U.S. Department of Housing and Urban Development
451 Seventh Street, SW
Washington, DC 20410
www.hud.gov
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Environmental Assessment
Determinations and Compliance Findings
for HUD-assisted Projects
24 CFR Part 58

Project Information

Project Name: Orchard-Village-Housing

HEROS Number: 900000010289383

Responsible Entity (RE): DETROIT, PLANNING AND DEVELOPMENT DEPARTMENT
DETROIT MI, 48226

RE Preparer: Kim Siegel

State / Local Identifier: Detroit, Michigan

Certifying Officer: Julie Schneider

Grant Recipient (if different than Responsible Ent ity):

Point of Contact:

Consultant (if applicabl e): The Mannik & Smith Group, Inc.

Point of Contact: Jenny Hamel

Project Location: Multiple, Detroit, MI 48219

Additional Location Information:
ADDRESS PARCEL NO ACREAGE +/- 1 - 21556 Orchard 22014271 0.20 2 - 21566 Orchard 22014270 0.10 3 - 21604 Orchard 22014269 0.15 4 - 21610 Orchard 22014268 0.15 5 - 21624 Orchard 22014267 0.20 6 - 21636 Orchard 22014266 0.20

7 - 21652 Orchard 22014265 0.20 8 - 21525 Santa Clara 22014362 0.13 9 - 21535 Santa Clara 22014363 0.10 10 - 21515 Santa Clara 22014361 0.10

Direct Comments to: Penny Dwoinen, Environmental Review Officer, City of Detroit
dwoinenp@detroitmi.gov
313-224-2933

Description of the Proposed Project [24 CFR 50.12 & 58.32; 40 CFR 1508.25]:

CHN Housing Partners and Detroit Blight Busters are proposing to develop multifamily housing in northwest Detroit. The project is being developed in response to a City of Detroit Request for Proposal for affordable, multifamily housing in this area. The development will be privately owned by CHN Housing Partners and Detroit Blight Busters. The property has been secured as of March 2022. The proposed project includes acquisition and new construction of four buildings on 43,000 square feet on 10 parcels of currently vacant land to create 48 units of affordable housing in the Orchard Village Neighborhood. The four buildings range from one to three stories in height. All units are two bedroom, one bathroom apartments of which five will be ADA barrier free ADA units. Additional scope items include construction of a one-story 700 square-foot community center on site, development of a central promenade walkway to link Santa Clara and Orchard Street, and 48 parking spaces on the property (including five ADA spaces). Construction is scheduled to begin in June of 2023. This project is receiving $1,000,000.00 in HOME 2019 and $1,935,892.00 in ARPA funding. This review is valid for up to five years.

Statement of Purpose and Need for the Proposal [40 CFR 1508.9(b)]:

The Orchard Village Housing Project will be a residential development with the long-term goal of providing affordable housing for low-income residents, enhancing quality of life, and providing personal development opportunities and financial literacy services through the redevelopment of the Site for rental units and a community space. It will also expand the job market and clean up the area. This will improve the immediate area, and the benefit the residents in the City of Detroit. The project will be 100% affordable to residents with incomes ranging from 30% to 60% AMI. Units are two-bedroom and one-bath and rental rates will range from $310 to $789. It is estimated that the construction will open up about 20-30 temporary jobs for the duration of the project. After its completion, there will likely be positions for about 2-4 full time employees in operations and maintenance.

Existing Conditions and Trends [24 CFR 58.40(a)]:

The Site, which is currently vacant, consists of 10 parcels, as well as abandoned rights-of-way, located on approximately 1.73 acres of mostly flat residential land with minimal vegetative cover. The proposed development is consistent with other development in the immediate area, including other multi-family housing. Many commercial/retail neighborhood services are located within one mile of the subject property. Included in these services are: supermarket (grocery, household items, and clothing), bank, gas station, car wash, auto maintenance and repair, and convenience. Municipal water supply and wastewater services are available for the site. The project area is made up of currently underutilized vacant land and appears to have been so since 2012. In the absence of this development, the site is likely to remain unutilized. The current housing market trends show an increase in the median cost both in the City of Detroit and the Metro-Detroit area as a whole. More affordable housing is needed in the area for low-income communities. The project will create 48 units of affordable housing which will expand the area population and bring more jobs into the community.

Maps, photographs, and other documentation of project location and description:
Appendix A Site Plan - Landscape Plan - Photometrics - Utility(1).pdf
Appendix A - Site Plan.pdf

Determination:

✓	Finding of No Significant Impact [24 CFR 58.40(g)(1); 40 CFR 1508.13] The project will not result in a significant impact on the quality of human environment
	Finding of Significant Impact

Approval Documents:
Signature Page - Orchard Villages.pdf

7015.15 certified by Certifying Officer on:

7015.16 certified by Authorizing Officer on:

Funding Information

Grant / Project Identification Number	HUD Program	Program Name
M21MC260202	Community Planning and Development (CPD)	HOME Program

Estimated Total HUD Funded, Assisted or Insured Amount: $1,000,000.00

This project anticipates the use of funds or assistance from another federal agency in addition to HUD in the form of:

Estimated Total Project Cost [24 CFR 58.2 (a) (5)]: $15,370,328.00

Compliance with 24 CFR §50.4, §58.5 and §58.6 Laws and Authorities

Compliance Factors: Statutes, Executive Orders, and Regulations listed at 24 CFR §50.4, §58.5, and §58.6	Are formal compliance steps or mitigation required?	Compliance determination (See Appendix A for source determinations)
STATUTES, EXECUTIVE ORDERS, AND REGULATIONS LISTED AT 24 CFR §50.4 & § 58.6		
Airport Hazards Clear Zones and Accident Potential Zones; 24 CFR Part 51 Subpart D	☐ Yes ☑ No	The project site is not within 15,000 feet of a military airport or 2,500 feet of a civilian airport. This can be seen in Appendix Q Airport Proximity. The project is in compliance with Airport Hazards requirements. Two (2) FAA-regulated commercial airports and one (1) executive (small engine) airport have been identified within 15 miles of the Site; noise pollution related to aviation has not been identified on the USDOT noise map and is therefore below 45.0 dBA. AIRPORT DISTANCE Detroit Metropolitan Wayne County Airport 13.65 mi Coleman A. Young International Airport 12.27 mi Oakland/Troy Airport 9.4 mi
Coastal Barrier Resources Act Coastal Barrier Resources Act, as amended by the Coastal Barrier Improvement Act of 1990 [16 USC 3501]	☐ Yes ☑ No	This project is not located in a CBRS Unit. Therefore, this project has no potential to impact a CBRS Unit and is in compliance with the Coastal Barrier Resources Act. The Detroit River, a jurisdictional waterway, is the nearest coastal zone in relation to the project Site. It is located approximately 11.62 miles southeast of the Site. The Project will not extend into the Detroit River and coastal waters will not be impacted by associated activities. A map of the

		coastal barriers in Wayne County can be seen in Appendix R Wayne County Coastal Barriers Map.
Flood Insurance Flood Disaster Protection Act of 1973 and National Flood Insurance Reform Act of 1994 [42 USC 4001-4128 and 42 USC 5154a]	☐ Yes ☑ No	Based on the project description the project includes no activities that would require further evaluation under this section. The project does not require flood insurance or is excepted from flood insurance. The project is in compliance with Flood Insurance requirements. According to the Federal Emergency Management Agency (FEMA) Flood Map, the Site is located in an area of minimal flooding as of October 2020. The site is located in Zone X, as seen in City of Detroit FEMA map number 26163C0067E eff. 2/2/2012. This map is attached under Appendix E National Flood Hazard Map.
STATUTES, EXECUTIVE ORDERS, AND REGULATIONS LISTED AT 24 CFR §50.4 & § 58.5		
Air Quality Clean Air Act, as amended, particularly section 176(c) & (d); 40 CFR Parts 6, 51, 93	☐ Yes ☑ No	The project's county or air quality management district is in non-attainment status for the following: Ozone. This project does not exceed de minimis emissions levels or the screening level established by the state or air quality management district for the pollutant(s) identified above. A copy of the Air Quality Report and Letter of Conformity can be found in Appendix K. The project is in compliance with the Clean Air Act. The Eliza Howell - NR monitoring station ID# 26-163-0093, located at 23751 Fenkell St, Detroit, MI, is the closest monitoring station in relation to the Site. MSG obtained air quality information from the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Air Quality Annual Report 2020 as well as a letter of conformity from EGLE stating that the Project should not exceed de minimis levels included in the federal general conformity requirements and does not require a detailed analysis.

Coastal Zone Management Act Coastal Zone Management Act, sections 307(c) & (d)	☐ Yes ☑ No	This project is not located in or does not affect a Coastal Zone as defined in the state Coastal Management Plan. This can be seen in Appendix G - Wayne County Coastal Zone Map. The project is in compliance with the Coastal Zone Management Act. The Detroit River, a jurisdictional waterway, is the nearest coastal zone in relation to the project Site. It is located approximately 11.62 miles southeast of the Site. The Project will not extend into the Detroit River and coastal waters will not be impacted by associated activities.
Contamination and Toxic Substances 24 CFR 50.3(i) & 58.5(i)(2)]	☐ Yes ☑ No	Site contamination was evaluated as follows: ASTM Phase I ESA, ASTM Phase II ESA. These Documents can be found in Appendix Di - Phase I and Appendix Dii - Phase II. The Phase I ESA, completed on February 15, 2022, identified one recognized environmental condition (REC), "There was a former dwelling at 21624 Orchard Street that was removed by 1986. The demolition practice and the type of fill used at the former dwelling are unknown. This size of this dwelling is estimated to be 600 to 800 square feet based on the building footprint in Sanborn Maps. It was present from about 1926 to 1986. The foundation type is unknown. If it contained a basement, the typical design during this period was to build an elevated first floor with basement depth for around four feet "The Phase II was completed on October 12, 2022. Four soil borings were drilled, and samples were taken to determine if there was contamination on site above the State of Michigan Department of the Environment, Great Lakes and Energy's (EGLE's) criteria. Based on the results of the samples, no contamination above EGLE's criteria was found. Therefore, the site is not a facility. The project is in compliance

		with contamination and toxic substances requirements. Because the property is made up of vacant lots, no renovation/remodeling is necessary. Additionally, there are no structures built before 1978. Due to these things, asbestos and lead surveys are not required. Because Radon is not present in over 25% of the county, evaluation is not necessary as part of the assessment.
Endangered Species Act Endangered Species Act of 1973, particularly section 7; 50 CFR Part 402	☐ Yes ☑ No	This project will have No Effect on listed species due to the nature of the activities involved in the project. It is in a highly urbanized and developed area, not near riparian or wetland areas, or any other critical habitats. A list of the endangered species in the region can be found in Appendix T - IPAC Endangered Species List. This project is in compliance with the Endangered Species Act.
Explosive and Flammable Hazards Above-Ground Tanks)[24 CFR Part 51 Subpart C	☐ Yes ☑ No	There are no current or planned stationary aboveground storage containers of concern within 1 mile of the project site. A map of the site demonstrating this can be seen in Appendix S - Site features map. The project is in compliance with explosive and flammable hazard requirements. The Phase I shows that the Site is located an Acceptable Separation Distance (ASD) from any above-ground explosive or flammable fuels or chemical containers (page 28). A letter from the Department of Public Services, Environmental Services Division, provided on January 5, 2022 in response to a request by ASTI during the Phase I of the Site, notes that after diligent search for records (pertaining to landfilling activity, spills/releases, 201 sites, above ground storage tanks, underground storage tanks, soil or water contamination, etc.), none have been found. Visual reconnaissance of the Site and surrounding area

		performed by ASTI during the Phase I revealed that there are no observed facilities that utilize or store large scale above ground storage tanks (ASTs) within a one-mile radius of the Site.
Farmlands Protection Farmland Protection Policy Act of 1981, particularly sections 1504(b) and 1541; 7 CFR Part 658	☐ Yes ☑ No	This project does not include any activities that could potentially convert agricultural land to a non-agricultural use. This is demonstrated in Appendix L - Farmland. The project is in compliance with the Farmland Protection Policy Act. The land which includes the subject property was acquired by the City of Detroit between 1922 and 1926. According to the Phase I, the subject property was developed prior to the record of any available historical data. Single family homes appear on the Site in historical imagery, procured by ASTI in their Phase I documentation, between 1937 and 2012. Sometime after 2012, all single family homes had been demolished; the site appears to have been vacant and undeveloped since this time. According to the UDSA Natural Resources Conservation Service's (NRCS) Web Soil Survey (http://websoilsurvey.sc.egov.usda.gov/ App/WebSoilSurvey.aspx), all parcels involved with the Site are considered Rapson-Urban land complex, sandy substratum. Under the current scope of work, all proposed ground-disturbing activities fall within the area identified by the NRCS as ''not prime farmland.''
Floodplain Management Executive Order 11988, particularly section 2(a); 24 CFR Part 55	☐ Yes ☑ No	This project does not occur in a floodplain. The project is in compliance with Executive Order 11988. This is demonstrated in FEMA map number 26163C0067E eff. 2/2/2012 which can be seen in Attachment E - National Flood Hazard Map. The site is located in Zone X.
Historic Preservation National Historic Preservation Act of	☐ Yes ☑ No	Based on Section 106 consultation the project will have No Adverse Effect on historic properties. Conditions: None.

1966, particularly sections 106 and 110; 36 CFR Part 800		Upon satisfactory implementation of the conditions, which should be monitored, the project is in compliance with Section 106. Technical report prepared by a qualified historian/archaeologist concluded it is unlikely that intact archaeological deposits are present within the project area and that there will be no adverse effects to aboveground resources over 50 years of age. SHPO concurred with this determination of no historic properties affected within the area of potential effects of this undertaking. City of Detroit Housing & Revitalization Department assumed HUD responsibilities for project, including tribal consultation related to historic properties including sites, burial grounds, sacred landscapes or features, ceremonial areas, traditional cultural places and landscapes, plant and animal communities, and buildings and structures with significant tribal association. Through this consultation, no Native historic properties were identified. The Redford Theatre is listed in the NRHP, however the new construction will have no adverse effect on this resource. A determination of no adverse effect is applied to the proposed undertaking. The section 106 application and letter review can be found in Appendix C.
Noise Abatement and Control Noise Control Act of 1972, as amended by the Quiet Communities Act of 1978; 24 CFR Part 51 Subpart B	☐ Yes ☑ No	The Preliminary Screening identified no noise generators in the vicinity of the project. The project is in compliance with HUD's Noise regulation. Noise Assessment conducted January 2022 by ASTI Environmental The main factors examined in a noise assessment are intensity, frequency, and duration. Noise in the area is primarily due to traffic on nearby roads. Based on review of the Noise Assessment Location (NAL) performed by ASTI, there are four (4)

		busy roads located within 1,000 feet of the site: AIRPORT DISTANCE Grand River Avenue 817 feet Lahser Road 418 feet Redford Street 481 feet Bentler Street 892 feet There are no active railways within 3,000 feet of the Site. Two (2) FAA-regulated commercial airports and one (1) executive (small engine) airports have been identified within 15 miles of the Site; noise pollution related to aviation has not been identified on the USDOT noise map and is therefore below 45.0 dBA. The noise pollution assessment can be found in Appendix N - Noise Assessment. AIRPORT DISTANCE Detroit Metropolitan Wayne County Airport 13.65 mi Coleman A. Young International Airport 12.27 mi Oakland/Troy Airport 9.40 mi Based on the HUD DNL calculator, the noise level at NAL #1, as predicted in 2032, is 59 dB; the Site is located in an area that is within acceptable standards for residential development.
Sole Source Aquifers Safe Drinking Water Act of 1974, as amended, particularly section 1424(e); 40 CFR Part 149	☐ Yes ☑ No	The project is not located on a sole source aquifer area. A map of sole source aquifers in the Northeast can be found in Appendix H - Sole Source Aquifers. The project is in compliance with Sole Source Aquifer requirements. Based upon review of the Designated Sole Source Aquifers in Region 5, no sole source aquifers are located within the State of Michigan.
Wetlands Protection Executive Order 11990, particularly sections 2 and 5	☐ Yes ☑ No	The project will not impact on- or off-site wetlands. A Map of the wetlands in the area can be found in Appendix F - Wetlands. The project is in compliance with Executive Order 11990. The National Wetlands Inventory (NWI) provided by the U.S. Fish and Wildlife Service's (USFWS) shows no evidence of the presence of wetlands within the Project area. An additional map from EGLE showing wetlands and wetland

		soils, as identified by the NWI and the Michigan Resource Inventory System (MIRIS), further shows that there are no wetlands present at the Site.
Wild and Scenic Rivers Act Wild and Scenic Rivers Act of 1968, particularly section 7(b) and (c)	☐ Yes ☑ No	This project is not within proximity of a NWSRS river. This can be seen in Appendix J - Wild and Scenic Rivers. The project is in compliance with the Wild and Scenic Rivers Act. According to the Michigan State Housing Development Authority and the USFWS Nationwide Rivers Inventory map dated April 2018, Wayne County, Michigan does not contain National Wild and Scenic River Systems.
HUD HOUSING ENVIRONMENTAL STANDARDS		
ENVIRONMENTAL JUSTICE		
Environmental Justice Executive Order 12898	☐ Yes ☑ No	No adverse environmental impacts were identified in the project's total environmental review. The project is in compliance with Executive Order 12898. MSG reviewed pertinent 2020 United States Census data regarding minority and low-income populations within the project area and surrounding vicinity. A review of the USEPA Environmental Justice (EJ) Screen was also completed to identify low income and minority populations in the project area. A copy of the data used in the summary below is available in Appendix M. Based on census data, 33.3% of the residents in Census Tract 5412 are below the poverty line; data from that year also reflects that 94.6% of the population in this tract represents minority populations. The median income for this tract is $25,771, compared to $49,359 for Wayne County. Commute time is 29.8 minutes, with 80.9% of workers using a car, truck, or van (65.7% drive alone), 9% using public transportation, 1.6% walking, 4.6% using ride share or other means, and 3.9% working remotely. Environmental Pollutants

		The 5412 Census Tract is in the 80th Percentile or higher, in the state of Michigan, for all of the following categories: - Particulate matter | 90th Percentile - Ozone | 82nd Percentile - 2017 Diesel Particulate Matter | 97th Percentile - 2017 Air Toxics Cancer Risk | 99th Percentile - 2017 Air Toxics Respiratory HI | 99th Percentile - Traffic Proximity | 85th Percentile - Lead Paint | 85th Percentile Critical Services Critical services include access to food and healthcare. The Site is not located within a food desert; the closest grocery store is within 0.6 miles and there are contiguous sidewalks along the walking route. The Site is not in a medically underserved area; it is within 2 miles from two (2) clinics and is within 5 miles of 10 dental offices and as well as the following hospitals: DMC Sinai Grace Hospital, Henry Ford Medical Center, Ascension Providence Hospital - Southfield, and Beaumont Hospital - Farmington Hills. This project will not result in disproportionately adverse environmental effects on minority or low-income populations. Rather, it will provide affordable housing options within the community and promote expansion of employment opportunities.

Environmental Assessment Factors [24 CFR 58.40; Ref. 40 CFR 1508.8 &1508.27]

Impact Codes: An impact code from the following list has been used to make the determination of impact for each factor.

(1) Minor beneficial impact
(2) No impact anticipated
(3) Minor Adverse Impact – May require mitigation
(4) Significant or potentially significant impact requiring avoidance or modification which may require an Environmental Impact Statement.

Environmental Assessment Factor	Impact Code	Impact Evaluation	Mitigation
LAND DEVELOPMENT			
Conformance with Plans / Compatible Land Use and Zoning / Scale and Urban Design	1	The Site has been rezoned from R1 to R3 in preparation for development of multifamily housing; the Project will utilize the zoning regulations for R3. There are several other multifamily housing properties nearby; the Project is not likely to negatively impact the comprehensive plan for this neighborhood. The proposed development is consistent with other development in the immediate area. The Burgess Manor Apartments are directly south of the Site across Orchard Street and the Chapel Place Apartments are at the northwest corner of Grand River and Bentler Street, southeast of the Site. The Site is unkempt, with broken sidewalk and sporadic and uneven vegetation. The development of this vacant land will be potentially beneficial and offer an improved neighborhood aesthetic as well as social and economic value to the surrounding community.	
Soil Suitability / Slope/ Erosion / Drainage and Storm Water Runoff	2	According to the USDA Natural Resources Conservation Service's (NRCS) Web Soil Survey (http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx), the slope of the site is 0 to 4%. According to topography made available through a MERIT Digital Elevation Model (DEM), the ground elevation is approximately 644 feet above sea level on the east side, gently sloping to 640 feet toward the west side of the Site (Figure 3). No slope hazards appear to be present and adverse impact is not anticipated. Based on information obtained from the USGS Redford, MI Quadrangle Map and Site observations; no potential erosion hazards exist within the Site. As site plans are further developed, soils will be carefully managed to avoid potential erosion. Any proposed ground disturbing activities will conform to Wayne County soil erosion and sedimentation control permitting requirements. See Figure 4. Two (2) main soils have been mapped on the Site by the USDA NRCS. Rapson-Urban land complex, sandy and loamy substratum with 0 to 4 percent slopes makes up the majority of the site, and Colwood-Urban land complex with 0 to 2 percent slopes has been identified in the northwestern corner of the site. Urban land-Fortress family complex with 0 to 4 percent slopes has been identified along the	

Environmental Assessment Factor	Impact Code	Impact Evaluation	Mitigation
		southwestern edge of the Project area, however this does not make up a significant portion of the Project area. No identified soils are classified as prime farmland. Based on previous land use pattern as residential, it is anticipated that soil conditions are suitable for development and the Site should not be negatively impacted by development. The Project proposes development on greenspace; this will increase the amount of impervious area, thus creating a potential for additional runoff. Stormwater runoff will enter the municipal stormwater sewer system.	
Hazards and Nuisances including Site Safety and Site-Generated Noise	1	The vacant site is unkempt and at times may be a collection area for litter. Development of the Site should present no additional hazards to this area and should eliminate nuisance conditions that are currently present. Development should present improved conditions at this site. Similar multi-family housing establishments are an established part of this community; noise should not exceed what is typical of this residential neighborhood. Construction activities will be limited to the days and hours specified under the City's noise ordinance.	
SOCIOECONOMIC			
Employment and Income Patterns	1	By providing affordable housing, the Project aims to attract new residents to the area; the influx in community members will support the local economy by increasing revenue at nearby businesses and filling previously unfilled job positions. The project will also create temporary jobs for construction workers.	
Demographic Character Changes / Displacement	1	The Project is meant to revitalize this vacant tract of land and encourage growth by providing much needed affordable housing. It is anticipated that the introduction of an affordable housing development will attract new residents while also providing current Detroit residents incentive to continue living and working in the area. The existing demographic character and social network of the community is not likely to be significantly altered, as the Project does not promote activity that is typically indicative or aligned with gentrification. The Site is currently vacant; therefore, the proposed development will not displace	

Environmental Assessment Factor	Impact Code	Impact Evaluation	Mitigation
		any residents. The nature of the Project is to provide affordable housing for Detroit residents.	
Environmental Justice EA Factor	2	No adverse environmental impacts were identified in the project's total environmental review. The project is in compliance with Executive Order 12898. MSG reviewed pertinent 2020 United States Census data regarding minority and low-income populations within the project area and surrounding vicinity. A review of the USEPA Environmental Justice (EJ) Screen was also completed to identify low income and minority populations in the project area. A copy of the data used in the summary below is available in Appendix M. Based on census data, 33.3% of the residents in Census Tract 5412 are below the poverty line; data from that year also reflects that 94.6% of the population in this tract represents minority populations. The median income for this tract is $25,771, compared to $49,359 for Wayne County. Commute time is 29.8 minutes, with 80.9% of workers using a car, truck, or van (65.7% drive alone), 9% using public transportation, 1.6% walking, 4.6% using ride share or other means, and 3.9% working remotely. Environmental Pollutants The 5412 Census Tract is in the 80th Percentile or higher, in the state of Michigan, for all of the following categories: - Particulate matter | 90th Percentile - Ozone | 82nd Percentile - 2017 Diesel Particulate Matter | 97th Percentile - 2017 Air Toxics Cancer Risk | 99th Percentile - 2017 Air Toxics Respiratory HI | 99th Percentile - Traffic Proximity | 85th Percentile - Lead Paint | 85th Percentile Critical Services Critical services include access to food and healthcare. The Site is not located within a food desert; the closest grocery store is within 0.6 miles and there are contiguous sidewalks along the walking route. The Site is not in a medically underserved area; it is within 2 miles from two (2) clinics and is within 5 miles of 10 dental offices and as well as the following hospitals: DMC Sinai Grace Hospital, Henry Ford Medical Center, Ascension Providence Hospital - Southfield, and Beaumont Hospital - Farmington Hills. This project will not result in disproportionately adverse environmental effects on minority or low-income populations. Rather,	

Environmental Assessment Factor	Impact Code	Impact Evaluation	Mitigation
		it will provide affordable housing options within the community and promote expansion of employment opportunities.	
		COMMUNITY FACILITIES AND SERVICES	
Educational and Cultural Facilities (Access and Capacity)	1	There are approximately 108 Public and Charter Schools within 5 miles of the Site. The table below shows the number of schools for each stage of education (data retrieved from greatschools.org), this data is also mapped in Figure 6. SCHOOL STAGE QUANTITY Preschool 41 Elementary 73 Middle 55 High School 37 According to Public School Review, 2022 statistics show that Detroit Public Schools ranks in the top 1% for largest student bodies in Michigan. The student to teacher ratio is approximately 16:1, which is below the state average of 17:1. The Orchard Village Housing Project aims to provide affordable housing to Detroit residents, a goal that has the potential to provide stability and a safe environment for families in the area. Affordable housing reduces residential mobility and school mobility, factors that are often detrimental to academic achievement, by supporting financial stability for families in low income areas. There are also a variety of cultural facilities in the area. Over twenty churches can be accessed within three-mile radius. There are also multiple art galleries and museums, the closest of which is just about a mile away. Community centers such as the Detroit Lithuanian Cultural Center, the Metro Detroit Corean Society, and the St. Mary's Cultural Center are all accessible within approximately six miles from the property.	
Commercial Facilities (Access and Proximity)	1	Many commercial/retail neighborhood services are located within one mile of the subject property. Included in these services are: supermarket (grocery, household items, and clothing), bank, gas station, car wash, auto maintenance and repair, and convenience. The proposed future development of housing in this area will likely be economically beneficial to local businesses, and the proximity to these businesses may also provide employment opportunities to those living in the Orchard Village Apartments. Figure 7 shows a map of businesses in the surrounding area.	

