STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RICK SNYDER
GOVERNOR

DAN WYANT
DIRECTOR

July 5, 2011

Ms. Susan Hedman, Regional Administrator
U.S. Environmental Protection Agency
Region 5
77 West Jackson Boulevard (R-19J)
Chicago, Illinois 60604-3507

Dear Ms. Hedman:

The Michigan Department of Environmental Quality (MDEQ) submits this request in support of a redesignation to attainment of the 15 ug/m^3 annual and 35 ug/m^3 daily fine particulate matter National Ambient Air Quality Standards for seven southeast Michigan counties (Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw and Wayne), and a proposed revision to the Michigan State Implementation Plan.

The MDEQ requests that the U.S. Environmental Protection Agency (U.S. EPA) proceed with final review and approval of this attainment redesignation. If you have any questions or need additional information, please contact Mr. G. Vinson Hellwig, Chief, Air Quality Division, at 517-373-7069, hellwigv@michigan.gov; or you may contact me.

Sincerely,

Dan Wyant

Dan Wyant
Director
517-373-7917

Enclosure
cc: Governor Rick Snyder
Ms. Cheryl Newton, U.S. EPA, Region 5
Mr. John Summerhays, U.S. EPA, Region 5
Mr. Andrew Chang, U.S. EPA, Region 5
Mr. Chuck Hersey, SEMCOG
Mr. Jim Sygo, Deputy Director, MDEQ
Mr. G. Vinson Hellwig, MDEQ
Mr. Robert Irvine, MDEQ
Ms. Cindy Hodges, MDEQ

Proposed Revision to Michigan's State Implementation Plan for Achieving the Particulate Matter less than 2.5 microns in diameter National Ambient Air Quality Standard (NAAQS)

Request to Redesignate to Attainment Status

For Both the Annual and 24-Hour $PM_{2.5}$ NAAQS

Southeast Michigan Counties of
Livingston, Macomb, Monroe, Oakland,
St. Clair, Washtenaw, and Wayne

and

Proposed Maintenance Plan for Southeast Michigan

July 5, 2011

Michigan Department of Environmental Quality
Air Quality Division

Table of Contents

List of Tables

List of Figures

Appendices

1. Introduction

The State of Michigan, through the Michigan Department of Environmental Quality (MDEQ), requests the U.S. Environmental Protection Agency (EPA) make a determination that Southeast Michigan is in attainment with the Particulate Matter less than 2.5 microns in diameter ($PM_{2.5}$) National Ambient Air Quality Standards (NAAQS), to change the legal status of the area from nonattainment to attainment, and to approve the maintenance plan as a revision to the Michigan State Implementation Plan (SIP). The seven counties in the Southeast Michigan $PM_{2.5}$ nonattainment area are Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne, shown in Figure 1.

The EPA established the NAAQS for fine particulate matter, the annual and daily $PM_{2.5}$ standard, in 1997 (See Table 1). The EPA designated areas in Michigan as attainment or nonattainment of the annual standard in January 2005. The designations were based on design values derived from air quality monitoring data for the years 2001-2003. Annual averages over 15 micrograms per cubic meter ($\mu g/m^3$) and daily standards over 65 $\mu g/m^3$ were considered to be violating the standard, too high to be protective of health. The EPA designated seven counties in Michigan as nonattainment for the annual standard.

The EPA revised the NAAQS for $PM_{2.5}$, for the daily standard, in 2006. While the annual standard was maintained at 15 $\mu g/m^3$, the daily standard was reduced to 35 $\mu g/m^3$. (See Table 1)

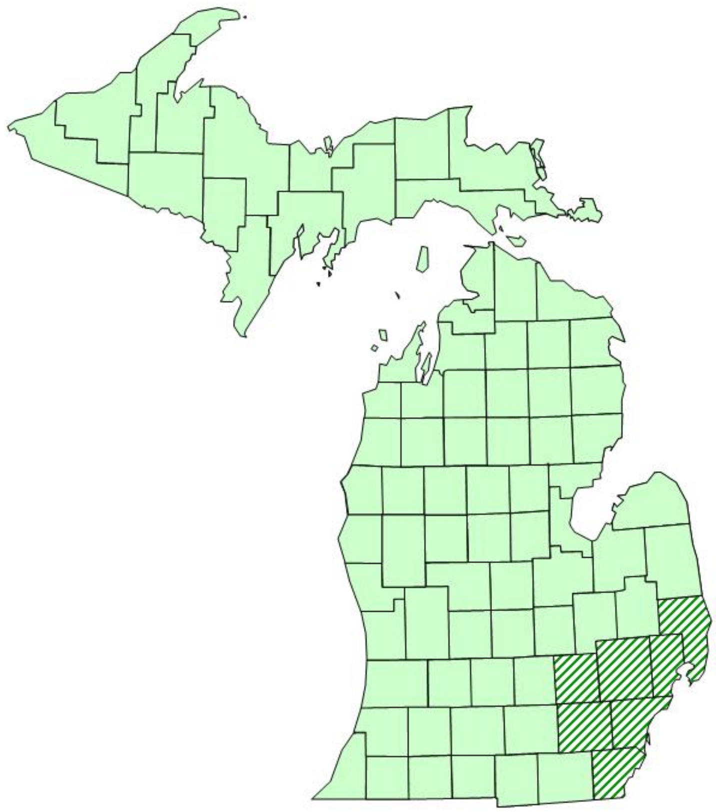
The EPA designated areas in Michigan as attainment or nonattainment of the 2006 $PM_{2.5}$ standards in November 2009. The designations were based on design values derived from air quality monitoring data for the years 2006-2008. Daily values over 35 $\mu g/m^3$ were considered to be violating the standard, too high to be protective of health. The EPA designated seven counties in Michigan as nonattainment for the annual and daily standards.

Table 1. National Ambient Air Quality Standards for Fine Particles.

	Annual	**24-Hour**
1997 Fine Particles Standards ($PM_{2.5}$)	**15 $\mu g/m^3$** Annual arithmetic mean, averaged over three years	**65 $\mu g/m^3$** 24-hour average, 98th percentile, averaged over three years
2006 Fine Particles Standards ($PM_{2.5}$)	**15 $\mu g/m^3$** Annual arithmetic mean, averaged over three years	**35 $\mu g/m^3$** 24-hour average, 98th percentile, averaged over three years

Air quality monitoring data collected in the 2007-2010 period showed all seven counties in Southeast Michigan in attainment for the $PM_{2.5}$ annual and daily NAAQS.

Figure 1. Southeast Michigan Counties for $PM_{2.5}$ Attainment Redesignation
Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne.



2. Redesignation Package Components

Section 107 of the federal Clean Air Act (CAA) establishes requirements to be met in order for an area to be qualified for redesignation to attainment, including:

- A determination that the area has attained the NAAQS;
- An approved SIP for the area under Section 110 (k) of the CAA;
- A determination that the improvement in air quality is due to permanent and enforceable reductions in emissions resulting from implementation of the SIP and applicable federal requirements;
- A fully approved maintenance plan under Section 175A of the CAA; and
- A determination that all Section 110 and Part D requirements under the CAA have been met.

This document summarizes compliance with each required component of an attainment redesignation.

3. Demonstration of Attainment of the Standard

The MDEQ maintains a comprehensive network of $PM_{2.5}$ air quality monitors throughout Michigan with the primary objective being to determine compliance with the $PM_{2.5}$ NAAQS. The MDEQ submits network reviews to the EPA Region 5 annually to ensure that air monitoring operations comply with all applicable federal requirements. Figure 2 shows the locations of $PM_{2.5}$ monitors in Southeast Michigan.

Figure 2. Locations of $PM_{2.5}$ Monitors.

Data from air quality monitors indicates whether or not violations of the $PM_{2.5}$ NAAQS are occurring. The monitoring site design value (DV) for the annual average is the three-year average of the annual averages, based on data from each of the monitoring sites. For the period 2008-2010, the design value is less than 15 µg/m^3 for the Southeast Michigan area. The DV for the daily standard at each site is the three-year average of the 98 percentile concentration of the 24-hour average values, based on data from each of the monitoring sites. For the period 2008-2010, the design value is less than 35 µg/m^3 for the Southeast Michigan area. Table 2 shows the design values, confirming attainment of the annual NAAQS. Table 3 shows the design values, confirming attainment of the daily NAAQS.

Table 2. Southeast Michigan 2007-2010 Monitor Data Design Value for Annual $PM_{2.5}$ NAAQS. *In Microgram Per Cubic Meter.*

		Annual Average				3-year Average	
County	Monitor	2007	2008	2009	2010	2007-2009	2008-2010
Macomb	New Haven 260990009	11.94	10.66	9.49	8.92	10.7	9.7
Monroe	Luna Pier 261150005	13.08	11.36	10.33	9.36	11.6	10.4
Oakland	Oak Park 261250001	13.33	10.86	10.03	9.12	11.4	10.0
St. Clair	Port Huron 261470005	12.44	11.08	9.74	8.94	11.1	9.9
Washtenaw	Ypsilanti 261610008	12.98	10.91	9.94	9.24	11.3	10.0
Wayne	Allen Park 261630001	12.76	11.83	11.06	10.23	11.9	11.0
	Dearborn 261630033	16.89	13.34	12.07	11.33	14.1	12.2
	E 7 Mile 261630019	13.01	11.33	10.54	9.89	11.6	10.6
	FIA 261630039	13.83	12.23	10.70	10.05	12.3	11.0
	Linwood 261630016	13.86	11.94	10.36	9.85	12.1	10.7
	Livonia 261630025	12.75	11.01	9.88	9.10	11.2	10.0
	Newberry 261630038	14.02	11.81	10.17	10.04	12.0	10.7
	SW HS 261630015	14.54	12.85	11.12	10.67	12.8	11.5
	Wyandotte 261630036	13.45	10.94	10.36	9.36	11.6	10.2

Table 3. Southeast Michigan 2007-2010 Monitor Data Design Value for Daily $PM_{2.5}$ NAAQS. *In Microgram Per Cubic Meter.*

		Daily 98th Percentile				3-year Average	
County	Monitor	2007	2008	2009	2010	2007-2009	2008-2010
Macomb	New Haven 260990009	29.0	28.9	26.2	25.5	28	27
Monroe	Luna Pier 261150005	32.2	28.6	23.6	26.3	28	26
Oakland	Oak Park 261250001	35.3	30.4	30.1	27.1	32	29
St. Clair	Port Huron 261470005	36.3	31.0	29.9	25.8	32	29
Washtenaw	Ypsilanti 261610008	34.5	28.2	28.2	23.3	30	27
Wayne	Allen Park 261630001	31.0	30.3	29.2	27.8	30	29
	Dearborn 261630033	36.6	31.7	35.7	28.6	35	32
	E 7 Mile 261630019	31.9	31.9	29.2	28.6	31	30
	FIA 261630039	34.8	31.7	31.7	27.7	33	30
	Linwood 261630016	34.3	30.0	31.0	27.9	32	30
	Livonia 261630025	32.8	28.3	29.3	25.3	30	28
	Newberry 261630038	33.4	31.5	25.9	30.4	30	29
	SW HS 261630015	34.0	34.3	30.9	26.6	33	31
	Wyandotte 261630036	28.6	26.3	26.9	24.4	27	26

Figure 3. Historic Annual PM2.5 Design Values. shows historic annual 3-year average design values at each site in the area to be redesignated. The data shows a strong and

steady decline in annual $PM_{2.5}$ concentrations in the region. This decline is consistent with the decline in emissions experienced over this time period due to control measures enacted at both the national and local level. Appendix A contains a table of the historical annual $PM_{2.5}$ values by quarter and year.

Figure 3. Historic Annual $PM_{2.5}$ Design Values.

