

Annual Ambient Air Monitoring Network Review Plan for 2023



Department of Environment, Great Lakes, and Energy
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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 2023 calendar year, contingent upon adequate levels of funding.

Federal Changes

Historically 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 Lead (Pb), Sulfur Dioxide (SO₂), Nitrogen Dioxide (NO₂), Carbon Monoxide (CO), secondary NAAQS for NO₂ and SO₂, Particulate Matter (PM), and Ozone. Changes or revisions in the ambient air monitoring rules, made by the United States Environmental Protection Agency (USEPA) can be found in 40 CFR Part 58, which contains the ambient air monitoring requirements for all criteria pollutants.¹

Historical Changes

Lead: On November 12, 2008, the USEPA modified, strengthened, and reduced the primary, health-based lead NAAQS from a maximum quarterly average of 1.5 µg/m³ to a 3-month rolling average of 0.15 µg/m³.

Sulfur Dioxide: On November 16, 2009, the USEPA proposed to modify the SO₂ NAAQS and proposed the creation of a two-tier monitoring network based on SO₂ emissions, requiring a total of 12 SO₂ stations in Michigan. The SO₂ NAAQS became final on August 23, 2010. The network design was modified to a single tier requiring a total of five SO₂ monitors in Michigan. Changes to the SO₂ monitoring network are discussed in this network review and were required to be implemented before January 1, 2013.

On February 12, 2010, a secondary NAAQS for SO₂ 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 NO₂ NAAQS and required the deployment of a two-tiered NO₂ monitoring network consisting of near-roadway and community monitors. Design of the new NO₂ monitoring network is discussed in this network review. The NO₂ monitors had a deployment deadline of January 1, 2013.

¹ [Federal Register: Extension of Start Date for Revised Photochemical Assessment Monitoring Stations](#)

On February 12, 2010, a secondary NAAQS for NO₂ 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 NO₂ 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: The USEPA revised and lowered the PM_{2.5} annual average NAAQS to 12.0 µg/m³, which was effective March 18, 2013.

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

Recent Changes

Ozone: Effective December 20, 2019, the USEPA extended the start date for the required Photochemical Assessment Monitoring Stations (PAMS) from June 1, 2019, to June 1, 2021. This extension was made to give states more time to acquire the necessary equipment and expertise needed to successfully make the required PAMS measurements. The PAMS network is designed to evaluate the precursor compounds that contribute to the formation of ozone.

Sensors: Air sensor monitors that are lower in cost, portable and generally easier to operate than regulatory-grade monitors are now being widely used to understand air quality conditions. They can be used for research; for personal exposure monitoring; to supplement existing monitoring; to establish and characterize emission sources; for educational purposes; and for informal air quality awareness. The USEPA is involved in the advancement of air sensor technology, including performance evaluations of sensor devices and best practices for effectively using sensors. None, however, meet the strict requirements, or have been formally submitted to the USEPA for such a determination. The USEPA, states, tribes, and local air agencies are taking a collaborative approach in developing and implementing recommendations for advanced sensor monitoring.

Changes and Recommendations for Michigan's Air Monitoring Network in 2023

Several changes are planned for 2023. The AQD plans to establish a new air monitoring site in an area of Northeast Detroit near Hamtramck to measure fine particulate matter (PM₁₀ and PM_{2.5}) and black carbon. The exact location has not yet been selected and the site is anticipated to be established in the summer or fall of 2023. The AQD is planning to locate a continuous fine particulate (PM_{2.5}) sampler in Marquette, MI. The exact location

has not yet been selected and the site is anticipated to be established in the summer or fall of 2023. Other changes anticipated include the upgrade of filter-based, 1 in 3 day sampling for FRM PM_{2.5} to continuous technology.

Depending on the timing of funding received and instrument purchases, these upgrades are anticipated to occur in the second calendar quarter of 2023.

Particulate Matter and Black Carbon: Through the American Rescue Plan (ARP), specific funding will be allocated for the following changes:

- PM_{2.5} FRM samplers at Oak Park (261250001) and E 7 Mile (261630019) will each be replaced with a continuous Teledyne T640.
- Both PM_{2.5} and PM₁₀ TEOMs at Dearborn (261630033) will be replaced with one continuous Teledyne T640x.
- The co-located PM_{2.5} FRM at Ypsilanti (261610008) will be shut down. It won't be needed once the last Thermo BAM 5014i is removed and replaced with a continuous Teledyne T640.
- The Thermo BAM 5014i at Tecumseh (260910007) will be replaced with a continuous Teledyne T640.
- As described above, a yet to be determined site in Northeast Detroit, near the Hamtramck area, will sample PM_{2.5} and PM₁₀ with a continuous T640x. An aethalometer will be placed at the site to measure black carbon.
- The USEPA requires one site to be co-located for every ten sites for a continuous PM method. Hence, a site will be selected to operate a duplicate Teledyne T640 analyzer.
- As described above, a site not yet determined in the Marquette area will sample for PM_{2.5} with a MetOne BAM 1020.

Air toxics: Contingent upon available funding, the new site in Northeast Detroit, near the Hamtramck area, may sample for air toxics as well as some other sites in central and Southwest Detroit.

Sensors: Michigan has acquired the following sensors:

- Purple Air Sensors
- AirBeam
- Portable weather stations
- Aeroqual Pro
- Aeroqual Starter
- Smoke kit

The AQD will be developing a strategy for deployment of these sensors in different areas around the state and in collaborative projects with local partner organizations and communities. See purchased inventory and other details in the Sensor section of this document.

EJ Areas: EGLE has applied for additional grant funding to increase air monitoring; specifically, the measurement of air toxics in underserved communities of color. If adequate funding and staff resources allow, EGLE intends to add air toxics measurements to several existing sites so the data can be used for health and environmental assessments, and assist in focusing compliance inspections. Short-term sampling studies may also be conducted in other areas of the state where the public has concerns about air quality and stationary monitors are not located. Special studies can provide additional information for health assessments, regulatory or compliance actions, or decision making concerning future potential expansion of the monitoring network to address public concerns about air quality.

Lead and Metals: EGLE lost site access to S. Delray (261630027) and had to shut it down on April 6, 2020. However, due to the construction of the Gordie Howe International Bridge (GHIB), three new sites were added in 2018 to the S. Delray area, which measure metals along with several other parameters.

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 23, 2022, 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 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 23, 2022, either by e-mail or by postal service (verbal comments are not accepted) and should be sent to:

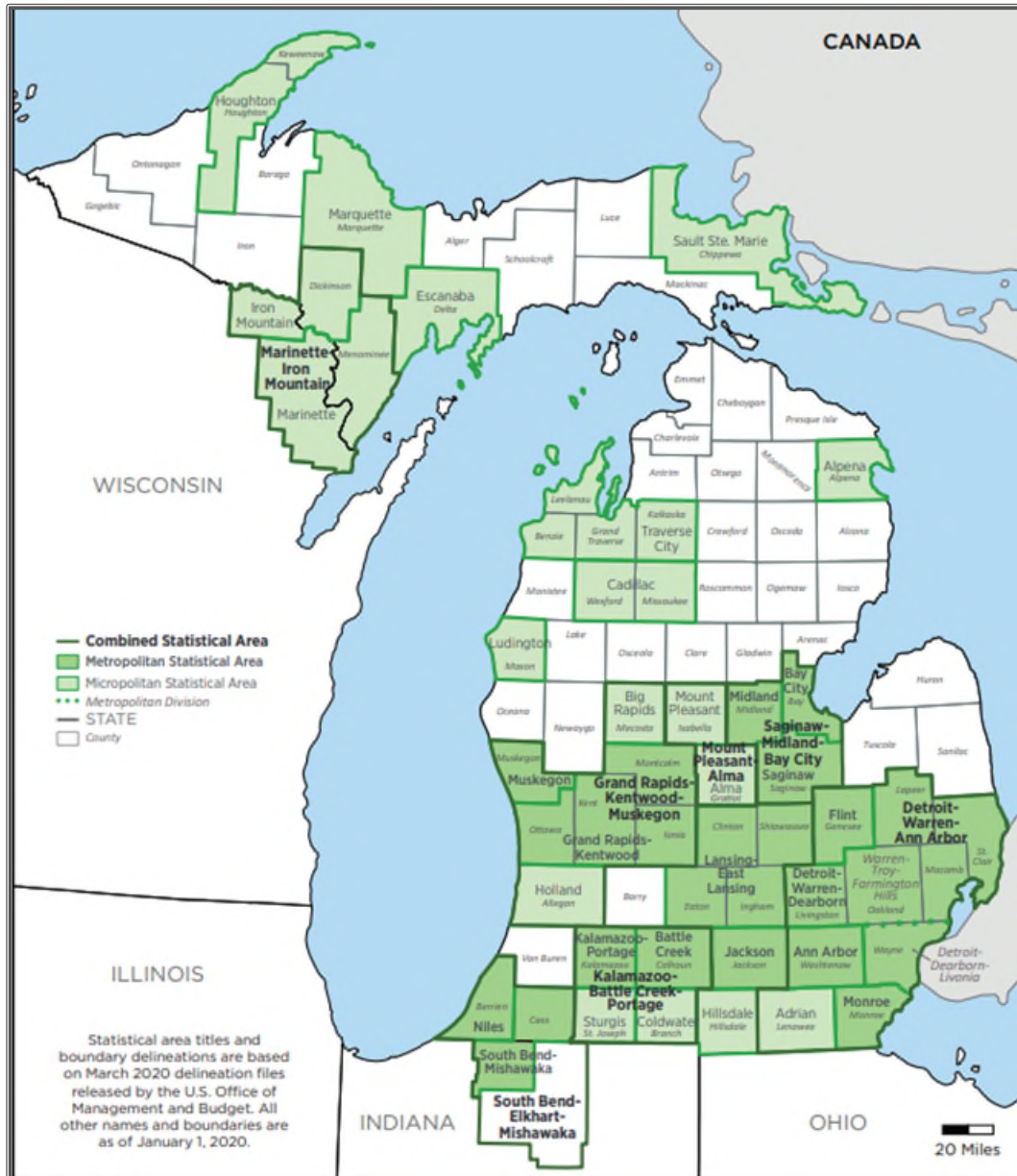
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All written comments received will be organized by topic, summarized, and addressed in the final version of the Michigan Ambient Air Monitoring Network Review. The final document will be placed on the AQD section of EGLE's Internet home page and sent to the USEPA Region 5 office for approval. Hardcopies of the final version will be available for inspection, by appointment only, 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 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 μm) and PM₁₀ (≤10 μm) are based on the 2010 Metropolitan Statistical Area (MSA) geographical borders, population totals, and historical concentrations. The CBSA and MSA outlines for Michigan are shown in **Figure 1**².

Figure 1: CBSAs and MSAs in Michigan's Upper and Lower Peninsula



² https://www2.census.gov/geo/maps/metroarea/stcbsa_pg/Feb2013/cbsa2013_MI.pdf

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 with a high level of commuting to or from these urban clusters. 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 with adjacent counties having a high degree of social and economic integration. Changes to the metropolitan and micropolitan areas as a result of the 2020 Census were released in 2022. The following areas were affected:

- Ionia added to the Grand Rapids-Kentwood MSA
- Owosso removed as a Micropolitan and as a result, Lansing-East Lansing-Owosso is no longer a CSA
- Van Buren County removed from Kalamazoo-Portage MSA
- Coldwater Micropolitan added to the Kalamazoo-Battle Creek-Portage CSA
- Warsaw, IN Micropolitan was added to the South Bend-Elkhart-Mishawaka CSA

The specific counties that make up each MSA or micropolitan area in Michigan are listed in **Table 1 and Table 2**.³ 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 PM₁₀. **Table 1** shows the adjusted 2021 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. **Table 2** shows 2021 population estimates for micropolitan areas in Michigan.

³ Metropolitan and Micropolitan Statistical Areas: April 1, 2010 to July 1, 2019 (CBSA-EST2009-1). Source: U.S. Census Bureau, Population Release Date March 2019. https://www.census.gov/data/tables/time-series/demo/popest/2020s-total-metro-and-micro-statistical-areas.html#par_textimage_1139876276

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

Core-based statistical areas

Combined Statistical Areas	Population Estimates 2021	Core-based Statistical Areas	Population Estimates 2021	County
Detroit-Warren-Ann Arbor CSA	5,393,033	Detroit-Dearborn-Livonia MSA & Warren- Troy-Farmington MSA	4,365,205	Wayne
				Oakland
				Macomb
				Livingston
				St. Clair
		Lapeer		
		Flint MSA	404,208	Genesee
		Ann Arbor MSA	369,390	Washtenaw
Monroe MSA	155,274	Monroe		
Adrian Micropolitan	98,956	Lenawee		
Grand Rapids- Kentwood- Muskegon CSA	1,429,112	Grand Rapids-Kentwood MSA	1,091,620	Kent
				Ottawa
				Montcalm
				Ionia
		Muskegon MSA	176,511	Muskegon
		Holland Micropolitan	120,950	Allegan
Big Rapids Micropolitan	40,031	Mecosta		
none		Lansing-East Lansing MSA	540,281	Ingham
				Eaton
				Clinton
Kalamazoo-Battle Creek-Portage CSA	500,670	Owosso Micropolitan	67,877	Shiawassee
		Kalamazoo-Portage MSA	261,108	Kalamazoo
		Battle Creek MSA	133,819	Calhoun
		Coldwater Micropolitan	44,985	Branch
Saginaw-Midland-Bay City CSA	376,033	Sturgis Micropolitan	66,758	St. Joseph
		Saginaw MSA	189,591	Saginaw
		Bay City MSA	102,985	Bay
South Bend-Elkhart-Mishawaka, IN-MI CSA	809,944	Midland MSA	83,457	Midland
		South Bend-Mishawaka, IN-MI MSA	323,695	St. Joseph, IN
				Cass
		Elkhart-Goshen, IN MSA	206,921	Elkhart, IN
		Niles-Benton Harbor MSA	153,101	Berrien
Mount Pleasant-Alma CSA	106,357	Warsaw,IN Micropolitan	80,106	Kosciusko,IN
		Plymouth, IN Micropolitan	46,121	Marshall, IN
none		Mount Pleasant Micropolitan	64,813	Isabella
		Alma Micropolitan	41,544	Gratiot
none		Jackson MSA	160,050	Jackson

Table 2: Composition of Micropolitan Statistical Areas in Michigan

Micropolitan Area	Principal Cities	Counties	Population Estimates 2018
Adrian Micropolitan Area	Adrian	Lenawee	98,956
Alma Micropolitan Area	Alma	Gratiot	41,549
Alpena Micropolitan Area	Alpena	Alpena	28,893
Big Rapids Micropolitan Area	Big Rapids	Mecosta	40,031
Cadillac Micropolitan Area	Cadillac	Missaukee, Wexford	49,031
Coldwater Micropolitan Area	Coldwater	Branch	44,985
Escanaba Micropolitan Area	Escanaba	Delta	36,826
Hillsdale Micropolitan Area	Hillsdale	Hillsdale	45,546
Holland Micropolitan Area	Holland (pt.)	Allegan	120,950
Houghton Micropolitan Area	Houghton	Houghton, Keweenaw	39,420
Iron Mountain Micropolitan Area	Iron Mountain, MI	Dickinson, MI; Florence, WI	30,380
Ludington Micropolitan Area	Ludington	Mason	29,383
Marinette Micropolitan Area	Marinette, WI	Menominee, MI; Marinette, WI	65,174
Marquette Micropolitan Area	Marquette	Marquette	66,103
Mount Pleasant Micropolitan Area	Mount Pleasant	Isabella	64,813
Sault Ste. Marie Micropolitan Area	Sault Ste. Marie	Chippewa	36,816
Sturgis Micropolitan Area	Sturgis	St. Joseph	60,758
Traverse City Micropolitan Area	Traverse City	Benzie, Grand Traverse, Kalkaska, Leelanau	154,685

Other Monitoring Network Requirements

NCore sites provide a full suite of measurements at one location. NCore stations collect the following measurements: year-round ozone, SO₂ (trace), CO (trace), NO_y (reactive oxides of nitrogen), PM_{2.5} FRM, continuous PM_{2.5}, speciated PM_{2.5}, PM coarse (PM_{10-2.5}), wind speed, wind direction, relative humidity, and ambient temperature. Previously, a minimum of 10 NCore sites nationwide measured lead; however, this requirement was removed in 2016. The NCore stations in Michigan, located at GrandRapids–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 was extended to June 1, 2021. The USEPA approved for the Detroit-E 7 Mile site to host the PAMS monitoring rather than the Allen Park NCore site. Both sites will conduct the PAMS suite of measurements in 2023.

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 Plan should:

- Be conducted at least once a year;
- Determine if the system meets the monitoring objectives stated in Appendix D of 40 CFR Part 58 "Network Design Criteria for Ambient Air Quality Monitoring"⁴;
- Determine if the system meets the appropriate spatial scales and monitoring objectives, population-driven requirements, and the minimum number of stations that are required based on the likelihood of exceeding the NAAQS;
- Identify needed modifications to the network including termination and relocation of unnecessary stations;
- Identify any new stations that are necessary;
- Correct any inadequacies previously identified; 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.

Modifications to the network should address:

- New census data;
- Changes in air quality levels; and
- Changes in emission patterns.

⁴"Environmental Protection Agency Ambient Air Quality Surveillance Regulations." 40 CFR Part 58, Appendix D; April 27, 2016.

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.

Monitor Deployment by Location

Table 3 summarizes the distribution of ambient air monitors by pollutant in operation in Michigan during 2022-2023. The distinction is made between building, trailer and a shelter to indicate differences in floor space and temperature control, information useful in planning deployment of new monitors.

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Table 3: Monitor Distribution of the 2022-2023 Network in Michigan

Site Name	AQS ID	O ₃	PM _{2.5} FRM	Continuous PM _{2.5}	Speciation	PM ₁₀	PM Coarse	CO	NO ₂	NOy	SO ₂	Metals (TSP)	Black Carbon	VOCs	Carbonyls	PAHs	Meteorological	Building/Trailer
Holland	260050003	x		MB													x	T
Bay City	260170014			MB													x	T
Benzonia (Frankfort)	260190003	x																T
Coloma	260210014	x															x	T
Cassopolis	260270003	x															x	B
Rose Lake	260370002	x																B
Otisville	260492001	x															x	T
Flint	260490021	x	6d	MB													x	T
Harbor Beach	260630007	x															x	T
Belding	260670003											Pb & 4					x	S
Lansing	260650018	x	3d	T T					x		x						x	T
Kalamazoo	260770008	x		T													x	T
Grand Rapids	260810020	x	3d	TX	x	TX	TX	Tr	P	Tr	Tr			P	P		x	T
Evans	260810022	x															x	T
Grand Rapids Near Road	260810023			MB				x	x								x	T
Tecumseh	260910007	x		T													x	T
New Haven	260990009	x		T													x	T
Sterling Hts/Freedom Hill	260990021																x	B
Warren	260991003	x																T
Manistee (Tribal)	261010922	x	3d														x	B
Scottville	261050007	x															x	T
Houghton Lake	261130001	x		TB					x								x	T
Muskegon	261210039	x															x	T
Oak Park	261250001	x	T														x	T
Pontiac	261250011																x	B
Rochester	261250012																x	C
Jenison	261390005	x		TX		TX											x	T
Port Huron	261470005	x		T							x						x	T
Port Huron-Rural St.	261470031											Pb & 4						C
Marquette	not available yet			MB														T
Seney	261530001	x		MB													x	T
Ypsilanti	261610008	x		T													x	T
Allen Park	261630001	x	3d	TX	x	TX	TX	Tr		Tr	Tr		x				x	T
River Rouge	261630005											Pb & 4			x		x	T
Fort St. (SWHS) - Detroit	261630015		3d	T	x	x			x		x	Pb & 4	x	x	x		x	B
E. 7 Mile - Detroit	261630019	x	T						P	Tr				P	P		x	B
Joy Rd. - Detroit	261630026																x	C
Dearborn	261630033		3d&6d	TX	x	x&TX						x	x	x	x	x	x	B
Eliza Howell	261630093			MB				x	x								x	T
NMH 48217	261630097			T							x	Pb & 4						T
DP4th	261630098			T				x	x		x	Pb & 4	x					T
Trinity	261630099			T				x	x		x	Pb & 4	x					T
Military	261630100			T					x		x	Pb & 4	x					T
Livonia Near Road	261630101							x	x								x	T
Det-Hamtramck	not available yet			TX		TX							x					T
Total		26	9	23	4	5	2	6	10	3	9	9	6	4	5	1	34	43
3d	a run every three days (FRM filter)		TX	T640X		P	PAMS		Pb & 4			Lead & Metals suite: Mn, As, Cd, Ni						
6d	a run every six days (FRM filter)		T/TT	T640/duplicates		Tr	Trace		B/T/S/C			Building/Trailer/Shelter/Container						
			MB	MetOne BAM														
			TB	ThermoBAM														

Quality Assurance (QA)

EGLE has an approved Quality Management Plan (QMP). In turn, the Air Monitoring Section (AMS) 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), PAMS, 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 AMS'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} and PM₁₀, PM_{2.5} Speciation, High Volume TSP [total suspended particulate], and PM₁₀) and the gaseous monitors (CO, SO₂, ozone, NO_y, NO_x, and NO₂) at least once a year. All audit results are reported to AQS quarterly. The toxics monitors (volatile organic compounds [VOCs], carbonyl compounds, and polyaromatic 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 AMS's QA Manager 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.⁵ 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.

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 $\mu\text{g}/\text{m}^3$ to 0.15 $\mu\text{g}/\text{m}^3$ 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 $\mu\text{g}/\text{m}^3$.

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://www.epa.gov/amtic/sampling-schedule-calendar>

⁵ "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

In 2018, EGLE added three new lead monitoring sites near the GHIB. Additional site details are in the Special Purpose Monitoring section.

