.354	3.462	2.303	0.374
	1Q	27.4	0.5	26.9	8.888	3.345	6.283	2.226	1.171	2.994	1.992	0.374

YEAR	**QTR**	**FRMh**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**	**DON**
2005	**2Q**	77.8	0.5	77.3	22.011	10.345	22.917	0.000	3.777	8.415	9.834	0.367
	2Q	73.4	0.5	72.9	20.758	9.756	21.613	0.000	3.562	7.936	9.274	0.367
	2Q	69.6	0.5	69.1	19.676	9.247	20.486	0.000	3.377	7.523	8.791	0.367
	2Q	67.0	0.5	66.5	18.936	8.899	19.715	0.000	3.250	7.240	8.460	0.367
	2Q	62.2	0.5	61.7	17.569	8.257	18.292	0.000	3.015	6.717	7.849	0.367
	2Q	60.3	0.5	59.8	17.028	8.003	17.729	0.000	2.922	6.510	7.608	0.367
	2Q	59.0	0.5	58.5	16.658	7.829	17.344	0.000	2.859	6.369	7.442	0.367
	2Q	58.8	0.5	58.3	16.601	7.802	17.284	0.000	2.849	6.347	7.417	0.367
2006	**2Q**	60.1	0.5	59.6	16.971	7.976	17.670	0.000	2.913	6.488	7.582	0.367
	2Q	58.4	0.5	57.9	16.487	7.748	17.166	0.000	2.829	6.303	7.366	0.367
	2Q	54.1	0.5	53.6	15.262	7.173	15.891	0.000	2.619	5.835	6.819	0.367
	2Q	45.5	0.5	45.0	12.814	6.022	13.341	0.000	2.199	4.899	5.725	0.367
	2Q	41.8	0.5	41.3	11.760	5.527	12.244	0.000	2.018	4.496	5.254	0.367
	2Q	38.9	0.5	38.4	10.934	5.139	11.385	0.000	1.877	4.180	4.885	0.367

	2Q	38.6	0.5	38.1	10.849	5.099	11.296	0.000	1.862	4.148	4.847	0.367
	2Q	36.1	0.5	35.6	10.137	4.764	10.554	0.000	1.740	3.876	4.529	0.367
2007	**2Q**	56.5	0.5	56.0	15.946	7.494	16.603	0.000	2.737	6.096	7.124	0.367
	2Q	54.5	0.5	54.0	15.376	7.227	16.010	0.000	2.639	5.879	6.870	0.367
	2Q	54.2	0.5	53.7	15.291	7.186	15.921	0.000	2.624	5.846	6.832	0.367
	2Q	49.5	0.5	49.0	13.953	6.557	14.527	0.000	2.395	5.334	6.234	0.367
	2Q	46.1	0.5	45.6	12.984	6.102	13.519	0.000	2.228	4.964	5.801	0.367
	2Q	44.4	0.5	43.9	12.500	5.875	13.015	0.000	2.145	4.779	5.585	0.367
	2Q	44.3	0.5	43.8	12.472	5.862	12.986	0.000	2.140	4.768	5.572	0.367
	2Q	43.0	0.5	42.5	12.102	5.688	12.600	0.000	2.077	4.627	5.407	0.367
2008	**2Q**	66.9	0.5	66.4	18.907	8.886	19.686	0.000	3.245	7.229	8.447	0.367
	2Q	56.7	0.5	56.2	16.003	7.521	16.662	0.000	2.746	6.118	7.150	0.367
	2Q	56.0	0.5	55.5	15.804	7.427	16.454	0.000	2.712	6.042	7.061	0.367
	2Q	39.5	0.5	39.0	11.105	5.219	11.562	0.000	1.906	4.246	4.962	0.367
	2Q	38.2	0.5	37.7	10.735	5.045	11.177	0.000	1.842	4.104	4.796	0.367
	2Q	36.7	0.5	36.2	10.308	4.844	10.732	0.000	1.769	3.941	4.605	0.367
	2Q	36.5	0.5	36.0	10.251	4.818	10.673	0.000	1.759	3.919	4.580	0.367
	2Q	35.6	0.5	35.1	9.995	4.697	10.406	0.000	1.715	3.821	4.465	0.367
2009	**2Q**	35.0	0.5	34.5	9.824	4.617	10.228	0.000	1.686	3.756	4.389	0.367
	2Q	33.6	0.5	33.1	9.425	4.430	9.813	0.000	1.618	3.603	4.211	0.367
	2Q	33.0	0.5	32.5	9.254	4.349	9.635	0.000	1.588	3.538	4.135	0.367
	2Q	32.4	0.5	31.9	9.083	4.269	9.458	0.000	1.559	3.473	4.058	0.367
	2Q	30.7	0.5	30.2	8.599	4.042	8.954	0.000	1.476	3.288	3.842	0.367
	2Q	29.3	0.5	28.8	8.201	3.854	8.538	0.000	1.407	3.135	3.664	0.367
	2Q	28.8	0.5	28.3	8.058	3.787	8.390	0.000	1.383	3.081	3.600	0.367
	2Q	27.4	0.5	26.9	7.660	3.600	7.975	0.000	1.315	2.928	3.422	0.367

YEAR	**QTR**	**FRMh**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**	**DON**
2005	**3Q**	84.9	0.5	84.4	18.233	10.480	29.488	0.000	2.768	10.692	12.739	0.363
	3Q	70.4	0.5	69.9	15.100	8.680	24.422	0.000	2.292	8.855	10.550	0.363
	3Q	62.6	0.5	62.1	13.415	7.711	21.697	0.000	2.036	7.867	9.373	0.363
	3Q	61.7	0.5	61.2	13.221	7.600	21.382	0.000	2.007	7.753	9.237	0.363
	3Q	58.9	0.5	58.4	12.616	7.252	20.404	0.000	1.915	7.398	8.815	0.363
	3Q	58.7	0.5	58.2	12.573	7.227	20.334	0.000	1.908	7.373	8.784	0.363
	3Q	50.0	0.5	49.5	10.693	6.147	17.295	0.000	1.623	6.271	7.471	0.363
	3Q	47.8	0.5	47.3	10.218	5.873	16.526	0.000	1.551	5.992	7.139	0.363

2006	**3Q**	54.7	0.5	54.2	11.709	6.730	18.937	0.000	1.777	6.866	8.181	0.363
	3Q	50.8	0.5	50.3	10.866	6.246	17.574	0.000	1.649	6.372	7.592	0.363
	3Q	47.1	0.5	46.6	10.067	5.787	16.281	0.000	1.528	5.904	7.034	0.363
	3Q	45.4	0.5	44.9	9.700	5.575	15.687	0.000	1.472	5.688	6.777	0.363
	3Q	45.1	0.5	44.6	9.635	5.538	15.583	0.000	1.463	5.650	6.732	0.363
	3Q	44.4	0.5	43.9	9.484	5.451	15.338	0.000	1.440	5.562	6.626	0.363
	3Q	43.5	0.5	43.0	9.289	5.340	15.024	0.000	1.410	5.448	6.490	0.363
	3Q	49.9	0.5	49.4	10.672	6.134	17.260	0.000	1.620	6.258	7.456	0.363
2007	**3Q**	61.7	0.5	61.2	13.221	7.600	21.382	0.000	2.007	7.753	9.237	0.363
	3Q	58.7	0.5	58.2	12.573	7.227	20.334	0.000	1.908	7.373	8.784	0.363
	3Q	56.5	0.5	56.0	12.098	6.954	19.565	0.000	1.836	7.094	8.452	0.363
	3Q	56.2	0.5	55.7	12.033	6.917	19.461	0.000	1.826	7.056	8.407	0.363
	3Q	54.7	0.5	54.2	11.709	6.730	18.937	0.000	1.777	6.866	8.181	0.363
	3Q	54.3	0.5	53.8	11.622	6.681	18.797	0.000	1.764	6.816	8.120	0.363
	3Q	53.8	0.5	53.3	11.514	6.619	18.622	0.000	1.748	6.752	8.045	0.363
	3Q	51.0	0.5	50.5	10.909	6.271	17.644	0.000	1.656	6.398	7.622	0.363
2008	**3Q**	50.0	0.5	49.5	10.693	6.147	17.295	0.000	1.623	6.271	7.471	0.363
	3Q	49.5	0.5	49.0	10.585	6.085	17.120	0.000	1.607	6.208	7.396	0.363
	3Q	47.1	0.5	46.6	10.067	5.787	16.281	0.000	1.528	5.904	7.034	0.363
	3Q	45.1	0.5	44.6	9.635	5.538	15.583	0.000	1.463	5.650	6.732	0.363
	3Q	45.0	0.5	44.5	9.613	5.526	15.548	0.000	1.459	5.638	6.717	0.363
	3Q	44.4	0.5	43.9	9.484	5.451	15.338	0.000	1.440	5.562	6.626	0.363
	3Q	43.8	0.5	43.3	9.354	5.377	15.128	0.000	1.420	5.486	6.536	0.363
	3Q	40.2	0.5	39.7	8.576	4.930	13.871	0.000	1.302	5.029	5.992	0.363
2009	**3Q**	41.9	0.5	41.4	8.944	5.141	14.464	0.000	1.358	5.245	6.249	0.363
	3Q	33.5	0.5	33.0	7.129	4.098	11.530	0.000	1.082	4.181	4.981	0.363
	3Q	31.7	0.5	31.2	6.740	3.874	10.901	0.000	1.023	3.953	4.709	0.363
	3Q	31.1	0.5	30.6	6.610	3.800	10.691	0.000	1.003	3.877	4.619	0.363
	3Q	28.4	0.5	27.9	6.027	3.464	9.748	0.000	0.915	3.535	4.211	0.363
	3Q	28.4	0.5	27.9	6.027	3.464	9.748	0.000	0.915	3.535	4.211	0.363
	3Q	27.5	0.5	27.0	5.833	3.353	9.433	0.000	0.885	3.421	4.075	0.363
	3Q	26.9	0.5	26.4	5.703	3.278	9.224	0.000	0.866	3.345	3.985	0.363

YEAR	QTR	FRMh	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc	DON
2005	4Q	100.3	0.5	99.8	39.790	17.834	21.070	0.034	4.278	7.911	8.883	0.375
	4Q	83.1	0.5	82.6	32.932	14.760	17.439	0.028	3.541	6.548	7.352	0.375
	4Q	73.7	0.5	73.2	29.184	13.081	15.454	0.025	3.138	5.803	6.515	0.375
	4Q	68.2	0.5	67.7	26.992	12.098	14.293	0.023	2.902	5.367	6.026	0.375
	4Q	61.9	0.5	61.4	24.480	10.972	12.963	0.021	2.632	4.867	5.465	0.375
	4Q	51.2	0.5	50.7	20.214	9.060	10.704	0.017	2.173	4.019	4.513	0.375
	4Q	48.8	0.5	48.3	19.257	8.631	10.197	0.017	2.070	3.829	4.299	0.375
	4Q	48.3	0.5	47.8	19.058	8.542	10.092	0.016	2.049	3.789	4.254	0.375
2006	4Q	100.7	0.5	100.2	39.949	17.905	21.155	0.034	4.295	7.943	8.918	0.375
	4Q	82.1	0.5	81.6	32.533	14.582	17.228	0.028	3.498	6.469	7.263	0.375
	4Q	68.0	0.5	67.5	26.912	12.062	14.251	0.023	2.893	5.351	6.008	0.375
	4Q	58.9	0.5	58.4	23.284	10.436	12.330	0.020	2.503	4.629	5.198	0.375
	4Q	55.7	0.5	55.2	22.008	9.864	11.654	0.019	2.366	4.376	4.913	0.375
	4Q	50.8	0.5	50.3	20.054	8.988	10.619	0.017	2.156	3.987	4.477	0.375
	4Q	50.7	0.5	50.2	20.014	8.971	10.598	0.017	2.152	3.979	4.468	0.375
	4Q	48.3	0.5	47.8	19.058	8.542	10.092	0.016	2.049	3.789	4.254	0.375
2007	4Q	58.7	0.5	58.2	23.204	10.400	12.287	0.020	2.495	4.614	5.180	0.375
	4Q	58.0	0.5	57.5	22.925	10.275	12.140	0.020	2.465	4.558	5.118	0.375
	4Q	45.8	0.5	45.3	18.061	8.095	9.564	0.016	1.942	3.591	4.032	0.375
	4Q	41.7	0.5	41.2	16.426	7.362	8.698	0.014	1.766	3.266	3.667	0.375
	4Q	40.3	0.5	39.8	15.868	7.112	8.403	0.014	1.706	3.155	3.542	0.375
	4Q	40.3	0.5	39.8	15.868	7.112	8.403	0.014	1.706	3.155	3.542	0.375
	4Q	39.7	0.5	39.2	15.629	7.005	8.276	0.013	1.680	3.107	3.489	0.375
	4Q	35.2	0.5	34.7	13.835	6.201	7.326	0.012	1.487	2.751	3.089	0.375
2008	4Q	70.8	0.5	70.3	28.028	12.562	14.842	0.024	3.013	5.573	6.257	0.375
	4Q	63.2	0.5	62.7	24.998	11.204	13.237	0.022	2.688	4.970	5.581	0.375
	4Q	62.7	0.5	62.2	24.799	11.115	13.132	0.021	2.666	4.931	5.536	0.375
	4Q	55.1	0.5	54.6	21.769	9.757	11.527	0.019	2.340	4.328	4.860	0.375
	4Q	40.2	0.5	39.7	15.828	7.094	8.382	0.014	1.702	3.147	3.534	0.375
	4Q	39.6	0.5	39.1	15.589	6.987	8.255	0.013	1.676	3.099	3.480	0.375
	4Q	37.4	0.5	36.9	14.712	6.594	7.790	0.013	1.582	2.925	3.284	0.375
	4Q	35.1	0.5	34.6	13.795	6.183	7.305	0.012	1.483	2.743	3.080	0.375
2009	4Q	92.1	0.5	91.6	36.520	16.369	19.339	0.031	3.926	7.261	8.153	0.375
	4Q	59.2	0.5	58.7	23.403	10.490	12.393	0.020	2.516	4.653	5.225	0.375
	4Q	55.7	0.5	55.2	22.008	9.864	11.654	0.019	2.366	4.376	4.913	0.375

4Q	49.9	0.5	49.4	19.695	8.828	10.429	0.017	2.118	3.916	4.397	0.375
4Q	46.2	0.5	45.7	18.220	8.166	9.648	0.016	1.959	3.623	4.068	0.375
4Q	45.3	0.5	44.8	17.861	8.006	9.458	0.015	1.920	3.551	3.987	0.375
4Q	40.6	0.5	40.1	15.988	7.166	8.466	0.014	1.719	3.179	3.569	0.375
4Q	35.9	0.5	35.4	14.114	6.326	7.474	0.012	1.517	2.806	3.151	0.375

Liberty SMAT RRFs and Future High Day Calculations, by Total Species

Methodology:

- Use measured SO4 and EC
- Use retained nitrate (calculated)
- Use calculated indirect NH4 (retained) method for baseline and future
- Use calculated particle bound water for baseline and future
- Degrees of Neutralization (DON) constant from base to future

CAMx Modeled Species - High Day Total Base (as ranked without regional OTHER)

2007	TOA	EC	SO4	NO3	OTHER
1Q	7.679	3.399	6.308	3.981	11.800
2Q	1.549	1.806	12.198	0.137	8.104
3Q	1.628	1.993	16.973	0.031	9.339
4Q	12.104	4.428	7.795	5.832	16.153
2014	**TOA**	**EC**	**SO4**	**NO3**	**OTHER**
1Q	6.110	1.649	4.488	3.834	9.622
2Q	1.277	1.108	4.906	0.595	6.541
3Q	1.294	1.352	5.677	0.081	8.590
4Q	9.931	2.069	4.752	4.471	13.415

RRFs (Future Projected divided by Baseline)

RRF	TOA	EC	SO4	NO3	OTHER
1Q	0.796	0.485	0.712	0.963	0.815
2Q	0.824	0.614	0.402	4.326	0.807
3Q	0.795	0.678	0.334	2.600	0.920
4Q	0.820	0.467	0.610	0.767	0.830

					2007								2014					
YEAR	**QTR**	**FRMh**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**	**DON**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**
2005	**1Q**	52.4	0.5	51.9	17.149	6.454	12.122	4.295	2.259	5.777	3.844	0.374	13.645	3.131	8.625	4.136	1.842	4.424
2005	**1Q**	44.7	0.5	44.2	14.604	5.497	10.324	3.658	1.924	4.920	3.274	0.374	11.621	2.667	7.345	3.522	1.569	3.767
2005	**1Q**	41.8	0.5	41.3	13.646	5.136	9.646	3.418	1.798	4.597	3.059	0.374	10.858	2.492	6.863	3.291	1.466	3.520
2005	**1Q**	37.8	0.5	37.3	12.325	4.638	8.712	3.087	1.624	4.152	2.763	0.374	9.807	2.250	6.199	2.972	1.324	3.179
2005	**1Q**	37.4	0.5	36.9	12.192	4.589	8.619	3.054	1.606	4.107	2.733	0.374	9.701	2.226	6.132	2.941	1.310	3.145
2005	**1Q**	33.4	0.5	32.9	10.871	4.091	7.684	2.723	1.432	3.662	2.437	0.374	8.650	1.985	5.467	2.622	1.168	2.804
2005	**1Q**	31.2	0.5	30.7	10.144	3.818	7.170	2.541	1.336	3.417	2.274	0.374	8.071	1.852	5.102	2.446	1.090	2.617
2005	**1Q**	31.0	0.5	30.5	10.078	3.793	7.124	2.524	1.328	3.395	2.259	0.374	8.019	1.840	5.069	2.431	1.083	2.600
2006	**1Q**	60.6	0.5	60.1	19.858	7.474	14.037	4.974	2.616	6.690	4.451	0.374	15.801	3.626	9.988	4.789	2.133	5.123
2006	**1Q**	51.9	0.5	51.4	16.983	6.392	12.005	4.254	2.237	5.722	3.807	0.374	13.514	3.101	8.542	4.096	1.825	4.381
2006	**1Q**	47.9	0.5	47.4	15.662	5.894	11.071	3.923	2.063	5.276	3.511	0.374	12.462	2.860	7.877	3.777	1.683	4.040
2006	**1Q**	44.7	0.5	44.2	14.604	5.497	10.324	3.658	1.924	4.920	3.274	0.374	11.621	2.667	7.345	3.522	1.569	3.767
2006	**1Q**	40.4	0.5	39.9	13.184	4.962	9.319	3.302	1.737	4.441	2.955	0.374	10.490	2.407	6.631	3.180	1.416	3.401
2006	**1Q**	36.1	0.5	35.6	11.763	4.427	8.315	2.946	1.550	3.963	2.637	0.374	9.360	2.148	5.916	2.837	1.264	3.034
2006	**1Q**	33.5	0.5	33.0	10.904	4.104	7.708	2.731	1.436	3.673	2.444	0.374	8.676	1.991	5.484	2.630	1.171	2.813
2006	**1Q**	27.7	0.5	27.2	8.987	3.382	6.353	2.251	1.184	3.028	2.015	0.374	7.151	1.641	4.520	2.168	0.965	2.318
2007	**1Q**	54.1	0.5	53.6	17.710	6.665	12.519	4.436	2.333	5.966	3.970	0.374	14.092	3.234	8.907	4.271	1.903	4.569
2007	**1Q**	48.1	0.5	47.6	15.728	5.919	11.118	3.939	2.072	5.299	3.525	0.374	12.514	2.872	7.910	3.793	1.690	4.057
2007	**1Q**	47.0	0.5	46.5	15.364	5.783	10.861	3.848	2.024	5.176	3.444	0.374	12.225	2.805	7.728	3.706	1.651	3.963
2007	**1Q**	46.9	0.5	46.4	15.331	5.770	10.837	3.840	2.020	5.165	3.437	0.374	12.199	2.799	7.711	3.698	1.647	3.955
2007	**1Q**	46.3	0.5	45.8	15.133	5.695	10.697	3.790	1.994	5.098	3.392	0.374	12.041	2.763	7.611	3.650	1.626	3.904
2007	**1Q**	30.2	0.5	29.7	9.813	3.693	6.937	2.458	1.293	3.306	2.200	0.374	7.808	1.792	4.936	2.367	1.054	2.531
2007	**1Q**	28.0	0.5	27.5	9.086	3.420	6.423	2.276	1.197	3.061	2.037	0.374	7.230	1.659	4.570	2.191	0.976	2.344
2007	**1Q**	26.1	0.5	25.6	8.459	3.184	5.979	2.119	1.114	2.850	1.896	0.374	6.730	1.544	4.254	2.040	0.909	2.182
2008	**1Q**	47.7	0.5	47.2	15.596	5.870	11.024	3.906	2.055	5.254	3.496	0.374	12.409	2.848	7.844	3.761	1.675	4.023
2008	**1Q**	35.8	0.5	35.3	11.664	4.390	8.245	2.921	1.537	3.929	2.614	0.374	9.281	2.130	5.866	2.813	1.253	3.009
2008	**1Q**	35.7	0.5	35.2	11.631	4.377	8.221	2.913	1.532	3.918	2.607	0.374	9.254	2.124	5.850	2.805	1.249	3.000
2008	**1Q**	34.5	0.5	34.0	11.234	4.228	7.941	2.814	1.480	3.785	2.518	0.374	8.939	2.051	5.650	2.709	1.207	2.898
2008	**1Q**	30.4	0.5	29.9	9.879	3.718	6.984	2.474	1.302	3.328	2.215	0.374	7.861	1.804	4.969	2.383	1.061	2.549
2008	**1Q**	29.4	0.5	28.9	9.549	3.594	6.750	2.392	1.258	3.217	2.140	0.374	7.598	1.744	4.803	2.303	1.026	2.463
2008	**1Q**	29.2	0.5	28.7	9.483	3.569	6.703	2.375	1.249	3.195	2.126	0.374	7.545	1.731	4.769	2.287	1.019	2.446
2008	**1Q**	28.9	0.5	28.4	9.384	3.532	6.633	2.350	1.236	3.161	2.103	0.374	7.467	1.713	4.720	2.263	1.008	2.421
2009	**1Q**	54.8	0.5	54.3	17.942	6.753	12.683	4.494	2.364	6.044	4.022	0.374	14.276	3.276	9.024	4.327	1.927	4.628
2009	**1Q**	42.2	0.5	41.7	13.778	5.186	9.740	3.451	1.815	4.642	3.088	0.374	10.963	2.516	6.930	3.323	1.480	3.554

2009	**1Q**	40.3	0.5	39.8	13.151	4.949	9.296	3.294	1.732	4.430	2.948	0.374	10.464	2.401	6.614	3.172	1.413	3.392
2009	**1Q**	35.1	0.5	34.6	11.432	4.303	8.081	2.863	1.506	3.851	2.563	0.374	9.097	2.087	5.750	2.757	1.228	2.949
2009	**1Q**	33.3	0.5	32.8	10.838	4.079	7.661	2.714	1.428	3.651	2.429	0.374	8.623	1.979	5.451	2.614	1.164	2.796
2009	**1Q**	32.5	0.5	32.0	10.573	3.979	7.474	2.648	1.393	3.562	2.370	0.374	8.413	1.931	5.318	2.550	1.136	2.728
2009	**1Q**	31.6	0.5	31.1	10.276	3.867	7.264	2.574	1.354	3.462	2.303	0.374	8.176	1.876	5.168	2.478	1.104	2.651
2009	**1Q**	27.4	0.5	26.9	8.888	3.345	6.283	2.226	1.171	2.994	1.992	0.374	7.072	1.623	4.470	2.144	0.955	2.293

					2007								**2014**					
YEAR	**QTR**	**FRMh**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**	**DON**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**
2005	**2Q**	77.8	0.5	77.3	22.011	10.345	22.917	0.000	3.777	8.415	9.834	0.367	18.139	6.347	9.217	0.000	3.049	3.385
2005	**2Q**	73.4	0.5	72.9	20.758	9.756	21.613	0.000	3.562	7.936	9.274	0.367	17.106	5.986	8.693	0.000	2.875	3.192
2005	**2Q**	69.6	0.5	69.1	19.676	9.247	20.486	0.000	3.377	7.523	8.791	0.367	16.214	5.674	8.239	0.000	2.725	3.026
2005	**2Q**	67.0	0.5	66.5	18.936	8.899	19.715	0.000	3.250	7.240	8.460	0.367	15.604	5.460	7.929	0.000	2.623	2.912
2005	**2Q**	62.2	0.5	61.7	17.569	8.257	18.292	0.000	3.015	6.717	7.849	0.367	14.478	5.066	7.357	0.000	2.433	2.702
2005	**2Q**	60.3	0.5	59.8	17.028	8.003	17.729	0.000	2.922	6.510	7.608	0.367	14.032	4.910	7.131	0.000	2.358	2.618
2005	**2Q**	59.0	0.5	58.5	16.658	7.829	17.344	0.000	2.859	6.369	7.442	0.367	13.727	4.803	6.975	0.000	2.307	2.561
2005	**2Q**	58.8	0.5	58.3	16.601	7.802	17.284	0.000	2.849	6.347	7.417	0.367	13.680	4.787	6.952	0.000	2.299	2.553
2006	**2Q**	60.1	0.5	59.6	16.971	7.976	17.670	0.000	2.913	6.488	7.582	0.367	13.985	4.894	7.107	0.000	2.351	2.610
2006	**2Q**	58.4	0.5	57.9	16.487	7.748	17.166	0.000	2.829	6.303	7.366	0.367	13.586	4.754	6.904	0.000	2.284	2.535
2006	**2Q**	54.1	0.5	53.6	15.262	7.173	15.891	0.000	2.619	5.835	6.819	0.367	12.577	4.401	6.391	0.000	2.114	2.347
2006	**2Q**	45.5	0.5	45.0	12.814	6.022	13.341	0.000	2.199	4.899	5.725	0.367	10.559	3.695	5.366	0.000	1.775	1.970
2006	**2Q**	41.8	0.5	41.3	11.760	5.527	12.244	0.000	2.018	4.496	5.254	0.367	9.691	3.391	4.925	0.000	1.629	1.808
2006	**2Q**	38.9	0.5	38.4	10.934	5.139	11.385	0.000	1.877	4.180	4.885	0.367	9.011	3.153	4.579	0.000	1.514	1.681
2006	**2Q**	38.6	0.5	38.1	10.849	5.099	11.296	0.000	1.862	4.148	4.847	0.367	8.940	3.128	4.543	0.000	1.503	1.668
2006	**2Q**	36.1	0.5	35.6	10.137	4.764	10.554	0.000	1.740	3.876	4.529	0.367	8.354	2.923	4.245	0.000	1.404	1.559
2007	**2Q**	56.5	0.5	56.0	15.946	7.494	16.603	0.000	2.737	6.096	7.124	0.367	13.141	4.598	6.677	0.000	2.209	2.452
2007	**2Q**	54.5	0.5	54.0	15.376	7.227	16.010	0.000	2.639	5.879	6.870	0.367	12.671	4.434	6.439	0.000	2.130	2.364
2007	**2Q**	54.2	0.5	53.7	15.291	7.186	15.921	0.000	2.624	5.846	6.832	0.367	12.601	4.409	6.403	0.000	2.118	2.351
2007	**2Q**	49.5	0.5	49.0	13.953	6.557	14.527	0.000	2.395	5.334	6.234	0.367	11.498	4.023	5.843	0.000	1.933	2.145
2007	**2Q**	46.1	0.5	45.6	12.984	6.102	13.519	0.000	2.228	4.964	5.801	0.367	10.700	3.744	5.437	0.000	1.798	1.997
2007	**2Q**	44.4	0.5	43.9	12.500	5.875	13.015	0.000	2.145	4.779	5.585	0.367	10.301	3.605	5.235	0.000	1.731	1.922
2007	**2Q**	44.3	0.5	43.8	12.472	5.862	12.986	0.000	2.140	4.768	5.572	0.367	10.278	3.596	5.223	0.000	1.727	1.918
2007	**2Q**	43.0	0.5	42.5	12.102	5.688	12.600	0.000	2.077	4.627	5.407	0.367	9.973	3.490	5.068	0.000	1.676	1.861
2008	**2Q**	66.9	0.5	66.4	18.907	8.886	19.686	0.000	3.245	7.229	8.447	0.367	15.581	5.452	7.917	0.000	2.619	2.907
2008	**2Q**	56.7	0.5	56.2	16.003	7.521	16.662	0.000	2.746	6.118	7.150	0.367	13.187	4.615	6.701	0.000	2.216	2.461
2008	**2Q**	56.0	0.5	55.5	15.804	7.427	16.454	0.000	2.712	6.042	7.061	0.367	13.023	4.557	6.618	0.000	2.189	2.430

2008	**2Q**	39.5	0.5	39.0	11.105	5.219	11.562	0.000	1.906	4.246	4.962	0.367	9.151	3.202	4.650	0.000	1.538	1.708
2008	**2Q**	38.2	0.5	37.7	10.735	5.045	11.177	0.000	1.842	4.104	4.796	0.367	8.846	3.096	4.495	0.000	1.487	1.651
2008	**2Q**	36.7	0.5	36.2	10.308	4.844	10.732	0.000	1.769	3.941	4.605	0.367	8.494	2.972	4.316	0.000	1.428	1.585
2008	**2Q**	36.5	0.5	36.0	10.251	4.818	10.673	0.000	1.759	3.919	4.580	0.367	8.447	2.956	4.293	0.000	1.420	1.576
2008	**2Q**	35.6	0.5	35.1	9.995	4.697	10.406	0.000	1.715	3.821	4.465	0.367	8.236	2.882	4.185	0.000	1.384	1.537
2009	**2Q**	35.0	0.5	34.5	9.824	4.617	10.228	0.000	1.686	3.756	4.389	0.367	8.095	2.833	4.114	0.000	1.361	1.511
2009	**2Q**	33.6	0.5	33.1	9.425	4.430	9.813	0.000	1.618	3.603	4.211	0.367	7.767	2.718	3.947	0.000	1.305	1.449
2009	**2Q**	33.0	0.5	32.5	9.254	4.349	9.635	0.000	1.588	3.538	4.135	0.367	7.626	2.669	3.875	0.000	1.282	1.423
2009	**2Q**	32.4	0.5	31.9	9.083	4.269	9.458	0.000	1.559	3.473	4.058	0.367	7.485	2.619	3.804	0.000	1.258	1.397
2009	**2Q**	30.7	0.5	30.2	8.599	4.042	8.954	0.000	1.476	3.288	3.842	0.367	7.086	2.480	3.601	0.000	1.191	1.322
2009	**2Q**	29.3	0.5	28.8	8.201	3.854	8.538	0.000	1.407	3.135	3.664	0.367	6.758	2.365	3.434	0.000	1.136	1.261
2009	**2Q**	28.8	0.5	28.3	8.058	3.787	8.390	0.000	1.383	3.081	3.600	0.367	6.641	2.324	3.374	0.000	1.116	1.239
2009	**2Q**	27.4	0.5	26.9	7.660	3.600	7.975	0.000	1.315	2.928	3.422	0.367	6.312	2.209	3.208	0.000	1.061	1.178

					2007								**2014**					
YEAR	**QTR**	**FRMh**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**	**DON**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**
2005	**3Q**	84.9	0.5	84.4	18.233	10.480	29.488	0.000	2.768	10.692	12.739	0.363	14.489	7.108	9.863	0.000	2.546	3.576
2005	**3Q**	70.4	0.5	69.9	15.100	8.680	24.422	0.000	2.292	8.855	10.550	0.363	11.999	5.887	8.168	0.000	2.108	2.962
2005	**3Q**	62.6	0.5	62.1	13.415	7.711	21.697	0.000	2.036	7.867	9.373	0.363	10.660	5.230	7.257	0.000	1.873	2.631
2005	**3Q**	61.7	0.5	61.2	13.221	7.600	21.382	0.000	2.007	7.753	9.237	0.363	10.506	5.154	7.152	0.000	1.846	2.593
2005	**3Q**	58.9	0.5	58.4	12.616	7.252	20.404	0.000	1.915	7.398	8.815	0.363	10.025	4.919	6.825	0.000	1.761	2.475
2005	**3Q**	58.7	0.5	58.2	12.573	7.227	20.334	0.000	1.908	7.373	8.784	0.363	9.991	4.902	6.801	0.000	1.755	2.466
2005	**3Q**	50.0	0.5	49.5	10.693	6.147	17.295	0.000	1.623	6.271	7.471	0.363	8.497	4.169	5.785	0.000	1.493	2.097
2005	**3Q**	47.8	0.5	47.3	10.218	5.873	16.526	0.000	1.551	5.992	7.139	0.363	8.120	3.984	5.527	0.000	1.427	2.004
2006	**3Q**	54.7	0.5	54.2	11.709	6.730	18.937	0.000	1.777	6.866	8.181	0.363	9.304	4.565	6.334	0.000	1.635	2.297
2006	**3Q**	50.8	0.5	50.3	10.866	6.246	17.574	0.000	1.649	6.372	7.592	0.363	8.635	4.236	5.878	0.000	1.517	2.131
2006	**3Q**	47.1	0.5	46.6	10.067	5.787	16.281	0.000	1.528	5.904	7.034	0.363	8.000	3.925	5.446	0.000	1.406	1.975
2006	**3Q**	45.4	0.5	44.9	9.700	5.575	15.687	0.000	1.472	5.688	6.777	0.363	7.708	3.782	5.247	0.000	1.354	1.903
2006	**3Q**	45.1	0.5	44.6	9.635	5.538	15.583	0.000	1.463	5.650	6.732	0.363	7.656	3.756	5.212	0.000	1.345	1.890
2006	**3Q**	44.4	0.5	43.9	9.484	5.451	15.338	0.000	1.440	5.562	6.626	0.363	7.536	3.697	5.130	0.000	1.324	1.860
2006	**3Q**	43.5	0.5	43.0	9.289	5.340	15.024	0.000	1.410	5.448	6.490	0.363	7.382	3.622	5.025	0.000	1.297	1.822
2006	**3Q**	49.9	0.5	49.4	10.672	6.134	17.260	0.000	1.620	6.258	7.456	0.363	8.480	4.161	5.773	0.000	1.490	2.093
2007	**3Q**	61.7	0.5	61.2	13.221	7.600	21.382	0.000	2.007	7.753	9.237	0.363	10.506	5.154	7.152	0.000	1.846	2.593
2007	**3Q**	58.7	0.5	58.2	12.573	7.227	20.334	0.000	1.908	7.373	8.784	0.363	9.991	4.902	6.801	0.000	1.755	2.466
2007	**3Q**	56.5	0.5	56.0	12.098	6.954	19.565	0.000	1.836	7.094	8.452	0.363	9.613	4.716	6.544	0.000	1.689	2.373
2007	**3Q**	56.2	0.5	55.7	12.033	6.917	19.461	0.000	1.826	7.056	8.407	0.363	9.562	4.691	6.509	0.000	1.680	2.360

2007	**3Q**	54.7	0.5	54.2	11.709	6.730	18.937	0.000	1.777	6.866	8.181	0.363	9.304	4.565	6.334	0.000	1.635	2.297
2007	**3Q**	54.3	0.5	53.8	11.622	6.681	18.797	0.000	1.764	6.816	8.120	0.363	9.236	4.531	6.287	0.000	1.623	2.280
2007	**3Q**	53.8	0.5	53.3	11.514	6.619	18.622	0.000	1.748	6.752	8.045	0.363	9.150	4.489	6.229	0.000	1.608	2.258
2007	**3Q**	51.0	0.5	50.5	10.909	6.271	17.644	0.000	1.656	6.398	7.622	0.363	8.669	4.253	5.901	0.000	1.523	2.140
2008	**3Q**	50.0	0.5	49.5	10.693	6.147	17.295	0.000	1.623	6.271	7.471	0.363	8.497	4.169	5.785	0.000	1.493	2.097
2008	**3Q**	49.5	0.5	49.0	10.585	6.085	17.120	0.000	1.607	6.208	7.396	0.363	8.412	4.127	5.726	0.000	1.478	2.076
2008	**3Q**	47.1	0.5	46.6	10.067	5.787	16.281	0.000	1.528	5.904	7.034	0.363	8.000	3.925	5.446	0.000	1.406	1.975
2008	**3Q**	45.1	0.5	44.6	9.635	5.538	15.583	0.000	1.463	5.650	6.732	0.363	7.656	3.756	5.212	0.000	1.345	1.890
2008	**3Q**	45.0	0.5	44.5	9.613	5.526	15.548	0.000	1.459	5.638	6.717	0.363	7.639	3.748	5.200	0.000	1.342	1.886
2008	**3Q**	44.4	0.5	43.9	9.484	5.451	15.338	0.000	1.440	5.562	6.626	0.363	7.536	3.697	5.130	0.000	1.324	1.860
2008	**3Q**	43.8	0.5	43.3	9.354	5.377	15.128	0.000	1.420	5.486	6.536	0.363	7.433	3.647	5.060	0.000	1.306	1.835
2008	**3Q**	40.2	0.5	39.7	8.576	4.930	13.871	0.000	1.302	5.029	5.992	0.363	6.815	3.344	4.639	0.000	1.197	1.682
2009	**3Q**	41.9	0.5	41.4	8.944	5.141	14.464	0.000	1.358	5.245	6.249	0.363	7.107	3.487	4.838	0.000	1.249	1.754
2009	**3Q**	33.5	0.5	33.0	7.129	4.098	11.530	0.000	1.082	4.181	4.981	0.363	5.665	2.779	3.856	0.000	0.995	1.398
2009	**3Q**	31.7	0.5	31.2	6.740	3.874	10.901	0.000	1.023	3.953	4.709	0.363	5.356	2.628	3.646	0.000	0.941	1.322
2009	**3Q**	31.1	0.5	30.6	6.610	3.800	10.691	0.000	1.003	3.877	4.619	0.363	5.253	2.577	3.576	0.000	0.923	1.297
2009	**3Q**	28.4	0.5	27.9	6.027	3.464	9.748	0.000	0.915	3.535	4.211	0.363	4.789	2.350	3.260	0.000	0.841	1.182
2009	**3Q**	28.4	0.5	27.9	6.027	3.464	9.748	0.000	0.915	3.535	4.211	0.363	4.789	2.350	3.260	0.000	0.841	1.182
2009	**3Q**	27.5	0.5	27.0	5.833	3.353	9.433	0.000	0.885	3.421	4.075	0.363	4.635	2.274	3.155	0.000	0.814	1.144
2009	**3Q**	26.9	0.5	26.4	5.703	3.278	9.224	0.000	0.866	3.345	3.985	0.363	4.532	2.223	3.085	0.000	0.796	1.119

					2007								**2014**					
YEAR	**QTR**	**FRMh**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**	**DON**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**
2005	**4Q**	100.3	0.5	99.8	39.790	17.834	21.070	0.034	4.278	7.911	8.883	0.375	32.645	8.332	12.846	0.026	3.553	4.825
2005	**4Q**	83.1	0.5	82.6	32.932	14.760	17.439	0.028	3.541	6.548	7.352	0.375	27.019	6.896	10.632	0.022	2.940	3.993
2005	**4Q**	73.7	0.5	73.2	29.184	13.081	15.454	0.025	3.138	5.803	6.515	0.375	23.944	6.112	9.422	0.019	2.606	3.539
2005	**4Q**	68.2	0.5	67.7	26.992	12.098	14.293	0.023	2.902	5.367	6.026	0.375	22.145	5.652	8.714	0.018	2.410	3.273
2005	**4Q**	61.9	0.5	61.4	24.480	10.972	12.963	0.021	2.632	4.867	5.465	0.375	20.084	5.126	7.903	0.016	2.186	2.968
2005	**4Q**	51.2	0.5	50.7	20.214	9.060	10.704	0.017	2.173	4.019	4.513	0.375	16.584	4.233	6.526	0.013	1.805	2.451
2005	**4Q**	48.8	0.5	48.3	19.257	8.631	10.197	0.017	2.070	3.829	4.299	0.375	15.799	4.033	6.217	0.013	1.719	2.335
2005	**4Q**	48.3	0.5	47.8	19.058	8.542	10.092	0.016	2.049	3.789	4.254	0.375	15.635	3.991	6.153	0.013	1.702	2.311
2006	**4Q**	100.7	0.5	100.2	39.949	17.905	21.155	0.034	4.295	7.943	8.918	0.375	32.776	8.366	12.897	0.026	3.567	4.844
2006	**4Q**	82.1	0.5	81.6	32.533	14.582	17.228	0.028	3.498	6.469	7.263	0.375	26.691	6.813	10.503	0.021	2.905	3.945
2006	**4Q**	68.0	0.5	67.5	26.912	12.062	14.251	0.023	2.893	5.351	6.008	0.375	22.079	5.636	8.688	0.018	2.403	3.263
2006	**4Q**	58.9	0.5	58.4	23.284	10.436	12.330	0.020	2.503	4.629	5.198	0.375	19.103	4.876	7.517	0.015	2.079	2.823
2006	**4Q**	55.7	0.5	55.2	22.008	9.864	11.654	0.019	2.366	4.376	4.913	0.375	18.056	4.609	7.105	0.015	1.965	2.669

2006	**4Q**	50.8	0.5	50.3	20.054	8.988	10.619	0.017	2.156	3.987	4.477	0.375	16.453	4.200	6.474	0.013	1.791	2.432
2006	**4Q**	50.7	0.5	50.2	20.014	8.971	10.598	0.017	2.152	3.979	4.468	0.375	16.420	4.191	6.461	0.013	1.787	2.427
2006	**4Q**	48.3	0.5	47.8	19.058	8.542	10.092	0.016	2.049	3.789	4.254	0.375	15.635	3.991	6.153	0.013	1.702	2.311
2007	**4Q**	58.7	0.5	58.2	23.204	10.400	12.287	0.020	2.495	4.614	5.180	0.375	19.037	4.859	7.491	0.015	2.072	2.814
2007	**4Q**	58.0	0.5	57.5	22.925	10.275	12.140	0.020	2.465	4.558	5.118	0.375	18.808	4.801	7.401	0.015	2.047	2.780
2007	**4Q**	45.8	0.5	45.3	18.061	8.095	9.564	0.016	1.942	3.591	4.032	0.375	14.818	3.782	5.831	0.012	1.613	2.190
2007	**4Q**	41.7	0.5	41.2	16.426	7.362	8.698	0.014	1.766	3.266	3.667	0.375	13.477	3.440	5.303	0.011	1.467	1.992
2007	**4Q**	40.3	0.5	39.8	15.868	7.112	8.403	0.014	1.706	3.155	3.542	0.375	13.019	3.323	5.123	0.010	1.417	1.924
2007	**4Q**	40.3	0.5	39.8	15.868	7.112	8.403	0.014	1.706	3.155	3.542	0.375	13.019	3.323	5.123	0.010	1.417	1.924
2007	**4Q**	39.7	0.5	39.2	15.629	7.005	8.276	0.013	1.680	3.107	3.489	0.375	12.822	3.273	5.046	0.010	1.395	1.895
2007	**4Q**	35.2	0.5	34.7	13.835	6.201	7.326	0.012	1.487	2.751	3.089	0.375	11.350	2.897	4.466	0.009	1.235	1.678
2008	**4Q**	70.8	0.5	70.3	28.028	12.562	14.842	0.024	3.013	5.573	6.257	0.375	22.995	5.869	9.049	0.019	2.503	3.399
2008	**4Q**	63.2	0.5	62.7	24.998	11.204	13.237	0.022	2.688	4.970	5.581	0.375	20.509	5.235	8.070	0.017	2.232	3.031
2008	**4Q**	62.7	0.5	62.2	24.799	11.115	13.132	0.021	2.666	4.931	5.536	0.375	20.346	5.193	8.006	0.016	2.214	3.007
2008	**4Q**	55.1	0.5	54.6	21.769	9.757	11.527	0.019	2.340	4.328	4.860	0.375	17.860	4.559	7.028	0.014	1.944	2.640
2008	**4Q**	40.2	0.5	39.7	15.828	7.094	8.382	0.014	1.702	3.147	3.534	0.375	12.986	3.315	5.110	0.010	1.413	1.919
2008	**4Q**	39.6	0.5	39.1	15.589	6.987	8.255	0.013	1.676	3.099	3.480	0.375	12.790	3.264	5.033	0.010	1.392	1.890
2008	**4Q**	37.4	0.5	36.9	14.712	6.594	7.790	0.013	1.582	2.925	3.284	0.375	12.070	3.081	4.750	0.010	1.314	1.784
2008	**4Q**	35.1	0.5	34.6	13.795	6.183	7.305	0.012	1.483	2.743	3.080	0.375	11.318	2.889	4.454	0.009	1.232	1.673
2009	**4Q**	92.1	0.5	91.6	36.520	16.369	19.339	0.031	3.926	7.261	8.153	0.375	29.962	7.648	11.790	0.024	3.261	4.428
2009	**4Q**	59.2	0.5	58.7	23.403	10.490	12.393	0.020	2.516	4.653	5.225	0.375	19.201	4.901	7.556	0.015	2.090	2.838
2009	**4Q**	55.7	0.5	55.2	22.008	9.864	11.654	0.019	2.366	4.376	4.913	0.375	18.056	4.609	7.105	0.015	1.965	2.669
2009	**4Q**	49.9	0.5	49.4	19.695	8.828	10.429	0.017	2.118	3.916	4.397	0.375	16.159	4.124	6.358	0.013	1.759	2.388
2009	**4Q**	46.2	0.5	45.7	18.220	8.166	9.648	0.016	1.959	3.623	4.068	0.375	14.949	3.816	5.882	0.012	1.627	2.209
2009	**4Q**	45.3	0.5	44.8	17.861	8.006	9.458	0.015	1.920	3.551	3.987	0.375	14.654	3.740	5.766	0.012	1.595	2.166
2009	**4Q**	40.6	0.5	40.1	15.988	7.166	8.466	0.014	1.719	3.179	3.569	0.375	13.117	3.348	5.161	0.011	1.427	1.939
2009	**4Q**	35.9	0.5	35.4	14.114	6.326	7.474	0.012	1.517	2.806	3.151	0.375	11.579	2.956	4.556	0.009	1.260	1.711

		2014										
YEAR	**QTR**	**SO4**	**NO3r**	**NH4r**	**S Term**	**N Term**	**A Term**	**Part 1**	**Part 2**	**Part 3**	**Sum**	**PBW Total**
2005	**1Q**	8.625	4.136	4.424	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	2.654
2005	**1Q**	7.345	3.522	3.767	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	2.260
2005	**1Q**	6.863	3.291	3.520	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	2.112
2005	**1Q**	6.199	2.972	3.179	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.907
2005	**1Q**	6.132	2.941	3.145	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.887
2005	**1Q**	5.467	2.622	2.804	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.682

2005	**1Q**	5.102	2.446	2.617	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.570
2005	**1Q**	5.069	2.431	2.600	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.559
2006	**1Q**	9.988	4.789	5.123	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	3.073
2006	**1Q**	8.542	4.096	4.381	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	2.628
2006	**1Q**	7.877	3.777	4.040	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	2.424
2006	**1Q**	7.345	3.522	3.767	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	2.260
2006	**1Q**	6.631	3.180	3.401	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	2.040
2006	**1Q**	5.916	2.837	3.034	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.820
2006	**1Q**	5.484	2.630	2.813	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.687
2006	**1Q**	4.520	2.168	2.318	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.391
2007	**1Q**	8.907	4.271	4.569	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	2.741
2007	**1Q**	7.910	3.793	4.057	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	2.434
2007	**1Q**	7.728	3.706	3.963	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	2.378
2007	**1Q**	7.711	3.698	3.955	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	2.372
2007	**1Q**	7.611	3.650	3.904	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	2.342
2007	**1Q**	4.936	2.367	2.531	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.519
2007	**1Q**	4.570	2.191	2.344	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.406
2007	**1Q**	4.254	2.040	2.182	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.309
2008	**1Q**	7.844	3.761	4.023	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	2.413
2008	**1Q**	5.866	2.813	3.009	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.805
2008	**1Q**	5.850	2.805	3.000	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.800
2008	**1Q**	5.650	2.709	2.898	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.738
2008	**1Q**	4.969	2.383	2.549	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.529
2008	**1Q**	4.803	2.303	2.463	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.478
2008	**1Q**	4.769	2.287	2.446	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.467
2008	**1Q**	4.720	2.263	2.421	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.452
2009	**1Q**	9.024	4.327	4.628	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	2.776
2009	**1Q**	6.930	3.323	3.554	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	2.132
2009	**1Q**	6.614	3.172	3.392	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	2.035
2009	**1Q**	5.750	2.757	2.949	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.769
2009	**1Q**	5.451	2.614	2.796	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.677
2009	**1Q**	5.318	2.550	2.728	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.636
2009	**1Q**	5.168	2.478	2.651	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.590
2009	**1Q**	4.470	2.144	2.293	0.502	0.241	0.257	-22441.739	-108.978	22550.872	0.154	1.375

YEAR	QTR	2014 SO4	NO3r	NH4r	S Term	N Term	A Term	Part 1	Part 2	Part 3	Sum	PBW Total
2005	2Q	9.217	0.000	3.385	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	3.356
2005	2Q	8.693	0.000	3.192	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	3.165
2005	2Q	8.239	0.000	3.026	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	3.000
2005	2Q	7.929	0.000	2.912	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.887
2005	2Q	7.357	0.000	2.702	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.679
2005	2Q	7.131	0.000	2.618	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.596
2005	2Q	6.975	0.000	2.561	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.540
2005	2Q	6.952	0.000	2.553	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.531
2006	2Q	7.107	0.000	2.610	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.587
2006	2Q	6.904	0.000	2.535	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.514
2006	2Q	6.391	0.000	2.347	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.327
2006	2Q	5.366	0.000	1.970	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.954
2006	2Q	4.925	0.000	1.808	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.793
2006	2Q	4.579	0.000	1.681	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.667
2006	2Q	4.543	0.000	1.668	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.654
2006	2Q	4.245	0.000	1.559	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.546
2007	2Q	6.677	0.000	2.452	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.431
2007	2Q	6.439	0.000	2.364	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.344
2007	2Q	6.403	0.000	2.351	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.331
2007	2Q	5.843	0.000	2.145	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.127
2007	2Q	5.437	0.000	1.997	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.980
2007	2Q	5.235	0.000	1.922	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.906
2007	2Q	5.223	0.000	1.918	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.902
2007	2Q	5.068	0.000	1.861	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.845
2008	2Q	7.917	0.000	2.907	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.883
2008	2Q	6.701	0.000	2.461	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.440
2008	2Q	6.618	0.000	2.430	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.409
2008	2Q	4.650	0.000	1.708	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.693
2008	2Q	4.495	0.000	1.651	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.637
2008	2Q	4.316	0.000	1.585	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.572
2008	2Q	4.293	0.000	1.576	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.563
2008	2Q	4.185	0.000	1.537	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.524
2009	2Q	4.114	0.000	1.511	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.498
2009	2Q	3.947	0.000	1.449	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.437

2009	**2Q**	3.875	0.000	1.423	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.411
2009	**2Q**	3.804	0.000	1.397	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.385
2009	**2Q**	3.601	0.000	1.322	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.311
2009	**2Q**	3.434	0.000	1.261	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.250
2009	**2Q**	3.374	0.000	1.239	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.229
2009	**2Q**	3.208	0.000	1.178	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.168

		2014										
YEAR	**QTR**	**SO4**	**NO3r**	**NH4r**	**S Term**	**N Term**	**A Term**	**Part 1**	**Part 2**	**Part 3**	**Sum**	**PBW Total**
2005	**3Q**	9.863	0.000	3.576	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	3.623
2005	**3Q**	8.168	0.000	2.962	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	3.001
2005	**3Q**	7.257	0.000	2.631	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.666
2005	**3Q**	7.152	0.000	2.593	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.627
2005	**3Q**	6.825	0.000	2.475	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.507
2005	**3Q**	6.801	0.000	2.466	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.499
2005	**3Q**	5.785	0.000	2.097	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.125
2005	**3Q**	5.527	0.000	2.004	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.031
2006	**3Q**	6.334	0.000	2.297	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.327
2006	**3Q**	5.878	0.000	2.131	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.159
2006	**3Q**	5.446	0.000	1.975	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.001
2006	**3Q**	5.247	0.000	1.903	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.928
2006	**3Q**	5.212	0.000	1.890	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.915
2006	**3Q**	5.130	0.000	1.860	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.885
2006	**3Q**	5.025	0.000	1.822	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.846
2006	**3Q**	5.773	0.000	2.093	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.121
2007	**3Q**	7.152	0.000	2.593	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.627
2007	**3Q**	6.801	0.000	2.466	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.499
2007	**3Q**	6.544	0.000	2.373	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.404
2007	**3Q**	6.509	0.000	2.360	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.391
2007	**3Q**	6.334	0.000	2.297	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.327
2007	**3Q**	6.287	0.000	2.280	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.310
2007	**3Q**	6.229	0.000	2.258	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.288
2007	**3Q**	5.901	0.000	2.140	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.168
2008	**3Q**	5.785	0.000	2.097	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.125
2008	**3Q**	5.726	0.000	2.076	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.104
2008	**3Q**	5.446	0.000	1.975	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.001

2008	**3Q**	5.212	0.000	1.890	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.915
2008	**3Q**	5.200	0.000	1.886	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.910
2008	**3Q**	5.130	0.000	1.860	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.885
2008	**3Q**	5.060	0.000	1.835	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.859
2008	**3Q**	4.639	0.000	1.682	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.704
2009	**3Q**	4.838	0.000	1.754	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.777
2009	**3Q**	3.856	0.000	1.398	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.417
2009	**3Q**	3.646	0.000	1.322	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.339
2009	**3Q**	3.576	0.000	1.297	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.314
2009	**3Q**	3.260	0.000	1.182	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.198
2009	**3Q**	3.260	0.000	1.182	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.198
2009	**3Q**	3.155	0.000	1.144	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.159
2009	**3Q**	3.085	0.000	1.119	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.133

		2014										
YEAR	**QTR**	**SO4**	**NO3r**	**NH4r**	**S Term**	**N Term**	**A Term**	**Part 1**	**Part 2**	**Part 3**	**Sum**	**PBW Total**
2005	**4Q**	12.846	0.026	4.825	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	4.570
2005	**4Q**	10.632	0.022	3.993	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	3.782
2005	**4Q**	9.422	0.019	3.539	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	3.352
2005	**4Q**	8.714	0.018	3.273	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	3.100
2005	**4Q**	7.903	0.016	2.968	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	2.811
2005	**4Q**	6.526	0.013	2.451	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	2.321
2005	**4Q**	6.217	0.013	2.335	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	2.212
2005	**4Q**	6.153	0.013	2.311	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	2.189
2006	**4Q**	12.897	0.026	4.844	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	4.588
2006	**4Q**	10.503	0.021	3.945	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	3.736
2006	**4Q**	8.688	0.018	3.263	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	3.091
2006	**4Q**	7.517	0.015	2.823	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	2.674
2006	**4Q**	7.105	0.015	2.669	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	2.527
2006	**4Q**	6.474	0.013	2.432	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	2.303
2006	**4Q**	6.461	0.013	2.427	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	2.299
2006	**4Q**	6.153	0.013	2.311	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	2.189
2007	**4Q**	7.491	0.015	2.814	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	2.665
2007	**4Q**	7.401	0.015	2.780	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	2.633
2007	**4Q**	5.831	0.012	2.190	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	2.074
2007	**4Q**	5.303	0.011	1.992	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	1.886

2007	**4Q**	5.123	0.010	1.924	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	1.822
2007	**4Q**	5.123	0.010	1.924	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	1.822
2007	**4Q**	5.046	0.010	1.895	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	1.795
2007	**4Q**	4.466	0.009	1.678	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	1.589
2008	**4Q**	9.049	0.019	3.399	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	3.219
2008	**4Q**	8.070	0.017	3.031	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	2.871
2008	**4Q**	8.006	0.016	3.007	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	2.848
2008	**4Q**	7.028	0.014	2.640	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	2.500
2008	**4Q**	5.110	0.010	1.919	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	1.818
2008	**4Q**	5.033	0.010	1.890	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	1.790
2008	**4Q**	4.750	0.010	1.784	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	1.690
2008	**4Q**	4.454	0.009	1.673	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	1.584
2009	**4Q**	11.790	0.024	4.428	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	4.194
2009	**4Q**	7.556	0.015	2.838	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	2.688
2009	**4Q**	7.105	0.015	2.669	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	2.527
2009	**4Q**	6.358	0.013	2.388	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	2.262
2009	**4Q**	5.882	0.012	2.209	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	2.092
2009	**4Q**	5.766	0.012	2.166	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	2.051
2009	**4Q**	5.161	0.011	1.939	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	1.836
2009	**4Q**	4.556	0.009	1.711	0.726	0.001	0.273	-24065.474	-206.071	24271.803	0.258	1.621

Liberty Future High Days, by Total Species

Methodology:

- Sum species from high day calculations

YEAR	QTR	FRMf	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBW
2005	**1Q**	39.0	0.5	38.5	13.645	3.131	8.625	4.136	1.842	4.424	2.654
2005	**1Q**	33.3	0.5	32.8	11.621	2.667	7.345	3.522	1.569	3.767	2.260
2005	**1Q**	31.1	0.5	30.6	10.858	2.492	6.863	3.291	1.466	3.520	2.112
2005	**1Q**	28.1	0.5	27.6	9.807	2.250	6.199	2.972	1.324	3.179	1.907
2005	**1Q**	27.8	0.5	27.3	9.701	2.226	6.132	2.941	1.310	3.145	1.887
2005	**1Q**	24.9	0.5	24.4	8.650	1.985	5.467	2.622	1.168	2.804	1.682
2005	**1Q**	23.2	0.5	22.7	8.071	1.852	5.102	2.446	1.090	2.617	1.570
2005	**1Q**	23.1	0.5	22.6	8.019	1.840	5.069	2.431	1.083	2.600	1.559
2006	**1Q**	45.0	0.5	44.5	15.801	3.626	9.988	4.789	2.133	5.123	3.073
2006	**1Q**	38.6	0.5	38.1	13.514	3.101	8.542	4.096	1.825	4.381	2.628
2006	**1Q**	35.6	0.5	35.1	12.462	2.860	7.877	3.777	1.683	4.040	2.424
2006	**1Q**	33.3	0.5	32.8	11.621	2.667	7.345	3.522	1.569	3.767	2.260
2006	**1Q**	30.1	0.5	29.6	10.490	2.407	6.631	3.180	1.416	3.401	2.040
2006	**1Q**	26.9	0.5	26.4	9.360	2.148	5.916	2.837	1.264	3.034	1.820
2006	**1Q**	25.0	0.5	24.5	8.676	1.991	5.484	2.630	1.171	2.813	1.687
2006	**1Q**	20.7	0.5	20.2	7.151	1.641	4.520	2.168	0.965	2.318	1.391
2007	**1Q**	40.2	0.5	39.7	14.092	3.234	8.907	4.271	1.903	4.569	2.741
2007	**1Q**	35.8	0.5	35.3	12.514	2.872	7.910	3.793	1.690	4.057	2.434
2007	**1Q**	35.0	0.5	34.5	12.225	2.805	7.728	3.706	1.651	3.963	2.378
2007	**1Q**	34.9	0.5	34.4	12.199	2.799	7.711	3.698	1.647	3.955	2.372
2007	**1Q**	34.4	0.5	33.9	12.041	2.763	7.611	3.650	1.626	3.904	2.342
2007	**1Q**	22.5	0.5	22.0	7.808	1.792	4.936	2.367	1.054	2.531	1.519
2007	**1Q**	20.9	0.5	20.4	7.230	1.659	4.570	2.191	0.976	2.344	1.406
2007	**1Q**	19.5	0.5	19.0	6.730	1.544	4.254	2.040	0.909	2.182	1.309
2008	**1Q**	35.5	0.5	35.0	12.409	2.848	7.844	3.761	1.675	4.023	2.413
2008	**1Q**	26.7	0.5	26.2	9.281	2.130	5.866	2.813	1.253	3.009	1.805
2008	**1Q**	26.6	0.5	26.1	9.254	2.124	5.850	2.805	1.249	3.000	1.800
2008	**1Q**	25.7	0.5	25.2	8.939	2.051	5.650	2.709	1.207	2.898	1.738
2008	**1Q**	22.7	0.5	22.2	7.861	1.804	4.969	2.383	1.061	2.549	1.529
2008	**1Q**	21.9	0.5	21.4	7.598	1.744	4.803	2.303	1.026	2.463	1.478

