

# **Michigan's 2012 Ambient Air Monitoring Network Review**



**Michigan Department of Environmental Quality**  
**Air Quality Division**  
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## **INTRODUCTION:**

The purpose of this document is to examine Michigan's ambient air monitoring network in operation during 2010-2011 and recommend changes based on monitor history, population distribution, and modifications to federal monitoring requirements under the Clean Air Act (CAA), 40 Code of Federal Regulations (CFR) Part 58. Recommended changes to this network will be implemented during the 2012 calendar year, contingent upon adequate levels of funding.

Although the Departments of Natural Resources and Environmental Quality were merged into the Department of Natural Resources and Environment (DNRE) in January 2010, they were split apart again during calendar year 2011. In this report, all naming conventions for this department will revert from DNRE to the MDEQ regardless of when the split is actually formalized.

### **Federal Changes**

There are a number of changes at the federal level that may impact the design of Michigan's monitoring network. These changes include revisions to the National Ambient Air Quality Standard (NAAQS) for lead, NO<sub>2</sub>, and SO<sub>2</sub>. In addition, the NAAQS for CO, ozone, and urban visibility as well as secondary NAAQS for SO<sub>2</sub> and NO<sub>2</sub> are scheduled for review before the end of 2012.

On November 12, 2008, the U.S. Environmental Protection Agency (EPA) modified the lead NAAQS by reducing the level of the standard from a maximum quarterly average of 1.5 micrograms per cubic meter (µg/m<sup>3</sup>) to 0.15 µg/m<sup>3</sup>, as a three-month rolling average. The design of the monitoring network was modified to consist of both population-oriented monitors and source-oriented monitors. In the source-oriented monitoring network design, an emissions threshold of 1.0 ton per year was used to trigger the monitoring requirement. This first round of source-oriented lead monitoring sites were required to be operational by January 1, 2010. Then, the EPA reduced the threshold to 0.5 tpy, requiring a new round of source-oriented lead monitors to become operational by December 27, 2011. These new monitors are discussed in detail in this network review. The EPA has also mandated a special study involving smaller airports with emissions of lead that equal or are greater than 0.5 tpy. Oakland County International Airport falls into this requirement. In addition to source-oriented monitoring, there is a non-source-oriented requirement for lead monitoring to be conducted at NCore sites. The MDEQ began collection of lead at the population-oriented sites on January 1, 2010.

On February 9, 2010, the EPA changed the NO<sub>2</sub> NAAQS and required the deployment of a two-tiered NO<sub>2</sub> monitoring network consisting of near-roadway and community monitors. The design of the new NO<sub>2</sub> monitoring network is discussed in this network review. These NO<sub>2</sub> monitors have a deployment deadline of January 1, 2013.

On November 16, 2009, the EPA proposed to modify the SO<sub>2</sub> NAAQS and proposed the creation of a two-tier monitoring network based on SO<sub>2</sub> emissions, requiring a total of 12 SO<sub>2</sub> stations in Michigan. The SO<sub>2</sub> NAAQS became final on August 23, 2010. The network design was modified to a single tier requiring a total of five SO<sub>2</sub> monitors in Michigan. The changes to the SO<sub>2</sub> monitoring network are discussed in this network review. The changes to the SO<sub>2</sub> network are required to be implemented before January 1, 2013.

On March 12, 2008, the EPA changed the NAAQS for ozone, reducing the level of the standard from 0.08 ppm to 0.075 ppm. Then, on January 19, 2010, the EPA proposed a further strengthening of the level of the primary standard to somewhere between 0.060 ppm and 0.070 ppm. A secondary O<sub>3</sub> NAAQS was also proposed to protect vegetation. These two proposed changes also impact the design of the ambient monitoring network. Background

monitors may need to be deployed in rural areas to assess the impact of ozone on sensitive vegetation, in micropolitan statistical areas with an urban cluster of 10,000 and less than 50,000 people and at maximum concentration areas impacted by transport. Smaller metropolitan areas with population levels between 50,000 and 350,000 people, currently without ozone monitors, and no historical ozone data are required to have one ozone monitor per MSA according to the January 19, 2010 proposal. The changes to the ozone NAAQS were due to be finalized by August 31, 2010, but EPA requested a continued abeyance to delay until December 31, 2010 while they considered further information. The EPA expects that this process will require just over seven months and requested an extension until July 29, 2011. Changes may become final by August 12, 2011<sup>1</sup>. Therefore, any changes to the ozone network will be discussed in the 2013 network review. Due to the uncertain status of the ozone NAAQS, the MDEQ will strive to maintain status quo until more information about the ozone NAAQS is received.

The design of MDEQ's ambient monitoring network may also be impacted by possible changes to other NAAQS, which include the secondary SO<sub>2</sub> and NO<sub>2</sub> NAAQS, the CO NAAQS and the PM NAAQS. A secondary NAAQS for NO<sub>2</sub> and SO<sub>2</sub> was proposed on February 12, 2010 and the final rule making is due by July 12, 2011. On January 28, 2011, EPA proposed a CO NAAQS which is expected to become final in August 2011. Lastly, the particulate NAAQS is undergoing review. Modifications may include an urban visibility component. A proposed rulemaking is anticipated in the fall 2011. These pending changes will be discussed in the 2013 Annual Network Review .

The MDEQ cannot implement the new monitoring requirements described above without new funding and a concomitant reduction in other monitoring requirements due to financial and staffing limitations. Although EPA has requested funding to support these endeavors, it is unknown if adequate funds will be made available. As a result, the State and Local air agencies in Region 5 with assistance from the Lake Michigan Air Directors Consortium have drafted a proposal to identify which monitoring activities can be implemented and which are too costly. As funding becomes available or as changes to the NAAQS are finalized, the MDEQ may be able to gradually implement more of the requirements. This year's network review will describe the required monitoring activities, identify those that will be cost effective to implement and delineate those that will create undue financial and/or staffing burdens.

### **Recommendations for Michigan's Air Monitoring Network in 2012**

The following changes will be made to Michigan's ambient air monitoring network during 2012. If funding cuts occur, additional changes to the network may have to be implemented.

- The following **new** lead sites may be operational during 2012 contingent upon adequate funding:
  1. Belding–Reed St. (260670002) TSP lead<sup>2</sup> monitoring
  2. East Jordan downwind of East Jordan Ironworks if adequate funding becomes available<sup>2</sup>
  3. Vassar downwind of Metavation<sup>2</sup>
  4. Oakland County International Airport
  
- During 2012, contingent upon adequate levels of funding, the following **new** NO<sub>2</sub> sites will be operated:

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<sup>1</sup> United States Court of Appeals for the District of Columbia Circuit. State of Mississippi et al v. United States Environmental Protection Agency No 08-1200 "EPA's Revised Motion Requesting a Continued Abeyance and Response to the State Petitioner's Cross-Motion." December 8, 2010.

<sup>2</sup> To include manganese, nickel, cadmium and arsenic in addition to lead.

1. Detroit-Eliza Howell Park Site #1 beginning June 2011
  2. Detroit -Eliza Howell Park Site #2 beginning June 2011
- Prior to January 1, 2012 , contingent upon adequate funding, the MDEQ is planning to deploy and operate a SO<sub>2</sub> monitor at:
    1. Port Huron (261470005).

## **Network Review Goals**

The Michigan Ambient Air Monitoring Network Review will describe the ambient air monitoring network, show how the network meets the EPA's monitoring regulations, discuss the public comment procedure, summarize recent changes to the network and address potential impacts of other actions in greater detail. All discussions of air monitors reference a unique nine-digit site identification code to remove all ambiguity regarding the monitor location.

## **Public Comment Process**

The EPA requires that the MDEQ document the process for obtaining public comments and include any comments received through the public notification process. As such, this network review document was placed on the Air Quality Division (AQD) section of the MDEQ Internet homepage to solicit comments from the general public and stakeholders. Reviewers are given 30 calendar days from the date that the draft network review report is posted to provide written comments. Written comments are accepted either by e-mail or by parcel post (verbal comments were not accepted) and should be sent to:

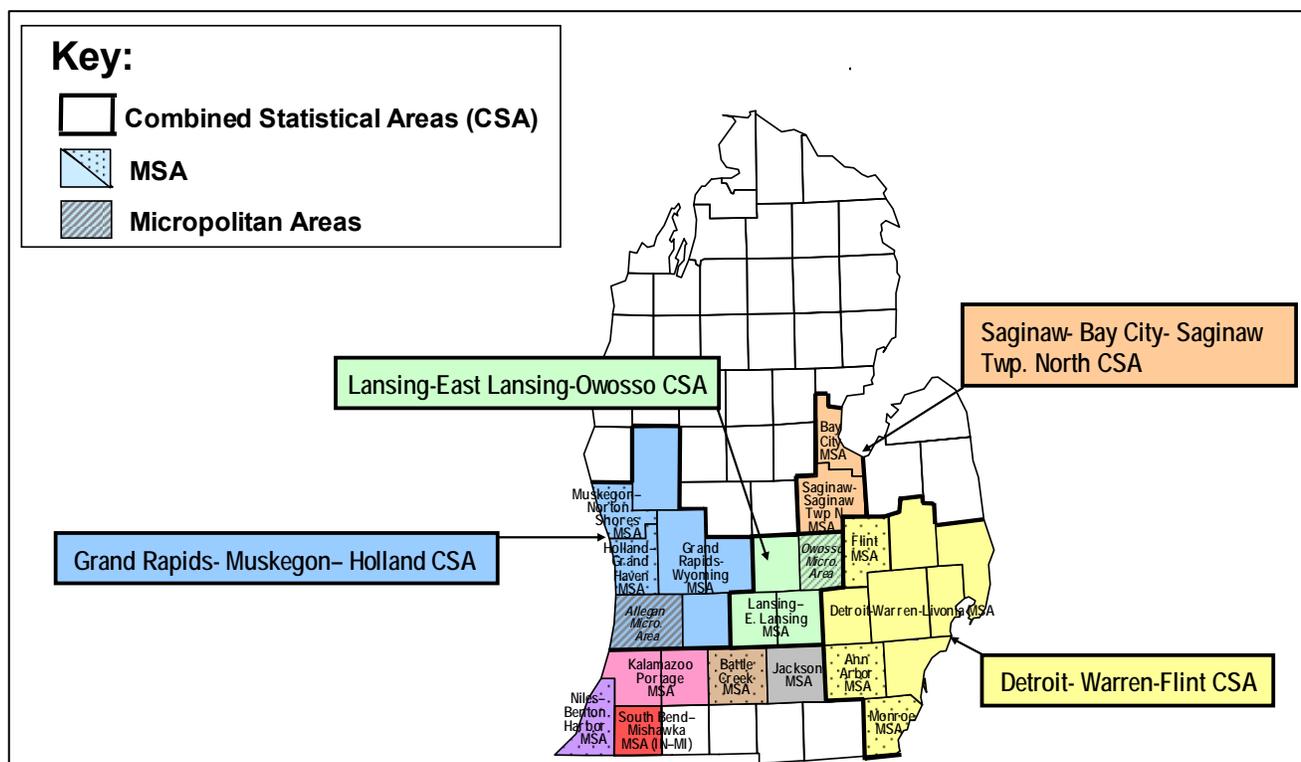
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All written comments that are received will be organized by topic, summarized, and addressed in the final version of the Michigan Ambient Air Monitoring Network Review. The final document will be placed on the AQD section of the MDEQ Internet homepage and sent to EPA Region 5 for approval. Hardcopies of the final version will be available for inspection free of charge at the MDEQ AQD offices located in Lansing (525 West Allegan Street) or Detroit (3058 West Grand Boulevard, Suite 2-300). Requests for hard copies of the plan may incur a nominal fee to cover copying and/or mailing costs. These requests should be directed to Mr. Craig Fitzner, AQD, 517-373-7044, [Fitzner@michigan.gov](mailto:Fitzner@michigan.gov).

**AMBIENT AIR MONITORING NETWORK REQUIREMENTS:**

The minimum network design criteria for ozone, PM<sub>2.5</sub> (PM with an aerodynamic diameter less than or equal to [≤] 2.5 micrometers) and PM<sub>10</sub> (≤10 micrometers) are based on the 2000 Metropolitan Statistical Area (MSA) geographical borders, population totals, and historical concentrations. The MSA outlines for Michigan's Lower Peninsula, shown in **Figure 1** have not changed from the 2000 to 2010 census.

**FIGURE 1: MSAs IN MICHIGAN'S LOWER PENINSULA**



MSAs must have an urban core population totaling at least 50,000 people in the most recent decennial census. The MSAs as so defined are shown in **Figure 1**. MSAs are one or more counties that have a sizeable urban cluster or have a high level of commuting to or from an urban cluster. MSAs and/or micropolitan areas are grouped to form consolidated statistical areas (CSAs), also shown in **Figure 1**. Note: Only those micropolitan areas that are part of larger CSAs are shown in **Figure 1**. The CSA is defined as a geographical area consisting of two or more adjacent Core-Based Statistical Areas (CBSA) with employment interchange of at least 15%. A CBSA is defined as an entity consisting of the county or counties associated with at least one urbanized area/urban cluster of at least 10,000 in population, plus adjacent counties having a high degree of social and economic integration.

The specific counties that make up each MSA or micropolitan area in Michigan are listed in **Table 1**.<sup>3</sup> These geographical areas, coupled with their population totals and historical ambient monitoring data, were used to develop the minimum monitoring network design for ozone, PM<sub>2.5</sub>, and PM<sub>10</sub>. **Table 1** shows the 2010 population totals.

<sup>3</sup> Metropolitan and Micropolitan Statistical Areas: April 1, 2000 to July 1, 2009 (CBSA-EST2009-1) Source U. S. Census Bureau, Population Release Date March 2010.

**TABLE 1: COMPOSITION OF CORE-BASED STATISTICAL AREAS IN MICHIGAN**

CORE BASED STATISTICAL AREA	2010 POPULATION	URBAN CORE	CENTRAL METROPOLITAN COUNTIES	OUTLYING METROPOLITAN COUNTIES
Ann Arbor	344,791	Ann Arbor Urbanized Area	Washtenaw	
Battle Creek	136,146	Battle Creek Urban Area	Calhoun	
Bay City	107,771	Bay City Urbanized Area	Bay	
Detroit-Warren-Livonia*	4,296,250	Detroit Urbanized Area	Macomb, Oakland, Wayne	
		Port Huron Urbanized Area	St. Clair	
		Lapeer Urban Cluster		Lapeer
		South Lyon- Howell- Brighton Urbanized Area	Livingston	
Flint	425,790	Flint Urbanized Area	Genesee	
Grand Rapids-Wyoming	774,160	Grand Rapids Urbanized Area	Kent	Barry, Newaygo
		Ionia Urban Cluster		Ionia
Holland-Grand Haven	263,801	Holland Urbanized Area	Ottawa	
Jackson	160,248	Jackson Urbanized Area	Jackson	
Kalamazoo-Portage	326,589	Kalamazoo Urbanized Area	Kalamazoo	
		Paw Paw Urban Cluster		Van Buren
Lansing-East Lansing	464,036	Lansing Urbanized Area	Clinton, Eaton, Ingham	
Monroe	152,021	Monroe Urbanized Area	Monroe	
Muskegon-Norton Shores	172,188	Muskegon Urbanized Area	Muskegon	
Niles-Benton Harbor	156,813	Benton Harbor – St Joseph Urbanized Area	Berrien	
Saginaw-Saginaw Twp. North	200,169	Saginaw Urbanized Area	Saginaw	
South Bend-Mishawaka Indiana-Michigan (IN-MI)	52,293	South Bend, IN-MI Urbanized Area (part)	Cass	

\* The Detroit-Warren-Livonia MSA is subdivided into the Detroit-Livonia-Dearborn Metropolitan Division (Wayne Co.) and the Warren-Farmington Hills-Troy Metropolitan Division (Lapeer, Livingston, Macomb, Oakland and St. Clair Counties).

Some air proposed monitoring requirements are based on micropolitan statistical areas with an urban cluster of at least 10,000 but less than 50,000 people. The total population in micropolitan areas in Michigan is shown in **Table 2**.

**TABLE 2: COMPOSITION OF MICROPOLITAN STATISTICAL AREAS IN MICHIGAN**

MICROPOLITAN AREA	URBAN CORE	MICROPOLITAN AREA POP <sup>4</sup>	COUNTIES
Traverse City	Traverse City Urban Cluster	143,372	Grand Traverse, Benzie <sup>5</sup> , Kalkaska <sup>5</sup> , Leelanau <sup>5</sup>
Allegan	Plainwell-Otsego Urban Cluster	111,408	Allegan
Adrian	Adrian Urban Cluster	99,892	Lenawee
Midland	Midland Urban Cluster	83,629	Midland
Mount Pleasant	Mount Pleasant Urban Cluster	70,311	Isabella
Marquette	Marquette Urban Cluster	67,077	Marquette
Sturgis	Sturgis Urban Cluster	61,295	St. Joseph
Cadillac	Cadillac Urban Cluster	47,584	Wexford, Missaukee <sup>5</sup>
Coldwater	Coldwater Urban Cluster	45,248	Branch
Big Rapids	Big rapids Urban Cluster	42,798	Mecosta
Alma	Alma Urban Cluster	42,476	Gratiot
Houghton	Houghton Urban Cluster	38,784	Houghton, Keweenaw <sup>5</sup>
Sault Ste. Marie	Sault Ste. Marie Urban Cluster	38,520	Chippewa
Escanaba	Escanaba Urban Cluster	37,069	Delta
Alpena	Alpena Urban Cluster	29,598	Alpena
Iron Mountain	Iron Mt-Kingsford WI U. Cluster	26,168	Dickinson
Marinette	Marinette WI Menominee	24,029	Menominee

**Other Monitoring Network Requirements**

National Core (NCore) site provide a full suite of measurements at one location. NCore stations collect the following measurements: ozone, SO<sub>2</sub> (trace), CO (trace), NO<sub>y</sub>, continuous PM<sub>2.5</sub>, wind speed, wind direction, relative humidity, and ambient temperature. In addition, filter-based measurements are required for PM coarse (PM<sub>10-2.5</sub>) on a once every three day sampling frequency and PM<sub>2.5</sub>. Speciated PM coarse will be added at a later date when suitable technology becomes available. A minimum of ten NCore sites nationwide measure lead, but the EPA has proposed that NCore stations house the non-source-oriented lead monitors. The NCore stations in Michigan, located at Grand Rapids – Monroe St (260810020) and Allen Park (261630001) became operational January 1, 2010, one full year ahead of schedule.

State and Local Air Monitoring Stations (SLAMS) monitors will supplement the network and improve spatial coverage. Specific network design criteria are contained in the monitoring regulations that describe the SLAMS monitoring networks for criteria pollutants. These requirements are discussed in detail in the remainder of this review.

If access to a design value site is lost, the MDEQ will attempt to locate a new site as physically close to the design value site as possible. The new monitor will have the same scale of representativeness and monitoring objectives as the closed site. If subsequent data indicate

<sup>4</sup> 2010 census data  
<sup>5</sup> Outlying Micropolitan County

that the new site is not the design value site, one of the pre-existing sites will become the design value site and the new site will be shut down.

### **Network Review Requirements**

According to 40 CFR, an air monitoring network review should:

- Be conducted at least once a year.
- Determine if the system meets the monitoring objectives stated in Appendix D of 40 CFR, Part 58 "Network Design Criteria for Ambient Air Quality Monitoring."<sup>6</sup>
- Determine if the system meets the appropriate spatial scales and monitoring objectives, population-driven requirements, and the minimum number of stations that are required, based on the likelihood of exceeding the NAAQS.
- Identify needed modifications to the network including termination and relocation of unnecessary stations.
- Identify any new stations that are necessary.
- Correct any inadequacies identified previously.
- Be used as a starting point for five-year regional assessments.

Elements that must be included in the network review are:

- the EPA's Air Quality System (AQS) site identification number,
- site locations including coordinates and street address,
- sampling and analysis methods,
- operating schedule,
- monitoring objective and spatial scales,
- identification of those sites that are suitable and not suitable for comparison to the NAAQS (for PM<sub>2.5</sub> only),
- the MSA, CBSA, or CSA represented by each monitor,
- evidence that the siting and operation of the monitor meets 40 CFR Part 58, Appendices A (quality assurance requirements), C (ambient air quality monitoring), D (network design criteria) and E (probe and monitoring path siting criteria).

For Michigan, the site-specific data is summarized in various tables throughout the review. The modifications to the network should address:

- new census data.
- changes in air quality levels.
- changes in emission patterns.

The time frame for implementation of modifications is one year from the time of the previous network review. Changes will be made on a calendar year whenever possible.

Prior to 2007, the particulate network was reviewed in a separate review that was submitted to the EPA each July. Recent changes to the monitoring regulations have incorporated the particulate review into the overall monitoring network review.

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<sup>6</sup> "Environmental Protection Agency Ambient Air Quality Surveillance Regulations." 40 CFR Part 58 Appendix D, October 17, 2006.

### **Monitor Deployment By Location**

**Table 3** summarizes the distribution of ambient air monitors by pollutant in operation in Michigan during 2010. The purpose of including information about the shelter type (building or trailer) is to show the possible availability of space for monitors that require a temperature controlled environment. Although most monitors are located at a building, access to the interior for more monitor deployment may not be possible. In these instances where access is not guaranteed, no shelter is shown. The distinction is made between building and trailer to indicate differences in floor space and temperature control, information useful in planning deployment of new monitors. This review summarizes the purpose behind the continued operation of each monitor, by pollutant and discusses plans for network operations.

TABLE 3: MONITOR DISTRIBUTION THROUGHOUT THE 2010 NETWORK IN MICHIGAN

Site Name- a box indicates site closure	AQS ID	O <sub>3</sub>	PM <sub>2.5</sub>	PM <sub>2.5</sub> TEOM	Speciation	PM <sub>10</sub>	PM <sub>nonres</sub>	CO	trace CO	NO <sub>2</sub>	NO <sub>x</sub>	SO <sub>2</sub>	trace SO <sub>2</sub>	Metals (TSP), Inc. Lead	VOCs	Carbonyls	PAHs	Meteor- ological para-	Building or Trailer
Holland	260050003	x	x															x	T
Bay City	260170014		x	x														x	T
Benzonia	260190003	x																x	T
Coloma	260210014	x	x															x	T
Cassopolis	260270003	x																x	B
Rose Lake	260370001	x																	B
Flint	260490021	x	x	x										Mn Only				x	T
Otisville	260492001	x																x	T
Harbor Beach	260630007	x																x	T
Belding - Reed St	260670002																	x	B
Belding - Merrick St	260670003													Pb + 4					
Lansing	260650012	x	x	x						x								x	T
Kalamazoo	260770008	x	x	x														x	T
Grand Rapids - Wealthy St	260810007		x			x													
Grand Rapids - Monroe St	260810020	x	x	x	x	x	x	x		x		x		Pb + 4				x	T
Evans	260810022	x																x	T
Tecumseh	260910007	x	x		x													x	T
New Haven	260990009	x	x															x	T
Sterling Hts/Freedom Hill	260990021																	x	
Warren	260991003	x																	T
Manistee +	261010922	x	x															x	B
Scottville	261050007	x																x	T
Houghton Lake	261130001	x	x	x	x					x								x	T
Luna Pier	261150005		x		x														
Muskegon - Green Creek Rd	261210039	x																x	T
Muskegon - Apple St	261210040		x																
Oak Park	261250001	x	x															x	T
Pontiac	261250011																	x	
Rochester	261250012																	x	
Janison	261390005	x	x															x	T
Port Huron	261470005	x	x	x	x													x	T
Seney	261530001	x		x														x	T
Ypsilanti	261610008	x	x	x														x	T
Allen Park	261630001	x	x	x	x	x	x	x		x		x		Pb + 4				x	T
River Rouge	261630005													4		x		x	T
Detroit - SW HS	261630015		x		x	x						x		4	x	x		x	B
Detroit - Linwood	261630016		x																B
Detroit - E. 7 Mile	261630019	x	x							x								x	B
Livonia	261630025		x															x	T
Joy Rd	261630026																	x	
S Delray/ Jefferson	261630027													4					T
Dearborn	261630033		x	x	x	x								Pb + 11	x	x	x	x	B
Wyandotte	261630036		x																
Detroit - Newberry School	261630038		x	x														x	B
Detroit - FIA/Lafayette	261630039		x	x														x	T
Total		26	27	13	8	5		0	2	3	2	1	2	8	2	3		35	

+ = tribal  
  retained, but operating in reduced capacity  
 4 = Suite reduced to Mn, As, Cd, Ni

## **Quality Assurance (QA)**

The MDEQ has an approved Quality Management Plan (QMP). In turn, the Air Monitoring Unit (AMU) has a Quality Assurance Project Plan (QAPP), which covers the operation of the ambient air monitoring network. The AMU also has QAPPs for the PM<sub>2.5</sub> monitoring program, the NATTS, and has adopted the EPA's PM<sub>2.5</sub> Speciation Trends Network (STN) QAPP. Lastly, the AMU has approved standard operating procedures, standardized forms and documentation policies, and a robust audit and assessment program to ensure high data quality.

As part of the network review process, it is important to ensure that each monitor meets the specific requirements in 40 CFR Part 58, Appendix A governing proper calibration and operation of each monitor, proper probe height and monitor path length. In addition, the site itself must meet specific criteria governing distances from large trees and buildings, exhaust vents, highways, etc. To address the adequacy of these operational parameters, various types of audits are performed.

Audits are conducted by the AMU's Quality Assurance (QA) Team, which has a separate reporting line of supervision. The audits are conducted on the particulate-based monitors every six months (PM<sub>2.5</sub> FRM, continuous PM<sub>2.5</sub> TEOM, PM<sub>2.5</sub> Speciation, High Volume TSP [total suspended particulate], and PM<sub>10</sub>) and the gaseous monitors (CO, SO<sub>2</sub>, ozone, and NO<sub>2</sub>) at least once a year. The toxics monitors (volatile organic compounds [VOCs] and carbonyl compounds) are also audited once a year by the QA Team. These audits are conducted with independent equipment and gases, which are only used for quality assurance. The AMU's QA Coordinator reviews the results from all audits.

External audits are conducted annually by the EPA. The EPA conducts Performance Evaluation Program (PEP) audits for PM<sub>2.5</sub> samplers (eight sites a year) and National Performance Audit Program (NPAP) for the gaseous monitors (20% of the sites per year) using a Thru-the-Probe audit system. The EPA also conducts program-wide Technical Systems Audits every three to five years to evaluate overall program operations, and assess adequacy of documentation and records retention. External audits are also conducted on the laboratory operations for air toxics (VOCs and carbonyls) and metals through the use of performance evaluation samples. The concentrations of the audit samples are unknown to both the AQD staff and the MDEQ Environmental Laboratory staff.

## **LEAD MONITORING NETWORK:**

### **Background**

On December 14, 2010, the EPA revised the ambient monitoring requirements to better address possible exposures to lead<sup>7</sup>. Monitoring is required for point sources that emit 0.5 tons of lead per year or more, if modeling indicates that the maximum concentration is more than half of the level of the air quality standard. If modeling indicates that there is little likelihood of violating the NAAQS, a waiver from monitoring may be obtained from the regional administrator. These new monitoring stations must be operational by December 27, 2011.

EPA added a more stringent monitoring requirement to the federal regulations for a special year long study investigating possible impacts from airports emitting 0.5 tons of lead per year (tpy) or more. Fifteen airports were selected as participants because of the number of piston driven planes using leaded fuel at the facility, the runway configurations and the existence of "ambient air" within 150 meters of a runway. No waivers or appeals are possible for relief from this monitoring requirement. The lead monitors at these 15 airports also have to be operational by December 27, 2011.

The final component of the 2010 revisions to the monitoring regulations includes the addition of population-oriented lead monitors at NCore stations that are located in CBSAs with populations greater than 500,000. These monitors need to be in place by January 1, 2012.

Sampling that is implemented as a result of these changes to the monitoring rules need to conform to practices currently in use in the rest of the lead network. Namely, sampling will be conducted on a once every six day schedule and employ a high volume TSP sampler. The filters will be analyzed by the MDEQ laboratory using inductively coupled plasma/mass spectrometry (ICP/MS).

To place these new monitoring requirements into context, the 2008 lead NAAQS is reviewed below as are changes already implemented in the lead network.

### **The 2008 Lead NAAQS**

The 2008 lead NAAQS reduced the level of the standard from a maximum quarterly average of 1.5 ug/m<sup>3</sup> to 0.15 ug/m<sup>3</sup> as a rolling three-month average. To determine if the primary NAAQS is met, the maximum three-month average within a three-year period is compared to the level of 0.15 ug/m<sup>3</sup>.

In addition to changing the level and form of the standard, the 2008 NAAQS also changed monitoring requirements. The EPA required that ambient monitoring be performed downwind of point sources emitting one ton or more per year of lead, unless modeling proved that the sources didn't pose a health risk.

The NAAQS retained the TSP size fraction of lead, but acknowledged that agencies may, under certain conditions, measure lead as PM<sub>10</sub>, if low volume sampling devices are used. Currently, the MDEQ is using high volume TSP samplers to measure lead and will continue to do so for compliance with the NAAQS and consistency with historical data. The NAAQS requires that

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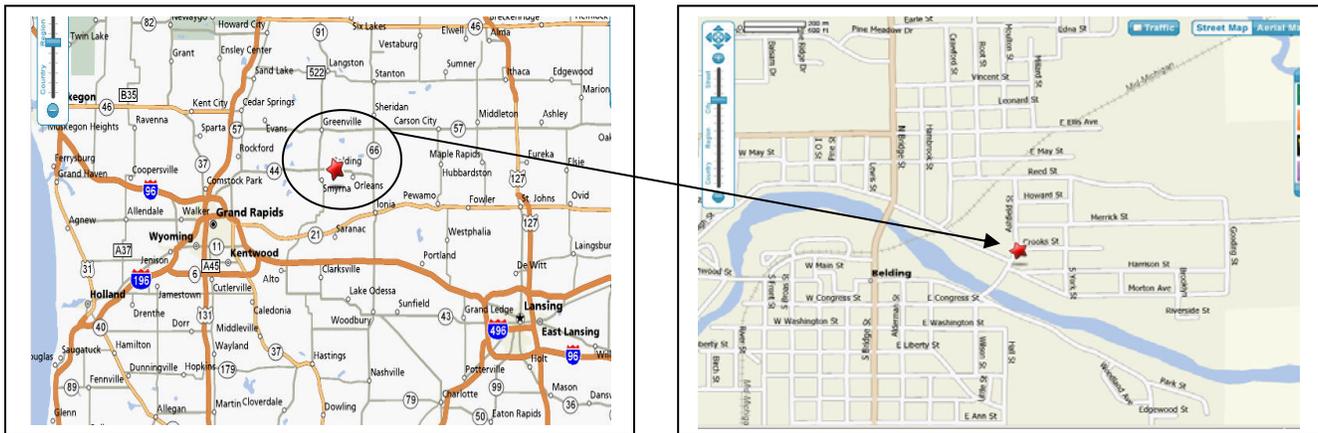
<sup>7</sup> "Environmental Protection Agency National Ambient Air Quality Standards for Lead; Final Rule." 40 CFR parts 50, 51, 53 and 58, November 12, 2008.

lead sampling be conducted on a once every six day schedule. The filters are analyzed by the MDEQ laboratory using ICP/MS.

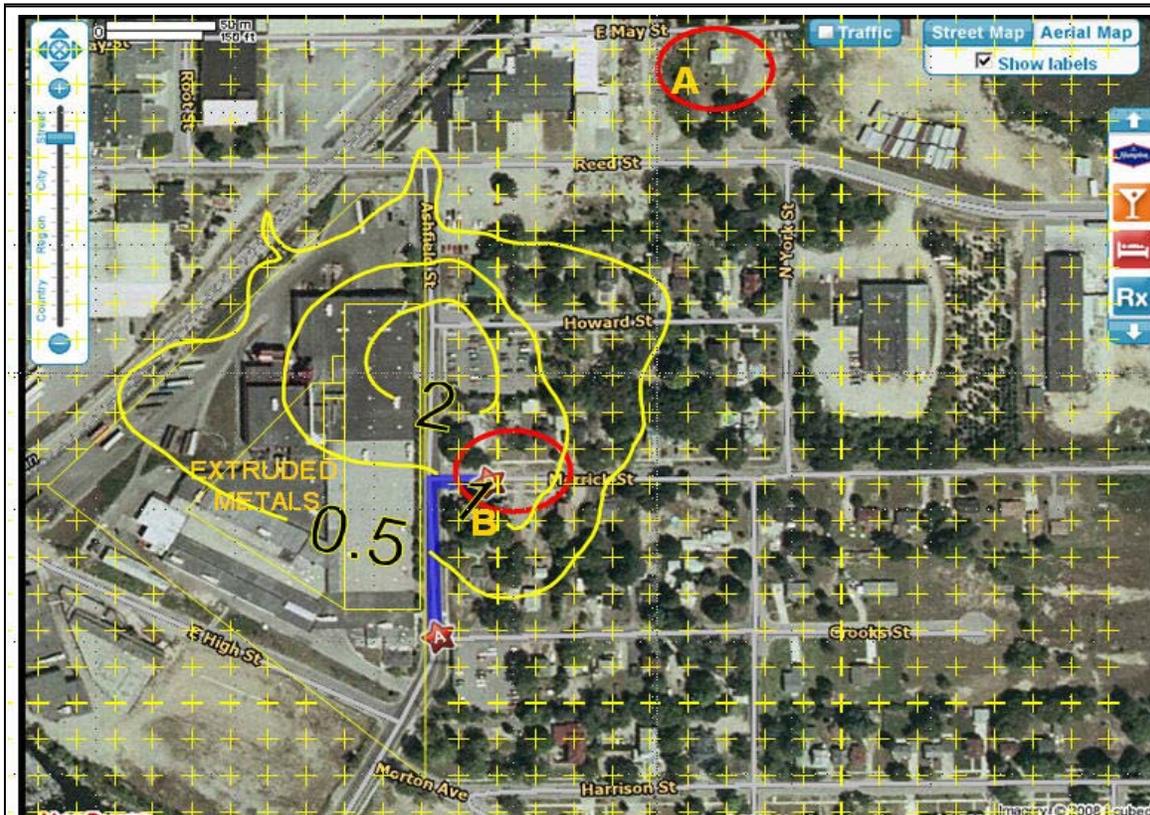
The facilities emitting more than one ton per year, the screening process, the model output and locations for candidate sites is described in even more detail in "Michigan's 2010 Ambient Air Monitoring Network Review." Belding-Merrick St, (260670003) was the only source-oriented monitor required in Michigan for facilities exceeding or equaling the one ton per year emission threshold. The NAAQS specifies that these source-oriented monitoring sites should be sited to measure lead on the microscale to middle scale corresponding to a range from several meters up to 4.0 kilometers. These "one ton" source oriented monitors were required to be operational by January 1, 2010. The Belding – Merrick (260670003) site meets both siting and sampling requirements and was operational before the January 1, 2010 deadline.

The location of Extruded Metals now referred to as "Mueller Industries" at 302 Ashfield, Belding MI 48809 is shown in **Figure 2**. The area surrounding the facility is mainly residential with a few parking lots and commercial buildings in the area. A prefabricated building manufacturing company, now closed, is located nearby as is seen in the photographs that follow. The area is hilly with Extruded Metals at a lower elevation and the residential area at an elevation closer to stack height. Due to the short stack heights, the maximum point of impact is near the facility's fence line, as shown by the modeling output in **Figure 3**.

**FIGURE 2: BELDING MI AND THE LOCATION OF EXTRUDED METALS**



**FIGURE 3: MODELED LEAD ISOPLETHS COMPARED TO POSSIBLE MONITORING SITE LOCATIONS IN BELDING**

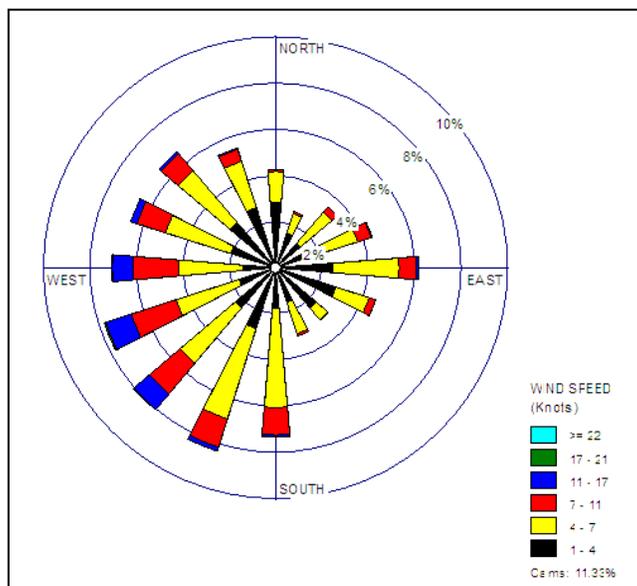


Winds are primarily from the west as shown by the wind rose in **Figure 4**.

