

**Evaluation of Indiana's Continuous PM2.5 Data**  
**Revised Proposed Exclusion of Data from Comparison to the NAAQS**  
**October 18, 2013**

**Introduction**

The State of Indiana through the Office of Air Quality of IDEM has operated continuous PM2.5 monitors since 2000. Over the years the network has expanded to 15 sites. The monitors have been converted from available non FEM monitors to FEM monitors as they became approved, the reliability was considered adequate, and funding was sufficient to obtain them. The data from the continuous FEM monitors currently are used for AQI purposes and for submittal to AirNow for national and regional mapping purposes. Indiana has not used the data for design value calculations and comparison to the National Ambient Air Quality Standards (NAAQS). The comparison between the data from the intermittent FRM/FEMs and the continuous FEMs has not always met the criteria for comparison as set forth in 40CFR Part 53. This analysis and proposal details Indiana's determination of the data which are acceptable for use in NAAQS calculations or should be excluded.

**Rules and Guidance**

The rules and procedures for the testing and approval of ambient air monitoring reference and equivalent methods are contained in 40CFR part 53. Table C-4 of Subpart C contains the specific criteria for the determination of Class III FEM monitors for the collection of PM2.5 concentrations.

On January 15, 2013 USEPA promulgated new requirements (78 FR 3086) for assessing the continuous PM2.5 data. These included amending "§58.11 Network Technical Requirements" by adding a new subsection (e) which defined the data and the requirements needed to determine if continuous FEM data from a State's or Local Agency's network should be used for comparison to the NAAQS.

§58.11(e) is summarized as follows:

1. State and local governments must assess the data from the Class III FEM PM2.5 monitors using the performance criteria in Table C-4 of subpart C to identify data which does not meet criteria and should not be used in comparison to the NAAQS.
2. The assessment should be included in the agency's annual network plan.
3. Values down to 0 ug/m3 can be included.
4. A minimum of one test site with one FRM and at least one FEM is required.
5. The precision statistic does not apply.
6. All seasons must be covered, with no more than 36 consecutive months aggregated together.
7. The key statistic metric is the bias (both additive and multiplicative) of the FEM compared to the FRM. Correlation is required to be reported, but failure to meet these criteria is not cause to exclude the data.

In April 2013, detailed instructions and a template for requesting exclusion of the data were distributed by OAQPS. It provided a detailed summary of the items required, explanation of the required statistics, and a variety of analysis tools available to aid in the analysis. The procedures for submitting the exclusion request outside of the annual network review were also included.

### **Indiana's Network**

At the end of 2012 Indiana operated 16 continuous PM<sub>2.5</sub> monitors at 15 sites across the state. All the monitors are FEMs and collocated with intermittent FEMs (R&P/Thermo 2025 w/VSCC). Ten sites use the Met One BAM1020, three sites use the Thermo 5030 SHARP, one site collects data with an Thermo TEOM 1400a w/8500C FDMS, and one site operates both a BAM1020 and a TEOM. Table 1 is a listing of current network.

### **Data Period to Review**

In general, Indiana evaluated the data for the current monitor being used at the sites for the past three years, 2010 thru 2012. If a current site had not been collecting data with the current monitor for a minimum of two years, it was not evaluated in terms of data exclusion. Past monitors which were discontinued during this period and replaced with another monitoring method were also not included. Table 1 lists the sites which are included in this analysis.

### **Request for Exclusion of Data**

In accordance with the PM NAAQS rule published on January 15, 2013 and specific to the provisions detailed in §58.10 (b)(13) and §58.11 (e), Indiana is requesting that data from specific sites and time periods be set aside for comparison to the NAAQS. IDEM is working to optimize the monitoring instrumentation used to meet all of the monitoring objectives. Indiana is not yet at a point where the comparability of all the PM<sub>2.5</sub> continuous FEMs operated in the network compared to the collocated FRMs is acceptable such that Indiana is comfortable using the continuous FEM data for comparison to the NAAQS. After assessing the comparability of the PM<sub>2.5</sub> FEMs to the collocated FRMs in the network, IDEM has determined that most sites, with the results summarized in Table 2, do not meet the comparability requirements and an exclusion of the data is requested.

Of the ten sites evaluated, Indiana determined that three were acceptable for NAAQS data comparison and seven should have excluded data.

### **Analysis of Data**

All available data were used in the evaluation, including data down to 0.0 ug/m<sup>3</sup>. A minimum of 23 samples were required in a season to be considered a complete data set. Indiana had begun using complete months for its seasonal evaluation from the beginning; winter (Dec – Feb), spring (Mar – May), summer (Jun – Aug), and fall (Sep – Nov). The seasons used in this proposal are the same as opposed to the calendar seasons.

Indiana uses three different monitoring methods in its network to obtain continuous PM2.5 data; Met One BAM 1020, Thermo Environmental 5030 SHARP, and R&P1400a TEOM w/8500C FDMS. Indiana has had varied success with collecting data comparable to the intermittent FRM samplers from the different monitors. Each one has its own unique operational issues.

#### Met One BAM 1020

The data from the Met One BAM 1020 monitors were divided into three periods; the original FEM configuration, data with the zero baseline being adjusted on a yearly basis, and data using six-month zero baseline adjustments and the most current procedures and practices developed and proposed by Met One.

These modifications and additions to the procedures for testing and maintaining the BAM 1020s were implemented during 2012 at different times at the various sites. The calibration procedures and background zero testing procedures were modified during the 2012 calibration season in order to obtain better correlation between the BAM 1020s and the FRMs. Background zero testing was moved from the annual calibration date to a semiannual schedule in April and October. Calibrating the filter temperature and filter relative humidity (RH) during the annual calibrations was also implemented. In addition, IDEM began recording the filter RH in the internal data record as well as the delta T to monitor the effectiveness of the sample heater during high dew point periods.

As Indiana progressed from each period, the intent was that the data would have better quality and be more comparable to the intermittent data. If the entire period met the comparison criteria for the complete period and for each of the individual periods, then the data are considered acceptable for comparison to the NAAQS. If the entire time period did not meet the criteria, the past two periods were considered to be excluded from NAAQS comparability, and a reevaluation of the data beginning with the implementation of the current practices and procedures will be conducted at the end of 2013, when enough seasonal should be collected to make a determination.

Only Elkhart – Prairie St. provided data which were acceptable for each evaluation period and is considered acceptable for NAAQS comparison.

The remainder of the sites using the BAM 1020 failed to meet the criteria for the complete time period or one or more of the individual monitoring periods. All are requesting an exclusion of the data for the time period prior to the date the current procedures were implemented during 2012. And as stated above, the current data periods are considered ‘incomplete’ and will be re-evaluated at the end of 2013.

The results of the individual evaluations for sites using the BAM 1020 are in Tables 3 through 8.

#### Thermo Environmental 5030 SHARP

Two of the three sites with TECO SHARP monitors, Anderson - Eastside Elementary and Hammond – Purdue, have data which are within the parameters and are acceptable for comparison to the NAAQS for

the period of 2010 - 2012. The FEM criteria were met for the entire period as well as each two year period (2010-2011 & 2011-2012). Individual years of data (2010 at Hammond – Purdue, 2010 & 2012 at Anderson – Eastside Elem.) did not meet criteria. This is due to incomplete data from the start dates in 2010 and insufficient seasonal data in 2012 at Anderson – Eastside Elem.

Bloomington - Binford data did not meet the criteria for the three year period as well as 2012 and the 2011-2012 periods. It had developed a very low slope in 2012 and preliminary evaluation of the 2013 data collected at this time indicates the trend is continuing. IDEM is working to correct this problem.

The SHARP evaluations are in Tables 9 through 11.

#### R&P 1400a TEOM w/FDMS

An exclusion of the data from Indpls – W. 18<sup>th</sup> St. is requested. Even though the data met the criteria for the 2010-2012 time period, the data from 2011 and 2012, as well as the two year period of 2011-2012 do not meet the criteria. The intercept has risen each year, and a preliminary evaluation of the 2013 data collected to day, indicate that this problem is continuing. This monitor will be replaced in the future, once a new unit can be obtained. The results from Indianapolis – W. 18<sup>th</sup> St. are in Table 12.

An exclusion of the TEOM data (POC 4) from the Lafayette – Greenbush St. site is also requested. The monitor was installed at the site to provide comparison data between an FRM, a BAM1020, and a TEOM. None of the periods of data met the criteria for comparability. This monitor is planned to be discontinued at the end of 2013, due to its age and poor data quality. The results are in Table 13

#### **Periods of Data Exclusion and AQS Coding**

Indiana is basing its recommendations to exclude PM2.5 continuous FEM data on the information summarized on the individual site tables, Tables 3 - 13. Per EPA Region 5 approval, Indiana will load or move as necessary, these data in AQS in a manner where the data are only used for the appropriate monitoring objective(s). Table 14 details the data reporting and coding which Indiana proposes for continuous FEM data already residing in AQS. Additionally, Indiana will continue to load any new data generated for the next 18 months (through December 31, 2014) in the same manner or, until such time as a request is made by Indiana and approval is received from Region 5, to change the monitoring objectives that the data from the PM2.5 continuous FEMS can support.

Continuous FEM data collected and submitted during periods prior to the data included in this exclusion request are also considered not acceptable for comparison to the NAAQS. Upon approval from USEPA, that data will be moved to the proper parameter code and monitor type and not be considered eligible for comparison to the NAAQS. The monitors and data periods are listed in Table 15.