For 2023, there are no new facilities that need to be investigated with regard to the lead NAAQS requirements. The Merrick St. site (260670003) and the Port Huron Rural St. site (261470031) are 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. In 2016 part of the revised 2016 USEPA regulations stated removal of lead monitoring requirement at NCore sites, provided they are attaining the standard. As a result, EGLE discontinued lead sampling at the two NCore sites at Grand Rapids (260810020) and Allen Park (261630001) in 2020.

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 site 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 PM₁₀ 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 PM₁₀ sampler under certain instances. However, EGLE opted to collect co-located lead measurements as both TSP and PM₁₀ 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 MetOne 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 St. site (261470031) in August 2018.

EGLE lost site access to S. Delray (261630027) on W. Jefferson Ave. due to a change in property ownership, and on April 6, 2021, the site was shut down, resulting in the loss of a historical lead site. The loss of this site reduces the state network to nine sites, which requires only one co-located site; however, EGLE plans to continue to operate co-located samplers at both Dearborn and Port Huron in 2023.

Table 5 summarizes the lead monitoring site information for the Michigan lead network in 2022. **Figure 2** shows monitoring site locations in the 2023 network.

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

Site Name and ID	Site Purpose	2016	2017	2018	2019	2020	2021	2022
Belding-Reed St (260670002)	Source -oriented	X	X	X				
Belding (260670003)	Source -oriented	X	X	X	X	X	X	X
Grand Rapids-Monroe St. (260810020)	NCore Non-Source -oriented	X	X	X	X			
Port Huron-Rural St. (261470031)	Source -oriented <i>co-located site</i>	XX	XX	XX	XX	XX	XX	XX
Allen Park (261630001)	NCore Non-Source -oriented	X	X	X	X			
River Rouge (261630005)	Non-Source -oriented			X	X	X	X	X
SWHS (261630015)	Non-Source -oriented			X	X	X	X	X
S.Delray (261630027)	Non-Source -oriented			X	X	X	X	
Dearborn (261630033)	NATTS <i>co-located site</i>	XX	XX	XX	XX	XX	XX	XX
NMH48217 (261630097)	SLAMS	X	X	X	X	X	X	X
Trinity (261630098)	Source -oriented			X	X	X	X	X
DP4TH (261630099)	Source -oriented			X	X	X	X	X
Military (261630100)	Source -oriented			X	X	X	X	X
Total No of sites		7	7	13	12	10	10	9
No. Co-located sites Required		1	1	2	2	2	2	1

Table 4

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			Part. Size	Sampling		Purpose/Type	Parameter		Scale	County	Date		Facility Name	Est Emissions Tons/yr
Site Name	AQS Site ID	Address		Latitude	Longitude		Frequency	Code			POC	Estab.		
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	-82.44923	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	-82.44923	1:12,co-loc	max conc	14129	2	Micro	St. Clair	8/1/08	Mueller Industries	0.75

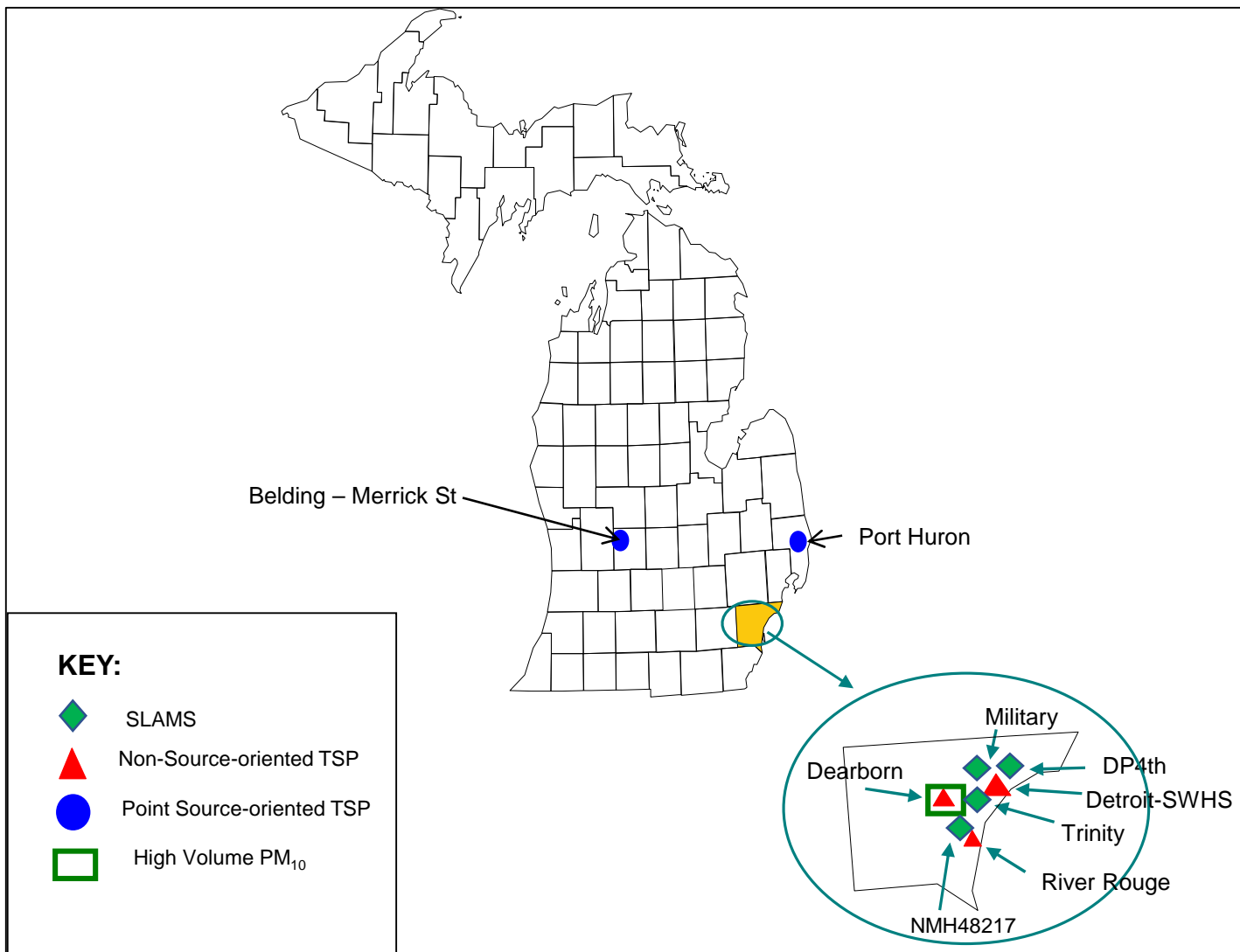
Non Source Oriented Sites

Monitoring Sites			Part. Size	Sampling		Purpose/Type	Parameter		Scale	County	Date		CBSA ¹	2021 Population Estimate
Site Name	AQS Site ID	Address		Latitude	Longitude		Frequency	Code			POC	Estab.		
River Rouge	261630005	315 Genesee	TSP	42.26722	-83.13222	1:6	pop. exp.	14129	1	Neighborhood	Wayne	1/1/18	DWL	4,365,205
Fort St. (SWHS)	261630015	150 Waterman	TSP	42.30278	-83.10667	1:6	pop. exp.	14129	1	Neighborhood	Wayne	1/1/18	DWL	4,365,205
S. Delray	261630027	7701 W. Jefferson	TSP	42.29222	-83.10694	1:6	pop. exp.	14129	1	Neighborhood	Wayne	1/1/18	DWL	4,365,205
Dearborn	261630033	2842 Wyoming	TSP	42.30667	-83.14889	1:6	max conc	14129	1	Neighborhood	Wayne	6/1/90	DWL	4,365,205
Dearborn	261630033	2842 Wyoming	TSP	42.30667	-83.14889	1:12, co-loc	max conc	14129	2	Neighborhood	Wayne	6/1/90	DWL	4,365,205
Dearborn	261630033	2842 Wyoming	PM ₁₀	42.30667	-83.14889	1:6	max conc	14129	1	Neighborhood	Wayne	6/1/90	DWL	4,365,205
Dearborn	261630033	2842 Wyoming	PM ₁₀	42.30667	-83.14889	1:12, co-loc	max conc	14129	2	Neighborhood	Wayne	6/1/90	DWL	4,365,205
NMH 48217	261630097	3225 Deacon St	TSP	42.26167	-85.15789	1:6	pop.exp	14129	1	Neighborhood	Wayne	9/1/18	DWL	4,365,205
DP4th	261630098	4700 W Fort St	TSP	42.31216	-83.09194	1:6	max conc	14129	1	Neighborhood	Wayne	7/17/18	DWL	4,365,205
Trinity	261630099	9191W Fort St	TSP	42.29582	-83.12943	1:6	max conc	14129	1	Neighborhood	Wayne	10/17/18	DWL	4,365,205
Military	261630100	1238 Military Park	TSP	42.30934	-83.11572	1:6	max conc	14129	1	Neighborhood	Wayne	11/1/18	DWL	4,365,205

¹ CBSA Key:

DWL = Detroit-Dearborn-Livonia MSA and Warren-Troy-Farmington MSA

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 Manager each quarter. An independent audit is conducted by a member of the AMS'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 Manager reviews all audit results and hard copies are retained in the QA files. The audit results are uploaded to the 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 the 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 for analysis to the USEPA. As of 2021 they require these be sent to the Region 4 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 4 laboratory.

Plans for the 2023 Lead Monitoring Network

In 2023, EGLE will continue to collect high volume TSP and PM₁₀ lead measurements at the NATTS site:

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

In 2023, EGLE will continue TSP lead source-oriented measurements at:

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

In 2023, EGLE will continue TSP lead measurements at the three sites set up in 2018 around the GHIB area.

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

In 2018, EGLE added high volume TSP lead, non-source-oriented measurements at following sites, EGLE lost site access to S. Delray (261630027) and shut down the site on April 6, 2021:

- River Rouge (261630005);
- Detroit–SWHS (261630015); and
- NMH 48217 (261630097)

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*⁶ 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 SO₂
- Trace CO
- NO/NO_y

- Wind speed
- Wind direction
- Relative humidity
- Outdoor temperature
- Lead (not required in 2016 ruling, discontinued sampling 2020)

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 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 currently 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 USEPA schedule to meet the NCore monitoring requirements.

Lead was added to both sites in January 2010 and discontinued in 2020 since the measured levels were low and no longer mandated. Relative Humidity was added to the Grand Rapids-Monroe St. (260810020) NCore station on March 3, 2010.

In October 2020, the low volume PM₁₀, PM_{2.5} TEOM, and high volume PM₁₀ instrumentation at both NCore sites was replaced by a continuous FEM method T640X instrument. The T640X is designed to continuously measure for PM_{2.5}, PM₁₀ and coarse particulate matter (PM_{10-2.5}).

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**.

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

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 monitoring the appropriate section of the network review.

Plans for 2023 NCore Monitoring Network

In 2023, 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).

In 2023, seasonal PAMS measurements will also 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.

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 1400a replaced with a Teledyne API Model T640X	Tapered element oscillating microbalance ---- FEM	11/4/1999 ----- 10/22/2020	The T640X replaced the PM _{2.5} ,TEOM , low vol PM ₁₀ and high vol PM ₁₀ (used to calculate PM _{coarse})
PM _{2.5} FRM mass	Ncore	Neighborhood	1:3 days ----- continuous	R & P Partisol plus 2025 replaced with a Teledyne API Model T640X	manual collection, gravimetric analysis ----- FEM	10/23/1998 ----- 10/22/2020	The T640X replaced the PM _{2.5} ,TEOM , low vol PM ₁₀ and high vol PM ₁₀ (used to calculate PM _{coarse})
PM _{10-2.5} FRM mass	Ncore	Neighborhood	1:3 days ----- continuous	R & P Partisol plus 2025 replaced with a Teledyne API Model T640X	manual collection, gravimetric analysis ----- FEM	7/16/2010 ----- 10/22/2020	The T640X replaced the PM _{2.5} ,TEOM , low vol PM ₁₀ and high vol PM ₁₀ (used to calculate PM _{coarse})
PM _{2.5} Speciation	Ncore	Neighborhood	1:3 days	Met One Super SASS and URG 3000N	manual collection, laboratory analysis *	6/1/2002 at a 1:6 sampling frequency	On 1/1/2011 sampling frequency changed to 1:3
Trace CO	NCore/AQI	Neighborhood	Continuous	Thermo Fisher 48i-TLE**	Non-dispersive, infrared	4/25/2007	probe height 5m
Trace SO ₂	NCore/AQI	Neighborhood	Continuous	Thermo Fisher 43i-TLE**	UV fluorescence	4/1/2008	probe height 5m
NO/NO _y	NCore/AQI	Neighborhood	Continuous	Thermo Fisher 42i-Y	Chemiluminescence	4/1/2008	external converter installed at 10m
Ozone	NCore/AQI was NAMS	Neighborhood	Continuous	API 400 A1E	UV Absorption	4/24/1980	Runs year round
Lead	Non-Source	Neighborhood	1:6 days	General Metal Works Hi-Vol filter based	Manual collection, ICP/MS analysis	1/8/2010	Shutdown 2020, not mandated
Wind Speed	Ncore	Neighborhood	Continuous	R. M. Young Propeller, Anemometer & vane	Vector summation	1/1/1988	set at 10m
Wind direction	Ncore	Neighborhood	Continuous	R. M. Young Propeller, Anemometer & vane	Vector summation	1/1/1988	set at 10m
Relative Humidity	Ncore	Neighborhood	Continuous	R.M.Young	Resistance hygrometer	3/3/2010	set t >4m
Outdoor Temperature	Ncore	Neighborhood	Continuous	R.M.Young	Thermometer	7/15/1993	set t >4m
Sigma Theta	SLAMS	Neighborhood	Continuous	R. M. Young Propeller, Anemometer & vane	Calculation	1/16/2001	optional
Barometric Pressure	SLAMS	Neighborhood	Continuous	R.M.Young	Electronic pressure sensor	7/15/1993	optional
PM ₁₀ Hi-Vol	SLAMS	Neighborhood	1:6 days	Hi-Vol replaced with a Teledyne API Model T640X	manual collection, gravimetric analysis ---- FEM	1/1/1985 ----- 10/22/2020	The T640X replaced the PM _{2.5} ,TEOM , low vol PM ₁₀ and high vol PM ₁₀ (used to calculate PM _{coarse})

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

**TLE Trace Level Enhanced

Table 7: Measurements Collected at the Allen Park (261630001) NCore Site

Parameter	Designation	Spatial Scale	Sampling Frequency	Instrument Type	Method	Monitor Start-Up Date	Comments
PM _{2.5} continuous	NCore/AQI	Neighborhood	Continuous	R & P TEOM 1400a replaced with a Teledyne API Model T640X	Tapered element oscillating microbalance ----- FEM	2/1/2001 ----- 10/06/2020	The T640X replaced the PM _{2.5} ,TEOM , low vol PM ₁₀ and high vol PM ₁₀ (used to calculate PM _{coarse})
PM _{2.5} FRM mass	Ncore	Neighborhood	1:3 days ----- continuous	R & P Partisol plus 2025 replaced with a Teledyne API Model T640X	manual collection, gravimetric analysis ----- FEM	5/12/1999 ----- 10/06/2020	The T640X replaced the PM _{2.5} ,TEOM , low vol PM ₁₀ and high vol PM ₁₀ (used to calculate PM _{coarse})
PM _{10-2.5} FRM mass	Ncore	Neighborhood	1:1 day ----- continuous	R & P Partisol plus 2025 replaced with a Teledyne API Model T640X	manual collection, gravimetric analysis ----- FEM	7/16/2010 ----- 10/22/2020	The T640X replaced the PM _{2.5} ,TEOM , low vol PM ₁₀ and high vol PM ₁₀ (used to calculate PM _{coarse})
PM _{2.5} Speciation	Ncore	Neighborhood	1:3 days	Met One Super SASS and URG 3000N +IMPROVE carbon channel	manual collection, laboratory analysis *	12/1/2000	-----
Trace CO	NCore/AQI	Neighborhood	Continuous	Thermo Fisher 48i-TLE**	Non-dispersive, infrared	6/1/2007	probe height 5m
Trace SO ₂	NCore/AQI	Neighborhood	Continuous	Thermo Fisher 43i-TLE**	UV fluorescence	4/1/2008	probe height 5m
NO/NO _y	NCore/AQI	Neighborhood	Continuous	Thermo Fisher 42i-Y	Chemiluminescence	4/1/2008	external converter installed at 10m
Ozone	NCore/AQI was NAMS	Neighborhood	Continuous	API 400 A1E	UV Absorption	1/1/1980	Runs year round
Lead	Non-Source	Neighborhood	1:6 days	General Metal Works Hi-Vol filter based	Manual collection,ICP/MS analysis	3/2/2001 to 3/31/2007 then 1/2/2010	Shutdown 2020,not mandated
Wind Speed	Ncore	Neighborhood	Continuous	R. M. Young Propeller, Anemometer & vane	Vector summation	10/18/1981	set at 10m
Wind direction	Ncore	Neighborhood	Continuous	R. M. Young Propeller, Anemometer & vane	Vector summation	10/18/1981	set at 10m
Relative Humidity	Ncore	Neighborhood	Continuous	R.M.Young	Resistance hygrometer	1/1/2000	set t >4m
Outdoor Temperature	Ncore	Neighborhood	Continuous	R.M.Young	Thermometer	1/1/2000	set t >4m
Sigma Theta	SLAMS	Neighborhood	Continuous	R. M. Young Propeller, Anemometer & vane	Calculation	9/1/2001	optional
Barometric Pressure	SLAMS	Neighborhood	Continuous	R.M.Young	Electronic pressure sensor	1/5/1971	optional
Black Carbon	SLAMS	Neighborhood	Continuous	Magee Large Spot Ae21	Optical absorption	12/19/2003	Not Required Ncore
PM ₁₀ Hi-Vol	SLAMS	Neighborhood	1:6 days	Hi-Vol replaced with a Teledyne API Model T640X	manual collection, gravimetric analysis ----- FEM	9/12/1987 ----- 10/06/2020	The T640X replaced the PM _{2.5} ,TEOM , low vol PM ₁₀ and high vol PM ₁₀ (used to calculate PM _{coarse})

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

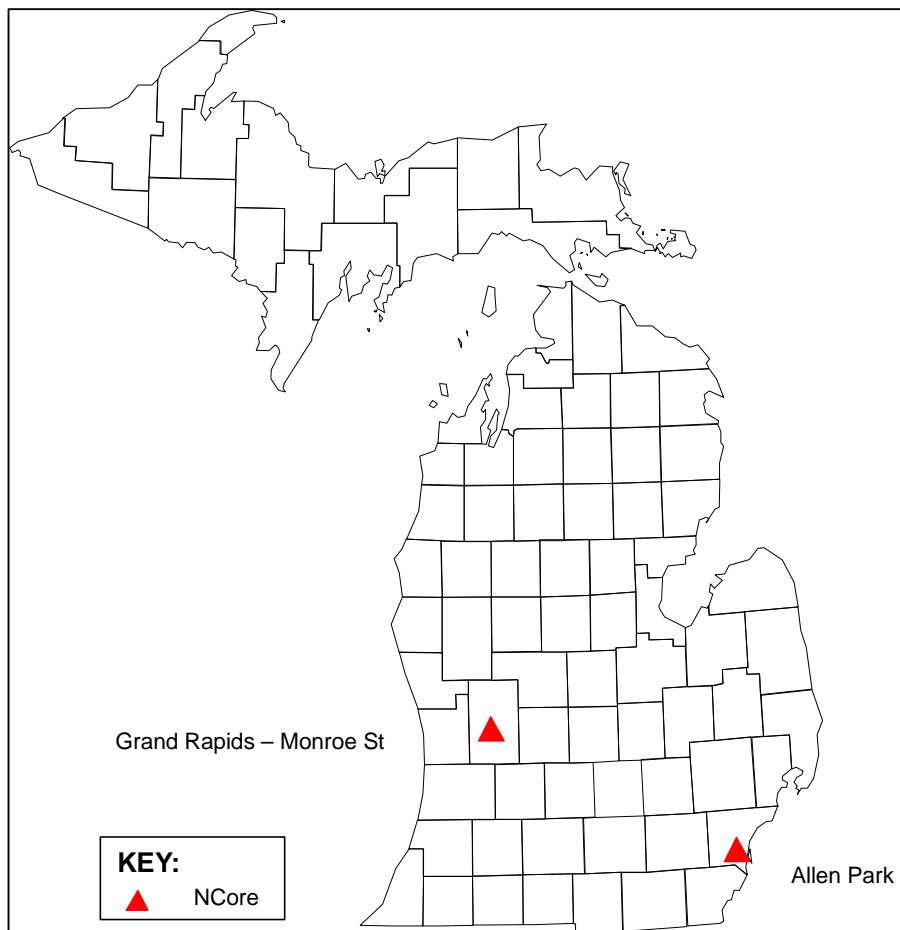
**TLE Trace Level Enhanced

Table 8: Michigan's NCore Monitoring Network

Monitoring Sites			Purpose/							2021	
Site Name	AQS Site ID	Address	Latitude	Longitude	Type	Scale	County	Date Estab.	CBSA ¹	Population Estimate	
Grand Rapids	260810020	1179 Monroe St., NW	42.984167	-85.671389	Pop. Exp.	Neighborhood	Kent	1/1/10	GW	1,091,620	
Allen Park	261630001	14700 Goddard	42.228611	-83.208333	Pop. Exp.	Neighborhood	Wayne	1/1/10	DWL-WTF	4,365,205	

¹ CBSA Key:
 DWL& WTF = Detroit-Warren-Livonia and Wareren-Troy-Farmington Core Based Statistical Area
 GW = Grand Rapids-Kentwood 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.⁷ *Note:* Background and transport ozone monitors are still required but are not shown in **Table 9**.