The location labeled A in **Figures 3** and **5** is at 545 Reed St. at well house #5, operated by the Belding Department of Works. Previously, the MDEQ had monitored TSP at this location (260670002) and discontinued it in 1987. A meteorological tower was deployed to this location and the MDEQ has collected resultant wind speed, resultant wind direction, temperature, pressure and sigma theta at this location since January 2010. There is insufficient space at the lead site to accommodate these measurements.

The lead site, shown by B in **Figures 3** and **5**, is closer to the site of maximum impact and is located at 509 Merrick St. (260670003) in the right of way of the road, as shown in **Figure 6**. The lead monitor was operational before the January 1, 2010 deadline. Lead levels measured at this location have violated the NAAQS seven of the 12 three-month periods in 2010. The ambient monitoring results are shown in **Table 4**.

**FIGURE 4: WIND ROSE USING DATA FROM THE GRAND RAPIDS MONROE ST SITE (260810020) FOR BELDING IN IONIA COUNTY**



**FIGURE 5: MAP OF EXTRUDED METALS, AND MONITORING LOCATIONS**



**TABLE 4: LEAD MEASURED AT BELDING -**

**FIGURE 6: BELDING- MERRICK ST (260670003)**

**MERRICK ST (260670003)**

**LEAD MONITOR**

Year	Month	Mo. Avg.	3-Mo Avg.
2010	1	0.09350	---
2010	2	<b>0.2025</b>	---
2010	3	0.02368	0.11
2010	4	<b>0.2645</b>	<b>0.16</b>
2010	5	<b>0.3609</b>	<b>0.22</b>
2010	6	<b>0.2264</b>	<b>0.28</b>
2010	7	0.1368	<b>0.24</b>
2010	8	<b>0.4131</b>	<b>0.26</b>
2010	9	0.07521	<b>0.21</b>
2010	10	<b>0.2934</b>	<b>0.26</b>
2010	11	0.01609	0.13
2010	12	0.03450	0.11
2011	1	<b>0.1947</b>	0.08
2011	2	0.09663	0.10



**Point Source-Oriented Monitoring Network Design ( Sources ≥ 0.5 tpy and < 1 tpy)**

Similar to the analysis for sources greater than 1 tpy, the MDEQ investigated sources emitting lead in quantities greater than or equal to 0.5 tpy based upon an updated list received from the EPA on December 14, 2010, in **Table 5**.

**TABLE 5: UPDATED LIST OF LEAD POINT SOURCES <sup>8</sup>**

Units = tons per year

County	Facility Name	City	NEI	TRI					State E.I.					NOTES
			05	05	06	07	08	09	05	06	07	08	09	
Calhoun	Hayes-Albion Corp.	Albion	0.71	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Closed 2002
Charlevoix	East Jordan Iron Works	East Jordan	0.67	0.01	0.01	0.01	0.01	0.01	0.7	0.6	0.5	0.1	0.1	MUST MODEL
Clinton	Federal Mogul	Saint Johns	0.61	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Closed 2008
Ionia	Extruded Metals	Belding	0.93	0.92	1.27	0.87	0.83	1.12	0.9	1.0	0.9	0.8	1.1	Pb monitor in place
Kent	Sparta Foundry Inc.	Sparta	0.58	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Closed 2004
Oceana	Kurziel Iron	Rothbury	0.60	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Closed 2009
Tuscola	Grede Foundries Inc. (Metavation)	Vassar	0.55	0.55	0.52	0.42	0.22	0.25	0.6	0.5	0.4	0.2	0.1	MUST MODEL

<sup>8</sup> Received from Region 5 EPA, dated December 14, 2010.

The list was reviewed by MDEQ emission inventory staff who provided the following summary:

**Hayes-Albion Harvard Industries**, 601 N. Albion, Albion, MI: As a result of bankruptcy, the plant ceased operations in February, 2002 with an auction liquidation of manufacturing equipment. The Harvard Industries site is the home of a former foundry operation that has been abandoned after the bankruptcy. An emission inventory report was last filed under Hayes Albion Corporation (B1547) in year 2002

**Federal Mogul**, 310 E Steel St, St Johns, MI (B2407) Federal-Mogul Corp. shut down its plant in St. Johns in 2008. An emission inventory report was last filed under Federal Mogul-St. Johns (B2407) in 2007. Manufacturing operations were moved to its Greenville plant for consolidation as a result of the company's bankruptcy and is now making power train products from St. Johns facility.

**Sparta Foundry/Kurdzial Industries**, 252 E. Gardner St. Sparta, MI. The foundry building has been empty since Kurdzial ceased operations there in 2004. The property belonging to Kurdzial was not part of Federal Mogul bankruptcy proceedings, but still appears in EPA's Envirofacts registry, which also shows operations were abandoned by Kurdzial. UAW-CIO Local 8 now is operating at this address. An emission inventory report was last filed under Sparta Foundry (N5795) in year 2004.

**Carlton Creek Ironworks LLC** (Kurdziel Iron), 2625 Winston Rd, Rothbury, MI (B1961). Manufacturing operations have been shut down since February, 2009. During 2008, lead emissions were estimated at 257.7 lbs.

Because modeling<sup>9</sup> was performed prior to receipt of EPA's list shown in **Table 5**, the MDEQ used older data, which included – in addition to East Jordan Iron Works and Grede Foundries, also known as Metavation – the Karn Weedock Consumers Energy plant in Bay City and the Detroit Waste Water Treatment Plant. These four sources were modeled in the fall of 2010.

East Jordan Iron Works is located at 301 Spring St in East Jordan, in Charlevoix County. Modeling assumed the worst case scenario and used two horizontal stacks placed roughly in the center of the processing area of the facility; using the highest emission value (0.67 tpy) obtained from the 2005 NEI. The monthly average concentrations ranged from 0.014 ug/m<sup>3</sup> to 1.368 ug/m<sup>3</sup>, with predicted values in the residential areas to the east and southeast of the facility being in the range from 0.16 ug/m<sup>3</sup> to 0.315 ug/m<sup>3</sup>, clearly over the level of the NAAQS. More recent state emission estimates show that for 2008 and 2009, 242.4 (0.1 tpy) and 242.9 (0.1 tpy) pounds per year of lead were released, respectively. Assuming proportional scaling of the modeled output, of those updated emissions estimates of 0.1 tpy would result in ambient concentrations reaching 0.204 ug/m<sup>3</sup>. Hence, modeled concentrations are more than 50% of the NAAQS. **Figure 7** shows the modeled isopleths overlaid on an aerial map of East Jordan. The area enclosed by the circle is relatively free of trees and other obstructions and may contain a suitable location for a monitoring site.

The MDEQ may have difficulty deploying and operating a lead site in east Jordan. The costs to create the required infrastructure will be minimal because a shelter is not necessary. However, the remote location will incur significant travel costs and the MDEQ currently does not have staff that regularly visit that area of the state. Therefore, the MDEQ would have to hire a sub-contractor; it is unknown whether MDEQ will be able to obtain permission to fill a contracting position.

<sup>9</sup> MDEQ had a student intern available for modeling work through December 15, 2010.

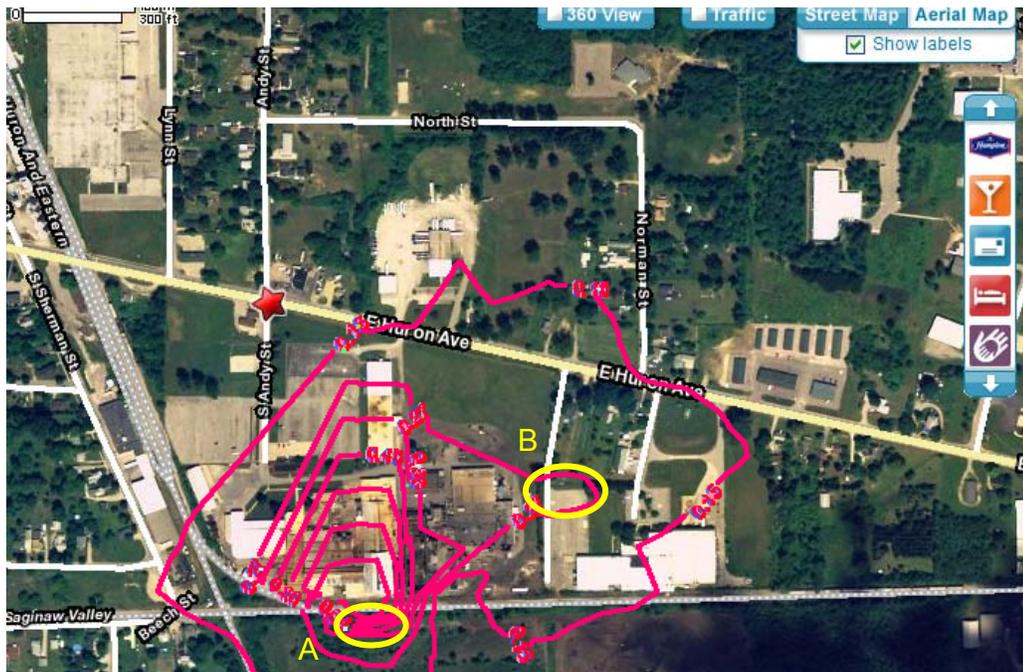
Metavation Vassar, LLC, formerly known as Grede Foundries is located at 700 E Huron Ave in Vassar in Tuscola County. No previous modeling had been performed on Metavation so assumptions had to be made to approximate the building height and stack locations. The worst case scenario was modeled by choosing the stack that would create the highest concentrations. The 2004 TRI value of 0.63 tpy was used as the input into the model. The maximum monthly concentration was 0.808, with values ranging from 0.043 to 0.649  $\mu\text{g}/\text{m}^3$  in the surrounding residential areas. More recent inventory data for 2008 and 2009 estimates lead emissions at 426.3 (0.2 tpy) and 277 (0.1 tpy) pounds per year, respectively. Assuming proportional scaling of the modeled output, use of these updated emissions estimates of either 0.1 or 0.2 tpy would result in concentrations of 0.103 or 0.206  $\mu\text{g}/\text{m}^3$ , both of which are greater than 50% of the NAAQS. **Figure 8** shows the modeled isopleths overlaid on an aerial map of Vassar. Possible monitoring site locations are shown by yellow circles. **Figure 9** provides a more detailed views of possible locations.

Vassar is relatively close to an existing monitoring location in Otisville. Therefore, travel costs to operate a site in Vassar should be minimal and staff are in the general vicinity on a routine basis.

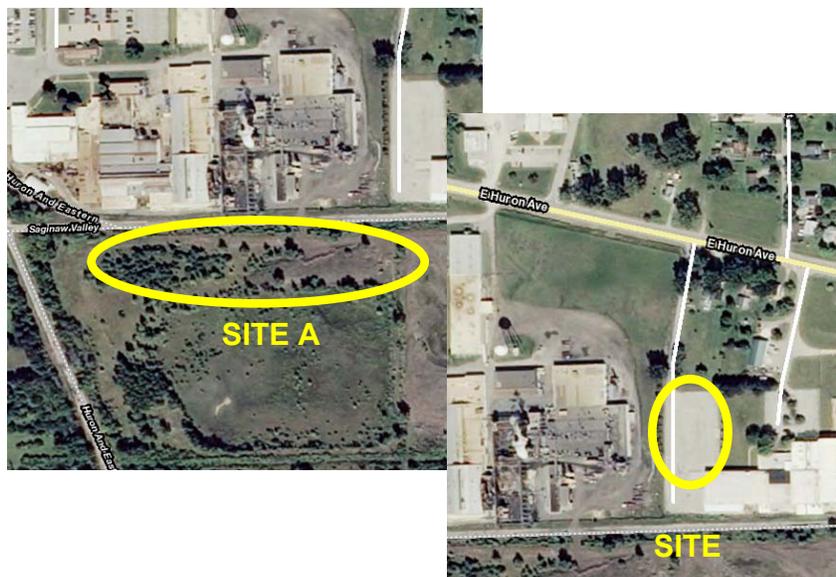
**FIGURE 7: MODELED LEAD ISOPLETHS COMPARED TO POSSIBLE MONITORING SITE LOCATIONS IN EAST JORDAN**



**FIGURE 8: MODELED LEAD ISOPLETHS COMPARED TO POSSIBLE MONITORING SITE LOCATIONS IN VASSAR**



**FIGURE 9: POSSIBLE MONITORING SITE LOCATIONS IN VASSAR**



## Area Source-Oriented Monitoring Network Design

As part of the monitoring requirements associated with the 2008 lead NAAQS, a list of airports with significant propeller-driven aircraft emissions was developed by EPA<sup>10</sup> OTAQ/OAQPS based on revised 2002 National Emissions Inventory data, targeting airports emitting one ton or more of lead per year. The Michigan airport with the highest lead emissions was Oakland County Airport, totaling 0.76 tons/year (see **Table 6**).

**TABLE 6: INITIAL LIST OF LEAD AREA SOURCES IN MICHIGAN THAT COULD TRIGGER A MONITORING REQUIREMENT**

Lead Area Sources in Michigan - According to EPA			
Airport Name	Abbreviation	County	Lead Emissions tons/yr
Oakland County Int'l	PTK	Oakland	0.76
Detroit Metropolitan	DTW	Wayne	0.39

When the EPA proposed revisions to the monitoring requirements for lead, they revisited the level of the threshold for monitoring at airports, suggesting a level of 0.5 tpy. Setting the threshold at this level would trigger monitoring requirements at 58 airports, according to the 2008 NEI. Based on public comments received about using a level of 0.5 tpy, the EPA decided to perform a “special study” to investigate whether lead “emissions from some airports have the potential to cause or contribute to exceedances of the lead NAAQS, and whether lead monitoring at airports is necessary to ensure compliance with the lead NAAQS.”<sup>11</sup>

EPA OTAQ used three criteria to select airports for their special monitoring study:<sup>12</sup>

1. Lead emissions greater than or equal to 0.50 tons per year (tpy);
2. Airport runway configuration and meteorology that lead to greater frequency of operations from one or two runways; and,
3. Ambient air within 150 meters of the location(s) of maximum emissions.

The fifteen airports selected for this year long study, were published in the *Federal Register* and are shown in **Table 7**.<sup>13</sup> Airports and monitoring agencies are not permitted to opt out.

In an USEPA memo dated January 20, 2010 from Meredith Pedde, and Marion Hoyer, OTAQ/ASD, airports in the 2008 NEI that have lead inventories of 0.50 tpy or more were identified. Michigan airports excerpted from this memo are shown in **Table 8**. According to the memo, the 2008 inventory estimates lead emissions from Oakland County International Airport at 0.53 tpy.

<sup>10</sup> Area sources were supplied in an e-mail from Motria Caudill, Region 5 EPA to Mary Ann Heindorf et al. MDEQ, December 3, 2008

<sup>11</sup> *Federal Register*, December 27, 2010, Volume 75, Page 81130

<sup>12</sup> Criteria used to select airports for the monitoring study Memorandum November 18, 2010 from Meredith Pedde, OTAQ/ASD and Marion Hoyer OTAQ/ASD to Lead NAAQS Docket EOA-HQ-OAR-2006-0735

<sup>13</sup> *Federal Register* December 27, 2010, Volume 75, Part 58 Appendix D Table D-3A

**TABLE 7: AIRPORTS TO BE MONITORED FOR LEAD**

<b>Airport</b>	<b>County</b>	<b>State</b>
Merrill Field	Anchorage	AK
Pryor Field Regional	Limestone	AL
Palo Alto Airport of Santa Clara County	Santa Clara	CA
McClellan-Palomar	San Diego	CA
Reid-Hillview	Santa Clara	CA
Gillespie Field	San Diego	CA
San Carlos	San Mateo	CA
Nantucket Memorial	Nantucket	MA
Oakland County International	Oakland	MI
Republic	Suffolk	NY
Brookhaven	Suffolk	NY
Stinson Municipal	Bexar	TX
Northwest Regional	Denton	TX
Harvey Field	Snohomish	WA
Auburn Municipal	King	WA

**TABLE 8: AIRPORTS WITH ESTIMATED LEAD EMISSIONS OF 0.50 TONS OR MORE BASED ON 2008 ACTIVITY DATA AND AIRPORT-SPECIFIC PERCENT OF BASED AIRCRAFT THAT ARE SINGLE- OR MULTI-ENGINE AIRCRAFT<sup>14</sup>**

<b>Airport ID</b>	<b>State</b>	<b>County</b>	<b>EPA Region</b>	<b>Facility Name</b>	<b>Percent of Based Aircraft that are Single- or Multi- Engine</b>	<b>2008 Lead Emissions (tons) using Percent of Based Aircraft</b>
PTK	MI	Oakland	5	Oakland County Intl	81%	0.53

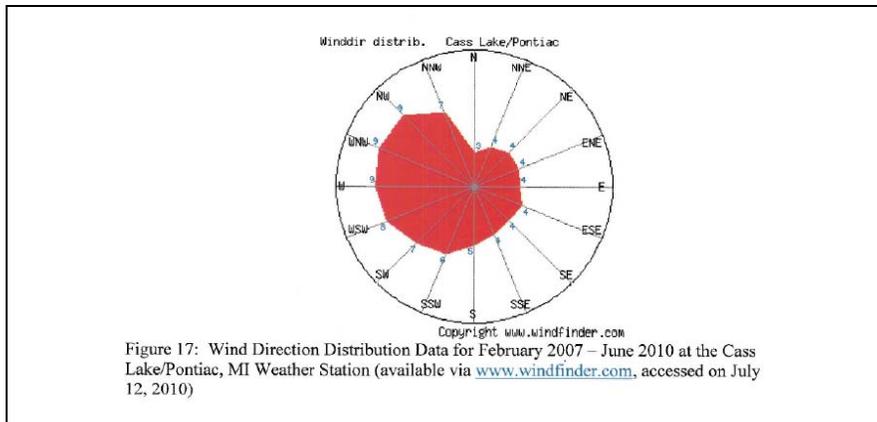
The information supplied by EPA to support the selection of a site on the Oakland County International Airport property is provided below.<sup>15</sup>

*Most active runway:* There are three runways at Oakland County International Airport: 9R/27L, 9L/27R and 18/36. The EPA contacted the Oakland County International Airport manager, Mr. Karl Randall, on August 4, 2010. He indicated that about 95% of the time piston-engine aircraft use runway 9L/27R since they didn't need the extra length that 9R/27L provides and he stated that this runway use avoids the mixing of the jet and piston-engine aircraft use patterns. Of the piston-engine aircraft operations occurring at runway 9L/27R, Mr. Randall indicated that 75-85% of the time they use runway 27R.

*Wind direction distribution data for the nearest site to Oakland County International Airport (Cass Lake/Pontiac MI, ~ 10 km southeast of Oakland County International Airport) in Figure 17 shows that the prevailing winds are from the northwest to southwest directions, supporting the fact that runway 27R is the most active runway for piston-engine aircraft at Oakland County International airport.*

<sup>14</sup> Draft memorandum January 20, 2010 from Meredith Pedde, OTAQ/ASD and Marion Hoyer OTAQ/ASD to Lead NAAQS Docket EOA-HQ-OAR-2006-0735

<sup>15</sup> Criteria used to select airports for the monitoring study Memorandum, November 18, 2010 from Meredith Pedde, OTAQ/ASD and Marion Hoyer OTAQ/ASD to Lead NAAQS Docket EOA-HQ-OAR-2006-0735 page 24-26.

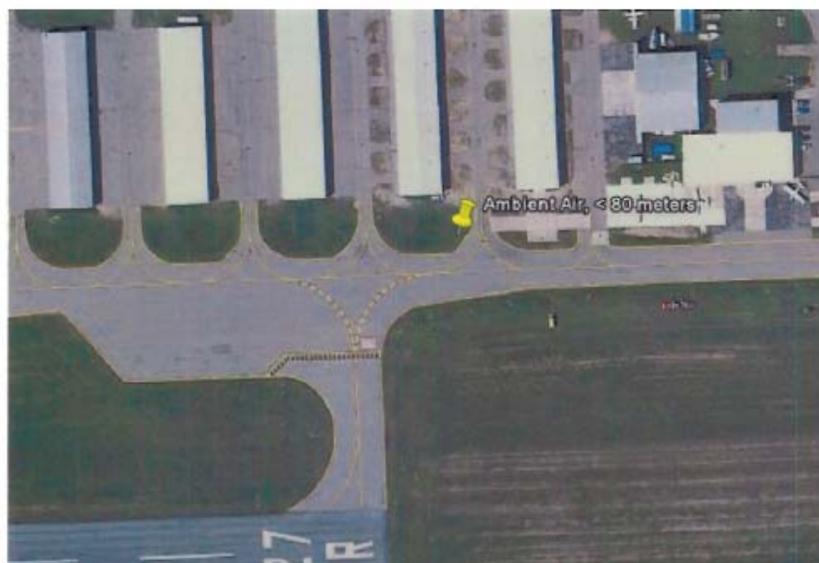


Daily operations data reported to the FAA Air Traffic Activity Data System for Oakland County International Airport indicates that in 2008 the most active three-month period was from June to August. Using Mr. Randall's piston-engine runway statistics, the EPA estimates that 26,000 to 29,000 piston-engine operations occurred at runway 27R from June through August 2008.

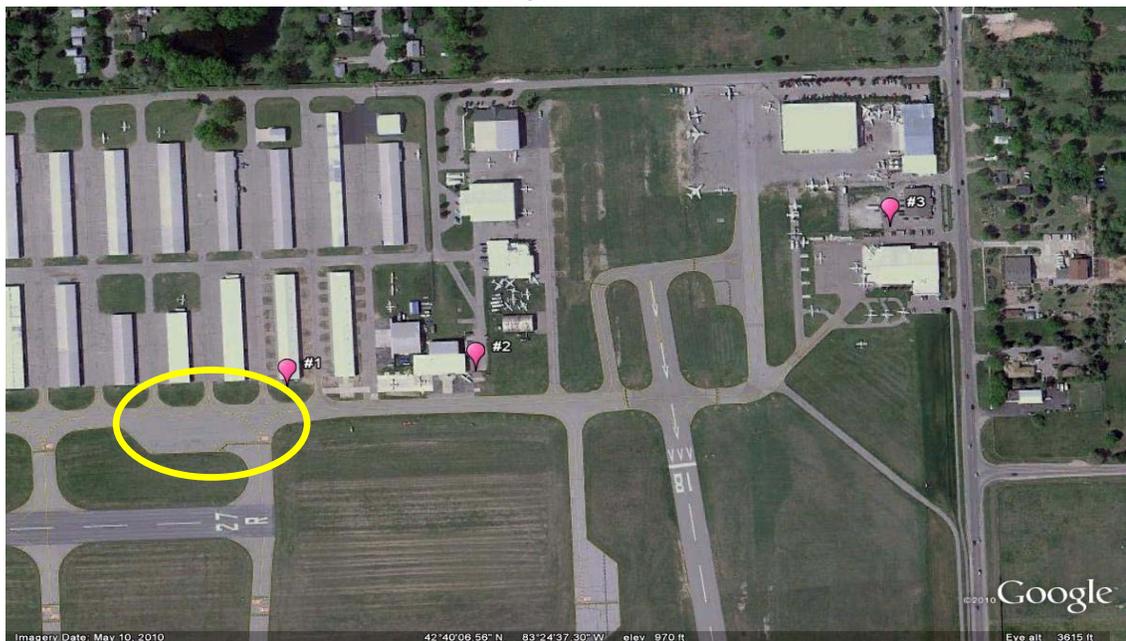
*Ambient Air: Mr. Randall stated that piston-engine aircraft conduct their run-up checks in the marked area immediately north of the end of runway 27R. At the Oakland County International Airport, ambient air closest to the maximum impact area at runway 27R is less than 80 meters away in the grassy area near the hangars where general aviation pilots park their car and access their aircraft (Figure 18)."*

The EPA's suggestion of where the monitor should be placed is shown in **Figure 10**. The rev-up zone is located in the yellow circle in **Figure 11**, which compares the EPA's location with other possible locations offered by the Oakland County International Airport and the MDEQ.

**FIGURE 10: EPA OTAQ'S LOCATION FOR A LEAD MONITOR AT OAKLAND COUNTY INTERNATIONAL AIRPORT**



**FIGURE 11: POSSIBLE LOCATIONS FOR A LEAD SITE AT OAKLAND COUNTY INTERNATIONAL AIRPORT**



**Non-Source-Oriented/ NCore Monitoring Network Design**

According to the November 12, 2008 lead NAAQS, each core based statistical area (CBSA) with a population equaling or exceeding 500,000 people shall have a lead monitoring station to measure neighborhood scale lead in the urban area.

When the monitoring requirements to the lead NAAQS became final on December 14, 2010, the EPA replaced this monitoring requirement with one calling for monitoring at NCore sites in CBSAs with populations greater than 500,000 by January 1, 2012.

According to the 2010 census, there are two CBSAs in Michigan with population levels exceeding 500,000. Both of these CBSAs contain an NCore station as is shown in **Table 9**.

**TABLE 9: CBSAS WITH MORE THAN 500,000 PEOPLE<sup>16</sup>**

<b>CBSA</b>	<b>2010 Population</b>	<b>Counties</b>	<b>Existing NCore Sites</b>
Detroit-Warren-Livonia Metro Area	4,296,250	Macomb Oakland Wayne Lapeer St Clair Livingston	Allen Park (261630001)
Grand Rapids-Wyoming Metro Area	774,160	Kent Barry Newaygo Ionia	Grand Rapids-Monroe St (260810020)

<sup>16</sup> 2010 census data.

The MDEQ deployed the TSP lead sites to the NCore stations before January 1, 2010 for a variety of reasons:

- The changes in the monitoring regulations did not result in a difference in the network design.
- The MDEQ desired to have a population-oriented lead site near the point source monitoring site in Belding for comparative purposes, so lead was added to the Grand Rapids NCore site (260810020).
- The MDEQ was already collecting trace metals at the Allen Park NCore site (261630001). The addition of lead to the list of elements reported is a minimal expense and will provide comparisons to the other NCore site.

**Lead Co-location Requirements**

If a primary quality assurance organization (PQAO) has a mixture of source and non-source-oriented lead sites, the number of co-located lead sites is equal to 15% of the total number of these lead sites. **Table 10** described the deployment schedule for various components of the lead network and shows the calculations for determining the number of co-located lead sites that are required.

As shown by the table, only one co-located monitoring station is required under any of the scenarios for Michigan's lead network. Currently, the co-located site is at Dearborn. According to the *Federal Register*, the co-located site should be at the location with the highest lead concentrations, which would be at Belding (260670003). However, this is impossible because the station occupies a minimal footprint located in the right of way of the road, as shown in **Figure 6**.

**TABLE 10: DEPLOYMENT SCHEDULE FOR LEAD SITES AND CALCULATION OF THE TOTAL NUMBER OF CO-LOCATED LEAD SITES**

Site Name & ID	Site Purpose	2010	2011	2012	2013
Dearborn (261630033)	NATTS; co-located site	operational	operational	operational	operational
Grand Rapids-Monroe St. (260810020)	NCore Non-Source-oriented	operational	operational	operational	operational
Allen Park (261630001)	NCore Non-Source-oriented	operational	operational	operational	operational
Belding (2606670003)	Source-oriented	operational	operational	operational	operational
Vassar (26157????)	Source-oriented		operational	operational	operational
E Jordan (26029????)	Source-oriented		operational	operational	operational
Oakland Co Airport (26125????)	Source-oriented			operational	
<b>Total No. Sites</b>		<b>4</b>	<b>6</b>	<b>7</b>	<b>6</b>
<b>No. Co-Located Sites Required</b>		<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>

The MDEQ is working on developing an abatement strategy with Mueller Brass and expects implementation in the very near future. The MDEQ anticipates that ambient lead levels will begin to decline once these changes are made. For these reasons, the MDEQ will seek a waiver from the co-location requirement at Belding from Regional Administrator.

The MDEQ prefers to leave the co-located lead site at the National Air Toxics Trend Site (NATTS) at Dearborn (261630033), which is located close to many industrial processes including a steel mill, a rail yard and an incinerator. The station is sited at Salina School. Typically, NATTS sites determine lead as PM<sub>10</sub> using a high volume sampler and thus do not meet the monitoring requirements, which specify the use of a high volume TSP sampler or a low volume PM<sub>10</sub> sampler under certain instances. However, the MDEQ opted to collect co-located lead measurements as both TSP and PM<sub>10</sub> at the Dearborn site to continue generating trend data (TSP – Pb), promote comparability with other NATTS sites in the nation (PM<sub>10</sub> – Pb) and to determine precision for both size fractions. In addition, a single Met One SASS monitor supports the measurement of lead as PM<sub>2.5</sub>, rounding out the suite of various particle sizes. As long as the total number of lead sites in Michigan is less than ten, the co-located TSP samplers at Dearborn also fulfill the 15% co-location requirement for the lead network. The sampling frequency for all of the high volume lead measurements at Dearborn is once every six days. If the MDEQ encounters budgetary problems, the sampling frequency of the PM<sub>10</sub> and TSP co-located samplers will be reduced from once every six days to once every 12 days as is allowed by EPA. The MDEQ opts to operate co-located samplers on a once every six day schedule to collect more complete data.

**Table 11** summarizes the lead monitoring site information for the sites that were in operation in 2010. **Table 12** shows the proposed new lead network broken down by source-oriented and non-source-oriented sites. **Figure 12** compares monitoring site locations in the 2011 network with those proposed for 2012.

### **Waiver(s) From Lead Monitoring**

In the Network Review that was due July 1, 2009, waivers from monitoring were sought for point sources where modeling indicated there was little likelihood to violate the NAAQS. According to the waiver process, new waivers from monitoring for these sources need to be applied for five years after the first waiver was obtained. Therefore, the MDEQ will seek a waiver renewal in July 2014.

### **Lead Quality Assurance (QA)**

The site operator conducts a precision flow check each month. The flow check values are sent to the senior auditor each quarter. An independent audit is conducted by a member of the AMU's QA Team every six months. The auditor is in a separate line of reporting authority from the site operator and uses independent, dedicated equipment to perform the flow rate audit. The auditor also assesses the condition of the monitor and siting criteria. The QA Coordinator reviews all audit results, and hard copies are retained in the QA files. The audit results are uploaded to the EPA's AQS database each quarter.

The MDEQ Laboratory participates in an external performance testing programs that is administered by the EPA. The audit program is part of the NPAP and is required by regulation. The EPA annually sends a filter strip that is spiked with a known concentration of lead. The laboratory reports the result to the EPA and it is compared to the "true" value.

**TABLE 11: LEAD SITES IN OPERATION IN 2010**

Operating Schedule: 1:6 days  
 Method: High Volume Sampler & ICAP Spectra  
 Network as of December, 2010

**Source Oriented Sites**

Monitoring Sites			Part. Size	Sampling			Date Estab.	Facility Name	County	Date Estab.	Est Emissions Tons/yr
Site Name	AQS Site ID	Address		Latitude	Longitude	Frequency Purpose					
Belding - Merrick St	260670003	509 Merrick	TSP	43.09984	-85.22163	1:6 max conc	Neighborhood	Ionia	1/1/10	Extruded Metals	0.9 - 1.0

**Non-Source Oriented Sites**

Monitoring Sites			Part. Size	Sampling			Date Estab.	CBSA <sup>1</sup>	Pop (2010 Census)			
Site Name	AQS Site ID	Address		Latitude	Longitude	Frequency Purpose				Scale		
Grand Rapids - Monroe St	260810020	1179 Monroe St., NW	TSP	42.984167	-85.67139	1:6	Pop. Exp.	Neighborhood	Kent	1/8/10	GW	774,160
Allen Park	261630001	14700 Goddard	TSP	42.228611	-83.20833	1:6	Pop. Exp.	Neighborhood	Wayne	1/2/10	DWL	4,296,250
Dearborn	261630033	2842 Wyoming	TSP	42.306666	-83.14889	1:6	max conc	Neighborhood	Wayne	6/1/90	DWL	4,296,250
Dearborn	261630033	2842 Wyoming	TSP	42.306666	-83.14889	1:6, co-loc	max conc	Neighborhood	Wayne	6/1/90	DWL	4,296,250
Dearborn	261630033	2842 Wyoming	PM 10	42.306666	-83.14889	1:6	max conc	Neighborhood	Wayne	6/1/90	DWL	4,296,250
Dearborn	261630033	2842 Wyoming	PM 10	42.306666	-83.14889	1:6, co-loc	max conc	Neighborhood	Wayne	6/1/90	DWL	4,296,250

<sup>1</sup> CBSA Key:  
 DWL = Detroit-Warren-Livonia Core Based Statistical Area  
 GW = Grand Rapids-Wyoming Core Based Statistical Area

**TABLE 12: PROPOSED LEAD MONITORING NETWORK**

Operating Schedule: 1:6 days  
 Method: High Volume Sampler & ICAP Spectra  
 Proposed 2012 Network

**Point Source Oriented Sites**

Monitoring Sites			Part. Size	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Date Estab.	Facility Name	Est Emissions Tons/yr
Site Name	AQS Site ID	Address										
Belding - Merrick St	260670003	509 Merrick	TSP	43.09984	-85.22163	1:6	max conc	Neighborhood	Ionia	1/1/10	Extruded Metals	0.9 - 1.0
East Jordan	26029????	???	TSP	???	???	1:6	max conc	Neighborhood	Charlevoix	planned 12/27/10	East Jordan Ironworks	0.5 - 1
Vassar	26157????	???	TSP	???	???	1:6	max conc	Neighborhood	Tuscola	planned 12/27/10	Metavation	0.5 - 1
Belding - Reed St	260670002	(DPW Pump House)	TSP	43.101944	-85.22000	1:6	max conc	Neighborhood	Ionia	TBD	Extruded Metals	0.9 - 1.0

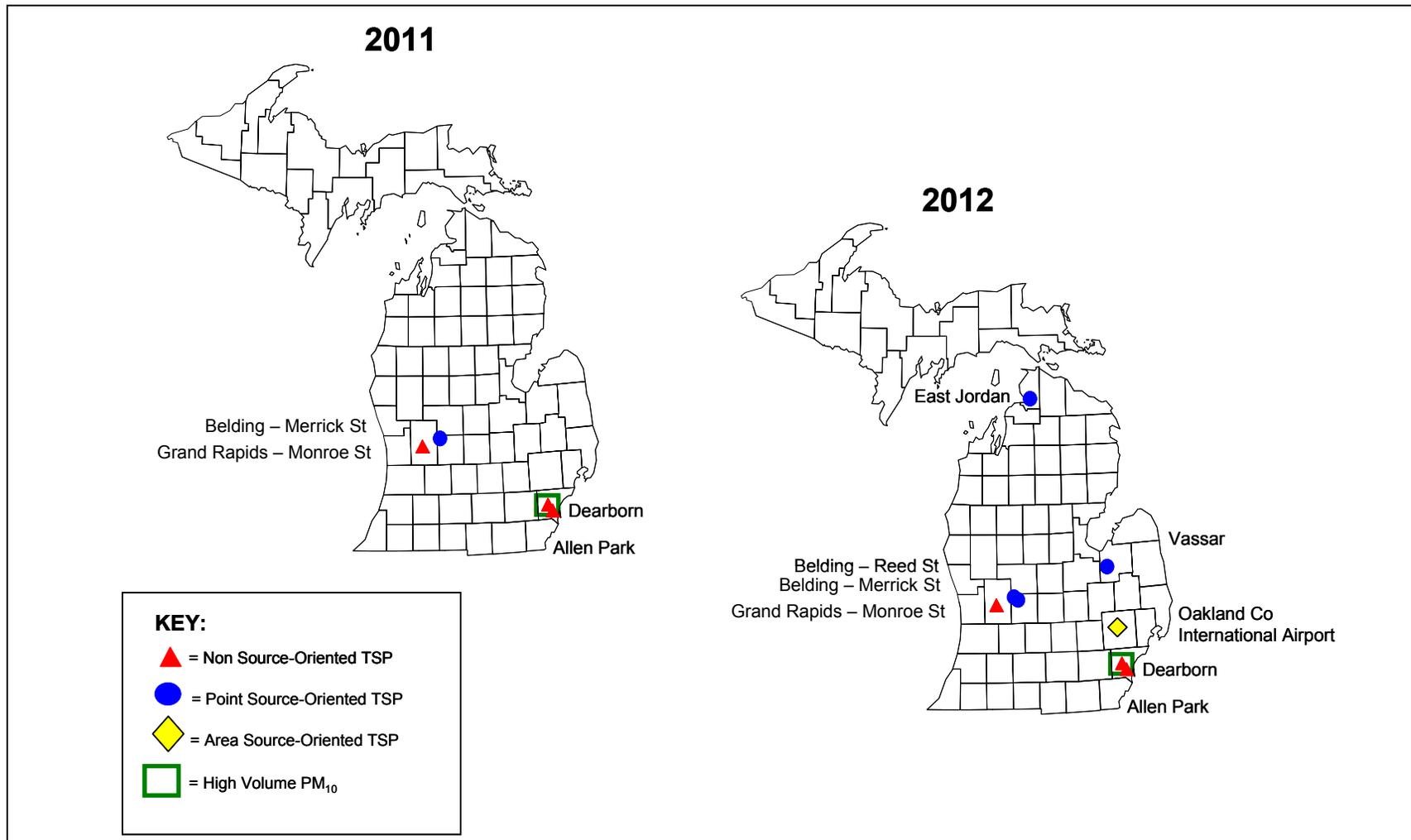
**Area Source Oriented Sites**

Monitoring Sites			Part. Size	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Date Estab.	Facility Name	Est Emissions Tons/yr
Site Name	AQS Site ID	Address										
Oakland Co Airport	26125????	???	TSP	42.668056	-83.41000	1:6	max conc	middle	Oakland	planned 12/27/10	Oakland County International Airpor	0.5 - 1

Monitoring Sites			Part. Size	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Date Estab.	CBSA <sup>1</sup>	Pop (2010 Census)
Site Name	AQS Site ID	Address										
Grand Rapids - Monroe St	260810020	1179 Monroe St., NW,	TSP	42.984167	-85.67139	1:6	pop. exp.	Neighborhood	Kent	1/8/10	GW	774,160
Allen Park	261630001	14700 Goddard	TSP	42.228611	-83.20833	1:6	pop. exp.	Neighborhood	Wayne	1/2/10	DWL	4,296,250
Dearborn	261630033	2842 Wyoming	TSP	42.306666	-83.14889	1:6	max conc	Neighborhood	Wayne	6/1/90	DWL	4,296,250
Dearborn	261630033	2842 Wyoming	TSP	42.306666	-83.14889	1:6, CO-100	max conc	Neighborhood	Wayne	6/1/90	DWL	4,296,250
Dearborn	261630033	2842 Wyoming	PM 10	42.306666	-83.14889	1:6	max conc	Neighborhood	Wayne	6/1/90	DWL	4,296,250
Dearborn	261630033	2842 Wyoming	PM 10	42.306666	-83.14889	1:6, CO-100	max conc	Neighborhood	Wayne	6/1/90	DWL	4,296,250

<sup>1</sup> CBSA Key:  
 DWL = Detroit-Warren-Livonia Core Based Statistical Area  
 GW = Grand Rapids-Wyoming Core Based Statistical Area

**FIGURE 12: COMPARISON OF MICHIGAN'S 2011 LEAD MONITORING NETWORK WITH THE SOURCE AND NON-SOURCE-ORIENTED NETWORK**



## **Plans for the 2012 Lead Monitoring Network**

In 2012, the MDEQ is planning to continue to collect lead measurements using high volume TSP samplers at the NCore sites in:

- Grand Rapids–Monroe St. (260810020)
- Allen Park (261630001)

High volume TSP lead measurements will continue to be collected at the NATTS site:

- Dearborn NATTS site (261630033)
- Co-located Dearborn NATTS (261630033)

The MDEQ is also planning to continue the collection of co-located PM<sub>10</sub> lead at the Dearborn (261630033) NATTS site during 2012.

