RICK SNYDER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

DAN WYANT
DIRECTOR

JUL 07 2015

June 29, 2015

Mr. Michael Compher
U.S. Environmental Protection Agency
Region 5
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

Dear Mr. Compher: Michael

The grant process requires states to submit an annual description of the ambient air monitoring network after it has undergone a 30-day public comment period. The Michigan Department of Environmental Quality (MDEQ) has just completed its review process and is submitting this review to comply with the United States Environmental Protection Agency (USEPA).

During the 30-day public comment period, the MDEQ received two comments, which are addressed in the network review. The final version of Michigan's Network Review is enclosed and has also been posted on the Internet for public review.

If you have any questions, need additional information, or wish to discuss regional approval of the proposed monitoring activities, please contact me at 517-284-6758.

Sincerely,

Amy E. Robinson

Amy Robinson
Air Monitoring Unit
Air Quality Division

Enclosure
cc: Mr. Scott Hamilton, USEPA
Ms. Lynn Fiedler, MDEQ
Ms. Susan Kilmer, MDEQ
Mr. Craig Fitzner, MDEQ
Mr. Daniel Ling, MDEQ
Ms. Tammy Eaton, MDEQ

Michigan's 2016 Ambient Air Monitoring Network Review

Michigan Department of Environmental Quality
Air Quality Division
Draft May 18, 2015

Cover picture courtesy of Rebbecca Radulski, Gaylord Alpenfest, Gaylord, Michigan.

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Introduction:

The purpose of this document is to examine Michigan's ambient air monitoring network in operation during 2015 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 2016 calendar year, contingent upon adequate levels of funding.

Federal Changes

There have been a number of changes at the federal level that have impacted the design of Michigan's monitoring network. These changes include revisions to the National Ambient Air Quality Standard (NAAQS) for Particulate Matter (PM), Pb, NO_2, SO_2, CO and secondary NAAQS for NO_2 and SO_2. In addition, the review of the ozone NAAQS is ongoing.

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 ($\mu g/m^3$) to 0.15 $\mu g/m^3$, as a three-month rolling average.

On February 9, 2010, the EPA changed the NO_2 NAAQS and required the deployment of a two-tiered NO_2 monitoring network consisting of near-roadway and community monitors. Design of the new NO_2 monitoring network is discussed in this network review. These NO_2 monitors had a deployment deadline of January 1, 2013.

On November 16, 2009, the EPA proposed to modify the SO_2 NAAQS and proposed the creation of a two-tier monitoring network based on SO_2 emissions, requiring a total of 12 SO_2 stations in Michigan. The SO_2 NAAQS became final on August 23, 2010. The network design was modified to a single tier requiring a total of five SO_2 monitors in Michigan. Changes to the SO_2 monitoring network are discussed in this network review. Changes to the SO_2 network were required to be implemented before January 1, 2013.

On August 13, 2011, the EPA proposed to retain the CO NAAQS level while adding additional monitoring requirements. The EPA proposed that CO monitors be added to the near-roadway sites. These CO monitors had a deployment deadline of January 1, 2014.

A secondary NAAQS for NO_2 and SO_2 was proposed on February 12, 2010 and the final rule was effective June 4, 2012. The EPA chose to retain the standards while adding additional monitoring requirements.

On January 15, 2013 the PM NAAQS was revised and the EPA lowered the $PM_{2.5}$ annual average to 12.0 $\mu g/m^3$.

Recommendations for Michigan's Air Monitoring Network in 2016

The following changes will be made to Michigan's ambient air monitoring network during 2016. If funding cuts occur, additional changes to the network may have to be implemented.

After January 1, 2016 the MDEQ is planning to remove the following parameters:

1. Lead at Allen Park (261630001)
2. Lead at Grand Rapids (260810020)

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, the DEQ Calendar issued on May 18, 2015 announced that 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 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 are not accepted) and should be sent to:

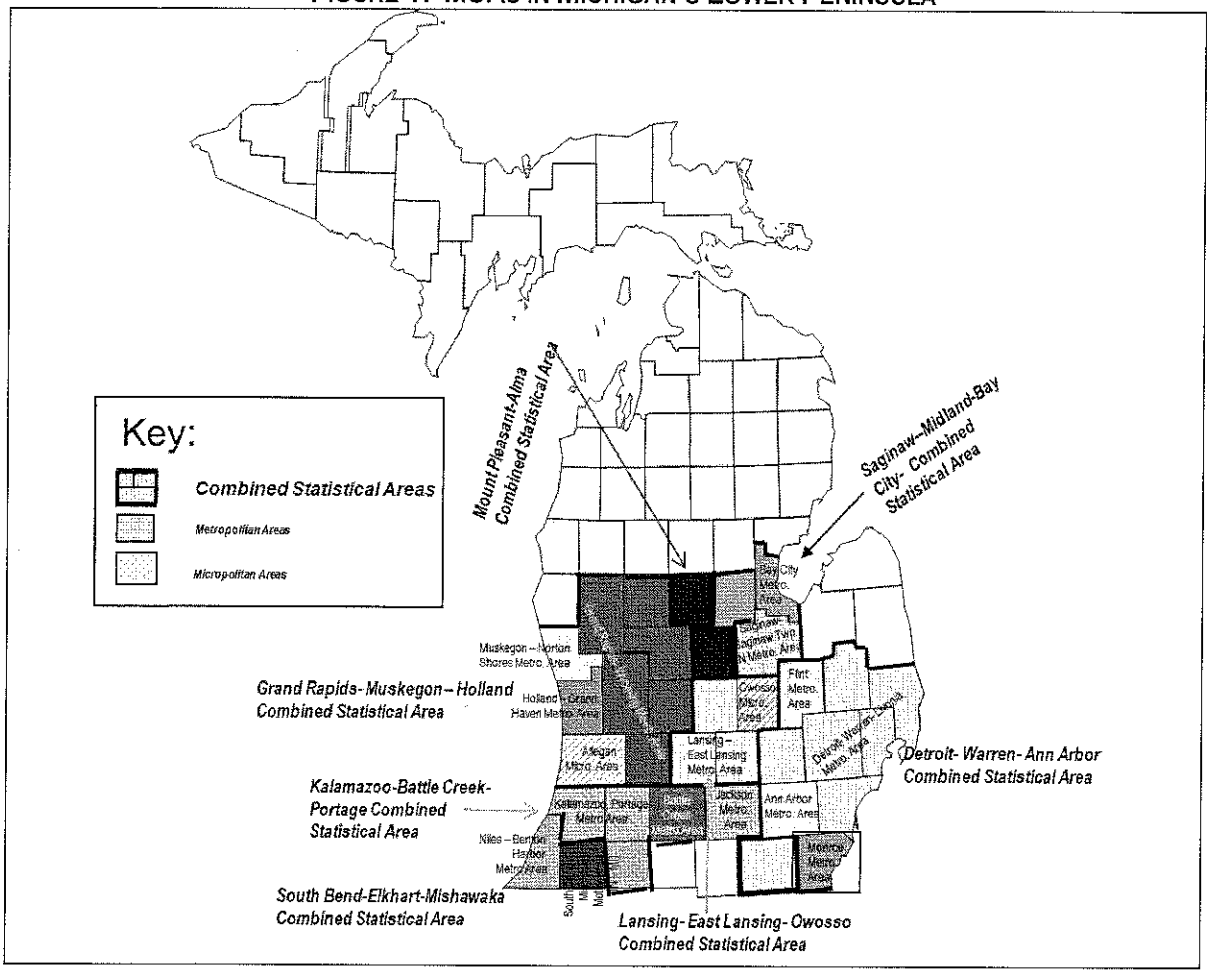
Ms. Amy Robinson
MDEQ – Air Quality Division
P.O. Box 30260
Lansing, MI 48909-7760
robinsona1@michigan.gov

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, 517-284-6743, fitznerc@michigan.gov.

Ambient Air Monitoring Network Requirements:

The minimum network design criteria for ozone, $PM_{2.5}$ (particulate matter with an aerodynamic diameter less than or equal to [≤] 2.5 micrometers) and PM_{10} (≤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 are shown in **Figure 1**.

FIGURE 1: MSAS IN MICHIGAN'S LOWER PENINSULA



To be classified as an MSA, an area must have an urban core population totaling at least 50,000 people in the most recent decennial census. Micropolitan statistical areas contain an urban core of at least 10,000 (but less than 50,000). MSAs that consist of one or more counties, have a sizeable urban cluster or 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**. 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. Changes to the metropolitan and micropolitian areas as a result of the 2010 Census were released in 2013. The areas that will be

affected include Midland, Hillsdale, Three Rivers, Ludington, and Whitehall. However, the remainder of MSAs in the state were unaffected by the 2010 census.

The specific counties that make up each MSA or micropolitan area in Michigan are listed in **Table 1**.[1] These geographical areas, coupled with their population totals and historical ambient monitoring data, were used to develop the minimum monitoring network design for ozone, $PM_{2.5}$, and PM_{10}. **Table 1** shows the 2010 population totals.

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, Montcalm, 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	
Midland	83,629	Midland	Midland	
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 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**.

[1] 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 2: COMPOSITION OF MICROPOLITAN STATISTICAL AREAS IN MICHIGAN

MICROPOLITAN AREA	URBAN CORE	MICROPOLITAN AREA POP[2]	COUNTIES
Traverse City	Traverse City Urban Cluster	143,372	Grand Traverse, Benzie[3], Kalkaska[3], Leelanau[3]
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
Owosso	Owosso Urban Cluster	69,232	Shiawassee
Marquette	Marquette Urban Cluster	67,077	Marquette
Ionia	Ionia Urban Cluster	63,941	Ionia
Sturgis	Sturgis Urban Cluster	61,295	St. Joseph
Cadillac	Cadillac Urban Cluster	47,584	Wexford, Missaukee[3]
Hillsdale	Hillsdale Urban Cluster	46,229	Hillsdale
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[3]
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
Ludington	Ludington Urban Cluster	28,680	Mason
Marinette	Marinette WI Menominee	24,029	Menominee

Other Monitoring Network Requirements

National Core (NCore) sites provide a full suite of measurements at one location. NCore stations collect the following measurements: ozone, SO_2 (trace), CO (trace), NO_Y, $PM_{2.5}$ FRM, continuous $PM_{2.5}$, speciated $PM_{2.5}$, wind speed, wind direction, relative humidity, and ambient temperature. In addition, filter-based measurements are required for PM coarse ($PM_{10-2.5}$) on a once every three day sampling frequency. A minimum of ten NCore sites nationwide measure lead. 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.

[2] 2010 census data
[3] Outlying Micropolitan County

Network Review Requirements

According to 40 CFR 58.10, 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,"[4]
- 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 previously identified,
- 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 $PM_{2.5}$ 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, and;
- 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 basis whenever possible.

[4] "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 2015. 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.

TABLE 3: MONITOR DISTRIBUTION THROUGHOUT THE 2015 NETWORK IN MICHIGAN

Site Name	AQS ID	O_3	$PM_{2.5}$	$PM_{2.5}$ TEOM	Speciation	PM_{10}	PM Coarse	CO	trace CO	NO_2	NOy	SO_2	trace SO2	Metals (TSP)	VOCs	Carbonyls	PAHs	Meteorological	Building/Trailer
Holland	260050003	x	x															x	T
Bay City	260170014		x	x														x	T
Benzonia (Frankfort)	260190003	x																	T
Coloma	260210014	x	x															x	T
Cassopolis	260270003	x																x	B
Sault Ste. Marie +	260330901	x	x	x[b]														x	
Rose Lake	260370001	x																	B
Flint	260490021	x	x	x														x	T
Otisville	260492001	x																x	T
Harbor Beach	260630007	x																x	T
Belding - Reed St	260670002													Pb & 4				x	B
Belding - Merrick St	260670003													Pb & 4					
Lansing	260650012	x	x	x						x		x						x	T
Kalamazoo	260770008	x	x	x														x	T
Gr.Rapids-Wealthy St	260810007		x																
Gr.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													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	T
Sterling State Park	261150006		x									x						x	T
Muskegon-Green Ck Rd	261210039	x																x	T
Oak Park	261250001	x	x															x	T
Pontiac	261250011																	x	
Rochester	261250012																	x	
Jenison	261390005	x																x	T
West Olive	261390011											x						x	T
Port Huron	261470005	x	x	x								x						x	T
Port Huron Rural St	261470031													Pb & 4					
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					x								4		x		x	T
Fort St (SW HS)-Detroit	261630015		x		x	x						x		4	x	x		x	B
Linwood	261630016		x																B
E. 7 Mile - Detroit	261630019	x	x							x								x	B
Livonia	261630025		x																
Livonia Near Road	261630095		x					x		x								x	T
Joy Rd - Detroit	261630026																	x	
S Delray/ Jefferson	261630027													4					T
Dearborn	261630033		x	x	x	x								x	x	x	x	x	B
Wyandotte	261630036		x																
FIA/Ambassador Bridge	261630039		x	x														x	T
Eliza Howell #1	261630093							x		x								x	T
Eliza Howell #2	261630094							x		x								x	T
	Total	27	26	14	5	5	2	3	2	6	2	5	2	9	2	3	1	39	

+ = Tribal monitor

b = BAM Unit

4 = Metals 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), that covers the operation of the ambient air network. The QAPP addresses criteria pollutants, air toxics, metals, and particulates including the EPA $PM_{2.5}$ Speciation Trends Network (STN). Separate QAPPs exist for the National Air Toxics Trend Site (NATTS) and National Core Monitoring sites (NCore). Special purpose monitoring projects also have dedicated QAPPs. 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, 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 ($PM_{2.5}$ FRM, continuous $PM_{2.5}$ TEOM, BAM, $PM_{2.5}$ Speciation, High Volume TSP [total suspended particulate], and PM_{10}) and the gaseous monitors (CO, SO_2, ozone, and NO_2) at least once a year. All audit results are reported to AQS quarterly. The toxics monitors (volatile organic compounds [VOCs], carbonyl compounds, and poly-aromatic hydrocarbons [PAH]) are also audited once a year and the aethalometers are audited every six months 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 $PM_{2.5}$ 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 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 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[5]. On January 5, 2015, the EPA proposed to retain the current standard. 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.

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. In the proposed monitoring regulations of 2015, the EPA has proposed to remove lead monitoring at NCore sites, provided the sites are attaining the standard.

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^3 to 0.15 ug/m^3 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^3.

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. In 2010, the new per ton threshold was reduced to 0.5 ton/year.

The NAAQS retained the TSP size fraction of lead, but acknowledged that agencies may, under certain conditions, measure lead as PM_{10} 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 lead sampling be conducted on a once every six day schedule. These filters are analyzed by the MDEQ laboratory using ICP/MS.

Point Source-oriented Monitoring

For 2016, there are no new facilities that need to be investigated with regards to the lead NAAQS requirements. However, there are some issues that need to be discussed. First, the MDEQ is in the process of petitioning for attainment status for the lead nonattainment area in Belding, Michigan. The Reed St. monitor (260670002) demonstrated attainment in September 2014. When the area is reclassified, the MDEQ would like to shut down one of the two existing monitors. Once the area is reclassified as attainment, the MDEQ will perform an analysis to

[5] "Environmental Protection Agency National Ambient Air Quality Standards for Lead; Final Rule." 40 CFR parts 50, 51, 53 and 58, November 12, 2008.

determine which monitor in Belding to shutdown. The MDEQ will share this analysis with the EPA Region 5 in an upcoming annual network review before shutting down the monitor.

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. The EPA has now reversed this with the 2015 proposed monitoring regulation changes. If this regulation becomes final by the end of 2015, lead monitoring at MDEQ's NCore sites will be shutdown.

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 4** 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. In addition, the MDEQ expects lead impacts in Belding to decrease significantly due to adopted abatement strategies. For these reasons, the MDEQ seeks a waiver from the co-location requirement at Belding from the 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_{10} 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_{10} sampler under certain instances. However, the MDEQ opted to collect co-located lead measurements as both TSP and PM_{10} at the Dearborn site to continue generating trend data, promote comparability with other NATTS sites in the nation and to determine precision for both size fractions. In addition, a Met One SASS monitor supports the measurement of lead as $PM_{2.5}$, 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 would fulfill the 15% co-location requirement for the lead network.

TABLE 4: DEPLOYMENT SCHEDULE FOR LEAD SITES AND CALCULATION OF THE TOTAL NUMBER OF CO-LOCATED LEAD SITES

Site Name & ID	Site Purpose	2013	2013	2014	2015	2016
Dearborn (261630033)	NATTS; co-located site	operational	operational	operational	operational	operational
Grand Rapids-Monroe St. (260810020)	NCore Non-Source- oriented	operational	operational	operational	operational	proposed to discontinue*
Allen Park (261630001)	NCore Non-Source- oriented	operational	operational	operational	operational	proposed to discontinue*
Belding (260670003)	Source-oriented	operational	operational	operational	operational	operational
Belding-Reed St (260670002)	Source-oriented	operational	operational	operational	operational	operational
Vassar (261570001)	Source-oriented	operational	operational	operational	discontinued	discontinued
E Jordan (260290011)	Source-oriented	operational	discontinued	discontinued	discontinued	discontinued
Oakland Co Airport (261250013)	Source-oriented	operational	discontinued	discontinued	discontinued	discontinued
Port Huron, Rural St. (261470031)	Source-oriented		operational	operational	operational	operational
Total No. Sites		8	7	7	6	4
No. Co-Located Sites Required		1	1	1	1	1

Table 5 summarizes the lead monitoring site information for the Michigan lead network.
Figure 2 shows monitoring site locations in the 2014 and 2015 network.
* Dependent upon the finalization of the EPA air monitoring rule.

TABLE 5: MICHIGAN'S LEAD MONITORING NETWORK

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

Point Source Oriented Sites

Monitoring Sites												
Site Name	AQS Site ID	Address	Part. Size	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Date Estab.	Facility Name	Est Emissions Tons/yr
Belding - Merrick St	260670003	509 Merrick	TSP	43.09984	-85.22163	1:6	max conc	Micro	Ionia	1/1/10	Mueller Industries	0.9 - 1.0
Port Huron	261470031	324 Rural St	TSP	42.98209	-82.449233	1:6	max conc	Micro	St. Clair	1/1/13	Mueller Industries	0.75
Belding - Reed St	260670002	545 Reed St	TSP	43.101944	-85.22000	1:6	max conc	Middle	Ionia	7/2/11	Mueller Industries	0.9 - 1.0

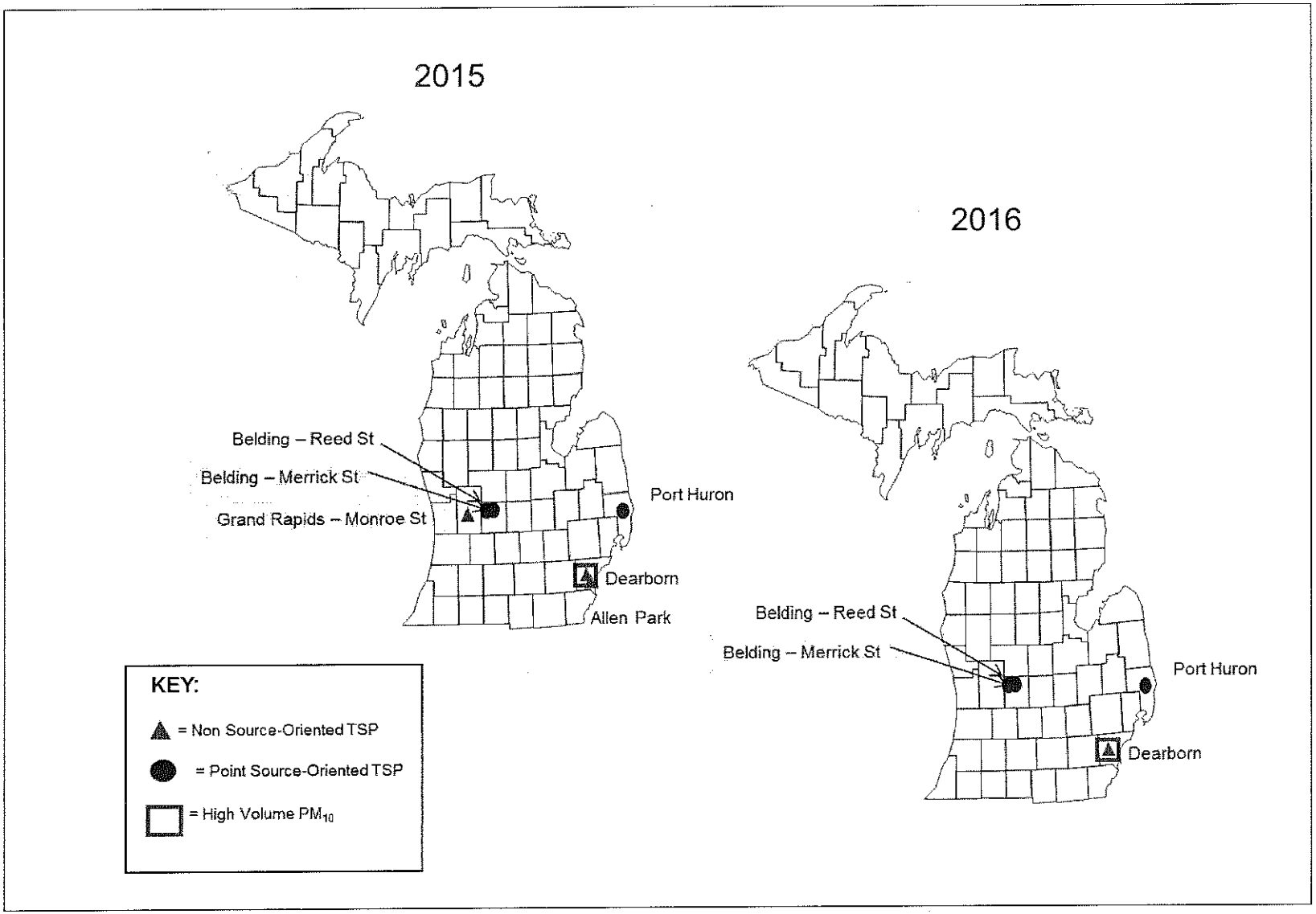
Area Source Oriented Sites

Monitoring Sites												
Site Name	AQS Site ID	Address	Part. Size	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Date Estab.	CBSA [1]	Pop (2010 Census)
Grand Rapids – Monroe St	260810020	1179 Monroe St., NW,	TSP	42.984167	-85.671389	1:6	pop. exp.	Neighborhood	Kent	1/8/10	GW	774,160
Allen Park	261630001	14700 Goddard	TSP	42.228611	-83.208333	1:6	pop. exp.	Neighborhood	Wayne	1/2/10	DWL	4,296,250
Dearborn	261630033	2842 Wyoming	TSP	42.306666	-83.148889	1:6	max conc	Neighborhood	Wayne	6/1/90	DWL	4,296,250
Dearborn	261630033	2842 Wyoming	TSP	42.306666	-83.148889	1:6, co-loc	max conc	Neighborhood	Wayne	6/1/90	DWL	4,296,250
Dearborn	261630033	2842 Wyoming	PM 10	42.306666	-83.148889	1:6	max conc	Neighborhood	Wayne	6/1/90	DWL	4,296,250
Dearborn	261630033	2842 Wyoming	PM 10	42.306666	-83.148889	1:6, co-loc	max conc	Neighborhood	Wayne	6/1/90	DWL	4,296,250

[1] **CBSA Key:**

DWL = Detroit-Warren-Livonia Core Based Statistical Area
GW = Grand Rapids-Wyoming Core Based Statistical Area

FIGURE 2: MICHIGAN'S LEAD MONITORING NETWORK



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. These waivers were renewed again in July 2014. 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 2019.

Lead Quality Assurance (QA)

The site operator conducts a precision flow check each month. The flow check values are sent to the QA coordinator 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 program that is administered by the EPA. External lead PEP audits are conducted annually by the EPA. For this audit, the EPA 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. A co-located lead filter is sent to the EPA Region 9 lab once per quarter to assess laboratory precision.

Plans for the 2016 Lead Monitoring Network

In 2016, the MDEQ is planning to continue to collect high volume TSP lead measurements 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_{10} lead at the Dearborn (261630033) NATTS site during 2016.

In 2016, the MDEQ is planning to continue lead source oriented measurements at:

- Belding–Reed St. (260670002) TSP lead monitoring
- Port Huron (261470031) TSP lead monitoring
- Belding–Merrick St. (260670003) TSP lead monitoring

In 2016, depending on the finalization of the EPA's air monitoring rule, the MDEQ is planning to discontinue collecting lead measurements using high volume TSP samplers at the NCore sites in:

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

NCore Monitoring Network:

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).

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 in Michigan.

Whether urban or rural, the *Federal Register*[6] specifies the minimum parameters that each NCore site must measure:

- Continuous $PM_{2.5}$
- 24-hr $PM_{2.5}$
- Speciated $PM_{2.5}$
- $PM_{10-2.5}$
- Ozone
- SO_2
- CO
- NO/NO_Y
- Wind speed
- Wind direction
- Relative humidity
- Outdoor temperature
- Lead (2015 proposal to discontinue)

Michigan NCore Sites

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

Tables 6 and **7** list the parameters measured at Grand Rapids-Monroe St. (260810020) and Allen Park (261630001), respectively. Start dates are also shown.

[6] "Environmental Protection Agency National Ambient Air Quality Standards for Lead; Final Rule." 40 CFR Parts 50, 51, 53 and 58, November 12, 2008.

The speciation samplers at the MDEQ NCore stations sample on a once every three day sampling schedule to meet the NCore monitoring requirements.

Low volume PM_{10} was added to the Grand Rapids–Monroe St. (260810020) site on January 14, 2010 and was added to the Allen Park (261630001) 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 8**. A map showing the locations of NCore sites is displayed in **Figure 3**.

NCore Quality Assurance

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

Plans for 2016 NCore Monitoring Network

In 2016, 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)
- Lead monitoring will be discontinued at both sites, provided the 2015 proposed monitoring regulations are finalized.

