



pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION



Bureau of Air Quality

FRM v. FEM

The Rivalry

MARAMA Annual Monitoring Meeting
December 11, 2013
Richmond, VA

FRM v. FEM

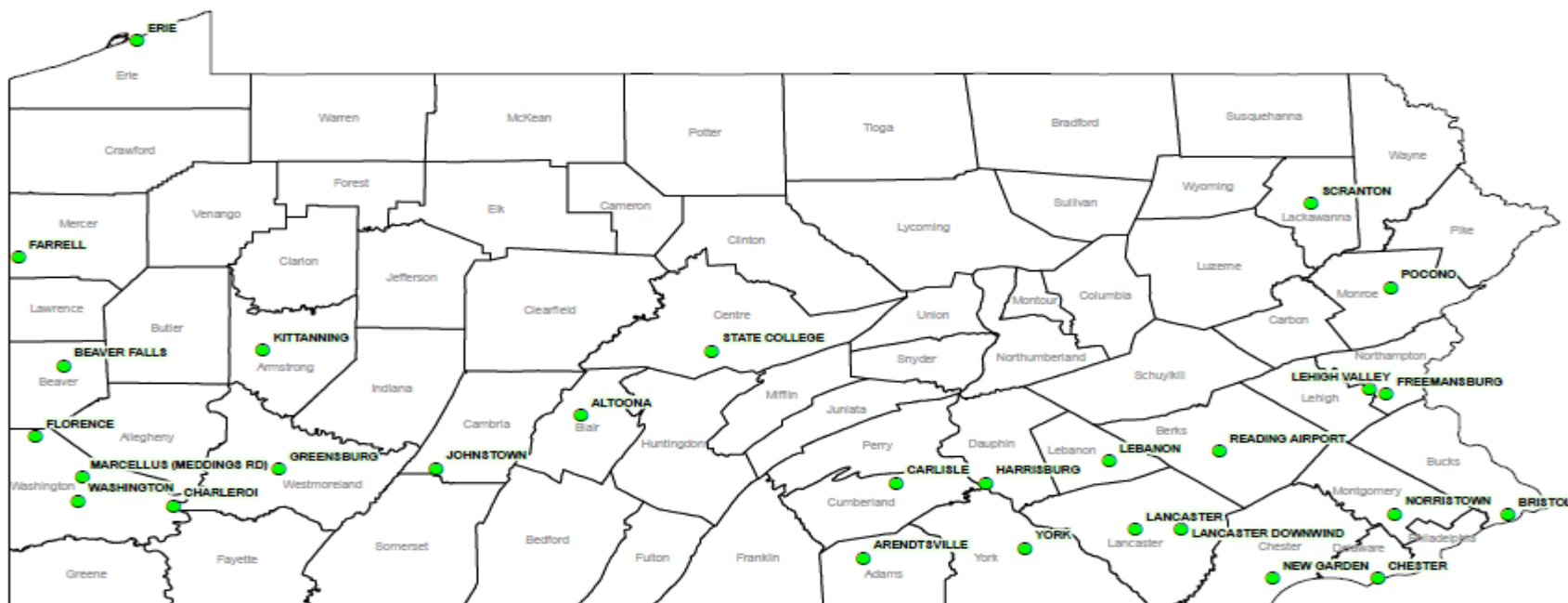
- The DEP currently operates 18 FRM and 26 FEM (of which 21 are BAM and 5 are FDMS TEOM) PM2.5 monitors
- As of 2013, of the 18 FRM monitors, locations are colocated with an FEM monitor
- Throughout 2013, the DEP is analyzing the relationship between the colocated FRM and FEM monitors

PA PM2.5 Monitoring Map

Commonwealth of Pennsylvania
Department of Environmental Protection
Bureau of Air Quality