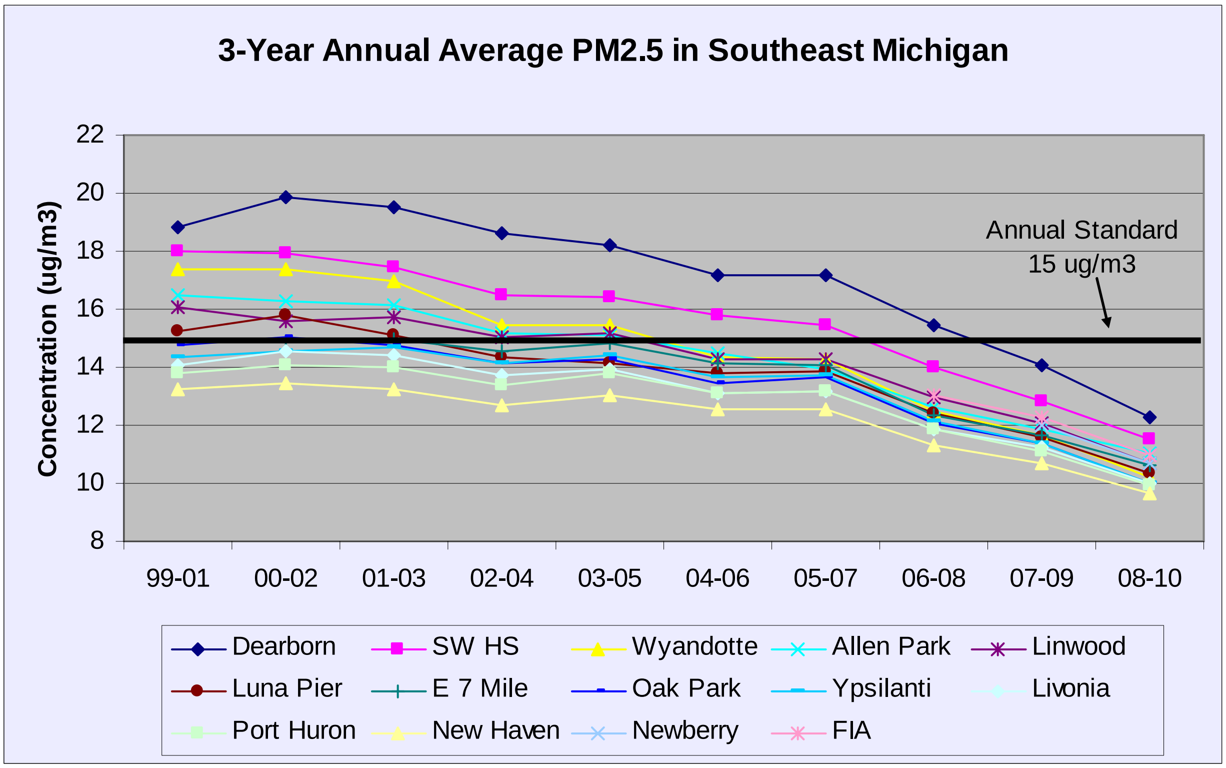
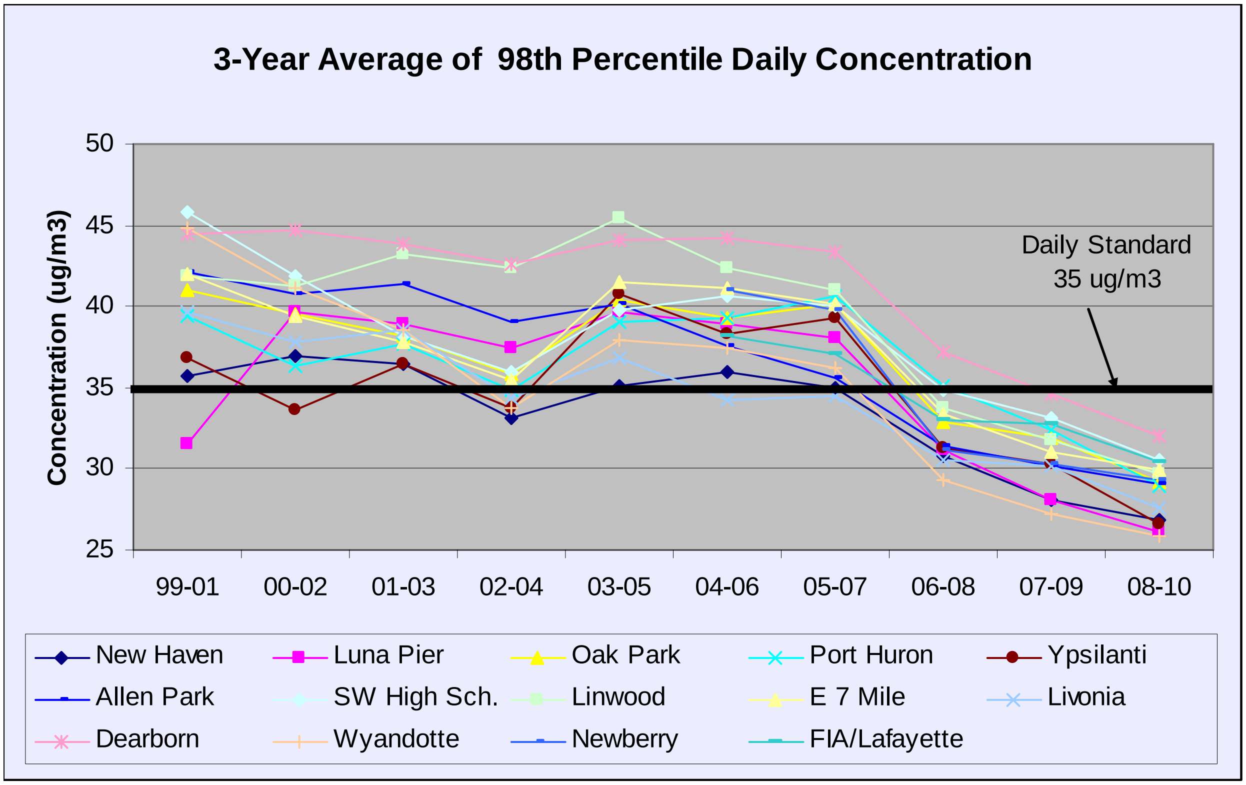


Figure 4 shows historic daily 3-year average design values for the 98% concentrations at each site in the area to be redesignated. The data show a significant drop in emissions since 2005 with the end result being all monitors in compliance with the 24-hour $PM_{2.5}$ NAAQS. Appendix A also contains a table of the historical daily $PM_{2.5}$ values.

Figure 4. Historic Daily $PM_{2.5}$ Design Values.



State and local air monitoring data is submitted to EPA's monitoring data repository called the Air Quality System (AQS). All data in the AQS has been quality assured, meeting the requirements specified in *Title 40 of the Code of Federal Regulations Part 58 Appendix A*. The completeness criteria for ambient monitoring data are specified in *40 CFR, Part 50, National Primary and Secondary Ambient Air Quality Standards, Appendix N.* A minimum completeness of 75 percent per quarter for each year period is required at each monitoring site. Data completeness information is presented in Table **4**. All monitors in Southeast Michigan meet the completeness criteria.

Table 4. Percent Data Completeness per Quarter for 2007-2010.

Monitor	2007 Q1	2007 Q2	2007 Q3	2007 Q4	2008 Q1	2008 Q2	2008 Q3	2008 Q4	2009 Q1	2009 Q2	2009 Q3	2009 Q4	2010 Q1	2010 Q2	2010 Q3	2010 Q4
New Haven 260990009	97	97	87	97	97	90	97	100	93	97	100	87	100	100	100	100
Luna Pier 261150005	97	87	94	100	100	100	94	90	97	97	97	87	100	97	100	94
Oak Park 261250001	100	93	97	100	97	93	97	100	100	97	90	100	97	100	97	94
Port Huron 261470005	97	93	97	97	97	97	97	97	90	100	97	97	93	100	97	100
Ypsilanti 261610008	90	90	97	100	90	100	100	97	97	97	100	100	97	93	100	97
Allen Park 261630001	96	97	93	100	97	99	93	95	93	98	92	93	89	96	91	90
SW HS 261630015	93	100	87	97	100	100	100	97	100	90	100	94	100	100	97	97
Linwood 261630016	87	87	97	97	94	100	94	100	90	87	87	100	87	93	100	97
E 7 Mile 261630019	100	93	100	90	97	100	81	100	100	100	97	90	100	77	84	94
Livonia 261630025	87	100	100	90	87	97	100	97	97	100	93	90	93	97	87	97
Dearborn 261630033	97	97	94	90	100	93	97	100	90	100	93	100	90	100	97	100
Wyandotte 261630036	97	93	97	97	100	97	97	100	93	97	93	77	77	97	94	100
Newberry 261630038	87	90	87	100	94	97	87	93	83	94	90	94	90	100	100	97
FIA 261630039	97	100	97	93	97	93	94	97	97	100	100	91	92	98	83	91

4. State Implementation Plan Approval and Compliance with Clean Air Act (CAA) Section 110 and Part D Requirements

The Southeast Michigan area is classified as a $PM_{2.5}$ nonattainment area under Part D, Subpart 1 of the CAA. Section 110 of the CAA delineates general SIP requirements and Part D contains requirements specific to nonattainment areas. Southeast Michigan meets all applicable requirements for $PM_{2.5}$ redesignation under these provisions.

Southeast Michigan was originally classified as a nonattainment area under the 1997 annual $PM_{2.5}$ NAAQS. The EPA strengthened the daily standard in 2006 and Southeast Michigan was then classified as nonattainment for the daily $PM_{2.5}$ NAAQS as well.

Michigan's SIP was submitted to EPA in May 2008 and contains all required emission control programs related to $PM_{2.5}$ under Section 110 of the CAA. Programs for emissions limitations, permitting, emission inventories and statements, emission fees, enforcement authorities, and ambient monitoring have been implemented in Michigan and are included in the SIP.

5. Demonstration of Improvement in Air Quality

Improvement in air quality must be reasonably attributed to emissions reductions of primary $PM_{2.5}$ and the $PM_{2.5}$ precursor pollutants nitrogen oxides (NO_X) and sulfur dioxide (SO_2) that are permanent and enforceable. An examination of primary $PM_{2.5}$, NO_X and SO_2 emissions from a period of nonattainment (2005) to attainment (2008) shows a decline in overall emissions during this time period. The source of the emissions data is the MDEQ 2005 (base M) and 2008 (base B) emissions inventory processed by the Lake Michigan Air Directors Consortium (LADCO) to yield annual and winter day nonattainment area (NAA) totals. The on-road emissions were calculated by the Southeast Michigan Council of Governments (SEMCOG) using the 2010a version of the Motor Vehicle Emission Simulator model. Non-road emissions estimates were obtained using EPA's National Mobile Inventory Model. Details regarding this data are included in Appendices A and B.

Table 5 and Table 6 identify emission reductions by source category for the Southeast Michigan NAA. While SO_2 emissions increased slightly over this 3-year period, both NO_X, and $PM_{2.5}$ emissions decreased by more than 10 percent. All pollutant emissions decreased for the marine, airports and railroad category (MAR) and on-road mobile sources. All pollutant emissions increased for the electric generating unit (EGU) sources.

Table 5. Southeast Michigan Emission Reduction Demonstration Inventories for 2005 and 2008 for Annual $PM_{2.5}$. *All units are in tons per year.*

	NOx		SO_2		$PM_{2.5}$	
	2005	2008	2005	2008	2005	2008
EGU	69,756.71	70,008.00	227,751.98	233,870.64	1,105.51	1,375.31
NON-EGU	18,684.20	18,817.18	16,240.13	19,793.49	2,454.95	1,605.72
Area	15,949.68	17,157.57	4,629.99	5,702.94	5,456.25	5,406.06
Non-road	28,829.50	24,065.61	2,739.34	426.61	2,203.67	1,773.31
MAR	7,380.89	6,380.17	681.42	588.82	193.09	165.62
On-road	154,294.00	119,194.00	3,809.00	1,066.00	5,323.00	4,360.00
Total	294,894.98	255,622.53	253,108.86	261,447.50	16,736.47	14,686.02

Table 6. Southeast Michigan Emission Reduction Demonstration Inventories for 2005 and 2008 for Daily $PM_{2.5}$. *All units are in tons per winter day.*

	NOx		SO_2		$PM_{2.5}$	
	2005	2008	2005	2008	2005	2008
EGU	217.63	220.95	636.63	682.05	2.90	2.91
NON-EGU	51.51	49.76	44.06	51.33	6.61	3.98
Area	81.73	80.58	16.08	16.46	25.21	15.46
Non-road	54.99	47.82	4.61	0.81	4.16	3.70
MAR	20.97	19.80	2.85	1.75	0.52	0.50
On-road	461.20	366.20	8.60	3.10	19.20	15.70
Total	887.63	785.11	712.83	755.50	58.60	42.25

Reductions in emissions between 2005 and 2008 can be attributed to the combination of local and national control programs contained in the $PM_{2.5}$ SIP for Southeast Michigan. This SIP, submitted in May 2008 included targeted reductions in the industrialized area of Detroit as well as federal emissions controls that were being phased in for both stationary and mobile sources. The significant emission reductions these measures produced have brought all monitors in Southeast Michigan into compliance with both the annual and 24-hour $PM_{2.5}$ NAAQS.

<u>Point Sources</u>

Companies in the nonattainment area have made significant emissions reductions that are permanent and enforceable. Additional detail on all of these companies can be found in Appendix D.

One source that has made significant reductions is the Severstal steel mill located less than one mile southwest of the Dearborn monitor. Appendix D gives detailed information about this point source. Based on the MDEQ's permit #182-05B for Severstal, baghouses were installed for their Basic Oxygen Furnace and Blast Furnace C and began operation in 2007. Severstal's Blast Furnace B is currently shutdown, but will have a baghouse installed when it restarts. In addition, torch cutting is no longer permitted on site, scarfing operations reduced their opacity and torpedo cars were required to reduce smoking. This source was also subject to Maximum Achievable Control Technology (MACT) Subpart FFFFF for integrated iron and steel mills. Total emissions reductions were 147 tons of $PM_{2.5}$.

Another large source in the area is US Steel. US Steel upgraded a baghouse on their Blast Furnace B in September 2005, which reduced particulate emissions by 76 tons per year (Consent Order 1-2005). In addition this facility is subject to MACT Subpart FFFFF for integrated iron and steel mills and Subpart CCCCC for coke oven: pushing, quenching and battery stacks.