Environmental Assessment Factor	Impact Code	Impact Evaluation	Mitigation
Health Care / Social Services (Access and Capacity)	1	The Site is not in a medically underserved area; it is within 2 miles from two (2) clinics and is within 5 miles of 10 dental offices and as well as the following hospitals: DMC Sinai Grace Hospital, Henry Ford Medical Center, Ascension Providence Hospital - Southfield, and Beaumont Hospital - Farmington Hills. Affordable housing assists underserved and vulnerable populations by providing low-cost and stable rental housing to help residents live productive and fruitful lives. The Project intends to provide affordable rent to those in need, along with a community center for residents and the surrounding neighborhood. The community center will provide a gathering space as well as a computer area with printers and free wireless internet. CHN is working with a local non-profit to provide financial literacy services to residents, and there are many other social service facilities nearby including: substance abuse services, crisis intervention, youth centers, behavioral therapy services, counseling, and others. See Figure 9.	
Solid Waste Disposal and Recycling (Feasibility and Capacity)	2	Solid waste disposal is regulated under the Solid Waste Disposal Act (42 U.S.C. 6901-6987 et seq.) as amended by the Resource Conservation and Recovery Act of 1976. The City of Detroit coordinates with Waste Management for solid waste disposal and curbside recycling. This service is currently provided for the community and extending service to the proposed development will not result in a significant impact to the existing community. See Figure 10.	
Waste Water and Sanitary Sewers (Feasibility and Capacity)	2	Based on the current status of the Site, a vacant lot, current use does not generate a significant amount of waste water. Waste water generated by the City of Detroit is treated at the Detroit Waste Water Treatment Facility. Treated water is then released into the Detroit River. Effluent from the current use will be collected by existing infrastructure (ie. sewer) and transported to the waste waster treatment facility. Additionally, surface runoff from impermeable materials will be collected by storm sewers, underground detention, and surrounding greenspace; eliminating the potential for decreased surface quality via runoff.	

Environmental Assessment Factor	Impact Code	Impact Evaluation	Mitigation
Water Supply (Feasibility and Capacity)	2	Clean municipal drinking water supply is available for the site. See Figure 15 for service area, violations, facilities, and water treatment plants. Water supply information specific to the construction such as the size of the water pipes can be found in Figure 18 - Site and Utility Plan.	
Public Safety - Police, Fire and Emergency Medical	2	The Site is under the jurisdiction of Detroit Public Safety, which includes police, fire, and emergency medical services. This service is currently provided for the community and extending this service to the proposed development will not result in a significant impact to the existing community. The Eighth Precinct of the Detroit Police Department covers the project location. The precinct office located at 21555 West McNichols Road Detroit, MI 48219 is less than one mile away from the property. No police services will be negatively impacted by the proposed project. See Figure 12.	
Parks, Open Space and Recreation (Access and Capacity)	2	There are many parks in the City of Detroit, nine (9) of which are within one mile of the Site. The Milan and Hope parks offer picnic areas, walking paths, play areas, and sport fields/courts. Planned improvements for Rogell Park include a system of trails for walking and biking as well as community areas such as pavilions, a clubhouse, and an amphitheater. Figure 13 shows parks within one mile of the Site.	
Transportation and Accessibility (Access and Capacity)	2	The primary mode of transportation for the City of Detroit is the automobile. Grand River Avenue is directly to the south of the Site, connecting the community to southeast toward Downtown Detroit as well as northwest toward Lansing. M-24 links the community south to I-94 and the Detroit Metropolitan Airport, the State's main domestic and international airport, which is approximately 14 miles from the Site. The Oakland/Troy Airport, located 9 miles north, serves business travelers and tourists using private, corporate, or charter planes. There are Smart Bus Crosstown Bus Routes via 280 (Western Wayne Crosstown), 305 (Grand River), and 375 (Telegraph Old Redford/Pontiac) with stops within .25 miles of the Site. The Metro Park Express Route via 275 (Telegraph Taylor/Tel-Twelve Mall) bus stop is within 1.6 miles of the Site. The Detroit Department of Transportation provides three (3) bus stops with	

Environmental Assessment Factor	Impact Code	Impact Evaluation	Mitigation
		frequent service that link to major corridors. The closest AmTrak platform is in Royal Oak, approximately 14 miles northeast of the Site. Non-motorized transportation includes many contiguous subdivision sidewalks and sidewalks along major streets. There are designated, protected bike lanes along Grand River Avenue. The proposed development of Orchard Village Apartments will provide parking for residents. The proposed development will include 48 parking spaces, five (5) spaces will be ADA accessible. The proposed development is estimated to add 29 trips during the AM peak hour and 34 trips during the PM peak hour. The daily trips generated is estimated to be 323 trips. The addition of these trips to the surrounding roadway network should result in very minimal impact to the performance of the adjacent roadways. See Figures 14.1 through 14.3.	
NATURAL FEATURES			
Unique Natural Features /Water Resources	2	No unique natural features or water resources have been identified that will be negatively impacted by development at the Site.	
Vegetation / Wildlife (Introduction, Modification, Removal, Disruption, etc.)	2	The National Wetlands Inventory (NWI) provided by the U.S. Fish and Wildlife Service's (USFWS) shows no evidence of the presence of wetlands within the Project area. An additional map from EGLE showing wetlands and wetland soils, as identified by the NWI and the Michigan Resource Inventory System (MIRIS), further shows that there are no wetlands present at the Site. These maps are provided in Appendix F. There are no unique natural features on the property and the project will not have any impact on natural features in the city.	
Other Factors 1	2	The Federal Clean Air Act of 1970 establishes regulations on land use controls for projects in urban areas. These regulations are prepared on a state level in the form of State Implementation Plans (SIP) and reviewed by the United States Environmental Protection Agency (EPA). Under EPA regulations, National Ambient Air Quality Standards (NAAQS) were established to measure air quality and identify violations, and include	

Environmental Assessment Factor	Impact Code	Impact Evaluation	Mitigation
		the six (6) critical criteria listed below. Particulate Matter Ozone Sulfur Dioxide Nitrogen Carbon Monoxide Lead Ten (10) ambient air-monitoring stations are currently located within Wayne County and operated by the State of Michigan. The Eliza Howell - NR monitoring station ID# 26-163-0093, located at 23751 Fenkell St, Detroit, MI, is the closest monitoring station in relation to the Site. MSG obtained air quality information from the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Air Quality Annual Report 2020 as well as a letter of conformity from EGLE stating that the Project should not exceed de minimis levels included in the federal general conformity requirements and does not require a detailed analysis. A copy of the letter and the annual report are presented in Appendix K.	
Other Factors 2			
CLIMATE AND ENERGY			
Climate Change	1	The Orchard Village Apartments will contribute to population and development density, reducing the contribution of housing demand to climate change by reducing the number of single-family homes. Climate change factors such as hurricanes, coastal flooding, drought, etc. will not be impacted by the project. This project will not have a minor benefit on climate change as it is removing vegetation and increasing impervious surface area. Nevertheless, it should not have a large impact on climate change issues such as extreme cold, extreme heat, and flooding. Additionally, the developer will strive to use environmentally efficient appliances and systems throughout the project.	
Energy Efficiency	2	The City of Detroit has experienced a decrease in population of 74,666 residents between 2010 and 2020, according to the US Census. Per the US Energy Information Administration (EIA) 2015 Residential Energy Consumption Survey (released 2018, next report available 2023), the average annual energy consumption in rented apartments per household in the Midwest is 41.1 million Btu. The electrical grid has the capacity to withstand this additional load with little	

Environmental Assessment Factor	Impact Code	Impact Evaluation	Mitigation
		impact. Refer to Figure 5. The project location is within the DTE Energy service area. Historically, the Site has been used for single family homes and will not require extensive effort to re-secure electric service. All construction will comply with local municipality and county codes and performed in accordance with all applicable federal, state, and local (City of Detroit) regulations. The developer will strive to use environmentally efficient appliances and systems throughout the project.	

Supporting documentation

Figure 18 - Site and Utility Plan.pdf
Figure 17 - Churches.pdf
Figure 16 - Arts and Museums.pdf
Appendix A Site Plan - Landscape Plan - Photometrics - Utility.pdf
Figure 15 - Drinking Water.pdf
Appendix I Rare Species Review(1).pdf
Appendix F Wetlands(1).pdf
Appendix K Nonattainment - Ozone(1).pdf
Appendix K Letter of Conformity(1).pdf
Appendix K 2020 Air Quality Report(1).pdf
Appendix M Environmental Justice(1).pdf
Figure 14 - Transportation.pdf
Figure 13 - Parks.pdf
Figure 12 - Public Safety.pdf
Figure 11 - Underground Detention Plans.pdf
Figure 10 - Solid Waste.pdf
Figure 9 - Social Services.pdf
Figure 8 - Healthcare Facilities.pdf
Figure 7 - Commercial Facilities.pdf
Figure 6 - Educational Facilities.pdf
Figure 5 - Energy.pdf
Figure 4 - USGS Quadrangle Map.pdf
Figure 3 - Elevation.pdf
Figure 2 - ALTA survey.pdf
Figure 1 - Site Map.pdf

Additional Studies Performed:

Field Inspection [Optional]: Date and completed by:

1/24/2022 12:00:00 AM

List of Sources, Agencies and Persons Consulted [40 CFR 1508.9(b)]:

Phase I and Phase II ESA performed by ASTI Environmental US Census Bureau US Federal Emergency Management Agency National Wetlands Inventory US Fish and Wildlife Service Michigan Resource Inventory System Michigan State University - Michigan Natural Features Inventory Michigan Department of Environment, Great Lakes, and Energy US Department of Agriculture US Environmental Protection Agency Wayne County Department of Public Services, Environmental Services Division US Geological Survey US Energy Information Administration City of Detroit Public School Review Google Earth/Maps Transit Guide: Detroit MERIT DEM Map Michigan State Housing Development Authority US Department of Transportation

List of Permits Obtained:

Public Outreach [24 CFR 58.43]:

All historical, local and federal contacts on the City of Detroit 2023 Interested Parties List were sent a copy of the Notice of Intent to Request for Release of Funds to use HUD funding for the project and were asked to comment on this project.

Cumulative Impact Analysis [24 CFR 58.32]:

Impact on human environment: The Orchard Village Housing Project will improve the appearance and safety of what are currently vacant parcels, while improving the availability of much needed affordable housing in Detroit. Whether this site is improved using federal or private funding, the local economy and social stability will improve with development of multi-family housing at this site. Impact on natural environment: The proposed project will have minimal negative effect on the natural environment. The most significant potential impact is the addition of impervious pavement, however with the proposed stormwater management/underground detention plan, the site will be engineered to appropriately manage rainfall and additional runoff. Occupancy and maintenance of this site will be an improvement over the current vacant status; animals in the area will encounter less potentially harmful/life threatening litter on the premises.

Alternatives [24 CFR 58.40(e); 40 CFR 1508.9]

No other sites were considered for this project.

No Action Alternative [24 CFR 58.40(e)]

No action / no construction: If this project does not come to fruition and the site remains vacant land, the site will likely remain unkempt and overgrown. The site will not serve as an economic or social asset for the community. The site would remain an area of greenspace in a heavily developed area. It was observed during the Phase I that the site has been used for community agricultral programming and that raised-bed gardens and mulch were observed. Should the site remain undeveloped, this activity would likely continue to occur.

Summary of Findings and Conclusions:

The proposed low-income housing construction will not adversely impact the City of Detroit or neighborhoods surrounding the site. The activity is compatible with the surrounding neighborhood and zoning and will have minimal impact on existing resources or services in the area. The proposed project will provide more low-income housing and housing options to the City of Detroit.

Mitigation Measures and Conditions [CFR 1505.2(c)]:

Summarized below are all mitigation measures adopted by the Responsible Entity to reduce, avoid or eliminate adverse environmental impacts and to avoid non-compliance or non-conformance with the above-listed authorities and factors. These measures/conditions must be incorporated into project contracts, development agreements and other relevant documents. The staff responsible for implementing and monitoring mitigation measures should be clearly identified in the mitigation plan.

Law, Authority, or Factor	Mitigation Measure or Condition	Comments on Completed Measures	Mitigation Plan	Complete

Project Mitigation Plan

Supporting documentation on completed measures

APPENDIX A: Related Federal Laws and Authorities

Airport Hazards

General policy	Legislation	Regulation
It is HUD's policy to apply standards to prevent incompatible development around civil airports and military airfields.		24 CFR Part 51 Subpart D

1. To ensure compatible land use development, you must determine your site's proximity to civil and military airports. Is your project within 15,000 feet of a military airport or 2,500 feet of a civilian airport?

✓ **No**

Based on the response, the review is in compliance with this section. Document and upload the map showing that the site is not within the applicable distances to a military or civilian airport below

Yes

<u>Screen Summary</u>

Compliance Determination

The project site is not within 15,000 feet of a military airport or 2,500 feet of a civilian airport. This can be seen in Appendix Q Airport Proximity. The project is in compliance with Airport Hazards requirements. Two (2) FAA-regulated commercial airports and one (1) executive (small engine) airport have been identified within 15 miles of the Site; noise pollution related to aviation has not been identified on the USDOT noise map and is therefore below 45.0 dBA. AIRPORT DISTANCE Detroit Metropolitan Wayne County Airport 13.65 mi Coleman A. Young International Airport 12.27 mi Oakland/Troy Airport 9.4 mi

Supporting documentation

Appendix Q Airport Proximity.pdf

Are formal compliance steps or mitigation required?

Yes

✓ No

Coastal Barrier Resources

General requirements	Legislation	Regulation
HUD financial assistance may not be used for most activities in units of the Coastal Barrier Resources System (CBRS). See 16 USC 3504 for limitations on federal expenditures affecting the CBRS.	Coastal Barrier Resources Act (CBRA) of 1982, as amended by the Coastal Barrier Improvement Act of 1990 (16 USC 3501)	

1. Is the project located in a CBRS Unit?

✓ No

Document and upload map and documentation below.

Yes

Compliance Determination

This project is not located in a CBRS Unit. Therefore, this project has no potential to impact a CBRS Unit and is in compliance with the Coastal Barrier Resources Act. The Detroit River, a jurisdictional waterway, is the nearest coastal zone in relation to the project Site. It is located approximately 11.62 miles southeast of the Site. The Project will not extend into the Detroit River and coastal waters will not be impacted by associated activities. A map of the coastal barriers in Wayne County can be seen in Appendix R Wayne County Coastal Barriers Map.

Supporting documentation

Appendix R Wayne County Coastal Barriers Map.pdf

Are formal compliance steps or mitigation required?

Yes

✓ No

Flood Insurance

General requirements	Legislation	Regulation
Certain types of federal financial assistance may not be used in floodplains unless the community participates in National Flood Insurance Program and flood insurance is both obtained and maintained.	Flood Disaster Protection Act of 1973 as amended (42 USC 4001-4128)	24 CFR 50.4(b)(1) and 24 CFR 58.6(a) and (b); 24 CFR 55.1(b).

1. Does this project involve <u>financial assistance for construction, rehabilitation, or acquisition of a mobile home, building, or insurable personal property</u>?

✓ No. This project does not require flood insurance or is excepted from flood insurance.

Based on the response, the review is in compliance with this section.

Yes

4. While flood insurance is not mandatory for this project, HUD strongly recommends that all insurable structures maintain flood insurance under the National Flood Insurance Program (NFIP). Will flood insurance be required as a mitigation measure or condition?

Yes

✓ No

<u>Screen Summary</u>

Compliance Determination

Based on the project description the project includes no activities that would require further evaluation under this section. The project does not require flood insurance or is excepted from flood insurance. The project is in compliance with Flood Insurance requirements. According to the Federal Emergency Management Agency (FEMA) Flood Map, the Site is located in an area of minimal flooding as of October 2020. The site is located in Zone X, as seen in City of Detroit FEMA map number 26163C0067E eff. 2/2/2012. This map is attached under Appendix E National Flood Hazard Map.

Supporting documentation

Appendix E National Flood Hazard map.pdf

Are formal compliance steps or mitigation required?

Yes

- ✓ No

Air Quality

General requirements	Legislation	Regulation
The Clean Air Act is administered by the U.S. Environmental Protection Agency (EPA), which sets national standards on ambient pollutants. In addition, the Clean Air Act is administered by States, which must develop State Implementation Plans (SIPs) to regulate their state air quality. Projects funded by HUD must demonstrate that they conform to the appropriate SIP.	Clean Air Act (42 USC 7401 et seq.) as amended particularly Section 176(c) and (d) (42 USC 7506(c) and (d))	40 CFR Parts 6, 51 and 93

1. Does your project include new construction or conversion of land use facilitating the development of public, commercial, or industrial facilities OR five or more dwelling units?

✓ Yes

No

Air Quality Attainment Status of Project's County or Air Quality Management District

2. Is your project's air quality management district or county in non-attainment or maintenance status for any criteria pollutants?

No, project's county or air quality management district is in attainment status for all criteria pollutants.

✓ Yes, project's management district or county is in non-attainment or maintenance status for the following criteria pollutants (check all that apply):

Carbon Monoxide

Lead

Nitrogen dioxide

Sulfur dioxide

✓ Ozone

Particulate Matter, <2.5 microns

Particulate Matter, <10 microns

3. What are the *de minimis* emissions levels (<u>40 CFR 93.153</u>) or screening levels for the non-attainment or maintenance level pollutants indicated above

Ozone ppb (parts per million)

Provide your source used to determine levels here:
50 tons per year per EPA General Conformity De Minimis Table: https://www.epa.gov/general-conformity/de-minimis-tables

4. **Determine the estimated emissions levels of your project. Will your project exceed any of the de minimis or threshold emissions levels of non-attainment and maintenance level pollutants or exceed the screening levels established by the state or air quality management district?**

✓ No, the project will not exceed *de minimis* or threshold emissions levels or screening levels.

Enter the estimate emission levels:

Ozone 0.00 ppb (parts per million)

Based on the response, the review is in compliance with this section.

Yes, the project exceeds *de minimis* emissions levels or screening levels.

<u>**Screen Summary**</u>

Compliance Determination

The project's county or air quality management district is in non-attainment status for the following: Ozone. This project does not exceed de minimis emissions levels or the screening level established by the state or air quality management district for the pollutant(s) identified above. A copy of the Air Quality Report and Letter of Conformity can be found in Appendix K. The project is in compliance with the Clean Air Act. The Eliza Howell - NR monitoring station ID# 26-163-0093, located at 23751

Fenkell St, Detroit, MI, is the closest monitoring station in relation to the Site. MSG obtained air quality information from the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Air Quality Annual Report 2020 as well as a letter of conformity from EGLE stating that the Project should not exceed de minimis levels included in the federal general conformity requirements and does not require a detailed analysis.

Supporting documentation

Appendix K - Ozone-monitors-2018-20-nonattainment-area.pdf
Appendix K Nonattainment - Ozone.pdf
Appendix K Letter of Conformity.pdf
Appendix K 2020 Air Quality Report.pdf

Are formal compliance steps or mitigation required?

Yes

✓ No

Coastal Zone Management Act

General requirements	Legislation	Regulation
Federal assistance to applicant agencies for activities affecting any coastal use or resource is granted only when such activities are consistent with federally approved State Coastal Zone Management Act Plans.	Coastal Zone Management Act (16 USC 1451-1464), particularly section 307(c) and (d) (16 USC 1456(c) and (d))	15 CFR Part 930

1. Is the project located in, or does it affect, a Coastal Zone as defined in your state Coastal Management Plan?

Yes

✓ No

Based on the response, the review is in compliance with this section. Document and upload all documents used to make your determination below.

Screen Summary

Compliance Determination

This project is not located in or does not affect a Coastal Zone as defined in the state Coastal Management Plan. This can be seen in Appendix G - Wayne County Coastal Zone Map. The project is in compliance with the Coastal Zone Management Act. The Detroit River, a jurisdictional waterway, is the nearest coastal zone in relation to the project Site. It is located approximately 11.62 miles southeast of the Site. The Project will not extend into the Detroit River and coastal waters will not be impacted by associated activities.

Supporting documentation

Appendix G Wayne County Coastal Zone map(1).pdf

Are formal compliance steps or mitigation required?

Yes

✓ No

Contamination and Toxic Substances

General requirements	Legislation	Regulations
It is HUD policy that all properties that are being proposed for use in HUD programs be free of hazardous materials, contamination, toxic chemicals and gases, and radioactive substances, where a hazard could affect the health and safety of the occupants or conflict with the intended utilization of the property.		24 CFR 58.5(i)(2) 24 CFR 50.3(i)

1. How was site contamination evaluated? Select all that apply. Document and upload documentation and reports and evaluation explanation of site contamination below.

✓ American Society for Testing and Materials (ASTM) Phase I Environmental Site Assessment (ESA)
✓ ASTM Phase II ESA
Remediation or clean-up plan
ASTM Vapor Encroachment Screening
None of the Above

2. Were any on-site or nearby toxic, hazardous, or radioactive substances found that could affect the health and safety of project occupants or conflict with the intended use of the property? (Were any recognized environmental conditions or RECs identified in a Phase I ESA and confirmed in a Phase II ESA?)

✓ No

Explain:
The Limited Phase II ESA concluded that based on the data, no release of hazardous substances has occured at the subject property with respect to the RECs assessed. They recommended no further investigation.

Based on the response, the review is in compliance with this section.

Yes

Screen Summary
Compliance Determination

Site contamination was evaluated as follows: ASTM Phase I ESA, ASTM Phase II ESA. These Documents can be found in Appendix Di - Phase I and Appendix Dii - Phase II. The Phase I ESA, completed on February 15, 2022, identified one recognized environmental condition (REC), "There was a former dwelling at 21624 Orchard Street that was removed by 1986. The demolition practice and the type of fill used at the former dwelling are unknown. This size of this dwelling is estimated to be 600 to 800 square feet based on the building footprint in Sanborn Maps. It was present from about 1926 to 1986. The foundation type is unknown. If it contained a basement, the typical design during this period was to build an elevated first floor with basement depth for around four feet "The Phase II was completed on October 12, 2022. Four soil borings were drilled, and samples were taken to determine if there was contamination on site above the State of Michigan Department of the Environment, Great Lakes and Energy's (EGLE's) criteria. Based on the results of the samples, no contamination above EGLE's criteria was found. Therefore, the site is not a facility. The project is in compliance with contamination and toxic substances requirements. Because the property is made up of vacant lots, no renovation/remodeling is necessary. Additionally, there are no structures built before 1978. Due to these things, asbestos and lead surveys are not required. Because Radon is not present in over 25% of the county, evaluation is not necessary as part of the assessment.

Supporting documentation

Appendix P Radon Map.pdf
Appendix Dii Phase II.pdf
Appendix Di Phase I(1).pdf

Are formal compliance steps or mitigation required?

