STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

July 1, 2019

Mr. Ed Nam
United States Environmental Protection Agency
Region 5
77 West Jackson Boulevard, A-18J
Chicago, Illinois 60604-3507

Dear Mr. Nam:

The Michigan Department of Environment, Great Lakes, and Energy (EGLE) has recently completed the 2020 Annual Network Review. 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. EGLE is submitting this network review to the United States Environmental Protection Agency (USEPA) for review and approval.

During the 30-day public comment period, EGLE received three comments, which are addressed in the Network Review. The final version of Michigan's Network Review for 2020 is enclosed and will be 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 517-242-2655.

Sincerely,

Susan Kilmer, Supervisor
Air Monitoring Unit
Air Quality Division

Enclosure – with eCopy
cc: Mr. Michael Compher, USEPA
Mr. Scott Hamilton, USEPA
Ms. Mary Ann Dolehanty, EGLE
Mr. Tom Shanley, EGLE
Ms. Jennifer Kang, EGLE

Michigan's 2020 Annual Ambient Air Monitoring Network Review

July 1, 2019

Department of Environment, Great Lakes, and Energy
Air Quality Division
P.O. Box 30260
Lansing, Michigan 48909-7760

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INTRODUCTION

The purpose of this document is to examine Michigan's ambient air monitoring network and recommend changes based on monitor history, population distribution, and modifications to federal monitoring requirements under the Clean Air Act (CAA), Title 40 of the Code of Federal Regulations (CFR) Part 58. Recommended changes to this network will be implemented during the 2020 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 Standards (NAAQS) for Ozone, Particulate Matter (PM), Lead (Pb), Nitrogen Dioxide (NO_2), Sulfur Dioxide (SO_2), Carbon Monoxide (CO), and secondary NAAQS for NO_2 and SO_2. In addition, there were changes in the ambient air monitoring rules.

Lead: On November 12, 2008, the United States Environmental Protection Agency (USEPA) 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 3-month rolling average.

Sulfur Dioxide: On November 16, 2009, the USEPA 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 February 12, 2010, a secondary NAAQS for SO_2 was proposed and the final rule was effective June 4, 2012. The USEPA chose to retain the standards while adding additional monitoring requirements

Nitrogen Dioxide: On February 9, 2010, the USEPA 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 February 12, 2010, a secondary NAAQS for NO_2 was proposed, and the final rule was effective June 4, 2012. The USEPA chose to retain the standards while adding additional monitoring requirements.

On December 22, 2016, the USEPA finalized the rule to remove the requirement of tier III near-road NO_2 monitors.

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

Particulate Matter: On January 15, 2013, the PM NAAQS was revised and the USEPA lowered the $PM_{2.5}$ annual average to 12.0 µg/m^3.

Ozone: On October 26, 2015, the ozone NAAQS was revised and the USEPA strengthened the ozone 8-hour standard to 0.070 parts per million (ppm).

On April 27, 2016, the USEPA finalized revisions to the CFR Part 58, which contain the ambient air monitoring requirements for criteria pollutants. [1]

Changes and Recommendations for Michigan's Air Monitoring Network in 2019-2020

The following changes will be made to Michigan's ambient air monitoring network during 2019-2020. If funding cuts occur, additional changes to the network may have to be implemented.

Lead and Metals: Lead sampling at National Core (NCore) sites is no longer required. The Michigan Department of Environment, Great Lakes, and Energy (EGLE) is proposing to shut down the metals sampler at Allen Park (26163001) and Grand Rapids (260810020) January 1, 2020.

$PM_{2.5}$ Continuous FEM: In the spring of 2019, a Federal Equivalent Method (FEM) continuous $PM_{2.5}$ BAMs (beta attenuation monitor) was added to the Ypsilanti site (261610008) as the primary sampler to satisfy the method co-location requirement for the Thermo BAM (method code 183). The Flint site (260490021) operates a Met One continuous $PM_{2.5}$ BAM (method code 170) as the primary monitor to meet the co-location requirement. EGLE intends to install $PM_{2.5}$ FEM BAMs at several sites to transition from a filter-based network to a continuous network, which provides real-time data, reduces laboratory costs, and reduces labor costs. The following sites will add a continuous FEM BAM instrument in 2019:

- Bay City (260170014) (summer 2019);
- Ypsilanti (261610008) (spring 2019);
- Livonia near road (261630025) (summer 2019); and
- Holland (260050003) (summer 2019).

Continuous $PM_{2.5}$ TEOMs: Tapered Element Oscillating Microbalance Monitors (TEOMs), used to display data for public notification, but are not regulatory monitors, will be shut down and replaced with FEM continuous $PM_{2.5}$ BAMs:

- Bay City (260170014) (summer 2019); and
- Ypsilanti (261610008) (spring 2019).

[1] https://www.federalregister.gov/documents/2016/03/28/2016-06226/revisions-to-ambient-monitoring-quality-assurance-and-other-requirements

$PM_{2.5}$ FRM: In 2020 EGLE is proposing to shut down the $PM_{2.5}$ filter-based Federal Reference Method (FRM) samplers at the following sites:

- Livonia near-road (261630025);
- Holland (260050003); and
- Bay City (260170014).

In accordance with 40 CFR Part 58, Appendix A, the number of required co-located sites is 15 percent of the network. The reduction in the filter-based samplers reduces the required number of co-located monitors. With this reduction, only two co-located sites are required. EGLE proposes to keep co-located FRM monitors at the Kalamazoo (260770008) and Dearborn (261630033) sites and shut down the secondary samplers at Grand Rapids (260810020) and Ypsilanti (261610008).

PAMS Sites: Based on 40 CFR Part 58, Appendix D, EGLE is required to begin making Photochemical Assessment Monitoring Station (PAMS) measurements June 1 through August 31, at NCore sites located in Core-based Statistical Areas (CBSAs) with populations of one million or more. The purpose of the PAMS network is to evaluate the ozone precursor compounds. Based on communications with the USEPA, the necessary equipment to begin making PAMS measurements were to be purchased and delivered prior to the start of the PAMS season in 2019. Due to contract delays, the necessary equipment will not be delivered in time to begin making PAMS measurements on June 1, 2019. The USEPA is working on a rulemaking to extend the start date and expect a proposed rule change will be signed by June 1, 2019. The Grand Rapids and Detroit sites will not begin making PAMS measurements during the summer of 2019. Michigan's PAMS monitoring is anticipated to begin in 2020-2021, contingent on receiving adequate federal funding and equipment provided through the national purchasing contract.

The parameters for PAMS include ozone, volatile organic compounds (VOCs) by auto-GC, direct-NO_2, reactive oxides of nitrogen (NO_Y), carbonyls (3-8 hour samples every three days), mixing height using ceilometer, solar radiation, UV radiation, precipitation, wind speed, wind direction, relative humidity, barometric pressure, and temperature.

EGLE has two NCore sites, one in Grand Rapids (260810020) and one in Detroit. As requested during the previous network review process, the Detroit PAMS station will be operated at the E 7 Mile (261630019) site instead of the NCore station at Allen Park (261630001). The USEPA approved the waiver for an alternate location on October 4, 2018.

In January 2019, EGLE added an NO_2 monitor at the Jenison site (261390005) to fulfil the population-based NO_2 area-wide requirement in the Grand Rapids area. When the direct NO_2 measurement is added to the Grand Rapids NCore site for PAMS, the Jenison monitor may be discontinued.

Other: In the spring of 2019, EGLE learned that the Livonia near-road (261630025) site will have to be shut down and relocated.

Network Review Goals

The Michigan Ambient Air Monitoring Network Review will describe the ambient air monitoring network, show how the network meets the USEPA'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 USEPA requires that EGLE document the process for obtaining public comments and include any comments received through the public notification process. As such, on May 13, 2019, it was announced through the AQD list serve that this network review document was placed on the Air Quality Division (AQD) section of EGLE's Internet home page to solicit comments from the general public and stakeholders. In addition, the public comment period will be announced in a press release. Reviewers are given 30 calendar days from the date the draft network review report is posted to provide written comments. Written comments are accepted until close of business June 13, 2019, either by e-mail or by postal service (verbal comments are not accepted) and should be sent to:

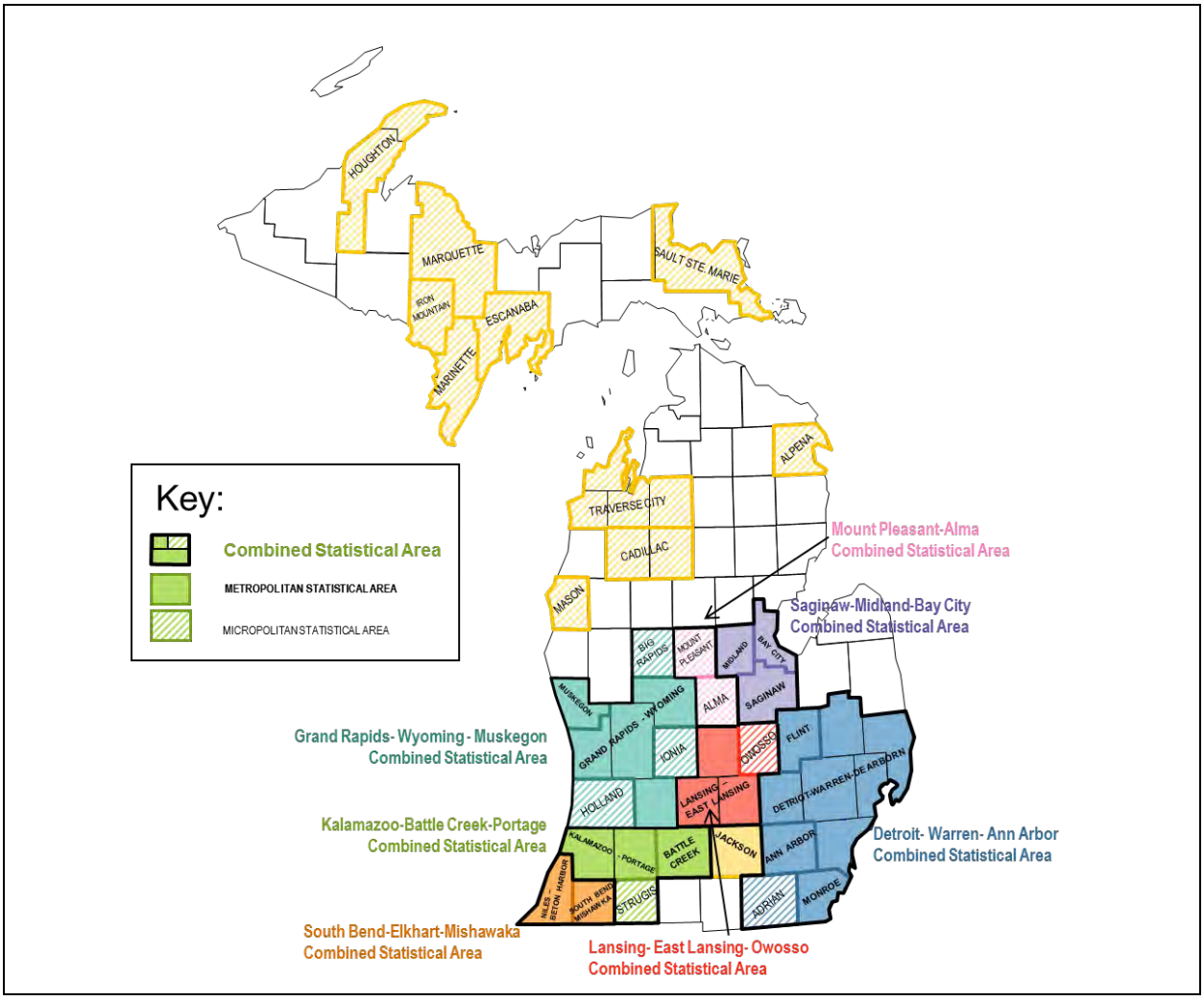
Navnit K. Ghuman
EGLE – Air Quality Division
3058 West Grand Blvd. Suite 2-300
Detroit, MI 48202
GhumanN@michigan.gov

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 EGLE's Internet home page and sent to the USEPA Region 5 office for approval. Hardcopies of the final version will be available for inspection free of charge at the 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 Ms. Navnit K. Ghuman, AQD, 313-456-4695, GhumanN@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 2017 Metropolitan Statistical Area (MSA) geographical borders, population totals, and historical concentrations. The MSA outlines for Michigan 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**. 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

micropolitan areas as a result of the 2010 Census were released in 2013. The areas 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**.[2] 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 adjusted 2017 population totals.

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**.

[2] Metropolitan and Micropolitan Statistical Areas: April 1, 2010 to July 1, 2017 (CBSA-EST2009-1). Source: U.S. Census Bureau, Population Release Date March 2018.

Table 1: Composition of Core-based Statistical Areas in Michigan

Combined Statistical Areas	2017 Projected Census Numbers	Core-based Statistical Areas	2010 Census data	County
Detroit-Warren-Ann Arbor CSA	5,336,286	Detroit-Warren-Dearborn MSA	4,313,002	Wayne
				Oakland
				Macomb
				Livingston
				St. Clair
				Lapeer
		Flint MSA	407,385	Genessee
		Ann Arbor MSA	367,627	Washtenaw
		Monroe MSA	149,649	Monroe
		Adrian Micropolitan	98,623	Lenawee
Grand Rapids-Wyoming-Muskegon CSA	1,456,935	Grand Rapids-Wyoming MSA	1,059,113	Kent
				Ottawa
				Montcalm
				Barry
		Muskegon MSA	173,693	Muskegon
		Holland Micropolitan	116,447	Allegan
		Ionia Micropolitan	64,291	Ionia
		Big Rapids Micropolitan	43,391	Mecosta
Lansing-East Lansing-Owosso CSA	546,102	Lansing-East Lansing MSA	477,656	Ingham
				Eaton
				Clinton
		Owosso Micropolitan	68,446	Shiawassee
Kalamazoo-Battle Creek-Portage CSA	533,413	Kalamazoo-Portage MSA	338,338	Kalamazoo
				Van Buren
		Battle Creek MSA	134,128	Calhoun
		Sturgis Micropolitan	60,947	St. Joseph
Saginaw-Midland-Bay City CSA	379,584	Saginaw MSA	191,934	Saginaw
		Bay City MSA	104,239	Bay
		Midland MSA	83,411	Midland
South Bend-Elkhart-Mishawaka, IN-MI CSA	727,604	South Bend-Mishawaka, IN-MI MSA	321,815	St. Joseph, IN
				Cass
		Elkhart-Goshen, IN MSA	205,032	Elkhart, IN
		Niles-Benton Harbor MSA	154,259	Berrien
		Plymouth, IN Micropolitan	46,498	Marshall, IN
Mount Pleasant-Alma CSA	112,081	Mount Pleasant Micropolitan	71,063	Isabella
		Alma Micropolitan	41,018	Gratiot
none		Jackson MSA	158,640	Jackson

Table 2: Composition of Micropolitan Statistical Areas in Michigan

Micropolitan Area	Principal Cities	Counties	Population 2017 Census
Adrian Micropolitan Area	Adrian	Lenawee	98,623
Alma Micropolitan Area	Alma	Gratiot	41,018
Alpena Micropolitan Area	Alpena	Alpena	28,462
Big Rapids Micropolitan Area	Big Rapids	Mecosta	43,391
Cadillac Micropolitan Area	Cadillac	Missaukee, Wexford	48,274
Coldwater Micropolitan Area	Coldwater	Branch	43,410
Escanaba Micropolitan Area	Escanaba	Delta	35,965
Hillsdale Micropolitan Area	Hillsdale	Hillsdale	45,879
Holland Micropolitan Area	Holland (pt.)	Allegan	116,447
Houghton Micropolitan Area	Houghton	Houghton, Keweenaw	38,410
Ionia Micropolitan Area	Ionia	Ionia	64,291
Iron Mountain Micropolitan Area	Iron Mountain, MI	Dickinson, MI; Florence, WI	29,786
Ludington Micropolitan Area	Ludington	Mason	29,073
Marinette Micropolitan Area	Marinette, WI	Menominee, MI; Marinette, WI	63,356
Marquette Micropolitan Area	Marquette	Marquette	66,502
Mount Pleasant Micropolitan Area	Mount Pleasant	Isabella	71,063
Owosso Micropolitan Area	Owosso	Shiawassee	68,446
Sault Ste. Marie Micropolitan Area	Sault Ste. Marie	Chippewa	37,711
Sturgis Micropolitan Area	Sturgis	St. Joseph	60,947
Traverse City Micropolitan Area	Traverse City	Benzie, Grand Traverse, Kalkaska, Leelanau	148,671

Other Monitoring Network Requirements

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 (reactive oxides of nitrogen), $PM_{2.5}$ 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. Previously, a minimum of 10 NCore sites nationwide measure lead; however, this requirement was removed in 2016. 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.

The 2015 Ozone Standard added an additional requirement to the NCore sites by requiring PAMS monitors to be located at certain NCore sites. The two NCore sites in Michigan were initially required to implement PAMS monitoring on June 1, 2019, but due to a delay in federal funding, this deadline has been extended to 2020-2021. The Detroit E 7 Mile site will host the PAMS monitoring instead of the Allen Park NCore site. Both sites will conduct the PAMS suite of measurements when full funding is received.

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.

Network Review Requirements

According to 40 CFR Part 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"[3];
- 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; and
- Be used as a starting point for five-year regional assessments.

Elements that must be included in the network review are:

- The USEPA's Air Quality System (AQS) site identification number;
- Site locations including coordinates and street address;
- Sampling and analysis methods, including parameter codes;
- 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; and
- 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.

[3] "Environmental Protection Agency Ambient Air Quality Surveillance Regulations." 40 CFR Part 58, Appendix D; April 27, 2016.

Monitor Deployment by Location

Table 3 summarizes the distribution of ambient air monitors by pollutant in operation in Michigan during 2019-2020. 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 2019-2020 Network in Michigan

Site Name	AQS ID	O_3	$PM_{2.5}$	$PM_{2.5}$ TEOM	$PM_{2.5}$ BAM	Speciation	PM_{10}	PM Coarse	CO	Trace CO	NO_2	NOy	SO_2	Trace SO_2	Metals (TSP)	Black Carbon	VOCs	Carbonyls	PAHs	Meteorological	Building/Trailer
Holland	260050003	x			x															x	T
Bay City	260170014				x															x	T
Benzonia (Frankfort)	260190003	x																			T
Coloma	260210014	x																		x	T
Cassopolis	260270003	x																		x	B
Rose Lake 2	260370002	x																			B
Flint	260490021	x	3d		x															x	T
Otisville	260492001	x																		x	T
Harbor Beach	260630007	x																		x	T
Belding - Merrick St.	260670003														Pb & 4						
Lansing Filley	260650018	x	3d	x							x		x							x	T
Kalamazoo	260770008	x	3d&6d	x																x	T
Gr.Rapids-Monroe St.	260810020	x	3d	x		x	x	x		x	xP	x		x			xP	xP		x	T
Evans	260810022	x																		x	T
Tecumseh	260910007	x			x															x	T
New Haven	260990009	x	3d																	x	T
Sterling Hts/Freedom Hill	260990021																			x	
Warren	260991003	x																			T
Manistee *	261010922	x	3d																	x	B
Scottville	261050007	x																		x	T
Houghton Lake	261130001	x			x						x									x	T
Sterling State Park	261150006												x							x	T
Muskegon-Green Crk. Rd.	261210039	x																		x	T
Oak Park	261250001	x	3d																	x	T
Pontiac	261250011																			x	
Rochester	261250012																			x	
Jenison	261390005	x	3d				x				x									x	T
West Olive	261390011												x							x	T
Port Huron	261470005	x	3d	x									x							x	T
Port Huron-Rural St.	261470031														Pb & 4						
Seney	261530001	x			x															x	T
Ypsilanti	261610008	x	3d		x															x	T
Allen Park	261630001	x	3d	x		x	x	x		x		x		x		x				x	T
River Rouge	261630005														Pb & 4			x		x	T
Fort St. (SWHS) - Detroit	261630015		3d		x	x	x				x		x		Pb & 4	x	x	x		x	B
E. 7 Mile - Detroit	261630019	x	3d								xP	x					xP	xP		x	B
Joy Rd. - Detroit	261630026																			x	
S Delray / Jefferson	261630027														Pb & 4						T
Dearborn	261630033		3d&6d	x		x	x								x	x	x	x	x	x	B
Eliza Howell	261630093								x		x									x	T
Livonia Near-road	261630095				x				x		x									x	T
NMH 48217	261630097			x									x		Pb & 4						T
DP4th	261630098				x				x		x		x		Pb & 4	x					T
Trinity	261630099				x				x		x		x		Pb & 4	x				x	T
Military	261630100				x						x		x		Pb & 4	x					T
Total		26	14	7		4	5	2	4	2	11	3	9	2	10	6	4	5	1	36	

* = Tribal monitor
4 = Metals suite: Mn, As, Cd, Ni,
P = PAMS
3d = a run every three days
6d = a run every six days
3d&6d = colocated $PM_{2.5}$

Quality Assurance (QA)

EGLE has an approved Quality Management Plan (QMP). In turn, the Air Monitoring Unit (AMU) has a Quality Assurance Project Plan (QAPP), which covers operation of the ambient air network. The QAPP addresses criteria pollutants, air toxics, metals, and particulates including the USEPA $PM_{2.5}$ Speciation Trends Network (STN). Separate QAPPs exist for the National Air Toxics Trend Site (NATTS) and NCore. Special purpose monitoring projects also have dedicated QAPPs. 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.

The USEPA finalized revisions to the ambient air monitoring requirements for criteria pollutants, which were published in the Federal Register on March 27, 2016, and became effective on April 27, 2016. EGLE has implemented most of these changes and has procured the equipment to fully implement the requirement for conducting lower level annual audit points for the gaseous monitors.

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, NO_Y, 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 USEPA. The USEPA conducts Performance Evaluation Program (PEP) audits for $PM_{2.5}$ samplers (eight sites per year) and National Performance Audit Program (NPAP) for the gaseous monitors (20 percent of the sites per year) using a Thru-The-Probe (TTP) audit system. The USEPA also conducts program-wide Technical Systems Audits (TSA) 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 EGLE Environmental Laboratory staff.

LEAD MONITORING NETWORK

Background

On December 14, 2010, the USEPA revised the ambient monitoring requirements to better address possible exposures to lead.[4] On January 5, 2015, the USEPA 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 final monitoring regulations of 2016, the USEPA has removed lead monitoring requirement at NCore sites, provided the sites are attaining the standard. EGLE

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 µg/m^3 to 0.15 µg/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 µg/m^3.

In addition to changing the level and form of the standard, the 2008 NAAQS also changed monitoring requirements. The USEPA 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 Total Suspended Particle (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. EGLE is currently 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. The filters are analyzed by EGLE laboratory using ICP/MS. EGLE follows the USEPA sampling schedule published yearly on the USEPA web site at: https://www3.USEPA.gov/ttnamti1/calendar.html.

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

Point Source-oriented Monitoring

For 2020, there are no new facilities that need to be investigated with regard to the lead NAAQS requirements. The Reed St. monitor (260670002) in Belding, Michigan demonstrated attainment and EGLE shutdown the site January 2019. The Merrick St. site (260670003) is still operating.

Non-source-oriented/NCore Monitoring Network Design

According to the November 12, 2008, lead NAAQS, each 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 USEPA has now reversed this with the 2016 monitoring regulation changes. In 2018 EGLE added three new lead monitoring sites near the Gordie Howe International Bridge (GHIB). Additional site details are in the Special Purpose Monitoring section.

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 percent of the total number of these lead sites. According to the *Federal Register,* the co-located site should be at the location with the highest lead concentrations. **Table 4** describes the deployment schedule for various components of the EGLE lead network and total number of co-located lead sites that are required.

EGLE prefers to retain one co-located lead site at the NATTS at Dearborn (261630033), which is located close to many industrial sources including a steel mill, automotive manufacturing plant, and a rail yard. The station is sited at Salina Elementary 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, EGLE 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 shown in **Table 4,** the total number of lead sites in Michigan was expanded in 2018 when the new GHIB sites were installed. A second co-located site for lead was established to meet the 15 percent requirement. A second co-located monitor was added to the Port Huron–Rural Street site (261470031) in August 2018.

Table 5 summarizes the lead monitoring site information for the Michigan lead network. **Figure 2** shows monitoring site locations in the 2018 and 2019 network.