TABLE 6: MEASUREMENTS COLLECTED AT THE GRAND RAPIDS - MONROE ST. (260810020) NCORE SITE

PARAMETER	DESIGNATION	SPATIAL SCALE	SAMPLING FREQUENCY	INSTRUMENT TYPE	METHOD	EXISTING MONITOR START UP DATE	NEW MONITOR ANTICIPATED START UP DATE	COMMENTS
$PM_{2.5}$ continuous	NCore/AQI	Neighborhood	Continuous	R & P TEOM 1400 a	tapered element oscillating microbalance	11/4/99	---	***DOES NOT meet FEM or ARM requirements***
$PM_{2.5}$ FRM mass	NCore	Neighborhood	1:3 days	R & P Partisol plus 2025	manual collection, gravimetric analysis	10/23/98	---	---
$PM_{2.5}$ 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_2	NCore/AQI	Neighborhood	Continuous	API 100 eu/ TECO 43i	UV fluorescence	4/1/08	---	probe height 5 m
NO_y	NCore/AQI	Neighborhood	Continuous	TECO 42C	chemiluminescece	4/1/08	---	external converter installed at 10 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	---	Proposed to discontinue in 2015
$PM_{10-2.5}$ mass	NCore	Neighborhood	1:3 days	R & P Partisol plus 2025	manual collection, gravimetric analysis	7/16/10	---	---
$PM_{10-2.5}$ Continuous	---	---	---	---	---	---	---	Not planned
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	R. M. Young Prop. Anemom. & vane	calculation	1/16/01	---	Optional
Barometric Pressure	SLAMS	---	Continuous	R. M. Young	electronic pressure sensor	7/15/93	---	Optional
PM_{10} Hi-vol	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 7: MEASUREMENTS COLLECTED AT THE ALLEN PARK (261630001) NCORE SITE

PARAMETER	DESIGNATION	SPATIAL SCALE	SAMPLING FREQUENCY	INSTRUMENT TYPE	METHOD	EXISTING MONITOR START UP DATE	NEW MONITOR ANTICIPATED START UP DATE	COMMENTS
$PM_{2.5}$ continuous	NCore/AQI	Neighborhood	Continuous	R & P TEOM 1400 a	tapered element oscillating microbalance	2/1/01	---	***DOES NOT meet FEM or ARM requirements***
$PM_{2.5}$ FRM mass	NCore	Neighborhood	1:1 day	R & P Partisol plus 2025	manual collection, gravimetric analysis	5/12/99	---	---
$PM_{2.5}$ 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_2	NCore/AQI	Neighborhood	Continuous	API 100 eu / TECO 43 i as	UV fluorescence	4/1/08	---	4 m probe ht
NO_y	NCore/AQI	Neighborhood	Continuous	TECO 42C	chemiluminescece	4/1/08	---	external converter installed at 10 m
Ozone	NCore/AQI was NAMS	Neighborhood	Continuous	API 400 E	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	---	Proposed to discontinue in 2015
$PM_{10-2.5}$ mass	NCore	Neighborhood	1:3 days	R & P Partisol plus 2025	manual collection, gravimetric analysis	7/16/10	---	---
$PM_{10-2.5}$ Continuous	---	---	---	---	---	---	---	Not planned
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	R. M. Young Prop. Anemom. & vane	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 AE21	optical absorption	12/19/03	---	Not Req by NCore
PM_{10} 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.

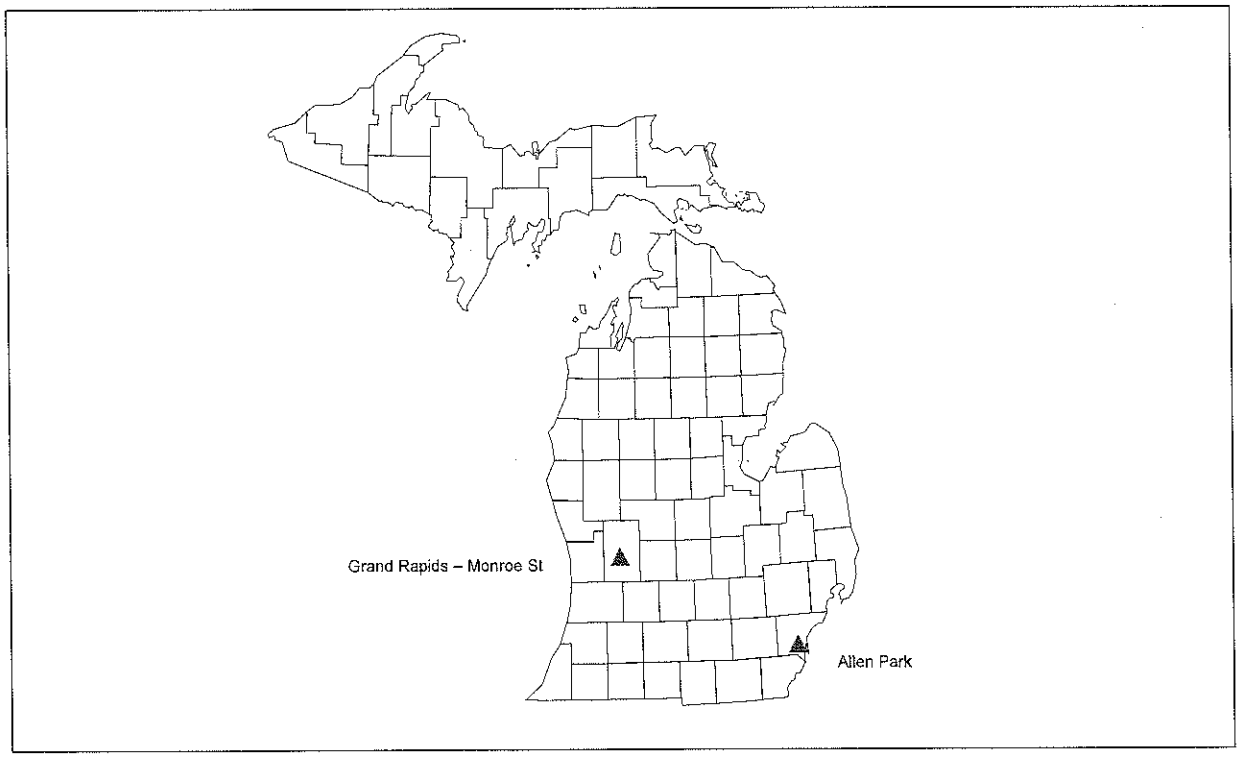
TABLE 8: MICHIGAN'S NCORE MONITORING NETWORK

Monitoring Sites										
Site Name	AQS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Date Estab.	CBSA[1]	Pop (2010 Census)
Grand Rapids - Monroe St	260810020	1179 Monroe St., NW.	42.98417	-85.6714	Pop. Exp.	Neighborhoo	Kent	1/1/10	GW	774,160
Allen Park	261630001	14700 Goddard	42.22861	-83.2083	Pop. Exp.	Neighborhoo	Wayne	1/1/10	DWL	4,296,250

[1] CBSA Key:

DWL = Detroit-Warren-Livonia Core Based Statistical Area
GW = Grand Rapids-Wyoming Core Based Statistical Area

FIGURE 3: MICHIGAN'S NCORE 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 ≥ 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.[7] Note: background and transport ozone monitors are still required, but are not shown in **Table 9**.

TABLE 9: SLAMS MINIMUM OZONE MONITORING REQUIREMENTS

MSA POPULATION[1,2]	MOST RECENT THREE-YEAR DESIGN VALUE CONCENTRATIONS ≥ 85% OF ANY OZONE NAAQS[3]	MOST RECENT THREE-YEAR DESIGN VALUE CONCENTRATIONS < 85% OF ANY OZONE NAAQS[3,4]
> 10 million	4	2
4 - 10 million	3	1
350,000 - < 4 million	2	1
50,000 - < 350,000[5]	1	0

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

Applying the requirements described in **Table 9** to Michigan's MSAs, population totals and the most recent 3-year design values results in a minimum ozone network design summarized in **Table 10**[8]. All monitors in Michigan are within 85% of the ozone NAAQS of 0.075 ppm.

Figure 4 illustrates changes in the 3-year averages of the fourth highest ozone values, called design values, from 2010 to 2014. When contemplating changes to the ozone network, it is important to consider changes in 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 are discussed below.

[7] Table D-2 of Appendix D to Part 58.

[8] 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 10: Application of Minimum Ozone Requirements in the October 17, 2006 Final Revision to the Monitoring Regulation to Michigan's Ozone Network

Table 17: Application of Minimum Ozone Monitoring 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

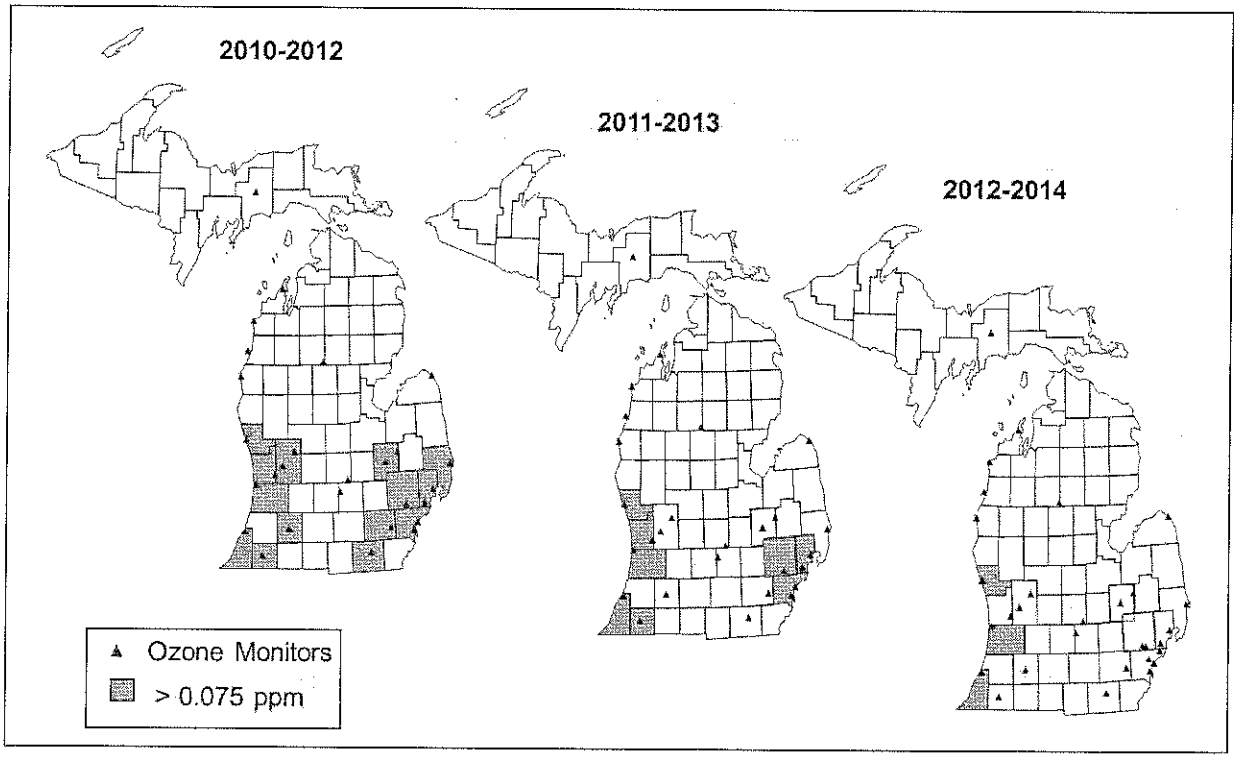
Decimals to the right of the third decimal place are truncated.

The 3-year O3 average at the MSA Design Value site is shown in bold.

Values for sites >= 85% NAAQS are in red.

CBSA	2010 Population	Counties	Existing Monitors	2012-2014 most recent 3-year O3 design value	Min No monitors Required
Detroit-Warren-Livonia Metro Area	4,296,250	Macomb	New Haven	0.074	3
			Warren	0.072	
		Oakland	Oak Park	0.071	
		Wayne	Allen Park	0.068	
			Detroit - E 7 Mile	0.074	
		Lapeer	---		
		St Clair	Port Huron	0.074	
		Livingston	---		
Flint Metro Area	425,790	Genesee	Flint	0.072	2
			Otisville	0.072	
Monroe Metro Area	152,021	Monroe	---		
Ann Arbor Metro Area	344,791	Washtenaw	Ypsilanti	0.073	1
Grand Rapids-Wyoming Metro Area	774,160	Kent	Grand Rapids - Monroe St	0.071	2
			Evans	0.070	
		Barry	---		
		Newaygo	---		
		Ionia	---		
Holland-Grand Haven Metro Area	263,801	Ottawa	Jenison	0.075	1
Muskegon-Norton Shores Metro Area	172,188	Muskegon	Muskegon - Green Creek Rd	0.079	1
Lansing-East Lansing Metro Area	464,036	Clinton	Rose Lake	0.069	2
		Ingham	Lansing	0.070	
		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	0.073	1
		Van Buren	---		
Niles-Benton Harbor Metro Area	156,813	Berrien	Coloma	0.079	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	0.073	1
Other areas:	Comments				
	transport site	Lenawee	Tecumseh	0.073	
		Benzie	Frankfort	0.073	
		Huron	Harbor Beach	0.071	
		Allegan	Holland	0.063	
	background site	Missaukee	Houghton lake	0.070	
		Mason	Scottville	0.074	
		Schoolcraft	Seney	0.073	
	tribal site	Manistee	Manistee	0.072	
		Chippewa	Sault Ste. Marie	0.065	

FIGURE 4: COMPARISON OF 4TH HIGHEST 8-HOUR OZONE VALUES AVERAGED OVER THREE YEARS 2010-2012, 2011-2013 AND 2012-2014



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. The 2012-2014 data shows Detroit-E 7 Mile to be the design value site, however New Haven and Port Huron (261470005) have equal three-year averages. 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. 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. The Oak Park (261250001) and Port Huron (261470005) monitors are the only ozone sites in Oakland and St. Clair Counties, respectively. All monitors in Southeast Michigan are meeting the current ozone standard.

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 although it 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; they 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. They consist of the urban center city site in Grand Rapids on Monroe St. (260810020) and the downwind site at Evans (260810022).

Two monitors are required in the Lansing-East Lansing MSA consisting 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. Coloma (260210014) and Muskegon-Green Creek Rd. (261210039) are violating the 0.075 ppm 8-hour ozone NAAQS.

The ozone monitor in Holland (260050003) is in Allegan County and is violating the 0.075 ppm 8-hour ozone NAAQS. This site continually measures the highest ozone values in the state and had historically been the highest in the region.

The Lake Michigan Air Directors Consortium (LADCO) created the map shown in **Figure 5** comparing ozone concentrations across the region.

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 eight 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.

To the best of our knowledge, the tribal ozone sites in Manistee (261010922) and in Sault Ste Marie (260330901) will continue to operate.

FIGURE 5: OZONE DESIGN VALUES 2012 – 2014[9]

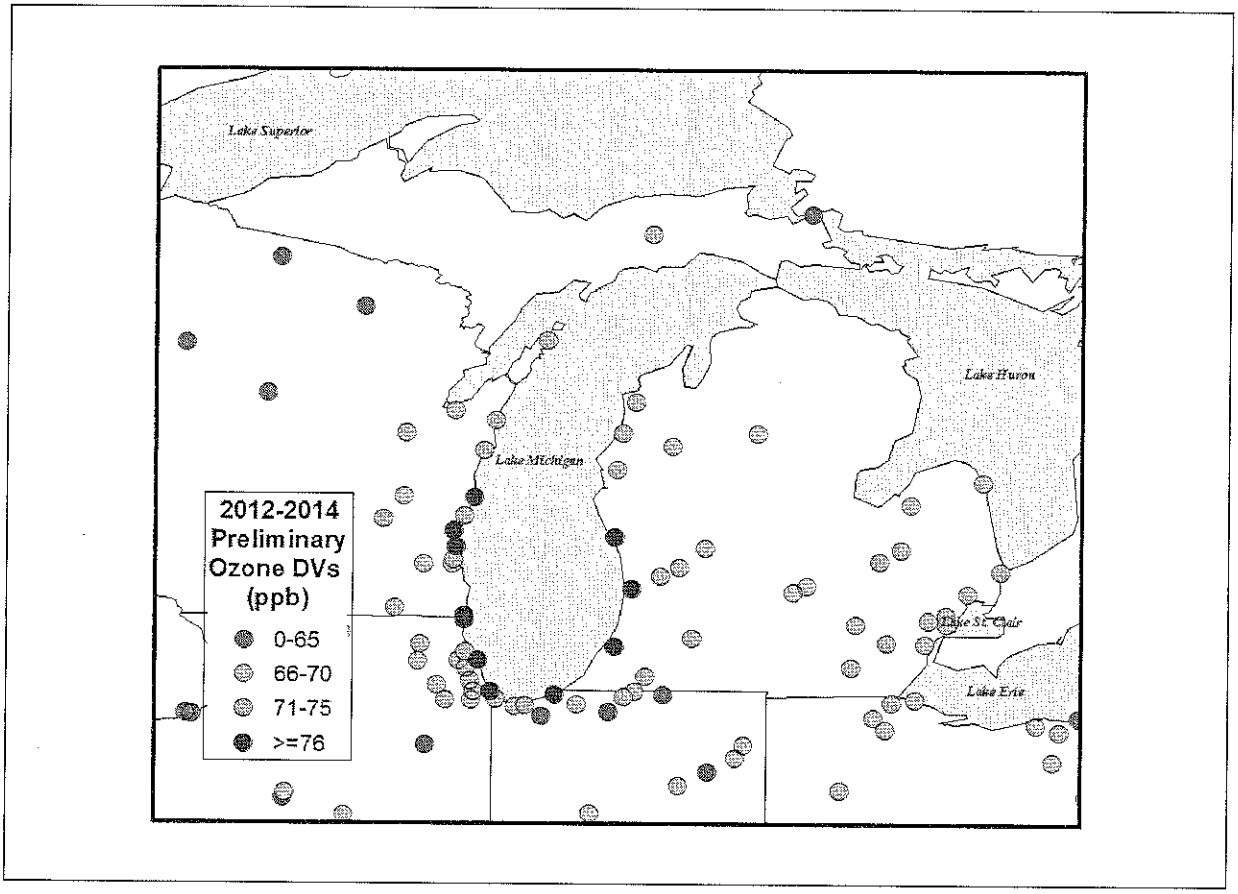


Table 11 summarizes the ozone monitoring site information for sites that were in existence in 2015 and are planned to be operational in 2016. **Figure 6** illustrates the geographical distribution of this network.

[9] Map provided by D. Kenski, Lake Michigan Air Directors Consortium

TABLE 11: MICHIGAN'S OZONE MONITORING NETWORK

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

Former NAMS sites are shown in bold.

SLAMS Stations

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Start Date	CBSA [1]	Pop (2010 Census)
Rose Lake	**260370001**	**8562 E Stoll Rd**	42.7983	-84.39389	**max conc**	**urban**	**Clinton**	**6/7/79**	**LEL**	**464,036**
Flint	**260490021**	**Whaley Park, 3610 Iowa**	43.0472	-83.67028	**pop exp**	**nghbrhd**	**Genesee**	**6/16/92**	**F**	**425,790**
Otisville	**260492001**	**G-11107 Washburn Rd**	43.1683	-83.46167	max conc	urban	Genesee	5/13/80	F	425,790
Lansing	**260650012**	**220 N Pennsylvania**	42.7386	-84.53472	**pop exp**	**nghbrhd**	**Ingham**	**9/5/80**	**LEL**	**464,036**
GR - Monroe St	***260810020***	***1179 Monroe NW***	*42.9842*	*-85.6714*	***pop exp***	***nghbrhd***	***Kent***	***4/24/80***	***GW***	***774,160***
Warren	**260991003**	**29900 Hoover**	42.5133	-83.00611	**max conc**	**urban**	**Macomb**	**1/1/77**	**DWL**	**4,296,250**
Holland	260050003	966 W 32nd St	42.7678	-86.14861	max conc	urban	Allegan	8/25/92	A	111,408
Frankfort / Benzonia	260190003	West St., Benzonia Twp.	44.61894	-86.19944	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	5/18/91	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	42.2761	-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	8792 Raisin Center Highway	41.9956	-83.94667	up wind backgrd	regional	Lenawee	7/8/53	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	4/1/98	Not in CBSA	N/A
Scottville	261050007	525 W US 10	43.9533	-86.29444	max conc	regional	Mason	4/1/98	Not in CBSA	N/A
Muskegon - Green Ck	261210039	1340 Green Creek Road	43.2761	-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	urban	Ottawa	4/1/89	HGH	263,801
Port Huron	261470005	2525 Dove Rd	42.9533	-82.45639	pop exp	urban	Saint Clair	2/28/81	DWL	4,296,250
Seney	261530001	Seney Wildlife Refuge, HCR 2 Box 1	46.2689	-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
Allen Park	*261630001*	*14700 Goddard*	*42.2286*	*-83.2083*	*pop exp*	*nghbrhd*	*Wayne*	*1/1/80*	*DWL*	*4,296,250*
Detroit - E 7 Mile	261630019	11600 East Seven Mile Road	42.4308	-83.00028	max conc	urban	Wayne	4/11/77	DWL	4,296,250

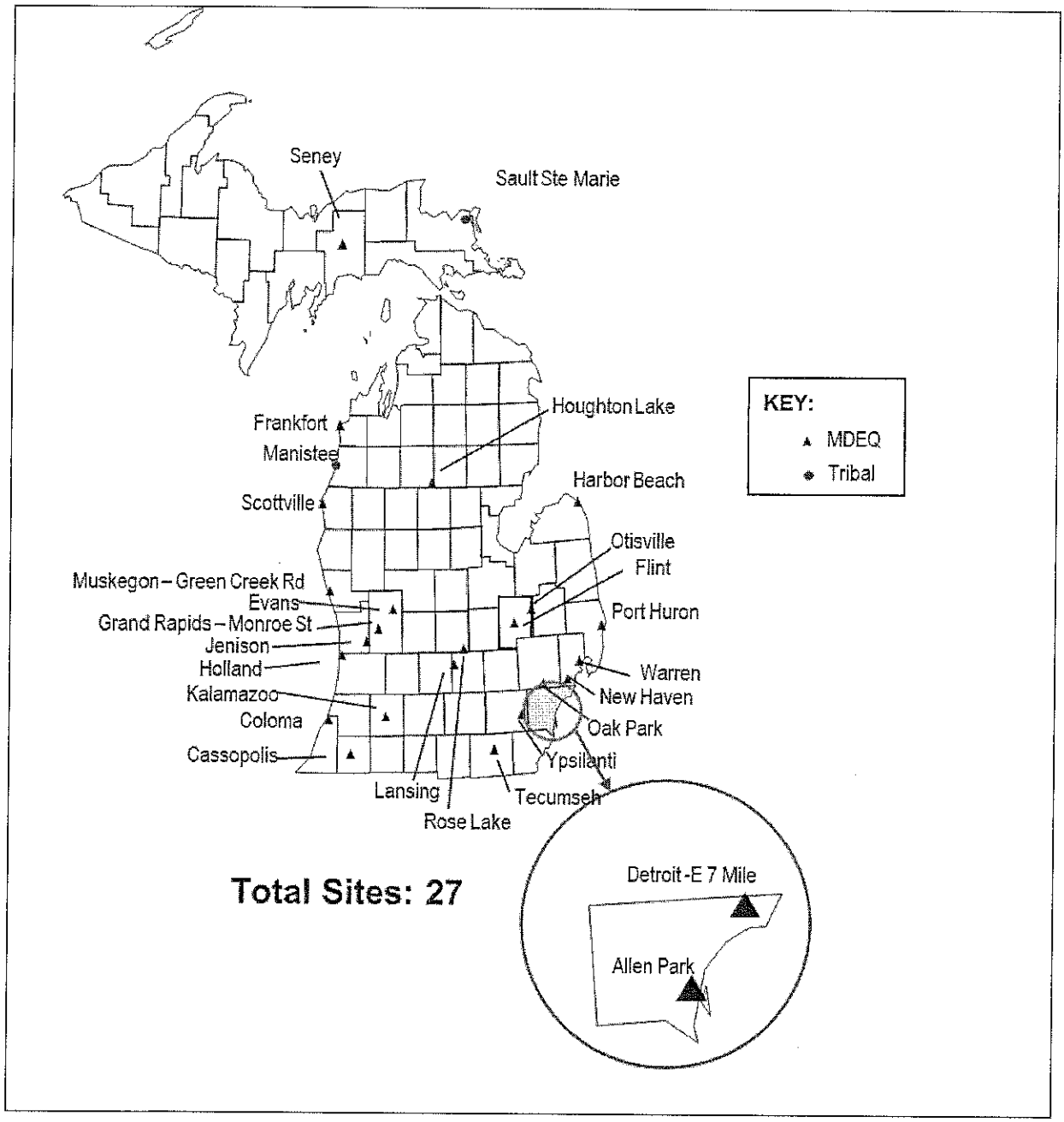
Tribal Stations

Site Name	Monitoring Sites AIRS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Start Date	CBSA [1]	Pop (2010 Census)
Manistee	261010922	3031 Domres Rd	44.307	-86.24268	transport	regional	Manistee	4/1/06	Not in CBSA	N/A
Sault Ste. Marie	266330901	850 W Easterday Ave	46.4936	-84.3641	transport	nghbrhd	Chippewa	1/1/12	Not in CBSA	N/A

[1] 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 6: MICHIGAN'S OZONE NETWORK



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. While there were no changes to Michigan's ozone season, which extends from April 1 through September 30, the new ozone NAAQS proposal extends the ozone season in Michigan from March 1 through October 31. When the new NAAQs is finalized the MDEQ will adjust the length of the ozone season in Michigan.