Source-oriented monitoring for lead and collection of meteorological measurements will continue in Belding at:

- Belding–Merrick St. (260670003) TSP lead monitoring

The MDEQ will deploy the following point source–oriented lead sites by December 27, 2011:

- Belding–Reed St. (260670002) TSP lead monitoring.
- East Jordan (26029????) downwind of East Jordan Ironworks if adequate funding becomes available and if the MDEQ receives permission to hire a subcontractor for site operation.
- Vassar (26147????) downwind of Metavation.

The MDEQ will deploy the following area source-oriented lead site by December 27, 2011 and operate until December 31, 2012:

- Oakland County International Airport (26125????)

## **NCORE MONITORING NETWORK:**

Various iterations of the Monitoring Strategy<sup>17</sup> discussed the elimination of NAMS sites and the creation of NCore sites. The purpose of the NCore stations is to collect a variety of air quality measurements that can be used to provide an integrated approach to air quality management. Collection of a suite of measurements at a single site improves our understanding of how concentrations of various pollutants are inter related and can evaluate the effectiveness of control programs. Data from NCore sites is also used for the determination of air quality trends, for model evaluation and for attainment purposes. Reference or equivalent methods must be used.

### **Network Design**

Neighborhood and urban scale measurements are to be made at one NCore site per state. Some states, including Michigan, have more than one major population center or multiple airsheds with unique characteristics, so two to three NCore stations are required to adequately characterize air quality. Sampling at NCore sites should use a spatial scale of neighborhood (up to 4 km) or urban (4 km to 50 km).

Lastly, there are a limited number of rural NCore stations. These NCore sites are located away from the influences of major sources, are sited in areas of relatively homogeneous geography and should sample on a regional scale or larger. There are no rural NCore sites proposed for Michigan.

Whether urban or rural, the *Federal Register*<sup>18</sup> specifies the minimum parameters that each NCore site must measure:

- Continuous PM<sub>2.5</sub>
- 24-hr PM<sub>2.5</sub>
- Speciated PM<sub>2.5</sub>
- PM<sub>10-2.5</sub>
- Speciated PM<sub>10-2.5</sub>
- Ozone
- SO<sub>2</sub>
- CO
- NO/NO<sub>y</sub>
- Wind speed
- Wind direction
- Relative humidity
- Outdoor temperature
- Lead (at 10 NCore sites nationwide)

Although a waiver from the Regional Administrator may allow the substitution of oxides of nitrogen (NO<sub>x</sub>) monitoring for NO<sub>y</sub>, the MDEQ has deployed NO<sub>y</sub> monitors. Although meteorological measurements from other near by sites may be substituted for NCore measurements, the MDEQ continues to collect meteorological measurements at its NCore stations. The wind speed (WS) and wind direction (WD) are collected as vector measurements along with sigma theta . The *Federal Register* also specifies that ten NCore sites nationwide will be required to collect lead at the NCore

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<sup>17</sup> "Ambient Air Monitoring Strategy for State, Local, and Tribal Air Agencies," Office of Air Quality Planning and Standards, Research Triangle Park, NC, December 2008

<sup>18</sup> "Environmental Protection Agency National Ambient Air Quality Standards for Lead; Final Rule." 40 CFR Parts 50, 51, 53 and 58, November 12, 2008.

site or within the same MSA/CSA. The non-source-oriented lead sites previously described in the MDEQ's network review happen to coincide with the NCore site locations.

Grant guidance states that agencies are "encouraged to migrate to low-volume PM<sub>10</sub> sampling," especially at locations that are co-located with PM<sub>2.5</sub> FRMs to support measurement of PM<sub>10-2.5</sub>. The MDEQ initiated low volume PM<sub>10</sub> sampling at both NCore stations in July, 2010. Until technology develops sufficiently, continuous and speciated coarse particulate measurements, ammonia and nitric acid measurements are not required at NCore sites.

### **Michigan NCore Sites**

The MDEQ's NCore sites are located at the Grand Rapids-Monroe St. site (260810020) in the Grand Rapids-Wyoming CBSA and Allen Park (261630001) in the Detroit-Warren-Livonia CBSA. Details were provided in the 2010 Network Review.

**Tables 13 and 14** list the parameters measured at Grand Rapids-Monroe St. (260810020) and Allen Park (261630001), respectively. Start dates are also shown.

The speciation sampler at the Grand Rapids-Monroe St. station samples on a once every three day sampling schedule to meet the NCore monitoring requirements. The MDEQ modified the sampling schedule from once every six day to once every three days on January 1, 2011.

Low volume PM<sub>10</sub> was added to the Grand Rapids-Monroe St. (260810020) NCore site on January 14, 2010 and was added to the Allen Park (261630001) NCore site on January 8, 2010. Lead was added to both sites in January 2010. Humidity was added to the Grand Rapids-Monroe St. (260810020) NCore station on March 3, 2010.

Site specific data for Michigan's NCore network is summarized in **Table 15**. A map showing the locations of NCore sites is displayed in **Figure 13**.

### **NCore Quality Assurance**

NCore stations contain a variety of monitors that are required to meet the federal requirements for an NCore station. Quality assurance is discussed for each type of monitor in the appropriate section of the network review.

### **Plans for 2012 NCore Monitoring Network**

In 2012, the MDEQ is planning to continue to collect the measurements required for the NCore program at the following sites:

- Grand Rapids-Monroe St. (260810020)
- Allen Park (261630001)

The sampling frequency of speciated PM<sub>2.5</sub> at Grand Rapids-Monroe St. (260810020) was increased from once every six days to once every three days on January 1, 2011. Samples will continue to be collected using the increased sampling frequency during 2012, pending adequate funding.

**TABLE 13: MEASUREMENTS COLLECTED AT THE GRAND RAPIDS - MONROE ST. (260810020) N CORE SITE**

PARAMETER	DESIGNATION	SPATIAL SCALE	SAMPLING FREQUENCY	INSTRUMENT TYPE	METHOD	EXISTING MONITOR START UP DATE	NEW MONITOR ANTICIPATED START UP DATE	COMMENTS
PM <sub>2.5</sub> continuous	NCore/AQI	Neighborhood	Continuous	R & P TEOM 1400 a	tapered element oscillating microbalance	11/4/99	---	<i>DOES NOT meet FEM or ARM requirements</i>
PM <sub>2.5</sub> FRM mass	NCore	Neighborhood	1:3 days	R & P Partisol plus 2025	manual collection, gravimetric analysis	10/23/98	---	---
PM <sub>2.5</sub> Speciation	NCore	Neighborhood	1:3 days	Met One SASS + URG 3000N	manual collection, laboratory analysis*	6/1/02 at 1:6 sampling frequency	---	Freq. changed to 1:3 on 1/1/2011
Trace CO	NCore/AQI	Neighborhood	Continuous	API 300 eu/TECO 48 i	non-dispersive infra red	4/25/07	---	probe height 5 m
Trace SO <sub>2</sub>	NCore/AQI	Neighborhood	Continuous	API 100 eu/TECO 43i	UV fluorescence	4/1/08	---	probe height 5 m
NO <sub>y</sub>	NCore/AQI	Neighborhood	Continuous	TECO 42C	chemiluminescence	4/1/08	---	external converter installed at 10 m probe height 5 m
Ozone	NCore/AQI was NAMS	Neighborhood	Continuous	API 400 A1E	UV absorption	4/24/80	---	Year round
Lead	Non source	Neighborhood	1:6 days	General Metal Works Hi Vol filter based	manual collection, ICP/MS analysis	1/8/10	---	---
PM <sub>10-2.5</sub> mass	NCore	Neighborhood	1:3 days	R & P Partisol plus 2025	manual collection, gravimetric analysis	7/16/10	---	---
PM <sub>10-2.5</sub> Continuous	---	---	---	---	---	---	---	Not planned
PM <sub>10-2.5</sub> Speciation	---	---	---	---	---	---	---	EPA to provide details later
WS	NCore	---	Continuous	R. M. Young Prop. Anemom. & vane	Vector summation	1/1/88	---	At 10 m
WD	NCore	---	Continuous	R. M. Young Prop. Anemom. & vane	Vector summation	1/1/88	---	At 10 m
Relative Humidity	NCore	---	Continuous	R. M. Young	resistance hygrometer	3/3/10	---	> 4 m
Outdoor Temperature	NCore	---	Continuous	R. M. Young	thermometer	7/15/93	---	> 4 m
Sigma Theta	SLAMS	---	Continuous	ESC Data Logger	calculation	1/16/01	---	optional
Barometric Pressure	SLAMS	---	Continuous	R. M. Young	electronic pressure sensor	7/15/93	---	optional
PM <sub>10</sub>	SLAMS	Neighborhood	1:6 days	Hi-vol	manual collection, gravimetric analysis	1/1/85	---	---

\* Laboratory analysis consists of ion chromatography, X-Ray Fluorescence (XRF) and thermal optical analysis for ions, trace metals and forms of carbon, respectively.

**TABLE 14: MEASUREMENTS COLLECTED AT THE ALLEN PARK (261630001) N CORE SITE**

PARAMETER	DESIGNATION	SPATIAL SCALE	SAMPLING FREQUENCY	INSTRUMENT TYPE	METHOD	EXISTING MONITOR START UP DATE	NEW MONITOR ANTICIPATED START UP DATE	COMMENTS
PM <sub>2.5</sub> continuous	NCore/AQI	Neighborhood	Continuous	R & P TEOM 1400 a	tapered element oscillating microbalance	2/1/01	---	<i>DOES NOT meet FEM or ARM requirements</i>
PM <sub>2.5</sub> FRM mass	NCore	Neighborhood	1:1 day	R & P Partisol plus 2025	manual collection, gravimetric analysis	5/12/99	---	---
PM <sub>2.5</sub> Speciation	NCore	Neighborhood	1:3 day	Met One Super SASS + URG 3000N + IMPROVE carbon channel	manual collection, laboratory analysis*	12/1/00	---	---
Trace CO	NCore/AQI	Neighborhood	Continuous	API 300 eu/TECO 48 i	non-dispersive infra red	6/1/07	---	4 m probe ht
Trace SO <sub>2</sub>	NCore/AQI	Neighborhood	Continuous	API 100 eu /TECO 43 i as	UV fluorescence	4/1/08	---	4 m probe ht
NO <sub>y</sub>	NCore/AQI	Neighborhood	Continuous	TECO 42C	chemiluminescece	4/1/08	---	external converter installed at 10 m 4 m probe ht
Ozone	NCore/AQI was NAMS	Neighborhood	Continuous	API 400 A	UV absorption	1/1/80	---	Year round 4 m probe ht
Lead	Non source	Neighborhood	1:6 days	General Metal Works Hi Vol filter based	manual collection, ICP/MS analysis	3/2/01 to 3/31/07; 1/2/10	---	---
PM <sub>10-2.5</sub> mass	NCore	Neighborhood	1:3 days	R & P Partisol plus 2025	manual collection, gravimetric analysis	7/16/10	---	---
PM <sub>10-2.5</sub> Continuous	---	---	---	---	---	---	---	Not planned
PM <sub>10-2.5</sub> Speciation	---	---	---	---	---	---	---	EPA to provide details later
WS	NCore	---	Continuous	R. M. Young Prop. Anemom. & vane	Vector summation	10/18/81	---	At 10 m
WD	NCore	---	Continuous	R. M. Young Prop. Anemom. & vane	Vector summation	10/18/81	---	At 10 m
Relative Humidity	NCore	---	Continuous	R. M. Young	resistance hygrometer	1/1/00	---	> 4 m
Outdoor Temperature	NCore	---	Continuous	R. M. Young	thermometer	1/1/00	---	> 4 m
Sigma Theta	SLAMS	---	Continuous	ESC Data Logger	calculation	9/1/01	---	optional
Barometric Pressure	SLAMS	---	Continuous	R. M. Young	electronic pressure sensor	1/5/71	---	optional
Black Carbon	SLAMS	---	Continuous	Magee large spot AE2100	optical absorption	12/19/03	---	Not Req by NCore
PM <sub>10</sub> Hi-vol	Was NAMS	Neighborhood	1:6 days	Hi-vol	manual collection, gravimetric analysis	9/12/87	---	---

\* Laboratory analysis consists of ion chromatography, X-Ray Fluorescence (XRF) and thermal optical analysis for ions, trace metals and forms of carbon, respectively.

**TABLE 15: N CORE NETWORK IN MICHIGAN**

Monitoring Sites					Sampling				Date	Pop	
Site Name	AQS Site ID	Address	Latitude	Longitude	Frequency	Purpose	Scale	County	Estab.	CBSA <sup>1</sup>	(2010 Census)
Grand Rapids - Monroe St	260810020	1179 Monroe St., NW.	42.98417	-85.67139	1:6	Pop. Exp.	Neighborhood	Kent	1/1/10	GW	774,160
Allen Park	261630001	14700 Goddard	42.22861	-83.20833	1:6	Pop. Exp.	Neighborhood	Wayne	1/1/10	DWL	4,296,250

<sup>1</sup> CBSA Key:  
 DWL = Detroit-Warren-Livonia Core Based Statistical Area  
 GW = Grand Rapids-Wyoming Core Based Statistical Area

**FIGURE 13: MICHIGAN'S N CORE MONITORING NETWORK**



**OZONE MONITORING NETWORK:**

As a result of the October 17, 2006 monitoring regulations, the minimum number of required ozone sites in an MSA were changed. In addition, due to the 2000 census, MSA boundaries were modified and population totals tied to measurements of ambient air quality were increased. A monitor with a design value (using the most recent three years of data) that is  $\geq 85\%$  of the ozone NAAQS has a higher probability of violating the standard. Therefore, the EPA requires more monitors in these MSAs. In other instances, the number of monitors may be reduced if the design value is greater than 115% of the NAAQS.<sup>19</sup> Note: background and transport ozone monitors are still required, but are not shown in **Table 16**. MSA boundaries have not been changed as a result of the 2010 Census.

**TABLE 16: SLAMS MINIMUM OZONE MONITORING REQUIREMENTS**

<b>MSA POPULATION<sup>1,2</sup></b>	<b>MOST RECENT THREE-YEAR DESIGN VALUE CONCENTRATIONS <math>\geq 85\%</math> OF ANY OZONE NAAQS<sup>3</sup></b>	<b>MOST RECENT THREE-YEAR DESIGN VALUE CONCENTRATIONS <math>&lt; 85\%</math> OF ANY OZONE NAAQS<sup>3,4</sup></b>
> 10 million	4	2
4 - 10 million	3	1
350,000 - < 4 million	2	1
50,000 - < 350,000 <sup>5</sup>	1	0

- <sup>1</sup> Minimum monitoring requirements apply to the MSA.
- <sup>2</sup> Population based on the latest available census figures.
- <sup>3</sup> The ozone NAAQS levels and forms are defined in 40 CFR Part 50.
- <sup>4</sup> These minimum monitoring requirements apply in the absence of a design value.
- <sup>5</sup> MSA must contain an urbanized area of 50,000 or more population.

Applying the requirements described in **Table 16** to Michigan's MSAs, population totals and the most recent three-year design values results in a minimum ozone network design summarized in **Table 17**<sup>20</sup>. All monitors in Michigan are with in 85% of the ozone NAAQS of 0.075 ppm. On January 19, 2010, the EPA proposed to lower the level of the ozone NAAQS from 0.075 ppm to a value between 0.060 and 0.070 ppm, while retaining the same 8-hour form of the standard. No increase in the number of ozone sites will occur as a result of changing the level of the standard to between 0.060 and 0.070 ppm because none of the sites in Michigan are less than 85% of the 0.075 ppm.

**Figure 14** illustrates changes in the three year averages of the fourth highest ozone values, called design values, from 2006 to 2010. When contemplating changes to the ozone network, it is important to consider changes design values in nonattainment areas. However, the level of the NAAQS may become more stringent, and until we know the impact of these possible changes, the MDEQ is reluctant to alter the ozone network. Individual monitors and attainment status is discussed below.

In Southeast Michigan, New Haven (260990009) has been the design value site for many years, measuring maximum ozone concentrations downwind from Detroit. However, in 2009, the Detroit-E 7 Mile (261630019) location became the new design value site for the Detroit- Warren-Livonia MSA.

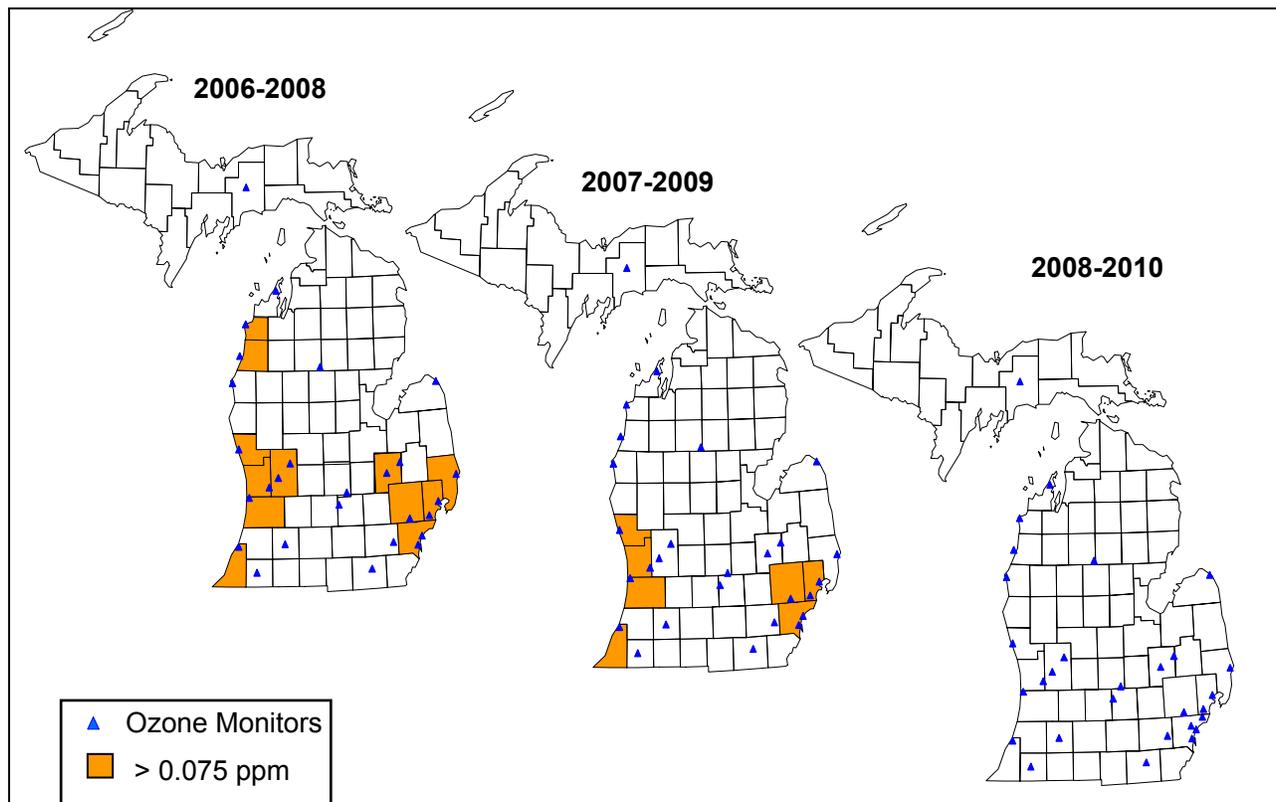
<sup>19</sup> Table D-2 of Appendix D to Part 58.

<sup>20</sup> The proposed changes to the ozone NAAQS have changed the data handling procedures. Instead of truncating any numbers to the right of the third decimal place, values are to be rounded. **Table 19** retains the truncation convention because the proposed change hasn't been finalized yet.

**Table 17: Application of Minimum Ozone Requirements in the October 17, 2006 Final Revision to the Monitoring Regulation to Michigan's Ozone Network**

	NAAQS:	0.075 ppm				
	> = 85%	0.063 ppm				
Decimals to the right of the third decimal place are truncated.						
<b>The 3-year O3 average at the MSA Design Value site is shown in bold.</b>						
<i>Values for sites &gt;= 85% NAAQS are in red.</i>						
<b>CBSA</b>	<b>2010 Population</b>	<b>Counties</b>	<b>Existing Monitors</b>	<b>2008-2010 most recent 3-year O3 design value</b>	<b>Min No monitors Required</b>	
Detroit-Warren-Livonia Metro Area	4,296,250	Macomb	New Haven	0.074	3	
			Warren	0.073		
		Oakland	Oak Park	0.073		
			Wayne	Allen Park		0.066
				Detroit - E 7 Mile		0.075
				Lapeer		---
		St Clair	Port Huron	0.071		
		Livingston	---			
Flint Metro Area	425,790	Genesee	Flint	0.068	2	
			Otisville	0.068		
Monroe Metro Area	152,021	Monroe	---			
Ann Arbor Metro Area	344,791	Washtenaw	Ypsilanti	0.066	1	
Grand Rapids-Wyoming Metro Area	774,160	Kent	Grand Rapids - Monroe St	0.067	2	
			Evans	0.069		
		Barry	---			
		Newaygo	---			
		Ionia	---			
Holland-Grand Haven Metro Area	263,801	Ottawa	Jenison	0.069	1	
Muskegon-Norton Shores Metro Area	172,188	Muskegon	Muskegon - Greek Creek Rd	0.074	1	
Lansing-East Lansing Metro Area	464,036	Clinton	Rose Lake	0.065	2	
		Ingham	Lansing	0.068		
		Eaton	---			
Bay City Metro Area	107,771	Bay	---			
Saginaw-Saginaw Twp N Metro Area	200,169	Saginaw	---			
Kalamazoo-Portage Metro Area	326,589	Kalamazoo	Kalamazoo	0.068	1	
		Van Buren	---			
Niles-Benton Harbor Metro Area	156,813	Berrien	Coloma	0.071	1	
Jackson Metro Area	160,248	Jackson	---			
Battle Creek Metro Area	136,146	Calhoun	---			
South Bend Mishawaka Metro Area IN/MI	52,293	Cass	Cassopolis	0.070	1	
<b>Other areas:</b>	<u>Comments</u>					
	<i>transport site</i>	Lenawee	Tecumseh	0.068		
		Benzie	Frankfort	0.069		
		Huron	Harbor Beach	0.067		
		Allegan	Holland	0.074		
	<i>background site</i>	Missaukee	Houghton lake	0.065		
		Mason	Scottville	0.068		
		Schoolcraft	Seney	0.067		
	<i>tribal site</i>	Manistee	Manistee	0.067		

**FIGURE 14: COMPARISON OF 4<sup>TH</sup> HIGHEST 8-HOUR OZONE VALUES AVERAGED OVER THREE YEARS 2006-2008, 2007-2009 AND 2008-2010**



This is also true using 2010 ozone data. The location of the maximum ozone concentration has moved about 19 miles closer to the urban center city area, possibly due to changes in the amount, type and location of ozone precursor emissions. Both the New Haven (260990009) and Detroit-E 7 Mile (261630019) sites need to be retained until the location of the design value site stabilizes. Allen Park (261630001) is upwind of the central business district and is an NCore site for the Detroit-Warren-Livonia MSA. As such, the MDEQ is required to measure ozone over the entire year at the Allen Park (261630001) site, instead of only during the April through September ozone season in Michigan. Although three ozone sites have been identified for the Detroit-Warren-Livonia MSA, EPA Regional staff have indicated that Warren (260991003) may be becoming the new design value site for that area, so the Warren ozone monitor needs to be retained. The Oak Park (261250001) and Port Huron (261470005) monitors are the only ozone sites in Oakland and St. Clair Counties, respectively.

Two monitors are required in the Ann Arbor MSA and consist of the Ypsilanti monitor (261610008) and the downwind monitor in Oak Park (261250001). The urban center city location coupled with a downwind maximum concentration site is a carry-over from the defunct NAMS network. There is not sufficient space in Washtenaw County to site a downwind monitor to measure maximum ozone concentrations, so Oakland County houses the downwind site at Oak Park (261250001), although Oakland County is outside of the boundary of the Ann Arbor MSA. The upwind/downwind configuration will be retained wherever possible to preserve historical trend data.

Two monitors are required in the Flint MSA and consist of the urban center city site in Flint (260490021) and the downwind site at Otisville (260492001).

Two ozone monitors are also required in the Grand Rapids-Wyoming MSA and consist of the urban center city site in Grand Rapids on Monroe Street (260810020) and the downwind site at Evans (260810022).

Two monitors are required in the Lansing-East Lansing MSA and consist of the urban center city site in Lansing (260650012) and the downwind Rose Lake (260370001) location.

A single ozone monitor is required in the MSAs of Holland-Grand Haven, Muskegon-Norton Shores, Kalamazoo-Portage, Niles-Benton Harbor, and South Bend-Mishawaka. The Jenison (261390005), Muskegon-Green Creek Rd. (261210039), Kalamazoo (260770008), Coloma (260210014) and Cassopolis (260270003) monitors fulfill these requirements, respectively.

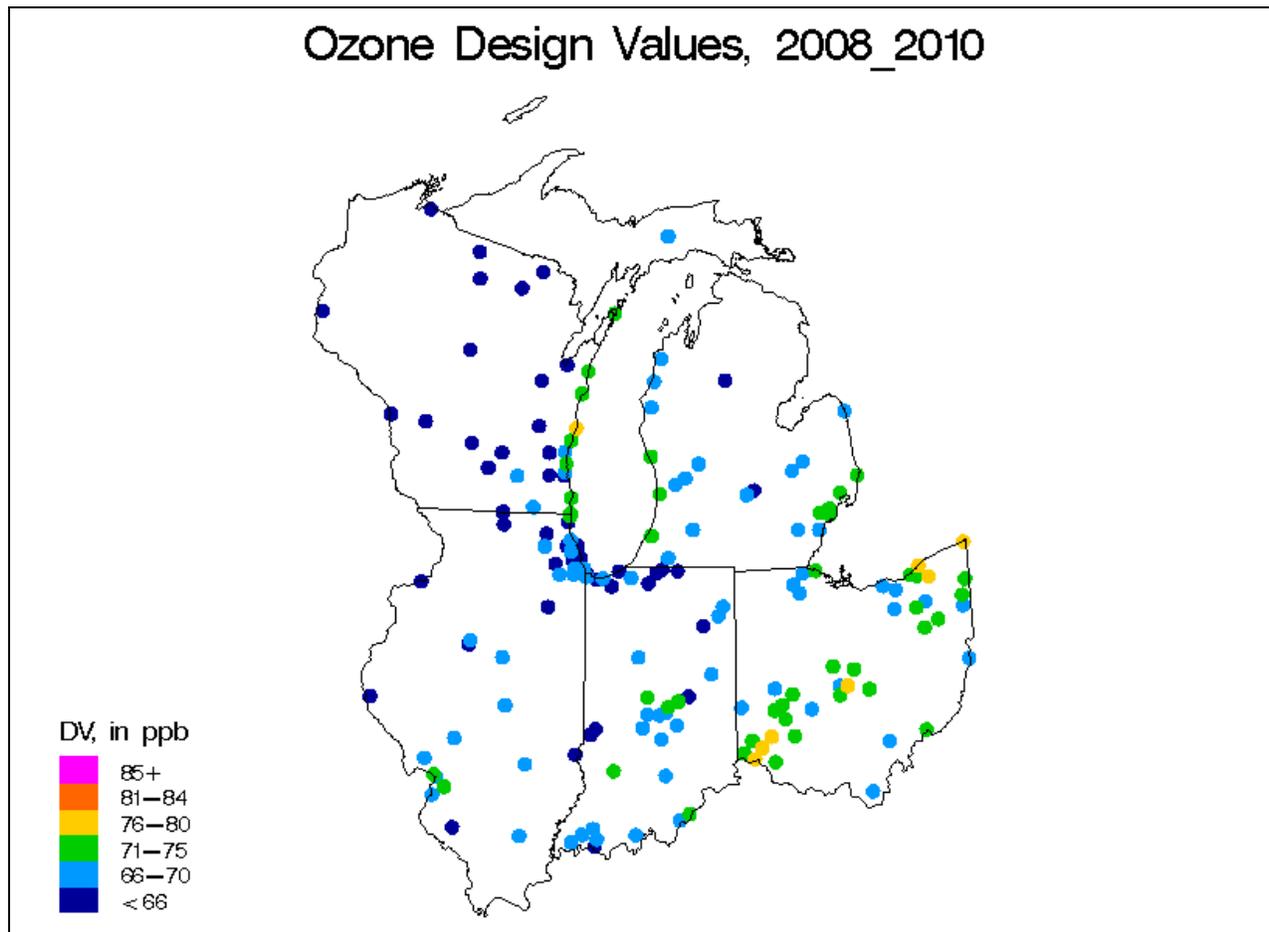
The ozone monitor in Holland (260050003 is in Allegan County) is now meeting the 0.075 ppm 8-hour ozone NAAQS. Although Allegan County is classified as a micropolitan area and as such, is not required to have a monitor, the previous violation status of this monitor suggests that it continue operation. This site continually measures the highest ozone values in the state and usually across the region.

The Lake Michigan Air Directors Consortium (LADCO) created a map shown in **Figure 15** comparing ozone concentrations across the region. Holland no longer has the highest design value in the region. In fact there are at least 8 other sites in Region 5 with design values greater than Holland .

Tecumseh (260910007) measures ozone transport into Southeast Michigan and is required by Michigan's maintenance plan. Harbor Beach (260630007) measures transport out of Southeast Michigan under southwesterly winds. Scottville (261050007) and Benzonia (260190003) are sited to measure transport of ozone along Lake Michigan and have been in operation for 8 and 14 years, respectively. These two sites are also an important part of Michigan's maintenance plan. Houghton Lake (261130001) and Seney (261530001) measure background ozone levels in the Lower and Upper Peninsulas, respectively.

The tribal ozone site in Manistee (261010922) in Manistee County continues to operate. Review of tribal monitors is outside the scope of this review, but the site in Manistee is listed for completeness, to provide a description of spatial coverage of ozone sites across the area and to identify changes to that coverage.

**FIGURE 15: OZONE DESIGN VALUES 2008 – 2010 ACROSS REGION 5<sup>21</sup>**



**Table 18** summarizes the ozone monitoring site information for sites that were in existence in 2010 and are planned to be operational in 2012. **Figure 16** illustrates the geographical distribution of this network.