Table 4: Deployment Schedule for Lead Sites and Calculation of the Total Number of Co-located Lead Sites

Site Name and ID	Site Purpose	2014	2015	2016	2017	2018	2019	2020
Belding-Reed St (260670002)	Source-oriented	operational	operational	operational	operational	operational	____	____
Belding (260670003)	Source-oriented	operational	operational	operational	operational	operational	operational	operational
Grand Rapids-Monroe St. (260810020)	Ncore Non-Source-oriented	operational	operational	operational	operational	operational	operational	___
Port Huron, Rural St. (261470031)	Source-oriented *co-located site*	operational	operational	operational	operational	operational	operational	operational
Allen Park (261630001)	NCore Non-Source-oriented	operational	operational	operational	operational	operational	operational	___
River Rouge (261630005)	Non-Source-oriented	___	____	____	____	operational	operational	operational
SWHS (261630015)	Non-Source-oriented	___	___	____	____	operational	operational	operational
S. Delray (261630027)	Non-Source-oriented	___	____	____	____	operational	operational	operational
Dearborn (261630033)	NATTS *co-located site*	operational	operational	operational	operational	operational	operational	operational
NMH48217 (261630097)	SLAMS	___	___	operational	operational	operational	operational	operational
Trinity (261630098)	Source-oriented	___	____	____	____	operational	operational	operational
DP4TH (261630099)	Source-oriented	____	____	____	____	operational	operational	operational
Military (261630100)	Source-oriented	____	____	____	____	operational	operational	operational
Total No. Sites		6	6	7	7	13	12	10
No. Co-Located Sites Required		1	1	1	1	2	2	2

Table 5: Michigan's Lead Monitoring Network

Operating Schedule: 1:6 days

Method: High Volume Sampler & ICAP Spectra, Method Code 108

Point Source-Oriented Sites

Monitoring Sites														
Site Name	AQS Site ID	Address	Part. Size	Latitude	Longitude	Sampling Frequency	Purpose/ Type	Parameter Code	POC	Scale	County	Date Estab.	Facility Name	Est Emissions Tons/yr
Belding - Merrick St.	260670003	509 Merrick St.	TSP	43.09984	-85.22163	1:6	max conc	14129	1	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	14129	1	Micro	St. Clair	1/1/13	Mueller Industries	0.75
Port Huron	261470031	324 Rural St.	TSP	42.98209	-82.449233	1:12,co-loc	max conc	14129	2	Micro	St. Clair	8/1/08	Mueller Industries	0.75

Non Source-Oriented Sites

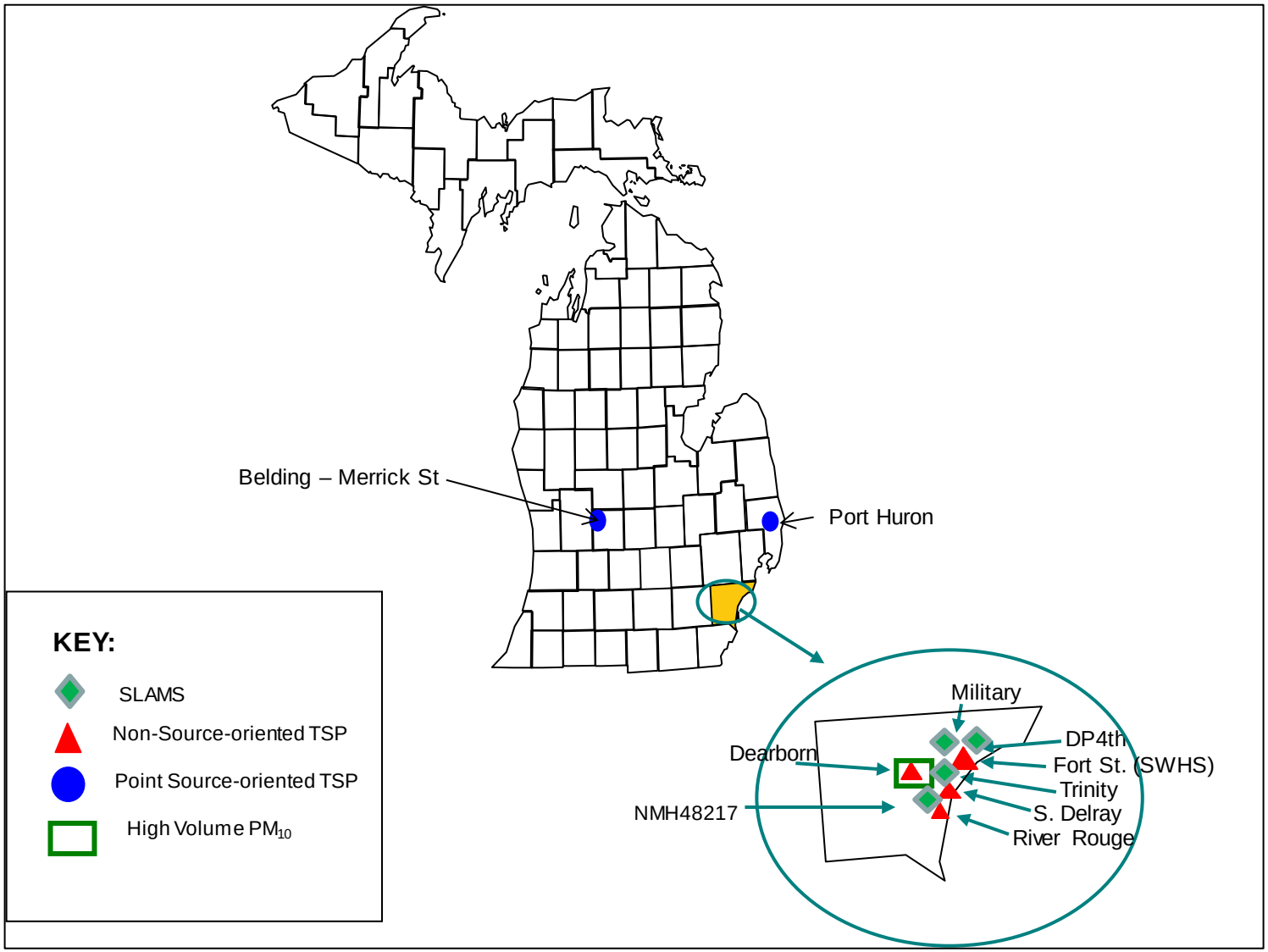
Monitoring Sites														
Site Name	AQS Site ID	Address	Part. Size	Latitude	Longitude	Sampling Frequency	Purpose/ Type	Parameter Code	POC	Scale	County	Date Estab.	CBSA [1]	Pop (2017 Estimate)
Grand Rapids - Monroe St.	260810020	1179 Monroe St. NW	TSP	42.984167	-85.671389	1:6	pop. exp.	14129	1	Neighborhood	Kent	1/8/10	GW	1,059,113
Allen Park	261630001	14700 Goddard	TSP	42.228611	-83.208333	1:6	pop. exp.	14129	1	Neighborhood	Wayne	1/2/10	DWL	4,313,002
River Rouge	261630005	315 Genesee	TSP	42.267222	-83.13222	1:6	pop. exp.	14129	1	Neighborhood	Wayne	1/1/18	DWL	4,313,002
Fort St. (SWHS)	261630015	150 Waterman	TSP	42.302778	-83.106667	1:6	pop. exp.	14129	1	Neighborhood	Wayne	1/1/18	DWL	4,313,002
S. Delray	261630027	7701 W. Jefferson	TSP	42.292222	-83.106944	1:6	pop. exp.	14129	1	Neighborhood	Wayne	1/1/18	DWL	4,313,002
Dearborn	261630033	2842 Wyoming	TSP	42.306666	-83.148889	1:6	max conc	14129	1	Neighborhood	Wayne	6/1/90	DWL	4,313,002
Dearborn	261630033	2842 Wyoming	TSP	42.306666	-83.148889	1:12, co-loc	max conc	14129	2	Neighborhood	Wayne	6/1/90	DWL	4,313,002
Dearborn	261630033	2842 Wyoming	PM_{10}	42.306666	-83.148889	1:6	max conc	14129	1	Neighborhood	Wayne	6/1/90	DWL	4,313,002
Dearborn	261630033	2842 Wyoming	PM_{10}	42.306666	-83.148889	1:12, co-loc	max conc	14129	2	Neighborhood	Wayne	6/1/90	DWL	4,313,002
NMH 48217	261630097	3225 Deacon St	TSP	42.2616692	-85.157893	1:6	pop.exp	14129	1	Neighborhood	Wayne	9/1/18	DWL	4,313,002
DP4th	261630098	4700 W Fort St	TSP	42.312158	-83.091943	1:6	max conc	14129	1	Neighborhood	Wayne	7/17/18	DWL	4,313,002
Trinity	261630099	9191W Fort St	TSP	42.295824	-83.129431	1:6	max conc	14129	1	Neighborhood	Wayne	10/17/18	DWL	4,313,002
Military	261630100	1238 Military Park	TSP	42.30934	-83.115722	1:6	max conc	14129	1	Neighborhood	Wayne	11/1/18	DWL	4,313,002

[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 2010 Network Review, 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. The current emission inventory data indicates that the previous sources are below the threshold that previously required a waiver. Likewise, there are no new sources of lead over this threshold value.

Lead Quality Assurance

The site operator conducts a flow rate verification 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 USEPA's AQS database each quarter. External lead PEP audits are conducted annually by the USEPA. The USEPA uses a separate sampler at the monitoring station to collect a filter on the same day as an EGLE sample. The USEPA's PEP filter is analyzed by a USEPA laboratory. Once EGLE enters the filter results in the AQS database, the USEPA enters the result from the co-located PEP filter for comparison.

EGLE's Laboratory participates in an external performance testing program that is administered by the USEPA. The laboratory analyzes spiked filter strips each month which are reported to the USEPA AQS database. Once a quarter, EGLE sends a co-located lead filter to the USEPA Region 9 laboratory. The results from the primary filter, analyzed by EGLE laboratory, are compared to the co-located filter that was analyzed by the USEPA Region 9 laboratory.

Plans for the 2020 Lead Monitoring Network

In 2020, EGLE will continue to collect high volume TSP and PM_{10} lead measurements at the NATTS site:

- Dearborn NATTS site (261630033); and
- Co-located Dearborn NATTS (261630033).

In 2020, EGLE will continue TSP lead source-oriented measurements at:

- Port Huron (261470031);
- Co-located Port Huron (261470031); and
- Belding–Merrick St. (260670003).

In 2020, EGLE will continue TSP lead measurements at the three new sites set up in 2018 around the Gordie Howe International Bridge area.

- DP4th (261630098);
- Trinity (261630099); and
- Military (261630100).

In 2018, EGLE also added high volume TSP lead non-source-oriented measurements at existing three sites:

- River Rouge (261630005);
- Southwest High School (261630015);
- S. Delray (261630027); and
- NMH 48217 (261630097).

Lead sampling at NCore sites is no longer required, thus in 2020, EGLE will discontinue collecting lead measurements using high volume TSP samplers at the NCore sites in:

- Grand Rapids–Monroe St. (260810020); and
- 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. 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*[5] specifies the minimum parameters that each NCore site must measure:

- Continuous $PM_{2.5}$
- 24-hour $PM_{2.5}$
- Speciated $PM_{2.5}$
- $PM_{10–2.5}$
- Ozone
- Trace SO_2
- Trace CO
- NO/NO_Y
- Wind speed
- Wind direction
- Relative humidity
- Outdoor temperature
- Lead (2016 discontinued, not required)

Michigan NCore Sites

EGLE'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. The 2015 ozone NAAQS has a requirement for PAMS measurements of specific ozone precursor compounds at some

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

NCore sites across the nation. These requirements for EGLE are discussed in the PAMS chapter later in this 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.

Speciation samplers at EGLE NCore stations sample on a once every three-day sampling schedule to meet the NCore monitoring requirements. The USEPA sampling schedule is followed.

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

EGLE'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 2020 NCore Monitoring Network

In 2020 EGLE is planning to continue to collect the measurements required for the NCore program at the following sites:

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

Starting in 2020 or 2021, contingent on federal funding, seasonal PAMS measurements will be collected at the Grand Rapids NCore site and the Detroit-E 7 Mile site as an alternative to the Allen Park site, as approved by USEPA Region 5.

Lead monitoring will be discontinued at both sites, since the measured levels are low and it is no longer mandated.

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	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 Super 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 infrared	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	Chemiluminescence	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	Will be shut down, not required
$PM_{10\text{-}2.5}$ mass	NCore	Neighborhood	1:3 days	R & P Partisol plus 2025	Manual collection, gravimetric analysis	7/16/10	---
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	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 infrared	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	Chemiluminescence	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	Will be shutdown, not required
$PM_{10\text{-}2.5}$ mass	NCore	Neighborhood	1:3 days	R & P Partisol plus 2025	Manual collection, gravimetric analysis	7/16/10	---
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 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/ Type	Scale	County	Date Estab.	CBSA[1]	Pop (2015 Estimate)
Grand Rapids - Monroe St.	260810020	1179 Monroe St., NW,	42.98417	-85.6714	Pop. Exp.	Neighborhood	Kent	1/1/10	GW	1,456,935
Allen Park	261630001	14700 Goddard	42.22861	-83.2083	Pop. Exp.	Neighborhood	Wayne	1/1/10	DWL	5,336,286

[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

On October 26, 2015, the USEPA revised the ozone NAAQS, lowering the standard to 0.070 ppm and extending the ozone season in many areas, including Michigan, from March 1 through October 31. EGLE began the expanded season in 2017.

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 2010 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 percent of the ozone NAAQS has a higher probability of violating the standard. Therefore, the USEPA requires more monitors in these MSAs. In other instances, the number of monitors may be reduced if the design value is greater than 115 percent of the NAAQS.[6] 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 3-year Design Value Concentrations ≥ 85% of any Ozone NAAQS[3]	Most Recent 3-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**. All monitors in Michigan are above 85 percent of the ozone NAAQS of 0.070 ppm.

Figure 4 illustrates changes in the 3-year averages of the fourth highest ozone values, called design values, from 2014 to 2018. When contemplating changes to the ozone network, it is important to consider changes in design values in nonattainment areas. In 2015 the USEPA lowered the ozone NAAQS to 0.070 ppm. The USEPA's nonattainment designations were based on the ozone design values for 2014-2016.

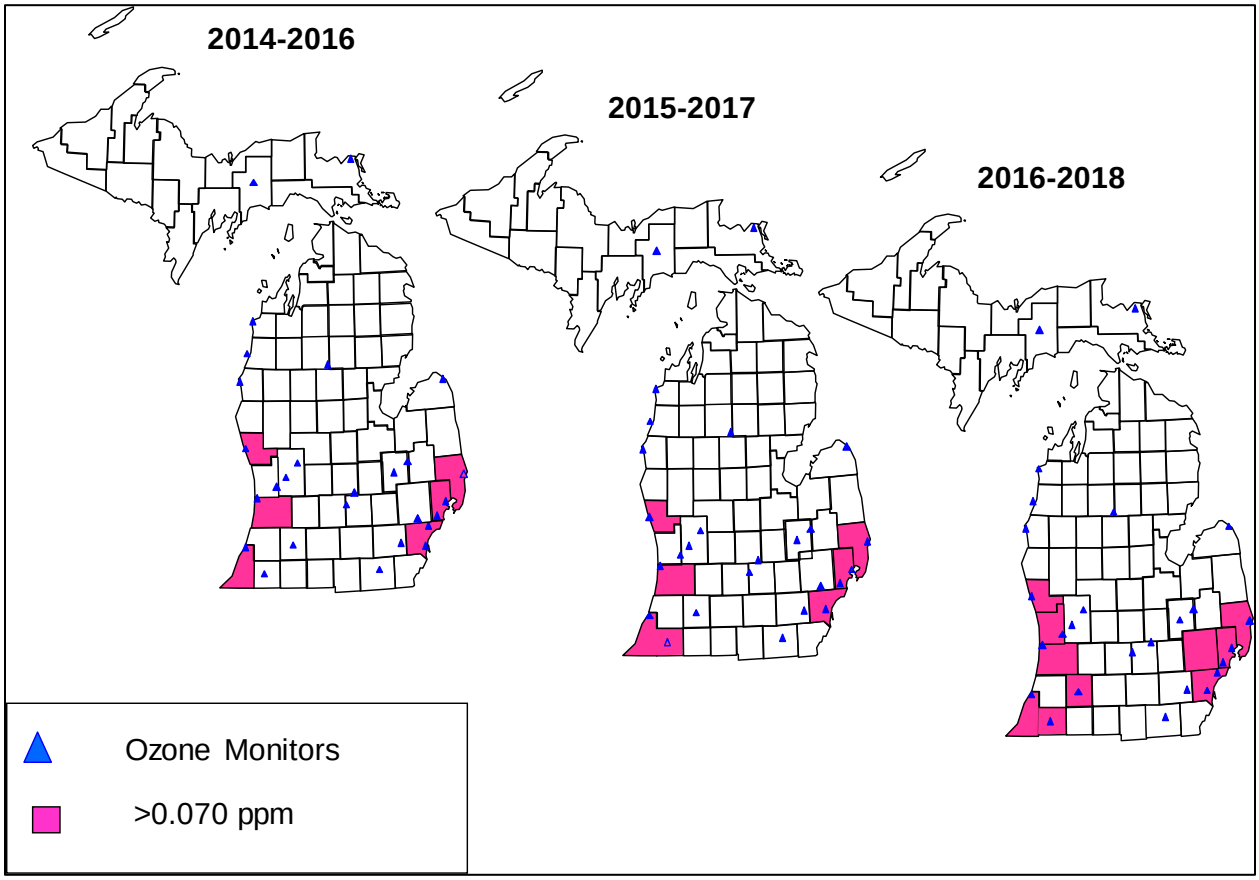
[6] Table D-2 of Appendix D to Part 58.

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

NAAQS: 0.070 ppm
85% NAAQS: 0.059 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.

MSA	2017 Population	Counties	Existing Monitors	2016-2018 3-year O_3 design value	Min. No. Monitors Required
Detroit-Warren-Livonia MSA	4,313,002	Macomb	New Haven	0.073	**3**
			Warren	0.069	
		Oakland	Oak Park	0.073	
		Wayne	Allen Park	0.069	
			Detroit - E 7 Mile	**0.074**	
		Lapeer	---		
		St. Clair	Port Huron	0.072	
		Livingston	---		
Flint MSA	407,385	Genesee	Flint	**0.069**	2
			Otisville	0.068	
Monroe MSA	149,649	Monroe	---		
Ann Arbor MSA	367,627	Washtenaw	Ypsilanti	**0.068**	2
Grand Rapids-Wyoming MSA	1,059,113	Kent	Grand Rapids - Monroe St.	0.069	2
			Evans	0.068	
		Barry	---		
		Ottawa	Jenison	**0.071**	1
		Montcalm	---		
Muskegon-Norton Shores MSA	173,693	Muskegon	Muskegon - Green Creek Rd.	**0.078**	1
Lansing-East Lansing MSA	477,656	Clinton	Rose Lake	**0.069**	2
		Ingham	Lansing	0.068	
		Eaton	---		
Bay City MSA	104,239	Bay	---		
Saginaw MSA	191,934	Saginaw	---		
Kalamazoo-Portage MSA	338,338	Kalamazoo	Kalamazoo	**0.071**	1
		Van Buren	---		
Niles-Benton Harbor MSA	154,259	Berrien	Coloma	**0.074**	1
Jackson MSA	158,640	Jackson	---		
Battle Creek MSA	134,128	Calhoun	---		
South Bend Mishawaka MSA	321,815	Cass	Cassopolis	**0.074**	1
Other areas:	Comments				
	transport site	Lenawee	Tecumseh	0.069	
		Benzie	Frankfort	0.070	
		Huron	Harbor Beach	0.068	
		Allegan	Holland	0.074	
	background site	Missaukee	Houghton Lake	0.067	
		Mason	Scottville	0.068	
		Schoolcraft	Seney	0.065	
	tribal site	Manistee	Manistee	0.067	

Figure 4: Comparison of 4th Highest 8-Hour Ozone Values Averaged Over Three Years 2014-2016, 2015-2017 and 2016-2018



In southeast Michigan, New Haven (260990009) has been the design value site for many years, measuring maximum ozone concentrations downwind from Detroit. However, in 2015, the Port Huron (2611470005) monitoring site became the new design value site for the Detroit-Warren-Livonia MSA. The location of the maximum ozone concentration has moved in recent years, possibly due to changes in the amount, type, and location of ozone precursor emissions. The E 7 Mile (261630019) site is the new design value site. Allen Park (261630001) is upwind of the central business district and is an NCore site for the Detroit-Warren-Livonia MSA. Both NCore sites are required by EGLE to measure ozone over the entire year. Although three ozone sites are required for the Detroit-Warren-Livonia MSA, USEPA Region 5 staff have indicated that E 7 Mile (2601630019) 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. Based on the 2016-2018 data, Allen Park (261630001) and Warren (261631003) are below the 0.070 ppm design values whereas Oak Park (261250001), E 7 Mile (261630019), Port Huron (261470005), and New Haven (260990009) are over the design value.

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. 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).

Three 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), the downwind site at Evans (260810022), and the Jenison (26139005) site.

Two monitors are required in the Lansing-East Lansing MSA consisting of the urban center city site in Lansing (260650018) and the downwind Rose Lake 2 (260370002) location. Due to the Lansing School District's property redevelopment project, EGLE was required to move the monitoring site from Lansing Eastern High School (260650012) in April 2018 to 815 Filley Street in Lansing. The new Lansing site began operation in May 2018.

A single ozone monitor is required in each of the MSAs of Holland-Grand Haven, Muskegon-Norton Shores, Kalamazoo-Portage, Niles-Benton Harbor, and South Bend-Mishawaka. The Holland (260050003), Muskegon–Green Creek Rd. (261210039), Kalamazoo (260770008), Coloma (260210014), and Cassopolis (260270003) monitors fulfill these requirements, respectively. Nonattainment designations on the west side of the state were based on the 2014-2016 design values at the Holland, Muskegon, and Coloma sites.

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 Frankfort/Benzonia (260190003) are sited to measure transport of ozone along Lake Michigan and have been in operation for 20 and 26 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 upper region of the Lower Peninsula and Upper Peninsula, respectively.

The tribal ozone site in Manistee (261010922) will continue to run; however, the Sault Ste. Marie (260330901) site shut down in March 2019 due to funding issues.

Created by the Lake Michigan Air Directors Consortium (LADCO), **Figure 5** (map) compares ozone concentrations across the region.

Figure 5: Ozone Design Values 2014 – 2016[7]

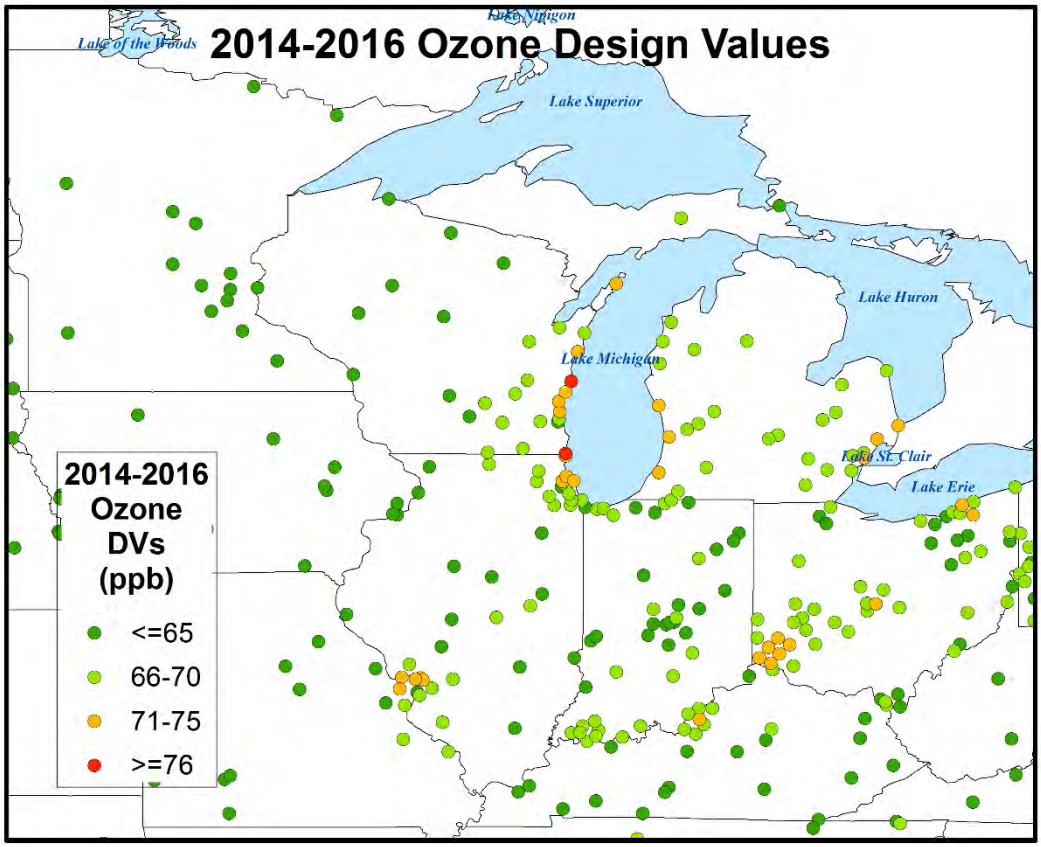


Table 11 summarizes the ozone monitoring site information for sites that were operational in 2019 and are planned to be operational in 2020. **Figure 6** illustrates the geographical distribution of this network.