2008	**1Q**	21.8	0.5	21.3	7.545	1.731	4.769	2.287	1.019	2.446	1.467
2008	**1Q**	21.5	0.5	21.0	7.467	1.713	4.720	2.263	1.008	2.421	1.452
2009	**1Q**	40.7	0.5	40.2	14.276	3.276	9.024	4.327	1.927	4.628	2.776
2009	**1Q**	31.4	0.5	30.9	10.963	2.516	6.930	3.323	1.480	3.554	2.132
2009	**1Q**	30.0	0.5	29.5	10.464	2.401	6.614	3.172	1.413	3.392	2.035
2009	**1Q**	26.1	0.5	25.6	9.097	2.087	5.750	2.757	1.228	2.949	1.769
2009	**1Q**	24.8	0.5	24.3	8.623	1.979	5.451	2.614	1.164	2.796	1.677
2009	**1Q**	24.2	0.5	23.7	8.413	1.931	5.318	2.550	1.136	2.728	1.636
2009	**1Q**	23.5	0.5	23.0	8.176	1.876	5.168	2.478	1.104	2.651	1.590
2009	**1Q**	20.4	0.5	19.9	7.072	1.623	4.470	2.144	0.955	2.293	1.375

YEAR	**QTR**	**FRMf**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBW**
2005	**2Q**	44.0	0.5	43.5	18.139	6.347	9.217	0.000	3.049	3.385	3.356
2005	**2Q**	41.5	0.5	41.0	17.106	5.986	8.693	0.000	2.875	3.192	3.165
2005	**2Q**	39.4	0.5	38.9	16.214	5.674	8.239	0.000	2.725	3.026	3.000
2005	**2Q**	37.9	0.5	37.4	15.604	5.460	7.929	0.000	2.623	2.912	2.887
2005	**2Q**	35.2	0.5	34.7	14.478	5.066	7.357	0.000	2.433	2.702	2.679
2005	**2Q**	34.1	0.5	33.6	14.032	4.910	7.131	0.000	2.358	2.618	2.596
2005	**2Q**	33.4	0.5	32.9	13.727	4.803	6.975	0.000	2.307	2.561	2.540
2005	**2Q**	33.3	0.5	32.8	13.680	4.787	6.952	0.000	2.299	2.553	2.531
2006	**2Q**	34.0	0.5	33.5	13.985	4.894	7.107	0.000	2.351	2.610	2.587
2006	**2Q**	33.1	0.5	32.6	13.586	4.754	6.904	0.000	2.284	2.535	2.514
2006	**2Q**	30.7	0.5	30.2	12.577	4.401	6.391	0.000	2.114	2.347	2.327
2006	**2Q**	25.8	0.5	25.3	10.559	3.695	5.366	0.000	1.775	1.970	1.954
2006	**2Q**	23.7	0.5	23.2	9.691	3.391	4.925	0.000	1.629	1.808	1.793
2006	**2Q**	22.1	0.5	21.6	9.011	3.153	4.579	0.000	1.514	1.681	1.667
2006	**2Q**	21.9	0.5	21.4	8.940	3.128	4.543	0.000	1.503	1.668	1.654
2006	**2Q**	20.5	0.5	20.0	8.354	2.923	4.245	0.000	1.404	1.559	1.546
2007	**2Q**	32.0	0.5	31.5	13.141	4.598	6.677	0.000	2.209	2.452	2.431
2007	**2Q**	30.9	0.5	30.4	12.671	4.434	6.439	0.000	2.130	2.364	2.344
2007	**2Q**	30.7	0.5	30.2	12.601	4.409	6.403	0.000	2.118	2.351	2.331
2007	**2Q**	28.1	0.5	27.6	11.498	4.023	5.843	0.000	1.933	2.145	2.127
2007	**2Q**	26.2	0.5	25.7	10.700	3.744	5.437	0.000	1.798	1.997	1.980
2007	**2Q**	25.2	0.5	24.7	10.301	3.605	5.235	0.000	1.731	1.922	1.906
2007	**2Q**	25.1	0.5	24.6	10.278	3.596	5.223	0.000	1.727	1.918	1.902
2007	**2Q**	24.4	0.5	23.9	9.973	3.490	5.068	0.000	1.676	1.861	1.845

2008	**2Q**	37.9	0.5	37.4	15.581	5.452	7.917	0.000	2.619	2.907	2.883
2008	**2Q**	32.1	0.5	31.6	13.187	4.615	6.701	0.000	2.216	2.461	2.440
2008	**2Q**	31.7	0.5	31.2	13.023	4.557	6.618	0.000	2.189	2.430	2.409
2008	**2Q**	22.4	0.5	21.9	9.151	3.202	4.650	0.000	1.538	1.708	1.693
2008	**2Q**	21.7	0.5	21.2	8.846	3.096	4.495	0.000	1.487	1.651	1.637
2008	**2Q**	20.9	0.5	20.4	8.494	2.972	4.316	0.000	1.428	1.585	1.572
2008	**2Q**	20.8	0.5	20.3	8.447	2.956	4.293	0.000	1.420	1.576	1.563
2008	**2Q**	20.2	0.5	19.7	8.236	2.882	4.185	0.000	1.384	1.537	1.524
2009	**2Q**	19.9	0.5	19.4	8.095	2.833	4.114	0.000	1.361	1.511	1.498
2009	**2Q**	19.1	0.5	18.6	7.767	2.718	3.947	0.000	1.305	1.449	1.437
2009	**2Q**	18.8	0.5	18.3	7.626	2.669	3.875	0.000	1.282	1.423	1.411
2009	**2Q**	18.4	0.5	17.9	7.485	2.619	3.804	0.000	1.258	1.397	1.385
2009	**2Q**	17.5	0.5	17.0	7.086	2.480	3.601	0.000	1.191	1.322	1.311
2009	**2Q**	16.7	0.5	16.2	6.758	2.365	3.434	0.000	1.136	1.261	1.250
2009	**2Q**	16.4	0.5	15.9	6.641	2.324	3.374	0.000	1.116	1.239	1.229
2009	**2Q**	15.6	0.5	15.1	6.312	2.209	3.208	0.000	1.061	1.178	1.168

YEAR	**QTR**	**FRMf**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBW**
2005	**3Q**	41.7	0.5	41.2	14.489	7.108	9.863	0.000	2.546	3.576	3.623
2005	**3Q**	34.6	0.5	34.1	11.999	5.887	8.168	0.000	2.108	2.962	3.001
2005	**3Q**	30.8	0.5	30.3	10.660	5.230	7.257	0.000	1.873	2.631	2.666
2005	**3Q**	30.4	0.5	29.9	10.506	5.154	7.152	0.000	1.846	2.593	2.627
2005	**3Q**	29.0	0.5	28.5	10.025	4.919	6.825	0.000	1.761	2.475	2.507
2005	**3Q**	28.9	0.5	28.4	9.991	4.902	6.801	0.000	1.755	2.466	2.499
2005	**3Q**	24.7	0.5	24.2	8.497	4.169	5.785	0.000	1.493	2.097	2.125
2005	**3Q**	23.6	0.5	23.1	8.120	3.984	5.527	0.000	1.427	2.004	2.031
2006	**3Q**	27.0	0.5	26.5	9.304	4.565	6.334	0.000	1.635	2.297	2.327
2006	**3Q**	25.1	0.5	24.6	8.635	4.236	5.878	0.000	1.517	2.131	2.159
2006	**3Q**	23.3	0.5	22.8	8.000	3.925	5.446	0.000	1.406	1.975	2.001
2006	**3Q**	22.4	0.5	21.9	7.708	3.782	5.247	0.000	1.354	1.903	1.928
2006	**3Q**	22.3	0.5	21.8	7.656	3.756	5.212	0.000	1.345	1.890	1.915
2006	**3Q**	21.9	0.5	21.4	7.536	3.697	5.130	0.000	1.324	1.860	1.885
2006	**3Q**	21.5	0.5	21.0	7.382	3.622	5.025	0.000	1.297	1.822	1.846
2006	**3Q**	24.6	0.5	24.1	8.480	4.161	5.773	0.000	1.490	2.093	2.121
2007	**3Q**	30.4	0.5	29.9	10.506	5.154	7.152	0.000	1.846	2.593	2.627
2007	**3Q**	28.9	0.5	28.4	9.991	4.902	6.801	0.000	1.755	2.466	2.499

2007	**3Q**	27.8	0.5	27.3	9.613	4.716	6.544	0.000	1.689	2.373	2.404
2007	**3Q**	27.7	0.5	27.2	9.562	4.691	6.509	0.000	1.680	2.360	2.391
2007	**3Q**	27.0	0.5	26.5	9.304	4.565	6.334	0.000	1.635	2.297	2.327
2007	**3Q**	26.8	0.5	26.3	9.236	4.531	6.287	0.000	1.623	2.280	2.310
2007	**3Q**	26.5	0.5	26.0	9.150	4.489	6.229	0.000	1.608	2.258	2.288
2007	**3Q**	25.2	0.5	24.7	8.669	4.253	5.901	0.000	1.523	2.140	2.168
2008	**3Q**	24.7	0.5	24.2	8.497	4.169	5.785	0.000	1.493	2.097	2.125
2008	**3Q**	24.4	0.5	23.9	8.412	4.127	5.726	0.000	1.478	2.076	2.104
2008	**3Q**	23.3	0.5	22.8	8.000	3.925	5.446	0.000	1.406	1.975	2.001
2008	**3Q**	22.3	0.5	21.8	7.656	3.756	5.212	0.000	1.345	1.890	1.915
2008	**3Q**	22.2	0.5	21.7	7.639	3.748	5.200	0.000	1.342	1.886	1.910
2008	**3Q**	21.9	0.5	21.4	7.536	3.697	5.130	0.000	1.324	1.860	1.885
2008	**3Q**	21.6	0.5	21.1	7.433	3.647	5.060	0.000	1.306	1.835	1.859
2008	**3Q**	19.9	0.5	19.4	6.815	3.344	4.639	0.000	1.197	1.682	1.704
2009	**3Q**	20.7	0.5	20.2	7.107	3.487	4.838	0.000	1.249	1.754	1.777
2009	**3Q**	16.6	0.5	16.1	5.665	2.779	3.856	0.000	0.995	1.398	1.417
2009	**3Q**	15.7	0.5	15.2	5.356	2.628	3.646	0.000	0.941	1.322	1.339
2009	**3Q**	15.4	0.5	14.9	5.253	2.577	3.576	0.000	0.923	1.297	1.314
2009	**3Q**	14.1	0.5	13.6	4.789	2.350	3.260	0.000	0.841	1.182	1.198
2009	**3Q**	14.1	0.5	13.6	4.789	2.350	3.260	0.000	0.841	1.182	1.198
2009	**3Q**	13.7	0.5	13.2	4.635	2.274	3.155	0.000	0.814	1.144	1.159
2009	**3Q**	13.4	0.5	12.9	4.532	2.223	3.085	0.000	0.796	1.119	1.133

YEAR	**QTR**	**FRMf**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBW**
2005	**4Q**	67.3	0.5	66.8	32.645	8.332	12.846	0.026	3.553	4.825	4.570
2005	**4Q**	55.8	0.5	55.3	27.019	6.896	10.632	0.022	2.940	3.993	3.782
2005	**4Q**	49.5	0.5	49.0	23.944	6.112	9.422	0.019	2.606	3.539	3.352
2005	**4Q**	45.8	0.5	45.3	22.145	5.652	8.714	0.018	2.410	3.273	3.100
2005	**4Q**	41.6	0.5	41.1	20.084	5.126	7.903	0.016	2.186	2.968	2.811
2005	**4Q**	34.4	0.5	33.9	16.584	4.233	6.526	0.013	1.805	2.451	2.321
2005	**4Q**	32.8	0.5	32.3	15.799	4.033	6.217	0.013	1.719	2.335	2.212
2005	**4Q**	32.5	0.5	32.0	15.635	3.991	6.153	0.013	1.702	2.311	2.189
2006	**4Q**	67.6	0.5	67.1	32.776	8.366	12.897	0.026	3.567	4.844	4.588
2006	**4Q**	55.1	0.5	54.6	26.691	6.813	10.503	0.021	2.905	3.945	3.736
2006	**4Q**	45.7	0.5	45.2	22.079	5.636	8.688	0.018	2.403	3.263	3.091
2006	**4Q**	39.6	0.5	39.1	19.103	4.876	7.517	0.015	2.079	2.823	2.674

2006	**4Q**	37.4	0.5	36.9	18.056	4.609	7.105	0.015	1.965	2.669	2.527
2006	**4Q**	34.2	0.5	33.7	16.453	4.200	6.474	0.013	1.791	2.432	2.303
2006	**4Q**	34.1	0.5	33.6	16.420	4.191	6.461	0.013	1.787	2.427	2.299
2006	**4Q**	32.5	0.5	32.0	15.635	3.991	6.153	0.013	1.702	2.311	2.189
2007	**4Q**	39.5	0.5	39.0	19.037	4.859	7.491	0.015	2.072	2.814	2.665
2007	**4Q**	39.0	0.5	38.5	18.808	4.801	7.401	0.015	2.047	2.780	2.633
2007	**4Q**	30.8	0.5	30.3	14.818	3.782	5.831	0.012	1.613	2.190	2.074
2007	**4Q**	28.1	0.5	27.6	13.477	3.440	5.303	0.011	1.467	1.992	1.886
2007	**4Q**	27.1	0.5	26.6	13.019	3.323	5.123	0.010	1.417	1.924	1.822
2007	**4Q**	27.1	0.5	26.6	13.019	3.323	5.123	0.010	1.417	1.924	1.822
2007	**4Q**	26.7	0.5	26.2	12.822	3.273	5.046	0.010	1.395	1.895	1.795
2007	**4Q**	23.7	0.5	23.2	11.350	2.897	4.466	0.009	1.235	1.678	1.589
2008	**4Q**	47.6	0.5	47.1	22.995	5.869	9.049	0.019	2.503	3.399	3.219
2008	**4Q**	42.5	0.5	42.0	20.509	5.235	8.070	0.017	2.232	3.031	2.871
2008	**4Q**	42.1	0.5	41.6	20.346	5.193	8.006	0.016	2.214	3.007	2.848
2008	**4Q**	37.0	0.5	36.5	17.860	4.559	7.028	0.014	1.944	2.640	2.500
2008	**4Q**	27.1	0.5	26.6	12.986	3.315	5.110	0.010	1.413	1.919	1.818
2008	**4Q**	26.7	0.5	26.2	12.790	3.264	5.033	0.010	1.392	1.890	1.790
2008	**4Q**	25.2	0.5	24.7	12.070	3.081	4.750	0.010	1.314	1.784	1.690
2008	**4Q**	23.7	0.5	23.2	11.318	2.889	4.454	0.009	1.232	1.673	1.584
2009	**4Q**	61.8	0.5	61.3	29.962	7.648	11.790	0.024	3.261	4.428	4.194
2009	**4Q**	39.8	0.5	39.3	19.201	4.901	7.556	0.015	2.090	2.838	2.688
2009	**4Q**	37.4	0.5	36.9	18.056	4.609	7.105	0.015	1.965	2.669	2.527
2009	**4Q**	33.6	0.5	33.1	16.159	4.124	6.358	0.013	1.759	2.388	2.262
2009	**4Q**	31.1	0.5	30.6	14.949	3.816	5.882	0.012	1.627	2.209	2.092
2009	**4Q**	30.5	0.5	30.0	14.654	3.740	5.766	0.012	1.595	2.166	2.051
2009	**4Q**	27.3	0.5	26.8	13.117	3.348	5.161	0.011	1.427	1.939	1.836
2009	**4Q**	24.2	0.5	23.7	11.579	2.956	4.556	0.009	1.260	1.711	1.621

Ranked Future Days per Year

2005	4Q	67.3	2006	4Q	67.6	2007	1Q	40.2	2008	4Q	47.6	2009	4Q	61.8
2005	4Q	55.8	2006	4Q	55.1	2007	4Q	39.5	2008	4Q	42.5	2009	1Q	40.7
2005	4Q	49.5	2006	4Q	45.7	2007	4Q	39.0	2008	4Q	42.1	2009	4Q	39.8
2005	4Q	45.8	2006	1Q	45.0	2007	1Q	35.8	2008	2Q	37.9	2009	4Q	37.4
2005	2Q	44.0	2006	4Q	39.6	2007	1Q	35.0	2008	4Q	37.0	2009	4Q	33.6
2005	3Q	41.7	2006	1Q	38.6	2007	1Q	34.9	2008	1Q	35.5	2009	1Q	31.4
2005	4Q	41.6	2006	4Q	37.4	2007	1Q	34.4	2008	2Q	32.1	2009	4Q	**31.1**
2005	2Q	**41.5**	2006	1Q	**35.6**	2007	2Q	**32.0**	2008	2Q	**31.7**	2009	4Q	30.5
2005	2Q	39.4	2006	4Q	34.2	2007	2Q	30.9	2008	4Q	27.1	2009	1Q	30.0
2005	1Q	39.0	2006	4Q	34.1	2007	4Q	30.8	2008	4Q	26.7	2009	4Q	27.3
2005	2Q	37.9	2006	2Q	34.0	2007	2Q	30.7	2008	1Q	26.7	2009	1Q	26.1
2005	2Q	35.2	2006	1Q	33.3	2007	3Q	30.4	2008	1Q	26.6	2009	1Q	24.8
2005	3Q	34.6	2006	2Q	33.1	2007	3Q	28.9	2008	1Q	25.7	2009	1Q	24.2
2005	4Q	34.4	2006	4Q	32.5	2007	4Q	28.1	2008	4Q	25.2	2009	4Q	24.2
2005	2Q	34.1	2006	2Q	30.7	2007	2Q	28.1	2008	3Q	24.7	2009	1Q	23.5
2005	2Q	33.4	2006	1Q	30.1	2007	3Q	27.8	2008	3Q	24.4	2009	3Q	20.7
2005	2Q	33.3	2006	3Q	27.0	2007	3Q	27.7	2008	4Q	23.7	2009	1Q	20.4
2005	1Q	33.3	2006	1Q	26.9	2007	4Q	27.1	2008	3Q	23.3	2009	2Q	19.9
2005	4Q	32.8	2006	2Q	25.8	2007	4Q	27.1	2008	1Q	22.7	2009	2Q	19.1
2005	4Q	32.5	2006	3Q	25.1	2007	3Q	27.0	2008	2Q	22.4	2009	2Q	18.8
2005	1Q	31.1	2006	1Q	25.0	2007	3Q	26.8	2008	3Q	22.3	2009	2Q	18.4
2005	3Q	30.8	2006	3Q	24.6	2007	4Q	26.7	2008	3Q	22.2	2009	2Q	17.5
2005	3Q	30.4	2006	2Q	23.7	2007	3Q	26.5	2008	3Q	21.9	2009	2Q	16.7
2005	3Q	29.0	2006	3Q	23.3	2007	2Q	26.2	2008	1Q	21.9	2009	3Q	16.6
2005	3Q	28.9	2006	3Q	22.4	2007	2Q	25.2	2008	1Q	21.8	2009	2Q	16.4
2005	1Q	28.1	2006	3Q	22.3	2007	3Q	25.2	2008	2Q	21.7	2009	3Q	15.7
2005	1Q	27.8	2006	2Q	22.1	2007	2Q	25.1	2008	3Q	21.6	2009	2Q	15.6
2005	1Q	24.9	2006	2Q	21.9	2007	2Q	24.4	2008	1Q	21.5	2009	3Q	15.4
2005	3Q	24.7	2006	3Q	21.9	2007	4Q	23.7	2008	2Q	20.9	2009	3Q	14.1
2005	3Q	23.6	2006	3Q	21.5	2007	1Q	22.5	2008	2Q	20.8	2009	3Q	14.1
2005	1Q	23.2	2006	1Q	20.7	2007	1Q	20.9	2008	2Q	20.2	2009	3Q	13.7
2005	1Q	23.1	2006	2Q	20.5	2007	1Q	19.5	2008	3Q	19.9	2009	3Q	13.4
8th-high			**8th-high**			**8th-high**			**8th-high**			**7th-high**		

Liberty Future 24-Hour Weighted Design Value, by Total Species

Methodology:

- Identify official 98th percentile value for each year
- Rounded to nearest integer

Future Projected FRM High Days

	2005	2006	2007	2008	2009
98th-Percentile	41.5	35.6	32.0	31.7	31.1

3-Year Design Values

3-Year Period	Avg
2005-2007	36.4
2006-2008	33.1
2007-2009	31.6

5-Year Weighted Average

5-Year Period	Avg
2005-2009	34

Liberty Regional/Local Split, based on SWPA sites

For the Liberty regional/local split fractions, the quarterly averages of Lawrenceville, Florence, and Greensburg (concurrent with Liberty high days) were calculated as the regional component. The average of the regional site species compositions were subtracted from Liberty high day compositions, then the regional/local fractions were applied to Liberty high day species compositions.

Lawrenceville CSN Notes

- Measured carbons switched from TOT to TOR for Lawrenceville on 10/1/09
- Some EC/OC not included with MATS data after TOT/TOR switch; substituted from AQS
- Missing concurrent FRM mass was substituted with CSN total mass
- All CSN species are submitted to EPA AQS by RTI, reviewed by ACHD
- Calculated species taken from EPA MATS 2.5.1 species-for-fractions

Florence CSN Notes

- Measured carbons switched from TOT to TOR for Florence on 5/12/07
- Some EC/OC not included with MATS data after TOT/TOR switch; substituted from AQS
- Missing concurrent FRM mass was substituted with CSN total mass
- All CSN species are submitted to EPA AQS by RTI, reviewed by PA DEP
- Calculated species taken from EPA MATS 2.5.1 species-for-fractions

Greensburg CSN Notes

- Measured carbons switched from TOT to TOR for Greensburg on 5/6/07
- Some EC/OC not included with MATS data after TOT/TOR switch; substituted from AQS
- Missing concurrent FRM mass was substituted with CSN total mass
- All CSN species are submitted to EPA AQS by RTI, reviewed by PA DEP
- Calculated species taken from EPA MATS 2.5.1 species-for-fractions

Lawrenceville CSN Quarterly Averages

- Calculate quarterly averages of high days (concurrent with Liberty high days)

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20050203	4.270	5.880	6.540	1.850	7.170	1.490	1.250	1.290	0.033	2.600	26.500
20050215	3.300	0.000	1.380	0.700	2.650	0.590	0.520	0.560	0.214	2.250	5.900
20050317	3.880	5.930	7.050	1.750	5.580	1.310	1.060	1.150	0.007	2.410	22.800
AVG	3.817	3.937	4.990	1.433	5.133	1.130	0.943	1.000	0.085	2.420	18.400

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20050510	10.710	0.000	0.720	0.000			2.150	2.330	0.000	11.020	24.500
20050621	13.670	0.000	0.520	2.060	5.550	1.210	0.940	1.010	0.151	9.060	28.900
20050627	15.160	0.000	0.740	2.640	11.000	1.390	1.190	1.300	0.174	10.550	39.400
AVG	13.180	0.000	0.660	1.567	8.275	1.300	1.427	1.547	0.108	10.210	30.933

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20050721	10.900	0.000	0.600	3.360	5.980	0.650	0.860	0.880	0.308	3.520	25.900
20050919	14.100	0.000	0.870	4.000	4.780	1.420	0.840	0.840	0.284	3.810	27.300
AVG	12.500	0.000	0.735	3.680	5.380	1.035	0.850	0.860	0.296	3.665	26.600

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20051001	8.230	0.000	0.960	3.010	6.440	1.190	0.480	0.480	0.366	3.030	21.200
20051031	6.830	0.000	0.910	2.610	8.480	2.610	1.970	2.150	0.375	2.450	23.400
20051112	2.900	0.000	1.090	1.220	7.360	1.940	0.980	1.060	0.375	1.040	16.600
AVG	5.987	0.000	0.987	2.280	7.427	1.913	1.143	1.230	0.372	2.173	20.400

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20060222	5.200	3.110	4.010	3.150	7.140	1.980	1.200	1.260	0.375	1.560	22.600
20060312	4.110	0.300	1.440	1.840	3.670	1.080	0.490	0.540	0.375	1.440	13.400
20060330	8.730	0.000	1.650	3.690	6.070	1.410	0.950	1.090	0.375	3.130	22.500
AVG	6.013	1.137	2.367	2.893	5.627	1.490	0.880	0.963	0.375	2.043	19.500

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20060411	5.090	0.000	1.130	2.030	5.270	1.500	1.470	1.720	0.375	1.820	16.000
20060529	14.700	0.000	1.350	5.120	8.790	1.530	0.950	1.130	0.348	5.440	36.200
20060616	5.170	0.000	0.690	1.950	7.890	1.310	1.160	1.240	0.375	1.850	20.500

AVG	8.320	0.000	1.057	3.033	7.317	1.447	1.193	1.363	0.366	3.037	24.233

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20060710	17.500	0.000	0.260	5.220	6.150	0.730	0.550	0.510	0.298	5.300	37.600
20060716	5.130	0.000	0.660	1.720	6.380	1.030	0.610	0.640	0.335	1.850	18.700
20060908	14.800	0.000	0.920	5.470	5.990	1.770	1.360	1.390	0.370	5.400	31.000
AVG	12.477	0.000	0.613	4.137	6.173	1.177	0.840	0.847	0.334	4.183	29.100

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20061002	5.450	0.000	0.830	2.590	5.150	1.720	0.820	0.860	0.375	1.950	16.000
20061125	3.340	0.000	1.570	1.420	9.710	2.240	0.780	0.840	0.375	1.200	19.900
20061213	3.250	0.000	2.120	1.720	4.790	0.930	0.690	0.690	0.375	1.160	14.100
AVG	4.013	0.000	1.507	1.910	6.550	1.630	0.763	0.797	0.375	1.437	16.667

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20070217	4.140	3.860	4.110	2.590	4.600	0.900	0.410	0.460	0.355	1.350	16.700
20070313	4.890	0.000	1.130	2.170	4.570	1.880	1.180	1.210	0.375	1.750	15.600
20070319	3.400	1.800	2.260	1.730	4.060	1.420	1.200	1.150	0.355	1.080	15.100
AVG	4.143	1.887	2.500	2.163	4.410	1.400	0.930	0.940	0.362	1.393	15.800

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20070524	14.800	0.000	1.050	5.410	6.840	1.070	1.700	1.710	0.366	5.450	32.500
20070530	5.490	0.000	0.620	1.990	5.080	1.160	1.110	1.180	0.362	2.030	16.900
20070617	12.900	0.000	0.820	4.390	6.060	1.090	0.580	0.710	0.340	4.720	30.700
AVG	11.063	0.000	0.830	3.930	5.993	1.107	1.130	1.200	0.356	4.067	26.700

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20070804	13.600	0.000	0.620	4.230	6.540	0.770	0.710	0.770	0.311	4.460	29.800
20070828	21.700	0.000	0.730	6.600	4.420	1.040	1.060	1.180	0.304	6.840	39.300
20070903	7.980	0.000	1.040	2.660	6.340	1.430	0.390	0.450	0.333	2.870	23.100
AVG	14.427	0.000	0.797	4.497	5.767	1.080	0.720	0.800	0.316	4.723	30.733

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20071021	2.930	0.000	0.330	1.050	3.410	0.710	0.650	0.730	0.358	1.090	9.400
20071114	6.000	0.000	2.070	2.050	4.010	1.490	4.900	5.470	0.342	2.200	17.800
AVG	4.465	0.000	1.200	1.550	3.710	1.100	2.775	3.100	0.350	1.645	13.600

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20080224	7.070	5.820	6.230	4.460	6.920	1.070	0.410	0.480	0.375	2.150	27.700
20080307	6.400	2.170	2.720	3.120	4.660	0.730	2.150	2.110	0.375	2.030	18.700
AVG	6.735	3.995	4.475	3.790	5.790	0.900	1.280	1.295	0.375	2.090	23.200

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20080506	5.600	0.000	1.160	2.230	5.680	0.960	2.890	3.060	0.375	2.010	17.800
20080530	4.950	0.000	0.620	1.830	6.040	0.890	2.180	2.190	0.370	1.800	16.400
AVG	5.275	0.000	0.890	2.030	5.860	0.925	2.535	2.625	0.373	1.905	17.100

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20080717	13.400	0.000	0.640	4.280	6.670	1.210	1.040	1.010	0.319	4.580	32.300
20080729	10.700	0.000	0.950	3.400	9.730	1.590	1.100	1.140	0.318	3.630	34.600
20080903	11.000	0.000	0.970	3.680	4.960	1.220	1.620	1.680	0.335	3.970	26.300
AVG	11.700	0.000	0.853	3.787	7.120	1.340	1.253	1.277	0.324	4.060	31.067

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20090419	7.340	0.000	1.860	3.190	8.590	1.210	2.140	2.310	0.375	2.630	23.000
20090525	4.890	0.000	0.610	1.810	6.490	0.000	1.340	1.460	0.370	1.780	17.000
20090606	5.700	0.000	1.210	2.380	6.250	0.390	0.760	0.820	0.375	2.040	16.800
AVG	5.977	0.000	1.227	2.460	7.110	0.533	1.413	1.530	0.373	2.150	18.933

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20090706	3.400	0.000	0.870	1.220	5.900	1.020	0.960	0.930	0.359	1.260	15.100
20090817	10.200	0.000	0.740	3.340	6.240	1.170	1.660	1.630	0.327	3.600	26.800
AVG	6.800	0.000	0.805	2.280	6.070	1.095	1.310	1.280	0.343	2.430	20.950

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20091022	4.200	0.000	0.780	1.660	3.935	1.661	1.850	1.940	0.375	1.500	16.300
20091115	4.670	0.000	2.560	2.430	5.474	1.601	2.790	2.430	0.375	1.670	20.900
AVG	4.435	0.000	1.670	2.045	4.704	1.631	2.320	2.185	0.375	1.585	18.600

Lawrenceville CSN Speciation Quarterly High Day SANDWICH Averages

YEAR	QTR	FRMc	SO4	NO3r	NO3	NH4	OC	EC	CRUSTalt	DON	H2Oaim
2005	1Q	18.400	3.817	3.937	4.990	1.433	5.133	1.130	1.000	0.085	2.420
2005	2Q	30.933	13.180	0.000	0.660	1.567	8.275	1.300	1.547	0.108	10.210
2005	3Q	26.600	12.500	0.000	0.735	3.680	5.380	1.035	0.860	0.296	3.665
2005	4Q	20.400	5.987	0.000	0.987	2.280	7.427	1.913	1.230	0.372	2.173
2006	1Q	19.500	6.013	1.137	2.367	2.893	5.627	1.490	0.963	0.375	2.043
2006	2Q	24.233	8.320	0.000	1.057	3.033	7.317	1.447	1.363	0.366	3.037
2006	3Q	29.100	12.477	0.000	0.613	4.137	6.173	1.177	0.847	0.334	4.183
2006	4Q	16.667	4.013	0.000	1.507	1.910	6.550	1.630	0.797	0.375	1.437
2007	1Q	15.800	4.143	1.887	2.500	2.163	4.410	1.400	0.940	0.362	1.393
2007	2Q	26.700	11.063	0.000	0.830	3.930	5.993	1.107	1.200	0.356	4.067
2007	3Q	30.733	14.427	0.000	0.797	4.497	5.767	1.080	0.800	0.316	4.723
2007	4Q	13.600	4.465	0.000	1.200	1.550	3.710	1.100	3.100	0.350	1.645
2008	1Q	23.200	6.735	3.995	4.475	3.790	5.790	0.900	1.295	0.375	2.090
2008	2Q	17.100	5.275	0.000	0.890	2.030	5.860	0.925	2.625	0.373	1.905
2008	3Q	31.067	11.700	0.000	0.853	3.787	7.120	1.340	1.277	0.324	4.060
2008	4Q										
2009	1Q										
2009	2Q	18.933	5.977	0.000	1.227	2.460	7.110	0.533	1.530	0.373	2.150
2009	3Q	20.950	6.800	0.000	0.805	2.280	6.070	1.095	1.280	0.343	2.430
2009	4Q	18.600	4.435	0.000	1.670	2.045	4.704	1.631	2.185	0.375	1.585

AVGs	QTR	FRMc	SO4	NO3r	NO3	NH4	OC	EC	CRUSTalt	DON	H2Oaim	NH4r	PBWcalc	OCMmb
	1Q	19.225	5.177	2.739	3.583	2.570	5.240	1.230	1.050	0.299	1.987	2.343	1.473	4.714
	2Q	23.580	8.763	0.000	0.933	2.604	6.911	1.062	1.653	0.315	4.274	2.762	3.478	5.361
	3Q	27.690	11.581	0.000	0.761	3.676	6.102	1.145	1.013	0.323	3.812	3.737	4.747	4.967
	4Q	17.317	4.725	0.000	1.341	1.946	5.598	1.569	1.828	0.368	1.710	1.739	2.025	4.932

PBW Calculation	SO4	NO3r	NH4r
- Calculated from SO4, NO3r, and NH4r	5.177	2.739	2.343
- NH4r calculated from DON, SO4, NO3r	8.763	0.000	2.762
- DON > 0.225, low acidity equation	11.581	0.000	3.737
	4.725	0.000	1.739

S Term	N Term	A Term	Part 1	Part 2	Part 3	Sum	PBWcalc
0.505	0.267	0.228	-19189.923	-111.778	19301.845	0.144	1.473
0.760	0.000	0.240	-20328.436	-230.997	20559.735	0.302	3.478
0.756	0.000	0.244	-20809.232	-227.749	21037.291	0.310	4.747
0.731	0.000	0.269	-23650.566	-209.263	23860.142	0.313	2.025

Methodology:

- Use measured SO4 and EC
- Use retained nitrate (calculated)
- Use calculated indirect NH4 (retained) method for baseline and future
- Use crustal (alt) for other particulate PM2.5 (OPP)
- Use calculated particle bound water for baseline and future
- Degrees of Neutralization (DON) constant from base to future
- Minimum (floor) for OCMmb is equal to OC
- If OCMmb < OCfloor, then adjust species by FRMc/CFM
- Reconstructed CFM = SO4+NO3r+NH4r+H2O+EC+Cr+Pa+OC

Reconstruction for Quarters with OCMmb < OCfloor

RFM	QTR	FRMc	SO4	NO3r	OC	EC	CRUSTalt	NH4r	PBWcalc	Pa	CFM	FRMc/CFM
	1Q	19.225	5.177	2.739	5.240	1.230	1.050	2.343	1.473	0.500	19.751	0.973
	2Q	23.580	8.763	0.000	6.911	1.062	1.653	2.762	3.478	0.500	25.130	0.938
	3Q	27.690	11.581	0.000	6.102	1.145	1.013	3.737	4.747	0.500	28.825	0.961
	4Q	17.317	4.725	0.000	5.598	1.569	1.828	1.739	2.025	0.500	17.983	0.963

Adjusted Averages

Adjusted AVGs	QTR	FRMc	SO4	NO3r	OC	EC	CRUSTalt	NH4r	PBWcalc	Pa	OCMmb
	1Q	19.225	5.039	2.666	5.100	1.197	1.022	2.280	1.434	0.500	5.087
	2Q	23.580	8.223	0.000	6.485	0.997	1.551	2.592	3.264	0.500	6.454
	3Q	27.690	11.125	0.000	5.862	1.100	0.973	3.590	4.560	0.500	5.842
	4Q	17.317	4.550	0.000	5.390	1.510	1.760	1.674	1.950	0.500	5.372

Quarterly Averages

AVGs	QTR	FRMc	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	19.225	0.500	18.725	5.087	1.197	5.039	2.666	1.022	2.280	1.434
	2Q	23.580	0.500	23.080	6.454	0.997	8.223	0.000	1.551	2.592	3.264
	3Q	27.690	0.500	27.190	5.842	1.100	11.125	0.000	0.973	3.590	4.560
	4Q	17.317	0.500	16.817	5.372	1.510	4.550	0.000	1.760	1.674	1.950

Relative Compositions (fractions of Non-Blank)

FRACT	QTR	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	1.000	0.272	0.064	0.269	0.142	0.055	0.122	0.077
	2Q	1.000	0.280	0.043	0.356	0.000	0.067	0.112	0.141
	3Q	1.000	0.215	0.040	0.409	0.000	0.036	0.132	0.168
	4Q	1.000	0.319	0.090	0.271	0.000	0.105	0.100	0.116

Florence CSN Quarterly Averages

- Calculate quarterly averages of high days (concurrent with Liberty high days)

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20050203	5.030	4.550	5.200	3.170	6.340	1.960	0.550	0.550	0.368	1.590	26.100	
20050215	2.690	0.000	0.720	0.770	1.370	0.400	0.140	0.140	0.286	0.750	5.900	
20050317	2.880	4.170	5.290	2.380	3.720	0.750	0.500	0.500	0.375	1.070	15.800	
AVG	3.533	2.907	3.737	2.107	3.810	1.037	0.397	0.397	0.343	1.137	15.933	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20050510	6.180	0.000	0.470	1.880	3.840	0.460	0.950	1.130	0.304	1.950	17.700	FRM_MASS = CSN
20050621	13.500	0.000	0.300	3.180	5.050	0.690	0.720	0.730	0.236	2.460	27.900	
20050627	17.700	0.000	0.290	5.140	6.320	0.690	0.460	0.460	0.290	5.060	41.700	
AVG	12.460	0.000	0.353	3.400	5.070	0.613	0.710	0.773	0.277	3.157	29.100	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20050721	7.650	0.000	0.310	1.850	3.890	0.410	0.460	0.390	0.242	1.410	19.100
20050913	20.000	0.000	0.220	5.490	4.920	0.690	1.290	1.540	0.274	4.960	39.500
20050919	10.700	0.000	0.180	2.180	2.620	0.730	0.700	0.830	0.204	2.520	20.900
AVG	12.783	0.000	0.237	3.173	3.810	0.610	0.817	0.920	0.240	2.963	26.500

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20051001	5.780	0.000	0.170	1.330	2.360	0.610	0.380	0.420	0.230	1.060	14.300
20051112	2.030	0.000	0.320	0.570	2.880	0.510	0.340	0.430	0.281	0.540	8.400
AVG	3.905	0.000	0.245	0.950	2.620	0.560	0.360	0.425	0.256	0.800	11.350

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20060222	4.370	0.590	1.490	1.830	3.600	0.940	0.600	0.580	0.375	1.500	17.400	FRM_MASS = CSN
20060312	2.960	0.000	0.390	1.070	2.410	0.440	0.260	0.310	0.361	1.100	9.500	
20060330	8.950	0.000	0.350	2.580	3.750	0.840	0.590	0.730	0.288	2.510	20.200	
AVG	5.427	0.197	0.743	1.827	3.253	0.740	0.483	0.540	0.341	1.703	15.700	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20060411	5.580	0.000	0.200	1.390	2.790	0.490	0.760	0.850	0.249	1.080	13.700	
20060529	19.800	0.000	0.300	4.160	5.280	0.600	0.700	0.750	0.210	4.310	38.700	
20060616	6.060	0.000	0.230	1.770	4.490	0.380	0.900	1.080	0.292	1.750	20.300	FRM_MASS = CSN

AVG	10.480	0.000	0.243	2.440	4.187	0.490	0.787	0.893	0.250	2.380	24.233	
DATE	**SO4**	**NO3R**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**	
20060710	16.200	0.000	0.170	3.890	5.240	0.600	0.520	0.670	0.240	2.970	35.800	FRM_MASS = CSN
20060908	10.000	0.000	0.170	2.030	3.440	0.480	0.360	0.360	0.203	2.380	21.800	
AVG	13.100	0.000	0.170	2.960	4.340	0.540	0.440	0.515	0.222	2.675	28.800	
DATE	**SO4**	**NO3R**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**	
20061002	3.810	0.000	0.330	0.990	2.750	0.490	0.730	0.720	0.260	0.810	11.600	
20061125	3.080	0.000	0.220	0.930	3.790	0.940	0.410	0.390	0.302	0.950	11.800	
20061213	2.650	0.000	0.830	1.000	3.230	0.460	0.240	0.280	0.375	0.950	10.800	
AVG	3.180	0.000	0.460	0.973	3.257	0.630	0.460	0.463	0.312	0.903	11.400	
DATE	**SO4**	**NO3R**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**	
20070217	3.240	1.410	1.660	1.240	2.660	0.580	0.410	0.340	0.256	0.790	11.900	
20070313	4.960	0.000	0.470	1.900	2.970	0.660	0.580	0.600	0.375	1.780	14.900	
20070319	2.090	0.420	0.880	0.750	1.900	0.300	0.320	0.290	0.301	0.610	8.700	
AVG	3.430	0.610	1.003	1.297	2.510	0.513	0.437	0.410	0.311	1.060	11.833	
DATE	**SO4**	**NO3R**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**	
20070524	15.800	0.000	0.500	4.620	4.930	1.070	1.020	1.000	0.292	4.580	32.800	
20070530	6.820	0.000	0.300	2.130	2.880	1.200	0.810	0.800	0.312	2.250	17.200	
20070617	10.600	0.000	0.300	3.160	4.780	0.800	0.850	1.010	0.298	3.210	28.400	
AVG	11.073	0.000	0.367	3.303	4.197	1.023	0.893	0.937	0.301	3.347	26.133	
DATE	**SO4**	**NO3R**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**	
20070804	12.200	0.000	0.230	3.140	3.890	0.754	0.960	0.950	0.257	2.540	29.900	
20070828	21.900	0.000	0.210	3.690	2.970	0.910	0.630	0.630	0.168	8.040	42.000	
20070903	9.240	0.000	0.340	3.350	4.070	1.020	0.530	0.520	0.363	3.410	23.700	
AVG	14.447	0.000	0.260	3.393	3.643	0.895	0.707	0.700	0.263	4.663	31.867	
DATE	**SO4**	**NO3R**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**	
20071009	7.510	0.000	0.420	2.340	2.130	0.790	0.780	0.710	0.312	2.470	17.800	
20071021	2.060	0.000	0.130	0.550	1.070	0.270	0.560	0.610	0.267	0.470	6.200	
20071114	6.010	0.000	1.330	2.680	2.100	0.754	0.240	0.280	0.375	2.150	15.400	
AVG	5.193	0.000	0.627	1.857	1.767	0.605	0.527	0.533	0.318	1.697	13.133	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20080224	6.970	3.260	3.670	3.200	3.800	1.510	0.420	0.460	0.323	2.140	23.100	
20080307	5.030	1.720	2.270	2.450			0.660	0.680	0.375	1.600	14.400	
20080325	3.710	0.000	0.690	1.270	1.660	0.483	0.690	0.610	0.342	1.360	9.500	
AVG	5.237	1.660	2.210	2.307	2.730	0.997	0.590	0.583	0.347	1.700	15.667	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20080418	8.010	0.000	0.270	2.450	3.490	0.726	0.950	1.090	0.306	2.550	19.500	
20080506	4.850	0.000	0.770	1.840	2.130	0.629	1.070	1.160	0.375	1.740	14.000	
20080530	5.790	0.000	0.190	1.590	2.540	0.745	1.000	1.020	0.275	1.440	17.200	
AVG	6.217	0.000	0.410	1.960	2.720	0.700	1.007	1.090	0.319	1.910	16.900	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20080717	13.700	0.000	0.260	3.530	2.580	1.030	0.980	0.940	0.258	2.860	31.500	FRM_MASS = CSN
20080729	14.500	0.000	0.330	3.450	5.220	2.600	0.340	0.320	0.238	2.640	35.400	FRM_MASS = CSN
20080903	11.900	0.000	0.360	3.530	2.970	0.846	0.680	0.670	0.297	3.560	25.900	
AVG	13.367	0.000	0.317	3.503	3.590	1.492	0.667	0.643	0.264	3.020	30.933	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20090419	7.790	0.000	0.860	2.870	2.970	0.761	0.790	0.840	0.368	2.850	19.600
20090525	3.880	0.000	0.640	1.150	2.600	0.600	0.640	0.730	0.296	1.160	14.100
20090606	3.760	0.000	0.370	1.280	1.920	0.498	0.600	0.670	0.340	1.370	12.400
AVG	5.143	0.000	0.623	1.767	2.497	0.620	0.677	0.747	0.335	1.793	15.367

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20090706	4.050	0.000	0.230	1.180	1.960	0.548	0.420	0.460	0.291	1.170	15.800	FRM_MASS = CSN
20090817	10.100	0.000	0.260	2.870	2.740	1.220	0.450	0.350	0.284	2.740	25.500	
20090904	9.130	0.000	0.300	2.270	1.610	0.656	1.370	1.320	0.249	1.750	23.600	
AVG	7.760	0.000	0.263	2.107	2.103	0.808	0.747	0.710	0.275	1.887	21.633	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20091022	4.190	0.000	0.190	1.200	2.370	0.524	0.480	0.450	0.286	1.160	15.200
20091109	4.360	0.000	0.290	1.430	3.870	0.993	0.990	1.090	0.328	1.540	20.600
20091115	3.830	0.000	1.710	1.850	3.200	0.889	0.550	0.590	0.375	1.370	19.600
AVG	4.127	0.000	0.730	1.493	3.147	0.802	0.673	0.710	0.330	1.357	18.467

Florence CSN Speciation Quarterly High Day SANDWICH Averages

YEAR	QTR	FRMc	SO4	NO3r	NO3	NH4	OC	EC	CRUSTalt	DON	H2Oaim
2005	1Q	15.933	3.533	2.907	3.737	2.107	3.810	1.037	0.397	0.343	1.137
2005	2Q	29.100	12.460	0.000	0.353	3.400	5.070	0.613	0.773	0.277	3.157
2005	3Q	26.500	12.783	0.000	0.237	3.173	3.810	0.610	0.920	0.240	2.963
2005	4Q	11.350	3.905	0.000	0.245	0.950	2.620	0.560	0.425	0.256	0.800
2006	1Q	15.700	5.427	0.197	0.743	1.827	3.253	0.740	0.540	0.341	1.703
2006	2Q	24.233	10.480	0.000	0.243	2.440	4.187	0.490	0.893	0.250	2.380
2006	3Q	28.800	13.100	0.000	0.170	2.960	4.340	0.540	0.515	0.222	2.675
2006	4Q	11.400	3.180	0.000	0.460	0.973	3.257	0.630	0.463	0.312	0.903
2007	1Q	11.833	3.430	0.610	1.003	1.297	2.510	0.513	0.410	0.311	1.060
2007	2Q	26.133	11.073	0.000	0.367	3.303	4.197	1.023	0.937	0.301	3.347
2007	3Q	31.867	14.447	0.000	0.260	3.393	3.643	0.895	0.700	0.263	4.663
2007	4Q	13.133	5.193	0.000	0.627	1.857	1.767	0.605	0.533	0.318	1.697
2008	1Q	15.667	5.237	1.660	2.210	2.307	2.730	0.997	0.583	0.347	1.700
2008	2Q	16.900	6.217	0.000	0.410	1.960	2.720	0.700	1.090	0.319	1.910
2008	3Q	30.933	13.367	0.000	0.317	3.503	3.590	1.492	0.643	0.264	3.020
2008	4Q										
2009	1Q										
2009	2Q	15.367	5.143	0.000	0.623	1.767	2.497	0.620	0.747	0.335	1.793
2009	3Q	21.633	7.760	0.000	0.263	2.107	2.103	0.808	0.710	0.275	1.887
2009	4Q	18.467	4.127	0.000	0.730	1.493	3.147	0.802	0.710	0.330	1.357

AVGs	QTR	FRMc	SO4	NO3r	NO3	NH4	OC	EC	CRUSTalt	DON	H2Oaim	NH4r	PBWcalc	OCMmb
	1Q	14.783	4.407	1.343	1.923	1.884	3.076	0.822	0.483	0.335	1.400	1.868	1.427	3.935
	2Q	22.347	9.075	0.000	0.399	2.574	3.734	0.689	0.888	0.296	2.517	2.688	3.219	5.288
	3Q	27.947	12.291	0.000	0.249	3.027	3.497	0.869	0.698	0.253	3.042	3.105	3.143	7.341
	4Q	13.588	4.101	0.000	0.515	1.318	2.698	0.649	0.533	0.304	1.189	1.246	1.530	5.028

PBW Calculation	SO4	NO3r	NH4r
- Calculated from SO4, NO3r, and NH4r	4.407	1.343	1.868
- NH4r calculated from DON, SO4, NO3r	9.075	0.000	2.688
- DON > 0.225, low acidity equation	12.291	0.000	3.105
	4.101	0.000	1.246

S Term	N Term	A Term	Part 1	Part 2	Part 3	Sum	PBWcalc
0.578	0.176	0.245	-21028.448	-145.654	21174.289	0.187	1.427
0.771	0.000	0.229	-19078.473	-239.613	19318.360	0.274	3.219
0.798	0.000	0.202	-16118.707	-261.104	16380.016	0.204	3.143
0.767	0.000	0.233	-19585.753	-236.085	19822.124	0.286	1.530

Methodology:

- Use measured SO4 and EC
- Use retained nitrate (calculated)
- Use calculated indirect NH4 (retained) method for baseline and future
- Use crustal (alt) for other particulate PM2.5 (OPP)
- Use calculated particle bound water for baseline and future
- Degrees of Neutralization (DON) constant from base to future
- Minimum (floor) for OCMmb is equal to OC

Quarterly Averages

AVGs	QTR	FRMc	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	14.783	0.500	14.283	3.935	0.822	4.407	1.343	0.483	1.868	1.427
	2Q	22.347	0.500	21.847	5.288	0.689	9.075	0.000	0.888	2.688	3.219
	3Q	27.947	0.500	27.447	7.341	0.869	12.291	0.000	0.698	3.105	3.143
	4Q	13.588	0.500	13.088	5.028	0.649	4.101	0.000	0.533	1.246	1.530

Relative Compositions (fractions of Non-Blank)

FRACT	QTR	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	1.000	0.275	0.058	0.309	0.094	0.034	0.131	0.100
	2Q	1.000	0.242	0.032	0.415	0.000	0.041	0.123	0.147
	3Q	1.000	0.267	0.032	0.448	0.000	0.025	0.113	0.115
	4Q	1.000	0.384	0.050	0.313	0.000	0.041	0.095	0.117

Greensburg CSN Quarterly Averages

- Calculate quarterly averages of high days (concurrent with Liberty high days)

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20050203	3.880	5.350	6.000	3.180	4.490	1.140	0.330	0.330	0.375	1.410	21.200	
20050215	2.720	0.000	1.180	1.260	3.000	0.740	0.350	0.390	0.375	0.970	8.100	
20050317	4.060	5.310	6.430	3.360	5.960	1.020	0.710	0.830	0.375	1.440	23.300	
AVG	3.553	3.553	4.537	2.600	4.483	0.967	0.463	0.517	0.375	1.273	17.533	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20050510	10.200	0.000	0.550	3.810	5.540	0.930	0.500	0.500	0.374	3.670	22.500	
20050621	13.200	0.000	0.400	3.610	5.320	1.030	0.530	0.500	0.273	3.240	30.300	
20050627	8.990	0.000	0.500	3.420	7.360	0.980	0.950	1.010	0.375	3.220	28.700	
AVG	10.797	0.000	0.483	3.613	6.073	0.980	0.660	0.670	0.341	3.377	27.167	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20050721	13.600	0.000	0.390	4.150	5.260	0.780	0.410	0.380	0.305	4.310	29.700	
20050913	25.100	0.000	0.810	7.380	7.160	1.680	1.100	1.420	0.294	7.370	49.800	FRM_MASS = CSN
20050919	10.800	0.000	0.590	3.250	4.320	1.230	0.590	0.610	0.301	3.330	23.400	
AVG	16.500	0.000	0.597	4.927	5.580	1.230	0.700	0.803	0.300	5.003	34.300	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20051001	6.180	0.000	0.630	2.370	5.610	2.200	0.430	0.430	0.375	2.210	20.300
20051031	5.660	0.000	0.720	2.270	4.830	1.980	0.670	0.710	0.375	2.030	17.800
20051112	1.800	0.000	0.860	0.800	8.030	1.410	0.470	0.520	0.375	0.640	14.600
AVG	4.547	0.000	0.737	1.813	6.157	1.863	0.523	0.553	0.375	1.627	17.567

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20060222	4.770	1.580	2.480	2.510	5.490	1.430	0.690	0.830	0.375	1.520	17.400
20060312	2.880	0.000	1.110	1.100	3.100	0.550	0.430	0.420	0.375	1.030	10.100
20060330	9.000	0.000	2.020	3.960	7.030	1.390	0.750	0.900	0.375	3.220	24.200
AVG	5.550	0.527	1.870	2.523	5.207	1.123	0.623	0.717	0.375	1.923	17.233

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20060411	4.700	0.000	0.680	1.850	4.920	1.080	1.680	1.740	0.375	1.680	15.200
20060529	14.200	0.000	0.570	4.360	6.490	0.800	0.720	0.720	0.307	4.550	32.900
20060616	8.790	0.000	0.480	2.760	5.330	0.710	0.580	0.710	0.314	2.930	20.800
AVG	9.230	0.000	0.577	2.990	5.580	0.863	0.993	1.057	0.332	3.053	22.967

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20060710	8.620	0.000	1.070	2.100	6.120	0.780	0.360	0.450	0.244	1.600	38.800
20060716	5.030	0.000	0.510	1.730	7.040	0.420	0.290	0.350	0.344	1.850	16.600
20060908	18.000	0.000	0.620	6.470	5.100	1.470	0.470	0.460	0.359	6.670	33.500
AVG	10.550	0.000	0.733	3.433	6.087	0.890	0.373	0.420	0.316	3.373	29.633

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20061002	4.280	0.000	0.740	1.590	3.370	1.030	0.310	0.330	0.371	1.550	11.900
20061125	3.260	0.000	1.080	1.490	9.230	1.760	0.800	0.800	0.375	1.170	21.200
20061213	3.290	0.000	1.770	1.580	3.930	0.930	0.230	0.240	0.375	1.180	13.100
AVG	3.610	0.000	1.197	1.553	5.510	1.240	0.447	0.457	0.374	1.300	15.400

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20070217	3.060	3.050	3.300	1.930	3.600	0.760	0.330	0.380	0.341	1.020	14.000
20070313	5.080	0.000	0.810	2.180	4.800	1.090	0.940	0.950	0.375	1.820	15.500
20070319	2.260	1.200	1.660	1.170	3.150	0.980	0.410	0.400	0.364	0.710	10.700
AVG	3.467	1.417	1.923	1.760	3.850	0.943	0.560	0.577	0.360	1.183	13.400

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20070524	14.800	0.000	0.560	5.090	3.980	1.370	0.890	0.890	0.344	5.450	31.800
20070530	12.200	0.000	0.440	4.020	2.710	1.550	0.760	0.780	0.330	4.330	24.100
20070617	13.500	0.000	0.600	4.960			0.490	0.500	0.367	4.950	30.200
AVG	13.500	0.000	0.533	4.690	3.345	1.460	0.713	0.723	0.347	4.910	28.700

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20070804	17.600	0.000	0.530	5.410	4.860	1.220	0.580	0.510	0.307	5.650	37.100
20070828	17.800	0.000	0.410	5.200	2.570	1.270	0.550	0.550	0.292	5.150	34.700
20070903	12.800	0.000	0.730	4.330	3.470	1.060	0.360	0.410	0.338	4.660	28.400
AVG	16.067	0.000	0.557	4.980	3.633	1.183	0.497	0.490	0.312	5.153	33.400

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS	
20071009	10.200	0.000	0.940	4.110	2.410	1.460	0.420	0.510	0.375	3.650	22.500	
20071021	2.280	0.000	0.200	0.800	1.700	0.473	0.220	0.210	0.351	0.850	6.900	
20071114	5.290	0.000	1.760	2.360	2.250	1.150	0.250	0.310	0.375	1.900	15.400	
AVG	5.923	0.000	0.967	2.423	2.120	1.028	0.297	0.343	0.367	2.133	14.933	
DATE	**SO4**	**NO3R**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**	
20080224	7.470	3.650	4.060	3.930	3.740	1.780	0.390	0.450	0.375	2.270	25.200	
20080307	5.780	1.890	2.440	2.690	3.080	1.300	0.460	0.490	0.370	1.880	17.300	
20080325	4.070	0.260	1.520	1.780	2.060	0.895	0.410	0.490	0.375	1.430	10.700	
AVG	5.773	1.933	2.673	2.800	2.960	1.325	0.420	0.477	0.373	1.860	17.733	
DATE	**SO4**	**NO3R**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**	
20080418	7.830	0.000	0.590	2.970	3.780	1.410	1.120	1.260	0.375	2.810	18.000	
20080506	6.170	0.000	1.000	2.480	2.510	1.100	0.920	1.030	0.375	2.210	17.000	
20080530					3.180	1.420					17.200	
AVG	7.000	0.000	0.795	2.725	3.157	1.310	1.020	1.145	0.375	2.510	17.400	
DATE	**SO4**	**NO3R**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**	
20080717	14.800	0.000	0.430	4.790	3.870	1.160	0.840	0.930	0.324	5.150	32.700	
20080729					7.080	1.410					35.400	
20080903	10.200	0.000	0.660	3.080	3.160	1.230	0.610	0.640	0.302	3.170	26.200	FRM_MASS = CSN
AVG	12.500	0.000	0.545	3.935	4.703	1.267	0.725	0.785	0.313	4.160	31.433	
DATE	**SO4**	**NO3R**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**	
20090419	6.840	0.000	1.090	2.750	4.170	2.050	0.470	0.530	0.375	2.450	22.200	
20090525	9.650	0.000	0.980	3.420	3.800	0.924	0.750	0.840	0.354	3.580	24.300	
20090606	6.100	0.000	0.900	2.380	3.860	0.993	0.310	0.350	0.375	2.190	16.700	
AVG	7.530	0.000	0.990	2.850	3.943	1.322	0.510	0.573	0.368	2.740	21.067	
DATE	**SO4**	**NO3R**	**NO3**	**NH4**	**OC**	**EC**	**CRUST**	**CRUSTalt**	**DON**	**H2O_AIM**	**FRM_MASS**	
20090706	3.340	0.000	0.390	1.200	2.450	0.848	0.390	0.350	0.359	1.240	16.700	
20090817	7.600	0.000	0.130	1.800	2.310	0.782	0.590	0.470	0.237	1.380	33.000	
20090904	8.030	0.000	0.590	2.730	2.480	0.990	0.550	0.460	0.340	2.930	21.100	
AVG	6.323	0.000	0.370	1.910	2.413	0.873	0.510	0.427	0.312	1.850	23.600	