With the new 1-hour NO_2 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_2 background levels, as well as year around ozone values, are necessary. Specifically, modeling staff need five years of both ozone and NO_2 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 were not 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_2 data to support NSR modeling is discussed in the NO_2 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 QA Coordinator 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 2016 Ozone Monitoring Network

Beginning October 1, 2009, the MDEQ began collecting ozone measurements all year at the NCore sites and plans to continue through 2016:

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

To support NSR modeling projects, the MDEQ will continue to collect ozone measurements all year through 2016:

- Lansing (260650012)
- Houghton Lake (261130001) (special purpose monitor)

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 2016 ozone network; operating April 1 through September 30 or longer if the EPA extends the ozone season:

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

To the best of our knowledge, these tribal monitors will also continue to operate in 2016:

- Manistee (261050922) (tribal monitor)
- Sault Ste. Marie (260330901) (tribal monitor)

$PM_{2.5}$ FRM Monitoring Network:

The January 15, 2013 revision to the PM NAAQS lowered the $PM_{2.5}$ annual average from 15.0 $\mu g/m^3$ to 12.0 $\mu g/m^3$. All sites in Michigan are currently meeting this standard.

The October 17, 2006 changes to the monitoring regulations impacted the minimum number of $PM_{2.5}$ sites in an MSA, as shown in **Table 13**.[10] 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 states in the Midwest show a bias. Therefore, the MDEQ will avoid deploying any continuous monitors that have ARM or FEM status.

Michigan does not spatially average $PM_{2.5}$ values from multiple sites to determine attainment with the annual $PM_{2.5}$ NAAQS. Therefore, if a $PM_{2.5}$ 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.

TABLE 12: $PM_{2.5}$ MINIMUM MONITORING REQUIREMENTS

MSA POPULATION[1,2]	MOST RECENT THREE-YEAR DESIGN VALUE CONCENTRATIONS ≥ 85% OF ANY $PM_{2.5}$ NAAQS[3]	MOST RECENT THREE-YEAR DESIGN VALUE CONCENTRATIONS < 85% OF ANY $PM_{2.5}$ NAAQS[3,4]
> 1,000,000	3	2
500,000 – < 1,000,000	2	1
50,000 - ≤ 500,000[5]	1	0

[1] Minimum monitoring requirements apply to the MSA.
[2] Population based on the latest available census figures.
[3] The $PM_{2.5}$ NAAQS levels and forms are defined in 40 CFR Part 50.
[4] These minimum monitoring requirements apply in the absence of a design value.
[5] 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 $PM_{2.5}$ measurements.

Applying **Table 12** to Michigan's MSAs, population totals and most recent three-year design values results in **Table 13**. Design values that are shown in bold represent the controlling site in each MSA, which is also called the design value site.

[10] Table D-5 of Appendix D to Part 58.

TABLE 13: APPLICATION OF THE MINIMUM $PM_{2.5}$ MONITORING REQUIREMENTS IN THE OCTOBER 17, 2006 FINAL REVISION TO THE MONITORING REGULATION TO MICHIGAN'S $PM_{2.5}$ FRM NETWORK

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

annual
85% of 12 ug/m3
10.2

24-hr
85% of 35 ug /m3
30

5% of the 24-Hr NAAQS
33-37 = 5% NAAQS

The 3-year PM2.5 average at MSA Design Value site is shown in bold.

MSA	2010 Population	Counties	Existing Monitors	2012-2014 most recent 3-year PM2.5 design value (annual)	2012-2014 most recent 3-year PM2.5 design value (24-Hr)	Min No monitors Required	Comments
Detroit-Warren-Livonia Metro Area	4,296,250	Macomb	New Haven	8.6	22	3	
		Oakland	Oak Park	9.1	23		
		Wayne	Allen Park	9.9	24		daily
			Detroit-SW HS	10.7	23		
			Detroit - Linwood	9.5	23		
			Detroit - E 7 Mi	9.4	25		
			Livonia	9.3	23		
			Dearborn	11.6	26		
			Wyandotte	9.0	21		
			Detroit-FIA/Lafayette	9.7	24		daily- special study
		Lapeer	---				
		St Clair	Port Huron	9.1	22		
		Livingston	---				
Flint Metro Area	425,790	Genesee	Flint	8.1	21	0	
Monroe Metro Area	152,021	Monroe	Sterling State Park	not enough data to calculate		0	
Ann Arbor Metro Area	344,791	Washtenaw	Ypsilanti	9.2	22	0	
Grand Rapids-Wyoming Metro Area	774,160	Kent	GR - Monroe St	9.1	22	1	
			GR - Wealthy St	9.5	24		
		Barry	---				
		Newaygo	---				
		Ionia	---				
Holland-Grand Haven Metro Area	263,801	Ottawa	Jenison (closed)			0	
Muskegon-Norton Shores Metro Area	172,188	Muskegon	Muskegon - Apple St (closed)			0	
Lansing-East Lansing Metro Area	464,036	Clinton	---				
		Ingham	Lansing	8.5	21	0	
		Eaton	---				
Bay City Metro Area	107,771	Bay	Bay City	7.8	20	0	
Kalamazoo-Portage Metro Area	326,589	Kalamazoo	Kalamazoo	9.1	23	0	
		Van Buren	---				
Niles-Benton Harbor Metro Area	156,813	Berrien	Coloma	8.4	20	0	
Jackson Metro Area	160,248	Jackson	---				
Battle Creek Metro Area	136,146	Calhoun	---				
South Bend-Mishawaka Metro Area IN/MI	52,293	Cass	---				
Other areas							
		Allegan	Holland	8.3	21		*micropolitan area*
		Missaukee	Houghton Lake	5.7	16		
		Manistee	Manistee	6.6	17		
		Tecumseh	Lenawee	8.6	22		
		Sault Ste. Marie	Chippewa	6.2	15		

The reduced concentrations of $PM_{2.5}$ measured since 2010 have caused the 2012-2014 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.

Only three $PM_{2.5}$ 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 $PM_{2.5}$ samples on a once every three day schedule.

The Wyandotte site (261630036) has the lowest design values in Wayne County. The Linwood site (261630016) is also located in Wayne County between the Dearborn (261630033) and E 7 Mile (261630019) sites. The MDEQ will continue to operate these sites.

The Detroit-SWHS site (261630015) is the second highest site in the Detroit-Warren-Livonia MSA. Also, there are plans to make a second International crossing near this site. The MDEQ will continue to operate this site.

Detroit–FIA/Lafayette (261630039) was a 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. The MDEQ will continue to operate this site.

The E 7 Mile site (261630019) is near the border of Wayne and Macomb Counties. The MDEQ will continue to operate this site.

The sites at New Haven (260990009) and Oak Park (261250001) are the only sites in Macomb and Oakland Counties, respectively. The MDEQ will continue to operate these.

The Livonia site (261630025) and the Livonia Near Road site (261630095) are in western Wayne County. The MDEQ will continue to operate these sites.

Through a cooperative grant project with EPA Region 5 and the EPA's Office of Research and Development (ORD), the MDEQ deployed a special purpose $PM_{2.5}$ FRM sampler to Tecumseh (260910007) in Lenawee County on April 1, 2008. Other special measurements that were added to the Tecumseh site include $PM_{2.5}$ 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. The Grand Rapids – Monroe St (260810020) is an NCore site and is therefore, required to retain the $PM_{2.5}$ monitor. At this time, MDEQ will continue to operate both monitors.

Due to the reduction in fine particulate values, a monitor is no longer required in the Monroe MSA. The Sterling State Park site (261150006) is in Monroe County and the MDEQ will continue to operate it.

As shown in **Table 13**, using the most recent three years of data, the Flint (260490021) monitor has an annual and a 24-hour design value equaling 8.1 and 21 $\mu g/m^3$, respectively. Both of these values are less than 85% of their respective NAAQS. Therefore, a $PM_{2.5}$ monitoring site is no longer required in the Flint MSA, but no changes are suggested at this time.

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. No changes are suggested at this time.

The annual and 24-hour $PM_{2.5}$ 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.

The Saginaw MSA is required to have a $PM_{2.5}$ FRM site. The EPA Regional Administrator granted a waiver allowing for the Bay City site (260170014) to fulfill this requirement. The 24-hour $PM_{2.5}$ 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.

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.

Coloma (260210014) fulfilled the requirement for the Niles-Benton Harbor MSA. The 24-hour $PM_{2.5}$ design value at this site is no longer greater than 85% of the NAAQS, indicating that a monitor is no longer required, but the MDEQ will continue to operate the monitor.

The $PM_{2.5}$ monitor in Holland (260050003) in Allegan County is a micropolitan area. The monitor's design value is no longer within 85% of the NAAQS. Now that concentrations have fallen, it may be possible to discontinue monitoring at Holland, but the MDEQ will continue to operate the monitor.

Houghton Lake (261130001) is the background $PM_{2.5}$ FRM site in Michigan.

There are two tribal $PM_{2.5}$ monitoring sites located in Michigan, one in Manistee (261010922) and a co-located pair in Sault Ste. Marie (260330901)

Table 14 summarizes the $PM_{2.5}$ FRM monitoring site information for 2014 and 2015. **Figure 7** illustrate the geographical distribution of $PM_{2.5}$ FRM monitors for 2014 and 2015.

TABLE 14: MICHIGAN'S $PM_{2.5}$ FRM NETWORK

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

SLAMS Network

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Start Date	CBSA [1]	Pop (2010 Census)
Holland	260050003	968 W. 32nd, Holland	42.767778	-86.148611	1:3	Pop. Exp.	Neighborhood	Allegan	10/31/98	A	111,408
Bay City	260170014	1001 Jennison St	43.571389	-83.890833	1:3	Pop. Exp.	Neighborhood	Bay	8/24/00	BC	107,771
Coloma	260210014	4689 Defield Rd., Paw Paw WWTP	42.197778	-86.309722	1:3	Transport	Regional	Berrien	11/7/98	NB	156,813
Flint	260490021	Whaley Park, 3616 Iowa St., Flint	43.04722	-83.670278	1:3	Pop. Exp.	Neighborhood	Genesee	12/16/98	F	425,790
Lansing	260650012	220 N. Pennsylvania	42.738611	-84.534722	1:3	Pop. Exp.	Neighborhood	Ingham	11/7/98	LEL	464,036
Kalamazoo	260770008	Fairgrounds, 1400 Olmsteed Rd	42.278056	-85.541944	1:3	Pop. Exp.	Neighborhood	Kalamazoo	11/19/98	KP	326,589
Grand Rapids-Wealthy St	260810007	507 Wealthy St	42.956111	-85.679167	1:3	Pop. Exp.	Neighborhood	Kent	1/1/07	GW	774,160
Grand Rapids - Monroe St	260810020	1179 Monroe St., NW,	42.964167	-85.671389	1:3	Pop. Exp.	Neighborhood	Kent	10/23/98	GW	774,160
Tecumseh	260910007	6792 Raisin Center Highway	41.995556	-83.946667	1:3	up wind backgrd	Regional	Lenawee	7/6/93	Not in CBSA	N/A
New Haven	260990009	57700 Gratiott	42.731389	-82.793611	1:3	Pop. Exp. Max. Conc.	Neighborhood	Macomb	12/22/98	DWL	4,296,250
Houghton Lake	261130001	1769 S Jeffs Rd	44.310556	-84.891944	1:3	Background	Regional	Missaukee	2/6/03	Not in CBSA	N/A
Sterling State Park	261150006	2800 Sate Park Rd.	41.9236	-83.345859	1:3	Transport	Regional	Monroe		M	152,021
Oak Park	261250001	13701 Oak Park Blvd.	42.463056	-83.183333	1:3	Pop. Exp.	Neighborhood	Oakland	12/25/98	DWL	4,296,250
Port Huron	261470005	2525 Dove Rd.	42.953333	-82.456389	1:3	Pop. Exp.	Urban	Saint Clair	2/11/99	DWL	4,296,250
Ypsilanti	261610008	555 Towner Ave	42.240556	-83.599722	1:3	Pop. Exp.	Neighborhood	Washtenaw	8/4/99	AA	344,791
Allen Park	261630001	14700 Goddard	42.226611	-83.208333	1:1	Pop. Exp.	Neighborhood	Wayne	5/12/99	DWL	4,296,250
Detroit - SW HS	261630015	SW Highschool, 150 Waterman	42.302778	-83.106667	1:3	Pop. Exp. Max. Conc.	Neighborhood	Wayne	2/26/99	DWL	4,296,250
Detroit - Linwood	261630016	2451 Marquette, McMichael School	42.3578	-83.09617	1:3	Pop. Exp.	Neighborhood	Wayne	5/12/99	DWL	4,296,250
Detroit - E 7 Mile	261630019	11600 E. 7 Mile, Osborne School	42.430833	-83.000278	1:3	Pop. Exp.	Neighborhood	Wayne	4/30/00	DWL	4,296,250
Livonia	261630025	38707 Seven Mile Rd	42.423055	-83.426389	1:3	Pop. Exp.	Neighborhood	Wayne	8/21/99	DWL	4,296,250
Livonia Near Road	261630095	18790 Haggerty Rd	42.421494	-83.425168	1:3	Near Road	Micro	Wayne	1/1/15	DWL	4,296,250
Dearborn	261630033	2842 Wyoming, Salina School	42.306666	-83.148889	1:3	Pop. Exp. Max. Conc.	Neighborhood	Wayne	2/5/99	DWL	4,296,250
Wyandotte	261630036	2628 Biddle, Wyandotte	42.18728	-83.15404	1:3	Pop. Exp.	Urban	Wayne	2/20/99	DWL	4,296,250
Detroit - FIA/Lafayette St	261630039	2000 W Lafayette	42.323333	-83.068611	1:1	Source Oriented	Neighborhood	Wayne	8/26/05	DWL	4,296,250

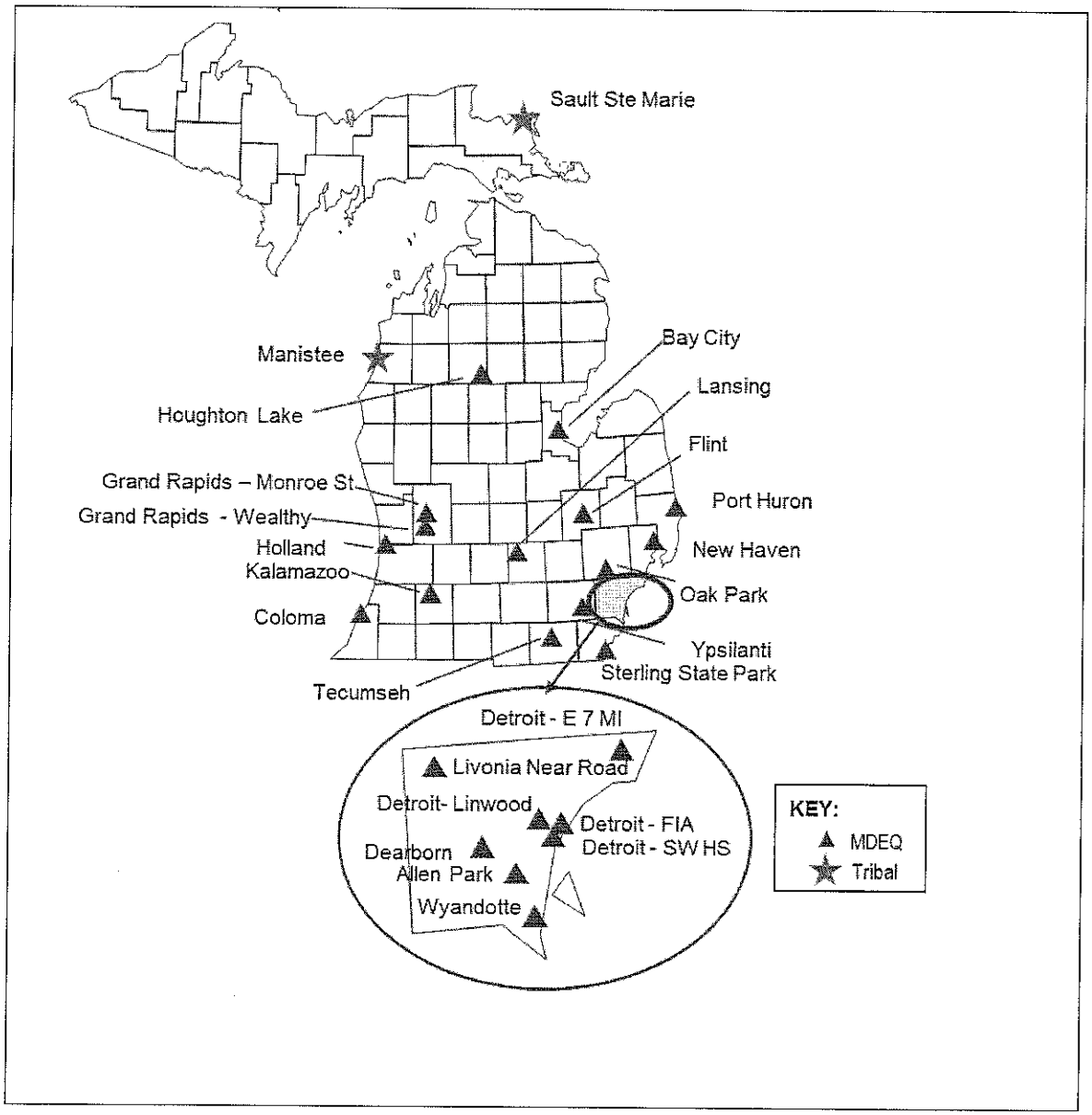
Special Purpose and Tribal $PM_{2.5}$ Monitors in Michigan

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Start Date	CBSA [1]	Pop (2010 Census)
Sault Ste Marie	260330901	650 W Easterday Ave	46.49173	-84.36513	1:3	Tribal	Neighborhood	Chippewa	1/1/11	Not in CBSA	N/A
Manistee	261010922	3031 Domres Rd	44.307	-86.24268	1:3	Tribal	Regional	Manistee	4/2/06	Not in CBSA	N/A

[1] 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 7: Michigan's $PM_{2.5}$ FRM Monitoring Network



$PM_{2.5}$ Quality Assurance

The $PM_{2.5}$ program has a fully approved Quality Assurance Project Plan (QAPP). The MDEQ operates four co-located $PM_{2.5}$ 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 Dearborn (261630033) is once every six days. In addition, a tribal co-located FRM is operated in Sault Ste. Marie (260330901).

The MDEQ's station operators conduct flow checks every four-weeks to ensure the flow rate is meeting the measurement quality objectives. Results from these flow checks are submitted to the $PM_{2.5}$ auditor each month for review. Every six months, each $PM_{2.5}$ 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 $PM_{2.5}$ monitor to run side-by-side with the station $PM_{2.5}$ 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, including distances from trees, exhaust vents, and large buildings. Probe heights and separation distances are also assessed.

Plans for the 2016 $PM_{2.5}$ FRM Monitoring Network

The following $PM_{2.5}$ monitors will be retained as part of the 2016 network:

- The one in three day $PM_{2.5}$ FRM monitor in Holland (260050003)
- The one in three day $PM_{2.5}$ FRM monitor in Bay City (260170014)
- The one in three day $PM_{2.5}$ FRM monitor in Coloma (260210014) transport
- The one in three day $PM_{2.5}$ FRM monitor in Flint (260490021)
- The one in three day $PM_{2.5}$ FRM monitor in Lansing (260650012)
- The one in three day $PM_{2.5}$ FRM monitor in Kalamazoo (260770008)
- The one in three day $PM_{2.5}$ FRM monitor in Grand Rapids-Wealthy (260810007)
- The one in three day $PM_{2.5}$ FRM monitor in Grand Rapids-Monroe St. (260810020)
- The one in three day $PM_{2.5}$ FRM monitor in Tecumseh (260910007)
- The one in three day $PM_{2.5}$ FRM monitor in New Haven (260990009)
- The one in three day $PM_{2.5}$ FRM monitor in Houghton Lake (261130001) background
- The one in three day $PM_{2.5}$ FRM monitor in Sterling State Park (261150006)
- The one in three day $PM_{2.5}$ FRM monitor in Oak Park (261250001)
- The one in three day $PM_{2.5}$ FRM monitor in Port Huron (261470005)
- The one in three day $PM_{2.5}$ FRM monitor in Ypsilanti (261610008)
- The daily $PM_{2.5}$ FRM monitor in Allen Park (261630001)
- The one in three day $PM_{2.5}$ FRM monitor at Detroit-SWHS (261630015)
- The one in three day $PM_{2.5}$ FRM monitor at Detroit-Linwood (261630016)
- The one in three day $PM_{2.5}$ FRM monitor at Detroit-E 7 Mile (261630019)
- The one in three day $PM_{2.5}$ FRM monitor in Livonia (261630025)
- The one in three day $PM_{2.5}$ FRM monitor at Livonia-Near Road (261630095)
- The one in three day $PM_{2.5}$ FRM monitor in Dearborn (261630033)
- The one in three day $PM_{2.5}$ FRM monitor in Wyandotte (261630036)
- The daily $PM_{2.5}$ FRM monitor in Detroit–FIA (261630039)

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

- The one in six day $PM_{2.5}$ FRM monitor in Kalamazoo (260770008).
- The one in six day $PM_{2.5}$ FRM monitor at Grand Rapids-Monroe St. (260810020).
- The one in six day $PM_{2.5}$ FRM monitor in Ypsilanti (261610008).
- The one in six day $PM_{2.5}$ FRM monitor in Dearborn (261630033).

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

- A one in three day $PM_{2.5}$ FRM tribal monitoring site in Manistee (261010922), contingent upon the Little River Band of Ottawa Indians' plans for 2016.
- A one in three day $PM_{2.5}$ FRM tribal monitoring site in Sault Ste. Marie (260330901), and a co-located one in six day precision monitor, contingent upon the Inter-Tribal Council's plans for 2016.

Continuous $PM_{2.5}$ Monitoring Network:

According to the October 17, 2006 changes to the monitoring regulations, 50% of the minimum number of required FRM sites must be co-located with a continuous $PM_{2.5}$ monitor. The 13 continuous monitors operational in the state exceed the minimum number that are required.

In 2015, the MDEQ operated Rupprecht & Patashnick TEOM samplers to supply continuous fine particulate data at 13 monitoring sites, as shown in **Table 15**. The MDEQ currently is meeting the minimum 50% co-location requirement. **Figure 8** illustrates the geographical distribution of the continuous monitoring network. In the event that another TEOM needs repair, the unit at the 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 continues field testing a MetOne Beta Attenuation Monitor (BAM) at Detroit-FIA/Lafayette (261630039) to assess data comparability between the BAM, the TEOM and the FRM. The FRM at Detroit-FIA/Lafayette is operating on a daily basis.

Michigan's NCore stations are required to operate continuous $PM_{2.5}$ samplers. Both Grand Rapids–Monroe St. (260810020) and Allen Park (261630001) currently have $PM_{2.5}$ TEOMs, meeting the requirement for continuous $PM_{2.5}$ measurements.

The MetOne BAM operated by the Inter-Tribal Council, Sault Ste. Marie (2960330901) is currently operated in a non-regulatory mode and as such should not be used to compare to the NAAQS.

The MDEQ operates the TEOMs from April through September with 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 $PM_{2.5}$ 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.