Table 9: SLAMS Minimum Ozone Monitoring Requirements

MSA Population ^{1,2}	Most Recent 3-year Design Value Concentrations $\geq 85\%$ 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 on or 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 2017 to 2020. 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.

⁷ Table D-2 of Appendix D to Part 58. www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-58/appendix-Appendix%20D%20to%20Part%2058

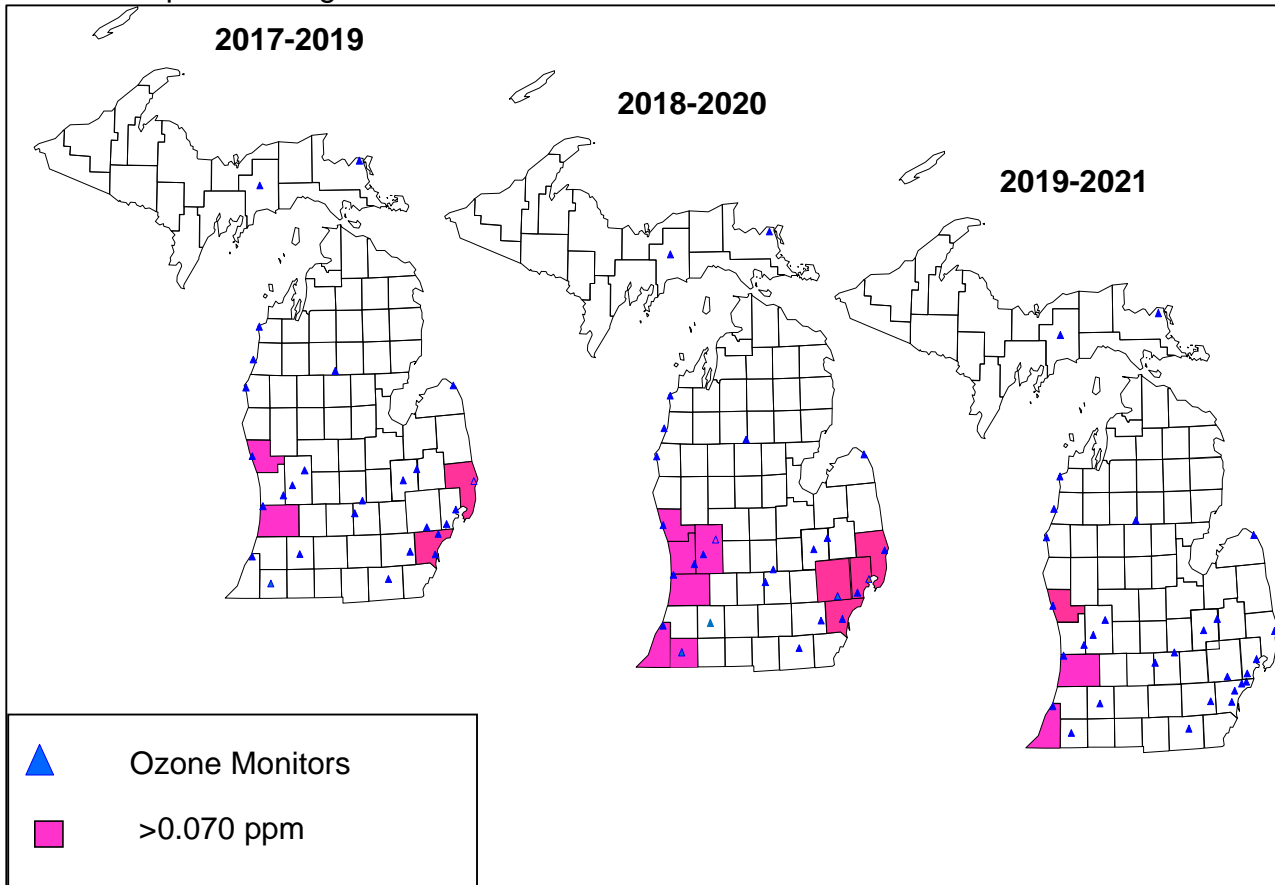
Table 10: Application of Minimum Ozone Requirements in the October 17, 2006 - Final Revision to the Monitoring Regulation to Michigan's Ozone Network

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	2021 Population	Counties	Existing Monitors	2019-2021 3-year O ₃ design value	Min. No. Monitors Required
Detroit-Dearborn-Livonia MSA & Warren-Troy-Farmington MSA	4,365,205	Macomb	New Haven	0.068	3
			Warren	0.066	
		Oakland	Oak Park	0.069	
		Wayne	Allen Park	0.067	
			Detroit - E 7 Mile	0.070	
		Lapeer	---		
	St. Clair	Port Huron	0.070		
		Livingston	---		
Flint MSA	404,208	Genesee	Flint	0.064	2
			Otisville	0.065	
Monroe MSA	155,274	Monroe	---		
Ann Arbor MSA	369,390	Washtenaw	Ypsilanti	0.066	2
Grand Rapids-Kentwood MSA	1,091,620	Kent	Grand Rapids	0.070	2
			Evans	0.065	
			Ionia	---	
		Ottawa	Jenison	0.069	
		Montcalm	---		
Muskegon-Norton Shores MSA	176,511	Muskegon	Muskegon	0.074	1
		Clinton	Rose Lake	0.061	2
Lansing-East Lansing MSA	540,281	Ingham	Lansing	0.060	
		Eaton	---		
Bay City MSA	102,985	Bay	---		
Saginaw MSA	189,591	Saginaw	---		
Kalamazoo-Portage MSA	340,318	Kalamazoo	Kalamazoo	0.065	1
Niles-Benton Harbor MSA	153,101	Berrien	Coloma	0.071	1
Jackson MSA	160,050	Jackson	---		
Battle Creek MSA	133,819	Calhoun	---		
South Bend Mishawaka MSA	323,695	Cass	Cassopolis	0.068	1
Other areas:		<u>Comments</u>			
	<i>transport site</i>	Lenawee	Tecumseh	0.064	
		Benzie	Frankfort	0.064	
		Huron	Harbor Beach	0.068	
		Allegan	Holland	0.075	
	<i>background site</i>	Missaukee	Houghton Lake	0.063	
		Mason	Scottville	0.064	
		Schoolcraft	Seney	0.064	
	<i>tribal site</i>	Manistee	Manistee	0.061	

Figure 4: Comparison of 4th Highest 8-Hour Ozone Values Averaged Over Three Years 2017-2019, 2018-2020 and 2019-2021

in three maps of Michigan



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. Since then, the design value site has fluctuated between the Port Huron and E 7 Mile sites. 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 and the Port Huron (2611470005) both have a 3-year average of 0.070 ppm, and could be considered the design value site for 2023. 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 year round.

Although three ozone sites are required for the Detroit-Warren-Livonia MSA, USEPA Region 5 staff have indicated that E 7 Mile (2601630019) will be 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. The 2019- 2021 data shows Allen Park (261630001), Warren (261631003), New Haven (2610990009) and Oak Park (261250001), are all below the 0.070 ppm design values, whereas E 7 Mile (261630019), and Port Huron (261470005) are at the 0.070 ppm design value.

Two monitors are required in the Ann Arbor MSA, they are 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 (261390005) 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 (260370002) location.

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 (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 (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) is operated by the Little River Band of Ottawa Indians. Continued operation in 2023 is anticipated contingent on funding.

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

Ozone nonattainment areas are classified based upon the severity of their ozone concentrations. Eight-hour Ozone (2015 Standard) classifications are listed below.

- Extreme: Area has a design value of 0.163 ppm and above
- Severe-17: Area has a design value of 0.111, up to but not including 0.163 ppm
- Severe-15: Area has a design value of 0.105, up to but not including 0.111 ppm
- Serious: Area has a design value of 0.093, up to but not including 0.105 ppm
- Moderate: Area has a design value of 0.081, up to but not including 0.093 ppm
- Marginal: Area has a design value of 0.071, up to but not including 0.081 ppm

Figure 5: Ozone Design Values 2018 – 2020⁸

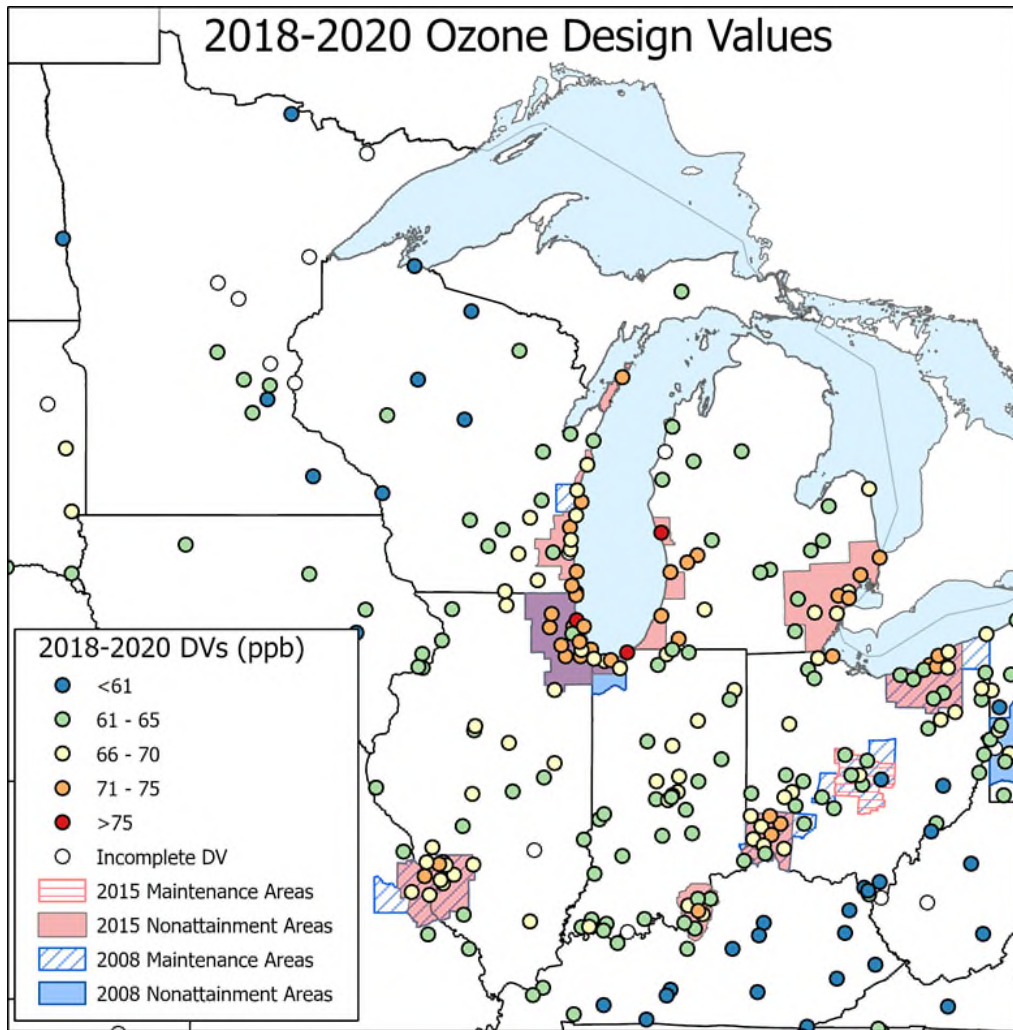


Table 11 summarizes the ozone monitoring site information for sites that were operational in 2022 and are planned to be operational in 2023. **Figure 6** illustrates the geographical distribution of this network.

⁸ Map provided by Angela F. Dickens, Ph.D, Lake Michigan Air Directors Consortium (LADCO).

MICHIGAN'S 2023 ANNUAL AMBIENT AIR MONITORING NETWORK REVIEW

Table 11: Michigan's Ozone Monitoring Network 2023

Operating Schedule: Hourly, March 1 to October 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											2021	
Site Name	AQS Site ID	Address	Latitude	Longitude	Purpose/ Type	Parameter Code	POC	Scale	County	Start Date	MSA ¹	Population Estimates
Holland	260050003	966 W 32 nd St	42.7678	-86.14861	max conc	44201	1	urban	Allegan	8/25/92	A	120,950
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	153,101
Cassopolis	260270003	Ross Beatty High School, 22721 Diamond	41.8956	-86.00167	pop exp	44201	2	urban	Cass	5/16/91	SBM	323,695
Rose Lake 2	260370002	9870 Stoll Rd, Lansing	42.7983	-84.39389	max conc	44201	1	urban	Clinton	9/30/16	LEL	540,281
Flint	260490021	Whaley Park, 3610 Iowa	43.0472	-83.67028	pop exp	44201	1	nghbrhd	Genesee	6/16/92	F	404,208
Otisville	260492001	G11107 Washburn Rd	43.1683	-83.46167	max conc	44201	1	urban	Genesee	5/13/80	F	404,208
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	404,208
Kalamazoo	260770008	Fairgrounds, 2500 Lake St	42.2781	-85.54194	pop exp	44201	1	nghbrhd	Kalamazoo	6/1/92	KP	261,108
Grand Rapids	260810020	1179 Monroe NW	42.9842	-85.6714	pop exp	44201	1	nghbrhd	Kent	4/24/80	GW	1,091,620
Evans	260810022	10300 14 Mile Road, NE	43.1767	-85.41667	max conc	44201	1	urban	Kent	4/1/99	GW	1,091,620
Tecumseh	260910007	6792 Raisin Center Highway	41.9956	-83.94667	up wind backgrd	44201	1	regional	Lenawee	7/6/93	AL	98,956
New Haven	260990009	57700 Gratiott	42.7314	-82.79361	max conc	44201	1	urban	Macomb	7/14/80	DWL	4,365,205
Warren	260991003	29900 Hoover	42.5133	-83.00611	max conc	44201	1	urban	Macomb	1/1/77	DWL	4,365,205
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	261210039	1340 Green Creek Road	43.2781	-86.31111	pop exp	44201	1	regional	Muskegon	5/1/91	MNS	176,511
Oak Park	261250001	13701 Oak Park Blvd.	42.4631	-83.18333	pop exp	44201	2	urban	Oakland	1/9/81	DWL	4,365,205
Jenison	261390005	6981 28Th Ave. Georgetown Twp.	42.8944	-85.85278	pop exp	44201	1	urban	Ottawa	4/1/89	GW	1,091,620
Port Huron	261470005	2525 Dove Rd	42.9533	-82.45639	pop exp	44201	1	urban	Saint Clair	2/28/81	DWL	4,365,205
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	369,390
Allen Park	261630001	14700 Goddard	42.2286	-83.2083	pop exp	44201	2	nghbrhd	Wayne	1/1/80	DWL	4,365,205
Detroit - E 7 Mile	261630019	11600 East Seven Mile Road	42.4308	-83.00028	max conc	44201	2	urban	Wayne	4/1/77	DWL	4,365,205

Tribal Stations

Monitoring Sites											2021	
Site Name	AIRS Site ID	Address	Latitude	Longitude	Purpose	Parameter Code	POC	Scale	County	Start Date	MSA ¹	Population Estimates
Manistee	261010922	3031 Domree Rd	44.307	-86.24268	transport	44,201	1	regional	Manistee	4/1/06	Not in MSA	N/A

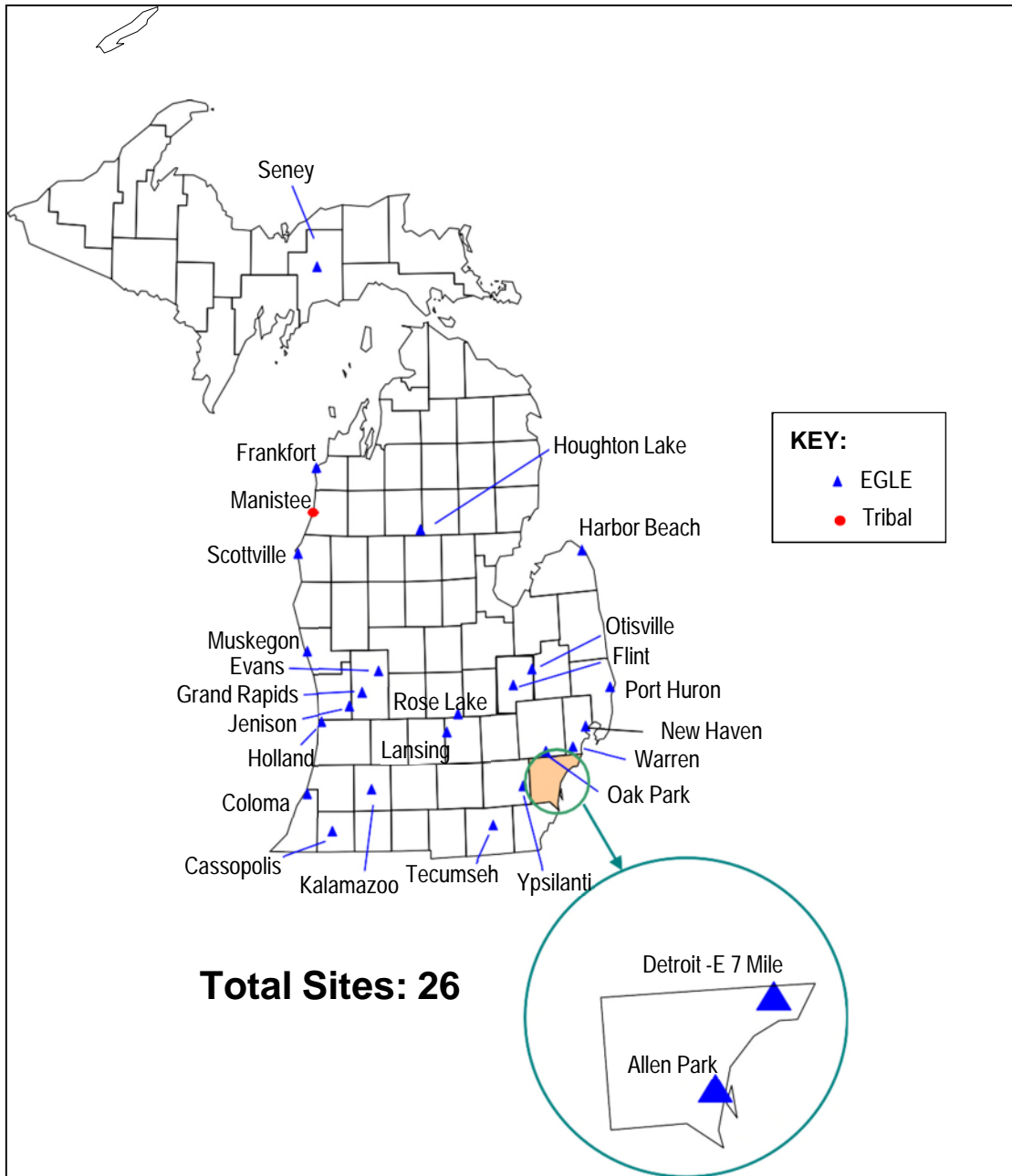
¹ **MSA Key:**
 A = Allegan Micropolitan Area
 AA = Ann Arbor MSA
 AL = Adrian Micropolitan Area
 DWL = Detroit-Dearborn-Livonia MSA and Warren-Troy-Farmington MSA
 F = Flint MSA
 GW = Grand Rapids-Kentwood MSA

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-INMI MSA

² **Former NAMS sites** are shown in **bold**. Old Lansing and Rose Lake have been moved

³ **NCore sites** are shown in *italics*.

Figure 6: Michigan's Ozone Network in 2022-2023



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 NO₂ 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 NO₂ background levels, as well as year-round ozone values, are necessary. Specifically, modeling staff need five years of ozone and NO₂ 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 (260650018) and Houghton Lake (261130001) stations. The new Filley St. Lansing (260650018) site was established in April 2018 when site access was lost to the Pennsylvania Ave. Lansing (260650012) site. EGLE continues to operate the same parameters as before. The collection of additional NO₂ data to support NSR modeling is discussed in the NO₂ section.

Ozone Quality Assurance

Site operators conduct 1-point quality assurance checks on the monitors every two weeks. Results are sent to the QA Manager for review each quarter. Each ozone monitor is also audited annually by the AMS'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 Manager reviews all audits. Hard copies are retained in the QA files.

The USEPA conducts TTP 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 7-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 in attainment or unclassifiable.

A redesignation request for the Ozone nonattainment area to the USEPA was submitted. And on March 11, 2022, the USEPA thus proposed to change the legal designation of the Detroit area from nonattainment to attainment for the 2015 ozone NAAQS, which is currently out for public comment. The USEPA will not take final action to determine that the Detroit area is attaining the NAAQS nor to approve the redesignation of this area if the design value of a monitoring site in the area violates the NAAQS prior to final approval of the redesignation. EGLE is committed to continuing monitoring ozone in this area to verify maintenance of the 2015 Ozone NAAQS.

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 2023 Ozone Monitoring Network

Beginning October 1, 2009, EGLE began collecting ozone measurements all year at the NCore sites and plans to continue through 2023:

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

To support NSR modeling projects, EGLE will continue to collect ozone measurements all year in 2023 at the following sites:

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

The current ozone network exceeds 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 2023 ozone network; operating March 1 through October 31:

- Holland (260050003)
- Frankfort/Benzonia (260190003)
- Coloma (260210014)
- Cassopolis (260270003)
- Rose Lake (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 (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 2023.

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/m³ to 12.0 µg/m³. 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 12**.⁹ 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.

⁹ Table D-5 of Appendix D to Part 58.

Reduced concentrations of PM_{2.5} measured since 2010 have caused the 2019-2020 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 just the one site to zero sites. Due to an increase in population, two monitoring 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 values were no longer within 85 percent of the NAAQS. As the agency works to transition to real-time monitoring, EGLE replaced the filter-based FRM sampler with a continuous FEM, MetOne BAM on January 6, 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 was less than 85 percent of the NAAQS, indicating that monitoring was no longer required. EGLE will continue to measure PM_{2.5} and has replaced the filter-based FRM and TEOM with a continuous FEM, MetOne BAM October 24, 2019.