<sup>21</sup> Map provided by D. Kenski, Lake Michigan Air Directors Consortium

**TABLE 18: MICHIGAN'S OZONE MONITORING NETWORK**

Operating Schedule: Hourly, April 1 to September 30; *NCore operate hourly all year*  
 Method: Ultra Violet Absorption Continuous Monitor

Network as of October, 2010  
**Former NAMS sites are shown in bold.**

SLAMS Stations

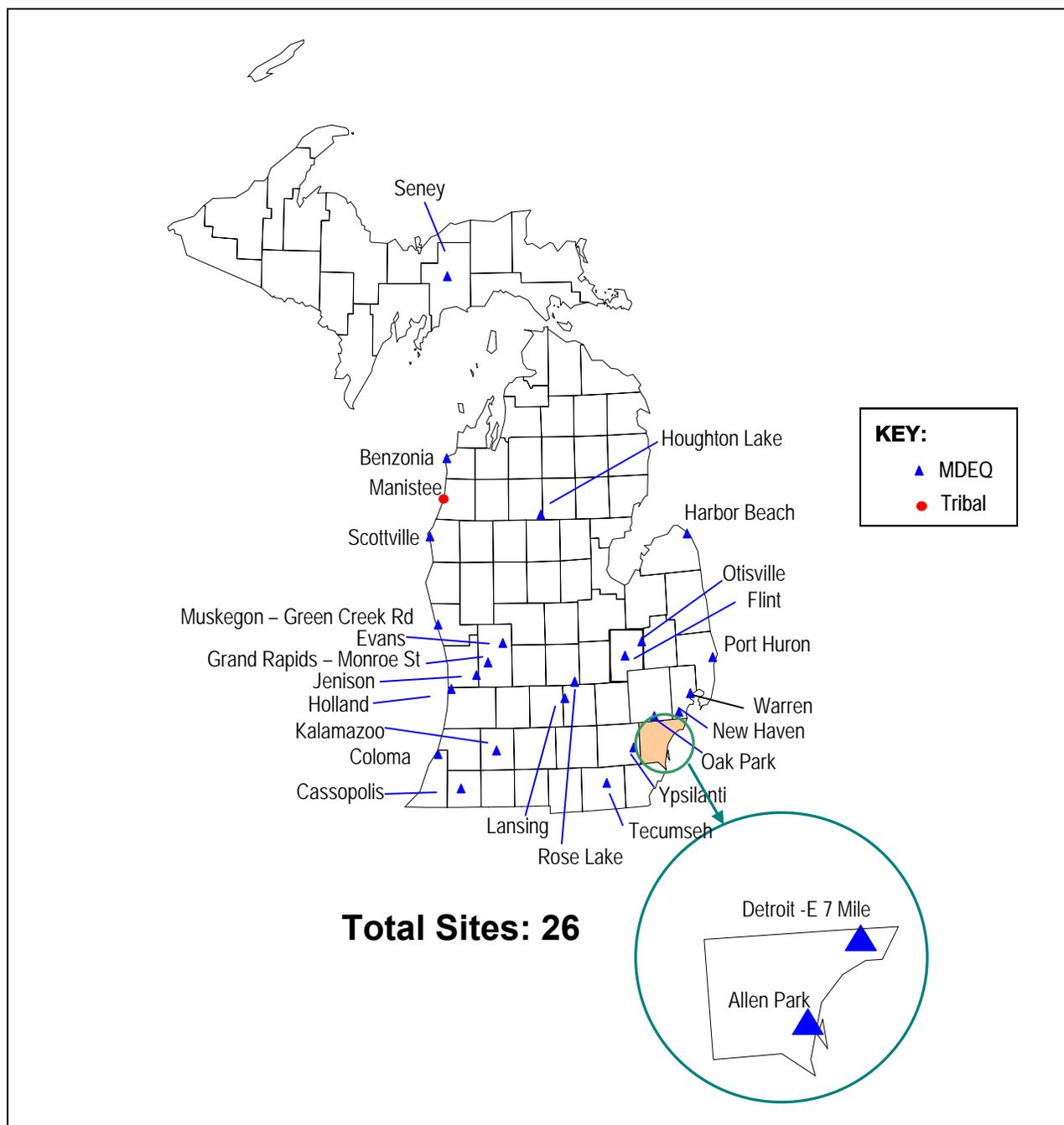
Monitoring Sites			<i>NCore sites are shown in italics</i>								Pop (2010)
Site Name	AQS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Start Date	CBSA <sup>1</sup>	Census	
<b>Rose Lake</b>	<b>260370001</b>	<b>8562 E Stoll Rd</b>	42.7983	-84.39389	<b>max conc</b>	<b>urban</b>	<b>Clinton</b>	<b>6/7/79</b>	<b>LEL</b>	<b>464,036</b>	
<b>Flint</b>	<b>260490021</b>	<b>Whaley Park, 3610 Iowa</b>	43.0472	-83.67028	<b>pop exp</b>	<b>nghbrhd</b>	<b>Genesee</b>	<b>6/16/92</b>	<b>F</b>	<b>425,790</b>	
<b>Otisville</b>	<b>260492001</b>	<b>G11107 Washburn Rd</b>	43.1683	-83.46167	<b>max conc</b>	<b>urban</b>	<b>Genesee</b>	<b>5/13/80</b>	<b>F</b>	<b>425,790</b>	
<b>Lansing</b>	<b>260650012</b>	<b>220 N Pennsylvania</b>	42.7386	-84.53472	<b>pop exp</b>	<b>nghbrhd</b>	<b>Ingham</b>	<b>9/5/80</b>	<b>LEL</b>	<b>464,036</b>	
<b>GR - Monroe St</b>	<b>260810020</b>	<b>1179 Monroe NW</b>	42.9842	-85.6714	<b>pop exp</b>	<b>nghbrhd</b>	<b>Kent</b>	<b>4/24/80</b>	<b>GW</b>	<b>774,160</b>	
<b>Warren</b>	<b>260991003</b>	<b>29900 Hoover</b>	42.5133	-83.00611	<b>max conc</b>	<b>urban</b>	<b>Macomb</b>	<b>1/1/77</b>	<b>DWL</b>	<b>4,296,250</b>	
Holland	260050003	966 W 32 <sup>nd</sup> St	42.7678	-86.14861	max conc	regional	Allegan	8/25/92	A	111,408	
Frankfort / Benzonia	260190003	West St., Benzonia Twp.	44.61694	-86.10944	max conc	regional	Benzie	7/28/92	Not in CBSA	N/A	
Coloma	260210014	Paw Paw WWTP, 4689 Defield Rd., Coloma	42.1978	-86.30972	max conc	regional	Berrien	8/3/92	NBH	156,813	
Cassopolis	260270003	Ross Beatty High School, 22721 Diamond	41.8956	-86.00167	pop exp	urban	Cass	5/16/91	SBM	52,293	
Harbor Beach	260630007	1172 S. M 25, Sand Beach Twp.	43.8364	-82.64306	backgrd	regional	Huron	4/1/94	Not in CBSA	N/A	
Kalamazoo	260770008	Fairgrounds, 2500 Lake St	42.2781	-85.54194	pop exp	nghbrhd	Kalamazoo	6/1/92	KP	326,589	
Evans	260810022	10300 14 Mile Road, NE	43.1767	-85.41667	max conc	urban	Kent	4/1/99	GW	774,160	
Tecumseh	260910007	6792 Raisin Center Highway	41.9956	-83.94667	up wind backgrd	regional	Lenawee	7/6/93	Not in CBSA	N/A	
New Haven	260990009	57700 Gratiott	42.7314	-82.79361	max conc	urban	Macomb	7/14/80	DWL	4,296,250	
Houghton Lake	261130001	1769 S Jeffs Road	44.3106	-84.89194	background	regional	Missaukee	4/1/96	Not in CBSA	N/A	
Scottville	261050007	525 W US 10	43.9533	-86.29444	max conc	regional	Mason	4/1/96	Not in CBSA	N/A	
Muskegon - Green Ck	261210039	1340 Green Creek Road	43.2781	-86.31111	pop exp	regional	Muskegon	5/1/91	MNS	172,188	
Oak Park	261250001	13701 Oak Park Blvd.	42.4631	-83.18333	pop exp	urban	Oakland	1/9/81	DWL	4,296,250	
Jenison	261390005	6981 28Th Ave. Georgetown Twp.	42.8944	-85.85278	pop exp	regional	Ottawa	4/1/89	HGH	263,801	
Port Huron	261470005	2525 Dove Rd	42.9533	-82.45639	pop exp	regional	Saint Clair	2/28/81	DWL	4,296,250	
Seney	261530001	Seney Wildlife Refuge, HCR 2 Box 1	46.2889	-85.95027	bkgrd	regional	Schoolcraft	1/15/02	Not in CBSA	N/A	
Ypsilanti	261610008	555 Towner Ave	42.2406	-83.59972	pop exp	nghbrhd	Washtenaw	4/1/00	AA	344,791	
<i>Allen Park</i>	<i>261630001</i>	<i>14700 Goddard</i>	<i>42.2286</i>	<i>-83.2083</i>	<i>pop exp</i>	<i>nghbrhd</i>	<i>Wayne</i>	<i>1/1/80</i>	<i>DWL</i>	<i>4,296,250</i>	
<b>Detroit - E 7 Mile</b>	<b>261630019</b>	<b>11600 East Seven Mile Road</b>	<b>42.4308</b>	<b>-83.00028</b>	<b>max conc</b>	<b>nghbrhd</b>	<b>Wayne</b>	<b>4/11/77</b>	<b>DWL</b>	<b>4,296,250</b>	

Tribal Stations

Monitoring Sites											Pop (2010)
Site Name	AQS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Start Date	CBSA <sup>1</sup>	Census	
Manistee	261010922	3031 Domres Rd	44.307	-86.24268	transport	regional	Manistee	4/1/06	Not in CBSA	N/A	

<sup>1</sup> CBSA Key: A = Allegan Micropolitan Area  
 AA = Ann Arbor Metro. Area  
 DWL= Detroit-Warren-Livonia Metro. Area  
 F = Flint Metro Area  
 GW=Grand Rapids-Wyoming Metro. Area  
 HGH = Holland-Grand Haven Metro. Area  
 KP= Kalamazoo-Portage Metro. Area  
 LEL= Lansing-E. Lansing Metro. Area  
 MNS = Muskegon-Norton Shores Metro. Area  
 NBH = Niles-Benton Harbor Metro. Area  
 SBM= South Bend-Mishawaka Metro. Area (IN/MI)

**FIGURE 16: MICHIGAN'S OZONE NETWORK**



## **Impact of the Proposed Changes to the Ozone Monitoring Requirements**

The EPA has proposed<sup>22</sup> to change the monitoring network design by modifying the requirements for ozone monitoring in smaller urban areas and in rural locations. Ozone monitors may be required in MSAs with population levels between 50,000 to 350,000 where there is no monitor or history of monitoring within the previous five years. If this portion of the rule remains in the final document, which is now expected in August 2011, ozone monitors may need to be added to the following metropolitan areas by April 1, 2013:

- Bay City Metro Area
- Saginaw–Saginaw Twp N Metro Area
- Jackson Metro Area
- Monroe Metro Area
- Battle Creek Metro Area

If these network design requirements become finalized, it is the MDEQ's intent to add an ozone monitor to the Bay City PM<sub>2.5</sub> site (260170014) to meet the monitoring requirements for MSAs with population totals between 50,000 and 350,000. Adding a new ozone monitor to this location will also provide better spatial coverage for the network. The costs to add a monitor to this location are minimal because the shelter is already in existence and staff frequent the site anyway for operation of the PM<sub>2.5</sub> FRM sampler. Due to the close proximity of the Bay City PM<sub>2.5</sub> site to Saginaw, the MDEQ intends to seek a waiver for the Saginaw–Saginaw Twp N Metro area ozone monitor.

The proposed legislation may require the MDEQ to create new sites in Jackson, Monroe and Battle Creek. At this time, it is unknown whether adequate levels of funding, staffing and materials will be available in 2012 to support creation and deployment of these new stations. The MDEQ realizes that ozone concentrations are expected to be lower in Battle Creek, making the Kalamazoo ozone monitor a poor surrogate and the creation of a new monitoring station in the Battle Creek Metro area, approximately 25 miles east of Kalamazoo could prevent the Battle Creek area from a nonattainment designation depending upon the level of the NAAQS. and the concentration of ozone values measured in Kalamazoo (260770008). However, creation of a single pollutant site near Battle Creek, one near Jackson and a site in Monroe may not adequately leverage limited resources. The MDEQ will re-examine this issue in the 2013 Network Review.

In addition, a secondary ozone standard was proposed that is designed to be protective of vegetation and crops. The secondary standard, called W126 relies on the sum of weighted hourly ozone concentrations. Weighted hourly values between 8 AM and 8 PM are totaled for each day. Monthly sums are totaled and weighted by data completeness. The three sequential months that form the largest total are then selected. This 3-month maximum total may either be compared to the standard or averaged over three years and then compared to the standard, depending on the what is finalized by the EPA. The proposed range of the standard is between 7 and 15 ppm-hours. To better characterize the impact from ozone in areas containing ozone sensitive species, the EPA is proposing to enhance the rural ozone monitoring network by the addition of three types of rural monitoring sites in each state by 2013. Monitors may be required in:

1. remote rural areas that contain ozone sensitive vegetation;

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<sup>22</sup> *Federal Register* January 19, 2010 "2010 National Ambient Air Quality Standards for Ozone." Vol 75 No 11.

2. non-urban locations where maximum ozone concentrations occur downwind from urban areas, and;
3. smaller communities outside of the larger urban MSAs.

Pending additional guidance from the EPA, the current design of the MDEQ's ozone monitoring network appears to fulfill the first two proposed requirements.

The ozone monitors at Houghton Lake (261130001) and Seney (261530001) are located in rural areas that contain ozone sensitive vegetation. The Houghton Lake monitor is located at a DNR deer research facility in an area of the state that is a mix of popular, quaking aspen and red pine. The Seney monitor is located in a Class 1 area that is predominantly marsh with areas of open water.

Regional transport from the Chicago area has been an on going issue so the MDEQ has operated a series of rural monitors along the Lake Michigan shoreline since the 1990s. Beginning with the most southern location, the monitors are: Coloma (260210014), Holland (260050003), Muskegon–Green Creek Rd. (261210039), Scottville (261050006) and Frankfort (260190003). There is also a tribal ozone monitor at Manistee (1010922) that lies between the MDEQ sites at Scottville and Frankfort.

The proposal further describes the siting criterion for smaller communities such as those locations in micropolitan areas downwind from sources that could experience maximum ozone concentrations. Traverse City is the largest micropolitan area in Michigan with the 2010 population totaling 143,372 people. The next most populous micropolitan area is Allegan in Allegan County with 111,408 people. There is already an ozone monitor in Allegan County at Holland (260050003), which is part of the Lake Michigan PAMS network and was once the location with the highest ozone concentrations in the region.

If the monitoring requirement for a micropolitan ozone site remains in the final version of the ozone NAAQS AND MDEQ has adequate resources for creation and or operation of a new ozone monitoring station, selection of Traverse City is preferred over other micropolitan areas because Traverse City is located downwind from the Chicago area and has a large population. The MDEQ will consider either assuming operation of the nonattaining tribal monitor at Peshawbestown (260890001) that was been shut down or creating a new site in the micropolitan area. The MDEQ will remain cognizant of these requirements when developing air monitoring network designs for the newly proposed NAAQS for lead, NO<sub>2</sub> and SO<sub>2</sub>. When more information is presented about the monitoring requirements and level of new ozone NAAQS and if adequate resources are available, the MDEQ will re-examine this issue.

Before April 1, 2013, contingent upon promulgation of the new ozone network design components, adequate funding and staffing, the MDEQ may consider:

1. Addition of an O<sub>3</sub> monitor to Bay City
2. Creation of a new O<sub>3</sub> site in Jackson
3. Addition of an O<sub>3</sub> monitor to Monroe, if leveraging SO<sub>2</sub> requirements are possible
4. Seeking a waiver from the Regional Administrator for an O<sub>3</sub> site in Saginaw–Saginaw Twp North because the Bay City (260170014) monitor is a good surrogate site
5. Possibly adding an O<sub>3</sub> site in Battle Creek, depending on the level of the O<sub>3</sub> NAAQS and ambient values in Kalamazoo (260770008)
6. Assuming operation of the tribal O<sub>3</sub> site at Peshawbestown (260890001) or creating a new site in Traverse City Micropolitan area. If this site is created, the MDEQ will continue communications with the local stakeholders.

## **Ozone Season & Modeling**

With the enactment of the 0.075 ppm 8-hour primary NAAQS, the length of the ozone season was modified in some areas. There are no changes to Michigan's ozone season, which extends from April 1 through September 30. If the EPA promulgates a more stringent ozone standard, the length of Michigan's ozone season may have to be re-evaluated.

With the new 1-hour NO<sub>2</sub> NAAQS, modeling conducted as part of the permitting process for new source review (NSR) has indicated that many facilities in Michigan could violate the standard. More refined modeling is an option using the Ozone Limiting Method or Plume Volume Molar Ratio Method (PVMRM), but more site-specific 1-hour NO<sub>2</sub> background levels as well as year around ozone values are necessary. Specifically, modeling staff need five years of both ozone and NO<sub>2</sub> data collected in small cities, urban and rural areas. While Allen Park (2616309001) and Grand Rapids–Monroe St. (260810020) generate ozone values in urban areas throughout the year, levels in smaller cities and rural areas are not currently available. Therefore, beginning October 1, 2010, the MDEQ began to monitor for ozone throughout the year at the Lansing (260650012) and Houghton Lake (261130001) stations. The collection of additional NO<sub>2</sub> data to support NSR modeling is discussed in the NO<sub>2</sub> section.

## **Ozone Quality Assurance**

Site operators conduct precision checks on the monitors every two weeks. The results of the precision checks are sent to the senior auditor for review each quarter. Each ozone monitor is also audited annually by the AMU's QA Team. The audit utilizes a dedicated ozone photometer to assess the accuracy of the station monitor. The auditor also assesses the monitoring system (inspecting the sample line, filters, and the inlet probe), siting, and documentation of precision checks. The results of the ozone audits and precision checks indicate whether the monitor is meeting the measurement quality objectives. The AMU uploads the results of the precision checks and audits to the EPA's AQS database each quarter. The QA Coordinator reviews all audits and hard copies are retained in the QA files.

The EPA conducts thru-the-probe audits of 20% of the MDEQ's ozone monitors each year. The audit consists of delivering four levels of ozone to the station monitor through the probe. The percent difference that is measured by the auditor's monitor is compared to the station monitor. The auditor also assesses station and monitoring siting criteria. The EPA auditor provides the AMU with a copy of the audit results and uploads the audit data to AQS.

## **Plans for the 2012 Ozone Monitoring Network**

Beginning October 1, 2009, the MDEQ began collecting ozone measurements all year at the NCore sites at Grand Rapids–Monroe St. (260810020) and Allen Park (261630001). The MDEQ plans to continue ozone measurements at these sites throughout 2011 and 2012. To support NSR modeling projects, the MDEQ will continue to collect ozone measurements all year at Lansing (260650012) and at Houghton Lake (261130001).

The current ozone network meets the minimum design specifications in 40 CFR Part 58. No ozone site reductions are planned at this time. The following monitors are planned to be retained as part of the 2012 ozone network:

- Holland (260050003)
- Frankfort/Benzonia (260190003)
- Coloma (260210014)
- Cassopolis (260270003)
- Rose Lake (260370001)
- Flint (260490021)
- Otisville (260492001)
- Harbor Beach (260630007) (downwind monitor)
- Lansing (260650012)
- Kalamazoo (260770008)
- Grand Rapids–Monroe St. (260810020)
- Evans (260810022)
- Tecumseh (260910007) (background monitor)
- New Haven (260990009)
- Warren (260991003)
- Scottville (261050007)
- Houghton Lake (261130001) (special purpose monitor)
- Muskegon–Green Creek Rd. (261210039)
- Oak Park (261250001)
- Jenison (261390005)
- Port Huron (261470005)
- Seney (261530001)
- Ypsilanti (261610008)
- Allen Park (261630001)
- Detroit-E 7 Mile (261630019)

To the best of our knowledge, this tribal monitor will continue operation:

- Manistee (261050922) (tribal monitor)

**PM<sub>2.5</sub> FRM MONITORING NETWORK:**

The October 17, 2006 changes to the monitoring regulations impacted PM<sub>2.5</sub> (fine particulate) measurements in a number of ways. The minimum number of PM<sub>2.5</sub> sites using an FRM in an MSA has been changed and is shown in **Table 19**.<sup>23</sup> In addition to these minimum requirements, background and transport monitors are required.

Although speciation monitoring is required, details specifying the exact number of sites and their sampling frequency were not stated in the October 17, 2006 regulations. However, the continued operation of the speciation trends site (Allen Park 261630001) on a once every three day sampling schedule is required.

The regulations also allow states to discontinue FRM monitors if they can operate continuous samplers in a way that qualifies them to be Approved Regional Method (ARM) or Federal Equivalent Method (FEM) samplers. Due to the high levels of nitrate and humidity in the Midwest, the continuous monitors used by the MDEQ (TEOMs), as well of many of the other monitors operated by the states in the Midwest show a positive bias. Therefore, to avoid an erroneous nonattainment designation caused by monitor bias, the MDEQ will avoid deploying any continuous monitors that have ARM or FEM status, because any data will be used by the EPA to determine attainment.

Michigan does not spatially average PM<sub>2.5</sub> values from multiple sites to determine attainment with the annual PM<sub>2.5</sub> NAAQS. Therefore, if a PM<sub>2.5</sub> monitor that is violating the NAAQS must be removed due to loss of access or funding, a replacement site need not be found, if the annual and/or 24-hour design value site(s) in that MSA are still operational. The attainment status of the area is dependent upon the design value sites. Thus, the loss of the subject site will affect the spatial coverage of the data set, but will have no impact on attainment status.

**TABLE 19: PM<sub>2.5</sub> MINIMUM MONITORING REQUIREMENTS**

<b>MSA POPULATION<sup>1,2</sup></b>	<b>MOST RECENT THREE-YEAR DESIGN VALUE CONCENTRATIONS ≥ 85% OF ANY PM<sub>2.5</sub> NAAQS<sup>3</sup></b>	<b>MOST RECENT THREE-YEAR DESIGN VALUE CONCENTRATIONS &lt; 85% OF ANY PM<sub>2.5</sub> NAAQS<sup>3,4</sup></b>
> 1,000,000	3	2
500,000 – < 1,000,000	2	1
50,000 - ≤ 500,000 <sup>5</sup>	1	0

<sup>1</sup> Minimum monitoring requirements apply to the MSA.

<sup>2</sup> Population based on the latest available census figures.

<sup>3</sup> The PM<sub>2.5</sub> NAAQS levels and forms are defined in 40 CFR Part 50.

<sup>4</sup> These minimum monitoring requirements apply in the absence of a design value.

<sup>5</sup> MSA must contain an urbanized area of 50,000 or more.

The regulations also state that any FRM monitors that are within ± 5% of the level of the 24-hour NAAQS, must sample on a daily sampling frequency. The monitoring regulations also state that 50% of all required FRM sites must co-locate continuous PM<sub>2.5</sub> measurements.

Applying **Table 19** to Michigan's MSAs, population totals and most recent three-year design values results in **Table 20**. Any design values that are within 85% of a PM<sub>2.5</sub> NAAQS are shown in blue font. Red font is used for those values that are greater than the NAAQS. Design values that are shown in bold represent the controlling site in each MSA, which is also called the design value site. The monitors with design values that are within 5% of the 24-hour NAAQS

<sup>23</sup> Table D-5 of Appendix D to Part 58.

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are shaded yellow. If these yellow shaded monitors are the design value site in a MSA, daily sampling must be initiated, according to the *Federal Register*. Changes in the minimum number of required monitoring stations within each MSA are shown in **green bold**.

**TABLE 20: APPLICATION OF THE MINIMUM PM<sub>2.5</sub> MONITORING REQUIREMENTS IN THE OCTOBER 17, 2006 FINAL REVISION TO THE MONITORING REGULATION TO MICHIGAN'S PM<sub>2.5</sub> FRM NETWORK**

*The annual avg & 24-hr avg are rounded to 1 and 0 decimal points respectively.*

MSA	2010 Population	Counties	Existing Monitors	2008-2010		Min No monitors Required	Comments
				most recent 3-year PM <sub>2.5</sub> design value (annual)	most recent 3-year PM <sub>2.5</sub> design value (24-Hr)		
				Values with in 5% of the 24-Hr NAAQS are shaded yellow. 33-37 = 5% NAAQS			
				annual 85% of 15 ug/m3 12.8	24-hr 85% of 35 ug /m3 30		
				Values for sites violating the NAAQS are in red. The 3-year PM <sub>2.5</sub> average at MSA Design Value site is shown in bold.			
				Values for sites within or equal to 85% of the NAAQS are in blue.			
Detroit-Warren-Livonia Metro Area	4,296,250	Macomb Oakland Wayne	New Haven Oak Park Allen Park Detroit-SW HS Detroit - Linwood Detroit - E 7 Mi Livonia Dearborn Wyandotte Detroit - Newberry Detroit-FIA/Lafayette	9.7 10.0 11.0 11.5 10.7 10.6 10.0 <b>12.2</b> 10.2 10.7 11.0	27 29 29 <b>31</b> <b>30</b> <b>30</b> 28 <b>32</b> 26 29 <b>30</b>	3	daily
		Lapeer St Clair Livingston	--- Port Huron ---	9.9	29		daily- special study
Flint Metro Area	425,790	Genesee	Flint	<b>9.1</b>	<b>26</b>	<b>0</b>	
Monroe Metro Area	152,021	Monroe	Luna Pier	<b>10.4</b>	<b>26</b>	<b>0</b>	
Ann Arbor Metro Area	344,791	Washtenaw	Ypsilanti Ann Arbor (closed)	<b>10.0</b>	<b>27</b>	<b>0</b>	
Grand Rapids-Wyoming Metro Area	774,160	Kent Barry Newaygo Ionia	GR - Monroe St GR - Wealthy St --- --- ---	9.9 <b>10.2</b> --- --- ---	26 <b>26</b> --- --- ---	<b>1</b>	
Holland-Grand Haven Metro Area	263,801	Ottawa	Janison	<b>9.7</b>	<b>25</b>	<b>0</b>	
Muskegon-Norton Shores Metro Area	172,188	Muskegon	Muskegon - Apple St	<b>8.9</b>	<b>26</b>	<b>0</b>	
Lansing-East Lansing Metro Area	464,036	Clinton Ingham Eaton	--- Lansing ---	<b>9.3</b> --- ---	<b>25</b> --- ---	<b>0</b>	
Bay City Metro Area	107,771	Bay	Bay City	<b>8.4</b>	<b>26</b>	<b>0</b>	
Saginaw-Saginaw Twp N Metro Area	200,169	Saginaw	Saginaw (closed)	---	---	---	
Kalamazoo-Portage Metro Area	326,589	Kalamazoo Van Buren	Kalamazoo ---	<b>10.2</b> ---	<b>26</b> ---	<b>0</b>	
Niles-Benton Harbor Metro Area	156,813	Berrien	Coloma	<b>9.2</b>	<b>23</b>	<b>0</b>	
Jackson Metro Area	160,248	Jackson	---	---	---	---	
Battle Creek Metro Area	136,146	Calhoun	---	---	---	---	
South Bend-Mishawaka Metro Area INMI	52,293	Cass	---	---	---	---	
<b>Other areas</b>							
		Allegan	Holland	8.9	25		micropolitan area
		Missaukee	Houghton Lake	6.1	19		
		Manistee	Manistee	6.8	21		
		Tecumseh	Lenawee	8.6	25		

On February 24, 2009, the United States Court of Appeals ordered the EPA to reconsider the annual NAAQS for PM<sub>2.5</sub>.<sup>24</sup> At this time, it is unknown what impact this may have on the design of the ambient monitoring network for PM<sub>2.5</sub>, but if the level of the standard is lowered appreciably, monitoring requirements for MSAs may be altered from the value in the right column to the higher value in the center column of **Table 19**. In addition, the EPA is considering modifying the 24-hr NAAQS to a more stringent level. Annual averages as well as the 98<sup>th</sup> percentile values averaged over the most recent three years for all PM<sub>2.5</sub> FRM sites in Michigan are shown in **Table 20**.

The reduced concentrations of PM<sub>2.5</sub> measured during 2010 have caused the 2008-2010 design values to drop markedly in many MSAs. The minimum number of monitoring sites in Monroe, Ann Arbor, Holland-Grand Haven, Muskegon-Norton Shores, Lansing-East Lansing, Bay City, Kalamazoo-Portage, Flint and Niles-Benton Harbor has fallen from one site to zero sites. Using the most recent data, only a single site is required in the Grand Rapids-Wyoming MSA, instead of two. Although the MDEQ may be able to remove ten PM<sub>2.5</sub> FRM stations from the fine particulate network, we are reluctant to do so at this time. If the annual or 24-hour PM<sub>2.5</sub> NAAQS is made more stringent in the near future, monitoring may be required again in these MSAs.

Only three PM<sub>2.5</sub> FRM monitors are required in the Detroit-Warren-Livonia MSA. Dearborn (261630033) has historically been the highest annual design value site. Allen Park (261630001) is the population-oriented trend site, and as such, is also required to collect speciated PM<sub>2.5</sub> samples on a once every three day schedule.

The conceptual model<sup>25</sup> of PM<sub>2.5</sub> created by Dr. Jay Turner, describing the nature of PM<sub>2.5</sub> across the area discusses an urban excess of fine particulate from local sources that impact Dearborn (261630033), Detroit-SWHS (261630015) and Wyandotte (261630036). Both Detroit-SWHS and Wyandotte need to be retained to continue to evaluate the impacts from these local sources. Also, a new international border crossing called Detroit River International Crossing (DRIC) could be built near Detroit-SWHS and contribute more emissions from motor vehicles, reiterating the need to retain the Detroit-SWHS monitor. Emissions near the Detroit-E 7 Mile site (261630019) could be increasing. So, although only three monitors are required in the Detroit-Warren-Livonia Metropolitan Area, the conceptual model as well as other data analysis results reinforce the importance of retaining a larger network. With the 24-hour values falling at many sites in the Detroit-Warren-Livonia MSA, the monitor at Detroit-FIA/Lafayette street now has the second highest 24-hr values in the MSA. This site needs to be retained as it is a mobile source oriented site.

Previously, a co-located sampler was in operation at the Allen Park site (261630001). When Allen Park (261630001) became the NCore site for the Detroit-Warren-Livonia MSA, deck space was at a premium. To make room on the deck, the MDEQ moved the co-located sampler from Allen Park (261630001) to Dearborn (261630033), where the deck was recently enlarged. The co-located monitor at Dearborn (261630033) began operation on January 1, 2010.

The sites at Detroit-Newberry School (261630038) and Detroit-FIA/Lafayette (261630039) are special purpose monitors that have been located to measure impacts from diesel powered mobile sources and from the international border crossing at the Ambassador Bridge, respectively.

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<sup>24</sup> American Farm Bureau Federation and National Pork Producers Council v. EPA, United States Court of Appeals for the District of Columbia Circuit Court 2/24/09

<sup>25</sup> Turner, Jay R. "A Conceptual Model for Ambient Fine particulate Matter Over Southeast Michigan: High Concentration days. Washington University in St. Louis. Revision 0.1 (First Draft) March 4, 2008.

Through a cooperative grant project with EPA Region 5 and EPA's Office of Research and Development (ORD), the MDEQ deployed a special purpose PM<sub>2.5</sub> FRM sampler to Tecumseh (260910007) in Lenawee County on April 1, 2008. Other special measurements that were added to the Tecumseh site include: PM<sub>2.5</sub> speciation and continuous EC/OC. The MDEQ will continue to collect FRM measurements at Tecumseh as the upwind background site near the Detroit-Warren-Livonia MSA.

In the past, two monitors were required in the Grand Rapids-Wyoming MSA, the site at Monroe St. (260810020) and at Wealthy St. in Wyoming (260810007). Now that the design value has been reduced, only a single site is required in the Grand Rapids-Wyoming MSA.

Previously, particulate levels at the Grand Rapids-Monroe St. (260810020) monitor triggered the daily monitoring requirement because they were within +/- 5% of the 24-hour NAAQS. According to data collected during 2008, levels have declined and daily sampling was no longer required at the Grand Rapids-Monroe St. site. The sampling frequency was reduced to once every three days on April 1, 2009 at the beginning of the quarter following completion of validation of the fourth quarter 2008 data.

During 2009, a co-located PM<sub>2.5</sub> FRM sampler operated at the Grand Rapids-Monroe site (260810020) on a once every six day sampling frequency to support improved data capture rates.

Due to the reduction in fine particulate values, a monitor is no longer required in the Monroe MSA. The Luna Pier site is the only PM<sub>2.5</sub> site in Monroe County, located east of I-75, close to the Ohio border. It was selected to help determine transport into the Detroit MSA. The FRM monitor will be retained until possible changes in the NAAQS are made final.

As shown in **Table 20**, using the most recent three years of data, the Flint (260490021) monitor has an annual and a 24-hour design value equaling 9.1 and 26 µg/m<sup>3</sup> respectively. Both of these values are less than 85% of their respective NAAQS. Therefore, a PM<sub>2.5</sub> monitoring site is no longer required in the Flint MSA. No changes are suggested at this time because a more stringent standard for fine particulate could occur.

Fine particulate concentrations have dropped below 85% of the level of the NAAQS in the Ann Arbor MSA, so a monitor is no longer required. The Ypsilanti site (261610008) is located in a zip code with some of the highest incidences of asthma in Michigan. A co-located monitor is also located at this site to determine precision. The sampling frequency of the co-located sampler was increased from once every 12 days to once every six days beginning January 1, 2009 to make it easier to capture 75% complete data per quarter. No changes are suggested at this time because a more stringent standard for fine particulate could occur.

PM<sub>2.5</sub> levels measured at Jenison (261390005) and Muskegon-Apple St (261210040) were within 5% of the level of the 24-hour NAAQS, so the sampling frequency was changed from once every six days to daily for both Jenison (261390005) and Muskegon-Apple Street (261210040) on January 1, 2007. On April 1, 2009 both sites began sampling on a once every three day schedule, because the levels of fine particulate had dropped to less than 5% of the NAAQS. The 2009 and 2010 data show that levels have dropped even further. Previously, a single PM<sub>2.5</sub> FRM monitor was required in the Holland-Grand Haven MSA and Muskegon-Norton Shores MSA. These requirements were fulfilled by the monitor in Jenison (261390005) and by the monitor in Muskegon (261210040), respectively. Recent design values indicate that monitoring is no longer required in these MSAs, but monitoring at these sites will continue in case the NAAQS becomes more stringent.

The annual and 24-hour PM<sub>2.5</sub> design values at the Lansing monitor (260650012) are no longer greater than 85% of the NAAQS, indicating that monitoring is no longer required. The MDEQ will continue to operate the monitor for one more year pending a NAAQS revision.

The Saginaw-Saginaw Township North MSA is required to have a PM<sub>2.5</sub> FRM site. The MDEQ used to operate a PM<sub>2.5</sub> monitoring site at Saginaw Valley University (261450018) but access was lost due to rapid increases in enrollment at the university. The monitoring trailer was located close to student dormitories and had to be removed for expansion of student housing. The site was shut down January 1, 2006. Annual average PM<sub>2.5</sub> levels at the Saginaw site were less than those measured at the Bay City site. The 98<sup>th</sup> percentiles of the 24-hour values that were measured at Saginaw were either within 0.2 µg/m<sup>3</sup> of those measured at Bay City or were 2 to 6 µg/m<sup>3</sup> less than Bay City, depending upon the year. The EPA Regional Administrator granted a waiver for the PM<sub>2.5</sub> Saginaw monitor.

The 24-hour PM<sub>2.5</sub> design value of the monitor in Bay City is less than 85% of the NAAQS, indicating that monitoring is no longer required. The MDEQ will continue to operate the monitor for at least one more year.

The Kalamazoo monitor (260770008) fulfilled the requirement that the Kalamazoo-Portage MSA have one FRM sampler. Both the most recent 24-hour and annual design value at the Kalamazoo monitor are now less than 85% of the respective NAAQS, indicating that one site is no longer necessary in this MSA. However, the MDEQ will continue to operate the monitor for one more year.

During 2008, a co-located PM<sub>2.5</sub> FRM sampler was operated at Kalamazoo (260770008) on a once every 12 day sampling schedule to determine precision. The sampling frequency was increased to once every six days on January 1, 2009 to improve data capture.

Coloma (260210014) fulfilled the requirement for the Niles-Benton Harbor MSA. The 24-hour PM<sub>2.5</sub> design value at this site is no longer greater than 85% of the NAAQS, indicating that a monitor is no longer required.

The PM<sub>2.5</sub> monitor in Holland (260050003) in Allegan County is a micropolitan area. The monitor's design value is no longer within 5% of the NAAQS. Because the site is in a micropolitan area, daily sampling was not required. Now that concentrations have fallen, it may be possible to discontinue monitoring at Holland, but the MDEQ will continue to operate the monitor for one more year for the reasons discussed previously.

Houghton Lake (261130001) is the background PM<sub>2.5</sub> FRM site in Michigan.

A tribal PM<sub>2.5</sub> monitor is located in Manistee (261010922). Tribal monitors are also operational in the Sault Ste Marie area.

**Table 21** summarizes the PM<sub>2.5</sub> FRM monitoring site information for sites that existed in 2010 and those that will operate in 2012. **Figure 17** illustrates the geographical distribution of PM<sub>2.5</sub> FRM monitors.