DATE	SO4	NO3R	NO3	NH4	OC	EC	CRUST	CRUSTalt	DON	H2O_AIM	FRM_MASS
20091022	4.020	0.000	0.450	1.590	2.620	1.280	0.660	0.650	0.375	1.440	17.400
20091109	4.150	0.000	0.770	1.770	5.200	2.010	0.930	1.010	0.375	1.490	22.500
20091115	4.300	0.000	1.630	2.070	5.360	1.070	0.530	0.520	0.375	1.540	21.200
AVG	4.157	0.000	0.950	1.810	4.393	1.453	0.707	0.727	0.375	1.490	20.367

Greensburg CSN Speciation Quarterly SANDWICH High Day Averages

YEAR	QTR	FRMc	SO4	NO3r	NO3	NH4	OC	EC	CRUSTalt	DON	H2Oaim
2005	**1Q**	17.533	3.553	3.553	4.537	2.600	4.483	0.967	0.517	0.375	1.273
2005	**2Q**	27.167	10.797	0.000	0.483	3.613	6.073	0.980	0.670	0.341	3.377
2005	**3Q**	34.300	16.500	0.000	0.597	4.927	5.580	1.230	0.803	0.300	5.003
2005	**4Q**	17.567	4.547	0.000	0.737	1.813	6.157	1.863	0.553	0.375	1.627
2006	**1Q**	17.233	5.550	0.527	1.870	2.523	5.207	1.123	0.717	0.375	1.923
2006	**2Q**	22.967	9.230	0.000	0.577	2.990	5.580	0.863	1.057	0.332	3.053
2006	**3Q**	29.633	10.550	0.000	0.733	3.433	6.087	0.890	0.420	0.316	3.373
2006	**4Q**	15.400	3.610	0.000	1.197	1.553	5.510	1.240	0.457	0.374	1.300
2007	**1Q**	13.400	3.467	1.417	1.923	1.760	3.850	0.943	0.577	0.360	1.183
2007	**2Q**	28.700	13.500	0.000	0.533	4.690	3.345	1.460	0.723	0.347	4.910
2007	**3Q**	33.400	16.067	0.000	0.557	4.980	3.633	1.183	0.490	0.312	5.153
2007	**4Q**	14.933	5.923	0.000	0.967	2.423	2.120	1.028	0.343	0.367	2.133
2008	**1Q**	17.733	5.773	1.933	2.673	2.800	2.960	1.325	0.477	0.373	1.860
2008	**2Q**	17.400	7.000	0.000	0.795	2.725	3.157	1.310	1.145	0.375	2.510
2008	**3Q**	31.433	12.500	0.000	0.545	3.935	4.703	1.267	0.785	0.313	4.160
2008	**4Q**										
2009	**1Q**										
2009	**2Q**	21.067	7.530	0.000	0.990	2.850	3.943	1.322	0.573	0.368	2.740
2009	**3Q**	23.600	6.323	0.000	0.370	1.910	2.413	0.873	0.427	0.312	1.850
2009	**4Q**	20.367	4.157	0.000	0.950	1.810	4.393	1.453	0.727	0.375	1.490

AVGs	QTR	FRMc	SO4	NO3r	NO3	NH4	OC	EC	CRUSTalt	DON	H2Oaim	NH4r	PBWcalc	OCMmb
	1Q	16.475	4.586	1.858	2.751	2.421	4.125	1.090	0.572	0.371	1.560	2.239	1.443	4.188
	2Q	23.460	9.611	0.000	0.676	3.374	4.420	1.187	0.834	0.353	3.318	3.388	4.176	3.763
	3Q	30.473	12.388	0.000	0.560	3.837	4.483	1.089	0.585	0.311	3.908	3.848	4.802	7.261
	4Q	17.067	4.559	0.000	0.963	1.900	4.545	1.396	0.520	0.373	1.638	1.699	1.935	6.458

PBW Calculation	SO4	NO3r	NH4r
- Calculated from SO4, NO3r, and NH4r	4.586	1.858	2.239
- NH4r calculated from DON, SO4, NO3r	9.611	0.000	3.388
- DON > 0.225, low acidity equation	12.388	0.000	3.848
	4.559	0.000	1.699

S Term	N Term	A Term	Part 1	Part 2	Part 3	Sum	PBWcalc
0.528	0.214	0.258	-22483.678	-120.982	22604.826	0.166	1.443
0.739	0.000	0.261	-22698.775	-215.326	22914.422	0.321	4.176
0.763	0.000	0.237	-20026.644	-233.054	20259.994	0.296	4.802
0.729	0.000	0.271	-23934.164	-207.480	24141.954	0.309	1.935

Methodology:

- Use measured SO4 and EC
- Use retained nitrate (calculated)
- Use calculated indirect NH4 (retained) method for baseline and future
- Use crustal (alt) for other particulate PM2.5 (OPP)
- Use calculated particle bound water for baseline and future
- Degrees of Neutralization (DON) constant from base to future
- Minimum (floor) for OCMmb is equal to OC

Reconstruction for Quarters with OCMmb < OCfloor

RFM	QTR	FRMc	SO4	NO3r	OC	EC	CRUSTalt	NH4r	PBWcalc	Pa	CFM	FRMc/CFM
	1Q											
	2Q	23.460	9.611	0.000	4.420	1.187	0.834	3.388	4.176	0.500	24.116	0.973
	3Q											
	4Q											

Adjusted Averages

Adjusted	QTR	FRMc	SO4	NO3r	OC	EC	CRUSTalt	NH4r	PBWcalc	Pa	OCMmb
AVGs	1Q	16.475	4.586	1.858	4.125	1.090	0.572	2.239	1.443	0.500	4.188
	2Q	23.460	9.350	0.000	4.299	1.155	0.811	3.296	4.063	0.500	4.286
	3Q	30.473	12.388	0.000	4.483	1.089	0.585	3.848	4.802	0.500	7.261
	4Q	17.067	4.559	0.000	4.545	1.396	0.520	1.699	1.935	0.500	6.458

Quarterly Averages

AVGs	QTR	FRMc	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	16.475	0.500	15.975	4.188	1.090	4.586	1.858	0.572	2.239	1.443
	2Q	23.460	0.500	22.960	4.286	1.155	9.350	0.000	0.811	3.296	4.063
	3Q	30.473	0.500	29.973	7.261	1.089	12.388	0.000	0.585	3.848	4.802
	4Q	17.067	0.500	16.567	6.458	1.396	4.559	0.000	0.520	1.699	1.935

Relative Compositions (fractions of Non-Blank)

FRACT	QTR	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	1.000	0.262	0.068	0.287	0.116	0.036	0.140	0.090
	2Q	1.000	0.187	0.050	0.407	0.000	0.035	0.144	0.177
	3Q	1.000	0.242	0.036	0.413	0.000	0.020	0.128	0.160
	4Q	1.000	0.390	0.084	0.275	0.000	0.031	0.103	0.117

Liberty SANDWICH High Day Averages, Local and Regional Split

CSN Quarterly Compositions, SWPA sites (concurrent with Liberty High Days)

Lawrenceville	**QTR**	**FRMc**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**
	1Q	19.225	0.500	18.725	5.087	1.197	5.039	2.666	1.022	2.280	1.434
	2Q	23.580	0.500	23.080	6.454	0.997	8.223	0.000	1.551	2.592	3.264
	3Q	27.690	0.500	27.190	5.842	1.100	11.125	0.000	0.973	3.590	4.560
	4Q	17.317	0.500	16.817	5.372	1.510	4.550	0.000	1.760	1.674	1.950

Florence	**QTR**	**FRMc**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**
	1Q	14.783	0.500	14.283	3.935	0.822	4.407	1.343	0.483	1.868	1.427
	2Q	22.347	0.500	21.847	5.288	0.689	9.075	0.000	0.888	2.688	3.219
	3Q	27.947	0.500	27.447	7.341	0.869	12.291	0.000	0.698	3.105	3.143
	4Q	13.588	0.500	13.088	5.028	0.649	4.101	0.000	0.533	1.246	1.530

Greensburg	**QTR**	**FRMc**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**
	1Q	16.475	0.500	15.975	4.188	1.090	4.586	1.858	0.572	2.239	1.443
	2Q	23.460	0.500	22.960	4.286	1.155	9.350	0.000	0.811	3.296	4.063
	3Q	30.473	0.500	29.973	7.261	1.089	12.388	0.000	0.585	3.848	4.802
	4Q	17.067	0.500	16.567	6.458	1.396	4.559	0.000	0.520	1.699	1.935

SWPA	**QTR**	**FRMc**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**
Avgs	**1Q**	16.828	0.500	16.328	4.403	1.036	4.677	1.956	0.692	2.129	1.435
	2Q	23.129	0.500	22.629	5.343	0.947	8.882	0.000	1.083	2.859	3.515
	3Q	28.703	0.500	28.203	6.815	1.019	11.935	0.000	0.752	3.514	4.168
	4Q	15.990	0.500	15.490	5.619	1.185	4.403	0.000	0.938	1.540	1.805

Liberty	**QTR**	**FRMc**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**
	1Q	29.350	0.500	28.850	9.533	3.588	6.738	2.388	1.256	3.211	2.137
	2Q	34.667	0.500	34.167	9.729	4.572	10.130	0.000	1.670	3.720	4.347
	3Q	42.147	0.500	41.647	8.997	5.171	14.551	0.000	1.366	5.276	6.286
	4Q	46.575	0.500	46.075	18.370	8.233	9.728	0.016	1.975	3.652	4.101

Liberty Local	QTR	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	12.522	5.129	2.552	2.061	0.432	0.564	1.082	0.702
	2Q	11.538	4.386	3.625	1.247	0.000	0.586	0.861	0.832
	3Q	13.443	2.182	4.152	2.616	0.000	0.614	1.762	2.117
	4Q	30.585	12.751	7.048	5.324	0.016	1.037	2.112	2.296

Liberty Regional	QTR	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	16.328	4.403	1.036	4.677	1.956	0.692	2.129	1.435
	2Q	22.629	5.343	0.947	8.882	0.000	1.083	2.859	3.515
	3Q	28.203	6.815	1.019	11.935	0.000	0.752	3.514	4.168
	4Q	15.490	5.619	1.185	4.403	0.000	0.938	1.540	1.805

Local Fractions of Species	QTR	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	0.538	0.711	0.306	0.181	0.449	0.337	0.329
	2Q	0.451	0.793	0.123	0.000	0.351	0.231	0.191
	3Q	0.243	0.803	0.180	0.000	0.449	0.334	0.337
	4Q	0.694	0.856	0.547	1.000	0.525	0.578	0.560

Regional Fractions of Species	QTR	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	0.462	0.289	0.694	0.819	0.551	0.663	0.671
	2Q	0.549	0.207	0.877	0.000	0.649	0.769	0.809
	3Q	0.757	0.197	0.820	0.000	0.551	0.666	0.663
	4Q	0.306	0.144	0.453	0.000	0.475	0.422	0.440

Liberty Local LPM Fractions	QTR	LPM	OCMmb	EC	OPP
	1Q	8.245	0.622	0.309	0.068
	2Q	8.598	0.510	0.422	0.068
	3Q	6.948	0.314	0.598	0.088
	4Q	20.836	0.612	0.338	0.050

Liberty Quarterly SANDWICH High Day Concentrations, by Regional/Local

Split Compositions (fractions of species)

		Regional							Local						
FRACT	QTR	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
	1Q	0.462	0.289	0.694	0.819	0.551	0.663	0.671	0.538	0.711	0.306	0.181	0.449	0.337	0.329
	2Q	0.549	0.207	0.877	0.000	0.649	0.769	0.809	0.451	0.793	0.123	0.000	0.351	0.231	0.191
	3Q	0.757	0.197	0.820	0.000	0.551	0.666	0.663	0.243	0.803	0.180	0.000	0.449	0.334	0.337
	4Q	0.306	0.144	0.453	0.000	0.475	0.422	0.440	0.694	0.856	0.547	1.000	0.525	0.578	0.560

Methodology:

- Apply quarterly relative compositions to each quarterly high day in 5-year period
- FRMh is FRM high day (8 per quarter)

					Regional							Local						
YEAR	QTR	FRMh	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc
2005	1Q	52.4	0.5	51.9	7.921	1.864	8.414	3.518	1.245	3.830	2.581	9.227	4.590	3.708	0.777	1.014	1.947	1.263
	1Q	44.7	0.5	44.2	6.746	1.587	7.166	2.996	1.060	3.262	2.198	7.858	3.909	3.158	0.662	0.864	1.658	1.076
	1Q	41.8	0.5	41.3	6.303	1.483	6.696	2.799	0.991	3.048	2.054	7.343	3.653	2.951	0.618	0.807	1.549	1.005
	1Q	37.8	0.5	37.3	5.693	1.340	6.047	2.528	0.895	2.753	1.855	6.632	3.299	2.665	0.558	0.729	1.399	0.908
	1Q	37.4	0.5	36.9	5.632	1.325	5.982	2.501	0.885	2.723	1.835	6.561	3.263	2.636	0.552	0.721	1.384	0.898
	1Q	33.4	0.5	32.9	5.021	1.182	5.334	2.230	0.789	2.428	1.636	5.849	2.910	2.350	0.493	0.643	1.234	0.801
	1Q	31.2	0.5	30.7	4.686	1.103	4.977	2.081	0.736	2.266	1.527	5.458	2.715	2.193	0.460	0.600	1.152	0.747
	1Q	31.0	0.5	30.5	4.655	1.095	4.945	2.067	0.732	2.251	1.517	5.423	2.697	2.179	0.457	0.596	1.144	0.742
2006	1Q	60.6	0.5	60.1	9.173	2.158	9.744	4.074	1.441	4.435	2.989	10.685	5.315	4.294	0.900	1.175	2.255	1.463
	1Q	51.9	0.5	51.4	7.845	1.846	8.333	3.484	1.233	3.793	2.556	9.139	4.546	3.672	0.770	1.005	1.928	1.251
	1Q	47.9	0.5	47.4	7.234	1.702	7.685	3.213	1.137	3.498	2.357	8.427	4.192	3.386	0.710	0.926	1.778	1.153
	1Q	44.7	0.5	44.2	6.746	1.587	7.166	2.996	1.060	3.262	2.198	7.858	3.909	3.158	0.662	0.864	1.658	1.076
	1Q	40.4	0.5	39.9	6.090	1.433	6.469	2.705	0.957	2.944	1.984	7.094	3.529	2.851	0.597	0.780	1.497	0.971
	1Q	36.1	0.5	35.6	5.433	1.279	5.772	2.413	0.854	2.627	1.770	6.329	3.148	2.543	0.533	0.696	1.336	0.866
	1Q	33.5	0.5	33.0	5.037	1.185	5.350	2.237	0.791	2.435	1.641	5.867	2.919	2.358	0.494	0.645	1.238	0.803
	1Q	27.7	0.5	27.2	4.151	0.977	4.410	1.844	0.652	2.007	1.353	4.836	2.406	1.943	0.407	0.532	1.020	0.662
2007	1Q	54.1	0.5	53.6	8.181	1.925	8.690	3.633	1.286	3.955	2.666	9.530	4.740	3.829	0.803	1.048	2.011	1.304
	1Q	48.1	0.5	47.6	7.265	1.710	7.717	3.226	1.142	3.513	2.367	8.463	4.210	3.401	0.713	0.930	1.786	1.158
	1Q	47.0	0.5	46.5	7.097	1.670	7.539	3.152	1.115	3.432	2.312	8.267	4.112	3.322	0.696	0.909	1.745	1.132

	1Q	46.9	0.5	46.4	7.082	1.666	7.522	3.145	1.113	3.424	2.307	8.250	4.104	3.315	0.695	0.907	1.741	1.129
	1Q	46.3	0.5	45.8	6.990	1.645	7.425	3.104	1.098	3.380	2.278	8.143	4.051	3.272	0.686	0.895	1.718	1.115
	1Q	30.2	0.5	29.7	4.533	1.067	4.815	2.013	0.712	2.192	1.477	5.280	2.627	2.122	0.445	0.581	1.114	0.723
	1Q	28.0	0.5	27.5	4.197	0.988	4.458	1.864	0.660	2.029	1.368	4.889	2.432	1.965	0.412	0.538	1.032	0.669
	1Q	26.1	0.5	25.6	3.907	0.919	4.150	1.735	0.614	1.889	1.273	4.551	2.264	1.829	0.383	0.500	0.960	0.623
2008	**1Q**	47.7	0.5	47.2	7.204	1.695	7.652	3.199	1.132	3.483	2.347	8.392	4.174	3.372	0.707	0.923	1.771	1.149
	1Q	35.8	0.5	35.3	5.388	1.268	5.723	2.393	0.847	2.605	1.755	6.276	3.122	2.522	0.529	0.690	1.324	0.859
	1Q	35.7	0.5	35.2	5.372	1.264	5.707	2.386	0.844	2.598	1.750	6.258	3.113	2.515	0.527	0.688	1.321	0.857
	1Q	34.5	0.5	34.0	5.189	1.221	5.512	2.305	0.815	2.509	1.691	6.045	3.007	2.429	0.509	0.665	1.276	0.827
	1Q	30.4	0.5	29.9	4.563	1.074	4.847	2.027	0.717	2.207	1.487	5.316	2.644	2.136	0.448	0.584	1.122	0.728
	1Q	29.4	0.5	28.9	4.411	1.038	4.685	1.959	0.693	2.133	1.437	5.138	2.556	2.065	0.433	0.565	1.084	0.703
	1Q	29.2	0.5	28.7	4.380	1.031	4.653	1.945	0.688	2.118	1.427	5.103	2.538	2.050	0.430	0.561	1.077	0.698
	1Q	28.9	0.5	28.4	4.335	1.020	4.604	1.925	0.681	2.096	1.412	5.049	2.512	2.029	0.425	0.555	1.065	0.691
2009	**1Q**	54.8	0.5	54.3	8.288	1.950	8.803	3.681	1.302	4.007	2.700	9.654	4.802	3.879	0.813	1.061	2.037	1.321
	1Q	42.2	0.5	41.7	6.364	1.498	6.760	2.827	1.000	3.077	2.074	7.414	3.688	2.979	0.624	0.815	1.564	1.015
	1Q	40.3	0.5	39.8	6.074	1.429	6.452	2.698	0.955	2.937	1.979	7.076	3.520	2.843	0.596	0.778	1.493	0.969
	1Q	35.1	0.5	34.6	5.281	1.243	5.609	2.345	0.830	2.553	1.721	6.152	3.060	2.472	0.518	0.676	1.298	0.842
	1Q	33.3	0.5	32.8	5.006	1.178	5.318	2.223	0.787	2.421	1.631	5.832	2.901	2.343	0.491	0.641	1.231	0.798
	1Q	32.5	0.5	32.0	4.884	1.149	5.188	2.169	0.767	2.361	1.591	5.689	2.830	2.286	0.479	0.625	1.201	0.779
	1Q	31.6	0.5	31.1	4.747	1.117	5.042	2.108	0.746	2.295	1.547	5.529	2.751	2.222	0.466	0.608	1.167	0.757
	1Q	27.4	0.5	26.9	4.106	0.966	4.361	1.823	0.645	1.985	1.338	4.783	2.379	1.922	0.403	0.526	1.009	0.655

					Regional							**Local**						
YEAR	**QTR**	**FRMh**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**
2005	**2Q**	77.8	0.5	77.3	12.087	2.142	20.096	0.000	2.451	6.468	7.953	9.924	8.202	2.822	0.000	1.326	1.948	1.882
	2Q	73.4	0.5	72.9	11.399	2.021	18.952	0.000	2.311	6.099	7.500	9.359	7.735	2.661	0.000	1.251	1.837	1.775
	2Q	69.6	0.5	69.1	10.805	1.915	17.964	0.000	2.191	5.781	7.109	8.871	7.332	2.522	0.000	1.186	1.741	1.682
	2Q	67.0	0.5	66.5	10.398	1.843	17.288	0.000	2.109	5.564	6.841	8.537	7.056	2.427	0.000	1.141	1.676	1.619
	2Q	62.2	0.5	61.7	9.648	1.710	16.040	0.000	1.956	5.162	6.348	7.921	6.547	2.252	0.000	1.059	1.555	1.502
	2Q	60.3	0.5	59.8	9.351	1.657	15.546	0.000	1.896	5.003	6.152	7.677	6.345	2.183	0.000	1.026	1.507	1.456
	2Q	59.0	0.5	58.5	9.148	1.621	15.208	0.000	1.855	4.895	6.018	7.510	6.207	2.135	0.000	1.004	1.474	1.424
	2Q	58.8	0.5	58.3	9.116	1.616	15.156	0.000	1.849	4.878	5.998	7.485	6.186	2.128	0.000	1.000	1.469	1.419
2006	**2Q**	60.1	0.5	59.6	9.320	1.652	15.494	0.000	1.890	4.987	6.132	7.651	6.324	2.176	0.000	1.023	1.502	1.451
	2Q	58.4	0.5	57.9	9.054	1.605	15.052	0.000	1.836	4.844	5.957	7.433	6.144	2.114	0.000	0.994	1.459	1.409
	2Q	54.1	0.5	53.6	8.381	1.486	13.934	0.000	1.700	4.485	5.514	6.881	5.687	1.957	0.000	0.920	1.351	1.305
	2Q	45.5	0.5	45.0	7.037	1.247	11.699	0.000	1.427	3.765	4.630	5.777	4.775	1.643	0.000	0.772	1.134	1.095

	2Q	41.8	0.5	41.3	6.458	1.145	10.737	0.000	1.310	3.456	4.249	5.302	4.382	1.508	0.000	0.709	1.041	1.005
	2Q	38.9	0.5	38.4	6.005	1.064	9.983	0.000	1.218	3.213	3.951	4.930	4.075	1.402	0.000	0.659	0.968	0.935
	2Q	38.6	0.5	38.1	5.958	1.056	9.905	0.000	1.208	3.188	3.920	4.891	4.043	1.391	0.000	0.654	0.960	0.927
	2Q	36.1	0.5	35.6	5.567	0.987	9.255	0.000	1.129	2.979	3.662	4.570	3.777	1.300	0.000	0.611	0.897	0.867
2007	**2Q**	56.5	0.5	56.0	8.757	1.552	14.558	0.000	1.776	4.685	5.761	7.189	5.942	2.044	0.000	0.961	1.411	1.363
	2Q	54.5	0.5	54.0	8.444	1.497	14.038	0.000	1.712	4.518	5.555	6.933	5.730	1.971	0.000	0.927	1.361	1.314
	2Q	54.2	0.5	53.7	8.397	1.488	13.960	0.000	1.703	4.493	5.525	6.894	5.698	1.960	0.000	0.922	1.353	1.307
	2Q	49.5	0.5	49.0	7.662	1.358	12.739	0.000	1.554	4.100	5.041	6.291	5.199	1.789	0.000	0.841	1.235	1.193
	2Q	46.1	0.5	45.6	7.130	1.264	11.855	0.000	1.446	3.815	4.691	5.854	4.839	1.665	0.000	0.783	1.149	1.110
	2Q	44.4	0.5	43.9	6.865	1.217	11.413	0.000	1.392	3.673	4.516	5.636	4.658	1.603	0.000	0.753	1.106	1.069
	2Q	44.3	0.5	43.8	6.849	1.214	11.387	0.000	1.389	3.665	4.506	5.623	4.648	1.599	0.000	0.752	1.104	1.066
	2Q	43.0	0.5	42.5	6.646	1.178	11.049	0.000	1.348	3.556	4.372	5.456	4.510	1.551	0.000	0.729	1.071	1.035
2008	**2Q**	66.9	0.5	66.4	10.383	1.840	17.262	0.000	2.105	5.556	6.831	8.524	7.046	2.424	0.000	1.139	1.673	1.616
	2Q	56.7	0.5	56.2	8.788	1.558	14.610	0.000	1.782	4.702	5.782	7.215	5.963	2.051	0.000	0.964	1.416	1.368
	2Q	56.0	0.5	55.5	8.678	1.538	14.428	0.000	1.760	4.644	5.710	7.125	5.889	2.026	0.000	0.952	1.398	1.351
	2Q	39.5	0.5	39.0	6.098	1.081	10.139	0.000	1.237	3.263	4.012	5.007	4.138	1.424	0.000	0.669	0.983	0.949
	2Q	38.2	0.5	37.7	5.895	1.045	9.801	0.000	1.195	3.154	3.879	4.840	4.000	1.376	0.000	0.647	0.950	0.918
	2Q	36.7	0.5	36.2	5.661	1.003	9.411	0.000	1.148	3.029	3.724	4.647	3.841	1.321	0.000	0.621	0.912	0.881
	2Q	36.5	0.5	36.0	5.629	0.998	9.359	0.000	1.141	3.012	3.704	4.622	3.820	1.314	0.000	0.618	0.907	0.876
	2Q	35.6	0.5	35.1	5.489	0.973	9.125	0.000	1.113	2.937	3.611	4.506	3.724	1.281	0.000	0.602	0.884	0.854
2009	**2Q**	35.0	0.5	34.5	5.395	0.956	8.969	0.000	1.094	2.887	3.549	4.429	3.661	1.259	0.000	0.592	0.869	0.840
	2Q	33.6	0.5	33.1	5.176	0.917	8.605	0.000	1.050	2.769	3.405	4.249	3.512	1.208	0.000	0.568	0.834	0.806
	2Q	33.0	0.5	32.5	5.082	0.901	8.449	0.000	1.030	2.719	3.344	4.172	3.449	1.186	0.000	0.558	0.819	0.791
	2Q	32.4	0.5	31.9	4.988	0.884	8.293	0.000	1.011	2.669	3.282	4.095	3.385	1.164	0.000	0.547	0.804	0.776
	2Q	30.7	0.5	30.2	4.722	0.837	7.851	0.000	0.958	2.527	3.107	3.877	3.205	1.102	0.000	0.518	0.761	0.735
	2Q	29.3	0.5	28.8	4.503	0.798	7.487	0.000	0.913	2.410	2.963	3.697	3.056	1.051	0.000	0.494	0.726	0.701
	2Q	28.8	0.5	28.3	4.425	0.784	7.357	0.000	0.897	2.368	2.911	3.633	3.003	1.033	0.000	0.486	0.713	0.689
	2Q	27.4	0.5	26.9	4.206	0.746	6.993	0.000	0.853	2.251	2.767	3.453	2.854	0.982	0.000	0.462	0.678	0.655

					Regional							**Local**						
YEAR	**QTR**	**FRMh**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**
2005	**3Q**	84.9	0.5	84.4	13.811	2.066	24.187	0.000	1.524	7.122	8.448	4.422	8.415	5.301	0.000	1.244	3.571	4.291
	3Q	70.4	0.5	69.9	11.438	1.711	20.031	0.000	1.262	5.898	6.996	3.662	6.969	4.391	0.000	1.030	2.957	3.554
	3Q	62.6	0.5	62.1	10.162	1.520	17.796	0.000	1.121	5.240	6.216	3.254	6.191	3.901	0.000	0.915	2.627	3.157
	3Q	61.7	0.5	61.2	10.014	1.498	17.538	0.000	1.105	5.164	6.126	3.206	6.102	3.844	0.000	0.902	2.589	3.112
	3Q	58.9	0.5	58.4	9.556	1.429	16.736	0.000	1.054	4.928	5.845	3.060	5.823	3.668	0.000	0.861	2.471	2.969

	3Q	58.7	0.5	58.2	9.524	1.424	16.678	0.000	1.051	4.911	5.825	3.049	5.803	3.656	0.000	0.858	2.462	2.959
	3Q	50.0	0.5	49.5	8.100	1.211	14.185	0.000	0.894	4.177	4.955	2.593	4.935	3.109	0.000	0.730	2.094	2.517
	3Q	47.8	0.5	47.3	7.740	1.158	13.555	0.000	0.854	3.991	4.734	2.478	4.716	2.971	0.000	0.697	2.001	2.405
2006	**3Q**	54.7	0.5	54.2	8.869	1.327	15.532	0.000	0.978	4.573	5.425	2.840	5.404	3.404	0.000	0.799	2.293	2.756
	3Q	50.8	0.5	50.3	8.231	1.231	14.415	0.000	0.908	4.244	5.035	2.635	5.015	3.159	0.000	0.741	2.128	2.557
	3Q	47.1	0.5	46.6	7.625	1.141	13.354	0.000	0.841	3.932	4.664	2.442	4.646	2.927	0.000	0.687	1.971	2.369
	3Q	45.4	0.5	44.9	7.347	1.099	12.867	0.000	0.811	3.789	4.494	2.352	4.477	2.820	0.000	0.662	1.900	2.283
	3Q	45.1	0.5	44.6	7.298	1.092	12.781	0.000	0.805	3.763	4.464	2.337	4.447	2.801	0.000	0.657	1.887	2.268
	3Q	44.4	0.5	43.9	7.184	1.074	12.580	0.000	0.793	3.704	4.394	2.300	4.377	2.757	0.000	0.647	1.857	2.232
	3Q	43.5	0.5	43.0	7.036	1.052	12.323	0.000	0.776	3.628	4.304	2.253	4.287	2.701	0.000	0.634	1.819	2.186
	3Q	49.9	0.5	49.4	8.084	1.209	14.157	0.000	0.892	4.168	4.945	2.588	4.925	3.103	0.000	0.728	2.090	2.512
2007	**3Q**	61.7	0.5	61.2	10.014	1.498	17.538	0.000	1.105	5.164	6.126	3.206	6.102	3.844	0.000	0.902	2.589	3.112
	3Q	58.7	0.5	58.2	9.524	1.424	16.678	0.000	1.051	4.911	5.825	3.049	5.803	3.656	0.000	0.858	2.462	2.959
	3Q	56.5	0.5	56.0	9.164	1.371	16.048	0.000	1.011	4.725	5.605	2.934	5.583	3.518	0.000	0.825	2.369	2.847
	3Q	56.2	0.5	55.7	9.114	1.363	15.962	0.000	1.006	4.700	5.575	2.918	5.553	3.499	0.000	0.821	2.356	2.832
	3Q	54.7	0.5	54.2	8.869	1.327	15.532	0.000	0.978	4.573	5.425	2.840	5.404	3.404	0.000	0.799	2.293	2.756
	3Q	54.3	0.5	53.8	8.804	1.317	15.418	0.000	0.971	4.540	5.385	2.819	5.364	3.379	0.000	0.793	2.276	2.735
	3Q	53.8	0.5	53.3	8.722	1.304	15.274	0.000	0.962	4.497	5.335	2.793	5.314	3.348	0.000	0.786	2.255	2.710
	3Q	51.0	0.5	50.5	8.264	1.236	14.472	0.000	0.912	4.261	5.055	2.646	5.035	3.172	0.000	0.744	2.136	2.568
2008	**3Q**	50.0	0.5	49.5	8.100	1.211	14.185	0.000	0.894	4.177	4.955	2.593	4.935	3.109	0.000	0.730	2.094	2.517
	3Q	49.5	0.5	49.0	8.018	1.199	14.042	0.000	0.885	4.135	4.905	2.567	4.885	3.078	0.000	0.722	2.073	2.491
	3Q	47.1	0.5	46.6	7.625	1.141	13.354	0.000	0.841	3.932	4.664	2.442	4.646	2.927	0.000	0.687	1.971	2.369
	3Q	45.1	0.5	44.6	7.298	1.092	12.781	0.000	0.805	3.763	4.464	2.337	4.447	2.801	0.000	0.657	1.887	2.268
	3Q	45.0	0.5	44.5	7.282	1.089	12.752	0.000	0.803	3.755	4.454	2.331	4.437	2.795	0.000	0.656	1.883	2.263
	3Q	44.4	0.5	43.9	7.184	1.074	12.580	0.000	0.793	3.704	4.394	2.300	4.377	2.757	0.000	0.647	1.857	2.232
	3Q	43.8	0.5	43.3	7.085	1.060	12.409	0.000	0.782	3.654	4.334	2.269	4.317	2.720	0.000	0.638	1.832	2.202
	3Q	40.2	0.5	39.7	6.496	0.972	11.377	0.000	0.717	3.350	3.974	2.080	3.958	2.494	0.000	0.585	1.680	2.018
2009	**3Q**	41.9	0.5	41.4	6.774	1.013	11.864	0.000	0.747	3.493	4.144	2.169	4.128	2.600	0.000	0.610	1.751	2.105
	3Q	33.5	0.5	33.0	5.400	0.808	9.457	0.000	0.596	2.785	3.303	1.729	3.290	2.073	0.000	0.486	1.396	1.678
	3Q	31.7	0.5	31.2	5.105	0.764	8.941	0.000	0.563	2.633	3.123	1.635	3.111	1.960	0.000	0.460	1.320	1.586
	3Q	31.1	0.5	30.6	5.007	0.749	8.769	0.000	0.552	2.582	3.063	1.603	3.051	1.922	0.000	0.451	1.295	1.556
	3Q	28.4	0.5	27.9	4.565	0.683	7.995	0.000	0.504	2.354	2.793	1.462	2.782	1.752	0.000	0.411	1.180	1.419
	3Q	28.4	0.5	27.9	4.565	0.683	7.995	0.000	0.504	2.354	2.793	1.462	2.782	1.752	0.000	0.411	1.180	1.419
	3Q	27.5	0.5	27.0	4.418	0.661	7.737	0.000	0.487	2.278	2.702	1.415	2.692	1.696	0.000	0.398	1.142	1.373
	3Q	26.9	0.5	26.4	4.320	0.646	7.565	0.000	0.477	2.228	2.642	1.383	2.632	1.658	0.000	0.389	1.117	1.342

					Regional							Local						
YEAR	**QTR**	**FRMh**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**
2005	**4Q**	100.3	0.5	99.8	12.172	2.567	9.538	0.000	2.031	3.335	3.909	27.618	15.267	11.532	0.034	2.247	4.576	4.974
	4Q	83.1	0.5	82.6	10.074	2.125	7.894	0.000	1.681	2.761	3.235	22.858	12.636	9.545	0.028	1.860	3.787	4.117
	4Q	73.7	0.5	73.2	8.927	1.883	6.996	0.000	1.490	2.446	2.867	20.257	11.198	8.458	0.025	1.648	3.356	3.648
	4Q	68.2	0.5	67.7	8.257	1.742	6.470	0.000	1.378	2.263	2.652	18.735	10.356	7.823	0.023	1.524	3.104	3.374
	4Q	61.9	0.5	61.4	7.488	1.579	5.868	0.000	1.250	2.052	2.405	16.991	9.393	7.095	0.021	1.382	2.815	3.060
	4Q	51.2	0.5	50.7	6.183	1.304	4.845	0.000	1.032	1.694	1.986	14.030	7.756	5.858	0.017	1.141	2.325	2.527
	4Q	48.8	0.5	48.3	5.891	1.242	4.616	0.000	0.983	1.614	1.892	13.366	7.389	5.581	0.017	1.087	2.215	2.407
	4Q	48.3	0.5	47.8	5.830	1.230	4.568	0.000	0.973	1.598	1.872	13.228	7.312	5.523	0.016	1.076	2.192	2.382
2006	**4Q**	100.7	0.5	100.2	12.220	2.578	9.576	0.000	2.039	3.349	3.925	27.729	15.328	11.578	0.034	2.256	4.594	4.994
	4Q	82.1	0.5	81.6	9.952	2.099	7.799	0.000	1.661	2.727	3.196	22.581	12.483	9.429	0.028	1.837	3.741	4.067
	4Q	68.0	0.5	67.5	8.232	1.736	6.451	0.000	1.374	2.256	2.644	18.680	10.326	7.800	0.023	1.520	3.095	3.364
	4Q	58.9	0.5	58.4	7.122	1.502	5.581	0.000	1.189	1.952	2.287	16.161	8.934	6.748	0.020	1.315	2.678	2.911
	4Q	55.7	0.5	55.2	6.732	1.420	5.276	0.000	1.123	1.845	2.162	15.276	8.444	6.378	0.019	1.243	2.531	2.751
	4Q	50.8	0.5	50.3	6.135	1.294	4.807	0.000	1.024	1.681	1.970	13.920	7.695	5.812	0.017	1.132	2.306	2.507
	4Q	50.7	0.5	50.2	6.122	1.291	4.798	0.000	1.022	1.678	1.966	13.892	7.679	5.801	0.017	1.130	2.302	2.502
	4Q	48.3	0.5	47.8	5.830	1.230	4.568	0.000	0.973	1.598	1.872	13.228	7.312	5.523	0.016	1.076	2.192	2.382
2007	**4Q**	58.7	0.5	58.2	7.098	1.497	5.562	0.000	1.184	1.945	2.280	16.106	8.903	6.725	0.020	1.310	2.668	2.901
	4Q	58.0	0.5	57.5	7.013	1.479	5.495	0.000	1.170	1.922	2.252	15.912	8.796	6.644	0.020	1.294	2.636	2.866
	4Q	45.8	0.5	45.3	5.525	1.165	4.329	0.000	0.922	1.514	1.774	12.536	6.930	5.234	0.016	1.020	2.077	2.258
	4Q	41.7	0.5	41.2	5.025	1.060	3.938	0.000	0.838	1.377	1.614	11.401	6.303	4.761	0.014	0.928	1.889	2.053
	4Q	40.3	0.5	39.8	4.854	1.024	3.804	0.000	0.810	1.330	1.559	11.014	6.088	4.599	0.014	0.896	1.825	1.984
	4Q	40.3	0.5	39.8	4.854	1.024	3.804	0.000	0.810	1.330	1.559	11.014	6.088	4.599	0.014	0.896	1.825	1.984
	4Q	39.7	0.5	39.2	4.781	1.008	3.746	0.000	0.798	1.310	1.535	10.848	5.997	4.530	0.013	0.883	1.797	1.954
	4Q	35.2	0.5	34.7	4.232	0.893	3.316	0.000	0.706	1.160	1.359	9.603	5.308	4.010	0.012	0.781	1.591	1.729
2008	**4Q**	70.8	0.5	70.3	8.574	1.808	6.719	0.000	1.431	2.350	2.753	19.454	10.754	8.123	0.024	1.583	3.223	3.504
	4Q	63.2	0.5	62.7	7.647	1.613	5.992	0.000	1.276	2.096	2.456	17.351	9.591	7.245	0.022	1.412	2.875	3.125
	4Q	62.7	0.5	62.2	7.586	1.600	5.945	0.000	1.266	2.079	2.436	17.213	9.515	7.187	0.021	1.400	2.852	3.100
	4Q	55.1	0.5	54.6	6.659	1.405	5.218	0.000	1.111	1.825	2.139	15.110	8.352	6.309	0.019	1.229	2.503	2.721
	4Q	40.2	0.5	39.7	4.842	1.021	3.794	0.000	0.808	1.327	1.555	10.986	6.073	4.587	0.014	0.894	1.820	1.979
	4Q	39.6	0.5	39.1	4.769	1.006	3.737	0.000	0.796	1.307	1.531	10.820	5.981	4.518	0.013	0.880	1.793	1.949
	4Q	37.4	0.5	36.9	4.500	0.949	3.527	0.000	0.751	1.233	1.445	10.211	5.645	4.264	0.013	0.831	1.692	1.839
	4Q	35.1	0.5	34.6	4.220	0.890	3.307	0.000	0.704	1.156	1.355	9.575	5.293	3.998	0.012	0.779	1.586	1.724
2009	**4Q**	92.1	0.5	91.6	11.172	2.356	8.754	0.000	1.864	3.061	3.588	25.349	14.012	10.584	0.031	2.062	4.200	4.565
	4Q	59.2	0.5	58.7	7.159	1.510	5.610	0.000	1.195	1.962	2.299	16.244	8.980	6.783	0.020	1.322	2.691	2.926

4Q	55.7	0.5	55.2	6.732	1.420	5.276	0.000	1.123	1.845	2.162	15.276	8.444	6.378	0.019	1.243	2.531	2.751
4Q	49.9	0.5	49.4	6.025	1.271	4.721	0.000	1.005	1.651	1.935	13.671	7.557	5.708	0.017	1.112	2.265	2.462
4Q	46.2	0.5	45.7	5.574	1.176	4.368	0.000	0.930	1.527	1.790	12.647	6.991	5.281	0.016	1.029	2.095	2.278
4Q	45.3	0.5	44.8	5.464	1.152	4.282	0.000	0.912	1.497	1.755	12.398	6.853	5.177	0.015	1.009	2.054	2.233
4Q	40.6	0.5	40.1	4.891	1.032	3.832	0.000	0.816	1.340	1.571	11.097	6.134	4.634	0.014	0.903	1.839	1.999
4Q	35.9	0.5	35.4	4.317	0.911	3.383	0.000	0.720	1.183	1.387	9.796	5.415	4.091	0.012	0.797	1.623	1.764

Liberty SMAT RRFs and Future High Day Calculations, by Regional/Local

Methodology:

- Use measured SO4 and EC
- Use retained nitrate (calculated)
- Use calculated indirect NH4 (retained) method for baseline and future
- Use calculated particle bound water for baseline and future
- Degrees of Neutralization (DON) constant from base to future
- Regional modeled OTHER is crustal; local OTHER is a mix of local primary material (LPM)
- For local RRFs, apportion modeled LPMm using monitored LPM fractions (OCMmb,EC,OPP)
- Modeled LPMm = POA+EC+OTHER

CAMx Modeled Species - Local Primary Material apportioned to POA, EC, OTHER

Ratio						OCMmb	EC			OPP
1Q						0.622	0.309			0.068
2Q						0.510	0.422			0.068
3Q						0.314	0.598			0.088
4Q						0.612	0.338			0.050

2007			SOA		LPMm	POA	EC			OTHER
1Q			0.000		4.679	2.911	1.448			0.320
2Q			0.000		6.650	3.393	2.804			0.453
3Q			0.000		6.959	2.185	4.159			0.615
4Q			0.000		5.050	3.090	1.708			0.251

2014			SOA		LPMm	POA	EC			OTHER
1Q			0.000		3.515	2.187	1.088			0.240
2Q			0.000		5.390	2.750	2.273			0.368
3Q			0.000		6.653	2.089	3.976			0.588
4Q			0.000		3.792	2.321	1.283			0.189

CAMx Modeled Species - High Days Regional/Local

	Regional					Local (LPM-apportioned)				
2007	**TOA**	**EC**	**SO4**	**NO3**	**OTHER**	**TOA**	**EC**	**SO4**	**NO3**	**OTHER**
1Q	7.255	2.892	5.520	3.924	8.052	2.911	1.448	0.788	0.058	0.320
2Q	1.167	1.218	11.162	0.114	2.425	3.393	2.804	1.036	0.024	0.453
3Q	1.261	1.406	15.827	0.030	3.334	2.186	4.159	1.145	0.001	0.615
4Q	11.709	3.995	6.915	5.755	11.931	3.091	1.708	0.880	0.076	0.251

2014	**TOA**	**EC**	**SO4**	**NO3**	**OTHER**	**TOA**	**EC**	**SO4**	**NO3**	**OTHER**
1Q	5.722	1.185	3.873	3.752	6.959	2.187	1.088	0.615	0.082	0.240
2Q	0.919	0.531	4.071	0.541	2.085	2.750	2.273	0.835	0.054	0.368
3Q	0.909	0.681	4.675	0.072	2.993	2.090	3.976	1.001	0.009	0.588
4Q	9.572	1.678	4.062	4.377	10.372	2.321	1.283	0.690	0.093	0.189

RRFs (Future Projected divided by Baseline)

	Regional					Local				
RRF	**TOA**	**EC**	**SO4**	**NO3**	**OTHER**	**TOA**	**EC**	**SO4**	**NO3**	**OTHER**
1Q	0.789	0.410	0.702	0.956	0.864	0.751	0.751	0.781	1.419	0.751
2Q	0.788	0.436	0.365	4.749	0.860	0.811	0.811	0.806	2.278	0.811
3Q	0.721	0.484	0.295	2.401	0.898	0.956	0.956	0.874	7.379	0.956
4Q	0.818	0.420	0.587	0.761	0.869	0.751	0.751	0.784	1.226	0.751

Projected Future Concentrations by Species

		2014 Regional					2014 Local					2014 Total						
YEAR	QTR	OCMmb	EC	SO4	NO3r	OPP	OCMmb	EC	SO4	NO3r	OPP	OCMmb	EC	SO4	NO3r	OPP	NH4r	DON
2005	1Q	6.248	0.764	5.903	3.364	1.076	6.932	3.448	2.896	1.103	0.762	13.180	4.212	8.799	4.467	1.838	4.585	0.374
2005	1Q	5.321	0.651	5.028	2.865	0.916	5.904	2.937	2.466	0.939	0.649	11.225	3.587	7.494	3.804	1.565	3.904	0.374
2005	1Q	4.972	0.608	4.698	2.677	0.856	5.516	2.744	2.304	0.877	0.606	10.488	3.352	7.002	3.554	1.462	3.648	0.374
2005	1Q	4.490	0.549	4.243	2.418	0.773	4.982	2.478	2.081	0.792	0.548	9.472	3.027	6.324	3.210	1.321	3.295	0.374
2005	1Q	4.442	0.543	4.197	2.392	0.765	4.929	2.452	2.059	0.784	0.542	9.371	2.995	6.256	3.176	1.307	3.260	0.374
2005	1Q	3.961	0.484	3.742	2.132	0.682	4.394	2.186	1.836	0.699	0.483	8.355	2.670	5.578	2.831	1.165	2.906	0.374
2005	1Q	3.696	0.452	3.492	1.990	0.636	4.101	2.040	1.713	0.652	0.451	7.796	2.492	5.205	2.642	1.087	2.712	0.374
2005	1Q	3.672	0.449	3.469	1.977	0.632	4.074	2.026	1.702	0.648	0.448	7.745	2.475	5.171	2.625	1.080	2.694	0.374
2006	1Q	7.235	0.885	6.836	3.896	1.246	8.028	3.993	3.353	1.277	0.883	15.262	4.878	10.189	5.172	2.128	5.309	0.374
2006	1Q	6.188	0.757	5.846	3.332	1.065	6.865	3.415	2.868	1.092	0.755	13.053	4.172	8.714	4.424	1.820	4.540	0.374
2006	1Q	5.706	0.698	5.391	3.072	0.982	6.331	3.149	2.645	1.007	0.696	12.037	3.847	8.036	4.079	1.678	4.187	0.374
2006	1Q	5.321	0.651	5.028	2.865	0.916	5.904	2.937	2.466	0.939	0.649	11.225	3.587	7.494	3.804	1.565	3.904	0.374
2006	1Q	4.803	0.587	4.538	2.586	0.827	5.329	2.651	2.226	0.848	0.586	10.133	3.238	6.765	3.434	1.413	3.525	0.374
2006	1Q	4.286	0.524	4.049	2.308	0.738	4.755	2.365	1.986	0.756	0.523	9.041	2.889	6.036	3.064	1.261	3.145	0.374
2006	1Q	3.973	0.486	3.754	2.139	0.684	4.408	2.193	1.841	0.701	0.485	8.380	2.678	5.595	2.840	1.169	2.915	0.374
2006	1Q	3.274	0.400	3.094	1.763	0.564	3.633	1.807	1.518	0.578	0.399	6.907	2.208	4.611	2.341	0.963	2.403	0.374
2007	1Q	6.452	0.789	6.097	3.474	1.111	7.159	3.561	2.990	1.139	0.787	13.612	4.350	9.087	4.613	1.898	4.735	0.374
2007	1Q	5.730	0.701	5.414	3.085	0.987	6.358	3.163	2.656	1.011	0.699	12.088	3.863	8.070	4.097	1.686	4.205	0.374
2007	1Q	5.598	0.685	5.289	3.014	0.964	6.211	3.089	2.594	0.988	0.683	11.809	3.774	7.883	4.002	1.647	4.108	0.374
2007	1Q	5.586	0.683	5.278	3.008	0.962	6.198	3.083	2.589	0.986	0.681	11.783	3.766	7.867	3.993	1.643	4.099	0.374
2007	1Q	5.513	0.674	5.210	2.969	0.949	6.117	3.043	2.555	0.973	0.673	11.631	3.717	7.765	3.942	1.622	4.046	0.374
2007	1Q	3.575	0.437	3.378	1.925	0.616	3.967	1.973	1.657	0.631	0.436	7.542	2.411	5.035	2.556	1.052	2.624	0.374
2007	1Q	3.310	0.405	3.128	1.782	0.570	3.673	1.827	1.534	0.584	0.404	6.984	2.232	4.662	2.367	0.974	2.429	0.374
2007	1Q	3.082	0.377	2.912	1.659	0.531	3.419	1.701	1.428	0.544	0.376	6.501	2.078	4.340	2.203	0.907	2.261	0.374
2008	1Q	5.682	0.695	5.369	3.059	0.978	6.304	3.136	2.633	1.003	0.693	11.986	3.831	8.002	4.062	1.671	4.169	0.374
2008	1Q	4.249	0.520	4.015	2.288	0.732	4.715	2.345	1.969	0.750	0.518	8.964	2.865	5.985	3.038	1.250	3.118	0.374
2008	1Q	4.237	0.518	4.004	2.282	0.730	4.702	2.339	1.964	0.748	0.517	8.939	2.857	5.968	3.029	1.246	3.109	0.374
2008	1Q	4.093	0.501	3.867	2.204	0.705	4.541	2.259	1.897	0.722	0.499	8.634	2.759	5.764	2.926	1.204	3.003	0.374
2008	1Q	3.599	0.440	3.401	1.938	0.620	3.994	1.987	1.668	0.635	0.439	7.593	2.427	5.069	2.573	1.059	2.641	0.374
2008	1Q	3.479	0.425	3.287	1.873	0.599	3.860	1.920	1.612	0.614	0.424	7.339	2.346	4.900	2.487	1.023	2.553	0.374
2008	1Q	3.455	0.422	3.264	1.860	0.595	3.833	1.907	1.601	0.610	0.421	7.288	2.329	4.866	2.470	1.016	2.535	0.374

2008	**1Q**	3.419	0.418	3.230	1.841	0.589	3.793	1.887	1.585	0.603	0.417	7.212	2.305	4.815	2.444	1.006	2.509	0.374
2009	**1Q**	6.537	0.799	6.176	3.520	1.125	7.253	3.608	3.030	1.154	0.797	13.789	4.407	9.206	4.673	1.923	4.797	0.374
2009	**1Q**	5.020	0.614	4.743	2.703	0.864	5.570	2.771	2.327	0.886	0.612	10.590	3.384	7.070	3.589	1.477	3.684	0.374
2009	**1Q**	4.791	0.586	4.527	2.580	0.825	5.316	2.644	2.221	0.846	0.584	10.107	3.230	6.748	3.425	1.409	3.516	0.374
2009	**1Q**	4.165	0.509	3.936	2.243	0.717	4.622	2.299	1.930	0.735	0.508	8.787	2.808	5.866	2.978	1.225	3.056	0.374
2009	**1Q**	3.948	0.483	3.731	2.126	0.680	4.381	2.179	1.830	0.697	0.482	8.330	2.662	5.561	2.823	1.161	2.897	0.374
2009	**1Q**	3.852	0.471	3.640	2.074	0.663	4.274	2.126	1.785	0.680	0.470	8.126	2.597	5.425	2.754	1.133	2.827	0.374
2009	**1Q**	3.744	0.458	3.537	2.016	0.645	4.154	2.066	1.735	0.661	0.457	7.898	2.524	5.273	2.677	1.101	2.747	0.374
2009	**1Q**	3.238	0.396	3.060	1.744	0.558	3.593	1.787	1.501	0.571	0.395	6.831	2.183	4.561	2.315	0.953	2.376	0.374

		2014					**2014**					**2014**						
		Regional					**Local**					**Total**						
YEAR	**QTR**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**DON**
2005	**2Q**	9.525	0.934	7.329	0.000	2.107	8.044	6.648	2.274	0.000	1.075	17.569	7.582	9.603	0.000	3.182	3.526	0.367
2005	**2Q**	8.983	0.881	6.912	0.000	1.987	7.586	6.270	2.145	0.000	1.014	16.569	7.151	9.057	0.000	3.001	3.326	0.367
2005	**2Q**	8.515	0.835	6.552	0.000	1.884	7.190	5.943	2.033	0.000	0.961	15.705	6.778	8.585	0.000	2.845	3.152	0.367
2005	**2Q**	8.194	0.804	6.305	0.000	1.813	6.920	5.719	1.957	0.000	0.925	15.114	6.523	8.262	0.000	2.738	3.034	0.367
2005	**2Q**	7.603	0.746	5.850	0.000	1.682	6.420	5.307	1.815	0.000	0.858	14.023	6.052	7.665	0.000	2.540	2.815	0.367
2005	**2Q**	7.369	0.723	5.670	0.000	1.630	6.223	5.143	1.760	0.000	0.832	13.591	5.866	7.429	0.000	2.462	2.728	0.367
2005	**2Q**	7.209	0.707	5.547	0.000	1.595	6.087	5.031	1.721	0.000	0.814	13.296	5.738	7.268	0.000	2.408	2.669	0.367
2005	**2Q**	7.184	0.704	5.528	0.000	1.589	6.067	5.014	1.715	0.000	0.811	13.250	5.719	7.243	0.000	2.400	2.660	0.367
2006	**2Q**	7.344	0.720	5.651	0.000	1.625	6.202	5.126	1.754	0.000	0.829	13.546	5.846	7.404	0.000	2.454	2.719	0.367
2006	**2Q**	7.135	0.700	5.490	0.000	1.578	6.025	4.980	1.704	0.000	0.805	13.160	5.679	7.193	0.000	2.384	2.641	0.367
2006	**2Q**	6.605	0.648	5.082	0.000	1.461	5.577	4.610	1.577	0.000	0.746	12.182	5.258	6.659	0.000	2.207	2.445	0.367
2006	**2Q**	5.545	0.544	4.267	0.000	1.227	4.683	3.870	1.324	0.000	0.626	10.228	4.414	5.591	0.000	1.853	2.053	0.367
2006	**2Q**	5.089	0.499	3.916	0.000	1.126	4.298	3.552	1.215	0.000	0.574	9.387	4.051	5.131	0.000	1.700	1.884	0.367
2006	**2Q**	4.732	0.464	3.641	0.000	1.047	3.996	3.303	1.130	0.000	0.534	8.728	3.767	4.771	0.000	1.581	1.752	0.367
2006	**2Q**	4.695	0.460	3.612	0.000	1.039	3.965	3.277	1.121	0.000	0.530	8.659	3.737	4.733	0.000	1.569	1.738	0.367
2006	**2Q**	4.387	0.430	3.375	0.000	0.970	3.704	3.062	1.047	0.000	0.495	8.091	3.492	4.423	0.000	1.466	1.624	0.367
2007	**2Q**	6.901	0.677	5.309	0.000	1.527	5.827	4.816	1.648	0.000	0.779	12.728	5.493	6.957	0.000	2.305	2.555	0.367
2007	**2Q**	6.654	0.652	5.120	0.000	1.472	5.619	4.644	1.589	0.000	0.751	12.273	5.297	6.709	0.000	2.223	2.463	0.367
2007	**2Q**	6.617	0.649	5.091	0.000	1.464	5.588	4.619	1.580	0.000	0.747	12.205	5.267	6.671	0.000	2.211	2.450	0.367
2007	**2Q**	6.038	0.592	4.646	0.000	1.336	5.099	4.214	1.442	0.000	0.682	11.137	4.806	6.088	0.000	2.017	2.235	0.367
2007	**2Q**	5.619	0.551	4.323	0.000	1.243	4.745	3.922	1.342	0.000	0.634	10.364	4.473	5.665	0.000	1.877	2.080	0.367
2007	**2Q**	5.410	0.530	4.162	0.000	1.197	4.568	3.776	1.292	0.000	0.611	9.978	4.306	5.454	0.000	1.807	2.003	0.367
2007	**2Q**	5.397	0.529	4.153	0.000	1.194	4.558	3.767	1.289	0.000	0.609	9.955	4.296	5.442	0.000	1.803	1.998	0.367

2007	**2Q**	5.237	0.514	4.030	0.000	1.159	4.422	3.655	1.251	0.000	0.591	9.659	4.169	5.280	0.000	1.750	1.939	0.367
2008	**2Q**	8.182	0.802	6.296	0.000	1.810	6.909	5.711	1.954	0.000	0.924	15.091	6.513	8.249	0.000	2.734	3.029	0.367
2008	**2Q**	6.925	0.679	5.328	0.000	1.532	5.848	4.834	1.654	0.000	0.782	12.773	5.513	6.982	0.000	2.314	2.564	0.367
2008	**2Q**	6.839	0.671	5.262	0.000	1.513	5.775	4.773	1.633	0.000	0.772	12.614	5.444	6.895	0.000	2.285	2.532	0.367
2008	**2Q**	4.806	0.471	3.698	0.000	1.063	4.058	3.354	1.148	0.000	0.542	8.864	3.826	4.845	0.000	1.606	1.779	0.367
2008	**2Q**	4.646	0.456	3.574	0.000	1.028	3.923	3.242	1.109	0.000	0.524	8.568	3.698	4.684	0.000	1.552	1.720	0.367
2008	**2Q**	4.461	0.437	3.432	0.000	0.987	3.767	3.113	1.065	0.000	0.504	8.228	3.551	4.497	0.000	1.490	1.651	0.367
2008	**2Q**	4.436	0.435	3.413	0.000	0.981	3.746	3.096	1.059	0.000	0.501	8.182	3.531	4.473	0.000	1.482	1.642	0.367
2008	**2Q**	4.325	0.424	3.328	0.000	0.957	3.652	3.019	1.033	0.000	0.488	7.978	3.443	4.361	0.000	1.445	1.601	0.367
2009	**2Q**	4.251	0.417	3.271	0.000	0.940	3.590	2.967	1.015	0.000	0.480	7.841	3.384	4.286	0.000	1.420	1.574	0.367
2009	**2Q**	4.079	0.400	3.138	0.000	0.902	3.444	2.847	0.974	0.000	0.460	7.523	3.247	4.112	0.000	1.363	1.510	0.367
2009	**2Q**	4.005	0.393	3.081	0.000	0.886	3.382	2.795	0.956	0.000	0.452	7.387	3.188	4.038	0.000	1.338	1.483	0.367
2009	**2Q**	3.931	0.385	3.025	0.000	0.870	3.319	2.744	0.939	0.000	0.444	7.250	3.129	3.963	0.000	1.313	1.455	0.367
2009	**2Q**	3.721	0.365	2.863	0.000	0.823	3.143	2.597	0.889	0.000	0.420	6.864	2.962	3.752	0.000	1.243	1.378	0.367
2009	**2Q**	3.549	0.348	2.731	0.000	0.785	2.997	2.477	0.847	0.000	0.401	6.546	2.825	3.578	0.000	1.186	1.314	0.367
2009	**2Q**	3.487	0.342	2.683	0.000	0.771	2.945	2.434	0.833	0.000	0.394	6.432	2.776	3.516	0.000	1.165	1.291	0.367
2009	**2Q**	3.315	0.325	2.550	0.000	0.733	2.799	2.314	0.792	0.000	0.374	6.114	2.639	3.342	0.000	1.107	1.227	0.367