**Table 1  
Indiana's Continuous PM2.5 Monitoring Network**

Site Name	County	City	AQS#	Current FEM Sampler	Method Code	POC	Current FEM Method Start Date	Include in Analysis
Fort Wayne - Beacon St.	Allen	Fort Wayne	180030004	Met One BAM 1020	170	3	10/27/2012	No
Elkhart - Prairie St.	Elkhart	Elkhart	180390008	Met One BAM 1020	170	3	11/17/2010	Yes
New Albany	Floyd	New Albany	180431004	Met One BAM 1020	170	3	6/8/2011	No
Gary - IITRI	Lake	Gary	180890022	Met One BAM 1020	170	3	10/18/2011	No
Hammond - Purdue	Lake	Hammond	180891004	Thermo Scientific 5030 SHARP	184	3	2/4/2010	Yes
Anderson - Eastside Elem.	Madison	Anderson	180950011	Thermo Scientific 5030 SHARP	184	3	7/13/2010	Yes
Indpls - Washington Park	Marion	Indianapolis	180970078	Met One BAM 1020	170	4	7/21/2011	No
Indpls - W. 18th St	Marion	Indianapolis	180970081	Thermo Scientific TEOM 1400a w/8500C FDMS	181	3	10/1/2009	Yes
Bloomington - Binford	Monroe	Bloomington	181050003	Thermo Scientific 5030 SHARP	184	3	4/9/2009	Yes
Ogden Dunes	Porter	Ogden Dunes	181270024	Met One BAM 1020	170	3	6/11/2012	No
South Bend - Shields Dr.	St. Joseph	South Bend	181410015	Met One BAM 1020	170	3	10/16/2008	Yes
Lafayette - Greenbush St.	Tippecanoe	Lafayette	181570008	Met One BAM 1020	170	3	1/1/2010	Yes
Lafayette - Greenbush St.	Tippecanoe	Lafayette	181570008	Thermo Scientific TEOM 1400a w/8500C FDMS	181	4	11/6/2009	No
Evansville - Buena Vista	Vanderburgh	Evansville	181630021	Met One BAM 1020	170	3	2/17/2010	Yes
Terre Haute - Lafayette Ave.	Vigo	Terre Haute	181670018	Met One BAM 1020	170	3	12/3/2009	Yes
Larwill	Whitley		181830003	Met One BAM 1020	170	3	4/7/2010	Yes

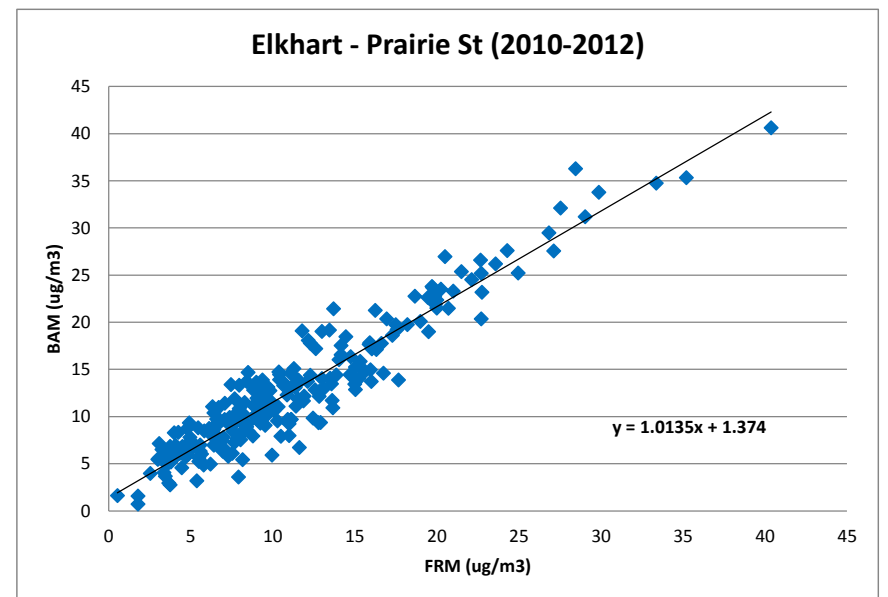
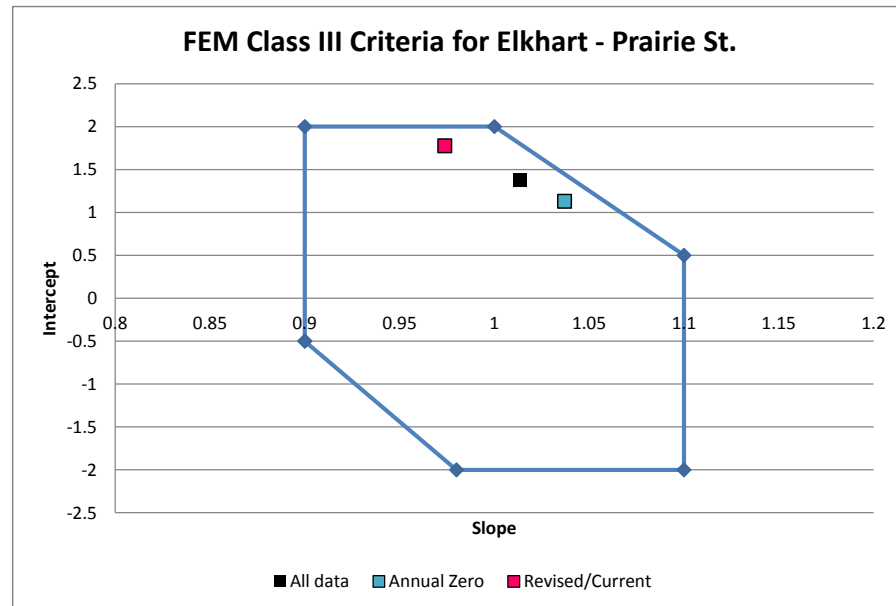
**Table 2**  
**PM2.5 Data Exclusion Summary (2010 - 2012)**

Site Name	AQS#	POC	Current FEM Sampler	Method Code	Current FEM Method Start Date	Data Period		Accept / Exclude Data?
						Start Date	End Date	
Elkhart - Prairie St.	180390008	3	Met One BAM 1020	170	11/17/2010	11/17/2010	4/5/2012	Accept
						4/6/2012	12/31/2012	Incomplete Data
Hammond - Purdue	180891004	3	Thermo Scientific 5030 SHARP	184	2/4/2010	2/4/2010	12/31/2012	Accept
Anderson - Eastside Elem.	180950011	3	Thermo Scientific 5030 SHARP	184	7/13/2010	7/13/2010	12/31/2012	Accept
Indpls - W. 18th St	180970081	3	Thermo Scientific TEOM 1400a w/8500C FDMS	181	10/1/2009	1/1/2010	12/31/2012	Exclude
Bloomington - Binford	181050003	3	Thermo Scientific 5030 SHARP	184	4/9/2009	1/1/2010	12/31/2012	Exclude
South Bend - Shields Dr.	181410015	3	Met One BAM 1020	170	10/16/2008	1/1/2010	4/8/2012	Exclude
						4/9/2012	12/31/2012	Incomplete Data
Lafayette - Greenbush St.	181570008	3	Met One BAM 1020	170	1/1/2010	1/1/2010	5/1/2012	Exclude
						5/2/2012	12/31/2012	Incomplete Data
Lafayette - Greenbush St.	181570008	4	Thermo Scientific TEOM 1400a w/8500C FDMS	181	11/6/2009	10/1/2010	12/31/2012	Exclude
Evansville - Buena Vista	181630021	3	Met One BAM 1020	170	2/17/2010	2/17/2010	10/19/2012	Exclude
						10/20/2012	12/31/2012	Incomplete Data
Terre Haute - Lafayette Ave.	181670018	3	Met One BAM 1020	170	12/3/2009	1/1/2010	4/8/2012	Exclude
						4/9/2012	12/31/2012	Incomplete Data
Larwill	181830003	3	Met One BAM 1020	170	4/7/2010	4/7/2010	10/18/2012	Exclude
						10/19/2012	12/31/2012	Incomplete Data

**Table 3**  
**Elkhart - Prairie St.**

Site Name           Elkhart - Prairie St  
 City                Elkhart  
 AQS #              180390008  
 POC                 3  
 Instrument         Met One BAM 1020  
 Method Description   Beta Attenuation