The Ford Motor Company-Rouge Complex, located in the area, is a major volatile organic compound (VOC) source, but has some NO_X emissions as well. This source is subject to two MACTs: Subpart IIII for surface coatings of automobiles and light duty trucks as well as Subpart MMMM for surface coating of miscellaneous metal parts and products.

The Marathon-Ashland Petroleum Refinery is subject to several MACT and New Source Performance Standards as detailed in their Renewable Operating Permit #199700013.

Dearborn Industrial Generation is a large source that burns blast furnace gas from Severstal to supply energy to Severstal. This source is subject to the Acid Rain Program and the NO_X SIP Call.

In addition to these permanent and enforceable emission reductions from the large companies around the Dearborn monitor, permanent and enforceable reductions have occurred from several facilities in Wayne County that have shut down. Table 7 shows the companies as well as the emissions changes from 2005 to 2008.

Table 7. List of Sources that have Gone Out of Business in Wayne County, Michigan between 2005 and 2008 and Their Emissions.

		Last Year	Permit	2005					2008				
Facility Name	SRN	Reported	voided?	NOx	PM_{10}	$PM_{2.5}$	SO_2	VOC	NOx	PM_{10}	$PM_{2.5}$	SO_2	VOC
Ajax Materials Corporation	M4601	2007	yes	8.4	3.1	-	4.4	4.3	--	--	--	--	--
Edison Energy Services	M4848	2007	yes	--	0.0	--	--	--	--	--	--	--	--
Ferrous Environmental	M4798	2007		--	5.5	--	--	--	--	--	--	--	--
Spartan Industrial	M3066	2007		--	--	--	--	8.9	--	--	--	--	--
Great Lakes Petroleum Terminal, LLC	B4752	2007	yes	14.3	0.5	0.5	31.1	34.1	--	--	--	--	--
Arkema, Inc*	B2173	2009	yes	89.0	3.8	3.8	0.3	13.3	35.8	1.5	1.5	0.1	7.9
M-Lok, Inc**	A8196	2008	Yes	--	--	--	--	26.8	--	--	--	--	16.0

*Arkema, Inc completely closed in 2009.
** M-Lok, Inc. closed in the summer of 2008.

Mobile Sources

In addition to these local stationary source controls, the Federal Motor Vehicle Control Program has produced significant emission reductions from on-road and non-road motor vehicles throughout the country. Phase-in of federal “Tier 2” emissions standards began in 2004, affecting light-duty passenger vehicles, including sport utility vehicles, minivans, and pickup trucks. In 2004, a requirement for lower sulfur gasoline began phasing in, and in 2006, a similar requirement for ultra low sulfur diesel fuel took effect. All of these controls contributed to a significant reduction in mobile source emissions of $PM_{2.5}$, NO_X and SO_2. These reductions are permanent and enforceable and have contributed to the overall improvement in $PM_{2.5}$ levels in Southeast Michigan.

In addition to federal mobile controls, several voluntary mobile control measures have occurred in the Detroit area. The Diesel Emissions Reduction Act (DERA) Grant projects have provided partial funding to retrofit 39 school buses with Diesel Oxidation Catalysts in 2005. An additional 160 Detroit Public School buses have or will be retrofitted in 2010 and 2011. DERA Grants have also provided for several other diesel emission reductions on marine and off-road equipment and heavy duty diesel trucks in 2008 and 2009.

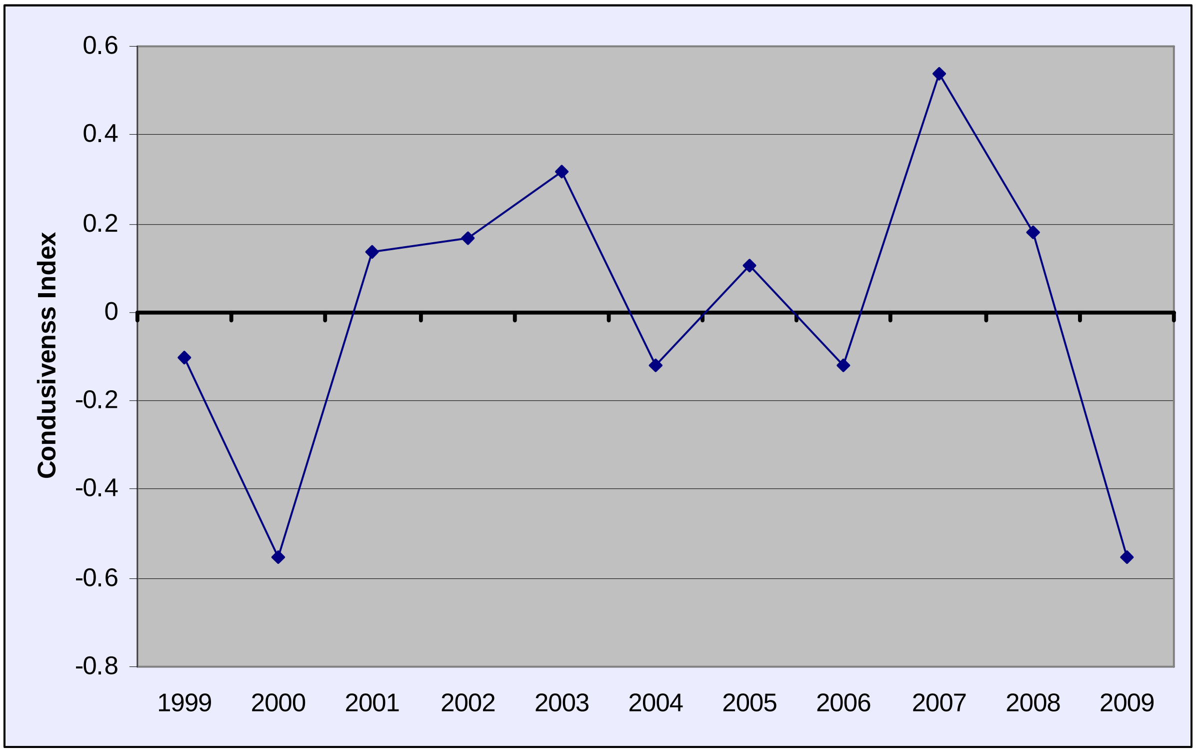
Four switch yard trains at the CSX rail yard by Severstal Steel were rebuilt using money mainly from the Federal Congestion Mitigation and Air Quality Improvement Funding. These rebuilds were expected to reduce emissions of NO_X by 66 ton per year and particulate matter (PM) by 1.8 tons per year. Financed by Chrysler's Supplemental Environmental Project, 28 trains were retrofitted with anti-idling technology in the US Steel Delray Connecting Railroad Company and Norfolk Southern Railroad/Consolidated Rail. This anti-idling technology was calculated to reduce NO_X emissions by 29 tons per year, and PM emissions by 1.3 tons per year.

Meteorological Conduciveness

Actual $PM_{2.5}$ levels adjusted for meteorological conduciveness are another indicator of overall improvement in air quality. $PM_{2.5}$ trend analysis is complicated by the dependence of $PM_{2.5}$ formation on meteorology, including wind direction, wind speed, pressure, and temperature changes. To more accurately discern trends in $PM_{2.5}$ concentrations, the data can be adjusted to remove the impact from meteorological confounders. LADCO used a statistical technique, called Classification and Regression Tree (CART) analysis, to partition $PM_{2.5}$ values into various categories of $PM_{2.5}$ conducive meteorology. This determined the $PM_{2.5}$-forming potential of each year's meteorology.[1] Metrological and monitoring data from five monitors in Detroit and Down River areas of Wayne County. Figure 5 shows that the years 2001, 2002, 2003, 2005, 2007, and 2008 were more conducive for $PM_{2.5}$ formation than the average.

[1] Kenski, Donna, Air Quality Overview, Lake Michigan Air Directors Consortium, Project Team Meeting, September 22-23, 2010

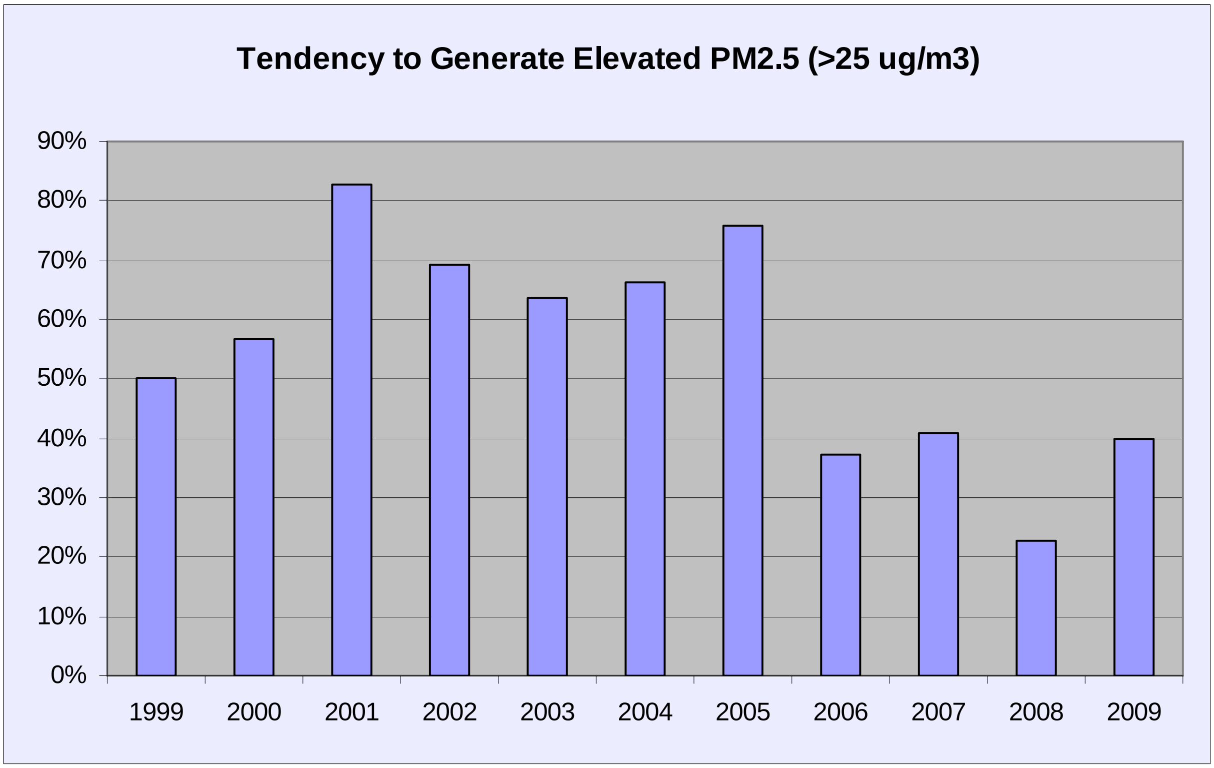
Figure 5. CART Index of $PM_{2.5}$ Conduciveness in Detroit.



Index represents fraction of $PM_{2.5}$ conducive days in each year, above or below the 1999-2009 average.
1=twice as many days as average, -1=half as many days as average year.

The MDEQ divided the number of days in which daily $PM_{2.5}$ values were elevated (above 25 µg/m^3) at ambient air quality monitors by the number of days with conducive meteorology. The ratios were converted to percentages to increase clarity. Because there is year-to-year fluctuation, an average of the percent of high $PM_{2.5}$ days over three years was calculated. This removed some of the uncertainty inherent in the yearly results. Figure 6 shows that during the period 1999 to 2004, over 60 percent of $PM_{2.5}$ conducive days experienced elevated $PM_{2.5}$ levels, but during the period 2008-2009, the percentage drops to 31.

Figure 6. Tendency to Generate Elevated $PM_{2.5.}$ Number of Elevated Days/Number of Conducive Days, Converted to Percent.



$PM_{2.5}$ concentrations in 2007-08 were moderate despite better than average $PM_{2.5}$-conducive meteorology. The CART analysis and the number of high $PM_{2.5}$ concentrations on meteorologically conducive days reinforces the demonstration that reductions in primary $PM_{2.5}$ and $PM_{2.5}$ precursor emissions have led to the actual improvements in air quality, rather than less conducive meteorology.

6. Weight of Evidence for Fine Particulate Matter

This section is called Weight of Evidence (WOE) because it is intended to provide additional supporting information, or "evidence," that emissions have been and are being reduced in the highest $PM_{2.5}$ area, in the vicinity of the Dearborn air monitor. This information should be seen as a supplement to the emission inventories that are contained in Section 5 of this document and which serve as the primary evidence that emission reductions have brought about the change in attainment status from nonattainment to attainment at the design value monitor in Dearborn between the years 2005 and 2008.

Using a WOE is consistent with Michigan's $PM_{2.5}$ implementation plan for the annual standard which was completed in 2008. A WOE approach was used because it is the most scientifically defensible; it relies on not one method, such as modeling, but multiple sources of information, providing a more robust SIP demonstration. The WOE included monitoring data, emissions inventory data, photochemical and dispersion modeling, and trend analysis. The implementation plan focused on the monitors in Wayne County that were not showing attainment of the standard in the years prior to 2008.