Yes

✓ No

Endangered Species

General requirements	ESA Legislation	Regulations
Section 7 of the Endangered Species Act (ESA) mandates that federal agencies ensure that actions that they authorize, fund, or carry out shall not jeopardize the continued existence of federally listed plants and animals or result in the adverse modification or destruction of designated critical habitat. Where their actions may affect resources protected by the ESA, agencies must consult with the Fish and Wildlife Service and/or the National Marine Fisheries Service ("FWS" and "NMFS" or "the Services").	The Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq*.); particularly section 7 (16 USC 1536).	50 CFR Part 402

1. Does the project involve any activities that have the potential to affect specifies or habitats?

✓ No, the project will have No Effect due to the nature of the activities involved in the project.

This selection is only appropriate if none of the activities involved in the project have potential to affect species or habitats. Examples of actions without potential to affect listed species may include: purchasing existing buildings, completing interior renovations to existing buildings, and replacing exterior paint or siding on existing buildings.
Based on the response, the review is in compliance with this section.

No, the project will have No Effect based on a letter of understanding, memorandum of agreement, programmatic agreement, or checklist provided by local HUD office

Yes, the activities involved in the project have the potential to affect species and/or habitats.

Screen Summary

Compliance Determination

This project will have No Effect on listed species due to the nature of the activities involved in the project. It is in a highly urbanized and developed area, not near riparian or wetland areas, or any other critical habitats. A list of the endangered species in the region can be found in Appendix T - IPAC Endangered Species List. This project is in compliance with the Endangered Species Act.

Supporting documentation

Appendix T IPAC Endangered Species List(1).pdf

Are formal compliance steps or mitigation required?

Yes

✓ No

Explosive and Flammable Hazards

General requirements	Legislation	Regulation
HUD-assisted projects must meet Acceptable Separation Distance (ASD) requirements to protect them from explosive and flammable hazards.	N/A	24 CFR Part 51 Subpart C

1. Is the proposed HUD-assisted project itself the development of a hazardous facility (a facility that mainly stores, handles or processes flammable or combustible chemicals such as bulk fuel storage facilities and refineries)?

✓ No

Yes

2. Does this project include any of the following activities: development, construction, rehabilitation that will increase residential densities, or conversion?

No

✓ Yes

3. Within 1 mile of the project site, are there any current or planned stationary aboveground storage containers that are covered by 24 CFR 51C? Containers that are NOT covered under the regulation include:

- **Containers 100 gallons or less in capacity, containing common liquid industrial fuels OR**
- **Containers of liquified petroleum gas (LPG) or propane with a water volume capacity of 1,000 gallons or less that meet the requirements of the 2017 or later version of National Fire Protection Association (NFPA) Code 58.**

If all containers within the search area fit the above criteria, answer “No.” For any other type of aboveground storage container within the search area that holds one of the flammable or explosive materials listed in Appendix I of 24 CFR part 51 subpart C, answer “Yes.”

✓ No

Based on the response, the review is in compliance with this section. Document and upload all documents used to make your determination below.

Yes

Screen Summary

Compliance Determination

There are no current or planned stationary aboveground storage containers of concern within 1 mile of the project site. A map of the site demonstrating this can be seen in Appendix S - Site features map. The project is in compliance with explosive and flammable hazard requirements. The Phase I shows that the Site is located an Acceptable Separation Distance (ASD) from any above-ground explosive or flammable fuels or chemical containers (page 28). A letter from the Department of Public Services, Environmental Services Division, provided on January 5, 2022 in response to a request by ASTI during the Phase I of the Site, notes that after diligent search for records (pertaining to landfilling activity, spills/releases, 201 sites, above ground storage tanks, underground storage tanks, soil or water contamination, etc.), none have been found. Visual reconnaissance of the Site and surrounding area performed by ASTI during the Phase I revealed that there are no observed facilities that utilize or store large scale above ground storage tanks (ASTs) within a one-mile radius of the Site.

Supporting documentation

Appendix S Site Features Map.pdf
Appendix O Explosive and Flammable Operation.pdf

Are formal compliance steps or mitigation required?

Yes

✓ No

Farmlands Protection

General requirements	Legislation	Regulation
The Farmland Protection Policy Act (FPPA) discourages federal activities that would convert farmland to nonagricultural purposes.	Farmland Protection Policy Act of 1981 (7 U.S.C. 4201 et seq.)	7 CFR Part 658

1. Does your project include any activities, including new construction, acquisition of undeveloped land or conversion, that could convert agricultural land to a non-agricultural use?

Yes

✓ No

If your project includes new construction, acquisition of undeveloped land or conversion, explain how you determined that agricultural land would not be converted:

The Project is located on a tract of land which has historically been for residential use.

Based on the response, the review is in compliance with this section. Document and upload all documents used to make your determination below.

Screen Summary

Compliance Determination

This project does not include any activities that could potentially convert agricultural land to a non-agricultural use. This is demonstrated in Appendix L - Farmland. The project is in compliance with the Farmland Protection Policy Act. The land which includes the subject property was acquired by the City of Detroit between 1922 and 1926. According to the Phase I, the subject property was developed prior to the record of any available historical data. Single family homes appear on the Site in historical imagery, procured by ASTI in their Phase I documentation, between 1937 and 2012. Sometime after 2012, all single family homes had been demolished; the site appears to have been vacant and undeveloped since this time. According to the UDSA Natural Resources Conservation Service's (NRCS) Web Soil Survey (http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx), all parcels involved with the Site are considered Rapson-Urban land complex, sandy substratum. Under the current scope of work, all proposed ground-disturbing activities fall within the area identified by the NRCS as ''not prime farmland.''

Supporting documentation

Appendix L Farmland.pdf

Are formal compliance steps or mitigation required?

Yes

✓ No

Floodplain Management

General Requirements	Legislation	Regulation
Executive Order 11988, Floodplain Management, requires federal activities to avoid impacts to floodplains and to avoid direct and indirect support of floodplain development to the extent practicable.	Executive Order 11988	24 CFR 55

1. Do any of the following exemptions apply? Select the applicable citation? [only one selection possible]

55.12(c)(3)
55.12(c)(4)
55.12(c)(5)
55.12(c)(6)
55.12(c)(7)
55.12(c)(8)
55.12(c)(9)
55.12(c)(10)
55.12(c)(11)
✓ None of the above

2. Upload a FEMA/FIRM map showing the site here:

Appendix E National Flood Hazard map(1).pdf

The Federal Emergency Management Agency (FEMA) designates floodplains. The FEMA Map Service Center provides this information in the form of FEMA Flood Insurance Rate Maps (FIRMs). For projects in areas not mapped by FEMA, use **the best available information** to determine floodplain information. Include documentation, including a discussion of why this is the best available information for the site.

Does your project occur in a floodplain?

✓ No

Based on the response, the review is in compliance with this section.

Yes

Screen Summary

Compliance Determination

This project does not occur in a floodplain. The project is in compliance with Executive Order 11988. This is demonstrated in FEMA map number 26163C0067E eff. 2/2/2012 which can be seen in Attachment E - National Flood Hazard Map. The site is located in Zone X.

Supporting documentation

Are formal compliance steps or mitigation required?

Yes

✓ No

Historic Preservation

General requirements	Legislation	Regulation
Regulations under Section 106 of the National Historic Preservation Act (NHPA) require a consultative process to identify historic properties, assess project impacts on them, and avoid, minimize, or mitigate adverse effects	Section 106 of the National Historic Preservation Act (16 U.S.C. 470f)	36 CFR 800 “Protection of Historic Properties” https://www.govinfo.gov/content/pkg/CFR-2012-title36-vol3/pdf/CFR-2012-title36-vol3-part800.pdf

Threshold
Is Section 106 review required for your project?

No, because the project consists solely of activities listed as exempt in a Programmatic Agreement (PA). (See the PA Database to find applicable PAs.)
No, because the project consists solely of activities included in a No Potential to Cause Effects memo or other determination [36 CFR 800.3(a)(1)].
✓ Yes, because the project includes activities with potential to cause effects (direct or indirect).

Step 1 – Initiate Consultation
Select all consulting parties below (check all that apply):

✓ State Historic Preservation Offer (SHPO) Completed

✓ Advisory Council on Historic Preservation Not Required

✓ Indian Tribes, including Tribal Historic Preservation Officers (THPOs) or Native Hawaiian Organizations (NHOs)

✓ Forest County Potawatomi Community of Wisconsin Completed

✓ Hannahville Indian Community	Completed
✓ Lac du Flambeau Reservation of Wisconsin	Completed
✓ Little Traverse Bay Bands of Odawa Indians	Completed
✓ Menominee Indian Tribe of Wisconsin	Completed
✓ Miami Tribe of Oklahoma	Completed
✓ Pokagon Band of Potawatomi Indians	Completed
✓ Sault Ste. Marie Tribe of Chippewa Indians	Completed
✓ Seneca-Cayuga Nation	Completed

✓ Other Consulting Parties

✓ City of Detroit Preservation Specialist	Completed

Describe the process of selecting consulting parties and initiating consultation here:

The Mannik & Smith Group - 36CFR Part 61 Qualified Historian/Architectural Historian, credentials on file with SHPO State Historic Preservation Office City of Detroit Local Historic District Map US Geological Survey quadrangles Tribal consultation (Housing & Revitalization Department at City of Detroit assumed responsibilities for contacting potentially affected tribes)

Document and upload all correspondence, notices and notes (including comments and objections received below).

Was the Section 106 Lender Delegation Memo used for Section 106 consultation?

Yes
No

Step 2 – Identify and Evaluate Historic Properties

1. **Define the Area of Potential Effect (APE), either by entering the address(es) or**

uploading a map depicting the APE below:

Within a half mile study area around the Project Location, the literature review identified the following previously recorded aboveground cultural resources: - The NRHP-listed Redford Theatre Building (ID #85000171) - Six NRHP-eligible buildings that are listed on the Michigan State Register of Historic Sites (SRHS), including one dwelling, one school, two banks, one commercial building, and the Redford Branch of the Detroit Public Library (which is also designated by the City of Detroit as a Local Historic District) - One property, a bank, that is listed on the SRHS but has not been evaluated for NRHP eligibility.   The Redford Theatre site is the only one of these resources that falls within the APE and may be visually impacted. See Attachment B for details. Field Reconnaissance also identified 10 residences, one office building, and one church that appear to be over 50 years of age within the APE. Photos of these resources are contained in Attachment D and Identification Forms are contained in Attachment E.

In the chart below, list historic properties identified and evaluated in the APE. Every historic property that may be affected by the project should be included in the chart.

Upload the documentation (survey forms, Register nominations, concurrence(s) and/or objection(s), notes, and photos) that justify your National Register Status determination below.

Address / Location / District	National Register Status	SHPO Concurrence	Sensitive Information

Additional Notes:

Additional properties are included in the attached Section 106 Application : N/A Prehistoric site (Unevaluated) Mt Hazel Cemetery Prehistoric site (Unevaluated) Wilmouth 19th Century site (Unevaluated) 17500 Lahser Detroit, MI 48219-2346 (Not Eligible) 21488 Santa Clara Detroit, MI 48219-2544 (Not Eligible) 21496 Santa Clara Detroit, MI 48219-2544 (Not Eligible) 21497 Santa Clara Detroit, MI 48219-2540 (Not Eligible) 21505 Santa Clara Detroit, MI 48219-2540 (Not Eligible) 21621 Santa Clara Detroit, MI 48219-2541 (Not Eligible) 21622 Santa Clara Detroit, MI 48219 (Not Eligible) 21630 Santa Clara Detroit, MI 48219-2543 (Not Eligible) 21638 Santa Clara Detroit, MI 48219-2543 (Not Eligible) 21654 Santa Clara Detroit, MI 48219-2543 (Not Eligible) 21654 Santa Clara Detroit, MI 48219-2379 (Not Eligible) 21680 Santa Clara Detroit, MI 48219-2543 (Not Eligible)

2. **Was a survey of historic buildings and/or archeological sites done as part of the**

project?

✓ Yes

Document and upload surveys and report(s) below.
For Archeological surveys, refer to HP Fact Sheet #6, Guidance on Archeological Investigations in HUD Projects.

Additional Notes:

No

Step 3 –Assess Effects of the Project on Historic Properties

Only properties that are listed on or eligible for the National Register of Historic Places receive further consideration under Section 106. Assess the effect(s) of the project by applying the Criteria of Adverse Effect. (36 CFR 800.5)] Consider direct and indirect effects as applicable as per guidance on direct and indirect effects.

Choose one of the findings below - No Historic Properties Affected, No Adverse Effect, or Adverse Effect; and seek concurrence from consulting parties.

No Historic Properties Affected

✓ No Adverse Effect

Based on the response, the review is in compliance with this section.
Document reason for finding:

The northeast corner of the Redford Theatre's rear parking lot falls within the area of potential visual effects. The theatre is listed in the NRHP under Criterion C for its architectural significance, as an example of Chinese-Japanese theatre design and as a well-preserved example of the ''atmospheric'' theatre genre of the 1920s. In this case, the project will not be visible from any area of the building where character-defining features are present, and will not introduce changes to the setting or character of the site that will adverselyaffect the integrity of the features from which the property derives its significance. The project will therefore have no adverse effect on this historic property. Field reconnaissance also identified 10 residences, one commercial building and one church in the APE that appear to be over 50 years of age, but possess insufficient material integrity, architectural distinction, or known historical associations to meet the eligibility criteria for listing in the NRHP under Criterion C, either individually or as part of a historically or visually cohesive historic district. However, additional research is recommended for two buildings - at 21680 Santa Clara and 21644 Orchard - to establish their historical significance in the context of early neighborhood development in Redford, just prior to its annexation by Detroit in 1926. In neither case does the setting of these buildings represent an important aspect of their significance, and the proposed project will not adversely affect those properties, should further research yield significant findings. For lack of architectural distinction, or for loss of material integrity, the remaining buildings in the APE do not individually meet the criteria for NRHP eligibility, nor are they part of an architecturally or visually cohesive historic district. Architectural Identification Forms for these resources are included in Attachment E. From an archaeological perspective, the residential properties that occupied the project area for much of the 20th century were built at a time when the City of Detroit had extended municipal utilities such as water, sewer, and rubbish removal city-wide. While this does not preclude the presence of archaeological deposits on these properties, they are less likely to be present than in parts of the city that were developed before the 1870s. More importantly, the piecemeal removal of buildings from the Project Area from the 1980s to the 2010s likely resulted in heavy disturbance to any such deposits. Overall, soil probing within the Project Area revealed gravelly, mottled soils indicative of prior disturbance. In the northern-northeastern portion of the project area, there appears to be an artificial berm. Soil probing in this area revealed mostly sand, not matching the soil profiles that exist in the rest of the survey area; therefore, it is interpreted that this sand came from fill. The soil probes in the southeastern portion of the area were mottled, and there is a sign nearby that suggests that it is being used as a soil dumping/work site. Probing in the southwestern portion of the project area revealed significance presence of gravel and soil mottling as well. For these reasons, it is unlikely that intact archaeological deposits are present within the project area.

Does the No Adverse Effect finding contain conditions?

Yes (check all that apply)

✓ No

Based on the response, the review is in compliance with this section. Document and upload concurrence(s) or objection(s) below.

Adverse Effect

Screen Summary

Compliance Determination

Based on Section 106 consultation the project will have No Adverse Effect on historic properties. Conditions: None. Upon satisfactory implementation of the conditions, which should be monitored, the project is in compliance with Section 106. Technical report prepared by a qualified historian/archaeologist concluded it is unlikely that intact archaeological deposits are present within the project area and that there will be no adverse effects to aboveground resources over 50 years of age. SHPO concurred with this determination of no historic properties affected within the area of potential effects of this undertaking. City of Detroit Housing & Revitalization Department assumed HUD responsibilities for project, including tribal consultation related to historic properties including sites, burial grounds, sacred landscapes or features, ceremonial areas, traditional cultural places and landscapes, plant and animal communities, and buildings and structures with significant tribal association. Through this consultation, no Native historic properties were identified. The Redford Theatre is listed in the NRHP, however the new construction will have no adverse effect on this resource. A determination of no adverse effect is applied to the proposed undertaking. The section 106 application and letter review can be found in Appendix C.

Supporting documentation

Appendix C Section 106 Letter Review.pdf
Appendix C Section 106 Application.pdf

Are formal compliance steps or mitigation required?

Yes

✓ No

Noise Abatement and Control

General requirements	Legislation	Regulation
HUD’s noise regulations protect residential properties from excessive noise exposure. HUD encourages mitigation as appropriate.	Noise Control Act of 1972 General Services Administration Federal Management Circular 75-2: “Compatible Land Uses at Federal Airfields”	Title 24 CFR 51 Subpart B

1. What activities does your project involve? Check all that apply:

✓ New construction for residential use

NOTE: HUD assistance to new construction projects is generally prohibited if they are located in an Unacceptable zone, and HUD discourages assistance for new construction projects in Normally Unacceptable zones. See 24 CFR 51.101(a)(3) for further details.

Rehabilitation of an existing residential property

A research demonstration project which does not result in new construction or reconstruction

An interstate land sales registration

Any timely emergency assistance under disaster assistance provision or appropriations which are provided to save lives, protect property, protect public health and safety, remove debris and wreckage, or assistance that has the effect of restoring facilities substantially as they existed prior to the disaster
None of the above

4. **Complete the Preliminary Screening to identify potential noise generators in the vicinity (1000’ from a major road, 3000’ from a railroad, or 15 miles from an airport).**

Indicate the findings of the Preliminary Screening below:

✓ There are no noise generators found within the threshold distances above.

Based on the response, the review is in compliance with this section. Document and upload a map showing the location of the project relative to any noise generators below.

Noise generators were found within the threshold distances.

Screen Summary

Compliance Determination

The Preliminary Screening identified no noise generators in the vicinity of the project. The project is in compliance with HUD's Noise regulation. Noise Assessment conducted January 2022 by ASTI Environmental The main factors examined in a noise assessment are intensity, frequency, and duration. Noise in the area is primarily due to traffic on nearby roads. Based on review of the Noise Assessment Location (NAL) performed by ASTI, there are four (4) busy roads located within 1,000 feet of the site: AIRPORT DISTANCE Grand River Avenue 817 feet Lahser Road 418 feet Redford Street 481 feet Bentler Street 892 feet There are no active railways within 3,000 feet of the Site. Two (2) FAA-regulated commercial airports and one (1) executive (small engine) airports have been identified within 15 miles of the Site; noise pollution related to aviation has not been identified on the USDOT noise map and is therefore below 45.0 dBA. The noise pollution assessment can be found in Appendix N - Noise Assessment. AIRPORT DISTANCE Detroit Metropolitan Wayne County Airport 13.65 mi Coleman A. Young International Airport 12.27 mi Oakland/Troy Airport 9.40 mi Based on the HUD DNL calculator, the noise level at NAL #1, as predicted in 2032, is 59 dB; the Site is located in an area that is within acceptable standards for residential development.

Supporting documentation

Appendix N Noise Assessment.pdf

Are formal compliance steps or mitigation required?

Yes

✓ No

Sole Source Aquifers

General requirements	Legislation	Regulation
The Safe Drinking Water Act of 1974 protects drinking water systems which are the sole or principal drinking water source for an area and which, if contaminated, would create a significant hazard to public health.	Safe Drinking Water Act of 1974 (42 U.S.C. 201, 300f et seq., and 21 U.S.C. 349)	40 CFR Part 149

1. Does the project consist solely of acquisition, leasing, or rehabilitation of an existing building(s)?

Yes

✓ No

2. Is the project located on a sole source aquifer (SSA)?

A sole source aquifer is defined as an aquifer that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. This includes streamflow source areas, which are upstream areas of losing streams that flow into the recharge area.

✓ No

Based on the response, the review is in compliance with this section. Document and upload documentation used to make your determination, such as a map of your project (or jurisdiction, if appropriate) in relation to the nearest SSA and its source area, below.

Yes

Screen Summary

Compliance Determination

The project is not located on a sole source aquifer area. A map of sole source aquifers in the Northeast can be found in Appendix H - Sole Source Aquifers. The project is in compliance with Sole Source Aquifer requirements. Based upon review of the

Designated Sole Source Aquifers in Region 5, no sole source aquifers are located within the State of Michigan.

Supporting documentation

Appendix H Sole Source Aquifers.pdf

Are formal compliance steps or mitigation required?

Yes

✓ No

Wetlands Protection

General requirements	Legislation	Regulation
Executive Order 11990 discourages direct or indirect support of new construction impacting wetlands wherever there is a practicable alternative. The Fish and Wildlife Service's National Wetlands Inventory can be used as a primary screening tool, but observed or known wetlands not indicated on NWI maps must also be processed Off-site impacts that result in draining, impounding, or destroying wetlands must also be processed.	Executive Order 11990	24 CFR 55.20 can be used for general guidance regarding the 8 Step Process.

1. Does this project involve new construction as defined in Executive Order 11990, expansion of a building's footprint, or ground disturbance? The term "new construction" shall include draining, dredging, channelizing, filling, diking, impounding, and related activities and any structures or facilities begun or authorized after the effective date of the Order

No

✓ Yes

2. Will the new construction or other ground disturbance impact an on- or off-site wetland? The term "wetlands" means those areas that are inundated by surface or ground water with a frequency sufficient to support, and under normal circumstances does or would support, a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds.

"Wetlands under E.O. 11990 include isolated and non-jurisdictional wetlands."

✓ No, a wetland will not be impacted in terms of E.O. 11990's definition of new construction.

Based on the response, the review is in compliance with this section. Document and upload a map or any other relevant documentation below which explains your determination

Yes, there is a wetland that be impacted in terms of E.O. 11990's definition of new construction.

<u>**Screen Summary**</u>
Compliance Determination

The project will not impact on- or off-site wetlands. A Map of the wetlands in the area can be found in Appendix F - Wetlands. The project is in compliance with Executive Order 11990. The National Wetlands Inventory (NWI) provided by the U.S. Fish and Wildlife Service's (USFWS) shows no evidence of the presence of wetlands within the Project area. An additional map from EGLE showing wetlands and wetland soils, as identified by the NWI and the Michigan Resource Inventory System (MIRIS), further shows that there are no wetlands present at the Site.

Supporting documentation

Appendix F Wetlands.pdf

Are formal compliance steps or mitigation required?

Yes

✓ No

Wild and Scenic Rivers Act

General requirements	Legislation	Regulation
The Wild and Scenic Rivers Act provides federal protection for certain free-flowing, wild, scenic and recreational rivers designated as components or potential components of the National Wild and Scenic Rivers System (NWSRS) from the effects of construction or development.	The Wild and Scenic Rivers Act (16 U.S.C. 1271-1287), particularly section 7(b) and (c) (16 U.S.C. 1278(b) and (c))	36 CFR Part 297

1. Is your project within proximity of a NWSRS river?

✓ No

Yes, the project is in proximity of a Designated Wild and Scenic River or Study Wild and Scenic River.

Yes, the project is in proximity of a Nationwide Rivers Inventory (NRI) River.

Screen Summary

Compliance Determination

This project is not within proximity of a NWSRS river. This can be seen in Appendix J - Wild and Scenic Rivers. The project is in compliance with the Wild and Scenic Rivers Act. According to the Michigan State Housing Development Authority and the USFWS Nationwide Rivers Inventory map dated April 2018, Wayne County, Michigan does not contain National Wild and Scenic River Systems.

Supporting documentation

Appendix J Wild and Scenic Rivers.pdf

Are formal compliance steps or mitigation required?

Yes

✓ No

Environmental Justice

General requirements	Legislation	Regulation
Determine if the project creates adverse environmental impacts upon a low-income or minority community. If it does, engage the community in meaningful participation about mitigating the impacts or move the project.	Executive Order 12898	

HUD strongly encourages starting the Environmental Justice analysis only after all other laws and authorities, including Environmental Assessment factors if necessary, have been completed.

1. Were any adverse environmental impacts identified in any other compliance review portion of this project's total environmental review?

Yes

✓ No

Based on the response, the review is in compliance with this section.

<u>Screen Summary</u>

Compliance Determination

No adverse environmental impacts were identified in the project's total environmental review. The project is in compliance with Executive Order 12898. MSG reviewed pertinent 2020 United States Census data regarding minority and low-income populations within the project area and surrounding vicinity. A review of the USEPA Environmental Justice (EJ) Screen was also completed to identify low income and minority populations in the project area. A copy of the data used in the summary below is available in Appendix M. Based on census data, 33.3% of the residents in Census Tract 5412 are below the poverty line; data from that year also reflects that 94.6% of the population in this tract represents minority populations. The median income for this tract is $25,771, compared to $49,359 for Wayne County. Commute time is 29.8 minutes, with 80.9% of workers using a car, truck, or van (65.7% drive alone), 9% using public transportation, 1.6% walking, 4.6% using ride share or other means, and 3.9% working remotely. Environmental Pollutants The 5412 Census Tract is in the 80th Percentile or higher, in the state of Michigan, for all of the following categories: - Particulate matter | 90th Percentile - Ozone | 82nd Percentile - 2017 Diesel Particulate Matter | 97th Percentile - 2017 Air Toxics Cancer

Risk | 99th Percentile - 2017 Air Toxics Respiratory HI | 99th Percentile - Traffic Proximity | 85th Percentile - Lead Paint | 85th Percentile Critical Services Critical services include access to food and healthcare. The Site is not located within a food desert; the closest grocery store is within 0.6 miles and there are contiguous sidewalks along the walking route. The Site is not in a medically underserved area; it is within 2 miles from two (2) clinics and is within 5 miles of 10 dental offices and as well as the following hospitals: DMC Sinai Grace Hospital, Henry Ford Medical Center, Ascension Providence Hospital - Southfield, and Beaumont Hospital - Farmington Hills. This project will not result in disproportionately adverse environmental effects on minority or low-income populations. Rather, it will provide affordable housing options within the community and promote expansion of employment opportunities.