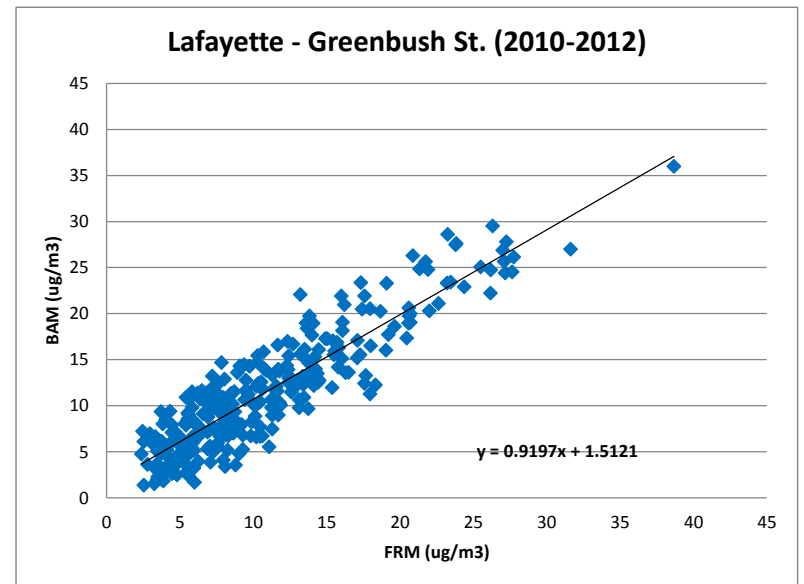
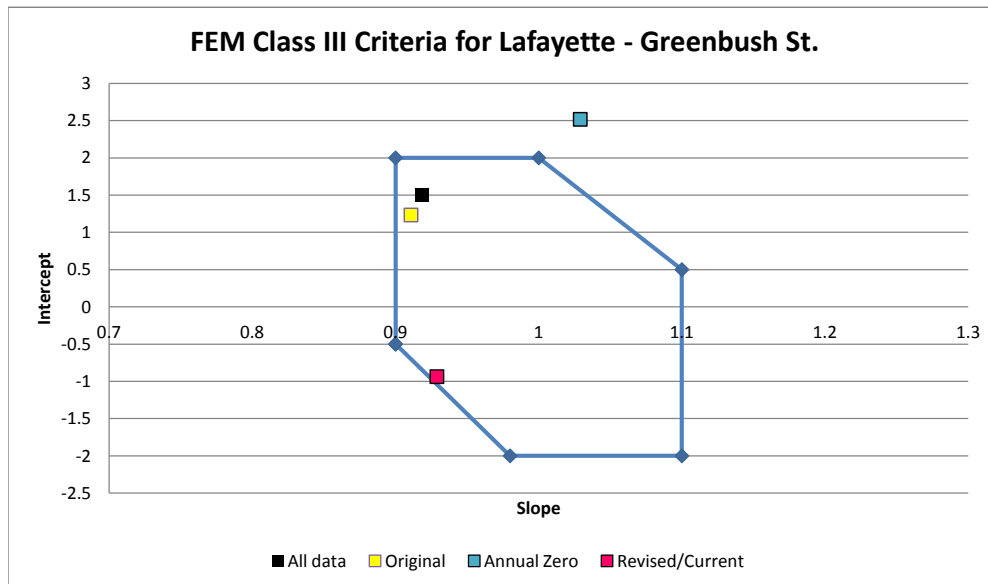
PM2.5 Continuous Data Period			Continuous/FRM Sample Pairs Per Season			Slope Criteria			Intercept Criteria			Correlation Criteria			Data Status	
Data Period	Begin Date	End Date	Season	# of Pairs	Meets Req?	Acceptable Range	Slope (m)	Meets Req?	Acceptable Range	Intercept (y)	Meets Req?	CCV	Acceptable Correlation Range	Correlation		Meet Req
All Data	11/17/2010	12/31/2012	Winter =	73	Yes	1 +/-0.10	1.0135	Yes	1.6718	1.3741	Yes	0.584	>=0.9500	0.9468	No	Acceptable for NAAQS Comparison
			Spring =	53												
			Summer =	54												
			Fall =	48												
			Total =	228												
Background Zero Adjust	11/17/2010	4/5/2012	Winter =	63	Yes	1 +/-0.10	1.0370	Yes	1.3616	1.1299	Yes	0.563	>=0.9500	0.9480	No	Acceptable for NAAQS Comparison
			Spring =	39												
			Summer =	28												
			Fall =	24												
			Total =	154												
Current / Updated Procedures	4/6/2012	12/31/2012	Winter =	10	No	1 +/-0.10	0.9738	Yes	2.0000	1.7763	Yes	0.631	>=0.9500	0.9457	No	Incomplete Data / Acceptable
			Spring =	14												
			Summer =	26												
			Fall =	24												
			Total =	74												



**Table 4**  
**Lafayette - Greenbush St.**

Site Name           Lafayette - Greenbush St.  
 City                 Lafayette  
 AQS #               181570008  
 POC                 3  
 Instrument         Met One BAM 1020  
 Method Description   Beta Attenuation

PM2.5 Continuous Data Period			Continuous/FRM Sample Pairs Per Season			Slope Criteria			Intercept Criteria			Correlation Criteria				Data Status
Data Period	Begin Date	End Date	Season	# of Pairs	Meets Req?	Acceptable Range	Slope (m)	Meets Req?	Acceptable Range	Intercept (y)	Meets Req?	CCV	Acceptable Correlation Range	Correlation	Meets Req?	
All Data	1/1/2010	12/31/2012	Winter =	74	Yes	1 +/-0.10	0.9183	Yes	2.0000	1.5078	Yes	0.567	>=0.9500	0.8959	No	Exclude (1/1/10 to 5/1/12)
			Spring =	67												
			Summer =	75												
			Fall =	81												
			Total =	297												
Original FEM	1/1/2010	6/20/2011	Winter =	35	Yes	1 +/-0.10	0.9108	Yes	2.0000	1.2334	Yes	0.577	>=0.9500	0.9243	No	Acceptable
			Spring =	45												
			Summer =	29												
			Fall =	26												
			Total =	135												
Background Zero Adjust	6/21/2011	5/1/2012	Winter =	29	No	1 +/-0.10	1.0290	Yes	1.4672	2.5173	No	0.550	>=0.9500	0.9360	No	Incomplete Data / Not Acceptable
			Spring =	17												
			Summer =	22												
			Fall =	29												
			Total =	97												
Current / Updated Procedures	5/2/2012	12/31/2012	Winter =	10	No	1 +/-0.10	0.9289	Yes	2.0000	-0.9369	Yes	0.542	>=0.9500	0.9497	No	Incomplete Data / Future Review
			Spring =	5												
			Summer =	24												
			Fall =	26												
			Total =	65												

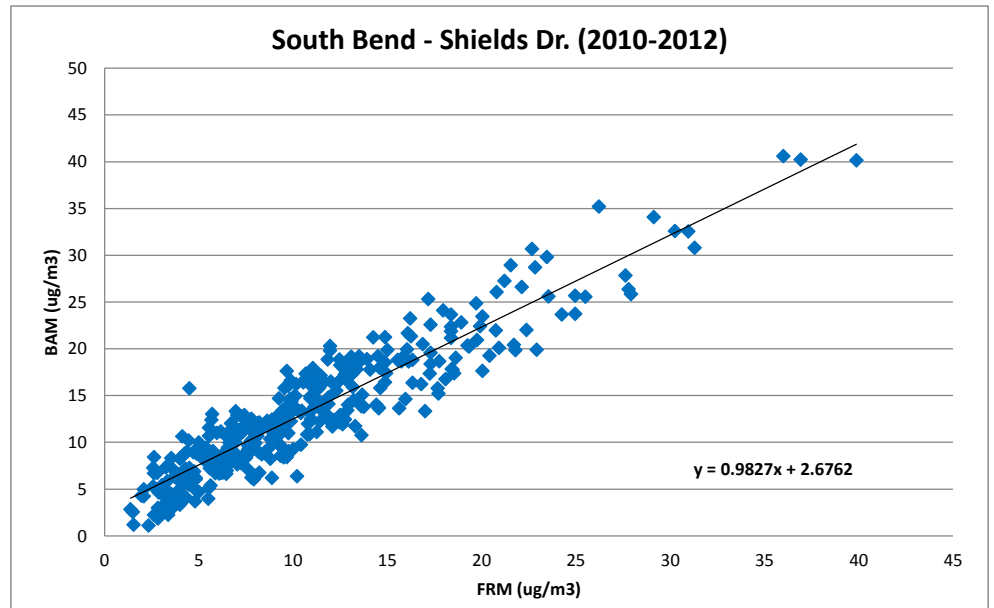
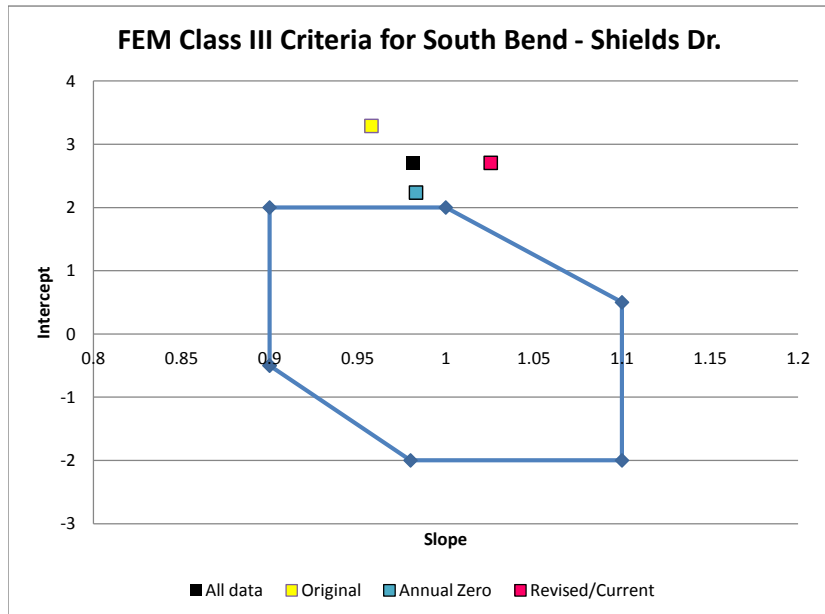




**Table 5**  
**South Bend - Shields Dr.**

Site Name            South Bend - Shields Dr  
 City                 South Bend  
 AQS #                181410015  
 POC                  3  
 Instrument         Met One BAM 1020  
 Method Description   Beta Attenuation