TABLE 15: MICHIGAN'S CONTINUOUS $PM_{2.5}$ MONITORING NETWORK

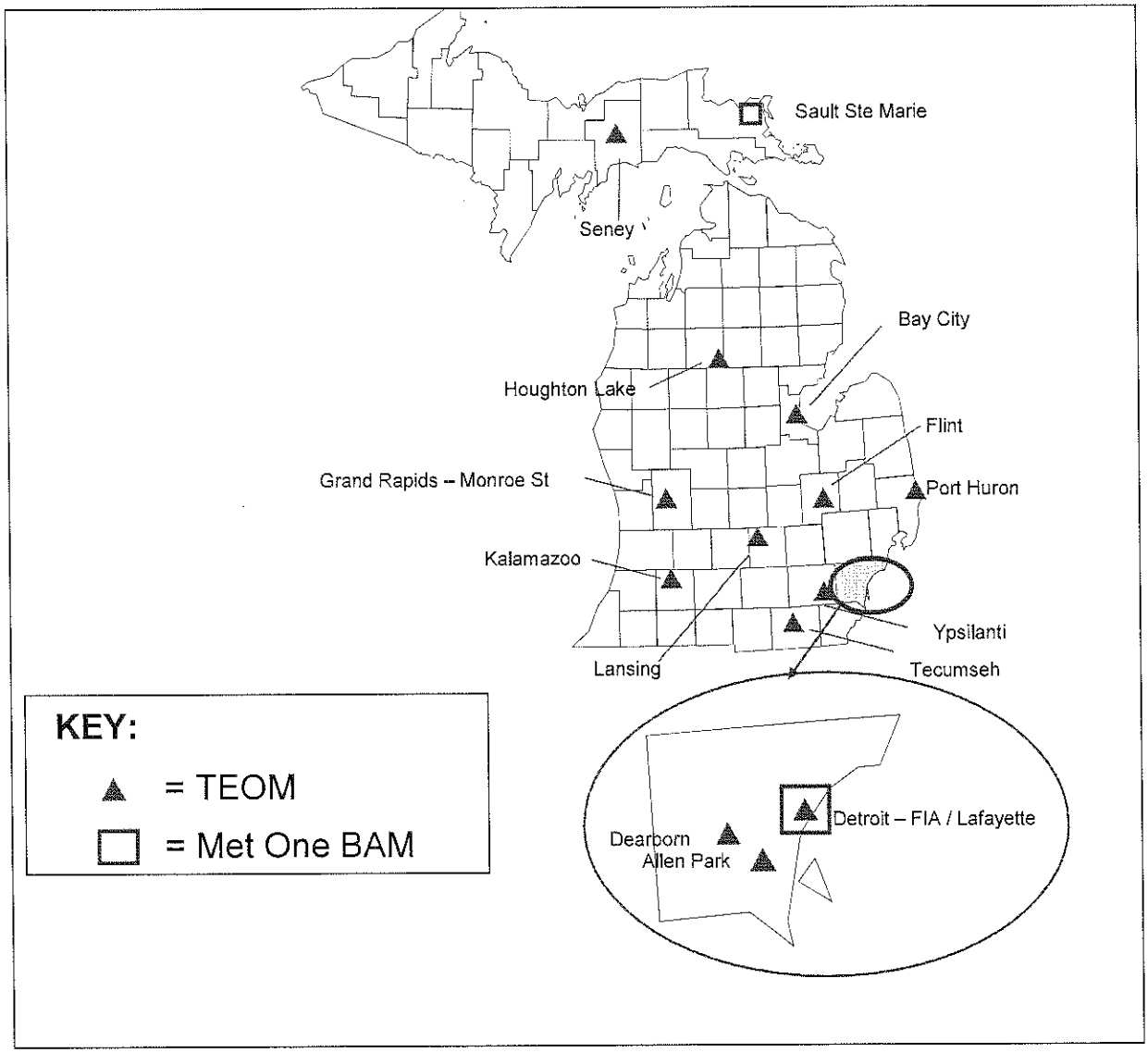
Operating Schedule: continuous

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Start Date	CBSA [1]	Pop (2010 Census)
Method: Rupprecht & Patashnick Tapered Element Oscilating Microbalance (TEOMS) Samplers										
Bay City	260170014	1001 Jennison St	43.571389	-83.890833	Pop. Exp.	Neighborhood	Bay	11/19/05	BC	107,771
Flint	260490021	Whaley Park, 3610 Iowa St., Flint	43.04722	-83.670278	Pop. Exp.	Neighborhood	Genesee	5/23/02	F	425,790
Lansing	260650012	220 N. Pennsylvania	42.738611	-84.534722	Pop. Exp.	Neighborhood	Ingham	12/1/99	LEL	464,036
Kalamazoo	260770008	Fairgrounds, 1400 Olmstead Rd	42.278056	-85.541944	Pop. Exp.	Neighborhood	Kalamazoo	8/17/00	KP	326,589
Grand Rapids - Monroe St	260810020	1179 Monroe St., NW,	42.984167	-85.671389	Pop. Exp.	Neighborhood	Kent	11/4/99	GW	774,160
Tecumseh	260910007	6792 Raisin Center Highway	41.995556	-83.946667	up wind backgrd	regional	Lenawee	6/1/09	Not in CBSA	N/A
Houghton Lake	261130001	1769 S Jeffs Rd	44.310556	-84.891944	Background	Regional	Missaukee	10/9/03	Not in CBSA	N/A
Port Huron	261470005	2525 Dove Rd.	42.953333	-82.456389	Pop. Exp.	Urban	Saint Clair	9/18/03	DWL	4,296,250
Seney	261530001	Seney Wildlife Refuge, HCR 2 Box 1	46.28888	-85.95027	Background	Regional	Schoolcraft	1/1/02	Not in CBSA	N/A
Ypsilanti	261610008	555 Towner Ave	42.240556	-83.599722	Pop. Exp.	Neighborhood	Washtenaw	2/24/00	Not in CBSA	N/A
Allen Park	261630001	14700 Goddard	42.228611	-83.208333	Pop. Exp.	Neighborhood	Wayne	12/1/00	DWL	4,296,250
Dearborn	261630033	2842 Wyoming, Salina School	42.306666	-83.148889	Pop. Exp. Max. Conc.	Neighborhood	Wayne	9/26/03	DWL	4,296,250
Detroit - FIA/Lafayette St	261630039	2000 W Lafayette	42.323333	-83.058611	Source Oriented	Neighborhood	Wayne	8/20/05	DWL	4,296,250
Method: MetOne Beta Attenuation Monitor (BAM)										
Sault Ste. Marie	260330901	650 W Easterday Ave	46.49366	-84.36416	Tribal	Neighborhood	Chippewa	1/1/2012	Not in CBSA	N/A
Detroit - FIA/Lafayette St	261630039	2000 W Lafayette	42.323333	-83.058611	Source Oriented	Neighborhood	Wayne	10/1/09	DWL	4,296,250

[1] **CBSA Key:**

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

FIGURE 8: MICHIGAN'S CONTINUOUS $PM_{2.5}$ NETWORK



$PM_{2.5}$ TEOM Quality Assurance

The site operator conducts flow checks for precision every four weeks. 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 2016 $PM_{2.5}$ TEOM Network

There are no changes planned for the $PM_{2.5}$ TEOM network, but if the EPA cuts funding, operation of some additional TEOMs may need to be discontinued in 2015. Continued operation of the $PM_{2.5}$ 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 $PM_{2.5}$ 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 $PM_{2.5}$ 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 2016, contingent upon adequate levels of funding, Michigan is planning to continue to operate $PM_{2.5}$ TEOM monitors at:

- Bay City (260170014)
- Flint (260490021)
- Lansing (260650012)
- Kalamazoo (260770008)
- Grand Rapids–Monroe St. (260810020)
- Tecumseh (260910007)
- Houghton Lake (261130001)
- Port Huron (261470005)
- Seney (261530001)
- Ypsilanti (261610008)
- Allen Park (261630001)
- Dearborn (261630033)
- Detroit–FIA/Lafayette (261630039) - TEOM and BAM

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 $PM_{2.5}$ TEOMs .

During 2016, to the best of our knowledge, the Inter-Tribal Council is planning to continue to operate a $PM_{2.5}$ BAM monitor at Sault Ste. Marie (260330901).

Speciated $PM_{2.5}$ Monitoring Network:

Continued operation of the speciation trend site network is required on a national level and these sites sample on an 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), which also has a sampling frequency of once every three days. The speciation network is described in **Table 16**. **Figure 9** illustrates the current coverage across Michigan.

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.

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. Large spot aethalometers from Magee Scientific operate at Dearborn (261630033) and Allen Park (261630001). 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 at the Detroit-Newberry site (261630038) site to determine diurnal variation in elemental carbon and organic carbon. This EC/OC is currently on reserve as a backup due to the loss of site access at Detroit Newberry. To help in the development of attainment strategies, the Southeast Michigan Council of Governments purchased a second Sunset EC/OC unit that is deployed at Dearborn (261630033). Last, an additional EC/OC unit is deployed at Tecumseh (260910007) to characterize levels upwind from Detroit.

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. Results from the precision checks are sent to the auditor for review each month. The QA team conducts flow rate audits on the $PM_{2.5}$ 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. Audit results are reviewed by the AMU's QA Coordinator. Audit data is also uploaded to the EPA's AQS database using the RTI interface. The EPA periodically conducts technical systems audits and instrument audits for the speciation network. The EPA also conducts audits of RTI National Laboratory, which supplies speciation analysis services for the entire nation.

TABLE 16: MICHIGAN'S $PM_{2.5}$ SPECIATION NETWORK

Current Speciation Sites

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

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

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Start Date	CBSA [1]	Pop (2010 Census)	Comments
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	4/8/08	Not in CBSA	N/A	SPM
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	11/2/03	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

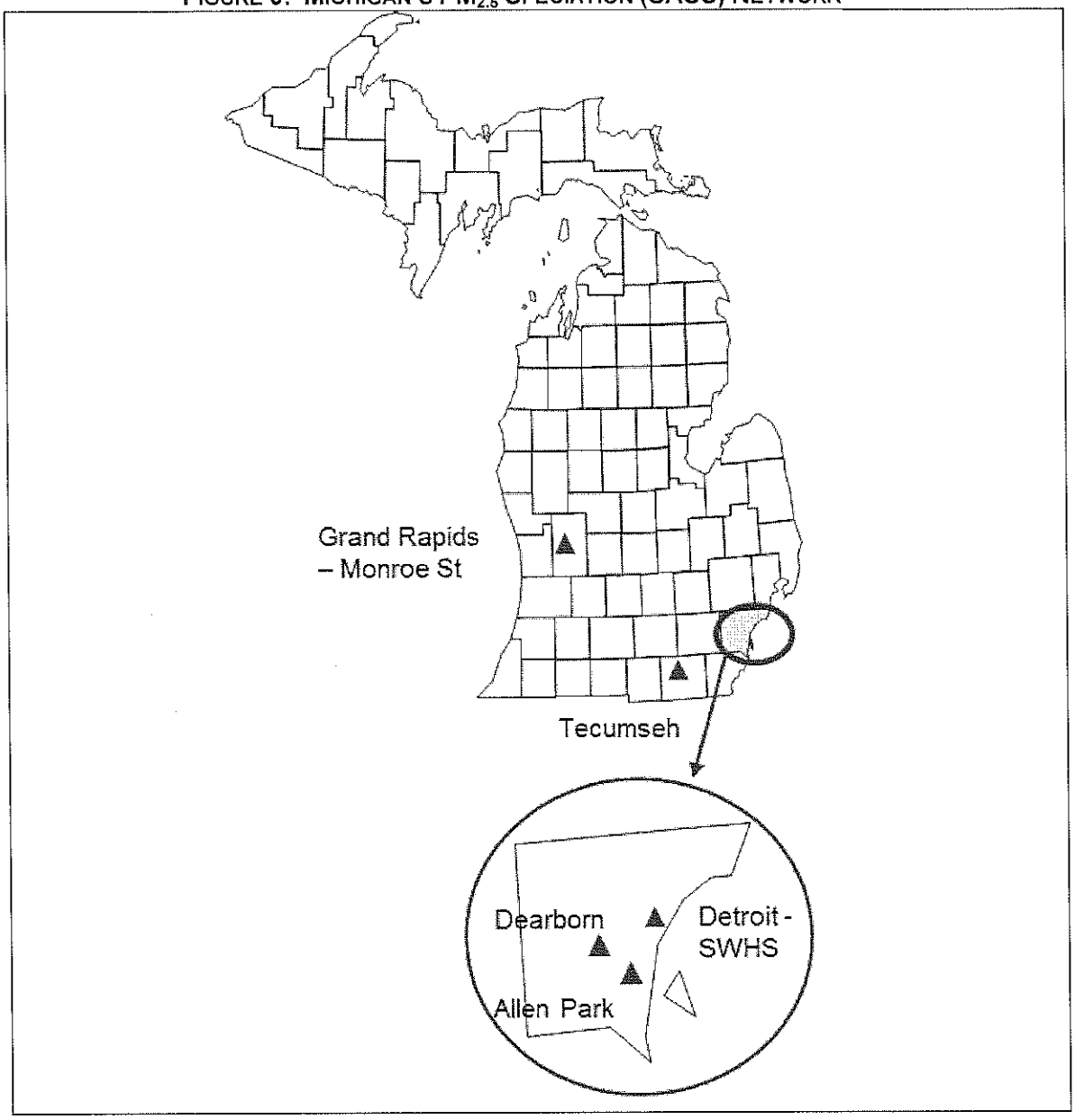
Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Method	Purpose	Scale	County	Start Date	CBSA [1]	Pop (2010 Census)	Comments
Allen Park	261630001	14700 Goddard	42.229	-83.20833	McGee large spot Aethalometer (carbon black)	Pop. Exp.	Neighborhood	Wayne	1/1/04	DWL	4,296,250	
Dearborn	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
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	

[1] **CBSA Key:**

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

SPM = Special Purpose Monitor

FIGURE 9: MICHIGAN'S $PM_{2.5}$ SPECIATION (SASS) NETWORK



Plans for the 2016 $PM_{2.5}$ Speciation Monitoring Network

During 2016, contingent upon adequate levels of funding, Michigan is planning to continue to operate 24-hour $PM_{2.5}$ SASS speciation monitors at:

- Grand Rapids-Monroe St. (260810020) operating once every three days
- Allen Park (261630001) operating once every three days
- Dearborn (261630033) operating once every six days
- Tecumseh (260910007) operating once every six days
- SWHS (261630015) operating once every six days

During 2016, contingent upon adequate levels of funding, Michigan is planning to continue to operate hourly Sunset EC/OC monitors at:

- Dearborn (261630033)
- Tecumseh (260910007)

During 2016, contingent upon adequate levels of funding, Michigan is planning to continue to operate hourly Magee aethalometer monitors at:

- Dearborn (261630033)
- Allen Park (261630001)

PM_{10} Monitoring Network:

The October 17, 2006 monitoring regulations modified the minimum number of PM_{10} 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_{10}, as shown in **Table 17**.[11]

TABLE 17: PM_{10} MINIMUM MONITORING REQUIREMENTS (NUMBER OF STATIONS PER MSA)[1]

POPULATION CATEGORY	HIGH CONCENTRATION[2]	MEDIUM CONCENTRATION[3]	LOW CONCENTRATION[4, 5]
> 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

[1] 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.
[2] High concentration areas are those for which ambient PM_{10} data show ambient concentrations exceeding the PM_{10} NAAQS by 20% or more.
[3] Medium concentration areas are those for which ambient PM_{10} data show ambient concentrations exceeding 80% of the PM_{10} NAAQS.
[4] Low concentration areas are those for which ambient PM_{10} data show ambient concentrations < 80% of the PM_{10} NAAQS.
[5] These minimum monitoring requirements apply in the absence of a design value.

Applying **Table 17** to Michigan's urban areas, population totals and historical PM_{10} data results in the design requirements that are shown in **Table 18**.

According to the tables, two to four PM_{10} 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_{10} monitoring requirements specify that one to two PM_{10} sites are required in the Grand Rapids-Wyoming MSA. There is one site currently in operation at Grand Rapids, Monroe St. (260810020).

According to the requirements, either no or one PM_{10} monitors are required in the Flint MSA. In 2006, the MDEQ operated a PM_{10} sampler in Flint (260490021) but as a result of budget cuts, PM_{10} 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_{10} high volume unit started sampling at River Rouge (261630005) on January 25, 2009. The PM_{10} filters at River Rouge (261630005), Allen Park (261630001), Detroit-SWHS (261630015) and Dearborn (261630033) are analyzed for Mn and compared with the TSP concentrations of Mn. An added benefit of this study is the collection of levels of PM_{10} at River Rouge (261630005). The Manganese Work Group will be analyzing the data on a yearly basis. Decisions about future monitoring for Mn in southeast Michigan will be made by the work group.

PM coarse measurements are required at NCore sites. One acceptable technology is to use two R & P Partisol Plus 2025 units equipped with a $PM_{2.5}$ head and a WINS impactor and the second with a PM_{10} head and a down tube. PM coarse is determined by subtracting the fine particulate from the PM_{10}. Therefore, to meet the NCore requirements, a Partisol sampler

[11] Table D-4 of Appendix D to Part 58.

equipped with a PM_{10} head and a down tube was deployed to Grand Rapids–Monroe St. (260810020) and Allen Park (261630001).

Table 19 summarizes the PM_{10} monitoring site information for sites in operation in 2015 and 2016. **Figure 10** shows the PM_{10} monitoring locations for 2015 and 2016.

TABLE 18: APPLICATION OF THE MINIMUM PM_{10} MONITORING REGULATIONS IN THE APRIL 30, 2007 CORRECTION TO THE OCTOBER 17, 2006 FINAL REVISION TO THE MONITORING REGULATION TO MICHIGAN'S PM_{10} NETWORK

Design value sites are in bold				2012-2014		
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	31	low	
			Detroit -SW HS	43	low	
			Dearborn	52	low	
			River Rouge	42	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	closed		
			GR- Wealthy	28	low	1-2
		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/IM	52,293	Cass	---	---		
Not in CBSA	N/A	Tuscola	Vassar	closed		0

MSAs with populations greater than 500,000 require at least 1 PM 10 monitor.

TABLE 19: MICHIGAN'S PM_{10} MONITORING NETWORK

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

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Monitor Type	Purpose	Scale	County	Start Date	CBSA [1]	Pop (2010 Census)
Allen Park	261630001	14700 Goddard	42.228611	-83.20833	1:6	High Vol	pop exp	nghbrhd	Wayne	9/12/87	DWL	4,296,250
Detroit - SWHS	261630015	150 Waterman	42.302778	-83.10667	1:6	High Vol	max conc	nghbrhd	Wayne	3/27/87	DWL	4,296,250
Dearborn	261630033	2842 Wyoming	42.306666	-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	42.984167	-85.67139	1:6	High Vol	pop exp	nghbrhd	Kent	3/20/87	GW	774,160
River Rouge	261630005	315 Genesee	42.267222	-83.13222	1:6	High Vol	pop exp	nghbrhd	Wayne	1/25/09	DWL	4,296,250
Dearborn	261630033	2842 Wyoming	42.306666	-83.14889	1:12	High Vol for precision	max conc	nghbrhd	Wayne	6/12/90	DWL	4,296,250
Dearborn	261630033 continuous	2842 Wyoming	42.306666	-83.14889	continuous	R&P PM10 TEOM	max conc	nghbrhd	Wayne	4/1/00	DWL	4,296,250

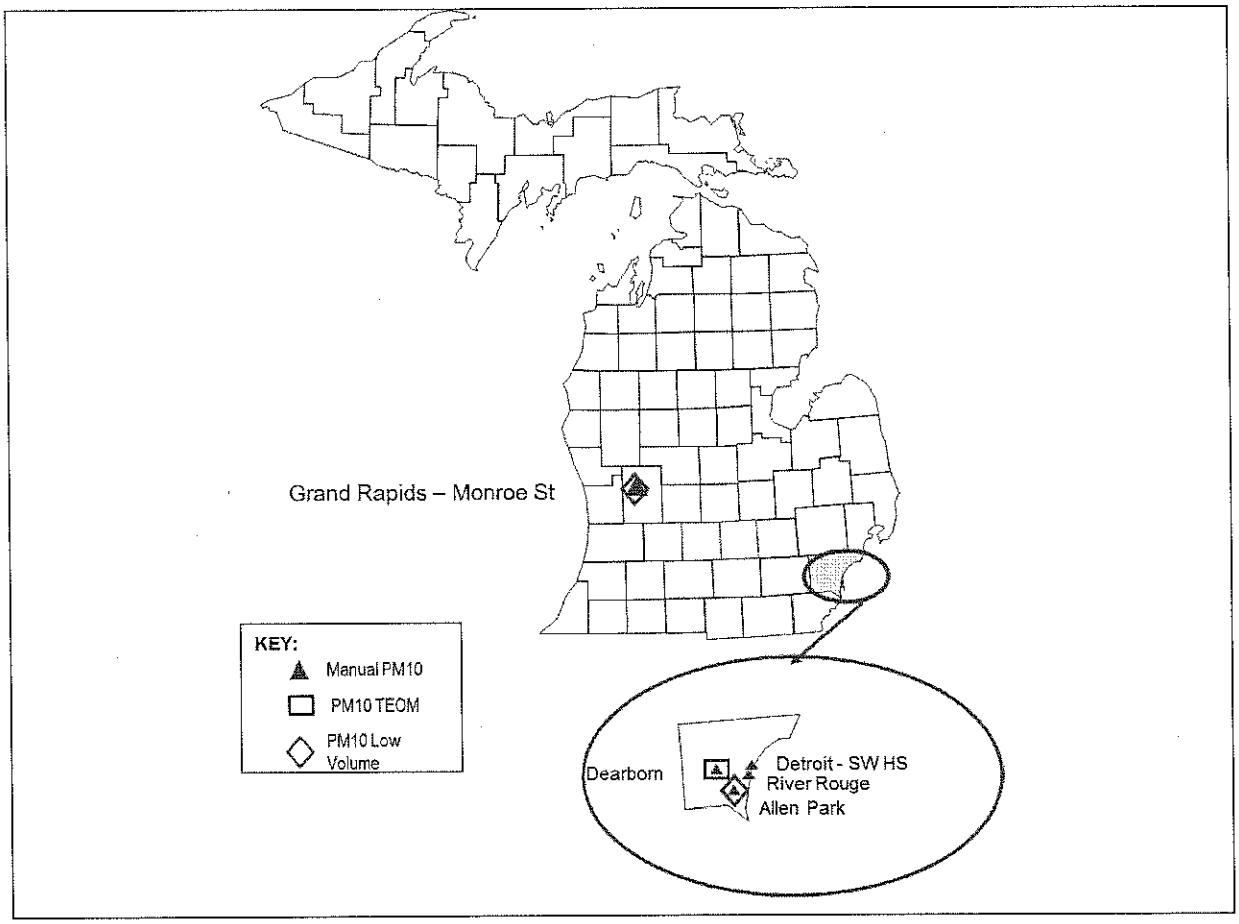
NCore Low Volume PM Coarse Sites

Method: Low volume Partisol 2025 Sampler with down tube and PM_{10} head co-loctaed with low volume Partisol 2025 $PM_{2.5}$ Sampler. PM_{coarse} determined by difference.

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Monitor Type	Purpose	Scale	County	Start Date	CBSA [1]	Pop (2010 Census)
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.984167	-85.67139	1:6	Low Vol Partisol	pop exp	nghbrhd	Kent	7/16/11	GW	774,160
Allen Park	261630001	14700 Goddard	42.228611	-83.20833	1:6	Low Vol Partisol	pop exp	nghbrhd	Wayne	7/16/11	DWL	4,296,250

[1] CBSA Key: DWL= Detroit-Warren-Livonia Metro. Area
GW=Grand Rapids-Wyoming Metro. Area

FIGURE 10: MICHIGAN'S PM_{10} MONITORING NETWORK



PM_{10} Quality Assurance

The site operator conducts a flow check once a month. Flow check values are sent to the QA Coordinator 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. Audit results are uploaded to the EPA's AQS database each quarter.

Plans for the 2016 PM_{10} Monitoring Network

During 2016, contingent upon adequate levels of funding, the MDEQ is planning to operate high volume PM_{10} monitors sampling over 24-hours at:

- The PM_{10} monitor at Monroe Street in Grand Rapids (260810020) on a once every six day schedule
- The PM_{10} monitor in Allen Park (261630001) on a once every six day schedule
- The PM_{10} monitor in Detroit–SWHS (261630015) on a once every six day schedule
- The PM_{10} monitor in Dearborn (261630033) on a once every six day schedule
- The PM_{10} co-located monitor in Dearborn (261630033) on a once every twelve day schedule
- The PM_{10} monitor at River Rouge (261630005) on a once every six day schedule

The MDEQ is planning to operate low volume PM_{10} monitors co-located with low volume $PM_{2.5}$ monitors to calculate $PM_{10-2.5}$ at the following NCore sites:

- The low volume PM_{10} monitor at Monroe St. in Grand Rapids (260810020) on a once every six day schedule.
- The low volume PM_{10} monitor at Allen Park (261630001) on a once every six day schedule.

The MDEQ also planning to operate:

- The special purpose monitor PM_{10} TEOM at Dearborn (261630033) on an hourly schedule.

Carbon Monoxide (CO) Monitoring Network:

Prior to the latest CO NAAQS review, the MDEQ operated trace CO monitors at Grand Rapids–Monroe St. (260810020) and Allen Park (261630001) as part of NCore.

On Aug 31, 2011,[12] the EPA finalized the new CO NAAQS and retained the level and form of the CO NAAQS but revised the design of the ambient monitoring network for CO to be more focused on heavily traveled urban roads. In the rule, 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_2 network design. The MDEQ has CO monitors in the two Eliza Howell near-roadway sites (261630093) and (261630094) and the Livonia Near Road (261630095) site.

Table 20 summarizes the CO monitoring site information for sites that were in existence in 2015. **Figure 11** 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 QA Coordinator 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. 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.

External audits are conducted by the EPA's thru-the-probe audit procedure for regular and trace level CO monitors. The EPA reports the results to AQS.

Plans for the 2016 CO Monitoring Network

During 2016, contingent upon adequate levels of funding, Michigan plans to continue to operate trace level CO monitors to support NCore operations:

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

During 2015, contingent upon adequate levels of funding, Michigan plans to continue to operate CO monitors to support the near-roadway network:

- Eliza Howell #1 (261630093)
- Eliza Howell #2 (261630094)
- Livonia Near Road (261630095)

[12] Environmental Protection Agency, "National Ambient Air Quality Standards for Carbon Monoxide," 40 CFR parts 50, 53 and 58, proposed rule January 28, 2011.