In the implementation plan, local strategies were shown through modeling to be effective for attaining the standard. As only two of the 13 monitors in the seven-county area were not in compliance with the standard in 2007 (SWHS showed attainment in 2008), and these two violating monitors were within three miles of each other, stationary source nonattainment area-wide controls were determined to be impractical. The plan noted that federal requirements (Acid Rain, NO_X SIP Call, mobile source controls, etc.) would already be controlling major sources in the region, although, monitoring trends and modeling data showed that these regional on-the-books federally mandated controls still may not quite provide for attainment at the Dearborn monitor by 2009. Thus efforts in the 2008 SIP primarily focused on identifying and reducing the local excess $PM_{2.5}$ in the Dearborn area.

This section includes background information on the nature of the $PM_{2.5}$ in the Dearborn area. The components of $PM_{2.5}$ are similar in many locations but component percentages can vary between locations. Understanding this mix can help determine sources in the area that can be considered as contributors to the overall $PM_{2.5}$ problem.

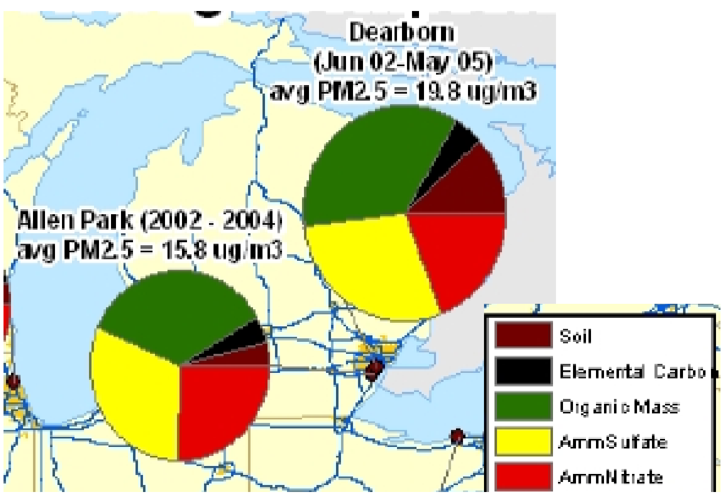
The section also provides information on typical sources of the three constituents of $PM_{2.5}$ that are accounted for in the inventory in Section 5. The three are primary $PM_{2.5}$, sulfates, and nitrates, the latter two of which are represented in the inventory by SO_2 and NO_X.

This SIP redesignation demonstration addresses both the annual and daily $PM_{2.5}$ standards. While high daily values are often driven by winter time inversions, unlike the high annual standard causes, the same controls that lead to annual reductions should have positive impacts on the daily standard. This WOE, therefore, is intended to apply to the daily standard as well as the annual.

6.1. $PM_{2.5}$ Composition

Fine particulate matter is a complex mixture of ammonium sulfate, ammonium nitrate, organic carbon, elemental carbon, soil (or crustal material) and other particles. Some $PM_{2.5}$, particularly in urban areas, is anthropogenic (man-made) in origin and some is biogenic (natural) in origin. $PM_{2.5}$ is composed of primary (directly emitted) and secondary (formed in the atmosphere) particles. Current speciation analyses of ambient monitoring data indicate that $PM_{2.5}$ concentrations result from both primary emissions (e.g., crustal matter, elemental carbon, and much of the organic carbon), and secondary formation (e.g., ammonium sulfate, ammonium nitrate, and some organic carbon). Figure 7 shows the composition of $PM_{2.5}$ at two monitors in the Detroit area.

Figure 7. Average $PM_{2.5}$ Composition for Dearborn and Allen Park.

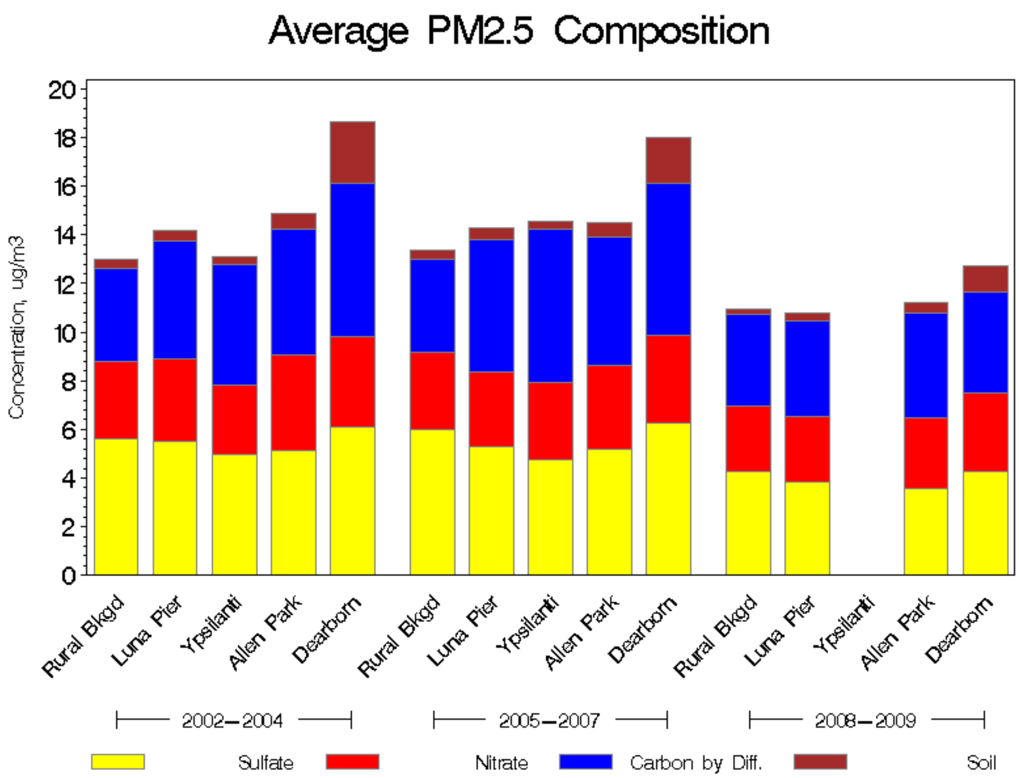


Source: Brown, et. al., 2006.

The largest components of $PM_{2.5}$ at the monitors showing nonattainment are ammonium sulfate, ammonium nitrate and organic carbon. Soil also is significant at the Dearborn monitor. The Dearborn and Allen Park monitors are only a few miles apart, but show differences in composition and average concentration, indicating that local sources have a large impact on the Dearborn monitor. Based on EPA's implementation guidance, primary $PM_{2.5}$ and SO_2 must be regulated. NO_X must be regulated unless the state or EPA can demonstrate that NOx is not a significant contributor to $PM_{2.5}$. Since ammonium nitrate contributes 20-30% of $PM_{2.5}$ mass, Michigan determined NO_X is a significant contributor to $PM_{2.5}$.

The ambient levels of $PM_{2.5}$ have been decreasing in recent years as can be seen in Figure 8. In recent years, all sites with speciated data have had reductions in sulfates and organic carbon. The soil component at Dearborn, which is largely composed of iron, has also decreased, which is attributed to additional controls installed at the Severstal steel mill. Regional controls of NO_X and SO_2 reduced $PM_{2.5}$ in this area and throughout the state, and will continue to do so for the next several years. Significant amounts of $PM_{2.5}$ came predominantly from local upwind industrial sources (iron and some organic carbon), and control of these sources significantly reduced the local excess at this site and brought it into attainment of both the annual and daily $PM_{2.5}$ standards in 2009 and has continued to keep it well within these standards in 2010.

Figure 8. Average $PM_{2.5}$ Species Composition by Site for Three Multi-Year Periods.



Source: LADCO, November 2010

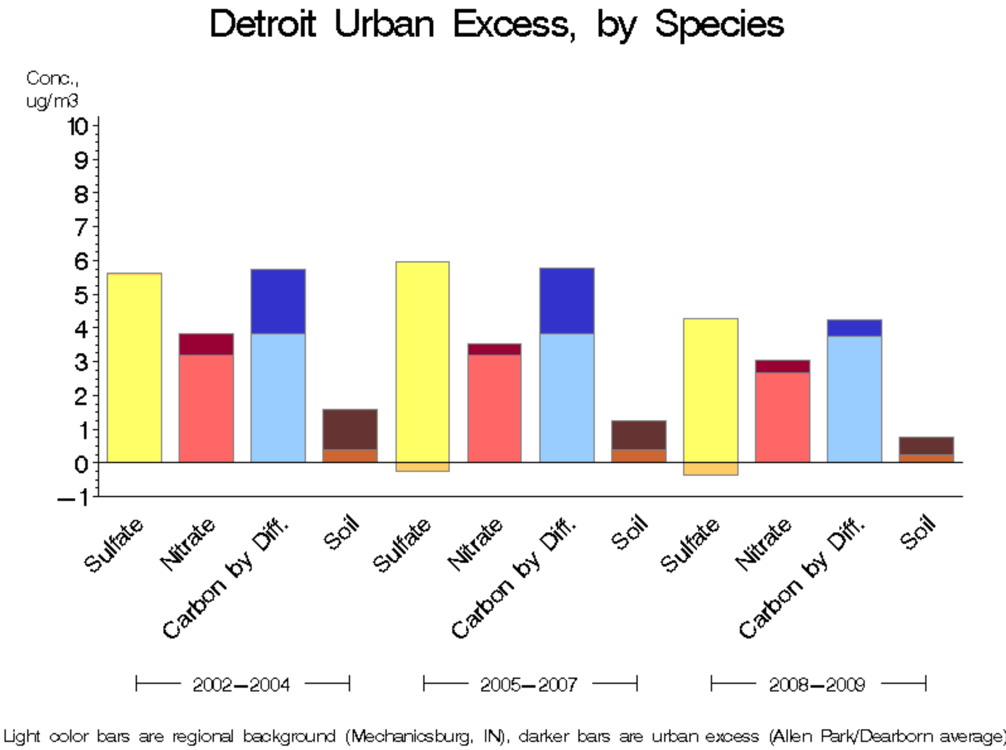
6.2. $PM_{2.5}$ Sources

$PM_{2.5}$ comes from a variety of local and regional sources. Primary $PM_{2.5}$ is directly emitted as a particle and is usually deposited on a monitor from nearby sources. However, on occasion, primary $PM_{2.5}$ is carried for many miles from forest fires or dust storms before it is deposited. NO_X is emitted as a gas, but can convert quickly to a particulate form of ammonium nitrate. Thus NO_X sources can be local sources within a few miles of a monitor, at a greater distance away from the monitor but within the Southeast Michigan region, or from a multi-state region. SO_2 requires time to form ammonium sulfate and will mostly come from a greater distance away from the monitor but within the Southeast Michigan region and from a multi-state region, similar to ammonium nitrate.

The Dearborn monitor is located in the industrialized core of Detroit, which contains a complex array of emission sources. In the area of the Dearborn monitor, there are a variety of sources of primary $PM_{2.5}$, including steel mills, an auto manufacturer, a refinery, and a variety of smaller stationary sources. Sources of NO_X include various sizes of industrial combustion operations and electric generating facilities. SO_2 sources are some of the same combustion operations, particularly large boilers and electric generating facilities burning coal or oil.

Figure 9 provides information on $PM_{2.5}$ coming in to Detroit, called background, and $PM_{2.5}$ locally generated, called urban excess. The federal regional controls address much of the background while controls of local facilities (as well as federal rules for mobile sources) address the urban excess. Ammonium sulfate, mostly from regional sources, has similar concentrations as the regional background, which has been reduced in recent years (2008-2009). Ammonium nitrate comes from local and regional sources and both the local and regional contribution has decreased in recent years. Soil is part of the primary $PM_{2.5}$ component and has also been decreasing in recent years, especially the local excess. Organic carbon is part of both the primary and secondary $PM_{2.5}$. The local portion is most likely primary $PM_{2.5}$ and has been decreasing over recent years. The background organic carbon is likely a mix of primary and secondary $PM_{2.5}$ and has remained relatively constant in recent years (see Figure 9). This figure shows that local concentrations of $PM_{2.5}$ have been significantly reduced, helping Southeast Michigan reach attainment.

Figure 9. The Urban Excess by Species in Detroit for Three Multi-Year Periods.



Source: LADCO, November 2010

6.3. Requirements for Permanent, Quantifiable Reductions

The CAA states that a redesignation request must demonstrate that the nonattainment area has experienced emission reductions that led to the improvement in its ambient air. Secondly, it is required that the emission reductions are shown to be permanent and quantifiable. As stated in Section 5, the emission reductions responsible for the continued decline in $PM_{2.5}$ levels in the nonattainment area, and particularly in the Dearborn area, come from a variety of sources.