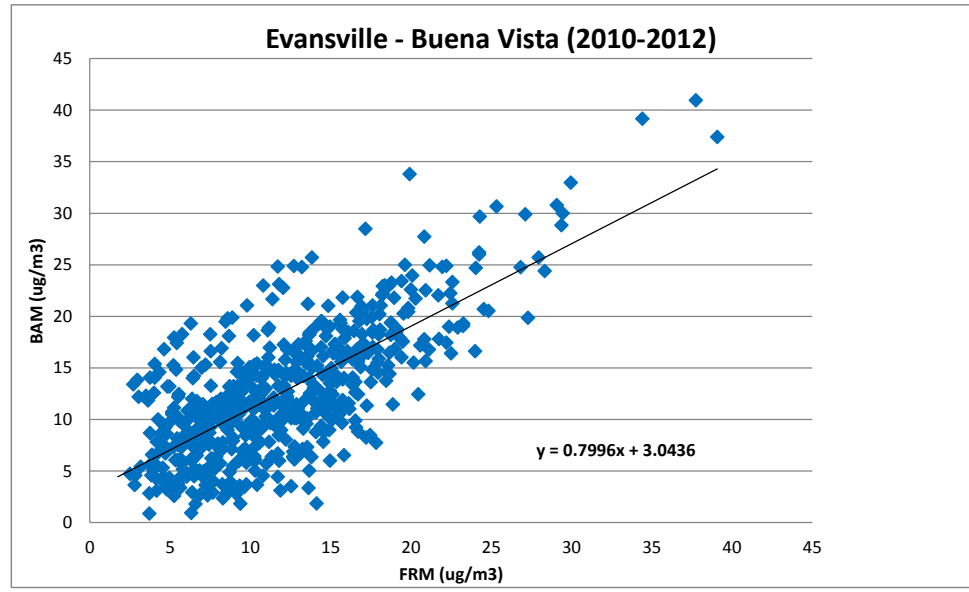
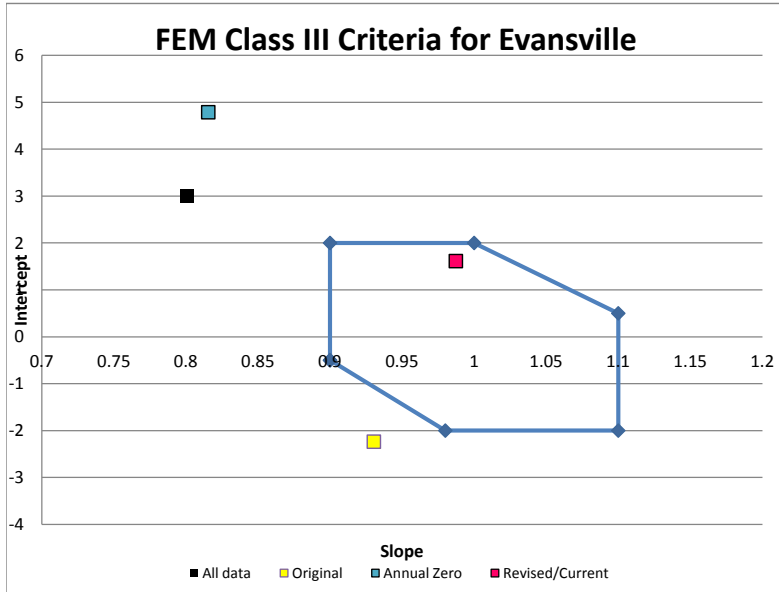
PM2.5 Continuous Data Period			Continuous/FRM Sample Pairs Per Season			Slope Criteria			Intercept Criteria			Correlation Criteria			Data Status	
Data Period	Begin Date	End Date	Season	# of Pairs	Meets Req?	Acceptable Range	Slope (m)	Meets Req?	Acceptable Range	Intercept (y)	Meets Req?	CCV	Acceptable Correlation Range	Correlation		Meets Req?
All Data	1/1/2010	12/31/2012	Winter =	89	Yes	1 +/-0.10	0.9812	Yes	2.0000	2.7032	No	0.605	>=0.9500	0.9298	No	Exclude (1/1/10-4/8/12)
			Spring =	87												
			Summer =	86												
			Fall =	83												
			Total =	345												
Original FEM	1/1/2010	11/9/2010	Winter =	20	No	1 +/-0.10	0.9578	Yes	2.0000	3.2901	No	0.637	>=0.9500	0.9339	No	Incomplete Data / Not Acceptable
			Spring =	30												
			Summer =	31												
			Fall =	18												
			Total =	99												
Background Zero Adjust	11/10/2010	4/8/2012	Winter =	59	Yes	1 +/-0.10	0.9831	Yes	2.0000	2.2362	No	0.575	>=0.9500	0.9248	No	Not Acceptable
			Spring =	40												
			Summer =	25												
			Fall =	37												
			Total =	161												
Current / Updated Procedures	4/9/2012	12/31/2012	Winter =	10	No	1 +/-0.10	1.0255	Yes	1.5134	2.7062	No	0.629	>=0.9500	0.9432	No	Incomplete Data / Future Review
			Spring =	17												
			Summer =	30												
			Fall =	28												
			Total =	85												



**Table 6**  
Evansville - Buena Vista

Site Name            Evansville - Buena Vista  
 City                 Evansville  
 AQS #                181630021  
 POC                  3  
 Instrument         Met One BAM 1020  
 Method Description   Beta Attenuation

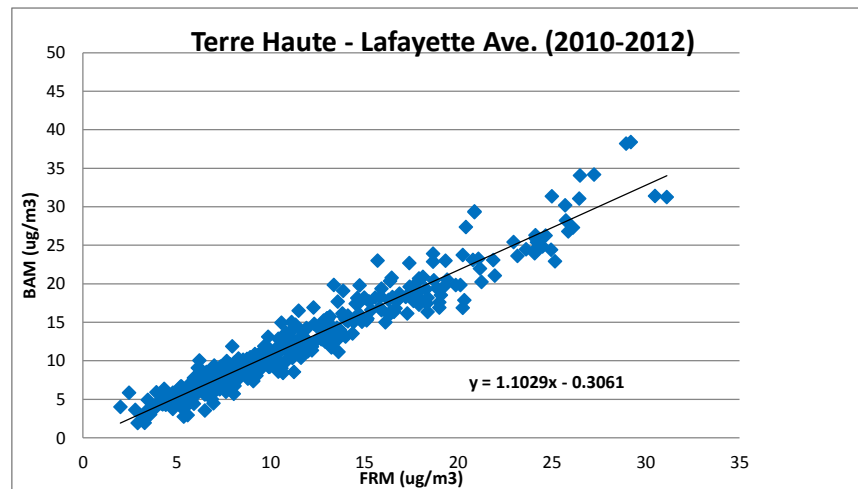
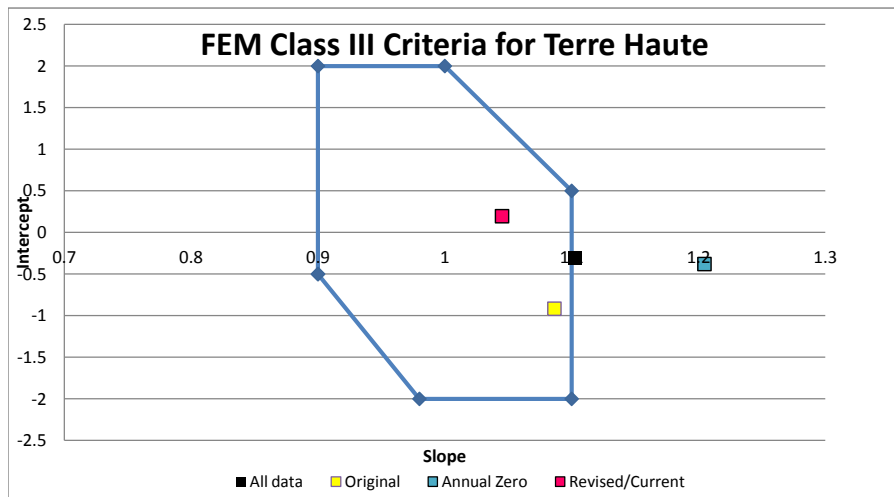
PM2.5 Continuous Data Period			Continuous/FRM Sample Pairs Per Season			Slope Criteria			Intercept Criteria			Correlation Criteria				
Data Period	Begin Date	End Date	Season	# of Pairs	Meets Req?	Acceptable Range	Slope (m)	Meets Req?	Acceptable Range	Intercept (y)	Meets Req?	CCV	Acceptable Correlation Range	Correlation	Meets Req?	Data Status
All Data	2/17/2010	12/31/2012	Winter =	114	Yes	1 +/-0.10	0.8010	No	2.0000	3.0016	No	0.467	>=0.9438	0.7203	No	Exclude (2/17/10 - 10/19/12)
			Spring =	185												
			Summer =	176												
			Fall =	83												
			Total =	558												
Original FEM	2/17/2010	9/22/2010	Winter =	11	No	1 +/-0.10	0.9304	Yes	2.0000	-2.2363	No	0.432	>=0.9363	0.9085	No	Incomplete Data / Not Acceptable
			Spring =	82												
			Summer =	88												
			Fall =	12												
			Total =	193												
Background Zero Adjust	9/23/2010	10/19/2012	Winter =	93	Yes	1 +/-0.10	0.8155	No	2.0000	4.7874	No	0.483	>=0.9472	0.7500	No	Not Acceptable
			Spring =	103												
			Summer =	88												
			Fall =	58												
			Total =	342												
Current / Updated Procedures	10/20/2012	5/31/2013	Winter =	10	No	1 +/-0.10	0.9873	Yes	2.0000	1.6139	Yes	0.440	>=0.9384	0.9667	Yes	Incomplete Data / Future Review
			Spring =													
			Summer =													
			Fall =	13												
			Total =	23												



**Table 7**  
**Terre Haute - Lafayette Ave.**

Site Name            Terre Haute - Lafayette Ave  
 City                 Terre Haute  
 AQS #               181670018  
 POC                 3  
 Instrument         Met One BAM 1020  
 Method Description   Beta Attenuation