[7] Map provided by D. Kenski, Lake Michigan Air Directors Consortium (LADCO).

Table 11: Michigan's Ozone Monitoring Network 2019-2020

Operating Schedule Hourly, March 1 to Octover 31; *NCore operate hourly all year*
Houghton Lake and Lansing operate hourly all year
Method: Ultra Violet Absorption Continuous Monitor, Method Code 087

SLAMS Stations

Monitoring Sites												
Site Name	AQS Site ID	Address	Latitude	Longitude	Purpose/ Type	Parameter Code	POC	Scale	County	Start Date	MSA[1]	Pop (2017 Estimate)
Holland	260050003	966 W 32nd St	42.7678	-86.14861	max conc	44201	1	urban	Allegan	8/25/92	A	116,447
Frankfort / Benzonia	260190003	West St., Benzonia Twp.	44.61694	-86.10944	max conc	44201	1	regional	Benzie	7/28/92	Not in MSA	N/A
Coloma	260210014	Paw Paw WWTP, 4689 Defield Rd.,Coloma	42.1978	-86.30972	max conc	44201	1	regional	Berrien	8/3/92	NBH	154,259
Cassopolis	260270003	Ross Beatty High School, 22721 Diamond	41.8956	-86.00167	pop exp	44201	2	urban	Cass	5/16/91	SBM	52,293
Rose Lake 2	260370002	9870 Stoll Rd., Lansing	42.7983	-84.39389	max conc	44201	1	urban	Clinton	9/30/16	LEL	477,656
Flint	**260490021**	**Whaley Park, 3610 Iowa**	**43.0472**	**-83.67028**	**pop exp**	**44201**	**1**	**nghbrhd**	**Genesee**	**6/16/92**	**F**	**407,385**
Otisville	**260492001**	**G11107 Washburn Rd**	**43.1683**	**-83.46167**	**max conc**	**44201**	**1**	**urban**	**Genesee**	**5/13/80**	**F**	**407,385**
Harbor Beach	260630007	1172 S. M 25, Sand Beach Twp.	43.8364	-82.64306	backgrd	44201	1	regional	Huron	4/1/94	Not in MSA	N/A
Lansing Filley	260650018	815 Filley St., Lansing	42.7614	-84.56287	pop exp	44201	2	nghbrhd	Ingham	4/1/18	LEL	477,656
Kalamazoo	260770008	Fairgrounds, 2500 Lake St	42.2781	-85.54194	pop exp	44201	1	nghbrhd	Kalamazoo	6/1/92	KP	338,338
GR - Monroe St	***260810020***	***1179 Monroe NW***	***42.9842***	***-85.6714***	***pop exp***	***44201***	***1***	***nghbrhd***	***Kent***	***4/24/80***	***GW***	***1,059,113***
Evans	260810022	10300 14 Mile Road, NE	43.1767	-85.41667	max conc	44201	1	urban	Kent	4/1/99	GW	1,059,113
Tecumseh	260910007	6792 Raisin Center Highway	41.9956	-83.94667	up wind backgrd	44201	1	regional	Lenawee	7/6/93	AL	98,623
New Haven	260990009	57700 Gratiott	42.7314	-82.79361	max conc	44201	1	urban	Macomb	7/14/80	DWL	4,313,002
Warren	**260991003**	**29900 Hoover**	**42.5133**	**-83.00611**	**max conc**	**44201**	**1**	**urban**	**Macomb**	**1/1/77**	**DWL**	**4,313,002**
Scottville	261050007	525 W US 10	43.9533	-86.29444	max conc	44201	1	regional	Mason	4/1/98	Not in MSA	N/A
Houghton Lake	261130001	1769 S Jeffs Road	44.3106	-84.89194	background	44201	1	regional	Missaukee	4/1/98	Not in MSA	N/A
Muskegon - Green Ck	261210039	1340 Green Creek Road	43.2781	-86.31111	pop exp	44201	1	regional	Muskegon	5/1/91	MNS	173,693
Oak Park	261250001	13701 Oak Park Blvd.	42.4631	-83.18333	pop exp	44201	2	urban	Oakland	1/9/81	DWL	4,313,002
Jenison	261390005	6981 28Th Ave. Georgetown Twp.	42.8944	-85.85278	pop exp	44201	1	urban	Ottawa	4/1/89	GW	1,059,113
Port Huron	261470005	2525 Dove Rd	42.9533	-82.45639	pop exp	44201	1	urban	Saint Clair	2/28/81	DWL	4,313,002
Seney	261530001	Seney Wildlife Refuge, HCR 2 Box 1	46.2889	-85.95027	bkgrd	44201	1	regional	Schoolcraft	1/15/02	Not in MSA	N/A
Ypsilanti	261610008	555 Towner Ave	42.2406	-83.59972	pop exp	44201	1	nghbrhd	Washtenaw	4/1/00	AA	367,627
Allen Park	*261630001*	*14700 Goddard*	*42.2286*	*-83.2083*	*pop exp*	*44201*	*2*	*nghbrhd*	*Wayne*	*1/1/80*	*DWL*	*4,313,002*
Detroit - E 7 Mile	261630019	11600 East Seven Mile Road	42.4308	-83.00028	max conc	44201	2	urban	Wayne	4/11/77	DWL	4,313,002

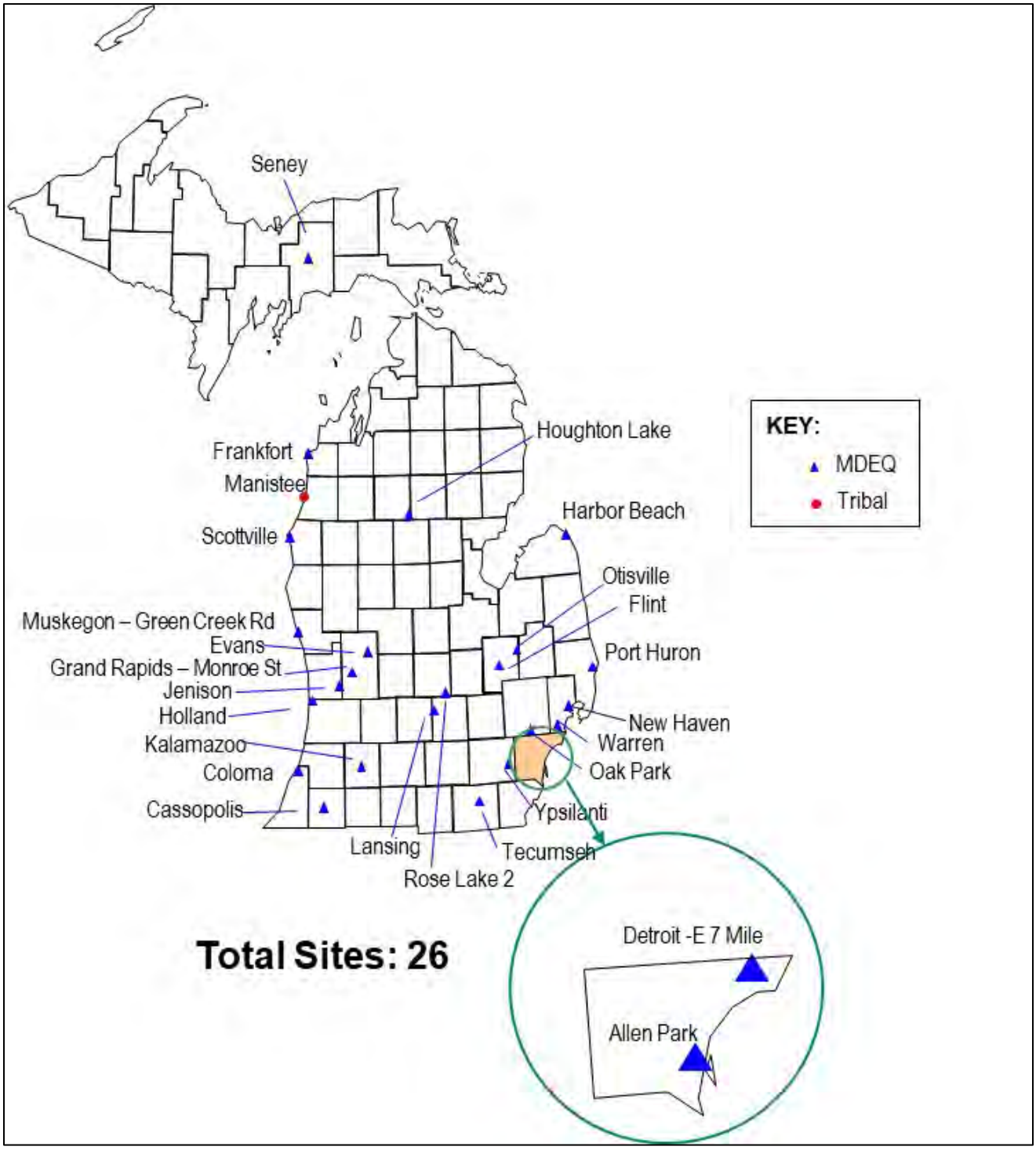
Tribal Stations

Monitoring Sites												
Site Name	AIRS Site ID	Address	Latitude	Longitude	Purpose	Parameter Code	POC	Scale	County	Start Date	MSA [1]	Pop (2017 Estimate)
Manistee	261010922	3031 Domres Rd	44.307	-86.24268	transport	44,201	1	regional	Manistee	4/1/06	Not in MSA	N/A

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

[2] **Former NAMS sites** are shown in **bold**.Old Lansing and Roselake have been moved
[3] **NCore sites** are shown in *italics*.

Figure 6: Michigan's Ozone Network in 2019-2020



Ozone Season and Modeling

The length of the ozone season was modified with the enactment of the 0.070 ppm 8-hour primary NAAQS. The new ozone NAAQS final rule extends the ozone season in Michigan from March 1 through October 31. This new season started with the 2017 ozone season.

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-round ozone values, are necessary. Specifically, modeling staff need five years of ozone and NO_2 data collected in small cities, urban, and rural areas. While Allen Park (261630001) and Grand Rapids–Monroe St. (260810020) measure ozone values in urban areas throughout the year, levels in smaller cities and rural areas were not available. Therefore, beginning October 1, 2010, EGLE began to monitor for ozone throughout the year at the Lansing (260650012) and Houghton Lake (261130001) stations. The new Lansing site (260650018) operates the same parameters as the previous Lansing site. The collection of additional NO_2 data to support NSR modeling is discussed in the NO_2 section.

Ozone Quality Assurance

Site operators conduct 1-point quality assurance 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 quality assurance checks indicate whether the monitor is meeting measurement quality objectives. The AMU uploads the results of the precision checks and audits to the USEPA's AQS database each quarter. The QA Coordinator reviews all audits and hard copies are retained in the QA files.

The USEPA conducts thru-the-probe audits of 20 percent of EGLE'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 USEPA auditor provides the AMU with a copy of the audit results and uploads the audit data to AQS.

Ozone Area Designations

On April 30, 2018, the USEPA made their final ozone nonattainment designations. On the west side of the state, part of Allegan County, all of Berrien County, and part of Muskegon County were reclassified for nonattainment for ozone. On the east side of the state, a seven-county area was reclassified as nonattainment for ozone which includes

Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne Counties. The remaining counties were designated attainment or unclassifiable.

In accordance with the CAA section 107(d), the USEPA must designate as nonattainment any area that violates the NAAQS and any nearby areas that contribute to the violation in the violating area. Based on the five factors below, the USEPA has determined that Livingston, Monroe, Oakland, and Washtenaw Counties contribute to the violating area.

1. Air Quality Data (including the design value calculated for each FRM or FEM monitor;
2. Emissions and Emissions-related Data (including locations of sources, population, amount of emissions, and urban growth patterns);
3. Meteorology (weather/transport patterns);
4. Geography/Topography (including mountain ranges or other physical features that may influence the fate and transport of emissions and ozone concentrations); and
5. Jurisdictional Boundaries (e.g., counties, air districts, existing nonattainment areas, areas of Indian country, Metropolitan Planning Organizations (MPOs)).

The nonattainment areas in western Michigan, with violating ozone monitors, are areas impacted by the unique air flow and meteorology of Lake Michigan and the resulting subregional transport of ozone and ozone-forming emissions from major urban areas in the Lake Michigan area (e.g., Chicago, Gary, and Milwaukee). At shoreline locations, the contribution of ozone-forming emissions from sources in Michigan is negligible.

Area	Michigan's Recommended Nonattainment Counties	EPA's Designated Nonattainment Counties
Detroit, MI	Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw and Wayne Counties	Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw and Wayne Counties
Muskegon, MI	Muskegon Partial County	Muskegon Partial County
Allegan, MI	Allegan Partial County	Allegan Partial County
Berrien, MI	Berrien County	Berrien County

Plans for the 2020 Ozone Monitoring Network

Beginning October 1, 2009, EGLE began collecting ozone measurements all year at the NCore sites and plans to continue through 2020:

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

To support NSR modeling projects, EGLE will continue to collect all year ozone measurements in 2020 at the following sites:

- Lansing (260650018); and
- Houghton Lake (261130001).

The current ozone network meets the minimum design specifications in 40 CFR Part 58. No ozone site reductions are planned at this time. The following monitors are planned to be retained as part of the 2020 ozone network; operating March 1 through October 31:

- Holland (260050003)
- Frankfort/Benzonia (260190003)
- Coloma (260210014)
- Cassopolis (260270003)
- Rose Lake 2 (260370002)
- 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)

The Manistee (261050922) tribal monitor will continue to operate in 2020; however, the Sault Ste. Marie (260330901) site has been shut down due to lack of grant funding.

$PM_{2.5}$ FRM MONITORING NETWORK

The January 15, 2013, revision to the PM NAAQS lowered the $PM_{2.5}$ annual average from 15.0 µg/m^3 to 12.0 µg/m^3. All counties 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**.[8] Background and transport monitors are required, in addition to these minimum requirements.

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.

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 3-year Design Value Concentrations ≥ 85% of any $PM_{2.5}$ NAAQS[3]	Most Recent 3-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 percent of the level of the 24-hour NAAQS must sample on a daily sampling frequency. The monitoring regulations also state that organizations co-locate 15 percent of sites for each primary method with a secondary $PM_{2.5}$ measurement to estimate precision at a reporting organization level.

In 2016, EGLE changed all FRM monitors to very sharp cut cyclones. The changes were made in April and May 2016. This changed the method code from 118 to 145. The dates of each instrument conversion can be determined by the data in the USEPA AQS database.

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

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

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	24-hr	5% of the 24-Hr NAAQS
85% of 12 ug/m3	85% of 35 ug /m3	33-37 = 5% NAAQS
10.2	30	

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

MSA	2017 Population Est.	Counties	Existing Monitors	2016-2018 3-year PM2.5 design value (annual)	2016-2018 3-year PM2.5 design value (24-Hr)	Min. No. monitors Required	Comments
Detroit-Warren-Livonia MSA	4,313,002	Macomb	New Haven	7.6	19	3	
		Oakland	Oak Park	8.1	20		
		Wayne	Allen Park	8.8	22		
			Detroit-SW HS	**11.3**	**28**		
			Detroit - Linwood	8.9	22		
			Detroit - E 7 Mi	8.1	19		
			Livonia	7.9	19		
			Dearborn	10.6	25		
			Wyandotte	7.6	20		
			Livonia Near Road	7.9	19.0		
		Lapeer	---				
		St Clair	Port Huron	8.0	19		
		Livingston	---				
Flint MSA	407,385	Genesee	Flint	***7.2***	**19**	0	
Monroe MSA	149,649	Monroe	Sterling State Park	**7.7**	**19**	0	
Ann Arbor MSA	367,627	Washtenaw	Ypsilanti	**8.1**	**19**	0	
Grand Rapids-Wyoming MSA	1,059,113	Kent	GR - Monroe St.	**8.2**	20	2	
		Barry	---				
		Ottawa	Jenison	8.3	22.0		
		Montcalm	---				
Muskegon-Norton Shores MSA	173,693	Muskegon	Muskegon - Apple St. (closed)			0	
Lansing-East Lansing MSA	477,,656	Clinton	---				
		Ingham	Lansing Filley	**7.8**	**29**	0	
		Eaton	---				
Bay City MSA	104,239	Bay	Bay City	**6.9**	**20**	0	
Kalamazoo-Portage MSA	338,338	Kalamazoo	Kalamazoo	**8.2**	**21**	0	
		Van Buren	---				
Jackson MSA	158,640	Jackson	---				
Battle Creek MSA	134,128	Calhoun	---				
South Bend-Mishaw aka MSA	321,815	Cass	---				
		St. Joseph, IN				0	
Other areas							
		Allegan	Holland	7.4	21		*micropolitan area*
		Missaukee	Houghton Lake	5.0	15		
		Manistee	Manistee	5.8	16		
		Lenawee	Tecumseh	7.6	19		
		Chippewa	Sault Ste Marie	5.6	18		

The reduced concentrations of $PM_{2.5}$ measured since 2010 have caused the 2016-2018 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. Due to an increase in population, two monitors sites are again required in the Grand Rapids-Wyoming MSA.

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 percent of the NAAQS. Now that concentrations have fallen, it is possible for EGLE to discontinue monitoring $PM_{2.5}$ FRM at Holland. However, EGLE plans to replace the filter-based FRM sampler with a continuous FEM BAM in 2019-2020.

The Saginaw MSA is required to have a $PM_{2.5}$ FRM site. The USEPA 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 percent of the NAAQS, indicating that monitoring is no longer required. EGLE will replace the filter based FRM and TEOM with a continuous FEM BAM in 2019-2020.

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 7.2 and 19 $\mu g/m^3$, respectively. Even though both design values are less than 85 percent of their respective NAAQS, EGLE will continue to operate a $PM_{2.5}$ monitor in the Flint MSA. On September 6, 2018, a continuous BAM replaced the TEOM. A filter-based FRM $PM_{2.5}$ sampler continues to run at the site as a secondary sampler.

The annual and 24-hour $PM_{2.5}$ design values at the previous Lansing monitor (260650012) are no longer greater than 85 percent of the NAAQS, indicating that monitoring is no longer required. On April 16, 2018, EGLE moved to a different location due to loss of site access. The new Lansing site (260650018) will continue to operate in 2020.

The Kalamazoo (260770008) monitor fulfilled the requirement that the Kalamazoo-Portage MSA have one FRM sampler. Both the 24-hour and annual design values at the Kalamazoo monitor are now less than 85 percent of the respective NAAQS, indicating that a site is no longer necessary in this MSA. EGLE intends to continue operation of both the primary and co-located, filter-based FRM $PM_{2.5}$ samplers at the Kalamazoo site. For public notification, the $PM_{2.5}$ TEOM will continue to operate at this site in 2020.

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). The Grand Rapids-Monroe St. (260810020) is an NCore site and is therefore required to retain the $PM_{2.5}$ monitor. Due to difficulties with accessing the Wealthy St. (260810007) site, EGLE relocated the $PM_{2.5}$ monitor to the Jenison (261390005) site in January 2018.

Through a cooperative grant project with USEPA Region 5 and the USEPA's Office of Research and Development (ORD), EGLE 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 included $PM_{2.5}$ speciation and continuous EC/OC. Sampling of EC/OC was discontinued March 31, 2018. Sampling of $PM_{2.5}$ speciation and $PM_{2.5}$ FRM was discontinued January 2, 2019. Since Tecumseh is the upwind background site near the Detroit-Warren-Livonia MSA, EGLE added a continuous FEM BAM January 1, 2019, replacing the continuous $PM_{2.5}$ TEOM and filter-based FRM sampler.

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

Houghton Lake (261130001) is the background $PM_{2.5}$ FRM site in Michigan. EGLE replaced the filter-based sampler with a continuous BAM on January 1, 2019. The Port Huron (261470005) site design value has also dropped but EGLE will continue to operate the $PM_{2.5}$ FRM.

Fine particulate concentrations have dropped below 85 percent of the level of the NAAQS in the Ann Arbor MSA, so a monitor is no longer required. However, EGLE will continue to monitor at the Ypsilanti site (261610008) in 2020.

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 Detroit-SWHS site (261630015) is the second highest site in the Detroit-Warren-Livonia MSA. With construction of the Gordie Howe International Bridge near this site, EGLE will continue operating the primary $PM_{2.5}$ along with a secondary $PM_{2.5}$ BAM, which was added in August 2018.

Located in Wayne County, both the Wyandotte (261630036) and Linwood (261630016) sites were shut down January 1, 2019. The primary and co-located FRM filter-based samplers at the Dearborn (261630033) site and E 7 Mile (261630019) site will continue to operate.

Detroit–FIA/Lafayette (261630039) was a special purpose monitor, due to a change in property ownership the site was shutdown May 23, 2018.

The Livonia site (261630025) in western Wayne County was shut down January 1, 2019. The Livonia near-road site (261630095) fulfills the requirement for $PM_{2.5}$ monitoring at a near-road site. In 2019-2020, EGLE is proposing to replace the filter-based monitor with a continuous FEM BAM monitor. A tribal $PM_{2.5}$ monitoring site located in Manistee (261010922) will continue to operate in 2020.

The above changes in the network will reduce the required number of co-located sites. This reduction to 14 sites equates to a 15 percent co-location requirement of two sites. EGLE proposes to keep Kalamazoo (260770008) and Dearborn (261630033) as the co-located sites and shut down the secondary samplers at Grand Rapids (260810020) and Ypsilanti (261610008) in 2019-2020.

Table 14 summarizes the $PM_{2.5}$ FRM monitoring site information for sites that were operating in 2019 and are planned to be operational in 2020. **Figure 7** illustrates the geographical distribution of $PM_{2.5}$ FRM monitors for 2019 and 2020.