		2014 Regional					**2014 Local**					**2014 Total**						
YEAR	**QTR**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**DON**
2005	**3Q**	9.952	1.000	7.145	0.000	1.368	4.228	8.045	4.635	0.000	1.189	14.180	9.045	11.780	0.000	2.557	4.271	0.363
2005	**3Q**	8.242	0.828	5.917	0.000	1.133	3.501	6.662	3.839	0.000	0.985	11.744	7.491	9.756	0.000	2.118	3.538	0.363
2005	**3Q**	7.323	0.736	5.257	0.000	1.006	3.111	5.919	3.410	0.000	0.875	10.433	6.655	8.668	0.000	1.881	3.143	0.363
2005	**3Q**	7.217	0.725	5.181	0.000	0.992	3.065	5.833	3.361	0.000	0.862	10.282	6.559	8.542	0.000	1.854	3.097	0.363
2005	**3Q**	6.886	0.692	4.944	0.000	0.946	2.925	5.566	3.207	0.000	0.823	9.812	6.258	8.151	0.000	1.769	2.956	0.363
2005	**3Q**	6.863	0.690	4.927	0.000	0.943	2.915	5.547	3.196	0.000	0.820	9.778	6.237	8.123	0.000	1.763	2.945	0.363
2005	**3Q**	5.837	0.587	4.190	0.000	0.802	2.479	4.718	2.718	0.000	0.697	8.316	5.305	6.909	0.000	1.500	2.505	0.363
2005	**3Q**	5.577	0.561	4.004	0.000	0.766	2.369	4.508	2.598	0.000	0.666	7.947	5.069	6.602	0.000	1.433	2.394	0.363
2006	**3Q**	6.391	0.642	4.588	0.000	0.878	2.715	5.166	2.977	0.000	0.764	9.106	5.808	7.565	0.000	1.642	2.743	0.363
2006	**3Q**	5.931	0.596	4.258	0.000	0.815	2.519	4.794	2.762	0.000	0.709	8.451	5.390	7.021	0.000	1.524	2.546	0.363
2006	**3Q**	5.495	0.552	3.945	0.000	0.755	2.334	4.442	2.559	0.000	0.657	7.829	4.994	6.504	0.000	1.412	2.358	0.363
2006	**3Q**	5.294	0.532	3.801	0.000	0.728	2.249	4.280	2.466	0.000	0.633	7.544	4.812	6.267	0.000	1.360	2.272	0.363
2006	**3Q**	5.259	0.529	3.776	0.000	0.723	2.234	4.251	2.449	0.000	0.628	7.493	4.780	6.225	0.000	1.351	2.257	0.363
2006	**3Q**	5.177	0.520	3.716	0.000	0.711	2.199	4.184	2.411	0.000	0.619	7.376	4.705	6.127	0.000	1.330	2.222	0.363
2006	**3Q**	5.070	0.510	3.640	0.000	0.697	2.154	4.099	2.361	0.000	0.606	7.224	4.608	6.002	0.000	1.303	2.176	0.363

2006	**3Q**	5.825	0.585	4.182	0.000	0.801	2.474	4.709	2.713	0.000	0.696	8.300	5.294	6.895	0.000	1.497	2.500	0.363
2007	**3Q**	7.217	0.725	5.181	0.000	0.992	3.065	5.833	3.361	0.000	0.862	10.282	6.559	8.542	0.000	1.854	3.097	0.363
2007	**3Q**	6.863	0.690	4.927	0.000	0.943	2.915	5.547	3.196	0.000	0.820	9.778	6.237	8.123	0.000	1.763	2.945	0.363
2007	**3Q**	6.603	0.664	4.741	0.000	0.907	2.805	5.338	3.075	0.000	0.789	9.408	6.001	7.816	0.000	1.697	2.834	0.363
2007	**3Q**	6.568	0.660	4.715	0.000	0.903	2.790	5.309	3.059	0.000	0.785	9.358	5.969	7.774	0.000	1.687	2.819	0.363
2007	**3Q**	6.391	0.642	4.588	0.000	0.878	2.715	5.166	2.977	0.000	0.764	9.106	5.808	7.565	0.000	1.642	2.743	0.363
2007	**3Q**	6.344	0.638	4.554	0.000	0.872	2.695	5.128	2.955	0.000	0.758	9.039	5.765	7.509	0.000	1.630	2.723	0.363
2007	**3Q**	6.285	0.632	4.512	0.000	0.864	2.670	5.080	2.927	0.000	0.751	8.955	5.712	7.439	0.000	1.615	2.697	0.363
2007	**3Q**	5.955	0.598	4.275	0.000	0.818	2.530	4.813	2.773	0.000	0.712	8.484	5.412	7.048	0.000	1.530	2.556	0.363
2008	**3Q**	5.837	0.587	4.190	0.000	0.802	2.479	4.718	2.718	0.000	0.697	8.316	5.305	6.909	0.000	1.500	2.505	0.363
2008	**3Q**	5.778	0.581	4.148	0.000	0.794	2.454	4.670	2.691	0.000	0.690	8.232	5.251	6.839	0.000	1.484	2.480	0.363
2008	**3Q**	5.495	0.552	3.945	0.000	0.755	2.334	4.442	2.559	0.000	0.657	7.829	4.994	6.504	0.000	1.412	2.358	0.363
2008	**3Q**	5.259	0.529	3.776	0.000	0.723	2.234	4.251	2.449	0.000	0.628	7.493	4.780	6.225	0.000	1.351	2.257	0.363
2008	**3Q**	5.247	0.527	3.767	0.000	0.721	2.229	4.241	2.444	0.000	0.627	7.476	4.769	6.211	0.000	1.348	2.252	0.363
2008	**3Q**	5.177	0.520	3.716	0.000	0.711	2.199	4.184	2.411	0.000	0.619	7.376	4.705	6.127	0.000	1.330	2.222	0.363
2008	**3Q**	5.106	0.513	3.666	0.000	0.702	2.169	4.127	2.378	0.000	0.610	7.275	4.640	6.044	0.000	1.312	2.191	0.363
2008	**3Q**	4.681	0.470	3.361	0.000	0.643	1.989	3.784	2.180	0.000	0.559	6.670	4.254	5.541	0.000	1.203	2.009	0.363
2009	**3Q**	4.882	0.491	3.505	0.000	0.671	2.074	3.946	2.274	0.000	0.583	6.955	4.437	5.778	0.000	1.254	2.095	0.363
2009	**3Q**	3.891	0.391	2.794	0.000	0.535	1.653	3.145	1.812	0.000	0.465	5.544	3.536	4.606	0.000	1.000	1.670	0.363
2009	**3Q**	3.679	0.370	2.641	0.000	0.506	1.563	2.974	1.713	0.000	0.440	5.242	3.344	4.355	0.000	0.945	1.579	0.363
2009	**3Q**	3.608	0.363	2.590	0.000	0.496	1.533	2.917	1.681	0.000	0.431	5.141	3.279	4.271	0.000	0.927	1.549	0.363
2009	**3Q**	3.290	0.331	2.362	0.000	0.452	1.397	2.659	1.532	0.000	0.393	4.687	2.990	3.894	0.000	0.845	1.412	0.363
2009	**3Q**	3.290	0.331	2.362	0.000	0.452	1.397	2.659	1.532	0.000	0.393	4.687	2.990	3.894	0.000	0.845	1.412	0.363
2009	**3Q**	3.184	0.320	2.286	0.000	0.438	1.352	2.573	1.483	0.000	0.380	4.536	2.893	3.768	0.000	0.818	1.366	0.363
2009	**3Q**	3.113	0.313	2.235	0.000	0.428	1.322	2.516	1.450	0.000	0.372	4.435	2.829	3.685	0.000	0.800	1.336	0.363

		2014					**2014**					**2014**						
		Regional					**Local**					**Total**						
YEAR	**QTR**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**DON**
2005	**4Q**	9.950	1.078	5.603	0.000	1.766	20.740	11.464	9.043	0.042	1.687	30.690	12.542	14.646	0.042	3.453	5.505	0.375
2005	**4Q**	8.236	0.892	4.637	0.000	1.461	17.165	9.489	7.485	0.035	1.396	25.401	10.381	12.122	0.035	2.858	4.556	0.375
2005	**4Q**	7.298	0.791	4.110	0.000	1.295	15.212	8.409	6.633	0.031	1.238	22.510	9.199	10.743	0.031	2.533	4.037	0.375
2005	**4Q**	6.750	0.731	3.801	0.000	1.198	14.069	7.777	6.135	0.029	1.145	20.819	8.508	9.935	0.029	2.342	3.734	0.375
2005	**4Q**	6.122	0.663	3.447	0.000	1.086	12.760	7.053	5.564	0.026	1.038	18.881	7.717	9.011	0.026	2.124	3.387	0.375
2005	**4Q**	5.055	0.548	2.846	0.000	0.897	10.536	5.824	4.594	0.021	0.857	15.591	6.372	7.441	0.021	1.754	2.796	0.375
2005	**4Q**	4.816	0.522	2.712	0.000	0.855	10.037	5.548	4.377	0.020	0.817	14.853	6.070	7.088	0.020	1.671	2.664	0.375

2005	**4Q**	4.766	0.516	2.684	0.000	0.846	9.933	5.491	4.331	0.020	0.808	14.699	6.007	7.015	0.020	1.654	2.636	0.375
2006	**4Q**	9.990	1.082	5.626	0.000	1.773	20.823	11.510	9.080	0.042	1.694	30.813	12.593	14.705	0.042	3.467	5.527	0.375
2006	**4Q**	8.136	0.881	4.581	0.000	1.444	16.957	9.374	7.394	0.034	1.380	25.093	10.255	11.975	0.034	2.823	4.501	0.375
2006	**4Q**	6.730	0.729	3.790	0.000	1.194	14.027	7.754	6.116	0.028	1.141	20.757	8.483	9.906	0.028	2.335	3.723	0.375
2006	**4Q**	5.823	0.631	3.279	0.000	1.033	12.136	6.709	5.292	0.025	0.987	17.959	7.339	8.571	0.025	2.021	3.221	0.375
2006	**4Q**	5.504	0.596	3.099	0.000	0.977	11.471	6.341	5.002	0.023	0.933	16.975	6.937	8.101	0.023	1.910	3.045	0.375
2006	**4Q**	5.015	0.543	2.824	0.000	0.890	10.453	5.778	4.558	0.021	0.850	15.468	6.322	7.382	0.021	1.740	2.774	0.375
2006	**4Q**	5.005	0.542	2.818	0.000	0.888	10.432	5.767	4.549	0.021	0.849	15.437	6.309	7.367	0.021	1.737	2.769	0.375
2006	**4Q**	4.766	0.516	2.684	0.000	0.846	9.933	5.491	4.331	0.020	0.808	14.699	6.007	7.015	0.020	1.654	2.636	0.375
2007	**4Q**	5.803	0.629	3.268	0.000	1.030	12.095	6.686	5.274	0.025	0.984	17.897	7.314	8.541	0.025	2.014	3.210	0.375
2007	**4Q**	5.733	0.621	3.228	0.000	1.017	11.949	6.605	5.210	0.024	0.972	17.682	7.226	8.439	0.024	1.989	3.171	0.375
2007	**4Q**	4.517	0.489	2.543	0.000	0.801	9.414	5.204	4.105	0.019	0.766	13.930	5.693	6.648	0.019	1.567	2.499	0.375
2007	**4Q**	4.108	0.445	2.313	0.000	0.729	8.562	4.733	3.733	0.017	0.697	12.670	5.178	6.046	0.017	1.425	2.272	0.375
2007	**4Q**	3.968	0.430	2.235	0.000	0.704	8.271	4.572	3.606	0.017	0.673	12.239	5.002	5.841	0.017	1.377	2.195	0.375
2007	**4Q**	3.968	0.430	2.235	0.000	0.704	8.271	4.572	3.606	0.017	0.673	12.239	5.002	5.841	0.017	1.377	2.195	0.375
2007	**4Q**	3.908	0.423	2.201	0.000	0.694	8.146	4.503	3.552	0.017	0.663	12.055	4.927	5.753	0.017	1.356	2.162	0.375
2007	**4Q**	3.460	0.375	1.948	0.000	0.614	7.211	3.986	3.144	0.015	0.587	10.671	4.361	5.092	0.015	1.201	1.914	0.375
2008	**4Q**	7.009	0.759	3.947	0.000	1.244	14.609	8.076	6.370	0.030	1.188	21.618	8.835	10.317	0.030	2.432	3.877	0.375
2008	**4Q**	6.251	0.677	3.520	0.000	1.109	13.030	7.203	5.682	0.026	1.060	19.281	7.880	9.202	0.026	2.169	3.458	0.375
2008	**4Q**	6.202	0.672	3.492	0.000	1.100	12.926	7.145	5.636	0.026	1.052	19.127	7.817	9.128	0.026	2.152	3.431	0.375
2008	**4Q**	5.444	0.590	3.065	0.000	0.966	11.347	6.272	4.948	0.023	0.923	16.790	6.862	8.013	0.023	1.889	3.012	0.375
2008	**4Q**	3.958	0.429	2.229	0.000	0.702	8.250	4.560	3.597	0.017	0.671	12.208	4.989	5.826	0.017	1.374	2.190	0.375
2008	**4Q**	3.898	0.422	2.195	0.000	0.692	8.125	4.492	3.543	0.016	0.661	12.024	4.914	5.738	0.016	1.353	2.157	0.375
2008	**4Q**	3.679	0.399	2.072	0.000	0.653	7.668	4.239	3.344	0.016	0.624	11.347	4.637	5.415	0.016	1.277	2.035	0.375
2008	**4Q**	3.450	0.374	1.943	0.000	0.612	7.190	3.975	3.135	0.015	0.585	10.640	4.348	5.078	0.015	1.197	1.908	0.375
2009	**4Q**	9.133	0.990	5.143	0.000	1.621	19.036	10.522	8.300	0.039	1.549	28.168	11.512	13.443	0.039	3.169	5.052	0.375
2009	**4Q**	5.853	0.634	3.296	0.000	1.039	12.199	6.743	5.319	0.025	0.992	18.051	7.377	8.615	0.025	2.031	3.238	0.375
2009	**4Q**	5.504	0.596	3.099	0.000	0.977	11.471	6.341	5.002	0.023	0.933	16.975	6.937	8.101	0.023	1.910	3.045	0.375
2009	**4Q**	4.925	0.534	2.773	0.000	0.874	10.266	5.675	4.476	0.021	0.835	15.191	6.208	7.250	0.021	1.709	2.725	0.375
2009	**4Q**	4.556	0.494	2.566	0.000	0.809	9.497	5.250	4.141	0.019	0.773	14.053	5.743	6.707	0.019	1.581	2.521	0.375
2009	**4Q**	4.467	0.484	2.515	0.000	0.793	9.310	5.146	4.060	0.019	0.757	13.777	5.630	6.575	0.019	1.550	2.471	0.375
2009	**4Q**	3.998	0.433	2.251	0.000	0.709	8.333	4.606	3.634	0.017	0.678	12.331	5.040	5.885	0.017	1.387	2.212	0.375
2009	**4Q**	3.530	0.382	1.987	0.000	0.626	7.357	4.067	3.208	0.015	0.598	10.886	4.449	5.195	0.015	1.225	1.953	0.375

YEAR	QTR	SO4	NO3r	NH4r	S Term	N Term	A Term	Part 1	Part 2	Part 3	Sum	2014 PBW Total
2005	1Q	8.799	4.467	4.585	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	2.695
2005	1Q	7.494	3.804	3.904	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	2.296
2005	1Q	7.002	3.554	3.648	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	2.145
2005	1Q	6.324	3.210	3.295	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.937
2005	1Q	6.256	3.176	3.260	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.916
2005	1Q	5.578	2.831	2.906	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.709
2005	1Q	5.205	2.642	2.712	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.594
2005	1Q	5.171	2.625	2.694	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.584
2006	1Q	10.189	5.172	5.309	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	3.121
2006	1Q	8.714	4.424	4.540	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	2.670
2006	1Q	8.036	4.079	4.187	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	2.462
2006	1Q	7.494	3.804	3.904	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	2.296
2006	1Q	6.765	3.434	3.525	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	2.072
2006	1Q	6.036	3.064	3.145	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.849
2006	1Q	5.595	2.840	2.915	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.714
2006	1Q	4.611	2.341	2.403	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.413
2007	1Q	9.087	4.613	4.735	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	2.784
2007	1Q	8.070	4.097	4.205	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	2.472
2007	1Q	7.883	4.002	4.108	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	2.415
2007	1Q	7.867	3.993	4.099	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	2.410
2007	1Q	7.765	3.942	4.046	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	2.379
2007	1Q	5.035	2.556	2.624	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.543
2007	1Q	4.662	2.367	2.429	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.428
2007	1Q	4.340	2.203	2.261	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.330
2008	1Q	8.002	4.062	4.169	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	2.451
2008	1Q	5.985	3.038	3.118	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.833
2008	1Q	5.968	3.029	3.109	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.828
2008	1Q	5.764	2.926	3.003	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.766
2008	1Q	5.069	2.573	2.641	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.553
2008	1Q	4.900	2.487	2.553	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.501
2008	1Q	4.866	2.470	2.535	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.491
2008	1Q	4.815	2.444	2.509	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.475
2009	1Q	9.206	4.673	4.797	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	2.820
2009	1Q	7.070	3.589	3.684	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	2.166

2009	**1Q**	6.748	3.425	3.516	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	2.067
2009	**1Q**	5.866	2.978	3.056	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.797
2009	**1Q**	5.561	2.823	2.897	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.704
2009	**1Q**	5.425	2.754	2.827	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.662
2009	**1Q**	5.273	2.677	2.747	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.615
2009	**1Q**	4.561	2.315	2.376	0.493	0.250	0.257	-22380.114	-104.899	22485.164	0.151	1.397

												2014
YEAR	**QTR**	**SO4**	**NO3r**	**NH4r**	**S Term**	**N Term**	**A Term**	**Part 1**	**Part 2**	**Part 3**	**Sum**	**PBW Total**
2005	**2Q**	9.603	0.000	3.526	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	3.497
2005	**2Q**	9.057	0.000	3.326	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	3.298
2005	**2Q**	8.585	0.000	3.152	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	3.126
2005	**2Q**	8.262	0.000	3.034	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	3.008
2005	**2Q**	7.665	0.000	2.815	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.791
2005	**2Q**	7.429	0.000	2.728	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.705
2005	**2Q**	7.268	0.000	2.669	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.646
2005	**2Q**	7.243	0.000	2.660	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.637
2006	**2Q**	7.404	0.000	2.719	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.696
2006	**2Q**	7.193	0.000	2.641	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.619
2006	**2Q**	6.659	0.000	2.445	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.425
2006	**2Q**	5.591	0.000	2.053	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.035
2006	**2Q**	5.131	0.000	1.884	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.868
2006	**2Q**	4.771	0.000	1.752	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.737
2006	**2Q**	4.733	0.000	1.738	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.723
2006	**2Q**	4.423	0.000	1.624	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.610
2007	**2Q**	6.957	0.000	2.555	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.533
2007	**2Q**	6.709	0.000	2.463	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.443
2007	**2Q**	6.671	0.000	2.450	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.429
2007	**2Q**	6.088	0.000	2.235	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.216
2007	**2Q**	5.665	0.000	2.080	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.063
2007	**2Q**	5.454	0.000	2.003	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.986
2007	**2Q**	5.442	0.000	1.998	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.981
2007	**2Q**	5.280	0.000	1.939	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.922
2008	**2Q**	8.249	0.000	3.029	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	3.003
2008	**2Q**	6.982	0.000	2.564	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.542

2008	**2Q**	6.895	0.000	2.532	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	2.510
2008	**2Q**	4.845	0.000	1.779	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.764
2008	**2Q**	4.684	0.000	1.720	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.705
2008	**2Q**	4.497	0.000	1.651	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.637
2008	**2Q**	4.473	0.000	1.642	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.628
2008	**2Q**	4.361	0.000	1.601	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.588
2009	**2Q**	4.286	0.000	1.574	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.561
2009	**2Q**	4.112	0.000	1.510	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.497
2009	**2Q**	4.038	0.000	1.483	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.470
2009	**2Q**	3.963	0.000	1.455	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.443
2009	**2Q**	3.752	0.000	1.378	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.366
2009	**2Q**	3.578	0.000	1.314	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.303
2009	**2Q**	3.516	0.000	1.291	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.280
2009	**2Q**	3.342	0.000	1.227	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.217

YEAR	**QTR**	**SO4**	**NO3r**	**NH4r**	**S Term**	**N Term**	**A Term**	**Part 1**	**Part 2**	**Part 3**	**Sum**	**2014 PBW Total**
2005	**3Q**	11.780	0.000	4.271	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	4.328
2005	**3Q**	9.756	0.000	3.538	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	3.584
2005	**3Q**	8.668	0.000	3.143	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	3.184
2005	**3Q**	8.542	0.000	3.097	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	3.138
2005	**3Q**	8.151	0.000	2.956	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.994
2005	**3Q**	8.123	0.000	2.945	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.984
2005	**3Q**	6.909	0.000	2.505	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.538
2005	**3Q**	6.602	0.000	2.394	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.425
2006	**3Q**	7.565	0.000	2.743	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.779
2006	**3Q**	7.021	0.000	2.546	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.579
2006	**3Q**	6.504	0.000	2.358	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.389
2006	**3Q**	6.267	0.000	2.272	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.302
2006	**3Q**	6.225	0.000	2.257	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.287
2006	**3Q**	6.127	0.000	2.222	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.251
2006	**3Q**	6.002	0.000	2.176	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.205
2006	**3Q**	6.895	0.000	2.500	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.533
2007	**3Q**	8.542	0.000	3.097	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	3.138
2007	**3Q**	8.123	0.000	2.945	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.984

2007	**3Q**	7.816	0.000	2.834	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.871
2007	**3Q**	7.774	0.000	2.819	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.856
2007	**3Q**	7.565	0.000	2.743	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.779
2007	**3Q**	7.509	0.000	2.723	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.759
2007	**3Q**	7.439	0.000	2.697	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.733
2007	**3Q**	7.048	0.000	2.556	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.589
2008	**3Q**	6.909	0.000	2.505	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.538
2008	**3Q**	6.839	0.000	2.480	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.512
2008	**3Q**	6.504	0.000	2.358	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.389
2008	**3Q**	6.225	0.000	2.257	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.287
2008	**3Q**	6.211	0.000	2.252	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.282
2008	**3Q**	6.127	0.000	2.222	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.251
2008	**3Q**	6.044	0.000	2.191	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.220
2008	**3Q**	5.541	0.000	2.009	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.036
2009	**3Q**	5.778	0.000	2.095	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.123
2009	**3Q**	4.606	0.000	1.670	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.692
2009	**3Q**	4.355	0.000	1.579	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.600
2009	**3Q**	4.271	0.000	1.549	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.569
2009	**3Q**	3.894	0.000	1.412	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.431
2009	**3Q**	3.894	0.000	1.412	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.431
2009	**3Q**	3.768	0.000	1.366	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.384
2009	**3Q**	3.685	0.000	1.336	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.354

YEAR	**QTR**	**SO4**	**NO3r**	**NH4r**	**S Term**	**N Term**	**A Term**	**Part 1**	**Part 2**	**Part 3**	**Sum**	**2014 PBW Total**
2005	**4Q**	14.646	0.042	5.505	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	5.208
2005	**4Q**	12.122	0.035	4.556	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	4.310
2005	**4Q**	10.743	0.031	4.037	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	3.820
2005	**4Q**	9.935	0.029	3.734	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	3.533
2005	**4Q**	9.011	0.026	3.387	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	3.204
2005	**4Q**	7.441	0.021	2.796	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	2.646
2005	**4Q**	7.088	0.020	2.664	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	2.520
2005	**4Q**	7.015	0.020	2.636	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	2.494
2006	**4Q**	14.705	0.042	5.527	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	5.229
2006	**4Q**	11.975	0.034	4.501	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	4.258

2006	**4Q**	9.906	0.028	3.723	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	3.522
2006	**4Q**	8.571	0.025	3.221	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	3.048
2006	**4Q**	8.101	0.023	3.045	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	2.881
2006	**4Q**	7.382	0.021	2.774	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	2.625
2006	**4Q**	7.367	0.021	2.769	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	2.620
2006	**4Q**	7.015	0.020	2.636	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	2.494
2007	**4Q**	8.541	0.025	3.210	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	3.037
2007	**4Q**	8.439	0.024	3.171	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	3.001
2007	**4Q**	6.648	0.019	2.499	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	2.364
2007	**4Q**	6.046	0.017	2.272	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	2.150
2007	**4Q**	5.841	0.017	2.195	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	2.077
2007	**4Q**	5.841	0.017	2.195	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	2.077
2007	**4Q**	5.753	0.017	2.162	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	2.046
2007	**4Q**	5.092	0.015	1.914	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	1.811
2008	**4Q**	10.317	0.030	3.877	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	3.669
2008	**4Q**	9.202	0.026	3.458	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	3.272
2008	**4Q**	9.128	0.026	3.431	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	3.246
2008	**4Q**	8.013	0.023	3.012	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	2.849
2008	**4Q**	5.826	0.017	2.190	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	2.072
2008	**4Q**	5.738	0.016	2.157	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	2.040
2008	**4Q**	5.415	0.016	2.035	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	1.926
2008	**4Q**	5.078	0.015	1.908	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	1.806
2009	**4Q**	13.443	0.039	5.052	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	4.780
2009	**4Q**	8.615	0.025	3.238	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	3.063
2009	**4Q**	8.101	0.023	3.045	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	2.881
2009	**4Q**	7.250	0.021	2.725	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	2.578
2009	**4Q**	6.707	0.019	2.521	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	2.385
2009	**4Q**	6.575	0.019	2.471	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	2.338
2009	**4Q**	5.885	0.017	2.212	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	2.093
2009	**4Q**	5.195	0.015	1.953	0.725	0.002	0.273	-24061.502	-205.854	24267.614	0.258	1.847

Liberty Future High Days, by Regional/Local

Methodology:

- Sum species from high day calculations

YEAR	QTR	FRMf	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBW
2005	**1Q**	40.3	0.5	39.8	13.180	4.212	8.799	4.467	1.838	4.585	2.695
2005	**1Q**	34.4	0.5	33.9	11.225	3.587	7.494	3.804	1.565	3.904	2.296
2005	**1Q**	32.2	0.5	31.7	10.488	3.352	7.002	3.554	1.462	3.648	2.145
2005	**1Q**	29.1	0.5	28.6	9.472	3.027	6.324	3.210	1.321	3.295	1.937
2005	**1Q**	28.8	0.5	28.3	9.371	2.995	6.256	3.176	1.307	3.260	1.916
2005	**1Q**	25.7	0.5	25.2	8.355	2.670	5.578	2.831	1.165	2.906	1.709
2005	**1Q**	24.0	0.5	23.5	7.796	2.492	5.205	2.642	1.087	2.712	1.594
2005	**1Q**	23.9	0.5	23.4	7.745	2.475	5.171	2.625	1.080	2.694	1.584
2006	**1Q**	46.6	0.5	46.1	15.262	4.878	10.189	5.172	2.128	5.309	3.121
2006	**1Q**	39.9	0.5	39.4	13.053	4.172	8.714	4.424	1.820	4.540	2.670
2006	**1Q**	36.8	0.5	36.3	12.037	3.847	8.036	4.079	1.678	4.187	2.462
2006	**1Q**	34.4	0.5	33.9	11.225	3.587	7.494	3.804	1.565	3.904	2.296
2006	**1Q**	31.1	0.5	30.6	10.133	3.238	6.765	3.434	1.413	3.525	2.072
2006	**1Q**	27.8	0.5	27.3	9.041	2.889	6.036	3.064	1.261	3.145	1.849
2006	**1Q**	25.8	0.5	25.3	8.380	2.678	5.595	2.840	1.169	2.915	1.714
2006	**1Q**	21.3	0.5	20.8	6.907	2.208	4.611	2.341	0.963	2.403	1.413
2007	**1Q**	41.6	0.5	41.1	13.612	4.350	9.087	4.613	1.898	4.735	2.784
2007	**1Q**	37.0	0.5	36.5	12.088	3.863	8.070	4.097	1.686	4.205	2.472
2007	**1Q**	36.1	0.5	35.6	11.809	3.774	7.883	4.002	1.647	4.108	2.415
2007	**1Q**	36.1	0.5	35.6	11.783	3.766	7.867	3.993	1.643	4.099	2.410
2007	**1Q**	35.6	0.5	35.1	11.631	3.717	7.765	3.942	1.622	4.046	2.379
2007	**1Q**	23.3	0.5	22.8	7.542	2.411	5.035	2.556	1.052	2.624	1.543
2007	**1Q**	21.6	0.5	21.1	6.984	2.232	4.662	2.367	0.974	2.429	1.428
2007	**1Q**	20.1	0.5	19.6	6.501	2.078	4.340	2.203	0.907	2.261	1.330
2008	**1Q**	36.7	0.5	36.2	11.986	3.831	8.002	4.062	1.671	4.169	2.451
2008	**1Q**	27.6	0.5	27.1	8.964	2.865	5.985	3.038	1.250	3.118	1.833
2008	**1Q**	27.5	0.5	27.0	8.939	2.857	5.968	3.029	1.246	3.109	1.828
2008	**1Q**	26.6	0.5	26.1	8.634	2.759	5.764	2.926	1.204	3.003	1.766
2008	**1Q**	23.4	0.5	22.9	7.593	2.427	5.069	2.573	1.059	2.641	1.553
2008	**1Q**	22.6	0.5	22.1	7.339	2.346	4.900	2.487	1.023	2.553	1.501

2008	**1Q**	22.5	0.5	22.0	7.288	2.329	4.866	2.470	1.016	2.535	1.491
2008	**1Q**	22.3	0.5	21.8	7.212	2.305	4.815	2.444	1.006	2.509	1.475
2009	**1Q**	42.1	0.5	41.6	13.789	4.407	9.206	4.673	1.923	4.797	2.820
2009	**1Q**	32.5	0.5	32.0	10.590	3.384	7.070	3.589	1.477	3.684	2.166
2009	**1Q**	31.0	0.5	30.5	10.107	3.230	6.748	3.425	1.409	3.516	2.067
2009	**1Q**	27.0	0.5	26.5	8.787	2.808	5.866	2.978	1.225	3.056	1.797
2009	**1Q**	25.6	0.5	25.1	8.330	2.662	5.561	2.823	1.161	2.897	1.704
2009	**1Q**	25.0	0.5	24.5	8.126	2.597	5.425	2.754	1.133	2.827	1.662
2009	**1Q**	24.3	0.5	23.8	7.898	2.524	5.273	2.677	1.101	2.747	1.615
2009	**1Q**	21.1	0.5	20.6	6.831	2.183	4.561	2.315	0.953	2.376	1.397

YEAR	**QTR**	**FRMf**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBW**
2005	**2Q**	45.5	0.5	45.0	17.569	7.582	9.603	0.000	3.182	3.526	3.497
2005	**2Q**	42.9	0.5	42.4	16.569	7.151	9.057	0.000	3.001	3.326	3.298
2005	**2Q**	40.7	0.5	40.2	15.705	6.778	8.585	0.000	2.845	3.152	3.126
2005	**2Q**	39.2	0.5	38.7	15.114	6.523	8.262	0.000	2.738	3.034	3.008
2005	**2Q**	36.4	0.5	35.9	14.023	6.052	7.665	0.000	2.540	2.815	2.791
2005	**2Q**	35.3	0.5	34.8	13.591	5.866	7.429	0.000	2.462	2.728	2.705
2005	**2Q**	34.5	0.5	34.0	13.296	5.738	7.268	0.000	2.408	2.669	2.646
2005	**2Q**	34.4	0.5	33.9	13.250	5.719	7.243	0.000	2.400	2.660	2.637
2006	**2Q**	35.2	0.5	34.7	13.546	5.846	7.404	0.000	2.454	2.719	2.696
2006	**2Q**	34.2	0.5	33.7	13.160	5.679	7.193	0.000	2.384	2.641	2.619
2006	**2Q**	31.7	0.5	31.2	12.182	5.258	6.659	0.000	2.207	2.445	2.425
2006	**2Q**	26.7	0.5	26.2	10.228	4.414	5.591	0.000	1.853	2.053	2.035
2006	**2Q**	24.5	0.5	24.0	9.387	4.051	5.131	0.000	1.700	1.884	1.868
2006	**2Q**	22.8	0.5	22.3	8.728	3.767	4.771	0.000	1.581	1.752	1.737
2006	**2Q**	22.7	0.5	22.2	8.659	3.737	4.733	0.000	1.569	1.738	1.723
2006	**2Q**	21.2	0.5	20.7	8.091	3.492	4.423	0.000	1.466	1.624	1.610
2007	**2Q**	33.1	0.5	32.6	12.728	5.493	6.957	0.000	2.305	2.555	2.533
2007	**2Q**	31.9	0.5	31.4	12.273	5.297	6.709	0.000	2.223	2.463	2.443
2007	**2Q**	31.7	0.5	31.2	12.205	5.267	6.671	0.000	2.211	2.450	2.429
2007	**2Q**	29.0	0.5	28.5	11.137	4.806	6.088	0.000	2.017	2.235	2.216
2007	**2Q**	27.0	0.5	26.5	10.364	4.473	5.665	0.000	1.877	2.080	2.063
2007	**2Q**	26.0	0.5	25.5	9.978	4.306	5.454	0.000	1.807	2.003	1.986
2007	**2Q**	26.0	0.5	25.5	9.955	4.296	5.442	0.000	1.803	1.998	1.981
2007	**2Q**	25.2	0.5	24.7	9.659	4.169	5.280	0.000	1.750	1.939	1.922

2008	**2Q**	39.1	0.5	38.6	15.091	6.513	8.249	0.000	2.734	3.029	3.003
2008	**2Q**	33.2	0.5	32.7	12.773	5.513	6.982	0.000	2.314	2.564	2.542
2008	**2Q**	32.8	0.5	32.3	12.614	5.444	6.895	0.000	2.285	2.532	2.510
2008	**2Q**	23.2	0.5	22.7	8.864	3.826	4.845	0.000	1.606	1.779	1.764
2008	**2Q**	22.4	0.5	21.9	8.568	3.698	4.684	0.000	1.552	1.720	1.705
2008	**2Q**	21.6	0.5	21.1	8.228	3.551	4.497	0.000	1.490	1.651	1.637
2008	**2Q**	21.4	0.5	20.9	8.182	3.531	4.473	0.000	1.482	1.642	1.628
2008	**2Q**	20.9	0.5	20.4	7.978	3.443	4.361	0.000	1.445	1.601	1.588
2009	**2Q**	20.6	0.5	20.1	7.841	3.384	4.286	0.000	1.420	1.574	1.561
2009	**2Q**	19.8	0.5	19.3	7.523	3.247	4.112	0.000	1.363	1.510	1.497
2009	**2Q**	19.4	0.5	18.9	7.387	3.188	4.038	0.000	1.338	1.483	1.470
2009	**2Q**	19.1	0.5	18.6	7.250	3.129	3.963	0.000	1.313	1.455	1.443
2009	**2Q**	18.1	0.5	17.6	6.864	2.962	3.752	0.000	1.243	1.378	1.366
2009	**2Q**	17.3	0.5	16.8	6.546	2.825	3.578	0.000	1.186	1.314	1.303
2009	**2Q**	17.0	0.5	16.5	6.432	2.776	3.516	0.000	1.165	1.291	1.280
2009	**2Q**	16.1	0.5	15.6	6.114	2.639	3.342	0.000	1.107	1.227	1.217

YEAR	**QTR**	**FRMf**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBW**
2005	**3Q**	46.7	0.5	46.2	14.180	9.045	11.780	0.000	2.557	4.271	4.328
2005	**3Q**	38.7	0.5	38.2	11.744	7.491	9.756	0.000	2.118	3.538	3.584
2005	**3Q**	34.5	0.5	34.0	10.433	6.655	8.668	0.000	1.881	3.143	3.184
2005	**3Q**	34.0	0.5	33.5	10.282	6.559	8.542	0.000	1.854	3.097	3.138
2005	**3Q**	32.4	0.5	31.9	9.812	6.258	8.151	0.000	1.769	2.956	2.994
2005	**3Q**	32.3	0.5	31.8	9.778	6.237	8.123	0.000	1.763	2.945	2.984
2005	**3Q**	27.6	0.5	27.1	8.316	5.305	6.909	0.000	1.500	2.505	2.538
2005	**3Q**	26.4	0.5	25.9	7.947	5.069	6.602	0.000	1.433	2.394	2.425
2006	**3Q**	30.1	0.5	29.6	9.106	5.808	7.565	0.000	1.642	2.743	2.779
2006	**3Q**	28.0	0.5	27.5	8.451	5.390	7.021	0.000	1.524	2.546	2.579
2006	**3Q**	26.0	0.5	25.5	7.829	4.994	6.504	0.000	1.412	2.358	2.389
2006	**3Q**	25.1	0.5	24.6	7.544	4.812	6.267	0.000	1.360	2.272	2.302
2006	**3Q**	24.9	0.5	24.4	7.493	4.780	6.225	0.000	1.351	2.257	2.287
2006	**3Q**	24.5	0.5	24.0	7.376	4.705	6.127	0.000	1.330	2.222	2.251
2006	**3Q**	24.0	0.5	23.5	7.224	4.608	6.002	0.000	1.303	2.176	2.205
2006	**3Q**	27.5	0.5	27.0	8.300	5.294	6.895	0.000	1.497	2.500	2.533
2007	**3Q**	34.0	0.5	33.5	10.282	6.559	8.542	0.000	1.854	3.097	3.138
2007	**3Q**	32.3	0.5	31.8	9.778	6.237	8.123	0.000	1.763	2.945	2.984

2007	**3Q**	31.1	0.5	30.6	9.408	6.001	7.816	0.000	1.697	2.834	2.871
2007	**3Q**	31.0	0.5	30.5	9.358	5.969	7.774	0.000	1.687	2.819	2.856
2007	**3Q**	30.1	0.5	29.6	9.106	5.808	7.565	0.000	1.642	2.743	2.779
2007	**3Q**	29.9	0.5	29.4	9.039	5.765	7.509	0.000	1.630	2.723	2.759
2007	**3Q**	29.7	0.5	29.2	8.955	5.712	7.439	0.000	1.615	2.697	2.733
2007	**3Q**	28.1	0.5	27.6	8.484	5.412	7.048	0.000	1.530	2.556	2.589
2008	**3Q**	27.6	0.5	27.1	8.316	5.305	6.909	0.000	1.500	2.505	2.538
2008	**3Q**	27.3	0.5	26.8	8.232	5.251	6.839	0.000	1.484	2.480	2.512
2008	**3Q**	26.0	0.5	25.5	7.829	4.994	6.504	0.000	1.412	2.358	2.389
2008	**3Q**	24.9	0.5	24.4	7.493	4.780	6.225	0.000	1.351	2.257	2.287
2008	**3Q**	24.8	0.5	24.3	7.476	4.769	6.211	0.000	1.348	2.252	2.282
2008	**3Q**	24.5	0.5	24.0	7.376	4.705	6.127	0.000	1.330	2.222	2.251
2008	**3Q**	24.2	0.5	23.7	7.275	4.640	6.044	0.000	1.312	2.191	2.220
2008	**3Q**	22.2	0.5	21.7	6.670	4.254	5.541	0.000	1.203	2.009	2.036
2009	**3Q**	23.1	0.5	22.6	6.955	4.437	5.778	0.000	1.254	2.095	2.123
2009	**3Q**	18.5	0.5	18.0	5.544	3.536	4.606	0.000	1.000	1.670	1.692
2009	**3Q**	17.6	0.5	17.1	5.242	3.344	4.355	0.000	0.945	1.579	1.600
2009	**3Q**	17.2	0.5	16.7	5.141	3.279	4.271	0.000	0.927	1.549	1.569
2009	**3Q**	15.8	0.5	15.3	4.687	2.990	3.894	0.000	0.845	1.412	1.431
2009	**3Q**	15.8	0.5	15.3	4.687	2.990	3.894	0.000	0.845	1.412	1.431
2009	**3Q**	15.3	0.5	14.8	4.536	2.893	3.768	0.000	0.818	1.366	1.384
2009	**3Q**	14.9	0.5	14.4	4.435	2.829	3.685	0.000	0.800	1.336	1.354

YEAR	**QTR**	**FRMf**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBW**
2005	**4Q**	72.6	0.5	72.1	30.690	12.542	14.646	0.042	3.453	5.505	5.208
2005	**4Q**	60.2	0.5	59.7	25.401	10.381	12.122	0.035	2.858	4.556	4.310
2005	**4Q**	53.4	0.5	52.9	22.510	9.199	10.743	0.031	2.533	4.037	3.820
2005	**4Q**	49.4	0.5	48.9	20.819	8.508	9.935	0.029	2.342	3.734	3.533
2005	**4Q**	44.8	0.5	44.3	18.881	7.717	9.011	0.026	2.124	3.387	3.204
2005	**4Q**	37.1	0.5	36.6	15.591	6.372	7.441	0.021	1.754	2.796	2.646
2005	**4Q**	35.4	0.5	34.9	14.853	6.070	7.088	0.020	1.671	2.664	2.520
2005	**4Q**	35.0	0.5	34.5	14.699	6.007	7.015	0.020	1.654	2.636	2.494
2006	**4Q**	72.9	0.5	72.4	30.813	12.593	14.705	0.042	3.467	5.527	5.229
2006	**4Q**	59.4	0.5	58.9	25.093	10.255	11.975	0.034	2.823	4.501	4.258
2006	**4Q**	49.3	0.5	48.8	20.757	8.483	9.906	0.028	2.335	3.723	3.522
2006	**4Q**	42.7	0.5	42.2	17.959	7.339	8.571	0.025	2.021	3.221	3.048

2006	**4Q**	40.4	0.5	39.9	16.975	6.937	8.101	0.023	1.910	3.045	2.881
2006	**4Q**	36.8	0.5	36.3	15.468	6.322	7.382	0.021	1.740	2.774	2.625
2006	**4Q**	36.8	0.5	36.3	15.437	6.309	7.367	0.021	1.737	2.769	2.620
2006	**4Q**	35.0	0.5	34.5	14.699	6.007	7.015	0.020	1.654	2.636	2.494
2007	**4Q**	42.5	0.5	42.0	17.897	7.314	8.541	0.025	2.014	3.210	3.037
2007	**4Q**	42.0	0.5	41.5	17.682	7.226	8.439	0.024	1.989	3.171	3.001
2007	**4Q**	33.2	0.5	32.7	13.930	5.693	6.648	0.019	1.567	2.499	2.364
2007	**4Q**	30.3	0.5	29.8	12.670	5.178	6.046	0.017	1.425	2.272	2.150
2007	**4Q**	29.2	0.5	28.7	12.239	5.002	5.841	0.017	1.377	2.195	2.077
2007	**4Q**	29.2	0.5	28.7	12.239	5.002	5.841	0.017	1.377	2.195	2.077
2007	**4Q**	28.8	0.5	28.3	12.055	4.927	5.753	0.017	1.356	2.162	2.046
2007	**4Q**	25.6	0.5	25.1	10.671	4.361	5.092	0.015	1.201	1.914	1.811
2008	**4Q**	51.3	0.5	50.8	21.618	8.835	10.317	0.030	2.432	3.877	3.669
2008	**4Q**	45.8	0.5	45.3	19.281	7.880	9.202	0.026	2.169	3.458	3.272
2008	**4Q**	45.4	0.5	44.9	19.127	7.817	9.128	0.026	2.152	3.431	3.246
2008	**4Q**	39.9	0.5	39.4	16.790	6.862	8.013	0.023	1.889	3.012	2.849
2008	**4Q**	29.2	0.5	28.7	12.208	4.989	5.826	0.017	1.374	2.190	2.072
2008	**4Q**	28.7	0.5	28.2	12.024	4.914	5.738	0.016	1.353	2.157	2.040
2008	**4Q**	27.2	0.5	26.7	11.347	4.637	5.415	0.016	1.277	2.035	1.926
2008	**4Q**	25.5	0.5	25.0	10.640	4.348	5.078	0.015	1.197	1.908	1.806
2009	**4Q**	66.7	0.5	66.2	28.168	11.512	13.443	0.039	3.169	5.052	4.780
2009	**4Q**	42.9	0.5	42.4	18.051	7.377	8.615	0.025	2.031	3.238	3.063
2009	**4Q**	40.4	0.5	39.9	16.975	6.937	8.101	0.023	1.910	3.045	2.881
2009	**4Q**	36.2	0.5	35.7	15.191	6.208	7.250	0.021	1.709	2.725	2.578
2009	**4Q**	33.5	0.5	33.0	14.053	5.743	6.707	0.019	1.581	2.521	2.385
2009	**4Q**	32.9	0.5	32.4	13.777	5.630	6.575	0.019	1.550	2.471	2.338
2009	**4Q**	29.5	0.5	29.0	12.331	5.040	5.885	0.017	1.387	2.212	2.093
2009	**4Q**	26.1	0.5	25.6	10.886	4.449	5.195	0.015	1.225	1.953	1.847

Ranked Future Days per Year

2005	4Q	72.6	2006	4Q	72.9	2007	4Q	42.5	2008	4Q	51.3	2009	4Q	66.7
2005	4Q	60.2	2006	4Q	59.4	2007	4Q	42.0	2008	4Q	45.8	2009	4Q	42.9
2005	4Q	53.4	2006	4Q	49.3	2007	1Q	41.6	2008	4Q	45.4	2009	1Q	42.1
2005	4Q	49.4	2006	1Q	46.6	2007	1Q	37.0	2008	4Q	39.9	2009	4Q	40.4
2005	3Q	46.7	2006	4Q	42.7	2007	1Q	36.1	2008	2Q	39.1	2009	4Q	36.2
2005	2Q	45.5	2006	4Q	40.4	2007	1Q	36.1	2008	1Q	36.7	2009	4Q	33.5
2005	4Q	44.8	2006	1Q	39.9	2007	1Q	35.6	2008	2Q	33.2	2009	4Q	**32.9**
2005	2Q	**42.9**	2006	4Q	**36.8**	2007	3Q	**34.0**	2008	2Q	**32.8**	2009	1Q	32.5
2005	2Q	40.7	2006	1Q	36.8	2007	4Q	33.2	2008	4Q	29.2	2009	1Q	31.0
2005	1Q	40.3	2006	4Q	36.8	2007	2Q	33.1	2008	4Q	28.7	2009	4Q	29.5
2005	2Q	39.2	2006	2Q	35.2	2007	3Q	32.3	2008	3Q	27.6	2009	1Q	27.0
2005	3Q	38.7	2006	4Q	35.0	2007	2Q	31.9	2008	1Q	27.6	2009	4Q	26.1
2005	4Q	37.1	2006	1Q	34.4	2007	2Q	31.7	2008	1Q	27.5	2009	1Q	25.6
2005	2Q	36.4	2006	2Q	34.2	2007	3Q	31.1	2008	3Q	27.3	2009	1Q	25.0
2005	4Q	35.4	2006	2Q	31.7	2007	3Q	31.0	2008	4Q	27.2	2009	1Q	24.3
2005	2Q	35.3	2006	1Q	31.1	2007	4Q	30.3	2008	1Q	26.6	2009	3Q	23.1
2005	4Q	35.0	2006	3Q	30.1	2007	3Q	30.1	2008	3Q	26.0	2009	1Q	21.1
2005	2Q	34.5	2006	3Q	28.0	2007	3Q	29.9	2008	4Q	25.5	2009	2Q	20.6
2005	3Q	34.5	2006	1Q	27.8	2007	3Q	29.7	2008	3Q	24.9	2009	2Q	19.8
2005	2Q	34.4	2006	3Q	27.5	2007	4Q	29.2	2008	3Q	24.8	2009	2Q	19.4
2005	1Q	34.4	2006	2Q	26.7	2007	4Q	29.2	2008	3Q	24.5	2009	2Q	19.1
2005	3Q	34.0	2006	3Q	26.0	2007	2Q	29.0	2008	3Q	24.2	2009	3Q	18.5
2005	3Q	32.4	2006	1Q	25.8	2007	4Q	28.8	2008	1Q	23.4	2009	2Q	18.1
2005	3Q	32.3	2006	3Q	25.1	2007	3Q	28.1	2008	2Q	23.2	2009	3Q	17.6
2005	1Q	32.2	2006	3Q	24.9	2007	2Q	27.0	2008	1Q	22.6	2009	2Q	17.3
2005	1Q	29.1	2006	2Q	24.5	2007	2Q	26.0	2008	1Q	22.5	2009	3Q	17.2
2005	1Q	28.8	2006	3Q	24.5	2007	2Q	26.0	2008	2Q	22.4	2009	2Q	17.0
2005	3Q	27.6	2006	3Q	24.0	2007	4Q	25.6	2008	1Q	22.3	2009	2Q	16.1
2005	3Q	26.4	2006	2Q	22.8	2007	2Q	25.2	2008	3Q	22.2	2009	3Q	15.8
2005	1Q	25.7	2006	2Q	22.7	2007	1Q	23.3	2008	2Q	21.6	2009	3Q	15.8
2005	1Q	24.0	2006	1Q	21.3	2007	1Q	21.6	2008	2Q	21.4	2009	3Q	15.3
2005	1Q	23.9	2006	2Q	21.2	2007	1Q	20.1	2008	2Q	20.9	2009	3Q	14.9
8th-high			**8th-high**			**8th-high**			**8th-high**			**7th-high**		

Liberty Future 24-Hour Weighted Design Value, by Regional/Local

Methodology:

- Identify official 98th percentile value for each year
- Rounded to nearest integer

Future Projected FRM High Days

	2005	2006	2007	2008	2009
98th-Percentile	42.9	36.8	34.0	32.8	32.9

3-Year Design Values

3-Year Period	Avg
2005-2007	37.9
2006-2008	34.5
2007-2009	33.2

5-Year Weighted Average

5-Year Period	Avg
2005-2009	35

Clairton FRM Observed High Days

Methodology:

- Identify official 98th percentile value for each year
- Rounded to nearest integer

FRM High Days

	2005	2006	2007	2008	2009
98th-Percentile	30.9	35.8	35.0	34.6	25.9

3-Year Design Values

3-Year Period	Avg
2005-2007	33.9
2006-2008	35.1
2007-2009	31.8

5-Year Weighted Average

5-Year Period	Avg
2005-2009	34

Clairton Top 3 Days per Quarter

2005	DATE	1Q	DATE	2Q	DATE	3Q	DATE	4Q
	20050203	21.4	20050627	30.9	20050913	57.3	20051031	21.7
	20050317	21.1	20050621	27.4	20050721	29.1	20051218	20.7
	20050323	19.9	20050510	23.5	20050703	27.6	20051224	18.4

2006	DATE	1Q	DATE	2Q	DATE	3Q	DATE	4Q
	20060330	23.6	20060529	38.7	20060710	35.8	20061125	28.2
	20060324	18.9	20060616	23.2	20060704	29.1	20061231	22.3
	20060222	18.5	20060411	18.7	20060908	28.4	20061101	16.1

2007	DATE	1Q	DATE	2Q	DATE	3Q	DATE	4Q
	20070301	21.1	20070617	30.0	20070828	40.4	20071208	24.5
	20070217	16.5	20070524	29.0	20070804	35.0	20071226	23.6
	20070331	15.3	20070530	27.1	20070729	31.8	20071009	18.9

2008	DATE	1Q	DATE	2Q	DATE	3Q	DATE	4Q
	20080224	29.3	20080418	23.5	20080729	40.6	20081102	22.0
	20080307	20.1	20080530	18.0	20080717	34.6	20081015	17.7
	20080113	17.5	20080506	16.2	20080903	30.7	20081226	14.4

2009	DATE	1Q	DATE	2Q	DATE	3Q	DATE	4Q
	20090314	19.3	20090419	20.4	20090904	25.9	20091109	28.0
	20090125	13.9	20090525	20.3	20090817	21.1	20091115	18.9
	20090206	13.3	20090606	15.0	20090916	16.8	20091121	16.5

Clairton Quarterly SANDWICH High Day Concentrations

- Based on Liberty species, see Liberty SANDWICH composition calculations

Relative Compositions (fractions of Non-Blank)

FRACT	QTR	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc	DON
	1Q	1.000	0.330	0.124	0.234	0.083	0.044	0.111	0.074	0.374
	2Q	1.000	0.285	0.134	0.296	0.000	0.049	0.109	0.127	0.367
	3Q	1.000	0.216	0.124	0.349	0.000	0.033	0.127	0.151	0.363
	4Q	1.000	0.399	0.179	0.211	0.000	0.043	0.079	0.089	0.375

Methodology:

- Apply quarterly relative compositions to each quarterly high day in 5-year period
- FRMh is FRM high day (3 per quarter)

YEAR	QTR	FRMh	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc	DON
2005	1Q	21.4	0.5	20.9	6.906	2.599	4.881	1.730	0.910	2.326	1.548	0.374
	1Q	21.1	0.5	20.6	6.807	2.562	4.811	1.705	0.897	2.293	1.526	0.374
	1Q	19.9	0.5	19.4	6.410	2.412	4.531	1.605	0.844	2.159	1.437	0.374
2006	1Q	23.6	0.5	23.1	7.633	2.873	5.395	1.912	1.006	2.571	1.711	0.374
	1Q	18.9	0.5	18.4	6.080	2.288	4.298	1.523	0.801	2.048	1.363	0.374
	1Q	18.5	0.5	18.0	5.948	2.238	4.204	1.490	0.784	2.004	1.333	0.374
2007	1Q	21.1	0.5	20.6	6.807	2.562	4.811	1.705	0.897	2.293	1.526	0.374
	1Q	16.5	0.5	16.0	5.287	1.990	3.737	1.324	0.696	1.781	1.185	0.374
	1Q	15.3	0.5	14.8	4.890	1.840	3.457	1.225	0.644	1.647	1.096	0.374
2008	1Q	29.3	0.5	28.8	9.516	3.581	6.727	2.383	1.254	3.206	2.133	0.374
	1Q	20.1	0.5	19.6	6.476	2.437	4.578	1.622	0.853	2.182	1.452	0.374
	1Q	17.5	0.5	17.0	5.617	2.114	3.971	1.407	0.740	1.892	1.259	0.374
2009	1Q	19.3	0.5	18.8	6.212	2.338	4.391	1.556	0.818	2.093	1.392	0.374
	1Q	13.9	0.5	13.4	4.428	1.666	3.130	1.109	0.583	1.492	0.992	0.374
	1Q	13.3	0.5	12.8	4.229	1.592	2.990	1.059	0.557	1.425	0.948	0.374

YEAR	QTR	FRMh	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc	DON
2005	2Q	30.9	0.5	30.4	8.656	4.068	9.013	0.000	1.486	3.309	3.867	0.367
	2Q	27.4	0.5	26.9	7.660	3.600	7.975	0.000	1.315	2.928	3.422	0.367
	2Q	23.5	0.5	23.0	6.549	3.078	6.819	0.000	1.124	2.504	2.926	0.367
2006	2Q	38.7	0.5	38.2	10.877	5.112	11.325	0.000	1.867	4.159	4.860	0.367
	2Q	23.2	0.5	22.7	6.464	3.038	6.730	0.000	1.109	2.471	2.888	0.367
	2Q	18.7	0.5	18.2	5.182	2.436	5.396	0.000	0.889	1.981	2.315	0.367
2007	2Q	30.0	0.5	29.5	8.400	3.948	8.746	0.000	1.442	3.212	3.753	0.367
	2Q	29.0	0.5	28.5	8.115	3.814	8.449	0.000	1.393	3.103	3.626	0.367
	2Q	27.1	0.5	26.6	7.574	3.560	7.886	0.000	1.300	2.896	3.384	0.367
2008	2Q	23.5	0.5	23.0	6.549	3.078	6.819	0.000	1.124	2.504	2.926	0.367
	2Q	18.0	0.5	17.5	4.983	2.342	5.188	0.000	0.855	1.905	2.226	0.367
	2Q	16.2	0.5	15.7	4.471	2.101	4.655	0.000	0.767	1.709	1.997	0.367
2009	2Q	20.4	0.5	19.9	5.666	2.663	5.900	0.000	0.972	2.166	2.532	0.367
	2Q	20.3	0.5	19.8	5.638	2.650	5.870	0.000	0.968	2.156	2.519	0.367
	2Q	15.0	0.5	14.5	4.129	1.940	4.299	0.000	0.709	1.579	1.845	0.367

YEAR	QTR	FRMh	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc	DON
2005	3Q	57.3	0.5	56.8	12.270	7.053	19.845	0.000	1.863	7.196	8.573	0.363
	3Q	29.1	0.5	28.6	6.178	3.551	9.992	0.000	0.938	3.623	4.317	0.363
	3Q	27.6	0.5	27.1	5.854	3.365	9.468	0.000	0.889	3.433	4.090	0.363
2006	3Q	35.8	0.5	35.3	7.626	4.383	12.333	0.000	1.158	4.472	5.328	0.363
	3Q	29.1	0.5	28.6	6.178	3.551	9.992	0.000	0.938	3.623	4.317	0.363
	3Q	28.4	0.5	27.9	6.027	3.464	9.748	0.000	0.915	3.535	4.211	0.363
2007	3Q	40.4	0.5	39.9	8.619	4.955	13.940	0.000	1.308	5.055	6.022	0.363
	3Q	35.0	0.5	34.5	7.453	4.284	12.054	0.000	1.131	4.371	5.207	0.363
	3Q	31.8	0.5	31.3	6.762	3.887	10.936	0.000	1.026	3.965	4.724	0.363
2008	3Q	40.6	0.5	40.1	8.663	4.979	14.010	0.000	1.315	5.080	6.053	0.363
	3Q	34.6	0.5	34.1	7.367	4.234	11.914	0.000	1.118	4.320	5.147	0.363
	3Q	30.7	0.5	30.2	6.524	3.750	10.551	0.000	0.990	3.826	4.558	0.363
2009	3Q	25.9	0.5	25.4	5.487	3.154	8.874	0.000	0.833	3.218	3.834	0.363
	3Q	21.1	0.5	20.6	4.450	2.558	7.197	0.000	0.676	2.610	3.109	0.363
	3Q	16.8	0.5	16.3	3.521	2.024	5.695	0.000	0.535	2.065	2.460	0.363

YEAR	QTR	FRMh	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBWcalc	DON
2005	**4Q**	21.7	0.5	21.2	8.452	3.788	4.476	0.007	0.909	1.681	1.887	0.375
	4Q	20.7	0.5	20.2	8.054	3.610	4.265	0.007	0.866	1.601	1.798	0.375
	4Q	18.4	0.5	17.9	7.137	3.199	3.779	0.006	0.767	1.419	1.593	0.375
2006	**4Q**	28.2	0.5	27.7	11.044	4.950	5.848	0.010	1.187	2.196	2.465	0.375
	4Q	22.3	0.5	21.8	8.692	3.896	4.602	0.007	0.934	1.728	1.940	0.375
	4Q	16.1	0.5	15.6	6.220	2.788	3.294	0.005	0.669	1.237	1.388	0.375
2007	**4Q**	24.5	0.5	24.0	9.569	4.289	5.067	0.008	1.029	1.903	2.136	0.375
	4Q	23.6	0.5	23.1	9.210	4.128	4.877	0.008	0.990	1.831	2.056	0.375
	4Q	18.9	0.5	18.4	7.336	3.288	3.885	0.006	0.789	1.459	1.638	0.375
2008	**4Q**	22.0	0.5	21.5	8.572	3.842	4.539	0.007	0.922	1.704	1.914	0.375
	4Q	17.7	0.5	17.2	6.858	3.074	3.631	0.006	0.737	1.363	1.531	0.375
	4Q	14.4	0.5	13.9	5.542	2.484	2.935	0.005	0.596	1.102	1.237	0.375
2009	**4Q**	28.0	0.5	27.5	10.964	4.914	5.806	0.009	1.179	2.180	2.448	0.375
	4Q	18.9	0.5	18.4	7.336	3.288	3.885	0.006	0.789	1.459	1.638	0.375
	4Q	16.5	0.5	16.0	6.379	2.859	3.378	0.005	0.686	1.268	1.424	0.375