TABLE 20: MICHIGAN'S CO MONITORING NETWORK

Operating Schedule: Continuous
Method: Gas Filter Correlation Analyzer- CO & Trace CO

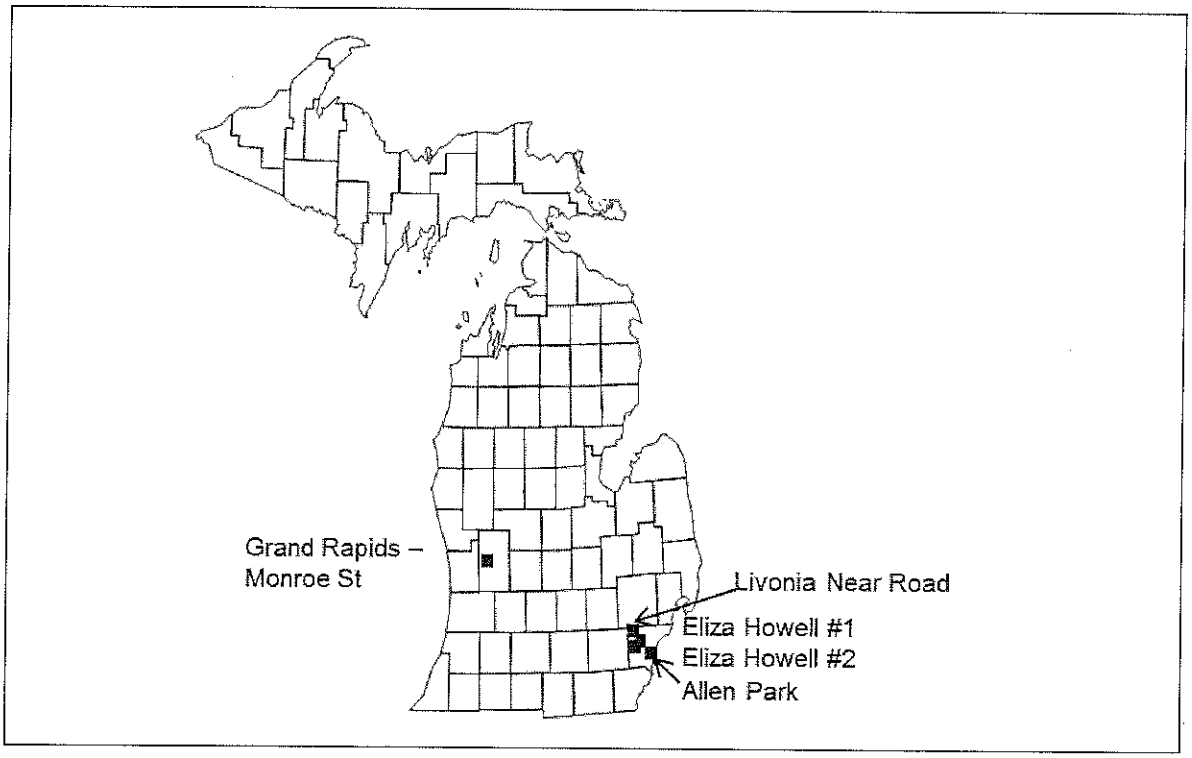
Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	CBSA [1]	Pop (2010 Census)
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.98417	-85.671389	trace	pop exp	nghbrhd	Kent	1/1/08	GW	774,160
Allen Park	261630001	14700 Goddard	42.22861	-83.208333	trace	pop exp	nghbrhd	Wayne	1/1/08	DWL	4,296,250

Near Roadway Sites

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	CBSA [1]	Pop (2010 Census)
Eliza Howell #1	261630093	Service Road I-96 & Telegraph	42.38599	-83.26632	CO	Near Road	micro	Wayne	9/1/11	DWL	4,296,250
Eliza Howell #2	261630094	Eliza Howell Park	42.3868	-83.270637	CO	Near Road	middle	Wayne	9/1/11	DWL	4,296,250
Livonia Near Road	261630095	18790 Haggerty Road	42.42149	-83.425168	CO	Near Road	micro	Wayne	1/1/15	DWL	4,296,250

[1] CBSA Key:
DWL= Detroit-Warren-Livonia Metro. Area GW=Grand Rapids-Wyoming Metro. Area

FIGURE 11: MICHIGAN'S CO MONITORING NETWORK



Nitrogen Dioxide (NO_2) and NO_Y Monitoring Network:

On February 9, 2010, the EPA modified the NO_2 NAAQS. Prior to this date, there was a single form of the standard; the annual average concentration of NO_2 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_2 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_2 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_2 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_2 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_2 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[13]. Because of budgetary constraints, the EPA has developed a build-and-hold system for implementing the new monitoring locations. Two Detroit near-road monitoring sites have been deployed. In addition, the MDEQ operates the community scale NO_2 monitor at its Detroit E 7 Mile (261630019) site. At this time, the Grand Rapids monitoring site is not listed for deployment by the EPA.

Table 21 summarizes the monitoring requirements for NO_2 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.

[13] "Primary National Ambient Air Quality Standards for Nitrogen Dioxide", EPA, 40 CFR Parts 50 and 58. February 9, 2010.

Table 21: NO_2 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					

Tier 1: Near Roadway NO_2 Monitors – Phase 2

The second near-roadway site for the Detroit-Warren-Livonia MSA was due by January 1, 2015. The Livonia Near Road site (261630095) was established in December 2014 and was operational by January 1, 2015. This is the heaviest traveled traffic segment in the Detroit-Warren-Livonia MSA, see yellow star on **Figure 12**. The new monitoring site can be seen in **Figure 13**.

FIGURE 12: COMPARISON OF ELIZA HOWELL PARK LOCATION WITH OTHER AIR MONITORING STATIONS AND ROADWAY SEGMENTS WITH THE HIGH TRAFFIC COUNTS

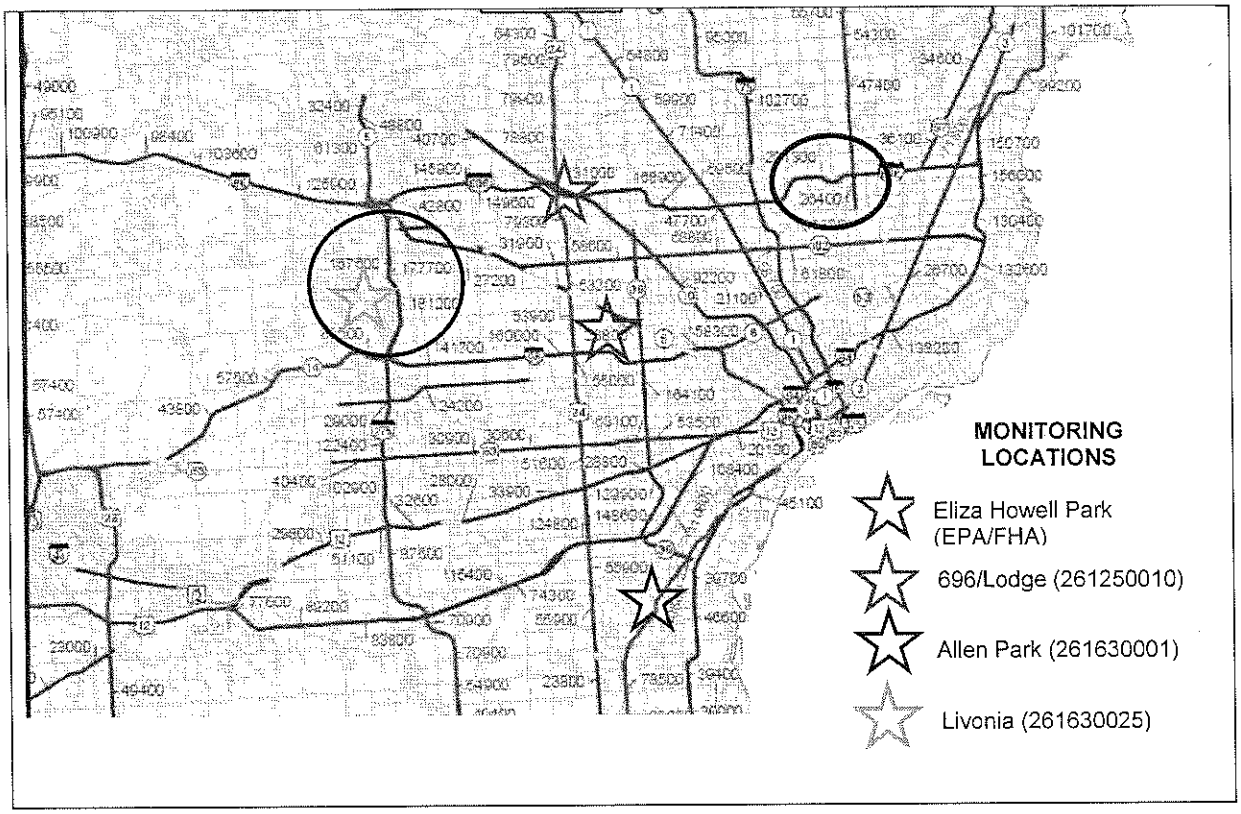


FIGURE 13: LIVONIA NEAR ROAD MONITORING SITE

Tier 2: Area-wide NO_2 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_2 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_2 levels.

Tier 3: NO_2 Monitors for Susceptible and Vulnerable Populations

The final tier of the new NO_2 monitoring network could include an environmental justice component as determined by the EPA Administrator. Forty additional monitoring sites will be deployed throughout the nation to meet the environmental justice component of the network design. At this time, the MDEQ is not planning on deploying any of these monitors.

NO_2 Monitoring for NSR

Recent modeling projects for new source review have shown that there is a possibility that the new 1-hour NO_2 NAAQS could be violated using current modeling techniques. More refined modeling that would provide a more accurate picture of the impact from new sources could be performed; however, the MDEQ lacked ambient data required for use in the models. At least five years of NO_2 data are required in both urban and rural locations. Therefore, on July 1, 2010, the MDEQ began collecting NO_2 measurements at Houghton Lake (261130001) and at Lansing (260650012).

NO_Y Monitoring

Trace NO_Y monitors for the NCore sites at Grand Rapids–Monroe St. (260810020) and Allen Park (261630001) have been operational since December 2007.

Table 22 summarizes the NO_2 and NO_Y monitoring site information for sites that are in existence in 2014 and will be added 2015. **Figure 14** shows the NO_2 and NO_Y monitoring network operated by the MDEQ in 2015 and 2016.

NO_2 and NO_Y Quality Assurance

The site operator performs a precision check of the analyzer every two weeks. The precision checks are sent to the QA Coordinator 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_2 monitors, the EPA conducts thru-the-probe audits at 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 NO_Y monitors.

Plans for the 2016 NO_2 and NO_Y Monitoring Network

During 2016 contingent upon adequate levels of funding, the MDEQ is planning to operate NO_2 at:

- Lansing (260650012)
- Houghton Lake (261130001)
- Detroit-E 7 Mile (261630019)
- Site #1 Eliza Howell Park (261630093)
- Site #2 Eliza Howell Park (261630094)
- Livonia Near Road (261630095)

Also contingent upon adequate funding, the MDEQ will continue to operate trace level NO_Y monitors at the NCore sites:

- Grand Rapids–Monroe St. site (26810020)
- Allen Park site (26163000)

TABLE 22: MICHIGAN'S NO_2 AND NO_Y MONITORING NETWORK

Operating Schedule: Continuous
Method: Chemiluminescense

NCore Sites

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	CBSA [1]	Pop (2010 Census)
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.984167	-85.671389	NOy	pop exp	nghbrhd	Kent	1/1/08	GW	774,160
Allen Park	261630001	14700 Goddard	42.228611	-83.208333	NOy	pop exp	nghbrhd	Wayne	1/1/08	DWL	4,296,250

Tier 1: Near Roadway Sites 2015

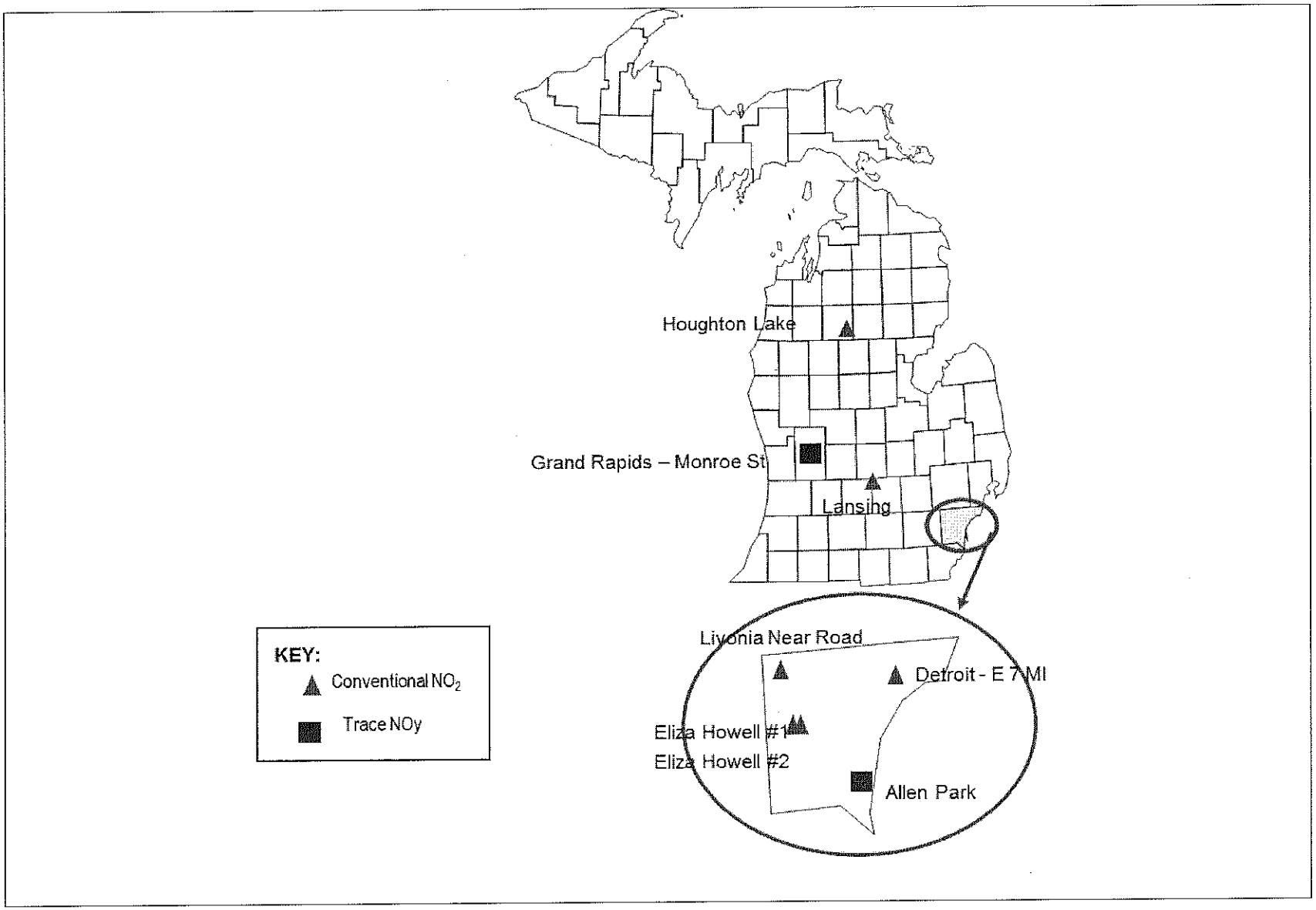
Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	CBSA [1]	Pop (2010 Census)
Eliza Howell #1	261630093	Service Road I-96 & Telegraph	42.38599	-83.26632	NO2	Near Road	micro	Wayne	9/1/11	DWL	4,296,250
Eliza Howell #2	261630094	Eliza Howell Park	42.386803	-83.270837	NO2	Near Road	middle	Wayne	9/1/11	DWL	4,296,250
Livonia Near Road	261630095	18790 Haggerty Raod	42.421494	-83.425168	NO2	Near Road	micro	Wayne	1/1/15	DWL	4,296,250

Tier 2: Community Sites

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	CBSA [1]	Pop (2010 Census)
Detroit - E 7 Mile	261630019	11600 East Seven Mile Road	42.430833	-83.000278	NO2	pop exp	urban	Wayne	12/1/90	DWL	4,296,250
Lansing	260650012	220 N Pennsylvania	42.738611	-84.534722	NO2	pop exp	nghbrhd	Ingham	9/5/80	LEL	464,036
Houghton Lake	261130001	1769 S Jeffs Road	44.310556	-84.891944	NO2	background	regional	Missaukee	4/1/98	Not in CBSA	N/A

[1] **CBSA Key:** DWL= Detroit-Warren-Livonia Metro. Area
GW=Grand Rapids-Wyoming Metro. Area
LEL= Lansing-East Lansing Metro. Area

FIGURE 14: MICHIGAN'S NO_2 AND NO_Y MONITORING NETWORK



Sulfur Dioxide (SO_2) Monitoring Network:

On June 2, 2010, the EPA made the SO_2 NAAQS more stringent by changing the current standard from a 24-hour and an annual average to an hourly measurement that can not exceed 75 ppb. The form of the standard is now a 99th percentile form averaged over three years. The secondary standard has not been changed[14].

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

(CBSA population[15]) * (total SO_2 emissions in that CBSA in tpy) / 1,0000,000 = PWEI

The PWEI value for each CBSA is compared to the threshold values shown in **Table 23** to determine the number of monitoring sites that are required:

Table 23: Population Weighted Emission Index Based Monitoring Requirements

Population Weighted Emissions Index Value	Number of Sites
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.

The EPA allows agencies to count the NCore SO_2 monitors as part of these new requirements. Also, because the new SO_2 monitors are not single source-oriented, existing infrastructure can be used to select locations for expansion of the SO_2 network.

If **Table 23** is applied to the PWEI calculations for the CBSAs in Michigan, the number of monitors that are required is shown in **Table 24**. The data in the table uses the 2010 Census data and the most recent version (2008) of the National Emissions Inventory data.

[14] Primary National Ambient Air Quality Standards for Sulfur Dioxide; Final Rule, 75 *Federal Register* 35520 (June 22, 2010).
[15] According to the latest Census Bureau estimates

TABLE 24: POPULATION WEIGHTED EMISSIONS INDEX TOTALS FOR CBSAS IN MICHIGAN

MSA	Counties	2008 NEI Download: Total County SO_2 Emissions, tpy	2008 NEI SO_2 Total Emissions, tpy	2010 Population	2008/2010 NEI PWEI	Monitors Required 2008 EI & 2010 Census
Detroit-Warren-Livonia Metro Area	Macomb	1,367.46	124,738	4,296,250	535,905	2
	Oakland	2,780.69				
	Wayne	55,790.51				
	Lapeer	152.87				
	St Clair	64,388.92				
	Livingston	257.45				
Flint Metro Area	Genesee	538.38	538	425,790	229	0
Monroe Metro Area	Monroe	135,799.72	135,800	152,021	20,644	1
Ann Arbor Metro Area	Washtenaw	530.36	530	344,791	183	0
Grand Rapids-Wyoming Metro Area	Kent	1,539.62	1,843	774,160	1,427	0
	Barry	116.40				
	Newaygo	75.23				
	Ionia	111.60				
Holland-Grand Haven Metro Area	Ottawa	39,664.67	39,665	263,801	10,464	1
Muskegon-Norton Shores Metro Area	Muskegon	11,611.80	11,612	172,188	1,999	0
Lansing-East Lansing Metro Area	Clinton	141.76	14,184	464,036	6,582	1
	Ingham	10,546.34				
	Eaton	3,496.12				
Bay City Metro Area	Bay	19,073.08	19,073	107,771	2,056	0
Saginaw-Saginaw Twp N Metro Area	Saginaw	821.42	821	200,169	164	0
Kalamazoo-Portage Metro Area	Kalamazoo	1,672.04	1,810	326,589	591	0
	Van Buren	138.04				
Niles-Benton Harbor Metro Area	Berrien	384.68	385	156,813	60	0
Jackson Metro Area	Jackson	293.11	293	160,248	47	0
Battle Creek Metro Area	Calhoun	666.26	666	136,146	91	0
South Bend Mishawaka Metro Area IN/MI	Cass	98.09	98	52,293	5	0

Based on the 2008 emissions data and 2010 population estimates, the Detroit-Warren-Livonia CBSA needs two SO_2 monitoring sites, while the Holland-Grand Haven Metropolitan Area, Lansing-East Lansing Metropolitan Area, and Monroe Metropolitan Area each need a single SO_2 monitoring site.

The NCore trace level SO_2 monitor at Allen Park (261630001) fulfills the requirement for one of the SO_2 monitors required in the Detroit-Warren-Livonia CBSA. The MDEQ also monitors at Detroit–SWHS (261630015) and Port Huron (261470005).

The MDEQ deployed the Sterling State Park (261150006) site on January 1, 2013 to fulfill the requirement for the Monroe Metropolitan Area.

The MDEQ deployed SO_2 monitors in the Holland-Grand Haven Metropolitan Area at the Jenison site (261390005) in Ottawa County and in the Lansing-East Lansing Metropolitan Area at the Lansing site (260650012) in Ingham County, on January 1, 2012. The MDEQ and Region 5 have come to the conclusion that the Jenison site (261390005) is not sited close enough to pick up the power plant in West Olive, therefore the MDEQ shut down the Jenison SO_2 monitor at the end of 2013. In December 2014, the MDEQ set up a new monitoring site in West Olive (261390011) to address the power plant emission . **Figure 15** shows the new site location.

Figure 15: West Olive Monitoring Site

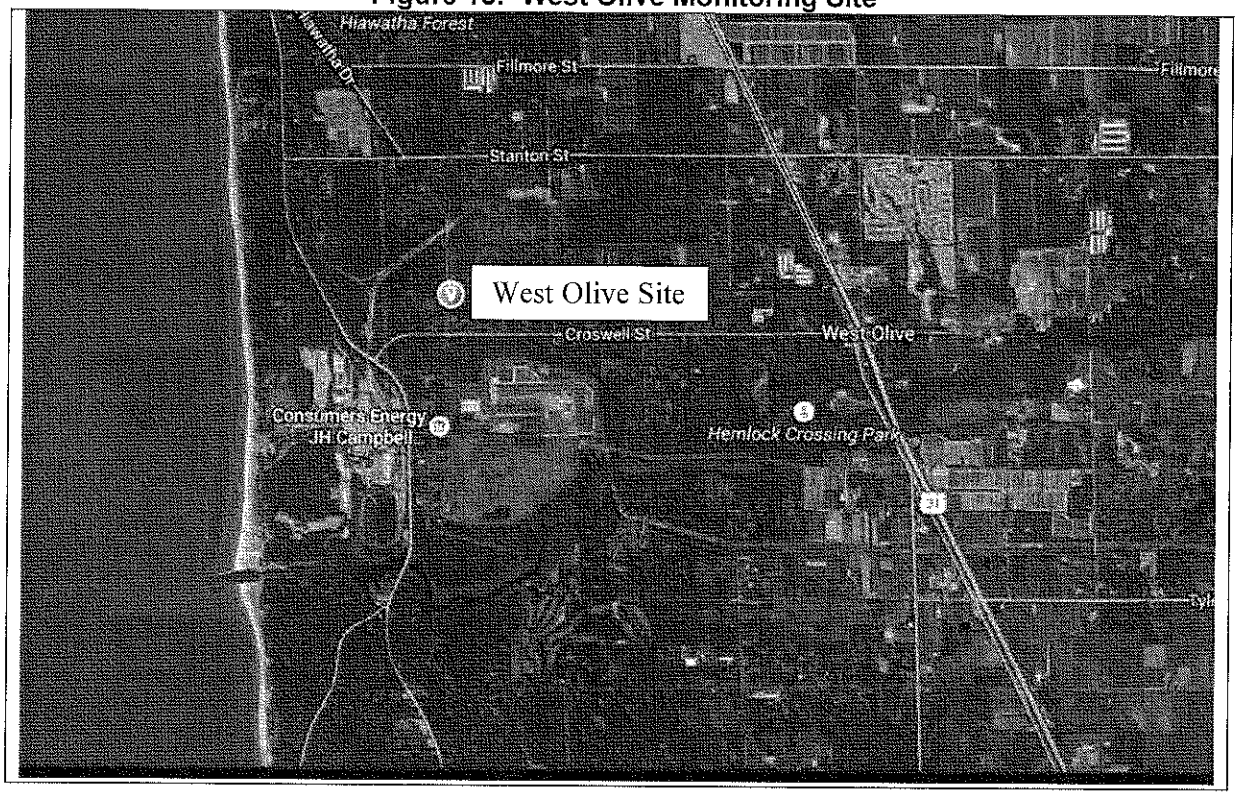


Table 25 summarizes the SO_2 monitoring site information for 2015 and 2016. **Figure 16** shows the geographical distribution of SO_2 sites across Michigan.

SO_2 Quality Assurance

The site operator performs a precision check of the analyzer every two weeks. Precision checks are sent to the QA Coordinator 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. 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.

The EPA conducts thru-the-probe audits on 20% of the SO_2 monitors each year. The audit consists of delivering four levels of calibration gas to the station monitor through the probe. The EPA reports the audit results to AQS.