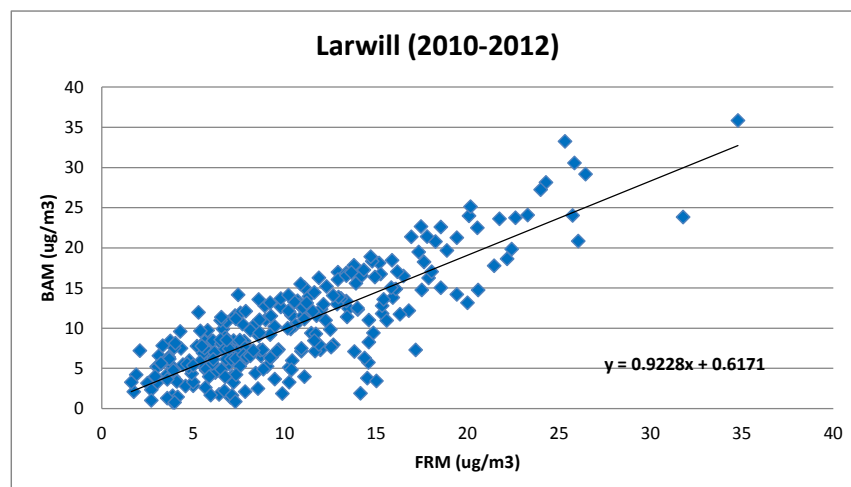
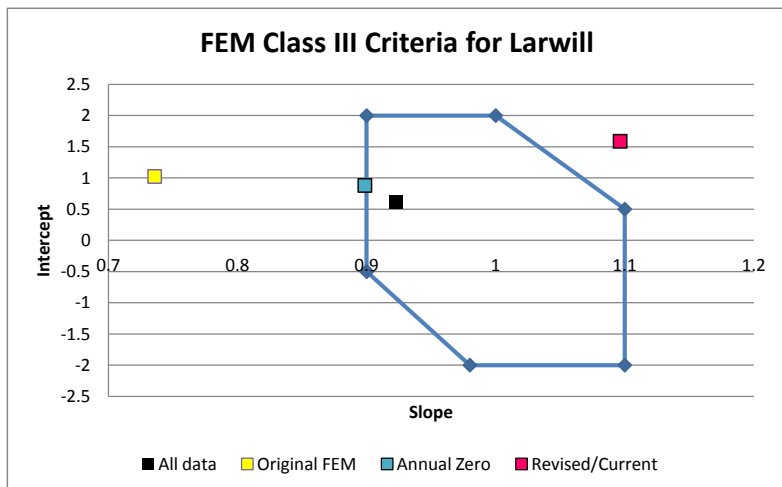
PM2.5 Continuous Data Period			Continuous/FRM Sample Pairs Per Season			Slope Criteria			Intercept Criteria			Correlation Criteria			Data Status	
Data Period	Begin Date	End Date	Season	# of Pairs	Meets Req?	Acceptable Range	Slope (m)	Meets Req?	Acceptable Range	Intercept (y)	Meets Req?	CCV	Acceptable Correlation Range	Correlation		Meets Req?
All Data	1/1/2010	12/31/2012	Winter =	87	Yes	1 +/-0.10	1.1029	No	0.49172	-0.3063	Yes	0.487	0.9474	0.9624	No	Exclude (1/1/10 - 4/8/12)
			Spring =	84												
			Summer =	91												
			Fall =	86												
			Total =	348												
Original FEM	1/1/2010	3/22/2011	Winter =	50	Yes	1 +/-0.10	1.0864	Yes	0.70952	0.9161	Yes	0.474	0.9447	0.9743	Yes	Acceptable
			Spring =	34												
			Summer =	31												
			Fall =	29												
			Total =	144												
Background Zero Adjust	3/23/2011	4/8/2012	Winter =	27	Yes	1 +/-0.10	1.2047	No	-0.85204	-0.3793	No	0.505	>=0.9500	0.9671	Yes	Not Acceptable
			Spring =	33												
			Summer =	29												
			Fall =	29												
			Total =	118												
Current / Updated Procedures	4/9/2012	12/31/2012	Winter =	10	No	1 +/-0.10	1.0451	Yes	1.25468	0.1957	Yes	0.450	>=0.9401	0.9751	Yes	Incomplete Data / Future Review
			Spring =	17												
			Summer =	31												
			Fall =	28												
			Total =	86												



**Table 8  
Larwill**

Site Name Larwill  
 City  
 AQS # 181830003  
 POC 3  
 Instrument Met One BAM 1020  
 Method Description Beta Attenuation

PM2.5 Continuous Data Period			Continuous/FRM Sample Pairs Per Season			Slope Criteria			Intercept Criteria			Correlation Criteria			Data Status	
Data Period	Begin Date	End Date	Season	# of Pairs	Meets Req?	Acceptable Range	Slope (m)	Meets Req?	Acceptable Range	Intercept (y)	Meets Req?	CCV	Acceptable Correlation Range	Correlation		Meets Req?
All Data	4/7/2010	12/31/2012	Winter =	64	Yes	1 +/-0.10	0.9228	Yes	2.0000	0.6171	Yes	0.553	>=0.9500	0.8400	No	Exclude (4/7/10 - 10/18/12)
			Spring =	70												
			Summer =	72												
			Fall =	58												
			Total =	264												
Original FEM	4/7/2010	9/20/2010	Winter =		No	1 +/-0.10	0.7357	No	2.0000	1.0238		0.605	>=0.9500	0.8519	No	Incomplete Data / Not Acceptable
			Spring =	19												
			Summer =	27												
			Fall =	3												
			Total =	49												
Background Zero Adjust	9/21/2010	10/18/2012	Winter =	55	Yes	1 +/-0.10	0.8988	No	2.0000	0.8581	Yes	0.531	>=0.9500	0.8180	No	Not Acceptable
			Spring =	51												
			Summer =	45												
			Fall =	44												
			Total =	195												
Current / Updated Procedures	10/19/2012	12/31/2012	Winter =	9	No	1 +/-0.10	1.0964	Yes	0.5775	1.5879	No	0.519	>=0.9500	0.9783	Yes	Incomplete Data / Future Review
			Spring =													
			Summer =													
			Fall =	11												
			Total =	20												



**Table 9  
Hammond - Purdue**

Site Name **Hammond - Purdue**  
 City **Hammond**  
 AQS # **180892004**  
 POC **3**  
 Instrument **Thermo Environmental SHARP 5030**  
 Method Description **Nephelometer Correcting BAM**

PM2.5 Continuous Data Period			Continuous/FRM Sample Pairs Per Season			Slope Criteria			Intercept Criteria			Correlation Criteria			Data Status	
Data Period	Begin Date	End Date	Season	# of Pairs	Meets Req?	Acceptable Range	Slope (m)	Meets Req?	Acceptable Range	Intercept (y)	Meets Req?	CCV	Acceptable Correlation Range	Correlation		Meets Req?
2010	2/1/2010	12/31/2010	Winter =	18	No	1 +/-0.10	0.8796	No	2.0000	1.3395	Yes	0.574	>=0.9500	0.9245	No	Incomplete Data / Not Acceptable
			Spring =	22												
			Summer =	12												
			Fall =	22												
			Total =	74												
2011	1/1/2011	12/31/2011	Winter =	25	No	1 +/-0.10	1.0269	Yes	1.4949	0.4330	Yes	0.432	>=0.9364	0.9077	No	Incomplete Data / Acceptable
			Spring =	26												
			Summer =	7												
			Fall =	17												
			Total =	75												
2012	1/1/2012	12/31/2012	Winter =	28	Yes	1 +/-0.10	1.0699	Yes	0.9273	-0.1385	Yes	0.557	>=0.9500	0.8936	No	Acceptable
			Spring =	26												
			Summer =	24												
			Fall =	27												
			Total =	105												
2010 - 2011	2/1/2010	12/31/2011	Winter =	43	No	1 +/-0.10	0.9241	Yes	2.0000	1.1953	Yes	0.512	>=0.9500	0.9128	No	Incomplete Data / Acceptable
			Spring =	48												
			Summer =	19												
			Fall =	39												
			Total =	149												
2011 - 2012	1/1/2011	12/31/2012	Winter =	53	Yes	1 +/-0.10	1.0565	Yes	1.1042	0.0448	Yes	0.505	>=0.9500	0.8981	No	Acceptable
			Spring =	52												
			Summer =	31												
			Fall =	44												
			Total =	180												
2010 - 2012	2/1/2010	12/31/2012	Winter =	71	Yes	1 +/-0.10	0.9814	Yes	2.0000	0.6393	Yes	0.531	>=0.9500	0.9012	No	Acceptable for NAAQS Comparison
			Spring =	74												
			Summer =	43												
			Fall =	66												
			Total =	254												

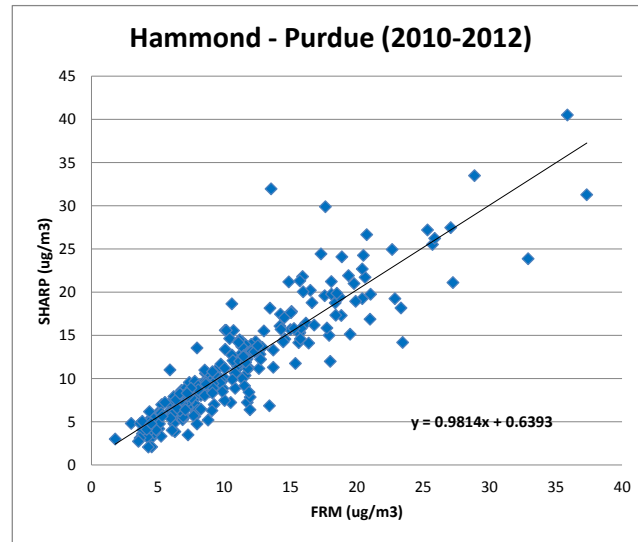
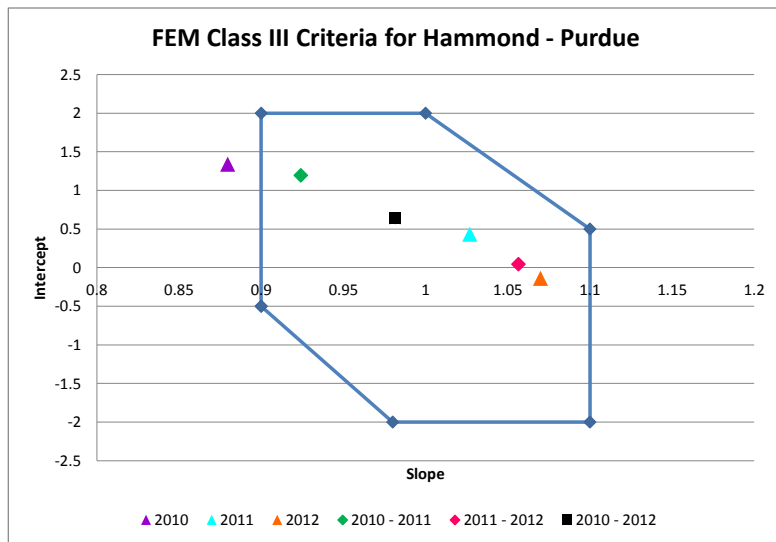
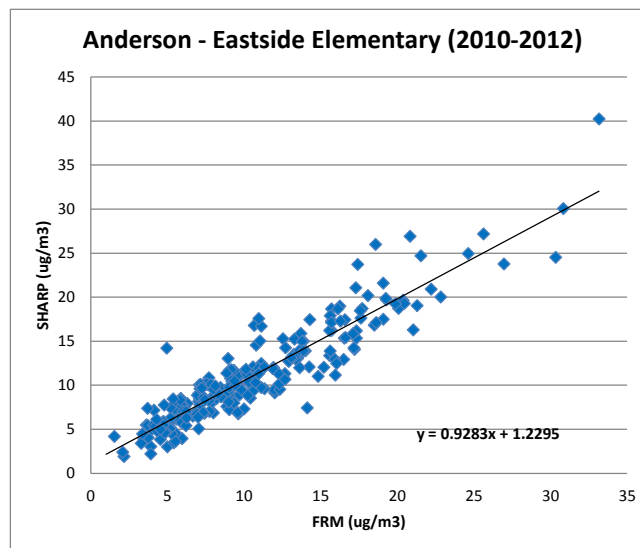
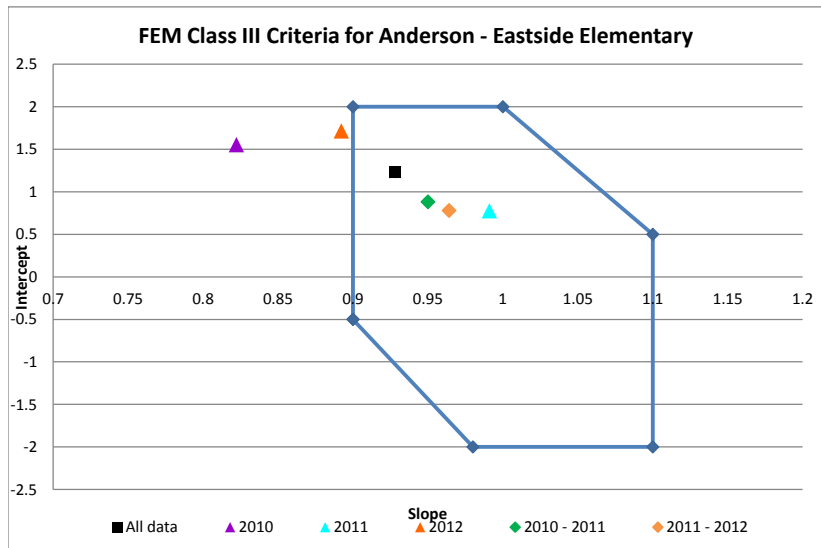