Clairton SMAT RRFs and Future High Day Calculations, by Total Species

- Based on Liberty species

Methodology:

- Use measured SO4 and EC
- Use retained nitrate (calculated)
- Use calculated indirect NH4 (retained) method for baseline and future
- Use calculated particle bound water for baseline and future
- Degrees of Neutralization (DON) constant from base to future

CAMx Modeled Species - High Day Total Base (as ranked without regional OTHER)

2007	TOA	EC	SO4	NO3	OTHER
1Q	7.145	4.217	6.607	2.979	16.151
2Q	2.197	2.373	8.080	0.188	10.586
3Q	1.933	2.679	14.336	0.118	12.460
4Q	10.802	5.371	7.392	5.654	16.326
2014	**TOA**	**EC**	**SO4**	**NO3**	**OTHER**
1Q	5.734	2.189	4.706	3.345	12.094
2Q	1.757	1.584	3.190	0.459	8.972
3Q	1.453	1.926	5.023	0.124	10.139
4Q	8.931	2.751	4.444	4.520	13.106

RRFs (Future Projected divided by Baseline)

RRF	TOA	EC	SO4	NO3	OTHER
1Q	0.803	0.519	0.712	1.123	0.749
2Q	0.800	0.668	0.395	2.445	0.848
3Q	0.752	0.719	0.350	1.052	0.814
4Q	0.827	0.512	0.601	0.799	0.803

					2007								2014					
YEAR	**QTR**	**FRMh**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**	**DON**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**
2005	**1Q**	21.4	0.5	20.9	6.906	2.599	4.881	1.730	0.910	2.326	1.548	0.374	5.542	1.349	3.477	1.942	0.681	1.863
2005	**1Q**	21.1	0.5	20.6	6.807	2.562	4.811	1.705	0.897	2.293	1.526	0.374	5.462	1.330	3.427	1.914	0.671	1.836
2005	**1Q**	19.9	0.5	19.4	6.410	2.412	4.531	1.605	0.844	2.159	1.437	0.374	5.144	1.252	3.227	1.803	0.632	1.729
2006	**1Q**	23.6	0.5	23.1	7.633	2.873	5.395	1.912	1.006	2.571	1.711	0.374	6.125	1.491	3.843	2.147	0.753	2.059
2006	**1Q**	18.9	0.5	18.4	6.080	2.288	4.298	1.523	0.801	2.048	1.363	0.374	4.879	1.188	3.061	1.710	0.600	1.640
2006	**1Q**	18.5	0.5	18.0	5.948	2.238	4.204	1.490	0.784	2.004	1.333	0.374	4.773	1.162	2.994	1.673	0.587	1.605
2007	**1Q**	21.1	0.5	20.6	6.807	2.562	4.811	1.705	0.897	2.293	1.526	0.374	5.462	1.330	3.427	1.914	0.671	1.836
2007	**1Q**	16.5	0.5	16.0	5.287	1.990	3.737	1.324	0.696	1.781	1.185	0.374	4.243	1.033	2.662	1.487	0.521	1.426
2007	**1Q**	15.3	0.5	14.8	4.890	1.840	3.457	1.225	0.644	1.647	1.096	0.374	3.924	0.955	2.462	1.375	0.482	1.319
2008	**1Q**	29.3	0.5	28.8	9.516	3.581	6.727	2.383	1.254	3.206	2.133	0.374	7.637	1.859	4.791	2.676	0.939	2.567
2008	**1Q**	20.1	0.5	19.6	6.476	2.437	4.578	1.622	0.853	2.182	1.452	0.374	5.197	1.265	3.261	1.821	0.639	1.747
2008	**1Q**	17.5	0.5	17.0	5.617	2.114	3.971	1.407	0.740	1.892	1.259	0.374	4.508	1.097	2.828	1.580	0.554	1.515
2009	**1Q**	19.3	0.5	18.8	6.212	2.338	4.391	1.556	0.818	2.093	1.392	0.374	4.985	1.213	3.128	1.747	0.613	1.676
2009	**1Q**	13.9	0.5	13.4	4.428	1.666	3.130	1.109	0.583	1.492	0.992	0.374	3.553	0.865	2.229	1.245	0.437	1.194
2009	**1Q**	13.3	0.5	12.8	4.229	1.592	2.990	1.059	0.557	1.425	0.948	0.374	3.394	0.826	2.129	1.190	0.417	1.141

					2007								2014					
YEAR	**QTR**	**FRMh**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**	**DON**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**
2005	**2Q**	30.9	0.5	30.4	8.656	4.068	9.013	0.000	1.486	3.309	3.867	0.367	6.925	2.716	3.558	0.000	1.259	1.307
2005	**2Q**	27.4	0.5	26.9	7.660	3.600	7.975	0.000	1.315	2.928	3.422	0.367	6.128	2.403	3.149	0.000	1.114	1.156
2005	**2Q**	23.5	0.5	23.0	6.549	3.078	6.819	0.000	1.124	2.504	2.926	0.367	5.239	2.055	2.692	0.000	0.953	0.989
2006	**2Q**	38.7	0.5	38.2	10.877	5.112	11.325	0.000	1.867	4.159	4.860	0.367	8.702	3.412	4.471	0.000	1.582	1.642
2006	**2Q**	23.2	0.5	22.7	6.464	3.038	6.730	0.000	1.109	2.471	2.888	0.367	5.171	2.028	2.657	0.000	0.940	0.976
2006	**2Q**	18.7	0.5	18.2	5.182	2.436	5.396	0.000	0.889	1.981	2.315	0.367	4.146	1.626	2.130	0.000	0.754	0.782
2007	**2Q**	30.0	0.5	29.5	8.400	3.948	8.746	0.000	1.442	3.212	3.753	0.367	6.720	2.635	3.453	0.000	1.222	1.268
2007	**2Q**	29.0	0.5	28.5	8.115	3.814	8.449	0.000	1.393	3.103	3.626	0.367	6.492	2.546	3.336	0.000	1.180	1.225
2007	**2Q**	27.1	0.5	26.6	7.574	3.560	7.886	0.000	1.300	2.896	3.384	0.367	6.059	2.376	3.114	0.000	1.102	1.143
2008	**2Q**	23.5	0.5	23.0	6.549	3.078	6.819	0.000	1.124	2.504	2.926	0.367	5.239	2.055	2.692	0.000	0.953	0.989
2008	**2Q**	18.0	0.5	17.5	4.983	2.342	5.188	0.000	0.855	1.905	2.226	0.367	3.986	1.563	2.048	0.000	0.725	0.752
2008	**2Q**	16.2	0.5	15.7	4.471	2.101	4.655	0.000	0.767	1.709	1.997	0.367	3.576	1.403	1.838	0.000	0.650	0.675
2009	**2Q**	20.4	0.5	19.9	5.666	2.663	5.900	0.000	0.972	2.166	2.532	0.367	4.533	1.778	2.329	0.000	0.824	0.855
2009	**2Q**	20.3	0.5	19.8	5.638	2.650	5.870	0.000	0.968	2.156	2.519	0.367	4.510	1.769	2.318	0.000	0.820	0.851
2009	**2Q**	15.0	0.5	14.5	4.129	1.940	4.299	0.000	0.709	1.579	1.845	0.367	3.303	1.295	1.697	0.000	0.601	0.623

					2007								2014					
YEAR	**QTR**	**FRMh**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**	**DON**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**
2005	**3Q**	57.3	0.5	56.8	12.270	7.053	19.845	0.000	1.863	7.196	8.573	0.363	9.224	5.071	6.954	0.000	1.516	2.521
2005	**3Q**	29.1	0.5	28.6	6.178	3.551	9.992	0.000	0.938	3.623	4.317	0.363	4.644	2.554	3.501	0.000	0.763	1.270
2005	**3Q**	27.6	0.5	27.1	5.854	3.365	9.468	0.000	0.889	3.433	4.090	0.363	4.401	2.420	3.318	0.000	0.723	1.203
2006	**3Q**	35.8	0.5	35.3	7.626	4.383	12.333	0.000	1.158	4.472	5.328	0.363	5.732	3.152	4.321	0.000	0.942	1.567
2006	**3Q**	29.1	0.5	28.6	6.178	3.551	9.992	0.000	0.938	3.623	4.317	0.363	4.644	2.554	3.501	0.000	0.763	1.270
2006	**3Q**	28.4	0.5	27.9	6.027	3.464	9.748	0.000	0.915	3.535	4.211	0.363	4.531	2.491	3.416	0.000	0.744	1.238
2007	**3Q**	40.4	0.5	39.9	8.619	4.955	13.940	0.000	1.308	5.055	6.022	0.363	6.479	3.562	4.885	0.000	1.065	1.771
2007	**3Q**	35.0	0.5	34.5	7.453	4.284	12.054	0.000	1.131	4.371	5.207	0.363	5.602	3.080	4.224	0.000	0.921	1.531
2007	**3Q**	31.8	0.5	31.3	6.762	3.887	10.936	0.000	1.026	3.965	4.724	0.363	5.083	2.795	3.832	0.000	0.835	1.389
2008	**3Q**	40.6	0.5	40.1	8.663	4.979	14.010	0.000	1.315	5.080	6.053	0.363	6.512	3.580	4.909	0.000	1.070	1.780
2008	**3Q**	34.6	0.5	34.1	7.367	4.234	11.914	0.000	1.118	4.320	5.147	0.363	5.537	3.045	4.175	0.000	0.910	1.514
2008	**3Q**	30.7	0.5	30.2	6.524	3.750	10.551	0.000	0.990	3.826	4.558	0.363	4.904	2.696	3.697	0.000	0.806	1.341
2009	**3Q**	25.9	0.5	25.4	5.487	3.154	8.874	0.000	0.833	3.218	3.834	0.363	4.125	2.268	3.110	0.000	0.678	1.128
2009	**3Q**	21.1	0.5	20.6	4.450	2.558	7.197	0.000	0.676	2.610	3.109	0.363	3.345	1.839	2.522	0.000	0.550	0.914
2009	**3Q**	16.8	0.5	16.3	3.521	2.024	5.695	0.000	0.535	2.065	2.460	0.363	2.647	1.455	1.995	0.000	0.435	0.724

					2007								2014					
YEAR	**QTR**	**FRMh**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**	**DON**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**
2005	**4Q**	21.7	0.5	21.2	8.452	3.788	4.476	0.007	0.909	1.681	1.887	0.375	6.988	1.940	2.691	0.006	0.729	1.011
2005	**4Q**	20.7	0.5	20.2	8.054	3.610	4.265	0.007	0.866	1.601	1.798	0.375	6.659	1.849	2.564	0.006	0.695	0.963
2005	**4Q**	18.4	0.5	17.9	7.137	3.199	3.779	0.006	0.767	1.419	1.593	0.375	5.901	1.638	2.272	0.005	0.616	0.853
2006	**4Q**	28.2	0.5	27.7	11.044	4.950	5.848	0.010	1.187	2.196	2.465	0.375	9.131	2.535	3.516	0.008	0.953	1.321
2006	**4Q**	22.3	0.5	21.8	8.692	3.896	4.602	0.007	0.934	1.728	1.940	0.375	7.186	1.995	2.767	0.006	0.750	1.039
2006	**4Q**	16.1	0.5	15.6	6.220	2.788	3.294	0.005	0.669	1.237	1.388	0.375	5.142	1.428	1.980	0.004	0.537	0.744
2007	**4Q**	24.5	0.5	24.0	9.569	4.289	5.067	0.008	1.029	1.903	2.136	0.375	7.911	2.196	3.046	0.007	0.826	1.144
2007	**4Q**	23.6	0.5	23.1	9.210	4.128	4.877	0.008	0.990	1.831	2.056	0.375	7.615	2.114	2.932	0.006	0.795	1.101
2007	**4Q**	18.9	0.5	18.4	7.336	3.288	3.885	0.006	0.789	1.459	1.638	0.375	6.065	1.684	2.335	0.005	0.633	0.877
2008	**4Q**	22.0	0.5	21.5	8.572	3.842	4.539	0.007	0.922	1.704	1.914	0.375	7.087	1.968	2.729	0.006	0.740	1.025
2008	**4Q**	17.7	0.5	17.2	6.858	3.074	3.631	0.006	0.737	1.363	1.531	0.375	5.670	1.574	2.183	0.005	0.592	0.820
2008	**4Q**	14.4	0.5	13.9	5.542	2.484	2.935	0.005	0.596	1.102	1.237	0.375	4.582	1.272	1.764	0.004	0.478	0.663
2009	**4Q**	28.0	0.5	27.5	10.964	4.914	5.806	0.009	1.179	2.180	2.448	0.375	9.065	2.517	3.490	0.008	0.946	1.311
2009	**4Q**	18.9	0.5	18.4	7.336	3.288	3.885	0.006	0.789	1.459	1.638	0.375	6.065	1.684	2.335	0.005	0.633	0.877
2009	**4Q**	16.5	0.5	16.0	6.379	2.859	3.378	0.005	0.686	1.268	1.424	0.375	5.274	1.464	2.031	0.004	0.551	0.763

YEAR	QTR	2014 SO4	NO3r	NH4r	S Term	N Term	A Term	Part 1	Part 2	Part 3	Sum	PBW Total
2005	1Q	3.477	1.942	1.863	0.477	0.267	0.256	-22273.805	-97.844	22371.795	0.145	1.059
2005	1Q	3.427	1.914	1.836	0.477	0.267	0.256	-22273.805	-97.844	22371.795	0.145	1.044
2005	1Q	3.227	1.803	1.729	0.477	0.267	0.256	-22273.805	-97.844	22371.795	0.145	0.983
2006	1Q	3.843	2.147	2.059	0.477	0.267	0.256	-22273.805	-97.844	22371.795	0.145	1.171
2006	1Q	3.061	1.710	1.640	0.477	0.267	0.256	-22273.805	-97.844	22371.795	0.145	0.932
2006	1Q	2.994	1.673	1.605	0.477	0.267	0.256	-22273.805	-97.844	22371.795	0.145	0.912
2007	1Q	3.427	1.914	1.836	0.477	0.267	0.256	-22273.805	-97.844	22371.795	0.145	1.044
2007	1Q	2.662	1.487	1.426	0.477	0.267	0.256	-22273.805	-97.844	22371.795	0.145	0.811
2007	1Q	2.462	1.375	1.319	0.477	0.267	0.256	-22273.805	-97.844	22371.795	0.145	0.750
2008	1Q	4.791	2.676	2.567	0.477	0.267	0.256	-22273.805	-97.844	22371.795	0.145	1.459
2008	1Q	3.261	1.821	1.747	0.477	0.267	0.256	-22273.805	-97.844	22371.795	0.145	0.993
2008	1Q	2.828	1.580	1.515	0.477	0.267	0.256	-22273.805	-97.844	22371.795	0.145	0.862
2009	1Q	3.128	1.747	1.676	0.477	0.267	0.256	-22273.805	-97.844	22371.795	0.145	0.953
2009	1Q	2.229	1.245	1.194	0.477	0.267	0.256	-22273.805	-97.844	22371.795	0.145	0.679
2009	1Q	2.129	1.190	1.141	0.477	0.267	0.256	-22273.805	-97.844	22371.795	0.145	0.649

YEAR	QTR	2014 SO4	NO3r	NH4r	S Term	N Term	A Term	Part 1	Part 2	Part 3	Sum	PBW Total
2005	2Q	3.558	0.000	1.307	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.296
2005	2Q	3.149	0.000	1.156	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.146
2005	2Q	2.692	0.000	0.989	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	0.980
2006	2Q	4.471	0.000	1.642	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.628
2006	2Q	2.657	0.000	0.976	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	0.967
2006	2Q	2.130	0.000	0.782	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	0.776
2007	2Q	3.453	0.000	1.268	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.257
2007	2Q	3.336	0.000	1.225	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.215
2007	2Q	3.114	0.000	1.143	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.134
2008	2Q	2.692	0.000	0.989	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	0.980
2008	2Q	2.048	0.000	0.752	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	0.746
2008	2Q	1.838	0.000	0.675	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	0.669
2009	2Q	2.329	0.000	0.855	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	0.848
2009	2Q	2.318	0.000	0.851	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	0.844
2009	2Q	1.697	0.000	0.623	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	0.618

YEAR	QTR	2014 SO4	NO3r	NH4r	S Term	N Term	A Term	Part 1	Part 2	Part 3	Sum	PBW Total
2005	3Q	6.954	0.000	2.521	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.555
2005	3Q	3.501	0.000	1.270	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.286
2005	3Q	3.318	0.000	1.203	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.219
2006	3Q	4.321	0.000	1.567	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.588
2006	3Q	3.501	0.000	1.270	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.286
2006	3Q	3.416	0.000	1.238	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.255
2007	3Q	4.885	0.000	1.771	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.794
2007	3Q	4.224	0.000	1.531	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.552
2007	3Q	3.832	0.000	1.389	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.408
2008	3Q	4.909	0.000	1.780	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.803
2008	3Q	4.175	0.000	1.514	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.534
2008	3Q	3.697	0.000	1.341	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.358
2009	3Q	3.110	0.000	1.128	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.142
2009	3Q	2.522	0.000	0.914	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	0.926
2009	3Q	1.995	0.000	0.724	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	0.733

YEAR	QTR	2014 SO4	NO3r	NH4r	S Term	N Term	A Term	Part 1	Part 2	Part 3	Sum	PBW Total
2005	4Q	2.691	0.006	1.011	0.726	0.002	0.273	-24064.907	-206.040	24271.204	0.258	0.957
2005	4Q	2.564	0.006	0.963	0.726	0.002	0.273	-24064.907	-206.040	24271.204	0.258	0.912
2005	4Q	2.272	0.005	0.853	0.726	0.002	0.273	-24064.907	-206.040	24271.204	0.258	0.808
2006	4Q	3.516	0.008	1.321	0.726	0.002	0.273	-24064.907	-206.040	24271.204	0.258	1.251
2006	4Q	2.767	0.006	1.039	0.726	0.002	0.273	-24064.907	-206.040	24271.204	0.258	0.984
2006	4Q	1.980	0.004	0.744	0.726	0.002	0.273	-24064.907	-206.040	24271.204	0.258	0.704
2007	4Q	3.046	0.007	1.144	0.726	0.002	0.273	-24064.907	-206.040	24271.204	0.258	1.084
2007	4Q	2.932	0.006	1.101	0.726	0.002	0.273	-24064.907	-206.040	24271.204	0.258	1.043
2007	4Q	2.335	0.005	0.877	0.726	0.002	0.273	-24064.907	-206.040	24271.204	0.258	0.831
2008	4Q	2.729	0.006	1.025	0.726	0.002	0.273	-24064.907	-206.040	24271.204	0.258	0.971
2008	4Q	2.183	0.005	0.820	0.726	0.002	0.273	-24064.907	-206.040	24271.204	0.258	0.777
2008	4Q	1.764	0.004	0.663	0.726	0.002	0.273	-24064.907	-206.040	24271.204	0.258	0.628
2009	4Q	3.490	0.008	1.311	0.726	0.002	0.273	-24064.907	-206.040	24271.204	0.258	1.242
2009	4Q	2.335	0.005	0.877	0.726	0.002	0.273	-24064.907	-206.040	24271.204	0.258	0.831
2009	4Q	2.031	0.004	0.763	0.726	0.002	0.273	-24064.907	-206.040	24271.204	0.258	0.722

Clairton Future High Days, by Total Species

Methodology:

- Sum species from high day calculations

YEAR	QTR	FRMf	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBW
2005	**1Q**	16.4	0.5	15.9	5.542	1.349	3.477	1.942	0.681	1.863	1.059
2005	**1Q**	16.2	0.5	15.7	5.462	1.330	3.427	1.914	0.671	1.836	1.044
2005	**1Q**	15.3	0.5	14.8	5.144	1.252	3.227	1.803	0.632	1.729	0.983
2006	**1Q**	18.1	0.5	17.6	6.125	1.491	3.843	2.147	0.753	2.059	1.171
2006	**1Q**	14.5	0.5	14.0	4.879	1.188	3.061	1.710	0.600	1.640	0.932
2006	**1Q**	14.2	0.5	13.7	4.773	1.162	2.994	1.673	0.587	1.605	0.912
2007	**1Q**	16.2	0.5	15.7	5.462	1.330	3.427	1.914	0.671	1.836	1.044
2007	**1Q**	12.7	0.5	12.2	4.243	1.033	2.662	1.487	0.521	1.426	0.811
2007	**1Q**	11.8	0.5	11.3	3.924	0.955	2.462	1.375	0.482	1.319	0.750
2008	**1Q**	22.4	0.5	21.9	7.637	1.859	4.791	2.676	0.939	2.567	1.459
2008	**1Q**	15.4	0.5	14.9	5.197	1.265	3.261	1.821	0.639	1.747	0.993
2008	**1Q**	13.4	0.5	12.9	4.508	1.097	2.828	1.580	0.554	1.515	0.862
2009	**1Q**	14.8	0.5	14.3	4.985	1.213	3.128	1.747	0.613	1.676	0.953
2009	**1Q**	10.7	0.5	10.2	3.553	0.865	2.229	1.245	0.437	1.194	0.679
2009	**1Q**	10.2	0.5	9.7	3.394	0.826	2.129	1.190	0.417	1.141	0.649

YEAR	QTR	FRMf	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBW
2005	**2Q**	17.6	0.5	17.1	6.925	2.716	3.558	0.000	1.259	1.307	1.296
2005	**2Q**	15.6	0.5	15.1	6.128	2.403	3.149	0.000	1.114	1.156	1.146
2005	**2Q**	13.4	0.5	12.9	5.239	2.055	2.692	0.000	0.953	0.989	0.980
2006	**2Q**	21.9	0.5	21.4	8.702	3.412	4.471	0.000	1.582	1.642	1.628
2006	**2Q**	13.2	0.5	12.7	5.171	2.028	2.657	0.000	0.940	0.976	0.967
2006	**2Q**	10.7	0.5	10.2	4.146	1.626	2.130	0.000	0.754	0.782	0.776
2007	**2Q**	17.1	0.5	16.6	6.720	2.635	3.453	0.000	1.222	1.268	1.257
2007	**2Q**	16.5	0.5	16.0	6.492	2.546	3.336	0.000	1.180	1.225	1.215
2007	**2Q**	15.4	0.5	14.9	6.059	2.376	3.114	0.000	1.102	1.143	1.134
2008	**2Q**	13.4	0.5	12.9	5.239	2.055	2.692	0.000	0.953	0.989	0.980
2008	**2Q**	10.3	0.5	9.8	3.986	1.563	2.048	0.000	0.725	0.752	0.746
2008	**2Q**	9.3	0.5	8.8	3.576	1.403	1.838	0.000	0.650	0.675	0.669
2009	**2Q**	11.7	0.5	11.2	4.533	1.778	2.329	0.000	0.824	0.855	0.848

2009	**2Q**	11.6	0.5	11.1	4.510	1.769	2.318	0.000	0.820	0.851	0.844
2009	**2Q**	8.6	0.5	8.1	3.303	1.295	1.697	0.000	0.601	0.623	0.618

YEAR	QTR	FRMf	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBW
2005	**3Q**	28.3	0.5	27.8	9.224	5.071	6.954	0.000	1.516	2.521	2.555
2005	**3Q**	14.5	0.5	14.0	4.644	2.554	3.501	0.000	0.763	1.270	1.286
2005	**3Q**	13.8	0.5	13.3	4.401	2.420	3.318	0.000	0.723	1.203	1.219
2006	**3Q**	17.8	0.5	17.3	5.732	3.152	4.321	0.000	0.942	1.567	1.588
2006	**3Q**	14.5	0.5	14.0	4.644	2.554	3.501	0.000	0.763	1.270	1.286
2006	**3Q**	14.2	0.5	13.7	4.531	2.491	3.416	0.000	0.744	1.238	1.255
2007	**3Q**	20.1	0.5	19.6	6.479	3.562	4.885	0.000	1.065	1.771	1.794
2007	**3Q**	17.4	0.5	16.9	5.602	3.080	4.224	0.000	0.921	1.531	1.552
2007	**3Q**	15.8	0.5	15.3	5.083	2.795	3.832	0.000	0.835	1.389	1.408
2008	**3Q**	20.2	0.5	19.7	6.512	3.580	4.909	0.000	1.070	1.780	1.803
2008	**3Q**	17.2	0.5	16.7	5.537	3.045	4.175	0.000	0.910	1.514	1.534
2008	**3Q**	15.3	0.5	14.8	4.904	2.696	3.697	0.000	0.806	1.341	1.358
2009	**3Q**	12.9	0.5	12.4	4.125	2.268	3.110	0.000	0.678	1.128	1.142
2009	**3Q**	10.6	0.5	10.1	3.345	1.839	2.522	0.000	0.550	0.914	0.926
2009	**3Q**	8.5	0.5	8.0	2.647	1.455	1.995	0.000	0.435	0.724	0.733

YEAR	QTR	FRMf	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBW
2005	**4Q**	14.8	0.5	14.3	6.988	1.940	2.691	0.006	0.729	1.011	0.957
2005	**4Q**	14.1	0.5	13.6	6.659	1.849	2.564	0.006	0.695	0.963	0.912
2005	**4Q**	12.6	0.5	12.1	5.901	1.638	2.272	0.005	0.616	0.853	0.808
2006	**4Q**	19.2	0.5	18.7	9.131	2.535	3.516	0.008	0.953	1.321	1.251
2006	**4Q**	15.2	0.5	14.7	7.186	1.995	2.767	0.006	0.750	1.039	0.984
2006	**4Q**	11.0	0.5	10.5	5.142	1.428	1.980	0.004	0.537	0.744	0.704
2007	**4Q**	16.7	0.5	16.2	7.911	2.196	3.046	0.007	0.826	1.144	1.084
2007	**4Q**	16.1	0.5	15.6	7.615	2.114	2.932	0.006	0.795	1.101	1.043
2007	**4Q**	12.9	0.5	12.4	6.065	1.684	2.335	0.005	0.633	0.877	0.831
2008	**4Q**	15.0	0.5	14.5	7.087	1.968	2.729	0.006	0.740	1.025	0.971
2008	**4Q**	12.1	0.5	11.6	5.670	1.574	2.183	0.005	0.592	0.820	0.777
2008	**4Q**	9.9	0.5	9.4	4.582	1.272	1.764	0.004	0.478	0.663	0.628
2009	**4Q**	19.1	0.5	18.6	9.065	2.517	3.490	0.008	0.946	1.311	1.242
2009	**4Q**	12.9	0.5	12.4	6.065	1.684	2.335	0.005	0.633	0.877	0.831
2009	**4Q**	11.3	0.5	10.8	5.274	1.464	2.031	0.004	0.551	0.763	0.722

Ranked Future Days per Year

2005	3Q	28.3	2006	2Q	21.9	2007	3Q	20.1	2008	1Q	22.4	2009	4Q	19.1
2005	2Q	**17.6**	2006	4Q	**19.2**	2007	3Q	**17.4**	2008	3Q	**20.2**	2009	1Q	**14.8**
2005	1Q	16.4	2006	1Q	18.1	2007	2Q	17.1	2008	3Q	17.2	2009	3Q	12.9
2005	1Q	16.2	2006	3Q	17.8	2007	4Q	16.7	2008	1Q	15.4	2009	4Q	12.9
2005	2Q	15.6	2006	4Q	15.2	2007	2Q	16.5	2008	3Q	15.3	2009	2Q	11.7
2005	1Q	15.3	2006	3Q	14.5	2007	1Q	16.2	2008	4Q	15.0	2009	2Q	11.6
2005	4Q	14.8	2006	1Q	14.5	2007	4Q	16.1	2008	1Q	13.4	2009	4Q	11.3
2005	3Q	14.5	2006	1Q	14.2	2007	3Q	15.8	2008	2Q	13.4	2009	1Q	10.7
2005	4Q	14.1	2006	3Q	14.2	2007	2Q	15.4	2008	4Q	12.1	2009	3Q	10.6
2005	3Q	13.8	2006	2Q	13.2	2007	4Q	12.9	2008	2Q	10.3	2009	1Q	10.2
2005	2Q	13.4	2006	4Q	11.0	2007	1Q	12.7	2008	4Q	9.9	2009	2Q	8.6
2005	4Q	12.6	2006	2Q	10.7	2007	1Q	11.8	2008	2Q	9.3	2009	3Q	8.5
2nd-high			**2nd-high**			**2nd-high**			**2nd-high**			**2nd-high**		

Clairton Future 24-Hour Weighted Design Value, by Total Species

Methodology:

- Identify official 98th percentile value for each year
- Rounded to nearest integer

Future Projected FRM High Days

	2005	2006	2007	2008	2009
98th-Percentile	17.6	19.2	17.4	20.2	14.8

3-Year Design Values

3-Year Period	Avg
2005-2007	18.1
2006-2008	18.9
2007-2009	17.5

5-Year Weighted Average

5-Year Period	Avg
2005-2009	18

Clairton Quarterly SANDWICH High Day Concentrations, by Regional/Local

- Based on Liberty species, see Liberty SANDWICH regional/local composition calculations

Split Compositions (fractions of species)

		Regional							Local						
FRACT	**QTR**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**
	1Q	0.462	0.289	0.694	0.819	0.551	0.663	0.671	0.538	0.711	0.306	0.181	0.449	0.337	0.329
	2Q	0.549	0.207	0.877	0.000	0.649	0.769	0.809	0.451	0.793	0.123	0.000	0.351	0.231	0.191
	3Q	0.757	0.197	0.820	0.000	0.551	0.666	0.663	0.243	0.803	0.180	0.000	0.449	0.334	0.337
	4Q	0.306	0.144	0.453	0.000	0.475	0.422	0.440	0.694	0.856	0.547	1.000	0.525	0.578	0.560

Methodology:

- Apply quarterly relative compositions to each quarterly high day in 5-year period
- FRMh is FRM high day (3 per quarter)

					Regional							Local						
YEAR	**QTR**	**FRMh**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**
2005	**1Q**	21.4	0.5	20.9	3.190	0.751	3.388	1.417	0.501	1.542	1.039	3.716	1.848	1.493	0.313	0.409	0.784	0.509
	1Q	21.1	0.5	20.6	3.144	0.740	3.340	1.396	0.494	1.520	1.024	3.663	1.822	1.472	0.308	0.403	0.773	0.501
	1Q	19.9	0.5	19.4	2.961	0.697	3.145	1.315	0.465	1.432	0.965	3.449	1.716	1.386	0.290	0.379	0.728	0.472
2006	**1Q**	23.6	0.5	23.1	3.526	0.830	3.745	1.566	0.554	1.705	1.149	4.107	2.043	1.650	0.346	0.452	0.867	0.562
	1Q	18.9	0.5	18.4	2.808	0.661	2.983	1.247	0.441	1.358	0.915	3.271	1.627	1.315	0.275	0.360	0.690	0.448
	1Q	18.5	0.5	18.0	2.747	0.646	2.918	1.220	0.432	1.328	0.895	3.200	1.592	1.286	0.270	0.352	0.675	0.438
2007	**1Q**	21.1	0.5	20.6	3.144	0.740	3.340	1.396	0.494	1.520	1.024	3.663	1.822	1.472	0.308	0.403	0.773	0.501
	1Q	16.5	0.5	16.0	2.442	0.575	2.594	1.085	0.384	1.181	0.796	2.845	1.415	1.143	0.240	0.313	0.600	0.389
	1Q	15.3	0.5	14.8	2.259	0.532	2.399	1.003	0.355	1.092	0.736	2.631	1.309	1.057	0.222	0.289	0.555	0.360
2008	**1Q**	29.3	0.5	28.8	4.396	1.034	4.669	1.952	0.691	2.125	1.432	5.120	2.547	2.058	0.431	0.563	1.080	0.701
	1Q	20.1	0.5	19.6	2.991	0.704	3.178	1.329	0.470	1.446	0.975	3.485	1.733	1.400	0.293	0.383	0.735	0.477
	1Q	17.5	0.5	17.0	2.595	0.611	2.756	1.152	0.408	1.255	0.845	3.022	1.503	1.215	0.255	0.332	0.638	0.414
2009	**1Q**	19.3	0.5	18.8	2.869	0.675	3.048	1.274	0.451	1.387	0.935	3.342	1.663	1.343	0.281	0.367	0.705	0.457
	1Q	13.9	0.5	13.4	2.045	0.481	2.172	0.908	0.321	0.989	0.666	2.382	1.185	0.957	0.201	0.262	0.503	0.326
	1Q	13.3	0.5	12.8	1.954	0.460	2.075	0.868	0.307	0.945	0.637	2.276	1.132	0.914	0.192	0.250	0.480	0.311

					Regional								Local					
YEAR	**QTR**	**FRMh**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**
2005	**2Q**	30.9	0.5	30.4	4.754	0.843	7.903	0.000	0.964	2.544	3.128	3.903	3.226	1.110	0.000	0.522	0.766	0.740
	2Q	27.4	0.5	26.9	4.206	0.746	6.993	0.000	0.853	2.251	2.767	3.453	2.854	0.982	0.000	0.462	0.678	0.655
	2Q	23.5	0.5	23.0	3.596	0.637	5.979	0.000	0.729	1.924	2.366	2.953	2.441	0.840	0.000	0.395	0.580	0.560
2006	**2Q**	38.7	0.5	38.2	5.973	1.059	9.931	0.000	1.211	3.196	3.930	4.904	4.053	1.394	0.000	0.656	0.963	0.930
	2Q	23.2	0.5	22.7	3.550	0.629	5.901	0.000	0.720	1.899	2.335	2.914	2.409	0.829	0.000	0.390	0.572	0.553
	2Q	18.7	0.5	18.2	2.846	0.504	4.731	0.000	0.577	1.523	1.872	2.337	1.931	0.664	0.000	0.312	0.459	0.443
2007	**2Q**	30.0	0.5	29.5	4.613	0.818	7.669	0.000	0.935	2.468	3.035	3.787	3.130	1.077	0.000	0.506	0.743	0.718
	2Q	29.0	0.5	28.5	4.456	0.790	7.409	0.000	0.904	2.385	2.932	3.659	3.024	1.040	0.000	0.489	0.718	0.694
	2Q	27.1	0.5	26.6	4.159	0.737	6.915	0.000	0.843	2.226	2.737	3.415	2.823	0.971	0.000	0.456	0.670	0.647
2008	**2Q**	23.5	0.5	23.0	3.596	0.637	5.979	0.000	0.729	1.924	2.366	2.953	2.441	0.840	0.000	0.395	0.580	0.560
	2Q	18.0	0.5	17.5	2.736	0.485	4.549	0.000	0.555	1.464	1.800	2.247	1.857	0.639	0.000	0.300	0.441	0.426
	2Q	16.2	0.5	15.7	2.455	0.435	4.082	0.000	0.498	1.314	1.615	2.016	1.666	0.573	0.000	0.269	0.396	0.382
2009	**2Q**	20.4	0.5	19.9	3.112	0.552	5.173	0.000	0.631	1.665	2.047	2.555	2.112	0.726	0.000	0.341	0.501	0.484
	2Q	20.3	0.5	19.8	3.096	0.549	5.147	0.000	0.628	1.657	2.037	2.542	2.101	0.723	0.000	0.340	0.499	0.482
	2Q	15.0	0.5	14.5	2.267	0.402	3.770	0.000	0.460	1.213	1.492	1.862	1.539	0.529	0.000	0.249	0.365	0.353

					Regional								Local					
YEAR	**QTR**	**FRMh**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**
2005	**3Q**	57.3	0.5	56.8	9.294	1.390	16.277	0.000	1.025	4.793	5.685	2.976	5.663	3.568	0.000	0.837	2.403	2.888
	3Q	29.1	0.5	28.6	4.680	0.700	8.196	0.000	0.516	2.413	2.863	1.498	2.851	1.796	0.000	0.422	1.210	1.454
	3Q	27.6	0.5	27.1	4.434	0.663	7.766	0.000	0.489	2.287	2.712	1.420	2.702	1.702	0.000	0.399	1.146	1.378
2006	**3Q**	35.8	0.5	35.3	5.776	0.864	10.116	0.000	0.637	2.979	3.533	1.849	3.519	2.217	0.000	0.520	1.493	1.795
	3Q	29.1	0.5	28.6	4.680	0.700	8.196	0.000	0.516	2.413	2.863	1.498	2.851	1.796	0.000	0.422	1.210	1.454
	3Q	28.4	0.5	27.9	4.565	0.683	7.995	0.000	0.504	2.354	2.793	1.462	2.782	1.752	0.000	0.411	1.180	1.419
2007	**3Q**	40.4	0.5	39.9	6.529	0.977	11.434	0.000	0.720	3.367	3.994	2.090	3.978	2.506	0.000	0.588	1.688	2.029
	3Q	35.0	0.5	34.5	5.645	0.844	9.887	0.000	0.623	2.911	3.453	1.808	3.440	2.167	0.000	0.508	1.460	1.754
	3Q	31.8	0.5	31.3	5.122	0.766	8.970	0.000	0.565	2.641	3.133	1.640	3.121	1.966	0.000	0.461	1.324	1.591
2008	**3Q**	40.6	0.5	40.1	6.562	0.981	11.491	0.000	0.724	3.384	4.014	2.101	3.998	2.519	0.000	0.591	1.696	2.039
	3Q	34.6	0.5	34.1	5.580	0.835	9.772	0.000	0.616	2.877	3.413	1.787	3.400	2.142	0.000	0.503	1.443	1.734
	3Q	30.7	0.5	30.2	4.942	0.739	8.654	0.000	0.545	2.548	3.023	1.582	3.011	1.897	0.000	0.445	1.278	1.535
2009	**3Q**	25.9	0.5	25.4	4.156	0.622	7.279	0.000	0.459	2.143	2.542	1.331	2.532	1.595	0.000	0.374	1.075	1.291
	3Q	21.1	0.5	20.6	3.371	0.504	5.903	0.000	0.372	1.738	2.062	1.079	2.054	1.294	0.000	0.304	0.872	1.047
	3Q	16.8	0.5	16.3	2.667	0.399	4.671	0.000	0.294	1.375	1.631	0.854	1.625	1.024	0.000	0.240	0.690	0.829

					Regional							Local						
YEAR	**QTR**	**FRMh**	**Blank**	**Non-Blank**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**PBWcalc**
2005	**4Q**	21.7	0.5	21.2	2.586	0.545	2.026	0.000	0.431	0.709	0.830	5.867	3.243	2.450	0.007	0.477	0.972	1.057
	4Q	20.7	0.5	20.2	2.464	0.520	1.931	0.000	0.411	0.675	0.791	5.590	3.090	2.334	0.007	0.455	0.926	1.007
	4Q	18.4	0.5	17.9	2.183	0.460	1.711	0.000	0.364	0.598	0.701	4.954	2.738	2.068	0.006	0.403	0.821	0.892
2006	**4Q**	28.2	0.5	27.7	3.378	0.713	2.647	0.000	0.564	0.926	1.085	7.666	4.237	3.201	0.010	0.624	1.270	1.381
	4Q	22.3	0.5	21.8	2.659	0.561	2.083	0.000	0.444	0.729	0.854	6.033	3.335	2.519	0.007	0.491	1.000	1.086
	4Q	16.1	0.5	15.6	1.903	0.401	1.491	0.000	0.317	0.521	0.611	4.317	2.386	1.803	0.005	0.351	0.715	0.777
2007	**4Q**	24.5	0.5	24.0	2.927	0.617	2.294	0.000	0.488	0.802	0.940	6.642	3.671	2.773	0.008	0.540	1.100	1.196
	4Q	23.6	0.5	23.1	2.817	0.594	2.208	0.000	0.470	0.772	0.905	6.393	3.534	2.669	0.008	0.520	1.059	1.151
	4Q	18.9	0.5	18.4	2.244	0.473	1.759	0.000	0.374	0.615	0.721	5.092	2.815	2.126	0.006	0.414	0.844	0.917
2008	**4Q**	22.0	0.5	21.5	2.622	0.553	2.055	0.000	0.438	0.719	0.842	5.950	3.289	2.484	0.007	0.484	0.986	1.072
	4Q	17.7	0.5	17.2	2.098	0.442	1.644	0.000	0.350	0.575	0.674	4.760	2.631	1.987	0.006	0.387	0.789	0.857
	4Q	14.4	0.5	13.9	1.695	0.358	1.328	0.000	0.283	0.465	0.544	3.847	2.126	1.606	0.005	0.313	0.637	0.693
2009	**4Q**	28.0	0.5	27.5	3.354	0.707	2.628	0.000	0.560	0.919	1.077	7.610	4.207	3.178	0.009	0.619	1.261	1.371
	4Q	18.9	0.5	18.4	2.244	0.473	1.759	0.000	0.374	0.615	0.721	5.092	2.815	2.126	0.006	0.414	0.844	0.917
	4Q	16.5	0.5	16.0	1.951	0.412	1.529	0.000	0.326	0.535	0.627	4.428	2.448	1.849	0.005	0.360	0.734	0.797

Clairton SMAT RRFs and Future High Day Calculations, by Regional/Local

- Based on Liberty species

Methodology:

- Use measured SO4 and EC
- Use retained nitrate (calculated)
- Use calculated indirect NH4 (retained) method for baseline and future
- Use calculated particle bound water for baseline and future
- Degrees of Neutralization (DON) constant from base to future
- Regional modeled OTHER is crustal; local OTHER is a mix of local primary material (LPM)
- For local RRFs, apportion modeled LPMm using monitored LPM fractions (OCMmb,EC,OPP)
- Modeled LPMm = POA+EC+OTHER

CAMx Modeled Species - Local Primary Material apportioned to POA, EC, OTHER

Ratio						OCMmb	EC			OPP
1Q						0.622	0.309			0.068
2Q						0.510	0.422			0.068
3Q						0.314	0.598			0.088
4Q						0.612	0.338			0.050

2007			SOA		LPMm	POA	EC			OTHER
1Q			0.000		11.075	6.890	3.427			0.757
2Q			0.000		9.890	5.045	4.170			0.674
3Q			0.000		11.237	3.529	6.715			0.993
4Q			0.000		7.046	4.312	2.383			0.351

2014			SOA		LPMm	POA	EC			OTHER
1Q			0.000		7.194	4.475	2.226			0.492
2Q			0.000		8.905	4.543	3.755			0.607
3Q			0.000		10.271	3.226	6.138			0.907
4Q			0.000		4.781	2.926	1.617			0.238

CAMx Modeled Species - High Days Regional/Local

	Regional					Local (LPM-apportioned)				
2007	**TOA**	**EC**	**SO4**	**NO3**	**OTHER**	**TOA**	**EC**	**SO4**	**NO3**	**OTHER**
1Q	6.394	3.189	5.017	2.865	6.856	6.890	3.427	1.590	0.114	0.757
2Q	1.525	1.522	6.637	0.172	2.218	5.046	4.170	1.443	0.016	0.674
3Q	1.327	1.599	12.759	0.113	2.909	3.529	6.715	1.578	0.005	0.993
4Q	10.264	4.374	6.385	5.583	10.816	4.312	2.383	1.007	0.071	0.351

2014	**TOA**	**EC**	**SO4**	**NO3**	**OTHER**	**TOA**	**EC**	**SO4**	**NO3**	**OTHER**
1Q	5.119	1.351	3.635	3.211	6.352	4.475	2.226	1.071	0.134	0.492
2Q	1.014	0.611	1.946	0.428	1.783	4.543	3.755	1.244	0.031	0.607
3Q	0.718	0.583	3.678	0.117	1.945	3.226	6.138	1.345	0.007	0.907
4Q	8.477	1.915	3.752	4.429	9.615	2.926	1.617	0.692	0.092	0.238

RRFs (Future Projected divided by Baseline)

	Regional					Local				
RRF	**TOA**	**EC**	**SO4**	**NO3**	**OTHER**	**TOA**	**EC**	**SO4**	**NO3**	**OTHER**
1Q	0.801	0.424	0.725	1.121	0.927	0.650	0.650	0.674	1.175	0.650
2Q	0.664	0.401	0.293	2.487	0.804	0.900	0.900	0.862	1.979	0.900
3Q	0.541	0.365	0.288	1.035	0.669	0.914	0.914	0.852	1.494	0.914
4Q	0.826	0.438	0.588	0.793	0.889	0.679	0.679	0.687	1.291	0.679

Projected Future Concentrations by Species

YEAR	QTR	2014 Regional OCMmb	EC	SO4	NO3r	OPP	2014 Local OCMmb	EC	SO4	NO3r	OPP	2014 Total OCMmb	EC	SO4	NO3r	OPP	NH4r	DON
2005	1Q	2.554	0.318	2.455	1.588	0.464	2.414	1.201	1.006	0.368	0.265	4.968	1.519	3.461	1.956	0.730	1.861	0.374
2005	1Q	2.517	0.314	2.420	1.565	0.458	2.379	1.183	0.991	0.362	0.262	4.896	1.497	3.411	1.928	0.719	1.834	0.374
2005	1Q	2.371	0.295	2.279	1.474	0.431	2.240	1.114	0.934	0.341	0.246	4.611	1.410	3.212	1.815	0.677	1.727	0.374
2006	1Q	2.823	0.352	2.713	1.755	0.513	2.668	1.327	1.112	0.406	0.293	5.490	1.679	3.825	2.161	0.807	2.057	0.374
2006	1Q	2.248	0.280	2.161	1.398	0.409	2.125	1.057	0.885	0.324	0.234	4.373	1.337	3.047	1.722	0.643	1.638	0.374
2006	1Q	2.200	0.274	2.114	1.368	0.400	2.079	1.034	0.866	0.317	0.229	4.278	1.308	2.981	1.684	0.629	1.603	0.374
2007	1Q	2.517	0.314	2.420	1.565	0.458	2.379	1.183	0.991	0.362	0.262	4.896	1.497	3.411	1.928	0.719	1.834	0.374
2007	1Q	1.955	0.244	1.879	1.216	0.356	1.848	0.919	0.770	0.281	0.203	3.803	1.163	2.649	1.497	0.559	1.425	0.374
2007	1Q	1.809	0.225	1.738	1.124	0.329	1.709	0.850	0.712	0.260	0.188	3.518	1.075	2.451	1.385	0.517	1.318	0.374
2008	1Q	3.519	0.438	3.383	2.188	0.640	3.326	1.654	1.386	0.507	0.366	6.845	2.093	4.769	2.695	1.006	2.564	0.374
2008	1Q	2.395	0.298	2.302	1.489	0.436	2.263	1.126	0.943	0.345	0.249	4.659	1.424	3.245	1.834	0.684	1.745	0.374
2008	1Q	2.077	0.259	1.997	1.292	0.378	1.963	0.977	0.818	0.299	0.216	4.041	1.235	2.815	1.591	0.594	1.514	0.374
2009	1Q	2.297	0.286	2.208	1.428	0.418	2.171	1.080	0.905	0.331	0.239	4.468	1.366	3.113	1.759	0.656	1.674	0.374
2009	1Q	1.637	0.204	1.574	1.018	0.298	1.547	0.770	0.645	0.236	0.170	3.185	0.974	2.219	1.254	0.468	1.193	0.374
2009	1Q	1.564	0.195	1.504	0.972	0.284	1.478	0.735	0.616	0.225	0.163	3.042	0.930	2.119	1.198	0.447	1.140	0.374

YEAR	QTR	2014 Regional OCMmb	EC	SO4	NO3r	OPP	2014 Local OCMmb	EC	SO4	NO3r	OPP	2014 Total OCMmb	EC	SO4	NO3r	OPP	NH4r	DON
2005	2Q	3.158	0.338	2.318	0.000	0.775	3.514	2.904	0.956	0.000	0.470	6.672	3.243	3.274	0.000	1.245	1.202	0.367
2005	2Q	2.795	0.299	2.051	0.000	0.686	3.110	2.570	0.846	0.000	0.416	5.904	2.869	2.897	0.000	1.102	1.064	0.367
2005	2Q	2.389	0.256	1.754	0.000	0.586	2.659	2.197	0.724	0.000	0.355	5.048	2.453	2.477	0.000	0.942	0.910	0.367
2006	2Q	3.968	0.425	2.912	0.000	0.974	4.416	3.650	1.202	0.000	0.590	8.384	4.075	4.114	0.000	1.564	1.511	0.367
2006	2Q	2.358	0.253	1.731	0.000	0.579	2.624	2.169	0.714	0.000	0.351	4.982	2.421	2.445	0.000	0.930	0.898	0.367
2006	2Q	1.891	0.203	1.388	0.000	0.464	2.104	1.739	0.573	0.000	0.281	3.995	1.941	1.960	0.000	0.745	0.720	0.367
2007	2Q	3.065	0.328	2.249	0.000	0.752	3.410	2.818	0.928	0.000	0.456	6.475	3.147	3.177	0.000	1.208	1.167	0.367
2007	2Q	2.961	0.317	2.173	0.000	0.727	3.294	2.723	0.897	0.000	0.440	6.255	3.040	3.069	0.000	1.167	1.127	0.367
2007	2Q	2.763	0.296	2.028	0.000	0.678	3.075	2.541	0.837	0.000	0.411	5.838	2.837	2.865	0.000	1.089	1.052	0.367
2008	2Q	2.389	0.256	1.754	0.000	0.586	2.659	2.197	0.724	0.000	0.355	5.048	2.453	2.477	0.000	0.942	0.910	0.367
2008	2Q	1.818	0.195	1.334	0.000	0.446	2.023	1.672	0.551	0.000	0.270	3.841	1.867	1.885	0.000	0.717	0.692	0.367

2008	**2Q**	1.631	0.175	1.197	0.000	0.400	1.815	1.500	0.494	0.000	0.243	3.446	1.675	1.691	0.000	0.643	0.621	0.367
2009	**2Q**	2.067	0.221	1.517	0.000	0.507	2.300	1.901	0.626	0.000	0.307	4.368	2.123	2.143	0.000	0.815	0.787	0.367
2009	**2Q**	2.057	0.220	1.510	0.000	0.505	2.289	1.892	0.623	0.000	0.306	4.346	2.112	2.132	0.000	0.811	0.783	0.367
2009	**2Q**	1.506	0.161	1.105	0.000	0.370	1.676	1.385	0.456	0.000	0.224	3.182	1.547	1.562	0.000	0.594	0.573	0.367

		2014 Regional					**2014 Local**					**2014 Total**						
YEAR	**QTR**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**DON**
2005	**3Q**	5.031	0.507	4.693	0.000	0.686	2.720	5.176	3.041	0.000	0.765	7.751	5.683	7.734	0.000	1.451	2.804	0.363
2005	**3Q**	2.533	0.255	2.363	0.000	0.345	1.370	2.606	1.531	0.000	0.385	3.903	2.862	3.894	0.000	0.731	1.412	0.363
2005	**3Q**	2.400	0.242	2.239	0.000	0.327	1.298	2.470	1.451	0.000	0.365	3.698	2.711	3.690	0.000	0.692	1.338	0.363
2006	**3Q**	3.126	0.315	2.916	0.000	0.426	1.691	3.217	1.890	0.000	0.476	4.817	3.532	4.807	0.000	0.902	1.743	0.363
2006	**3Q**	2.533	0.255	2.363	0.000	0.345	1.370	2.606	1.531	0.000	0.385	3.903	2.862	3.894	0.000	0.731	1.412	0.363
2006	**3Q**	2.471	0.249	2.305	0.000	0.337	1.336	2.543	1.494	0.000	0.376	3.807	2.791	3.799	0.000	0.713	1.378	0.363
2007	**3Q**	3.534	0.356	3.296	0.000	0.482	1.911	3.636	2.137	0.000	0.538	5.445	3.992	5.433	0.000	1.019	1.970	0.363
2007	**3Q**	3.056	0.308	2.850	0.000	0.416	1.652	3.144	1.847	0.000	0.465	4.708	3.452	4.698	0.000	0.881	1.703	0.363
2007	**3Q**	2.772	0.279	2.586	0.000	0.378	1.499	2.852	1.676	0.000	0.422	4.271	3.132	4.262	0.000	0.799	1.545	0.363
2008	**3Q**	3.552	0.358	3.313	0.000	0.484	1.920	3.654	2.147	0.000	0.540	5.472	4.012	5.460	0.000	1.024	1.980	0.363
2008	**3Q**	3.020	0.304	2.817	0.000	0.412	1.633	3.108	1.826	0.000	0.459	4.653	3.412	4.643	0.000	0.871	1.684	0.363
2008	**3Q**	2.675	0.270	2.495	0.000	0.365	1.446	2.752	1.617	0.000	0.407	4.121	3.022	4.112	0.000	0.771	1.491	0.363
2009	**3Q**	2.250	0.227	2.098	0.000	0.307	1.216	2.315	1.360	0.000	0.342	3.466	2.541	3.459	0.000	0.649	1.254	0.363
2009	**3Q**	1.824	0.184	1.702	0.000	0.249	0.987	1.877	1.103	0.000	0.278	2.811	2.061	2.805	0.000	0.526	1.017	0.363
2009	**3Q**	1.444	0.145	1.347	0.000	0.197	0.781	1.485	0.873	0.000	0.220	2.224	1.631	2.219	0.000	0.416	0.805	0.363

		2014 Regional					**2014 Local**					**2014 Total**						
YEAR	**QTR**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**OCMmb**	**EC**	**SO4**	**NO3r**	**OPP**	**NH4r**	**DON**
2005	**4Q**	2.135	0.239	1.191	0.000	0.384	3.981	2.201	1.682	0.009	0.324	6.116	2.439	2.873	0.009	0.707	1.080	0.375
2005	**4Q**	2.035	0.228	1.135	0.000	0.365	3.793	2.097	1.603	0.009	0.309	5.828	2.324	2.738	0.009	0.674	1.029	0.375
2005	**4Q**	1.803	0.202	1.005	0.000	0.324	3.361	1.858	1.421	0.008	0.273	5.164	2.060	2.426	0.008	0.597	0.912	0.375
2006	**4Q**	2.790	0.312	1.556	0.000	0.501	5.202	2.875	2.198	0.012	0.423	7.992	3.187	3.754	0.012	0.924	1.411	0.375
2006	**4Q**	2.196	0.246	1.224	0.000	0.394	4.094	2.263	1.730	0.010	0.333	6.290	2.508	2.955	0.010	0.727	1.111	0.375
2006	**4Q**	1.571	0.176	0.876	0.000	0.282	2.929	1.619	1.238	0.007	0.238	4.501	1.795	2.114	0.007	0.521	0.795	0.375
2007	**4Q**	2.417	0.270	1.348	0.000	0.434	4.507	2.491	1.905	0.011	0.367	6.924	2.762	3.253	0.011	0.801	1.223	0.375
2007	**4Q**	2.327	0.260	1.297	0.000	0.418	4.338	2.398	1.833	0.010	0.353	6.665	2.658	3.131	0.010	0.771	1.177	0.375
2007	**4Q**	1.853	0.207	1.033	0.000	0.333	3.455	1.910	1.460	0.008	0.281	5.309	2.117	2.494	0.008	0.614	0.938	0.375

2008	**4Q**	2.166	0.242	1.208	0.000	0.389	4.037	2.232	1.706	0.010	0.328	6.203	2.474	2.914	0.010	0.717	1.095	0.375
2008	**4Q**	1.732	0.194	0.966	0.000	0.311	3.230	1.785	1.365	0.008	0.263	4.962	1.979	2.331	0.008	0.574	0.876	0.375
2008	**4Q**	1.400	0.157	0.781	0.000	0.251	2.610	1.443	1.103	0.006	0.212	4.010	1.599	1.884	0.006	0.464	0.708	0.375
2009	**4Q**	2.770	0.310	1.545	0.000	0.498	5.164	2.855	2.182	0.012	0.420	7.934	3.164	3.727	0.012	0.918	1.401	0.375
2009	**4Q**	1.853	0.207	1.033	0.000	0.333	3.455	1.910	1.460	0.008	0.281	5.309	2.117	2.494	0.008	0.614	0.938	0.375
2009	**4Q**	1.612	0.180	0.899	0.000	0.289	3.005	1.661	1.270	0.007	0.244	4.616	1.841	2.168	0.007	0.534	0.815	0.375

												2014
YEAR	**QTR**	**SO4**	**NO3r**	**NH4r**	**S Term**	**N Term**	**A Term**	**Part 1**	**Part 2**	**Part 3**	**Sum**	**PBW Total**
2005	**1Q**	3.461	1.956	1.861	0.476	0.269	0.256	-22260.785	-96.978	22357.908	0.145	1.054
2005	**1Q**	3.411	1.928	1.834	0.476	0.269	0.256	-22260.785	-96.978	22357.908	0.145	1.039
2005	**1Q**	3.212	1.815	1.727	0.476	0.269	0.256	-22260.785	-96.978	22357.908	0.145	0.978
2006	**1Q**	3.825	2.161	2.057	0.476	0.269	0.256	-22260.785	-96.978	22357.908	0.145	1.165
2006	**1Q**	3.047	1.722	1.638	0.476	0.269	0.256	-22260.785	-96.978	22357.908	0.145	0.928
2006	**1Q**	2.981	1.684	1.603	0.476	0.269	0.256	-22260.785	-96.978	22357.908	0.145	0.907
2007	**1Q**	3.411	1.928	1.834	0.476	0.269	0.256	-22260.785	-96.978	22357.908	0.145	1.039
2007	**1Q**	2.649	1.497	1.425	0.476	0.269	0.256	-22260.785	-96.978	22357.908	0.145	0.807
2007	**1Q**	2.451	1.385	1.318	0.476	0.269	0.256	-22260.785	-96.978	22357.908	0.145	0.746
2008	**1Q**	4.769	2.695	2.564	0.476	0.269	0.256	-22260.785	-96.978	22357.908	0.145	1.452
2008	**1Q**	3.245	1.834	1.745	0.476	0.269	0.256	-22260.785	-96.978	22357.908	0.145	0.988
2008	**1Q**	2.815	1.591	1.514	0.476	0.269	0.256	-22260.785	-96.978	22357.908	0.145	0.857
2009	**1Q**	3.113	1.759	1.674	0.476	0.269	0.256	-22260.785	-96.978	22357.908	0.145	0.948
2009	**1Q**	2.219	1.254	1.193	0.476	0.269	0.256	-22260.785	-96.978	22357.908	0.145	0.676
2009	**1Q**	2.119	1.198	1.140	0.476	0.269	0.256	-22260.785	-96.978	22357.908	0.145	0.645

												2014
YEAR	**QTR**	**SO4**	**NO3r**	**NH4r**	**S Term**	**N Term**	**A Term**	**Part 1**	**Part 2**	**Part 3**	**Sum**	**PBW Total**
2005	**2Q**	3.274	0.000	1.202	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.192
2005	**2Q**	2.897	0.000	1.064	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.055
2005	**2Q**	2.477	0.000	0.910	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	0.902
2006	**2Q**	4.114	0.000	1.511	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.498
2006	**2Q**	2.445	0.000	0.898	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	0.890
2006	**2Q**	1.960	0.000	0.720	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	0.714

2007	**2Q**	3.177	0.000	1.167	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.157
2007	**2Q**	3.069	0.000	1.127	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.118
2007	**2Q**	2.865	0.000	1.052	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	1.043
2008	**2Q**	2.477	0.000	0.910	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	0.902
2008	**2Q**	1.885	0.000	0.692	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	0.686
2008	**2Q**	1.691	0.000	0.621	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	0.616
2009	**2Q**	2.143	0.000	0.787	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	0.780
2009	**2Q**	2.132	0.000	0.783	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	0.776
2009	**2Q**	1.562	0.000	0.573	0.731	0.000	0.269	-23601.814	-209.579	23811.659	0.266	0.569