Plans for the 2016 SO_2 Monitoring Network

During 2016, contingent upon adequate levels of funding, the MDEQ is planning to continue to operate an SO_2 monitor at:

- Detroit-SWHS (261630015)
- Grand Rapids–Monroe St. (260810020)
- Allen Park (261630001)
- Lansing (260650012)
- Port Huron (261470005)
- Sterling State Park (261150006)
- West Olive (261390011)

TABLE 25: MICHIGAN'S SO_2 MONITORING NETWORK

Operating Schedule: Continuous
Method: Ultra Violet Stimulated Fluorescence

NCore Sites

Monitoring Sites											
Site Name	AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	CBSA [1]	Pop (2010 Census)
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.9842	-85.671389	trace	pop exp	nghbrhd	Kent	1/1/08	GW	778,089
Allen Park	261630001	14700 Goddard	42.2286	-83.208333	trace	pop exp	nghbrhd	Wayne	1/1/08	DWL	4,403,437

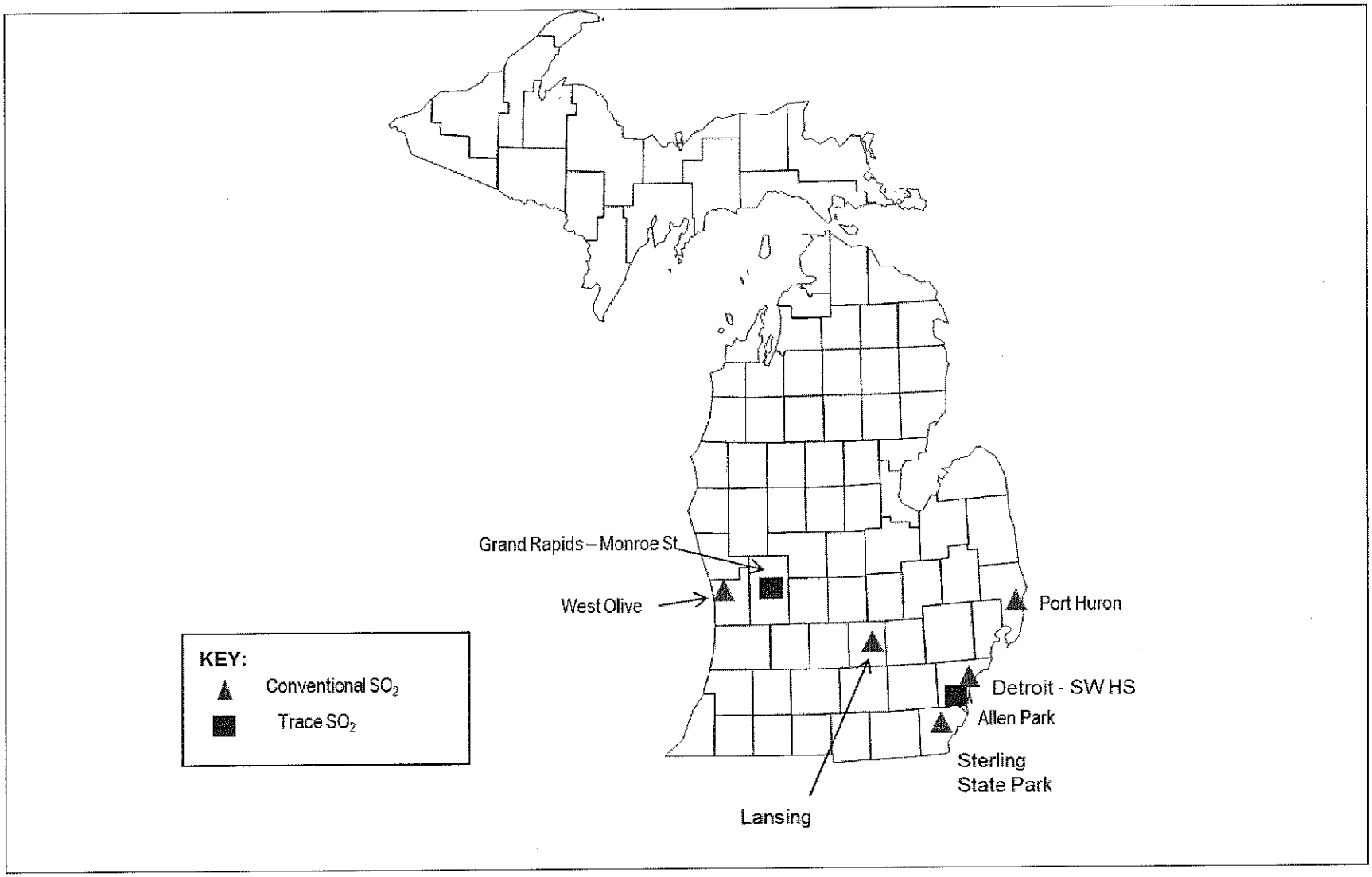
Source-Oriented Sites

Monitoring Sites											
Site Name	AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose	Scale	County	Start Date	CBSA [1]	Pop (2010 Census)
Lansing	260650012	220 N Pennsylvania	42.7386	-84.534722	SO2	Max Conc	nghbrhd	Ingham	1/1/12	LEL	464,036
Sterling Sate Park	261150006	2800 State Park Road	41.9236	-83.345858	SO2	Max Conc	nghbrhd	Monroe	1/1/13	Monroe	152,021
West Olive	261390011	8578 Hiawatha Dr.	42.9231	-86.194604	SO2	Max Conc	nghbrhd	Ottawa	1/1/15	HGH	263,801
Detroit - SW HS	261630015	150 Waterman	42.3028	-83.106667	SO2	Max Conc	nghbrhd	Wayne	1/1/71	DWL	4,403,437
Port Huron	261470005	2525 Dove Rd	42.9533	-82.456389	SO2	Max Conc	urban	Saint Clair	2/28/81*	DWL	4,296,250

[1] **CBSA Key:**
DWL= Detroit-Warren-Livonia Metro. Area
GW=Grand Rapids-Wyoming Metro. Area
LEL= Lansing-East Lansing Metro. Area
HGH= Holland-Grand Haven Metro. Area
Monroe= Monroe Urbanized Area

* Monitor shutdown in 2007 restarted in January 2012

FIGURE 16: MICHIGAN'S SO_2 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 ten 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 manganese, arsenic, cadmium, and nickel at all sites. Lead is monitored at source-oriented sites and at NCore sites, as discussed in the lead section of this report. The Dearborn NATTS Site (261630033) has a more extensive metals list, which includes: beryllium, vanadium, chromium, manganese, nickel, cobalt, copper, zinc, arsenic, molybdenum, cadmium, barium, lead, and iron.

The trace metals sites include:

- Allen Park (261630001)
- Detroit-SWHS (261630015)
- S Delray-Jefferson (261630027)
- River Rouge (261630005)
- Dearborn (261630033)

Lead sites that have additional trace metals include:

- Belding-Merrick St. (260670003)
- Belding-Reed St. (260670002)
- Port Huron (261470031)

Trace metals as PM_{10} 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_{10} and TSP trace metals are also collected at Dearborn.

The MDEQ would like to shut down one of the Belding monitors, provided that the lead non-attainment area is reclassified to attainment (see Lead Monitoring section for more details).

To provide data for an internal manganese work group, PM_{10} metals sampling was initiated at River Rouge (261630005) on January 25, 2009. PM_{10} 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_{10} include:

- Allen Park (261630001)
- Detroit-SWHS (261630015)
- River Rouge (261630005)
- Dearborn (261630033)

Table 26 summarizes the trace metal monitoring site information. **Figure 17** compares the locations of trace metal monitoring sites.

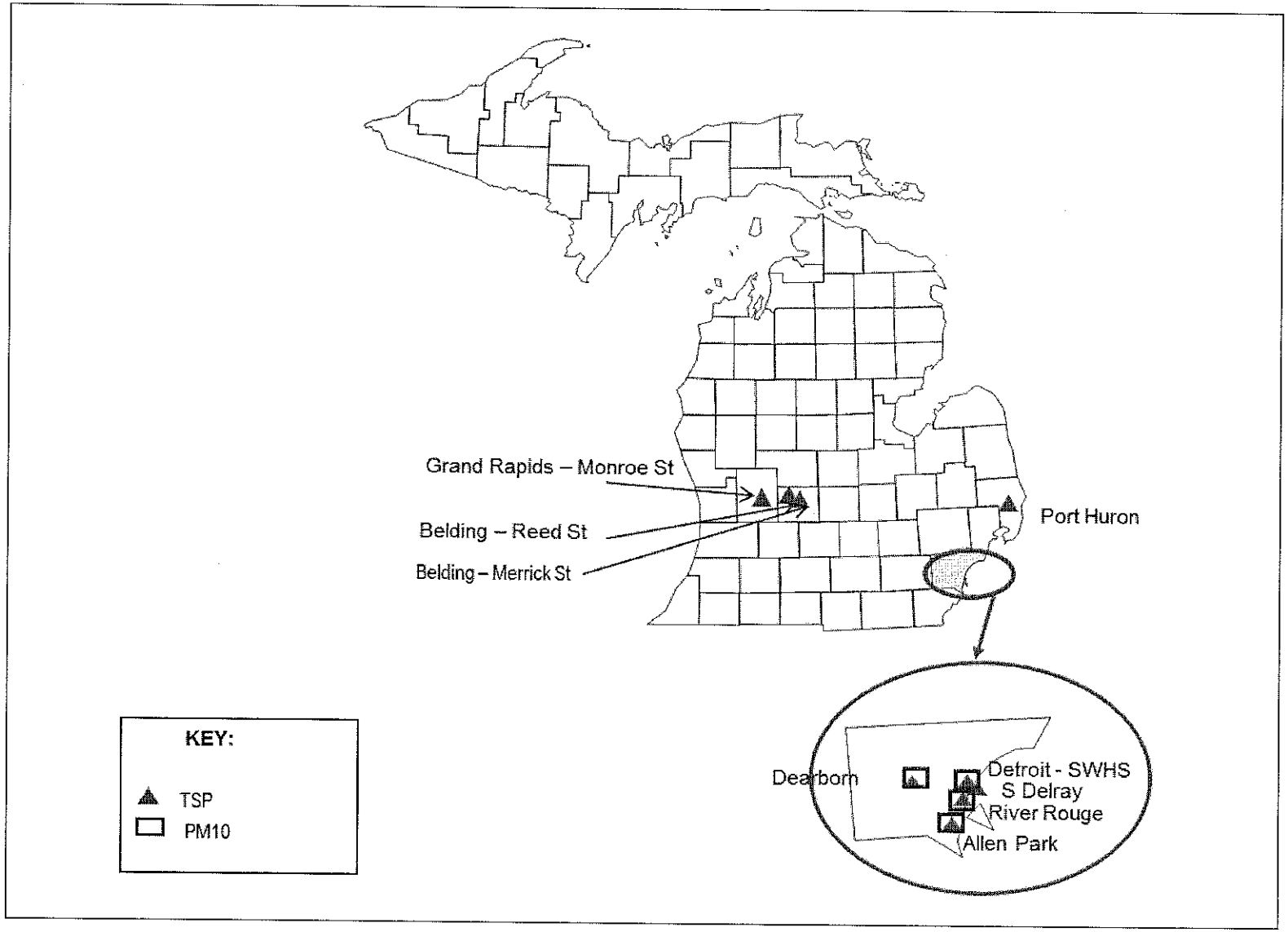
Table 26: Michigan's Trace Metal Monitoring Network

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

Monitoring Sites													
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Elements	Size	Purpose	Scale	County	Date Estab.	CBSA [1]	Pop (2010 Census)
Belding - Reed St	260670002	545 Reed St	43.101944	-85.22000	1:6	Pb, Mn, As, Cd, Ni	TSP	max conc	middle	Ionia	7/2/11	GW	778,009
Belding - Merrick St	260670003	509 Merrick	43.09984	-85.22163	1:6	Pb, Mn, As, Cd, Ni	TSP	max conc	micro	Ionia	1/1/10	GW	778,009
Grand Rapids - Monroe St	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
Port Huron	261470031	324 Rural St	42.98209	-82.449233	1:6	Mn, As, Cd, Ni	TSP	max conc	micro	Saint Clair	1/1/13	DWL	4,296,250
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	10/8/04	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	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

[1] CBSA Key: DWL= Detroit-Warren-Livonia Metro. Area GW = Grand Rapids- Weyoming Metro Area

FIGURE 17: MICHIGAN'S TRACE METAL MONITORING NETWORK



Trace Metal Quality Assurance

The site operator conducts a precision flow check once a month. Flow check values are sent to the QA Coordinator 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. 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. 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. Results for the participating laboratories are compared to each other since a "true" value is not known.

Precision samples for both PM_{10} and TSP-sized trace metals are collected at Dearborn (261630033) on a once every 12 day frequency.

Plans for the 2016 Trace Metal Network:

During 2016, contingent upon adequate levels of funding, the MDEQ plans to continue to collecting trace metal measurements, as described for the above elements at:

- Belding-Reed St. (260670002) - TSP – lead, manganese, nickel, arsenic and cadmium
- Belding-Merrick St. (260670003) - TSP – lead, manganese, nickel, arsenic and cadmium
- Grand Rapids-Monroe St. (260810020) - TSP – manganese, nickel, arsenic and cadmium
- Allen Park (261630001) - TSP – manganese, nickel, arsenic and cadmium; for PM_{10} manganese, nickel, arsenic and cadmium
- Detroit-SWHS (261630015) - TSP - manganese, nickel, arsenic and cadmium; for PM_{10} 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_{10} manganese, nickel, arsenic and cadmium
- Dearborn NATTS site (261630033) for both PM_{10} and TSP – metals reported include manganese, nickel, arsenic, cadmium, lead, beryllium, vanadium, chromium, cobalt, copper, zinc, molybdenum, barium and iron.
- Port Huron (261470031) - TSP – lead, 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 the 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.

Table 27 summarizes the VOC monitoring site information. **Figure 18** 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 hours. The auditor assesses the sampling configuration, including the condition and height of probe and siting criteria.

The MDEQ Laboratory also participates in both national and regional performance test programs. 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 2016 VOC Monitoring Network

During 2016, contingent upon adequate levels of funding, the MDEQ plans to continue collecting VOCs at:

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

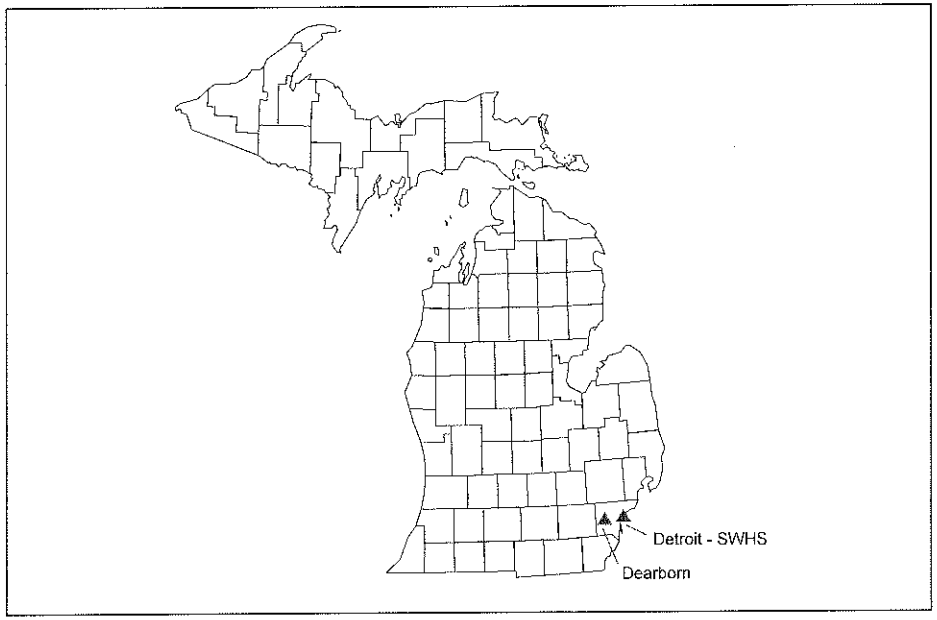
TABLE 27: MICHIGAN'S VOC MONITORING NETWORK

Operating Schedule: 1:6 and 1:12
Method: Stainless Steel Pressurized Canister Sampler; Gas Chromatograph/ Mass Spectrometer (24-hr samples)

Monitoring Sites											
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Date Estab.	CBSA [1]	Pop (2010 Census)
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

[1] **CBSA Key:** DWL= Detroit-Warren-Livonia Metro. Area

FIGURE 18: 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, this runs on a once every 12 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.

Table 28 summarizes the carbonyl monitoring site information for sites that were in existence in 2015 and are continuing to operate in 2016. **Figure 19** 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 carbonyl samples are sent to two different labs. NATTS samples go to a National Contract Lab. The National Lab participates in a national performance test program. The lab where the Detroit-SWHS and River Rouge samples go is also required to participate in the NATTS performance test program. The national contractor 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 2016 Carbonyl Monitoring Network

During 2016, contingent upon adequate levels of funding, Michigan plans to continue collecting carbonyls at:

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

TABLE 28: MICHIGAN'S CARBONYL MONITORING NETWORK

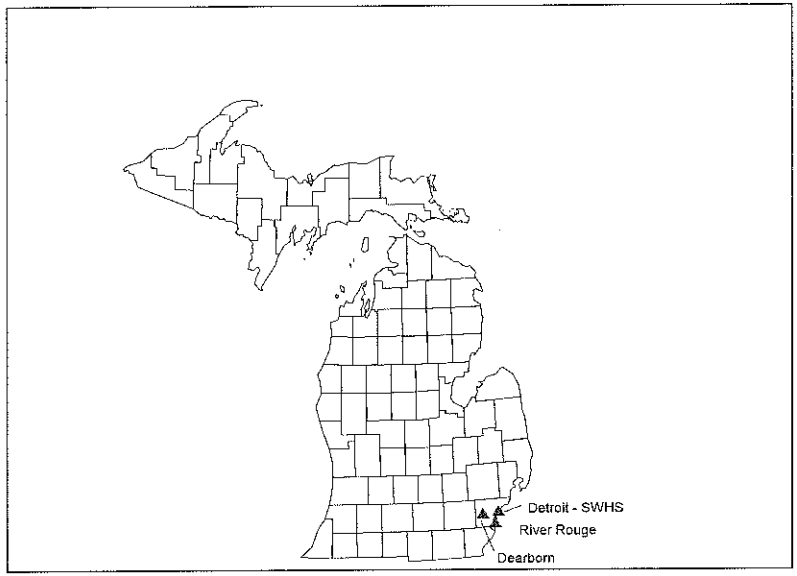
Operating Schedule: 1:6 and 1:12

Method: 2,4 dinitrophenyl hydrazine treated silica gel cartridges; HPLC w ith ultraviolet absorption

Monitoring Sites											
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Date Estab.	CBSA [1]	Pop (2010 Census)
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	1:12	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

[1] **CBSA Key:** DWL= Detroit-Warren-Livonia Metro. Area

FIGURE 19: MICHIGAN'S CARBONYL MONITORING NETWORK



Polynuclear Aromatic Hydrocarbon 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 29 shows the site information for PAH sites that were in operation in 2014 and are currently operating. **Figure 20** shows the locations of sites where PAH monitoring occurs. design.

PAH Quality Assurance

The site operator conducts a precision flow check once a month. The flow check values are sent to the QA Coordinator 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.

Plans for the 2016 PAH Monitoring Network

During 2016, contingent upon adequate levels of funding, Michigan plans to continue collecting PAHs at:

- Dearborn (261630033) – once every six days and precision samples

TABLE 29: MICHIGAN'S PAH MONITORING NETWORK

Operating Schedule: 1:6

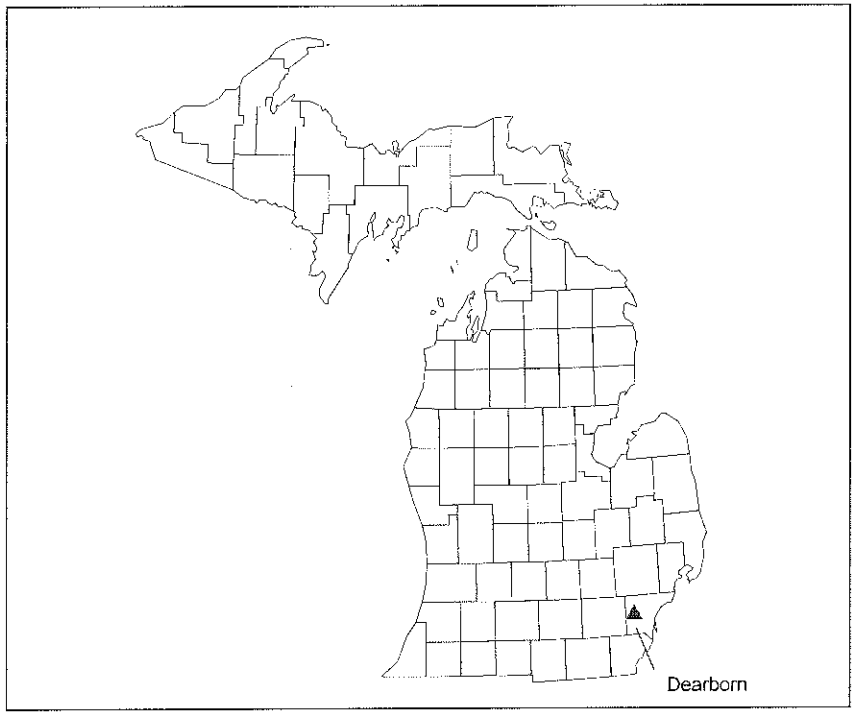
Method: Polyurethane foam plugs and XAD-2 resin with gas chromatography mass spectrometry

Network as of 2012

Monitoring Sites											
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose	Scale	County	Date Estab.	CBSA [1]	Pop (2010 Census)
Dearborn	261630033	2842 Wyoming	42.30667	-83.1489	1:6	max conc	nghbrhd	Wayne	6/1/90	DWL	4,296,250

[1] **CBSA Key:** DWL= Detroit-Warren-Livonia Metro. Area

FIGURE 20: 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 30**. The MDEQ is not planning any changes to the meteorological measurements.

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 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 2016 Meteorological Monitoring Network

During 2016, contingent upon adequate levels of funding, Michigan plans to continue collecting 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)
- Sterling St Park–Monroe (261150006)
- Muskegon–Green Creek Rd. (261210039)
- Oak Park (261250001)
- Pontiac (261250011)
- Rochester (261250012)
- Jenison (261390005)
- West Olive (261390011)
- Port Huron (261470005)

- Seney (261530001)
- Ypsilanti (261610008)
- Allen Park (261630001)
- River Rouge (261630005)
- Detroit–SWHS (261630015)
- Livonia Near Road (261630095)
- Detroit-Joy Rd. (261630026)
- Dearborn (261630033)
- Detroit–FIA/Lafayette (261630039)
- Eliza Howell #1 (261630093)
- Eliza Howell #2 (261630094)

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

- Manistee (261010922)
- Sault Ste. Marie (260330901)

TABLE 30: 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				X
Sault Ste Marie +	260330901	X	X	X		X		X
Flint	260490021	X	X	X		X		X
Otisville	260492001	X	X	X		X		X
Harbor Beach	260630007	X	X	X				X
Belding- Reed St	260670002	X	X	X		X		X
Lansing	260650012	X	X	X		X		X
Kalamazoo	260770008	X	X	X				X
Grand Rapids - Monroe St	260810020	X	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
Sterling Hts/ Freedom Hill	260990021	X	X	X				X
Manistee +	261010922	X	X	X		X	X	X
Scottville	261050007	X	X	X				X
Houghton Lake	261130001	X	X	X		X		X
Sterling St Park - Monroe	261150006	X	X	X				X
Muskegon, Green Ck Rd	261210039	X	X	X				X
Oak Park	261250001	X	X	X		X		X
Pontiac	261250011	X	X	X				X
Rochester	261250012	X	X	X				X
Jenison	261390005	X	X	X				X
West Olive	261390011	X	X	X				X
Port Huron	261470005	X	X	X		X		X
Seney	261530001	X	X	X	X	X	X	X
Ypsilanti	261610008	X	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 Near Road	261630095	X	X	X	X	X		X
Detroit - Joy Rd	261630026	X	X	X				X
Dearborn	261630033	X	X	X	X	X		X
Detroit -FIA/Lafayette	261630039	X	X	X				X
Eliza Howell #1	261630093	X	X	X				X
Eliza Howell #2	261630094	X	X	X	X	X		X

Adequacy of Michigan's Monitoring Sites:

The suitability of monitoring site locations is frequently assessed by the AMU's QA Team and the EPA. The EPA assesses the adequacy of the stations during $PM_{2.5}$ 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.

Table 31 Summarizes the various monitoring waivers the MDEQ has requested.

TABLE 31: SUMMARY OF WAIVERS FOR MICHIGAN'S MONITORING NETWORK

Type of Wavier	Explanation
Ozone Monitor	The Ann Arbor MSA does not have enough space for the downwind monitor in Washtenaw County, therefore the MDEQ requests to place it in Oakland County
Lead Co-location	There is not a large enough foot print at the Belding monitoring sites to co-locate a lead monitor. Therefore, the MDEQ requests to leave the lead co-location at Dearborn. Originally requested in 2010.
Lead Monitoring	Request to waive lead monitoring at Consumer's JH Campbell plant. Modeling shows low impact. Originally requested in 2009 and re-submitted in 2014. Needs to be renewed every 5 years.
Lead Monitoring	Request to waive lead monitoring at St. Mary's Cement plant. Modeling shows low impact. Originally requested in 2009 and re-submitted in 2014. Needs to be renewed every 5 years.
Lead Monitoring	Request to waive lead monitoring at Consumer's Karn-Weadock plant. Modeling shows low impact. Originally requested in 2011 and re-submitted in 2016. Needs to be renewed every 5 years.
Tree Line	At the Dearborn NATTS, there is a tree on personal property that is getting close to the drip line limit. The MDEQ has a waiver request pending.

Appendix A: Acronyms and Their Definitions:

>	Greater than
<	Less than
≥	Greater than or equal to
≤	Less than or equal to
%	Percent
$\mu g/m^3$	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
BAM	Beta Attenuation Monitor (hourly $PM_{2.5}$ measurement monitor)
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)
GFIs	Ground fault circuit interrupters
hr	Hour
IN-MI	Indiana-Michigan
LADCO	Lake Michigan Air Directors Consortium
DEQ	Michigan Department of Environmental Quality
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_2	Nitrogen dioxide
NO_X	Oxides of Nitrogen
NO_Y	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
$PM_{2.5}$	Particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
PM_{10}	Particulate matter with a diameter of 10 microns or less
$PM_{10-2.5}$	Coarse PM equal to the concentration difference between PM_{10} and $PM_{2.5}$
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 $PM_{2.5}$)
SLAMS	State and Local Air Monitoring Station
SO_2	Sulfur dioxide
STAG	State Air Grant (federal)
STN	Speciation Trend Network ($PM_{2.5}$)
TEOM	Tapered element oscillating microbalance (hourly $PM_{2.5}$ 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

Appendix B: Summary of Comments Received and Replies

As part of the network review process, the EPA requires that the MDEQ solicit public comments. MDEQ made the draft 2015 Network Review available for public review by posting the document on its air quality homepage. To ensure that public was aware that the document was open for comment, the 30-day public comment period was announced in the DEQ Calendar on May 18, 2015.

The MDEQ received two comments to the network review. Both comments spoke to the need for MDEQ to increase SO_2 monitoring throughout the State.

Comment:

Two commenters argued the need for MDEQ to increase its focus on sulfur dioxide (SO_2).

The first commenter asked that MDEQ rely upon source-oriented dispersion modeling to increase the number of SO_2 samplers in MDEQ's ambient air monitoring network and/or to relocate existing analyzers to better quantify maximum impacts from the sources already monitored by MDEQ. The commenter provided modeling analyses for DTE's St. Clair, Belle River, Trenton Channel, River Rouge and Monroe plants along with Lansing Board of Water and Light's Eckert plant, Consumer Energy's Campbell plant and Wisconsin Electric's Presque Isle plant. This commenter also stated that SO_2 contributes to the formation of secondary particulate matter.

The second commenter asked that MDEQ install a SO_2 monitor at its New Haven air monitoring station (260990009) so to provide estimates of the SO_2 levels being advected into the Port Huron area

Response:

MDEQ's SO_2 air monitoring network is a result of three different requirements or rationale. The first two are required in federal regulations (40 CFR Part 58) that prescribe the minimum required monitoring States must perform under an acceptable State Implementation Plan (SIP).

The first is EPA's requirement to carryout trace level SO_2 monitoring at all National Core (NCore) monitoring sites. MDEQ has met this requirement at its two NCore stations: Allen Park (2616300) and Grand Rapids-Monroe Street (260810020).