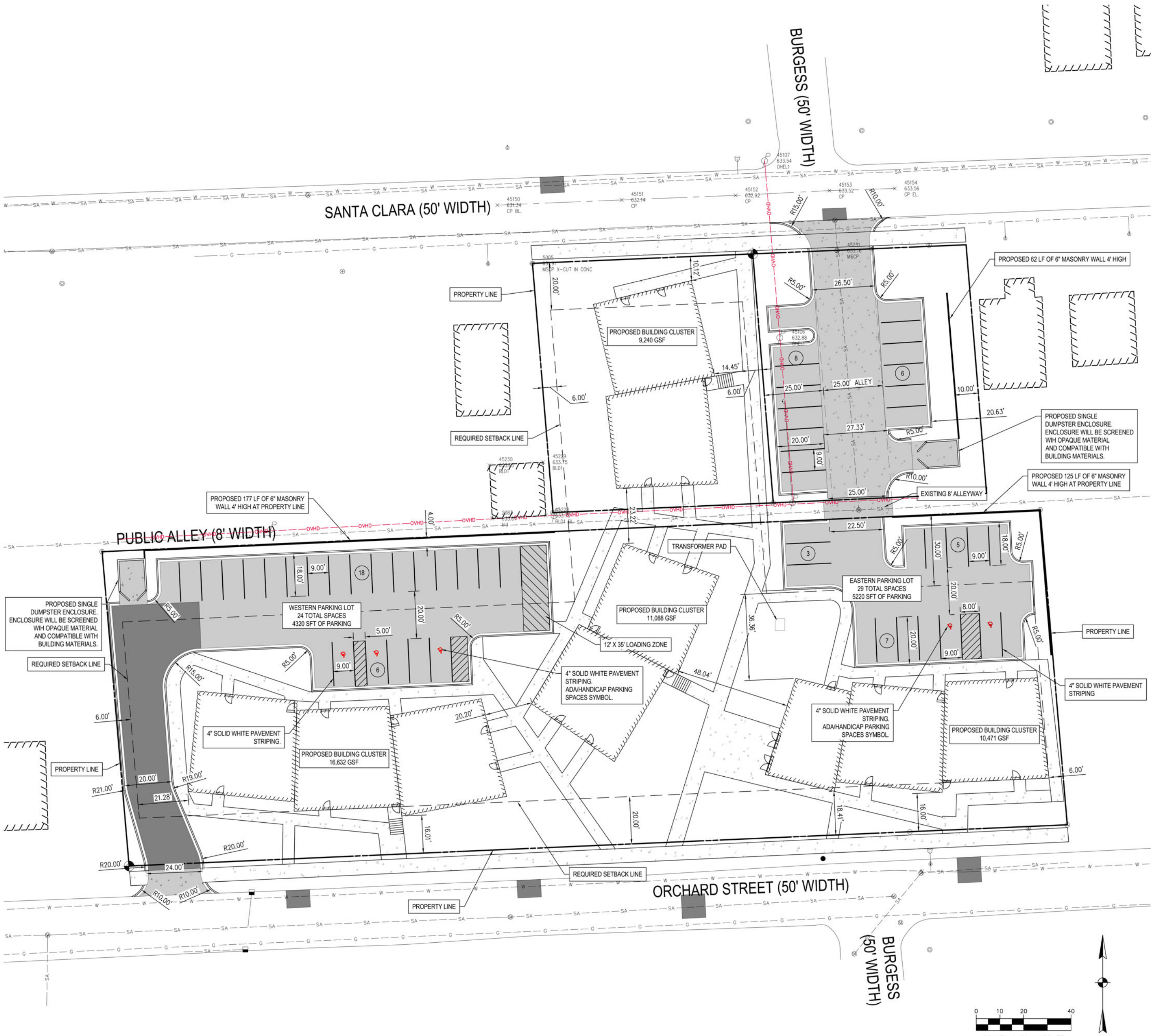
Supporting documentation

Appendix M Environmental Justice.pdf

Are formal compliance steps or mitigation required?

Yes

✓ No



LEGEND

- PROPERTY LINE
- PAVEMENT LIMITS
- E — EXISTING UNDERGROUND ELECTRIC LINE
- OVHD — EXISTING OVERHEAD ELECTRIC LINE
- G — EXISTING GAS LINE
- SA — EXISTING COMBINED SEWER LINE
- W — EXISTING WATER LINE
- EXISTING BUILDING LINE
- PROPOSED BUILDING LINE
- PROPOSED MASONRY WALL LINE
- EXISTING GUY WIRE/ UTILITY POLE
- HEAVY DUTY ASPHALT
- REGULAR DUTY ASPHALT
- CONCRETE SIDEWALK
- CONCRETE PAVEMENT
- (5) NUMBER OF PARKING SPACES

DEVELOPMENT SUMMARY			
SUBJECT	REQUIRED CODES	PROPOSED	SECTION
ZONING	R3 – LOW DENSITY RESIDENTIAL DISTRICT	R3 – LOW DENSITY RESIDENTIAL DISTRICT	50–8–74
SITE AREA	7000 SF	70006 SF	50–13–4
LOT COVERAGE	.12 RSR	.149 RSR	
SETBACKS			
FRONT	20'	10'–3" (NORTH) , 16' (SOUTH)	
REAR	30'	30'	
SIDE (NORTH PROPERTY)	6'	6'	
SIDE (SOUTH PROPERTY)	6'	6'	
PARKING (TOTAL)	36 SPACES	53 SPACES	50–14–34
INTERIOR LANDSCAPING (EAST)	522 SF	720 SF	50–14–343
ACCESSIBLE PARKING	2 REQURIRED TOTAL	3 SPACES (WEST), 2 SPACES (EAST)	50–14–182
LOADING	(1) 12'X35'	(1) 12'X35'	50–14–112
BUILDING HEIGHT	NONE	42'	50–13–4
MAX F.A.R.	0.7 = 44,213 SF.	0.69 = 43,400 SF.	50–13–4

PROJECT NOTES:

DIMENSIONS OF PAVMENT WIDTHS SHALL BE INTREPRETED AT CURB TO BE UP TO THE FACE OF CURB.

ALTERNATIVE ENGINEERING DESIGN

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Key Section

Key Plan

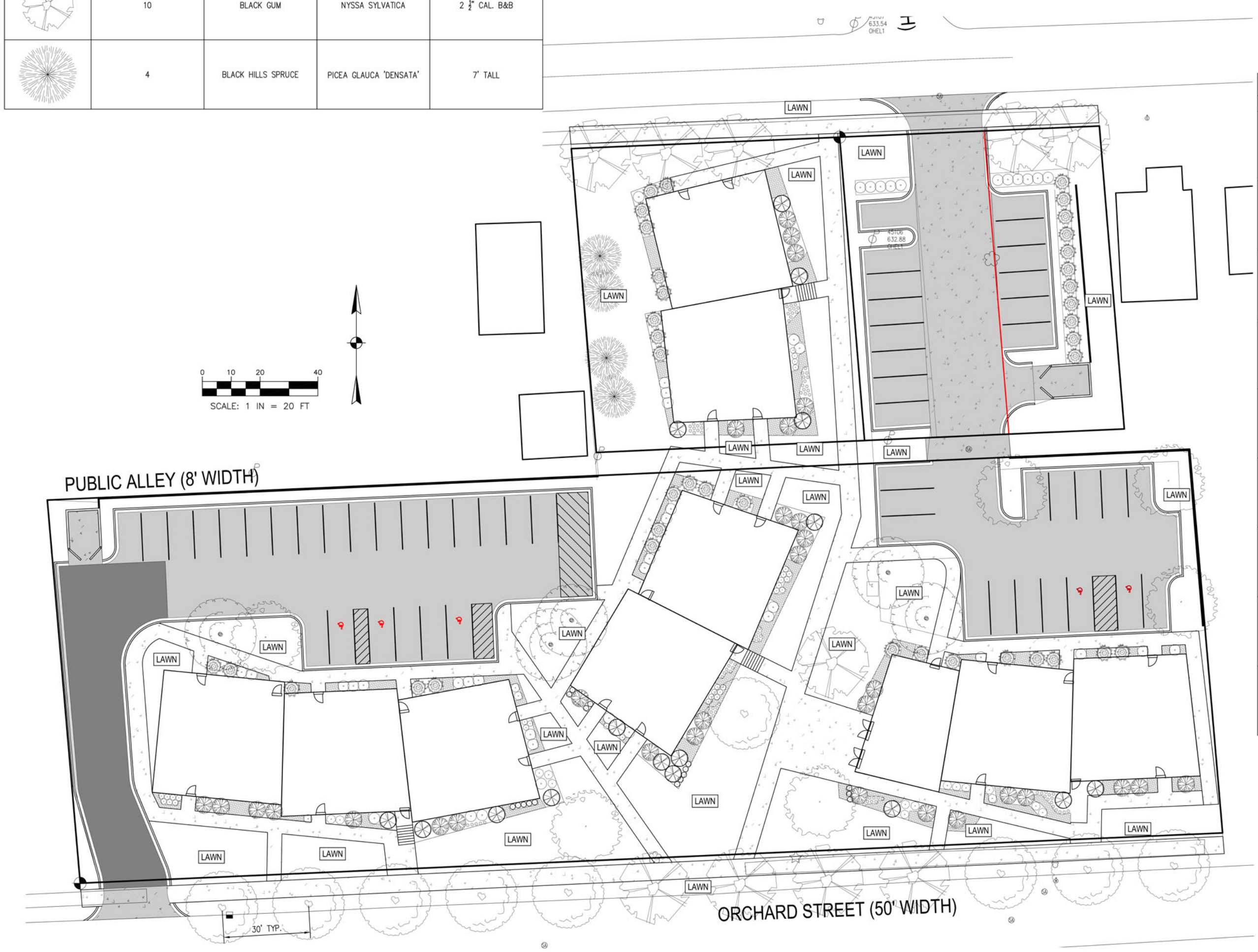
Sheet Name

SITE PLAN

C3.0

PROPOSED TREE QUANTITIES				
SYMBOL	NUMBER OF TREES	COMMON NAME	SCIENTIFIC NAME	SIZE
	5	RED OAK	QUERCUS RUBRA	2 ½" CAL. B&B
	6	RED MAPLE	ACER RUBRUM	2 ½" CAL. B&B
	9	KENTUCKY COFFEE TREE	GYMNOCLADUS DIOICUS	2 ½" CAL. B&B
	10	BLACK GUM	NYSSA SYLVATICA	2 ½" CAL. B&B
	4	BLACK HILLS SPRUCE	PICEA GLAUCA 'DENSATA'	7' TALL

DETROIT ZONING ORDINANCE – LANDSCAPE REQUIREMENTS DIVISION 2: LANDSCAPING SCREENING AND FENCING						
	REQUIRED AREA/LENGTH	DESIGN AREA/LENGTH	ZONING CODE	REQUIRED SPACING	MIN. REQUIRED	DESIGN QUANTITY
RIGHT-OF-WAY SCREENING (SANTA CLARA)	183 LF	183 LF	SEC. 50-14-341	1 TREE/30 LF	7	5
RIGHT-OF-WAY SCREENING (ORCHARD ST)	396 LF	396 LF	SEC. 50-14-341	1 TREE/30 LF	14	12
OFF-STREET PARKING INTERIOR LANDSCAPING (SANTA CLARA)	522 SF	1,183 SF	SEC. 50-14-343	1 TREE/250 SF	3	5
OFF-STREET PARKING INTERIOR LANDSCAPING (ORCHARD ST)	414 SF	952 SF	SEC. 50-14-343	1 TREE/250 SF	2	4



PROPOSED SHRUB AND PERENNIAL QUANTITIES				
SYMBOL	NUMBER OF TREES	COMMON NAME	SCIENTIFIC NAME	SIZE
	317	CREEPING LILY TURF	LIRIOPE SPICATA	#1
	17	SENSATION PINK CONEFLOWER	ECHINACEA 'SENSATION PINK;	#1
	43	DWARF ENGLISH BOXWOOD	BUXUS SEMPERVIRENS 'SUFFRUTIOSA	#3
	83	EAST FRIESLAND SAGE	SALVIA NEMOROSA 'EAST FRIESLAND'	#1
	31	LACY BLUE RUSSIAN SAGE	PEROVSKIA ATRIPLICIFOLIA 'LISSLITT'	#1
	16	ROCKY MOUNTAIN JUNIPER	JUNIPERUS SCOPULORUM 'WICHITA BLUE'	5' TALL B&B
	18	PIA BIGLEAF HYDRANGEA	HYDRANGEA MACROPHYLLA 'PIA'	#3
	31	BLUE CHIP JUNIPER	JUNIPERUS HORIZONTALIS 'BLUE CHIP'	#3
	38	RAINBOW DROOPING LEUCOTHOE	LEUCOTHOE FONTANESIANA 'RAINBOW'	#3

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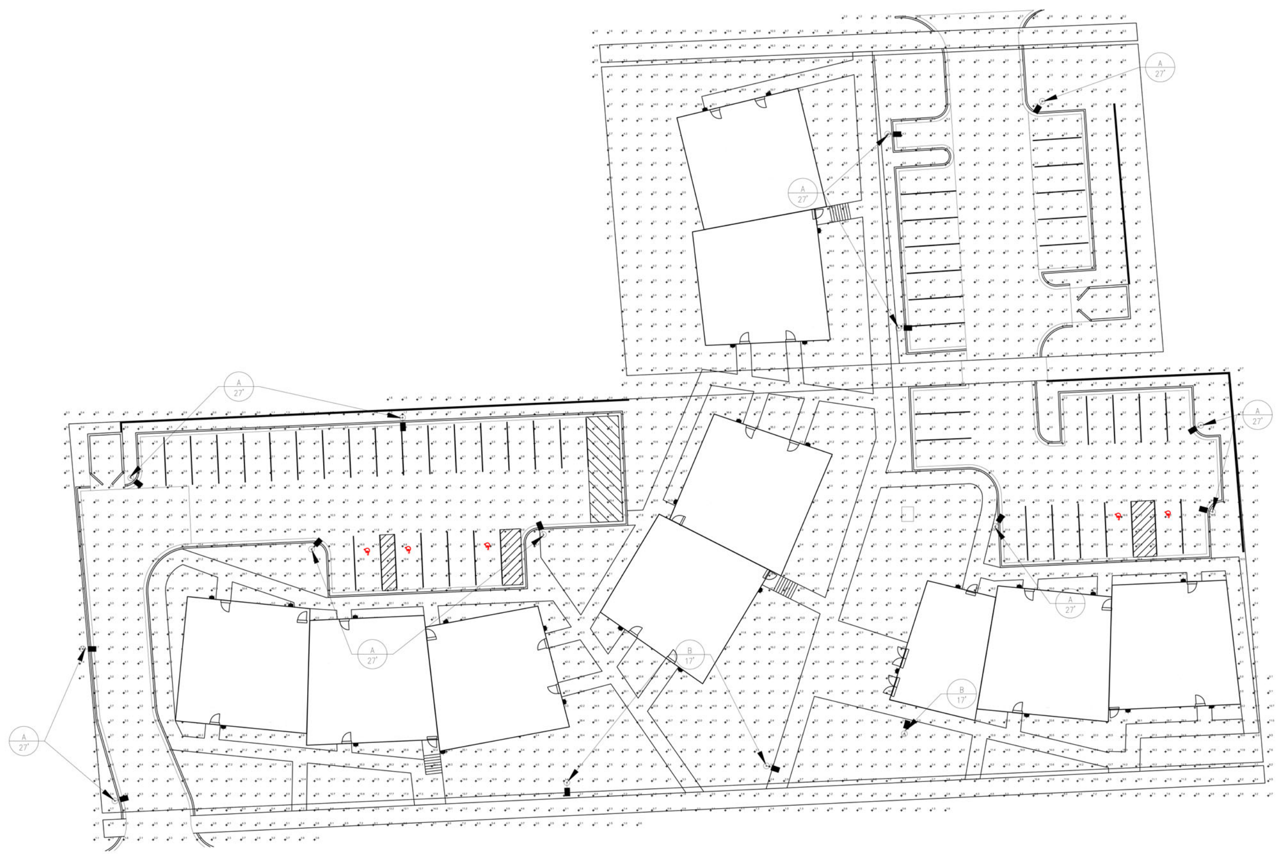
Key Section

Key Plan

Sheet Name

LANDSCAPE PLAN

L1.0



LUMINAIRE SCHEDULE								
SYMBOL	ID	QUANTITY	MOUNTING HEIGHT	MANUFACTURER	CATALOG NUMBER	DESCRIPTION	LUMENS PER LAMP	WATTAGE
	A	12	27	LITHONIA LIGHTING	RADPT P4 40K ASY HS	RAADEAN POST-TOP WITH P4 4000K ASYMMETRIC DISTRIBUTION WITH HOUSE-SIDE SHIELD	ABSOLUTE	85.7
	B	3	17	LITHONIA LIGHTING	RADPT P1 40K PATH HS	RADEAN POST-TOP WITH P1 4000K PATHWAY DISTRIBUTION WITH HOUSE-SIDE SHIELD	ABSOLUTE	25.4
	C	27	17	LITHONIA LIGHTING	WDGE4 LED P6 70CRI R4 40K	WDGE4 LED ARCHITECTURAL WALL LUMINAIRE SIZE 4	25,000	185.0

LIGHT INTENSITY REQUIREMENTS & STATISTICS			
ZONING ORDINANCE REQUIREMENTS		PROPOSED ON SITE	
CLASSIFICATION & ZONING ORDINANCE SECTION	REQUIRED INTENSITY	LOCATION	AVG. INTENSITY
PARKING AREA (50-14-397)	2.0-5.0 fc	WEST PARKING LOT	2.4 fc
		NORTHEAST PARKING LOT	3.0 fc
PEDESTRIAN PATHS (50-14-397)	0.5 -1.0 fc	BUILDING SIDEWALK	1.1 fc

LEGEND

LIGHT POLE

WALL LIGHT

ID FROM LUMINAIRE SCHEDULE — A
LIGHT MOUNTING HEIGHT — X'
LIGHT IDENTIFICATION

0.0 LIGHT INTENSITY (fc)

NOTES

1. CONTRACTOR SHALL BE RESPONSIBLE FOR LIGHT POLE FOUNDATIONS AND INSTALLATION, ALL ASSOCIATED CIRCUITING, AND CONDUIT INSTALLATION.
2. ALL LIGHTING SHALL BE DIRECTED DOWNWARDS.
3. LIGHT INTENSITIES DISPLAYED ARE AS MEASURED AT 5 FEET ABOVE GRADE.

0 10 20 40

SCALE: 1 IN = 20 FT

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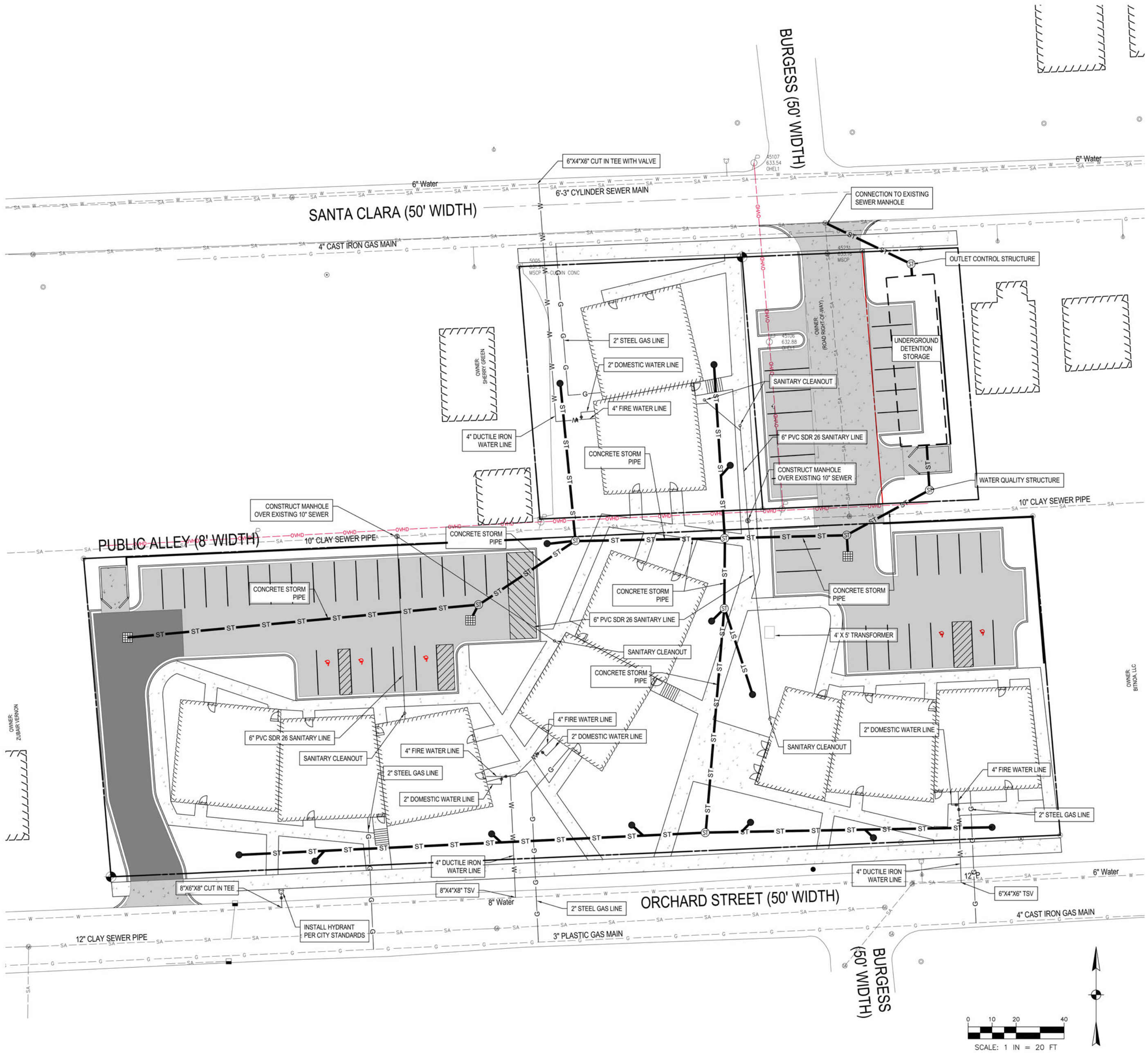
Key Section

Key Plan

Sheet Name

LIGHTING PLAN

C7.0



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- EXISTING BUILDING LINE
- PROPOSED BUILDING LINE
- EXISTING GUY WIRE/ UTILITY POLE
- PROPOSED SEWER LEAD
- W — PROPOSED WATER LINE
- G — PROPOSED GAS LINE
- ST — PROPOSED STORM LINE
- PROPOSED REAR YARD DRAIN
- PROPOSED STORM CATCH BASIN
- ST — PROPOSED STORM MANHOLE

NOTES:

ALL REAR YARD DRAINS SHALL BE PVC SCH 40. EVERYTHING BEYOND THE FIRST MANHOLE CONNECTION SHALL BE REINFORCED CONCRETE PIPE.

SANITARY LEADS SHALL BE PVC SDR 26 PIPE.

PROPOSED UNDERGROUND DETENTION SHALL BE CMP.

4" FIRE LINES SHALL BE DUCTILE IRON PIPE. 2" DOMESTIC SHALL BE TYPE-K COPPER PIPE.

GAS AND ELECTRIC SHALL BE COORDINATED WITH DETROIT EDISON. THE LAYOUT SHOWN DOES NOT REFLECT WHAT THE UTILTIY COMPANY WILL BUILD.