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, Method Code 142

SLAMS Network

Monitoring Sites													
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose/ Type	Parameter Code	POC	Scale	County	Start Date	MSA [1]	Pop (2017 Estimate)
Flint	260490021	Whaley Park, 3610 Iowa St., Flint	43.04722	-83.670278	1:3	Pop. Exp.	88101	1	Neighborhood	Genesee	12/16/98	F	407,385
Lansing Filley	260650018	815 Filley St Lansing	42.76138	-84.562867	1:3	Pop. Exp.	88101	1	Neighborhood	Ingham	05/16//2018	LEL	477,656
Kalamazoo	260770008	Fairgrounds,1400 Olmstead Rd.	42.278056	-85.541944	1:3	Pop. Exp.	88101	1	Neighborhood	Kalamazoo	11/19/98	KP	338,338
Kalamazoo	260770008	Fairgrounds,1400 Olmstead Rd.	42.278056	-85.541944	1:6, co-loc	Pop. Exp.	88101	2	Neighborhood	Kalamazoo	11/19/98	KP	338,338
Grand Rapids - Monroe St.	260810020	1179 Monroe St., NW,	42.984167	-85.671389	1:3	Pop. Exp.	88101	1	Neighborhood	Kent	10/23/98	GW	1,059,113
New Haven	260990009	57700 Gratiott	42.731389	-82.793611	1:3	Pop. Exp.	88101	1	Neighborhood	Macomb	12/22/98	DWL	4,313,002
Oak Park	261250001	13701 Oak Park Blvd.	42.463056	-83.183333	1:3	Pop. Exp.	88101	1	Neighborhood	Oakland	12/25/98	DWL	4,313,002
Jenison	261390005	6981 28th Ave GeorgetownTwp	42.894444	-85.852778	1:3	Pop. Exp.	88101	1	Neighborhood	Ottawa	1/14/18	GW	1,059,113
Port Huron	261470005	2525 Dove Rd.	42.953333	-82.456389	1:3	Pop. Exp.	88101	1	Urban	Saint Clair	2/11/99	DWL	4,313,002
Ypsilanti	261610008	555 Towner Ave.	42.240556	-83.599722	1:3	Pop. Exp.	88101	1	Neighborhood	Washtenaw	8/4/99	AA	367,627
Allen Park	261630001	14700 Goddard	42.228611	-83.208333	1:3	Pop. Exp.	88101	1	Neighborhood	Wayne	5/12/99	DWL	4,313,002
Detroit - SWHS	261630015	150 Waterman	42.302778	-83.106667	1:3	Pop. Exp. Max. Conc.	88101	1	Neighborhood	Wayne	2/26/99	DWL	4,313,002
Detroit - E 7 Mile	261630019	11600 E. 7 Mile, Osborne School	42.430833	-83.000278	1:3	Pop. Exp.	88101	1	Neighborhood	Wayne	4/30/00	DWL	4,313,002
Dearborn	261630033	2842 Wyoming, Salina School	42.306666	-83.148889	1:3	Pop. Exp. Max. Conc.	88101	1	Neighborhood	Wayne	2/5/99	DWL	4,313,002
Dearborn	261630033	2842 Wyoming, Salina School	42.306666	-83.148889	1:6, co-loc	Pop. Exp. Max. Conc.	88101	2	Neighborhood	Wayne	2/5/99	DWL	4,313,002

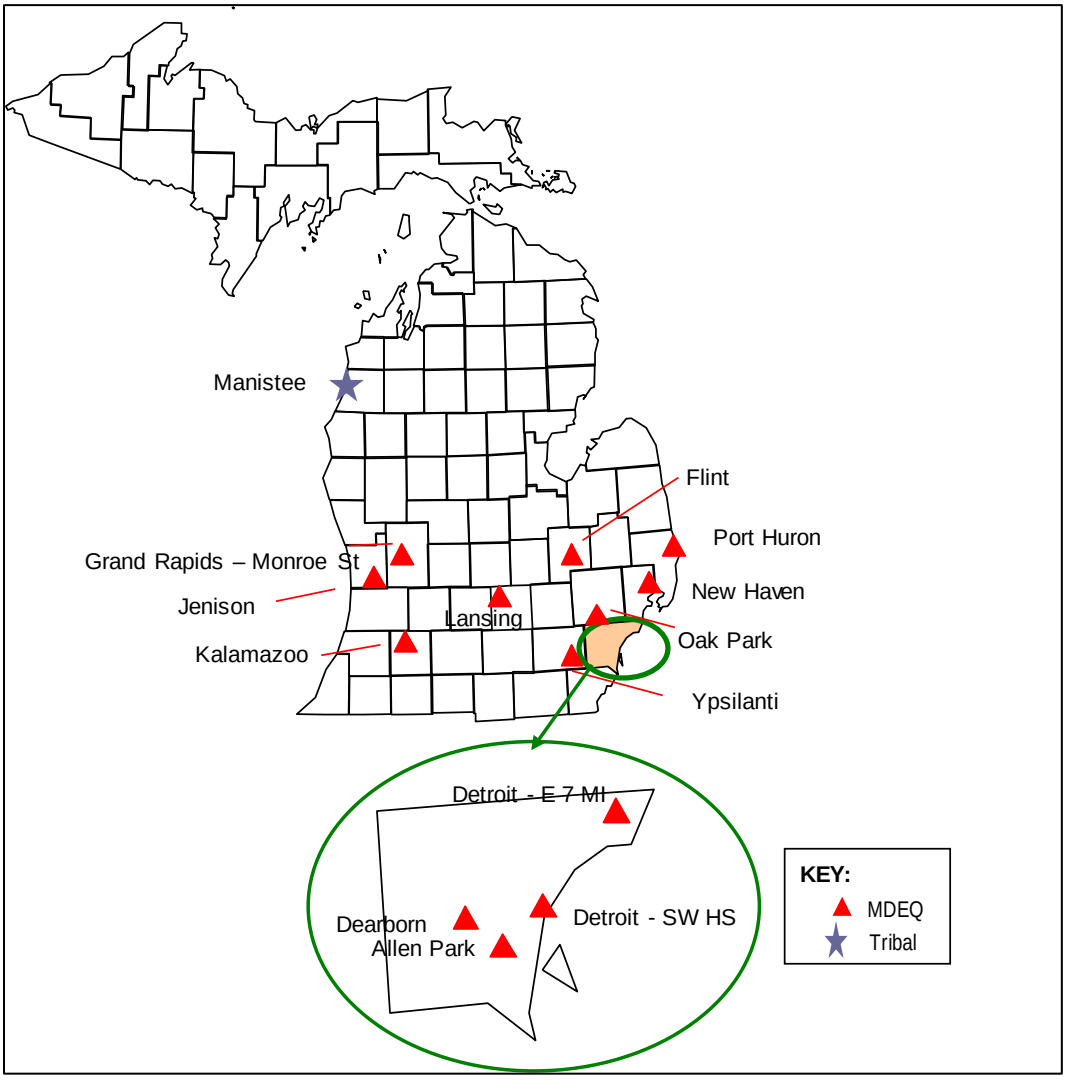
Special Purpose and Tribal $PM_{2.5}$ Monitors in Michigan

Monitoring Sites													
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose/ Type	Parameter Code	POC	Scale	County	Start Date	MSA [1]	Pop (2017 Estimate)
Manistee	261010922	3031 Domres Rd.	44.307	-86.24268	1:3	Tribal	88101	1	Regional	Manistee	4/2/06	Not in CBSA	N/A

[1] MSA Key:

AA = Ann Arbor MSA
DWL = Detroit-Warren-Livonia MSA
F = Flint MSA
GW = Grand Rapids-Wyoming MSA
KP = Kalamazoo-Portage MSA
LEL = Lansing-E. Lansing MSA

Figure 7: Michigan's $PM_{2.5}$ FRM Monitoring Network



$PM_{2.5}$ Quality Assurance

The $PM_{2.5}$ sampling is addressed in the Air Monitoring Unit program QAPP. EGLE plans to operate two co-located $PM_{2.5}$ FRM samplers, meeting the precision monitoring requirement of 15 percent. The sampling frequency of the co-located precision samplers at Kalamazoo (260770008) and Dearborn (261630033) is once every six days.

EGLE's station operators conduct flow rate verifications every four weeks to ensure the flow rate is meeting the measurement quality objectives. Results from these flow checks are submitted to the Quality Assurance Team each month for review and are uploaded to the USEPA's AQS database each quarter. 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 USEPA'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.

EGLE participates in the USEPA's PEP audits at eight sites each year. The USEPA 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 a USEPA laboratory for analysis. Once the EGLE filter weight is entered into the USEPA's AQS database, the audit filter weight is entered by the USEPA whereby the concentrations are compared between the PEP audit filter and the station filter. The USEPA 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 2019-2020 $PM_{2.5}$ FRM Monitoring Network

The following filter based $PM_{2.5}$ FRM monitors and sampling frequencies will be retained as part of the 2020 network:

- Flint (260490021) one in three day
- Lansing (260650018) one in three day
- Kalamazoo (260770008) one in three day
- Kalamazoo (260770008) one in six day
- Grand Rapids-Monroe St. (260810020) one in three day
- Manistee (261010922) tribal site, one in three day
- Jenison (261390005) one in three day
- New Haven (260990009) one in three day
- Oak Park (261250001) one in three day
- Port Huron (261470005) one in three day
- Ypsilanti (261610008) one in three day
- Allen Park (261630001) one in three day

- Detroit-SWHS (261630015) one in three day
- Detroit-E 7 Mile (261630019) one in three day
- Dearborn (261630033) one in three day
- Dearborn (261630033) one in six day

The following FRM $PM_{2.5}$ monitors were shut down in 2018-2019:

- Livonia (261630025) historical (January 1, 2019)
- Linwood (261630016) (January 1, 2019)
- Wyandotte (261630036) (January 1, 2019)
- Detroit–FIA (261630039) (May 23, 2018) – due to loss of site access
- Houghton Lake (261130001) – replaced with FEM continuous BAM
- Tecumseh (260910007) – replaced with FEM continuous BAM

To reduce travel and lab costs, the following FRM $PM_{2.5}$ monitors will be replaced with a continuous FEM BAM in 2019:

- Holland (260050003);
- Bay City (260170014); and
- Livonia-Near-road (261630095).

The following co-located, secondary sampler will be shut down:

- 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).

CONTINUOUS $PM_{2.5}$ MONITORING NETWORK

According to the October 17, 2006, changes to the monitoring regulations, 50 percent of the minimum number of required FRM sites must be co-located with a continuous $PM_{2.5}$ monitor. The current number of continuous monitors operational in the state exceed the minimum number that are required. State agencies are encouraged by the USEPA to convert the existing filter based FRM $PM_{2.5}$ samplers to FEM continuous instruments. This change in technology allows for real-time measurements for both public notification and regulatory comparison to the National Ambient Air Quality Standards. The change in technology also reduces filter costs, laboratory analysis costs, and staff time to conduct filter installation and recovery. Both filter-based and continuous instruments still require the monthly flow rate verifications and semi-annual audits.

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. The $PM_{2.5}$ TEOMs at Grand Rapids-Monroe St. (260810020) and Allen Park (261630001) need to continue operation to meet the NCore requirement for continuous fine particulate measurements.

In 2020 EGLE will operate 7 Rupprecht & Patashnick TEOM, non-FEM samplers for public notification purposes and 9 FEM BAM monitors to supply continuous fine particulate data at 16 monitoring sites, as shown in **Table 15**. **Figure 8** illustrates the geographical distribution of the continuous monitoring network.

With the ongoing construction of the Gordie Howe International Bridge, EGLE will operate $PM_{2.5}$ FEM BAM samplers at Fort St. (SWHS) (261630015), DP4th (261630098), Trinity (261630099) and Military Park (2616300100) which have been operational since the summer and fall of 2018.

The MetOne BAM operated by the Inter-Tribal Council, Sault Ste. Marie (2960330901), shut down March 1, 2019, due to non-renewal of federal funding.

EGLE operates the TEOMs from March through October with an inlet temperature of 50°C. Once the ozone season is over, starting November 1, EGLE 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. Over time and with adequate funding, EGLE will transition these instruments out of service in favor of the real-time FEM continuous samplers.

Table 15: Michigan's Continuous $PM_{2.5}$ Monitoring Network

Operating Schedule: continuous

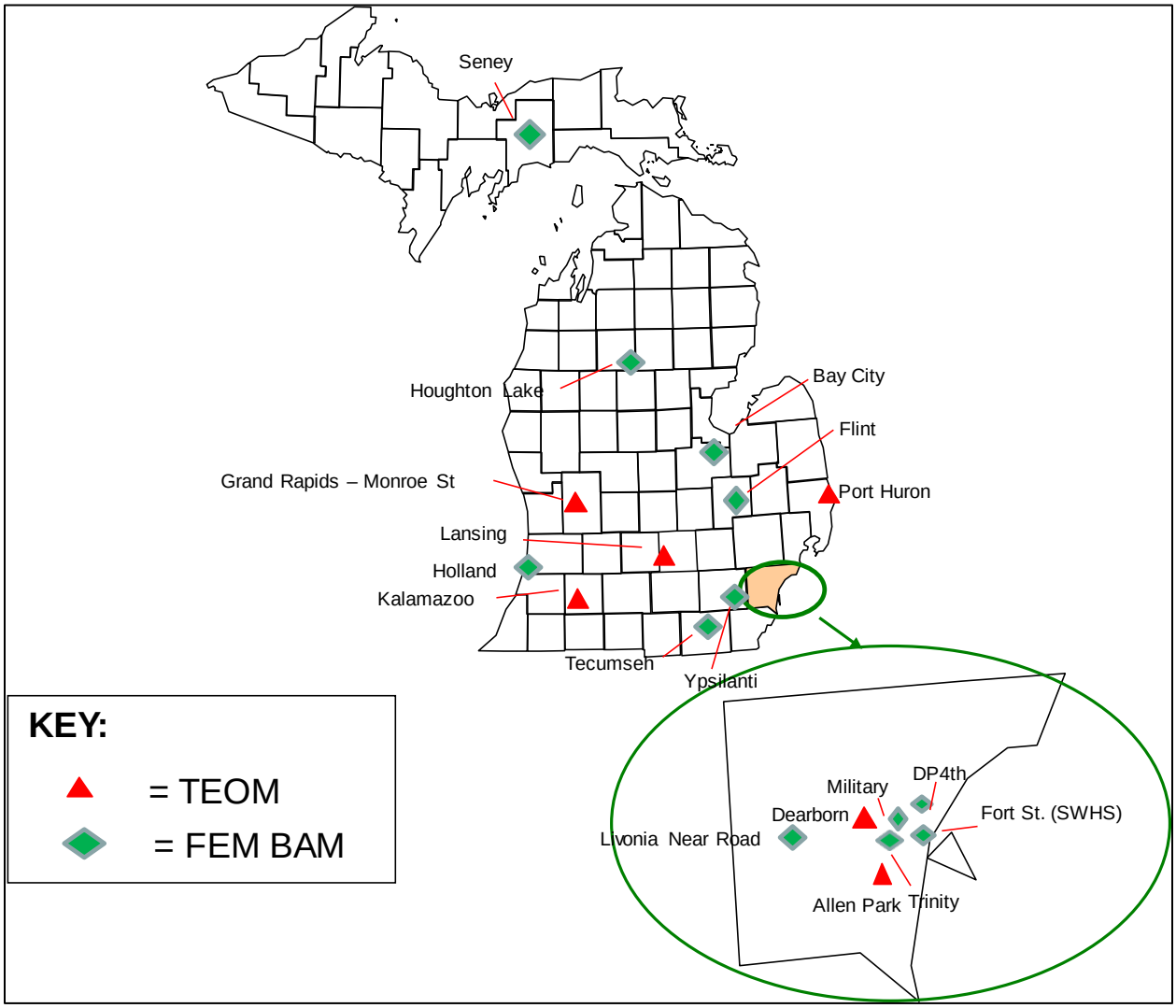
Method:	Rupprecht & Patashnick Tapered Element Oscilating Microbalance (TEOMS) Samplers Method Codes 701/703										
	Monitoring Sites										
Site Name	AQS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Start Date	CBSA [1]	Pop (2010 Census)
Lansing	260650012	220 N. Pennsylvania	42.738611	-84.534722	Pop. Exp.	Neighborhood	Ingham	12/1/99	LEL	477,656
Kalamazoo	260770008	Fairgrounds, 1400 Olmstead Rd.	42.278056	-85.541944	Pop. Exp.	Neighborhood	Kalamazoo	8/17/00	KP	338,338
Grand Rapids - Monroe St.	260810020	1179 Monroe St., NW,	42.984167	-85.671389	Pop. Exp.	Neighborhood	Kent	11/4/99	GW	1,059,113
Port Huron	261470005	2525 Dove Rd.	42.953333	-82.456389	Pop. Exp.	Urban	Saint Clair	9/18/03	DWL	4,313,002
Allen Park	261630001	14700 Goddard	42.228611	-83.208333	Pop. Exp.	Neighborhood	Wayne	12/1/00	DWL	4,313,002
Dearborn	261630033	2842 Wyoming, Salina School	42.306666	-83.148889	Pop. Exp. Max. Conc.	Neighborhood	Wayne	9/26/03	DWL	4,313,002

Method:	MetOne Beta Attenuation Monitor (BAM) Method Code 170									
	Monitoring Sites									
Site Name	AQS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Start Date	CBSA [1]	Pop (2010 Census)
Holland	260050003	966 W 32nd	42.767778	-86.148611	Pop. Exp.	urban	Allegan	8/1/19	A	116,447
Bay City	260170014	1001 Jennison St.	43.571389	-83.890833	Pop. Exp.	Neighborhood	Bay	8/1/19	BC	104,239
Flint	260490021	3610 Iowa St., Flint	43.04722	-83.670278	Pop. Exp.	Neighborhood	Genesee	9/11/18	F	407,385
Livonia-NR	261630095	18790 Haggerty Rd	42.421494	-83.425168	Near Road	micro	Wayne	8/1/19	DWL	4,313,002

Method:	Thermo Beta Attenuation Monitor (BAM) Method Code 183									
	Monitoring Sites									
Site Name	AQS Site ID	Address	Latitude	Longitude	Purpose	Scale	County	Start Date	CBSA [1]	Pop (2010 Census)
Tecumseh	260910007	6792 Raisin Center Highway	41.995556	-83.946667	up wind backgrd	regional	Lenawee	11/27/18	AL	98,623
Houghton Lake	261130001	1769 S Jeffs Rd.	44.310556	-84.891944	Background	Regional	Missaukee	11/28/18	Not in CBSA	N/A
Seney	261530001	Seney Wildlife Refuge, HCR 2 Box 1	46.288880	-85.950270	Background	Regional	Schoolcraft	1/1/19	Not in CBSA	N/A
Ypsilanti	261610008	555 Towner Ave.	42.240556	-83.599722	Pop. Exp.	Neighborhood	Washtenaw	2/24/00	AA	367,627
Detroit-SWHS	261630015	150 Waterman	42.302778	-83.106667	Background	Neighborhood	Wayne	8/21/18	DWL	4,313,002
DP4th	161630098	4700 W Fort St	42.312158	-83.091943	Background	Neighborhood	Wayne	8/1/18	DWL	4,313,002
Trinity	261630099	9191 W Fort St	42.295824	-83.129431	Background	Neighborhood	Wayne	10/18/18	DWL	4,313,002
Military	261630100	1238 Military St	12.312078	-83.103469	Background	Neighborhood	Wayne	11/1/18	DWL	4,313,002

[1] **CBSA Key:**
A = Allegan Micropolitan Area
AL = Adrian Lenawee Micropolitan. Area
AA = Ann Arbor Metro. Area
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



$PM_{2.5}$ Continuous Quality Assurance

The AMU site operator conducts flow rate verifications once a month. Results from the flow checks are sent to the QA Team for review each month and reported to the USEPA's AQS database each quarter. 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. Each quarter the flow audits are uploaded to the USEPA's AQS database.

Plans for the 2020 $PM_{2.5}$ TEOM and $PM_{2.5}$ BAM Network

During 2020, Michigan will continue to operate $PM_{2.5}$ TEOM (non-FEM) monitors at:

- Lansing (260650018)
- Kalamazoo (260770008)
- Grand Rapids–Monroe St. (260810020)
- Port Huron (261470005)
- Allen Park (261630001)
- Dearborn (261630033)
- New Mount Hermon (261630095)

During 2020, EGLE plans to operate $PM_{2.5}$ BAM monitors at:

- Holland (260050003) (Method 170)
- Bay City (260170014) (Method 170)
- Flint (260490021) (Method 170 – as primary for co-location)
- Tecumseh (260910007) (Method 183)
- Houghton Lake (261130001) (Method 183)
- Seney (26153001) (Method 183)
- Ypsilanti (261610008) (Method 183 – as primary for co-location)
- Livonia-Near-road (261630095) (Method 170)
- Fort St. (SWHS) (261630015) (Method 183)
- DP4th (261630098) (Method 183)
- Trinity (261630099) (Method 183)
- Military (261630100) (Method 183)

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 frequency of once every three days, following the USEPA sampling schedule. 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. EGLE will continue to operate the three different carbon samplers to support USEPA OAQPS inter-sampler comparability studies.

Continuous Speciation Measurements

In addition to the speciated measurements integrated over a 24-hour time period described above, EGLE operates continuous monitors for black carbon using aethalometry. 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. As part of the Community Scale Air Toxics monitoring grant in 2015, three new aethalometers were purchased from Magee Scientific. These were installed in 2016 as Special Purpose Monitors at Eliza Howell Near-road (261630093), Eliza Howell Downwind (261630094), and Livonia Near-road (261630095) for the Air Toxics Near-roadway study. When that study ended in 2017, these instruments were relocated to the three new GHIB monitoring locations and another at Detroit-SWHS in 2018.

Speciation Quality Assurance

The site operator conducts flow rate verifications every four weeks. Results from the flow checks are sent to the QA Team for review each month and uploaded to the USEPA's AQS database each quarter. The QA team conducts semi-annual flow rate audits on the $PM_{2.5}$ speciation monitors. 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 USEPA's AQS database each quarter. The USEPA periodically conducts technical systems audits and instrument audits for the speciation network. The USEPA also conducts audits of the national contract 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 and Grand Rapids), once every 6 days all others. Follows USEPA sampling schedule.

Method: Met One SASS and URG 3000 N units to collect organic & elemental carbon, Method Code 811 (SASS) Method Code 839/840 (URG)

Monitoring Sites												
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose/ Type	POC	Scale	County	Start Date	MSA [1]	Pop 2017 Estimate
Grand Rapids - Monroe St	260810020	1179 Monroe St., NW,	42.984	-85.67139	1:3	Pop. Exp.	5	Neighborhood	Kent	11/4/99	GW	1,059,113
Allen Park	261630001	14700 Goddard	42.229	-83.20833	1:3	Pop. Exp.	5	Neighborhood	Wayne	12/1/00	DWL	4,313,002
Fort St. (SWHS)	261630015	150 Waterman St	42.303	-83.10667	1:6	Pop. Exp. Max. Conc.	5	Neighborhood	Wayne	11/2/08	DWL	4,313,002
Dearborn	261630033	2842 Wyoming, Salina School	42.307	-83.14889	1:6	Pop. Exp. Max. Conc.	5	Neighborhood	Wayne	9/26/03	DWL	4,313,002

Continuous Speciation Measurements

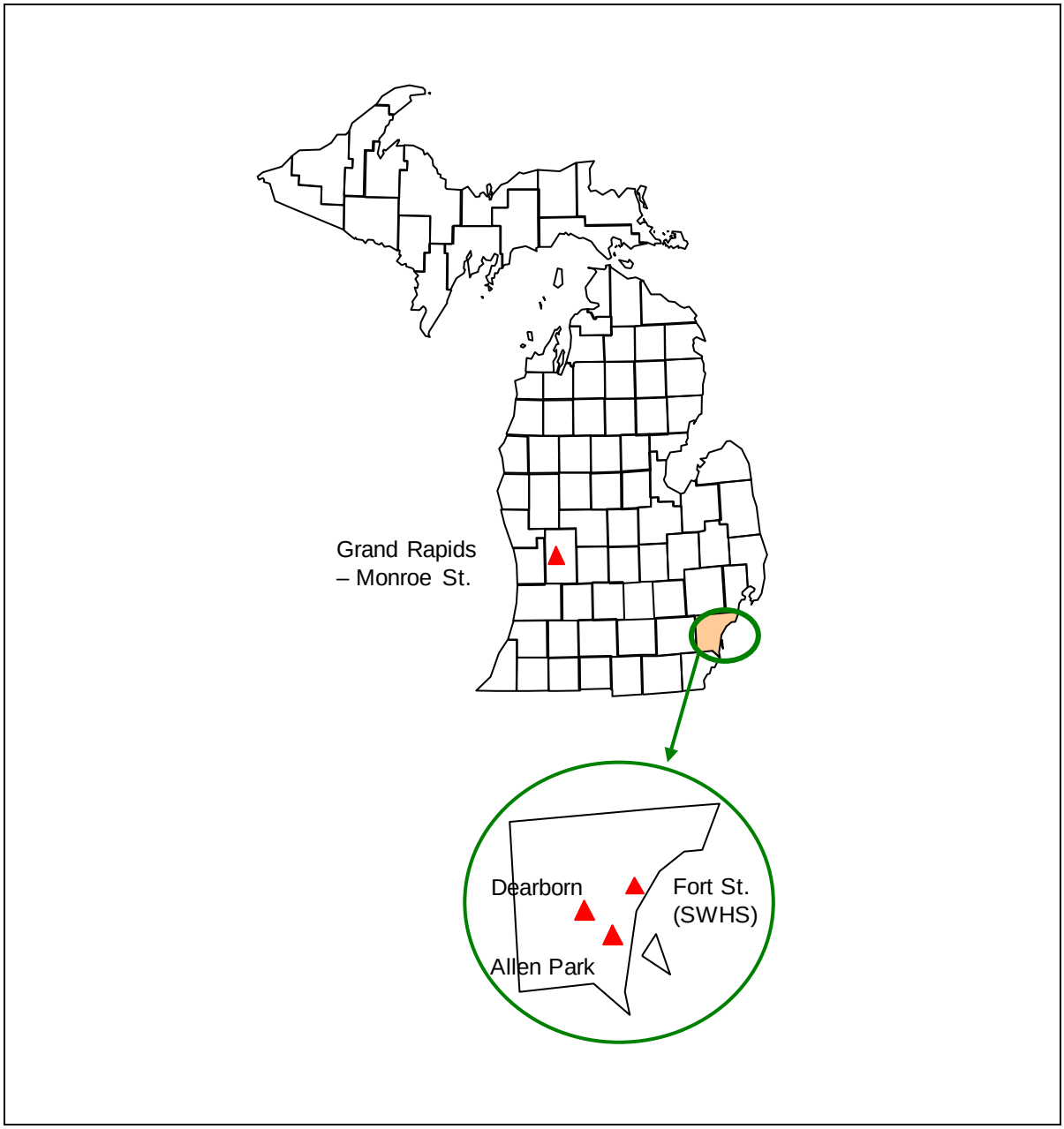
Method: Magee Aethalometer: Method Code 861

Monitoring Sites												
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Method	Purpose	POC	Scale	County	Start Date	MSA [1]	Pop 2017 Estimate
Allen Park	261630001	14700 Goddard	42.229	-83.20833	McGee large spot Aethalometer (carbon black)	Pop. Exp.	1	Neighborhood	Wayne	1/1/04	DWL	4,313,002
Fort St. (SWHS)	261630015	150 Waterman St	42.303	-83.10667	McGee large spot Aethalometer (carbon black)	SPM		Neighborhood	Wayne	8/20/18	DWL	4,313,002
Dearborn	261630033	2842 Wyoming, Salina School	42.307	-83.14889	McGee large spot Aethalometer (carbon black)	Pop. Exp. Max. Conc.	1	Neighborhood	Wayne	12/19/03	DWL	4,313,002
DP4th	161630098	4700 W Fort St	42.312	-83.09194	McGee large spot Aethalometer (carbon black)	SPM	1	Neighborhood	Wayne	7/30/18	DWL	4,313,002
Trinity	261630099	9191 W Fort St	42.296	-83.12943	McGee large spot Aethalometer (carbon black)	SPM	1	Neighborhood	Lenawee	10/23/18	DWL	4,313,002
Military	261630100	1238 Military St	12.312	-83.10347	McGee large spot Aethalometer (carbon black)	SPM	1	Neighborhood	Wayne	11/17/18	DWL	4,313,002

[1] MSA Key:

AL = Adrian Micropolitan Area
DWL = Detroit-Warren-Livonia MSA
GW = Grand Rapids-Wyoming MSA
SPM = Special Purpose Monitor

Figure 9: Michigan's $PM_{2.5}$ Speciation (SASS) Network



Plans for the 2020 $PM_{2.5}$ Speciation Monitoring Network

MetOne SASS and URG 3000N:

During 2020, contingent upon adequate levels of funding, EGLE will continue to operate 24-hour $PM_{2.5}$ 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; and
- SWHS (261630015) operating once every six days.