The second EPA requirement is the Population Weighted Emission Index (PWEI), added to Part 58 in 2010. For any area with a calculated PWEI value between 5000 and 100,000 million person-tons per year, MDEQ is required to have one SO_2 monitor. As a result, MDEQ has SO_2 monitors in Lansing (260650012), Monroe-Sterling State Park (261150006), and West Olive (261390011) to fulfill PWEI requirements for Lansing Board of Water and Light's Eckert station, DTE's Monroe plant and Consumer Energy's Campbell plant, respectively. The Jenison SO_2 (261390005) monitor was originally deployed to characterize it SO_2 emissions in the county while the exact location of the new site was being determined.

The third rationale used by MDEQ for SO_2 monitoring revolves around continuing those State and Local Air Monitoring Stations (SLAMS) that have observed the highest SO_2 concentrations in the past. For this reason, MDEQ monitors SO_2 at Port Huron (261470005) and Detroit-Southwestern High School (also known as Detroit-Fort Street, 261630015).

While not part of the MDEQ network, SO_2 monitoring is also being carried out at a school by a southwest Detroit industrial facility near River Rouge. This data is being uploaded to EPA's national data repository, AQS, and as such, is available for regulatory use.

Currently, the EPA is developing regulations on the need for additional SO_2 data to make SO_2 designations in areas not currently designated as nonattainment. This is the proposed "Data Requirements Rule" that, if finalized, will require States to characterize the air quality these areas through either monitoring or dispersion modeling. The Data Requirement Rule is expected to be finalized in the summer of 2015 with any subsequent monitoring due by January 2017. Until EPA puts final regulations in place, MDEQ does not believe the time is ripe to propose or implement additional SO_2 monitoring at Marquette, St. Clair, Trenton or Belle River. However, once EPA regulations are available, MDEQ will solicit public comment as part of its annual air monitoring network review process on how and where additional SO_2 monitoring should be conducted, if the State has the resources to conduct such monitoring. Under the proposed regulations, the State will have the choice of characterizing attainment status of source-specific areas through the use of dispersion modeling in lieu of ambient monitoring.

With respect to the modeling submitted by the commenter on the placement of MDEQ's SO_2 monitors, MDEQ believes that this modeling supports our monitor placement in Monroe. While the commenter suggests the Lansing and Detroit-Southwestern High School monitors "...could be relocated to capture peak SO_2 concentrations", MDEQ believes that these monitors are indeed impacted by the nearby emission sources. Additionally, the area of Oakwood Hts/Melvindale that is suggested for monitor placement already has quality assured monitors located in that area. All of the data from these monitors is in the AQS database and is currently monitoring attainment. MDEQ also believes that given site access, siting criterion for trees and other obstructions, and the need to be in close proximity to electrical power, moving these sites to localized hotspots is not possible without being cost prohibitive.

One commenter asked for SO_2 monitoring at our existing New Haven site (260990009). If this commenter is willing to provide an SO_2 monitor, calibrator, and gas standard tank the MDEQ would be willing to install and operate them at our New Haven site as special purpose monitors for a finite period of time.

Lastly, MDEQ recognizes that SO_2 emissions may lead to secondary ambient particulate production. There are no proposed changes to the $PM_{2.5}$ network at this time. As long as funding is maintained, the MDEQ is not considering changes to the $PM_{2.5}$ FRM or speciation networks.

APPENDIX C

June 17, 2015

Ms. Amy Robinson
MDEQ – Air Quality Division
P.O. Box 30260
Lansing, MI 48909-7760
robinsona1@michigan.gov

Subject: **DTE Energy Comments on the Draft 2016 Michigan Ambient Air Monitoring Network Review**

Dear Ms. Robinson:

DTE Energy is pleased to submit the following comments regarding the Draft 2016 Michigan Ambient Air Quality Monitoring Network Review. We are supportive of your efforts to meet the air quality monitoring requirements mandated in EPA's regulations, especially with the uncertain Federal and State funding for this program.

DTE Energy supports the proposed changes in the draft network plan for 2016. However, DTE Energy has a couple of important comments regarding the network plan. The first one applies to the State's $PM_{2.5}$ monitoring plan and the second one is associated with the SO_2 monitoring plan.

Michigan's proposal to keep using the Federal Reference Method (FRM) to measure $PM_{2.5}$ is preferable to switching to Federal Equivalent Method (FEM) samplers (I.e., TEOMs), that are biased high in the Midwest. This is especially important with EPA's recent lowering of the annual NAAQS to 12.0 ug/m^3, making it much more difficult to meet than the previous 15.0 ug/m^3 NAAQS.

There are quite a few $PM_{2.5}$ monitoring sites that would not be required to meet EPA's minimum siting criteria; especially those with recent 3-year average design values less than 85 percent of the 24-hour and annual NAAQS. Keeping those sites operational will help future air permit applicants determine representative background concentration values, rather than forcing them to use less appropriate, farther away, site data. This critical information will provide more real-world data, and rely less on estimated impacts from sources not modeled in air quality impact assessments, which is required for most sources seeking permits to install.

Last year, DTE Energy commented that the State's 2015 Monitoring Plan should add an SO_2 monitor to its existing New Haven site to provide a more representative background estimate for upcoming 1-hour SO_2 designations in areas not yet designated. This would have been extremely beneficial for impending designations in St. Clair County, where a lawsuit settlement between EPA and the Sierra Club has sped up the designation process. Michigan must provide a recommendation to EPA by September 2015 for this part of Michigan. DTE Energy and Agency staff are currently developing a dispersion modeling protocol to predict whether the SO_2 NAAQS is met around these power plants.

However, the nearest monitoring site, in Port Huron, is impacted by these two power plants, as well as two other sources in Michigan and a couple other sources in Ontario. It will be difficult to segregate the Port Huron SO_2 data to estimate a representative background concentration. We believe it is very important to avoid double-counting impacts from these DTE Energy power plants and from other SO_2 sources that impact the Port Huron monitor. Having at least two of these sources located in Canada makes it difficult to acquire accurate actual SO_2 emission data, increasing the uncertainty of the impact analysis.

DTE Energy may ask the State of Michigan to recommend that EPA designate this County as unclassifiable. We realize that the State does not have the funds to install and operate any new SO_2 monitoring sites, but DTE Energy may fund one or two new sites to avoid overestimating source impacts in St. Clair County. DTE Energy submitted a modeling protocol to the State for these plants, and now awaits approval from the State (& Region 5 of EPA) to perform the impact analysis. In the meantime, the September deadline is quickly approaching.

Thank you for the opportunity to review this important document. The Michigan Department of Environmental Quality's Air Quality Division (MDEQ-AQD) staff should be commended for the quality of this draft monitoring plan.

Michael Lebeis

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June 18, 2015

Amy Robinson
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Air Quality Division
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Via Electronic Mail

Re: Sierra Club and Earthjustice Comments on Michigan's Proposed 2016 Ambient Air Monitoring Network Review

Ms. Robinson:

On behalf of Sierra Club and Earthjustice, we submit the following comments on the Michigan Department of Environmental Quality's proposed 2016 Ambient Air Monitoring Network Review ("MDEQ 2016 Proposed Monitoring Plan").[1] These comments focus on the sulfur dioxide monitoring aspects of the Plan and briefly touch on the importance of monitoring PM2.5. In addition, these comments address why Michigan should use modeling to implement the 2010 SO_2 National Ambient Air Quality Standards (NAAQS).[2]

[1] Michigan Department of Environmental Quality Air Quality Division, *Michigan's 2016 Ambient Air Monitoring Network Review* (proposed May 18, 2015), available at http://www.michigan.gov/documents/deq/deq-aqd-toxics-2016_Air_Mon_Network_Review_489490_7.pdf (last visited June 8, 2015).

[2] MDEQ's 2016 Proposed Monitoring Plan also demonstrates that at least eight counties in Michigan are exceeding the 2008 Ozone NAAQS based on 2011-2013 data, while three counties exceed the standard using 2012-2014 data. 2016 Proposed Monitoring Plan at p. 24. As explained in Sierra Club's June 4, 2014 comments on Michigan's Proposed Infrastructure State Implementation Plan, it is critical that MDEQ require coal-fired EGUs that are causing such exceedances to install pollution controls and comply with stringent emission limits in order to protect public health and avoid future non-attainment designations. See Sierra Club, *Comments Concerning Michigan State Implementation Plan Infrastructure Applicable to the 2010 Nitrogen Dioxide, 2010 Sulfur Dioxide, 2008 Ozone, and 2012 Particulate Matter 2.5 National Ambient Air Quality Standards* (June 4, 2014), at pp. 22-25, attached hereto as Ex. 1; *see also* Sierra Club, Earthjustice et al, *Comments on Draft Permits to Install No. 215-11B (Trenton Channel) and 40-08G (River Rouge)*, attached as Ex. 2. Those comments are incorporated herein by reference.

I. There Is a Compelling Need for Additional Source-Oriented SO_2 Modeling and Monitoring in Michigan.

A. Without the Use of SO_2 Modeling, the Proposed Monitoring Network is Insufficient to Identify Even the Most Significant Violations of the NAAQS.

The overriding purpose of an air quality monitoring network is to determine which areas of Michigan do not meet the NAAQS and therefore require pollution reductions to ensure that the residents of those areas are not breathing unhealthy air. When the U.S. Environmental Protection Agency ("EPA") revised the SO_2 NAAQS in 2010, it highlighted the significance of stationary sources in terms of monitoring network design and noted that peak 1-hour concentrations would likely be greatest near stationary sources.[3]

However, EPA decided to rely heavily on modeling to identify areas exceeding the SO_2 NAAQS in light of the expense and burden of establishing a monitoring network that addresses all significant sources, the "special challenges SO_2 emissions present in terms of monitoring short-term SO_2 levels for comparison with the NAAQS in many situations," and "the superior utility that modeling offers for assessing SO_2 concentrations."[4] In particular, EPA noted that:

> [W]e intend to use a hybrid analytic approach that would combine the use of monitoring and modeling to assess compliance with the new 1-hour SO_2 NAAQS.... [W]e believe that for a short-term 1-hour standard it is more technically appropriate, efficient, and effective to use modeling as the principle means of assessing compliance for medium to larger sources, and to rely more on monitoring for groups of smaller sources and sources not as conducive to modeling.[5]

EPA's final 2010 SO_2 NAAQS rule simply built upon EPA's historical practice of using modeling to determine attainment and nonattainment status for SO_2 NAAQS. In doing so, EPA properly recognized the "strong source-oriented nature of SO_2 ambient impacts,"[6] and concluded that the appropriate methodology for purposes of determining compliance, attainment, and nonattainment with the new NAAQS is modeling.[7] Accordingly, in promulgating the 2010 SO_2 NAAQS, EPA explained that, for the one-hour standard, "it is more appropriate and efficient to principally use modeling to assess compliance for

[3] U.S. Environmental Protection Agency (EPA), Primary National Ambient Air Quality Standard for Sulfur Dioxide; Final Rule, 75 Fed. Reg. 35,520, 35,557 (June 22, 2010) (to be codified at 40 C.F.R. pts. 50, 53, and 58) ["SO_2 NAAQS Final Rule"].
[4] *Id.* at 35,550.
[5] *Id.* at 35,551.
[6] *Id.* at 35,570.
[7] *See id.* at 35,551

medium to larger sources . . . ."[8] Similarly, EPA then explained in a white paper that using modeling to determine attainment for the SO_2 standard "could better address several potentially problematic issues than would the narrower monitoring-focused approach discussed in the proposal for the SO_2 NAAQS, including the unique source-specific impacts of SO_2 emissions and the special challenges SO_2 emissions have historically presented in terms of monitoring short-term SO_2 levels for comparison with the NAAQS in many situations (75 FR 35550)."[9]

Because EPA is now subject to a consent decree to complete area SO_2 designations for many areas throughout the country by in July 2, 2016, and the rest of the country by December 31, 2017 or December 31, 2020, the agency has emphasized the need for states to efficiently gather data for designation.[10] Acknowledging that this new timeline "does not provide for establishment and use of data from new ambient monitors," EPA anticipates that modeling will be a more reliable source of designation information.[11] Plants located in Michigan for which EPA will issue area designations by July 2, 2016, include Karn/Weadock, Erickson, Eckert, Presque Isle, Monroe, JH Campbell, Belle River, and St. Clair.[12]

B. As a Supplement to Modeling, MDEQ Should Strengthen Its Network of SO_2 Monitors.

In its proposed Data Requirements Rule for the 1-Hour Sulfur Dioxide NAAQS,[13] EPA indicated that it will allow states the "flexibility to choose whether to use monitoring or modeling to characterize air quality around or in proximity to identified sources."[14] However, EPA emphasized that the current monitoring network "is not appropriately positioned or of adequate size for purposes of the 2010 SO_2 standard to characterize the air quality around many of the nation's larger SO_2 sources in operation today."[15] EPA therefore indicated that in order to use monitoring to characterize air quality, states "will need to take explicit actions to identify, relocate and/or install new ambient SO_2 monitors

[8] *Id.* at 35,570
[9] EPA, *Implementation of the 1-Hour SO2 NAAQS Draft White Paper for Discussion* at 3-4 ["EPA White Paper"], *available at* http://www.epa.gov/airquality/sulfurdioxide/pdfs/20120522whitepaper.pdf (to be codified at 40 C.F.R. pt. 51).
[10] EPA, *Updated Guidance for Area Designations for the 2010 Primary Sulfur Dioxide National Ambient Air Quality Standard* at 2 (March 20, 2015) *available at* http://www.epa.gov/oaqps001/sulfurdioxide/pdfs/20150320SO2designations.pdf.
[11] *Id.* at 3.
[12] EPA, *Air Designations for the 2010 SO2 National Ambient Air Quality Standard to be Completed by July 2, 2016*, available at http://www.epa.gov/airquality/sulfurdioxide/designations/pdfs/sourceareas.pdf.
[13] Data Requirements Rule for the 1-Hour Sulfur Dioxide (SO_2) Primary National Ambient Air Quality Standard (NAAQS); Proposed Rule, 79 Fed. Reg. 27,446 (May 13, 2014), *available at* http://www.gpo.gov/fdsys/pkg/FR-2014-05-13/pdf/2014-09458.pdf ["proposed Data Requirements Rule"].
[14] *Id.* at 27,453.
[15] *Id.* at 27,449.

that would characterize peak 1-hour SO_2 concentrations in areas around or impacted by identified SO_2 sources."[16]

The proposed rule's companion Technical Assistance Document further indicates that states should take into account all existing data in determining where to site monitors, including "existing modeling results."[17] An air agency that chooses to use monitoring as a means of satisfying the anticipated data requirements rule are thus required to develop a network proposal in which it demonstrates that the area characterized around an identified SO_2 source (or sources) includes the locations where peak 1-hour SO_2 concentrations are expected to occur.[18]

The Technical Assistance Document further explains how to identify these locations where peak 1-hour concentrations are likely to occur. Rather than recommending minimum criteria for the number of monitors in a network, EPA emphasizes that the number of monitors and their locations relative to sources will be case-specific.[19]

The Sierra Club recognizes that MDEQ lacks sufficient resources to add all large and medium SO_2 sources to the monitoring network at this time. However, in the interest of both efficiency and the health of Michigan residents, and in recognition of EPA's expressed preferences, MDEQ should ensure its existing monitors are placed in priority areas based on the extent of emissions and/or proximity to large, potentially-affected populations. Priority areas include capturing the peak emissions concentrations from the following major sources:

- DTE's St. Clair and Belle River plants;
- DTE's Trenton Channel and River Rouge plants;
- Wisconsin Electric's Presque Isle plant;
- Lansing Board of Water & Light's Eckert plant;
- DTE's Monroe plant; and
- Consumers Energy's J.H. Campbell plant.

[16] *Id.* at 27,458. In the proposed rule's companion Technical Assistance Document (TAD), EPA offers the following guidance on how air agencies might satisfy the SO_2 data requirements in order to determine compliance with the NAAQS: "The EPA expects monitoring conducted in response to [an anticipated] future data requirements rule to be targeted, source-oriented monitoring, for which the primary objective would be to identify peak SO_2 concentrations in the ambient air that are attributable to an identified emission source or group of sources." EPA Office of Air and Radiation, Office of Air Quality Planning and Standards, Air Quality Assessment Division, SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document (December 2013 Draft), at 2 *available at* http://www.epa.gov/airquality/sulfurdioxide/pdfs/SO2MonitoringTAD.pdf ["Proposed Data Requirements Rule TAD"].

[17] Proposed Data Requirements Rule TAD at 2.

[18] *Id.* at 16 ("The primary objective is to place monitoring sites at the location or locations of expected peak concentrations.").

[19] *Id.* at 11.

Where the air monitoring network is insufficient to adequately characterize peak SO_2 air quality, MDEQ must use dispersion modeling to determine compliance with the 1-hour SO_2 standard.

C. The Public Health Impacts of SO_2 Emissions on Michigan Residents are Significant.

In order to "protect public health with an adequate margin of safety," EPA revised the SO_2 primary NAAQS in 2010 to replace the 24-hour and annual standards with a short-term, 1-hour standard.[20] In revising the standard, EPA noted that its rationale focused primarily on the causal relationship between respiratory morbidity following short-term exposure to SO_2.[21] Indeed, SO_2 exposure for as little as 5-10 minutes can lead to adverse health effects to asthmatics.[22] EPA also noted that the existing standards were not adequate to "protect public health with an adequate margin of safety."[23] EPA then selected a short-term standard that was designed to limit adverse respiratory effects on at-risk populations.[24]

Short-term SO_2 exposure is associated with a variety of negative health effects, particularly among at-risk populations:

> Current scientific evidence links health effects with short-term exposure to SO_2 ranging from 5-minutes to 24-hours. Adverse respiratory effects include narrowing of the airways which can cause difficulty breathing (bronchoconstriction) and increased asthma symptoms. These effects are particularly important for asthmatics during periods of faster or deeper breathing (e.g., while exercising or playing).
>
> Studies also show an association between short-term SO_2exposure and increased visits to emergency departments and hospital admissions for respiratory illnesses - particularly in at-risk populations including children, the elderly and asthmatics.[25]

Unfortunately, a considerable portion of Michigan's residents can be categorized as at-risk, and many of these at-risk populations live in the Detroit-Warren-Livonia area, a major population center located near some of the state's largest stationary sources of SO_2 emissions. For example, the prevalence of asthma among Detroit adults is 50 percent

[20] SO_2 NAAQS Final Rule, 75 Fed. Reg. at 35,521.
[21] *Id.* at 35,526.
[22] *Id.* at 35,536.
[23] *Id.* at 35,550.
[24] *Id.*
[25] EPA, Fact Sheet: Revisions to the Primary National Ambient Air Quality Standard, Monitoring Network, and Data Reporting Requirements for Sulfur Dioxide, *available at* http://www.epa.gov/airquality/sulfurdioxide/pdfs/20100602fs.pdf (last visited June 18, 2012).

higher than that of Michigan as a whole, and rates of asthma hospitalization in Detroit are three times higher than that of Michigan as a whole.[26]

D. SO_2 Emissions Contribute to the Creation of Fine Particulate Matter, Which is Linked to Premature Death.

In addition to the adverse health effects attributable directly to SO_2, the health of Michigan residents is further threatened because SO_2 pollution contributes to the formation of secondary particles of fine particulate matter (PM2.5). Secondary particles of PM2.5 are formed from atmospheric reactions of chemicals including SO_2, and most of the fine particle pollution in the United States is formed in this way.[27]

PM2.5 pollution contributes to a number of adverse health effects, including heart attacks, aggravated asthma, decreased lung function, coughing, and difficulty breathing.[28] Most disturbingly, PM2.5 is also associated with premature death in people with existing heart or lung disease.[29] According to the EPA, "the evidence is sufficient to conclude that the relationship between long-term PM2.5 exposures and mortality is causal."[30]

The estimated numbers of deaths caused by fine particulate matter from some of the state's largest SO_2 sources emphasize the urgency of adequate SO_2 monitoring. DTE's Trenton Channel plant alone is estimated to have caused between 56 and 110 premature deaths in 2011, ranking it among the 18 plants in the nation whose premature deaths cost society more than the value of the electricity they generate.[31] Similarly, DTE's St. Clair plant is estimated to have caused between 76 and 160 premature deaths in 2011, while the J.H. Campbell plant is estimated to have caused between 70 and 140 premature deaths in that year.[32]

Additional statistics on health impacts caused by fine particle pollution from each of the major sources identified above have been compiled by the Clean Air Task Force. These data, summarized below, reveal that each of the major sources has substantial health

[26] *See* "Disparities in Michigan's Asthma Burden," at 2, *available at*http://www.michigan.gov/documents/mdch/Disparities-in-Michigan-Asthma-Burden_424786_7.pdf, (last visited June 10, 2015).
[27] EPA, Basic Information on Particulate Matter, *available at* http://www.epa.gov/pm/basic.html (last visited June 18, 2012).
[28] EPA, Health information on Particulate Matter, *available at* http://www.epa.gov/pm/health.html (last visited June 10, 2015).
[29] *Id.*
[30] EPA, Integrated Science Assessment for Particulate Matter, EPA/600/R-08/139F, at 7-96 (Dec. 2009), *available at* http://www.epa.gov/ncea/pdfs/partmatt/Dec2009/PM_ISA_full.pdf (last visited June 16, 2014)
[31] Environmental Integrity Project, Net Loss: Comparing the Cost of Pollution vs. the Value of Electricity from 51 Coal-Fired Plants (June 2012), at ii, v, *available at* http://www.environmentalintegrity.org/news_reports/documents/PowerPlantReport_2012.6.6.Final.pdf (last visited June 10, 2015).
[32] *Id.*

effects on the surrounding communities through increased heart attacks, asthma attacks, chronic bronchitis, and death.[33]

Source	Deaths	Heart Attacks	Asthma Attacks	Hospital Admissions	Chronic Bronchitis	Asthma ER visits
St. Clair	66	110	1,000	49	39	54
Belle River	55	89	860	41	33	45
Trenton Channel	58	93	920	43	34	50
River Rouge	20	33	320	15	12	17
Presque Isle	14	22	220	10	8	13
Eckert	10	16	160	7	6	9
Monroe	140	230	2,200	100	83	120
J.H. Campbell	67	110	1,100	49	40	65

*These data are estimated annual impacts from each plant in 2012.[34]

II. The State Cannot Rely on Monitoring to Comply with the SO_2 NAAQS.

Before discussing specific inadequacies in Michigan's proposed monitoring network, it is important to note that the state should not use a monitoring network as the primary means of evaluating SO_2 NAAQS compliance but, instead, should rely on lower-cost and more accurate air dispersion modeling.

A. Monitors Alone Cannot Accurately Evaluate Compliance with the SO_2 NAAQS for Medium and Large Sources.

When EPA promulgated the 2010 SO_2 NAAQS, it conceded that the existing monitor network—which dwindled from 1496 sites in 1980 to 488 monitors in 2008- —is insufficient to support a monitoring approach to implementation.[35] As EPA explained in the final 2010 SO_2 NAAQS Rule, when designating attainment, it relies on dispersion modeling to confirm the absence of violations, "even if monitoring does not show a violation."[36] The EPA concluded that monitoring in general is "less appropriate, more expensive, and slower to establish,"[37] and that "dispersion models are able to characterize air quality impacts from the modeled sources across the domain of interest on an hourly

[33] Clean Air Task Force, *Death and Disease from Power Plants, available at* http://www.catf.us/fossil/problems/power_plants/ (last visited June 10, 2015).
[34] *Id.*
[35] SO_2 NAAQS Final Rule, 75 Fed. Reg. at 35,525.
[36] *Id.* at 35,551.
[37] *Id.*

basis with a high degree of spatial resolution, overcoming the limitations of an approach based solely on monitoring."[38]

Deploying a more extensive monitoring network would be too slow, too impractical, and too ineffective to replace modeling as the primary means of implementing the 1-hr SO_2 NAAQS.

First, the minimum monitoring requirements established by EPA will be largely insufficient to characterize SO_2 air quality or to determine compliance with the 1-hr SO_2 standard.[39] EPA itself acknowledges that "[t]the total number of monitoring sites that will serve the variety of data needs will be substantially higher than these minimum requirements provide."[40] For any area with fewer than three SO_2 monitors positioned to capture peak concentrations from a large SO_2 source, monitoring will be inadequate to establish 1-hr SO_2 compliance.[41] And if only one monitor is located near a large source, that source has a clear invitation to game the system by, for example, slightly adjusting its stack or operating parameters to ensure that high impacts will not occur at the one monitor.

Second, even if the state were to have the resources to deploy a sufficient number of monitors, the state may not be able locate a monitor where models indicate the highest impact is likely to occur for technical reasons, such as inability to gain physical or legal access to the site, or lack of access to power supply.[42]

Third, even if a sufficiently extensive monitoring network were established, implementation of the NAAQS through monitoring would likely take up to a decade, which is an untenable amount of time. Not only would this delay be a disservice to the public, it would also be a disservice to the regulated entities, especially owners of coal-fired power plants. Coal-fired power plants are making critical decisions now about the need for additional pollution controls or retirements because of a number of factors such as other major environmental regulations, declining demand for energy, declining prices and increasing availability of zero or low SO_2 generating sources, and the age of the existing coal fired power plant fleet. Evaluating and achieving compliance through more expeditious and cost-effective air dispersion modeling can thus provide the regulatory clarity needed to make prudent decisions about those plants now that reliance on increased monitoring alone cannot.

[38] *Id.* at 35,559.
[39] *See* Andrew Gray, Gray Sky Solutions, "Review of Michigan's 2015 SO_2 Ambient Air Monitoring Network," June 20, 2014, at 3, attached as Ex. 3.
[40] 40 C.F.R. § 58 App. D, § 1.1.2 (2011).
[41] Gray at 3.
[42] An inability to place monitors at appropriate locations is another argument in favor of a modeling approach, as EPA has long recognized: "Although siting criteria may preclude the placement of ambient monitors at certain locations, this does not preclude the placement of model receptors at these sites." U.S. EPA 1994 SO_2 Guideline Document at 2-6.