PRELIMINARY STORMWATER MANAGEMENT VOLUME CALCULATIONS

PRELIMINARY VOLUME CALCULATIONS FOR SITE PLAN APPROVAL

SITE DATA

AREA	=	1.69 ACRES
C (PRE–DEV)	=	0.18
C (POST–DEV)	=	0.73

WATER QUALITY

V_R	=	NO RETENTION PLANNED FOR SITE
V_{ED}	=	7,821 CFT

INFRASTRUCTURE/CHANNEL PROTECTION

V_{2-YR}	=	5,736 CFT

FLOOD CONTROL

V_{10}	=	6,576 CFT

DESIGN VOLUME = 7,821 CFT

PROVIDED STORAGE VOLUME = ±7,500 CFT

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Key Section

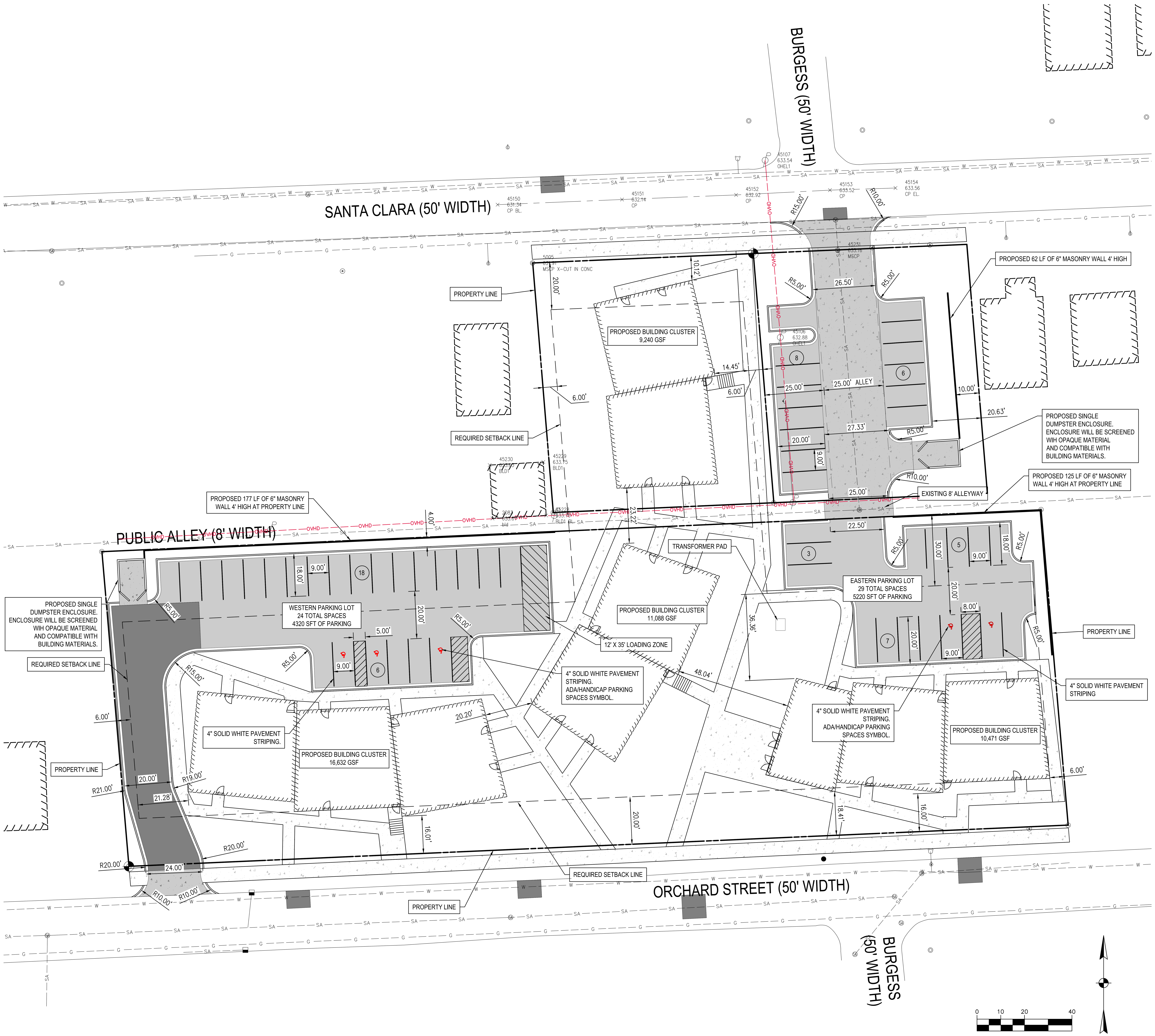
Key Plan

Sheet Name

UTILITY PLAN

C4.0

ALTERNATIVE ENGINEERING DESIGN



LEGEND

- PROPERTY LINE
- PAVEMENT LIMITS
- E — EXISTING UNDERGROUND ELECTRIC LINE
- OVHD — EXISTING OVERHEAD ELECTRIC LINE
- G — EXISTING GAS LINE
- SA — EXISTING COMBINED SEWER LINE
- W — EXISTING WATER LINE
- EXISTING BUILDING LINE
- PROPOSED BUILDING LINE
- PROPOSED MASONRY WALL LINE
- EXISTING GUY WIRE/ UTILITY POLE
- HEAVY DUTY ASPHALT
- REGULAR DUTY ASPHALT
- CONCRETE SIDEWALK
- CONCRETE PAVEMENT
- 5 — NUMBER OF PARKING SPACES

DEVELOPMENT SUMMARY			
SUBJECT	REQUIRED CODES	PROPOSED	SECTION
ZONING	R3 – LOW DENSITY RESIDENTIAL DISTRICT	R3 – LOW DENSITY RESIDENTIAL DISTRICT	50–8–74
SITE AREA	7000 SF	70006 SF	50–13–4
LOT COVERAGE	.12 RSR	.149 RSR	
SETBACKS			
FRONT	20'	10'–3" (NORTH) , 16' (SOUTH)	
REAR	30'	30'	
SIDE (NORTH PROPERTY)	6'	6'	
SIDE (SOUTH PROPERTY)	6'	6'	
PARKING (TOTAL)	36 SPACES	53 SPACES	50–14–34
INTERIOR LANDSCAPING (EAST)	522 SF	720 SF	50–14–343
ACCESSIBLE PARKING	2 REQURIRED TOTAL	3 SPACES (WEST), 2 SPACES (EAST)	50–14–182
LOADING	(1) 12'X35'	(1) 12'X35'	50–14–112
BUILDING HEIGHT	NONE	42'	50–13–4
MAX F.A.R.	0.7 = 44,213 SF.	0.69 = 43,400 SF.	50–13–4

PROJECT NOTES:

DIMENSIONS OF PAVMENT WIDTHS SHALL BE INTREPRETED AT CURB TO BE UP TO THE FACE OF CURB.

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Issued For:

No:	Description	Date
	SITE PLAN REVIEW	01/14/22
	REVISED SPA	12/07/22

Key Section

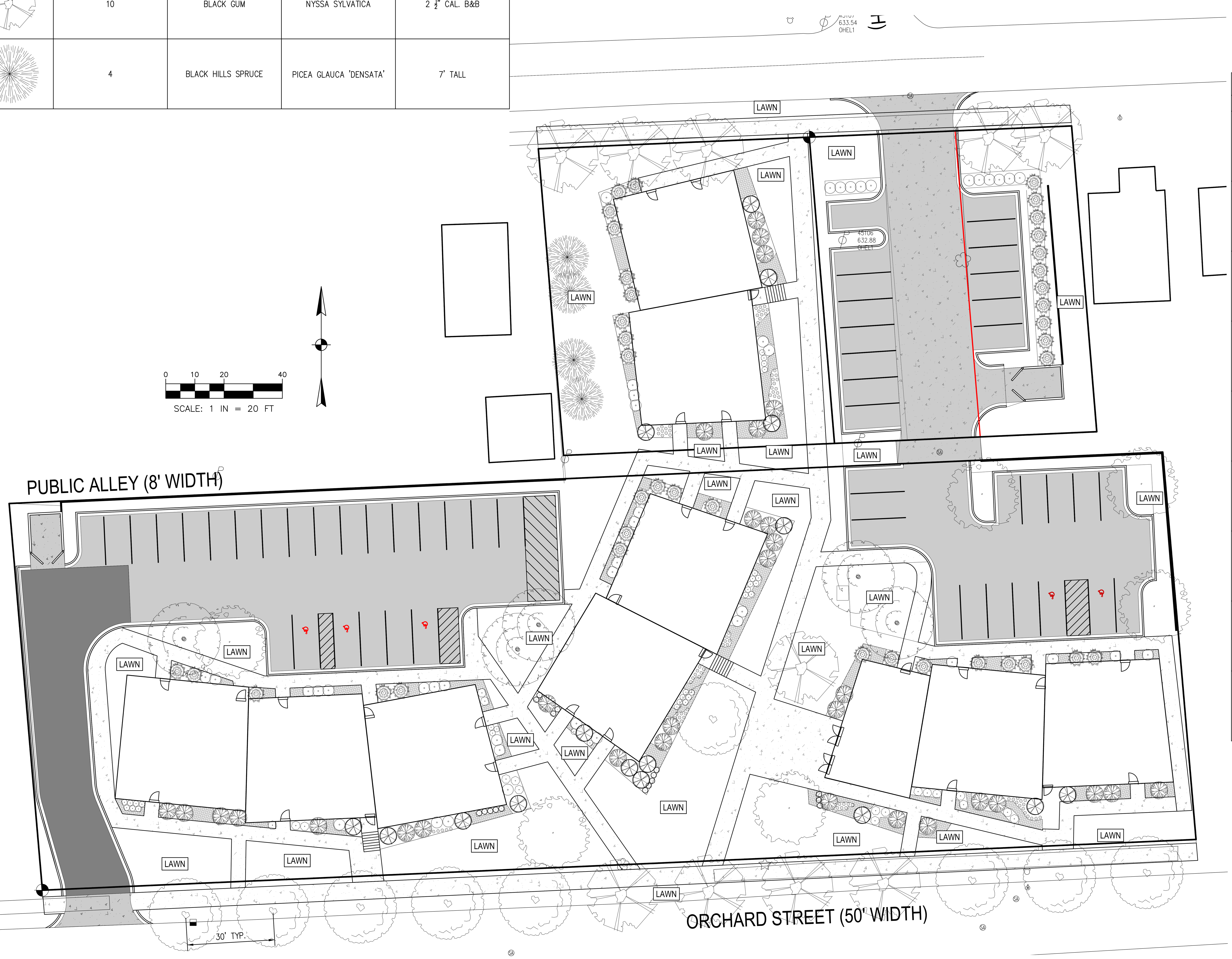
Key Plan

Sheet Name
SITE PLAN

C3.0

PROPOSED TREE QUANTITIES				
SYMBOL	NUMBER OF TREES	COMMON NAME	SCIENTIFIC NAME	SIZE
	5	RED OAK	QUERCUS RUBRA	2 ½" CAL. B&B
	6	RED MAPLE	ACER RUBRUM	2 ½" CAL. B&B
	9	KENTUCKY COFFEE TREE	GYMNOCLADUS DIOICUS	2 ½" CAL. B&B
	10	BLACK GUM	NYSSA SYLVATICA	2 ½" CAL. B&B
	4	BLACK HILLS SPRUCE	PICEA GLAUCA 'DENSATA'	7' TALL

DETROIT ZONING ORDINANCE – LANDSCAPE REQUIREMENTS DIVISION 2: LANDSCAPING SCREENING AND FENCING						
	REQUIRED AREA/LENGTH	DESIGN AREA/LENGTH	ZONING CODE	REQUIRED SPACING	MIN. REQUIRED	DESIGN QUANTITY
RIGHT-OF-WAY SCREENING (SANTA CLARA)	183 LF	183 LF	SEC. 50-14-341	1 TREE/30 LF	7	5
RIGHT-OF-WAY SCREENING (ORCHARD ST)	396 LF	396 LF	SEC. 50-14-341	1 TREE/30 LF	14	12
OFF-STREET PARKING INTERIOR LANDSCAPING (SANTA CLARA)	522 SF	1,183 SF	SEC. 50-14-343	1 TREE/250 SF	3	5
OFF-STREET PARKING INTERIOR LANDSCAPING (ORCHARD ST)	414 SF	952 SF	SEC. 50-14-343	1 TREE/250 SF	2	4



PROPOSED SHRUB AND PERENNIAL QUANTITIES				
SYMBOL	NUMBER OF TREES	COMMON NAME	SCIENTIFIC NAME	SIZE
	317	CREEPING LILY TURF	LIRIOPE SPICATA	#1
	17	SENSATION PINK CONEFLOWER	ECHINACEA 'SENSATION PINK;	#1
	43	DWARF ENGLISH BOXWOOD	BUXUS SEMPERVIRENS 'SUFFRUTIOSA'	#3
	83	EAST FRIESLAND SAGE	SALVIA NEMOROSA 'EAST FRIESLAND'	#1
	31	LACY BLUE RUSSIAN SAGE	PEROVSKIA ATRIPLICIFOLIA 'LISSLITT'	#1
	16	ROCKY MOUNTAIN JUNIPER	JUNIPERUS SCOPULORUM 'WICHITA BLUE'	5' TALL B&B
	18	PIA BIGLEAF HYDRANGEA	HYDRANGEA MACROPHYLLA 'PIA'	#3
	31	BLUE CHIP JUNIPER	JUNIPERUS HORIZONTALIS 'BLUE CHIP'	#3
	38	RAINBOW DROOPING LEUCOTHOE	LEUCOTHOE FONTANESIANA 'RAINBOW'	#3

MISS DIG System, Inc. 1-800-482-7171

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LICENSED ARCHITECT LORCAN PATRICK O'HERLIHY 1301063539 10/31/2018 RENEWAL DATE STATE OF MICHIGAN

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	SITE PLAN REVIEW	01/14/22
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Key Section

Key Plan

Sheet Name
LANDSCAPE PLAN

L1.0

LUMINAIRE SCHEDULE

SYMBOL	ID	QUANTITY	MOUNTING HEIGHT	MANUFACTURER	CATALOG NUMBER	DESCRIPTION	LUMENS PER LAMP	WATTAGE
	A	12	27	LITHONIA LIGHTING	RADPT P4 40K ASY HS	RAADEAN POST-TOP WITH P4 4000K ASYMMETRIC DISTRIBUTION WITH HOUSE-SIDE SHIELD	ABSOLUTE	85.7
	B	3	17	LITHONIA LIGHTING	RADPT P1 40K PATH HS	RADEAN POST-TOP WITH P1 4000K PATHWAY DISTRIBUTION WITH HOUSE-SIDE SHIELD	ABSOLUTE	25.4
	C	27	17	LITHONIA LIGHTING	WDGE4 LED P6 70CRI R4 40K	WDGE4 LED ARCHITECTURAL WALL LUMINAIRE SIZE 4	25,000	185.0

LIGHT INTENSITY REQUIREMENTS & STATISTICS

ZONING ORDINANCE REQUIREMENTS		PROPOSED ON SITE	
CLASSIFICATION & ZONING ORDINANCE SECTION	REQUIRED INTENSITY	LOCATION	AVG. INTENSITY
PARKING AREA (50-14-397)	2.0-5.0 fc	WEST PARKING LOT	2.4 fc
		NORTHEAST PARKING LOT	3.0 fc
PEDESTRIAN PATHS (50-14-397)	0.5 -1.0 fc	BUILDING SIDEWALK	1.1 fc

LEGEND

LIGHT POLE

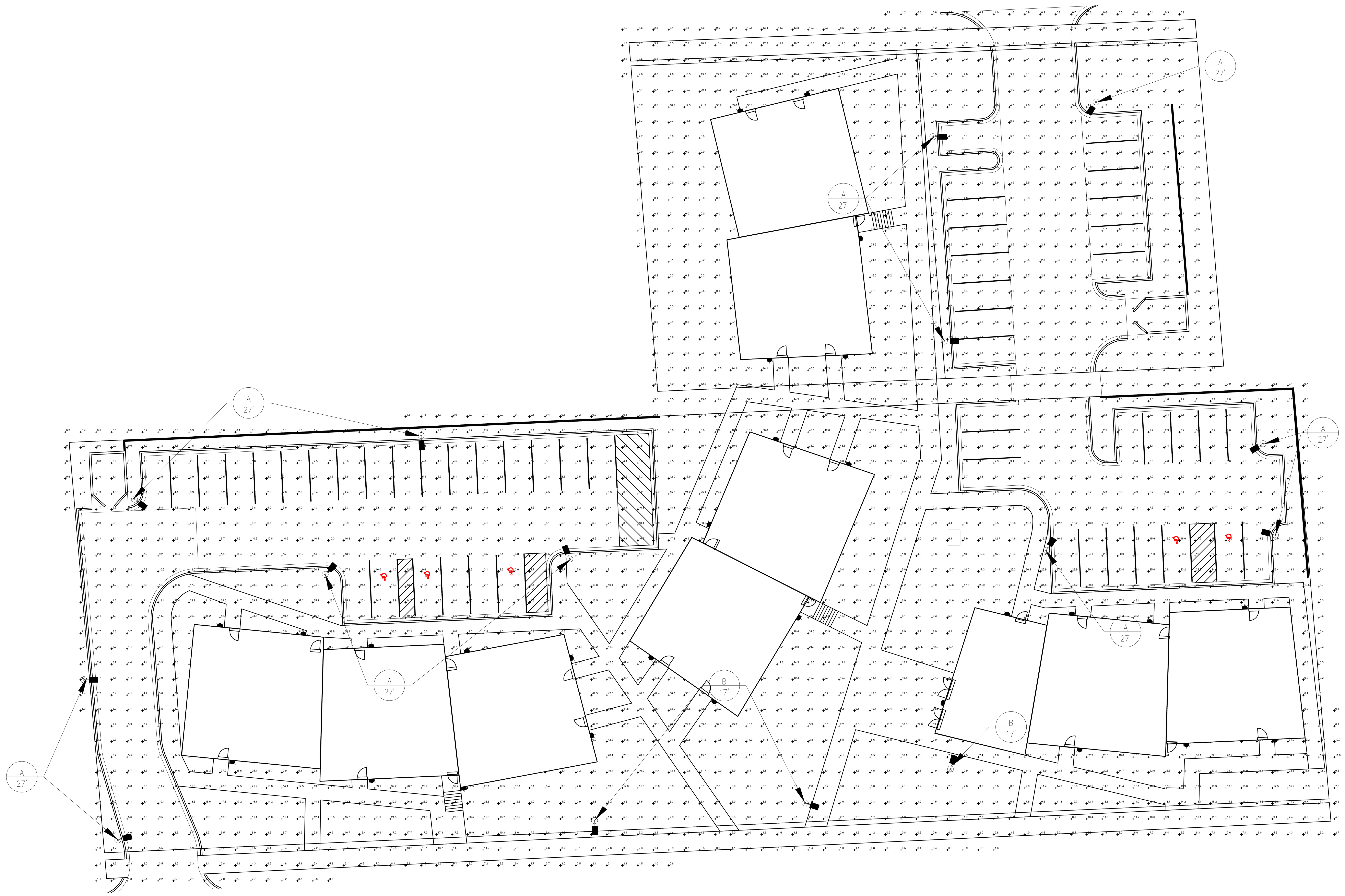
WALL LIGHT

ID FROM LUMINAIRE SCHEDULE — A

LIGHT MOUNTING HEIGHT — X'

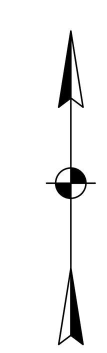
LIGHT IDENTIFICATION

0.0 LIGHT INTENSITY (fc)



NOTES

1. CONTRACTOR SHALL BE RESPONSIBLE FOR LIGHT POLE FOUNDATIONS AND INSTALLATION, ALL ASSOCIATED CIRCUITING, AND CONDUIT INSTALLATION.
2. ALL LIGHTING SHALL BE DIRECTED DOWNWARDS.
3. LIGHT INTENSITIES DISPLAYED ARE AS MEASURED AT 5 FEET ABOVE GRADE.



0 10 20 40

SCALE: 1 IN = 20 FT

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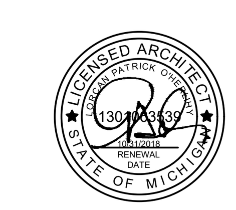

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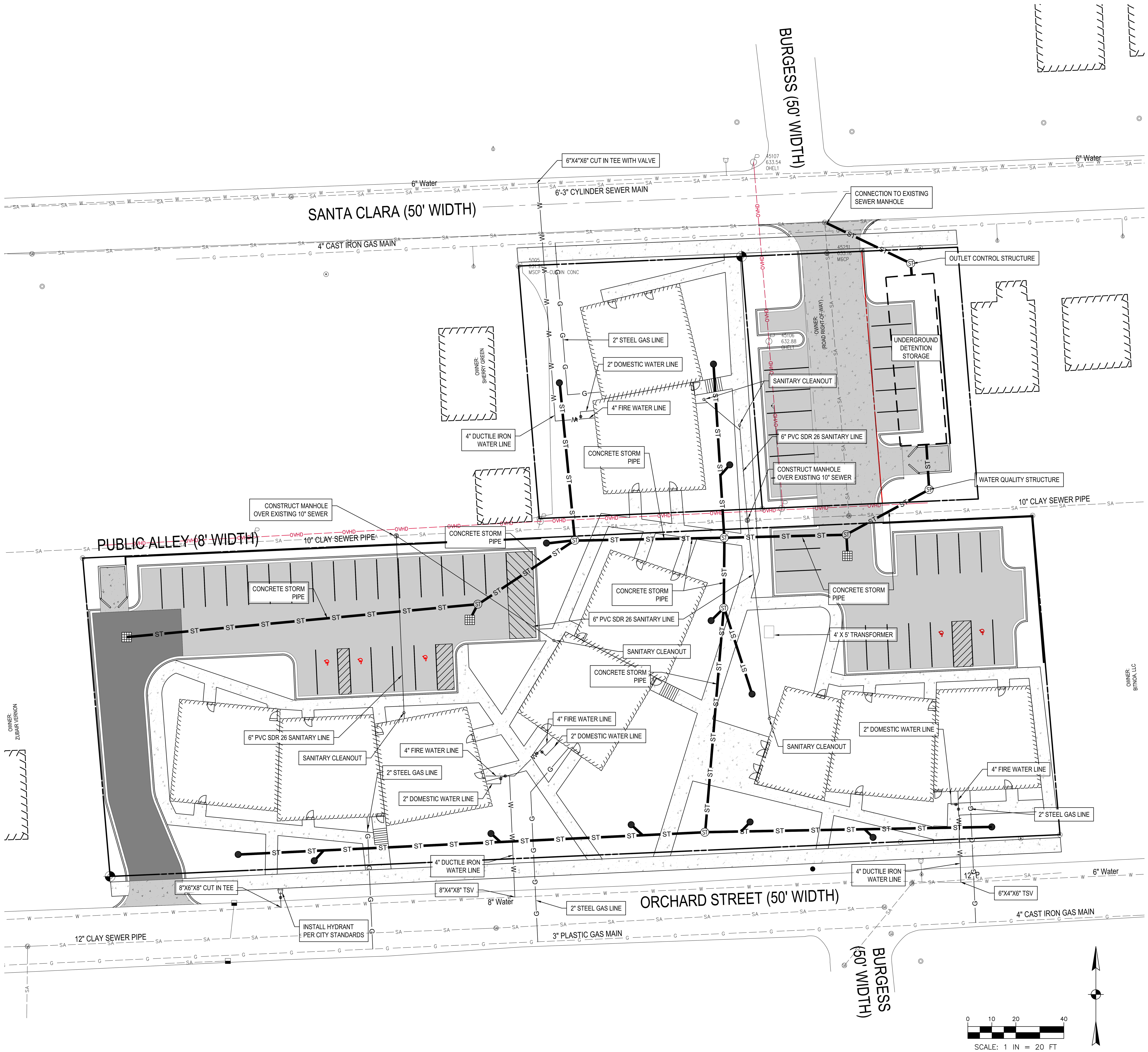
Key Section

Key Plan

Sheet Name

LIGHTING PLAN

C7.0



LEGEND

- PROPERTY LINE
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- W — EXISTING WATER LINE
- EXISTING BUILDING LINE
- PROPOSED BUILDING LINE
- EXISTING GUY WIRE/ UTILITY POLE
- PROPOSED SEWER LEAD
- W — PROPOSED WATER LINE
- G — PROPOSED GAS LINE
- ST — PROPOSED STORM LINE
- PROPOSED REAR YARD DRAIN
- PROPOSED STORM CATCH BASIN
- (ST) PROPOSED STORM MANHOLE

NOTES:

ALL REAR YARD DRAINS SHALL BE PVC SCH 40. EVERYTHING BEYOND THE FIRST MANHOLE CONNECTION SHALL BE REINFORCED CONCRETE PIPE.

SANITARY LEADS SHALL BE PVC SDR 26 PIPE.

PROPOSED UNDERGROUND DETENTION SHALL BE CMP.

4" FIRE LINES SHALL BE DUCTILE IRON PIPE. 2" DOMESTIC SHALL BE TYPE-K COPPER PIPE.