On January 1, 2019, EGLE shut down the 24-hour $PM_{2.5}$ speciation monitors at:

- Tecumseh (260910007).

Black Carbon - Aethalometer:

During 2020, EGLE will continue to operate hourly Magee aethalometer monitors at:

- Dearborn (261630033);
- Allen Park (261630001);
- Fort St. SWHS (261630015);
- DP4th 261630098);
- Trinity (261630099); and
- Military Park (261630100).

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**.[9]

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 USEPA 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 a co-located pair at the design value site at Dearborn (261630033).

The PM_{10} monitoring requirements specify that two to four PM_{10} sites are required in the Grand Rapids-Wyoming MSA. There are currently two sites in operation, one at Grand Rapids-Monroe St. (260810020) and the second at Jenison (261390005).

According to the requirements, either zero or one PM_{10} monitor is required in the Flint MSA. In 2006 EGLE 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, PM_{10} filters at Allen Park (261630001), Detroit-SWHS (261630015) and Dearborn (261630033) are analyzed for Mn and compared with the concentrations of Mn on the TSP filters. The manganese data was reviewed and determined to be equivalent to the TSP values. Therefore, the PM_{10} manganese analysis was discontinued in March 2009.

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

PM coarse measurements are required at NCore sites. One acceptable technology is to use two R & P Partisol Plus 2025 low volume samplers; one equipped with a $PM_{2.5}$ head and a very sharp cut cyclone, and the second with a PM_{10} head and a down tube. PM coarse value is determined by subtracting the fine particulate from the PM_{10} size fraction. These paired samplers operate at both NCore sites; Grand Rapids–Monroe St. (260810020) and Allen Park (261630001).

Table 19 summarizes the PM_{10} monitoring site information for sites in operation in 2019 and 2020. **Figure 10** shows the PM_{10} monitoring locations for 2019 and 2020.

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

MSA	2017 Estimated Population	Counties	Existing Monitors	2016-2018 most recent 3-year PM10 design value (24-Hr)	Conc. Class.	Min No monitors Required
Detroit-Warren-Livonia MSA	4,313,002	Macomb	---	**---**		2-4
		Oakland	---	**---**		
		Wayne	Allen Park	37	low	
			Detroit -SW HS	74	low	
			Dearborn	**58**	low	
		Lapeer	---	**---**		
		St Clair	---	**---**		
		Livingston	---	---		
Flint MSA	407,385	Genesee	---	---		
Monroe MSA	149,649	Monroe	---	**---**		
Ann Arbor MSA	367,627	Washtenaw	---	**---**		0-1
Grand Rapids-Wyoming MSA	1,059,113	Kent	GR - Monroe St	34		2
		Barry	---	---		
		Ottawa	Jenison started 2018	---		
		Montcalm	---	---		
Muskegon-Norton Shores MSA	173,693	Muskegon	---	---		
Lansing-East Lansing MSA	477,656	Clinton	---	---		0-1
		Ingham	---	---		
		Eaton	---	---		
Bay City MSA	104,239	Bay	---	---		
Saginaw-Saginaw Twp N MSA	191,934	Saginaw	---	---		
Kalamazoo-Portage MSA	338,338	Kalamazoo	---	---		0-1
		Van Buren	---	---		
Niles-Benton Harbor MSA	154,259	Berrien	---	---		
Jackson MSA	158,640	Jackson	---	---		
Battle Creek MSA	134,128	Calhoun	---	---		
South Bend-Mishawaka MSA	321,815	Cass	---	---		0-1
		St. Joseph, IN	---	---		

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: Method Code 109 (Dearborn also uses a R&P TEOM to make continuous measurements: Method Code 079)

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Monitor Type	Purpose/ Type	Parameter Code	POC	Scale	County	Start Date	MSA [1]	Pop (2015 Estimate)
Allen Park	261630001	14700 Goddard	42.228611	-83.20833	1:6	High Vol	pop exp	81102	1	nghbrhd	Wayne	9/12/87	DWL	4,313,002
Detroit - SWHS	261630015	150 Waterman	42.302778	-83.10667	1:6	High Vol	max conc	81102	1	nghbrhd	Wayne	3/27/87	DWL	4,313,002
Dearborn	261630033	2842 Wyoming	42.306666	-83.14889	1:6	High Vol	max conc	81102	1	nghbrhd	Wayne	6/12/90	DWL	4,313,002
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.984167	-85.67139	1:6	High Vol	pop exp	81102	1	nghbrhd	Kent	3/20/87	GW	1,059,113
Jenison	261390005	6981 28Th Ave. Georgetow n Tw p.	42.894444	-85.85278	1:6	High Vol	pop exp	81102	1	nghbrhd	Ottaw a	1/1/18	GW	1,059,113
Dearborn	261630033	2842 Wyoming	42.306666	-83.14889	1:12	High Vol for precision	max conc	81102	9	nghbrhd	Wayne	6/12/90	DWL	4,313,002
Dearborn	261630033 continuous	2842 Wyoming	42.306666	-83.14889	continuous	R&P PM10 TEOM	max conc	81102	3	nghbrhd	Wayne	4/1/00	DWL	4,313,002

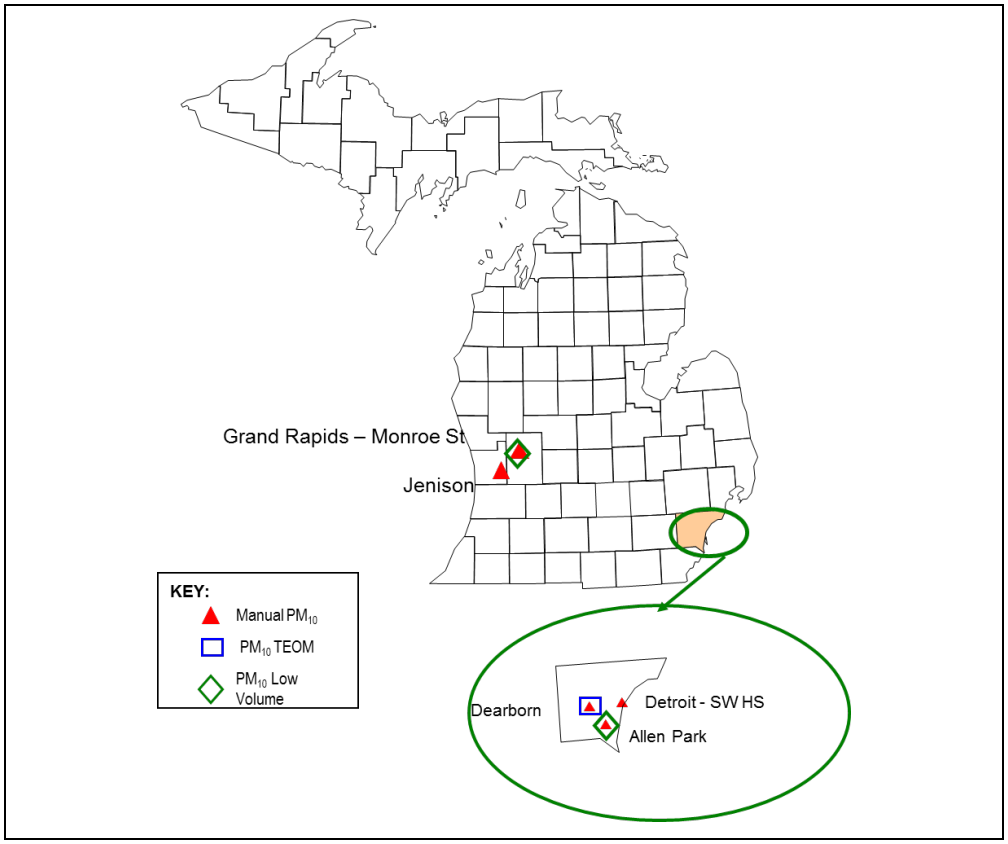
NCore Low Volume PM Coarse Sites

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.
Method Code 127 (PM_{10}) and Method Code 118 ($PM_{2.5}$)

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Monitor Type	Purpose	Parameter Code	POC	Scale	County	Start Date	MSA [1]	Pop (2015 Estimate)
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.984167	-85.67139	1:6	Low Vol Partisol	pop exp	81102	1	nghbrhd	Kent	7/16/11	GW	1,059,113
Allen Park	261630001	14700 Goddard	42.228611	-83.20833	1:6	Low Vol Partisol	pop exp	81102	1	nghbrhd	Wayne	7/16/11	DWL	4,313,002

[1] **MSA Key:** DWL= Detroit-Warren-Livonia MSA
GW = Grand Rapids-Wyoming MSA

Figure 10: Michigan's PM_{10} Monitoring Network



PM_{10} Quality Assurance

The AMU site operator conducts a flow rate verification once a month. Flow check values are sent to the QA Team for review and are reported to the USEPA's AQS database each quarter. An independent flow rate 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 USEPA's AQS database each quarter.

Plans for the 2020 PM_{10} Monitoring Network

During 2020, contingent upon adequate levels of funding, EGLE is planning to operate:

1. **High volume PM_{10} monitors sampling over 24-hours at:**

    - Grand Rapids-Monroe St. (260810020) - once every six day
    - Jenison (261390005) - once every six day.
    - Allen Park (261630001) - once every six day
    - Detroit–SWHS (261630015) - once every six day
    - Dearborn (261630033) - once every six day
    - Dearborn (261630033) - once every 12 day

2. **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:

    - Grand Rapids (260810020) - once every six-day schedule; and
    - Allen Park (261630001) - once every six-day

3. **Continuous PM_{10} TEOM** at Dearborn (261630033) - hourly schedule.

CARBON MONOXIDE (CO) MONITORING NETWORK

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

On August 31, 2011,[10] the USEPA 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-road monitoring stations that are required in the NO_2 network design. EGLE has CO monitor at two sites; Eliza Howell Near-road (261630093) and the Livonia near-road (261630095) site. Due to an increase in population, the Grand Rapids MSA is required to have a near-roadway monitoring station. Upon receipt of funding, EGLE will establish a near-roadway monitoring site in Grand Rapids in the time frame of 2021.

Table 20 summarizes the CO monitoring site information for sites that will operate in 2020. **Figure 11** shows the distribution of CO monitors across the state of Michigan.

CO Quality Assurance

The AMU site operator performs a 1-point quality assurance check of the analyzer every two weeks. Results of 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 a dedicated gas calibrator and calibration gases that are only for audits. The independent audit challenges the accuracy of the station monitor at several concentrations using a certified gas standard. The auditor also assesses the monitoring system (inspecting the sample line, filters, and inlet probe), siting, and documentation of the 1-point checks. Results of the 1-point checks and annual audits indicate whether the monitor is meeting the measurement quality objectives. The AMU uploads the results of the checks and audits to the USEPA'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 USEPA's thru-the-probe audit procedure for regular and trace level CO monitors. The USEPA reports the results to AQS.

Plans for the 2020 CO Monitoring Network

Contingent upon adequate levels of funding, EGLE plans to continue to operate trace level CO monitors to support NCore operations:

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

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

Contingent upon adequate levels of funding, EGLE plans to operate CO monitors at the near-roadway monitoring sites:

- Eliza Howell (roadway) (261630093); and
- Livonia Near-road (261630095).

Contingent on adequate funding, EGLE will operate the CO monitors around the Gordie Howe International Bridge project:

- DP4th (261630098); and
- Trinity (261630099).

Table 20: Michigan's CO Monitoring Network

Operating Schedule: Continuous

Method: Gas Filter Correlation Analyzer- CO: Method 054 and Trace CO: Method Code 093

Ncore Sites (Trace)

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose/ Type	Parameter Code	POC	Scale	County	Start Date	MSA [1]	Pop (2017 Estimate)
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.98417	-85.671389	trace	pop exp	42101	1	nghbrhd	Kent	1/1/08	GW	1,059,113
Allen Park	261630001	14700 Goddard	42.22861	-83.208333	trace	pop exp	42101	1	nghbrhd	Wayne	1/1/08	DWL	4,313,002

Near Roadway Sites

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose	Parameter Code	POC	Scale	County	Start Date	MSA [1]	Pop (2017 Estimate)
Eliza Howell (Roadway)	261630093	Service Road I-96 & Telegraph	42.38599	-83.26632	CO	Near Road	42101	1	micro	Wayne	9/1/11	DWL	4,313,002
Livonia Near Road	261630095	18790 Haggerty Road	42.42149	-83.425168	CO	Near Road	42101	1	micro	Wayne	1/1/15	DWL	4,313,002

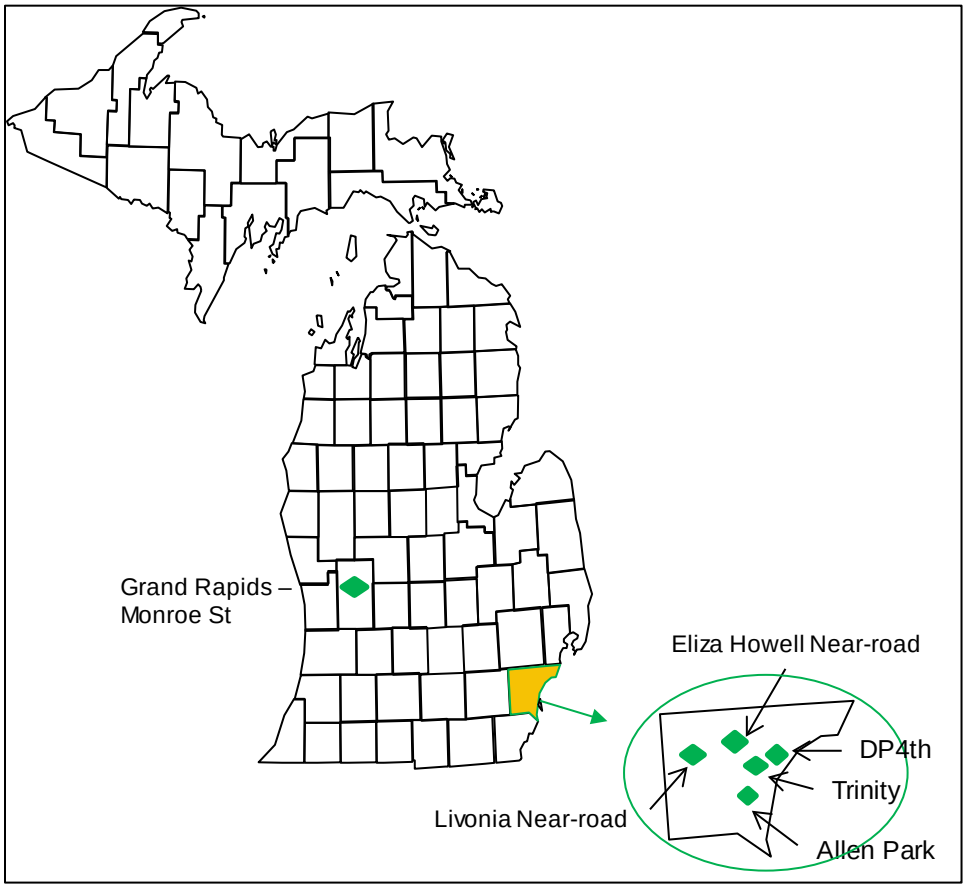
Special Purpose Monitors

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose	Parameter Code	POC	Scale	County	Start Date	MSA [1]	Pop (2017 Estimate)
DP4th	261630098	4700 W Fort St	42.31216	-83.091943	CO	SPM	42101	1	nghbrhd	Wayne	9/1/11	DWL	4,313,002
Trinity	261630099	9191 W Fort St	42.29582	-83.129431	CO	SPM	42101	1	nghbrhd	Wayne	9/1/11	DWL	4,313,002

[1] MSA Key:

DWL = Detroit-Warren-Livonia MSA GW = Grand Rapids-Wyoming MSA

Figure 11: Michigan's CO Monitoring Network



NITROGEN DIOXIDE (NO_2) and NO_Y MONITORING NETWORK

On February 9, 2010, the USEPA modified the NO_2 NAAQS from an ***annual*** average concentration of 53 ppb to an ***hourly*** average of 100 ppb.

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 focuses on near-roadway monitoring as well as monitoring at urban locations. The minimally required components of the network are:

Tier 1: Near-road 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

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

The USEPA Administrator must require a minimum of 40 NO_2 monitors nationwide in locations with "susceptible and vulnerable" populations.

The network design described above uses the latest available Census figures. The new monitoring stations were to be deployed and operational by January 1, 2013.[11] Due to budgetary constraints, the USEPA developed a build-and-hold system for implementing the new monitoring locations. Two Detroit near-road monitoring sites have been deployed. In addition, EGLE operated the community scale NO_2 monitor at its Detroit-E 7 Mile (261630019) site.

The USEPA has finalized a new rule, which eliminates Tier 3 of the near-road sites. This would have removed the requirement for a near-road site in Grand Rapids; however, the Grand Rapids CBSA exceeded the one million population threshold, which is now subject to the Tier 1 requirements. Funding for a near-road site in the Grand Rapids CBSA per CFR

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

requirements has been approved. EGLE is investigating locations for a near-road monitoring station and anticipates starting operations in 2021, pending receipt of funding and the ability to locate an appropriate location. The existing NO_Y monitor at the NCore site did not meet the CFR requirements for the near-roadway site.

The one million population in Grand Rapids requires both a near-road site (Tier 1) and a population-based area monitor (Tier 2). EGLE planned to install a 'true NO_2' for PAMS, which would meet both the population requirement and the PAMS requirement. However, since USEPA funding for the PAMS direct NO_2 has been delayed, EGLE installed in 2019 a traditional NO_X analyzer at Jenison (261390005). EGLE will shut down the NO_X at Jenison once the PAMS funding is available for the direct NO_2 sampler at Grand Rapids.

Table 21 summarizes the monitoring requirements for NO_2 according to the various tiers for all CBSAs in Michigan. As shown by this table, one monitor is required in Grand Rapids-Wyoming MSA and three monitors are required in the Detroit-Warren-Livonia MSA.

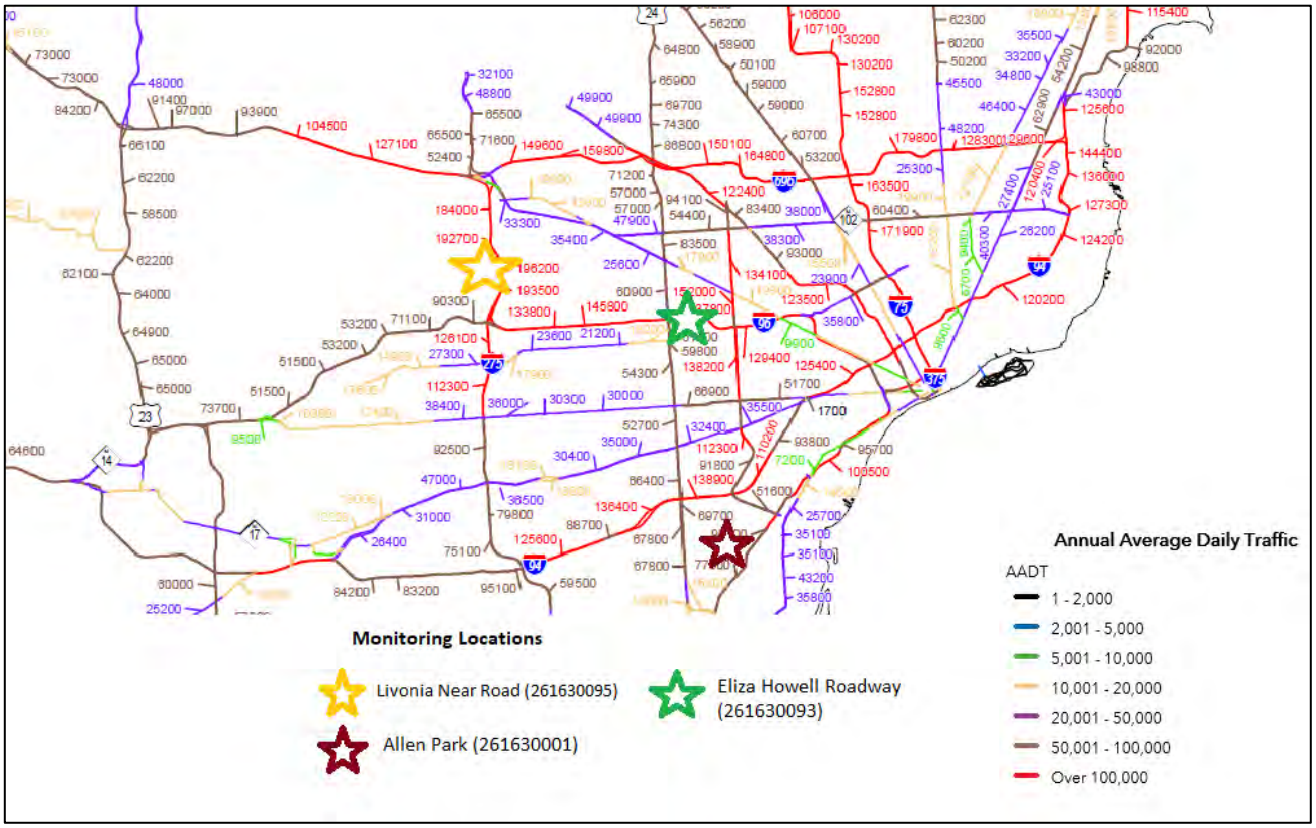
Table 21: NO_2 Network Design

MSA	Counties	2017 Estimated Population	Near-roadway Monitors Req'd	Additional Near-roadway Site	250,000 AADT	Community Wide Monitor	EJ Monitor
Detroit-Warren-Livonia MSA	Macomb Oakland Wayne Lapeer St Clair Livingston	4,313,002	1	1		1	
Flint MSA	Genesee	407,385					
Monroe MSA	Monroe	149,649					
Ann Arbor MSA	Washtenaw	367,627					
Grand Rapids-Wyoming MSA	Kent Barry Ottawa Montcalm	4,059,113	1			1	
Muskegon-Norton Shores MSA	Muskegon	173,693					
Lansing-East Lansing MSA	Clinton Ingham Eaton	477,656					
Bay City MSA	Bay	104,239					
Saginaw MSA	Saginaw	191,934					
Kalamazoo-Portage MSA	Kalamazoo Van Buren	338,338					
Niles-Benton Harbor MSA	Berrien	154,259					
Jackson MSA	Jackson	158,640					
Battle Creek MSA	Calhoun	134,128					
South Bend Mishawaka MSA IN/MI	Cass St. Joseph, IN	321,815					

Tier 1: Near-roadway NO_2 Monitors – Phase 2

The second near-road 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**. (https://www.michigan.gov/mdot/0,4616,7-151-11151-22141--,00.html)

Figure 12: Comparison of Eliza Howell Park Location with other Air Monitoring Stations and Roadway Segments with High Traffic Counts



Tier 2: Area-wide NO_2 Monitors

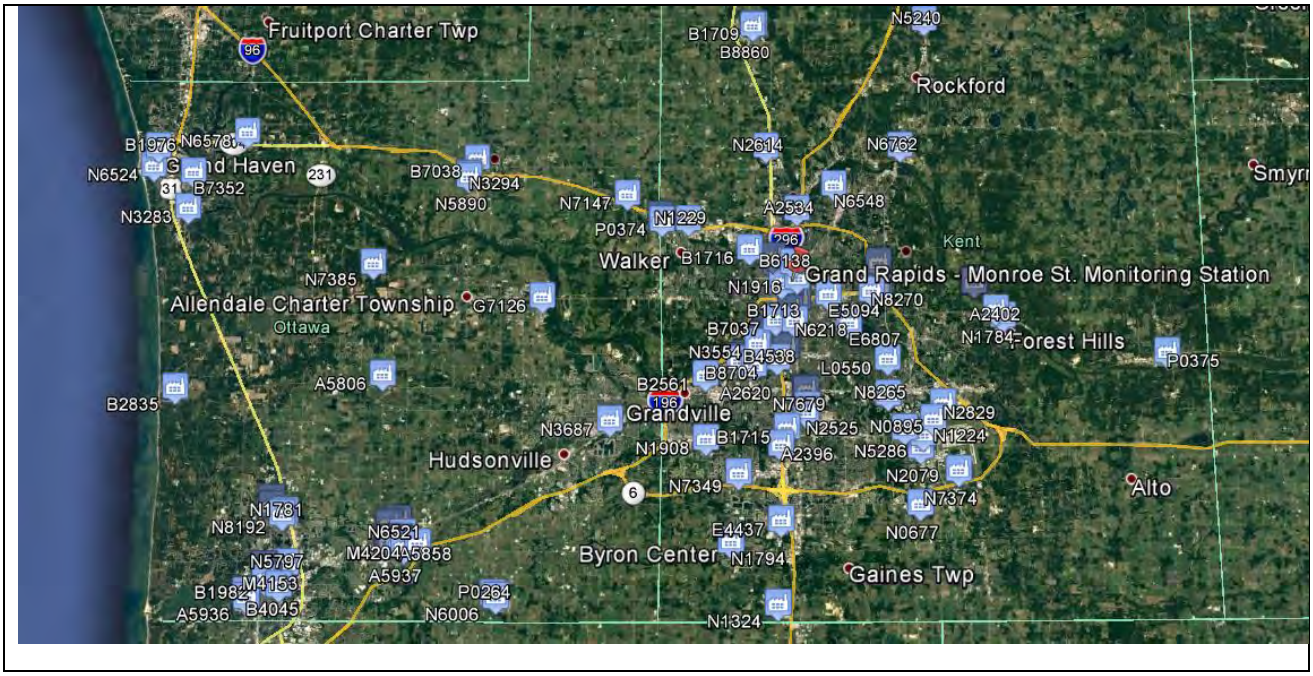
Area-wide monitoring is required in every CBSA with 1,000,000 or more people. The Detroit-Warren-Livonia MSA and the Grand Rapids-Wyoming MSA both meet this requirement in Michigan. In Detroit, EGLE is currently operating NO_2 monitors at the sites identified as Detroit-SWHS (261630015), DP4 (261630098), Trinity (261630099), and Military Park (261630100). The NO_X monitor at the Detroit-E 7 Mile site (261630019) in northeast Detroit was shut down in late 2018 to prepare the site for the upcoming PAMS work, which will include the operation of direct NO_2 and NO_Y monitors.