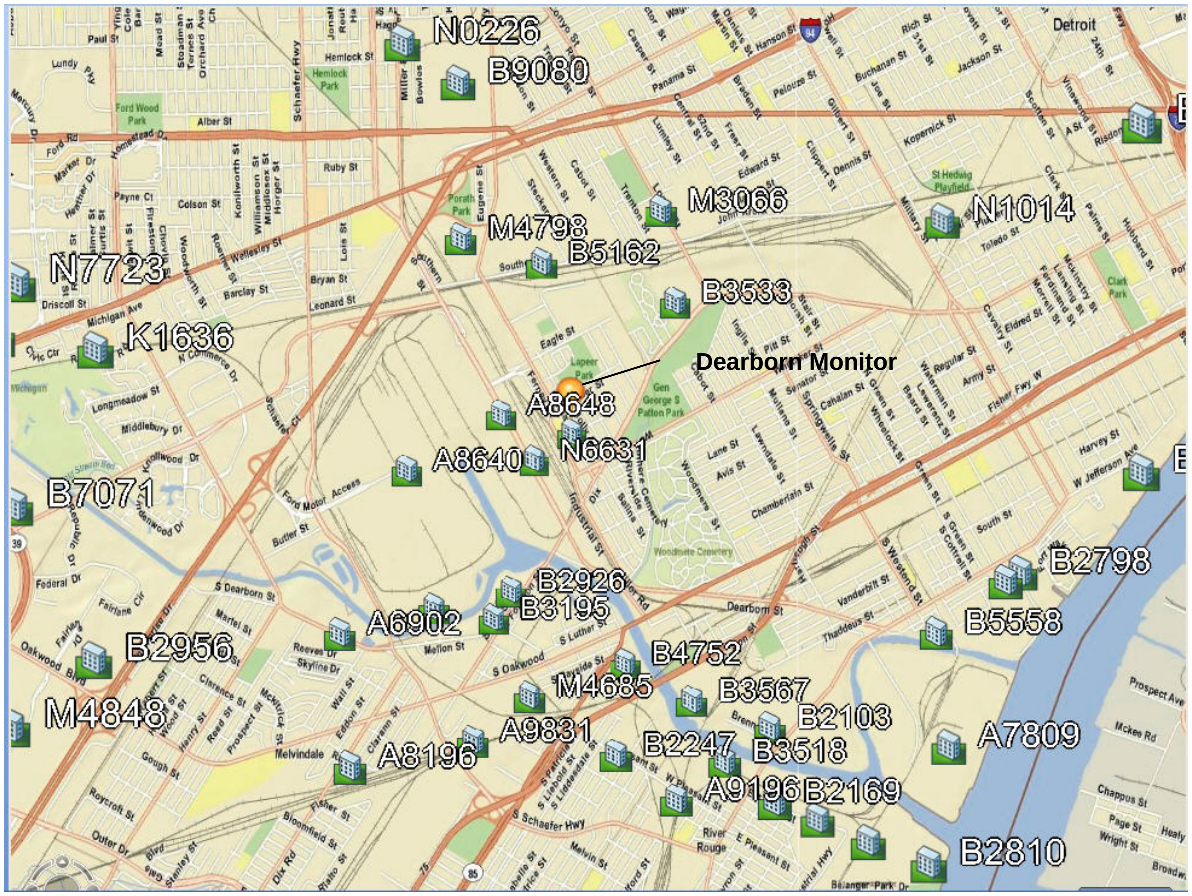
The largest emission reductions between 2005 and 2008 are from the on-road mobile sector. These reductions are primarily due to federal control programs that are permanent and enforceable and therefore meet the intent of the CAA. Other emission reductions that are positively impacting the nonattainment area are the federal and state acid rain program and NO_X SIP call affecting EGUs. While the EGUs in the nonattainment inventory do not show emission reductions from 2005-2008, these programs on a regional basis are reducing $PM_{2.5}$ levels in the air reaching the nonattainment area and contributing to attainment. These control programs are permanent and enforceable and meet the CAA requirement.

Stationary source controls that were included in Southeast Michigan's $PM_{2.5}$ SIP and permanent closure of facilities in the vicinity of the Dearborn monitor also result in permanent and enforceable emission reductions that directly impact the monitors in that area. Appendix D in this document contains information regarding a number of these sources.

6.4. Stationary Source Facility Details

To further evaluate local stationary emission sources, sources were analyzed for emissions, throughput (as a stable surrogate for emissions), emission controls and other pertinent information and compared to the ambient $PM_{2.5}$. Figure 10 shows the location of emissions sources around the Dearborn monitor. Changes at many of these sources are analyzed in Appendix D.

Figure 10. Map of Emission Sources Near the Dearborn Monitor.



List of Sources

SRN	Source	SRN	Source
A6902	Darling International Inc	B3533	Edw C Levy Co Plant 1
A7809	US Steel Great Lakes Works	B3567	St Mary's Cement
A8196	M-Lok Riley Plating – OOB*	B4752	Great Lakes Petroleum Terminal – OOB*
A8640	SeverStal North America	B5162	Xcel Steel Pickling (formerly Castle Steel)
A8648	Ford Motor Co. - Rouge Complex	B5558	Honeywell – OOB*
A9196	Fabricon Products Inc	B7071	Automotive Components Holding
A9831	Marathon-Ashland Oil Refinery	B9080	Envirosolids, LLC
B2103	Detroit Water and Sewerage Department	K1636	City of Dearborn
B2169	Carmeuse Lime, Inc. (River Rouge Facility)	M3066	Spartan Industrial – OOB*
B2247	Buckeye Terminals LLC (Detroit Terminal)	M4685	Detroit Salt
B2798	Detroit Edison Co. - Delray	M4798	Ferrous Environmental – OOB*
B2810	Detroit Edison Co. - River Rouge	M4848	Ford Motor Allen Park Clay Mine – OOB*
B2926	Sunoco Partners M & T, L.P. (River Rouge Terminal)	N0226	Hinkle MFG LLC
B2956	Ford Motor New Model Program	N1014	Magni Industries Inc
B3195	Cadillac Asphalt Products	N6631	Dearborn Industrial Generation
B3518	United States Gypsum Company	N7723	DTE Energy / Ford World Headquarters

* OOB means out of business

6.5. Other Source Categories

Point source emissions were discussed in Section 6.4 and in detail in Appendix D. This section addresses the remaining area and mobile sources addressed in the emissions inventory in Section 5.

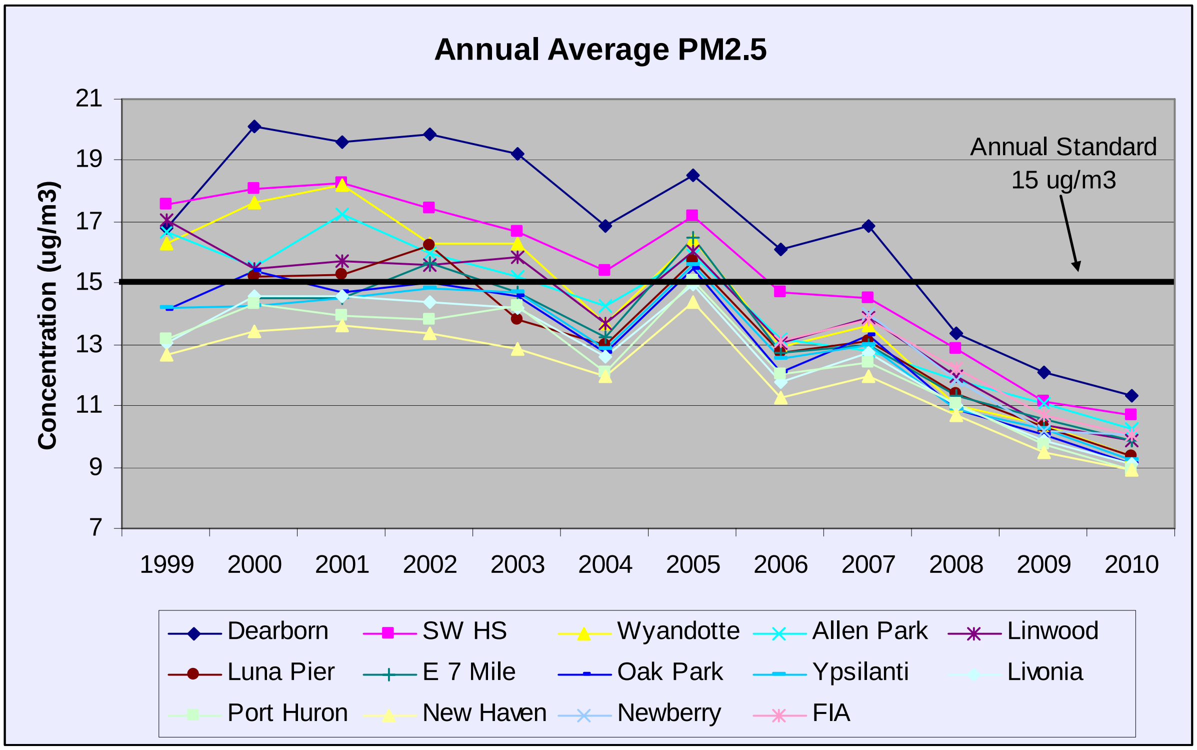
Based on the emissions inventory all area and mobile sources have lower emissions in 2008 compared to 2005 for primary $PM_{2.5}$. Mobile sources (including non-road, MAR, and on-road) have also reduced emissions for NO_X and SO_2. Phase in of the Tier 2 mobile vehicle controls, low sulfur gasoline requirements and corresponding diesel rules that puts similar controls on diesel fuel and heavy-duty vehicles are producing significant reduction in mobile emissions. In addition regional summertime gasoline rules that reduce the Reid vapor pressure (RVP) in fuel from 7.8 to 7.0 began in 2007.

Also federal rules for aircraft, recreational vehicles, diesel marine engines and large industrial spark-ignition engines went into effect between 2005 and 2008 which produced emission reductions in the MAR and non-road mobile emissions categories.

6.6. Trends Analysis

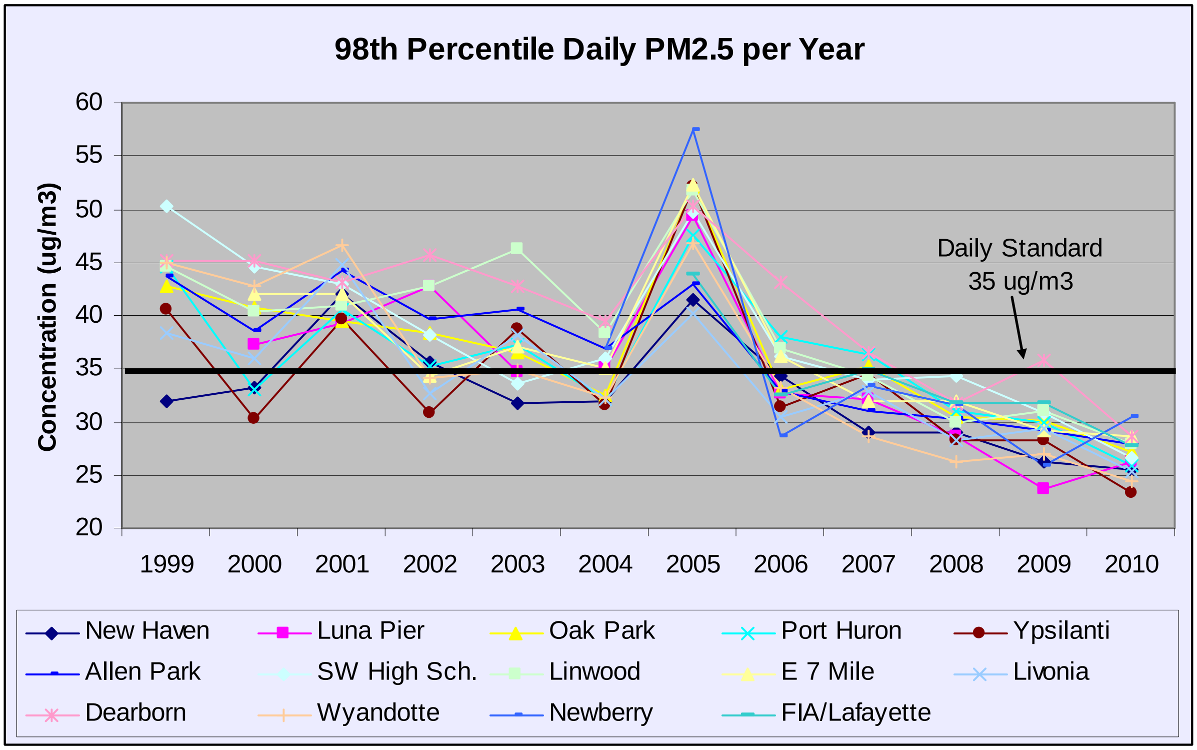
The 3-year $PM_{2.5}$ annual average (Figure 11) and 3-year 98th percentile (Figure 12) for daily $PM_{2.5}$ have decreased over the last 10 years. The only monitor in Southeast Michigan that was above the standard in the 2006-2008 3-year average was the Dearborn monitor. Since 2007-2009, this monitor has been in compliance with both the annual and daily $PM_{2.5}$ standard.