GAS AND ELECTRIC SHALL BE COORDINATED WITH DETROIT EDISON. THE LAYOUT SHOWN DOES NOT REFLECT WHAT THE UTILTIY COMPANY WILL BUILD.

PRELIMINARY STORMWATER MANAGEMENT VOLUME CALCULATIONS

PRELIMINARY VOLUME CALCULATIONS FOR SITE PLAN APPROVAL

SITE DATA

AREA	=	1.69 ACRES
C (PRE–DEV)	=	0.18
C (POST–DEV)	=	0.73

WATER QUALITY

V_R	=	NO RETENTION PLANNED FOR SITE
V_{ED}	=	7,821 CFT

INFRASTRUCTURE/CHANNEL PROTECTION

V_{2-YR}	=	5,736 CFT

FLOOD CONTROL

V_{10}	=	6,576 CFT

DESIGN VOLUME = 7,821 CFT

PROVIDED STORAGE VOLUME = ±7,500 CFT

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2	REVISED SPA	12/07/22

Key Section

Key Plan

Sheet Name

UTILITY PLAN

C4.0

ALTERNATIVE ENGINEERING DESIGN

Housing and Revitalization Department
CITY OF DETROIT

Coleman A. Young Municipal Center
2 Woodward Avenue. Suite 908
Detroit, Michigan 48226

Phone: 313.224.6380
Fax: 313.224.1629
www.detroitmi.gov

December 1, 2022

Penny Dwoinen
City of Detroit Housing & Revitalization Department
Coleman A. Young Municipal Center
2 Woodward Avenue, Suite 908
Detroit, MI 48226

RE: Section 106 Review of a HOME Funded Project Located at 21556 - 21652 Orchard St. and 21525-21535 Santa Clara in the City of Detroit, Wayne County, Michigan

Dear Mrs. Dwoinen,

Under the authority of the National Historic Preservation Act (NHPA) of 1966, as amended, and the "Programmatic Agreement between the Michigan State Historic Preservation Office and the City of Detroit, Michigan…," dated November 9, 2016, the City of Detroit has reviewed the above-cited project and has determined it to be an undertaking as defined by 36 CFR 800.16(y).

Per Stipulation VI of Programmatic Agreement (PA), the proposed undertaking qualified for review by SHPO's archaeologist. A technical report, completed by Robert Chidester of Mannick & Smith Group, concluded is unlikely that intact archaeological deposits are present within the project area. In a letter dated December 1, 2022, SHPO concurred with the determination of no historic properties affected within the area of potential effects of this undertaking.

Additionally, the Housing & Revitalization Department has assumed HUD's environmental review responsibilities for the project, including tribal consultation related to historic properties. Historic properties include archeological sites, burial grounds, sacred landscapes or features, ceremonial areas, traditional cultural places and landscapes, plant and animal communities, and buildings and structures with significant tribal association. Through tribal consultation, no Native historic properties were identified.

We have determined that within in the Area of Potential Effects (APE), the Redford Theater is listed in the National Register of Historic Places (NRHP), however the new construction will have no adverse effect on this resource. Therefore, a determination of **no adverse effect** is applied to the proposed undertaking. This project may proceed without further coordination with the Preservation Specialist. If you have any questions, please contact Tiffany Ciavattone at CiavattoneT@detroitmi.gov.

Sincerely,

Housing and Revitalization Department
CITY OF DETROIT

Coleman A. Young Municipal Center
2 Woodward Avenue. Suite 908
Detroit, Michigan 48226

Phone: 313.224.6380
Fax: 313.224.1629
www.detroitmi.gov

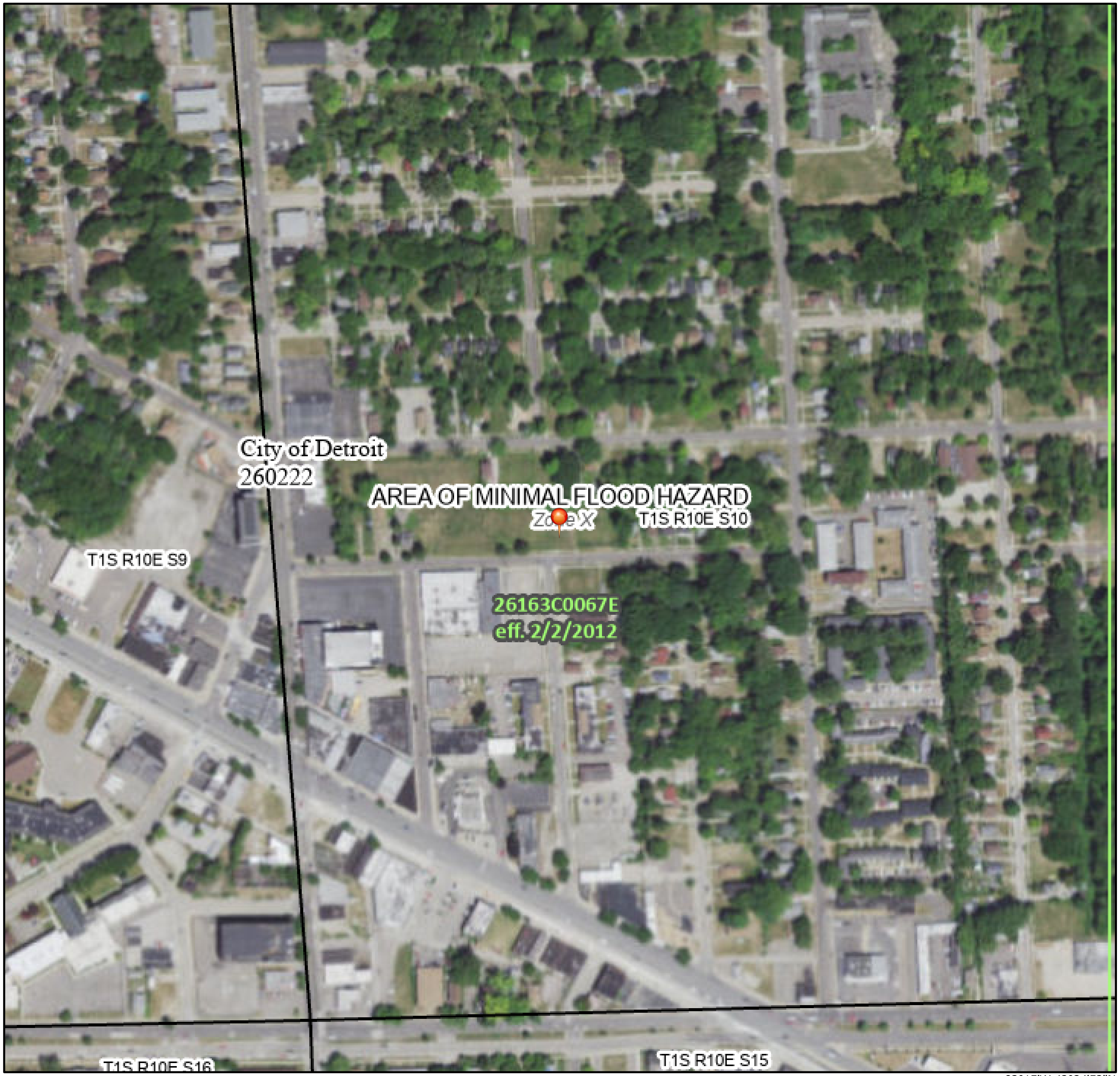
Tiffany Ciavattone

Tiffany Ciavattone
Preservation Specialist
City of Detroit
Housing & Revitalization Department

National Flood Hazard Layer FIRMette

FEMA

83°15'37"W 42°25'19"N



Feet
0 250 500 1,000 1,500 2,000

1:6,000

83°15'W 42°24'52"N

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) *Zone A, V, A99*
		With BFE or Depth *Zone AE, AO, AH, VE, AR*
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
		Future Conditions 1% Annual Chance Flood Hazard *Zone X*
		Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
		Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN	Area of Minimal Flood Hazard *Zone X*
		Effective LOMRs
		Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES	(B) 20.2 / 17.5	Cross Sections with 1% Annual Chance Water Surface Elevation
	8	Coastal Transect
	513	Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/8/2022 at 8:10 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

U.S. Fish and Wildlife Service
National Wetlands Inventory

Orchard Village Apartments | Wetlands

August 8, 2022

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

Wetlands Map Viewer

August 8, 2022

Part 303 Final Wetlands Inventory

- Wetlands as identified on NWI and MIRIS maps
- Soil areas which include wetland soils
- Wetlands as identified on NWI and MIRIS maps and soil areas which include wetland soils

1:19,175

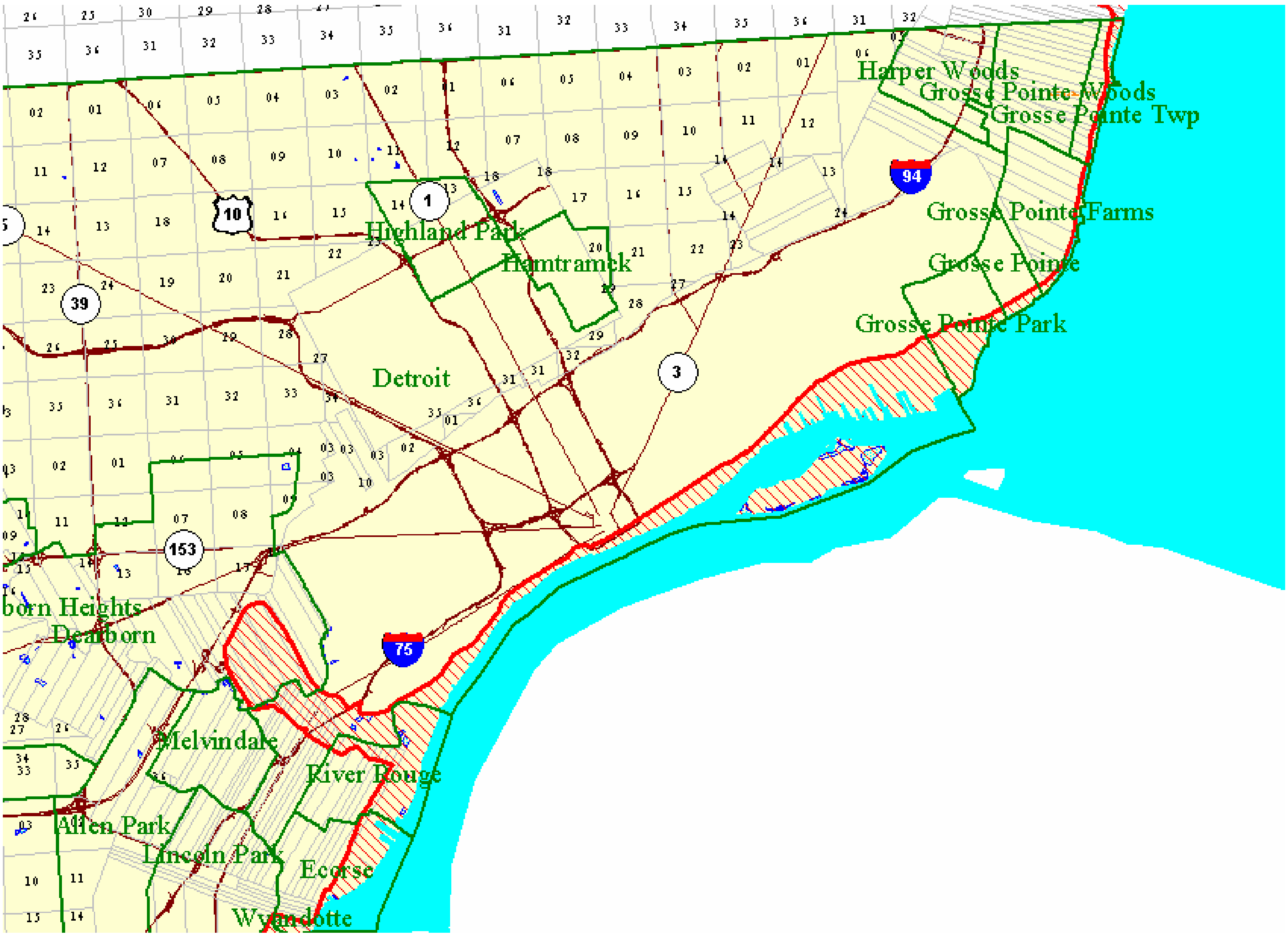
0	0.15	0.3	0.6 mi
0	0.25	0.5	1 km

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Disclamer: This map is not intended to be used to determine the specific

Wayne County
Grosse Point Township, Grosse Point Woods, Grosse Point Farms
Grosse Point, Grosse Point Park, and Detroit, T1S R14E
Detroit, T1S R14E, T2S R13E, andT2S R12E
River Rouge, T2S R11E

The heavy red line is the ***Coastal Zone Management Boundary***
The red hatched area is the ***Coastal Zone Management Area***.



21525 Santa Clara

21525 Santa Clara

Detroit, MI 48219

Inquiry Number: 6797557.8

December 22, 2021

The EDR Aerial Photo Decade Package

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

EDR Aerial Photo Decade Package

12/22/21

Site Name:	**Client Name:**
21525 Santa Clara	Applied Science & Technology
21525 Santa Clara	10448 Citation Drive
Detroit, MI 48219	Brighton, MI 48116
EDR Inquiry # 6797557.8	Contact: Laura Gray

Environmental Data Resources, Inc. (EDR) Aerial Photo Decade Package is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDR's professional researchers provide digitally reproduced historical aerial photographs, and when available, provide one photo per decade.

Search Results:

Year	Scale	Details	Source
2016	1"=500'	Flight Year: 2016	USDA/NAIP
2012	1"=500'	Flight Year: 2012	USDA/NAIP
2009	1"=500'	Flight Year: 2009	USDA/NAIP
2005	1"=500'	Flight Year: 2005	USDA/NAIP
1999	1"=500'	Acquisition Date: March 28, 1999	USGS/DOQQ
1997	1"=500'	Flight Date: May 04, 1997	DTE
1987	1"=500'	Flight Date: June 14, 1987	USDA
1981	1"=500'	Flight Date: October 17, 1981	DTE
1976	1"=500'	Flight Date: March 25, 1976	USDA
1972	1"=500'	Flight Date: July 01, 1972	USDA
1967	1"=500'	Flight Date: May 12, 1967	DTE
1961	1"=500'	Flight Date: May 24, 1961	DTE
1957	1"=500'	Flight Date: May 16, 1957	DTE
1952	1"=500'	Flight Date: April 25, 1952	DTE
1949	1"=500'	Flight Date: May 03, 1949	DTE
1940	1"=500'	Flight Date: August 01, 1940	USDA
1937	1"=500'	Flight Date: July 23, 1937	USDA

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INQUIRY #: 6797557.8

YEAR: 2016

= 500'

N

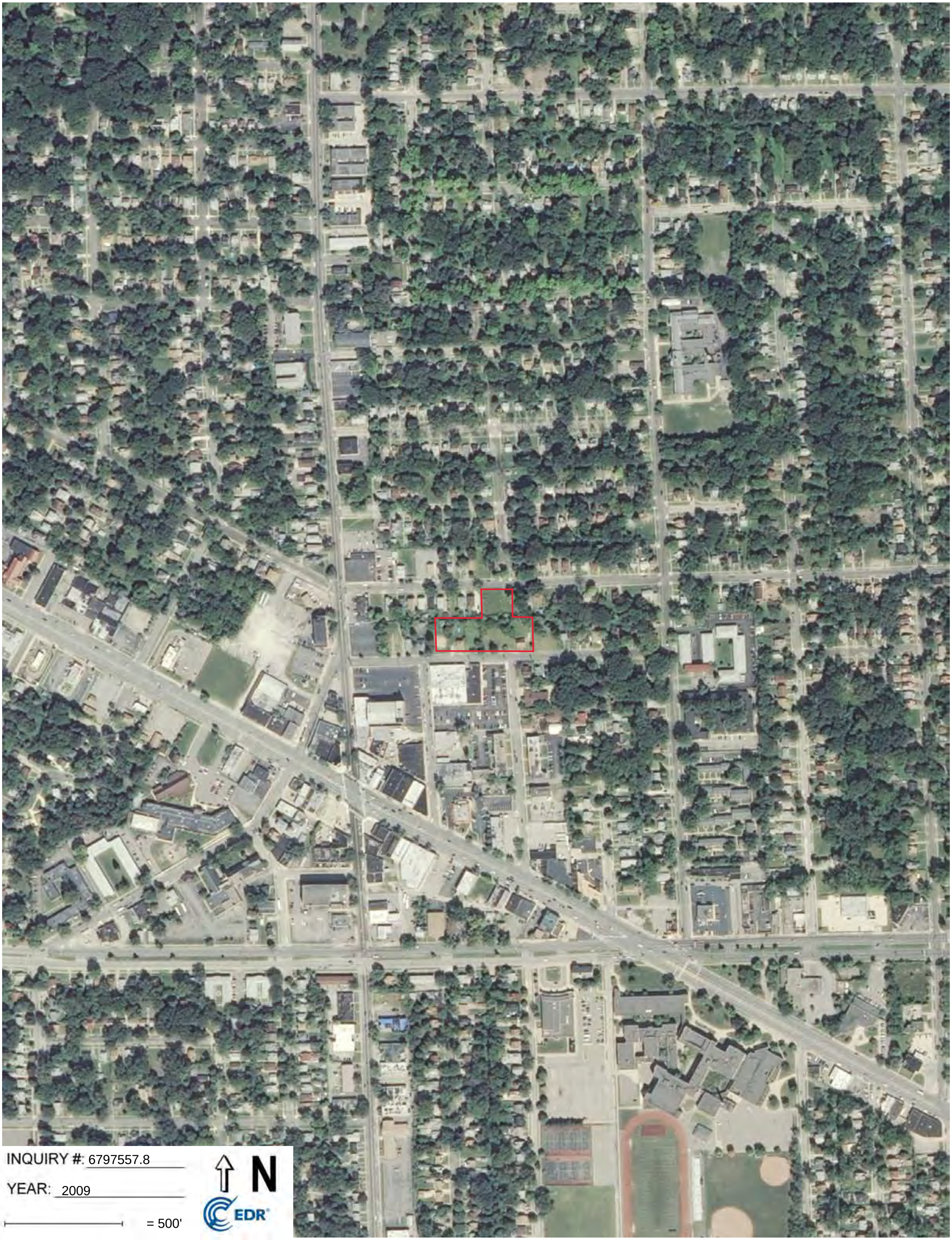
EDR

INQUIRY #: 6797557.8

YEAR: 2012

= 500'

N



INQUIRY #: 6797557.8

YEAR: 2009

= 500'

N

INQUIRY #: 6797557.8

YEAR: 2005

= 500'

N

EDR

INQUIRY #: 6797557.8

YEAR: 1999

= 500'

N

EDR


INQUIRY #: 6797557.8
YEAR: 1997
= 500'
N
EDR

INQUIRY #: 6797557.8

YEAR: 1987

= 500'

N

EDR

INQUIRY #: 6797557.8

YEAR: 1981

= 500'

N

INQUIRY #: 6797557.8

YEAR: 1976

= 500'

N

EDR

INQUIRY #: 6797557.8

YEAR: 1972

= 500'

N

EDR

INQUIRY #: 6797557.8

YEAR: 1967

= 500'

N

EDR

INQUIRY #: 6797557.8

YEAR: 1961

= 500'

N

EDR


INQUIRY #: 6797557.8
YEAR: 1957
= 500'
N


INQUIRY #: 6797557.8
YEAR: 1952
= 500'
N
EDR

INQUIRY #: 6797557.8

YEAR: 1949

= 500'

N

INQUIRY #: 6797557.8

YEAR: 1940

= 500'

N

EDR

INQUIRY #: 6797557.8

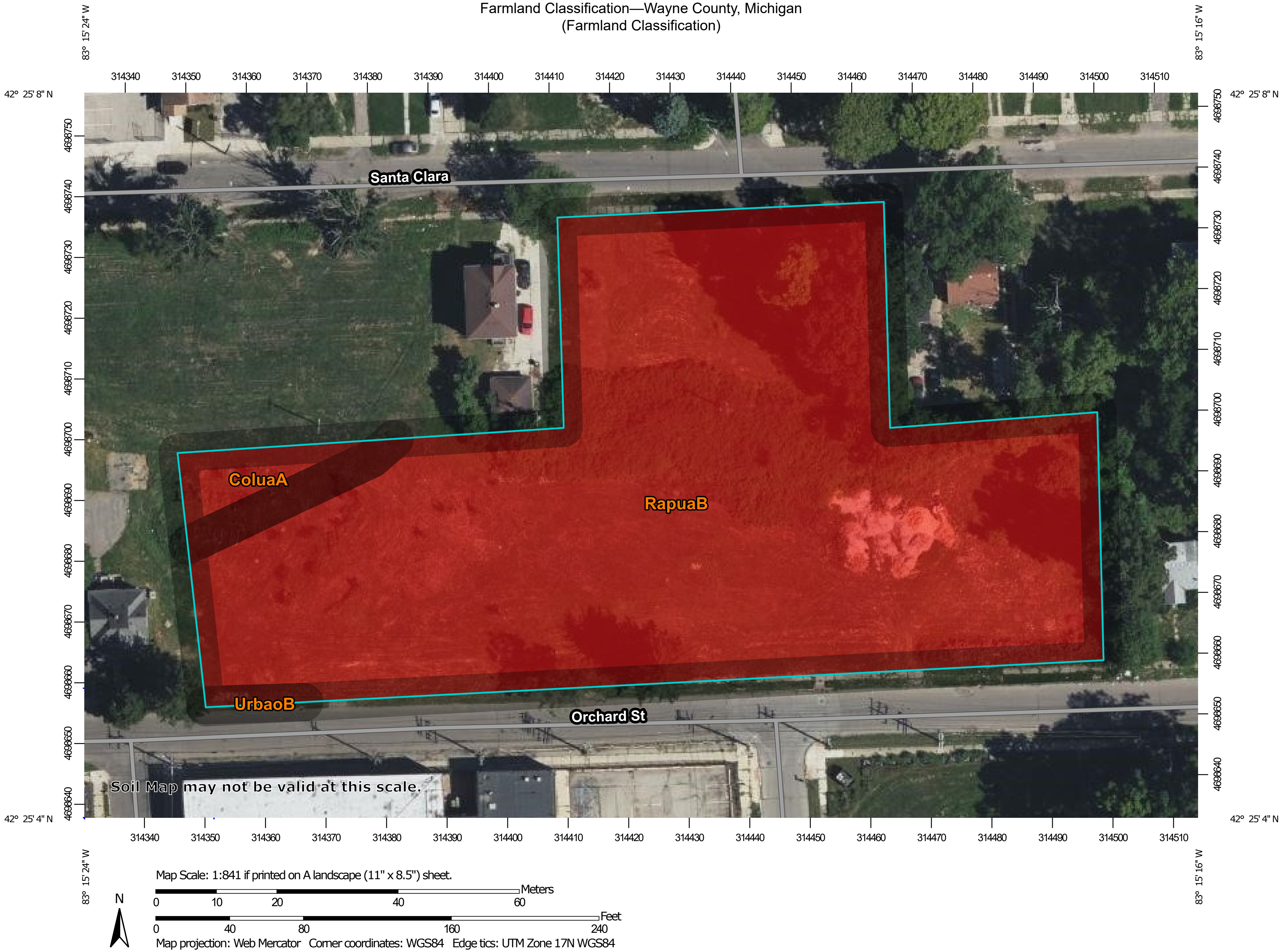
YEAR: 1937

= 500'

N

EDR

Farmland Classification—Wayne County, Michigan
(Farmland Classification)



Map Scale: 1:841 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated
- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated
- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated

- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Wayne County, Michigan
Survey Area Data: Version 7, Sep 7, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 5, 2020—Aug 12, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
ColuaA	Colwood-Urban land complex, 0 to 2 percent slopes	Not prime farmland	0.1	3.6%
RapuaB	Rapson-Urban land complex, sandy substratum, 0 to 4 percent slopes	Not prime farmland	2.0	96.3%
UrbaoB	Urban land-Fortress family complex, 0 to 4 percent slopes	Not prime farmland	0.0	0.0%
Totals for Area of Interest			**2.0**	**100.0%**

Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The majority of soil attributes are associated with a component of a map unit, and such an attribute has to be aggregated to the map unit level before a thematic map can be rendered. Map units, however, also have their own attributes. An attribute of a map unit does not have to be aggregated in order to render a corresponding thematic map. Therefore, the "aggregation method" for any attribute of a map unit is referred to as "No Aggregation Necessary".