Table 10  
Anderson - Eastside Elementary

Site Name Anderson - Eastside Elementary School  
 City Anderson  
 AQS # 180950011  
 POC 3  
 Instrument Thermo Environmental SHARP 5030  
 Method Description Nephelometer Correcting BAM

PM2.5 Continuous Data Period			Continuous/FRM Sample Pairs Per Season			Slope Criteria			Intercept Criteria			Correlation Criteria			Data Status	
Data Period	Begin Date	End Date	Season	# of Pairs	Meets Req?	Acceptable Range	Slope (m)	Meets Req?	Acceptable Range	Intercept (y)	Meets Req?	CCV	Acceptable Correlation Range	Correlation		Meets Req?
2010	7/13/2010	12/31/2010	Winter =	11	No	1 +/-0.10	0.8222	No	2.0000	1.5541	Yes	0.53	>=0.9500	0.8633	No	Incomplete Data / Not Acceptable
			Spring =													
			Summer =	14												
			Fall =	25												
			Total =	50												
2011	1/1/2011	12/31/2011	Winter =	27	No	1 +/-0.10	0.9910	Yes	1.9688	0.7771	Yes	0.522	>=0.9500	0.9471	No	Incomplete Data / Acceptable
			Spring =	24												
			Summer =	27												
			Fall =	6												
			Total =	84												
2012	1/1/2012	12/31/2012	Winter =	26	No	1 +/-0.10	0.8922	No	2.0000	1.7156	Yes	0.489	>=0.9478	0.9289	No	Incomplete Data / Not Acceptable
			Spring =	31												
			Summer =	26												
			Fall =	19												
			Total =	102												
2010 - 2011	7/13/2010	12/31/2011	Winter =	38	Yes	1 +/-0.10	0.9500	Yes	2.0000	0.8819	Yes	0.529	>=0.9500	0.9216	No	Acceptable
			Spring =	24												
			Summer =	41												
			Fall =	31												
			Total =	134												
2011 - 2012	1/1/2011	12/31/2012	Winter =	53	Yes	1 +/-0.10	0.9520	Yes	2.0000	1.1811	Yes	0.519	>=0.9500	0.9413	No	Acceptable
			Spring =	55												
			Summer =	53												
			Fall =	25												
			Total =	186												
2010 - 2012	7/13/2010	12/31/2012	Winter =	64	Yes	1 +/-0.10	0.9283	Yes	2.0000	1.2295	Yes	0.52	>=0.9500	0.9241	No	Acceptable for NAAQS Comparison
			Spring =	55												
			Summer =	67												
			Fall =	50												
			Total =	236												



**Table 11**  
**Bloomington - Binford**

Site Name      Bloomington - Binford  
 City            Bloomington  
 AQS #          181050003  
 POC            3  
 Instrument     Thermo Environmental SHARP 5030  
 Method Description   Nephelometer Correcting BAM

PM2.5 Continuous Data Period			Continuous/FRM Sample Pairs Per Season			Slope Criteria			Intercept Criteria			Correlation Criteria			Data Status	
Data Period	Begin Date	End Date	Season	# of Pairs	Meets Req?	Acceptable Range	Slope (m)	Meets Req?	Acceptable Range	Intercept (y)	Meets Req?	CCV	Acceptable Correlation Range	Correlation		Meets Req?
2010	1/1/2010	12/31/2010	Winter =	18	No	1 +/-0.10	0.9131	Yes	2.0000	0.9416	Yes	0.46	>=0.9421	0.9398	No	Incomplete Data / Acceptable
			Spring =	27												
			Summer =	29												
			Fall =	18												
			Total =	92												
2011	1/1/2011	12/31/2011	Winter =	27	No	1 +/-0.10	0.9422	Yes	2.0000	0.2379	Yes	0.485	>=0.9470	0.9176	No	Incomplete Data / Acceptable
			Spring =	27												
			Summer =	24												
			Fall =	16												
			Total =	94												
2012	1/1/2012	12/31/2012	Winter =	29	Yes	1 +/-0.10	0.6677	No	2.0000	1.4063	No	0.443	>=0.9387	0.8851	No	Not Acceptable
			Spring =	26												
			Summer =	28												
			Fall =	23												
			Total =	106												
2010 - 2011	1/1/2010	12/31/2011	Winter =	45	Yes	1 +/-0.10	0.9307	Yes	2.0000	0.5499	Yes	0.474	>=0.9447	0.9290	No	Acceptable
			Spring =	54												
			Summer =	53												
			Fall =	34												
			Total =	186												
2011 - 2012	1/1/2011	12/31/2012	Winter =	56	Yes	1 +/-0.10	0.8459	No	2.0000	0.4371	Yes	0.469	>=0.9438	0.8879	No	Not Acceptable
			Spring =	53												
			Summer =	52												
			Fall =	39												
			Total =	200												
2010 - 2012	1/1/2010	12/31/2012	Winter =	74	Yes	1 +/-0.10	0.8895	No	2.0000	0.3800	Yes	0.472	>=0.9444	0.9066	No	Exclude
			Spring =	80												
			Summer =	81												
			Fall =	57												
			Total =	292												

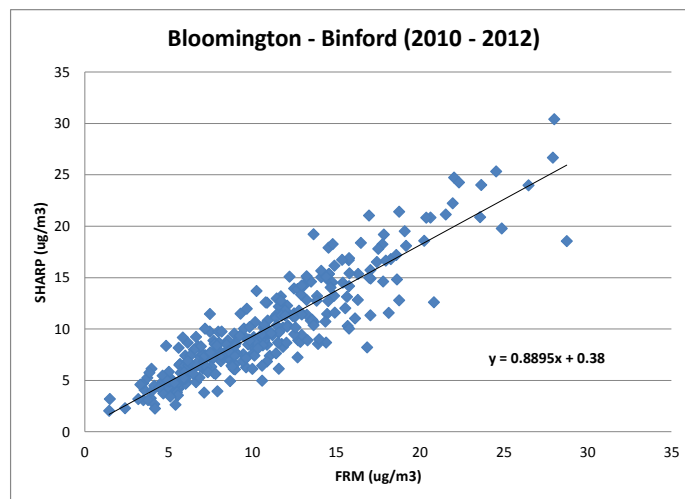
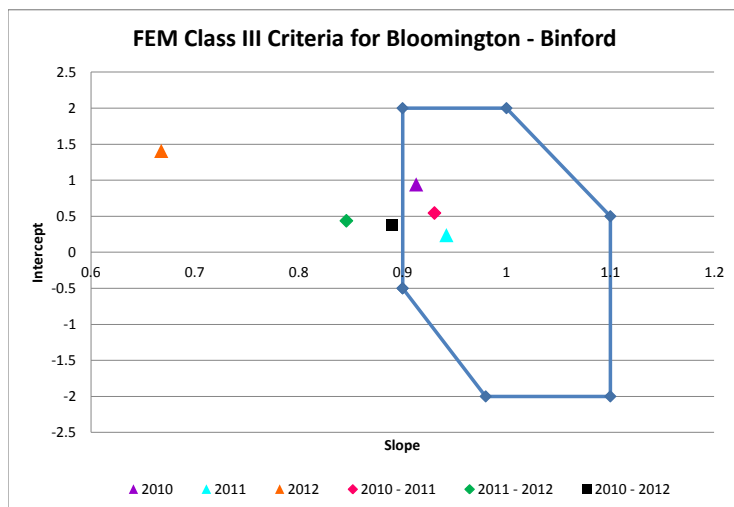
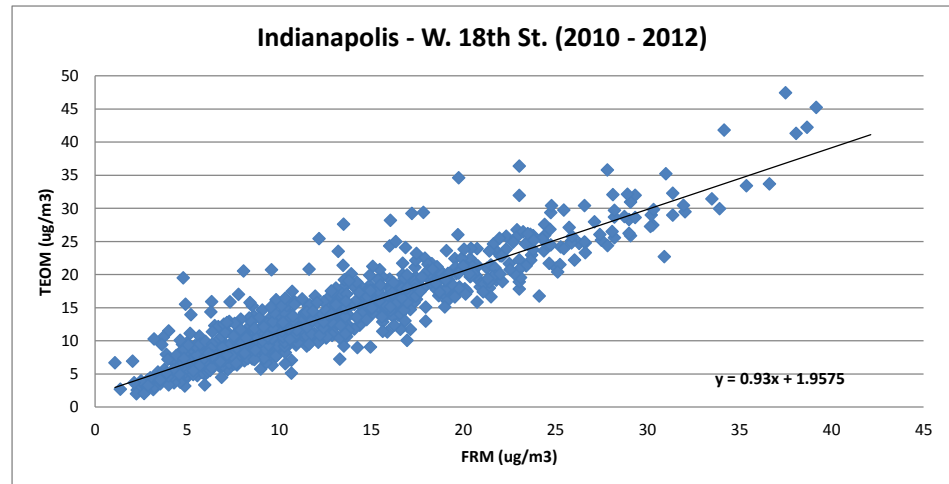
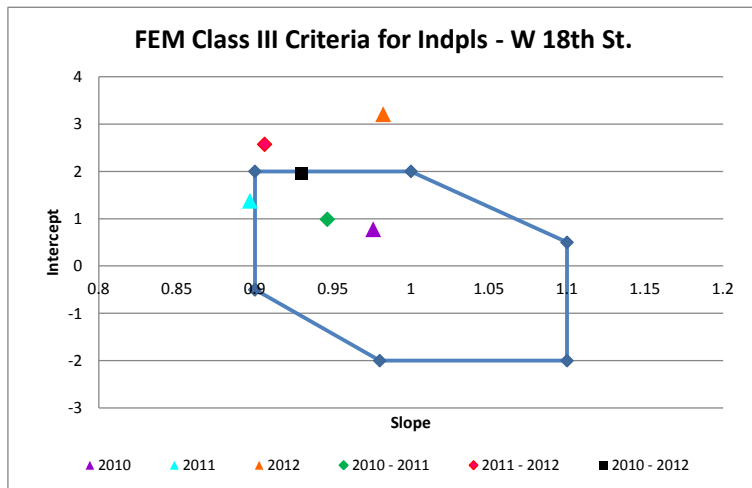