Figure 11. Annual Average of Annual $PM_{2.5}$.



Source: MDEQ monitor data

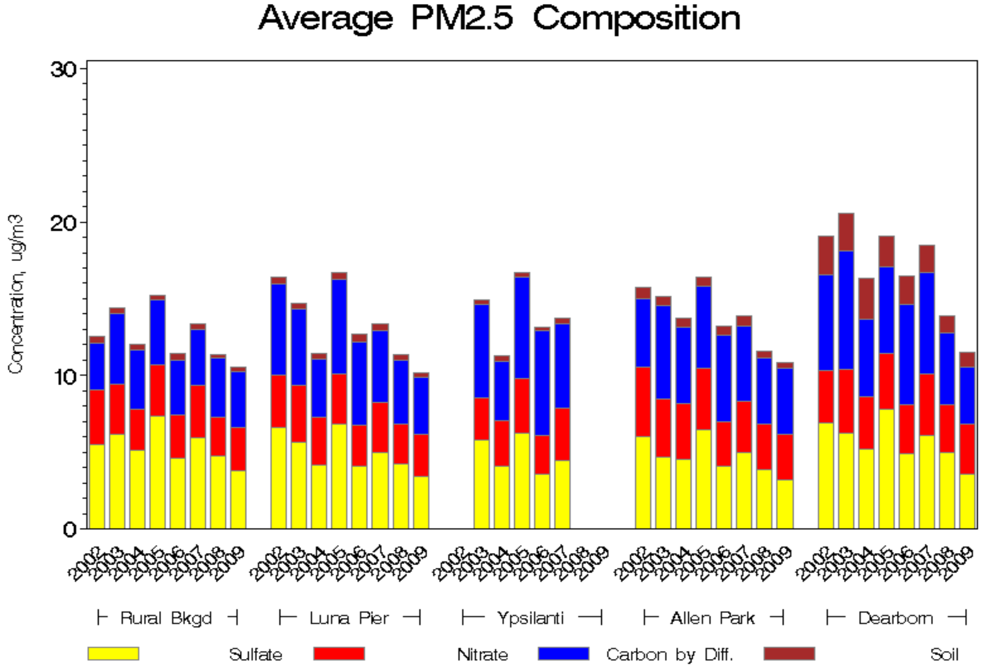
Figure 12. 98th Percentile Concentration of Daily $PM_{2.5}$.



Source: MDEQ monitor data

The $PM_{2.5}$ speciation data in Figure 13 shows a decrease in concentrations each year at the speciated sites in Southeast Michigan. While all sites show a decrease mostly due to sulfate reductions, Dearborn shows reductions in carbon and soil concentrations as well.

Figure 13. The Average $PM_{2.5}$ Species Composition per Site by Year.



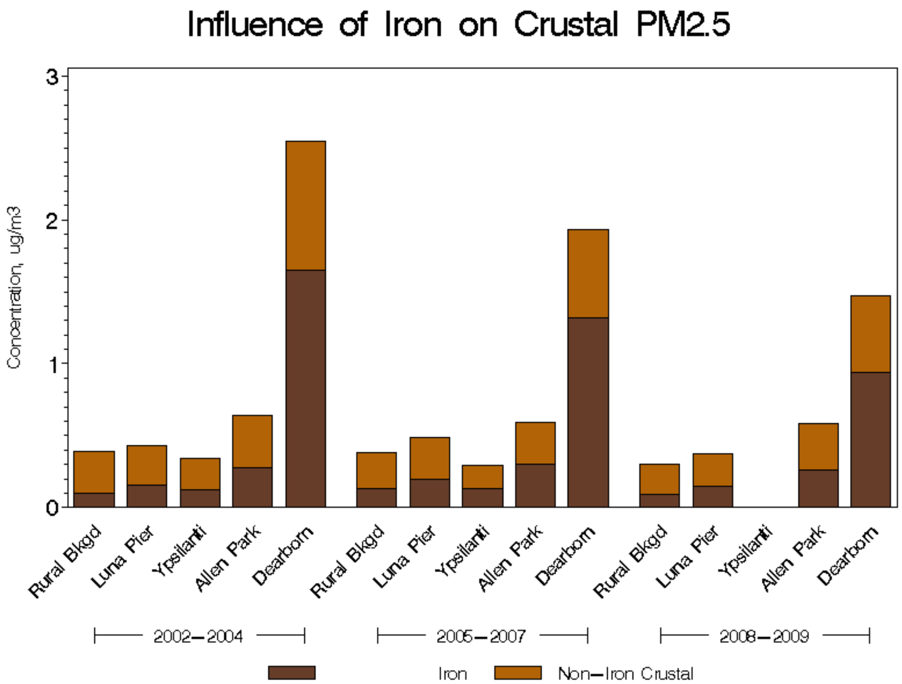
Source: LADCO, November 2010

A trend that is statistically significant gives greater credibility to trend analysis data than merely observing a downward trend. Two statistical tests, least squares fit and Theil fit regression were preformed by LADCO (September 2010) on the speciated components of $PM_{2.5}$ to determine if the downward trends observed in Detroit are statistically significant. Both tests showed a statistical decrease in organic carbon, ammonium sulfate, ammonium nitrate, and soil at the Detroit sites.

These tests indicate that the downward trends in Detroit are more than a random coincidence. Based on these analyses, which were used to calculate a yearly concentration change, there has been an average annual reduction in $PM_{2.5}$ of 0.4 to 0.6 $\mu g/m^3$ per year. The NO_X SIP call, the Acid Rain Program, and the sulfur reductions in fuels have all contributed to the decrease in ammonium sulfate and ammonium nitrate. The decrease in organic carbon has been significant, but the sources of organic carbon are still uncertain, as will be discussed further below.

Reductions in soil, particularly at the Dearborn monitor, are due to decreases in iron. While iron is a component of soil, it also has an additional source at the Dearborn monitor, a steel mill. As seen in Figure 14, much of the soil (or crustal) is composed of iron at the Dearborn monitor, and it has been decreasing in recent years.

Figure 14. The Iron Component of Soil (or Crustal) $PM_{2.5}$.



Source: LADCO, November 2010

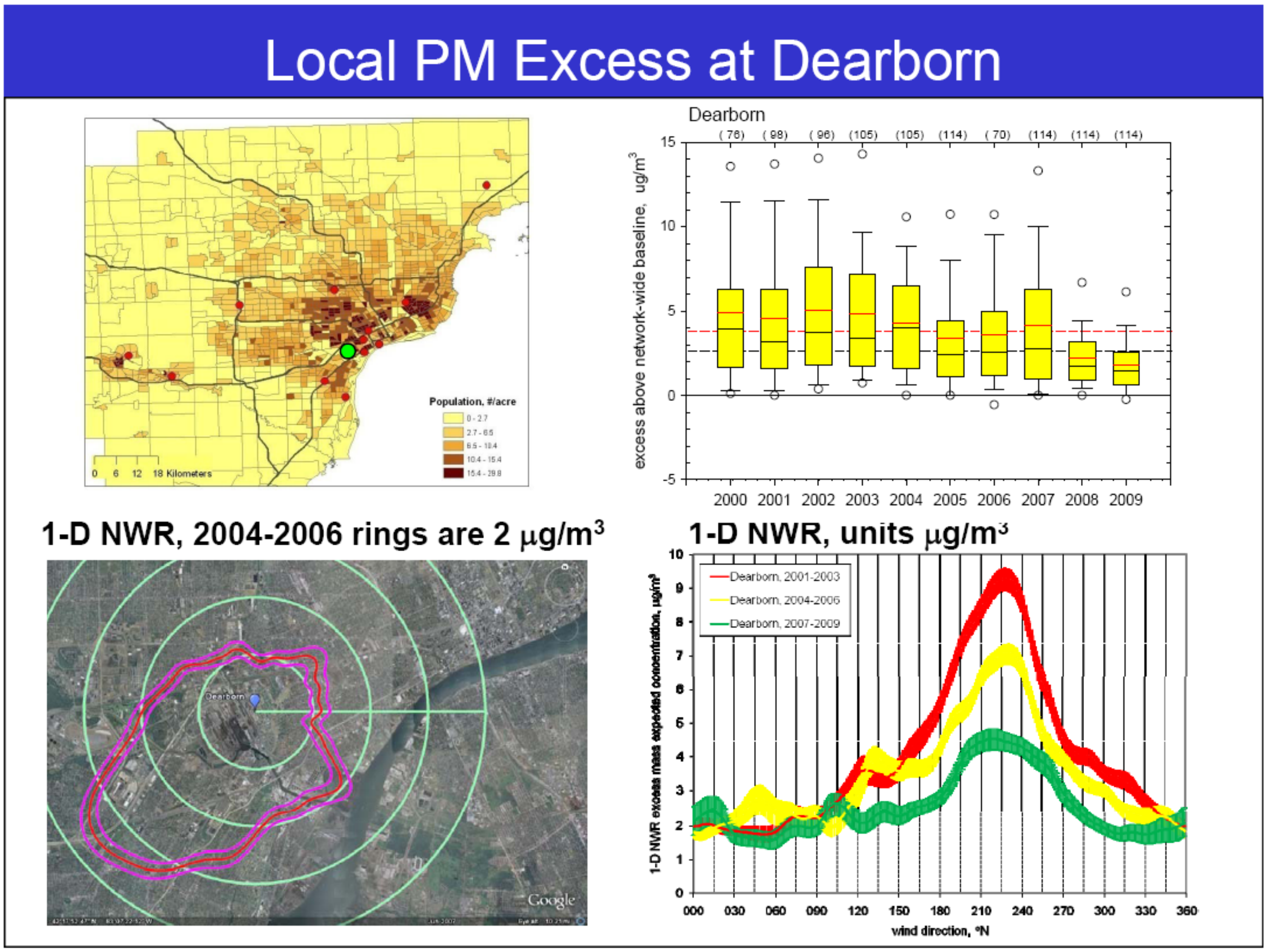
The Dearborn monitor is in a very industrialized area, directly downwind of a steel mill, and a few miles from a car manufacturing plant, oil refinery, waste incinerator, a second steel mill, a rail yard and electric generating units. Figure 15 shows the local excess of PM at Dearborn for the daily $PM_{2.5}$ standard. The map in Figure 15 shows the population density, indicating high population around the Dearborn monitor (marked by the green dot). The red dots on the map mark the location of other monitors in the area.

The bar graph in the upper right hand corner of Figure 15 indicates the "excess" $PM_{2.5}$ concentrations (finer local scale source contributions) above the "network-wide" base concentration (regional background source contributions). The excess local and regional network-wide base concentrations at Dearborn have decreased over the years. In 2008 and 2009, the mean local excess (red line in the yellow bar) has also decreased and is near the regional network-wide base concentration (black line in the yellow bar).

A 1-dimensional nonparametric wind regression (1-D NWR) indicates the average concentration when winds come from a specific wind direction and is particularly useful for identifying sources and their emissions strengths. The figure in the lower left corner of Figure 15 indicates the sources to the southwest of the Dearborn monitor (center of circles) have the greatest contributions to the Dearborn monitor. This is the direction of the nearby steel mill. The graph in the lower right corner of

Figure 15 transforms the 1-D NWR plot into a linear scale. It also separates out the years into three (3) three-year periods. It shows that concentrations, particularly from the southwest, have decreased by nearly 5 µg/m^3 over the nine-year period.

Figure 15. Local PM Excess at the Dearborn Monitor.



Source: Turner, 2010

Table 8 further indicates that the southwest sector has a much greater contribution to local $PM_{2.5}$ excess mass than other sectors, but it is also decreasing in recent years. In 2007, the steel mill southwest of the Dearborn monitor, Severstal, installed baghouses on their Blast Furnace and Basic Oxygen Furnace. Thus the reduction in $PM_{2.5}$ contribution in the southwest sector may be explained by the Severstal controls.

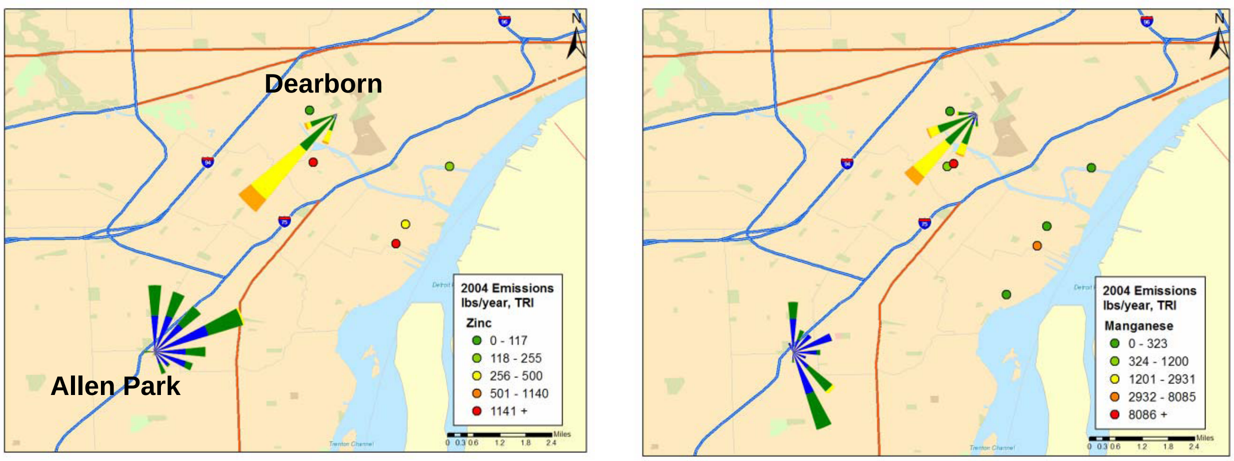
Table 8. Period Average Contribution to $PM_{2.5}$ (µg/M^3) for the Southwest (SW, 165-290 ^{O}n) Sector at Dearborn.