YEAR	**QTR**	**SO4**	**NO3r**	**NH4r**	**S Term**	**N Term**	**A Term**	**Part 1**	**Part 2**	**Part 3**	**Sum**	**2014 PBW Total**
2005	**3Q**	7.734	0.000	2.804	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.841
2005	**3Q**	3.894	0.000	1.412	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.431
2005	**3Q**	3.690	0.000	1.338	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.356
2006	**3Q**	4.807	0.000	1.743	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.766
2006	**3Q**	3.894	0.000	1.412	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.431
2006	**3Q**	3.799	0.000	1.378	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.396
2007	**3Q**	5.433	0.000	1.970	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.996
2007	**3Q**	4.698	0.000	1.703	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.726
2007	**3Q**	4.262	0.000	1.545	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.566
2008	**3Q**	5.460	0.000	1.980	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	2.006
2008	**3Q**	4.643	0.000	1.684	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.706
2008	**3Q**	4.112	0.000	1.491	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.511
2009	**3Q**	3.459	0.000	1.254	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.271
2009	**3Q**	2.805	0.000	1.017	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	1.030
2009	**3Q**	2.219	0.000	0.805	0.734	0.000	0.266	-23320.363	-211.360	23531.993	0.270	0.815

YEAR	**QTR**	**SO4**	**NO3r**	**NH4r**	**S Term**	**N Term**	**A Term**	**Part 1**	**Part 2**	**Part 3**	**Sum**	**2014 PBW Total**
2005	**4Q**	2.873	0.009	1.080	0.725	0.002	0.273	-24059.569	-205.749	24265.575	0.258	1.021
2005	**4Q**	2.738	0.009	1.029	0.725	0.002	0.273	-24059.569	-205.749	24265.575	0.258	0.973
2005	**4Q**	2.426	0.008	0.912	0.725	0.002	0.273	-24059.569	-205.749	24265.575	0.258	0.862
2006	**4Q**	3.754	0.012	1.411	0.725	0.002	0.273	-24059.569	-205.749	24265.575	0.258	1.335

2006	**4Q**	2.955	0.010	1.111	0.725	0.002	0.273	-24059.569	-205.749	24265.575	0.258	1.050
2006	**4Q**	2.114	0.007	0.795	0.725	0.002	0.273	-24059.569	-205.749	24265.575	0.258	0.752
2007	**4Q**	3.253	0.011	1.223	0.725	0.002	0.273	-24059.569	-205.749	24265.575	0.258	1.156
2007	**4Q**	3.131	0.010	1.177	0.725	0.002	0.273	-24059.569	-205.749	24265.575	0.258	1.113
2007	**4Q**	2.494	0.008	0.938	0.725	0.002	0.273	-24059.569	-205.749	24265.575	0.258	0.887
2008	**4Q**	2.914	0.010	1.095	0.725	0.002	0.273	-24059.569	-205.749	24265.575	0.258	1.036
2008	**4Q**	2.331	0.008	0.876	0.725	0.002	0.273	-24059.569	-205.749	24265.575	0.258	0.829
2008	**4Q**	1.884	0.006	0.708	0.725	0.002	0.273	-24059.569	-205.749	24265.575	0.258	0.670
2009	**4Q**	3.727	0.012	1.401	0.725	0.002	0.273	-24059.569	-205.749	24265.575	0.258	1.325
2009	**4Q**	2.494	0.008	0.938	0.725	0.002	0.273	-24059.569	-205.749	24265.575	0.258	0.887
2009	**4Q**	2.168	0.007	0.815	0.725	0.002	0.273	-24059.569	-205.749	24265.575	0.258	0.771

Clairton Future High Days, by Regional/Local

Methodology:

- Sum species from high day calculations

YEAR	QTR	FRMf	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBW
2005	**1Q**	16.0	0.5	15.5	4.968	1.519	3.461	1.956	0.730	1.861	1.054
2005	**1Q**	15.8	0.5	15.3	4.896	1.497	3.411	1.928	0.719	1.834	1.039
2005	**1Q**	14.9	0.5	14.4	4.611	1.410	3.212	1.815	0.677	1.727	0.978
2006	**1Q**	17.7	0.5	17.2	5.490	1.679	3.825	2.161	0.807	2.057	1.165
2006	**1Q**	14.2	0.5	13.7	4.373	1.337	3.047	1.722	0.643	1.638	0.928
2006	**1Q**	13.9	0.5	13.4	4.278	1.308	2.981	1.684	0.629	1.603	0.907
2007	**1Q**	15.8	0.5	15.3	4.896	1.497	3.411	1.928	0.719	1.834	1.039
2007	**1Q**	12.4	0.5	11.9	3.803	1.163	2.649	1.497	0.559	1.425	0.807
2007	**1Q**	11.5	0.5	11.0	3.518	1.075	2.451	1.385	0.517	1.318	0.746
2008	**1Q**	21.9	0.5	21.4	6.845	2.093	4.769	2.695	1.006	2.564	1.452
2008	**1Q**	15.1	0.5	14.6	4.659	1.424	3.245	1.834	0.684	1.745	0.988
2008	**1Q**	13.1	0.5	12.6	4.041	1.235	2.815	1.591	0.594	1.514	0.857
2009	**1Q**	14.5	0.5	14.0	4.468	1.366	3.113	1.759	0.656	1.674	0.948
2009	**1Q**	10.5	0.5	10.0	3.185	0.974	2.219	1.254	0.468	1.193	0.676
2009	**1Q**	10.0	0.5	9.5	3.042	0.930	2.119	1.198	0.447	1.140	0.645

YEAR	QTR	FRMf	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBW
2005	**2Q**	17.3	0.5	16.8	6.672	3.243	3.274	0.000	1.245	1.202	1.192
2005	**2Q**	15.4	0.5	14.9	5.904	2.869	2.897	0.000	1.102	1.064	1.055
2005	**2Q**	13.2	0.5	12.7	5.048	2.453	2.477	0.000	0.942	0.910	0.902
2006	**2Q**	21.6	0.5	21.1	8.384	4.075	4.114	0.000	1.564	1.511	1.498
2006	**2Q**	13.1	0.5	12.6	4.982	2.421	2.445	0.000	0.930	0.898	0.890
2006	**2Q**	10.6	0.5	10.1	3.995	1.941	1.960	0.000	0.745	0.720	0.714
2007	**2Q**	16.8	0.5	16.3	6.475	3.147	3.177	0.000	1.208	1.167	1.157
2007	**2Q**	16.3	0.5	15.8	6.255	3.040	3.069	0.000	1.167	1.127	1.118
2007	**2Q**	15.2	0.5	14.7	5.838	2.837	2.865	0.000	1.089	1.052	1.043
2008	**2Q**	13.2	0.5	12.7	5.048	2.453	2.477	0.000	0.942	0.910	0.902
2008	**2Q**	10.2	0.5	9.7	3.841	1.867	1.885	0.000	0.717	0.692	0.686
2008	**2Q**	9.2	0.5	8.7	3.446	1.675	1.691	0.000	0.643	0.621	0.616
2009	**2Q**	11.5	0.5	11.0	4.368	2.123	2.143	0.000	0.815	0.787	0.780

2009	**2Q**	11.5	0.5	11.0	4.346	2.112	2.132	0.000	0.811	0.783	0.776
2009	**2Q**	8.5	0.5	8.0	3.182	1.547	1.562	0.000	0.594	0.573	0.569

YEAR	QTR	FRMf	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBW
2005	**3Q**	28.8	0.5	28.3	7.751	5.683	7.734	0.000	1.451	2.804	2.841
2005	**3Q**	14.7	0.5	14.2	3.903	2.862	3.894	0.000	0.731	1.412	1.431
2005	**3Q**	14.0	0.5	13.5	3.698	2.711	3.690	0.000	0.692	1.338	1.356
2006	**3Q**	18.1	0.5	17.6	4.817	3.532	4.807	0.000	0.902	1.743	1.766
2006	**3Q**	14.7	0.5	14.2	3.903	2.862	3.894	0.000	0.731	1.412	1.431
2006	**3Q**	14.4	0.5	13.9	3.807	2.791	3.799	0.000	0.713	1.378	1.396
2007	**3Q**	20.4	0.5	19.9	5.445	3.992	5.433	0.000	1.019	1.970	1.996
2007	**3Q**	17.7	0.5	17.2	4.708	3.452	4.698	0.000	0.881	1.703	1.726
2007	**3Q**	16.1	0.5	15.6	4.271	3.132	4.262	0.000	0.799	1.545	1.566
2008	**3Q**	20.5	0.5	20.0	5.472	4.012	5.460	0.000	1.024	1.980	2.006
2008	**3Q**	17.5	0.5	17.0	4.653	3.412	4.643	0.000	0.871	1.684	1.706
2008	**3Q**	15.5	0.5	15.0	4.121	3.022	4.112	0.000	0.771	1.491	1.511
2009	**3Q**	13.1	0.5	12.6	3.466	2.541	3.459	0.000	0.649	1.254	1.271
2009	**3Q**	10.8	0.5	10.3	2.811	2.061	2.805	0.000	0.526	1.017	1.030
2009	**3Q**	8.6	0.5	8.1	2.224	1.631	2.219	0.000	0.416	0.805	0.815

YEAR	QTR	FRMf	Blank	Non-Blank	OCMmb	EC	SO4	NO3r	OPP	NH4r	PBW
2005	**4Q**	14.7	0.5	14.2	6.116	2.439	2.873	0.009	0.707	1.080	1.021
2005	**4Q**	14.1	0.5	13.6	5.828	2.324	2.738	0.009	0.674	1.029	0.973
2005	**4Q**	12.5	0.5	12.0	5.164	2.060	2.426	0.008	0.597	0.912	0.862
2006	**4Q**	19.1	0.5	18.6	7.992	3.187	3.754	0.012	0.924	1.411	1.335
2006	**4Q**	15.2	0.5	14.7	6.290	2.508	2.955	0.010	0.727	1.111	1.050
2006	**4Q**	11.0	0.5	10.5	4.501	1.795	2.114	0.007	0.521	0.795	0.752
2007	**4Q**	16.6	0.5	16.1	6.924	2.762	3.253	0.011	0.801	1.223	1.156
2007	**4Q**	16.0	0.5	15.5	6.665	2.658	3.131	0.010	0.771	1.177	1.113
2007	**4Q**	12.9	0.5	12.4	5.309	2.117	2.494	0.008	0.614	0.938	0.887
2008	**4Q**	14.9	0.5	14.4	6.203	2.474	2.914	0.010	0.717	1.095	1.036
2008	**4Q**	12.1	0.5	11.6	4.962	1.979	2.331	0.008	0.574	0.876	0.829
2008	**4Q**	9.8	0.5	9.3	4.010	1.599	1.884	0.006	0.464	0.708	0.670
2009	**4Q**	19.0	0.5	18.5	7.934	3.164	3.727	0.012	0.918	1.401	1.325
2009	**4Q**	12.9	0.5	12.4	5.309	2.117	2.494	0.008	0.614	0.938	0.887
2009	**4Q**	11.3	0.5	10.8	4.616	1.841	2.168	0.007	0.534	0.815	0.771

Ranked Future Days per Year

2005	3Q	28.8	2006	2Q	21.6	2007	3Q	20.4	2008	1Q	21.9	2009	4Q	19.0
2005	2Q	**17.3**	2006	4Q	**19.1**	2007	3Q	**17.7**	2008	3Q	**20.5**	2009	1Q	**14.5**
2005	1Q	16.0	2006	3Q	18.1	2007	2Q	16.8	2008	3Q	17.5	2009	3Q	13.1
2005	1Q	15.8	2006	1Q	17.7	2007	4Q	16.6	2008	3Q	15.5	2009	4Q	12.9
2005	2Q	15.4	2006	4Q	15.2	2007	2Q	16.3	2008	1Q	15.1	2009	2Q	11.5
2005	1Q	14.9	2006	3Q	14.7	2007	3Q	16.1	2008	4Q	14.9	2009	2Q	11.5
2005	4Q	14.7	2006	3Q	14.4	2007	4Q	16.0	2008	2Q	13.2	2009	4Q	11.3
2005	3Q	14.7	2006	1Q	14.2	2007	1Q	15.8	2008	1Q	13.1	2009	3Q	10.8
2005	4Q	14.1	2006	1Q	13.9	2007	2Q	15.2	2008	4Q	12.1	2009	1Q	10.5
2005	3Q	14.0	2006	2Q	13.1	2007	4Q	12.9	2008	2Q	10.2	2009	1Q	10.0
2005	2Q	13.2	2006	4Q	11.0	2007	1Q	12.4	2008	4Q	9.8	2009	3Q	8.6
2005	4Q	12.5	2006	2Q	10.6	2007	1Q	11.5	2008	2Q	9.2	2009	2Q	8.5
2nd-high			**2nd-high**			**2nd-high**			**2nd-high**			**2nd-high**		

Clairton Future 24-Hour Weighted Design Value, by Regional/Local

Methodology:

- Identify official 98th percentile value for each year
- Rounded to nearest integer

Future Projected FRM High Days

	2005	2006	2007	2008	2009
98th-Percentile	17.3	19.1	17.7	20.5	14.5

3-Year Design Values

3-Year Period	Avg
2005-2007	18.0
2006-2008	19.1
2007-2009	17.5

5-Year Weighted Average

5-Year Period	Avg
2005-2009	18

$PM_{2.5}$ SIP

Appendix I

RACT/RACM Analysis

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REASONABLY AVAILABLE CONTROL MEASURE REASONABLY AVAILABLE CONTROL TECHNOLOGY ANALYSIS FOR THE LIBERTY-CLAIRTON $PM_{2.5}$ NONATTAINMENT AREA

COUNTY OF ALLEGHENY CONTRACT NUMBER 130103

CONSULTANT TECHNICAL SUPPORT FOR AIR POLLUTANT AREA AND MOBILE SOURCES ANALYSIS

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CONTENTS

Page

ACRONYMS AND ABBREVIATIONS v
CHAPTER I. INTRODUCTION 1
CHAPTER II. AREA SOURCES – COMMERCIAL/INDUSTRIAL 5
CHAPTER III. AREA SOURCES – HOME 19
CHAPTER IV. MOBILE SOURCES 35
CHAPTER V. RECOMMENDATIONS 59

TABLES

Page

Table I-1. Area – Commercial-Industrial 2
Table I-2. Area Sources – Home 3
Table I-3. Mobile Sources RACM Option List for L-C 3
Table V-1. Area – Commercial-Industrial RACT/RACM Analysis Summary 60
Table V-2. Area Sources – Home RACM Analysis Summary 61
Table V-3. Mobile Sources RACM Analysis Summary 62

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ACRONYMS AND ABBREVIATIONS

$\mu g/m^3$	micrograms per cubic meter
ACHD	Allegheny County Health Department
APCD	air pollution control district
APUs	Auxiliary Power Units
ARB	Air Resources Board
BAAQMD	Bay Area Air Quality Management District
BACT	best available control technology
CMAQ	Community Multiscale Air Quality
CO	carbon monoxide
CO_2	carbon dioxide
DPF	diesel particulate filter
EPA	U.S. Environmental Protection Agency
EPS	Electrified Parking Spaces
gr/dscf	grains per dry standard cubic feet
HAP	hazardous air pollutant
HEPA	high-efficiency particulate air
HPBA	Hearth Patio and Barbeque Association
LAER	lowest achievable emission rate
lbs	pounds
L-C	Liberty-Clairton
MOVES	Motor Vehicle Emissions Simulator
NAAQS	national ambient air quality standards
NAAs	nonattainment areas
NEI	National Emissions Inventory
NMIM	National Mobile Inventory Model
NO_x	oxides of nitrogen
NSPS	New Source Performance Standards
NSR	New Source Review
O_2	oxygen
OWBs	outdoor wood-fired boilers
PM_{10}	particulate matter with an aerodynamic diameter of 10 microns or less
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 microns or less
RACM	reasonably available control measures
RACT	reasonably available control technologies
RFP	Reasonable Further Progress
SCAQMD	South Coast Air Quality Management District
SCCs	Source Classification Codes
SIP	State Implementation Plan
SMAQMD	Sacramento Metropolitan Air Quality Management District
SO_2	sulfur dioxide
SPC	Southwest Pennsylvania Commission
tpy	tons per year
VMT	vehicle miles traveled
VOCs	volatile organic compounds

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CHAPTER I. INTRODUCTION

The analysis provided in this report was developed according to the Federal guidance for reasonably available control technologies (RACT) and reasonably available control measures (RACM). That guidance requires particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$) nonattainment areas (NAAs) to consider RACT and RACM that might contribute to expeditious attainment in a specific NAA. This report describes the details of those requirements that were used to determine the control measures recommended for adoption (FR 2005; 2007).

The U.S. Environmental Protection Agency (EPA) interprets RACM as a collection of measures that, taken as a group, advance the national ambient air quality standards (NAAQS) attainment date by at least one year. A RACT/RACM analysis must consider which emission sources to control, to what level, and when the controls can and should be implemented.

States need not analyze every conceivable measure. RACT/RACM are, by their definition, reasonable. Any unreasonable measure, which is "absurd, unenforceable, or impractical," or that would cause "severely disruptive socioeconomic impacts" (e.g., gas rationing and mandatory source shutdowns), would not be required. Measures that are not necessary to satisfy Reasonable Further Progress (RFP) or expeditious attainment are also not required RACT/RACM for the area. Finally, any measures that, collectively, would not advance attainment by at least one year are not required for $PM_{2.5}$ RACT/RACM, even if those measures are individually reasonable.

Similar to New Source Review (NSR) requirements, RACT/RACM analyses must address both direct $PM_{2.5}$ and gaseous precursors, in particular sulfur dioxide (SO_2) and oxides of nitrogen (NO_x), unless NO_x and SO_2 emissions do not significantly contribute to $PM_{2.5}$ in the area. RACT/RACM are not needed for ammonia or volatile organic compounds (VOCs) unless modeling shows that reductions of these are effective in reducing $PM_{2.5}$ levels in the area. EPA encourages states to consider the potential for reducing condensable emissions when evaluating potential measures for RACT. EPA expects areas to more rigorously identify RACT/RACM for those precursors that are most effective in reducing $PM_{2.5}$. Less rigorous analysis is needed for pollutants that have trivial impacts on $PM_{2.5}$ reductions.

While an area's RACT determination may include an appropriately supported certification of previously conducted RACT determinations, such as those completed for ozone or particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}), existing RACT should be closely reviewed in light of newer information that may have arisen since the initial determinations. Identifying potential RACT/RACM measures entails three main steps:

(1) Examining the emissions source categories in the NAA with direct $PM_{2.5}$ and precursor emissions, such as NO_x and SO_2. Priority should be given to categories with the largest inventory of $PM_{2.5}$ or precursors. Although many of these sources are already well controlled, small incremental improvements result in higher emission reductions than categories with smaller inventories.

(2) Considering technologically feasible emissions control technologies or measures for each source. Technological feasibility determinations should include considerations of the source's operating procedures, raw materials, physical plant layout, and any other environmental impacts. The cost of preventing adverse water, solid waste, and energy impacts should be considered when assessing the economic feasibility of the $PM_{2.5}$ control technology.

(3) Considering the control efficiency and possible emissions reductions, by pollutant, for each technology or measure and the date by which the technology or measure could be reasonably implemented. States should consider the capital costs, annual costs, and cost effectiveness of an emissions reduction technology, as well as any effects on the local economy. EPA is not proposing a fixed cost effectiveness threshold for RACT. If essential reductions are more costly to achieve because many sources are already

controlled, the cost per ton of control may necessarily be higher. The significant benefits associated with $PM_{2.5}$ ambient reduction should be a relevant consideration in control strategy development.

Because NAAQS violations generally reflect a combination of regional scale, metropolitan scale, and local scale impacts, all three scales must be addressed in an area's RACT/RACM analysis. Considering the variety of emissions sources, control measure types, and nonattainment situations, EPA did not define a de minimis threshold for the $PM_{2.5}$ RACT analysis. A state needing significant emission reductions for attainment will likely consider controls on smaller sources than would be analyzed by states that do not require significant reductions.

The RACT/RACM control measures are selected based on the reductions needed to obtain the earliest possible attainment year. The selected measures should be adopted and submitted to EPA within three years of the nonattainment designation. Implementation of RACT measures should in no case start later than the beginning of the year before the attainment date.

As supporting information for identification of RACT and RACM, the state ordinarily provides data on technologically feasible control measures:

(1) A list of all emissions source categories, sources, and activities in the NAAs;

(2) For each source category, source, or activity, an inventory of direct $PM_{2.5}$ and precursor emissions;

(3) For each source category, source, or activity, a list of technologically feasible emission control technologies and/or measures; and

(4) For each technologically feasible emission control technology or measure, the state should provide the following information: (a) the control efficiency by pollutant; (b) the possible emission reductions by pollutant; (c) the estimated cost per ton of pollutant reduced; and (d) the date by which the technology or measure could be reasonably implemented.

The source category information for the Liberty-Clairton (L-C) area was sorted into three sectors: (1) area sources: commercial/industrial (small point sources), (2) area sources: home, and (3) mobile sources. The sources and source categories that fell into each of those sector groups are listed in Tables I-1, I-2, and I-3, respectively.

Table I-1. Area – Commercial-Industrial

Source Categories	Associated Facilities	RACM Options
1. Industrial laundries		
2. Dry cleaners and tailors		
3. Funeral homes and pathogenic incinerators	Jefferson Hills Crematory	PM controls
4. Public housing projects		
5. Schools		
6. Scrap salvage yards and metal recycling	Tube City IMS-USX Clairton	PM controls
7. Automotive and truck mechanical repair services		
8. Truck spring manufacturers		
9. Automotive and truck body repair services		
10. Construction companies		
11. Ready mix concrete		
12. Aluminum casting		
13. Wood fabrication		
14. Box, crate, and skid manufacturing		

Source Categories	Associated Facilities	RACM Options
15. Gasoline service stations		
16. Bulk building materials		
17. Metal welding and repair		
18. Automobile dealers		
19. Restaurants		Catalytic oxidizers or high-efficiency particulate air (HEPA) filters
20. Metal etching	Tech Met Glassport Plant	NO_x control
21. Refractories	TYK Refractories	PM control
22. Concrete reinforced steel and metal slupe manufacturing	Riverview Steel Corporation	Facility closed

Table I-2. Area Sources – Home

	RACM Options
a. Wood-burning Stoves and Fireplaces	1. Woodstove changeout program. 2. Outreach programs. 3. Curtailments during days with expected high ambient levels of $PM_{2.5}$. 4. Woodstove replacement when homes are sold.
b. Wood-burning Boilers	1. Compliance with new state/county regulations. 2. Curtailments during days with expected high ambient levels of $PM_{2.5}$.
c. Coal Furnaces	1. Changeout to natural gas.
d. Lawn Care	1. Restrict commercial operations to certain times of day. 2. Native grass planting (reduce mowing acreage). 3. Less frequent maintenance mowing. 4. Replace older mowers with those meeting latest Tier standards.
e. Lawn Mowers	1. Changeout to electric mowers. 2. Replace older mowers with those meeting latest Tier standards.
f. Snow Blowers	1. Replacement program.

Table I-3. Mobile Sources RACM Option List for L-C

	RACM Options
a. On-road Highway	1. Onroad diesel engine retrofits for school buses, trucks, and transit buses using EPA-verified technologies. 2. Diesel idling programs for trucks. 3. Transportation control measures, as well as other transportation demand management and transportation systems management strategies. 4. Programs to reduce emissions or accelerate retirement of high emitting vehicles. 5. Emission testing and repair/maintenance programs for onroad vehicles. 6. Programs to expand use of clean burning fuels. 7. Low emissions specification for public or private vehicle fleets. 8. Opacity or other emission standards for gross emitting diesel equipment.
b. On-road Local	Same as (a) options.
c. Off-road	1. Diesel idling programs for construction equipment. 2. Nonroad diesel engine retrofit, rebuild or replacement with catalyzed particle filter.

	RACM Options
	3. Programs to reduce emissions or accelerate retirement of high emitting boats and lawn and garden equipment. 4. Emissions testing and repair/maintenance programs for nonroad heavy-duty vehicles and equipment. 5. Programs to expand use of clean burning fuels. 6. Low emission specifications for equipment or fuel used in large construction contracts. 7. Opacity of other emission standards for gross emitting diesel equipment.
d. Trucks to and from Industrial Facilities	1. Diesel retrofits or replacement with new lower polluting engines. 2. Diesel idling programs for trucks. 3. Emission or opacity testing for NAA based trucks.
e. Railroad	1. Diesel idling programs. 2. Low emission specifications for equipment or fuel used at industrial facilities or switch yards.
f. Marine	1. Diesel idling programs. 2. Low emission specifications for equipment dedicated to industrial facilities in the NAA.
g. Air	Closest airport is Allegheny County Airport near West Mifflin – outside the NAA

The cost analyses that are presented in the following sections compute the estimated cost effectiveness of the RACM/RACT options by estimating the annualized cost of the measure and comparing that with the estimated annual emission reduction benefit. The annualized cost is computed using a 5 percent discount rate. This discount rate is consistent with the rate used in recent EPA regulatory analyses. Discount rates in the source materials used in this study ranged from 3 to 7 percent. When a discount rate different from 5 percent was used in the source materials, it was converted to 5 percent in this study. This discount rate is used to convert any capital cost estimates into an equivalent annual cost stream. The other key variable used to estimate the capital recovery factor that is multiplied by the capital cost in the annualized cost estimation process is the estimated equipment lifetime. The equipment lifetime can range from 3 to 20 years depending on the control technique being considered, or the remaining expected life of the equipment being retrofit.

REFERENCES:

FR, 2005: Federal Register, “Proposed Rule to Implement the Fine Particle National Ambient Air Quality Standards,” Vol. 70, No. 210, November 1, 2005.

FR, 2007: Federal Register, “Clean Air Fine Particle Implementation Rule,” Vol. 72, No. 79, April 25, 2007.

CHAPTER II. AREA SOURCES – COMMERCIAL/INDUSTRIAL

Of the source categories and associated facilities listed in Table I-1, the annual emission estimates for 2007 were reviewed, and the list was reduced to those source categories (or facilities) with at least one ton per year of emissions of $PM_{2.5}$, SO_2, or NO_x in that year. For the point sources, five facilities were identified (those not already evaluated by the Allegheny County Health Department [ACHD]), and this number was reduced to four when it was determined that Riverview Steel Corporation no longer operates. The only area source-commercial/industrial category with emissions above the threshold is restaurants. Control alternatives are evaluated for restaurants with charbroilers.

RACM Analysis

SOURCE CATEGORY: Crematoriums
ASSOCIATED SOURCE CLASSIFICATION CODES (SCCs) FOR AREA SOURCES: 31502101

DESCRIPTION

The emissions listed below are for Jefferson Hills Crematory. These emission estimates are the permit limits. The facility permit limits particulate emissions to not exceed 0.08 grains per dry standard cubic feet (gr/dscf) at 7 percent oxygen (O_2). The information on particulate matter and visible emissions limits in EPA's on-line RACT/best available control technology (BACT)/lowest achievable emission rate (LAER) clearinghouse was reviewed for crematoriums. This clearinghouse had information about five permits. All five permits were issued to new facilities (BACT-PSD) in the period between 1984 and 1990. There certainly could be permits issued after 1990 for new crematoriums, but they are not listed in the clearinghouse. The PM emission limits for the permits are expressed in different units but the ones with primary emission limits in the same units as Jefferson Hills are:

1. 0.0330 gr/dscf at 12% carbon dioxide (CO_2)
2. 0.08 gr/dscf at 12% CO_2
3. 0.08 gr/dscf corr to CO_2

It appears that the current emission limit at the Jefferson Hills crematorium is the same as the BACT/PSD-based emission limits at 2 of the 3 crematoriums with similar emission limits.

EMISSIONS INVENTORY (annual tons)		
Pollutant	2007 tons	2014 tons
NO_x	1.83	1.83
$PM_{2.5}$	1.83	1.83
SO_2	0.53	0.53
VOC	0.01	0.01
CURRENT CONTROL REQUIREMENT		
TECHNOLOGICALLY FEASIBLE EMISSION CONTROL TECHNOLOGIES		
Option 1		
1. Control Efficiency by Pollutant		
2. Potential Emission Reductions by Pollutant		
Pollutant	2014	
NO_x		
$PM_{2.5}$		
SO^2		
VOC		
3. Cost per Ton of Pollutant Reduced		
4. Date by which the Technology or Measure Could be Reasonably Implemented		

Option 2	
1. Control Efficiency by Pollutant	
2. Potential Emission Reductions by Pollutant	
Pollutant	2014
NO_x	
$PM_{2.5}$	
SO_2	
VOC	
3. Cost per Ton of Pollutant Reduced	
4. Date by which the Technology or Measure Could be Reasonably Implemented	
Option 3	
1. Control Efficiency by Pollutant	
2. Potential Emission Reductions by Pollutant	
Pollutant	2014
NO_x	
$PM_{2.5}$	
SO_2	
VOC	
3. Cost per Ton of Pollutant Reduced	
4. Date by which the Technology or Measure Could be Reasonably Implemented	

RACM Analysis

SOURCE CATEGORY: Scrap Salvage Yards and Metal Recycling – Hand Held Torch Cutting (Tube City IMS – U.S. Steel Clients)
ASSOCIATED SOURCE CLASSIFICATION CODES (SCCs) FOR AREA SOURCES: 30400768

DESCRIPTION

Tube City IMS has a contract with U.S. Steel to remove scrap metal removal from U.S. Steel-Clairton Works. Pieces of scrap may be too large to load in one piece onto a truck for removal. During 2008, Tube City IMS requested and was granted a permit to cut those pieces with a hand held torch using an oxy-acetylene mixture. Emissions are from hand held torch cutting. The facility estimated that no more than 375 hours of cutting would be required to cut an estimated maximum of 1,500 tons of scrap per year. Most of the emissions from this operation are from the metal that is removed during torch cutting, rather than from the torch itself.

A BACT analysis was performed for this permit application. The emissions from this source are small, and that analysis indicated that control was either not technically feasible and/or not cost effective. For this installation BACT requires: good operating practices, including routine process equipment monitoring and inspections.

EMISSIONS INVENTORY (annual tons)		
Pollutant	2007 tons	2014 tons
NO_x	0.26	0.26
$PM_{2.5}$	7.38	7.38
SO_2	0.0	0.0
VOC	0.01	0.01
CURRENT CONTROL REQUIREMENT Good operating practices, including routine process equipment monitoring and inspections		
TECHNOLOGICALLY FEASIBLE EMISSION CONTROL TECHNOLOGIES		
Option 1 No feasible, cost effective options were identified		
1. Control Efficiency by Pollutant		
2. Potential Emission Reductions by Pollutant		
Pollutant	2014	
NO_x		
$PM_{2.5}$		
SO_2		
VOC		
3. Cost per Ton of Pollutant Reduced		
4. Date by which the Technology or Measure Could be Reasonably Implemented		
Option 2		
1. Control Efficiency by Pollutant		

2. Potential Emission Reductions by Pollutant	
Pollutant	2014
NO_x	
$PM_{2.5}$	
SO_2	
VOC	
3. Cost per Ton of Pollutant Reduced	
4. Date by which the Technology or Measure Could be Reasonably Implemented	
Option 3	
1. Control Efficiency by Pollutant	
2. Potential Emission Reductions by Pollutant	
Pollutant	2014
NO_x	
$PM_{2.5}$	
SO_2	
VOC	
3. Cost per Ton of Pollutant Reduced	
4. Date by which the Technology or Measure Could be Reasonably Implemented	

RACM Analysis

SOURCE CATEGORY: Metal Etching
ASSOCIATED SOURCE CLASSIFICATION CODES (SCCs) FOR AREA SOURCES: 30901501

DESCRIPTION

This process is present at the Tech Met Glassport Plant. Tech Met provides chemical milling services to a variety of aerospace, medical, and industrial customers. Chemical milling is a form of non-traditional machining by which controlled amounts of material are removed from components by chemical etching. The chemical milling operation uses strong acid solutions to etch parts most often made from high temperature alloys (iron, nickel, and chrome), as well as titanium alloys. The process consists of preparing parts, typically by abrasive blasting; dip coating with a maskant material, and immersion etching in an acid solution. The facility operates two dip coating operations, neither of which is controlled. The maskants employed by the dip coating operations are solvent-based with tetrachloroethylene (Perc) being the main VOC/hazardous air pollutant (HAP). The facility operates three etching process lines, each being controlled by their individual wet pack fume scrubber. The typical etching and solutions are tanks of hydrochloric, nitric, and hydrofluoric acids in concentrations ranging from 3-20% by volume of technical grade acids in water solutions. Each of the three scrubbers use caustic soda as the primary scrubbing chemistry, but is augmented as necessary by use of sulfate additives to reduce NO_x emissions. The facility also operates three small natural gas-fired hot water heaters and one (1) emergency generator. NO_x is present as a reaction product when metals are etched in the presence of nitric acid.

EMISSIONS INVENTORY (annual tons)		
Pollutant	2007 tons	2014 tons
NO_x	21.17	21.17
$PM_{2.5}$	0	0
SO_2	0	0
VOC	0	0
CURRENT CONTROL REQUIREMENT NO_x emissions from the milling tank are controlled by 2 scrubbers at 55% efficiency.		
TECHNOLOGICALLY FEASIBLE EMISSION CONTROL TECHNOLOGIES		
Option 1 Packed Water Scrubbers		
1. Control Efficiency by Pollutant—No information for this control applied to this process was available in the EPA RACT/BACT/LAER Clearinghouse. The RACT analysis performed for the St. Louis $PM_{2.5}$ State Implementation Plan (SIP) included an evaluation of MEMC Electronic Materials Inc-St. Peters that concluded that wet scrubbing should be considered RACT for this source category. The specifications for the controls at MEMC were N-120 SPD MOD Etching, packed water scrubbers, 20% NO_x control at 100% capture efficiency; and K-45 APD Etching, packed water scrubbers, 20% NO_x control at 100% Capture efficiency. The Missouri Department of Natural Resources' analysis of additional control technologies concluded that there are no additional cost effective control technologies for NO_x because the costs are too high. The South Coast Air Quality Management District (SCAQMD) BACT Guidelines for Non-Major Polluting Facilities for chemical milling tanks indicates that a Packed Chemical Scrubber is the BACT control technology for chemical milling tanks that use nickel alloys, stainless steel, and titanium.		

2. Potential Emission Reductions by Pollutant	
Pollutant	2014 tons
NO_x	10-15
$PM_{2.5}$	
SO_2	
VOC	
3. Cost per Ton of Pollutant Reduced $8,048-$13,078 per NO_x ton based on Missouri Department of Natural Resources analysis for MEMC Electronic Materials, Inc.	
4. Date by which the Technology or Measure Could be Reasonably Implemented	
Option 2	
1. Control Efficiency by Pollutant	
2. Potential Emission Reductions by Pollutant	
Pollutant	2014
NO_x	
$PM_{2.5}$	
SO_2	
VOC	
3. Cost per Ton of Pollutant Reduced	
4. Date by which the Technology or Measure Could be Reasonably Implemented	
Option 3	
1. Control Efficiency by Pollutant	
2. Potential Emission Reductions by Pollutant	
Pollutant	2014
NO_x	
$PM_{2.5}$	
SO_2	
VOC	
3. Cost per Ton of Pollutant Reduced	
4. Date by which the Technology or Measure Could be Reasonably Implemented	

REFERENCES:

MDNR: Missouri Department of Natural Resources, "Technical Determination of Reasonably Available Control Technology for the Control of Direct Fine Particles, Sulfur Dioxide and Oxides of Nitrogen in the Missouri Portion of the St. Louis $PM_{2.5}$ Nonattainment Area," Jefferson City, MO.

MDNR: Missouri Department of Natural Resources, Consent Agreement between the Missouri Department of Natural Resources and MEMC Electronic Materials, Inc., Jefferson City, MO.

SCAQMD: South Coast Air Quality Management District, "Best Available Control Technology Guidelines, Part D – BACT Guidelines for Non-Major Polluting Facilities," revised October 2008 (Chemical Milling Tanks), http://www.aqmd.gov/bact/PartD-10-3-2008.pdf.

RACM Analysis

SOURCE CATEGORY: Manufacture of Non-Clay Refractory Products
ASSOCIATED SOURCE CLASSIFICATION CODES (SCCs) FOR POINT SOURCES: 30500598

DESCRIPTION

TYK America, Inc. – Large Plant engages in the manufacture of non-clay refractory products for the iron and steel industry. Refractories made at the Large plant include resin bonded Magnesia Carbon bricks, resin bonded Alumina Carbon bricks, pre-cast monolithic shapes, and wet mortars. Dry materials arrive onsite sized and in bags. Phenolic resin (5% phenol, 35% ethylene glycol, and 34% VOC) arrives onsite in 55 gallon drums.

In brick production, dry raw materials are weighed and loaded into one of three skip hoists. The hoists discharge the materials into one of three Simpson mixers. Mixers are equipped with dust collection hoods. After dry mixing, the phenolic resin is added and mixing is continued. Completed wet mix is discharged into bulk bags and stored. During storage, the mix is cured and aged. Particulate emissions from the weighing, skip hoists, mixers, and discharge points are controlled with baghouses. After aging, the material is placed on a conveyor feeder, weighed, and charged by hand into one of nine (9) dry presses where it is shaped and compacted into bricks. The bricks are loaded into one of eight (8) curing ovens where they are cured for 48 hours at elevated temperatures. Cured bricks are removed from the ovens and stored for shipment. Particulate emissions from the wet material conveyor, weighing, and brick presses are controlled with baghouses. VOC emissions from the curing ovens are controlled with nine (9) natural gas-fired afterburners.

In pre-cast shape and wet mortar production, dry materials are weighed and loaded into a mixer. Water is added and the material is mixed. In pre-cast shape production, the wet mix is poured into molds and cured. The mold is removed; the pre-cast shape is air dried and then placed in a drying oven. Dried shapes are packed and shipped. Alternately, in mortar mix production, the wet mix is weighed and poured into five-gallon buckets, packed, and shipped. Particulate emissions from the weighing and mixing are controlled with a baghouse.

ACHD previously determined that RACT for the materials handling, weighing, transferring, mixing, and pressing operations (P001-P006 and P008-P010) is:

(1) Control emissions from the materials handling, weighing, transferring, mixing, and pressing operations (P001-P003, P005-P006, and P008-P009) with baghouses;
(2) Emissions shall be limited to the potential to emit as shown in Appendix A, page 2. Particulate limitations have been established by §2104.02.a.1; and
(3) The materials handling, weighing, transferring, mixing, and pressing operations (P001-P003, P005-P006, and P008-P009) and baghouses shall be properly maintained and operated in accordance with manufacturer's specifications and good engineering practices.

ACHD determined that RACT for the brick curing ovens (P007) is:

(1) The Permittee shall not operate or allow to be operated the brick curing ovens (P007) unless oven emissions are exhausted through an afterburner;
(2) The afterburners shall be properly maintained and operated in accordance with manufacturer's specifications and good engineering practices; and
(3) Emissions shall be limited to the potential to emit as shown in Appendix A, pages 2 and 3.

ACHD determined that RACT for the natural gas-fired oven burners (C001-C008), drying oven burner (C009), afterburners (C010-C017), and space heaters (H001) is:

(1) Burn natural gas only;
(2) Operate and maintain the oven burners, drying oven burner, afterburners, and space heaters in accordance with manufacturer's specifications and good engineering practices; and
(3) Emissions shall be limited to the potential to emit as shown in Appendix A, page 4.

ACHD determined that RACT for the welding operations (Weld) is:

(1) Operate the equipment in accordance with manufacturer's specifications and good engineering practices.
(2) Emissions shall be limited to the potential to emit as shown in Appendix A, page 5.

EMISSIONS INVENTORY (annual tons)		
Pollutant	2007 tons	2014 tons
NO_x	15.10	15.10
$PM_{2.5}$	7.29	7.29
SO_2	0.09	0.09
VOC	8.80	8.80
CURRENT CONTROL REQUIREMENT The $PM_{2.5}$ emissions are currently controlled by baghouses with an estimated $PM_{2.5}$ collection efficiency of 97%.		
TECHNOLOGICALLY FEASIBLE EMISSION CONTROL TECHNOLOGIES		
Option 1 Packed Water Scrubbers Options for improved PM collection efficiency might include switching out the materials in the bags, more frequent bag changeout, or adding a HEPA filter to the end of the exhaust stream.		
2. Potential Emission Reductions by Pollutant More site-specific information would be needed in order to quantify potential further PM emission reductions.		
Pollutant	2014	
NO_x		
$PM_{2.5}$		
SO_2		
VOC		
3. Cost per Ton of Pollutant Reduced Given the high existing PM control efficiency, improved PM control is not likely to be cost effective.		
4. Date by which the Technology or Measure Could be Reasonably Implemented 2013 or 2014.		
Option 2		
1. Control Efficiency by Pollutant		
2. Potential Emission Reductions by Pollutant		
Pollutant	2014	
NO_x		
$PM_{2.5}$		
SO_2		
VOC		

3. Cost per Ton of Pollutant Reduced	
4. Date by which the Technology or Measure Could be Reasonably Implemented	
Option 3	
1. Control Efficiency by Pollutant	
2. Potential Emission Reductions by Pollutant	
Pollutant	2014
NO_x	
$PM_{2.5}$	
SO_2	
VOC	
3. Cost per Ton of Pollutant Reduced	
4. Date by which the Technology or Measure Could be Reasonably Implemented	

RACM Analysis

SOURCE CATEGORY: Restaurants-Charbroiling
ASSOCIATED SOURCE CLASSIFICATION CODES (SCCs) FOR AREA SOURCES: 2302002100, 2302002200

DESCRIPTION

This source category includes charbroiling equipment located in restaurants, including hospitals, educational institutions, military and government facilities. This measure examines potential emission reductions from the commercial charbroiling portion of commercial cooking. There are two types of charbroilers—chain-driven (conveyorized) and under-fired. The under-fired charbroilers produce four times the emissions when equivalent amounts of product are cooked. The $PM_{2.5}$ and VOC emission estimates below show the conveyorized and under-fired portions of the L-C NAA emissions, as well as the totals.

Four of the air districts in California regulate chain-driven charbroiler emissions: SCAQMD, Bay Area Air Quality Management District (BAAQMD), San Joaquin Valley air pollution control district (APCD) and Ventura County APCD. Each of these air districts require chain-drive charbroilers to be equipped and operated with a catalytic oxidizer or equivalent control. As a result, the catalytic oxidizer has an established track record and has been proven capable of reliably reducing chain-driven charbroiler emissions of $PM_{2.5}$ by 85% and VOC by 86%. The SCAQMD has already approved catalytic oxidizers from a variety of manufacturers to meet their emission standards. The existing rules in these air districts also allow a restaurant operator the flexibility to install an alternative control device, provided the device has been certified to reduce emissions to no more than 0.74 pounds (lbs) of PM_{10} per 1,000 lbs of beef cooked.

The rules affecting chain-driven charbroilers typically only apply to restaurants that cook more than a certain amount of meat per week. The Bay Area rule requires that, within one year of adoption of the rule, those owners of restaurants that have chain-driven charbroilers and that purchase more than 500 lbs or more of beef per week would be required to install and operate an approved catalytic oxidizer, or other certified control. Restaurants that purchase less than 400 lbs of beef per week on their charbroilers would be exempt from the control requirement.

Approximately 82% of PM emissions from commercial cooking are attributable to under-fired charbroilers. PM emissions from existing under-fired charbroilers can be reduced by 36% by regulating the highest emitting restaurants (approximately the top 40%) that operate under-fired charbroilers.

Five years after adoption of a rule similar to what has been adopted in the Bay Area of California, all restaurants that have one or more under-fired charbroilers with an aggregate grill surface area of 10 square feet or more and that purchase 1,000 lbs of beef or more per week to install control technology certified to emit no more than 1.0 lbs of PM_{10} per 1,000 lbs of beef cooked. This will reduce emissions from these restaurants by 90%. Any restaurant that demonstrates that it grills less than 800 lbs of beef per week would be exempt.

Catalytic oxidizers, designed to fit directly on top of a chain-driven charbroiler, have not been developed for under-fired charbroilers. The currently available control options for an under-fired charbroiler are more expensive, although under-fired charbroilers produce more emissions. For this reason, the BAAQMD Rule focuses on restaurants with large grills that purchase 1000 lbs of beef per week (rather than 500) and grills 800 lbs of beef per week.

Before proceeding with any regulation of charbroiling in the L-C area, it is suggested that the ACHD survey the existing restaurants in the area to determine how many would really be affected by any proposed regulation based on cooking type and size (weekly meat purchases).

EMISSIONS INVENTORY (annual tons)

Pollutant	2007 tons	2014 tons
NO_x	0	0
$PM_{2.5}$	(0.418|2.956)* 3.374	(0.427|2.927) 3.354
SO_2	0	0
VOC	(0.104|0.359) 0.463	(0.103|0.355) 0.458

* Emissions from chain-drive charbroilers are presented first, then emissions from under-fired charbroilers.

CURRENT CONTROL REQUIREMENT

None

TECHNOLOGICALLY FEASIBLE EMISSION CONTROL TECHNOLOGIES

Option 1

Operators of chain-driven charbroilers must install and operate an approved catalytic oxidizer on their charbroiler exhaust stack

1. Control Efficiency by Pollutant

Application of flameless catalytic oxidizers to chain-driven charbroilers was found to effectively reduce $PM_{2.5}$ emissions by 83%. On average, catalytic oxidizers reduce VOC emissions by 86%.

2. Potential Emission Reductions by Pollutant

0.284 tons per year of $PM_{2.5}$ and 0.071 tons per year of VOC based on 80% rule penetration

Pollutant	2014
NO_x	0
$PM_{2.5}$	0.284
SO_2	0
VOC	0.071

3. Cost per Ton of Pollutant Reduced

$8,610 per $PM_{2.5}$ ton reduced based on a 10 year equipment lifetime. This is based on an initial cost of a catalytic oxidizer of $4,000, a $1,000 installation cost, a replacement cost of $4,000 after 5 years, and an annual maintenance cost of $750.

4. Date by which the Technology or Measure Could be Reasonably Implemented

Emission reductions would be observed one year after rule enactment.

Option 2

Include control of emissions from under-fired charbroilers

1. Control Efficiency by Pollutant

90% $PM_{2.5}$ reduction can be achieved by affected units

2. Potential Emission Reductions by Pollutant

0.421 tons per year of $PM_{2.5}$ based on 40% rule penetration

Pollutant	2014
NO_x	0
$PM_{2.5}$	0.421
SO_2	0
VOC	0

3. Cost per Ton of Pollutant Reduced

$16,384 per $PM_{2.5}$ ton reduced based on a 10 year equipment lifetime (and HEPA filter control technology). HEPA filters have a capital cost of $35,000 for a 3,000 cubic feet per minute unit and an estimated installation cost of $2,000. The annual operation and maintenance costs are anticipated not to exceed $3,000.

4. Date by which the Technology or Measure Could be Reasonably Implemented

Full implementation may take five years from promulgation.

Option 3	
1. Control Efficiency by Pollutant	
2. Potential Emission Reductions by Pollutant	
Pollutant	2014
NO_x	
$PM_{2.5}$	
SO_2	
VOC	
3. Cost per Ton of Pollutant Reduced	
4. Date by which the Technology or Measure Could be Reasonably Implemented	

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Lau, 2007: Virginia Lau, "Staff Report—Regulation 6, Rule 2: Commercial Cooking Equipment," Bay Area Air Quality Management District, November 2007.

SCAQMD, 2007: South Coast Air Quality Management District, "Final 2007 AQMP-Appendix VI: Reasonably Available Control Measures (RACM) Demonstration," June 2007.

SJVAPCD, 2008: San Joaquin Valley Unified Air Pollution Control District, "2008 PM-2.5 Plan—Appendix I: Candidate Control Measures," April 30, 2008.

Whynot, 1999: Jill Whynot, Gary Quinn, Pamela Perryman and Peter Votlucka, "Control of Fine Particulate (PM-2.5) Emissions from Restaurant Operations," J. Air & Waste Manage. Assoc. 49: PM-95-99.

CHAPTER III. AREA SOURCES – HOME

This section provides the RACM analyses for the source categories listed in Table I-2. The primary source types are residential wood combustion and lawn and garden equipment.

RACM Analysis

SOURCE CATEGORY: Wood Burning Stoves and Fireplaces (Residential Fuel Combustion)
ASSOCIATED SOURCE CLASSIFICATION CODES (SCCs) FOR AREA SOURCES: 214008100; 2104008210; 214008220; 214008230; 214008310; 2104008320; 2104008330; 2104008400; 2104008510; 2104008610

DESCRIPTION

This source category includes fireplaces, fireplace inserts, and woodstoves that burn wood for space heating.

EMISSIONS INVENTORY (annual tons)

Pollutant	2007 tons	2014 tons
NO_x	1.791	1.795
$PM_{2.5}$	14.503	13.792
SO_2	0.312	0.301
VOC	18.067	16.421

CURRENT CONTROL REQUIREMENT

There are no restrictions on residential wood stove and fireplace use in Allegheny County or the L-C $PM_{2.5}$ NAA. There have been some woodstove changeouts that have occurred – replacing existing woodstoves with new EPA-certified woodstoves.

TECHNOLOGICALLY FEASIBLE EMISSION CONTROL TECHNOLOGIES

Option 1: Woodstove Changeout Program:

This option generates incremental emissions reductions from woodstoves not certified by U.S. EPA.

A woodstove changeout program is one where incentives are offered to home owners with existing woodstoves to replace them with new cleaner burning woodstoves that are EPA-certified. The entire Pittsburgh metropolitan area has previous experience with a woodstove changeout program. This was a program designed to provide low income residents of the Pittsburgh metropolitan area with a free woodstove to replace an existing woodstove or fireplace insert. This program screened for low income households and also verified that an existing stove/insert was being replaced. This program started in September 2005 and ended two years later. There were 81 exchanges performed with 18 retailers being involved in the program. There was also a discount program which ended up replacing 95 stoves in three months. The trade association involved with the change-out process was the Hearth Patio and Barbeque Association (HPBA). They developed a form that retailers completed with estimates of yearly usage and an estimate of how many years the home owner had been burning wood. It was estimated that 20 exchanges yields between 0.25 to 1 tons per year (tpy) of PM emissions reduced.

1. Control Efficiency by Pollutant

There are many different stove types, and control efficiencies can vary by stove type, but a 65 percent PM emission reduction has been estimated for catalytic stoves compared with conventional stoves (Houk, 1992). EPA is currently considering various options for revision of the residential wood heaters New Source Performance Standards (NSPS).

2. Potential Emission Reductions by Pollutant

The control option is expected to yield the following 2014 emission reductions. $PM_{2.5}$ emissions reductions are expected to be on the order of 20.1% in 2014 relative to the baseline.

Pollutant	2014
NO_x	0.173
$PM_{2.5}$	2.778
SO_2	0.000
VOC	10.352

3. Cost per Ton of Pollutant Reduced The cost of the woodstove changeout program was estimated as the sum of all payouts. The analysis presumes a complete replacement of non-certified woodstoves with certified appliances. The number of candidate woodstoves for replacement was estimated at 240 based on the annual burn rate in tons for SCC 2104008210 and 2104008310, cord density of 1.163 and an average number of cords consumed by household of 1.75 increased by 25% to account for more severe climate in Allegheny County relative to the Sacramento-Bay Area (Houk, 2003 p. 15). Based on the Pittsburgh changeout campaign that targeted low income residents (HPBA), the average cost of the campaign per woodstove unit was $2,222. Using this rate, the cost of the campaign in Allegheny County is on the order of $75,248 which yields a cost-effectiveness value of $192,278 per ton of $PM_{2.5}$ reduced.
4. Date by which the Technology or Measure Could be Reasonably Implemented A woodstove changeout program has been implemented before in the Pittsburgh metropolitan area, so that it, or a similar structure, could begin implementation within 1 or 2 years. However, the process of selecting households and tracking implementation slows the changeout process. As a result, a limited number of changeouts could occur by 2014.
Option 2: Outreach Program EPA has partnered with the HPBA to conduct an education and outreach campaign, called "Burn Wise." The campaign encourages air pollution professionals to work with the local hearth retailers, local firefighters, chimney sweeps, insurance agents, doctors, teachers and others to deliver the Burn Wise message to the public. The Burn Wise campaign encourages the public to: 1) burn dry seasoned wood containing less than 20% moisture or wood pellets; 2) maintain a bright, hot fire and not let it smolder; and 3) upgrade pre-1990 appliances with energy saving EPA approved appliances. Suggested campaign materials include a campaign website, live-read promotional ads, fact sheets and educational DVD (EPA 2009 p. 8). Similar campaigns have been implemented throughout Washington State and California.
1. Control Efficiency by Pollutant Sacramento Metropolitan Air Quality Management District (SMAQMD)'s survey on Rule 421 found that 90% of respondents were aware of the regulation, which includes the provisions of the Burn Wise campaign model. The survey also indicated that there was a general level of compliance ranging between 57-70%. However, there is insufficient information to estimate the amount of emission reductions resulting from behavior change like fuel switching from green to seasoned wood.
2. Potential Emission Reductions by Pollutant Not quantified.
3. Cost per Ton of Pollutant Reduced The annual cost of the outreach campaign to SMAQMD was $200,000 and itemized as follows: 1) contractor outreach $105,000; 2) paid advertising $45,000; 3) staff cost $50,000 (EPA 2011) assuming that the hourly rate for support staff was $30/hour. If this option is combined with option 1 "Woodstove Changeout Program" and option 3 "Curtailment of Wood Fuel Burning with Expected High Ambient Levels of $PM_{2.5}$" the cost per incremental ton of $PM_{2.5}$ reduced would be negligible.
4. Date by which the Technology or Measure Could be Reasonably Implemented. The outreach campaign can be implemented within 6 months. If the outreach campaign is coordinated with other complementary options, the timeframe would extend to within 12 months.

Option 3: Curtailment of Wood Fuel Burning with Expected High Ambient Levels of $PM_{2.5}$

This option generates incremental emissions reductions from EPA certified and non-certified appliances excluding wood-burning boilers (or hydronic heaters).

Wood burning is restricted or prohibited when high ambient $PM_{2.5}$ concentrations are forecast. SMAQMD adopted a version of this option as Rule 421. Rule 421 requires limited mandatory curtailment when the 24-hour average $PM_{2.5}$ concentration is likely to exceed 31 micrograms per cubic meter (µg/m^3) (stage 1) and full curtailment when the forecast anticipates concentrations greater than 35 µg/m^3 (stage 2). Voluntary curtailment is triggered when the 24-hour average $PM_{2.5}$ forecast is in the range of 25 and 31 µg/m^3.

Certain exemptions apply like the burning of gaseous fuels or when wood burning is the sole source of adequate heat or when a waiver is extended due to economic hardship. EPA Phase II Certified word burning heaters and pellet-fueled wood burning are also exempt during stage 1 events (SMAQMD, 2009b).

Similar programs have been instituted in Denver CO, Bernalillo County NM, and throughout Washington State including the Puget Sound Clean Air Agency and Spokane Regional Clean Air Agency (WA).

1. Control Efficiency by Pollutant

The control efficiency will depend on the burning rate of appliances subject to the rule, the level of compliance during no-burn events, and the expected number of no-burn days in a year. The level of compliance was assessed at 57% for stage 1 events and 70% for stage 2 events (SMAQMD, 2009a p. 6). The number of exceedances of the short-term Federal standard (35 µg/m^3) at the Liberty site was 18 in the January through June timeframe (ACHD p.2). For the purpose of this analysis, the number of exceedances was assumed to be twice as large (36 days during the 182-day winter season) to account for wood burning in the fall and early winter. The expected number of no-burn days for stage 1 or stage 2 events was assumed to be the same.

2. Potential Emission Reductions by Pollutant

The control option is expected to yield the following 2014 emission reductions. $PM_{2.5}$ emissions reductions are expected to be on the order of 21.8% in 2014 relative to the baseline.

Pollutant	2014
NO_x	0.403
$PM_{2.5}$	3.004
SO_2	0.093
VOC	3.480

3. Cost per Ton of Pollutant Reduced

The annual cost to SMAQMD was estimated at $397,558 and itemized as follows: 1) forecasting cost $90,000; 2) contractor outreach $105,000 excluding paid advertising; 3) staff cost $74,638; and enforcement cost $127,920 (EPA 2011) assuming that the hourly rate for support and enforcement staff was $30/hour. Program administration cost is expected to be lower in Allegheny County given that the enforcement area is smaller and cost-of-living is lower compared with the Sacramento area.

The public will experience some cost savings of $30,000 when switching from wood fuel to natural gas because natural gas appliances have a higher thermal efficiency and natural gas fuel has a higher heat content than fuel wood. This estimate assumes a cost per cord of $180 (City-Data), an average cost of natural gas of $14.76/1000-cubic feet (EIA, 2009) and thermal efficiencies of 63% and 75% for the wood and natural gas appliances respectively (SMAQMD, 2009 p. 17). Note the cost to the public excludes the cost of acquiring the natural gas burning appliance. Also, there is no economic impact on residents that experience economic hardship due to the hardship waiver provision. The fraction of the population expected to claim a hardship waiver was 13.2% based on the average poverty rate of the targeted area (Southwest Pennsylvania Commission [SPC]).

On the basis of the aforementioned consideration, the cost-effectiveness for $PM_{2.5}$ reductions was determined to be $145,221 per ton.

4. Date by which the Technology or Measure Could be Reasonably Implemented.
In the experience of the SMAQMD, Rule 421 was one of the most difficult rules to get adopted. SMAQMD held five public meetings and received 200 comments on rule amendment proposal. Depending on the level of public reaction, the measure can be implemented within 12 to 18 months.

Option 4: Woodstove Replacement When Homes Are Sold
Old wood stoves are usually made of metal, weigh 250 to 500 lbs, last for decades, and can continue to pollute for just as long. As a result, homeowners are less likely to replace old stoves with a new, EPA certified, cleaner burning technology or remove the old stove especially if they are not using it. To help get these old stoves "off-line," some local communities have required the removal and destruction of old wood stoves upon the resale of a home. This requirement has proven very effective in locations like Mammoth Lakes, CA; Washoe County, NV; and Jacksonville, OR.

1. Control Efficiency by Pollutant
EPA certified catalytic woodstoves are 67% cleaner than conventional woodstoves with regard to $PM_{2.5}$ emissions. Similarly, EPA certified non-catalytic woodstoves are 64% cleaner.

2. Potential Emission Reductions by Pollutant
Emissions reductions are proportional to the number of homes sold. For the targeted area, 1.9% of the homes turn over in the market based on home sale records for the last 12-months. The control option is expected to yield the following 2014 emission reductions. $PM_{2.5}$ emissions reductions are expected to be on the order of 0.2% in 2014 relative to the baseline.

Pollutant	2014
NO_x	0.004
$PM_{2.5}$	0.034
SO_2	0.001
VOC	0.023

3. Cost per Ton of Pollutant Reduced
Costs were not quantified for this option.

4. Date by which the Technology or Measure Could be Reasonably Implemented
Given the slow turnover in the residential housing market, it is unlikely that this option could generate significant $PM_{2.5}$ emission reductions in a short or medium timeframe.

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ACHD, 2007: Allegheny County Health Department, "Air Quality Quarterly Report Ending June 2007," Pittsburgh, PA, November 29, 2007.

EIA, 2009: U.S. Energy Information Administration, "Natural Gas: Data: Pennsylvania" [Online], www.eia.gov/dnav/ng/ng_pri_rescom_dcu_SPA_a.htm, 2009.