The Grand Rapids area is required to have an area wide NO_2 monitor. The NO_Y monitor at the NCore site does not satisfy this requirement. EGLE planned to install a 'true NO_2' for

PAMS, which would meet both the population requirement and the PAMS requirement. However, since the USEPA funding for the PAMS direct NO_2 has been delayed, EGLE installed in 2019 a traditional NO_X analyzer at Jenison (261390005). EGLE will shut down the NO_X monitor at Jenison once PAMS funding is available for the direct NO_2 sampler at Grand Rapids. EGLE will also operate NO_Y monitors which are required for the PAMS.

Figure 13 shows the NO_2 emission points for Kent and Ottawa Counties, as well as the location of the Grand Rapids-Monroe Street site.

Figure 13: NO_2 Emission in Kent and Ottawa Counties



NO_2 Monitoring for GHIB Study

In 2018, to monitor NO_2 before, during, and after construction of the Gordie Howe International Bridge, EGLE added three new sites; DP4th (261630098), Trinity (261630099) and Military Park (261630100), in addition to the existing Detroit-SWHS (2616300015).

NO_2 Monitoring for NSR

Recent modeling projects for NSR (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, EGLE 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, EGLE 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 2019 and 2020. **Figure 14** shows the NO_2 and NO_Y monitoring network operated by EGLE in 2019 and 2020.

NO_2 and NO_Y Quality Assurance

The AMU site operator performs a 1-point quality assurance check of the analyzer every two weeks. The 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 at several concentrations using a certified gas standard. 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 USEPA'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 USEPA conducts thru-the-probe audits at 20 percent 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 USEPA is not conducting thru-the-probe audits for the NO_Y monitors.

Plans for the 2020 NO_2 and NO_Y Monitoring Network

During 2020, contingent upon adequate levels of funding, EGLE is planning to operate NO_2 and or NO_Y:

- Lansing (260650018);
- Houghton Lake (261130001);
- Jenison (261390005)
- Detroit-E 7 Mile (261630019);
- Eliza Howell Near-road site (261630093);
- Livonia Near-road (261630095).
- SWHS (261630015)
- DP4 (261630098)
- Trinity (261630099)
- Military (261630100)

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

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

Table 22: Michigan's NO_2 and NO_Y Monitoring Network

Operating Schedule: Continuous

Method: Chemiluminescense, Method Code 074 (NOx) and Method Code 075 (NO_y)

NCore Sites

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose/ Type	Parameter Code	POC	Scale	County	Start Date	CBSA [1]	Pop (2017 Estimate)
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.984167	-85.671389	NOy	pop exp	42612	1	nghbrhd	Kent	1/1/08	GW	1,059,113
Allen Park	261630001	14700 Goddard	42.228611	-83.208333	NOy	pop exp	42612	1	nghbrhd	Wayne	1/1/08	DWL	4,313,002

Tier 1: Near Roadway Sites

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose/ Type	Parameter Code	POC	Scale	County	Start Date	CBSA [1]	Pop (2017 Estimate)
Eliza Howell	261630093	Service Road I-96 & Telegraph	42.38599	-83.26632	NO2	Near Road	42602	1	micro	Wayne	9/1/11	DWL	4,313,002
Livonia Near Road	261630095	18790 Haggerty Raod	42.421494	-83.425168	NO2	Near Road	42602	1	micro	Wayne	1/1/15	DWL	4,313,002

Tier 2: Community Sites

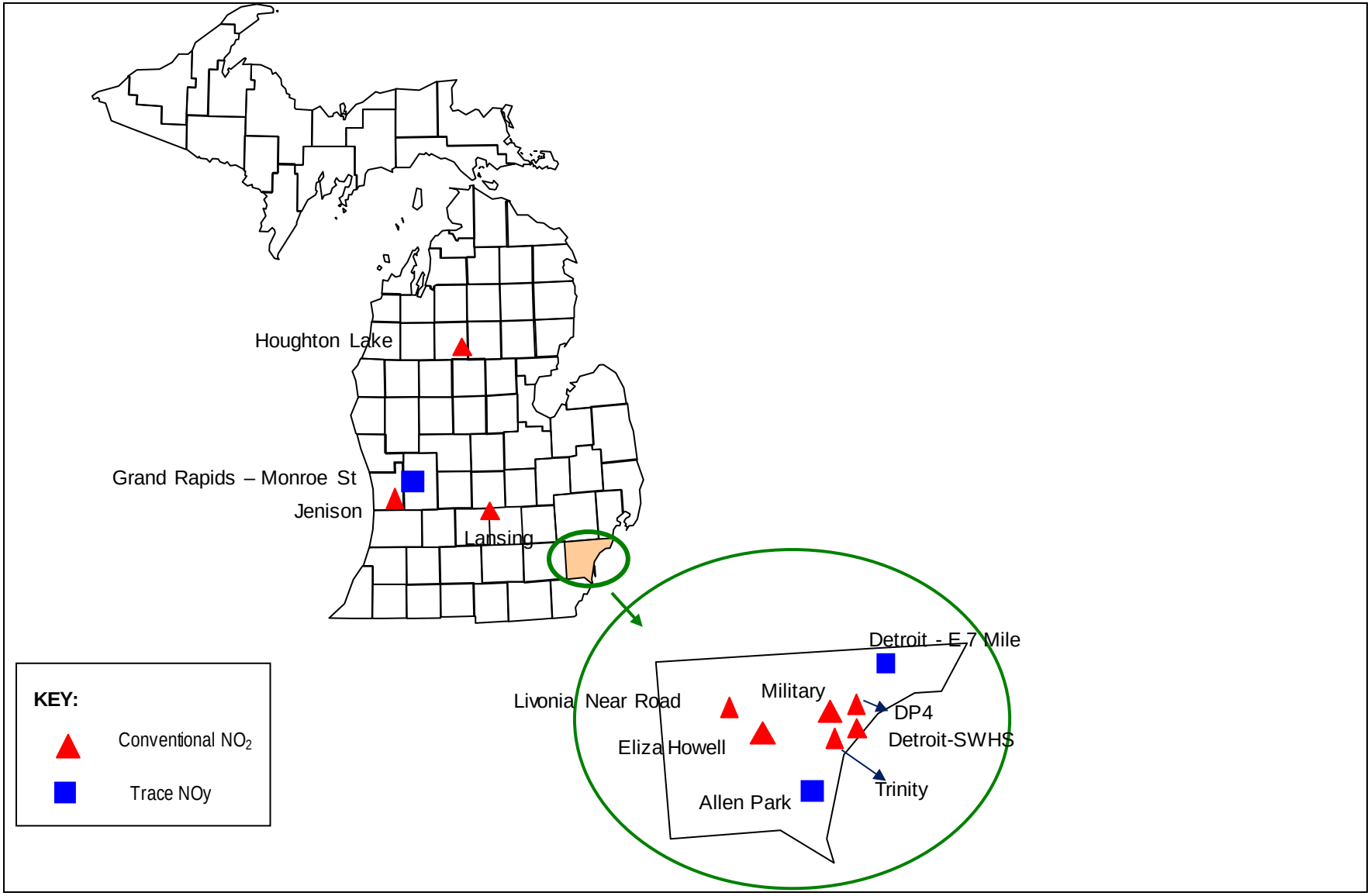
Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose/ Type	Parameter Code	POC	Scale	County	Start Date	CBSA [1]	Pop (2017 Estimate)
Lansing	260650012	220 N Pennsylvania	42.738611	-84.534722	NO2	pop exp	42602	1	nghbrhd	Ingham	9/5/80	LEL	472,276
Houghton Lake	261130001	1769 S Jeffs Road	44.310556	-84.891944	NO2	background	42602	1	regional	Missaukee	4/1/98	Not in CBSA	N/A
Jenison	261390005	6981 28th Ave	42.894444	-85.852778	NO2	pop exp	42602	1	nghbrhd	Ottaw a	1/8/19	GW	1,059,113
Detroit-SWHS	261630015	150 Waterman	42.302778	-83.106667	NO2	SPM	42602	1	nghbrhd	Wayne	6/11/18	DWL	4,313,002
Detroit - E 7 Mile	261630019	11600 East Seven Mile Road	42.430833	-83.000278	NOY	pop exp	42602	1	urban	Wayne	12/1/90	DWL	4,313,002
DP4th	261630098	4700 W Fort St	42.312158	-83.091943	NO2	SPM	42602	1	nghbrhd	Wayne	7/17/18	DWL	4,313,002
Trinity	261630099	9191 W Fort St	42.295824	-83.129431	NO2	SPM	42602	1	nghbrhd	Wayne	10/17/18	DWL	4,313,002
Military	261630100	1238 Military St	42.312078	-83.103469	NO2	SPM	42602	1	nghbrhd	Wayne	11/1/18	DWL	4,313,002

PAMS

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose/ Type	Parameter Code	POC	Scale	County	Start Date	CBSA [1]	Pop (2017 Estimate)
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.984167	-85.671389	NO2	pop exp	42602	1	nghbrhd	Kent	1/1/20	GW	1,059,113
Detroit - E 7 Mile	261630019	11600 East Seven Mile Road	42.430833	-83.000278	NO2	pop exp	42602	1	urban	Wayne	1/1/20	DWL	4,313,002

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

Figure 14: Michigan's NO_2 and NO_Y Monitoring Network



SULFUR DIOXIDE (SO_2) MONITORING NETWORK

On June 2, 2010, the USEPA made the SO_2 NAAQS more stringent by revoking the 24-hour and annual average standards and creating an hourly standard that cannot exceed 75 ppb. The form of the standard is the 99th percentile averaged over three years. The secondary standard has not been changed.[12]

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

(CBSA population)[13]* (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 than 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 USEPA 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 2014 version of the National Emissions Inventory data.

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

Table 24: Population Weighted Emissions Index Totals for CBSAs in Michigan

MSA	Counties	2014 NEI Download: Total County SO_2 Emissions, tpy	2014 NEI SO_2 Total Emissions, tpy	2010 Population	2014/2010 NEI PWEI	Monitors Required 2008 EI & 2010 Census
Detroit-Warren-Livonia Metro Area	Macomb	1,640.40	148,810	4,296,250	639,325	2
	Oakland	1,785.67				
	Wayne	53,783.79				
	Lapeer	339.64				
	St Clair	91,003.09				
	Livingston	257.45				
Flint Metro Area	Genesee	736.16	736	425,790	313	0
Monroe Metro Area	Monroe	17,728.75	17,729	152,021	2,695	0
Ann Arbor Metro Area	Washtenaw	596.75	597	344,791	206	0
Grand Rapids-Wyoming Metro Area	Kent	1,650.61	1,991	774,160	1,542	0
	Barry	152.05				
	Newaygo	79.70				
	Ionia	108.91				
Holland-Grand Haven Metro Area	Ottawa	40,353.25	40,353	263,801	10,645	1
Muskegon-Norton Shores Metro Area	Muskegon	12,313.94	12,314	172,188	2,120	0
Lansing-East Lansing Metro Area	Clinton	238.56	11,729	464,036	5,442	1
	Ingham	5,069.91				
	Eaton	6,420.12				
Bay City Metro Area	Bay	15,356.59	15,357	107,771	1,655	0
Saginaw-Saginaw Twp N Metro Area	Saginaw	500.99	501	200,169	100	0
Kalamazoo-Portage Metro Area	Kalamazoo	1,397.61	1,533	326,589	500	0
	Van Buren	134.89				
Niles-Benton Harbor Metro Area	Berrien	349.72	350	156,813	55	0
Jackson Metro Area	Jackson	444.89	445	160,248	71	0
Battle Creek Metro Area	Calhoun	388.72	389	136,146	53	0
South Bend Mishawaka Metro Area IN/MI	Cass	76.76	77	52,293	4	0

Based on the 2014 emissions data and 2010 population estimates, the Detroit-Warren-Livonia CBSA needs two SO_2 monitoring sites, while the Holland-Grand Haven Metropolitan Area and Lansing-East Lansing 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. EGLE also monitors at Detroit–SWHS (261630015) and Port Huron (261470005).

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

EGLE deployed SO_2 monitors in the Holland-Grand Haven Metropolitan Area at the West Olive site (261390011) in Ottawa County, on January 1, 2015, and in the Lansing-East Lansing Metropolitan Area at the Lansing site (260650012) in Ingham County, on January 1, 2012.

In 2019, SO_2 monitors were added to the three new GHIB sites; DP4 (261630098), Trinity (261630099), and Military Park (261630100).

Table 25 summarizes the SO_2 monitoring site information for 2019 and 2020. **Figure 16** shows the geographical distribution of SO_2 sites across Michigan.

SO_2 Monitoring and Modeling Requirements

With the revision to the SO_2 NAAQS in 2010, federal regulations also changed for both monitoring and modeling SO_2 emissions. The USEPA established a three-tiered process for assessing the attainment status of the ambient air near large sources emitting SO_2. States were first required to establish monitoring stations in areas with high population levels and high emission levels. Existing monitors in Detroit and Lansing, and new monitors in West Olive and Monroe met this obligation for assessment. Of these four areas, a portion of Wayne County was found to have levels of SO_2 exceeding the health-based standard. This area was designated by the USEPA as nonattainment. EGLE completed an attainment plan that included rulemaking, which would bring the area into compliance with the NAAQS. EGLE was sued by an affected company, lost the lawsuit, and now the USEPA has developed a Federal Implementation Plan for the nonattainment area.

The second tier requires States to conduct either monitoring or modeling for sources emitting over 16,000 tons per year. EGLE identified six areas meeting this criterion. Modeling has been completed for sources in St. Clair, Eaton, Ingham, Marquette, Ottawa, Bay, and Monroe Counties. The USEPA reviewed the modeling designated a small portion of St. Clair County as nonattainment in September 2016. The other areas were designated attainment/unclassifiable in September 2016. Control strategies will be developed for the sources in St. Clair County and the attainment plan will be incorporated into the Michigan State Implementation Plan (SIP). DTE Energy has informed EGLE that it will be installing two SO_2 special purpose monitoring stations in St. Clair County to provide additional SO_2 and meteorological data to aid future SIP development. These monitors are not part of a Data Requirements Rule network.

The third tier involves modeling of SO_2 source emissions greater than 2,000 tons per year. This modeling project involved two sources in Delta County and Alpena County, and was submitted to the USEPA on January 11, 2017. The modeling demonstrated that the two sources did not have an impact on the NAAQS. The USEPA designated the two counties as attainment/unclassifiable on April 9, 2018.

The necessity of taking a combination monitoring/modeling approach to assessment for SO_2 was borne out of the fact that monitoring could not cover every wind scenario at each large emission source nationwide and States could not bear the large associated expenses of establishing enough new monitoring sites to adequately characterize the SO_2 pollutant levels in ambient air. Assessment is enhanced with additional modeling, a less expensive methodology, which helps to inform planners about the degree of the problem to solve and also the effectiveness of different proposed control measures. EGLE continues to identify strategies to reduce SO_2 pollutant levels through collaboration with Michigan industry, as well as local and federal partners.

SO_2 Quality Assurance

The AMU site operator performs a 1-point quality assurance check of the analyzer every two weeks. The 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 a dedicated gas calibrator and calibration gases that are only for audits. The independent audit challenges the accuracy of the station monitor at several concentrations using a certified gas standard. The auditor also assesses the monitoring system (inspecting the sample line, filters, and inlet probe), siting, and documentation of precision checks. Results of the checks and audits indicate whether the monitor is meeting the measurement quality objectives. The AMU uploads 1-point checks and audit results to the USEPA's AQS database each quarter. The QA Coordinator reviews all audit results, and hard copies are retained in the QA files.

The USEPA conducts thru-the-probe audits on 20 percent 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 USEPA reports the audit results to AQS.

Plans for the 2020 SO_2 Monitoring Network

During 2020, contingent upon adequate levels of funding, EGLE is planning to continue to operate SO_2 monitors at:

- Lansing (260650018)
- Grand Rapids–Monroe St. (260810020) (NCore trace SO_2)
- Sterling State Park (261150006)
- West Olive (261390011)
- Port Huron (261470005)
- Allen Park (261630001) (NCore trace SO_2)
- Detroit-SWHS (261630015)
- NMH 48217 (261630097)
- DP4 (261630098)
- Trinity (261630099)
- Military Park (2161630100)

Table 25: Michigan's SO_2 Monitoring Network

Operating Schedule: Continuous

Method: Ultra Violet Stimulated Fluorescence; Method Code 060 (SO_2) and Method Code 600 (Trace SO_2)

NCore Sites , Trace

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose/ Type	Parmeter Code	POC	Scale	County	Start Date	MSA [1]	Pop (2017 Estimated)
Grand Rapids - Monroe St.	260810020	1179 Monroe NW	42.9842	-85.671389	trace	pop exp	42401	2	nghbrhd	Kent	1/1/08	GW	1,059,113
Allen Park	261630001	14700 Goddard	42.2286	-83.208333	trace	pop exp	42401	1	nghbrhd	Wayne	1/1/08	DWL	4,313,002

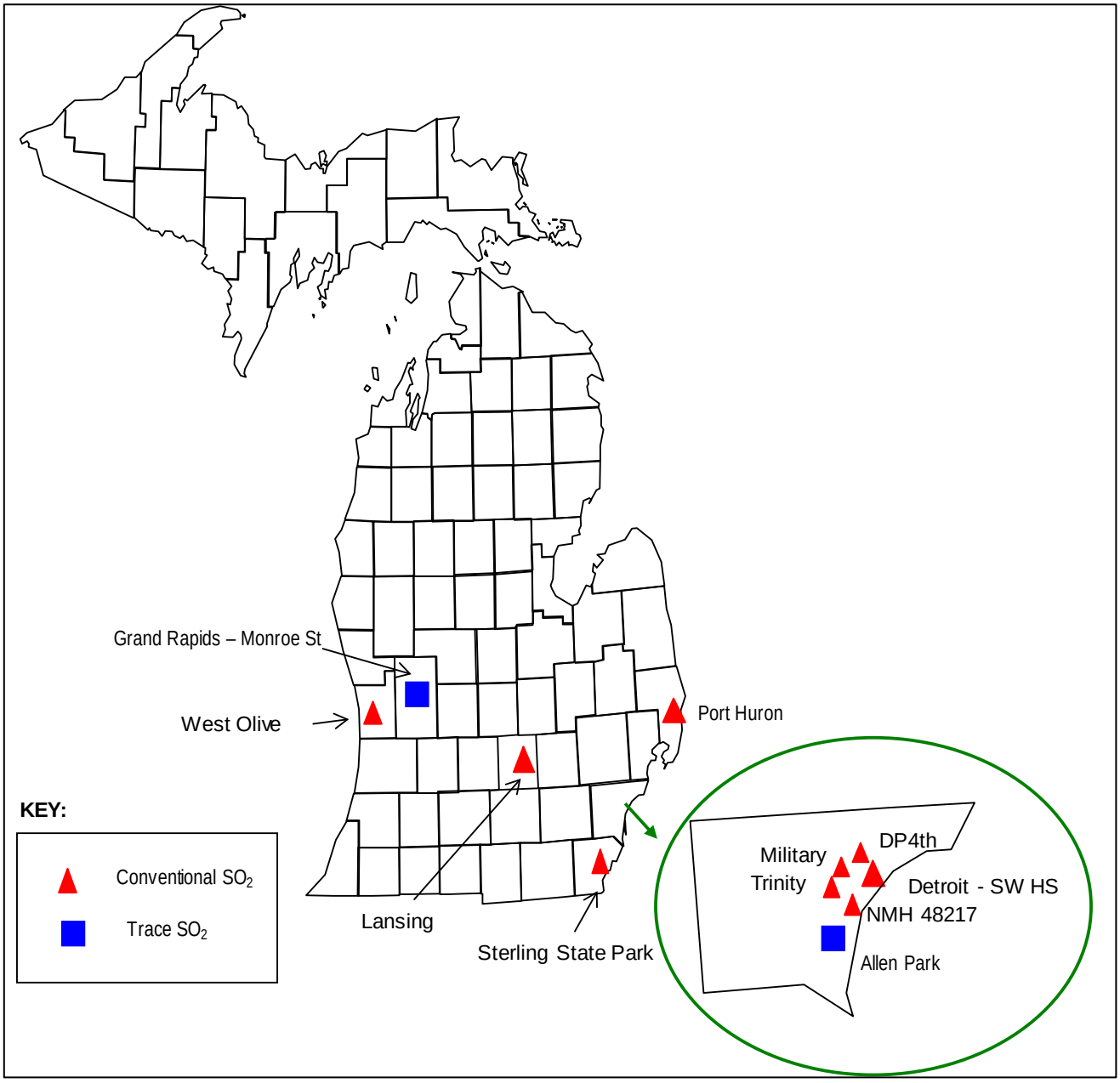
Source-Oriented Sites

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose/ Type	Parmeter Code	POC	Scale	County	Start Date	MSA [1]	Pop (2017 Estimated)
Lansing	260650012	220 N Pennsylvania	42.7386	-84.534722	SO2	Max Conc	42401	1	nghbrhd	Ingham	1/1/12	LEL	472,276
Sterling State Park	261150006	2800 State Park Rd	41.9236	-83.345858	SO2	Max Conc	42401	1	nghbrhd	Monroe	1/1/13	Monroe	149,649
West Olive	261390011	8578 Hiawatha Dr	42.9236	-86.196519	SO2	Max Conc	42401	1	nghbrhd	Ottawa	1/1/15	GW	1,059,113
Port Huron	261470005	2525 Dove Rd	42.9533	-82.456389	SO2	Max Conc	42401	1	urban	Saint Clair	2/28/81*	DWL	4,313,002
Detroit - SW HS	261630015	150 Waterman	42.3028	-83.106667	SO2	Max Conc	42401	1	nghbrhd	Wayne	1/1/71	DWL	4,313,002
DP4th	261630098	4700 W Fort St	42.3122	-83.091943	SO2	Max Conc	42401	1	SPM	Wayne	8/3/18	DWL	4,313,002
Trinity	261630099	9191 W Fort St	42.2958	-83.129431	SO2	Max Conc	42401	1	SPM	Wayne	10/23/18	DWL	4,313,002
Military	261630100	1238 Military St	42.3121	-83.103469	SO2	Max Conc	42401	1	SPM	Wayne	11/2/18	DWL	4,313,002

[1] **MSA Key:** DWL = Detroit-Warren-Livonia MSA
GW = Grand Rapids-Wyoming MSA
LEL = Lansing-East Lansing MSA

* Monitor shutdown in 2007 restarted in January 2012

Figure 15: Michigan's SO_2 Monitoring Network



TRACE METAL MONITORING NETWORK

Since 1981, monitoring for trace metals as TSP (Total Suspended Particles) has been conducted as part of the Michigan Toxics Air Monitoring Program (MITAMP). Over the years, the program gradually expanded to eight sites that collected TSP samples on a once every six or 12-day schedule. Sample collection follows the schedule developed by the USEPA. The TSP filters are analyzed by a laboratory for lead, manganese, arsenic, cadmium, and nickel. Further discussion of lead is detailed in another chapter. The Dearborn (261630033) NATTS site measures a larger list of metals in both the PM_{10} and TSP size fractions. The list of metals includes lead, beryllium, vanadium, chromium, manganese, nickel, cobalt, copper, zinc, arsenic, molybdenum, cadmium, barium, and iron.