As shown in **Table 13**, using the most recent three years of data, the Flint (260490021) monitor had an annual and a 24-hour design value equaling 6.8 and 17 µg/m³, respectively, which are less than 85 percent of their respective NAAQS. EGLE will still continue to operate a filter-based FRM PM_{2.5} monitor as a secondary sampler to the MetOne BAM in the Flint MSA in 2023. The continuous MetOne BAM replaced the TEOM on September 6, 2018.

The annual and 24-hour PM_{2.5} design values at the Lansing monitor (260650018) are no longer greater than 85 percent of the NAAQS, indicating that monitoring is no longer required. However, EGLE will continue to measure PM_{2.5}, and made the transition to a continuous FEM T640 in 2021 while continuing to run a co-located FRM filter-based sampler.

The Kalamazoo (260770008) monitor fulfilled the requirement that the Kalamazoo-Portage MSA have one FRM sampler. Both the 24-hour and annual design values are now less than 85 percent of the respective NAAQS, indicating that a site is no longer necessary in this MSA. On January 1, 2021, EGLE discontinued operation of both the primary and secondary, filter-based FRM PM_{2.5} samplers and the PM_{2.5} TEOM. A continuous PM_{2.5} FEM (T640) monitor installed October 20, 2020, will continue to operate at this site in 2023.

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} FRM monitor. Due to difficulties with accessing the Wealthy St. (260810007) site, EGLE had to relocate the PM_{2.5} monitor to the Jenison (261390005) site on January 14, 2018. The 24-hour and annual design values at both sites are now less than 85 percent of the respective NAAQS. EGLE replaced the FRM monitors at both sites with new, continuous PM_{2.5} FEM (T640X) monitors in October and December of 2020. The T640X has FEM status for PM_{2.5}, PM₁₀, and PM_{10-2.5}.

The Tecumseh site (260910007) is the upwind background site near the Detroit-Warren-Livonia MSA, where EGLE added a continuous FEM Thermo BAM on January 1, 2019, replacing the continuous PM_{2.5} TEOM and filter-based FRM sampler. In 2023 EGLE will replace the FEM Thermo BAM with a Teledyne T640 .

The sites at New Haven (260990009) and Oak Park (261250001) are the only sites in Macomb and Oakland Counties, respectively. EGLE will replace the Oak Park FRM monitor with an FEM Teledyne T640 in 2023. The New Haven PM_{2.5} FRM was replaced November 4, 2020, with a continuous PM_{2.5} FEM (T640X) monitor.

Houghton Lake (261130001) is the background PM_{2.5} FRM site in Michigan. EGLE replaced the filter-based sampler with a continuous PM_{2.5} MetOne BAM on January 1, 2019.

The Port Huron (261470005) site design value has also dropped, EGLE replaced the FRM PM_{2.5} monitor with a new continuous PM_{2.5} FEM (T640) monitor on November 6, 2020.

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. In 2023 at the Ypsilanti site (261610008), EGLE will replace the Thermo BAM with a PM_{2.5} FEM Teledyne T640 and shut down the co-located PM_{2.5} FRM.

Total of 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 with a primary and a secondary monitor. EGLE will continue the operation of both FRM monitors at Dearborn. Allen Park (261630001) is the population-oriented trend site, and an NCore site, and as such, is also required to collect speciated PM_{2.5} samples on a once every three day schedule. EGLE will continue to operate the FRM at the Allen Park site. Detroit-SWHS site (261630015) is the third highest site in the MSA. With construction of the GHIB near this site, EGLE will continue operating the primary PM_{2.5} along with a continuous FEM sampler. EGLE replaced the Thermo BAM with a T640 on September 29, 2020. The E 7 Mile (261630019) site PM_{2.5} FRM will be replaced with a continuous Teledyne T640 in 2023.

The Livonia site (261630025) in western Wayne County was shut down on January 1, 2019. The Livonia Near-road site (261630095) fulfilled the requirement for PM_{2.5} monitoring at the near-road site. However, the near-roadway site was shut down due to accessibility issues in July 2019. As a result, the MetOne BAM was moved to the Eliza Howell Near-roadway site (261630093) to satisfy the near-roadway requirement in the Detroit MSA for PM_{2.5} monitoring. A replacement site in Livonia along I-275 is slated to start sampling carbon monoxide and nitrogen dioxide in 2022.

A tribal PM_{2.5} FRM monitoring site located in Manistee (261010922) is operated by the Little River Band of Ottawa Indians and will continue to operate in 2023.

The above changes in the network will reduce the required number of FRM co-located sites. This reduction to 10 sites equates to a 15 percent co-location requirement of one site. EGLE proposes to keep Dearborn (261630033) as the co-located site.

Table 14 summarizes the PM_{2.5} FRM monitoring site information for sites that were operational in 2022 and are planned to be operational in 2023. **Figure 7** illustrates the geographical distribution of PM_{2.5} FRM monitors for 2023.

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

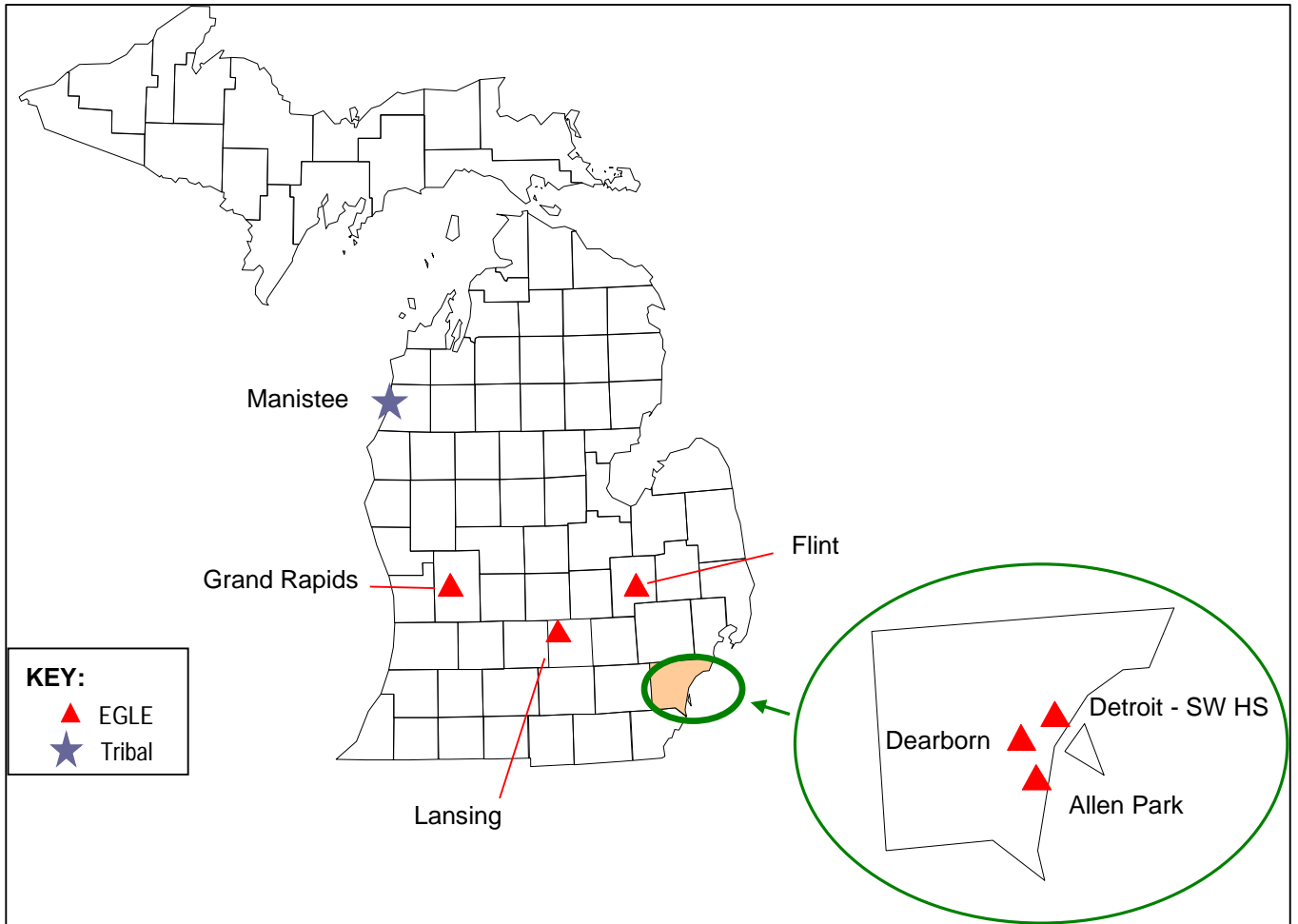
Monitoring Sites													
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose/Type	Parameter Code	POC	Scale	County	Start Date	MSA ¹	2021 Population Estimate
Flint	260490021	Whaley Park, 3610 Iowa St., Flint	43.04722	-83.670278	1:3	Pop. Exp./Co-located with Met One BAM	88101	1	Neighborhood	Genesee	12/16/98	F	404,208
Lansing	260650018	815 Filley St Lansing	42.76138	-84.562867	1:3	Pop. Exp./Co-located with T640	88101	1	Neighborhood	Ingham	05/16//2018	LEL	540,281
Grand Rapids	260810020	1179 Monroe St., NW,	42.984167	-85.671389	1:3	Pop. Exp./Co-located with T640X	88101	1	Neighborhood	Kent	10/23/98	GK	1,091,620
Allen Park	261630001	14700 Goddard	42.228611	-83.208333	1:3	Pop. Exp./Co-located with T640X	88101	1	Neighborhood	Wayne	5/12/99	DWL	4,365,205
Detroit - SWHS	261630015	150 Waterman	42.302778	-83.106667	1:3	Pop. Exp. Max. Conc.	88101	1	Neighborhood	Wayne	2/26/99	DWL	4,365,205
Dearborn	261630033	2842 Wyoming, Salina School	42.306666	-83.148889	1:3	Pop. Exp. Max. Conc.	88101	1	Neighborhood	Wayne	2/5/99	DWL	4,365,205
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	4,365,205

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	2019 Population 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: DWL = Detroit-Dearborn-Livonia MSA and Warren-Troy-Farmington MSA GK = Grand Rapids-Kentwood MSA
 F = Flint MSA LEL = Lansing - East 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 Section program QAPP. EGLE plans to operate one co-located PM_{2.5} FRM samplers, meeting the precision monitoring requirement of 15 percent. The sampling frequency of the co-located precision sampler at Dearborn (261630033) is once every six days. Each continuous method must have a co-located FRM sampler. An FRM sampler will operate at Flint (260490021) to co-locate with the MetOne BAM, Lansing (260650018) to co-locate with the T640, and both Grand Rapids (260810020) and Allen Park (261630001) NCore sites will operate FRM samplers with the T640X samplers.

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 AMS'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 Manager, copies are retained in the QA files, and the audits are uploaded to the AQS database. The AMS'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 Manager 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 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 2023 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 2023 network:

- Flint (260490021) one in six day (co-located with the MetOne BAM)
- Lansing (260650018) one in six day (co-located with the T640)
- Grand Rapids (260810020) one in three day-because of SASS/URG (co-located with the Teledyne T640X) (required for NCore)
- Manistee (261010922) tribal site, one in three day
- Allen Park (261630001) one in three day-because of SASS/URG (co-located with the Teledyne T640X) (required for NCore)
- Detroit-SWHS (261630015) one in three day
- Dearborn (261630033) one in three day
- Dearborn (261630033) one in six day (co-located with FRM)

CONTINUOUS PM_{2.5} MONITORING NETWORK

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 NAAQS. 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) were both replaced with continuous FEM T640X on October 20, and October 6, 2020, respectively, to meet the NCore requirement for continuous fine particulate measurements.

In 2023, EGLE will operate eight FEM MetOne BAM monitors, 15 FEM Teledyne T640 monitors, and four Teledyne T640X to supply continuous fine particulate data at 24 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 in 2023 will continue to run PM_{2.5} FEM T640 samplers at Detroit-SWHS (261630015), DP4th (261630098), Trinity (261630099) and Military Park (2616300100), which replaced the Thermo BAMs operational since the summer and fall of 2018.

The PM_{2.5}, T640, T640X, and BAM sites operate to support AIRNOW real time data reporting and to provide adequate spatial coverage.

A co-located site is required for a continuous PM method for every ten sites. The Trinity (261630099) site (or equivalent substitute) will operate a duplicate Teledyne T640 in 2023.

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

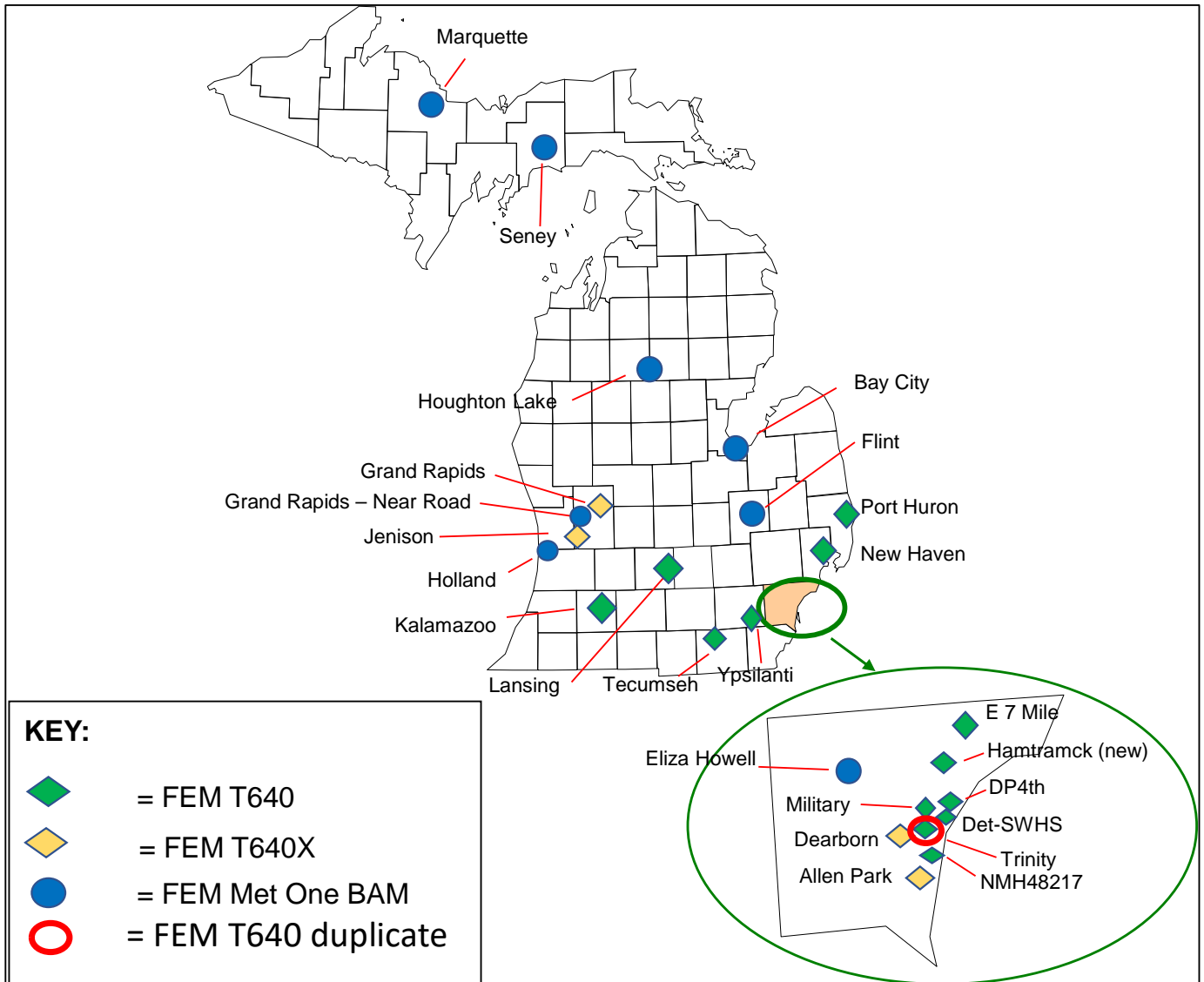
Operating Schedule: continuous

Method: MetOne Beta Attenuation Monitor (BAM) Method Code 170										
Site Name	Monitoring Sites		Latitude	Longitude	Purpose	Scale	County	Start Date	CBSA ¹	Estimated Population 2019
	AQS Site ID	Address								
Holland	260050003	966 W 32nd	42.767778	-86.148611	Pop. Exp.	urban	Allegan	8/1/19	A	118,081
Bay City	260170014	1001 Jennison St.	43.571389	-83.890833	Pop. Exp.	Neighborhood	Bay	8/1/19	BC	103,126
Flint	260490021	Whaley Park , 3610 Iowa St., Flint	43.047220	-83.670278	Pop. Exp./co-located with FRM)	Neighborhood	Genesee	9/11/18	F	405,813
Grand Rapids Near-Road	260810023	4365 Louisiana Ave. SW	42.885368	-85.679765	Pop. Exp.	Neighborhood	Kent	11/4/99	GK	1,077,370
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	1/1/21	Not in CBSA	N/A
Eliza Howell Near- Road	2601630094	23751 Fenkell St,	42.984167	-85.671389	Pop. Exp.	Neighborhood	Wayne	11/1/19	DWL	4,319,629
Marquette		To be determined			Background	Regional	Marquette	11/1/19	Not in CBSA	66,699

Method: Teledyne API T640 / T640X Method Code 236 / 238										
Site Name	Monitoring Sites		Latitude	Longitude	Purpose	Scale	County	Start Date	CBSA ¹	Estimated Population 2019
	AQS Site ID	Address								
Lansing	260650012	220 N. Pennsylvania	42.738611	-84.534722	Pop. Exp.	Neighborhood	Ingham	1/1/21	LEL	550,391
Kalamazoo	260770008	Fairgrounds, 1400 Olmstead Rd.	42.278056	-85.541944	Pop. Exp.	Neighborhood	Kalamazoo	1/1/21	KP	265,066
Grand Rapids.	260810020	1179 Monroe St., NW,	42.984167	-85.671389	Pop. Exp./co-located with FRM)	Neighborhood	Kent	1/1/21	GK	1,059,113
Tecumseh	260910007	6792 Raisin Center Highway	41.995556	-83.946667	up wind backgrd	regional	Lenawee	11/27/18	AL	98,451
New Haven	260990009	57700 Gratiot	42.731389	-82.793611	Pop. Exp.	Neighborhood	Macomb	1/1/21	DWL	4,319,629
Oak Park	261250001	13701 Oak Park Blvd.	42.463056	-83.183333	Pop. Exp.	Neighborhood	Oakland	12/22/22	DWL	4,319,629
Jenison	261390005	6981 29th Ave	42.894444	-85.852778	Background	Neighborhood	Ottawa	1/1/21	GK	1,077,370
Port Huron	261470005	2525 Dove Rd.	42.953333	-82.456389	Pop. Exp.	Urban	St. Clair	1/1/21	DWL	4,319,629
Ypsilanti	261610008	555 Towner Ave.	42.240556	-83.599722	Pop. Exp.	Neighborhood	Washtenaw	2/24/00	AA	367,601
Allen Park	261630001	14700 Goddard	42.228611	-83.208333	Pop. Exp./co-located with FRM)	Neighborhood	Wayne	1/1/21	DWL	4,319,629
Detroit-SWHS	261630015	150 Waterman	42.302778	-83.106667	Background	Neighborhood	Wayne	1/1/21	DWL	4,319,629
Detroit-E7 Mile	261630019	11600 E. 7 Mile	42.430833	-83.000278	Pop. Exp.	Neighborhood	Wayne	12/22/22	DWL	4,319,629
Dearborn	261630033	2842 Wyoming, Salina School	42.306666	-83.148889	Pop. Exp./ Max. Conc.	Neighborhood	Wayne	12/22/22	DWL	4,319,629
NMH48217	261630097	3225 S Deacon St.	42.261669	-83.157893	Pop. Exp.	Neighborhood	Wayne	7/22/21	DWL	4,319,629
DP4th	161630098	4700 W Fort St	42.312158	-83.091943	Background	Neighborhood	Wayne	1/1/21	DWL	4,319,629
Trinity	261630099	9191 W Fort St	42.295824	-83.129431	Background	Neighborhood	Wayne	1/1/21	DWL	4,319,629
Trinity	261630099	9191 W Fort St	42.295824	-83.129431	Background (co-located T640)	Neighborhood	Wayne	1/1/21	DWL	4,319,629
Military	261630100	1238 Military St	42.312078	-83.103469	Background	Neighborhood	Wayne	1/1/21	DWL	4,319,629
Hamtramack	261630102	to be determined	—	—	Background	Neighborhood	Wayne	12/22/22	DWL	4,319,629

A = Holland Micropolitan Area
 AA = Ann Arbor Metro. Area
 AL = Adrian Micropolitan Area
 BC = Bay City Metro. Area
 DWL = Detroit-Dearborn-Livonia MSA and Warren-Troy-Farmington MSA
 F = Flint Metro Area
 GK = Grand Rapids-Kentwood MSA
 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 AMS'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 Manager 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 AQS database.