EPA, 2009: U.S. Environmental Protection Agency, "Strategies for Reducing Residential Wood Smoke," EPA-456/B-09-001, Air Quality Planning Division, Office of Air Quality Planning and Standards, Research Triangle Park, NC, October 29, 2009.

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SMAQMD, 2009b: Sacramento Metropolitan Air Quality Management District, "Rule 421, Mandatory Episodic Curtailment of Wood and Other Solid Fuel Burning," adopted September 24, 2009.

SPC, 2010: Southwest Pennsylvania Commission, "County Profile – 09/20/10 (update of 08/20/2010)," 2010.

WA: "WA Burn Ban," [Online], www.http://waburnbans.net/.

RACM Analysis

SOURCE CATEGORY: Wood Burning Boilers (Residential Fuel Combustion)
ASSOCIATED SOURCE CLASSIFICATION CODES (SCCs) FOR AREA SOURCES: 2104008610

DESCRIPTION

This source category includes outdoor wood-fired boilers and hydronic heaters.

EMISSIONS INVENTORY (annual tons)		
Pollutant	2007 tons	2014 tons
NO_x	0.082	0.088
$PM_{2.5}$	1.236	1.322
SO_2	0.091	0.097
VOC	0.528	0.565

CURRENT CONTROL REQUIREMENT
25 Pa. Code Chapter 123.14 prohibits the sale, installation or purchase of non-Phase 2 outdoor wood-fired boilers (OWBs) after May 31, 2011.

TECHNOLOGICALLY FEASIBLE EMISSION CONTROL TECHNOLOGIES

Option 1: Compliance with State/County Regulations
25 Pa. Code Chapter 123.14 prohibits the sale, installation or purchase of non-Phase 2 OWBs. After May 31, 2011, a person may not sell, offer for sale, distribute or install an OWB unless it is a Phase 2 OWB. The regulation requires that Phase 2 OWBs be installed at a minimum of 50 feet from the nearest property line, have a stack height greater than 10 feet, and burn clean wood, wood pellets from clean wood, or starting fuel like heating oil, natural gas or propane. These requirements do not apply to a permanently installed OWB that was installed prior to October 2, 2010, and is transferred to a new owner as a result of a real estate transaction.

1. Control Efficiency by Pollutant
EPA estimates that Phase 2 OWBs are 90% cleaner (EPA, 2011b).

2. Potential Emission Reductions by Pollutant
The estimated number of OWB units in Allegheny County ranges between 11 and 44. The lower-limit represents an estimate based on inspection and enforcement records; the upper-limit was derived from the National Emissions Inventory (NEI)'s throughput for SCC 2104008610. The expected emission reductions were calculated assuming an annual OWB replacement rate of 5%. $PM_{2.5}$ emissions reductions are expected to be on the order of 4.2% in 2014 relative to the baseline.

Pollutant	2014
NO_x	0.004
$PM_{2.5}$	0.056
SO_2	0.004
VOC	0.024

3. Cost per Ton of Pollutant Reduced
The cost of this measure is difficult to assess given the variety of possible complaint actions. A homeowner may replace an OWB with a Phase 2 wood boiler, an electric furnace or a natural gas-fired furnace. For informational purposes, the unit price of a hydronic boiler is $9,000 and that of a natural gas furnace starts at $1,600.

4. Date by which the Technology or Measure Could be Reasonably Implemented.
Existing OWBs are exempt from the requirements 25 Pa. Code Chapter 123.14. Moreover, the exemption extends to new OWB owners that acquire the equipment as the result of a real estate transaction. It is very unlikely that any significant emission reduction will be achieved in a short timeframe.

Option 2: Curtailment of During Days with Expected High Ambient Levels of $PM_{2.5}$
This option generates incremental emissions reductions from EPA certified and non-certified appliances.

Wood burning is restricted or prohibited during episodes of high ambient $PM_{2.5}$ concentrations. SMAQMD adopted a version of this option as Rule 421. Rule 421 requires limited mandatory curtailment when the 24-hour average $PM_{2.5}$ concentration is likely to exceed 31 µg/m^3 (stage 1) and full curtailment when the forecast anticipates concentration greater than 35 µg/m^3 (stage 2). Voluntary curtailment is triggered when the 24-hour average $PM_{2.5}$ forecast is in the range of 25 and 31 µg/m^3.

Certain exemptions apply like the burning of gaseous fuels or when wood burning is the sole source of adequate heat or when a waiver is extended due to economic hardship. EPA Phase II Certified word burning heaters and pellet-fueled wood burning are also exempt during stage 1 events (SMAQMD, 2009b). It is plausible that households operating wood burning-boilers may use it as their primary source of heating. If so, the number of waivers under this program would extend to a very large portion of the regulated units.

Similar programs have been instituted in Denver CO, and throughout Washington State including the Puget Sound Clean Air Agency and Spokane Regional Clean Air Agency (WA).

1. Control Efficiency by Pollutant
The control efficiency will depend on the burning rate of appliances subject to the rule, the level of compliance during no-burn events, and the expected number of no-burn days in a year. The level of compliance was assessed at 57% for stage 1 events and 70% for stage 2 events (SMAQMD, 2009a p. 6). The number of exceedances of the short-term Federal standard (35 µg/m^3) at the Liberty site was 18 in the January through June timeframe (ACHD p.2). For the purpose of this analysis, the number of exceedances was assumed to be twice as large to account for wood burning in the fall and early winter. The expected number of no-burn days for stage 1 or stage 2 events was assumed to be the same.

2. Potential Emission Reductions by Pollutant
The control option is expected to yield the following 2014 emission reductions. $PM_{2.5}$ emissions reductions are expected to be on the order of 20.4% in 2014 relative to the baseline.

Pollutant	2014
NO_x	0.018
$PM_{2.5}$	0.270
SO_2	0.020
VOC	0.115

3. Cost per Ton of Pollutant Reduced
The annual cost to SMAQMD was estimated at $397,558 and itemized as follows: 1) forecasting cost $90,000; 2) contractor outreach $105,000 excluding paid advertising; 3) staff cost $74,638; and enforcement cost $127,920 (EPA 2011a) assuming that the hourly rate for support and enforcement staff was $30/hour. Program administration cost is expected to be lower in Allegheny County given that the enforcement area is smaller and cost-of-living is lower when compared to the Sacramento area.

The public will experience some cost savings of $1,854 when switching from wood fuel to natural gas because natural gas appliances have a higher thermal efficiency and natural gas fuel a has higher heat content than fuel wood. This estimate assumes a cost per cord of $180 (City-Data), an average cost of natural gas of $14.76/1000-cubic feet (EIA, 2009) and thermal efficiencies of 63% and 75% for the wood and natural gas appliances respectively (SMAQMD, 2009 p. 17). Note the cost to the public excludes the cost of acquiring the natural gas burning appliance. Also, there is no economic impact on residents that experience economic hardship due to the hardship waiver provision. The fraction of the population expected to claim a hardship waiver was 13.2% based on the average poverty rate of the targeted area (SPC).

On the basis of the aforementioned consideration, the cost-effectiveness for $PM_{2.5}$ reductions was determined to be

$1,483,652 per ton. If combined with Option a.3 "Curtailment of Wood Fuel Burning with Expected High Ambient Levels of $PM_{2.5}$" for non-boiler wood burning appliances, the incremental cost of administrating the program would be negligible.
4. Date by which the Technology or Measure Could be Reasonably Implemented. In the experience of the SMAQMD, Rule 421 was one of the most difficult rules to get adopted. SMAQMD held five public meetings and received 200 comments on rule amendment proposal. Depending on the level of public reaction, the measure can be implemented within 12 to 18 months.

REFERENCES:

ACHD, 2007: Allegheny County Health Department, "Air Quality Quarterly Report Ending June 2007,"Pittsburgh, PA, November 29, 2007.

EIA, 2009: U.S. Energy Information Administration, "Natural Gas: Data: Pennsylvania" [Online], www.eia.gov/dnav/ng/ng_pri_rescom_dcu_SPA_a.htm, 2009.

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SPC, 2010: Southwest Pennsylvania Commission, "County Profile – 09/20/10 (update of 08/20/2010)".

WA. "WA Burn Ban" [Online], www.http://waburnbans.net/.

SOURCE CATEGORY: Residential Coal Furnaces
ASSOCIATED SOURCE CLASSIFICATION CODES (SCCs) FOR AREA SOURCES: 2104002000

DESCRIPTION

Residential coal furnaces are not permitted in Allegheny County, and therefore emissions from this source is not likely to be significant. It is possible that emissions from residential coal furnaces in nearby counties are contributing to pollutant levels in the NAA, but these emissions can be difficult to measure and even more difficult to address. The primary reason that coal remains in use in some areas is because the price is often cheaper and more stable than heat from natural gas or electricity. Installing a residential natural gas furnace can cost between $3-7,000. The difference in fuel costs from coal vs. natural gas will vary depending on market prices.

Any residential coal furnaces in the Allegheny County area that do exist should be replaced with natural gas or electrical systems to improve local air quality. Residential coal systems rarely have significant pollutant controls, and therefore PM emissions from a small number of residential coal systems can be significant.

No analysis was conducted for these emissions because emissions from this source are estimated to be so small.

EMISSIONS INVENTORY (annual tons)		
Pollutant	2007 tons	2014 tons
NO_x	0.007	0.007
$PM_{2.5}$	0.003	0.003
SO_2	0.055	0.054
VOC	0.007	0.007
Emissions were estimated based on an allocation of residential coal combustion in Pennsylvania. State-level coal consumption was allocated to each county using the U.S. Census Bureau's 2000 Census Detailed Housing Information. This includes the number of housing units using a specific type of fuel for residential heating. State coal consumption was allocated to each county using the ratio of the number of houses burning coal in each county to the total number of houses burning coal in the state. Emissions are estimated to be nonzero in Allegheny County because of Census results which indicate noncompliance with regulations.		
CURRENT CONTROL REQUIREMENT		
TECHNOLOGICALLY FEASIBLE EMISSION CONTROL TECHNOLOGIES		

SOURCE CATEGORY: 4-stroke Gasoline Lawn Mowers, Residential
ASSOCIATED SOURCE CLASSIFICATION CODES (SCCs): 2265004010

DESCRIPTION

Lawn mowers used by residents of the L-C NAA. The inventory includes lawn mower emissions from 4-stroke gasoline-fueled engines.

EMISSIONS INVENTORY (annual tons)		
Pollutant	2007 tons	2014 tons
NO_x	0.525	0.351
$PM_{2.5}$	0.031	0.042
SO_2	0.005	0.006
VOC	6.252	3.419

CURRENT CONTROL REQUIREMENT
None.

TECHNOLOGICALLY FEASIBLE EMISSION CONTROL TECHNOLOGIES

Option 1
Lawn Mower Replacement Program: Program encourages trading of gasoline-powered mowers by providing funds to offset the purchase cost of electric mowers. For the past several years, both the South Coast and Sacramento AQMDs have conducted lawnmower exchange programs through which gasoline-powered lawn mowers were traded in for cordless electric mowers that produce zero emissions.

1. Control Efficiency by Pollutant: For those lawn mowers that are exchanged, the control efficiency would be 100 percent. However, this policy is a voluntary trade-in of an existing lawn mower for an electric version, at greatly reduced costs to the consumer. It is uncertain what portion of households would be interested in such a trade, and therefore this analysis assumes a relatively modest 10% penetration by 2014.

2. Potential Emission Reductions by Pollutant
The control option is expected to yield the following 2014 emission reductions:

Pollutant	2014
NO_x	0.035
$PM_{2.5}$	0.004
SO_2	0.001
VOC	0.342

3. Cost per Ton of Pollutant Reduced
The control option is expected to cost the following amount per ton of pollutants reduced:

Pollutant	2014
NO_x	$372,667
$PM_{2.5}$	$3,102,503
SO_2	$23,759,045
VOC	$38,305

4. Date by which the Technology or Measure Could be Reasonably Implemented:
It was assumed that a lawn mower trade-in could be implemented in 2013 and spring of 2014, such that 10% of all mowers in the L-C NAA would be electric by the year 2014.

Option 2
Replace older mowers with those meeting latest Tier standards: This program would function similar to the electric lawn mower exchange, except that consumers would be scrapping older lawnmowers for “cleaner” emitting lawnmowers. Since the reductions are expected to be less and the costs per unit are likely to be higher than the electric mower program, this option was not considered further.

Option 3 Native Landscaping: Native landscaping practices can help improve air quality on a local level by eliminating or reducing the need for lawn maintenance equipment such as lawn mowers, trimmers, and edgers. Little quantitative information is available on the expected reductions from such programs, and they are likely to vary on a case-by-case basis. Decreasing the operation of equipment will result in some level of emissions reduction, but this measure is not expected to advance the 2015 attainment date by a year.
Option 4 Less Frequent Maintenance Mowing: Restrictions on commercial maintenance mowing will result in decreased activity and emissions, but given the relatively low mass emissions, the reductions will not be significant. As with native landscaping, this measure is not expected to advance the 2015 attainment date by a year.

REFERENCES:

EPA, 2010: U.S. Environmental Protection Agency, Office of Transportation and Air Quality, "Median Life, Annual Activity, and Load Factors for Nonroad Engine Emissions Modeling," EPA-420-R-10-016, July 2010.

SCAQMD, 2010: South Coast Air Quality Management District, Board Meeting, "Adopt Resolution Accepting Requirements of CARBs Lawn and Garden Equipment Replacement Program, Recognize Funds and Execute Contracts to Conduct 2010 Lawn Mower Exchange Program, Resource Impact Attachments," February 5, 2010 http://www.aqmd.gov/hb/2010/February/10025a.htm.

SOURCE CATEGORY: Commercial Gasoline Leaf Blowers
ASSOCIATED SOURCE CLASSIFICATION CODES (SCCs): 2260004031, 2265004031

DESCRIPTION

Leaf blowers equipped with both 2-stroke and 4-stroke gasoline-fueled engines, used by commercial establishments in the NAA.

EMISSIONS INVENTORY (annual tons)		
Pollutant	2007 tons	2014 tons
NO_x	0.370	0.211
$PM_{2.5}$	0.201	0.227
SO_2	0.003	0.004
VOC	2.557	2.164

CURRENT CONTROL REQUIREMENT
None.

TECHNOLOGICALLY FEASIBLE EMISSION CONTROL TECHNOLOGIES

Option 1
Leaf Blower Replacement Program: Program encourages trading of gasoline-powered leaf blowers by providing funds to offset the purchase cost of electric blowers. For the past several years, both the South Coast and Sacramento AQMDs have conducted leaf blower exchange programs through which gasoline-powered leaf blowers were traded in for cordless electric blowers that produce zero emissions.

1. Control Efficiency by Pollutant: For leaf blowers that are exchanged, the control efficiency is 100 percent. However, this policy is a voluntary trade-in of an existing leaf blower for an electric version, at reduced costs to the user. This analysis assumes a relatively modest 10% penetration by 2014.

2. Potential Emission Reductions by Pollutant
The control option is expected to yield the following 2014 emission reductions:

Pollutant	2014
NO_x	0.020
$PM_{2.5}$	0.021
SO_2	0.000
VOC	0.205

3. Cost per Ton of Pollutant Reduced:

Pollutant	2014
NO_x	$29,783
$PM_{2.5}$	$27,650
SO_2	$1,774,656
VOC	$2,900

The total annualized costs of this program are estimated to be $593, based on the exchange of seven blowers at a cost of $174 each (there are 74 total leaf blowers estimated in the NAA). The cost is based on a SCAQMD figure for a top of the line leaf blower (SCAQMD, 2010). Leaf blowers have an assumed lifetime of 2.3 years, based on EPA estimates (EPA, 2010). The cost/ton is displayed above.

4. Date by which the Technology or Measure Could be Reasonably Implemented
It was assumed that a leaf blower trade-in could be implemented in 2013 and spring of 2014, such that 10% of all blowers in the L-C NAA would be electric by the year 2014.

REFERENCES:

EPA, 2010: U.S. Environmental Protection Agency, Office of Transportation and Air Quality, "Median Life, Annual Activity, and Load Factors for Nonroad Engine Emissions Modeling," EPA-420-R-10-016, July 2010.

SCAQMD, 2010: South Coast Air Quality Management District, Board Meeting, "Proposal to Execute Contract for 2010 Leaf Blower Exchange Program, Resource Impact Attachments," https://aqmd.gov/hb/2010/October/10106a.htm, October 1, 2010.

SOURCE CATEGORY: Commercial and Residential Gasoline Snowblowers
ASSOCIATED SOURCE CLASSIFICATION CODES (SCCs): 2260004035, 2260004036, 2265004035, 2265004036

DESCRIPTION

Snow blowers equipped with both 2-stroke and 4-stroke gasoline-fueled engines, used by commercial and residential establishments in the NAA.

EMISSIONS INVENTORY (annual tons)		
Pollutant	2007 tons	2014 tons
NO_x	0.136	0.154
$PM_{2.5}$	0.065	0.074
SO_2	0.002	0.002
VOC	3.394	3.325

CURRENT CONTROL REQUIREMENT
None.

TECHNOLOGICALLY FEASIBLE EMISSION CONTROL TECHNOLOGIES

Option 1
Snow Blower Replacement Program: Program encourages trading of gasoline-powered snow blowers by providing funds to offset the purchase cost of electric blowers. This program is assumed to operate in a similar fashion to lawn mower and leaf blower replacement programs, where existing gasoline powered units are traded in for electric units to reduce emissions.

1. Control Efficiency by Pollutant: For those snow blowers that are exchanged, the control efficiency would be 100 percent. This program involves a voluntary trade-in of an existing snow blower for an electric version, at reduced costs to the user. For this analysis, we assume 10% of households and businesses participating in 2014.

2. Potential Emission Reductions by Pollutant
The control option is expected to yield the following 2014 emission reductions:

Pollutant	2014
NO_x	0.015
$PM_{2.5}$	0.007
SO_2	0.000
VOC	0.331

3. Cost per Ton of Pollutant Reduced
The control option is expected to cost the following amount per ton of pollutants reduced:

Pollutant	2014
NO_x	$320,115
$PM_{2.5}$	$668,040
SO_2	$24,160,499
VOC	$14,792

The total annualized costs of this program are estimated to be $4,891, and that is based on the cost of exchanging 108 blowers at a cost of $175 each. The number of units represents 10% of the estimated snow blowers in the NAA (1,086 total). Snow blowers have an assumed lifetime of 4.4 years, based on EPA estimates (EPA, 2010). The cost/ton is displayed above.

4. Date by which the Technology or Measure Could be Reasonably Implemented
It was assumed that a snow blower trade-in could be implemented in 2013, such that 10% of all blowers in the L-C NAA would be electric by the year 2014.

REFERENCES:

EPA, 2010: U.S. Environmental Protection Agency, Office of Transportation and Air Quality, "Median Life, Annual Activity, and Load Factors for Nonroad Engine Emissions Modeling," EPA-420-R-10-016, July 2010.

CHAPTER IV. MOBILE SOURCES

This section provides RACM analyses for the on-road and off-road source categories listed in Table I-3. The focus is on options that are feasible for a partial county NAA.

RACM Analysis

SOURCE CATEGORY: Onroad Mobile Sources

ASSOCIATED SOURCE CLASSIFICATION CODES (SCCs) FOR ONROAD MOBILE SOURCES:
2201001xxx, 2201020xxx, 2201040xxx, 2201070xxx, 2201080xxx, 2230001xxx, 2230060xxx, 2230071xxx, 2230072xxx, 2230073xxx, 2230074xxx, 2230075xxx

DESCRIPTION: This source category includes motor vehicles registered to operate on highways or other public roads and includes motorcycles, passenger cars and trucks (including pick-up trucks, minivans and sport utility vehicles), buses, light commercial trucks, and heavy-duty trucks.

EMISSIONS INVENTORY (annual tons)		
Pollutant	2007 tons	2014 tons
NO_x	274.29	151.03
$PM_{2.5}$	9.91	6.18
SO_2	2.15	0.90
VOC	172.52	95.06

CURRENT CONTROL REQUIREMENT

Onroad vehicles are subject to federal emission standards. In addition, a vehicle inspection and maintenance program is in place in the area, as well as vehicle idling restrictions, and low vapor pressure gasoline requirements during the ozone season.

TECHNOLOGICALLY FEASIBLE EMISSION CONTROL TECHNOLOGIES

Option 1
Onroad diesel engine retrofits for school buses, trucks, and transit buses using EPA-verified technologies

1. Control Efficiency by Pollutant

According to EPA's listing of verified retrofit technologies, a number of different add-on control devices are verified to reduce direct $PM_{2.5}$ emissions from school buses, trucks, and transit buses. For this analysis, a single technology was selected to quantify the emissions reduction potential of option 1. The retrofit technology was chosen based on its applicability (to both buses and heavy duty trucks) and its control effectiveness. The "Purifilter Plus" system from manufacturer Engine Control Systems is a combination of a diesel particulate filter (DPF) and electrical panel for active regeneration at the garage/maintenance yard. It applies to heavy-duty trucks and urban buses (4-cycle non-Exhaust Gas Recirculation equipped vehicles), ranging from model year 1994 to 2006. Application of this technology is documented to reduce PM emissions by 90%, VOC emissions by 85% and carbon monoxide (CO) emissions by 75%.

2. Potential Emission Reductions by Pollutant

The potential emission reduction was calculated by assuming the retrofit of all eligible school buses, trucks, and transit buses in the NAA with the Purifilter Plus system during calendar year 2014. Out of the projected 13,685 vehicles operating in the NAA in 2014 (based on information from the Motor Vehicle Emissions Simulator (MOVES)2010a for Allegheny County allocated to the L-C area) only 207 are school buses, trucks, or transit buses and only 91 vehicles fall within the compatible model year and specified in EPA's technology verification listing, including: 6 transit buses and 9 school buses, as well as 76 heavy duty trucks.

Emissions reductions were estimated with MOVES2010a, by performing a simulation run at the County geographic level (national scale using MOVES defaults), with a retrofit input file developed to reflect the efficiency of the Purifilter Plus system (only running exhaust emissions were reduced). A global emissions reduction was calculated for the retrofit through the MOVES runs with/without DPF and this reduction efficiency was applied to the NAA 2014 emissions. Assuming all vehicles are retrofit during calendar year 2014, the following emissions reductions are estimated.

Pollutant (tons reduced in 2014)	2014
NO_x	-
$PM_{2.5}$	1.46
SO_2	-
VOC	2.34

3. Cost per Ton of Pollutant Reduced
According to EPA, DPFs generally cost between $5,000 to $15,000 including installation, depending on engine size, filter technology and installation requirements. Assuming all 91 eligible vehicles in the area would be retrofitted with this technology, the total upfront cost could range between $455,000 and $1,365.000. Translating this range into cost effectiveness, in total cost per ton of pollutant reduced, yields a cost effectiveness value of between $24,963 and $74,888 per ton of $PM_{2.5}$ reduced, and between $15,579 and $46,736 per ton of VOC reduced. This assumes that the DPF will last the life of the vehicle and that this life is 20 years on average, which covers 95% of the trucks in the area (Annualized Technology Capital Cost of $401 to $1,204 with a 5% discount rate). According to EPA's 2007 publication on the cost-effectiveness of heavy-duty diesel retrofits (EPA420-B-07-006), the cost effectiveness of such a technology should be between$12,400-$50,500 for school buses, $28,400-$69,900 for class 6&7 trucks, and $12,100-$44,100 for class 8b trucks. The cost-effectiveness of this retrofit option in the L-C area is thus similar to that suggested by EPA, nationwide.

4. Date by which the Technology or Measure Could be Reasonably Implemented
According to EPA, the installation of this retrofit technology on vehicles takes between six and eight hours. This suggests that the entire retrofit program could be fully implemented within one year of initiation.

Option 2
Diesel Idling Program for Trucks

1. Control Efficiency by Pollutant
This option aims to reduce emissions from idling of buses and trucks. The ACHD already has a regulation in place to limit idling from school buses and Diesel Powered Motor Vehicles (Article XXI Air Pollution Control). It limits idling to 5 minutes in most situations and it seems difficult to reduce idling durations further. However, this regulation has an exemption for trucks idling in order to "power a heater, air conditioner, or any ancillary equipment during sleeping and resting in a truck cab or sleeper berth." This specific type of idling also known as "extended idling" can be reduced by using EPA-verified technologies. Such technologies include Electrified Parking Spaces (EPS) and Auxiliary Power Units (APUs). An EPS is a system that can supply heating, cooling, and electrical power to a truck while the engine is turned off. It operates independently of the truck's engine, thus reducing main engine idling which results in lower emissions. Emissions reductions are difficult to quantify exactly since upstream emissions are emitted by the EPS. For the purpose of this analysis, these were not included. An APU system is a device that contains an EPA emission-certified engine that can supply cooling, heating, and electrical power. It is thus a mobile alternative to EPS. It operates independently of the truck's engine and can therefore reduce main engine idling, which in turn results in lower emissions. Again, for the purpose of this study, emissions from the APU were not included. This analysis thus provides the maximum emission reduction achievable through idling reduction.

2. Potential Emission Reductions by Pollutant
The potential emission reductions from reduced idling were estimated by assuming that 100% of extended idling emissions from combination long-haul trucks in the NAA were eliminated. Emissions reductions were estimated with MOVES2010a, by performing a simulation run at the County geographic level (national scale using MOVES defaults) in order to compute emissions for this specific idling process in Allegheny County. Those emissions were apportioned to the L-C area based on the ratio of combination long-haul trucks in the county vs. L-C area. Assuming all vehicles have an alternative to extended idling by calendar year 2014 (i.e. they have installed an APU or EPS have been created in the area), the following emissions reductions are estimated:

Pollutant (tons reduced in 2014)	2014
NO_x	5.31

$PM_{2.5}$	0.04
SO_2	0.001
VOC	0.8

3. Cost per Ton of Pollutant Reduced

The cost effectiveness analysis was performed for APUs since this system will likely be more appropriate for the L-C area given the relatively small number of trucks, and high upfront cost of truck electrification. Assuming that 100% of trucks are equipped with APUs in calendar year 2014 and that the cost of the technology is $7,750, the total upfront cost for the 29 combination long-haul trucks in the area would be $224,750. To calculate cost-effectiveness, it is important to take into account the fuel savings due to diesel consumption reduction (from idling reduction). According to EPA, a typical combination long-haul truck idles between 1,600 and 2,400 hours a year, which uses 960 to 1,440 gallons of fuel (EPA SmartWay). This corresponds to 0.6 gallons of fuel per hour of idling. For the purpose of this analysis, it was assumed that auxiliary diesel engines burn 0.25 gallons of fuel per hour of idling (according to a North Carolina State University study from October 2008). The MOVES2010a simulation run performed for Allegheny County estimated a total of 2,482,670 hours of idling in 2010, or 679 hours per truck per year. For the 29 trucks in the L-C area, that represents a total of 19,691 hours, corresponding to annual fuel savings of about 6,892 gallons of diesel. Assuming a cost of $2.86 per gallon of diesel in 2014 (per AEO2011) that yields annual fuel savings of $19,711.

Translating this into cost effectiveness, the total cost per ton of pollutant reduced is:

- $6,067 per ton of NO_x reduced
- $758,690 per ton of $PM_{2.5}$ reduced
- $21,919,718 per ton of SO_2 reduced
- $40,265 per ton of VOC reduced

This assumes a useful life of the APU technology is 5 years and a discount rate of 5% (which yields an Annualized Technology Capital Cost of $1,790).

4. Date by which the Technology or Measure Could be Reasonably Implemented

Given the small number of trucks that can benefit from APUs, the entire program could be fully implemented within one year of initiation. However, for this option to be effective, there would have to be evidence that the APU equipped trucks regularly overnight at a truck stop within the L-C area.

Option 3

Transportation Control Measures:

Establish an Employer Rideshare Program that provides incentives or encouragement for employers to offer a carpool/ridesharing program to employees.

1. Control Efficiency by Pollutant

Control efficiencies for a commuter benefit program involve a reduction in the total vehicle miles traveled (VMT) by individuals participating in the program.

2. Potential Emission Reductions by Pollutant

The largest employer within the L-C NAA is the U.S. Steel Corporation with approximately 1,200 employees. Implementing an Employer Rideshare Program at this facility could potentially reduce the number of vehicle trips by employees traveling to and from the facility. Several factors are considered when calculating the emissions reduction associated with this control including trip lengths, average vehicle occupancy, program participation rates and frequency. For the purpose of this analysis, it is assumed that only personal cars, personal trucks, light-duty trucks, and motorcycles are affected by this control measure. Additionally, an average one-way trip length of 6.9 miles was assumed for this analysis based on 2010 census data provided by the SPC for the five boroughs located within the L-C NAA. The average vehicle occupancy of 1.15 workers per vehicle is derived from the 2009 National Household Travel Survey and is specific to the Northeast Census Region. A conservative employee participation rate of twenty percent (20%) was assumed at a participation rate of two days per week. (Note: Cold start emission factors were not included in this analysis.)

Based on these assumptions, this control measure would reduce the VMT by 288,672 miles/year and would result in the following emissions reductions estimates:

Pollutant	2014
NO_x	0.28
$PM_{2.5}$	0.01
SO_2	-
VOC	0.25

3. Cost per Ton of Pollutant Reduced

The cost associated with implementation of an Employer Rideshare Program can be difficult to measure and can vary depending on the level of participation by the employer. Participation in an existing regional program may require minimal annual costs on behalf of the employer. For example, the SPC has a program in place, the CommuteInfo program, for which individuals can register to participate in a carpool matching service. The CommuteInfo program also provides resources and information to help regional employers learn about commuter options. While there is no cost associated with participation in this program, minimal administrative expenses may be incurred by the employer to promote employee participation in the program.

Current Best Workplaces for Commuter incentive programs typically offer a $30 per month participation incentive to employees who choose to rideshare. A 20% participation rate on U.S. Steel's workforce would amount to 240 participating employees. Assuming participating employees are provided a monthly $30 incentive to participate, the total cost to implement this program would amount to: (30 per employee per month *1200 employees * 20% participation * 12 months) = $86,400. If this costing information is appropriate for implementation by U.S. Steel, assuming a 5% discount rate, the annualized cost-effectiveness is $326,181 per ton of NO_x, $8,542,879 per ton of $PM_{2.5}$, and $359,343 per ton of VOC.

Potential funding sources to aid in program implementation could include Community Multiscale Air Quality (CMAQ) funding, including local matching of provided CMAQ funds.

4. Date by which the Technology or Measure Could be Reasonably Implemented

It is expected that an Employee Rideshare Program could be implemented within one year or less.

Option 4: Accelerated Vehicle Retirement Program light duty vehicles and trucks

1. Control Efficiency by Pollutant

The estimated reductions represent approximately a 1.1% reduction in passenger car/truck $PM_{2.5}$ emissions and a 4.5% reduction in passenger car/truck NO_x emissions in 2014.

2. Potential Emission Reductions by Pollutant

This program would target Tier 1 and older passenger cars and passenger trucks to be retired and replaced with vehicles of the 2011 or later model year. The analysis assumes that 10% of eligible vehicles are retired and replaced. Based on these assumptions, the following reductions could be achieved:

Pollutant	2014
NO_x	3.42
$PM_{2.5}$	0.03
SO_2	0.001
VOC	2.05

3. Cost per Ton of Pollutant Reduced

Following the design of the proposed Fleet Modernization program in California, this program would pay $4,000 to residents to retire older, higher emitting vehicles with vehicles from the most recent 8 model years. Assuming a discount rate of 5% and a vehicle lifetime of 10 years, the annual costs per ton of pollutant reduced are as follows: $1.24 million for $PM_{2.5}$, $12,100 for NO_x and $20,100 for VOC.

4. Date by which the Technology or Measure Could be Reasonably Implemented
It is unlikely that this program could be fully implemented prior to 2014 due to the time needed to set up the program and recruit the targeted vehicles.

Option 5
Emission Testing and Repair/Maintenance Programs for Onroad Vehicles:
Light-duty vehicles in the L-C area are already subject to a vehicle inspection and maintenance program as part of the Pittsburgh ozone NAA. This test includes an Onboard Diagnostic (OBDII) test. Due to the very small number of heavy-duty vehicles registered or operating in the L-C area, it would be cost prohibitive to set up a heavy-duty emission testing program just for those vehicles. Therefore, no further analysis was prepared for this measure.

Option 6
Program to Expand Use of Clean Burning Fuels:
This program focused on biodiesel 20% for use in all diesel vehicles in the areas.

Note that ethanol was also considered, but 10% ethanol showed no change in onroad vehicle gasoline emissions of $PM_{2.5}$ from the 2014 baseline. E85 was not considered because this would require the use of flex fuel or dedicated E85 vehicles.

1. Control Efficiency by Pollutant
EPA reports pollutant control efficiencies for using B20 in heavy-duty highway diesel vehicles of reductions of 15.6% for PM and 14.1% for VOC. NO_x emissions, on the other hand, are expected to increase by 2.2% with the use of B20. These control efficiencies were applied to all highway diesel vehicles operating in the L-C NAA.

2. Potential Emission Reductions by Pollutant (tons per year)
Provided adequate market penetration of B20 is achieved in Allegheny County by 2014, as outlined in the Pennsylvania Biofuel Development and In-state Production Incentive Act (Act 78), and assuming refueling infrastructure exists or can be installed to accommodate fuel usage of 100% of the onroad diesel vehicles, the following emissions reductions (or penalties) are estimated:

Pollutant	2014
NO_x	1.27 ton increase
$PM_{2.5}$	0.44 ton reduction
VOC	0.71 ton reduction

3. Cost per Ton of Pollutant Reduced
While the use of B20 would not require the construction of new refueling stations, some revisions to existing diesel infrastructure may be needed for biodiesel.

4. Date by which the Technology or Measure Could be Reasonably Implemented
As of 2010, three Pennsylvania Petroleum Pipeline fuel terminals with biodiesel injection capabilities will be in operation in Allegheny County. It is assumed for this assessment that additional terminal infrastructure will be in place by 2014 to accommodate 100% penetration of B20 into the market (400,000,000 gallons of statewide B20 production per annum), consistent with Act 78. It is expected that biodiesel could be available for sale in the area by 2014.

Option 7
Low Emissions Specification for Public or Private Fleets:
Since most light-duty fleets replace vehicles more frequently than every ten years, it is expected that most light-duty fleet vehicles will be meeting the most stringent light-duty criteria pollutant requirements and that additional reductions that could be achieved by replacing light-duty fleet vehicles with the most recent model year vehicles would be minimal. In contrast, specifying low emission standards for heavy-duty fleets could, even if just for a few vehicles, could have a more significant impact on $PM_{2.5}$ emissions in the region. Therefore, this analysis is focused on replacing heavy-duty diesel fleet vehicles with those meeting the latest emission standards.

1. Control Efficiency by Pollutant
As analyzed, this measure achieves a 4.1% reduction in heavy-duty truck $PM_{2.5}$ emissions, 3.6% reduction in NO_x emissions, 4.1% reduction in SO_2 emissions, and 1,8% reduction in VOC emissions.

2. Potential Emission Reductions by Pollutant This option was focused on reducing emissions from the 1991 through 2006 model years for diesel short and long haul single-unit or combination trucks. Older vehicles are likely already under consideration for upgrade or replacement, and newer vehicles would be subject to the latest emission standards. It was assumed that half of the eligible trucks would be replaced with comparable trucks meeting the 2010 emission standards and that 20% of the vehicle's mileage, on average, occurs in the NAA.	
Pollutant	2014
NO_x	1.70
$PM_{2.5}$	0.09
SO_2	0.004
VOC	0.08
3. Cost per Ton of Pollutant Reduced	
4. Date by which the Technology or Measure Could be Reasonably Implemented This program could be implemented by 2014.	
Option 8 Opacity or Other Emission Standards for Gross Emitting Diesel Vehicles: Section 2105.42 of the ACHD Rules and Regulations limits opacity on roadways and parking lots. Therefore, no further opacity testing of onroad vehicles was considered here.	

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EPA, 2007b: U.S. Environmental Protection Agency, "The Cost-Effectiveness of Heavy-Duty Diesel Retrofits and Other Mobile Source Emission Reduction Projects and Programs," EPA420-B-07-006, available at: http://epa.gov/cleandiesel/documents/420b07006.pdf, May 2007.

EPA, 2009: U.S. Environmental Protection Agency, "EPA SmartWay Technology Program Verified Retrofit Technologies, Engine Control Systems, *Purifilter Plus* System," available at: http://epa.gov/cleandiesel/documents/verif-letter-ecs6.pdf, March 2009,

EPA, 2010a: U.S. Environmental Protection Agency, "Motor Vehicle Emission Simulator, MOVES2010a," available at: http://www.epa.gov/otaq/models/moves/index.htm, August 2010.

EPA, 2010b: U.S. Environmental Protection Agency, Technical Bulletin, "Diesel Particulate Filter General Information," EPA-420-F-10-029, available at: http://www.epa.gov/cleandiesel/documents/420f10029.pdf, May 2010.

EPA, 2010c: U.S. Environmental Protection Agency, Technical Bulletin, "Diesel Particulate Filter Installation," EPA-420-F-10-028, available at: http://www.epa.gov/cleandiesel/documents/420f10028.pdf, May 2010.

NCSU, 2008: North Carolina State University, "EPA Truck OEM APU Prep Kit Design and Installation Project," Available at: http://www.ncsc.ncsu.edu/cleantransportation/docs/MIRT_APU_Prep_Kit_Design_Install_final10-28-08.pdf, October 2008.

SPC, 2011: Southwestern Pennsylvania Commission's CommuteInfo Program, http://www.commuteinfo.org/, accessed December 12, 2011.

Offroad RACM Analysis – Option C

SOURCE CATEGORY: Diesel Powered Construction Equipment

ASSOCIATED SOURCE CLASSIFICATION CODES (SCCs) FOR NONROAD MOBILE SOURCES: 2270002003, 2270002006, 2270002009, 2270002015, 2270002018, 2270002021, 2270002024, 2270002027, 2270002030, 2270002033, 2270002036, 2270002039, 2270002042, 2270002045, 2270002048, 2270002051, 2270002054, 2270002057, 2270002060, 2270002066, 2270002069, 2270002072, 2270002075, 2270002078, 2270002081

DESCRIPTION

This source category includes diesel-powered construction equipment not registered to operate on highways or other public roads, and includes: pavers, tampers/rammers, plate compactors, rollers, scrapers, paving equipment, surfacing equipment, signal boards/light plants, trenchers, bores/drill rigs, excavators, concrete/industrial saws, cement/mortar mixers, cranes, graders, off-highway trucks, crushing/processing equipment, rough terrain forklifts, rubber tire loaders, tractors/loaders/backhoes, crawler tractors/dozers, skid steer loaders, dumpers/tenders and other similar equipment.

EMISSIONS INVENTORY (annual tons)

Pollutant	2007 tons	2014 tons
NO_x	34.06	23.75
$PM_{2.5}$	2.87	2.06
SO_2	2.64	0.16
VOC	3.60	2.53

CURRENT CONTROL REQUIREMENT

No RACM related to the restriction of equipment idling or retrofitting of off-road engines are specified in the *Revision to the Allegheny County Portion of the Pennsylvania State Implementation Plan: Attainment Demonstration for the Liberty-Clairton $PM_{2.5}$ Nonattainment Area* prepared by ACHD in April 2011.

Regulations established at §2105.93 of ACHD Article XXI – Air Pollution Control restrict the operation of diesel-powered equipment at idle to no greater than five consecutive minutes, allowing for exceptions due to safe operation considerations, engine temperature requirements, maintenance and diagnostic purposes, queuing, and emergency situations.

In terms of voluntary measures, beginning in 2012, ACHD is providing up to $920,000 in grant funding from its Clean Air Fund to small construction companies to retrofit their diesel equipment. Additionally, according to ACHD, 14 excavators in the county have been retrofitted with diesel controls to date.

TECHNOLOGICALLY FEASIBLE EMISSION CONTROL TECHNOLOGIES

According to EPA's listing of verified retrofit technologies for diesel-powered vehicles and equipment, the Caterpillar, Inc. DPF is the only currently-verified technology possessing the ability to reduce direct $PM_{2.5}$ emissions for off-road construction equipment. Emissions reduction potential from this technology is also reported for VOC and CO.

Option 1

Diesel Idling Programs for Construction Equipment: Ensure equipment is in compliance with ACHD idling restrictions while operating in the NAA.

1. Control Efficiency by Pollutant

Control efficiencies associated with this measure would involve the reduction of idling hours from unrestrained conditions via complying with the current ACHD anti-idling regulation.

2. Potential Emission Reductions by Pollutant

No information on unrestricted equipment idling in the L-C area is available. Further, little-to-no information has been published on this subject in general, and it is not possible to extract idling estimates for construction equipment from the NONROAD/National Mobile Inventory Model (NMIM) models used to compute the L-C NAA emissions inventories. Because there is no basis for developing an unrestricted idling baseline against which reductions achieved from compliance with current idling restrictions can be assessed, no emissions reductions have been quantified for this measure.

Pollutant	2014
NO_x	Not Quantified
$PM_{2.5}$	Not Quantified
SO_2	Not Quantified
VOC	Not Quantified

3. Cost per Ton of Pollutant Reduced

The cost of implementing this measure cannot be quantified at this time due to a lack of emissions reduction estimates.

4. Date by which the Technology or Measure Could be Reasonably Implemented

Idling restrictions are currently already in effect in the NAA.

Option 2

Nonroad Diesel Engine Retrofit with Catalyzed Particle Filter: Retrofit eligible construction equipment in the NAA with the Caterpillar, Inc. DPF during calendar year 2014.

1. Control Efficiency by Pollutant

The Caterpillar, Inc. DPF applies to nonroad, 4-cycle, non-Exhaust Gas Recirculation equipped vehicles and equipment ranging from model year 1996 to 2005, and within the rated horsepower range of 174.2 to 301.5 horsepower. Application of this technology is documented to reduce PM emissions by 89%, VOC emissions by 93% and CO emissions by 90%.

2. Potential Emission Reductions by Pollutant

Out of the projected 127 construction vehicles operating in the NAA in 2014 (based on information from NONROAD/NMIM for Allegheny County allocated to the L-C area), only 18 pieces of equipment fall within the compatible model year and horsepower ranges specified in EPA's technology verification listing, including (but not limited to): tractors/loaders/backhoes (SCC 2270002066), skid steer loaders (SCC 2270002072), rough terrain forklifts (SCC 2270002057), rubber tire loaders (SCC 2270002060), rollers (2270002015), bores/drill rigs (SCC 2270002033), crawler tractors (SCC 2270002069), and excavators (2270002036). Of these 18 eligible pieces of equipment, 9.7% are considered Tier 0 vehicles by the model, 58.8% are considered Tier 1, and 31.5% are considered Tier 2 by the models for emissions calculation purposes. Assuming all vehicles are retrofit during calendar year 2014, the following emissions reductions are estimated:

Pollutant	2014
NO_x	-
$PM_{2.5}$	0.37
SO_2	-
VOC	0.48

3. Cost per Ton of Pollutant Reduced

The California Air Resources Board (ARB) estimates costs of retrofit technology to range up to $7,000 for equipment rated up to 100 horsepower, up to $9,000 for equipment rated between 100 and 275 horsepower, and $10,500 for equipment rated between 275 and 400 horsepower. Assuming all 18 eligible pieces of construction equipment in the area would be retrofitted with this technology, and assuming a discount rate of 5%, retrofit cost effectiveness are estimated at $80,803 per ton of $PM_{2.5}$ reduced, and $62,515 per ton of VOC reduced. In 2007, EPA published a report with DPF retrofit cost effectiveness information for nonroad vehicles with an approximate range of between $20,000 and $68,000 per ton of PM reduced. (Note EPA assumed a discount rate of 3% per annum.)

4. Date by which the Technology or Measure Could be Reasonably Implemented
EPA contends that typical installation of DPF on applicable vehicles takes between six to eight hours, implying that the program could be fully implemented within one year of initiation.

Option 3
Low Emissions Specifications for Equipment Used in NAA Projects (i.e., Large Construction Projects): Require the use of Tier 2 or better diesel-powered construction equipment in projects occurring within the L-C NAA.

1. Control Efficiency by Pollutant
Depending on equipment horsepower, NO_x and hydrocarbon (VOC) emissions standards for Tier 2 vehicles are approximately 20 and 50 percent lower than their Tier 1 predecessors. PM emissions standards are between approximately 20 and 65 percent lower.

2. Potential Emission Reductions by Pollutant
Of the entire Allegheny County diesel-powered construction equipment fleet estimated for calendar year 2014 by the NONROAD/NMIM emissions models, 37 pieces of Base Tier, Tier 0 and Tier 1 equipment are allocated to the L-C NAA. Assuming that all 37 of these engines/vehicles are replaced by usage of Tier 2 or better models, the following emissions reductions are estimated for calendar year 2014:

Pollutant	2014
NO_x	1.94
$PM_{2.5}$	0.43
SO_2	-
VOC	0.43

3. Cost per Ton of Pollutant Reduced
Implementation costs due to this measure will vary based on the composition of local fleets contracted to conduct construction projects within the L-C area. A significant portion of the total implementation costs of the project could be defrayed if construction project sponsors rented the equipment replacements, where available, instead of having the fleet owners replace the equipment outright. As an estimate, based on currently available list and auction prices for the affected equipment, replacing all 37 equipment with Tier 2 or better alternatives would produce a cost effectiveness of $6,432,267 per ton of VOC reduced, $6,351,616 per ton of PM reduced, and $1,409,032 per ton of NO_x reduced.

4. Date by which the Technology or Measure Could be Reasonably Implemented
Given adequate support and funding, this measure could be reasonably implemented within two years of initiation.

REFERENCES:

ACHD, 2010: Allegheny County Health Department, "County of Allegheny, Pennsylvania, Ordinance No. 16872, and Allegheny County Health Department Rules and Regulations - Article XXI: Air Pollution Control," Sections 2105.93 et seq. April 2010.

ACHD, 2011: Allegheny County Health Department, "Revision to the Allegheny County Portion of the Pennsylvania State Implementation Plan: Attainment Demonstration for the Liberty-Clairton $PM_{2.5}$ Nonattainment Area," April 2011.

CNH, 2008: CNH America LLC, "Case Construction Equipment U.S. Price List, PL-200 AA Revision 29," October 2008.

EPA, 1997: U.S. Environmental Protection Agency, "Emissions Standards Reference Guide for Heavy-Duty and Nonroad Engines," EPA420-F-97-014, September 1997.

EPA, 2006: U.S. Environmental Protection Agency, "Diesel Retrofits: Quantifying and Using their Benefits in SIPs and Conformity, Guidance for State and Local Air and Transportation Agencies, EPA420-B-06-005. June 2006.

EPA, 2007: U.S. Environmental Protection Agency, "Diesel Retrofits Technology: An Analysis of the Cost-Effectiveness of Reducing Particulate Matter and Nitrogen Oxides Emissions from Heavy-Duty Nonroad Diesel Engines through Retrofits," EPA421-R-07-005, May 2007.

EPA, 2011: U.S. Environmental Protection Agency, "V*erified Technologies List,"* at http://epa.gov/cleandiesel/verification/verif-list.htm, accessed December 1, 2011.

Rock and Dirt Equipment Marketplace Selling and Auction Prices for Construction Equipment, http://www.rockanddirt.com, accessed December 11, 2011.

WRAP, 2005: Western Regional Air Partnership, "Offroad Diesel Retrofit Guidance Document Volume 2: Retrofit Technologies, Applications and Experience" [cites information on retrofit costs to CARB], November 2005.

SOURCE CATEGORY: Nonroad Gasoline- and Diesel-powered Equipment and Vehicles

ASSOCIATED SOURCE CLASSIFICATION CODES (SCCs) FOR NONROAD MOBILE SOURCES: 2270000000, 2260000000, 2265000000, 2280000000

DESCRIPTION

This source category encompasses diesel- and gasoline-powered equipment and vehicles used in applicable recreational, construction, industrial, lawn and garden, agricultural, logging, oil exploration, railway maintenance and mining sectors.

EMISSIONS INVENTORY (annual tons)

Pollutant	2007 tons	2014 tons
NO_x	60.22	43.54
$PM_{2.5}$	6.07	4.95
SO_2	3.96	0.34
VOC	72.90	48.47

CURRENT CONTROL REQUIREMENT
None.

TECHNOLOGICALLY FEASIBLE EMISSION CONTROL TECHNOLOGIES

Option 1
Programs to expand use of clean burning fuels: Use 20% biodiesel blend (B20) and 10% ethanol blend gasoline (E10) within all nonroad equipment sectors for which such equipment exists in the L-C NAA.

1. Control Efficiency by Pollutant
EPA reports pollutant control efficiencies for using B20 in heavy duty highway and nonroad diesel vehicles of -15.6% for PM and -14.1% for VOC. Notably, NO_x penalties associated with the use of B20 are assessed at +2.2%. These control efficiencies were applied to all nonroad diesel vehicles operating in the L-C NAA.

For E10 in 2-stroke gasoline equipment, EPA reports the following control efficiencies: -2.1% for VOC and +65.1% for NO_x. With respect to 4-stroke equipment, control efficiencies are -15.75% for VOC and +40.25 for NO_x. These control efficiencies were applied to all gasoline-powered 2- and 4- stroke equipment projected to operate within the NAA in 2014.

2. Potential Emission Reductions by Pollutant
Provided adequate market penetration of B20 and E10 is achieved in Allegheny County by 2014, as outlined in the Pennsylvania Biofuel Development and In-state Production Incentive Act (Act 78), and assuming refueling infrastructure exists or can be installed to accommodate fuel usage of 100% of the vehicles and equipment described above, the following emissions reductions (or penalties) are estimated:

Pollutant	2014
NO_x	(3.71)
$PM_{2.5}$	0.48
SO_2	-
VOC	4.75

3. Cost per Ton of Pollutant Reduced
Although new refueling stations should not be needed to accommodate the consumption demands for B20 and E10 as an upper end cost estimate, three new refueling stations have been estimated. Refueling station costs and useful lifetime for a three lane refueling facility and four storage tanks have been estimated to cost $438,400 in existing literature. For this assessment, if was assumed that three refueling stations would need to be installed in the L-C area to supply fuel to equipment populations. The cost effectiveness for PM, in cost per ton of PM reduced,

is estimated at $178,240. For VOC, the cost effectiveness is estimated to be $18,011.

4. Date by which the Technology or Measure Could be Reasonably Implemented

As of 2010, three Pennsylvania Petroleum Pipeline fuel terminals with biodiesel injection capabilities will be in operation in Allegheny County. It is assumed for this assessment that additional terminal infrastructure will be in place by 2014 to accommodate 100% penetration of B20 into the market (400,000,000 gallons of statewide B20 production per annum), consistent with Act 78. It is also assumed that continued implementation of federal Renewable Fuels Standards will accommodate 100% penetration of E10 in the Allegheny County area by the time of this measure's implementation.

REFERENCES:

Ahouissoussi, N. and M. Wetzstein. Life-Cycle Costs of Alternative Fuels: Is Biodiesel Cost Competitive for Urban Buses? National Biodiesel Board Special Article, May 2007.

E.H. Pechan and Associates. *Evaluation of Air Quality Impacts of Biofuels in Pennsylvania – Final Report.* Prepared for the Pennsylvania Department of Environmental Protection Bureau of Air Quality. January 2010.

Pennsylvania Departments of Transportation and Agriculture. *Report to the Pennsylvania General Assembly on 2% Biodiesel Infrastructure Certification, as Prescribed by Act 78 of 2008.* August 2009.

U.S. Department of Energy. Alternative Fuels and Advanced Vehicles Data Center – Alternative Fueling Station Locator. http://www.afdc.energy.gov/afdc/fuels/stations.html. Accessed December 08 2011.

U.S. Environmental Protection Agency. *Draft Regulatory Impact Analysis: Changes to Renewable Fuel Standard Program*. EPA-420-D-09-001. May 2009.

SOURCE CATEGORY: Offroad Diesel Equipment

ASSOCIATED SOURCE CLASSIFICATION CODES (SCCs): 2270XXXXXX and 2285002015

DESCRIPTION

This analysis considers other offroad RACM suggested by EPA (Options c.4 and c.7) as potential options for controlling various high-emitting diesel equipment . Emissions from these SCCs are as follows:

EMISSIONS (annual tons)		
Pollutant	2007 tons	2014 tons
NO_x	125.25	91.57
$PM_{2.5}$	6.72	4.39
SO_2	4.64	0.36
VOC	9.46	6.30

CURRENT CONTROL REQUIREMENT
Aside from an ACHD offroad anti-idling regulation that governs the operation of select off-road diesel-fueled equipment, there are no local regulations addressing emission levels for off-road diesel equipment, including emissions compliance or opacity testing.

TECHNOLOGICALLY FEASIBLE EMISSION CONTROL TECHNOLOGIES
Two options suggested by EPA are discussed briefly below. Because these are not believed to be viable RACM candidates, a detailed evaluation of emissions reductions and costs was not conducted.

Option 1
Emissions testing and repair/maintenance programs for nonroad heavy-duty vehicles and equipment:

As part of ARB's onroad vehicle Smog Check program, emissions testing and repair/maintenance programs are specified to identify high emitters and initiate repair of such vehicles appropriately (ARB, 2011). This option would involve a comparable program for nonroad engines. Unfortunately, proposal, promulgation, and implementation of this type of program is not likely to occur within the necessary time frame, and actual reductions realized from equipment repair in the NAA are not expected to hasten attainment by 2014.

Option 2
Opacity or other emission standards for gross emitting diesel equipment:

Smoke opacity is used as an indicator for mal-maintenance. ARB has road-side anti-smoke inspections that test for excess opacity from heavy duty onroad vehicles, as well as self-inspections for heavy duty fleets. Smoke checks are also required under ARB's Smog Check Program, which is administered by the Bureau of Automotive Repair and requires vehicles to receive a biennial Smog Check (ARB, 2011). As with Option 1, actual reductions realized from smoke checks for off-road equipment are not expected to contribute to attainment by 2014.

REFERENCES:

ARB, 2011: California Air Resources Board, Heavy-Duty Vehicle Inspection Program, http://www.arb.ca.gov/enf/hdvip/hdvip.htm, accessed December 14, 2011.

SOURCE CATEGORY: Recreational Marine

ASSOCIATED SOURCE CLASSIFICATION CODES (SCCs): 2282005010, 2282005015, 2282010005, 2282020005, 2282020010
DESCRIPTION

This analysis considers RACM suggested by EPA as potential options for controlling emissions from recreational marine vessels (Option c.3). Options for addressing emissions from lawn mowers (also cited under Option c.3) are presented under the Home and Lawn Equipment RACM analysis. The emissions inventory below represents the following SCCs: 2282005010, 2282005015, 2282010005, 2282020005, 2282020010.

EMISSIONS INVENTORY (annual tons)		
Pollutant	2007 tons	2014 tons
NO_x	1.07	1.16
$PM_{2.5}$	0.14	0.07
SO_2	0.03	0.01
VOC	8.14	4.75
CURRENT CONTROL REQUIREMENT No local limitations exist on pleasure craft operation or their associated emissions within Allegheny County or the L-C $PM_{2.5}$ NAA.		
TECHNOLOGICALLY FEASIBLE EMISSION CONTROL TECHNOLOGIES One option suggested by EPA is discussed briefly below. Because this is not believed to be a viable RACM candidate, a detailed evaluation of emissions reductions and costs was not conducted.		
Option 1 Programs to reduce emissions or accelerate retirement of high emitting boats: Recreational marine accounts for approximately 2% and 10% of total NMIM $PM_{2.5}$ and VOC emissions, respectively. While there will be some pleasure craft traffic along the portion of the Monongahela River within the L-C area, boat traffic is predominantly commercial towboats and barges. Recreational boat traffic can originate from many areas outside of the NAA, as well as the county, so targeting controls for such movable equipment is not advised. It is also expected that the reductions achieved would not be cost-effective.		

RACM Analysis: Trucks to and from Industrial Facilities

SOURCE CATEGORY: Diesel Powered Short-haul and Long-haul Trucks

ASSOCIATED MOVES VEHICLE TYPES: Single Unit Short-haul Truck, Single Unit Long-haul Truck

DESCRIPTION. This source category includes diesel-powered single unit short- and long-haul trucks registered to operate on highways or other public roads.

EMISSIONS INVENTORY (annual tons)

Pollutant	2007 tons	2014 tons
NO_x	75.43	51.72
$PM_{2.5}$	1.82	1.16
SO_2	0.16	0.07
VOC	121.60	72.74

CURRENT CONTROL REQUIREMENT

Regulations established at §2105.92 of ACHD Article XXI – Air Pollution Control restrict the operation of diesel-powered motor vehicles at idle to no greater than five consecutive minutes in any sixty minute period, allowing for exceptions due to traffic conditions, boarding/discharging passengers, queuing, and/or turbo-charged engine cool-down or warm-up. Further, the restriction is eased to twenty minutes in any sixty minute period when the outdoor temperature is less than 40 or greater than 75 degrees Fahrenheit.

TECHNOLOGICALLY FEASIBLE EMISSION CONTROL TECHNOLOGIES

Option 1

Diesel retrofits or replacement with new lower polluting engines.

This option is covered by options a.1 and a.7 under Onroad Highway.

Option 2

Ensure compliance with idling restrictions established in Regulation §2105.92 of ACHD Article XXI – Air Pollution Control.

1. Control Efficiency by Pollutant

Control efficiencies for ensuring compliance with idling restrictions involve a reduction in total idling hours of vehicles traveling in and out of industrial facilities.

2. Potential Emission Reductions by Pollutant

The largest employer within the L-C NAA is the U.S. Steel Corporation. Approximately 198,560 diesel-powered short- and long-haul trucks travel to and from this facility annually. Because unrestricted idling times were unavailable from U.S. Steel, a weighted average idling time of 7.95 minutes per truck trip was computed based on information provided in the *Heavy-Duty Vehicle Idle Activity and Emissions Characterization Study* prepared by the Texas Commission on Environmental Quality. Emissions associated with idling reductions were calculated based on existing EPA guidance. Based on these assumptions and guidance, adherence to the five minute idling restriction would reduce total annual idling by 9,764 hours and would result in the following emissions reductions estimates:

Pollutant	2014
NO_x	1.45
$PM_{2.5}$	0.04
SO_2	-
VOC	-

3. Cost per Ton of Pollutant Reduced

The cost effectiveness for this control is difficult to measure in terms of direct cost. There are a number of ways in which U.S. Steel can incentivize adherence to the idling restrictions, such as rewarding the top ten drivers having

the lowest idling times on a monthly or quarterly basis, or providing incentives based on set idling thresholds (e.g. $15 gas/gift card for < 50 hours per month idling or $30 gas/gift card for <25 hours per month idling). Providing training sessions to help inform drivers about emissions, fuel consumption, and potential health risks associated with idling may also be beneficial.
4. Date by which the Technology or Measure Could be Reasonably Implemented It is expected that a driver incentive program to reduce idling could be implemented within one year or less.
Option 3 Emission or opacity testing for NAA based trucks This option is covered by option a.8 under Onroad Highway.

REFERENCES:

Allegheny County Health Department. *County of Allegheny, Pennsylvania, Ordinance No. 16872, and Allegheny County Health Department Rules and Regulations - Article XXI: Air Pollution Control*. Sections 2101.01 and 2105.01 et seq. July 2009.

North Central Texas Council of Governments. *Ways to Reduce Idling.* http://www.nctcog.org/trans/air/vehicles/waystoreduce.asp. Accessed December 13, 2011.