As of 11/5/2013

Particulate Matter $\leq 2.5 \mu\text{m}$ (PM2.5) Ambient Air Monitoring Network



FRM v. FEM

FRM, FEM BAM, FEM FDMS Monitor Start & End Dates								
Site Name	AQS Code	FRM			BAM		FDMS	
		Start Date	End Date	Restart Date	Start Date	End Date	Start Date	End Date
ALLENTOWN	42-077-0004	1/1/1999	12/31/2005					
ALTOONA	42-013-0801				6/30/2010			
ARENDTSVILLE	42-001-0001	1/1/1999	6/30/2009		7/1/2009			
BEAVER FALLS	42-007-0014	1/1/2000					10/1/2010	
BEAVER FALLS (COL)		1/1/2000	12/31/2008					
BRISTOL	42-017-0012	1/1/1999			6/30/2010			
CARLISLE	42-010-0101	3/1/2001			1/1/2009			
CARLISLE (OLD)	42-041-0100	2/1/2000	3/31/2001					
CHARLEROI	42-125-0005	1/1/1999	3/31/2009		4/1/2009			
CHARLEROI (COL)		1/1/2000	12/31/2008					
CHESTER	42-045-0002	1/1/1999	3/31/2009		4/1/2009			
CHESTER (COL)		3/1/2000						
ERIE	42-049-0003	1/1/1999	6/30/2009		7/1/2009			
FARRELL	42-085-0100	4/1/2000			11/1/2010			
FLORENCE	42-125-5001	1/1/1999	6/30/2009	7/1/2012	7/1/2009			
FREEMANSBURG	42-095-0025	1/1/1999	6/30/2009	3/1/2012	7/1/2009			
GREENSBURG	42-129-0008	1/1/1999	6/30/2009	10/1/2012	7/1/2009			
GREENSBURG (COL)					1/1/2012			
HARRISBURG	42-043-0401	1/1/1999	12/31/2008		1/1/2009	12/31/2011		
HARRISBURG TEMP		1/1/2012						
HARRISBURG (NEW)		soon			soon			
JOHNSTOWN	42-021-0011	1/1/1999	12/31/2010		4/1/2009			
KITTANNING	42-005-0001				7/1/2009			
LANCASTER	42-071-0007	1/1/1999					10/1/2010	
LANCASTER (COL)		1/1/2000	12/31/2003	1/1/2009				
LANCASTER DOWNWIND	42-071-0012				1/1/2014			
LEBANON	42-075-0100				3/1/2011			
LEHIGH VALLEY	42-095-0027	1/1/2010						
MARCELLUS (MEDDINGS RD)	42-125-5200	8/1/2012						
NEW GARDEN	42-029-0100	1/1/2002	6/30/2009	10/1/2012	7/1/2009			
NORRISTOWN	42-091-0013	1/1/1999					10/1/2010	
PERRY COUNTY	42-099-0301	1/1/2000	12/31/2005					
POCONO/SWIFTWATER	42-089-0002				6/1/2010			
READING	42-011-0009	1/1/1999	5/31/2006					
READING AIRPORT	42-011-0011	7/1/2007					10/1/2010	
READING TEMP	42-011-0010	5/1/2006	5/31/2007					
SCRANTON	42-069-2006	1/1/1999	6/30/2009		7/1/2009			
SCRANTON (COL)		5/1/2000	12/31/2003					
STATE COLLEGE	42-027-0100	2/1/2000			9/1/2010			
WASHINGTON	42-125-0200	1/1/1999			11/1/2010			
WILKES BARRE	42-079-1101	1/1/1999	12/31/2005					
YORK	42-133-0008	1/1/1999					10/1/2010	
YORK (COL)		1/1/2000						

- The graph on the left illustrates the installation dates of our FRM and FEM monitors
- Throughout 2012, the DEP reinstalled four FRM units at various locations for the purpose of testing the correlation of data between FRM and FEM monitors (Florence, Freemansburg, Greensburg and New Garden)

FRM v. FEM

Correlation between 2012 and 2013 (Preliminary)

Sites	2012			2013		
	Slope	Y-intercept	R ²	Slope	Y-intercept	R ²
Bristol				1.1766	-1.0045	0.936
Carlisle	0.9919	1.0535	0.826	1.0928	1.2562	0.955
Chester (1 in 6)	0.7742	1.0292	0.722			
Farrell	0.6663	5.9032	0.414	1.0958	2.1752	0.811
Florence				0.9726	0.171	0.81
Freemansburg				0.9633	2.0931	0.913
Greensburg				1.0454	4.0757	0.685
Harrisburg				0.985	3.4811	0.72
Johnstown						
New Garden				0.8265	3.147	0.761
State College	0.9281	2.1288	0.503	0.956	0.6396	0.869
Washington	0.755	2.7832	0.513	1.0402	1.0704	0.948
York				0.8702	-1.6275	0.914

FRM v FEM

- There are benefits to using either method
- Benefits of having an FRM
 - FRM monitors have been around awhile (FEM have not, in comparison)
 - FRM's tend to read lower concentrations than FEM
- Benefits of having an FEM
 - Cost savings to the agency
 - Retrieval of data is instantaneous

Next Steps

- DEP will continue to finish analyzing the comparison between FRM and FEM monitoring data once we have a complete year's worth of data
- DEP will then analyze which monitoring locations to discontinue the use of FRM monitoring equipment (to go solely with the co-located FEM monitoring data)
- Analyze other factors
 - Cost savings
 - The importance of nonattainment



Bureau of Air Quality

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