Plans for the 2023 Continuous MetOne BAM and Teledyne T640/T640X PM_{2.5} Network

During 2023, EGLE plans to operate PM_{2.5} MetOne BAM monitors at:

- Holland (260050003) Method 170
- Bay City (260170014) Method 170
- Flint (260490021) Method 170 (*co-located with FRM*)
- Grand Rapids-Near-road (260810023) Method 170
- Houghton Lake (261130001) Method 170
- Seney (261530001) Method 170
- Eliza Howell-Near-road (261600101) Method 170
- Marquette (to be assigned) Method 170

During 2023, EGLE plans to operate PM_{2.5} Teledyne T640/**T640X** monitors at:

- Lansing (260650018) Method 236 (*co-located with FRM*)
- Kalamazoo (260770008) Method 236
- Grand Rapids (260810020) **Method 238** (*co-located with FRM*)
- Tecumseh (260910007) Method 236
- New Haven (260990009) Method 236
- Oak Park (261250001) Method 236
- Jenison (261390005) **Method 238**
- Port Huron (261470005) Method 236
- Ypsilanti (261610008) Method 236
- Allen Park (261630001) **Method 238** (*co-located with FRM*)
- Detroit–SWHS (261630015) Method 236
- Det-E7 Mile (261630019) Method 236
- Dearborn (261630033) **Method 238**
- NMH 48217 (261630095) Method 236
- DP4th (261630098) Method 236
- Trinity (261630099) Method 236
- Trinity* (261630099) Method 236 (*co-located with T640*)
- Military (261630100) Method 236
- Hamtramck (261630102) Method **238**

A co-located site* is required for every ten sites for a continuous PM method. The Trinity (260650018) site (or equivalent) will operate a duplicate Teledyne T640 in 2023.

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 a 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 MetOne SUPER 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 aethalometers. 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 (261630015) in 2018. An aethalometer will be purchased and installed at the new North Detroit (Hamtramck area) site in 2023, using the grant funds from the American Rescue Plan (ARP) direct awards.

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 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 AMS's QA Manager. Only the audit data for SASS/URG is uploaded to the 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.

MICHIGAN'S 2023 ANNUAL AMBIENT AIR MONITORING NETWORK REVIEW

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													Pop 2017 Estimate
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose/Type	POC	Scale	County	Start Date	MSA ¹	Estimate	
Grand Rapids	260810020	1179 Monroe St., NW,	42.984	-85.67139	1:3	Pop. Exp.	5	Neighborhood	Kent	11/4/99	GK	1,091,620	
Allen Park	261630001	14700 Goddard	42.229	-83.20833	1:3	Pop. Exp.	5	Neighborhood	Wayne	12/1/00	DWL	4,365,205	
Detroit-SWHS	261630015	150 Waterman St	42.303	-83.10667	1:6	Pop. Exp. Max. Conc.	5	Neighborhood	Wayne	11/2/08	DWL	4,365,205	
Dearborn	261630033	2842 Wyoming, Salina School	42.307	-83.14889	1:6	Pop. Exp. Max. Conc.	5	Neighborhood	Wayne	9/26/03	DWL	4,365,205	

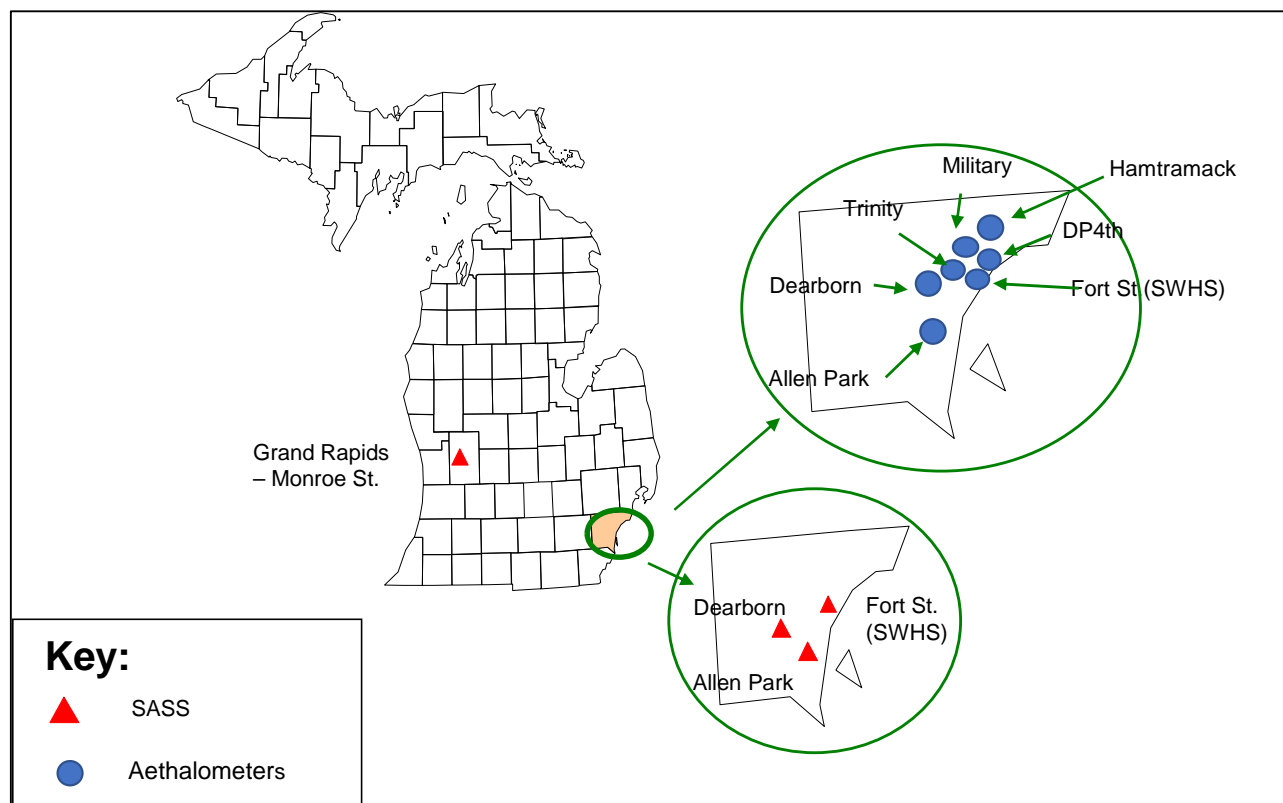
Continuous Speciation Measurements

Method: Magee Aethalometer: Method Code 861

Monitoring Sites													Pop 2017 Estimate
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Method	Purpose	POC	Scale	County	Start Date	MSA ¹	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	4,365,205	
Detroit-SWHS	261630015	150 Waterman St	42.303	-83.10667	McGee large spot Aethalometer (carbon black)	SPM		Neighborhood	Wayne	8/20/18	DWL	4,365,205	
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	4,365,205	
DP4th	161630098	4700 W Fort St	42.3122	-83.091943	McGee large spot Aethalometer (carbon black)	SPM	1	Neighborhood	Wayne	7/30/18	DWL	4,365,205	
Trinity	261630099	9191 W Fort St	42.2958	-83.129431	McGee large spot Aethalometer (carbon black)	SPM	1	Neighborhood	Lenawee	10/23/18	DWL	4,365,205	
Military	261630100	1238 Military St	42.3121	-83.129431	McGee large spot Aethalometer (carbon black)	SPM	1	Neighborhood	Wayne	11/17/18	DWL	4,365,205	
Hamtramck	261630102	to be determined	—	—	McGee large spot Aethalometer (carbon black)	SPM	1	Neighborhood	Wayne	11/17/18	DWL	4,365,205	

¹ MSA Key: DWL = Detroit-Dearborn-Livonia MSA and warren-Troy-Farmington MSA
 GK = Grand Rapids-Kentwood MSA
 PM = Special Purpose Monitor

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



Plans for the 2023 PM_{2.5} Speciation Monitoring Network

MetOne SASS and URG 3000N:

During 2023, contingent upon adequate levels of funding, EGLE will continue to operate 24-hour PM_{2.5} speciation monitors at:

- Grand Rapids (260810020) operating once every three days;
- Allen Park (261630001) operating once every three days;
- Detroit-SWHS (261630015) operating once every six days; and
- Dearborn (261630033) operating once every six days.

Black Carbon - Aethalometer:

During 2022, EGLE will continue to operate hourly Magee aethalometer monitors at:

- Allen Park (261630001);
- Detroit-SWHS (261630015);
- Dearborn (261630033);
- DP4th 261630098);
- Trinity (261630099);
- Military Park (261630100); and
- Hamtramck (to be determined) new.

PM₁₀ MONITORING NETWORK

The October 17, 2006, monitoring regulations modified the minimum number of PM₁₀ samplers required in MSAs. Since then, further revisions have occurred, relaxing the numbers of sites required in high population areas with low concentrations of PM₁₀, as shown in **Table 17**.¹⁰

Table 17: PM₁₀ 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 the USEPA and the state agency.

² High concentration areas are those for which ambient PM₁₀ data show ambient concentrations exceeding the PM₁₀ NAAQS by 20% or more.

³ Medium concentration areas are those for which ambient PM₁₀ data show ambient concentrations exceeding 80% of the PM₁₀ NAAQS.

⁴ Low concentration areas are those for which ambient PM₁₀ data show ambient concentrations < 80% of the PM₁₀ 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 PM₁₀ data results in the design requirements that are shown in **Table 18**.

According to the tables, two to four PM₁₀ 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 one at Allen Park (261630001) was shut down January 7, 2021, and replaced with the FEM, continuous T640X, which has been sampling since October 6, 2020.

The PM₁₀ monitoring requirements specify that two to four PM₁₀ sites are required in the Grand Rapids-Wyoming MSA. There are two sites in operation, one at Grand Rapids (260810020) and the second at Jenison (261390005). In January 2021, EGLE shut down both high volume filter-based monitors at each site and replaced them with the FEM, continuous T640X monitors that started sampling October and December 2020.

According to the requirements, either zero or one PM₁₀ monitor is required in the Flint MSA. In 2006, EGLE operated a PM₁₀ sampler in Flint (260490021) but as a result of budget cuts and low concentrations, PM₁₀ sampling was discontinued on April 1, 2007.

¹⁰ Table D-4 of Appendix D to Part 58.

As part of a special study investigating concentrations of manganese (Mn) in the Detroit urban area, PM₁₀ filters at Allen Park (261630001), Detroit-SWHS (261630015) and Dearborn (261630033) were analyzed for Mn and compared with the concentrationsof Mn on the TSP filters. The manganese data was reviewed and determined to be equivalent to the TSP values. Therefore, the PM₁₀ manganese analysis was discontinued in March 2009.

PM_{10-2.5} (coarse) measurements are required at NCore sites in Grand Rapids–Monroe St. (260810020) and Allen Park (261630001). It is determined by subtracting the fine particulate from the PM₁₀ size fraction. This is now measured by the FEM, continuous T640X which began on October 22, 2020.

Table 18: Application of the Minimum PM₁₀ Monitoring Regulations in the April 30, 2007, Correction to the October 17, 2006, Final Revision to the Monitoring Regulation to Michigan's PM₁₀ Network

MSA	Design value sites are in bold			2019-2021 most recent 3-year PM ₁₀ design value (24-Hr)	Conc. Class.	Min No monitors Required
	2021 Estimated Population	Counties	Existing Monitors			
		Macomb	---	---		2-4
		Oakland	---	---		
Detroit-Dearborn-Livonia MSA and Warren-Troy-Farmington MSA	4,365,208	Wayne	Allen Park	39	low	
			Detroit -SWHS	65	low	
			Dearborn	53	low	
		Lapeer	---	---		
		St Clair	---	---		
		Livingston	---	---		
Flint MSA	404,208	Genesee	---	---		
Monroe MSA	155,274	Monroe	---	---		
Ann Arbor MSA	369,390	Washtenaw	---	---		0-1
Grand Rapids-Kentwood MSA	1,090,620	Kent	Grand Rapids	43		2
		Barry		---		
		Ottawa	Jenison started 2018	50		
		Montcalm	---	---		
Muskegon-Norton Shores MSA	176,511	Muskegon	---	---		
Lansing-East Lansing MSA	540,281	Clinton	---	---		0-1
		Ingham	---	---		
		Eaton	---	---		
Bay City MSA	102,985	Bay	---	---		
Saginaw MSA	189,591	Saginaw	---	---		
Kalamazoo-Portage MSA	261,108	Kalamazoo	---	---		0-1
		Van Buren	---	---		
Niles-Benton Harbor MSA	153,101	Berrien	---	---		
Jackson MSA	160,050	Jackson	---	---		
Battle Creek MSA	133,819	Calhoun	---	---		
South Bend-Mishawaka MSA	323,695	Cass	---	---		0-1
		St. Joseph, IN	---	---		

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

Table 19 summarizes the PM₁₀ monitoring site information for sites in operation in 2022-2023. **Figure 10** shows the PM₁₀ monitoring locations for 2022-2023.

Table 19: Michigan's PM₁₀ Monitoring Network

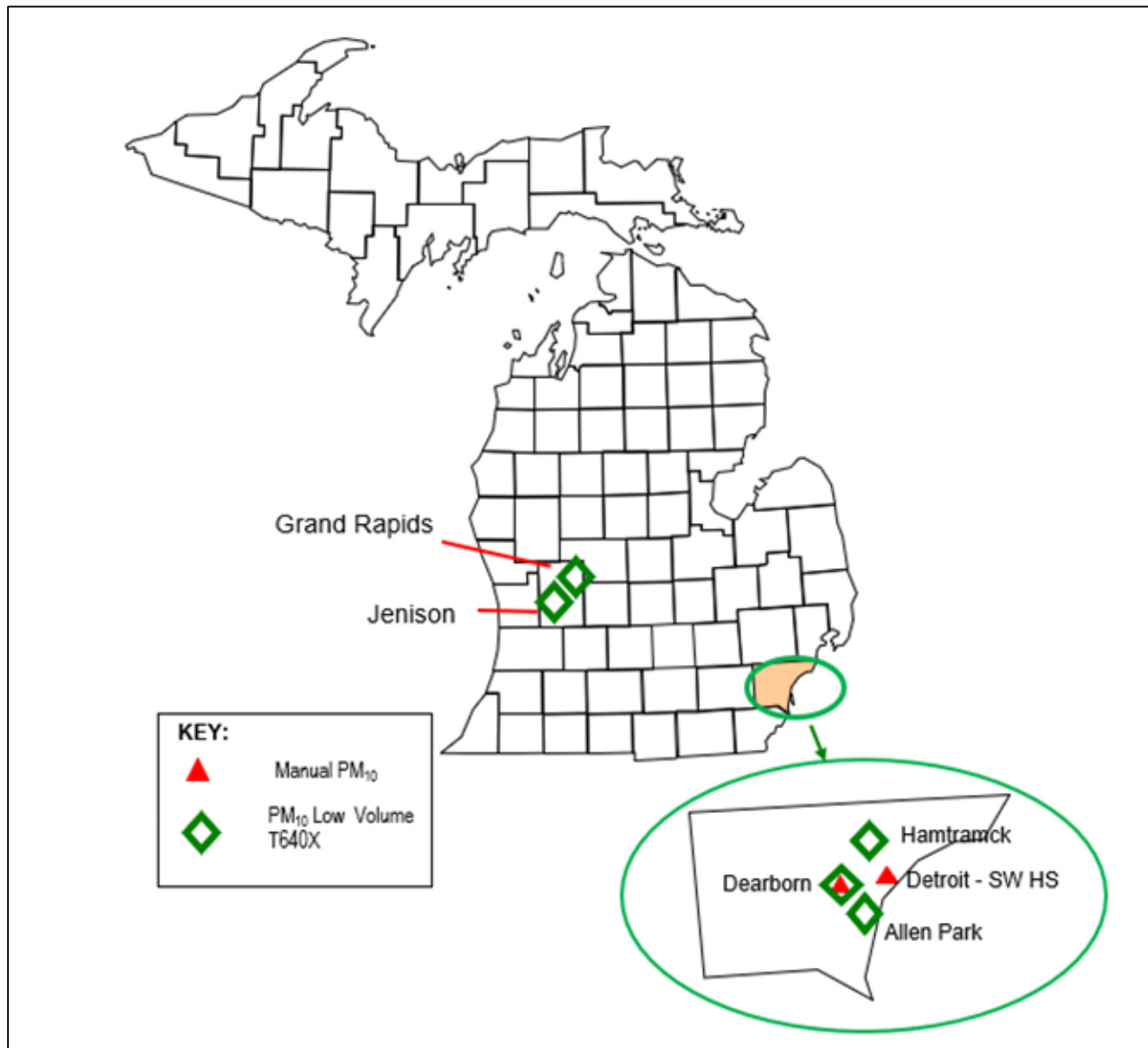
Manual High Volume PM ₁₀ Sites															
Method: Manual High Volume Sampler Tisch Environmental, Inc. Model TE-6070D-B															
Monitoring Sites														2021	
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Monitor Type	Purpose/Type	Parameter Code	POC	Scale	County	Start Date	CBSA ¹	Population Estimate	
Detroit - SWHS	261630015	150 Waterman	42.30278	-83.106667	1:6	High Vol	max conc	81102	1	nghbrhd	Wayne	3/27/87	DWL	4,365,205	
Dearborn	261630033	2842 Wyoming	42.30667	-83.148889	1:6	High Vol	max conc	81102	1	nghbrhd	Wayne	6/12/90	DWL	4,365,205	
Dearborn	261630033	2842 Wyoming	42.30667	-83.148889	1:12	High Vol for precision	max conc	81102	9	nghbrhd	Wayne	6/12/90	DWL	4,365,205	

Continous Low Volume PM ₁₀ Sites															
Method: Continous Particulate Mass Monitor Teledyne T640x PM ₁₀															
Monitoring Sites														2021	
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Monitor Type	Purpose/Type	Parameter Code	POC	Scale	County	Start Date	CBSA ¹	Population Estimate	
Grand Rapids	260810020	1179 Monroe NW	42.98417	-85.671389	continuous	T640x	pop exp	81102	1	nghbrhd	Kent	1/1/21	GK	1,091,620	
Jerison	261390005	6981 28Th Ave. Georgetown Twp.	42.89444	-85.852778	continuous	T640x	pop exp	81102	1	nghbrhd	Ottawa	1/1/21	GK	1,091,620	
Allen Park	261630001	14700 Goddard	42.22861	-83.208333	continuous	T640x	pop exp	81102	1	nghbrhd	Wayne	1/1/21	DWL	4,365,205	
Dearborn	261630033	2842 Wyoming	42.30667	-83.148889	continuous	T640x	max conc	81102	3	nghbrhd	Wayne	12/22/22	DWL	4,365,205	
Hamtramck	to be determined	to be determined	NA	NA	continuous	T640x	max conc	81102	1	nghbrhd	Wayne	7/15/05	DWL	4,365,205	

NCore Continous Low Volume PM Coarse Sites															
Method: Continous Particulate Mass Monitor Teledyne T640x PM _{10-2.5}															
Monitoring Sites														2021	
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Monitor Type	Purpose/Type	Parameter Code	POC	Scale	County	Start Date	CBSA ¹	Population Estimate	
Grand Rapids	260810020	1179 Monroe NW	42.98417	-85.671389	continuous	T640X	pop exp	81102	1	nghbrhd	Kent	1/1/21	GK	1,091,620	
Allen Park	261630001	14700 Goddard	42.22861	-83.208333	continuous	T640X	pop exp	81102	1	nghbrhd	Wayne	1/1/21	DWL	4,365,205	

¹ CBSA Key: DWL= Detroit-Dearborn-Livonia MSA and Warren-Troy-Farmington MSA
GK=Grand Rapids-Kentwood MSA

Figure 10: Michigan's PM₁₀ Monitoring Network



PM₁₀ 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 AMS'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 Manager reviews all audit results, and hard copies are retained in the QA files. Audit results are uploaded to the AQS database each quarter.

Plans for the 2023 PM₁₀ Monitoring Network

During 2023, contingent upon adequate levels of funding, EGLE is planning to operate:

1. High volume PM₁₀ monitors sampling over 24 hours at:
 - Detroit–SWHS (261630015) - once every six day
 - Dearborn (261630033) - once every six day
 - Dearborn (261630033) - once every 12 day (co-located)

2. Low volume PM₁₀ continuous Teledyne T640/T640X monitors to measure both PM₁₀ and PM_{10-2.5} (PM_c) at the following sites
 - Grand Rapids (260810020) PM₁₀ and PM_c
 - Jenison (261390005) PM₁₀
 - Allen Park (261630001) PM₁₀ and PM_c
 - Dearborn (261630033) PM₁₀
 - Hamtramck (to be determined) PM₁₀ and PM_c (new)

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, 2011¹¹, 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 NO₂ network design. EGLE had CO monitor at two sites; Eliza Howell Near-road (261630093) and the Livonia Near-road (261630095) site. Due to site access issues the Livonia Near-road site had to be shut down and relocated to the Livonia Near-road 2 (261630101) site in summer 2022. Due to an increase in population, the Grand Rapids MSA is required to have a near-roadway monitoring station. EGLE established a near-roadway monitoring site in Grand Rapids in 2022.

Table 20 summarizes the CO monitoring site information for sites that will operate in 2023. **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 Manager each quarter. Each monitor is audited annually by the AMS'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 Manager reviews all audit results, and hard copies are retained in the QA files.

External audits are conducted by the USEPA's TTP audit procedure for regular and trace level CO monitors. The USEPA reports the results to AQS.

¹¹ Environmental Protection Agency, "National Ambient Air Quality Standards for Carbon Monoxide," 40 CFR Parts 50, 53 and 58, proposed rule, January 28, 2011.

Plans for the 2023 CO Monitoring Network

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

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

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

- Grand Rapids Near-road (26810023);
- Eliza Howell (roadway) (261630093); and
- Livonia Near-road 2 (261630101).