Texas Commission on Environmental Quality. *Heavy-Duty Vehicle Idle Activity and Emissions Characterization Study.* August 2004.

United States Environmental Protection Agency, Office of Transportation and Air Quality. *Guidance for Quantifying and Using Long Duration Truck Idling Emission Reductions in State Implementation Plans and Transportation Conformity*. January 2004.

SOURCE CATEGORY: Diesel Switcher Locomotives
ASSOCIATED SOURCE CLASSIFICATION CODES (SCCs): 2285002010

DESCRIPTION

This source category includes diesel switch locomotives operating at railyards in or close to the L-C NAA, including Dura-Bond Industries in Port Vue, and McKeesport Connecting Railroad Company (located just outside the northern border of the NAA). Switch locomotives are used to join rail cars together to form trains within or around a railyard.

EMISSIONS INVENTORY (annual tons)

Pollutant	2007 tons	2014 tons
NO_x	1.506	1.225
$PM_{2.5}$	0.034	0.024
SO_2	0.010	0.002
VOC	0.059	0.046

CURRENT CONTROL REQUIREMENT

There are no idling restrictions on railyard operations in Allegheny County or the L-C $PM_{2.5}$ NAA. Regulations established at §2105.93 of the ACHD Article XXI – Air Pollution Control restrict the idling operation of diesel-fueled off-road vehicle engines greater than 25 hp to no more than five consecutive minutes, with exceptions to ensure safety and allow for queuing. Locomotives are exempt from this section, however.

Low-emitting switch locomotives are in operation at two locations in or near the L-C NAA. U.S. Steel's Clairton Coke facility operates two low-emitting switch locomotives that use diesel start battery-electric technology. In addition, at an East McKeesport switchyard located several miles north of the L-C NAA in Allegheny County, CSX replaced a vintage switcher with a 2-engine gen-set switcher locomotive, reducing emissions and fuel consumption.

TECHNOLOGICALLY FEASIBLE EMISSION CONTROL TECHNOLOGIES

Option 1

Locomotive Retrofit Projects with Idle Reduction Technologies: An idle reduction technology consists of the use of an alternative energy source in lieu of using the main switcher engine or a device designed to reduce long duration idling. For this control option, we consider use of a mobile APU that attaches onto the switchyard locomotive and provides heat or electrical power.

1. Control Efficiency by Pollutant

Control factors that account for reduced idling hours were calculated using EPA's SIP guidance on quantifying long duration switch yard locomotive idling reductions (EPA, 2009). An estimate of hours reduced while idling was made based on the Durabond switcher operations. These same reductions were assumed to apply to the McKeesport Connecting Railroad Company switcher, since fuel consumption is comparable for both switchers.

2. Potential Emission Reductions by Pollutant

The control option is expected to yield the following 2014 emission reductions:

Pollutant	2014
NO_x	0.131
$PM_{2.5}$	0.004
SO^2	NA
VOC	NA

3. Cost per Ton of Pollutant Reduced

The average cost of idle control technology for a switch engine was estimated by EPA to be $33,000 (EPA, 2005). Using these costs applied to the two switchers and an average lifetime of 20 years, a cost effectiveness of $40,400/ton NO_x and $1.3 million/ton $PM_{2.5}$ was estimated. Note that there would be some cost savings due to reduced fuel consumption, but since the total fuel consumption for these switchers is relatively low, the savings are not sufficient to reduce these high costs per ton to a range for consideration.

4. Date by which the Technology or Measure Could be Reasonably Implemented
The time-frame to install and realize benefits of anti-idling units on a switcher could be implemented prior to 2014.

Option 2
Ultra Low-Emitting Switch Locomotives: Replace existing switchers with ultra low-emitting switch locomotives. Gen-set, Diesel charged battery-electric hybrid, and liquefied natural gas switch locomotives are all technically feasible and commercially available. However, gen-set ultra low-emitting switch locomotives currently dominate the market and have proven to be the most reliable. As such, replacement with a Tier 3 gen-set engine will form the basis of this RACM option evaluation.

1. Control Efficiency by Pollutant
This option will yield reductions for NO_x and $PM_{2.5}$, calculated based on the difference between the 2014 modeled emission factors (15.5 g NO_x/horsepower-hour and 0.3 g $PM_{2.5}$/horsepower-hour) and EPA Tier 3 gen-set engine emission factors (3.0 g NO_x /horsepower-hour and 0.1 g $PM_{2.5}$/horsepower-hour). When coupled with expected fuel consumption reductions of 20%, this results in a control efficiency of 85 percent for NO_x, and 75 percent for $PM_{2.5}$.

2. Potential Emission Reductions by Pollutant

Pollutant	2014
NO_x	1.035
$PM_{2.5}$	0.018

3. Cost per Ton of Pollutant Reduced
For NO_x and $PM_{2.5}$, cost effectiveness was estimated by an ARB report on locomotive control options (ARB, 2009) to be $4,000-$6,000/ton reduced. However, since this was based on a fleet of switchers with relatively high activity/emissions, emissions reduced were significantly higher than the reductions calculated for the L-C area. Capital cost of a 2-engine gen-set locomotive is estimated to be $1.5 million. Using these costs applied to the two switchers with an average lifetime of 20 years, the cost effectiveness was estimated to be $232,500/ton NO_x and $13.6 million/ton $PM_{2.5}$ was estimated. These high costs per ton preclude this option from being considered as an economically viable control strategy.

4. Date by which the Technology or Measure Could be Reasonably Implemented
Benefits of replacement with a cleaner locomotive engine could be realized sufficiently prior to attainment date of 2015, but high costs relative to benefit will preclude this technology.

REFERENCES:

ARB, 2009: Air Resources Board, CA EPA, Technical Options to Achieve Additional Emissions and Risk Reductions from California Locomotives and Railyards, Chapter 2. Locomotive Options, available at http://www.arb.ca.gov/railyard/ted/tedr_loco_options.pdf, August 2009.

EPA, 2005. U.S. EPA, "Locomotive Switcher Idling and Idle Control Technology," An Overview for Citizens and Solutions for Railroad Companies, June 2005.

EPA, 2009: U.S. EPA, "Guidance for Quantifying and Using Long Duration Switch Yard Locomotive Idling Emission Reductions in State Implementation Plans," EPA-420-B-09-037, October 2009.

SOURCE CATEGORY: Diesel Line-haul Locomotives (Class I and Class II/III)
ASSOCIATED SOURCE CLASSIFICATION CODES (SCCs): 2285002006 & 2285002007

DESCRIPTION

This source category includes Class I freight line-haul locomotives operating in the L-C NAA, including CSX and Norfolk Southern, as well as Union Railroad Company, a Class II railroad.

EMISSIONS INVENTORY (annual tons)		
Pollutant	2007 tons	2014 tons
NO_x	74.069	53.954
$PM_{2.5}$	2.398	1.297
SO_2	0.784	0.127
VOC	3.895	2.421

CURRENT CONTROL REQUIREMENT
Aside from Federal controls regulating new and re-manufactured line haul locomotive engines, no local programs are in place for controlling line haul locomotive emissions.

TECHNOLOGICALLY FEASIBLE EMISSION CONTROL TECHNOLOGIES

Option 1
Replacement of Class II Medium Horsepower engines – Replace older pre-Tier 0 and Tier 0 engines to meet Tier 2 level standards.

1. Control Efficiency by Pollutant
This option will yield reductions for NO_x and $PM_{2.5}$, calculated based on the difference between the 2014 modeled emission factors (15.5 g NO_x /horsepower-hour and 0.3 g $PM_{2.5}$/horsepower-hour) and EPA Tier 2 emission factors (4.0 g NO_x /horsepower-hour and 0.1 g $PM_{2.5}$/horsepower-hour). This results in a control efficiency of 73 percent for NO_x, and 68 percent for $PM_{2.5}$.

2. Potential Emission Reductions by Pollutant
The control option is expected to yield the following 2014 emission reductions:

Pollutant	2014
NO_x	2.003
$PM_{2.5}$	0.036
SO^2	-
VOC	-

3. Cost per Ton of Pollutant Reduced
The average capital cost of a low-emitting Tier 2 locomotive is estimated to be $1 million (ARB, 2009). Based on 2005 Locomotive Roster & News, Union Railroad Company operates 33 locomotives with build dates ranging from 1972-1977 (Kerr, 2005) ; any of these may operate in the NAA, even though only a tenth of the total Union Railroad Company track miles occur in the L-C NAA. The unit cost was multiplied by 33 locomotives, with an assumed an average lifetime of 20 years. This resulted in a cost effectiveness exceeding $1.3 million/ton NO_x and $72 million/ton $PM_{2.5}$. The extremely high costs per ton preclude this option from being considered as an economically feasible control strategy.

4. Date by which the Technology or Measure Could be Reasonably Implemented
Benefits of replacement with a cleaner locomotive engine could be realized sufficiently prior to attainment date of 2015, but high costs relative to benefit will preclude this technology.

Option 2
Accelerate Replacement of Line Haul Locomotives: Accelerate use of Tier 4 interstate line haul locomotives. For Class I interstate freight locomotives, the fleet in 2014 would be assumed to be meeting approximately a Tier 2 level of control. Given that significant reductions for NO_x and $PM_{2.5}$ occur primarily between Tier 2 and Tier 4 emission levels (the difference between Tier 2 and 3 is minimal) and that interstate locomotives operate in such a large geographic area, this control option was not evaluated. Furthermore, Tier 4 engines will not be available prior to 2015 (ARB, 2009).

REFERENCES:

ARB, 2009: Air Resources Board, CA EPA, Technical Options to Achieve Additional Emissions and Risk Reductions from California Locomotives and Railyards, Chapter 2. Locomotive Options, available at http://www.arb.ca.gov/railyard/ted/tedr_loco_options.pdf, August 2009.

Kerr, 2005. James A. Kerr, "Locomotive Rosters and News, The Official 2005 Edition," 2005.

SOURCE CATEGORY: Commercial Marine Vessels (Underway; Distillate Fuel Combustion)
ASSOCIATED SOURCE CLASSIFICATION CODES (SCCs): 2280002200

DESCRIPTION

This source category includes diesel-fueled towboats, typically equipped with Category 1 engines less than 2,000 horsepower, that operate on the Monongahela River within 2 locks encompassing the boundary of the L-C NAA.

EMISSIONS INVENTORY (annual tons)		
Pollutant	2007 tons	2014 tons
NO_x	289.619	284.355
$PM_{2.5}$	6.359	6.058
SO_2	12.442	5.504
VOC	6.551	6.697

CURRENT CONTROL REQUIREMENT

There are no restrictions on towboat operations in Allegheny County or the L-C $PM_{2.5}$ NAA. With funds from a $1.5 million grant, ACHD initiated a project to repower four tugboats that operate within the Port of Pittsburgh. However, these vessels may not operate within the L-C area. As such, RACM repower or retrofit options should focus on vessels known to operate exclusively in the NAA. Otherwise, it is expected that the benefits realized relative to the cost will be prohibitive.

U.S. Steel's Clairton Coke Works owns a small fleet of tugs dedicated to facility operations. Requests have been made to Clairton Coke Works for the actual number of tugs as well as age/emission levels of the engines. If the tugs are an older vintage and not equipped with advanced emission controls, the facility may want to consider Options 1 or 2 below.

TECHNOLOGICALLY FEASIBLE EMISSION CONTROL TECHNOLOGIES

Option 1
Vessel Repowering: This strategy involves early repowering (or replacement) of older Tier 0 engines with current (Tier 2) engines. Vessels with Tier 0 engines have higher emissions per hp-hr than newer engines. Because of the long average lifetime of towboat engines (~13 years), the majority of the population remains at Tier 0. The Port of Los Angeles estimates that repowering harbor craft engines can reduce PM and NO_x emissions by an average of 25 percent and 60 percent, respectively (POLA, 2005).

Option 2
Diesel Particulate Filters: Retrofit tugboats with DPFs, an after-treatment device that can be retrofitted to existing marine engines with only minor modifications to the exhaust system. DPFs are primarily for reducing PM emissions, with typical reductions of 80 to 90%.

Option 3
Diesel Idling Program: Controls for vessel idling typically take the form of on-shore power sources (e.g., cold ironing). Hotelling time is negligible for towboats operating on inland rivers. Tugs are deployed nearly constantly, are rarely at dock, and are most often refueled midstream (EPA, 1999). Therefore, no idling or on-shore control options are considered.

REFERENCES:

EPA, 1999: U.S. EPA, "Commercial Marine Activity for Great Lake and Inland River Ports in the United States," EPA420-R-99-019, September 1999.

POLA, 2005: Port of Los Angeles, Report to Mayor Hahn and Councilwoman Hahn, from the No Net Increase Task Force, Los Angeles, 2005.

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CHAPTER V. RECOMMENDATIONS

This chapter summarizes the expected emission reductions and cost effectiveness associated with the RACT/RACM options evaluated for mobile and area sources in the L-C $PM_{2.5}$ NAA, addresses the expected ambient $PM_{2.5}$ concentration reduction estimates associated with these potential control measures, and evaluates whether the RACT/RACM options in combination would be expected to advance the attainment date by one year or more.

Tables V-1, V-2, and V-3 summarize the RACT/RACM options analyses presented in the previous three chapters for the three key sectors: Area-Commercial-Industrial, Area-Home, and Mobile Sources. Each table provides estimates of potential 2014 $PM_{2.5}$ emission reductions and dollars per $PM_{2.5}$ ton for each source category-RACM option combination.

The analyses presented in Tables V-1, V-2, and V-3 show that the primary opportunities for achieving short-term, cost-effective $PM_{2.5}$ and $PM_{2.5}$ precursor emission reductions in the L-C area are as follows:

Residential wood combustion:

1. Woodstove change-out program that seeks to identify non-certified woodstoves that are frequently operated and replace them with new, certified stoves.
2. A curtailment program on expected high $PM_{2.5}$ days (alone or combined with #1). The cost of this program depends on whether ACHD has the in-house capability for forecasting PM concentrations.

Restaurants with charbroiling – require 85-90 percent control on units with weekly meat purchases above a certain threshold. A key issue here is determining the population of potentially affected units in the NAA.

Targeted retrofit program for diesel vehicles that primarily operate in the L-C area – like frequent visitors to USS-Clairton.

Construction contracts that limit construction equipment to those that meet the latest emission standards, or are retrofit with diesel PM filters.

Tugboats – there may be cost-effective opportunities to reduce tugboat emissions, but we need to know more about the characteristics of the tugs owned by USS-Clairton to retrofit engine replacement options. USS-Clairton may have already accomplished such reductions.

The residential fuel combustion analysis found that a woodstove changeout program and/or a curtailment of residential wood burning were potentially cost effective strategies for the L-C area. While Allegheny County already had a recent woodstove changeout program targeting low income households, that program was applied over a much larger area than L-C. The program evaluated here would be designed to identify older woodstoves in the L-C area and to replace them with new cleaner-burning stoves. The emission inventory process applied during this study for L-C estimates the NAA woodstove population to be 240. If a woodstove changeout program were to be implemented in L-C, then we recommend that a household survey be performed to identify actual woodstove populations, as well as where the older woodstoves are. TranSystems Corporation|E.H. Pechan & Associates developed a survey instrument for a recent Mid-Atlantic Regional Air Management Association-Mid-Atlantic Northeast Visibility Union study that provides a sample questionnaire.

Having a successful woodstove changeout program also requires finding a way to reach-out to homeowners and accelerate the changeout process. Stakeholders who might assist in this process include any local woodstove retailers, homeowners associations, or municipalities/boroughs. Finding funding sources is another key program component.

Table V-1. Area – Commercial-Industrial RACT/RACM Analysis Summary

Source Categories	Associated Facilities	RACM Options	Potential 2014 $PM_{2.5}$ Emission Reduction (annual tons)	$/$PM_{2.5}$ Ton
1. Funeral homes and pathogenic incinerators	Jefferson Hills Crematory	PM controls	0	-
2. Scrap salvage yards and metal recycling	Tube City IMS-USX Clairton	PM controls	0	-
3. Restaurants		Catalytic oxidizers HEPA filters	0.284 0.421	$8,610 16,384
4. Metal etching	Tech Met Glassport Plant	NO_x control	0	*
5. Refractories	TYK Refractories	PM control	0	-

* NO_x cost per ton range is $8,000 - $13,000 per ton.

Table V-2. Area Sources – Home RACM Analysis Summary

	RACM Options		Potential 2014 $PM_{2.5}$ Emission Reduction (annual tons)	$/$PM_{2.5}$ Ton
a. Wood-burning Stoves and Fireplaces	1.	Woodstove changeout program.	1.389	$12,500
	2.	Outreach programs.	Not estimated	-
	3.	Curtailments during days with expected high ambient levels of $PM_{2.5}$.	3.004	$145,221
	4.	Woodstove replacement when homes are sold.	0.034	$12,500
b. Wood-burning Boilers	1.	Compliance with new state/county regulations.	0.056	-
	2.	Curtailments during days with expected high ambient levels of $PM_{2.5}$.	0.270	$1.48 x 10^6
c. Coal Furnaces	1.	Changeout to natural gas.	Not estimated	-
d. Lawn Mowers/ Lawn Care	1.	Changeout to electric mowers.	0.004	$3.1 x 10^6
	2.	Replace older mowers with those meeting latest Tier standards.	Not estimated	>1
	3.	Native landscaping	Not estimated	-
	4.	Less frequent maintenance mowing	Not estimated	-
e. Leaf Blowing	1.	Leaf blowers replacement program (with electric)	0.021	$27,640
f. Snow Blowers	1.	Replacement program.	0.007	$668,040

Table V-3. Mobile Sources RACM Analysis Summary

		RACM Options	Potential 2014 $PM_{2.5}$ Emission Reduction (annual tons)	$/$PM_{2.5}$ Ton
a. On-road Highway	1.	Onroad diesel engine retrofits for school buses, trucks, and transit buses using EPA-verified technologies.	1.46	$25,000-75,000
	2.	Diesel idling programs for trucks.	0.04	750,000
	3.	Transportation control measures, as well as other transportation demand management and transportation systems management strategies.	0.01	8×10^6
	4.	Programs to reduce emissions or accelerate retirement of high emitting vehicles.	0.03	1.24×10^6
	5.	Emission testing and repair/maintenance programs for onroad vehicles.	Not estimated	-
	6.	Programs to expand use of clean burning fuels.	0.44	-
	7.	Low emissions specification for public or private vehicle fleets.	0.09	-
	8.	Opacity or other emission standards for gross emitting diesel equipment.	Not estimated	-
b. Off-road	1.	Diesel idling programs for construction equipment.	Not estimated	-
	2.	Nonroad diesel engine retrofit, rebuild or replacement with catalyzed particle filter.	0.37	$80,000
	3.	Programs to reduce emissions or accelerate retirement of high emitting boats	Not estimated	-
	4.	Emissions testing and repair/maintenance programs for nonroad heavy-duty vehicles and equipment.	Not estimated	-
	5.	Programs to expand use of clean burning fuels.	0.48	6.3×10^6
	6.	Low emission specifications for equipment or fuel used in large construction contracts.	0.43	180,000
	7.	Opacity of other emission standards for gross emitting diesel equipment.	Not estimated	-
c. Trucks to and from Industrial Facilities	1.	Diesel retrofits or replacement with new lower polluting engines.	Not estimated	-
	2.	Diesel idling programs for trucks.	0.04	-
	3.	Emission or opacity testing for NAA based trucks.	Not estimated	-
d. Railroad	1.	Diesel idling programs for switchers.	0.004	1.3×10^6
	2.	Low emission specifications for equipment or fuel used at industrial facilities or switch yards.	0.018	13.6×10^6
	3.	Low emission specifications for Class II line-haul locomotives.	0.036	72×10^6
e. Marine	1.	Vessel re-powering.	Not estimated	-
	2.	Diesel particulate filters.	Not estimated	-
	3.	Diesel idling programs.	Not estimated	-

There are a number of PM NAAs in the western states that have curtailment programs on forecasted high $PM_{2.5}$ days. Typically the curtailments are in three stages, with voluntary curtailments when $PM_{2.5}$ levels are expected to be in the 25-31 µg/m^3 range, limited curtailments with 24-hour average concentrations between 31-35 µg/m^3, and full curtailment above 35 µg/m^3.

For restaurant charbroiling, the estimated emission reductions are based on the expected numbers of charbroiling operations in the restaurant population, which may or may not prove to be accurate for an area like L-C. Therefore, if ACHD were interested in pursuing emission regulations for this source type, more detailed assessments of the numbers and sizes (weekly meat quantities purchased) are needed as a next step.

The sum of the potential 2014 $PM_{2.5}$ emission reductions for the most cost-effective RACM options is 6.5 tpy. This amount is 0.3 percent of the direct $PM_{2.5}$ emissions estimated for the L-C $PM_{2.5}$ NAA during 2007. An estimate of 2014 point source $PM_{2.5}$ emissions is not available for the area yet, so the percentage of estimated 2014 emissions cannot be computed. In any event, an emissions reduction of this magnitude is unlikely to have a noticeable impact on $PM_{2.5}$ concentrations in the NAA.

The positive matrix factorization analyses that have been performed by ACHD staff and in the companion TranSystems Corporation|E.H. Pechan & Associates Emission Inventory Assessment report provide initial information about the potential air quality improvement associated with emission reductions of this magnitude. The separate regional emissions modeling analysis that ACHD is sponsoring will provide a more detailed assessment of the relationship between local emission changes and $PM_{2.5}$ concentrations.

In summary, the finding of this analysis is that the set of RACMs that have been identified for the L-C $PM_{2.5}$ NAA are not likely to advance the attainment date by one year or more.

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The following pages list controls and efficiencies for specific processes at point sources within the Liberty-Clairton area, compiled by ACHD, 2011.

Sources include:

US Steel Mon Valley Works - Clairton Plant

Koppers Industries Inc.-Clairton Plant

Mid-Continent Coal and Coke Co.

Durabond

Pennsylvania Electric Coil

Mon Valley Transportation Center

AKJ Industries

US Steel Clairton Coke Works

Point #	Seg #	U. S. Steel Emission Source Unit Description	Final Emis. Control Equip. (1)	Control % Effic. (1)	Capture % Effic. (1)	Secondary Emis. Control Equip. (2)	Control % Effic. (2)	Capture % Effic. (2)	Tertiary Emis. Control Equip. (3)	Control % Effic. (3)	Capture % Effic. (3)
		Battery C fugitives									
		Charging	PROven System (Pressure Regulated Oven) neg. pressure on Main & Slight positive pressure on Ovens, Screw Feed Larry Car With Drop Sleeves, Electronic Controls of Individual Ovens for Each Coking Stage, Stage Charging, Auto Lid Lifters, & Sealed Holes			<12 Sec.Visibles /Charge			V.E. Method 303 Daily		
		Door Leaks	PROven System Reduces Door Leaks & Improves Seals to Convey Emissions to Main, neg. pressure on Main, Diligent Operating and Maintenance Practices, <2.5% Leaks, PLD; <8% Door Areas V.E.or 40% Opacity Anytime/Oven			FLEXZED Sealing System on Doors For Adjusting to Varying Door Body & Chamber Frame Contours, Prevents Air Infiltration, Sealing Doors & Jambs, Cleaning & Maintenance			V.E. Door Leaks Reduced by PROven System, V.E. Method 303 Daily		
		Topside Leaks	PROven System Reduces Lids, Offtakes Leaks, & Collection Main, neg. pressure on Main, Diligent Operating and Maintenance Practices, <0.4% Lid & 1.5% Offtake Leaks, PLL; V.E.For <2% Charge Ports or Port Seals; V.E.For <5% Offtake Piping			Luting & Joint Sealing			V.E. Lids & Offtakes Leaks Reduced by PROven System, V.E. Method 303 Daily		
		Soaking	PROven System Reduces Soaking Seal Leaks Between Oven and Collector Main			Green Coke Occurence Reduced by PROven System			Operate According to Work Practice Plan, Part 63 Subpart CCCCC		
		Decarbonizing	Results of Carbon Burned to CO 14% Less CO	95							
1		**Battery #1 fugitives**									
	1	Charging	Stage Charging, Volumetric Controls, Steam Aspirators, Auto Lid Lifters, Dual Collector Main, & Sealed Holes			<V.E. 55 Sec./5 Charges,12 Sec.Visibles /Charge			V.E. Method 303 Daily		
	2	Door Leaks	<3.8% Leaks, PLD; <10% Door Areas V.E.or 40% Opacity Anytime/Oven			Sealing Doors & Jambs, Maintenance			V.E. Method 303 Daily		
	4	Topside Leaks	<0.4% Lid & 2.5% Offtake Leaks, PLL; V.E.For <2% Charge Ports or Port Seals; V.E.For <5% Offtake Piping			Joint Sealing			V.E. Method 303 Daily		
	5	Soaking									
	6	Decarbonizing									
2		**Battery #2 fugitives**									
	1	Charging	Stage Charging, Volumetric Controls, Steam Aspirators, Auto Lid Lifters, Dual Collector Main, & Sealed Holes			<V.E. 55 Sec./5 Charges,12 Sec.Visibles /Charge			V.E. Method 303 Daily		
	2	Door Leaks	<3.8% Leaks, PLD; <10% Door Areas V.E.or 40% Opacity Anytime/Oven			Sealing Doors & Jambs, Maintenance			V.E. Method 303 Daily		
	4	Topside Leaks	<0.4% Lid & 2.5% Offtake Leaks, PLL; V.E.For <2% Charge Ports or Port Seals; V.E.For <5% Offtake Piping			Joint Sealing			V.E. Method 303 Daily		
	5	Soaking									
	6	Decarbonizing									
3		**Battery #3 fugitives**									
	1	Charging	Stage Charging, Volumetric Controls, Steam Aspirators, Auto Lid Lifters, Dual Collector Main, & Sealed Holes			<V.E. 55 Sec./5 Charges,12 Sec.Visibles /Charge			V.E. Method 303 Daily		
	2	Door Leaks	<3.8% Leaks, PLD; <10% Door Areas V.E.or 40% Opacity Anytime/Oven			Sealing Doors & Jambs, Maintenance			V.E. Method 303 Daily		
	4	Topside Leaks	<0.4% Lid & 2.5% Offtake Leaks, PLL; V.E.For <2% Charge Ports or Port Seals; V.E.For <5% Offtake Piping			Joint Sealing			V.E. Method 303 Daily		

Point #	Seg #	U. S. Steel Emission Source Unit Description	Final Emis. Control Equip. (1)	Control % Effic. (1)	Capture % Effic. (1)	Secondary Emis. Control Equip. (2)	Control % Effic. (2)	Capture % Effic. (2)	Tertiary Emis. Control Equip. (3)	Control % Effic. (3)	Capture % Effic. (3)
	5	Soaking									
	6	Decarbonizing									
7		**Battery #13 fugitives**									
	1	Charging	Stage Charging, Volumetric Controls, Steam Aspirators, Auto Lid Lifters, Dual Collector Main, & Sealed Holes			<V.E. 55 Sec./5 Charges,12 Sec.Visibles /Charge			V.E. Method 303 Daily		
	2	Door Leaks	<3.8% Leaks, PLD; <10% Door Areas V.E.or 40% Opacity Anytime/Oven			Sealing Doors & Jambs, Maintenance			V.E. Method 303 Daily		
	4	Topside Leaks	<0.4% Lid & 2.5% Offtake Leaks, PLL; V.E.For <2% Charge Ports or Port Seals; V.E.For <5% Offtake Piping			Joint Sealing			V.E. Method 303 Daily		
	5	Soaking									
	6	Decarbonizing									
8		**Battery #14 fugitives**									
	1	Charging	Stage Charging, Volumetric Controls, Steam Aspirators, Auto Lid Lifters, Dual Collector Main, & Sealed Holes			<V.E. 55 Sec./5 Charges,12 Sec.Visibles /Charge			V.E. Method 303 Daily		
	2	Door Leaks	<3.8% Leaks, PLD; <10% Door Areas V.E.or 40% Opacity Anytime/Oven			Sealing Doors & Jambs, Maintenance			V.E. Method 303 Daily		
	4	Topside Leaks	<0.4% Lid & 2.5% Offtake Leaks, PLL; V.E.For <2% Charge Ports or Port Seals; V.E.For <5% Offtake Piping			Joint Sealing			V.E. Method 303 Daily		
	5	Soaking									
	6	Decarbonizing									
9		**Battery #15 fugitives**									
	1	Charging	Stage Charging, Volumetric Controls, Steam Aspirators, Auto Lid Lifters, Dual Collector Main, Sealed Holes, & Three Rounds Refractory Repair			<V.E. 55 Sec./5 Charges,12 Sec.Visibles /Charge			V.E. Method 303 Daily		
	2	Door Leaks	<3.8% Leaks, PLD; <10% Door Areas V.E.or 40% Opacity Anytime/Oven			Sealing Doors & Jambs, Maintenance, Three Round Refractory Repair			V.E. Method 303 Daily		
	4	Topside Leaks	<0.4% Lid & 2.5% Offtake Leaks, PLL; V.E.For <2% Charge Ports or Port Seals; V.E.For <5% Offtake Piping			Joint Sealing, Three Round Refractory Repair			V.E. Method 303 Daily		
	5	Soaking									
	6	Decarbonizing									
10		**Battery #19 fugitives**									
	1	Charging	Stage Charging, Volumetric Controls, Steam Aspirators, Auto Lid Lifters, Dual Collector Main, & Sealed Holes			<V.E. 55 Sec./5 Charges,12 Sec.Visibles /Charge			V.E. Method 303 Daily		
	2	Door Leaks	<3.8% Leaks, PLD;<8% Door Areas V.E.or 40% Opacity Anytime/Oven			Big Plug Doors, Sealing Doors & Jambs, Maintenance,Advanced Patching			V.E. Method 303 Daily		
	4	Topside Leaks	<0.4% Lid & 2.5% Offtake Leaks, PLL; V.E.For <2% Charge Ports or Port Seals; V.E.For <5% Offtake Piping			Joint Sealing, Advanced Patching			V.E. Method 303 Daily		
	5	Soaking									
	6	Decarbonizing									
11		**Battery #20 fugitives**									
	1	Charging	Stage Charging, Volumetric Controls, Steam Aspirators, Auto Lid Lifters, Dual Collector Main, & Sealed Holes			<V.E. 55 Sec./5 Charges,12 Sec.Visibles /Charge			V.E. Method 303 Daily		

Point #	Seg #	U. S. Steel Emission Source Unit Description	Final Emis. Control Equip. (1)	Control % Effic. (1)	Capture % Effic. (1)	Secondary Emis. Control Equip. (2)	Control % Effic. (2)	Capture % Effic. (2)	Tertiary Emis. Control Equip. (3)	Control % Effic. (3)	Capture % Effic. (3)
	2	Door Leaks	<3.8% Leaks, PLD; <5% Door Areas V.E.or 40% Opacity Anytime/Oven			Big Plug Doors, Sealing Doors & Jambs, Maintenance, Advanced Patching			V.E. Method 303 Daily		
	4	Topside Leaks	<0.4% Lid & 2.5% Offtake Leaks, PLL; V.E.For <1% Charge Ports or Port Seals; V.E.For <4% Offtake Piping			Joint Sealing, Advanced Patching			V.E. Method 303 Daily		
	5	Soaking									
	6	Decarbonizing									
12		**Battery B fugitives**									
	1	Charging	Stage Charging, Volumetric Controls, Steam Aspirators, Auto Lid Lifters, Dual Collector Main, & Sealed Holes			<V.E. 55 Sec./5 Charges,12 Sec.Visibles /Charge			V.E. Method 303 Daily		
	2	Door Leaks	<4.3% Leaks, PLD; <5% Door Areas V.E.or 40% Opacity Anytime/Oven			Sealing Doors & Jambs, Maintenance			V.E. Method 303 Daily		
	4	Topside Leaks	<0.4% Lid & 2.5% Offtake Leaks, PLL; V.E.For <1% Charge Ports or Port Seals; V.E.For <4% Offtake Piping			Joint Sealing			V.E. Method 303 Daily		
	5	Soaking									
	6	Decarbonizing									
		Battery Underfiring									
		Battery C Stack	Desulfurized COG Used, NOx CEMS, <0.009 grs. PT/dscf exhaust, Continuous Opacity Monitor, Opacity 20% @ 3min., 60%@anytime; Daily Opacity 15% Normal Coke Cycle, Daily 20%, Part 63 Subpart CCCCC.			New Ovens Have Significantly Less Raw COG Leakage Reducing Emissions of SO_2, PM2.5, NO_x, VOC & CO. & PROven System Keeps Low Oven Pressure, Pre-Stressing of Batt. Walls, & Oven Wall Maintenance			Less COG Needed / Ton of Coke. This Reduces All COG Emissions From C Batt. Stack, Staged Combustion Air Underfiring Reduces NOx, VOC, & CO		
13		Battery #1 Stack	Desulfurized COG Used; NOx CEMS; <0.015 grs.PT/dscf exhaust; COM, Opacity 20%@3min.,60%@anytime			Oven Wall Maintenance			Staged Underfiring; <500 ppm dry vol. SO_2 in Outlet		
14		Battery #2 Stack	Desulfurized COG Used; NOx CEMS; <0.015 grs.PT/dscf exhaust; COM, Opacity 20%@3min.,60%@anytime			Oven Wall Maintenance			Staged Underfiring; <500 ppm dry vol. SO_2 in Outlet		
15		Battery #3 Stack	Desulfurized COG Used; NOx CEMS; <0.015 grs.PT/dscf exhaust; COM, Opacity 20%@3min.,60%@anytime			Oven Wall Maintenance			Staged Underfiring; <500 ppm dry vol. SO_2 in Outlet		
19		Battery #13 Stack	Desulfurized COG Used; NOx CEMS; <0.015 grs.PT/dscf exhaust; COM, Opacity 20%@3min.,60%@anytime			Oven Wall Maintenance			Staged Underfiring; <500 ppm dry vol. SO_2 in Outlet		
20		Battery #14 Stack	Desulfurized COG Used; NOx CEMS; <0.015 grs.PT/dscf exhaust; COM, Opacity 20%@3min.,60%@anytime			Oven Wall Maintenance			Staged Underfiring; <500 ppm dry vol. SO_2 in Outlet		
21		Battery #15 Stack	Desulfurized COG Used; NOx CEMS; <0.015 grs.PT/dscf exhaust; COM, Opacity 20%@3min.,60%@anytime			Oven Wall Maintenance			Staged Underfiring; <500 ppm dry vol. SO_2 in Outlet		
22		Battery #19 Stack	Desulfurized COG Used; NOx CEMS; <0.015 grs.PT/dscf exhaust; COM, Opacity 20%@3min.,60%@anytime			Oven Wall Maintenance & Replacement, Revitalization Plan			WOBBE Stabilizer,Staged Underfiring; <500 ppm dry vol. SO_2 in Outlet		
23		Battery #20 Stack	Desulfurized COG Used; NOx CEMS; <0.015 grs.PT/dscf exhaust; COM, Opacity 20%@3min.,60%@anytime			Oven Wall Maintenance & Replacement, Revitalization Plan			WOBBE Stabilizer,Staged Underfiring; <500 ppm dry vol. SO_2 in Outlet		

Point #	Seg #	U. S. Steel Emission Source Unit Description	Final Emis. Control Equip. (1)	Control % Effic. (1)	Capture % Effic. (1)	Secondary Emis. Control Equip. (2)	Control % Effic. (2)	Capture % Effic. (2)	Tertiary Emis. Control Equip. (3)	Control % Effic. (3)	Capture % Effic. (3)
24		Battery B Stack	Desulfurized COG Used; NOx CEMS; <0.015 grs.PT/dscf exhaust; COM, Opacity 20%@3min.,60%@anytime			Oven Wall Maintenance			Staged Underfiring; <500 ppm dry vol. SO_2 in Outlet		
		PEC System, Batt. C									
		PEC Baghouse	New Pulse Jet Baghouse; PEC Maintained & Operated	99.684	90	(See PEC Fugitives)			<0.005 gr.PT/dscf Outlet; <0.02 lb.PT/Ton of Coke at Outlet, Part 63 Subpart CCCCC; & <20% V.E. at PEC Outlet Anytime		
		Traveling Hot Car	PEC Hood Over Coke Push of New Larger Hot Car, Uncovered Car Travel (With Fewer Trips, Shorter Distance, & Smaller Car Surface Area / Volume Ratio), <10% V.E. Anytime								
		PEC Fugitives	PEC Moveable Hood Integral to Door Machine for Pushing	0.001	90						
		Uncontrolled Pushing									
		Ball Mill									
25		**PEC System, Batt. 1-3**									
		PEC Baghouse	Pulse Jet Baghouse (5 Module), Belco; PEC Maintained & Operated	99.435		(See PEC Fugitives)			<0.040 lb./Ton of Coke at Outlet & <20% V.E. at PEC Outlet Anytime		
		Traveling Hot Car	<10% V.E. Anytime								
		PEC Fugitives	PEC Traveling Hood for Pushing + Fans Upgrade	0.001	88						
		Uncontrolled Pushing									
		Ball Mill									
27		**PEC System, Batt. 13-15**									
		PEC Baghouse	Pulse Jet Baghouse (5 Module), Belco; PEC Maintained & Operated	99.435		(See PEC Fugitives)			<0.040 lb./Ton of Coke at Outlet & <20% V.E. at PEC Outlet Anytime		
		Traveling Hot Car	<10% V.E. Anytime								
		PEC Fugitives	PEC Traveling Hood for Pushing + Fans Upgrade	0.001	88						
		Uncontrolled Pushing									
		Ball Mill									
28		**PEC System, Batt. 19-20**									
		PEC Baghouse	Pulse Jet Baghouse (5 Module), Belco; PEC Maintained & Operated	99.531		(See PEC Fugitives)			<0.010 gr.PT/dscf Batt #19 Outlets, <0.04 lb.PT/Ton of Coke Batt #20 Outlets, & <20% V.E. at PEC Outlets for Batt #19 & 20 Anytime		
		Traveling Hot Car	<10% V.E. Anytime								
		PEC Fugitives	PEC Traveling Hood for Pushing + Fans Upgrade	0.001	88						
		Uncontrolled Pushing									
		Ball Mill									

Point #	Seg #	U. S. Steel Emission Source Unit Description	Final Emis. Control Equip. (1)	Control % Effic. (1)	Capture % Effic. (1)	Secondary Emis. Control Equip. (2)	Control % Effic. (2)	Capture % Effic. (2)	Tertiary Emis. Control Equip. (3)	Control % Effic. (3)	Capture % Effic. (3)
29		**PEC System, Battery B**									
		PEC Baghouse	Pulse Jet Baghouse (12 Modules+ 2 Standby), Mikropul; PEC Maintained & Operated	88.84		(See PEC Fugitives)			<0.040 lb./Ton of Coke at Outlet & <20% V.E. at PEC Outlet Anytime		
		Traveling Hot Car	PEC Secondary Shed Hood			<10% V.E. Anytime					
		PEC Fugitives	PEC Sheds Hood for Pushing	0.001	95						
		Uncontrolled Pushing									
		Ball Mill									
		Quenching									
		Quench Tower C	Double Baffles, New Extra Tall Tower Height, Extra Exit Area; <5% Area Open to Sky, Part 63 Subpart CCCCC; & Below Baffles Second Mist Supression Spray (LEQ), Proper Maintenance, & Other Work Practices	71.82	100	Article XXI, §2105.21.g, Quenching; Larger Quench Sump for Better Settling & Cleaner Recycle Water, Rake to Remove Solids			Auxiliary Tower for Batt. C is Quench Tower B		
30		Quench Tower 1	Double Baffles, Normal Tower Height, & Proper Maintenance	71.82	100	Article XXI, §2105.21.g, Quenching					
33		Quench Tower #5A	Double Baffles, New Extra Tall Tower Height, Extra Exit Area; <5% Area Open to Sky, Part 63 Subpart CCCCC; & Below Baffles Second Mist Supression Spray (LEQ), Proper Maintenance, & Other Work Practices	71.82	100	Article XXI, §2105.21.g, Quenching; Larger Quench Sump for Better Settling & Cleaner Recycle Water, Rake to Remove Solids					
32		Quench Tower #7A	Double Baffles, New Extra Tall Tower Height, Extra Exit Area; <5% Area Open to Sky, Part 63 Subpart CCCCC; & Below Baffles Second Mist Supression Spray (LEQ), Proper Maintenance, & Other Work Practices	71.82	100	Article XXI, §2105.21.g, Quenching; Larger Quench Sump for Better Settling & Cleaner Recycle Water, Rake to Remove Solids					
34		Quench Tower B	Single Baffles, Normal Tower Height, & Proper Maintenance	71.82	100	Article XXI, §2105.21.g, Quenching					
		Boiler #1									
35		COG	NOx CEMS, <0.02 lbs.PT/10^6 BTU Input			COG <40 gr H_2S/100 dscf (Batts. 13-15, 19-20, B); COG <34 gr H2S/100 dscf (C, D Batts.)			<0.54 lb.NOx/MMBtu & <1740 Tons NOx/yr		
36		NG									
		Boiler #2									
38		COG	NOx CEMS, <0.02 lbs.PT/10^6 BTU Input			COG <40 gr H_2S/100 dscf (Batts. 13-15, 19-20, B); COG <34 gr H2S/100 dscf (C, D Batts.)			<0.54 lb.NOx/MMBtu & <1285 Tons NOx/yr		
39		NG									
		Boiler R-1									
47		COG	<0.02 lbs.PT/10^6 BTU Input			COG <40 gr H_2S/100 dscf (Batts. 13-15, 19-20, B); COG <34 gr H2S/100 dscf (C, D Batts.)			<0.54 lb.NOx/MMBtu & <525 Tons NOx/yr		
49		NG									

Point #	Seg #	U. S. Steel Emission Source Unit Description	Final Emis. Control Equip. (1)	Control % Effic. (1)	Capture % Effic. (1)	Secondary Emis. Control Equip. (2)	Control % Effic. (2)	Capture % Effic. (2)	Tertiary Emis. Control Equip. (3)	Control % Effic. (3)	Capture % Effic. (3)
		Boiler R-2									
49		COG	<0.02 lbs.PT/10^6 BTU Input			COG <40 gr H_2S/100 dscf (Batts. 13-15, 19-20, B); COG <34 gr H2S/100 dscf (C, D Batts.)			<0.54 lb.NOx/MMBtu & <525 Tons NOx/yr		
50		NG									
		Boiler T-1									
51		COG	<0.02 lbs.PT/10^6 BTU Input or Alternate <0.120 PM-10/10^6 BTU			COG <40 gr H_2S/100 dscf (Batts. 13-15, 19-20, B); COG <34 gr H2S/100 dscf (C, D Batts.)			<0.54 lb.NOx/MMBtu & <358 Tons NOx/yr		
52		NG									
		Boiler T-2									
53		COG	<0.02 lbs.PT/10^6 BTU Input or Alternate <0.120 PM-10/10^6 BTU			COG <40 gr H_2S/100 dscf (Batts. 13-15, 19-20, B); COG <34 gr H2S/100 dscf (C, D Batts.)			<0.54 lb.NOx/MMBtu & <358 Tons NOx/yr		
54		NG									
		BY-PRODUCT PLANT									
55		Tar/Flushing Liquor Decanters	LDAR for VHAP			Part 61 Subpart V					
56		F.L. Circ / Surge Tanks	LDAR for VHAP			Part 61 Subpart L					
57		Tar Storage / Separator Tanks	LDAR for VHAP			Part 61 Subpart L					
58		Weir Tank / Intercept Sump	LDAR for VHAP			Part 61 Subpart V					
59		Final Cooler Sump	Condenser	98		LDAR for VHAP			Part 61 Subpart V		
60		F.L. Pumphouse Sumps	LDAR for VHAP			Part 61 Subpart V					
61		Equip. Leaks / Sample Connections	LDAR for VHAP			Part 61 Subpart V					
62		Tar Collecting Tanks	LDAR for VHAP			Part 61 Subpart L					
		MATERIAL HANDLING									
63		#1 Unloader	Opacity, & NSPS Subparts A & Y								
		#2 Unloader	Opacity, & NSPS Subparts A & Y								
64		Pedestal Crane									
65		Clamshell Unloader									
65A		Boom Conveyor									
	1	Front End Loader to Truck									
	2	Truck to Hopper									
	3	Hopper to Conveyor	Enclosure Hood at 8.28% Moisture	50							
	4	Conveyor to Barge									
66		Coal Transfer for Conveyor & Tower Drops	Deflector Plates, Hoppers & Chutes at 6.46% Moisture			Opacity <20%@ 3min.,<60% @Anytime					
67	1	#1 Pulverizer - Primary	Enclosed Feed Chutes	50		Dust Suppressant Prior to Entry	92				
	2	#1 Pulverizer - Secondary	Enclosed Feed Chutes	50		Dust Suppressant Prior to Entry	92				
68	1	#2 Pulverizer - Primary	Enclosed Feed Chutes	50		Dust Suppressant Prior to Entry	92				
	2	#2 Pulverizer - Secondary	Direct Feed Chute & Distribution Plough, Enclosed Feed Chutes	50		Dust Suppressant Prior to Entry	92				
69		Coal Storage,Bins#1&2/Bunkers1,5,7&B									
70		Coal Storage, Pile Erosion									
71		Coke Transfer: B, C	Surfactant Dust Suppressant								
72		Coke Transfer: 13-15, 19-20									
73		Coke Pile, Load/Unload									
74	1	#1 Screening Station 1-3	Enclosure	50		Feed Conveyors Covered					
	2	#1 Screening Station Loadout	Enclosure Hood	50							

Point #	Seg #	U. S. Steel Emission Source Unit Description	Final Emis. Control Equip. (1)	Control % Effic. (1)	Capture % Effic. (1)	Secondary Emis. Control Equip. (2)	Control % Effic. (2)	Capture % Effic. (2)	Tertiary Emis. Control Equip. (3)	Control % Effic. (3)	Capture % Effic. (3)
75	1	#2 Screening Station 13-15, 19-20	Enclosure	50							
	2	#2 Screening Station Loadout	Enclosure Hood	50							
		#4 Screening Station B & C Baghouse	New Pulse Jet Baghouse - B & C	98.9		(See Screening Fugitives-B&C)					
		#4 Screening Station B & C Loadout	Enclosure Hood	50							
		#4 Screening Fugitives - B & C	Hoods, & Enclosure	50	85						
77		Coke Pile Erosion									
		MISCELLANEOUS									
78		Blasting - Black Beauty	Enclosure	50		Opacity					
79	1	Roads - Paved	Street Sweeping	90							
	2	Roads - Unpaved	Dust Suppressant	90							
80		Heavy Duty Motor Vehicles									
81		Tug Boat Exhaust									
82		**Facility Maintenance**									
	1	Safety-Kleen Parts Washer									
	2	Paints and Thinners									
83		SCOT Stack	Afterburner	98		LDAR for VHAP			H_2S CEM		
84		Cooling Tower, Induced Crossflow	Normal Mist Eliminator	98	100						
85		Flaring	Enclosed Flare at 1925°F	98		Part 63 Subpart L, Part 61 Subpart V					
86		Aeration Basins - WWTP									
87		**Methanol Usage**									
	1	Air Lines									
	2	Winter Lid Slurry									
	3	Storage Tanks									
88		WWT Surge Tank, Ammonia Flare	Flare at 1925°F	98		<2920 Hrs. WWT Opertion/yr.					
89		Ammonia Tanker Loading, Flare	(See WWT Surge Tank, Ammonia Flare)			<1400 Hrs. Operation/yr.					
90		COG Venting	Enclosed Flare For Abnormal COG By-Pass, (Part 63 Subpart L)	98							
91		Light Oil Collecting and Storage Tanks	Gas Blanketing System	98		LDAR for VHAP			Part 61 Subpart L		
92		Light Oil Barge Loading	Vapor Balancing System			LDAR for VHAP			Part 63 Subpart Y, Part 61 Subpart L		
93		Light Oil Decanters	LDAR for VHAP			Part 61 Subpart L, Part 61 Subpart V					
		Regenerator Stone Cleaning	Opacity <20% @3 min., 60% Anytime								

Koppers Industries Inc.-Clairton Plant

Point #	Seg #	Emission Source Unit Description	Final Emis. Control Equip. (1)	Control % Effic. (1)	Capture % Effic. (1)	Secondary Emis. Control Equip. (2)	Control % Effic. (2)	Capture % Effic. (2)	Tertiary Emis. Control Equip. (3)	Control % Effic. (3)	Capture % Effic. (3)
1		**Tar Refining**									
	1	TAR REFINING PROCESS	PROCESS HEATERS (8)/ USX, Temp.1200°F	95	100	BLANKET GAS BE1 CHILLER & SEPARATORS	60.15	100	NAT'L GAS BLANKETED TANKS & nc PRES. RELIEFS for TANKS V113, 8, 9, V110 & column ejectors 1T1, (2T4)+(TI), 2D5, 2T1, & 1T2	0.001	100
	2	TAR REFINING FUGITIVES	LDAR for FUGITIVES, Part 61 Subparts L & V	90	100						
2		Rod Pitch Process									
	1	MANUFACTURING	PULSEJET BAGHOUSE-LOW TEMP. <180°F for Pitch Cooler & Dryer	99	100						
	2	Fugitives									
3	1	2T1 Hot Oil Heater,2F-1B	Opacity <20% @ 3min., 60% Anytime								
	2	**1T2 Hot Oil Heater (Spare), 1F-1C**	Opacity <20% @ 3min., 60% Anytime								
4	1	2T2 Primary Heater, 2F-1A	Opacity <20% @ 3min., 60% Anytime								
5	1	TI Heater, 2F-2A	Opacity <20% @ 3min., 60% Anytime								
6	1	1T1 Hot Oil Heater, 1F-1B idle	Opacity <20% @ 3min., 60% Anytime								
7	1	2T4 Hot Oil Heater, 1F-2C	Opacity <20% @ 3min., 60% Anytime								
8	1	2D5 Secondary Heater, 2F-1C	Opacity <20% @ 3min., 60% Anytime								
	2	Prill Hot Oil Heater	Opacity <20% @ 3min., 60% Anytime								
9	1	**Petroleum Pitch RAILCARS Depress.**									
10		Transportation									
	1	Gasoline Vehicle Exhaust	Limit Truck Idling, & Vehicle Turnover								
	2	Diesel Vehicle Exhaust	Truck & Heavy Vehicle Retrofits, Limit Idling, & Vehicle Turnover								
	3	Paved Roads	DUST SUPPRES.-WATER SPRAYS	70	100						
	4	Unpaved Roads	DUST SUPPRES.-WATER SPRAYS	70	100						
11		Loading Losses									
	1	**Liquid Loading**									
	2	Rod Pitch Loading									
20		Creosote Process	THERMAL OXIDIZER [1] Temp.1400°F	99	100						
25		Soil/Vapor Recovery									
26		Cooling Tower									
28		Heaters (8) Blanket Gas VOC Only Combustion (See Refining)									

Mid-Continent Coal and Coke Co.

Point #	Seg #	Emission Source Unit Description	Final Emis. Control Equip. (1)	Control % Effic. (1)	Capture % Effic. (1)	Secondary Emis. Control Equip. (2)	Control % Effic. (2)	Capture % Effic. (2)	Tertiary Emis. Control Equip. (3)	Control % Effic. (3)	Capture % Effic. (3)
1		**Transfer Points**									
	1	Breeze Conveyor	V.E. <20%@3min.,&60%@ anytime								
	2	Screen#1outfall	V.E. <20%@3min.,&60%@ anytime								
	3	Screen#2outfall	V.E. <20%@3min.,&60%@ anytime								
	4	Conveyor Outfall	V.E. <20%@3min.,&60%@ anytime								
	5	Small Pile	V.E. <20%@3min.,&60%@ anytime								
	6	Buckwheat Pile	V.E. <20%@3min.,&60%@ anytime								
	7	**Coke Breeze**	V.E. <20%@3min.,&60%@ anytime								
2		Screens									
	1	Screen 1	Enclosure								
	2	Screen 2	Enclosure								
	3	Screen 3	Enclosure								
3		Wind Erosion									
	1	Wind Erosion									
4		**Storage Piles**									
	1	Storage Piles(0.814% Moisture)	Dust Suppressant	70							
5		Road Emissions									
	1	Trucks	V.E. <20%@3min.,&60%@ anytime								
	2	970F Loader	V.E. <20%@3min.,&60%@ anytime								
	3	950E Loader	V.E. <20%@3min.,&60%@ anytime								
	4	**950B Loader**	V.E. <20%@3min.,&60%@ anytime								
6	1	Diesel Fuel	<= 0.05% Sulfur Content	75							

Durabond

Point #	Seg #	Emission Source Unit Description	Final Emis. Control Equip. (1)	Control % Effic. (1)	Capture % Effic. (1)	Secondary Emis. Control Equip. (2)	Control % Effic. (2)	Capture % Effic. (2)	Tertiary Emis. Control Equip. (3)	Control % Effic. (3)	Capture % Effic. (3)
1		**FUSION BOND PROCESS**									
	1	FUSION BOND AIR WASH									
2		EXTRUSION PROCESS(X-TEC)									
	1	X-TEC OIL HEATER									
	2	XTEC WB BH STACK	Baghouse	90	90						
3		FUSION BOND OVEN 1									
4		FUSION BOND OVEN 2									
5		FUSION BOND OVEN 3									
6		FUSION BOND WB-1 BH STACK	Baghouse	90	90						
7		FUSION BOND WB-2 BH STACK	Baghouse	90	90						
8		FUSION BOND DRYING OVEN									
9		GASOLINE STORAGE TANK	Consevation Vent	75	100						
10		DIESEL STORAGE TANK									
11		ROAD EMISSIONS									
	1	ROAD DUST (Haul Trucks)	Watering	50	50						
	3	ROAD DUST (Forklifts)	Watering	50	50						
	2	FORKLIFT EMISSIONS (Diesel)	Catalytic Retrofit & Spark Adjust.	95	98						

Pennsylvania Electric Coil

Point #	Seg #	Emission Source Unit Description	Final Emis. Control Equip. (1)	Control % Effic. (1)	Capture % Effic. (1)	Secondary Emis. Control Equip. (2)	Control % Effic. (2)	Capture % Effic. (2)	Tertiary Emis. Control Equip. (3)	Control % Effic. (3)	Capture % Effic. (3)
A03		**Large Bake Oven**									
	1	Natural Gas Combustion	Opacity < 20%@3min.,60% anytime								
	2	Coating Evaporation	Opacity < 20%@3min.,60% anytime								
A04		Small Bake Oven									
	1	Natural Gas Combustion	Opacity < 20%@3min.,60% anytime								
	2	Coating Evaporation	Opacity < 20%@3min.,60% anytime								
A09	1	Abrasive Blasting	Baghouse, low temp.	99	99	Opacity<20%@3min.,60% anytime					
A10	1	**Paint Spray Booth**	Fabric Filters	99	100	Opacity<20%@3min.,60% anytime					
A14		Coil Manufacturing, Oven, 3 units									
	1	Natural Gas Combustion	Opacity < 20%@3min.,60% anytime								
	2	Coating Evaporation	Opacity < 20%@3min.,60% anytime								
A15		Skin/Tin Area									
	1	Tinning Process	Blast Baghouse, low temp.& Hood	98.4	100	Opacity<20%@3min.,60% anytime					
	2	Natural Gas Combustion	Opacity < 20%@3min.,60% anytime								
A16	1	**Gas Insulator**	Opacity < 20%@3min.,60% anytime								
A17	1	Coil Pressing Area	Opacity < 20%@3min.,60% anytime								
A18	1	Cleaning of Motor Parts	Opacity < 20%@3min.,60% anytime								
D03	1	U-372 Storage Area	Conservation Vent								
D04	1	U-475 Storage Area	Conservation Vent								
D05	1	TSR-601 Varnish Tank	Conservation Vent								
D06	1	B7-373 Resin Storage Tank	Conservation Vent								
D07	1	**B7-619 Resin Storage Tank**	Conservation Vent								
G08	1	Miscellaneous Fugitive Emissions									
I02	1	Boiler	Opacity < 20%@3min.,60% anytime								
I03	1	Gas Radient Space Heaters	Opacity < 20%@3min.,60% anytime								
P01		Small Burnoff Oven									
	1	Coating Evaporation	Afterburner for Fume	99	100				Precleaning Material		
	2	Natural Gas Combustion	Opacity < 20%@3min.,60% anytime								
P02		Large Burnoff Oven									
	1	Coating Evaporation	Afterburner for Fume	99	100				Precleaning Material		
	2	Natural Gas Combustion	Opacity < 20%@3min.,60% anytime								

Mon Valley Transportation Center

Point #	Seg #	Emission Source Unit Description	Final Emis. Control Equip. (1)	Control % Effic. (1)	Capture % Effic. (1)	Secondary Emis. Control Equip. (2)	Control % Effic. (2)	Capture % Effic. (2)	Tertiary Emis. Control Equip. (3)	Control % Effic. (3)	Capture % Effic. (3)
		Material Handling Process									
P	1	Rail Car (Bottom) Unloading									
	1a	Rail Car (Bottom Dump) to Hopper	Water Sprays	50	70						
	1b	Hopper Conveyor #1									
	1c	Dock Conveyor #2	Covered Conveyor	95	90						
P	2	Dock #2 Barge Loading									
	2a	**Dock #2 Barge Conveyor**	Covered Conveyor	95	90						
	2b	Dock #2 Drop Sleeve	Drop Sleeve	99	95						
P	3	Dock #3 Barge Unloading									
	3a	Dock #3 Barge Unloading Transfer									
	3b	Dock #3 Hopper Conveyor #1	Covered Conveyor	95	90						
	3c	Dock #3 Conveyor #2	Covered Conveyor	95	90						
P	4	Dock #2 Bin Transfer Station									
P	5	Dock #1 Barge Unloading									
	5a	Dock #1 Barge Unloading Transfer (Crane or Stick Excavator) + Hopper									
	5b	Dock #1 Conveyor #1	Covered Conveyor	95	90						
	5c	Dock #1 Conveyor #2	Covered Conveyor	95	90						
P	6	Pet Coke Screening									
P	6a	Pet Coke Screening + Conveyor Fugitives	Covered Conveyor	50	70						
	6b	Pet Coke Screening Loadout	Drop Sleeve	50	70						
		Fugitive Emssions									
F		Storage Piles									
F	2	Ground Storage Stockpiles Loadout	Water Sprays	50	70						
F		Wind Erosion									
F	3	Wind Erosion	Water Sprays	90	95						
F		Road Emissions									
F	1	Trucks	Dust Supressant or Water Sprays	95	95						
			Dust Supressant or Water Sprays	95	95						
			Dust Supressant or Water Sprays	95	95						
			Dust Supressant or Water Sprays	95	95						
C	1	Diesel Fuel	Catalytic Retrofit & Spark Ajustment	99	98						

AKJ Industries

Point #	Seg #	Emission Source Unit Description	Final Emis. Control Equip. (1)	Control % Effic. (1)	Capture % Effic. (1)	Secondary Emis. Control Equip. (2)	Control % Effic. (2)	Capture % Effic. (2)	Tertiary Emis. Control Equip. (3)	Control % Effic. (3)	Capture % Effic. (3)
1		**Unit#1 Coal Tar Waste Sludge Process**									
	1	Unit#1 Batch Mixer (Sludge/Diluent+Dispersant)	Flat Closed Lid, & Conservation Vent								
	2	Unit#1 Product Storage Tank (Fixed Roof)	Conservation Vent								
2		Unit#2 Coal Tar Waste Sludge Process									
	1	Unit#2 Batch Mixer (Sludge/Diluent+Dispersant)	Flat Closed Lid, & Conservation Vent								