**TABLE 21: PM<sub>2.5</sub> FRM NETWORK IN MICHIGAN**

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Operating Schedule: Once every 6 days, once every 3 days or daily see below  
 Method: Partisol 2025 Rupprecht & Patashnick Samplers

**SLAMS Network**

Network as of January 2011

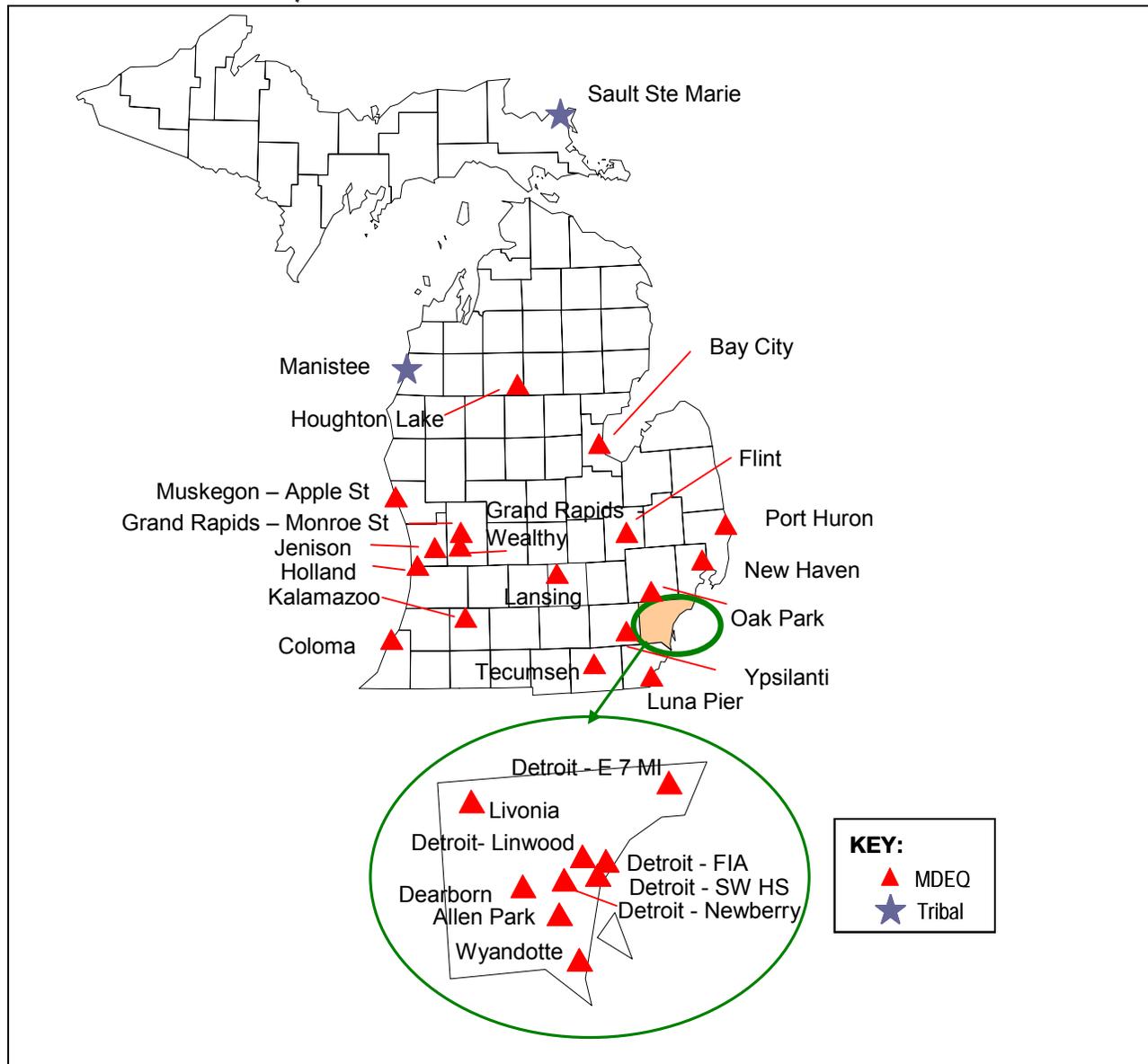
Site Name	Monitoring Sites		Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Start Date	CBSA <sup>1</sup>	Pop (2010 Census)
	AQS Site ID	Address									
Holland	260050003	966 W. 32 <sup>nd</sup> , Holland	42.768	-86.14861	1:3	Pop. Exp.	Neighborhood	Allegan	10/31/98	A	111,408
Bay City	260170014	1001 Jennison St	43.571	-83.89083	1:3	Pop. Exp.	Neighborhood	Bay	8/24/00	BC	107,771
Coloma	260210014	4689 Defield Rd., Paw Paw WWTP	42.198	-86.30972	1:3	Transport	Regional	Berrien	11/7/98	NB	156,813
Flint	260490021	Whaley Park, 3610 Iowa St., Flint	43.047	-83.67028	1:3	Pop. Exp.	Neighborhood	Genesee	12/16/98	F	425,790
Lansing	260650012	220 N. Pennsylvania	42.739	-84.53472	1:3	Pop. Exp.	Neighborhood	Ingham	11/7/98	LEL	464,036
Kalamazoo	260770008	Fairgrounds, 1400 Olmstead Rd	42.278	-85.54194	1:3	Pop. Exp.	Neighborhood	Kalamazoo	11/19/98	KP	326,589
Grand Rapids - Wealthy St	260810007	507 Wealthy St	42.956	-85.67917	1:3	Pop. Exp.	Neighborhood	Kent	1/1/07	GW	774,160
Grand Rapids - Monroe St	260810020	1179 Monroe St., MV,	42.984	-85.67139	1:3	Pop. Exp.	Neighborhood	Kent	10/23/98	GW	774,160
Tecumseh	260910007	6792 Raisin Center Highway	41.996	-83.94667	1:3	up wind backgrd	regional	Lenawee	7/6/93	Not in CBSA	N/A
New Haven	260990009	57700 Gratiott	42.731	-82.79361	1:3	Pop. Exp. Max. Conc.	Neighborhood	Macomb	12/22/98	DWL	4,296,250
Houghton Lake	261130001	1769 S Jeffs Rd	44.311	-84.89194	1:3	Background	Regional	Missaukee	2/8/03	Not in CBSA	N/A
Luna Pier	261150005	Erie Shooting Club	41.764	-83.47194	1:3	Transport	Regional	Monroe	12/17/99	M	152,021
Muskegon - Apple St	261210040	199 E. Apple	43.233	-86.23661	1:3	Pop. Exp.	Neighborhood	Muskegon	12/18/98	MNS	172,188
Oak Park	261250001	13701 Oak Park Blvd., 6981 28 <sup>th</sup> Ave, Georgetown Twp	42.463	-83.18333	1:3	Pop. Exp.	Urban	Oakland	12/25/98	DWL	4,296,250
Jenison	261390005	2525 Dove Rd.	42.894	-85.85278	1:3	Pop. Exp.	Neighborhood	Ottawa	11/7/98	HGH	263,801
Port Huron	261470005	555 Townner Ave	42.953	-82.45639	1:3	Pop. Exp.	Regional	Saint Clair	2/11/99	DWL	4,296,250
Ypsilanti	261610008	14700 Goddard	42.241	-83.59972	1:3	Pop. Exp.	Neighborhood	Washtena	8/4/99	AA	344,791
Allen Park	261630001	SW Highschool, 150 Waterman	42.229	-83.20633	1:1	Pop. Exp.	Neighborhood	Wayne	5/12/99	DWL	4,296,250
Detroit - SWHS	261630015	2451 Marquette, McMichael School	42.303	-83.10667	1:3	Pop. Exp. Max. Conc.	Neighborhood	Wayne	2/26/99	DWL	4,296,250
Detroit - Linwood	261630016	11600 E. 7 Mile, Osborne School	42.358	-83.09617	1:3	Pop. Exp.	Neighborhood	Wayne	5/12/99	DWL	4,296,250
Detroit - E 7 Mile	261630019	38707 Seven Mile Rd	42.431	-83.00028	1:3	Pop. Exp.	Neighborhood	Wayne	4/30/00	DWL	4,296,250
Livonia	261630025		42.423	-83.42639	1:3	Pop. Exp.	Neighborhood	Wayne	8/21/99	DWL	4,296,250
Dearborn	261630033	2842 Wyoming, Salina School	42.307	-83.14889	1:3	Pop. Exp. Max. Conc.	Neighborhood	Wayne	2/5/99	DWL	4,296,250
Wyandotte	261630036	3625 Biddle, Wyandotte	42.187	-83.15404	1:3	Pop. Exp.	Neighborhood	Wayne	2/20/99	DWL	4,296,250
Detroit - Newberry School	261630038	4045 29 <sup>th</sup> St	42.335	-83.1097	1:3	Source Oriented	Neighborhood	Wayne	12/26/05	DWL	4,296,250
Detroit - FIA/Lafayette St	261630039	2000 W/Lafayette	42.323	-83.06861	1:1	Source Oriented	Neighborhood	Wayne	8/26/05	DWL	4,296,250

**Special Purpose and Tribal PM<sub>2.5</sub> Monitors in Michigan**

Site Name	Monitoring Sites		Latitude	Longitude	Sampling Frequency	Monitor Type	Purpose	Scale	County	Start Date	CBSA <sup>1</sup>	Pop (2010 Census)
	AQS Site ID	Address										
Sault Ste Marie	260330001	Lake State University, 650 W Easterday Ave	46.492	-84.36513	1:3	Tribal	Tribal	Regional	Chippewa	1/31/01	Not in CBSA	N/A
Manistee	261010922	3031 Donres Rd	44.307	-86.24268	1:3	Tribal	Tribal	Regional	Manistee	4/2/06	Not in CBSA	N/A

<sup>1</sup> CBSA Key: A = Allegan Micropolitan Area  
 AA = Ann Arbor Metro. Area  
 DWL= Detroit-Warren-Livonia Metro. Area  
 F = Flint Metro Area  
 GW=Grand Rapids-Wyoming Metro. Area  
 HGH = Holland-Grand Haven Metro. Area  
 KP= Kalamazoo-Portage Metro. Area  
 LEL= Lansing-E. Lansing Metro. Area  
 M = Monroe Metro. Area  
 MNS = Muskegon-Norton Shores Metro. Area  
 NBH = Niles-Benton Harbor Metro. Area  
 SBM= South Bend-Mishawaka Metro. Area (IN/MI)

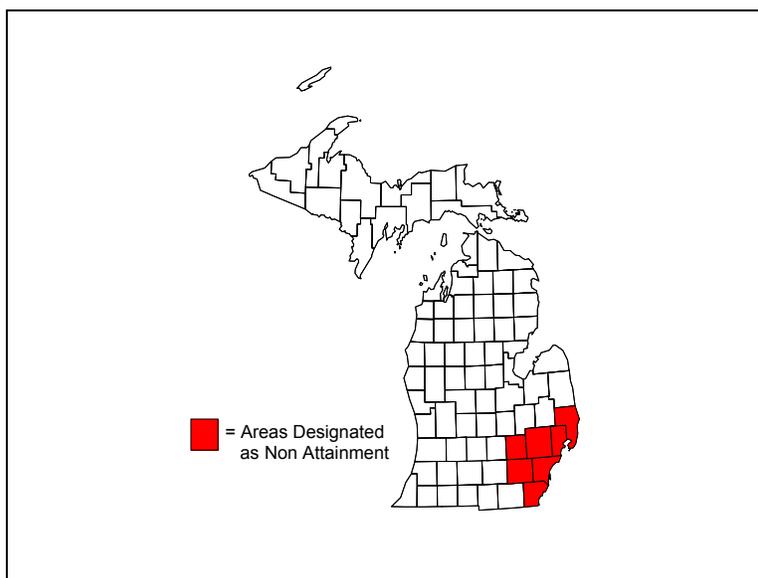
**Figure 17: Michigan's PM<sub>2.5</sub> FRM Monitoring Network**



**PM<sub>2.5</sub> Designations**

The EPA designated the seven-county area in SE Michigan as nonattainment for both the 24-hour and annual fine particulate NAAQS, as shown in **Figure 18**. The MDEQ is currently preparing a request to the EPA to redesignate to attainment. With completion of the 2010 data, all counties in Michigan are meeting the current PM<sub>2.5</sub> NAAQS.

**FIGURE 18: PM<sub>2.5</sub> NONATTAINMENT AREAS**



### **Conversion of PM<sub>2.5</sub> Grant Dollars**

Currently the PM<sub>2.5</sub> monitoring networks are funded through a Section 103 Grant. The EPA is considering changing the Section 103 Grant to a conventional Section 105 Grant, which required the receiving agency to supply a 40% match to the federal funds. If all of the funds are converted and a match is required, this would be equivalent to cutting more than \$400,000 from the MDEQ's PM<sub>2.5</sub> monitoring program. If this occurs, a number of PM<sub>2.5</sub> monitors will be shut down due to lack of funding.

### **PM<sub>2.5</sub> Quality Assurance**

The PM<sub>2.5</sub> program has separate, fully approved Quality Assurance Project Plan (QAPP). The MDEQ operates four co-located PM<sub>2.5</sub> FRM samplers, meeting the precision monitoring requirement of 15%. The sampling frequency of the precision samplers at Grand Rapids–Monroe St. (260810020), Kalamazoo (260770008), Ypsilanti (261610008), and Allen Park (261630001) was reduced from once every six days to once every 12 days, as specified in 40 CFR Part 58 modifications to the regulations. However, the limited number of samples that are collected per quarter has made collection of 75% complete data arduous. On January 1, 2009, the MDEQ opted to increase sampling from once every 12 days to once every six days at these co-located sites. The roll out of NCore monitoring on January 1, 2010 has made deck space a premium commodity at Grand Rapids–Monroe St. (260810020) and at Allen Park (261630001). Therefore, the MDEQ relocated the co-located sampler at Allen Park (261630001) to Dearborn (261630033) to clear more deck space on January 11, 2010.

In addition to operating precision monitors, the MDEQ's station operators conduct flow checks every 4-weeks to ensure the flow rate is meeting the measurement quality objectives. The results from these flow checks are submitted to the PM<sub>2.5</sub> auditor each month for review. Every six months, each PM<sub>2.5</sub> sampler is audited by a member of the AMU's QA Team. The auditor has a separate line of supervision from the site operator and uses dedicated equipment for audits. The audit assesses the accuracy of the flow, as well as the monitor sampling and siting criteria. Every flow audit is reviewed by the QA Coordinator, copies are retained in the QA files,

and the audits are uploaded to the EPA's AQS database. The AMU's auditor also performs a systems audit for each sampler. The systems audit evaluates the siting criteria, condition of the sampling site/station, and other parameters. Copies of the systems audit forms are reviewed by the QA Coordinator and are retained in the QA central files.

The MDEQ participates in the EPA's Performance Evaluation Program (PEP) audits at eight sites each year. The EPA auditor sets up a PM<sub>2.5</sub> monitor to run side-by-side with the station PM<sub>2.5</sub> sampler on a run day. The filter from the PEP audit is sent to an independent laboratory for analysis. Once the MDEQ filter weight is entered into the EPA's AQS database, the audit filter weight is entered by the EPA whereby the concentrations are compared between the PEP audit filter and the station filter. The EPA auditor also assesses the station and monitor siting criteria to evaluate adequacy of the location, distances from trees, exhaust vents, and large building. Probe heights and separation distances are also assessed.

### **Plans for the 2012 PM<sub>2.5</sub> FRM Monitoring Network**

The following PM<sub>2.5</sub> monitors will be retained as part of the 2012 network:

- The one in three day PM<sub>2.5</sub> FRM monitor in Holland (260050003)
- The one in three day PM<sub>2.5</sub> FRM monitor in Bay City (260170014)
- The one in three day PM<sub>2.5</sub> FRM monitor in Coloma (260210014) transport
- The one in three day PM<sub>2.5</sub> FRM monitor in Flint (260490021)
- The one in three day PM<sub>2.5</sub> FRM monitor in Lansing (260650012)
- The one in three day PM<sub>2.5</sub> FRM monitor in Kalamazoo (260770008)
- The one in three day PM<sub>2.5</sub> FRM monitor at Grand Rapids - Wealthy St (260810007)
- The one in three day PM<sub>2.5</sub> FRM monitor in Grand Rapids – Monroe St. (260810020)
- The one in three day PM<sub>2.5</sub> FRM monitor in Tecumseh (260910007)
- The one in three day PM<sub>2.5</sub> FRM monitor in New Haven (260990009)
- The one in three day PM<sub>2.5</sub> FRM monitor in Houghton Lake (261130001) background
- The one in three day PM<sub>2.5</sub> FRM monitor in Luna Pier (261150005) transport
- The one in three day PM<sub>2.5</sub> FRM monitor in Muskegon – Apple St (261210040)
- The one in three day PM<sub>2.5</sub> FRM monitor in Oak Park (261250001)
- The one in three day PM<sub>2.5</sub> FRM monitor in Jenison (261390005)
- The one in three day PM<sub>2.5</sub> FRM monitor in Port Huron (261470005)
- The one in three day PM<sub>2.5</sub> FRM monitor in Ypsilanti (261610008)
- The daily PM<sub>2.5</sub> FRM monitor in Allen Park (261630001)
- The one in three day PM<sub>2.5</sub> FRM monitor at Detroit-SWHS (261630015)
- The one in three day PM<sub>2.5</sub> FRM monitor at Detroit-Linwood (261630016)
- The one in three day PM<sub>2.5</sub> FRM monitor at Detroit-E 7 Mile (261630019)
- The one in three day PM<sub>2.5</sub> FRM monitor in Livonia (261630025)
- The one in three day PM<sub>2.5</sub> FRM monitor in Dearborn (261630033)
- The one in three day PM<sub>2.5</sub> FRM monitor in Wyandotte (261630036)
- The one in three day PM<sub>2.5</sub> FRM monitor at Detroit-Newberry School (261630038)
- The daily PM<sub>2.5</sub> FRM monitor at Detroit–FIA/Lafayette (261630039) will continue the special study comparing continuous fine particulate monitoring data with FRM measurements until one year of data have been collected. We have experienced instrumental difficulties with the continuous monitors.

The following precision monitors will continue operation contingent upon adequate funding:

- The one in six day PM<sub>2.5</sub> FRM monitor in Kalamazoo (260770008).
- The one in six day PM<sub>2.5</sub> FRM monitor at Grand Rapids – Monroe St. (260810020).
- The one in six day PM<sub>2.5</sub> FRM monitor in Ypsilanti (261610008).
- The one in six day PM<sub>2.5</sub> FRM monitor in Dearborn (261630033).

To the best of our knowledge, the following tribal FRM monitor will continue operation:

- A one in three day PM<sub>2.5</sub> FRM tribal monitoring site in Manistee (261010922), contingent upon the Little River Band of Ottawa Indians' plans for 2012.
- A one in three day PM<sub>2.5</sub> FRM tribal monitoring site in Sault Ste. Marie (260330901), contingent upon the Inter-Tribal Council's plans for 2012.

## **CONTINUOUS PM<sub>2.5</sub> MONITORING NETWORK**

According to the October 17, 2006 changes to the monitoring regulations, 50% of the minimum number of required FRM sites must now be collocated with a continuous PM<sub>2.5</sub> monitor. The 13 continuous monitors operational in the state exceed the minimum number that are required.

In 2010 and 2011, the MDEQ operated Rupprecht & Patashnick TEOM samplers to supply continuous fine particulate data at 13 monitoring sites, as shown in **Table 24**. The MDEQ currently is meeting the minimum 50% collocation requirement. **Figure 19** illustrates the geographical distribution of the continuous monitors. The newer TEOM unit that was co-located at Detroit-FIA/Lafayette (261630039) remains as a single monitor. The spare TEOM was deployed to Tecumseh (260910007) on June 1, 2009 to support a special project that is being conducted by Michigan State University (MSU) and University of Michigan (U of M), retaining the 13 sites. In the event that another TEOM needs repair, the unit at Detroit-FIA/Lafayette site will be deployed to the site lacking a functional TEOM. Therefore, incomplete data may be generated at the Detroit-FIA/Lafayette (261630039) site due to repair issues. The MDEQ is currently field testing a MetOne Beta Attenuation Monitor (BAM) and a Thermo-Fisher BAM at Detroit-FIA/Lafayette (261630039) to assess data comparability between the BAMs, the TEOM and the FRM. The FRM at Detroit-FIA/Lafayette is operating on a daily basis.

Michigan has two NCore stations, one in Detroit and one in Grand Rapids. These stations are required to operate a continuous PM<sub>2.5</sub> sampler. Both Grand Rapids–Monroe St. (260810020) and Allen Park (261630001) currently have PM<sub>2.5</sub> TEOMs, meeting the requirement for continuous PM<sup>2.5</sup> measurements.

### **Filter Dynamic Measurement System (FDMS) Inlets**

Initially, the MDEQ operated all TEOM units with an inlet temperature of 50°C. Because this high inlet temperature was volatilizing nitrate during the winter months, and due to the EPA's desire to make the continuous data as "FRM-like" as possible, FDMS inlets were installed on the TEOMs during October 2003 and operated until through April 2005, allowing the inlet temperature to be reduced. The data from units with the Filter Dynamic Measurement System (FDMS) inlets showed good correlation with the FRM data during the winter months, but during the summer, the correlation was poor. The FDMS units captured much more nitrate than the FRMs during the summer and thus yielded much higher TEOM readings than recorded by the FRMs. During summer days with high humidity, condensation occurred in the FDMS lines, interfering with data capture and creating maintenance problems. As a possible solution to both the condensation problem and data comparability issue, the MDEQ proposed to operate the TEOMs with the FDMS inlets during the winter months and without the FDMS inlets during the summer. The MDEQ selected the week of April 1, 2006 to remove the inlets and the week of October 1, 2006 to replace them, corresponding to Michigan's ozone monitoring season. Performance was worse than during the previous year, and was most likely due to a degradation of the nafion driers in the FDMS inlets. In March 2007, the chillers broke on two units and could not be replaced because the instrument manufacturer discontinued the necessary parts in the version of the FDMS units operated by the MDEQ. Rather than buying the version C upgrades to the FDMS units, all FDMS units were removed from the TEOMs in February 2007.

Beginning in 2007, the MDEQ operates the TEOMs from April through September at an inlet temperature of 50°C. Once the ozone season is over, starting October 1, the MDEQ reduces the inlet temperature to 30°C in the winter months to minimize loss of nitrates. Operating the

TEOMs in this way maximizes comparability with the FRMs. The PM<sub>2.5</sub> TEOM sites operate to support AIRNOW real time data reporting and to provide adequate spatial coverage. This will continue as long as adequate levels of funding are received.

The MDEQ is field testing other continuous monitors, a Met One Beta Attenuation Monitor (BAM) and a Thermo BAM, at the Detroit-FIA/Lafayette (261630039) site to determine comparability with FRM measurements. The sampling frequency of the FRM at Detroit-FIA/Lafayette was increased to daily to support the comparability study.

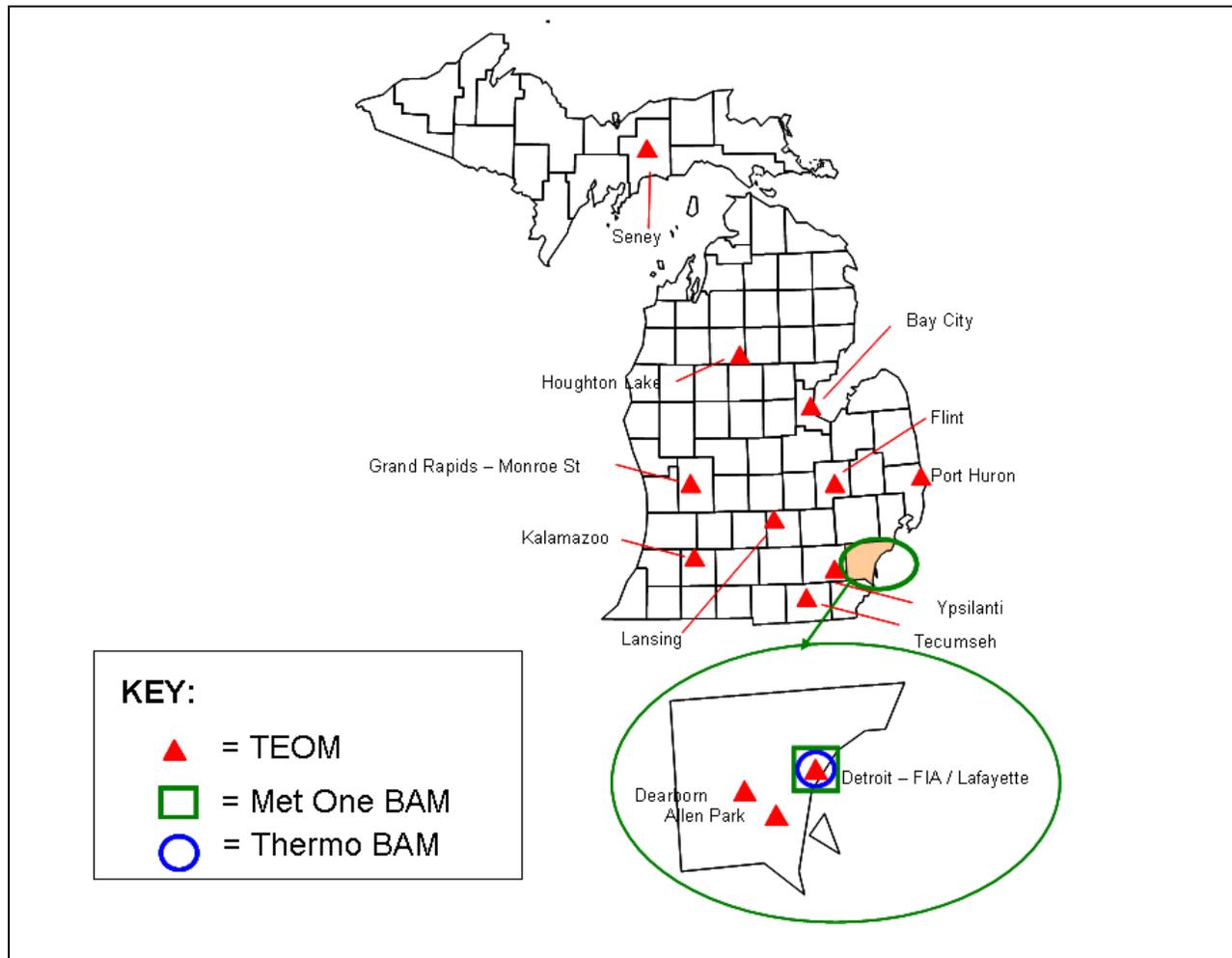
TABLE 22: MICHIGAN'S CONTINUOUS PM<sub>2.5</sub> MONITORING NETWORK

Operating Schedule: continuous											Network as of January 2011
Method: Rupprecht & Patashnick Tapered Element Oscilating Microbalance (TEOMS) Samplers											
Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Start Date	CBSA <sup>1</sup>	Pop (2010 Census)	
Bay City	260170014	1001 Jennison St	43.5714	-83.89083	Pop. Exp.	Neighborhood	Bay	11/19/05	BC	107,771	
Flint	260490021	W haley Park, 3610 Iowa St., Flint	43.0472	-83.67028	Pop. Exp.	Neighborhood	Genesee	5/23/02	F	425,790	
Lansing	260650012	220 N. Pennsylvania	42.7386	-84.53472	Pop. Exp.	Neighborhood	Ingham	12/1/99	LEL	464,036	
Kalamazoo	260770008	Fairgrounds, 1400 Olmstead Rd	42.2781	-85.54194	Pop. Exp.	Neighborhood	Kalamazoo	8/17/00	KP	326,589	
Grand Rapids - Monroe St	260810020	1179 Monroe St., NW,	42.9842	-85.67139	Pop. Exp.	Neighborhood	Kent	11/4/99	GW	774,160	
Tecumseh	260910007	6792 Raisin Center Highway	41.9956	-83.94667	up wind backgrd	regional	Lenawee	6/1/09	Not in CBSA	N/A	
Houghton Lake	261130001	1769 S Jeffs Rd	44.3106	-84.89194	Background	Regional	Missaukee	10/9/03	Not in CBSA	N/A	
Port Huron	261470005	2525 Dove Rd.	42.9533	-82.45639	Pop. Exp.	Regional	Saint Clair	9/18/03	DWL	4,296,250	
Seney	261530001	Seney Wildlife Refuge, HCR 2 Box 1	46.2889	-85.95027	bkgrd	Regional	Schoolcraft	1/1/02	Not in CBSA	N/A	
Ypsilanti	261610008	555 Towner Ave	42.2406	-83.59972	Pop. Exp.	Neighborhood	Washtenaw	2/24/00	Not in CBSA	N/A	
Allen Park	261630001	14700 Goddard	42.2286	-83.20833	Pop. Exp.	Neighborhood	Wayne	12/1/00	DWL	4,296,250	
Dearborn	261630033	2842 Wyoming, Salina School	42.3067	-83.14889	Pop. Exp. Max. Conc.	Neighborhood	Wayne	9/26/03	DWL	4,296,250	
Detroit - Newberry School	261630038	4045 29 <sup>th</sup> St	42.335	-83.1097	Source Oriented	Neighborhood	Wayne	1/1/05	DWL	4,296,250	
Detroit - FIA/Lafayette St	261630039	2000 W Lafayette	42.3233	-83.06861	Source Oriented	Neighborhood	Wayne	8/20/05	DWL	4,296,250	
Method: MetOne Beta Attenuation Monitor (BAM)											
Detroit - FIA/Lafayette St	261630039	2000 W Lafayette	42.3233	-83.06861	Source Oriented	Neighborhood	Wayne	10/1/09	DWL	4,296,250	
Method: Thermo Beta Attenuation Monitor (BAM)											
Detroit - FIA/Lafayette St	261630039	2000 W Lafayette	42.3233	-83.06861	Source Oriented	Neighborhood	Wayne	10/26/10	DWL	4,296,250	

<sup>1</sup> CBSA Key:

BC = Bay City Metro. Area	GW=Grand Rapids-Wyoming Metro. Area
DWL= Detroit-Warren-Livonia Metro. Area	KP= Kalamazoo-Portage Metro. Area
F = Flint Metro Area	LEL= Lansing-E. Lansing Metro. Area

**FIGURE 19: MICHIGAN'S CONTINUOUS PM<sub>2.5</sub> NETWORK**



### **PM<sub>2.5</sub> TEOM Quality Assurance**

The site operator conducts flow checks for precision every four weeks. The results from the precision checks are sent to the auditor for review each month. An independent flow rate audit is conducted by a member of the AMU's QA Team every six months. During the flow rate audit, the auditor assesses the condition of the station, sample probe, and siting criteria. The QA Coordinator reviews all audit results and hard copies of the results are retained in the QA files.

### **Plans for the 2012 PM<sub>2.5</sub> TEOM Network**

Minimal changes to the continuous PM<sub>2.5</sub> network are anticipated, but if EPA cuts funding, operation of some TEOMs may need to be discontinued in 2012. Continued operation of the PM<sub>2.5</sub> TEOMs at Dearborn (261630033), Allen Park (261630001), and Grand Rapids – Monroe St. (260610020) will be given the highest priority. The Dearborn (261630033) monitor measures the highest concentrations of PM<sub>2.5</sub> in Michigan and is needed for the development of attainment strategies, AIRNOW reporting, diurnal profiling and estimation of risk. The Allen Park (261630001) monitor is needed to provide a counterpoint to the measurements taken at Dearborn. Allen Park is a population-oriented site designated as the trend site for Michigan.

Dearborn is the maximum concentration site, so comparisons between these sites are important to characterize point source impacts on ambient air quality. Also, the PM<sub>2.5</sub> TEOMs at Grand Rapids-Monroe St. (260810020) and Allen Park (261630001) need to continue operation due to the NCore requirement for continuous fine particulate measurements.

During 2012, contingent upon adequate levels of funding, Michigan is planning to continue to operate PM<sub>2.5</sub> TEOM monitors at:

- Bay City (260170014)
- Flint (260490021)
- Lansing (260650012)
- Kalamazoo (260770008)
- Grand Rapids–Monroe St. (260810020)
- Houghton Lake (261130001)
- Port Huron (261470005)
- Seney (261530001)
- Ypsilanti (261610008)
- Allen Park (261630001)
- Dearborn (261630033)
- Detroit-FIA/Lafayette (261630039)

Considering the cost of replacement parts, age of the equipment and the frequency of repairs, if any TEOM monitors would need to be shut down, the highest priority would be given to retaining the Grand Rapids–Monroe St. (260810020) , Allen Park (261630001) NCore and Dearborn PM<sub>2.5</sub> TEOMs .

**SPECIATED PM<sub>2.5</sub> MONITORING NETWORK:**

The October 17, 2006 changes to the monitoring regulations specify that speciation monitoring is required but offer little detail. Continued operation of the speciation trend site network is required on a national level and these sites sample on an increased sampling frequency of once every three days. The speciated trend site in Michigan is located at Allen Park (261630001). All remaining supplemental speciation sites operate on a once every six day schedule, except for the NCore site at Grand Rapids–Monroe St (260810020). A new special purpose speciation site was established at Tecumseh (260910007) in April 2008 to assess organic carbon levels upwind from Detroit. Operation of the Tecumseh (260910007) monitor will continue contingent upon adequate funding. The speciation network is described in **Table 25**. **Figure 20** illustrates the coverage across Michigan.

The need for an additional speciation site in southeast Michigan became apparent as a result of the PM<sub>2.5</sub> conceptual model developed by Jay Turner as well as data analysis and source apportionment work performed by STI and Jay Turner<sup>26</sup>. There are several days when elevated PM<sub>2.5</sub> FRM measurements were made at Port Huron (261470005) and nowhere else in the CMA. As such, the MDEQ moved the Kalamazoo speciation monitor to Port Huron (261470005) on July 5, 2008 to better understand the composition of elevated PM<sub>2.5</sub> events downwind from Detroit. Monitoring will continue at this site in 2012 to better understand the nature of fine particulate downwind from the Detroit area.

The conceptual model also identified Detroit-SWHS (261630015) as a site that is influenced by point sources. Speciation data would help better define sources that contribute to elevated PM<sub>2.5</sub> levels at Detroit-SWHS. Therefore, the speciation sampler at Ypsilanti (261610008), was moved to Detroit-SWHS on November 2, 2008. Monitoring will continue at this site in 2012.

Beginning in 2003 and continuing through 2004, an IMPROVE speciation sampler was operated at Allen Park (261630001) to allow comparisons between the rural IMPROVE network and the urban STN network. Allen Park was one of several urban sites participating in this inter-comparison study. National data analysis indicated that there were differences in the results generated by the various carbon samplers.

To improve the EC/OC data that is collected by the speciation network, the EPA decided to upgrade the carbon channel to URG model 3000 N units, becoming more similar to the IMPROVE network. All upgrades have been accomplished.

Note that Allen Park (261630001) contains a suite of carbon channel samplers: an IMPROVE, a Met One SASS and an URG 3000 N. The MDEQ will continue to operate the three different carbon samplers to support EPA OAQPS inter-sampler comparability studies.

Lastly, NCore monitoring sites are required to collect speciated fine particulate on a once every three day schedule. As the speciation trend site for Michigan, the NCore site at Allen Park (261630001) is meeting this criterion. However, speciated fine particulate samples used to be collected at the NCore site at Grand Rapids–Monroe St. (260810020) on a once every six day schedule. The MDEQ increased the sampling frequency at Grand Rapids to once every three days beginning on January 3, 2011. The MDEQ will continue to operate at an increased sampling frequency as long as the EPA supplies adequate levels of funding.

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<sup>26</sup> Wade, K., J Turner, S. Brown, J Garlock, and H. Hafner, "Data Analysis and Source Apportionment of PM<sub>2.5</sub> in Selected Midwestern Cities," Prepared for LADCO, February 2008.

### **Chemical Composition of PM<sub>2.5</sub> and Lab Costs**

If the Section 103 funds are converted into Section 105 funds, forcing cuts to the fine particulate network, one option may be to archive some of the speciation filters for later analysis. Changes to the national speciation laboratory contract may support greater options in the selection of tests. Operational costs could be minimized by adopting an alternative approach to sample analysis so that more coverage can be retained in the monitoring network.

### **Continuous Speciation Measurements**

In addition to the speciated measurements integrated over a 24-hour time period described above, Michigan operates continuous monitors for carbon black and EC/OC. Two large spot aethalometers from Magee Scientific began operation at Dearborn (261630033) and Allen Park (261630001) on December 19, 2003 and January 1, 2004, respectively. These units measure carbon black, which is very similar to and correlates well with elemental carbon.

A continuous EC/OC monitor from Sunset Laboratories was deployed to the Newberry School (261630038) site on February 1, 2005 to determine diurnal variation in elemental carbon and organic carbon. To help in the development of attainment strategies, the Southeast Michigan Council of Governments purchased a second Sunset EC/OC unit that was deployed at Dearborn (261630033) on June 11, 2007. Lastly, an additional EC/OC unit was deployed to Tecumseh (260910007) on March 31, 2008 and operated until September 8, 2008 to characterize levels upwind from Detroit. It was removed in September 2008 to aid in a special study characterizing particulate near the Rouge Mere Rail Yard in Dearborn. The EC/OC sampler was returned to Tecumseh (260910007) on January 29, 2009.