Contingent on adequate funding, EGLE will operate the CO monitors around the GHIB project at:

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

Figure 11: Michigan's CO Monitoring Network

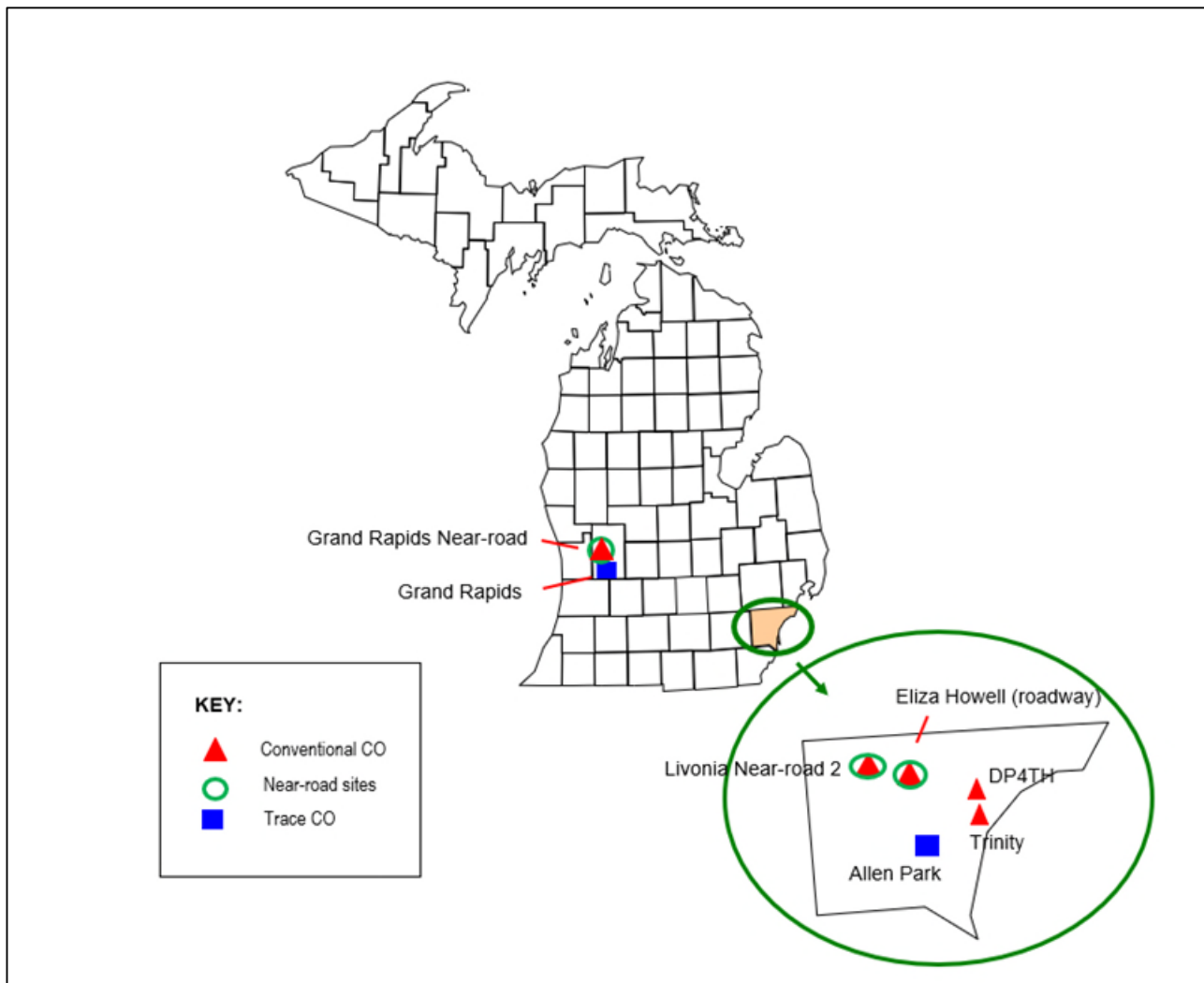


Table 20: Michigan's CO Monitoring Network

Operating Schedule: Continuous

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

Ncore Sites (Trace)

Monitoring Sites													2021
Site Name	AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose/Type	Parameter Code	POC	Scale	County	Start Date	MSA ¹	Population Estimate
Grand Rapids - Monroe St	260810020	1179 Monroe NW	42.984167	-85.671389	trace CO	pop exp	42101	1	nghbrhd	Kent	1/1/08	GK	1,091,620
Allen Park	261630001	14700 Goddard	42.228611	-83.208333	trace CO	pop exp	42101	1	nghbrhd	Wayne	1/1/08	DWL	4,365,205

Near Roadway Sites

Monitoring Sites													2019
Site Name	AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose	Parameter Code	POC	Scale	County	Start Date	MSA ¹	Population Estimate
Grand Rapids Near - Road	260810023	4365 Louisiana Ave. SW	42.885368	-85.679765	CO	Near Road	42101	1	micro	Kent	8/1/20	GK	1,091,620
Eliza Howell Near - Road	261630093	Service Road I-96 & Telegraph	42.38599	-83.26632	CO	Near Road	42101	1	micro	Wayne	9/1/11	DWL	4,365,205
Livonia Near - Road	261630101	14975 Eckels Rd	42.393574	-83.431948	CO	Near Road	42101	1	micro	Wayne	8/1/20	DWL	4,365,205

Special Purpose Monitors

Monitoring Sites													2019
Site Name	AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose	Parameter Code	POC	Scale	County	Start Date	MSA ¹	Population Estimate
DP4th	261630098	4700 W Fort St	42.312158	-83.091943	CO	SPM	42101	1	nghbrhd	Wayne	7/27/18	DWL	4,365,205
Trinity	261630099	9191 W Fort St	42.295824	-83.129431	CO	SPM	42101	1	nghbrhd	Wayne	10/25/18	DWL	4,365,205

¹ MSA Key:

DWL = Detroit-Dearborn-Livonia MSA and Warren-Troy-Farmingt
 GK = Grand Rapids-Kentwood MSA

NITROGEN DIOXIDE (NO₂) and NO_y MONITORING NETWORK

On February 9, 2010, the USEPA modified the NO₂ 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 NO₂ 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 1,000,000 people must have a microscale NO₂ 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 NO₂ 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 NO₂ 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 NO₂ 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, 2013.¹² 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 NO₂ 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 requirements was approved. EGLE started operation of the

¹² “Primary National Ambient Air Quality Standards for Nitrogen Dioxide,” USEPA, 40 CFR Parts 50 and 58. February 9, 2010.

Grand Rapids near-road monitoring station in summer 2022. 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 installed a 'true NO₂' for PAMS, which would meet both the population requirement and the PAMS requirement. Previously when the USEPA funding for the PAMS direct NO₂ was initially delayed, in 2019 EGLE installed a traditional NO_x analyzer at Jenison (261390005). Once the PAMS funding was received for the direct NO₂ sampler at Grand Rapids, EGLE shut down the NO_x analyzer at Jenison on January 6, 2021.

Table 21 summarizes the monitoring requirements for NO₂ according to the various tiers for all CBSAs in Michigan. As shown by this table, two monitors are required in Grand Rapids-Wyoming MSA and three monitors are required in the Detroit-Warren-Livonia MSA.

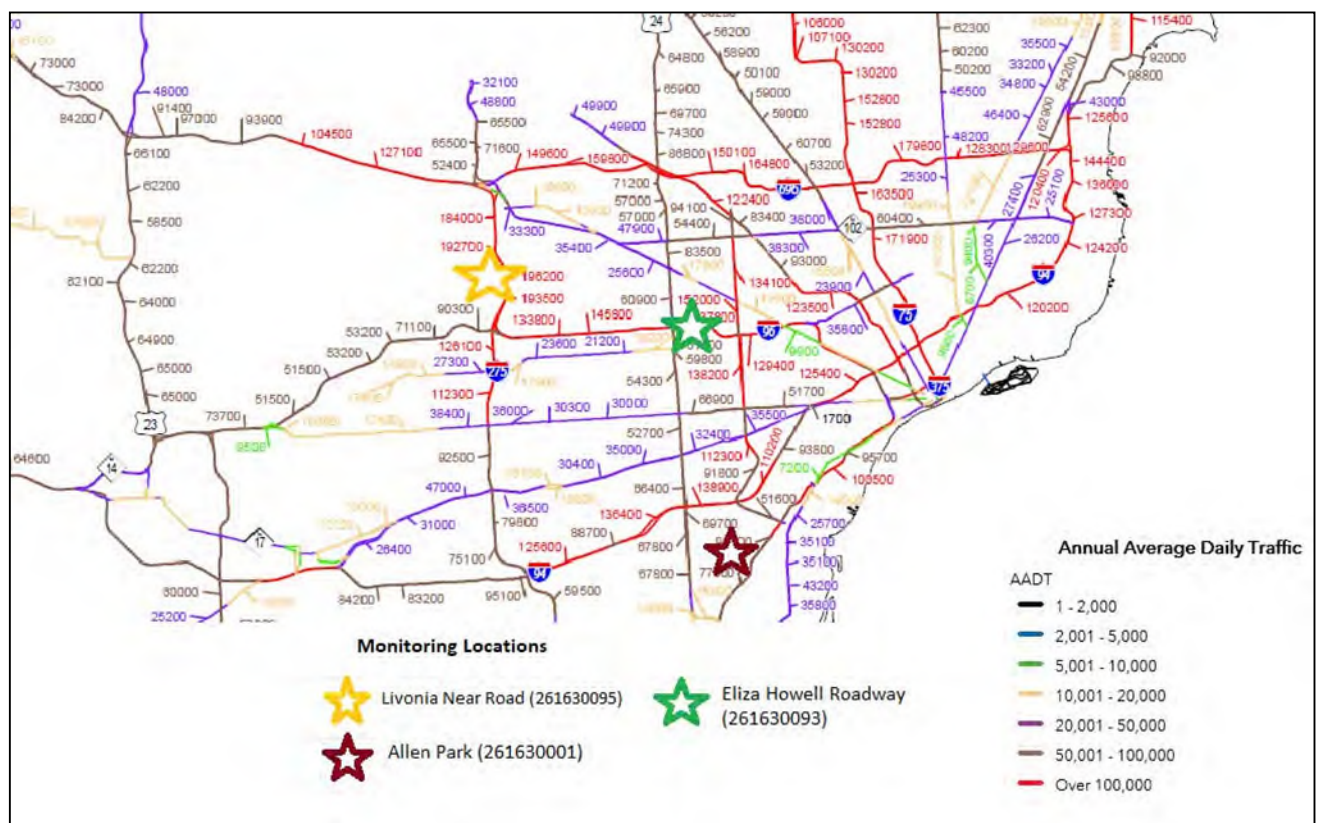
Table 21: NO₂ Network Design

MSA	Counties	2021 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	4,365,205	1	1		1	
Flint MSA	Genesee	404,208					
Monroe MSA	Monroe	155,274					
Ann Arbor MSA	Washtenaw	369,390					
Grand Rapids-Wyoming MSA	Kent Barry Ottawa Montcalm	1,091,620	1			1	
Muskegon-Norton Shores MSA	Muskegon	176,511					
Lansing-East Lansing MSA	Clinton Ingham Eaton	618,583					
Bay City MSA	Bay	102,985					
Saginaw MSA	Saginaw	189,591					
Kalamazoo-Portage MSA	Kalamazoo Van Buren	261,108					
Niles-Benton Harbor MSA	Berrien	153,101					
Jackson MSA	Jackson	160,050					
Battle Creek MSA	Calhoun	133,819					
South Bend Mishawaka MSA IN/MI	Cass St. Joseph, IN	323,695					

Tier 1: Near-roadway NO₂ 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 showing Annual Average Daily Traffic (AADT)** from 2013. Due to site access issues the site had to be shut down. It has been relocated in the same traffic area segment and started operation in summer of 2022. (<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 NO₂ 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 NO₂ monitors at the sites identified as Detroit-SWHS (261630015), DP4th (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 August 15, 2018, to prepare the site for the PAMS network, which includes the operation of direct NO₂ and NO_y monitors. The NO_y monitor has been operational since May 15, 2019, and the direct NO₂ has been operating since January 28, 2021.

The Grand Rapids MSA area is required to have an area wide NO₂ monitor as the population requirement. The NO_y monitor at the NCore site does not satisfy this requirement. EGLE installed a 'true NO₂' for PAMS, which meets both the population requirement and the PAMS requirement. When the USEPA funding for the PAMS direct NO₂ was delayed, on January 10, 2019, EGLE installed a traditional NO_x analyzer at Jenison (261390005). This was shut down on January 6, 2021, once PAMS funding allowed for the direct NO₂ sampler at Grand Rapids to be operational on January 14, 2021. This will meet both the NCore and PAMS requirements.

NO₂ Monitoring for GHIB Study

In 2018, to monitor NO₂ before, during, and after construction of the GHIB, EGLE added three new sites; DP4th (261630098), Trinity (261630099) and Military Park (261630100), in addition to the existing Detroit-SWHS site (2616300015).

NO₂ Monitoring for NSR

Recent modeling projects for NSR (New Source Review) have shown that there is a possibility that the new 1-hour NO₂ 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 NO₂ data are required in both urban and rural locations. Therefore, on July 1, 2010, EGLE began collecting NO₂ 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. The Detroit-E 7 Mile site is operating an NO_y monitor for PAMS.

Table 22 summarizes the NO₂ and NO_y monitoring site information for sites that were running in 2022 and will continue to operate in 2023. **Figure 13** shows the NO₂ and NO_y monitoring network operated by EGLE in 2022 and 2023.

NO₂ 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 Manager each month. Each monitor is audited annually by the AMS'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 AQS database each quarter. The QA Manager reviews all audit results and hard copies are retained in the QA files.

For conventional (non-trace level) NO₂ monitors, the USEPA conducts TTP 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 TTP audits for the NO_y monitors.

Plans for the 2023 NO₂ and NO_y Monitoring Network

During 2023, contingent upon adequate levels of funding, EGLE is planning to operate NO₂, NO_x at the following sites:

- Grand Rapids Near-road (260810023) Tier 1
- Eliza Howell Near-road site (261630093) Tier 1
- Livonia Near-road (261630095) Tier 1
- Lansing (260650018) Tier 2
- Houghton Lake (261130001) Tier 2
- Detroit SWHS (261630015) Tier 2
- DP4 (261630098) Tier 2
- Trinity (261630099) Tier 2
- Military (261630100) Tier 2

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

- Grand Rapids–Monroe St. (26810020) - NCore and PAMS
- Allen Park (261630001) - NCore
- Detroit-E 7 Mile (261630019) - PAMS

Also contingent upon adequate funding, EGLE will in 2023 operate direct NO₂ monitors during the PAMS season at the following sites:

- Grand Rapids (260810020)
- Detroit-E 7 Mile (261630019)

MICHIGAN'S 2020 ANNUAL AMBIENT AIR MONITORING NETWORK REVIEW

Table 22: Michigan's NO₂ and NO_y Monitoring Network

Operating Schedule: Continuous
 Method: Chemiluminescence, Method Code 074 (NO_x) 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	2021 Population Estimate
Grand Rapids	260810020	1179 Monroe NW	42.984167	-85.671389	NO _y *	pop exp	42612	1	nghbrhd	Kent	1/1/08	GK	1,091,620
Allen Park	261630001	14700 Goddard	42.228611	-83.208333	NO _y	pop exp	42612	1	nghbrhd	Wayne	1/1/08	DWL	4,365,205

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	2021 Population Estimate
Grand Rapids Near-Road	260810023	4365 Louisiana Ave. SW	42.885368	-85.679765	NO ₂	pop exp	42602	1	nghbrhd	Kent	6/30/22	GK	1,091,620
Eliza Howell Near-Road	261630093	Service Road I-96 & Telegraph	42.38599	-83.26632	NO ₂	Near Road	42602	1	micro	Wayne	9/1/11	DWL	4,365,205
Livonia Near-Road	261630101	14975 Eckels Rd.	42.393574	-83.431948	NO ₂	Near Road	42602	1	micro	Wayne	1/1/15	DWL	4,365,205

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	2019 Population Estimate
Lansing	260650018	220 N Pennsylvania	42.738611	-84.534722	NO ₂	pop exp	42602	1	nghbrhd	Ingham	9/5/80	LEL	540,281
Houghton Lake	261130001	1769 S Jeffs Road	44.310556	-84.891944	NO ₂	background	42602	1	regional	Missaukee	4/1/98	Not in CBSA	N/A
Detroit-SWHS	261630015	150 Waterman	42.302778	-83.106667	NO ₂	SPM	42602	1	nghbrhd	Wayne	6/1/18	DWL	4,365,205
Detroit - E 7 Mile	261630019	11600 East Seven Mile Road	42.430833	-83.000278	NO _y *	pop exp	42602	1	urban	Wayne	12/1/90	DWL	4,365,205
DP4th	261630098	4700 W Fort St	42.312158	-83.091943	NO ₂	SPM	42602	1	nghbrhd	Wayne	7/17/18	DWL	4,365,205
Trinity	261630099	9191 W Fort St	42.295824	-83.129431	NO ₂	SPM	42602	1	nghbrhd	Wayne	10/17/18	DWL	4,365,205
Military	261630100	1238 Military St	42.312078	-83.103469	NO ₂	SPM	42602	1	nghbrhd	Wayne	11/1/18	DWL	4,365,205

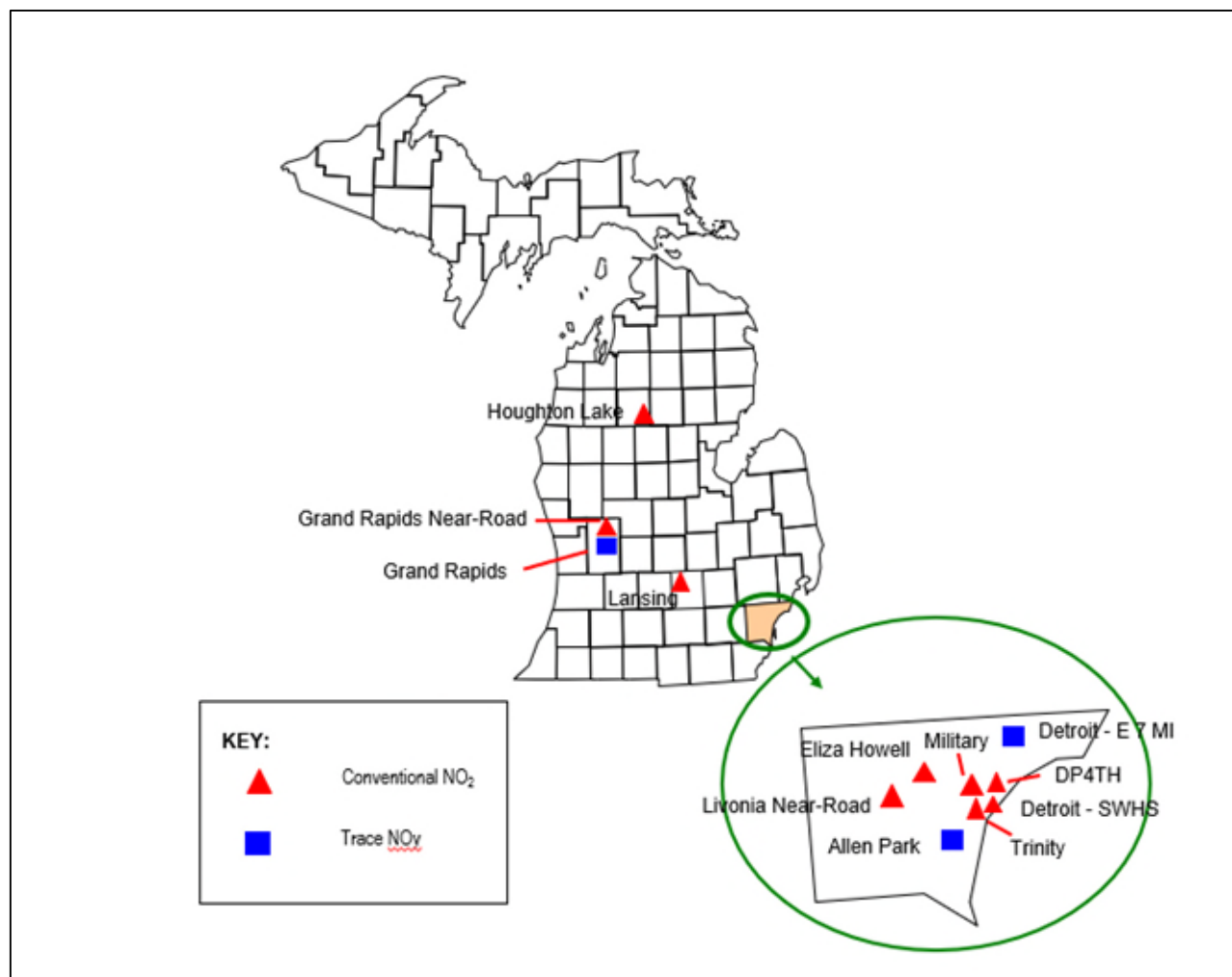
PAMS

Site Name	Monitoring Sites AQS Site ID	Address	Latitude	Longitude	Measurement	Purpose/Type	Parameter Code	POC	Scale	County	Start Date	CBSA ¹	2021 Population Estimate
Grand Rapids	260810020	1179 Monroe NW	42.984167	-85.671389	NO ₂ *	pop exp	42602	1	nghbrhd	Kent	1/1/08	GK	1,091,620
Detroit - E 7 Mile	261630019	11600 East Seven Mile Road	42.430833	-83.000278	NO ₂ *	pop exp	42602	1	urban	Wayne	12/1/90	DWL	4,365,205

¹ CBSA Key: DWL= Detroit-Dearborn-Livonia MSA and Warren-Troy-Farmington MSA
 GK = Grand Rapids-Kentwood MSA
 LEL= Lansing-East Lansing MSA

* PAMS direct-NO₂ ,NO_y

Figure 13: Michigan's NO₂ and NO_y Monitoring Network



SULFUR DIOXIDE (SO₂) MONITORING NETWORK

On June 2, 2010, the USEPA made the SO₂ 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.¹³

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

$$(\text{CBSA population})^{14} (\text{total SO}_2 \text{ emissions in that CBSA in tpy}) / 1,000,000 = \text{PWEI}$$

¹³ Primary National Ambient Air Quality Standards for Sulfur Dioxide; Final Rule, 75 *Federal Register* 35564 Section IV B part 5 (June 22, 2010).