Period	SW sector	Other Sectors
2001-2003	3.5	1.3
2004-2006	2.4	1.4
2007-2009	1.8	1.0

Source: Turner, 2010

Positive Matrix Factorization (PMF) indicates a strong southwesterly influence from a steel (manganese) and zinc factor at the Dearborn monitor (see Figure 16).

Figure 16. Wind Roses of Highest Factor Contribution Days Resolved by PMF at Allen Park and Dearborn for Industrial Zinc and Steel (Manganese).



Source: Wade, et. al, 2008

Doing PMF modeling using both an individual site and multiple site methodology, Wade, et. al. (2008) found over 2 µg/m^3 of $PM_{2.5}$ mass are contributed from the steel and zinc factors (the steel and zinc factors total contribute 2.4 µg/m^3 for the individual Dearborn site, or 2.85 for the Dearborn multi-site). All of these studies indicate that controls on the steel mill can and have greatly reduced $PM_{2.5}$ contributions from that source.

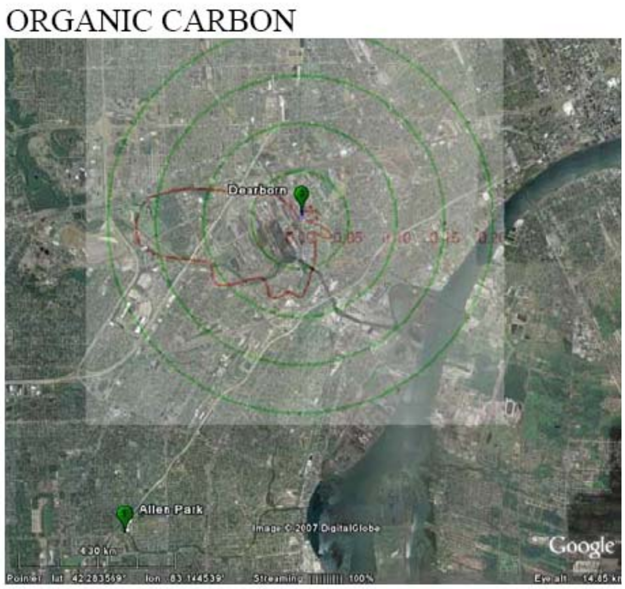
Table 9**.** Individual-Site (I) and Multi-Site (M) PMF-Resolved Factors for Allen Park and Dearborn. All concentration units are µg/m^3.

Factor	Allen Park-I	Allen Park-M	Dearborn-I	Dearborn-M
Sulfate	5.18	5.34	5.50	5.52
Nitrate	3.35	3.11	3.29	3.00
Organic matter	2.60	4.10	4.10	4.40
EC	2.48	2.28	2.49	2.39
Soil	0.97	0.34	1.12	0.97
Copper (Cu/Ni)	NR	NR	NR	NR
Zinc	0.37	0.19	1.10	1.55
Steel (Fe/Mn)	0.57	0.13	1.30	1.30
Modeled Mass	15.50	15.44	18.91	19.04
Measured Mass	15.65	15.65	19.06	19.06
NR=not resolved				

Multi-site modeling included only those days with valid data for both sites. PMF-modeled daily contributions from the individual-site modeling of Section 3 were censored to include only those days used for the multi-site modeling. Thus, the reported individual-site average contributions are modestly different from the results presented in Section 3 (Wade, et. al. 2008)

The other component that has been reduced at the Dearborn monitor is organic carbon (OC). As stated above, the sources of OC are still not well understood. Figure 17 below indicates a westerly excess of OC at the Dearborn monitor of 0.17 µg/m^3. However, this excess is small compared to the nearly 3 µg/m^3 reduction in OC that has been seen between 2002 and 2009.

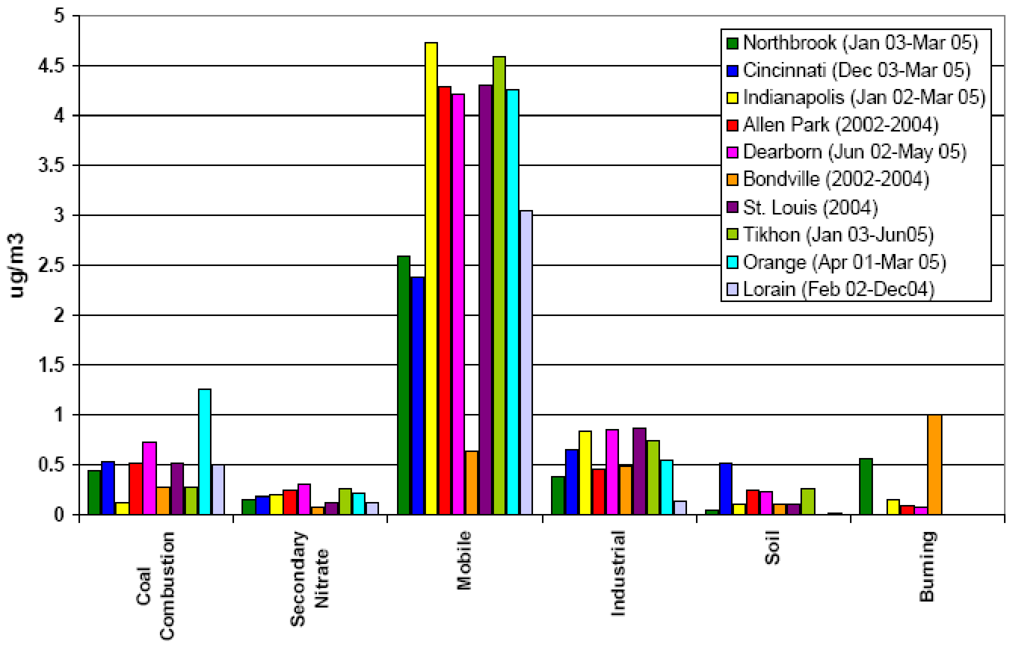
Figure 17. Non-Parametric Wind Regression (NWR) on the Excess Species Concentrations at Dearborn Compared with Allen Park. (Red Lines Denote an Excess at Dearborn while Blue Lines Denote an Excess at Allen Park.)



Source: Wade, et. al. 2008

Several source apportionment studies using both PMF and Chemical Mass Balance (CMB) have been done in the Detroit area. In some of these studies OC was apportioned to various factors. In all the OC source apportionment studies for PMF, mobile sources were major contributors to organic mass (see Figure 18). Coal combustion and industrial sources also contributed over ½ µg/m^3 to organic mass.

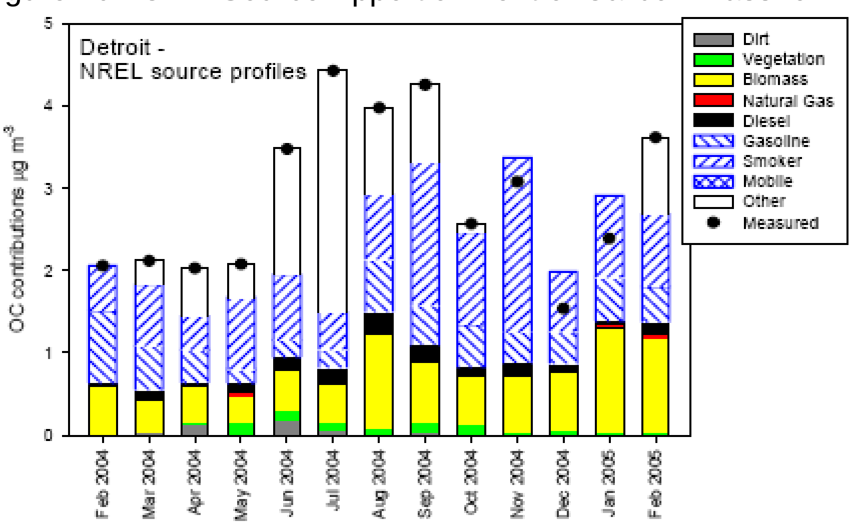
Figure 18. Average Concentration of Organic Matter by PMF Factor by Site for All Data.



Source: Brown, et. al. 2006

In CMB studies, carbon mass was apportioned largely to mobile sources, (especially lube oil impacted or smoking vehicles) and biomass burning (see Figure 19 and Sheesley et. al, February 2010).

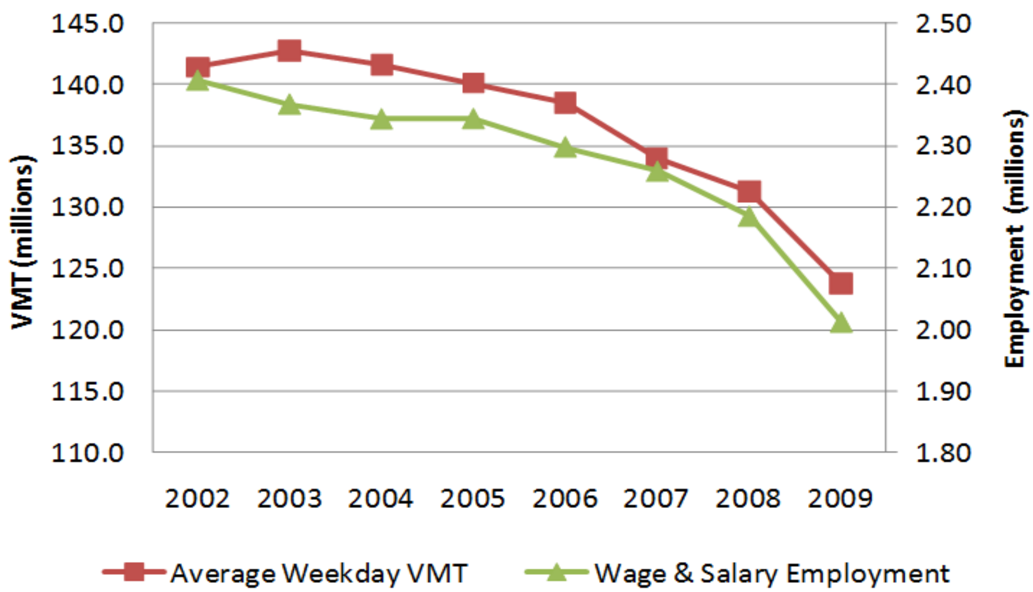
Figure 19. CMB Source Apportionment of Carbon Mass for Detroit.



Source: Brown, et. al. 2006

Over the past decade the Detroit area has seen a major reduction in employment, particularly in the manufacturing sector (see Appendix E for more information). As employment has declined, population as well as vehicle miles traveled (VMT) has declined (see Figure 20). However, it is difficult to directly tie a drop in VMT to the large amount of organic carbon reduction at the Dearborn monitor, since the drop in OC levels resulting from a drop in VMT would be expected to be relatively consistent across the southeast Michigan monitors, which is not the case.

Figure 20. Changes in Southeast Michigan Employment and Travel, 2002-2009.



Source: SEMCOG, 2010

6. References

Brown, S.G, Hafner, H.R, Roberts, P. T., Sheesley, R. J., and Shauer, J. J. (2006). "Integration of Results for the Upper Midwest Urban Organics Study," prepared by Sonoma Technology, Inc. (Petaluma, CA), and University of Wisconsin (Madison, WI), submitted to LADCO.

LADCO, 2010. "$PM_{2.5}$ Speciations Trends," for SEMOS meeting, November 17, 2010.

LADCO, 2010. "Air Quality Overview," for Project Team Meeting, September 22-23, 2010.

SEMCOG, 2010. The Impact of Southeast Michigan's New Economic Reality on Regional Pollutant Emissions.

Sheesley, R. J., Shauer, J. J., and Orf, M. L. (2010). "Assessing the Impact of Industrial Source Emissions on Atmospheric Carbonaceous Aerosol Concentrations Using Routine Monitoring Networks," J. Air & Waste Management. Assoc. 60:149–155.

Turner, J. 2010. "Southeast Michigan $PM_{2.5}$ Conceptual Model September Update," for SEMOS meeting, Sept. 30, 2010.

Wade, K.S.; Turner, J.R.; Brown, S.G; Garlock, J.L., Hafner, H.R. (2008). "Data analysis and source apportionment of $PM_{2.5}$ in selected Midwestern cities," Report # STI-907018.03-3264-FR (February 2008), prepared by Sonoma Technology, Inc. (Petaluma, CA), submitted to LADCO.