In 2020, the following sites will measure TSP lead, manganese, arsenic, cadmium, and nickel:

- Belding-Merrick St. (260670003)
- Port Huron (261470031)
- Detroit-SWHS (261630015)
- S. Delray-Jefferson (261630027)
- Dearborn (261630033) NATTS -13 metals list
- NMH 48217 (261630097)
- DP4 (261630098)
- Trinity (261630099)
- Military Park (261630100)

Table 26 summarizes the trace metals monitoring site information for 2020. **Figure 16** shows the geographical distribution of trace metal sites across Michigan.

Table 26: Michigan's Trace Metal Monitoring Network

Operating Schedule: Continuous

Method: Ultra Violet Stimulated Fluorescence; Method Code 060 (SO_2) and Method Code 600 (Trace SO_2)

NCore Sites, Trace

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose/ Type	Parmeter Code	POC	Scale	County	Start Date	MSA [1]	Pop (2015 Estimated)
Grand Rapids - Monroe St.	260810020	1179 Monroe NW	42.9842	-85.671389	trace	pop exp	42401	2	nghbrhd	Kent	1/1/08	GW	1,038,583
Allen Park	261630001	14700 Goddard	42.2286	-83.208333	trace	pop exp	42401	1	nghbrhd	Wayne	1/1/08	DWL	4,313,002

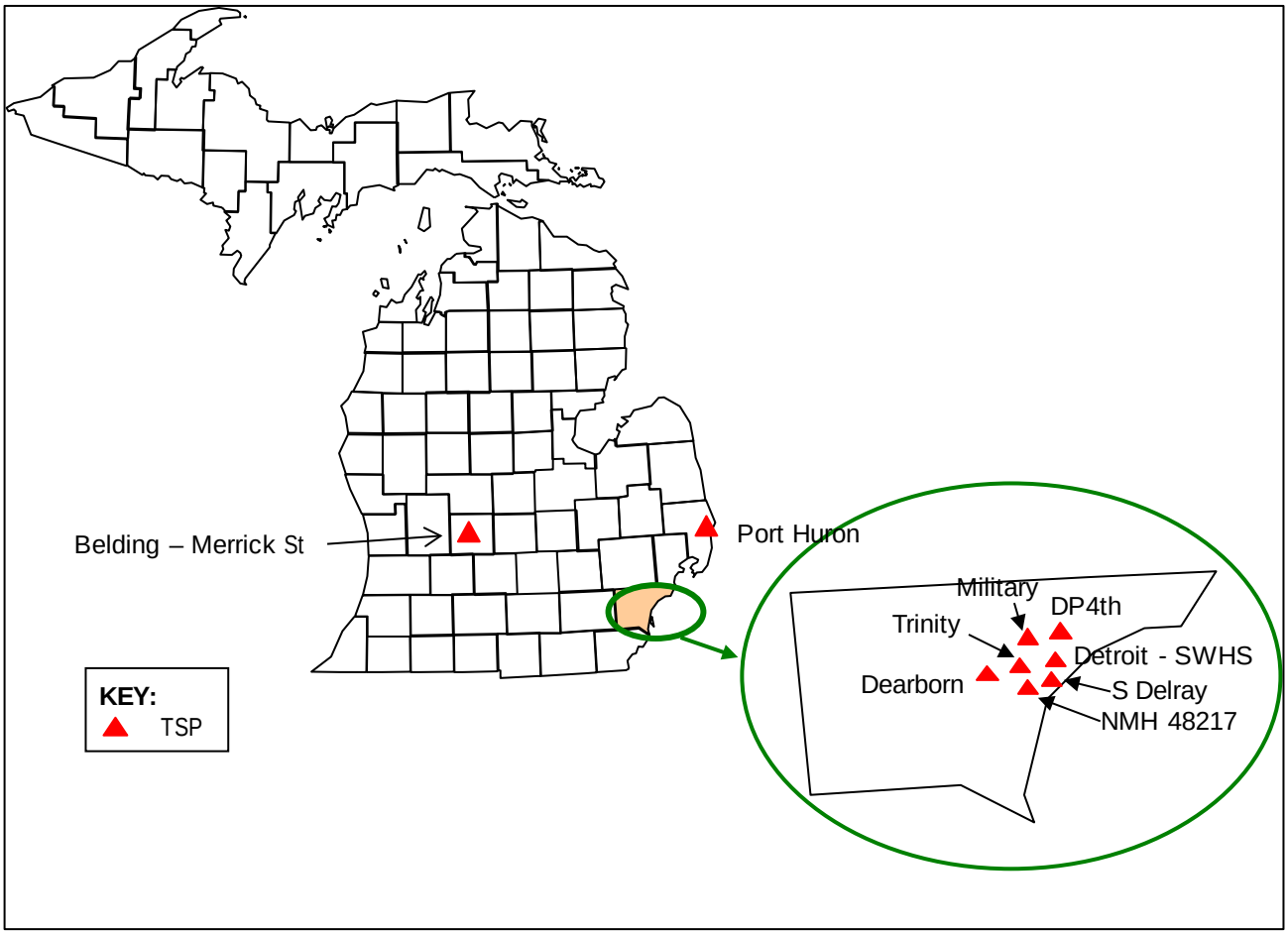
Source-Oriented and Community Sites

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose/ Type	Parmeter Code	POC	Scale	County	Start Date	MSA [1]	Pop (2015 Estimated)
Lansing	260650012	220 N Pennsylvania	42.7386	-84.534722	SO2	Max Conc	42401	1	nghbrhd	Ingham	1/1/12	LEL	472,276
Port Huron	261470005	2525 Dove Rd	42.9533	-82.456389	SO2	Max Conc	42401	1	urban	Saint Clair	2/28/81*	DWL	4,313,002
Detroit - SW HS	261630015	150 Waterman	42.3028	-83.106667	SO2	Max Conc	42401	1	nghbrhd	Wayne	1/1/71	DWL	4,313,002
DP4th	261630098	4700 W Fort St	42.3122	-83.091943	SO2	Max Conc	42401	1	SPM	Wayne	8/3/18	DWL	4,313,002
Trinity	261630099	9191 W Fort St	42.2958	-83.129431	SO2	Max Conc	42401	1	SPM	Wayne	10/23/18	DWL	4,313,002
Military	261630100	1238 Military	42.3121	-83.103469	SO2	Max Conc	42401	1	SPM	Wayne	11/2/18	DWL	4,313,002

[1] **MSA Key:** DWL = Detroit-Warren-Livonia MSA
GW = Grand Rapids-Wyoming MSA
LEL = Lansing-East Lansing MSA
Monroe = Monroe MSA

* Monitor shutdown in 2007 restarted in January 2012

Figure 16: Michigan's Trace Metal Monitoring Network



Trace Metal Quality Assurance

The site operator conducts a flow rate verification 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.

EGLE 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. EGLE 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.

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

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VOLATILE ORGANIC COMPOUND (VOC) MONITORING NETWORK

The collection and analysis of more than 50 VOC compounds per sample began at various sites in 1990 as part of the MITAMP. Either a once every six-day or once every 12-day sampling frequency has been used depending on the site and budget status. The VOC network follows the sampling calendar published by the USEPA. The Detroit-SWHS (261630015) site in Detroit has been the trend site and has collected VOC samples every year since 1993. The determination of VOC samples on a once every six-day sampling frequency using Method TO-15 is required for the NATTS site at Dearborn (261630033). A minimum of six precision (duplicate) samples per year are also collected at Dearborn (261630033) as part of the NATTS program.

Table 27 summarizes the VOC monitoring site information. **Figure 17** 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 USEPA 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 EGLE laboratory also participates in regional performance test programs. 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. The EGLE laboratory also participates in regional round robin samples.

Plans for the 2020 VOC Monitoring Network

During 2020, contingent upon adequate levels of funding, EGLE plans to continue collecting VOCs at:

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

Table 27: Michigan's VOC Monitoring Network

Operating Schedule: 1:6 and 1:12, Follows EPA Published Schedule
Method: Stainless Steel Pressurized Canister Sampler; Gas Chromatograph/ Mass Spectrometer (24-hr samples); Method Code 110

Monitoring Sites												
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose/ Type	POC	Scale	County	Date Estab.	MSA [1]	Pop (2015 Estimated)
Detroit - SWHS	261630015	150 Waterman	42.302778	-83.106667	1:12	pop exp	1	nghbrhd	Wayne	2/26/99	DWL	4,313,002
Dearborn	261630033	2842 Wyoming	42.306666	-83.148889	1:6	max conc	1	nghbrhd	Wayne	6/1/90	DWL	4,313,002

[1] **MSA Key:** DWL= Detroit-Warren-Livonia MSA

Figure 17: 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 carbonyl network follows the sampling calendar published by the USEPA. The Detroit-SWHS (261630015) 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 EGLE'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.

Carbonyl sampling is also a requirement of the PAMS (photochemical assessment monitoring station) network which is anticipated to be operational in 2020. The PAMS section of this document provides more details.

Table 28 summarizes the carbonyl monitoring site information for sites that were in existence in 2018 and will be added in 2019. **Figure 18** 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 USEPA 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 2020 Carbonyl Monitoring Network

During 2020, contingent upon adequate levels of funding, Michigan plans to continue collecting carbonyls at:

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

Table 28: Michigan's Carbonyl Monitoring Network

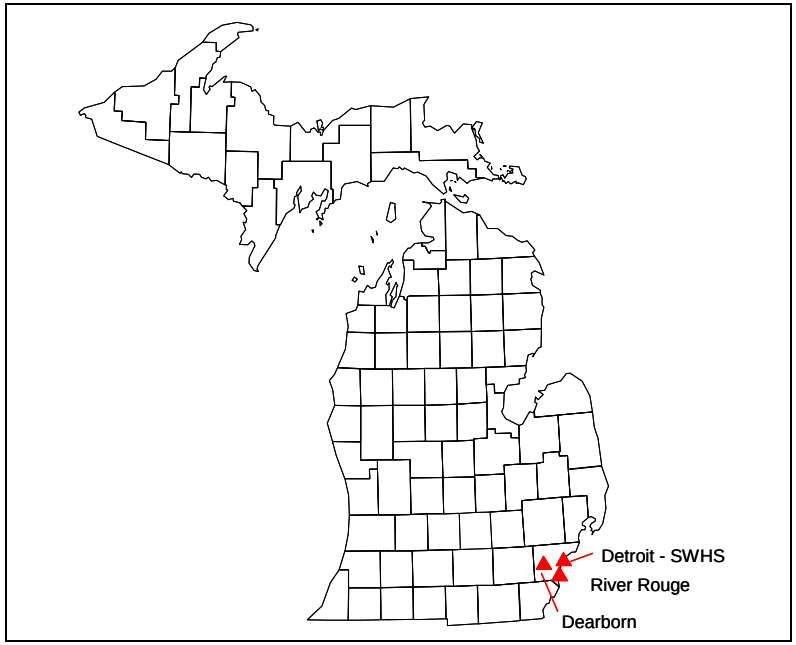
Operating Schedule: 1:6 and 1:12, Follows EPA published schedule

Method: 2,4 dinitrophenyl hydrazine treated silica gel cartridges; HPLC with ultraviolet absorption; Method Code 202

Monitoring Sites												
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose/ Type	POC	Scale	County	Date Estab.	MSA [1]	Pop (2015 Estimated)
Dearborn	261630033	2842 Wyoming	42.306666	-83.148889	1:6	max conc	1	nghbrhd	Wayne	6/1/90	DWL	4,313,002
River Rouge	261630005	315 Genesee	42.267222	-83.132222	1:12	max conc	1	nghbrhd	Wayne	1/1/94	DWL	4,313,002
Detroit - SWHS	261630015	150 Waterman	42.302778	-83.106667	1:12	pop exp	2	nghbrhd	Wayne	2/26/99	DWL	4,313,002

[1] **MSA Key:** DWL= Detroit-Warren-Livonia MSA

Figure 18: Michigan's Carbonyl Monitoring Network



POLYNUCLEAR AROMATIC HYDROCARBONS (PAHs) MONITORING NETWORK

As part of the USEPA'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 PAH network follows the sampling calendar published by the USEPA. 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 USEPA's co-location criteria.

The sample 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 USEPA method TO-13A.

Table 29 shows the site information for PAH sites that will be in operation in 2020 **Figure 19** shows the locations of the PAH monitoring sites.

PAH Quality Assurance

The site operator conducts a flow rate verification 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 2020 PAHs Monitoring Network

During 2020, contingent upon adequate levels of funding, Michigan plans to continue collecting PAHs at:

- Dearborn (261630033) – once every six days and precision once every two months.

Table 29: Michigan's PAHs Monitoring Network

Operating Schedule: 1:6 , Follows EPA published schedule

Method: Polyurethane foam plugs and XAD-2 resin with gas chromatography mass spectrometry; Method Code 202

Monitoring Sites														
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Parameter Code	POC	Purpose/ Type	POC	Scale	County	Date Estab.	MSA [1]	Pop (2015 Estimated)
Dearborn	261630033	2842 Wyoming	42.30667	-83.1489	1:6	various	1	max conc	1	nghbrhd	Wayne	6/1/90	DWL	4,313,002

[1] **MSA Key:** DWL= Detroit-Warren-Livonia MSA

Figure 19: Michigan's PAHs Monitoring Network

PAMS NETWORK

EGLE has not operated a Photochemical Assessment Monitoring Station (PAMS) site since before 2001. However, the recently revised monitoring rule (80 FR 65292; October 26, 2015) requires PAMS measurements June 1 through August 31 at NCore sites that are located in CBSAs with populations of one million or more. As long as federal funding is made available for Michigan to fully fund two PAMS sites, EGLE will implement the following changes to its network starting June 2020-2021.

Network Decision

EGLE has two NCore sites located at Allen Park (261630001) and Grand Rapids-Monroe St. (260810020). The Grand Rapids-Monroe St. (260810020) will serve as one of the locations and the second Detroit PAMS site will be operated at E 7 Mile (261630019) due to its higher ozone design values. This alternate site for the Detroit area PAMS station was approved by the USEPA in October 2018. The required PAMS sites will measure the parameters described below. Due to federal issues for funding, the purchasing process has been delayed. Equipment likely to be installed at the sites will be; ceilometers for determining mixing height, Auto-GCs for VOCs, true NO_2 using a direct reading NO_2 analyzer, and three 8-hour samples for carbonyls every three days. National purchasing contract will be used to obtain as much of the instrumentation as possible.

Auto GC Decision

A complete list of the targeted compounds is presented in **Table 30.**

EGLE intends to participate in the national contract purchasing program to obtain the CAS auto-gas chromatograph (GC) system for the hourly speciated VOC measurements.

Meteorology Measurements Decision

EGLE will measure wind direction, wind speed, temperature, humidity, atmospheric pressure, precipitation, solar radiation, ultraviolet radiation, and mixing height using Ceilometer. EGLE intends to participate in the national contract purchasing program to obtain the Ceilometer instruments.

Other Required Measurements

Carbonyl sampling at a frequency of three 8-hour samples on a one-in-three-day basis (90 samples per PAMS sampling season). EGLE intends to use the national contract laboratory for the analysis of the PAMS carbonyl samples. A complete list of the target carbonyl compounds may be found in **Table 30**. The TO-11A test method, as used in the National Air Toxics Trends (NATTS) program will be used.

EGLE will monitor for NO and NO_Y (total oxides of nitrogen) in addition to true NO_2. EGLE intends to participate in the national purchasing contract for the true NO_2 analyzers.

Table 30: PAMS Target Compound List

Priority Compounds				Optional Compounds			
1	1,2,3-trimethylbenzene [a]	19	n-hexane [b]	1	1,3,5-trimethylbenzene	19	m-diethlybenzene
2	1,2,4-trimethylbenzene [a]	20	n-pentane	2	1-pentene	20	methylcyclohexane
3	1-butene	21	o-ethyltoluene [a]	3	2,2-dimethylbutane	21	methylcyclopentane
4	2,2,4-trimethylpentane [b]	22	o-xylene [a,b]	4	2,3,4-trimethylpentane	22	n-decane
5	acetaldehyde [b,c]	23	p-ethyltoluene [a]	5	2,3-dimethylbutane	23	n-heptane
6	acetone [c,d]	24	Propane	6	2,3-dimethylpentane	24	n-nonane
7	benzene [a,b]	25	propylene	7	2,4-dimethylpentane	25	n-octane
8	c-2-butene	26	styrene [a,b]	8	2-methylheptane	26	n-propylbenzene [a]
9	ethane [d]	27	toluene [a,b]	9	2-methylhexane	27	n-undecane
10	ethylbenzene [a,b]	28	t-2-butene	10	2-methylpentane	28	p-diethylbenzene
11	Ethylene			11	3-methylheptane	29	t-2-pentene
12	formaldehyde [b,c]			12	3-methylhexane	30	α/β-pinene
13	Isobutane			13	3-methylpentane	31	1,3 butadiene [b]
14	Isopentane			14	Acetylene	32	benzaldehyde [c]
15	Isoprene			15	c-2-pentene	33	carbon tetrachloride [b]
16	m&p-xylenes [a,b]			16	cyclohexane	34	Ethanol
17	m-ethyltoluene [a]			17	cyclopentane	35	Tetrachloroethylene [b]
18	n-butane			18	isopropylbenzene [b]		

Source: Revisions to the Photochemical Assessment Monitoring Stations Compound Target List. USEPA, November 20, 2013

[a] Important SOAP (Secondary Organic Aerosols Precursor) Compounds
[b] HAP (Hazardous Air Pollutant) Compounds
[c] Carbonyl compounds
[d] Non-reactive compounds, not considered to be VOC for regulatory purposes

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 31**. EGLE 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 2020 Meteorological Monitoring Network

During 2020, 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)
- Lansing (260650018)
- Kalamazoo (260770008)
- Grand Rapids–Monroe St. (260810020)
- Evans (280810022)
- Tecumseh (260910007)
- New Haven (260990009)
- Sterling Heights/Freedom Hill (260990021)
- Manistee (261010922)- Tribal
- Scottville (261050007)
- Houghton Lake (261130001)
- Muskegon–Green Creek Rd. (261210039)
- Oak Park (261250001)
- Pontiac (261250011)

- Rochester (261250012)
- Jenison (261390005)
- Port Huron (261470005)
- Seney (261530001)
- Ypsilanti (261610008)
- Allen Park (261630001)
- River Rouge (261630005)
- Detroit–SWHS (261630015)
- Detroit–E 7 Mile (261630019)
- Livonia Near Road (261630095)
- Detroit–Joy Rd. (261630026)
- Dearborn (261630033)
- Eliza Howell (261630093)
- Trinity (261630099)

Table 31: Meteorological Measurements in Michigan

Site Name	AQS ID	WS 61103	WD 61104	Temperature 62101	Relative Humidity 62201	Barometric Pressure 64101	Solar Radiation 63301	Sigma Theta 61106
Holland	260050003	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
Flint	260490021	x	x	x		x		x
Otisville	260492001	x	x	x		x		x
Harbor Beach	260630007	x	x	x				x
Lansing	260650012	x	x	x		x		x
Belding-Merrick St.	260670003	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 (Tribal)	261010922	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
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 Mile	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
Eliza Howell Near Road	261630093	x	x	x				x
Trinity	261630099	x	x	x				x
	Total	**37**	**37**	**37**	**8**	**18**	**2**	**37**

All Parameters at all sites use POC 1, expect River Rouge WS and WD w hich is POC 2

SPECIAL PURPOSE MONITORS

EGLE is currently working on three special projects.

Near-roadway:

EGLE received a Community Scale Air Toxics Ambient Monitoring (CSATAM) grant in 2015 to evaluate the air toxics in the near-road environment. The study was conducted at three sites in Detroit: Eliza Howell Near-road (261630093), Eliza Howell Downwind (261630094), and Livonia Near-road (261630095). The grant involved a minimum of two years of monitoring at these sites, with a three-month intensive study where additional samples and increased sampling frequency were conducted. The intensive study was completed in July 2017. The monitoring portion of this study has concluded in 2017 and the final data report is expected in summer 2019.

The USEPA has approved funding for the required near-road monitoring station in the Grand Rapids area. This site is required since Grand Rapid CBSA hit the one-million population threshold. EGLE is exploring locations for this new site and plans to start monitoring in 2021 pending appropriate funding. The required parameters are: CO, NO_X, $PM_{2.5,}$ and meteorological parameters.

48217 Community Study:

A special purpose monitoring project resulted from community requests for ambient air monitoring in the SW Detroit 48217 ZIP code. The 48217 community has many industrial sources located in and around the ZIP code. EGLE established the NMH 48217 (261630097) site, located at New Mount Herman (NMH) Church at 3225 South Deacon St. in Detroit. In a collaborative effort with the community, a one-year study was conducted from September 2016-September 2017 for a variety of pollutants. A final report was published in May 2018 and is available on the EGLE website. The site now monitors for $SO_{2,}$ continuous $PM_{2.5,}$ and TSP metals including lead.

GHIB Study:

In a joint Canadian-American venture, the Gordie Howe International Bridge will be built linking Windsor, Ontario and Detroit, Michigan. Demolition, construction, and vehicular traffic using the bridge all have the potential to cause an increase in the level of air pollution in nearby communities. EGLE established three new air monitoring sites in SW Detroit and placed additional monitors in the existing Fort St. (SWHS) (261630015) site. The new sites are Detroit Police 4th Precinct or DP4th (261630098), Trinity (261630099), and Military Park (261630100). The three new sites are measuring NOx, $SO_{2,}$ CO, continuous $PM_{2.5}$, black carbon, and 5-trace metals including lead. There is no CO monitor at the Military Park (26163100) site. NOx, continuous $PM_{2.5}$, and black carbon were added to the Fort St. (SWHS) (261630015) site. The new sites and additional parameters at the SWHS site became operational in the summer and fall of 2018. **Table 32** identifies the instruments that were deployed for the project.

Table 32: Instruments and Sites Added for the Gordie Howe International Bridge Study

Site	Instrument	Sampling Frequency
SWHS (261630015)	MET	Hourly
	SO_2	Hourly
	NOx	Hourly
	TSP-Pb	24-hr every 6 day
	$PM_{2.5}$-BAM	Hourly
	Black Carbon-Aethalometer	Hourly
DP4th (261630098)	SO_2	Hourly
	CO	Hourly
	NOx	Hourly
	TSP-Pb	24-hr every 6 day
	$PM_{2.5}$-BAM	Hourly
	Black Carbon-Aethalometer	Hourly
Trinity (261630099)	MET	Hourly
	SO_2	Hourly
	CO	Hourly
	NOx	Hourly
	TSP-Pb	24-hr every 6 day
	$PM_{2.5}$-BAM	Hourly
	Black Carbon-Aethalometer	Hourly
Military (261630100)	SO_2	Hourly
	NOx	Hourly
	TSP-Pb	24-hr every 6 day
	$PM_{2.5}$-BAM	Hourly
	Black Carbon-Aethalometer	Hourly

ADEQUACY OF MICHIGAN'S MONITORING SITES

The suitability of monitoring site locations is frequently assessed by the AMU's QA Team and the USEPA. The USEPA assesses the adequacy of the stations during $PM_{2.5}$ PEP audits, gaseous NPAP audits, and technical 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 EGLE and USEPA auditors. If any issues are found during the audits, EGLE works with USEPA Region 5 to correct them during the audit follow-up process.

The Dearborn NATTS Site (261630033) had an issue with a tree dripline being too close to some of the monitors located on the sampler deck. The tree was located on private property, and therefore EGLE had no authority to remove the tree. EGLE was able to move the deck to the west side of the bunker, so that the tree drip line would no longer be an issue.

Table 33 summarizes the various monitoring waivers EGLE has requested.

Table 33: Summary of Waivers for Michigan's Monitoring Network

Type of Wavier	Explanation
Ozone Monitor	The Ann Arbor MSA is represented by a monitor in Oakland County.
Lead Co-location	There is not a large enough footprint at the Belding monitoring sites to co-locate a lead monitor. Therefore, EGLE requested to leave the lead co-location at Dearborn. Originally requested in 2010. A second co-located monitor is located in Port Huron.
Lead Monitoring	Request to waive lead monitoring at Consumer's JH Campbell plant. Modeling shows low impact. Originally requested in 2009 and resubmitted in 2014. Current emission data is below the required monitoring threshold.
Lead Monitoring	Request to waive lead monitoring at St. Mary's Cement plant. Modeling shows low impact. Originally requested in 2009 and resubmitted in 2014. Current emission data is below the required monitoring threshold.
Lead Monitoring	Request to waive lead monitoring at Consumer's Karn-Weadock plant. Modeling shows low impact. Originally requested in 2011 and resubmitted in 2016. Current emission data is below the required monitoring threshold.
PAMS Monitoring	The USEPA approved the request to locate the Detroit area PAMS station at the E 7 Mile site (261630019) in lieu of the NCore site in Allen Park (261630001).