Table 12  
Indianapolis - W. 18th St.

Site Name Indpls - W. 18th St  
 City Indianapolis  
 AQS # 180970081  
 POC 3  
 Instrument R&P 1400a TEOM w/ FDMS  
 Method Description TEOM

PM2.5 Continuous Data Period			Continuous/FRM Sample Pairs Per Season			Slope Criteria			Intercept Criteria			Correlation Criteria			Data Status	
Data Period	Begin Date	End Date	Season	# of Pairs	Meets Req?	Acceptable Range	Slope (m)	Meets Req?	Acceptable Range	Intercept (y)	Meets Req?	CCV	Acceptable Correlation Range	Correlation		Meets Req?
2010	1/1/2010	12/12/2010	Winter =	89	Yes	1 +/-0.10	0.9758	Yes	2.0000	0.7770	Yes	0.534	>=0.9500	0.9623	Yes	Acceptable
			Spring =	92												
			Summer =	92												
			Fall =	73												
			Total =	346												
2011	1/1/2011	12/31/2011	Winter =	81	Yes	1 +/-0.10	0.8968	No	2.0000	1.3790	Yes	0.541	>=0.9500	0.9362	No	Not Acceptable
			Spring =	81												
			Summer =	63												
			Fall =	76												
			Total =	301												
2012	1/1/2012	12/31/2012	Winter =	91	Yes	1 +/-0.10	0.9822	Yes	2.0000	3.2079	No	0.467	>=0.9434	0.8622	No	Not Acceptable
			Spring =	71												
			Summer =	49												
			Fall =	52												
			Total =	263												
2010 - 2011	1/1/2010	12/31/2011	Winter =	170	Yes	1 +/-0.10	0.9464	Yes	2.0000	0.9870	Yes	0.54	>=0.9500	0.9519	Yes	Acceptable
			Spring =	173												
			Summer =	155												
			Fall =	149												
			Total =	647												
2011 - 2012	1/1/2011	12/31/2012	Winter =	172	Yes	1 +/-0.10	0.9062	Yes	2.0000	2.5716	No	0.513	>=0.9500	0.8783	No	Not Acceptable
			Spring =	152												
			Summer =	112												
			Fall =	128												
			Total =	564												
2010 - 2012	1/1/2010	12/31/2012	Winter =	261	Yes	1 +/-0.10	0.9300	Yes	2.0000	1.9575	Yes	0.53	>=0.9500	0.91639	No	Exclude
			Spring =	244												
			Summer =	204												
			Fall =	201												
			Total =	910												

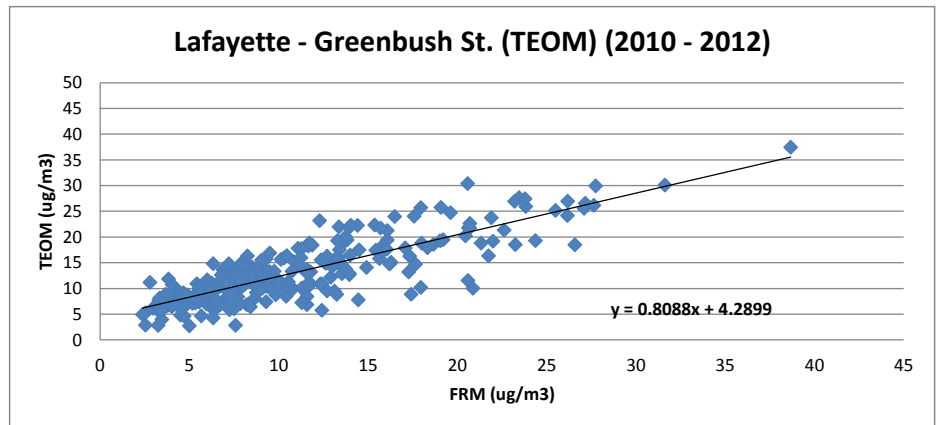
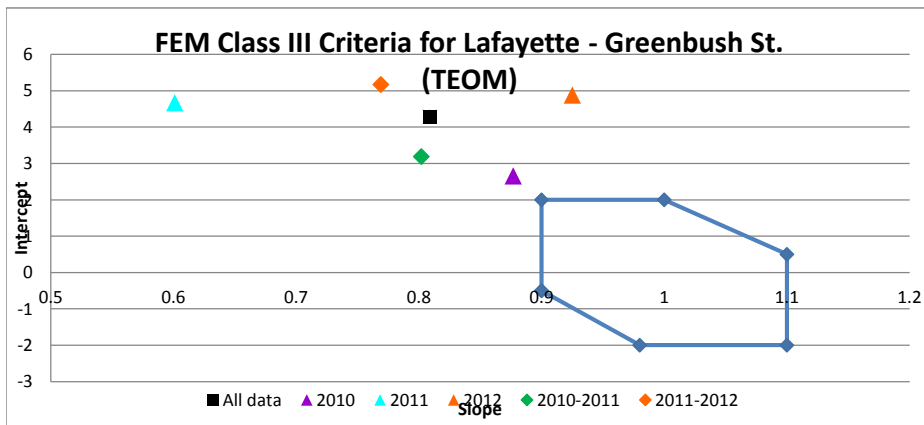




**Table 13**  
**Lafayette - Greenbush St.**

Site Name                   Lafayette - Greenbush St.  
 City                        Lafayette  
 AQS #                       181570008  
 POC                         4  
 Instrument                R&P 1400a TEOM w/ FDMS  
 Method Description      TEOM

PM2.5 Continuous Data Period			Continuous/FRM Sample Pairs Per Season			Slope Criteria			Intercept Criteria			Correlation Criteria			Data Status
Data Period	Begin Date	End Date	Season	# of Pairs	Meets Req?	Acceptable Range	Slope (m)	Meets Req?	Acceptable Range	Intercept (y)	Meets Req?	CCV	Acceptable Correlation Range	Correlation	
2010	1/1/2010	12/12/2010	Winter =	25	No	1 +/-0.10	0.8799	No	2.0000	2.6580	No	0.595	>=0.9500	0.9451	No
			Spring =	29											
			Summer =	20											
			Fall =	29											
			Total =	103											
2011	1/1/2011	12/31/2011	Winter =	10	No	1 +/-0.10	0.6010	No	2.0000	4.6706	No	0.568	>=0.9500	0.6552	No
			Spring =	0											
			Summer =	20											
			Fall =	29											
2012	1/1/2012	12/31/2012	Winter =	29	Yes	1 +/-0.10	0.9251	Yes	2.0000	4.8819	No	0.558	>=0.9500	0.9012	No
			Spring =	25											
			Summer =	28											
			Fall =	29											
2010 - 2011	1/1/2010	12/31/2011	Winter =	35	Yes	1 +/-0.10	0.8019	No	2.0000	3.1901	No	0.587	>=0.9500	0.8582	No
			Spring =	29											
			Summer =	40											
			Fall =	58											
2011- 2012	1/1/2011	12/31/2012	Winter =	39	Yes	1 +/-0.10	0.7689	No	2.0000	5.1721	No	0.563	>=0.9500	0.7634	No
			Spring =	25											
			Summer =	48											
			Fall =	58											
2010 - 2012	1/1/2010	12/31/2012	Winter =	64	Yes	1 +/-0.10	0.8088	No	2.0000	4.2899	No	0.583	>=0.9500	0.8402	No
			Spring =	54											
			Summer =	68											
			Fall =	87											
			Total =	273										Exclude	