¹⁴ According to the latest Census Bureau estimates.

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 SO₂ monitors as part of these new requirements. Also, because the new SO₂ monitors are not single source-oriented, existing infrastructure can be used to select locations for expansion of the SO₂ 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 2021 population estimates data and the 2017 version of the National Emissions Inventory data.

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

MSA	Counties	2017 NEI Download: Total County SO ₂ Emissions, tpy	2017 NEI SO ₂ Total Emissions, tpy	2021 Population Estimates	(2017 NEI) (2021 Population) = PWEI	PWEI based Monitor Requirement
Detroit-Dearborn-Livonia MSA and Warren-Troy-Farmington MSA	Macomb	88.35	52,818	4,365,205	230,563	2
	Oakland	82.02				
	Wayne	15,500.94				
	Lapeer	212.84				
	St Clair	36,933.43				
	Livingston	0.83				
Flint MSA	Genesee	190.71	191	404,208	77	0
Monroe MSA	Monroe	3,499.07	3,499	155,274	543	0
Ann Arbor MSA	Washtenaw	112.00	112	369,390	41	0
Grand Rapids-Kentwood MSA	Kent	45.56	76	1,091,620	83	0
	Ottawa					
	Barry	28.06				
	Newaygo	0.21				
	Ionia	2.44				
Holland-Grand Haven MSA	Ottawa	5,271.42	5,271	299,157	158	0
Muskegon-Norton Shores MSA	Muskegon	7.24	7	120,950	1	0
Lansing-East Lansing MSA	Clinton	118.93	4,376	540,281	236	1
	Ingham	1,222.50				
	Eaton	3,034.27				
Bay City MSA	Bay	888.95	889	102,985	92	0
Saginaw- MSA	Saginaw	13.17	13	189,591	2	0
Kalamazoo-Portage MSA	Kalamazoo	181.60	197	261,108	51	0
	Van Buren	15.62				
Niles-Benton Harbor MSA	Berrien	36.11	36	153,101	6	0
Jackson MSA	Jackson	56.61	57	160,050	9	0
Battle Creek MSA	Calhoun	32.33	32	133,819	4	0
South Bend MishawakaIN/MI MSA	Cass	0.59	1	323,695	0	0

Based on the 2017 emissions data and 2021 population estimates, the Detroit-Warren-Livonia CBSA needs two SO₂ monitoring sites, while the Holland-Grand Haven Metropolitan Area and Lansing-East Lansing Metropolitan Area each need a single SO₂ monitoring site.

The NCore trace level SO₂ monitor at Allen Park (261630001) fulfills the requirement for one of the SO₂ monitors required in the Detroit-Warren-Livonia CBSA. EGLE also monitors at Detroit–SWHS (261630015) and Port Huron (261470005).

EGLE deployed SO₂ 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 (260650018) in Ingham County. The USEPA approved the discontinuation of the West Olive site, which shut down on January 1, 2021. The USEPA also approved the discontinuation of the Sterling State Park site (261150006) in Monroe County, which shut down on January 1, 2021.

In 2018, SO₂ monitors were added to the three new GHIB sites: DP4th (261630098), Trinity (261630099), and Military Park (261630100).

Table 25 summarizes the SO₂ monitoring site information for sites that were operational in 2022 and are planned to be operational in 2023. **Figure 14** shows the geographical distribution of SO₂ sites across Michigan.

SO₂ Monitoring and Modeling Requirements

With the revision to the SO₂ NAAQS in 2010, federal regulations also changed for monitoring and modeling SO₂ emissions. The USEPA established a three-tiered process for assessing the attainment status of the ambient air near large sources emitting SO₂.

States were required in Tier 1 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 SO₂ 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 and designated a small portion of St. Clair County as nonattainment, and 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 installed two SO₂ special purpose monitoring stations in St. Clair County to provide additional SO₂ 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 SO₂ 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 SO₂ was borne out of the fact that monitoring could not cover every wind scenario at each large emission source nationwide. States could not bear the large associated expenses of establishing enough new monitoring sites to adequately characterize the SO₂ 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 and the effectiveness of different proposed control measures. EGLE continues to identify strategies to reduce SO₂ pollutant levels through collaboration with Michigan industry, as well as local and federal partners.

SO₂ 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 Manager each quarter. Each monitor is audited annually by the AMS'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 Manager reviews all audit results, and hard copies are retained in the QA files.

The USEPA conducts TTP audits on 20 percent of the SO₂ 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 2023 SO₂ Monitoring Network

During 2023, contingent upon adequate levels of funding, EGLE is planning to continue to operate SO₂ monitors at:

- Lansing (260650018)
- Grand Rapids (260810020) NCore trace SO₂
- Port Huron (261470005)
- Allen Park (261630001) NCore trace SO₂
- Detroit-SWHS (261630015)
- NMH 48217 (261630097)
- DP4 (261630098)
- Trinity (261630099)
- Military Park (2161630100)

Table 25: Michigan's SO₂ Monitoring Network

Operating Schedule: Continuous
 Method: Ultra Violet Stimulated Fluorescence; Method Code 060 (SO₂) and Method Code 600 (Trace SO₂)

NCore Sites, Trace

Site Name	Monitoring Sites		Latitude	Longitude	Measurement	Purpose/ Type	Parmeter Code	POC	Scale	County	Start Date	MSA ¹	2021 population Estimate
	AQS Site ID	Address											
Grand Rapids .	260810020	1179 Monroe NW	42.9842	-85.671389	trace	pop exp	42401	2	ngnbrhd	Kent	1/1/08	GK	1,091,620
Allen Park	261630001	14700 Goddard	42.2286	-83.208333	trace	pop exp	42401	1	ngnbrhd	Wayne	1/1/08	DWL	4,365,205

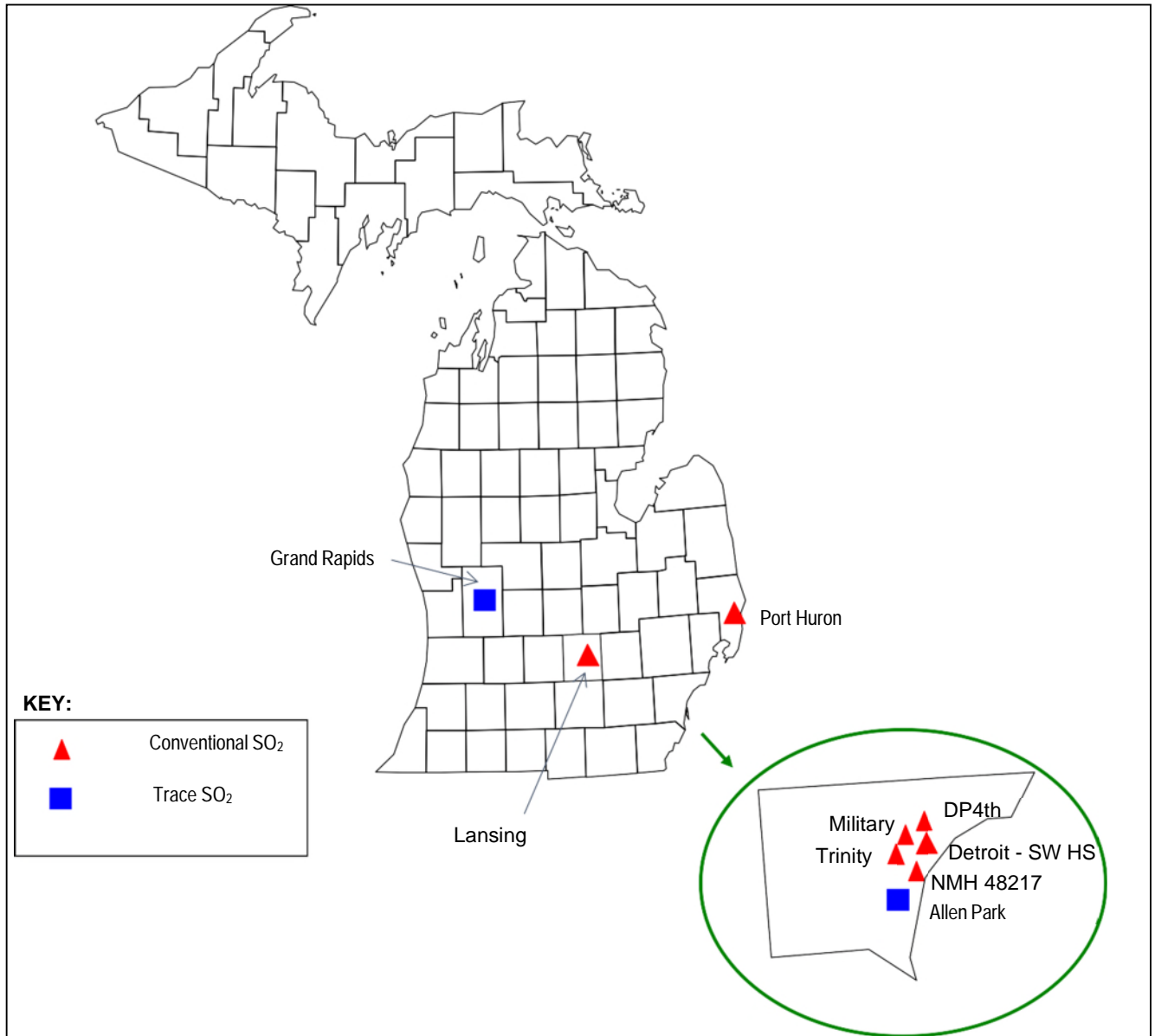
Source-Oriented and Community Sites

Site Name	Monitoring Sites		Latitude	Longitude	Measurement	Purpose/ Type	Parmeter Code	POC	Scale	County	Start Date	MSA ¹	2021 population Estimate
	AQS Site ID	Address											
Lansing	260650018	220 N Pennsylvania	42.7386	-84.534722	SO2	Max Conc	42401	1	ngnbrhd	Ingham	1/1/12	LEL	540,281
Port Huron	261470005	2525 Dove Rd	42.9533	-82.456389	SO2	Max Conc	42401	1	urban	St. Clair	2/28/81*	DWL	4,365,205
Detroit - SW HS	261630015	150 Waterman	42.3028	-83.106667	SO2	Max Conc	42401	1	ngnbrhd	Wayne	1/1/71	DWL	4,365,205
NMH48217	261630097	3225 S.Deacon St.	42.2617	-83.157893	SO2	pop exp	42401	1	ngnbrhd	Wayne	8/24/16	DWL	4,365,205
DP4th	261630098	4700 W Fort St	42.3122	-83.091943	SO2	Max Conc	42401	1	SPM	Wayne	8/3/18	DWL	4,365,205
Trinity	261630099	9191 W Fort St	42.2958	-83.129431	SO2	Max Conc	42401	1	SPM	Wayne	10/23/18	DWL	4,365,205
Military	261630100	1238 Military	42.3121	-83.103469	SO2	Max Conc	42401	1	SPM	Wayne	11/2/18	DWL	4,365,205

¹ MSA Key: DWL = Detroit-Dearborn-Livonia MSA and Warren-Troy-Farmington MSA
 GK = Grand Rapids- Kentwood MSA
 LEL = Lansing-East Lansing MSA
 Monroe = Monroe MSA

* Monitor shutdown in 2007 restarted in January 2012

Figure 14: Michigan's SO₂ 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 ten sites that collect TSP samples on a once every six or 12 day schedule. Due to site access issues the S. Delray-Jefferson site had to be shut down in 2021, and there are now only 9 sites. Sample collection follows the schedule developed by the USEPA. The TSP filters are analyzed by the EGLE laboratory for lead, manganese, arsenic, cadmium, and nickel. Further discussion of lead is detailed in another chapter.

The Dearborn (261630033) NATTS site measures a suite of 14 metals in both the TSP and PM₁₀ size fractions. The list of metals includes lead, beryllium, vanadium, chromium, manganese, nickel, cobalt, copper, zinc, arsenic, molybdenum, cadmium, barium, and iron.

In 2023, the following sites will measure TSP metals and PM₁₀ as indicated below:

- Belding-Merrick St. (260670003)
- Port Huron (261470031) co-located
- River Rouge (261630005)
- SW Detroit-SWHS (261630015)
- Dearborn (261630033) TSP NATTS -14 metals list and co-located
- Dearborn (261630033) PM₁₀ NATTS -14 metals list and co-located
- NMH 48217 (261630097)
- DP4 (261630098)
- Trinity (261630099)
- Military Park (261630100)

Table 26 summarizes the trace metals monitoring site information for 2023. **Figure 15** shows the geographical distribution of trace metal sites across Michigan.

Table 26: Michigan's Trace Metal Monitoring Network

Operating Schedule: 1:6, follows EPA published calendar

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

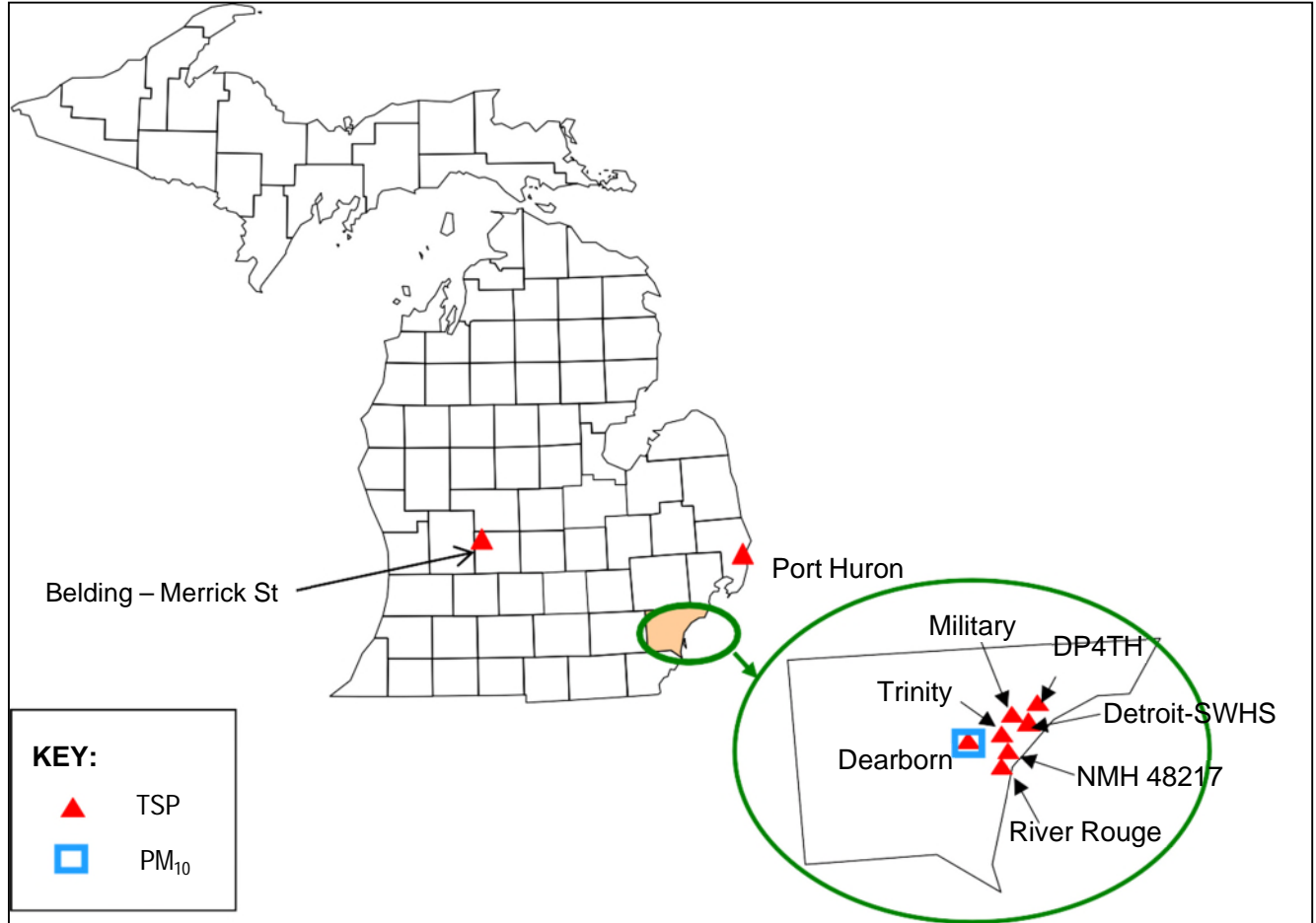
PM10: High Volume sampler using quartz filter; Emission Spectra ICAP for lead; ICP MS for remaining metals

Monitoring Sites													2021	
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Elements	Size	Purpose/Type	POC	Scale	County	Date Estab.	MSA ¹	Population Estimated
Belding - Merrick St	260670003	509 Merrick	43.09984	-85.22163	1:6	Pb, Mn, As, Cd, Ni	TSP	max conc	1	micro	Ionia	1/1/10	I	67,197
Port Huron	261470031	324 Rural St	42.98209	-82.449233	1:6	Pb, Mn, As, Cd, Ni	TSP	max conc	1	micro	Saint Clair	1/1/13	DWL	4,365,205
Port Huron (colocated)	261470031	324 Rural St	42.98209	-82.449233	1:12	Pb, Mn, As, Cd, Ni	TSP	max conc	1	micro	Saint Clair	1/1/13	DWL	4,365,205
River Rouge	261630005	315 Genesee	42.267222	-83.132222	1:6	Pb, Mn, As, Cd, Ni	TSP	max conc	1	nghbrhd	Wayne	1/1/94	DWL	4,365,205
Fort St. (SWHS)	261630015	150 Waterman	42.302778	-83.106667	1:6	Pb, Mn, As, Cd, Ni	TSP	pop exp	1	nghbrhd	Wayne	2/26/99	DWL	4,365,205
S Delray	261630027	7701 W Jefferson	42.292222	-83.106944	1:6	Pb, Mn, As, Cd, Ni	TSP	max conc	1	nghbrhd	Wayne	10/6/04	DWL	4,365,205
Dearborn	261630033	2842 Wyoming	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	TSP	max conc	1	nghbrhd	Wayne	6/1/90	DWL	4,365,205
Dearborn (colocated)	261630033	2842 Wyoming	42.306666	-83.148889	1:12	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	TSP	max conc	9	nghbrhd	Wayne	6/1/90	DWL	4,365,205
NMH 48217 ²	261630097	3225 S. Deacon St.	42.2617	-83.157893	1:6	Pb, Mn, As, Cd, Ni	TSP	max conc	1	SPM	Wayne	8/24/16	DWL	4,365,205
DP4th ²	261630098	4700 W Fort St	42.312158	-83.091943	1:6	Pb, Mn, As, Cd, Ni	TSP	max conc	1	SPM	Wayne	1/25/09	DWL	4,365,205
Trinity ²	261630099	9191 W Fort St	42.295824	-83.129431	1:6	Pb, Mn, As, Cd, Ni	TSP	pop exp	1	SPM	Wayne	1/25/09	DWL	4,365,205
Military ²	261630100	1238 Military St	42.312078	-83.103469	1:6	Pb, Mn, As, Cd, Ni	TSP	max conc	1	SPM	Wayne	6/1/90	DWL	4,365,205
Dearborn	261630033	2842 Wyoming	42.306666	-83.148889	1:6	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	PM 10	max conc	1	nghbrhd	Wayne	6/1/90	DWL	4,365,205
Dearborn	261630033	2842 Wyoming	42.306666	-83.148889	1:12	Be, V, Cr, Mn, Co, Ni, Cu, Zn, As, Mo, Cd, Ba, Pb, Fe	PM 10	max conc	3	nghbrhd	Wayne	6/1/90	DWL	4,365,205

¹ MSA Key: DWL Detroit-Dearborn-Livonia MSA and Warren-Troy-Farmington MSA
I Ionia Micropolitan

² SPM Special Purpose Monitor

Figure 15: 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 Manager each quarter. An independent audit is conducted by a member of the AMS'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 Manager 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 PM₁₀ and TSP-sized trace metals at Dearborn (261630033) and at Port Huron (261470031) TSP-size on a once every 12 day frequency.

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 (Michigan Toxics Air Monitoring Program). 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 SW 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. NATTS samples and SW Detroit samples go to a national contract lab and the trend site samples are analyzed by the EGLE lab.

Continuous VOC sampling with an Auto-GC is also a requirement of the PAMS (photochemical assessment monitoring station) network, which became operational in 2021. The PAMS section of this document provides more details.

Table 27 summarizes the VOC monitoring site information. **Figure 16** illustrates the geographical distribution of VOC monitors in Michigan.

VOC Quality Assurance

Once a year, the QA Team conducts a TTP 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. The QA Team also annually 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 National Contract laboratory also participates in performance test programs as administered by the USEPA. The QA Manager, reviews, and retains copies of all performance test audit samples.