Appendix A: Acronyms and Their Definitions

Acronym	Definition
>	Greater than
<	Less than
≥	Greater than or equal to
≤	Less than or equal to
%	Percent
µg/m^3	Micrograms per cubic meter
AERMOD	AMS/USEPA Regulatory Model
AMU	Air Monitoring Unit
AQD	Air Quality Division
AQS	Air Quality System (USEPA 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
EGLE	Environment Great Lakes and Energy
USEPA	United States 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
GHIB	Gordie Howe International Bridge
hr	Hour
IN-MI	Indiana-Michigan
LADCO	Lake Michigan Air Directors Consortium
EGLE	Michigan Department of Environment, Great Lakes, and Energy
MITAMP	Michigan Toxics Air Monitoring Program
MSA	Metropolitan Statistical Area
NAAQS	National Ambient Air Quality Standard

Acronym	Definition
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
NSR	New Source Review
OAQPS	Office of Air Quality and Planning and Standards (USEPA)
OC	Organic carbon
OTAQ	Office of Transportation and Air Quality (USEPA)
PAH	Polynuclear Aromatic Hydrocarbon
PAMS	Photochemical Assessment Monitoring Station
PEP	Performance Evaluation Program
PM	Particulate matter
PM2.5	Particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
PM10	Particulate matter with a diameter of 10 microns or less
PM10-2.5	Coarse PM equal to the concentration difference between PM10 and PM2.5
ppb	parts per billion
ppm	parts per million = mg/kg, mg/L, µg/g (1 ppm = 1,000 ppb)
PQAO	Primary Quality Assurance Organization
QA	Quality assurance
QAPP	Quality Assurance Project Plan
RTI	Research Triangle Institute (national contract laboratory for speciated PM2.5)
SLAMS	State and Local Air Monitoring Station
SO2	Sulfur dioxide
STAG	State Air Grant (federal)
STN	Speciation Trend Network (PM2.5)
TEOM	Tapered element oscillating microbalance (hourly PM2.5 measurement monitor)
tpy	ton per year
TRI	Toxic Release Inventory
TSA	Technical Systems Audits
TSP	Total Suspended Particulate
TTP	Through the probe audit
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 USEPA requires that EGLE solicit public comments. EGLE made the draft 2020 Network Review available for public comment by posting the document on its air quality web page. To ensure that the public was aware the document was open for comment, the 30-day public comment period was announced through the Air Quality Listserv and via a press release on May 31, 2019.

EGLE received three comments to the network review.

COMMENT (via email)

Good afternoon Ms. Ghuman,

This email is a response to the evaluation of air monitoring standards utilized by EGLE (MDEQ). Since 2015, the 48217 community has worked with the formerly named agency, MDEQ in establishing an air monitoring station in our zipcode.

The September 2016-2017 annual report was scrutinized by residents and environmentalists. The 2017-2018 was just recently submitted to the general public.

The difference between the two reports is the 2016-2017 report is much more extensive in that it evaluated pollutants that MDEQ did not traditionally evaluate. The evaluated pollutants were selected by the 48217 air monitoring committee members. Admittedly, EPA establishes the requirement listing.

Dr. Keisha Williams and Ms. Susan Kilmer meet with the 48217 Air Monitoring Committee prior to publicly presenting the annual results. We ask questions about various aspects of the standards established by EPA.

We have not, logically, been able to reconcile the health standards set by EPA. To state that one person or eight persons in a million might get cancer from a particular pollutant does not compute when so many of our neighbors endure cancer or illnesses caused by known pollutants.

The fact that EPA does not consider cumulative emissions and ultimate impacts from side-by-side companies/industries is difficult to reconcile in our community when so many of these pollutants are not being monitored, yet residents suffer from illnesses such as asthma, cardiac diseases and high blood pressure at a high rate.

Noticeably, arsenic has shown up on both reports while it is not one of the required pollutants to be examined. The source of this pollutant has not yet been determined.

In summary, our community's concerns focus around health. Methods and requirements established by EPA do not seemingly factor in the health outcomes for or concerns of residents who live in heavily polluted areas by emitting companys but appear to acquiesce in favor of the polluters.

Most residents in the triple city area of zipcodes 48217, 48218 and 48229 recognize because they are considered to be lower income and minorities, they are not valued by the legislators who are approached by the various industry lobbyists. We are considered as collateral damage.

The comments above are those expressed by members of the 48217 Zipcode Air Monitoring Committe for the air monitoring station located at the New Mt. Hermon Missionary Baptist Church, located at 3225 S. Deacon, Detroit., Michigan.

Dolores Leonard, Ed.D., NBCC, LPC
Coordinator
Air Monitoring Station Committee

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

June 27, 2019

Dr. Dolores Leonard, Ed.D., NBCC, LPC.
Coordinator
Air Monitoring Station Committee
2192 South Bassett Street
Detroit, Michigan 48217

Dear Dr. Leonard:

Thank you for your comments and feedback on behalf of the 48217 Air Monitoring Committee regarding the draft 2020 Michigan Air Monitoring Network Review. Each year, the Michigan Department of Environment, Great Lakes, and Energy (EGLE), Air Quality Division (AQD), meticulously evaluates federal requirements to ensure all standards are met by our statewide monitoring network. You raise some important questions regarding the air quality and health of the residents in ZIP Codes 48217, 48218, and 48229.

The United States Environmental Protection Agency sets health protective standards for the criteria pollutants, known as the National Ambient Air Quality Standards (NAAQS). The NAAQS are established for carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone, lead, and particulate matter (PM_{10} and $PM_{2.5}$ particle sizes). Many other compounds that do not have federal limits or standards are studied by the AQD's Toxics Unit, which then sets health benchmarks for these compounds in order to evaluate risk. Because the evaluation of risk and cumulative impacts are in the scope of the Toxics Unit, we are sharing your comments with Dr. Keisha Williams, acting Toxics Unit Supervisor (williamsk29@michigan.gov), who will provide a more detailed response to your questions.

The AQD is proud of the partnership that has formed with the 48217 Community in the operation of the monitoring station at the New Mt. Hermon Baptist Church. We plan to continue to operate this site, which provides real-time data for sulfur dioxide and particulate matter to the website (http://deqmiair.org/). Sampling will also continue for five metals including lead and arsenic. All of the data from the 48217 monitoring site will be included in the Annual Air Quality Report, which will be released soon for the statewide 2018 data.

If you have any questions, please contact me at 313-456-4695; ghumann@michigan.gov; or EGLE AQD, 3058 West Grand Blvd., Suite 2-300, Detroit, Michigan 48202.

Sincerely,

For Navnit K. Ghuman
Environmental Quality Analyst
Air Quality Division

cc: Ms. Susan Kilmer, EGLE
Dr. Keisha Williams, EGLE

Comment 2:

Dear Mr. Ghuman,

Please except the attached comment letter from the Keweenaw Bay Indian Community regarding Michigan's 2020 Annual Air Monitoring Network Review.

Thank you for your consideration of our comments.

Thank you,
Jane

Jane Kahkonen
Air Quality Specialist

Keweenaw Bay Indian Community
Natural Resources Department
14359 Pequaming Rd
L'Anse, MI 49946
(906) 524-5757 Ext. 28
(906) 524-5748 Fax

jkahkonen@kbic-nsn.gov
http://nrd.kbic-nsn.gov

KEWEENAW BAY INDIAN COMMUNITY

Keweenaw Bay Tribal Center
16429 Beartown Road
Baraga, Michigan 49908
Phone (906) 353-6623
Fax (906) 353-7540

2019 TRIBAL COUNCIL

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RODNEY LOONSFOOT
ELIZABETH D. MAYO

Navnit K. Ghuman
EGLE Air Quality Division
3058 W. Grand Blvd. Suite 2-300
Detroit, MI. 48202

June 13, 2019

Dear Mr. Ghuman,

Please accept the following comments from the Keweenaw Bay Indian Community (KBIC) regarding the Draft Michigan 2019 Annual Ambient Air Monitoring Network Review.

KBIC found the Draft review produced by the EGLE AQD an informative document describing the Michigan AQD monitoring sites, quality assurance guidelines, and pollutants and perimeters monitored. However, it was unfortunate to discover that the Tribal Monitoring Site located at Sault St. Marie Michigan has been decommissioned. The Sault St. Marie site was one of only 2 tribal monitoring sites located within the State of Michigan and the only tribally operated site in the Upper Peninsula (U.P.).

The Seney site, the only operational site within the Upper Peninsula, resides 140 miles to the east of the KBIC reservation and is not indicative of measuring the pollutants that are transported from the west from places like Duluth and beyond. Deposition of air pollutants that affect our reservation have the potential to become minimized by the time they reach the monitoring site in Seney and our forested landscape is proven to be a carbon sink for source pollution that is produced from afar. The Upper Peninsula encompasses 29% of the land base of Michigan and KBIC believes that a single site for such a large land mass is not sufficient. KBIC feels that adequate monitoring of real time air quality in the Upper Peninsula could be improved by adding another monitoring site to the U.P. Wild fire smoke, ozone, mercury, and SO2 are legitimate concerns about the air quality that affect our reservation, lifeways, and the Keweenaw Peninsula as a whole.

KBIC urges EGLE to consider the feasibility of adding an additional monitoring site to the U.P. and offer our collaboration and assistance to increase monitoring capabilities and provide AQ data. I thank you for allowing me the opportunity to provide my feedback to the Michigan Ambient Air Monitoring Network Review.

Sincerely,

Warren "Chris" Swartz, Jr., President
Keweenaw Bay Indian Community

cc. Evelyn Ravindran, KBIC Natural Resources Director
Jane Kahkonen, KBIC Air Quality Specialist
Dione Price, KBIC Environmental Specialist
Danielle Webb, KBIC Tribal Attorney

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

June 21, 2019

Mr. Warren C. Swartz, Jr., President
Keweenaw Bay Tribal Community
Keweenaw Bay Tribal Center
16429 Beartown Road
Baraga, Michigan 49908

Dear Mr. Swartz:

Thank you for your comments and feedback regarding the draft 2020 Michigan Air Monitoring Network Review. Each year, the Michigan Department of Environment, Great Lakes, and Energy (EGLE), Air Quality Division (AQD), meticulously evaluates all federal requirements to ensure all standards are met by our statewide monitoring network. We understand the concerns of the Keweenaw Bay Indian Community (KBIC) expressed in your letter dated June 13, 2019, and would like to address the lack of air monitoring in your area of the Upper Peninsula.

The United States Environmental Protection Agency (USEPA) provided funding from the Tribal Monitoring fund to operate the Sault Ste. Marie site. After evaluating several years of data from this site, the USEPA made the decision to decommission the Sault Ste. Marie monitor in 2019. Requirements such as population, current air quality levels, and the prevalence of industrial sources and major roadways are criteria that EGLE and the USEPA follow when setting up any monitoring network.

Taking into consideration these criteria, an additional air monitoring site in the Upper Peninsula is not required. However, we are in agreement in that having another site in the western region would provide additional data that is currently not available within Michigan. However, outside of Michigan, the Wisconsin Department of Natural Resources is running various air monitoring sites near their border with Michigan's Upper Peninsula; the Bad River reservation, Trout Lake, and Crandon, to name a few (https://dnr.wi.gov/topic/AirQuality/MonitorMap.html). In Canada, the Ontario Ministry of the Environment, Conservation and Parks has two monitoring sites: Thunder Bay and Sault Ste. Marie (http://www.airqualityontario.com/aqhi/locations.php).

The AQD encourages KBIC to apply for USEPA Tribal Monitoring funds since only one tribal site in Manistee, Michigan is conducting ambient air monitoring. We would be glad to serve as a resource and provide guidance to the tribe on setting up a new monitoring site.

Thank you for your comments and feedback. If you have further questions or concerns, please contact me at 313-456-4695; ghumann@michigan.gov; or Air Quality Division, 3058 West Grand Blvd., Suite 2-300, Detroit, Michigan 48202.

Sincerely,

Navnit K. Ghuman
Environmental Quality Analyst

cc: Ms. Evelyn Ravindran, KBIC
Ms. Dione Price, KBIC
Ms. Danielle Webb, KBIC
Ms. Katie Kruse, EGLE
Ms. Susan Kilmer, EGLE

Date: May 15, 2019

To: Navnit K. Ghuman
EGLE – Air Quality Division
3058 West Grand Blvd. Suite 2-300
Detroit, MI 48202
GhumanN@michigan.gov

From: Stuart Batterman and the Community Action to Promote Healthy Environments Partnership (CAPHE)
University of Michigan
Ann Arbor, MI 48109-2029

Re: Comments regarding the 2020 Michigan Ambient Air Monitoring Network Review

Thank you for the opportunity to provide some comments on this important document.

The Michigan Ambient Air Monitoring Network Review (Review) follows its predecessors, is clear, addresses EPA regulations adequately, and provides some historical background. The Division is known for its high quality data collection activities, and the Review provides helpful data. I have a limited number of comments for this Review.

General points:

1. Increase the comprehensiveness of the Review and include additional monitoring sites. The Review currently excludes non-EGLE operated monitoring sites. The Review should list, map and detail industry-owned and/or operated monitoring sites that report to EGLE and/or EPA or that were required as part of a permit condition to include monitoring, e.g., the 4 Marathon and 2 DTE sites in the Detroit region. These also include a number of TSP and PM10 monitors installed at various industrial sites.
    a. Monitoring parameters at these sites, e.g., QA, data reporting and other details, should be included, along with the rationale for these sites.
    b. Access to data generated by these sites should be made available (see below).

2. Enhance the data interpretation in the Review. The Review would benefit from a more detailed interpretation of data collected at each monitoring site. This could be phased in, e.g., each year a different county could be examined. This would provide a strong rationale for continuation/additions/deletions to the network. Elements of site-specific assessment might include:
    a. Detailed maps and a microinventory describing nearby emission sources at each monitor
    b. Description of local meteorology, seasonal wind roses and pollution roses
    c. Photos and other documentation (previous Reviews have shown this.
    d. Assessment of the data collected, trends, relationship to NAAQS and other guidelines, and overall value of the data at that site.

CAPHE Core Partners

Detroiters Working for Environmental Justice - Detroit Hispanic Development Corporation - Southwest Detroit Environmental Vision - University of Michigan School of Public Health

3. Discuss data utilization. The Review should discuss the present, future and potential utilization of the data collected by the monitoring network, and develop a plan promote utilization and interpretation. Relevant topics that should be discussed include:
    a. Improving public access to site-specific current, historical and anticipated air quality levels
    b. Source apportionment analyses that identify specific emission sources, source types, or source areas (in the case of regional and secondary pollutants) affecting air quality. Some of this can use simple wind rose and trends plots.
    c. Application in risk assessment and health impact assessments.
    d. Potential role in epidemiological investigations.

4. Include a section of the Review that addresses climate change and preparedness, and the Division's potential contributions. Dozens of the EQLE monitoring sites collect high quality surface meteorological data, and these data are underutilized. These may provide an excellent opportunity to examine precipitation, temperature and other factors affecting both pollutants (e.g., O3) and heat and cold stress and potentially precipitation. This information is important for sustainability and many other efforts at city and regional levels, particularly as stresses and climate adaptation efforts increase.

5. Incorporate plans for sensors. The advent of low-to-moderate cost sensors has presented both EGLE, cities and community organizations with opportunities to monitor air quality. This field is still evolving but EGLE could lay out a strategic framework to encourage and integrate these new data. This could include, for example:
    a. Policies designed to promote collocation and other activities to improve data quality and to understand the limitation
    b. Advice for entities that want to deploy these systems, e.g., how to select, site, interpret sensors and sensor data
    c. Goals and best practices for specific applications, e.g., community assessments and fence line monitoring
    d. Demonstrations and workshops to promote awareness and best practices

6. Discuss anticipated maintenance, downtime and replacement needs for instruments and systems. Most of the systems operate reliably and data completeness is generally good, but each instrument's lifetime is finite and a replacement refurbishment schedule would aid planning. Some states have explicit discussion of costs and budgets in their assessments.

7. Undertake a needs assessment and develop a strategic plan. EGLE should undertake a formal needs assessment and strategic plan for the monitoring division.
    a. This should include an external advisory committee to obtain input, review documents, and help advocate for the plan.

Specific points:

1. Specific P26: and elsewhere: Moving the NCore site from Allen Park to Detroit E-7 mile is warranted but should be done prior to the start of the O3 season. It is unclear in the Review if

and when this will happen; p. 26 implies that the Allen Park site will be continued, not discontinued.

2. P31 bottom. "A seven county area ... was reclassified". Should add "as non-attainment for ozone."

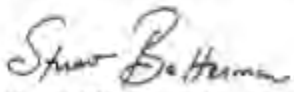
3. p.55: CO levels at Eliza Howell and Livonia and Trinity average below 1 ppm, as does the 90th percentile value (April 2019 data), and most of the readings using these conventional CO monitors are noise. If these instruments can be replaced with trace CO monitors, which cost roughly $5000 more, much more information can be obtained regarding traffic and other sources.

4. p.60: The NSR modeling indicating possibly violation of NO2 NAAQS should specify the areas potentially affected. These may not be the area of Houghton Lake and Lansing, though this is implied. Clarification would be helpful.

5. p.66: As noted earlier, DTE operates two sites and Marathon operates four sites for SO2 in SE Michigan; these should be incorporated into the analysis. I believe the DTE sites, 261470913 and 261470914, are the St. Clair County (but have not checked) noted on p. 66. These have been collecting data for some time, and essentially all of the 2018 data is available on the EPA web site. The Marathon site data for earlier years is available – strangely, none of the 2018 data is not available at this time. The Review should acknowledge that these data are available.

6. p.66: Remove the phrase "only a small region" from the sentence and use "a portion of Wayne County in the following sentence: Of these four areas, only a small region in eastern Wayne County was found to have levels of SO2 exceeding the health-based standard." This is a modeled result; modeling was limited in some regards; and this trivializes the SO2 exceedance that is still a NAAQS violation.

On behalf of Community Action to Promote Healthy Environments:



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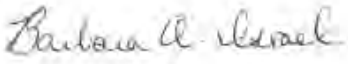

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STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

GRETCHEN WHITMER
GOVERNOR

LIESL EICHLER CLARK
DIRECTOR

June 26, 2019

Prof. Stuart Batterman, Ph.D.
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Ann Arbor, Michigan 48109-2029

Dear Dr. Batterman:

Thank you for taking the time to provide thoughtful and detailed comments on the draft 2020 Air Monitoring Network Review, sent May 15, 2019. The Michigan Department of Environment, Great Lakes, and Energy (EGLE), Air Quality Division (AQD), appreciates the ongoing discussions and opportunities for partnerships to protect public health. While some of the recommendations may not fit into the workload or focus of the Air Monitoring Unit (AMU), your comments are being shared with our Division Director, who will evaluate whether another program area could address some of these items. The AQD's response to your comments follows.

1. *Increase the comprehensiveness of the review to include additional (industrial) monitoring sites.*

Response: The annual network review is required, according to the Code of Federal Regulation (CFR), Title 40, Part 58. In section 58.10, the network plan describes how the state or local air monitoring stations (SLAMS) meet the requirements of the CFR. The plan addresses those monitoring stations that are part of the state-run network. Several industrial sources operate ambient air monitors as a requirement of either an air permit or a hazardous waste license. The AQD reports industrial data for the major sources to the United States Environmental Protection Agency's (USEPA) Air Quality System (AQS), which is available to the public. These industrial sites are not part of the SLAMS network and hence are not subject to the network review process.

2. *Enhance the data interpretation in the review.*

Response: The USEPA provides guidance to the states on what must be included in the annual network review. Some of the criteria are listed in 40 CFR Part 58, Section 58.10. Creating the annual network plan is a large task which takes several weeks to complete. Conducting the detailed analysis suggested in your letter would put a strain on our current staff resources. However, where possible, we try to add maps, photographs, and documentation to better explain the plan. Assessment of the data collected, trends, relationship to National Ambient Air Quality Standards (NAAQS), other guidelines and overall value of the data at a site, are better explained in the Annual Air Quality Report.

3. *Discuss data utilization.*

Response: The annual network plan describes where monitoring will be conducted and the pollutants that will be measured. The air monitoring network must meet specific regulatory requirements and associated quality assurance. The goal is to collect and report high quality data that can be utilized for decision making and to assist in public health assessments. The AMU does not decide or promote how the data will be used by others. The AQD's State Implementation Plan (SIP) Development Unit uses this data for planning purposes. Likewise, the AMU is not the group that would conduct source apportionment analysis or participate in epidemiological investigations. The monitoring data that is collected and reported is made publicly available for others to use. The public can sign up for notification programs such as EnviroFlash (http://miair.enviroflash.info) and view the continuous data in near real-time on EGLE's website: www.deqmiair.org and the USEPA's website: https://airnow.gov.

4. *Include a section of the review that addresses climate change and preparedness and the Division's potential contributions.*

Response: As stated in item 3 above, the goal is to collect and report high quality data that can be used for decision making and health assessments. This data is available for others to evaluate climate change and long-term trends.

5. *Incorporate plans for sensors.*

Response: As mentioned earlier the funding for instrumentation is limited. The AQD has not financially invested in purchasing sensors due to a greater priority and need to update and replace Federal Reference Method instrumentation for criteria pollutant and other special projects. If special grant funding is available in the future for such purchases of handheld and low-cost sensors, the AQD may seek to purchase some in order to better understand their usefulness and functionality. These sensors would not be part of a network plan because the data would not be used for regulatory purposes but rather would be more experimental in nature. Such a project would also require staff resources which has also been a challenge.

6. *Discuss anticipated maintenance, downtime, and replacement needs for instrumentation and systems.*

Response: Budgeting and equipment replacement is part of our internal planning. This planning would not typically be part of the network review, which strives to describe where monitoring will occur and the pollutants to be measured.

7. *Undertake a needs assessment and develop a strategic plan.*

Response: The AQD conducts planning for the monitoring program and other aspects of the air program. The current process of posting the network review for a 30-day public comment period allows for the public and external partners participation.

Responses to the Specific Points

1. Allen Park NCore site is not being moved; it will continue to sample O_3 all year round as before. NCore sites are required by USEPA to measure ozone over the entire year. The revised monitoring rule (80 FR 65292; October 26, 2015) requires PAMS measurements June 1 through August 31 at NCore sites. EGLE has two NCore sites located at Allen Park (261630001) and Grand Rapids-Monroe St. (260810020). The Grand Rapids-Monroe St. (260810020) will serve as one of the locations and the second, the Detroit PAMS site, will be operated at E 7 Mile (261630019) due to its higher ozone design values (Table 10 of Network Review), which has been approved by the USEPA in October 2018.

2. Edit was made on page 31, bottom paragraph to read as "A seven county area was reclassified *as non-attainment for ozone*."

3. Replacing conventional CO with trace CO monitors: As mentioned in the response to the 5th general point, AQD funding for instrumentation is limited and the greater priority is to update and replace Federal Reference Method instrumentation for criteria pollutant and other special projects.

4. On page 60: NSR modeling indicated possible violation of NO_2 NAAQS. The AQD could show potential specific areas affected in future Network Reviews. These might be available from the Permits Section. Houghton Lake and Lansing, are merely representative of rural and urban areas of the state not necessarily areas violating the NO_2 NAAQS.

5. Incorporation of DTE and Marathon data: - As mentioned in the response to first general point, the AQD reports the industrial data for the major sources to the USEPA's AQS, which is available to the public. These industrial sites are not part of the SLAMS network and are not subject to the network review process which is explained on page 9 under Network Review requirements and in details in the CFR, Title 40, Part 58 section 58.10.

6. Edits were made on page 66 first paragraph: Removed the phrase "only a small region" from the sentence and used "a portion of Wayne County" in the following sentence: Of these four areas, *only a small region* in eastern Wayne County was found to have levels of SO_2 exceeding the health-based standard."

Thank you for your comments and feedback. If you have further questions or concerns, please contact me at 313-456-4695; ghumann@michigan.gov; or EGLE AQD, 3058 West Grand Blvd., Suite 2-300, Detroit, Michigan 48202.

Sincerely

for Navnit K. Ghuman
Environmental Quality Analyst
Air Quality Division

cc: Dr. Amy Schultz, University of Michigan
Ms. Angela Reyes, Detroit Hispanic Development Corp.
Dr. Barbara Israel, University of Michigan
Ms. Kristina Rice, University of Michigan
Ms. Susan Kilmer, EGLE