Tie-break Rule: Lower

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Wayne County, Michigan

RapuaB—Rapson-Urban land complex, sandy substratum, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: 2v14j
Elevation: 600 to 650 feet
Mean annual precipitation: 28 to 38 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 135 to 210 days
Farmland classification: Not prime farmland

Map Unit Composition

Rapson, human transported surface, and similar soils: 50 percent
Urban land: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rapson, Human Transported Surface

Setting

Landform: Deltas
Down-slope shape: Linear
Across-slope shape: Convex, linear
Parent material: Sandy and loamy human-transported material over sandy glaciolacustrine deposits over loamy glaciolacustrine deposits over sandy glaciolacustrine deposits

Typical profile

^Au - 0 to 9 inches: sandy loam
^Cu - 9 to 12 inches: sandy loam
Bwb - 12 to 28 inches: sand
2C1 - 28 to 62 inches: silt loam
3C2 - 62 to 80 inches: sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 1.42 in/hr)
Depth to water table: About 30 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Gypsum, maximum content: 1 percent
Maximum salinity: Nonsaline (0.1 to 1.5 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: C
Ecological site: F099XY003MI - Warm Moist Sandy Depression
Hydric soil rating: No

Description of Urban Land

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Kibbie, human transported surface

Percent of map unit: 7 percent
Landform: Deltas
Down-slope shape: Linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Colwood, human transported surface

Percent of map unit: 5 percent
Landform: Deltas
Microfeatures of landform position: Open depressions
Down-slope shape: Linear, concave
Across-slope shape: Convex, linear
Hydric soil rating: No

Fortress family

Percent of map unit: 3 percent
Landform: Deltas
Down-slope shape: Linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Data Source Information

Soil Survey Area: Wayne County, Michigan
Survey Area Data: Version 7, Sep 7, 2021

Wayne County, Michigan

ColuaA—Colwood-Urban land complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2tx79
Elevation: 580 to 640 feet
Mean annual precipitation: 28 to 38 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 135 to 210 days
Farmland classification: Not prime farmland

Map Unit Composition

Colwood, human transported surface, and similar soils: 50 percent
Urban land: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Colwood, Human Transported Surface

Setting

Landform: Drainageways, lakebeds (relict)
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Parent material: Loamy human-transported material over loamy glaciolacustrine deposits

Typical profile

^Au - 0 to 9 inches: sandy loam
^Cu - 9 to 12 inches: loam
Bgb - 12 to 35 inches: silty clay loam
C - 35 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.01 to 0.14 in/hr)
Depth to water table: About 24 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 42 percent
Gypsum, maximum content: 1 percent
Maximum salinity: Nonsaline (0.1 to 1.5 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Ecological site: F099XY007MI - Lake Plain Flats
Hydric soil rating: No

Description of Urban Land

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Kibbie, human transported surface

Percent of map unit: 8 percent
Landform: Drainageways, lakebeds (relict)
Microfeatures of landform position: Rises
Down-slope shape: Linear, concave, convex
Across-slope shape: Concave, linear
Hydric soil rating: No

Anthroportic udorthents

Percent of map unit: 5 percent
Landform: Drainageways, lakebeds (relict)
Down-slope shape: Linear, concave
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

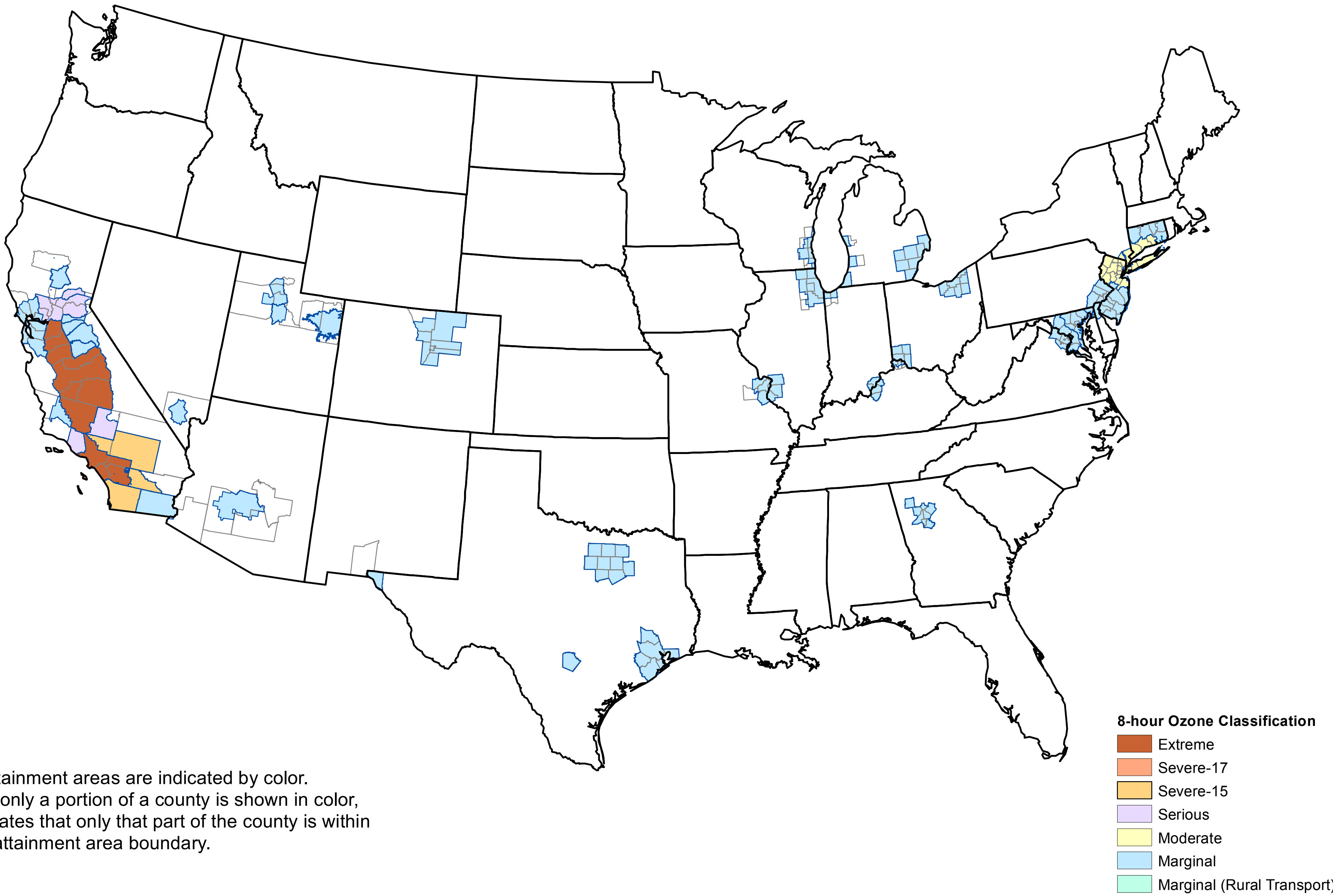
Livonia, human transported surface

Percent of map unit: 2 percent
Landform: Drainageways, lakebeds (relict)
Microfeatures of landform position: Rises
Down-slope shape: Linear, concave, convex
Across-slope shape: Concave, linear
Hydric soil rating: No

Data Source Information

Soil Survey Area: Wayne County, Michigan
Survey Area Data: Version 7, Sep 7, 2021

8-Hour Ozone Nonattainment Areas (2015 Standard)



Nonattainment areas are indicated by color. When only a portion of a county is shown in color, it indicates that only that part of the county is within a nonattainment area boundary.

For the Ozone-8Hr (2015) Cincinnati, OH-KY nonattainment area, the Ohio portion was redesignated on June 9, 2022. The Kentucky portion has not been redesignated.
For the Ozone-8Hr (2015) Louisville, KY-IN nonattainment area, the Ohio portion was redesignated on July 5, 2022. The Kentucky portion has not been redesignated.
The entire area is not considered in maintenance until all states in a multi-state area are redesignated.

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

GRETCHEN WHITMER
GOVERNOR

EGLE

LIESL EICHLER CLARK
DIRECTOR

September 26, 2022

City of Detroit
Housing Revitalization Department
2 Woodward Avenue, Suite 908
Detroit, Michigan 48226

Dear City of Detroit:

Subject: Orchard Village Housing Project in Detroit, Michigan

The Michigan Department of Environment, Great Lakes, and Energy (EGLE) has reviewed the federal regulations related to general conformity of projects with state implementation plans (SIP) for air quality. In particular, 40 Code of Federal Regulations (CFR) Section 93.150 et seq, which states that any federally funded project in a nonattainment or maintenance area must conform to the Clean Air Act requirements, including the State's SIP, if they may constitute a significant new source of air pollution.

On August 3, 2018, Wayne County was designated nonattainment for the 2015 ozone standard; and thus, general conformity must be evaluated when completing construction projects of a given size and scope. EGLE is currently working to complete the required SIP submittals for this area; therefore, an alternative evaluation was completed to assess conformity. Specifically, EGLE considered the following information from the United States Environmental Protection Agency's (USEPA) general conformity guidance, which states "historical analysis of similar actions can be used in cases where the proposed projects are similar in size and scope to previous projects."

EGLE has reviewed the Orchard Village Housing Project located in Detroit, Michigan, which is proposed to be completed with federal grant monies, including the development of multi-family housing on parcels of vacant residential land between Santa Clara and Orchard Streets at Burgess in Wayne County, Michigan. The long-term goal of the project is to enhance the quality of life of residents and regional economic development opportunities through the development of affordable housing, the creation of a community center for residents and the surrounding neighborhood, and provision of financial literacy services for those in need. The development will be located on parcels with the following addresses: 21556, 21566, 21604, 21610, 21624, 21636, 21636, and 21652 Orchard Street; and 21525, 21535, 21515 Santa Clara and associated abandoned rights-of-way in Detroit. Construction is expected to begin in May/June 2023 and will last approximately 16 to 18 months.

In reviewing the *"Air Quality and Greenhouse Gas Study: Uptown Orange Apartments in Orange, California,"* dated December 2012, prepared for KTGY Group, Inc. by UltraSystems Environmental, Inc., it was determined that emission levels for the project were below the de minimis levels for general conformity.

The Uptown Orange Apartments project and related parking structure construction was estimated to take 33 months to complete, would encompass an area of 5.57 acres, and included two four-story residential units with a total of 334 apartments, and two parking structures with a total of 494 and 679 parking stalls, respectively.

The size, scope, and duration of the proposed Orchard Village Housing Project construction project is much smaller in scale than the Uptown Orange Apartments project described above and should not exceed the de minimis levels included in the federal general conformity requirements. Therefore, it does not require a detailed conformity analysis.

If you have any further questions regarding this matter, please contact me at 517-648-6314; BukowskiB@Michigan.gov; or EGLE, AQD, P.O. Box 30260, Lansing, Michigan 48909-7760.

Sincerely,

Breanna Bukowski

Breanna Bukowski
Environmental Quality Analyst

cc: Michael Leslie, USEPA Region 5
Cheryl McHallam, CHN Housing Partners
Jenny Hamel, Mannik Smith Group

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

AIR QUALITY ANNUAL REPORT

2020

Michigan Department of Environment, Great Lakes, and Energy
Michigan.gov/EGLE | 800-662-9278

Air Quality Annual Report

2020

EXECUTIVE SUMMARY

This report gives an overview of the air quality for 2020. Current data for Michigan can be found on MIair (deqmiair.org) and Air Quality alerts can be delivered directly to email by signing up for the Michigan EnviroFlash program (http://miair.enviroflash.info/). Data in this report are collected by the Michigan Department of Environment, Great Lakes, and Energy (EGLE).

The federal Clean Air Act (CAA) requires the United States Environmental Protection Agency (USEPA) to establish National Ambient Air Quality Standards (NAAQS) for six criteria pollutants considered harmful to public health and the environment.

The six pollutants monitored by EGLE, Air Quality Division (AQD) are:

1. Carbon monoxide (CO)
2. Lead (Pb)
3. Nitrogen dioxide (NO_2)
4. Ozone (O_3)
5. Particulate matter smaller than 10 and 2.5 microns in diameter (PM_{10} and $PM_{2.5}$, respectively)
6. Sulfur dioxide (SO_2)

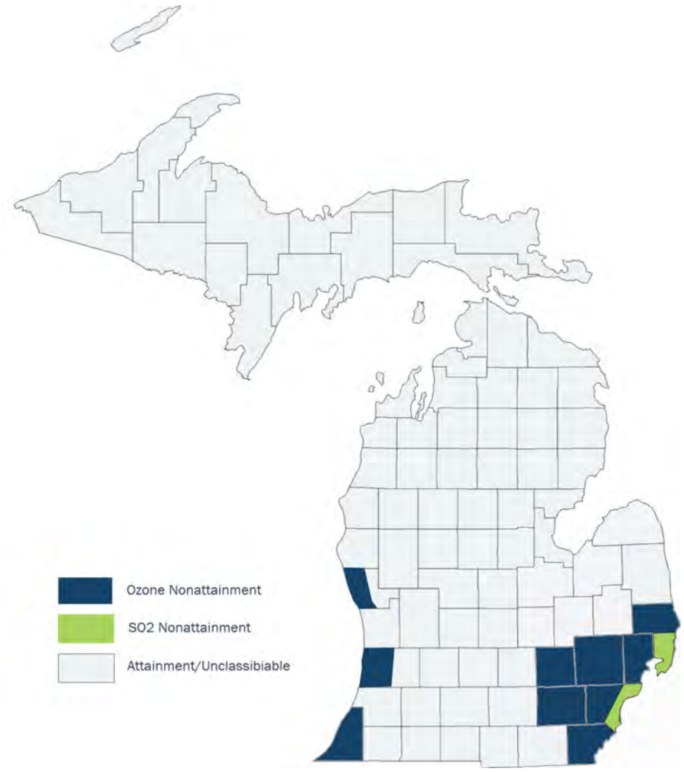
EGLE has established a network of more than 40 monitoring sites throughout the state that monitor for one or more of the criteria pollutants (Figure 1.1 and Table 1.2).

Congress passed the CAA in 1970; however, Michigan has had a long-standing history of environmental awareness well before the Act was established. In 1887, Detroit was the first city in Michigan to adopt an air quality ordinance, which declared that the dense smoke from burning coal was a public nuisance.

The USEPA reviews the criteria pollutant standards every five years. Over time, based upon health data, the standards have been tightened to better protect public health (see Appendix C). Areas that meet the NAAQS are considered in "attainment." Locations where air pollution levels persistently exceed the NAAQS may be designated as "nonattainment." The tightening standards are why some areas in the state may be designated to nonattainment from attainment even though monitoring shows that air quality continues to improve.

Since EGLE began monitoring in the early 1970s, criteria pollutant levels have continually decreased (see Chap. 2-7). The air is much cleaner today than when the CAA began. The entire state of Michigan is in attainment for CO, Pb, NO_2, and particulate matter. Although portions of the state are in nonattainment for SO_2 and O_3, as illustrated in the figure, levels of these pollutants are still decreasing. The NAAQS levels have also decreased recently, which prompted these nonattainment areas. EGLE is currently working on State Implementation Plans (SIPs) to reduce pollutants further and bring the entire state into attainment for SO_2 and ozone.

Attainment Status for the National Ambient Air Quality Standards



Several changes to the monitoring network occurred during 2020.

- The TSPs were shut down at Allen Park and Grand Rapids since they were no longer required for NCore sites (Chap. 7).
- Several changes were made to the $PM_{2.5}$ network, exchanging Federal Reference Method (FRM) manual filter-based monitors and/or non-regulatory continuous monitors for continuous, federal equivalent method (FEM) monitors due to funding changes. Sites that were affected were Eliza Howell-Near Road (Eliza Howell-NR), Bay City, Holland, Kalamazoo, Lansing, Port Huron, and New Haven. Several of these changes occurred at the end of 2020 and data will not be available until the 2021 report (Chap. 7).
- $PM_{2.5}$, PM_{10} and PM coarse measurements at Allen Park, Grand Rapids, and Jenison were switched to T640X instruments that accomplish the same measurements with one instrument.
- The Livonia-Near Road (Livonia-NR) monitor is in the process of moving since site access was lost in July 2019.
- The NOx monitor at Detroit-E 7 Mile was switched to an NOy and a NOx monitor was added to Jenison.
- Sampling continues for the Gordie Howe International Bridge (GHIB) project special study.
- The Detroit-W. Fort St. site name is being changed to Detroit-Southwest (Detroit-SW).

TABLE OF CONTENTS

INTRODUCTION

Air quality regulations in Michigan are based on National Ambient Air Quality Standards (NAAQS) established by United States Environmental Protection Agency (USEPA) based on the federal Clean Air Act (CAA). The NAAQS designates six criteria pollutants considered harmful to public health and the environment. The USEPA must describe the characteristics and potential health and welfare effects for these criteria pollutants. These standards define the maximum permissible concentration of criteria pollutants in the air (see Table 1.1).

The Michigan Department of Environment, Great Lakes, and Energy (EGLE), Air Quality Division (AQD) monitors the six criteria pollutants, which are:

- Carbon monoxide (CO);
- Lead (Pb);
- Nitrogen dioxide (NO_2);
- Ozone (O_3);
- Particulate matter smaller than 10 and 2.5 microns in diameter (PM_{10} and $PM_{2.5}$, respectively); and
- Sulfur dioxide (SO_2).

Chapters 2 through **7** provide information on each of the six criteria pollutants and include:

- Michigan's monitoring requirements for 2020;
- Attainment / nonattainment status;
- Monitoring site locations (tables and maps show all the monitors active in 2020); and
- Air quality trends from 2015-2020 broken down by location.[1]

The 2020 data for each criteria pollutant is available in **Appendix A.** COVID-19 did not impact air quality data collection in Michigan.

The AQD also monitors air toxics. Air toxics are other hazardous air pollutants that can affect human health and the environment.[2] This data can be found in **Appendix B.**

The purpose of this report is to provide a snapshot of Michigan's 2020 air quality data, air quality trends, overview of the monitoring network (available in much greater detail in the 2020 Network Review),[3] air toxics monitoring program, and other AQD programs, such as MIair and the Emissions Inventory.[4]

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1 Air quality trends are based on actual statewide monitored readings, which are also listed in the USEPA's Air Quality Subsystem Quick Look Report Data at www3.epa.gov/airtrends/ .

2 An Overview of Michigan Air Toxic Rules is available on the AQD website at www.michigan.gov/air (select "Permits," then "Toxics Laws and Rules.")

3 Available online at Michigan's 2020 Ambient Air Monitoring Network Review

4 Online information about criteria pollutants and air toxics, along with this and previous Annual Air Quality Reports, are available via the AQD's website at www.michigan.gov/air (select "Monitoring.")

CHAPTER 1: BACKGROUND INFORMATION

This section summarizes the development of the NAAQS (see **Appendix C** for further details) and how compliance with these standards is determined. Also included is an overview of Michigan's air sampling network, attainment status of the state, and information on MIair and the Air Quality Index (AQI).

National Ambient Air Quality Standards (NAAQS)

Under the CAA, the USEPA established a primary and secondary NAAQS for each criteria pollutant. The primary standard is designed to protect public health with an adequate margin of safety, including the health of the most susceptible individuals in a population, such as children, the elderly, and those with chronic respiratory ailments. Secondary standards are chosen to protect public welfare (personal comfort and well-being) and the environment.

In addition, the NAAQS have various averaging times to address health impacts. Short averaging times reflect the potential for acute (immediate) effects, whereas long-term averaging times are designed to protect against chronic (long-term) effects.

NAAQS have been established for CO, Pb, NO_2, PM, O_3, and SO_2. **Table 1.1** lists the primary and secondary NAAQS, averaging time, and concentration level for each criteria pollutant in effect in 2020. The concentrations are listed as parts per million (ppm), micrograms per cubic meter (µg/m^3), and/or milligrams per cubic meter (mg/m^3).

Table 1.1: NAAQS in Effect during 2020 for Criteria Pollutants

Pollutant	Primary (health) Level	Primary Averaging Time	Secondary (welfare) Level	Secondary Averaging Time
CO 8-hour average	9 ppm (10 mg/m^3)	8-hour average, not to be exceeded more than once per year *(1971)*	None*	None*
CO 1-hour average	35 ppm (40 mg/m^3)	1-hour average, not to be exceeded more than once per year *(1971)*	None*	None*
Lead	0.15 µg/m^3	Maximum rolling 3-month average *(2008)*	Same as Primary	Same as Primary
NO_2 Annual mean	0.053 ppm (100 µg/m^3)	Annual mean *(1971)*	Same as Primary	Same as Primary
NO_2 1-hour average	0.100 ppm	98th percentile of 1-hour average, averaged over 3 years *(2010)*	Same as Annual	Same as Annual
PM_{10}	150 µg/m^3	24-hour average, not to be exceeded more than once per year over 3 years *(1987)*	Same as Primary	Same as Primary
$PM_{2.5}$ Annual average	12.0 µg/m^3	Annual mean averaged over 3 years *(2012)*	15.0 µg/m^3	Annual mean
$PM_{2.5}$ 24-hour average	35 µg/m^3	98th percentile of 24-hour concentration, averaged over 3 years *(2006)*	Same as Primary	Same as Primary
Ozone	0.070 ppm	Annual 4th highest 8-hour daily max averaged over 3 years *(2015)*	Same as Primary	Same as Primary
SO_2	0.075 ppm	99th percentile of 1-hour daily max averaged over 3 years *(2010)*	0.5 ppm	3 hours

*In 1985, the USEPA revoked the secondary standard for CO (for public welfare) due to a lack of evidence of adverse effects on public welfare at or near ambient concentrations.

Michigan Air Sampling Network

EGLE's AQD operates the Michigan Air Sampling Network (MASN), along with other governmental agencies. For instance, the O_3 and $PM_{2.5}$ monitor in Manistee County is a tribal monitor operated by the Little River Band of Ottawa Indians. **Figure 1.1** is a picture of the Lansing site. **Figure 1.2** is a picture of the Military Park (GHIB) site. **Figure 1.3** shows a map of the 2020 MASN monitoring sites.

The MASN consists of federal reference method (FRM) monitors that enable continuous monitoring for the gaseous pollutants CO, NO_2, O_3, and SO_2 providing real-time hourly data. PM and Pb monitors measure concentrations over a 24-hour period. In addition, continuous $PM_{2.5}$ and PM_{10} monitors provide real-time hourly data for PM. $PM_{2.5}$ chemical speciation monitors determine the chemical composition of $PM_{2.5}$. The MASN data is also used to provide timely reporting to EGLE's air quality reporting web page (Mlair, see later in this chapter). The types of monitoring conducted in 2020 and the MASN locations are shown in **Table 1.2.**

Figure 1.1: Lansing site

Figure 1.2: Military Park site

The **NCore network** began January 1, 2011, as part of the USEPA's 2006 amended air monitoring requirements. NCore is a multi-pollutant network that integrates several advance measurement systems for particles, pollutant gases, and meteorology. Michigan has two NCore sites, Allen Park and Grand Rapids. Further information on this network is provided in **Chapters 2** through **7**.

The **Near-road Monitoring Network** focuses on vehicle emissions and how they disperse near roadways. Data from these sites are presented in **Chapters 2, 5,** and **7.**

Figure 1.3: 2020 MASN Monitoring Sites

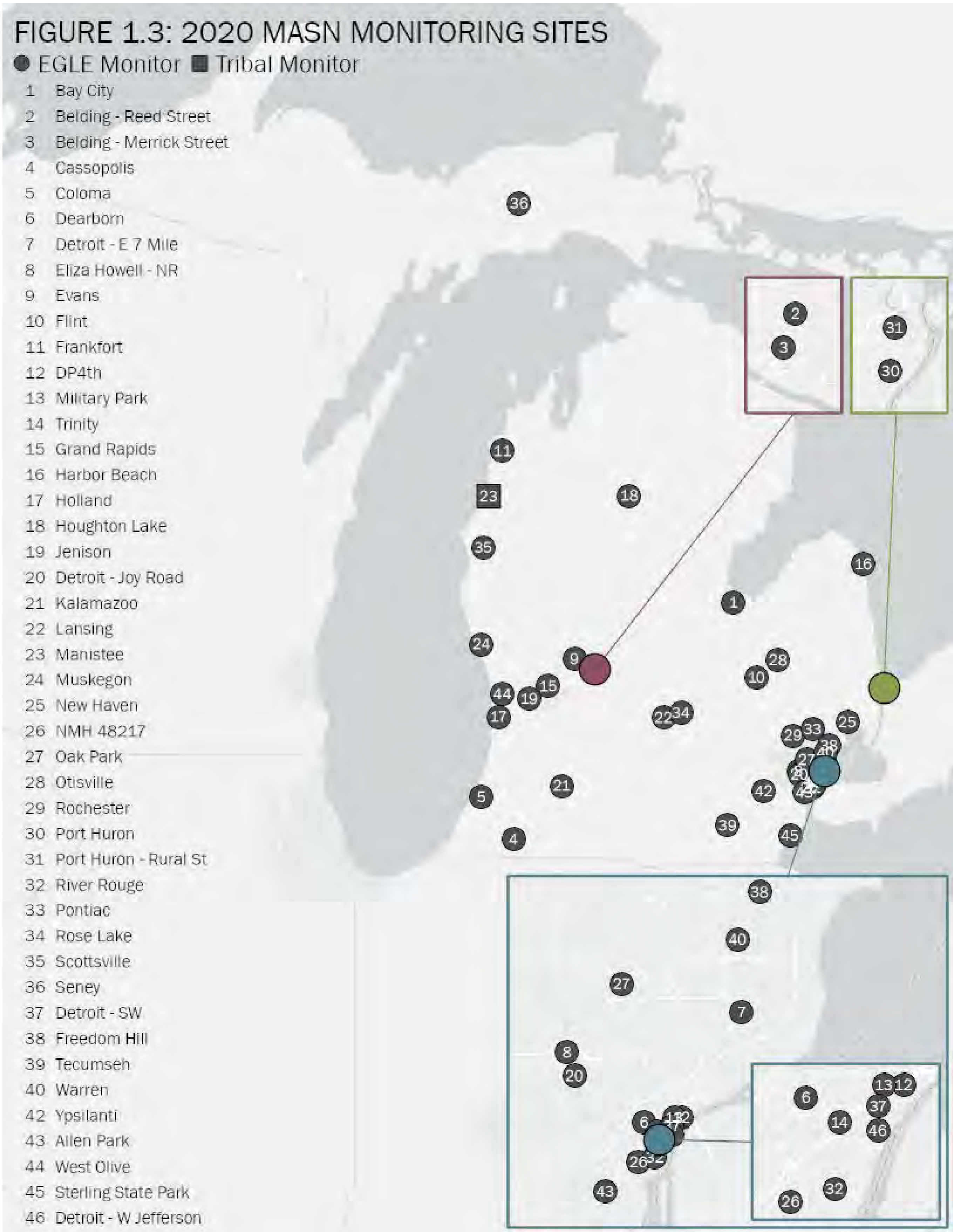


Table 1.2a: Types of Monitoring Conducted in 2020 and MASN Locations in Detroit-Ann Arbor Area.