**TABLE 23: MICHIGAN'S PM<sub>2.5</sub> SPECIATION NETWORK**

Operating Schedule: Once Every 3 days (Allen Park), once every 6 days all others

Network as of February, 2011

Method: Met One SASS and two URG 3000 N units to collect organic & elemental carbon at Dearborn & Ypsilanti

Site Name	Monitoring Sites		Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Start Date	CBSA <sup>1</sup>	Pop (2010 Census)	Comments
	AQS Site ID	Address										
Grand Rapids - Monroe St	260810020	1179 Monroe St., NW,	42.984	-85.67139	1:3	Pop. Exp.	Neighborhood	Kent	11/4/99	GW	774,160	
Tecumseh	260910007	6792 Raisin Center Highway	41.996	-83.94667	1:6	up wind backgrd	regional	Lenawee	4/6/08	Not in CBSA	N/A	SPM
Houghton Lake	261130001	1769 S Jeffs Rd	44.311	-84.89194	1:6	Background	Regional	Missaukee	10/9/03	Not in CBSA	N/A	
Luna Pier	261150005	Erie Shooting Club	41.764	-83.47194	1:6	Transport	Regional	Monroe	12/17/99	M	152,021	
Port Huron	261470005	2525 Dove Rd.	42.953	-82.45639	1:6	Pop. Exp.	Regional	Saint Clair	7/5/08	DWL	4,296,250	
Allen Park	261630001	14700 Goddard	42.229	-83.20833	1:3	Pop. Exp.	Neighborhood	Wayne	12/1/00	DWL	4,296,250	
Detroit - SW HS	261630015	SW Highschool, 150 Waterman St	42.303	-83.10667	1:6	Pop. Exp. Max. Conc.	Neighborhood	Wayne	11/2/08	DWL	4,296,250	
Dearborn	261630033	2842 Wyoming, Salina School	42.307	-83.14889	1:6	Pop. Exp. Max. Conc.	Neighborhood	Wayne	9/26/03	DWL	4,296,250	

Continuous Speciation Measurements

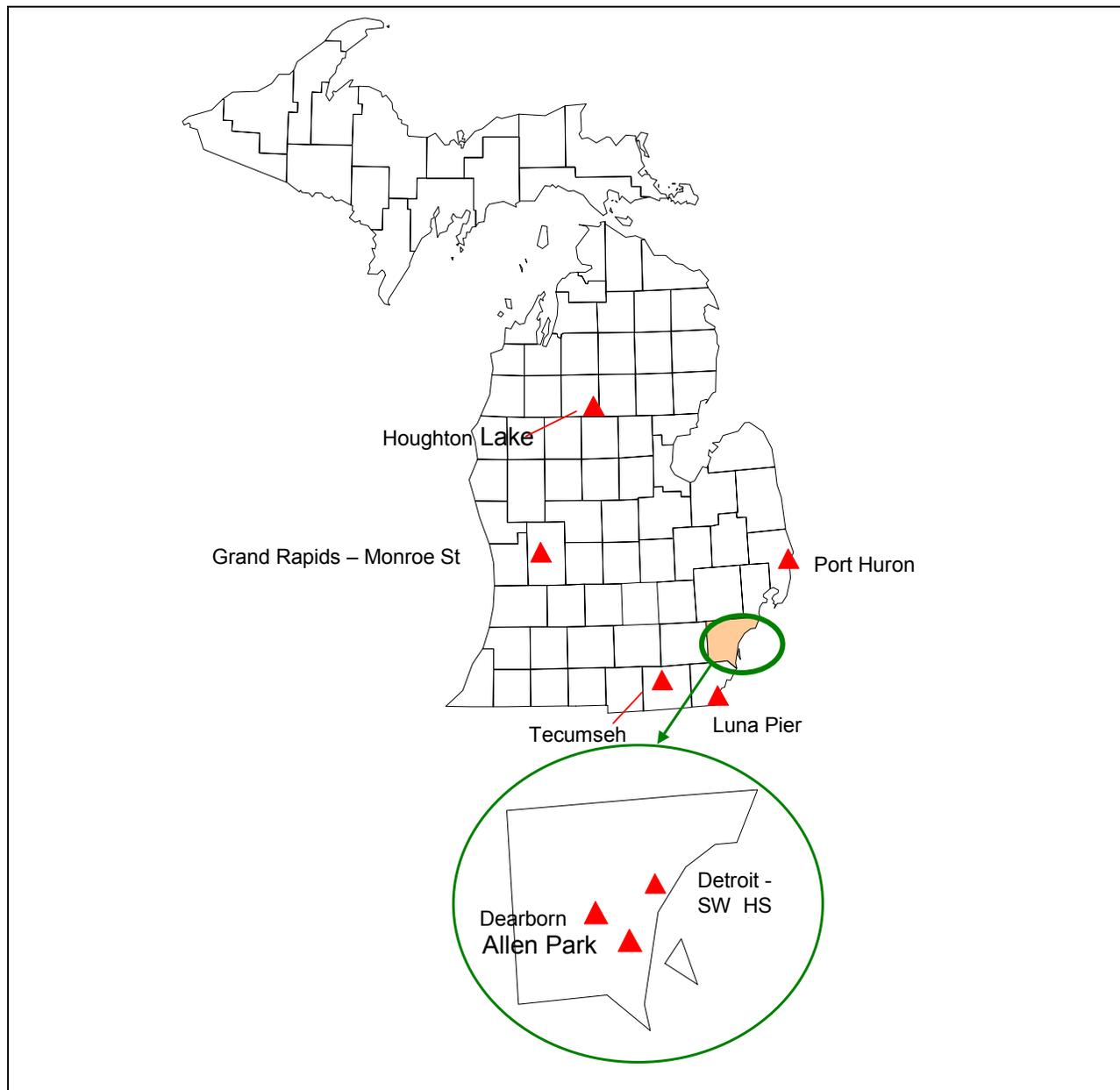
Site Name	Monitoring Sites		Latitude	Longitude	Sampling Method	Purpose	Scale	County	Start Date	CBSA <sup>1</sup>	Pop (2010 Census)	Comments
	AQS Site ID	Address										
Allen Park	261630001	14700 Goddard	42.229	-83.20833	McGee large spot Aethalometer (carbon black)	Pop. Exp.	Neighborhood	Wayne	1/1/04	DWL	4,296,250	
Dearborn	261630033	2842 Wyoming, Salina School	42.307	-83.14889	McGee large spot Aethalometer (carbon black)	Pop. Exp. Max. Conc.	Neighborhood	Wayne	12/19/03	DWL	4,296,250	
Tecumseh	260910007	6792 Raisin Center Highway	41.996	-83.94667	Sunset EC/OC	up wind backgrd	regional	Lenawee	3/31/08	Not in CBSA	N/A	SPM
Detroit - Newberry School	261630038	4045 29 <sup>th</sup> St	42.335	-83.1097	Sunset EC/OC	Source Oriented	Neighborhood	Wayne	2/1/05	DWL	4,296,250	
Dearborn	261630033	2842 Wyoming, Salina School	42.307	-83.14889	Sunset EC/OC	Pop. Exp. Max. Conc.	Neighborhood	Wayne	6/11/07	DWL	4,296,250	

<sup>1</sup> CBSA Key:

DWL= Detroit-Warren-Livonia Metro. Area  
 GW=Grand Rapids-Wyoming Metro. Area  
 M = Monroe Metro. Area

SPM = Special Purpose Monitor

**FIGURE 20: MICHIGAN'S PM<sub>2.5</sub> SPECIATION (SASS) NETWORK**



**Speciation Quality Assurance**

The MDEQ has adopted and follows the EPA's QAPP for the speciation trends network. The site operator conducts flow checks for precision every four weeks. The results from the precision checks are sent to the auditor for review each month. The QA team conducts flow rate audits on the PM<sub>2.5</sub> speciation monitors every six months. The auditor also assesses the monitoring station and siting criteria to ensure it continues to meet the measurement quality objectives. The audit results are reviewed by the AMU's QA Coordinator, and hard copies are retained in the QA files. The audit data is also uploaded to the EPA's AQS database. The EPA conducted flow rate and system audits on four of the network's PM<sub>2.5</sub> speciation monitors in 2006. All four stations that were audited were found to be acceptable and meeting the

measurement quality objectives. The EPA also conducts audits of RTI National Laboratory, which supplies speciation analysis services for the entire nation.

**Plans for the 2012 PM<sub>2.5</sub> Speciation Monitoring Network**

During 2012, contingent upon adequate levels of funding, Michigan is planning to continue to operate 24-hour PM<sub>2.5</sub> SASS speciation monitors at:

- Grand Rapids – Monroe St. (260810020) operating once every three days
- Tecumseh (260910007) operating once every six days
- Houghton Lake (261130001) operating once every six days
- Luna Pier (261150005) operating once every six days
- Port Huron (261470005) operating once every six days
- Allen Park (261630001) operating once every three days
- Dearborn (261630033) operating once every six days

**PM<sub>10</sub> MONITORING NETWORK:**

The October 17, 2006 monitoring regulations modified the minimum number of PM<sub>10</sub> samplers required in MSAs. Since then, further revisions have occurred relaxing the numbers of sites required in high population areas with low concentrations of PM<sub>10</sub>, as shown in **Table 24**.<sup>27</sup>

**TABLE 24: PM<sub>10</sub> MINIMUM MONITORING REQUIREMENTS (NUMBER OF STATIONS PER MSA)<sup>1</sup>**

<b>POPULATION CATEGORY</b>	<b>HIGH CONCENTRATION<sup>2</sup></b>	<b>MEDIUM CONCENTRATION<sup>3</sup></b>	<b>LOW CONCENTRATION<sup>4, 5</sup></b>
> 1,000,000	6-10	4-8	2-4
500,000 – 1,000,000	4-8	2-4	1-2
250,000 – 500,000	3-4	1-2	0-1
100,000 – 250,000	1-2	0-1	0

<sup>1</sup> Selection of urban areas and actual numbers of stations per area within the ranges shown in this table will be jointly determined by EPA and the State Agency.

<sup>2</sup> High concentration areas are those for which ambient PM<sub>10</sub> data show ambient concentrations exceeding the PM<sub>10</sub> NAAQS by 20% or more.

<sup>3</sup> Medium concentration areas are those for which ambient PM<sub>10</sub> data show ambient concentrations exceeding 80% of the PM<sub>10</sub> NAAQS.

<sup>4</sup> Low concentration areas are those for which ambient PM<sub>10</sub> data show ambient concentrations < 80% of the PM<sub>10</sub> NAAQS.

<sup>5</sup> These minimum monitoring requirements apply in the absence of a design value.

Applying **Table 24** to Michigan's urban areas, population totals and historical PM<sub>10</sub> data results in the design requirements that are shown in **Table 25**.

According to the tables, two to four PM<sub>10</sub> sites are required in the Detroit-Warren-Livonia Metropolitan Area. Currently, there are three sites in operation, one at Allen Park (261630001), one at Detroit-SWHS (261630015) and the design value site at Dearborn (261630033).

The PM<sub>10</sub> monitoring requirements specify that one to two PM<sub>10</sub> sites are required in the Grand Rapids-Wyoming MSA. There are two sites currently in operation in Grand Rapids, one on Wealthy St (260810007) and one on Monroe St. (260810020). Both of these sites are operational at the request of EPA Region 5.

According to the requirements, either no or one PM<sub>10</sub> monitors are required in the Flint MSA. In 2006, the MDEQ operated a PM<sub>10</sub> sampler in Flint (260490021) but as a result of budget cuts, PM<sub>10</sub> sampling was discontinued on April 1, 2007.

As part of a special study investigating the concentrations of manganese (Mn) in the Detroit urban area, a PM<sub>10</sub> high volume unit started sampling at River Rouge (261630005) on January 25, 2009. The PM<sub>10</sub> filters at River Rouge (261630005), Allen Park (261630001), Detroit-SWHS (261630015) and Dearborn (261630033) were analyzed for Mn and compared with the TSP concentrations of Mn. An added benefit of this study is the collection of levels of PM<sub>10</sub> at River Rouge (261630005). The Manganese Work Group will be analyzing the data after one year has been collected. Decisions about future monitoring for Mn in SE Michigan will be made by the work group.

<sup>27</sup> Table D-4 of Appendix D to Part 58.

PM course measurements are required at NCore sites. One acceptable technology is to use two R & P Partisol Plus 2025 units equipped with a PM<sub>2.5</sub> head and a WINS impactor and the second with a PM<sub>10</sub> head and a down tube. PM course is determined by subtracting the fine particulate from the PM<sub>10</sub>. Therefore, to meet the NCore requirements, a Partisol sampler equipped with a PM<sub>10</sub> head and a down tube were deployed to Grand Rapids–Monroe St. (260810020) and Allen Park (261630001). Collection of quality assured data began on July 16, 2010 at both sites.

**Table 26** summarizes the PM<sub>10</sub> monitoring site information for sites. **Figure 21** compares the PM<sub>10</sub> network in 2012.

**TABLE 25: APPLICATION OF THE MINIMUM PM<sub>10</sub> MONITORING REGULATIONS IN THE APRIL 30, 2007 CORRECTION TO THE OCTOBER 17, 2006 FINAL REVISION TO THE MONITORING REGULATION TO MICHIGAN'S PM<sub>10</sub> NETWORK**

Design value sites are in bold				2008-2010		
MSA	2010 Population	Counties	Existing Monitors	most recent 3-year PM10 design value (24-Hr)	Conc. Class.	Min No monitors Required
Detroit-Warren-Livonia Metro Area	4,296,250	Macomb	---	---		2-4
		Oakland	---	---		
		Wayne	Allen Park	36	low	
			Detroit -SW HS	52	low	
			Dearborn	<b>63</b>	low	
		Lapeer	---	---		
St Clair	---	---				
Livingston	---	---				
Flint Metro Area	425,790	Genesee	Flint	---	low	0 -1
Monroe Metro Area	152,021	Monroe	---	---		
Ann Arbor Metro Area	344,791	Washtenaw	---	---		
Grand Rapids-Wyoming Metro Area	774,160	Kent	GR - Monroe St	25		1-2
			GR- Wealthy	<b>36</b>	low	
		Barry	---	---		
		Newaygo	---	---		
Ionia	---	---				
Holland-Grand Haven Metro Area	263,801	Ottawa	---	---		
Muskegon-Norton Shores Metro Area	172,188	Muskegon	---	---		
Lansing-East Lansing Metro Area	464,036	Clinton	---	---		
		Ingham	---	---		
		Eaton	---	---		
Bay City Metro Area	107,771	Bay	---	---		
Saginaw-Saginaw Twp N Metro Area	200,169	Saginaw	---	---		
Kalamazoo-Portage Metro Area	326,589	Kalamazoo	---	---		
		Van Buren	---	---		
Niles-Benton Harbor Metro Area	156,813	Berrien	---	---		
Jackson Metro Area	160,248	Jackson	---	---		
Battle Creek Metro Area	136,146	Calhoun	---	---		
South Bend-Mishawaka Metro Area IN/MI	52,293	Cass	---	---		
MSAs with populations greater than 500,000 require at least 1 PM 10 monitor.						

**TABLE 26: MICHIGAN'S PM<sub>10</sub> MONITORING NETWORK**

Method: Manual High Volume Sampler (Dearborn also uses a R&P TEOM to make continuous measurements) Proposed 2012 Network

Site Name	Monitoring Sites		Latitude	Longitude	Sampling Frequency	Monitor Type	Purpose	Scale	County	Start Date	CBSA <sup>1</sup>	Pop (2010 Census)
	AQS Site ID	Address										
Allen Park	261630001	14700 Goddard	42.2286	-83.20833	1:6	High Vol	pop exp	nghbrhd	Wayne	9/12/87	DWL	4,296,250
Detroit - SWHS	261630015	150 Wateman	42.3028	-83.10667	1:6	High Vol	max conc	nghbrhd	Wayne	3/27/87	DWL	4,296,250
Dearborn	261630033	2842 Wyoming	42.3067	-83.14889	1:6	High Vol	max conc	nghbrhd	Wayne	6/12/90	DWL	4,296,250
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.9842	-85.67139	1:6	High Vol	pop exp	nghbrhd	Kent	3/20/87	GW	774,160
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.9842	-85.67139	1:6	High Vol	pop exp	nghbrhd	Kent	3/20/87	GW	774,160
Grand Rapids - Wealthy St	260810007	509 Wealthy	42.9561	-85.67917	1:6	High Vol	pop exp	nghbrhd	Kent	2/3/89	GW	774,160
River Rouge	261630005	315 Genesee	42.2672	-83.13222	1:6	High Vol	pop exp	nghbrhd	Wayne	1/25/09	DWL	4,296,250
Dearborn	261630033	2842 Wyoming	42.3067	-83.14889	1:6	High Vol for precision	max conc	nghbrhd	Wayne	6/12/90	DWL	4,296,250
Dearborn	261630033 continuous	2842 Wyoming	42.3067	-83.14889	continuous	R&P PM10 TEOM	max conc	nghbrhd	Wayne	4/1/00	DWL	4,296,250

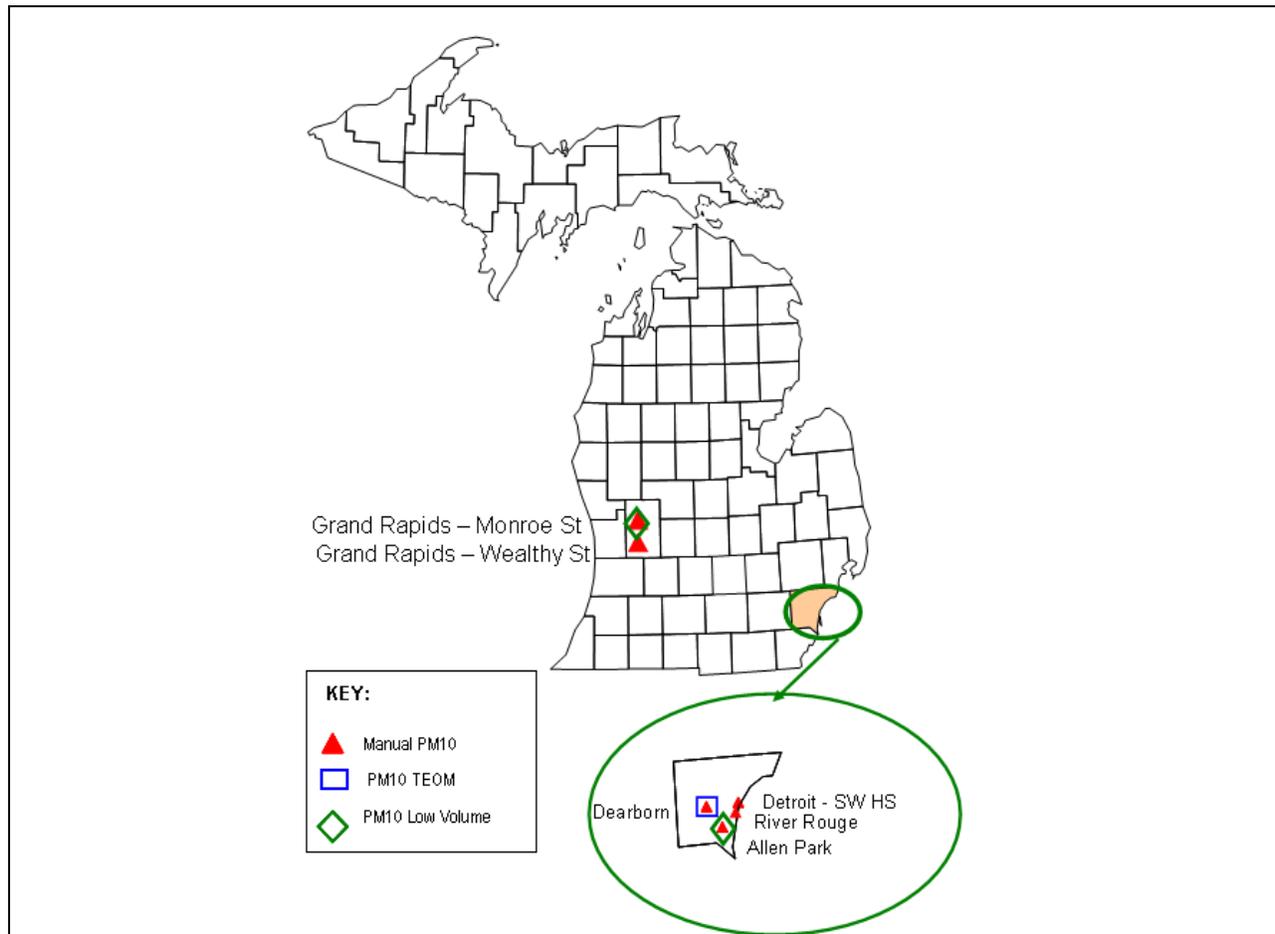
**NCore Low Volume PM Coarse Sites**

Method: Low volume Partisol 2025 Sampler with down tube and PM<sub>10</sub> head co-located with low volume Partisol 2025 PM<sub>2.5</sub> Sampler. PM<sub>coarse</sub> determined by difference.

Site Name	Monitoring Sites		Latitude	Longitude	Sampling Frequency	Monitor Type	Purpose	Scale	County	Start Date	CBSA <sup>1</sup>	Pop (2010 Census)
	AQS Site ID	Address										
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.9842	-85.67139	1:6	Low Vol Partisol	pop exp	nghbrhd	Kent	7/16/11	GW	774,160
Allen Park	261630001	14700 Goddard	42.2286	-83.20833	1:6	Low Vol Partisol	pop exp	nghbrhd	Wayne	7/16/11	DWL	4,296,250

<sup>1</sup> CBSA Key: DWL= Detroit-Warren-Livonia Metro. Area  
GW=Grand Rapids-Wyoming Metro. Area

**FIGURE 21: MICHIGAN'S PM<sub>10</sub> MONITORING NETWORK**



## **History of PM<sub>10</sub> Co-located and Continuous PM<sub>10</sub> Measurements**

Prior to 2001, both the MDEQ and the Wayne County Department of the Environment, Air Quality Management Division were responsible for operating PM<sub>10</sub> networks outside of and within Wayne County, respectively. The monitoring site that measured the highest concentration of PM<sub>10</sub> in each of these monitoring networks was subject to special monitoring requirements, as specified in the air monitoring regulations in effect during that time. In Wayne County, the highest PM<sub>10</sub> levels were measured at the Dearborn site (261630033) and were sufficiently high to trigger a daily sampling requirement. As time progressed, PM<sub>10</sub> levels dropped and the EPA allowed the sampling frequency of the manual sampler at Dearborn to be reduced to a once every six day frequency, if a continuous PM<sub>10</sub> sampler was added to the site. A Rupprecht & Patashnick PM<sub>10</sub> TEOM became operational on April 1, 2000, and the sampling frequency of the manual monitor was reduced to once every six days.

In the network outside of Wayne County, the Grand Rapids–Wealthy St. (260810007) monitor had the highest PM<sub>10</sub> values. Historically, PM<sub>10</sub> was sampled on a once every other day schedule, but as PM<sub>10</sub> levels dropped, the sampling frequency was reduced to once every six days.

To determine precision for each of the two PM<sub>10</sub> networks, a co-located monitor was operated on a once every six day sampling schedule at the two highest sites, Grand Rapids – Wealthy St. (260810007) and Dearborn (261630033). When a PM<sub>2.5</sub> FRM sampler had to be added to Grand Rapids to meet the modifications in network design, the co-located PM<sub>10</sub> sampler was removed on December 31, 2006 due to limited power. In addition, two precision samplers were no longer required because the MDEQ had assumed responsibility for the entire air monitoring network in October 2002.

## **PM<sub>10</sub> Quality Assurance**

The site operator conducts a flow check once a month. The flow check values are sent to a senior auditor each quarter. An independent audit is conducted by a member of the AMU's QA Team every six months. The auditor is in a separate line of reporting authority from the site operator and uses independent dedicated equipment to perform the flow rate audit. The auditor also assesses the condition of the monitor and siting criteria. The QA Coordinator reviews all audit results, and hard copies are retained in the QA files. The audit results are uploaded to the EPA's AQS database each quarter.

## **Plans for the 2012 PM<sub>10</sub> Monitoring Network**

During 2012, contingent upon adequate levels of funding, the MDEQ is planning to operate high volume PM<sub>10</sub> monitors sampling over 24-hrs at:

- The PM<sub>10</sub> monitor at Wealthy Street in Grand Rapids (260810007) on a once every six day schedule
- The PM<sub>10</sub> monitor at Monroe Street in Grand Rapids (260810020) on a once every six day schedule
- The PM<sub>10</sub> monitor in Allen Park (261630001) on a once every six day schedule
- The PM<sub>10</sub> monitor in Detroit–SWHS (261630015) on a once every six day schedule
- The PM<sub>10</sub> monitor in Dearborn (261630033) and the co-located PM<sub>10</sub> monitor on a once every six day schedule.

MDEQ is planning to operate low volume PM<sub>10</sub> monitors co-located with low volume PM<sub>2.5</sub> monitors to calculate PM<sub>coarse</sub> at the following NCore sites:

- The low volume PM<sub>10</sub> monitor at Monroe St in Grand Rapids (260810020) on a once every six day schedule.
- The low volume PM<sub>10</sub> monitor at Allen Park (261630001) on a once every six day schedule.

The MDEQ also planning to operate:

- The PM<sub>10</sub> monitor at River Rouge (261630005) on a once every six day schedule to support the Manganese Workgroup.
- The special purpose monitor PM<sub>10</sub> TEOM at Dearborn (261630033) on a hourly schedule.

### **Carbon Monoxide (CO) Monitoring Network:**

The monitoring regulations no longer require CO monitoring. Therefore, when the budget was cut April 2007, the following CO monitors were shut down: Warren (260991003), Oak Park (261250001), Livonia (261630025), and Detroit-Linwood (261630016). In the previous year, the trace level CO monitors at Detroit-Newberry School (261630038) and at Detroit-FIA/ Lafayette (261630039) were shut down on March 31<sup>st</sup>. Since Grand Rapids and Allen Park are NCore sites and trace CO is a required component of the NCore program, the CO monitors at Grand Rapids-Monroe St. (260810020) and Allen Park (261630001) were shut down and replaced with trace gas CO monitors.

On January 28, 2011<sup>28</sup> EPA proposed to retain the level and form of the CO NAAQS but revise the design of the ambient monitoring network for CO to be more focused on highly trafficked urban roads. In the proposal, CBSAs with population totals equal to or greater than one million people would be required to add CO monitors to near roadway monitoring stations that are required in the NO<sub>2</sub> network design. If this network design is retained in the final version of the CO NAAQS, two near roadway CO monitors will be required in the Detroit-Warren-Livonia CBSA, leveraging the infrastructure required for the NO<sub>2</sub> network. The EPA is expected to finalize the proposed changes to the CO NAAQS by August 12, 2011. Changes to the monitoring network have to be implemented by January 1, 2013 and will be discussed in greater detail in the Network Review that is due July 1, 2012.

**Table 27** summarizes the CO monitoring site information for sites that were in existence in 2010 and 2011. **Figure 22** shows the distribution of CO monitors across the state of Michigan.

### **CO Quality Assurance**

The site operator performs a precision check of the analyzer every two weeks. Results of precision checks are sent to the senior auditor each quarter. Each monitor is audited annually by the AMU's QA Team. The auditor has a separate reporting line of authority from the site operator. The auditor utilizes dedicated gas calibrator and calibration gases that are only for audits. The independent audit challenges the accuracy of the station monitor. The auditor also assesses the monitoring system (inspecting the sample line, filters, and inlet probe), siting, and documentation of precision checks. The results of the audits and precision checks indicate whether the monitor is meeting the measurement quality objectives. The AMU uploads the results of the precision checks and audits to the EPA's AQS database each quarter. The QA Coordinator reviews all audit results, and hard copies are retained in the QA files.

At this time, the EPA is not conducting thru-the-probe audits for the trace level CO monitors, but intends to implement this program in the future.

### **Plans for the 2012 CO Monitoring Network**

During 2012, contingent upon adequate levels of funding, Michigan is planning to continue to operate trace level CO monitors to support NCore operations:

- Grand Rapids – Monroe St. (26810020)
- Allen Park (261630001)

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<sup>28</sup> Environmental Protection Agency, "National Ambient Air Quality Standards for Carbon Monoxide," 40 CFR parts 50, 53 and 58, proposed rule January 28, 2011.

**TABLE 27: MICHIGAN'S CO MONITORING NETWORK**

Operating Schedule: Continuous Network as of March 2011  
 Method: Gas Filter Correlation Analyzer- Trace CO

Site Name	Monitoring Sites		Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	CBSA <sup>1</sup>	Pop (2010 Census)
	AQS Site ID	Address									
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.9842	-85.671389	trace	pop exp	nghbrhd	Kent	4/10/07	GW	774,160
Allen Park	261630001	14700 Goddard	42.2286	-83.208333	trace	pop exp	nghbrhd	Wayne	5/24/07	DWL	4,296,250

<sup>1</sup> CBSA Key: DWL= Detroit-Warren-Livonia Metro. Area  
 GW=Grand Rapids-Wyoming Metro. Area

**FIGURE 22: MICHIGAN'S CO MONITORING NETWORK**



## **NITROGEN DIOXIDE (NO<sub>2</sub>) AND NO<sub>y</sub> MONITORING NETWORK:**

On February 9, 2010, the EPA modified the NO<sub>2</sub> NAAQS. Prior to this date, there was a single form of the standard; the annual average concentration of NO<sub>2</sub> could not be greater than 53 parts per billion (ppb). The EPA has added an hourly level of 100 ppb to the NAAQS.

Along with modifications to the standard, changes to the design of the ambient monitoring network also occurred. A three-tiered monitoring network for NO<sub>2</sub> will focus on near roadway monitoring as well as monitoring at ambient locations. The minimally required components of the network are:

### **Tier 1: Near Roadway Monitors**

1. Every CBSA with a population greater than or equal to 500,000 people must have a microscale NO<sub>2</sub> monitor located within 50 meters of a major roadway.
2. An additional near roadway site is required in CBSAs with populations of 2,500,000 or more.
3. An additional near roadway site is required for any roadway segment with 250,000 or more annual average daily traffic (AADT) totals.

### **Tier 2: Area wide Monitors**

1. One NO<sub>2</sub> monitor in every CBSA with a population equal to or greater than 1,000,000 people. This monitor should be located in an area with an expected high concentration of NO<sub>2</sub> and should use a neighborhood or larger scale. Emission inventory data should be used to make this selection.

### **Tier 3: Regional Administrator Required Monitors**

1. The EPA Administrator must require a minimum of 40 NO<sub>2</sub> monitors nationwide in locations with "susceptible and vulnerable" populations.

The network design described above shall use the latest available census figures. The new monitoring stations must be deployed and operational by January 1, 2013<sup>29</sup>.

**Table 28** summarizes the monitoring requirements for NO<sub>2</sub> according to the various tiers for all CBSAs in Michigan. As shown by the table, one monitor is required in Grand Rapids-Wyoming MSA and three monitors are required in the Detroit-Warren-Livonia MSA.

### **Tier 1: Near Roadway NO<sub>2</sub> Monitors**

There are no highway segments with an AADT equal to or greater than 250,000 according to the Michigan Department of Transportation (MDOT) 2009 Sufficiency Report. **Table 29** summarizes the AADTs for 2006 and 2009 for the top ranked segments in both Grand Rapids-Wyoming CBSA and Detroit-Warren-Livonia CBSA. Two years were selected as a test of the stability of the metric. The roadway segments with AADT closest to 250,000 are located in southeast Michigan along sections of I-696 between I-75 and Couzens Ave. in Madison Heights at 214,000 AADT in 2006 and 203,800 in 2009. The segment of 696 between the 11 Mile inter-

<sup>29</sup> "Primary National Ambient Air Quality Standards for Nitrogen Dioxide" EPA 40 CFR Parts 50 and 58. February 9, 2010.

**Table 28: NO<sub>2</sub> Network Design**

MSA	Counties	2010 Population	Near Roadway Monitors Req'd	Additional Near Roadway Site	250,000 AADT?	Community Wide Monitor	EJ Monitor
Detroit-Warren-Livonia Metro Area	Macomb	4,296,250	1	1		1	
	Oakland						
	Wayne						
	Lapeer						
	St Clair						
	Livingston						
Flint Metro Area	Genesee	425,790					
Monroe Metro Area	Monroe	152,021					
Ann Arbor Metro Area	Washtenaw	344,791					
Grand Rapids-Wyoming Metro Area	Kent	774,160	1				
	Barry						
	Newaygo						
	Ionia						
Holland-Grand Haven Metro Area	Ottawa	263,801					
Muskegon-Norton Shores Metro Area	Muskegon	172,188					
Lansing-East Lansing Metro Area	Clinton	464,036					
	Ingham						
	Eaton						
Bay City Metro Area	Bay	107,771					
Saginaw-Saginaw Twp N Metro Area	Saginaw	200,169					
Kalamazoo-Portage Metro Area	Kalamazoo	326,589					
	Van Buren						
Niles-Benton Harbor Metro Area	Berrien	156,813					
Jackson Metro Area	Jackson	160,248					
Battle Creek Metro Area	Calhoun	136,146					
South Bend Mishawaka Metro Area IN/MI	Cass	52,293					

change at Parkview Blvd. and Mound Rd in Warren had an AADT value of 195,800 in 2006 and 194,500 in 2009. Lastly, the segment on 696 from M-1 to Bermuda-Mohawk had an AADT of 204,400 in 2006 that dropped 7% to 162,000 in 2009. All other sections of roadway in Michigan are under 200,000 AADT. The data show that year to year variability in the ranking make the use of AADTS an unstable metric, more so in the Detroit-Warren-Livonia CBSA than the Grand Rapids-Wyoming CBSA.

According to a presentation<sup>30</sup> summarizing a Draft Near-Road Monitoring Technical Assistance Document, EPA suggests that agencies use a metric that incorporates commercial traffic into the AADT data that they call a Fleet Equivalent AADT (FE AADT), which is calculated by:

**Equation 1:**

$$\text{Equation (1): } FE\ AADT = (AADT - HD\ counts) + (HD\ counts * 10)$$

HD = heavy Duty Vehicle Counts (e.g. trucks/ buses)

The HD counts are multiplied by ten because it is the Heavy Duty to Light Duty vehicle NO<sub>x</sub> emission ratio. Ten is “based on an interpretation of NO<sub>x</sub> emission factors from EPA’s regulatory Motor Vehicle Emissions Simulator (MOVES) model using national defaults.”

**TABLE 29: ROADWAY SEGMENTS WITH THE HIGHEST AADT COUNTS IN 2006 AND 2009**

<sup>30</sup> *Nealson Watkins US EPA – OAR – OAQPS Ambient Air Monitoring Group “Near-road Monitoring” NAQC - March 2011*

	2006			2009		
	Roadway and Segment	AADT	Rank	Roadway and Segment	AADT	Rank
<b>Grand Rapids – Wyoming CBSA</b>	US - 131 MARKET ST to PEARL ST	113,900	1st	US -131 from MARKET ST to PEARL ST	107,200	1st
	US - 131 HALL ST to JCT I-196 BL @ FRANKLIN ST	113,000	2nd	US -131 from HALL ST to JCT I-196BL (FRANKLIN ST)	104,900	2nd
	US - 131 JCT I-196 BL @ FRANKLIN ST to WEALTHY ST/US-131 BR	105,895	3rd	US - 31 JCT I-196/S JCT US-131 to JCT US-131BR (LEONARD ST)	103,100	3rd
	US - 131 BURTON ST to HALL ST	104,300	4th	US - 131 JCT I-196BL (FRANKLIN ST) to S JCT US-131BR GRAND RAPIDS	99,606	4th
	I- 296 JCT I-196 to JCT US-131 BR, LEONARD ST	102,663	5th	US - 131 from BURTON ST to HALL ST	99,400	5th
	US - 131 WEALTHY ST/US-131 BR to MARKET ST	101,400	6th	US - 131 S JCT US-131BR GRAND RAPIDS to MARKET ST	95,100	6th
	I - 96 JCT I-196 to JCT M-37, M-44	98,074	7th	US - 131 JCT M-11 (28TH ST) to NCL WYOMING, SCL GRAND RAPIDS	93,700	7th
	US - 131 N JCT I-296 to JCT I-96	96,721	8th	US - 131 SCL GRAND RAPIDS; NCL WYOMING to BURTON ST	93,700	8th
	US - 131 JCT M-11 28TH ST to BURTON ST	96,600	9th	US - 131 N JCT I-296 to JCT I-96	93,176	9th
	US - 131 PEARL ST to JCT I-196	95,900	10th	25 JCT I-196 to E JCT M-37/JCT M-44	92,114	10th
<b>Detroit – Warren- Livonia CBSA</b>	I - 696 from JCT I-75 to COUZENS ROAD	214,000	1st	I - 696 from JCT I-75 to COUZENS ROAD	203,800	1st
	I - 696 from JCT M-1 to BERMUDA-MOHAWK	204,400	2nd	I - 696 from 11 MILE RD to MOUND RD	194,500	2nd
	I - 696 from BERMUDA-MOHAWK to JCT I-75	199,000	3rd	I - 96 from 6 MILE RD to JCT I-275	182,400	3rd
	I - 96 from 6 MILE RD to JCT I-275	198,200	4th	I - 96 from 7 MILE RD to 6 MILE RD	181,416	4th
	I - 96 from 7 MILE RD to 6 MILE RD	197,700	5th	I - 696 from DEQUINDRE RD, WY CO L to 11 MILE RD	178,000	5th
	I - 696 from COOLIDGE RD to JCT M-1	197,200	6th	I - 96 from 8 MILE RD, N CO L to 7 MILE RD	171,900	6th
	I - 696 from 11 MILE RD to MOUND RD	195,800	7th	I - 94 from JCT I-75 to CHENE	169,500	7th
	I - 96 from 8 MILE RD, N CO L to 7 MILE RD	193,700	8th	I - 96 from JCT I-696 to EIGHT MILE RD, S CO L	167,432	8th
	I - 696 from COUZENS ROAD to DEQUINDRE RD, E CO L	189,700	9th	I - 696 from JCT M-1 to BERMUDA-MOHAWK	167,400	9th
	I - 696 from MOUND RD to JCT M-53	182,200	10th	I - 696 from COUZENS ROAD to DEQUINDRE RD, E CO L	165,607	10th

The FE AADTs for both CBSAs are shown in **Table 30**. CAADT stands for commercial AADT estimates. The consistency of the FE AADTs also varies by CBSA. The MDEQ will review the road segments listed in **Table 30** and identify which segments are most appropriate to house a monitoring station. Due to the prescriptive requirements describing road right of way by the Federal Highway Administration (FHWA), access to segments with the most traffic volume may not be possible. The MDEQ will work with MDOT to find suitable locations for near roadway monitoring stations. Exact locations will be documented in the July 2012 Network Review, with deployment by January 1, 2013.