**Table 14  
Proposed AQS Data Coding  
Continuous PM2.5 Data (2010 - 2012)**

Type of Data Usage	Parameter Name	Parameter Code	Monitor type	Primary Monitor	Data Substituted on days Primary Monitor is not Available?	Eligible for NAAQS	Eligible for AQI	
PM2.5 continuous FEM data are acceptable, but FRM is retained as the Primary Monitor	PM2.5 Local Conditions	88101	SLAMS	Intermittent FRM/FEM	Yes, if available	Yes	Yes	
			<b>Site Name</b>	<b>AQS#</b>	<b>POC</b>	<b>Method Code</b>	<b>Method Start Date</b>	<b>Coding Effective Dates</b>
			Elkhart - Prairie St.	180390008	3	170	11/17/2010	11/17/10 to 12/31/12
			Hammond - Purdue	180891004	3	184	2/4/2010	2/4/10 to 12/31/12
			Anderson - Eastside Elem.	180950011	3	184	7/13/2010	7/13/10 to 12/31/12

Type of Data Usage	Parameter Name	Parameter Code	Monitor type	Primary Monitor	Data Substituted on days Primary Monitor is not Available?	Eligible for NAAQS	Eligible for AQI	
PM2.5 Continuous FEM is being tested and is less than 24 months old, FRM is retained as the Primary Monitor.	PM2.5 Local Conditions	88101	SPM and Non-regulatory	Intermittent FRM/FEM	No	No	Yes	
			<b>Site Name</b>	<b>AQS#</b>	<b>POC</b>	<b>Method Code</b>	<b>Method Start Date</b>	<b>No Coding Change at This Time</b>
			Fort Wayne - Beacon St.	180030004	3	170	10/27/2012	10/27/12 to 12/31/12
			New Albany	180431004	3	170	6/8/2011	6/8/12 to 12/31/12
			Gary - IITRI	180890022	3	170	10/18/2011	10/18/12 to 12/31/12
			Indpls - Washington Park	180970078	4	170	7/21/2011	7/21/12 to 12/31/12
		Ogden Dunes	181270024	3	170	6/11/2012	6/11/12 to 12/31/12	

Type of Data Usage	Parameter Name	Parameter Code	Monitor type	Primary Monitor	Data Substituted on days Primary Monitor is not Available?	Eligible for NAAQS	Eligible for AQI	
PM25 Continuous FEM has been operating for more than 24 months and the monitor has been approved for exclusion to the NAAQS per 58.11 (e). Data are appropriate for AQI.	Acceptable PM2.5 AQI	88502	SLAMS	Intermittent FRM/FEM	No	No	Yes	
			<b>Site Name</b>	<b>AQS#</b>	<b>POC</b>	<b>Method Code</b>	<b>Method Start Date</b>	<b>Coding Effective Dates</b>
			Bloomington - Binford	181050003	3	184	4/9/2009	1/1/10 to 12/31/12
			Indpls - W. 18th St	180970081	3	181	10/1/2009	1/1/10 to 12/31/12
			South Bend - Shields Dr.	181410015	3	170	10/16/2008	1/1/10 to 4/8/12
			Lafayette - Greenbush St.	181570008	3	170	1/1/2010	1/1/10 to 5/1/12
			Lafayette - Greenbush St.	181570008	4	181	11/6/2009	1/1/10 to 12/31/12
			Evansville - Buena Vista	181630021	3	170	2/17/2010	2/17/10 to 10/19/12
			Terre Haute - Lafayette Ave.	181670018	3	170	12/3/2009	1/1/10 to 4/8/12
			Larwill	181830003	3	170	4/7/2010	4/7/10 to 10/18/12

Type of Data Usage	Parameter Name	Parameter Code	Monitor type	Primary Monitor	Data Substituted on days Primary Monitor is not Available?	Eligible for NAAQS	Eligible for AQI	
PM25 Continuous FEM has been operating for more than 24 months. Monitor operating with Revised/Current Procedures. Insufficient data to make evaluation. Data are appropriate for AQI.	PM2.5 Local Conditions	88101	SPM and Non-regulatory	Intermittent FRM/FEM	No	No	Yes	
			<b>Site Name</b>	<b>AQS#</b>	<b>POC</b>	<b>Method Code</b>	<b>Data Period Beginning Date</b>	<b>No Coding Change at This Time</b>
			South Bend - Shields Dr.	181410015	3	170	4/9/2012	4/9/12 to 12/31/12
			Lafayette - Greenbush St.	181570008	3	170	5/2/2012	5/2/12 to 12/31/12
			Evansville - Buena Vista	181630021	3	170	10/19/2012	10/19/12 to 12/31/12
			Terre Haute - Lafayette Ave.	181670018	3	170	4/8/2012	4/8/12 to 12/31/12
		Larwill	181830003	3	170	10/19/2012	10/19/12 to 12/31/12	

**Table 15  
Proposed AQS Data Coding  
Past and Discontinued Continuous PM2.5 FEM Monitors**

Type of Data Usage	Parameter Name	Parameter Code	Monitor type	Primary Monitor	Data Substituted on days Primary Monitor is not Available?	Eligible for NAAQS	Eligible for AQI
PM25 Continuous FEM Monitor was operating prior to exclusion request and is the current monitor. Data are appropriate for AQI.	Acceptable PM2.5 AQI	88502	SLAMS	Intermittent FRM/FEM	No	No	Yes
	Site Name	AQS#	POC	Method Code	Method Start Date	Coding Effective Dates	
	Indpls - W. 18th St	180970081	3	181	10/1/2009	10/1/09 to 12/31/09	
	Bloomington - Binford	181050003	3	184	4/9/2009	4/9/09 to 12/31/09	
	South Bend - Shields Dr.	181410015	3	170	10/16/2008	10/16/08 to 12/31/09	
	Lafayette - Greenbush St.	181570008	4	181	11/6/2009	11/6/09 to 12/31/09	
Terre Haute - Lafayette Ave.	181670018	3	170	12/3/2009	12/3/09 to 12/31/09		

Type of Data Usage	Parameter Name	Parameter Code	Monitor type	Primary Monitor	Data Substituted on days Primary Monitor is not Available?	Eligible for NAAQS	Eligible for AQI
PM25 Continuous FEM Monitor was operating prior to exclusion request and has been discontinued. Data are appropriate for AQI.	Acceptable PM2.5 AQI	88502	SLAMS	Intermittent FRM/FEM	No	No	Yes
	Site Name	AQS#	POC	Method Code	Data Period Beginning Date	Coding Effective Dates	
	Fort Wayne - Beacon St.	180030004	3	181	11/10/2009	11/10/09 to 10/21/12	
	New Albany	180431004	3	181	12/10/2009	12/10/09 to 06/08/11	
	Gary - IITRI	180890022	3	181	10/8/2009	10/08/09 to 4/27/11	
	Gary - IITRI	180890022	3	184	4/27/2011	4/27/11 to 10/18/11	
	Hammond - Purdue	180891004	3	184	11/1/2008	11/01/08 to 12/31/09	
	Indpls - Washington Park	180970078	3	181	1/4/2010	01/04/10 to 12/31/11	
	Ogden Dunes	181270024	3	181	10/8/2009	10/08/09 to 06/11/12	
Evansville - Buena Vista	181630021	3	181	10/21/2009	10/21/09 to 2/16/10		

## **Appendix A Response to Comments**

### **Comment #1**

Received from Joanne M. Alexandrovich, Ph.D., Vanderburgh County Ozone Officer.  
e-mail submission on September 27, 2013.

#### **Overall Comment**

Dr. Alexandrovich agrees that much of the data from the continuous FEM monitors are problematic and not representative of air quality as measured using intermittent monitors. She supports IDEM's request for exclusion of the data.

#### **Suggested Changes to Tables 14 and 15**

Delete the word "Change" in the bold faced headings in the far right hand columns  
Include the effective dates in the far right hand column of the second and bottom subtable in Table 14.

#### **Suggested changes to second to last paragraph on page 4**

Reword first sentence.  
Last sentence is not clear.

#### **Last paragraph on page 4**

A question is asked on the intentions for AQS coding of older data. Dr. Alexandrovich suggests the coding be changed to 88502, although she feels some data may not be appropriate for AQI.

#### **The Future of continuous PM<sub>2.5</sub> Monitoring in Indiana**

Dr. Alexandrovich watches the data on a daily basis and is aware of times when the monitor may be malfunctioning. Even though some sites appear to be collecting reliable data, she recommends that intermittent PM<sub>2.5</sub> samplers be collocated with all continuous PM<sub>2.5</sub> monitors.

### **Response**

#### **Overall Comment**

IDEM appreciates Dr. Alexandrovich's support of the monitoring efforts and the proposed data exclusion.

#### **Suggested Changes to Tables 14 and 15**

IDEM will delete the word "change" from the right columns in Tables 14 and 15.  
The second and bottom subtables of Table 14 will be changed to show the time period to help clarify the intent.

#### **Suggested changes to second to last paragraph on page 4**

IDEM will reword the first sentence per Dr. Alexandrovich's suggestion to make it clearer.

IDEM agrees that the last sentence of this paragraph is a bit confusing. This language was the proposed language suggested by USEPA in the Exclusion Guidance. It will remain as it is written.

**Last paragraph on page 4**

This exclusion analysis looks at the continuous FEM data which had been collected using the current monitor at the site. The analysis specifically looked at the data from January 1, 2010 through December 31, 2012, the three years of data used for the most current design value calculations, from these sites. If the current FEM monitor at the site was installed prior to January 1, 2010, that data are also requested to be excluded (first subpart of Table 15) and the parameter code would be changed to 88502. If an FEM was installed prior to January 1, 2010, and that monitor was changed to another FEM monitor during the 2010 to 2012 time period, that data are requested to be excluded also (second subpart of Table 15) and the parameter code would be changed to 88502. Any continuous PM<sub>2.5</sub> data in AQS prior to deployment of the FEM monitor are already coded as 88501 or 88502. No change is requested for that data.

**The Future of continuous PM<sub>2.5</sub> Monitoring in Indiana**

IDEM understands that the comparison of the continuous PM<sub>2.5</sub> data with the intermittent data is a concern to other government entities. It is also a concern of IDEM. To help insure that the most accurate data are used for design value purposes, all of the sites with continuous monitors have always operated a collocated intermittent FRM/FRM. IDEM will continue to operate both units at these sites into the future. Only after several more years of consistently correlated data would IDEM consider removing any intermittent samplers. That decision would be on a site by site basis.