Plans for the 2023 VOC Monitoring Network

During 2023, contingent upon adequate levels of funding, EGLE plans to continue collecting VOCs using Summa cans at:

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

In June 2021, EGLE started operating the continuous Auto-GC for VOC analysis at the following PAMS sites:

- Detroit E 7 Mile (261630019)
- Grand Rapids (260810020)

Figure 16: Michigan's VOC Monitoring Network

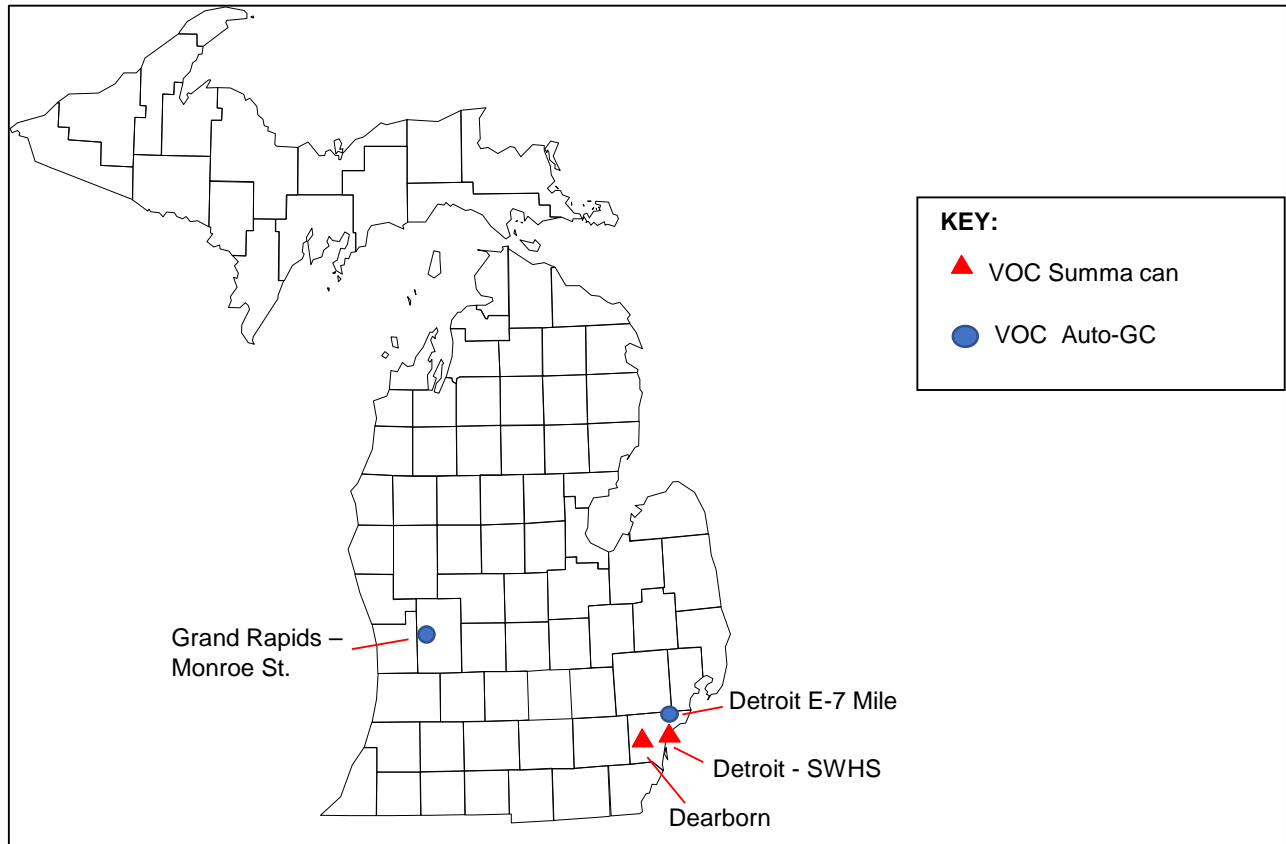


Table 27: Michigan's VOC Monitoring Network

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											2021	
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose/ Type	POC	Scale	County	Date Estab.	MSA ¹	Population Estimate
Detroit - SWHS	261630015	150 Waterman	42.302778	-83.106667	1:12	pop exp	1	nghbrhd	Wayne	2/26/99	DWL	4,365,205
Dearborn	261630033	2842 Wyoming	42.306666	-83.148889	1:6	max conc	1	nghbrhd	Wayne	6/1/90	DWL	4,365,205

Operating Schedule: Semi continuous ; 1 hour composite

Method: CAS Auto-GC

Monitoring Sites											2021	
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Purpose/ Type	POC	Scale	County	Date Estab.	MSA ¹	Population Estimate
Grand Rapids	260810020	1179 Monroe NW	42.984167	-85.671389	1-hr composite	pop exp	1	nghbrhd	Kent	6/1/21	GK	1,091,620
Detroit - E 7 Mile	261630019	11600 East Seven Mile Road	42.430833	-83.000278	1-hr composite	pop exp	1	nghbrhd	Wayne	6/1/21	DWL	4,365,205

¹ **MSA Key:** DWL= Detroit-Dearborn-Livonia MSA and Warren-Troy-Farmington MSA
GK=Grand Rapids-Kentwood MSA

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 SW 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. SW Detroit-SWHS site (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 became operational in 2021. The PAMS section of this document provides more details.

Table 28 summarizes the carbonyl monitoring site information for sites that were in existence in 2022 and will be added in 2023. **Figure 17** shows the distribution of carbonyl samplers across Michigan.

Carbonyl Quality Assurance

Once a year, the QA Team conducts a TTP 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 Detroit-SWHS and River Rouge samples go to a lab that 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 Manager reviews and retains copies of all performance test audit samples.

Plans for the 2023 Carbonyl Monitoring Network

During 2023, contingent upon adequate levels of funding, Michigan plans to continue collecting carbonyls year-round at:

- River Rouge (261630005) - Once every 12 days
- SW Detroit-SWHS (261630015) – Air Toxics Trend site; once every 12 days
- Dearborn (261630033) – NATTS site -once every six days and precision sample once every two months

In June 2021, EGLE started collecting *three 8-hour carbonyl samples on a one in three day basis* during June, July, and August at the following PAMS sites:

- Detroit E-7 Mile (261630019)
- Grand Rapids (260810020)

Figure 17: Michigan's Carbonyl Monitoring Network

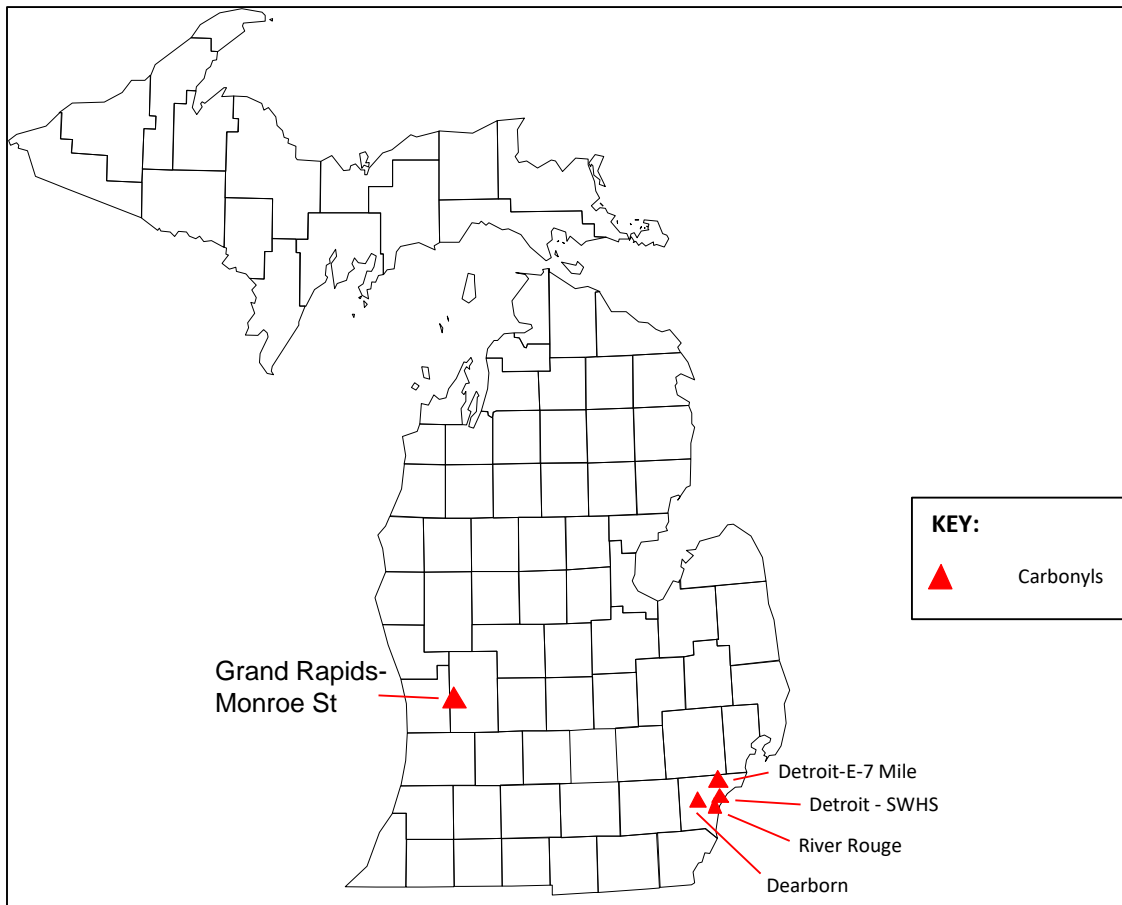


Table 28: Michigan's Carbonyl Monitoring Network

Operating Schedule: 1:6 and 1:12, Follows EPA published schedule
 Method: TO-11A ; 2,4 dinitrophenyl hydrazine treated silica gel cartridges; HPLC with ultraviolet absorption; Method Code 202

Monitoring Sites			Latitude	Longitude	Sampling Frequency	Purpose/ Type	POC	Scale	County	Date Estab.	MSA ¹	2021
Site Name	AQS Site ID	Address										Population Estimate
Dearborn	261630033	2842 Wyoming	42.306666	-83.148889	1:6	max conc	1	nghbrhd	Wayne	6/1/90	DWL	4,365,205
River Rouge	261630005	315 Genesee	42.267222	-83.132222	1:12	max conc	1	nghbrhd	Wayne	1/1/94	DWL	4,365,205
Detroit - SWHS	261630015	150 Waterman	42.302778	-83.106667	1:12	pop exp	2	nghbrhd	Wayne	2/26/99	DWL	4,365,205
Grand Rapids	260810020	1179 Monroe NW	42.984167	-85.671389	3 8-hr samples 1:3 day	pop exp	1	nghbrhd	Kent	6/1/21	GW	1,091,620
Detroit - E 7 Mile	261630019	11600 East Seven Mile Road	42.430833	-83.000278	3 8-hr samples 1:3 day	pop exp	1	nghbrhd	Wayne	6/1/21	DWL	4,365,205

¹ MSA Key: DWL= Detroit-Warren-Livonia
 GW=Grand Rapids-Wyoming Metro

POLYCYCLIC 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 2023. **Figure 18** 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 Manager each quarter. An independent audit is conducted by a member of the AMS'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 Manager reviews all audit results, and hard copies are retained in the QA files.

Plans for the 2023 PAH Monitoring Network

During 2022, 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													2021	
Site Name	AQS Site ID	Address	Latitude	Longitude	Sampling Frequency	Parameter Code	POC	Purpose/Type	POC	Scale	County	Date Estab.	MSA ¹	Population Estimate
Dearborn	261630033	2842 Wyoming	42.30667	-83.1489	1:6	various	1	max conc	1	nghrhd	Wayne	6/1/90	DWL	4,365,205

¹ MSA Key: DWL= Detroit-Dearborn-Livonia MSA and Warren-Troy-Farmington MSA

Figure 18: Michigan's PAHs Monitoring Network



PAMS NETWORK

The PAMS network is an ozone precursor monitoring network operated by state and local agencies. EGLE has not operated a Photochemical Assessment Monitoring Station (PAMS) site since before 2001. However, the revised monitoring rule (80 FR 65292; October 26, 2015)¹⁵ requires PAMS measurements June 1 through August 31 at NCore sites that are located in CBSAs with populations of one million or more. Federal funding was provided for Michigan to establish two PAMS sites which began operation in 2021. EGLE will continue to operate the PAMS stations in 2023.

¹⁵ [2015-26594.pdf \(thefederalregister.org\)](#)

Network Decision

EGLE has two NCore sites located at Allen Park (261630001) and Grand Rapids (260810020). The Grand Rapids site (260810020) serves as one of the locations and the second Detroit PAMS site operates 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. EGLE has used the national purchasing contract to obtain the auto-gas chromatographs (CAS), ceilometers (Vaisala), and true NO₂ (Teledyne) analyzers.

PAMS Parameters:

- Hourly averaged *ozone*.
- Auto-GCs for hourly averaged *speciated VOCs*, list of the targeted compounds is presented in **Table 30**.
- Hourly averaged *NO*, *reactive oxides of nitrogen (NO_y)* in addition to *true NO₂* sampling with the true NO₂ analyzers.
- *Carbonyl* sampling at a frequency of three 8-hour samples on a one in three day basis (90 samples per PAMS sampling season) is required. EGLE intends to use the national contract laboratory for analysis of the PAMS carbonyl samples. A complete list of the target carbonyl compounds is included in **Table 30**. The TO-11A test method, as used in the National Air Toxics Trends (NATTS) program, will be used.
- Meteorological Measurements:
 - Ceilometers for determining hourly averaged mixing height,
 - Hourly averaged ambient temperature
 - Hourly vector-averaged wind direction
 - Hourly vector-averaged wind speed
 - Hourly averaged atmospheric pressure
 - Hourly averaged relative humidity
 - Hourly precipitation
 - Hourly averaged solar radiation with a continuous pyranometer, and
 - Hourly averaged ultraviolet radiation with a continuous UV radiometer.

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-diethylbenzene
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. Description of the types of meteorological measurements that are made at each site are provided in **Table 31**. EGLE is not planning any changes to the meteorological measurements in 2023.

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 or Senior Environmental Technician may perform 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 Manager 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 2023 Meteorological Monitoring Network

During 2023, contingent upon adequate levels of funding, Michigan plans to continue collecting hourly meteorological measurements at:

- Holland (26005003)
- Bay City (260170014)
- Coloma (260210014)
- Cassopolis (260270003)
- Otisville (260492001)
- Flint (260490021)
- Harbor Beach (260630007)
- Lansing (260650018)
- Kalamazoo (260770008)
- Grand Rapids (260810020)
- Grand Rapids Near-road (260810023)
- Evans (280810022)
- Tecumseh (260910007)
- New Haven (260990009)
- Sterling Heights/Freedom Hill (260990021)
- Manistee Tribal (261010922)
- Scottville (261050007)
- Houghton Lake (261130001)
- Muskegon (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)
- Detroit–Joy Rd. (261630026)
- Dearborn (261630033)
- Eliza Howell (261630093)
- Trinity (261630099)
- Livonia Near-road (261630101)

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Table 31: Meteorological Measurements in Michigan

Site Name	AQS ID	Wind Speed 61103	Wind Direction 61104	Temperature 62101	Relative Humidity 62201	Precipitation 65102	Barometric Pressure 64101	UV Radiation 63302	Solar Radiation 63301	Mixing height 61301	Sigma Theta 61106
Holland	260050003	X	X	X	X		X		X		X
Bay City	260170014	X	X	X							X
Coloma	260210014	X	X	X							X
Cassopolis	260270003	X	X	X							X
Otisville	260492001	X	X	X			X				X
Flint	260490021	X	X	X			X				X
Harbor Beach	260630007	X	X	X							X
Lansing	260650012	X	X	X			X				X
Belding	260670002	X	X	X			X				X
Kalamazoo	260770008	X	X	X							X
Grand Rapids	260810020	X	X	X	X	x (pams)	X	x (pams)	x (pams)	x (pams)	X
Evans	260810022	X	X	X							X
Grand Rapids Near Road	260810023	X	X	X							X
Tecumseh	260910007	X	X	X			X				X
New Haven	260990009	X	X	X	X				X		X
Sterling Hts/ Freedom Hill	260990021	X	X	X							X
Manistee	261010922	X	X	X			X				X
Scottville	261050007	X	X	X							X
Houghton Lake	261130001	X	X	X			X				X
Muskegon	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
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 (pams)	X	x (pams)	x (pams)	x (pams)	X
Detroit - Joy Rd	261630026	X	X	X							X
Dearborn	261630033	X	X	X	X		X				X
Eliza Howell	261630093	X	X	X							X
Livonia Near Road	261630101	X	X	X							X
	Total	34	34	34	8	2	17	2	4	2	34

All Parameters at all sites use POC 1, except River Rouge WS and WD which is POC 2

Near-roadway and Special Purpose Monitors

The USEPA has approved funding for the required near-road monitoring station in the Grand Rapids area. This site is required since Grand Rapids CBSA hit the one million population threshold. EGLE started monitoring in summer 2021.

In 2023, contingent upon funding, EGLE will monitor at the following near-roadway sites:

- Grand Rapids Near-road (260810023); CO, NO_x, PM_{2.5} MetOne BAM and meteorological parameters.
- Eliza Howell Near-road (261630093); CO, NO_x, PM_{2.5} MetOne BAM and meteorological parameters.
- Livonia Near-road (261630101); CO, NO_x, and meteorological parameters.

GHIB Study:

In a joint Canadian-American venture, the GHIB is being constructed 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. In 2018, EGLE established three new air monitoring sites in SW Detroit and placed additional monitors in the existing SW Detroit (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 NO_x, SO₂, CO, continuous PM_{2.5}, black carbon, and 5 trace metals including lead. There is no CO monitor at the Military Park (26163100) site. A NO_x, continuous PM_{2.5}, and black carbon were added to the SW Detroit (SWHS) (261630015) site. The new sites and additional parameters at the SWHS site became operational in the summer and fall of 2018. In 2022, EGLE replaced the existing Thermo BAMs at all four sites with newer continuous PM_{2.5} Teledyne T640 instruments. **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
	NO _x	Hourly
	TSP-Pb	24-hr every 6 day
	Continuous PM2.5 T640	Hourly
	Black Carbon-Aethalometer	Hourly
DP4th (261630098)	SO ₂	Hourly
	CO	Hourly
	NO _x	Hourly
	TSP-Pb	24-hr every 6 day
	Continuous PM2.5 T640	Hourly
	Black Carbon-Aethalometer	Hourly
Trinity (261630099)	MET	Hourly
	SO ₂	Hourly
	CO	Hourly
	NO _x	Hourly
	TSP-Pb	24-hr every 6 day
	Continuous PM2.5 T640	Hourly
	Black Carbon-Aethalometer	Hourly
Military (261630100)	SO ₂	Hourly
	NO _x	Hourly
	TSP-Pb	24-hr every 6 day
	Continuous PM2.5 T640	Hourly
	Black Carbon-Aethalometer	Hourly

Sensors:

A new generation of low-cost, highly portable air quality sensor technology has helped in a wide range of applications beyond the traditional regulatory and regulatory equivalent monitoring. Potential non-regulatory applications being research, personal exposure monitoring, supplementing existing monitoring, source identification and characterization, education, information and awareness.

This sensor technology is relatively new and developing, many sensors have not yet been evaluated to determine the accuracy of their measurements. The USEPA has specific guidelines it must use in establishing regulatory-grade air monitors. No lower cost sensors currently meet these strict requirements or have been formally submitted to the USEPA for such a determination.

Sensor performance requirements differ according to the applications. The quality of data is dictated by the basic performance of the sensor, the way the sensor is operated, and the way its measurements are analyzed. Thus, understanding the strengths and limitations of an air sensor is important in making sure the data collected is useful for the intended purpose. Taking this into consideration EGLE purchased the sensors listed below. Some have been installed at existing ambient sites, and some are spoken for by various collaboratives.

Purchased Inventory :

- **Purple Air sensors:** PM_{2.5} – stationary, needs power and WIFI (20, some in use, some are spoken for)
- **AirBeam:** PM_{2.5} - mobile (one)
- **Portable weather stations:** 2 wired and 1 wireless (three)
- **Aeroqual Pro:** PM₁₀, PM_{2.5}, ozone, NO_x, CO, and VOCs (total) - portable handheld unit (one)
- **Aeroqual Starter:** PM₁₀, PM_{2.5}, ozone and NO_x - portable handheld unit (one)
- **Smoke kit:** Stationary or mobile measurement of PM_{2.5}. Pelican case with a Thermo PDR 1500, data logging, and met system (one).

ADEQUACY OF MICHIGAN'S MONITORING SITES

The suitability of monitoring site locations is frequently assessed by the AMS'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.

In 2021, EGLE lost site access to the historical S. Delray/Jefferson (261630027) site, which monitored for TSP (metals). Sampling for metals is currently being performed at six other nearby sites in the southwest Detroit area

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 <u>is located in</u> 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 <u>Karn-Weadock</u> 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 <u>NCORE</u> 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
ARP	American Rescue Plan
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
EJ Area	Environmental Justice Area
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

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Acronym	Definition
NAAQS	National Ambient Air Quality Standard
NAMS	National Air Monitoring Station
NATTS	National Air Toxics Trend Sites
NCORE	National Core Monitoring Sites
NEI	National Emission Inventory
NO ₂	Nitrogen Dioxide
NO _x	Oxides of Nitrogen
NO _y	Oxides of Nitrogen + nitric acid + organic and inorganic nitrates
NPAP	National Performance Audit Program
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
PM _c	Particulate Matter coarse
PM _{2.5}	Particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
PM ₁₀	Particulate matter with a diameter of 10 microns or less
PM _{10-2.5}	Coarse PM equal to the concentration difference between PM ₁₀ and PM _{2.5}
ppb	parts per billion
ppm	parts per million = mg/kg, mg/L, µg/g (1 ppm = 1,000 ppb)

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Acronym	Definition
PQAO	Primary Quality Assurance Organization
PVMRM	Plume Volume Molar Ratio Method
PWEI	Population Weighted Emissions Index
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
RTI	Research Triangle Institute (national contract laboratory for speciated PM _{2.5})
SASS	Source Assessment Sampling System
SLAMS	State and Local Air Monitoring Station
SO ₂	Sulfur Dioxide
SPM	Special Purpose Monitor
STAG	State Air Grant (federal)
STN	Speciation Trend Network (PM _{2.5})
STP	Suspended Total Particles
TEOM	Tapered Element Oscillating Microbalance (hourly PM _{2.5} 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 2023 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 23, 2022.