**TABLE 30: ROADWAY SEGMENTS WITH THE HIGHEST FE AADT COUNTS IN 2006 AND 2009**

**PUBLIC COMMENT DRAFT: MICHIGAN'S 2012 ANNUAL AMBIENT AIR MONITORING NETWORK REVIEW**

Grand Rapids – Wyoming CBSA	2009								2006			
	Description of Segment	FE AADT	FE AADT Rank	AADT Rank	CAADT Rank	FE AADT	FE AADT Rank	AADT Rank	CAADT Rank			
	131 MARKET ST to PEARL ST	161,128	1	1	2	180,554	2	1	8			
	131 JCT I-196BL (FRANKLIN ST) to S JCT US-131BR GRAND RAPIDS	157,404	2	4	1	175,798	3	3	1			
	131 S JCT US-131BR GRAND RAPIDS to MARKET ST	149,028	3	6	2	168,054	6	6	8			
	131 HALL ST to JCT I-196BL (FRANKLIN ST)	148,964	4	2	6	182,705	1	2	2			
	131 PEARL ST to JCT I-196/S JCT I-296	144,528	5	11	2	162,554	8	10	8			
	131 JCT I-196/S JCT US-131 to JCT US-131BR (LEONARD ST)	144,158	6	3	21	169,461	5	5	5			
	131 BURTON ST to HALL ST	143,464	7	5	6	174,005	4	4	2			
	132 N JCT I-296 to JCT I-96	141,200	8	9	5	154,798	11	8	11			
	131 JCT M-11 (28TH ST) to NCL WYOMING; SCL GRAND RAPIDS	137,764	9	7	6	166,305	7	9	2			
	131 SCL GRAND RAPIDS; NCL WYOMING to BURTON ST	137,764	9	7	6	N/A	N/A	N/A	N/A			
	25 JCT I-196 to E JCT M-37/JCT M-44	129,896	11	10	25	147,943	12	7	20			
	131 36TH ST to JCT M-11 (28TH ST)	127,250	12	12	10	137,696	13	14	14			

Detroit – Warren- Livonia CBSA	2009								2006			
	Description of Segment	FE AADT	FE AADT Rank	AADT Rank	CAADT Rank	FE AADT	FE AADT Rank	AADT Rank	CAADT Rank			
	I- 96 from 6 MILE RD to JCT I-275	283,209	1	3	5	337,817	1	4	3			
	I- 96 from 7 MILE RD to 6 MILE RD	282,225	2	4	5	337,317	2	5	3			
	I- 96 from 8 MILE RD, N CO L to 7 MILE RD	272,709	3	6	5	333,317	3	8	3			
	I- 696 from JCT I-75 to COUZENS ROAD	271,606	4	1	19	295,387	5	1	24			
	I- 96 from JCT I-696 to EIGHT MILE RD. S CO L	268,241	5	8	5	320,517	4	12	3			
	I- 696 from 11 MILE RD to MOUND RD	262,306	6	2	19	277,187	12	7	24			
	I- 94 from JCT US-24 to JCT M-39 SOUTHFIELD HWY	262,216	7	37	2	230,932	56	64	20			
	I- 696 from DEQUINDRE RD, W CO L to 11 MILE RD	245,806	8	5	19	257,187	32	15	24			
	I- 75 from CANIFF AVE to JCT M-8 DAVISON HWY	244,578	9	18	12	274,823	14	32	11			
	I- 75 from JCT M-8 DAVISON HWY to MC NICHOLS RD	244,578	9	18	12	289,123	6	16	11			
	I- 94 from JCT M-10 to JCT M-1	241,151	10	32	9	242,955	44	70	14			
	I- 94 from JCT M-10 to JCT M-1	241,151	10	32	9	280,023	9	24	11			
	I- 75 from 7 MILE RD to JCT M-102, N CO L, NCL DETROIT	239,756	11	24	12	236,760	51	78	14			
	I- 94 from JCT I-96 to LINWOOD	239,251	12	38	9	282,223	7	20	11			
	I- 75 from MC NICHOLS RD to 7 MILE RD	238,347	13	26	12	244,843	42	65	14			
	I- 94 from LINWOOD to TRUMBULL	237,362	14	43	9	219,789	73	110	14			
	I- 94 from TRUMBULL to JCT M-10	237,362	14	43	9	271,087	19	9	24			

The MDEQ also has the opportunity to leverage a pre-existing near roadway monitoring network that was established by EPA Office Research and Development (ORD) and the FHWA as part of a special research project investigating the impact of pollutants from major highways. Phase 1 was performed in Los Vegas. The second phase of the study began in Detroit in September 2010 near the intersection of I-96 and Telegraph Road, as shown in **Figure 23**. Four stations were created: one upwind, one 10 meters from the middle of I-96 and 100 meter and 300 meters from the middle of I-96 were established in the southern portion of the Eliza Howell Park. A map comparing the location of each monitoring shelter with the highway is shown in **Figure 24**.



The MDEQ is pursuing operating a NO<sub>2</sub> and CO monitor as well as meteorological equipment at Site #1, the 10 meter location and Site #2, the 100 meter location. Photographs of Site #1 are shown in **Figure 25** whereas Site #2 is shown in **Figure 26**.

**Figure 25: Near Roadway Site #1: 10 meters from I-96<sup>31</sup>**



Although I-96 between Telegraph and the Southfield Freeway does not carry the maximum level of traffic in the Detroit-Warren-Livonia CBSA, there are several advantages to using these stations at Eliza Howell Park to fulfill part of the near road NO<sub>2</sub> monitoring requirements. Leveraging the existing infrastructure built by EPA ORD/FHWA saves resources. Early assumption of operation of Stations 1 and 2 promotes continuity with the existing database already created by EPA ORD, who will be leaving in June 2011. Michigan will start collecting NO<sub>2</sub> measurements 16 months before required to do so. By assuming operation of the stations early, the MDEQ will be able to preserve the existing infrastructure and save a substantial amount of funding because the creation of a new near roadway monitoring station will be avoided. Operation and maintenance costs are minimal in comparison to creation of a new station. Adoption of both stations will allow further investigations into spatial variability of pollutants in a near roadway environment. Operation of Site #2 allows retention of the power supply into the park and makes sufficient space and power available for researchers for future studies. Also, the park is relatively safe and secure.

<sup>31</sup> Distance is measured from the center of the roadway.

Figure 26: Near Roadway Site #2: 100 meters<sup>32</sup> from I-96

### Tier 2: Area Wide NO<sub>2</sub> Monitors

Area wide monitoring is required in every CBSA with 1,000,000 or more people. The Detroit-Warren-Livonia CBSA is the only CBSA having this requirement in Michigan. The MDEQ is currently operating an NO<sub>2</sub> monitor at the Detroit-E 7 Mile site (261630019) in northeast Detroit which is downwind from the urban core and located in a residential neighborhood expected to have high NO<sub>2</sub> levels. An NO<sub>y</sub> is currently operational at the Allen Park NCore site (261630001), which is sandwiched between a residential neighborhood and I-75. Either of these locations would be a suitable area wide monitoring site.

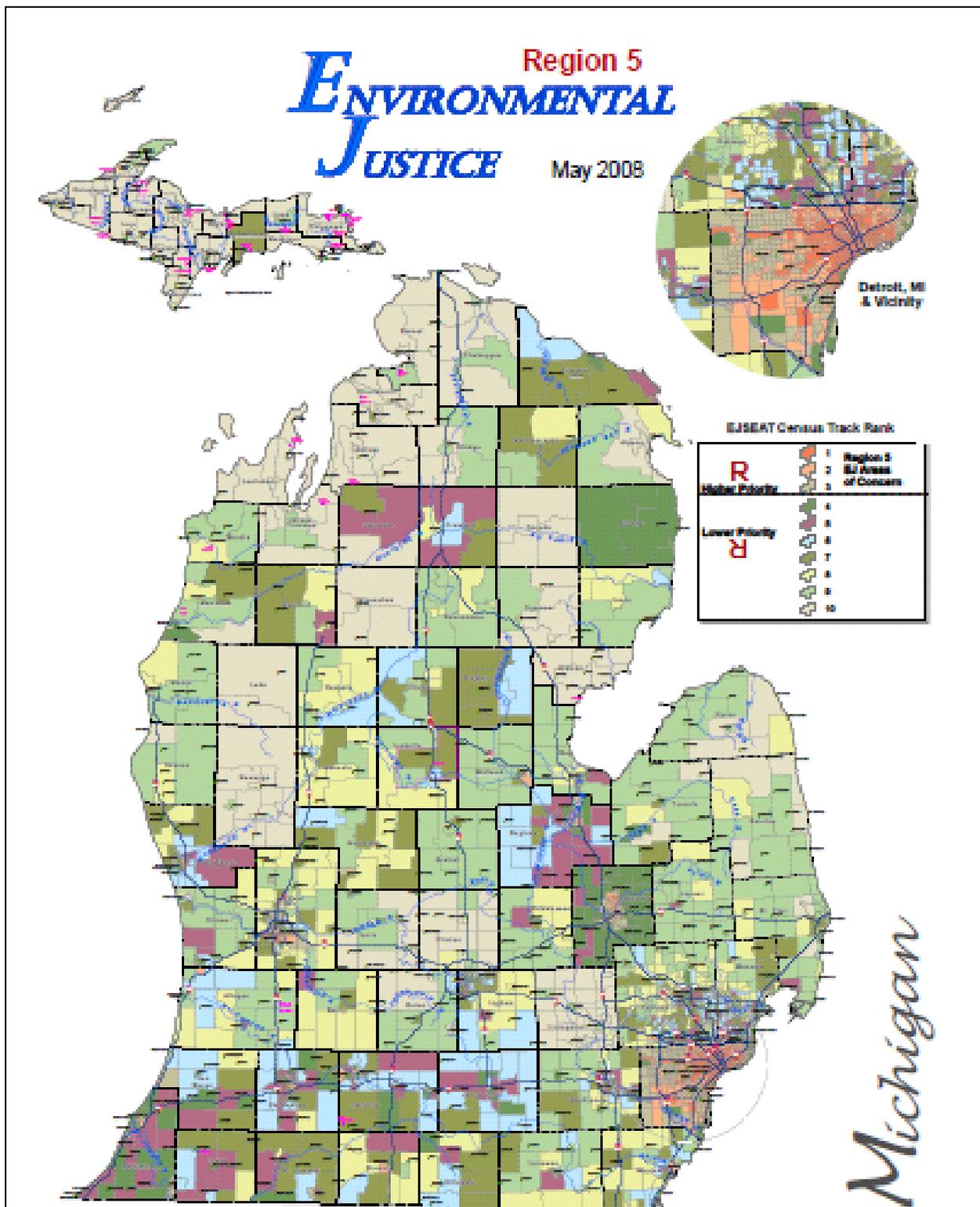
### Tier 3: NO<sub>2</sub> Monitors for Susceptible and Vulnerable Populations

The final tier of the new NO<sub>2</sub> monitoring network could include an environmental justice component as determined by the EPA Administrator. Forty additional monitoring sites will be deployed through out the nation to meet the environmental justice component of the network design. **Figure 27** shows the locations of environmental justice locations in most of the state. **Figure 28** shows the locations of these areas in southeast Michigan. Currently, it is the MDEQ's understanding that these monitors will be deployed to existing stations through a cooperative process between state and local air agencies and EPA. However, if it is deemed

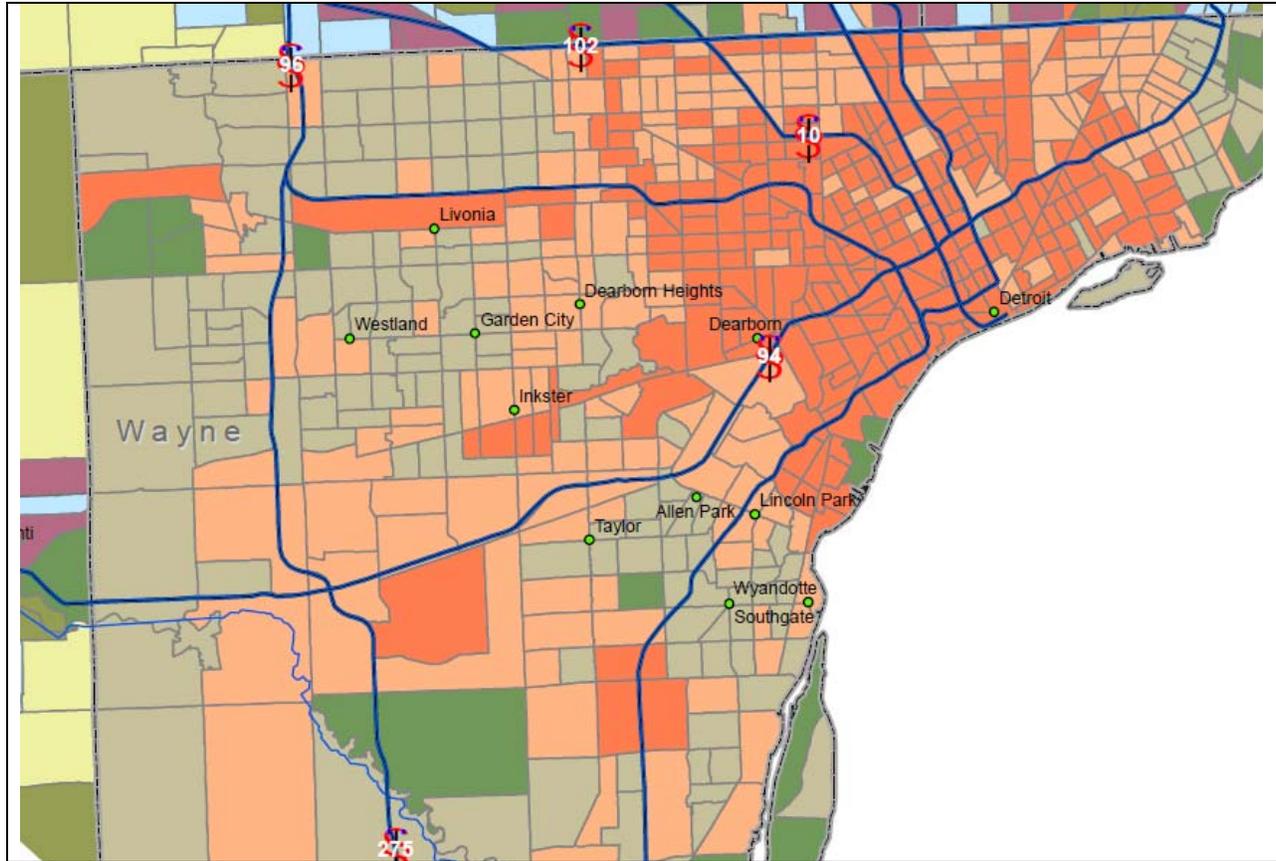
<sup>32</sup> Distance is measured from the center of the roadway.

necessary that NO<sub>2</sub> monitors must be deployed to NEW locations, the MDEQ lacks adequate resources to do so.

**Figure 27: Environmental Justice Areas in Michigan**



**Figure 28: Environmental Justice Areas in Southeast Michigan**



The MDEQ has minimized the coverage of its NO<sub>2</sub> monitoring network, retaining a single NO<sub>2</sub> monitor at the Detroit PAMS site located at the Detroit-E 7 Mile (261630019) site. It is a downwind NO<sub>2</sub> site in the Detroit area.

Recent modeling projects for new source review have shown that there is a possibility that the new NO<sub>2</sub> NAAQS could be violated using the very conservative estimates in the current techniques. More refined modeling that would provide a more accurate picture of the impact from new sources could be performed; however, the MDEQ lacks ambient data required for use in the models. At least five years of NO<sub>2</sub> data are required in both urban and rural locations. Therefore, July 1, 2010, the MDEQ began collecting NO<sub>2</sub> measurements at Houghton Lake (261130001) and at Lansing (260650012).

Trace NO<sub>y</sub> monitors for the NCore sites at Grand Rapids–Monroe St. (260810020) and Allen Park (261630001) have been operational since December 2007

**Table 31** summarizes the NO<sub>2</sub> and NO<sub>y</sub> monitoring site information for sites that were in existence in 2010. **Table 32** shows the NO<sub>2</sub> and NO<sub>y</sub> sites that will become operational during 2011. **Figure 29** compares the NO<sub>2</sub> and NO<sub>y</sub> monitoring network operated by MDEQ in 2010 with the current design.

## **NO<sub>2</sub> and NO<sub>y</sub> Quality Assurance**

The site operator performs a precision check of the analyzer every two weeks. The precision checks are sent to the senior auditor each month. Each monitor is audited annually by the AMU's QA Team, which has a separate reporting line of authority from the site operator. The auditor utilizes dedicated gas calibrator and calibration gases that are only for audits. The independent audit challenges the accuracy of the station monitor. The auditor also assesses the monitoring system (inspecting the sample line, filters, and inlet probe), siting, and documentation of precision checks. The results of the audits and precision checks indicate whether the monitor is meeting the measurement quality objectives. The AMU uploads the precision check results and audit results to the EPA's AQS database each quarter. The QA Coordinator reviews all audit results, and hard copies are retained in the QA files.

For conventional (non-trace level) NO<sub>2</sub> and NO<sub>y</sub> monitors, the EPA conducts thru-the-probe audits to 20% of the monitors each year. The audit consists of delivering four levels of calibration gas to the station monitor through the probe. At this time, the EPA is not conducting thru-the-probe audits for the trace level monitors, but intends to implement this program in the future.

## **Plans for the 2012 NO<sub>2</sub> and NO<sub>y</sub> Monitoring Network**

During 2012 contingent upon adequate levels of funding, the MDEQ is planning to operate NO<sub>2</sub> at:

- Lansing (260650012)
- Houghton Lake (261130001)
- Detroit-E 7 Mile (261630019)
- Site #1 Eliza Howell Park (26163????) beginning June 2011
- Site #2 Eliza Howell Park (26163????) beginning June 2011

Also contingent upon adequate funding, the MDEQ will continue to operate trace level NO<sub>y</sub> monitors at the NCore sites:

- Grand Rapids–Monroe St. site (26810020)
- Allen Park site (261630001)

On or before January 1, 2013, the MDEQ will operate the near roadway and community-oriented NO<sub>2</sub> monitors contingent upon adequate levels of funding and staffing. As the monitoring network designs become more finalized, they will continue to be documented in the annual network reviews.

**TABLE 31: NO<sub>2</sub> AND NO<sub>y</sub> SITES IN OPERATION IN 2010**

Operating Schedule: Continuous  
 Method: Chemiluminescence

Network as of March, 2011  
 Former NAMS sites are shown in bold.

Site Name	Monitoring Sites		Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	CBSA <sup>1</sup>	Pop (2010 Census)
	AQS Site ID	Address									
<b>Detroit - E 7 Mile</b>	<b>261630019</b>	<b>11600 East Seven Mile Road</b>	42.431	-83.00028	<b>NO<sub>2</sub></b>	<b>pop exp</b>	<b>urban</b>	<b>Wayne</b>	<b>12/1/90</b>	<b>DWL</b>	<b>4,296,250</b>
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.984	-85.67139	NO <sub>y</sub>	pop exp	nghbrhd	Kent	1/1/08	GW	774,160
Allen Park	261630001	14700 Goddard	42.229	-83.20833	NO <sub>y</sub>	pop exp	nghbrhd	Wayne	1/1/08	DWL	4,296,250

<sup>1</sup> CBSA Key: DWL= Detroit-Warren-Livonia Metro. Area  
 GW=Grand Rapids-Wyoming Metro. Area

**TABLE 32: PROPOSED NO<sub>2</sub> AND NO<sub>y</sub> MONITORING NETWORK**

Operating Schedule: Continuous  
 Method: Chemiluminescence

Network as of March, 2011  
 Former NAMS sites are shown in bold.

**NCore Sites**

Site Name	Monitoring Sites		Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	CBSA <sup>1</sup>	Pop (2010 Census)
	AQS Site ID	Address									
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.984	-85.67139	NO <sub>y</sub>	pop exp	nghbrhd	Kent	1/1/08	GW	774,160
Allen Park	261630001	14700 Goddard	42.229	-83.20833	NO <sub>y</sub>	pop exp	nghbrhd	Wayne	1/1/08	DWL	4,296,250

**Tier 1: Near Roadway Sites**

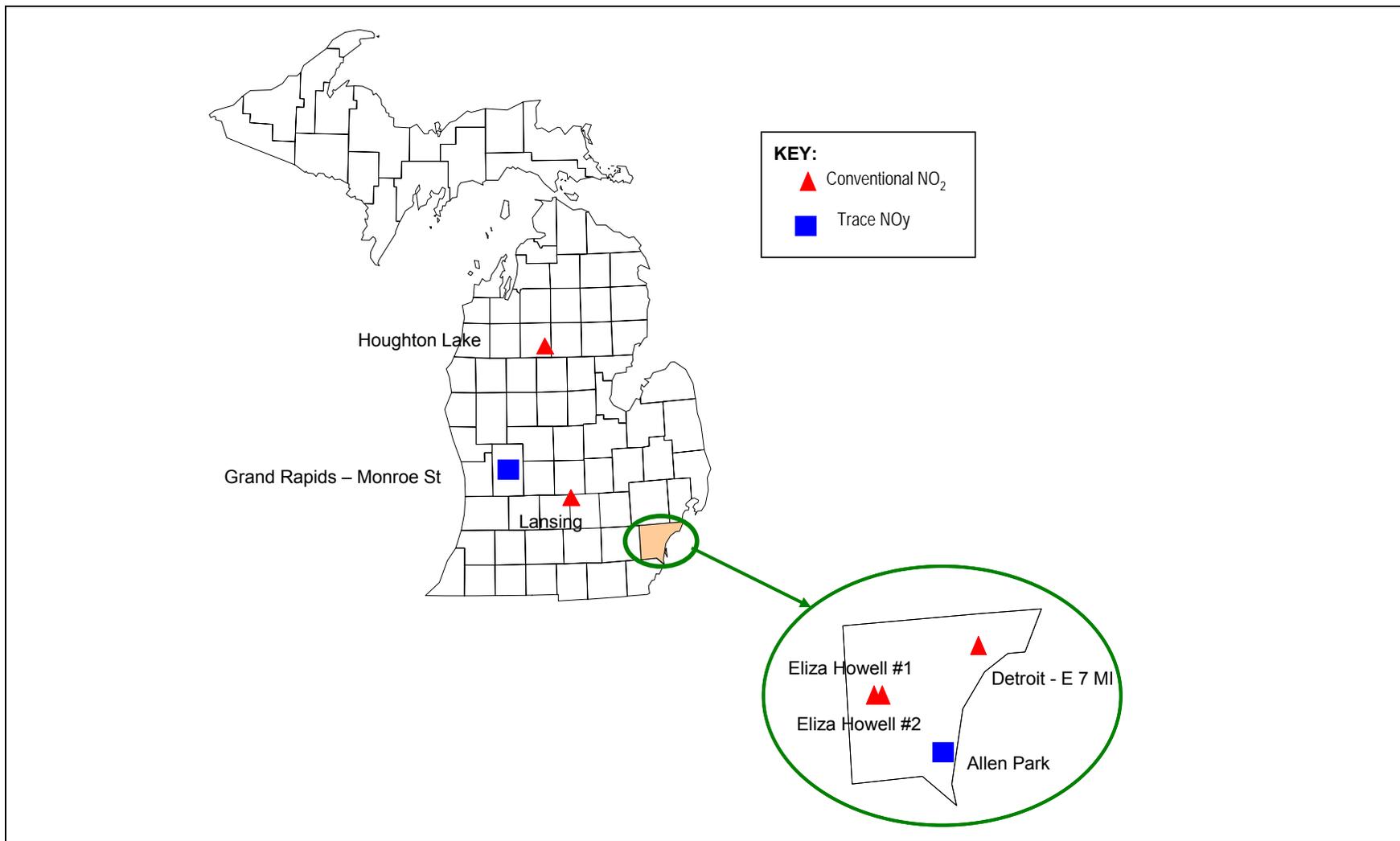
Site Name	Monitoring Sites		Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	CBSA <sup>1</sup>	Pop (2010 Census)
	AQS Site ID	Address									
Eliza Howell #1	26163????	Service Road I-96 & Telegrap	42.386	-83.26632	NO <sub>y</sub>	Near Road	nghbrhd	Wayne	June 2011	DWL	4,296,250
Eliza Howell #2	26163????	Eliza Howell Park	42.3868	83.27064	NO <sub>y</sub>	Near Road	nghbrhd	Wayne	June 2011	DWL	4,296,250

**Tier 2: Community Sites**

Site Name	Monitoring Sites		Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	CBSA <sup>1</sup>	Pop (2010 Census)
	AQS Site ID	Address									
<b>Detroit - E 7 Mile</b>	<b>261630019</b>	<b>11600 East Seven Mile Road</b>	42.431	-83.00028	<b>NO<sub>2</sub></b>	<b>pop exp</b>	<b>urban</b>	<b>Wayne</b>	<b>12/1/90</b>	<b>DWL</b>	<b>4,296,250</b>

<sup>1</sup> CBSA Key: DWL= Detroit-Warren-Livonia Metro. Area  
 GW=Grand Rapids-Wyoming Metro. Area

FIGURE 29: MICHIGAN'S NO<sub>2</sub> AND NO<sub>y</sub> MONITORING NETWORK



**SULFUR DIOXIDE (SO<sub>2</sub>) MONITORING NETWORK:**

On June 2, 2010, the EPA made the SO<sub>2</sub> NAAQS more stringent by changing the current standard from a 24-hour and an annual average to an hourly measurement that can't exceed 75 ppb. The form of the standard is now a 99<sup>th</sup> percentile form averaged over three years. The secondary standard has not been changed<sup>33</sup>.

To design a monitoring network, the EPA created the Population Weighted Emissions Index (PWEI) that is calculated by:

$$(CBSA\ population^{34}) * (total\ SO_2\ emissions\ in\ that\ CBSA\ in\ tpy) / 1,000,000 = PWEI$$

The PWEI value for each CBSA is compared to the threshold values shown in **Table 33** to determine the number of monitoring sites that are required:

**Table 33: Population Weighted Emission Index Based Monitoring Requirements**

<b>Population Weighted Emissions Index Value</b>	<b>Number of Sites</b>
Greater than or equal to 1,000,000	3
Greater 100,000 but less than 1,000,000	2
Greater than 5,000	1

The PWEI monitors serve a variety of purposes including assessing population exposure, determining trends and transport as well as ascertaining background levels.

Contributions from sources<sup>34</sup> are to be modeled with the outputs used to determine compliance with the NAAQS. If an area becomes designated as nonattainment as a result of the model output, both monitoring AND modeling would have to show that the area meets the NAAQS in order to achieve attainment.

EOA allows agencies to count the NCore SO<sub>2</sub> monitors as part of these new requirements. Also, because the new SO<sub>2</sub> monitors are not single source oriented, existing infrastructure can be used to select locations for expansion of the SO<sub>2</sub> network.

If **Table 33** is applied to the PWEI calculations for the CBSAs in Michigan, the number of monitors that are required is shown in **Table 34**. The data in the table uses the 2010 Census data and the most recent version (2008) of the National Emissions Inventory data.

<sup>33</sup> Primary National Ambient Air Quality Standards for Sulfur Dioxide; Final Rule, 75 *Federal Register* 35520 (June 22, 2010).

<sup>34</sup> According to the latest Census Bureau estimates

**TABLE 34: POPULATION WEIGHTED EMISSIONS INDEX TOTALS FOR CBSAs IN MICHIGAN**

MSA	Counties	2008 NEI		2010 Population	2008/2010 NEI PWEI	Monitors Required 2008 EI & 2010 Census
		2008 NEI Download: Total County SO <sub>2</sub> Emissions, tpy	SO <sub>2</sub> Total Emissions, tpy			
Detroit-Warren-Livonia Metro Area	Macomb	133.26	102740	4,296,250	441,397	2
	Oakland	529.32				
	Wayne	43572.47				
	Lapeer	5.69				
	St Clair	58498.83				
	Livingston	0.53				
Flint Metro Area	Genesee	19.95	20	425,790	8	0
Monroe Metro Area	Monroe	93861.37	93861	152,021	14,269	1
Ann Arbor Metro Area	Washtenaw	65.60	66	344,791	23	0
Grand Rapids-Wyoming Metro Area	Kent	155.94	157	774,160	122	0
	Barry	0.69				
	Newaygo	0.56				
	Ionia	0.16				
Holland-Grand Haven Metro Area	Ottawa	28679.65	28680	263,801	7,566	1
Muskegon-Norton Shores Metro Area	Muskegon	9657.45	9657	172,188	1,663	0
Lansing-East Lansing Metro Area	Clinton	9.40	10062	464,036	4,669	0
	Ingham	6459.82				
	Eaton	3592.99				
Bay City Metro Area	Bay	20195.08	20195	107,771	2,176	0
Saginaw-Saginaw Twp N Metro Area	Saginaw	357.28	357	200,169	72	0
Kalamazoo-Portage Metro Area	Kalamazoo	1228.80	1233	326,589	403	0
	Van Buren	4.27				
Niles-Benton Harbor Metro Area	Berrien	31.98	32	156,813	5	0
Jackson Metro Area	Jackson	53.91	54	160,248	9	0
Battle Creek Metro Area	Calhoun	341.02	341	136,146	46	0
South Bend Mishawaka Metro Area IN/MI	Cass	0.50	1	52,293	0	0

Based on the 2008 emissions data and 2010 population estimates, the Detroit-Warren-Livonia CBSA needs two SO<sub>2</sub> monitoring sites, while the Holland-Grand Haven Metropolitan Area and Monroe Metropolitan Area each need a single SO<sub>2</sub> monitoring site.

The NCore trace level SO<sub>2</sub> monitor at Allen Park (261630001) fulfills the requirement for one of the SO<sub>2</sub> monitors required in the Detroit-Warren-Livonia CBSA. Previously, MDEQ operated a SO<sub>2</sub> monitor at Port Huron (261470005). Historical data at Port Huron was substantially below the NAAQS so it was shut down on March 31, 2007 due to budget cuts. Now that the NAAQS is lower, there may be a possibility that SO<sub>2</sub> concentrations could violate the NAAQS. Therefore, the MDEQ may need to redeploy a SO<sub>2</sub> monitor to Port Huron (261470005).

The MDEQ proposes to meet the requirement for a SO<sub>2</sub> monitor in the Holland-Grand Haven metropolitan area by deploying an SO<sub>2</sub> instrument to the Jenison site (261390005) in Ottawa County, by January 1, 2013.

Lastly, the new SO<sub>2</sub> NAAQS requires a monitor in the Monroe metropolitan area due to the influence of the Monroe Power Plant. The plant has very tall stacks and it is unlikely that elevated SO<sub>2</sub> levels would be measured near the facility. Therefore modeling will be performed to identify the location of maximum impact. The only site operated by the MDEQ in Monroe County is at Luna Pier (261150005), which is unsuitable as SO<sub>2</sub> site due to location and lack of a shelter. Depending on the results from the modeling, the MDEQ will try to identify a suitable location that leverages state-owned property. Possible locations for this site will be discussed in more detail in the 2013 Network Review.

**Table 35** summarizes the SO<sub>2</sub> monitoring site information for sites that were in existence in 2010, and **Table 36** lists the proposed locations for the new SO<sub>2</sub> monitors. **Figure 30** shows the geographical distribution of SO<sub>2</sub> sites across Michigan.

### **SO<sub>2</sub> Quality Assurance**

The site operator performs a precision check of the analyzer every two weeks. The precision checks are sent to the senior auditor each quarter. Each monitor is audited annually by the AMU's QA Team, which has a separate reporting line of authority from the site operator. The auditor utilizes dedicated gas calibrator and calibration gases that are only for audits. The independent audit challenges the accuracy of the station monitor. The auditor also assesses the monitoring system (inspecting the sample line, filters, and inlet probe), siting, and documentation of precision checks. The results of the audits and precision checks indicate whether the monitor is meeting the measurement quality objectives. The AMU uploads the precision check results and audit results to the EPA's AQS database each quarter. The QA Coordinator reviews all audit results, and hard copies are retained in the QA files.

For conventional (non-trace level) SO<sub>2</sub> monitors, the EPA conducts thru-the-probe audits to 20% of the monitors each year. The audit consists of delivering four levels of calibration gas to the station monitor through the probe. At this time, the EPA is not conducting thru-the-probe audits for the trace level SO<sub>2</sub> monitors, but intends to implement this program in the future.

### **Plans for the 2012 SO<sub>2</sub> Monitoring Network**

During 2012, contingent upon adequate levels of funding, the MDEQ is planning to continue to operate a SO<sub>2</sub> monitor at:

- Detroit-SWHS (261630015).

Also contingent upon adequate funding, as part of the NCore operations, the MDEQ will continue to operate trace level SO<sub>2</sub> monitors at:

- Grand Rapids–Monroe St. (260810020)
- Allen Park (261630001)

Prior to January 1, 2012, contingent upon adequate funding, the MDEQ is planning to deploy and operate a SO<sub>2</sub> monitor at:

- Port Huron (261470005).

Beginning January 1, 2013, the MDEQ will operate additional SO<sub>2</sub> monitors, contingent upon adequate funding and a concomitant reduction in work load. Namely, the MDEQ will add SO<sub>2</sub> monitors to:

- Jenison (261390005) to meet the Holland-Grand Haven CBSA monitoring requirement for SO<sub>2</sub>.

The MDEQ may create a new station contingent upon adequate levels of funding and staffing as well as a concomitant reduction in work load in or in close proximity to:

- Monroe County

As the monitoring network designs become more finalized, they will continue to be documented in the annual network reviews.

**TABLE 35: MICHIGAN'S SO<sub>2</sub> MONITORING NETWORK IN 2011 AND 2012**

Operating Schedule: Continuous

Planned network 2013

Method: Ultra Violet Stimulated Fluorescence

Former NAMS sites are shown in bold.

**NCore Sites**

Site Name	Monitoring Sites		Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	CBSA <sup>1</sup>	Pop (2010 Census)
	AQS Site ID	Address									
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.9842	-85.671389	trace	pop exp	nghbrhd	Kent	1/1/08	GW	778,009
Port Huron	261470005	2525 Dove Rd	42.9533	-82.456389	SO <sub>2</sub>	pop exp	regional	Saint Clair	2/28/81	DWL	4,296,250
Allen Park	261630001	14700 Goddard	42.2286	-83.208333	trace	pop exp	nghbrhd	Wayne	1/1/08	DWL	4,403,437

**Source-Oriented Sites**

Site Name	Monitoring Sites		Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	CBSA <sup>1</sup>	Pop (2010 Census)
	AQS Site ID	Address									
Monroe	26115????	Unknown	???	???	SO <sub>2</sub>	Max Conc	Regional	Monroe	before 1/2013	Monroe	152,021
Jenison	261390005	698 1 28 <sup>th</sup> Ave, Georgetown Twp	42.8944	-85.852778	SO <sub>2</sub>	Pop. Exp.	nghbrhd	Ottawa	before 1/2013	HGH	263,801
<b>Detroit - SW HS</b>	<b>261630015</b>	<b>150 Waterman</b>	<b>42.3028</b>	<b>-83.106667</b>	<b>SO<sub>2</sub></b>	<b>max conc</b>	<b>nghbrhd</b>	<b>Wayne</b>	<b>1/1/71</b>	<b>DWL</b>	<b>4,403,437</b>

<sup>1</sup> CBSA Key: DWL= Detroit-Warren-Livonia Metro. Area  
 GW=Grand Rapids-Wyoming Metro. Area

**TABLE 36: MICHIGAN'S POSSIBLE SO<sub>2</sub> MONITORING NETWORK IN 2013**

Operating Schedule: Continuous

Planned network 2013

Method: Ultra Violet Stimulated Fluorescence

Former NAMS sites are shown in bold.

**NCore Sites**

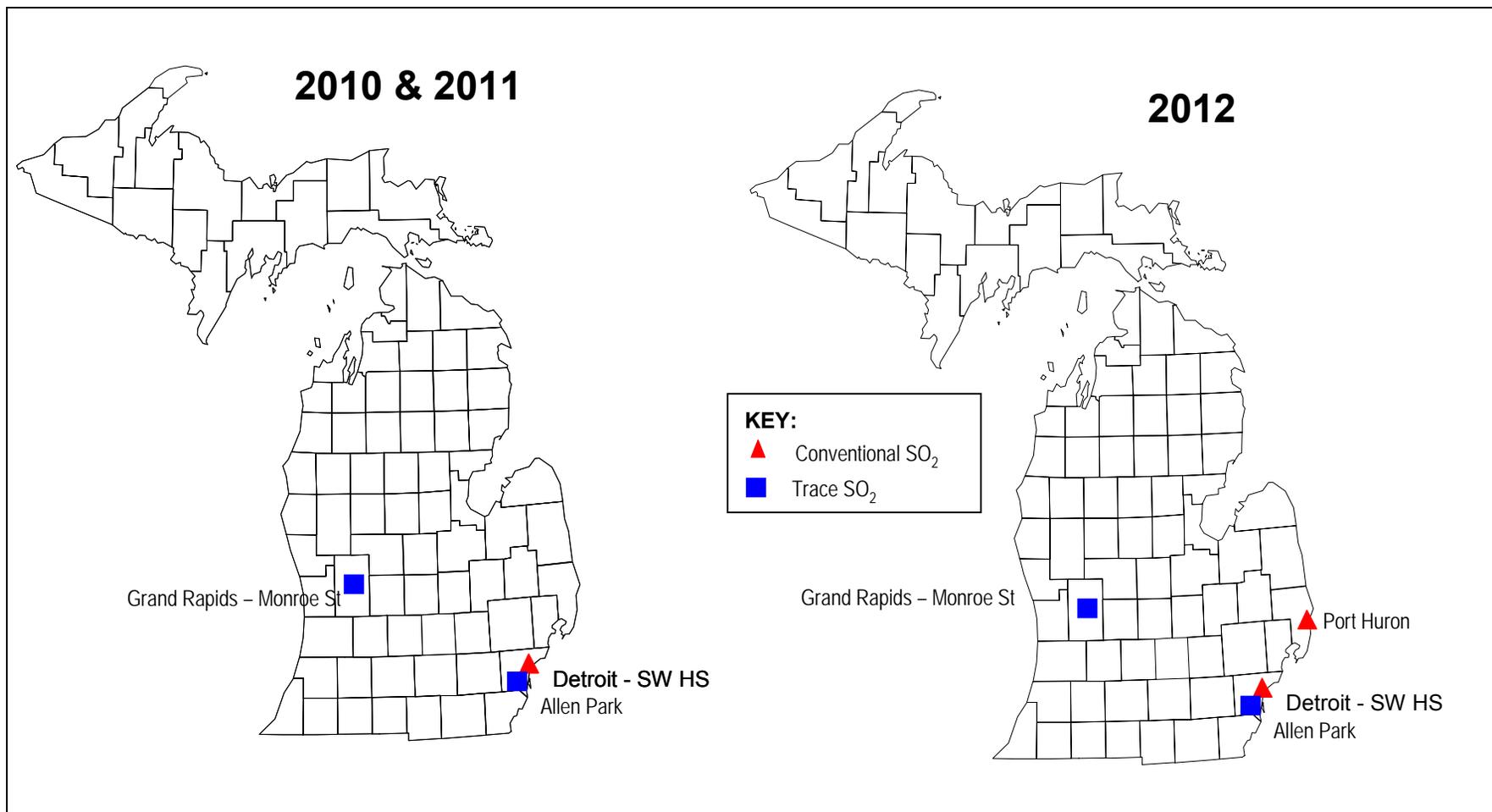
Site Name	Monitoring Sites		Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	CBSA <sup>1</sup>	Pop (2010 Census)
	AQS Site ID	Address									
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.9842	-85.671389	trace	pop exp	nghbrhd	Kent	1/1/08	GW	778,009
Port Huron	261470005	2525 Dove Rd	42.9533	-82.456389	SO <sub>2</sub>	pop exp	regional	Saint Clair	2/28/81	DWL	4,296,250
Allen Park	261630001	14700 Goddard	42.2286	-83.208333	trace	pop exp	nghbrhd	Wayne	1/1/08	DWL	4,403,437

**Source-Oriented Sites**

Site Name	Monitoring Sites		Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	CBSA <sup>1</sup>	Pop (2010 Census)
	AQS Site ID	Address									
Monroe	26115????	Unknown	???	???	SO <sub>2</sub>	Max Conc	Regional	Monroe	before 1/2013	Monroe	152,021
Jenison	261390005	698 1 28 <sup>th</sup> Ave, Georgetown Twp	42.8944	-85.852778	SO <sub>2</sub>	Pop. Exp.	nghbrhd	Ottawa	before 1/2013	HGH	263,801
<b>Detroit - SW HS</b>	<b>261630015</b>	<b>150 Waterman</b>	<b>42.3028</b>	<b>-83.106667</b>	<b>SO<sub>2</sub></b>	<b>max conc</b>	<b>nghbrhd</b>	<b>Wayne</b>	<b>1/1/71</b>	<b>DWL</b>	<b>4,403,437</b>

<sup>1</sup> CBSA Key: DWL= Detroit-Warren-Livonia Metro. Area  
 GW=Grand Rapids-Wyoming Metro. Area

**FIGURE 30: MICHIGAN'S SO<sub>2</sub> MONITORING NETWORK**



**TRACE METAL MONITORING NETWORK:**

Since 1981, monitoring for trace metals as TSP has been conducted as part of the Michigan Toxics Air Monitoring Program (MITAMP). Over the years, the program gradually expanded to nine sites that collected TSP samples on a once every six or once every 12 day schedule. The samples were analyzed for trace levels of metals. The suite of elements has been modified over the years, with the most recent list including beryllium, vanadium, chromium, manganese, nickel, cobalt, copper, zinc, arsenic, molybdenum, cadmium, barium, lead, and iron.