EPA itself has acknowledged that for medium to large sources, monitoring is "less appropriate, more expensive, and slower to establish" than modeling.[43]. This has been EPA's position for decades. For example, in 1994, EPA explained:

> A small number of ambient SO_2 monitors usually is not representative of the air quality for an area. Typically, modeling estimates of maximum ambient concentration are based on a fairly infrequent combination of meteorological and source operating conditions. To capture such results on a monitor would normally require a prohibitively large and expensive network. Therefore, dispersion modeling will generally be necessary to evaluate comprehensively a source's impacts and to determine the areas expected high concentrations.[] Air quality modeling results would be especially important if sources were not emitting at their maximum level during the monitoring period or if the monitoring period did not coincide with potentially worst-case meteorological conditions.

U.S. EPA 1994 SO_2 Guideline Document at 2-5 to 2-6 (emphasis added). EPA has also explained:

> Monitoring is not more accurate than computer modeling, except for determining ambient concentrations under real-time conditions at a discrete location. Monitoring is limited in time as well as space. Monitoring can only measure pollutant concentrations as they occur; it cannot predict future concentrations when emission levels and meteorological conditions may differ from present conditions. Computer modeling, on the other hand, can analyze all possible conditions to predict concentrations that may not have occurred yet but could occur in the future.

67 Fed. Reg. 22,168, 22,185 (May 2, 2002) (emphasis added).

As far back as 1983, EPA stated that in "most SO_2 cases, monitoring data alone will not be sufficient for areas dominated by point sources. A small number of ambient monitors usually is not representative of the air quality for the entire area."[44] "EPA explained that it was 'not practical, given the number and complexity of sulfur dioxide sources, to install a sufficient number of monitors to provide the spatial coverage provided by air quality dispersion models.'"[45] (emphasis added).

Indeed, it is unlikely that *any* number of monitors would be sufficient to implement the NAAQS. The State and Territorial Air Pollution Program Administrators/Association of Local Air Pollution Control Officers (now National Association of Clean Air Agencies, or "NACAA") told EPA over a decade ago that monitoring could not be used to

[43] SO_2 NAAQS Final Rule, 75 Fed. Reg. at 35,551.
[44] Sheldon Meyers, Memorandum re Section 107 Designation Policy Summary (April 21, 1983), attached hereto as Exhibit 3; *see also Montana Sulphur & Chemical Co. v. EPA,* 666 F.3d 1174, 1184 (9th Cir. 2012)
[45] *Id.*

effectively determine compliance with short-term SO_2 ambient standards.[46] NACAA explained that since short-term SO_2 "concentrations are strongly influenced by meteorology (wind direction, wind speed, stability, etc.), there is no assurance that any prescribed number of monitors around a facility would detect the highest levels in adjacent population neighborhoods."[47]. NACAA also explained that "[r]edeploying monitors in the existing network to cover specific facilities in an attempt to keep costs down does not recognize the true potential of need."[48] NACAA also explained that redeployment of existing monitors is problematic because many existing monitors are needed for long-term trends analysis. NACAA further acknowledged the difficulty of gaining physical and legal access to essential monitoring locations.[49]

B. The Cost of Modeling is Modest Compared to the Cost of Monitoring.

The cost of modeling compliance with the SO_2 NAAQS is modest, particularly in comparison to the costs of installing and operating a monitoring network. One of the main reasons it is significantly cheaper to model rather than monitor for attainment designations is the profile of SO_2 emitters. SO_2 emissions are not spread evenly across all of the 84,000 SO_2 emitters in the United States. Instead, just 540 sources, 236 of which are coal-fired EGUs, are responsible for 90% of all SO_2 emissions in the United States.[50] In Michigan, over 80 percent of the state's SO_2 emissions are emitted by approximately 70 coal-fired electric generating units.[51] As a result, by focusing on this small subset of SO_2 sources, Michigan could expeditiously make significant progress in ensuring that the health protections promised by the NAAQS are met.

The profile of SO_2 emitters—where a handful of medium and large sources generate nearly all of SO_2 emissions in the country and the source specific locational nature of the SO_2 air pollution—means that SO_2 air pollution from medium and large sources can be readily and accurately modeled by simple particle dispersion modeling.

The Michigan DEQ modeling staff could likely model the medium and large SO_2emitters under its current budget. If the Michigan DEQ did not have in-house modeling resources, the agency would incur some costs charged by third party modelers, but even these costs are comparatively nominal. Independent third party modelers could conduct AERMOD time series modeling for SO_2 for less than $5,000 per source, and in most instances less than $3,000. Thus to model the large and medium sources in Michigan that cause 90% of the SO_2 emissions would cost less than $150,000. This number drops rapidly, however,

[46] *See* STAPPA-ALAPCO Letter to Eric Ginsburg (Feb. 15, 2001).
[47] *Id.* at 1
[48] *Id.* at 1-2.
[49] *Id.* at 4.
[50] EPA, Next Steps of Area Designations and Implementation of the Sulfur Dioxide National Ambient Air Quality Standard, at 3, (February 6, 2013) *available at* http://www.epa.gov/oaqps001/sulfurdioxide/pdfs/20130207 SO_2 StrategyPaper.pdf, (last visited June 10, 2015) ["EPA 2013 Strategy Paper"].
[51] EPA Technology Transfer Network, 2011 National Emissions Inventory, *available at* http://www.epa.gov/ttnchie1/net/2011inventory.html.

when one accounts for the sources in areas monitored as nonattainment or that have committed to retiring by a date certain.

In stark contrast, simply purchasing and installing a single monitor can cost an air agency "anywhere from $50,000 to $100,000" per site.[52] In fact, many states submitted comments to EPA stating that implementing the SO_2 NAAQS via monitors would be cost-prohibitive.[53] MDEQ's 2016 Proposed Monitoring Network report conditions the planned operation of SO_2 monitors on "adequate levels of funding."[54]

III. The Current Monitoring Network Is Inadequate to Monitor The Threats to Michigan Citizens' Health Posed by Large Sources of SO_2 Emissions.

While monitoring should not be relied upon as the primary means of evaluating SO_2 NAAQS compliance, it is an important component of Michigan's efforts to characterize air quality. As such, Michigan's plan should better utilize source-oriented monitors that effectively address the state's largest sources of SO_2.

A. Source-Oriented SO_2 Monitors Are Needed to Meet Monitoring Objectives.

When adopting the 1-hour NAAQS for SO_2, EPA observed that the highest concentrations of SO_2 would most likely be found near large stationary sources:

> A significant fact for ambient SO_2 concentrations is that stationary sources are the predominant emission sources of SO_2 and the peak, maximum SO_2 concentrations that may occur are most likely to occur nearer the parent stationary source.[55]

EPA has "recognized over many years that peak concentrations of SO_2 are commonly caused by one or a few major point sources… and are typically observed relatively close to the source."[56] Despite the source-oriented nature of SO_2 pollution, EPA's analysis pursuant to the 2010 SO_2 NAAQS review found that "only up to a third" of SO_2 monitors "were sited to characterize peak 1-hour ambient SO_2 concentrations."[57] This analysis "led the EPA to conclude that the network was not properly focused to support the revised NAAQS."[58] In 2014, the EPA reiterated that the SO_2 monitoring network is ill-positioned and ill-sized to characterize air quality around "many of the larger SO_2 sources."[59]

[52] EPA 2013 Strategy Paper at 2.
[53] SO_2 NAAQS Final Rule, 75 Fed. Reg. at 35,551.
[54] MDEQ 2016 Proposed Monitoring Network at 63.
[55] SO_2 NAAQS Final Rule, 75 Fed. Reg. at 35,557.
[56] Proposed Data Requirements Rule, 79 Fed. Reg. at 27,449.
[57] *Id.*
[58] *Id.*
[59] *Id.*

Pursuant to EPA regulations, monitoring network plans must achieve three objectives: 1) provide the public with data on air pollution; 2) provide supporting data for air pollution research; and 3) "support compliance with ambient air quality standards and emissions strategy development."[60] Additionally, a network must also incorporate "a variety of types of monitoring sites."[61]

> Monitoring sites must be capable of informing managers about many things including the peak air pollution levels, typical levels in populated areas, air pollution transported into and outside of a city or region, and air pollution levels near specific sources.[62]

Because stationary sources are by far the largest contributors to ambient SO_2 pollution, MDEQ must place monitors in areas of predicted peak emissions concentrations for at least the largest sources of SO_2 emissions.[63] Due to the source-oriented nature of SO_2 pollution, monitors sited to measure background concentration levels or typical concentrations in high-density population areas need to be supplemented with monitors sited to "determine the impact of significant sources or source categories on air quality."[64] EPA's proposed 2013 implementation strategy for SO_2 NAAQS involves identifying priority source areas of SO_2 pollution. Because SO_2 has localized impacts, monitoring objectives should include "characterization of peak air quality concentrations in the area around the source," and "characterization of air quality in populated areas."[65]

An SO_2 monitoring network can only support compliance with ambient air quality standards if individual monitors are located such that they will measure the areas of greatest anticipated concentration, *i.e.*, areas affected by the largest sources of SO_2 pollution.[66] A network that omits monitors near the largest sources of SO_2 pollution therefore also fails to provide at-risk members of the public with adequate and accurate information about the quality of the air they are breathing.

B. Michigan's Limited Monitoring Network is Inadequate to Determine Whether Some of the Largest Pollution Sources Are Causing Unhealthy Levels of SO_2.

[60] 40 C.F.R. § 58 App. D, § 1.1 (2011).
[61] *Id.* §1.1.1. The regulations specify "six general site types: (a) Sites located to determine the highest concentrations expected to occur in the area covered by the network. (b) Sites located to measure typical concentrations in areas of high population density. (c) Sites located to determine the impact of significant sources or source categories on air quality. (d) Sites located to determine general background concentration levels. (e) Sites located to determine the extent of regional pollutant transport among populated areas; and in support of secondary standards. (f) Sites located to measure air pollution impacts on visibility, vegetation damage, or other welfare-based impacts."
[62] *Id.*
[63] Proposed Data Requirements Rule TAD at 16.
[64] 40 C.F.R. § 58 App. D, § 1.1.
[65] EPA 2013 Strategy Paper at 5.
[66] Proposed Data Requirements Rule TAD at 16.

MDEQ currently operates five SO_2 ambient air monitors in the state: one in Lansing, one in the Sterling State Park in Monroe County, one in Port Huron, and one at the Southwest High School in Detroit, and one in West Olive.[67] MDEQ also operates NCore monitors at Allen Park and in Grand Rapids at Monroe St.[68]

At Sierra Club's request, an air dispersion modeling expert conducted a review of MDEQ's 2015 Proposed Monitoring Plan (hereinafter, "Gray Report").[69] In that report, Dr. Gray 1) examined whether MDEQ's monitors are deployed in a manner that captures peak predicted impacts from major sources, and 2) recommended the best location for a single monitor to identify the highest SO_2 concentrations caused by emissions from each of the major sources. These recommended monitor sites, which have not yet been deployed, represent the beginning of what Sierra Club hopes will eventually be a robust monitoring network, informed and supplemented by air quality modeling that will ensure that Michigan is able to identify, address, and prevent SO_2 NAAQS exceedances.

MDEQ's 2016 Proposed Monitoring Plan fails to address any of the shortcomings identified in the Gray Report. As discussed in greater detail below, the Gray Report found that MDEQ's 2015 Plan failed to include SO_2 monitors capable of capturing peak predicted emissions concentrations from several of the largest SO_2 sources, including the Trenton Channel, St. Clair, Belle River, and Presque Isle power plants.[70] Without monitors near these large sources of SO_2, the monitoring network cannot effectively determine the "peak air pollution levels" caused by such sources.[71] Additionally, by omitting source-oriented monitors near many of the largest sources of SO_2, the monitoring network fails to provide adequate information on "air pollution levels near specific sources."[72] Finally, while monitors are better placed with regards to SO_2 emissions from the River Rouge and Eckert plants, MDEQ should consider installing additional monitors to ensure that peak air pollution levels are being caught.[73]

Because Michigan's monitoring network does not capture predicted peak SO_2 concentrations from a number of major sources, MDEQ must either redeploy or expand its monitoring network. In addition, because the monitoring network is not expansive enough to characterize SO_2 air quality, MDEQ must rely on dispersion modeling to comply with the 1-hour SO_2 standard.

[67] MDEQ 2016 Proposed Monitoring Plan at 64. MDEQ had previously deployed an SO_2 monitor at the Jenison site in Ottawa County, but shut down the monitor in 2013 pending the move of its monitor to West Olive.
[68] *Id.*
[69] Andrew Gray, Gray Sky Solutions, "Review of Michigan's 2015 SO_2 Ambient Air Monitoring Network," June 20, 2014, at 3, attached as Ex. 3.
[70] *Id.* at 4.
[71] 40 C.F.R. § 58 App. D, § 1.1 (2011).
[72] *Id.*
[73] Gray Report at 4, 6, and 11.

IV. Modeling and Emissions Data Support the Installation or Redeployment of Source-Oriented SO_2 Monitors Near DTE's River Rouge, Trenton Channel, St. Clair, Belle River, and Presque Isle Power Plants.

Air dispersion modeling performed at the Sierra Club's request indicates that both allowable and, in some instances, maximum or actual emissions from the St. Clair, Belle River, Monroe, J.H. Campbell, Eckert, and Presque Isle power plants result in modeled violations of the 1-hour SO_2 NAAQS.[74] In addition, MDEQ's own modeling data for the St. Clair, Belle River, Trenton Channel and River Rouge plants shows predicted violations of the NAAQS.[75] As shown in Table 1, below, all of these plants have modeled maximum emissions above the SO_2 NAAQS.

Based on a review of the air modeling analyses, the Gray Report concluded that several of these plants do not have SO_2 monitors located in the peak emissions concentration areas identified by the modeling. Table 1, below, summarizes the Gray Report's findings and recommendations for where MDEQ should place SO_2 monitors to better capture predicted peak emissions concentrations from these major sources.

Table 1 Summary of Recommended Monitor Locations

Source	Allowable Emissions (tpy)	Modeled Maximum SO_2 Concentrations (ppb)	Monitor Located Near Modeled Peak?	Recommended Monitor Location
River Rouge	34,200	91	YES*	Oakwood Hts/Melvindale
Trenton Channel	44,254	107	**NO**	Allen Rd. & West Rd.
Belle River	71,631	85	**NO**	St. Clair Hwy & King Rd.
St. Clair	98,322	186	**NO**	
JH Campbell	87,563	111	YES	West Olive
Monroe	14,300	91	YES	Sterling Park

[74] *See* Steven Klafka, *Belle River and St. Clair Power Plants, St. Clair, Michigan, Evaluation of Compliance with 1-hour NAAQS for SO2 (May 28, 2014)*, [hereinafter "Klafka Belle River and St. Clair Report"], attached hereto as Ex. 4; Steven Klafka, Eckert Station, Lansing, Michigan, *Evaluation of Compliance with 1-hour NAAQS for SO2 (May 30, 2014)*, [hereinafter "Eckert Report"], attached hereto as Ex. 5; Steven Klafka, *J.H. Campbell Plant, West Olive, Michigan, Evaluation of Compliance with 1-hour NAAQS for SO2 (May 28, 2014)*, [hereinafter "J.H. Campbell Report"], attached hereto as Ex. 6; Steven Klafka, *Monroe Power Plant, Monroe, Michigan, Evaluation of Compliance with 1-hour NAAQS for SO2 (April 16, 2014)*, [hereinafter "Monroe Report"], attached hereto as Ex. 7; Steven Klafka, *Presque Isle Power Plant, Marquette, Michigan, Evaluation of Compliance with the 1-hour NAAQS for SO2 (May 30, 2014)* [hereinafter "Presque Isle Report"], attached hereto as Ex. 8.

[75] H. Andrews Gray, *SO2 Impacts from the St. Clair and Belle River Power Plants* (June 3, 2014) (attached hereto as Ex. 9) [Gray St Clair/Belle River Report]. Gray conducted his analysis of the impacts from the St. Clair and Belle River plants using modeling files obtained from MDEQ. Gray also used MDEQ's modeling files to analyze the appropriate locations for monitors for the Trenton Channel and River Rouge plants.

Eckert Station	29, 068	117	YES*	2-3 km SE or SW of plant
Presque Isle	30,482	295	NO	Southwest Marquette

* The monitors near River Rouge and Eckert Station could be relocated to capture peak SO_2 concentrations. See text for details.

MDEQ must therefore redeploy or expand its monitoring network to cover peak concentrations from major sources. Moreover, because the monitoring network is not sufficient to characterize SO_2 air quality, MDEQ must continue to use dispersion modeling to comply with the 1-hour SO_2 standard for all sources.

A. The Monitoring Network Does Not Adequately Capture SO_2 Impacts from DTE's River Rouge and Trenton Channel Power Plant.

The Southwest High School (SWHS) SO_2 monitor is located within five kilometers of a number of large SO_2 sources in the Detroit area, including the River Rouge power plant. The Gray Report noted that while the SWHS monitor is "located in an area where high concentrations from the River Rouge plant might be expected to occur,...the modeled peak impacts from all nearby sources combined (and also peak impacts from individual sources, including River Rouge) were typically located to the south or southwest of the SWHS monitor."[76] To capture the peak predicted concentrations from the River Rouge plant, MDEQ should place a monitor near the intersection of Oakwood Blvd. and S. Dix St, between the Oakwood Heights and Melvindale neighborhoods.[77] As discussed above, however, regardless of placement, a single monitor cannot suffice to characterize the SO_2 air quality in the surrounding area, and so the state must continue to use modeling to evaluate and demonstrate compliance with the 1-hr SO_2 NAAQS.[78]

Moreover, the Gray Report concluded that "there currently exists no monitor in southern Wayne County that can be used to characterize peak SO_2 air quality around the Trenton Channel power plant."[79] The Gray Report noted that the Allen Park monitor is located about 8 to 10 km southwest of major SO_2 sources, but in a generally upwind direction, and therefore likely does not capture peak emissions concentrations.[80] The Gray Report thus found that the Allen Park monitor "does not satisfy the need for source-oriented monitors that can be used to characterize peak concentrations around major sources, as required by the proposed data requirements rule."[81] To assess peak SO_2 concentrations associated with emissions from the Trenton Channel power plant, the Gray Report recommended that MDEQ place a monitor approximately 4.5 km northwest of the plant, near the intersection of Allen Road and West Road in the Woodhaven neighborhood.[82]

[76] Gray Report at 6.
[77] *Id.*
[78] *Id.*
[79] *Id.*
[80] *Id.*
[81] *Id.*
[82] *Id.* at 7.

Again, however, even with a properly placed monitor, the state must continue to use modeling to evaluate and demonstrate compliance with the 1-hr SO_2 NAAQS.

B. The Monitoring Network Does Not Adequately Capture SO_2 Impacts from DTE's St. Clair and Belle River Power Plants.

The St. Clair and Belle River power plants can emit up to 98,322 tons SO_2/year and 71,631 tons SO_2/year, respectively. Modeling performed by MDEQ and on behalf of the Sierra Club indicates that the two plants' emissions will cause violations of the SO_2 NAAQS over a wide area.[83] Yet, no SO_2 monitor is sited close enough to the plants to capture their peak emissions concentrations.

Modeling analysis using MDEQ's inputs and outputs found that peak SO_2 concentrations from the Belle River and St. Clair plants are expected to occur between approximately 3.5 and 6 kilometers north and northwest of the two power plants.[84] The nearest SO_2 monitor is the Port Huron monitor, which is located over 20 km north of the plants. The Gray Report found that "[w]hile there will likely be *some* occasional impact at the Port Huron monitor due to emissions from the St. Clair and Belle River power plants, there is almost no chance that the maximum SO_2 concentration generated by St. Clair and Belle River will be observed in Port Huron."[85] In fact, MDEQ has itself acknowledged that a monitor placed at such a distance is unlikely to capture peak emissions concentrations from a large SO_2 source; MDEQ moved the Jenison monitor to West Olive *because* the Jenison monitor, located 30 km east of the J.H. Campbell plant, was too far away to capture the plant's emissions. [86]

Similarly, because the Port Huron monitor cannot capture the peak SO_2 emissions concentrations from the Belle River and St. Clair power plants, the Gray Report recommended that MDEQ redeploy the monitor to an area slightly northwest of the two sources, such as the Pine River Elementary School or the St. Clair Lion's Club.[87] Even if MDEQ installed a properly placed monitor, however, the state must continue to use modeling to evaluate and demonstrate compliance with the 1-hr SO_2 NAAQS.[88]

C. The Monitoring Network May Not Adequately Capture SO_2 Peak Concentrations from the J.H. Campbell Plant.

Modeling performed on behalf of the Sierra Club predicts that the West Olive monitor should capture secondary modeled peak concentrations.[89] However, the monitor is not

[83] *See supra* at Table 1.
[84] Gray Report at 7.
[85] *Id.* at 8.
[86] *Id* at 7.
[87] *Id.* at 9.
[88] *Id.*
[89] *Id.* at 7.

ideally placed to capture primary peak concentrations from the Campbell plant.[90] Even with this monitor, however, because a single monitor cannot suffice to characterize SO_2 air quality, MDEQ must continue to use modeling to evaluate and demonstrate compliance with the 1-hr SO_2 NAAQS.

D. The Monitoring Network Does Not Adequately Capture SO_2 Impacts from the Presque Isle Power Plant.

Modeling performed on behalf of the Sierra Club predicts that the Presque Isle plant's emissions will cause exceedances of the SO_2 NAAQS.[91] Again, however, no SO_2 monitor is sited close enough to the plants to capture the plant's peak emissions concentrations. Based on the results of the air dispersion modeling, the Gray Report recommendeds that MDEQ place a monitor in southwestern Marquette, north of Highway 41.[92] Once again, even if MDEQ installed a properly placed monitor, the state must continue to use modeling to evaluate and demonstrate compliance with the 1-hr SO_2 NAAQS.

E. The Lansing Monitor May Not Capture Peak SO_2 Concentrations from the Eckert Power Plant.

Modeling performed on behalf of the Sierra Club predicted that the Eckert plant's emissions may cause exceedances of the SO_2 NAAQS.[93] The Gray Report found that the Lansing monitor is not co-located with the Eckert plant's predicted peak emissions concentrations.[94] Specifically, the Gray Report noted that while "[t]he Lansing SO_2 monitoring site is located about 3 km to the northeast of the Eckert Station power plant," "[t]he modeled peak SO_2 concentration is located 1.8 km to the south-southeast of the power plant."[95] The Report further finds that the monitor appears to be located in an area of somewhat lower concentrations, likely due to lower wind frequency in that direction.[96] As a result, the Gray Report recommends that MDEQ consider relocating the SO_2 monitor to a location about 2-3 km to the southeast or west-southwest of the plant in order to capture the peak concentration impacts from Eckert Station.[97] As stated above, however, because a single monitor cannot suffice to characterize the SO_2 air quality in the surrounding area, MDEQ must continue to use modeling to evaluate and demonstrate compliance with the 1-hr SO_2 NAAQS.

V. Maintaining the Current Network of Speciated PM2.5 Monitors Is Critical to Protecting Public Health.

[90] *Id.*
[91] *See supra* at Table 1.
[92] *See* Gray Report at 14, Figure 13.
[93] *See supra* Table 1.
[94] Gray Report at 11.
[95] *Id.*
[96] *Id.*
[97] *Id.*

Sierra Club appreciates MDEQ's response to comments urging the need to retain the Southwest High School Monitor in Detroit in the face of budget shortfalls.[98]

Speciated PM2.5 monitoring is essential to protecting the health of Michigan residents, especially those in urban Detroit. Chemical speciation of particulate matter is "needed to characterize PM2.5 composition and to better understand the sources and processes leading to elevated PM2.5 concentrations."[99] Chemical speciation provides information on the levels of metals and other hazardous air pollutants that make up particulate matter. In EPA's own words, speciation of PM2.5 is "critically important for the implementation efforts associated with air quality programs," including source attribution analysis (*i.e.*, determining the likely mix of sources impacting a site), emission inventory, air quality model evaluation, and tracking the success of emissions reductions programs.[100] Emission inventory and modeling tools are essential to developing sound source emission reduction strategies.[101] Understanding the chemical composition of PM2.5 in an area is also vital to assessing the health risks associated with PM2.5.[102]

Maintaining speciated PM2.5 monitoring capabilities is particularly important at the Southwest High School in Detroit, which is located near a mix of large industrial sources and power plants that emit many toxic air pollutants, including mercury, lead, arsenic, cadmium, and chromium. Without adequate monitoring, MDEQ and EPA cannot assess whether concentrations of toxic air pollutants have reached unsafe levels, nor can they design and implement effective emission reduction strategies for these toxic air pollutants.

VI. Conclusion

For the reasons set forth above, because the monitoring network will not characterize peak concentrations from the Trenton Channel, St. Clair, Belle River, and Presque Isle power plants, MDEQ must amend its proposed 2016 Monitoring Plan to add or re-deploy source-oriented monitors associated with those plants, and should consider adding source-oriented monitors associated with the River Rouge and Eckert plants to ensure that peak concentrations are caught. MDEQ must also continue to rely on dispersion modeling to comply with the 1-hour SO_2 standard. Finally, in order to protect the health of Michigan citizens, the State should maintain speciated PM2.5 monitoring, particularly in the Detroit area.

[98] MDEQ 2015 Proposed Monitoring Plan, Appendix B: Summary of Comments Received and Replies at 87.
[99] EPA, "Revised Requirements for Designation of Reference and Equivalent Methods for PM2.5 and Ambient Air Quality Surveillance for Particulate Matter," Final Rule, 62 Fed. Reg. 38764, 38777 (July 18, 1997).
[100] *Id.* at 38778. *See also* EPA, "Particulate Matter (PM2.5) Speciation Guidance Document," pp 6-7 (draft dated July 22, 1998), available at http://www.epa.gov/ttnamti1/files/ambient/pm25/spec/specpln2.pdf; http://www.epa.gov/region4/sesd/pm25/p2.html
[101] *Id.*
[102] *Id.*

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