7. Maintenance Plan

A maintenance plan must demonstrate continued attainment for at least 10 years after approval of a redesignation. Section 175A of the CAA sets forth the elements of a maintenance plan for areas seeking redesignation from nonattainment to attainment. Eight years after the redesignation, a revised maintenance plan for the next ten years must be submitted to the EPA. To address the possibility of future NAAQS violations, the maintenance plan must contain contingency measures.

Continued future attainment is demonstrated through emission inventory projections. This demonstration includes an attainment year inventory for 2008, an interim year of 2018, and a projected maintenance inventory for 2022. The future year inventories of primary $PM_{2.5}$, NO_X, and SO_2 emissions are shown to remain below attainment year 2008 emissions levels, insuring that the area remains in attainment.

Reductions in $PM_{2.5}$ emissions will be realized from a variety of sources, including federal MACT standards for hazardous air pollutants, federal diesel emissions programs, and federal mobile source control programs for both on-road and non-road sources. The future year emissions inventories do not include any EGU controls for the EPA's proposed Transport Rule or Michigan's mercury rule but reductions from these sources are expected. The EPA has also developed new NAAQS for NO_X and SO_2 which may further reduce primary $PM_{2.5}$, SO_2 and NO_X in Southeast Michigan. Voluntary diesel strategies such as clean school bus programs will result in additional $PM_{2.5}$ reductions. The maintenance plan inventory emissions totals for primary $PM_{2.5}$, NO_X, and SO_2 are provided in Table 10 for annual $PM_{2.5}$ and Table 11 for daily $PM_{2.5}$. The methodologies used for growing emissions to 2018 and 2022 as well as the controls that will impact emissions in those years are described in Appendix B and Appendix C.

Table 10. Maintenance Plan Emission Inventories for annual $PM_{2.5}$, 2008-2022.
All units are in tons per year.

	NOx			SO_2			$PM_{2.5}$		
	2008	2018	2022	2008	2018	2022	2008	2018	2022
EGU	70,008.00	57,627.53	60,748.05	233,870.64	205,085.72	216,191.10	1,375.31	1,443.34	1,521.50
NON-EGU	18,817.18	18,590.74	18,590.74	19,793.49	19,555.30	19,555.30	1,605.72	1,586.40	1,586.40
Area	17,157.57	17,563.12	17,805.41	5,702.94	5,837.74	5,918.27	5,406.06	5,533.84	5,610.18
Non-road	24,065.61	10,666.13	8,899.43	426.61	29.38	30.80	1,773.31	1,093.56	910.17
MAR	6,380.17	3,723.14	2,591.48	588.82	399.87	312.15	165.62	73.77	37.06
On-road	119,194.00	37,847.00	28,044.00	1,065.00	310.00	294.00	4,360.00	1,633.00	1,311.00
Total	255,622.53	146,017.66	136,679.11	261,447.50	231,218.01	242,301.62	14,686.02	11,363.91	10,976.30

Table 11. Maintenance Plan Emission Inventories for Daily $PM_{2.5}$, 2008-2022.
All units are in tons per winter day.

	NOx			SO_2			$PM_{2.5}$		
	2008	2018	2022	2008	2018	2022	2008	2018	2022
EGU	220.95	186.31	196.40	682.05	595.46	627.70	2.91	3.07	3.24
NON-EGU	49.76	53.49	53.49	51.33	55.17	55.17	3.98	4.28	4.28
Area	80.58	82.72	83.88	16.46	16.90	17.13	15.46	15.87	16.09
Non-road	47.82	23.47	19.44	0.81	0.06	0.07	3.70	2.39	1.98
MAR	19.80	15.90	14.34	1.75	0.00	0.00	0.50	0.00	0.00
On-road	366.20	117.80	88.10	3.10	0.90	0.80	15.70	6.60	5.60
Total	785.11	479.69	455.50	755.50	668.49	700.87	42.25	32.21	31.19

The focus of the $PM_{2.5}$ inventory effort was to produce emission inventories for the nonattainment year (2005) and the attainment year (2008). The future year projections (2018 and 2022) take into account existing control measures and measures that are promulgated and known to be on the way. Many of the future year emission estimates for this inventory product were grown from the LADCO Base B (2007, 2008) Inventory. Where data was not available in the Base B inventory, data from the previous inventory cycle - Base M (2005) run was utilized, if appropriate.

The inventory was further processed by LADCO to produce annual and winter day totals. Full documentation of methodologies and models used to derive emission inventories is contained in Appendices B and C. A 2018 and 2022 maintenance inventory was prepared by LADCO and SEMCOG. Future year EGU emissions do not assume reductions from the federal proposed Transport Rule.

Maintenance Commitments

Michigan will develop and submit to the EPA, no later than eight years after approval of this redesignation request, a new maintenance plan covering the next ten-year period.

The MDEQ will continue to track $PM_{2.5}$ levels through the operation of an EPA-approved monitoring network as necessary to demonstrate ongoing compliance with the NAAQS. Data will be entered into the Air Quality System on a timely basis in accordance with federal regulations. The MDEQ will continue to produce periodic emission inventories as required by the federal Consolidated Emissions Reporting Rule (40 CFR, Part 51) to track future levels of emissions. The control measures for $PM_{2.5}$, SO_2 and NO_X emissions that were contained in the SIP before redesignation of these areas to attainment will be retained, as required by Section 175A of the CAA.

Michigan will expeditiously enact legal authorities needed for additional contingency control measures and/or studies of conditions resulting in unexpected $PM_{2.5}$ increases in response to identified triggering events.

Action Level Response

An Action Level Response will be prompted when a two-year annual average of 15 $\mu g/m^3$ or a two-year 98th percentile average monitored value of 35 $\mu g/m^3$ or higher occurs within the maintenance area. A review of circumstances leading to the high monitored values will be conducted if this response is triggered. The MDEQ will explore whether a special event, malfunction, or noncompliance with permit conditions resulted in high $PM_{2.5}$ levels in order to immediately address corrective measures. The MDEQ will also review meteorological conditions during high $PM_{2.5}$ episodes. This review will be conducted within six months following the close of the $PM_{2.5}$ year. If the MDEQ determines that contingency measure implementation is necessary to prevent a future violation, the MDEQ will select and implement a measure that can be implemented promptly.

Contingency Measure Response

If a violation of the $PM_{2.5}$ NAAQS occurs, Michigan will select one or more control measures from the following list of potential contingency measure for implementation. The timing for implementation of a contingency measure is dependent on the process needed for legal adoption and source compliance, which varies for each measure. Some potential measures/controls have already been promulgated and are scheduled to be implemented at the federal or state levels. Other measures will need state administrative rulemaking or legislative approval. The MDEQ will seek to expedite the process of securing enabling authority and implementing the selected measures as needed to reduce $PM_{2.5}$ levels, with a goal of having measures in place as expeditiously as practicable, and within 18 months after state certification of the violation. Opportunity for public participation in the contingency measure response will be provided. The MDEQ will submit the identified enforceable contingency measures to the EPA as revisions to the SIP as needed.

List of Potential Contingency Measures

1. Wood stove change-out program.
2. Steel mill controls.
3. Coke battery controls.
4. Diesel retrofit program.
5. Reduced idling program.
6. ICI Boiler controls.
7. Food preparation flame broiler control.
8. EGU controls.

8. Transportation Conformity Budgets

Transportation conformity is required by Section 176(c) of the CAA. Transportation plans, programs, and projects must conform to the applicable SIP. The federal transportation conformity rule established the criteria and procedures for determining whether conformity is met. Conformity to a SIP means that transportation activities will not produce new air quality violations, worsen existing violations, or delay timely attainment of the NAAQS.

Estimates of on-road motor vehicle emissions from cars, buses, and trucks driven on public roadways are projected for the maintenance period to assess emission trends and to ensure continued compliance with the $PM_{2.5}$ NAAQS. These estimates are considered a ceiling or "budget" for emissions and are used to determine whether transportation plans and projects conform to the SIP. Estimated on-road mobile emissions of $PM_{2.5}$ and NO_X must not exceed the emission budgets contained in the maintenance plan. The emissions estimates for this sector reflect appropriate and up-to-date assumptions about vehicle miles traveled, socioeconomic variables, fuels used, weather inputs, and other planning assumptions. On-road emissions have been projected to 2022 in the maintenance inventory.

Typically, the formula for calculating maintenance conformity budgets is:

On-road emissions inventory for maintenance year + safety margin

Where:
safety margin = 90% of emissions reduction from all sources between the attainment year and the maintenance year.

However, recent EPA guidance states that the final budget is equal to either the calculated budget or the attainment year emissions, whichever is lower. Table 12 shows the conformity budgets resulting from the conformity budget formula. In all cases, the calculated budgets are higher than the attainment year emissions inventory. Therefore, the final budgets will be set equal to the 2008 on-road emissions inventory. These values are shown in Table 13 and Table 14.

Table 12. Motor Vehicle Emissions Budget Calculation for Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne Counties.

Annual $PM_{2.5}$, *Ton per year*							
$PM_{2.5}$	**Point-EGU**	**Point-Non-EGU**	**Area Total**	**MAR**	**Onroad**	**Nonroad**	**Total**
2008	1,375.3	1,605.7	5,406.0	165.6	4,360.0	1,773.3	14,685.9
2022	1,521.0	1,586.0	5,610.0	37.1	1,311.0	910.2	10,975.3
Emissions Reduction	145.7	-19.7	204.0	-128.6	-3,049.0	-863.1	-3,710.6
Safety Margin							3,340
Conformity Budget							**4,651**
NOx	**Point-EGU**	**Point-Non-EGU**	**Area Total**	**MAR**	**Onroad**	**Nonroad**	**Total**
2008	70,008.0	18,817.2	17,157.6	6,380.2	119,194.0	24,065.6	255,622.6
2022	60,748.0	18,591.0	17,805.0	2,591.5	28,044.0	8,899.4	136,678.9
Emissions Reduction	-9,260.0	-226.2	647.4	-3,788.7	-91,150.0	-15,166.2	-118,943.7
Safety Margin							107,050
Conformity Budget							**126,759**
Daily $PM_{2.5}$, *Tons per day.*							
$PM_{2.5}$	**Point-EGU**	**Point-Non-EGU**	**Area Total**	**MAR**	**Onroad**	**Nonroad**	**Total**
2008	2.9	4.0	15.5	0.5	15.7	4.2	42.8
2022	3.2	4.3	16.1	0.0	5.6	1.5	30.7
Emissions Reduction	0.3	0.3	0.6	-0.5	-10.1	-2.8	-12.1
Safety Margin							10.9
Conformity Budget							**16.5**
NOx	**Point-EGU**	**Point-Non-EGU**	**Area Total**	**MAR**	**Onroad**	**Nonroad**	**Total**
2008	221.0	49.8	80.6	19.8	365.3	58.4	794.9
2022	196.4	53.5	83.9	14.3	88.1	9.0	445.2
Emission Reduction	-24.6	3.7	3.3	-5.5	-277.2	-49.4	-349.7
Safety Margin							315.0
Conformity Budget							**380.6**

Table 13. Final Motor Vehicle Transportation Conformity Budget Calculation for Annual $PM_{2.5}$. *In tons per year.*

	Tons/Year	
	$PM_{2.5}$	NOx
Total Emission Reduction 2008 - 2022	3,711	118,944
Safety Margin (90% of total reduction)	3,340	107,050
2022 On-Road Mobile Emissions	1,311	28,044
Calculated Budget = 2022 On-Road Emissions + Safety Margin	4,651	135,094
Attainment Year Emissions (2008)	4,360	119,194
Final Budget*	**4,360**	**119,194**

*Per EPA guidance, the final budget is equal to either the calculated budget or the attainment year emissions, which ever is lower.

Table 14. Final Motor Vehicle Transportation Conformity Budget Calculation for Daily $PM_{2.5}$. *In tons per day.*

	Tons/Winter Weekday	
	$PM_{2.5}$	NOx
Total Emission Reduction 2008 - 2022	12	350
Safety Margin (90% of total reduction)	11	315
2022 On-Road Mobile Emissions	6	88
Calculated Budget = 2022 On-Road Emissions + Safety Margin	17	403
Attainment Year Emissions (2008)	16	365
Final Budget*	**16**	**365**

*Per EPA guidance, the final budget is equal to either the calculated budget or the attainment year emissions, whichever is lower.

9. Public Participation and Comments

In accordance with Section 110 (a) (2) of the CAA, public participation in the SIP process was provided for as follows:

Notice of availability of the $PM_{2.5}$ redesignation documents and notice of the public comment period and opportunity to request a public hearing was posted on the MDEQ web pages at http://www.Michigan.gov/deqair and http://www.michigan.gov/deqcalendar.

A public hearing for this redesignation request, including the baseline emissions inventory for $PM_{2.5}$, SO_2 and NO_X and the maintenance plan SIP revision was held on May 26, 2011, at Constitution Hall in Lansing, Michigan.

A summary of comments received and the MDEQ responses are included in Appendix F.