Monitoring for trace metals is not required by the monitoring regulations. Due to budget cuts, reductions had to be made in the monitoring program for trace metals so that other required monitors could be retained. As a result, some trace metal sites were completely shut down, while the number of elements measured at others was reduced. As a result of the April 2007 budget cuts, trace metal monitors at the following sites were shut down:

- Grand Rapids–Monroe St. (260810020)
- Houghton Lake (261130001)
- Ypsilanti (261610008)
- Detroit-E 7 Mile (261630019).

Laboratory analysis for trace metals was limited to only manganese at:

- Flint (260490021).

Laboratory analysis for trace metals was reduced to manganese, arsenic, cadmium, and nickel at:

- Allen Park (261630001)
- Detroit-SWHS (261630015)
- South Delray (261630027)
- River Rouge (261630005).

Trace metals as PM<sub>10</sub> are determined as part of the NATTS program at Dearborn (261630033). To promote comparability with the TSP-size trace metals collected at other monitoring stations, and to assess both inter-sampler precision and method precision, co-located PM<sub>10</sub> and TSP trace metals are also collected at Dearborn.

To provide data for an internal manganese work group, PM<sub>10</sub> metals sampling was initiated at River Rouge (261630005) on January 25, 2009. PM<sub>10</sub> filters collected at Allen Park (261630001) and Detroit-SWHS (261630015) were also analyzed for manganese starting January 25, 2009.

Laboratory analysis for manganese as PM<sub>10</sub> was initiated at:

- Allen Park (261630001)
- Detroit-SWHS (261630015)
- River Rouge (261630005)

Lead sampling using high volume samplers was initiated in January 2010 at the NCore stations at Allen Park (261630001) and Grand Rapids-Monroe St. (260810020). A source-oriented lead monitoring station has been in operation in Belding-Merrick St. (260670003). Changes in the source stack profile have prompted a second lead site to be deployed to Belding-Reed St. (260670002). The MDEQ is working on deploying a source-oriented lead site in Vassar. The filters that are collected as part of the lead program at Allen park (261630001), Grand Rapids-Monroe St. (260810020), Belding-Merrick St. (260670003) and the two new lead sites at Belding-Reed St. (260670002) and Vassar (26157???) are also being analyzed for manganese, arsenic, cadmium and nickel.

**Table 37** summarizes the trace metal monitoring site information for sites that were in existence in 2010 and operational in 2011. **Table 38** shows the configuration of the 2012 network.

**Figure 31** compares the locations of trace metal monitoring sites.

**TABLE 37: MICHIGAN'S TRACE METAL MONITORING NETWORK IN 2010 AND 2011**

Operating Schedule: 1:6  
 Method: TSP: High Volume sampler using glass fiber filter ; Emission Spectra ICAP for lead; ICP MS for remaining metals Former NAMS sites are shown in bold.  
 PM10: High Volume sampler using quartz filter; Emission Spectra ICAP for lead; ICP MS for remaining metals Network as of April 2011

Monitoring Sites													Pop
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Elements	Size	Purpose	Scale	County	Date Estab.	CBSA <sup>1</sup>	(2010 Census)
Flint	260490021	Whaley Park, 3610 Iowa	43.04722	-83.670278	1:6	Mn	TSP	max conc	nghbrhd	Genesee	6/17/92	F	425,790
Belding - Merrick St	260670003	509 Merrick	43.09984	-85.22163	1:6	Pb, Mn, As, Cd, Ni	TSP	max conc	nghbrhd	Ionia	1/1/10	GW	778,009
Grand Rapids - Monroe	260810020	1179 Monroe St NW	42.984167	-85.671389	1:6	Pb, Mn, As, Cd, Ni	TSP	pop exp	nghbrhd	Kent	1/8/10	GW	778,009
Allen Park	261630001	14700 Goddard	42.228611	-83.208333	1:6	Mn, As, Cd, Ni	TSP	pop exp	nghbrhd	Wayne	5/1/99	DWL	4,296,250
Dearborn	261630033	2842 Wyoming	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	TSP	max conc	nghbrhd	Wayne	6/1/90	DWL	4,296,250
River Rouge	261630005	315 Genesee	42.267222	-83.132222	1:6	Mn, As, Cd, Ni	TSP	max conc	nghbrhd	Wayne	1/1/94	DWL	4,296,250
Detroit - SW HS	261630015	150 Waterman	42.302778	-83.106667	1:6	Mn, As, Cd, Ni	TSP	pop exp	nghbrhd	Wayne	2/26/99	DWL	4,296,250
S Delray	261630027	7701 W Jefferson	42.292222	-83.106944	1:6	Mn, As, Cd, Ni	TSP	max conc	nghbrhd	Wayne	10/6/04	DWL	4,296,250
Dearborn	261630033	2842 Wyoming	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	TSP	max conc	nghbrhd	Wayne	6/1/90	DWL	4,296,250
Allen Park	261630001	14700 Goddard	42.228611	-83.208333	1:6	Mn, As, Cd, Ni	PM 10	pop exp	nghbrhd	Wayne	1/25/09	DWL	4,296,250
River Rouge	261630005	315 Genesee	42.267222	-83.132222	1:6	Mn, As, Cd, Ni	PM 10	max conc	nghbrhd	Wayne	1/25/09	DWL	4,296,250
Detroit - SW HS	261630015	150 Waterman	42.302778	-83.106667	1:6	Mn, As, Cd, Ni	PM 10	pop exp	nghbrhd	Wayne	1/25/09	DWL	4,296,250
Dearborn	261630033	2842 Wyoming	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	PM 10	max conc	nghbrhd	Wayne	6/1/90	DWL	4,296,250
Dearborn	261630033	2842 Wyoming	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	PM 10	max conc	nghbrhd	Wayne	6/1/90	DWL	4,296,250

<sup>1</sup> CBSA Key: DWL= Detroit-Warren-Livonia Metro. Area GW = Grand Rapids- Weyoming Metro Area  
 F = Flint Metro Area

**TABLE 38: PROPOSED METAL MONITORING NETWORK**

Operating Schedule: 1:6

Method:

TSP: High Volume sampler using glass fiber filter ; Emission Spectra ICAP for lead; ICP MS for remaining metals

PM10: High Volume sampler using quartz filter; Emission Spectra ICAP for lead; ICP MS for remaining metals

Proposed 2012 Network

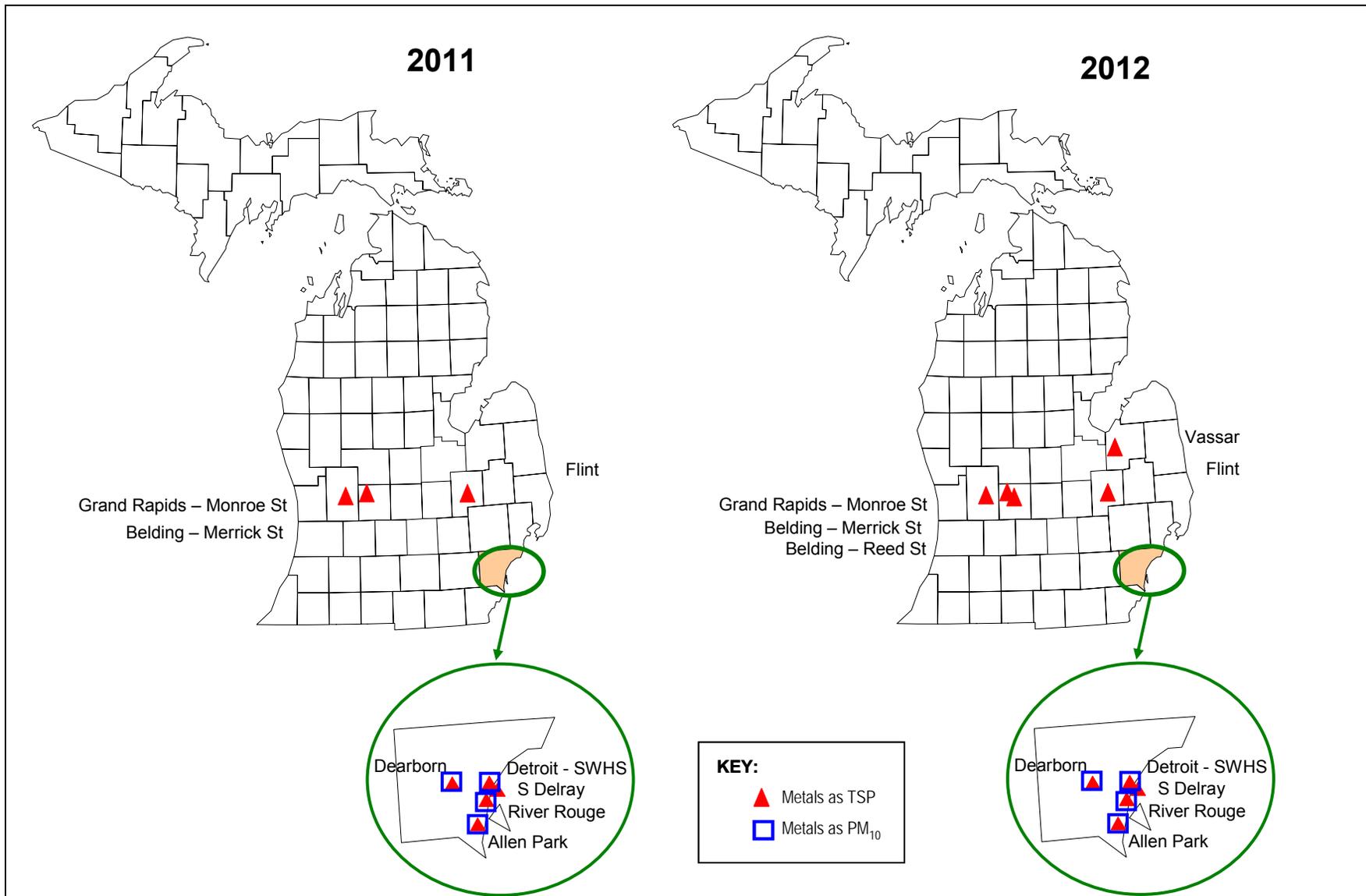
Monitoring Sites			Latitude	Longitude	Sampling Frequency	Elements	Size	Purpose	Scale	County	Date Estab.	CBSA <sup>1</sup>
Site Name	AQS Site ID	Address										
Flint	260490021	Whaley Park, 3610 Iowa	43.04722	-83.670278	1:6	Mn	TSP	max conc	nghbrhd	Genesee	6/17/92	F
Belding - Reed St	260670002	545 Reed St	43.101944	-85.22000	1:6	Pb, Mn, As, Cd, Ni	TSP	max conc	nghbrhd	Ionia	1/1/10	GW
Belding - Merrick St	260670003	509 Merrick	43.09984	-85.22163	1:6	Pb, Mn, As, Cd, Ni	TSP	max conc	nghbrhd	Ionia	1/1/10	GW
Grand Rapids - Monroe	260810020	1179 Monroe St NW	42.984167	-85.671389	1:6	Pb, Mn, As, Cd, Ni	TSP	pop exp	nghbrhd	Kent	1/8/10	GW
Vassar	26157????	???	TSP	???	1:6	Pb, Mn, As, Cd, Ni	TSP	max conc	Neighborhood	Tuscola	planned 12/27/10	Not in CBSA
Allen Park	261630001	14700 Goddard	42.228611	-83.208333	1:6	Mn, As, Cd, Ni	TSP	pop exp	nghbrhd	Wayne	5/1/99	DWL
Dearborn	261630033	2842 W yoming	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	TSP	max conc	nghbrhd	Wayne	6/1/90	DWL
River Rouge	261630005	315 Genesee	42.267222	-83.132222	1:6	Mn, As, Cd, Ni	TSP	max conc	nghbrhd	Wayne	1/1/94	DWL
Detroit - SW HS	261630015	150 Waterman	42.302778	-83.106667	1:6	Mn, As, Cd, Ni	TSP	pop exp	nghbrhd	Wayne	2/26/99	DWL
S Delray	261630027	7701 W Jefferson	42.292222	-83.106944	1:6	Mn, As, Cd, Ni	TSP	max conc	nghbrhd	Wayne	10/6/04	DWL
Dearborn	261630033	2842 W yoming	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	TSP	max conc	nghbrhd	Wayne	6/1/90	DWL
Allen Park	261630001	14700 Goddard	42.228611	-83.208333	1:6	Mn, As, Cd, Ni	PM 10	pop exp	nghbrhd	Wayne	1/25/09	DWL
River Rouge	261630005	315 Genesee	42.267222	-83.132222	1:6	Mn, As, Cd, Ni	PM 10	max conc	nghbrhd	Wayne	1/25/09	DWL
Detroit - SW HS	261630015	150 Waterman	42.302778	-83.106667	1:6	Mn, As, Cd, Ni	PM 10	pop exp	nghbrhd	Wayne	1/25/09	DWL
Dearborn	261630033	2842 W yoming	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	PM 10	max conc	nghbrhd	Wayne	6/1/90	DWL
Dearborn	261630033	2842 W yoming	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	PM 10	max conc	nghbrhd	Wayne	6/1/90	DWL

<sup>1</sup> CBSA Key:

DWL= Detroit-Warren-Livonia Metro. Area  
F = Flint Metro Area

GW = Grand Rapids- Weyoming Metro Area

FIGURE 31: MICHIGAN'S TRACE METAL MONITORING NETWORK



## **Trace Metal Quality Assurance**

The site operator conducts a precision flow check once a month. The flow check values are sent to the senior auditor each quarter. An independent audit is conducted by a member of the AMU's QA Team every six months. The auditor is in a separate line of reporting authority from the site operator and uses independent, dedicated equipment to perform the flow rate audit. The auditor also assesses the condition of the monitor and siting criteria. The QA Coordinator reviews all audit results, and hard copies are retained in the QA files. The audit results are uploaded to the EPA's AQS database each quarter.

The MDEQ Laboratory participates in two types of external performance testing programs. A nationally based audit program sends a sample that has a known concentration of metals spiked onto a filter. The lab analyzes the filter in the same fashion as the routine samples. The results are compared to a "true" value and tabulated for all participants in the program. The MDEQ Laboratory also receives regional round robin audits. The regional audit sample is collected by running an ambient air monitor for 24 hours. The filter is cut into strips and sent to several laboratories. The results for the participating laboratories are compared to each other since a "true" value is not known.

Precision samples for both PM<sub>10</sub> and TSP-sized trace metals are collected at Dearborn (261630033) on a once every six day frequency.

### **Plans for the 2012 Trace Metal Network:**

Continued measurements of Mn as PM<sub>10</sub> are needed to support the investigation of elevated Mn levels by the Manganese Workgroup, so MDEQ will continue the collection of these measurements for one more year, contingent upon funding.

During 2012, contingent upon adequate levels of funding, MDEQ is planning to continue to collect trace metal measurements, as described for the above elements at:

- Flint (260490021) – manganese only
- Belding – Merrick St (260670003) - TSP – lead, manganese, nickel, arsenic and cadmium
- Grand Rapids-Monroe St. (260810020) - TSP – lead, manganese, nickel, arsenic and cadmium
- Allen Park (261630001) - TSP – lead, manganese, nickel, arsenic and cadmium; for PM<sub>10</sub> manganese, nickel, arsenic and cadmium
- Detroit-SWHS (261630015) - TSP - manganese, nickel, arsenic and cadmium; for PM<sub>10</sub> manganese, nickel, arsenic and cadmium
- South Delray (261630027) - TSP – manganese, nickel, arsenic and cadmium only
- River Rouge (261630005) - TSP - manganese, nickel, arsenic and cadmium; for PM<sub>10</sub> manganese, nickel, arsenic and cadmium
- Dearborn NATTS site (261630033) for both PM<sub>10</sub> and TSP – metals reported include manganese, nickel, arsenic, cadmium, lead, beryllium, vanadium, chromium, cobalt, copper, zinc, molybdenum, barium and iron.

During 2012, contingent upon adequate levels of funding, the MDEQ is planning to add TSP lead monitoring to Belding-Reed St. (260670002) and will also include manganese, nickel, arsenic and cadmium. The lead site in Vassar (26157????) will also include monitoring for manganese, nickel, arsenic and cadmium .

## **VOLATILE ORGANIC COMPOUND (VOC) MONITORING NETWORK:**

The collection of more than 50 VOCs per sample began at various sites in 1990 as part of MITAMP air toxics network. Either a once every six day or once every 12 day sampling frequency has been used depending on the site and budget status. The Detroit-SWHS (261630005) site in Detroit has been the trend site and has collected VOC samples every year since 1993. The determination of VOC samples on a one every six day sampling frequency using Method TO-15 is required for the NATTS site at Dearborn (261630033). A minimum of six precision samples per year are also collected at Dearborn (261630033) as part of the NATTS program.

At most sites, monitoring for VOCs is not required by the monitoring regulations. Due to recent budget cuts, reductions had to be made in the monitoring program so that other required monitors could be retained. To save some of the VOC monitoring sites, other sites were completely shut down.

As a result of the April 2007 budget cuts, the VOC samplers at the following sites were shut down: Grand Rapids (260810020), Houghton Lake (261130001), and Ypsilanti (261610008).

**Table 39** summarizes the VOC monitoring site information for sites that were in existence in 2010 and are operating in 2011. **Figure 32** illustrates the geographical distribution of VOC monitors in Michigan.

### **VOC Quality Assurance**

Once a year, the QA Team conducts a thru-the-probe audit using a known concentration of specialized calibration gas. The gas is sent through the station sample probe and collected into a clean, evacuated 6-liter Summa canister over a 24-hour period, and analyzed using EPA Method TO-15. The results are compared to the auditor's target concentration. Once a year, the QA Team also conducts a zero air check on the sampler by running VOC-free air through the probe and into an air canister for 24 hrs. The auditor assesses the sampling configuration, including the condition and height of probe and siting criteria.

The MDEQ Laboratory also participates in both a national and regional performance test program. The national program sends a spiked sample of known compounds and concentrations to the laboratory. The results from state laboratories are compared to the "true" value. The regional performance test audit is produced by a multi-sampling unit that collects actual ambient air. The results from the participating laboratories are compared to each other since a "true" value is not known. The QA Coordinator receives, reviews, and retains copies of all performance test audit samples.

Performance evaluation samples containing known levels of various VOCs are analyzed by the MDEQ Laboratory. The MDEQ Laboratory also participates in regional round robin samples.

### **Plans for the 2012 VOC Monitoring Network**

During 2012, contingent upon adequate levels of funding, the MDEQ is planning to continue to collect VOCs at:

- Detroit-SWHS (261630015) once every 12 days.
- Dearborn NATTS site (261630033) once every six days and precision samples.

**TABLE 39: MICHIGAN'S VOC MONITORING NETWORK**

Operating Schedule: 1:6

Method: Stainless Steel Pressurized Canister Sampler; Gas Chromatograph/ Mass Spectrometer (24-hr samples)

Network as of April, 2011

Site Name	Monitoring Sites		Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Date Estab.	CBSA <sup>1</sup>	Pop (2010 Census)
	AQS Site ID	Address									
Detroit - SWHS	261630015	150 Waterman	42.302778	-83.106667	1:12	pop exp	nghbrhd	Wayne	2/26/99	DWL	4,296,250
Dearborn	261630033	2842 Wyoming	42.306666	-83.148889	1:6	max conc	nghbrhd	Wayne	6/1/90	DWL	4,296,250

<sup>1</sup> CBSA Key: DWL= Detroit-Warren-Livonia Metro. Area

**FIGURE 32: MICHIGAN'S VOC MONITORING NETWORK**



## **CARBONYL MONITORING NETWORK:**

The collection of carbonyl compounds, including formaldehyde and acetaldehyde as part of MITAMP began at various sites in 1995. Either a once every six day or once every 12 day sampling frequency has been used depending on the site and budget status. The Detroit-SWHS (261630005) site in Detroit has been the trend site and has collected carbonyl samples every year since 1995.

Levels of formaldehyde in southeast Michigan are very heterogeneous, unlike other areas of the United States. Historical concentrations at River Rouge (261630005) are elevated, so the continuation of this monitor is important for the characterization of risk and for the determination of trends. Sampling for carbonyls is performed at River Rouge (261630005) on a once every six day schedule. Detroit-SWHS (261630015) is the MDEQ's air toxic trend site, so monitoring has continued on a once every 12 day schedule. Monitoring for carbonyl compounds on a one in six day frequency using Method TO-11A is required at the Dearborn NATTS site (261630033). Also, as a part of NATTS, six precision samples for carbonyls are collected every year.

At most sites, monitoring for carbonyls is not required by the monitoring regulations. Due to recent budget cuts, reductions had to be made in the monitoring program so that other required monitors could be retained. As a result some of the carbonyl monitoring sites were completely shut down, including:

- Grand Rapids-Monroe St. (260810020)
- Houghton Lake (261130001)
- Ypsilanti (261610008).

**Table 40** summarizes the carbonyl monitoring site information for sites that were in existence in 2010 and are continuing to operate in 2011. **Figure 33** shows the distribution of carbonyl samplers across Michigan.

### **Carbonyl Quality Assurance**

Once a year, the QA Team conducts a thru-the-probe audit using a known concentration of specialized calibration gas. The gas is sent through the station sample probe and collected on a dinitrophenyl hydrazine (DNPH) cartridge over a 24-hour period, and analyzed using EPA Method TO-11A. The laboratory result is compared to the auditor's target concentration. The QA Team also conducts a zero air check of the sampler once a year by sending carbonyl-free air through the probe and into the sampler for 24 hours. The auditor assesses the sampling configuration, including the condition and height of probe and siting criteria.

The MDEQ Laboratory also participates in both a national and regional performance test program. The national program sends a spiked sample of known compounds and concentrations to the Laboratory. The results are compared to the "true" value. The regional performance test audit is produced by a multi-sampling unit that collects actual ambient air. The results from the participating laboratories are compared to each other since a "true" value is not known. The QA Coordinator receives, reviews, and retains copies of all performance test audit samples.

### **Plans for the 2012 Carbonyl Monitoring Network**

During 2012, contingent upon adequate levels of funding, Michigan is planning to continue to collect carbonyls at:

- Detroit-SWHS (261630015) once every 12 days
- River Rouge (261630005) once every six days
- Dearborn NATTS site (261630033) once every six days and precision samples.

**TABLE 40: MICHIGAN'S CARBONYL MONITORING NETWORK**

Operating Schedule: 1:6 and 1:12  
 Method: 2,4 dinitrophenyl hydrazine treated silica gel cartridges; HPLC with ultraviolet absorption  
 Network as of April, 2011

Monitoring Sites			Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Date Estab.	CBSA <sup>1</sup>	Pop (2010 Census)
Site Name	AQS Site ID	Address									
Dearborn	261630033	2842 Wyoming	42.306666	-83.148889	1:6	max conc	nghbrhd	Wayne	6/1/90	DWL	4,296,250
River Rouge	261630005	315 Genesee	42.267222	-83.132222	1:6	max conc	nghbrhd	Wayne	1/1/94	DWL	4,296,250
Detroit - SWHS	261630015	150 Waterman	42.302778	-83.106667	1:12	pop exp	nghbrhd	Wayne	2/26/99	DWL	4,296,250

<sup>1</sup> CBSA Key: DWL= Detroit-Warren-Livonia Metro. Area

**FIGURE 34: MICHIGAN'S CARBONYL MONITORING NETWORK**



### **POLYNUCLEAR AROMATIC HYDROCARBON (PAH) MONITORING NETWORK:**

As part of the EPA's desire to augment the NATTS, PAHs were added to the Dearborn site on April 6, 2008. Samples are collected on a once every six day sampling schedule using an Anderson PS-1 sampler. The sampler contains a glass thimble filled with prepared polyurethane foam plugs that surround XAD-2 resin. Volatile PAHs are absorbed into the foam and XAD-2 resin. Particle bound PAHs are trapped on a filter that precedes the thimble. A second sampler was deployed to the Dearborn site so that six precision samples can be collected each year, conforming to the EPA's co-location criteria.

The media is sent to the national contract laboratory, Eastern Research Group (ERG), where it is extracted and analyzed according to ASTM test method D 6209, which is equivalent to EPA method TO-13A.

**Table 41** shows the site information for PAH sites that were in operation in 2009 and are currently operating. **Figure 34** shows the locations of sites where PAH monitoring occurs.

#### **PAH Quality Assurance**

The site operator conducts a precision flow check once a month. The flow check values are sent to the senior auditor each quarter. An independent audit is conducted by a member of the AMU's QA Team once a year. The auditor is in a separate line of reporting authority from the site operator and uses independent, dedicated equipment to perform the flow rate audit. The auditor also assesses the condition of the monitor and siting criteria. The QA Coordinator reviews all audit results, and hard copies are retained in the QA files. The audit results are uploaded to the EPA's AQS database each quarter.

#### **Plans for the 2012 PAH Monitoring Network**

During 2012, contingent upon adequate levels of funding, Michigan is planning to continue to collect PAHs on a once every six day sampling frequency at:

- Dearborn (261630033).

**TABLE 41: PAH NETWORK IN MICHIGAN**

Operating Schedule: 1:6										Network as of April, 2011		
Method: Polyurethane foam plugs and XAD-2 resin with gas chromatography mass spectrometry												
Monitoring Sites												Pop
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Date Estab.	CBSA <sup>1</sup>	(2010 Census)	
Dearborn	261630033	2842 Wyoming	42.30667	-83.1489	1:6	max conc	nghbrhd	Wayne	6/1/90	DWL	4,296,250	
<sup>1</sup> CBSA Key:		DWL= Detroit-Warren-Livonia Metro. Area										

**FIGURE 34: MICHIGAN'S PAH MONITORING NETWORK**



## **METEOROLOGICAL MEASUREMENTS:**

Various meteorological measurements have been added to supplement the ambient monitoring network and enhance data analysis activities. A description of the types of meteorological measurements that are made at each site is provided in **Table 42**. No changes are planned to the meteorological network.

### **Meteorological Equipment Quality Assurance**

On an annual basis, an Equipment Technician conducts a multi-speed and directional certification of the propeller anemometer and vane systems. The QA Team staff or senior Environmental Technician performs a "sun shot" to check the true north orientation of the anemometer and vane system at the station.

An independent audit is conducted by the QA Team to assess the accuracy of the indoor and outdoor temperature, barometric pressure, and relative humidity measurements at the site. The comparison is done between the station's measurements and the auditor's certified thermometer, barometer, and hygrometer to ensure the quality objectives are being met. The QA Coordinator reviews the results of both the wind speed and wind direction certifications as well as the independent audits. Hard copies of all assessments are retained in the QA file system.

### **Plans for the 2012 Meteorological Monitoring Network**

During 2012, contingent upon adequate levels of funding, Michigan is planning to continue to collect hourly meteorological measurements at:

- Holland (26005003)
- Bay City (260170014)
- Coloma (260210014)
- Cassopolis (260270003)
- Flint (260490021)
- Otisville (260492001)
- Harbor Beach (260630007)
- Belding-Reed St. (260670002)
- Lansing (260650012)
- Kalamazoo (260770008)
- Grand Rapids–Monroe St. (260810020)
- Evans (280810022)
- Tecumseh (260910007)
- New Haven (260990009)
- Sterling Heights/Freedom Hill (260990021)
- Scottville (261050007)
- Houghton Lake (261130001)
- Muskegon–Green Creek Rd. (261210039)
- Oak Park (261250001)
- Pontiac (261250011)
- Rochester (261250012)
- Jenison (261390005)
- Port Huron (261470005)
- Seney (261530001)
- Ypsilanti (261610008)

- Allen Park (261630001)
- River Rouge (261630005)
- Detroit–SWHS (261630015)
- Detroit–Linwood (261630016)
- Livonia (261630025)
- Detroit–Joy Rd. (261630026)
- Dearborn (261630033)
- Detroit–Newberry School (261630038)
- Detroit–FIA/Lafayette (261630039)

To the best of our knowledge, the following tribal meteorological equipment monitor will continue operation:

- Manistee (261010922).

**TABLE 42: METEOROLOGICAL MEASUREMENTS IN MICHIGAN**

Site Name	AQS ID	WS	WD	Temperature	Rel. Humidity	Barom. Pressure	Solar Radiation	Sigma Theta
Holland	260050003	X	X	X	X	X	X	X
Bay City	260170014	X	X	X				X
Coloma	260210014	X	X	X				X
Cassopolis	260270003	X	X	X				
Flint	260490021	X	X	X		X		X
Otisville	260492001	X	X	X				X
Harbor Beach	260630007	X	X	X				X
Belding- Reed St	260670002	X	X	X				X
Lansing	260650012	X	X	X		X		X
Kalamazoo	260770008	X	X	X				X
Grgand Rapids - Monroe St	260810020	X	X	X		X		X
Evans	260810022	X	X	X				X
Tecumseh	260910007	X	X	X		X		X
New Haven	260990009	X	X	X	X	X	X	X
Sterling Hts/ Freedom Hill	260990021	X	X	X				
Manistee +	261010922	X	X	X		X	X	
Scottville	261050007	X	X	X				X
Houghton Lake	261130001	X	X	X		X		X
Muskegon, Green Ck Rd	261210039	X	X	X				X
Oak Park	261250001	X	X	X				X
Pontiac	261250011	X	X	X				X
Rochester	261250012	X	X	X				X
Jenison	261390005	X	X	X				X
Port Huron	261470005	X	X	X				X
Seney	261530001	X	X	X	X	X	X	X
Ypsilanti	261610008	X	X	X		X		
Allen Park	261630001	X	X	X	X	X		X
River Rouge	261630005	X	X	X				X
Detroit - SW HS	261630015	X	X	X	X	X		X
Detroit - E 7 Mi	261630019	X	X	X	X	X		X
Livonia	261630025	X	X	X	X	X		X
Detroit - Joy Rd	261630026	X	X	X				X
Dearborn	261630033	X	X	X	X	X		X
Detroit - Newberry School	261630038	X	X	X				X
Detroit -FIA/Lafayette	261630039	X	X	X				X
Total		35	35	35	8	15	4	31

**ADEQUACY OF MICHIGAN'S MONITORING SITES:**

The suitability of the monitoring sites locations is frequently assessed by the AMU's QA Team and by the EPA. The EPA assesses the adequacy of the stations during PM<sub>2.5</sub> PEP audits, gaseous NPAP audits, and systems audits. The results indicate that the stations are properly sited, which includes distances away from obstructions, large trees, and set-backs from roadways. Suitability of probe heights and separation distances are assessed both by MDEQ and EPA auditors.

The overall design of the regional air monitoring networks will be assessed by the Regional EPA office with assistance from state, local and tribal agencies once every five years. The next regional review is due by July 1, 2015. This review assesses any redundancies of monitors along border areas will be assessed, identifies monitors that are no longer necessary and determines network deficiencies. Preliminary versions of this assessment were reviewed and suggested changes to Michigan's ambient air monitoring network are addressed in various portions of this review.

**APPENDIX A: ACRONYMS AND THEIR DEFINITIONS:**

>	Greater than
<	Less than
≥	Greater than or equal to
≤	Less than or equal to
%	Percent
µg/m <sup>3</sup>	Micrograms per cubic meter
AERMOD	AMS/EPA Regulatory Model
AMU	Air Monitoring Unit
AQD	Air Quality Division
AQS	Air Quality System (EPA air monitoring data archive)
ARM	Approved regional method
CAA	Clean Air Act
CASTNET	Clean Air Status and Trends Network
CBSA	Core-Based Statistical Area
CFR	Code of Federal Regulations
CO	Carbon monoxide
CSA	Consolidated Statistical Area
DNPH	2,4 -di nitrophenyl hydrazine – this is the derivatizing agent on the cartridges used to collect carbonyl samples
DPW	Department of Public Works
EC	Elemental carbon
EPA	U.S. Environmental Protection Agency
FDMS	Filter Dynamic Measurement System
FEM	Federal Equivalent Method
FIA	Family Independence Agency
FRM	Federal Reference Method
GC	Gas chromatograph (instrument providing VOC measurements)
GFI	Ground fault circuit interrupters
hr	Hour
IN-MI	Indiana-Michigan
LADCO	Lake Michigan Air Directors Consortium
DNRE	Michigan Department of Natural Resources and Environment
MITAMP	Michigan Toxics Air Monitoring Program
MSA	Metropolitan Statistical Area
NAAQS	National Ambient Air Quality Standard
NAMS	National Air Monitoring Station
NATTS	National Air Toxics Trend Sites
NCore	National Core Monitoring Sites
NEI	National Emission Inventory
NO <sub>2</sub>	Nitrogen dioxide
NO <sub>x</sub>	Oxides of Nitrogen
NO <sub>y</sub>	Oxides of nitrogen + nitric acid + organic and inorganic nitrates
NPAP	National Performance Audit Program
OAQPS	Office of Air Quality and Planning and Standards (EPA)
OC	Organic carbon
OTAQ	Office of Transportation and Air Quality (EPA)
PAH	Polynuclear Aromatic Hydrocarbon
PAMS	Photochemical Assessment Monitoring Station

**APPENDIX A: ACRONYMS AND THEIR DEFINITIONS, CONTINUED**

PEP	Performance Evaluation Program
PM	Particulate matter
PM <sub>2.5</sub>	Particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
PM <sub>10</sub>	Particulate matter with a diameter of 10 microns or less
PM <sub>10-2.5</sub>	Coarse PM equal to the concentration difference between PM <sub>10</sub> and PM <sub>2.5</sub>
ppb	parts per billion
ppm	parts per million = mg/kg, mg/L, µg/g (1 ppm = 1,000 ppb)
QA	Quality assurance
QAPP	Quality Assurance Project Plan
RTI	Research Triangle Institute (national contract laboratory for speciated PM <sub>2.5</sub> )
SLAMS	State and Local Air Monitoring Station
SO <sub>2</sub>	Sulfur dioxide
STAG	State Air Grant (federal)
STN	Speciation Trend Network (PM <sub>2.5</sub> )
TEOM	Tapered element oscillating microbalance (hourly PM <sub>2.5</sub> measurement monitor)
tpy	ton per year
TRI	Toxic Release Inventory
TSP	Total Suspended Particulate
U of M	University of Michigan
U.S.	United States
VOC	Volatile organic compounds