Airs ID	Site Name	CO	NO_2	Trace NO_y	O_3	PM_{10}	$PM_{2.5}$ FRM	$PM_{2.5}$ Continuous	$PM_{2.5}$ Speciation	SO_2	VOC	Carbonyls	Trace Metals (As, Cd, Mn, Ni, Pb)	Wind Speed & Direction, Temp.	Relative Humidity	Solar Radiation	Barometric Pressure
260910007	Tecumseh				√			√F						√			√
260990009	New Haven				√		√							√	√	√	
260991003	Warren				√												
261250001	Oak Park				√		√							√			
261470005	Port Huron				√		√	√T		√				√			
261470031	Port Huron-Rural St.												√				
261610008	Ypsilanti				√			√F						√			√
261630001	Allen Park	√*		√	√	√	√	√T	√+A	√*				√	√		√
261630005	River Rouge											√	√	√			
261630015	Detroit-SW[5]		√			√	√	√F	√+A	√	√	√	√	√	√		√
261630019	Detroit-E 7 Mile			√	√		√							√	√		√
261630027	Detroit-W. Jefferson												√				
261630033	Dearborn					√^	√	√T	√+A		√	√	√#	√	√		√
261630093	Eliza Howell-NR	√	√					√F						√			
261630097	New Mount Herman (NMH) 48217							√T		√			√				
261630098	Detroit Police 4th Precinct (DP4th)	√	√					√F	A	√			√				
261630099	Trinity	√	√					√F	A	√			√	√			
261630100	Military Park		√					√F	A	√			√				

√ = Data Collected

= 9 additional metals sampled: Ba, Be, Cr, Co, Cu, Fe, Mo, V, Zn

F = FEM continuous $PM_{2.5}$ monitor

T = TEOM (non-FEM) continuous $PM_{2.5}$ monitor

* = Trace monitor

^ = Continuous PM_{10} monitor

A = Aethalometer monitor

[5] Detroit-SW is renamed from Detroit-W. Fort St., SWHS, Southwestern High School, N. Delray to reflect the site more accurately and maintain some continuity from its previous names.

Table 1.2b: Types of Monitoring Conducted in 2020 and MASN Locations in other Michigan CSAs.

Area (CSA)	Airs ID	Site Name	CO	NO_2	Trace NO_y	O_3	PM_{10}	$PM_{2.5}$ FRM	$PM_{2.5}$ Continuous	$PM_{2.5}$ Speciation	SO_2	VOC	Carbonyls	Trace Metals (As, Cd, Mn, Ni, Pb)	Wind Speed & Direction, Temp.	Relative Humidity	Solar Radiation	Barometric Pressure
Flint	260490021	Flint				√		√	√F						√			√
Flint	260492001	Otisville				√									√			
Grand Rapids	261390005	Jenison		√		√	√	√							√			
Grand Rapids	261390011	West Olive									√				√			
Grand Rapids	260810020	Grand Rapids	√*		√	√	√	√	√T	√	√*				√			√
Grand Rapids	260810022	Evans				√									√			
Lansing/E. Lansing	260650018	Lansing		√		√		√	√F		√				√			√
Lansing/E. Lansing	260370002	Rose Lake				√												

√ = Data Collected

F = FEM continuous $PM_{2.5}$ monitor

T = TEOM (non-FEM) continuous $PM_{2.5}$ monitor

* = Trace monitor

Table 1.2c: Types of Monitoring Conducted in 2020 and MASN Locations in Michigan Counties.

County	Airs ID	Site Name	CO	NO_2	Trace NO_y	O_3	PM_{10}	$PM_{2.5}$ FRM	$PM_{2.5}$ Continuous	$PM_{2.5}$ Speciation	SO_2	VOC	Carbonyls	Trace Metals (As, Cd, Mn, Ni, Pb)	Wind Speed & Direction, Temp.	Relative Humidity	Solar Radiation	Barometric Pressure
Monroe	261150006	Sterling State Park									√				√			
Huron	260630007	Harbor Beach				√									√			
Bay	260170014	Bay City							√F						√			
Missaukee	261130001	Houghton Lake		√		√			√F						√			√
Allegan	260050003	Holland				√			√F						√	√	√	√
Benzie	260190003	Frankfort[6]				√												
Berrien	260210014	Coloma				√									√			
Cass	260270003	Cassopolis				√									√			
Kalamazoo	260770008	Kalamazoo				√		√	√T						√			
Manistee	261010922	Manistee (tribal)				√		√							√		√	√
Mason	261050007	Scottville				√									√			
Muskegon	261210039	Muskegon				√									√			
Schoolcraft	261530001	Seney				√			√F						√	√	√	√
Ionia	260670002	Belding-Reed St.													√			
Ionia	260670003	Belding-Merrick St.												√				

√ = Data Collected

F = FEM continuous $PM_{2.5}$ monitor

T = TEOM (non-FEM) continuous $PM_{2.5}$ monitor

[6] Also called Benzonia.

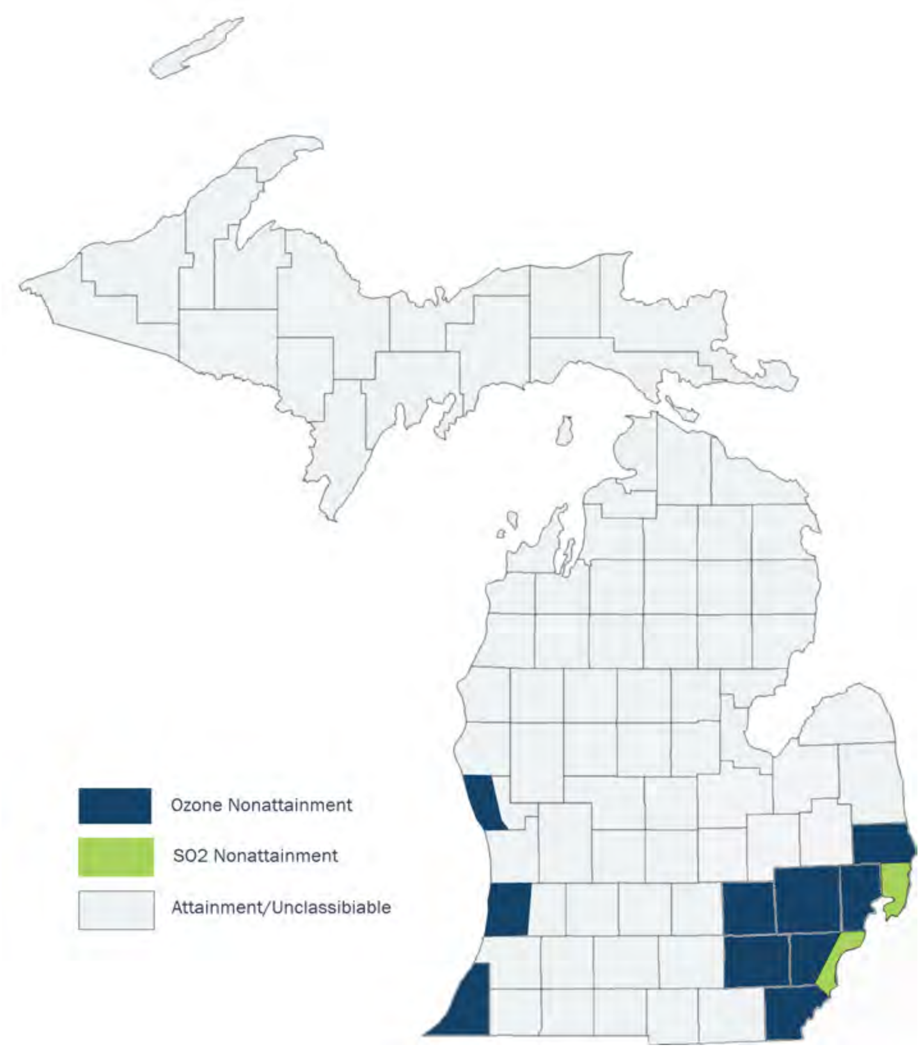
Current Attainment Status

Areas of the state that are below the NAAQS concentration level are called attainment areas. The entire state of Michigan is in attainment for the following pollutants:

- CO
- Pb
- NO_2
- Particulate Matter

Nonattainment areas are those that have been classified by the USEPA as having concentrations over the NAAQS level. Portions of the state are in nonattainment for SO_2 and O_3 (see **Figure 1.4**). The SO_2 nonattainment area includes a portion of Wayne County and a portion of St. Clair County. Ozone nonattainment areas include a portion of Allegan County, all of Berrien County, a portion of Muskegon County and the 7-county area of Southeast Michigan, which includes Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne Counties. Nonattainment status for O_3 was effective on August 3, 2019.

Figure 1.4: Attainment Status for the National Ambient Air Quality Standards

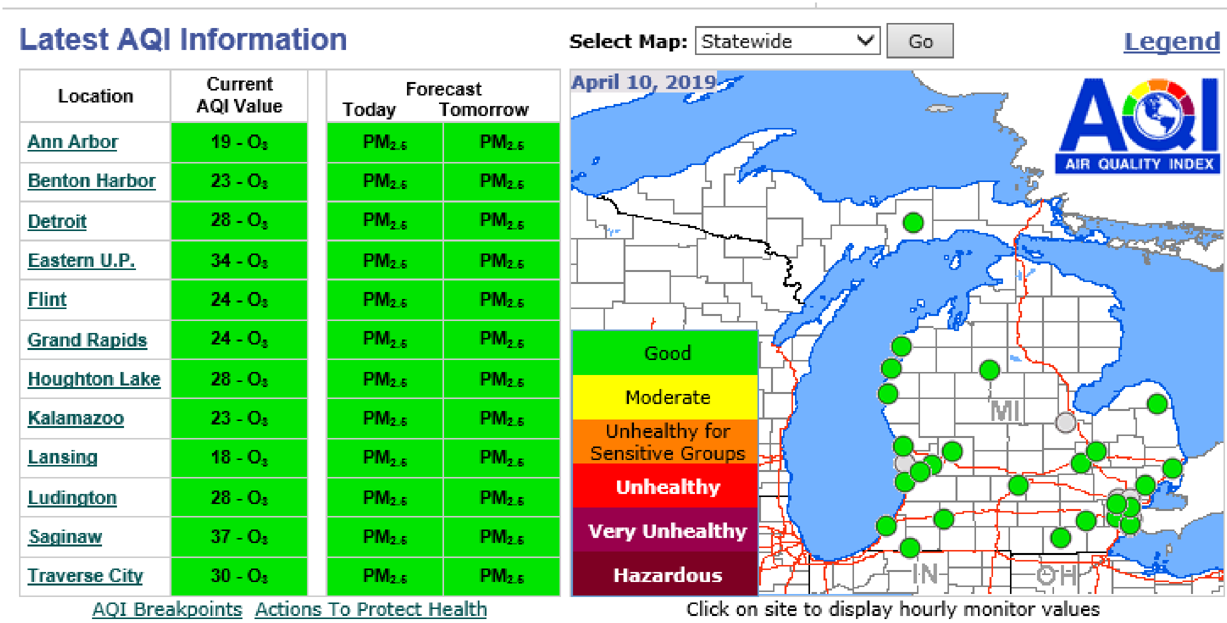


MIair – Air Quality Information in Real-Time

MIair is the internet tool that provides real-time air quality information via EGLE's web page. The deqmiair.org hotlink opens to the current Air Quality Index (AQI) map and displays air quality forecasts for "today" and "tomorrow." **MIair** also hosts EnviroFlash, the automated air quality notification system.

Air Quality Index

The Air Quality Index (AQI) is a simple tool developed to communicate current air quality information to the public. The current day's color-coded AQI values, ranging from Good to Hazardous (see **Table 1.3**), are displayed in a forecast table and as dots on a Michigan map (see example below).



Location	Current AQI Value	Forecast Today	Forecast Tomorrow
Ann Arbor	19 - O_3	$PM_{2.5}$	$PM_{2.5}$
Benton Harbor	23 - O_3	$PM_{2.5}$	$PM_{2.5}$
Detroit	28 - O_3	$PM_{2.5}$	$PM_{2.5}$
Eastern U.P.	34 - O_3	$PM_{2.5}$	$PM_{2.5}$
Flint	24 - O_3	$PM_{2.5}$	$PM_{2.5}$
Grand Rapids	24 - O_3	$PM_{2.5}$	$PM_{2.5}$
Houghton Lake	28 - O_3	$PM_{2.5}$	$PM_{2.5}$
Kalamazoo	23 - O_3	$PM_{2.5}$	$PM_{2.5}$
Lansing	18 - O_3	$PM_{2.5}$	$PM_{2.5}$
Ludington	28 - O_3	$PM_{2.5}$	$PM_{2.5}$
Saginaw	37 - O_3	$PM_{2.5}$	$PM_{2.5}$
Traverse City	30 - O_3	$PM_{2.5}$	$PM_{2.5}$

As can be seen from the AQI bar graphs for the Detroit-Warren-Dearborn area (Figure 1.5) and the Grand Rapids-Wyoming area (Figure 1.6), air quality in Michigan is generally in the Good or Moderate range. An area will occasionally fall into the Unhealthy for Sensitive Groups range, but rarely reaches Unhealthy levels.

In the Detroit area, only two days were in the Unhealthy range, both for $PM_{2.5}$ on July 4 and 5, due to fireworks. In the Unhealthy for Sensitive Groups (USG), 15 days were due to ozone, five were due to $PM_{2.5}$ and four were due to SO_2. In Detroit area, $PM_{2.5}$ leads the AQI 220 days, meaning that pollutant has the highest AQI value of all the pollutants measured per day.

In the Grand Rapids area, only one day was in the Unhealthy range, for $PM_{2.5}$ on July 4, due to fireworks. In the Unhealthy for Sensitive Groups (USG), six days were due to ozone, one was due to $PM_{2.5}$ (on July 5th). In Grand Rapids area, ozone leads the AQI 247 days, meaning that pollutant has the highest AQI value of all the pollutants measured per day.

Figure 1.5: 2020 AQI Days per Pollutant for Detroit-Warren-Dearborn MSA, numbers next to categories are for the Overall AQI Value (First Bar on Graph)

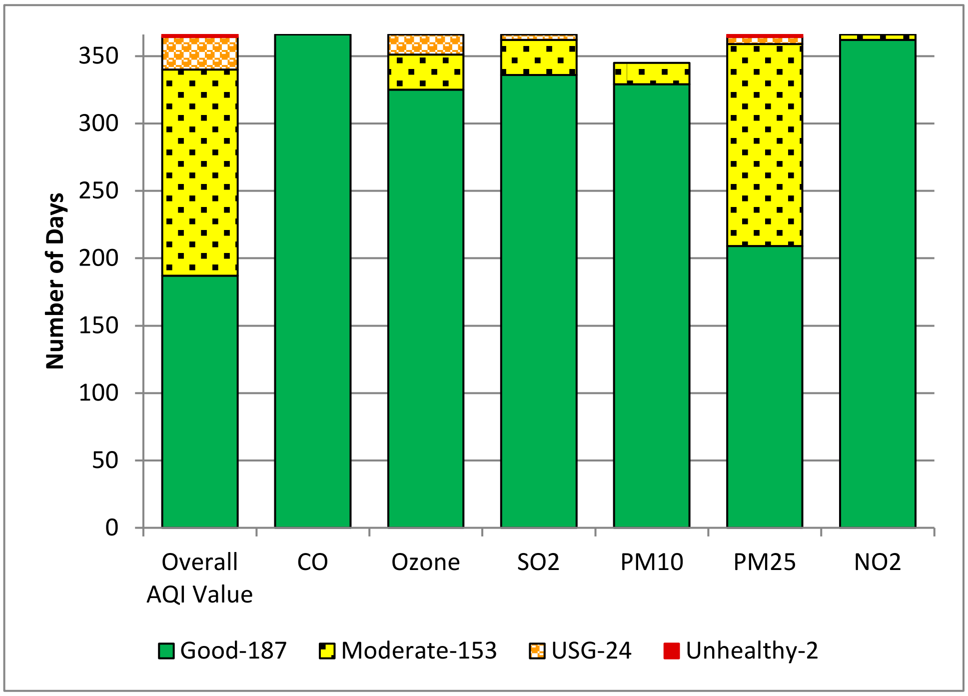
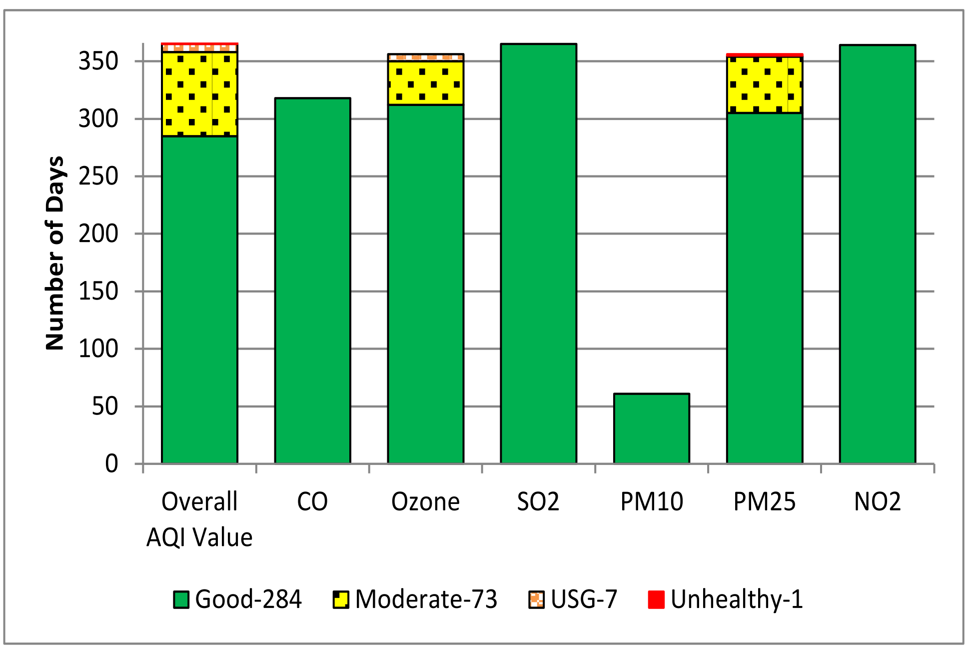


Figure 1.6: 2020 AQI Days Per Pollutant for Grand Rapids-Wyoming MSA, numbers next to categories are for the Overall AQI Value (First Bar on Graph)



MIair includes an "Air Quality Index Fact Sheet" link: michigan.gov/documents/deq/deq-aqd-aqifacts_273090_7.pdf, which contains activity recommendations based on the AQI levels (also **Table 1.3**).

Table 1.3: AQI Colors and Health Statements

AQI Color, Category and Value	Particulate Matter (µg/m³) 24-hour	Ozone (ppm) 8-hour / 1-hour	Carbon Monoxide (ppm) 8-hour	Sulfur Dioxide (ppm) 24-hour	Nitrogen Dioxide (ppm) 1-hour
GREEN: Good 1- 50	None	None	None	None	None
YELLOW: Moderate 51- 100	Unusually sensitive people should consider reducing prolonged or heavy exertion.	Unusually sensitive people should consider reducing prolonged or heavy exertion.	None	None	Unusually sensitive people should consider limiting prolonged outdoor exertion
ORANGE: Unhealthy for Sensitive Groups 101- 150	People with heart or lung disease, children, teens, & older adults should reduce prolonged or heavy exertion.	People with heart or lung disease, children, teens, & older adults, and people who are active outdoors should reduce prolonged or heavy exertion.	People with heart disease, such as angina, should reduce heavy exertion & avoid sources of CO, such as heavy traffic.	People with asthma should consider reducing outdoor exertion.	People with lung disease, children, & older adults should limit prolonged outdoor exertion
RED: Unhealthy 151- 200	People with heart or lung disease, children, teen, & older adults should avoid prolonged or heavy exertion. Everyone should reduce prolonged or heavy exertion.	People with heart or lung disease, children, teens & older adults, and people who are active outdoors should avoid prolonged or heavy exertion. Everyone should reduce prolonged or heavy exertion.	People with heart disease, such as angina, should reduce moderate exertion & avoid sources of CO, such as heavy traffic.	Children, asthmatics, & people with heart or lung disease should reduce outdoor exertion.	People with lung disease, children, & older adults should avoid prolonged outdoor exertion. Everyone should limit prolonged outdoor exertion.
PURPLE: Very Unhealthy 201- 300	People with heart or lung disease, children, teens, & older adults should avoid all physical activity outdoors. Everyone else should avoid prolonged or heavy outdoor exertion.	People with heart or lung disease, children & older adults, and people who are active outdoors should avoid all physical activity outdoors. Everyone else should limit outdoor exertion.	People with heart disease, such as angina, should avoid exertion & sources of CO, such as heavy traffic.	Children, asthmatics, & people with heart or lung disease should avoid outdoor exertion. Everyone should reduce outdoor exertion.	People with lung disease, children, & older adults should avoid all outdoor exertion. Everyone else should limit prolonged outdoor exertion.
MAROON: Hazardous 301- 500	People with heart or lung disease, children, teens, & older adults should remain indoors. Everyone should avoid all physical activity outdoors.	People with heart or lung disease, children, and older adults should remain indoors. Everyone should avoid all physical activity outdoors.	People with heart disease, such as angina, should avoid exertion & CO sources, such as heavy traffic. Everyone should limit heavy exertion.	Children, asthmatics, & people with heart or lung disease should remain indoors. Everyone should avoid outdoor exertion.	Children and People with respiratory disease, such as asthma, should avoid outdoor exertion.

Air Quality Forecasts

AQD meteorologists provide air pollution forecasts to alert the public when air pollution levels may become elevated. *Action!* Days are declared when levels are expected to reach or exceed the Unhealthy for Sensitive Groups AQI health indicator. On Action! Days, businesses, industry, government, and the public are encouraged to reduce air pollution levels by limiting vehicle use, refueling only after 6 PM, carpooling, walking, biking, or taking public transit, deferring the use of gasoline-powered lawn and recreation equipment, limiting the use of volatile chemicals, and curtailing all burning. More information on voluntary air pollution control measures can be found under the Action! Days tab on **MIair**.

The weather plays a significant role in air quality (see **Chapter 9** for an annual weather summary) and can either help increase or decrease the amount of pollution in the air. High temperatures, sun, and longer days (i.e., more daylight hours) are conducive to ozone formation, whereas rain tends to wash pollutants out of the air. *Action!* Days are declared when meteorological conditions are conducive for the formation of elevated ground-level O_3 or $PM_{2.5}$ concentrations.

Table 1.4 shows that there were some *Action!* Days declared during the summer of 2020.

Table 1.4: *Action!* Days Declared During Summer 2020

Location	Year	Number	Dates
Ann Arbor	2020	9	6/18, 6/19, 6/20, 7/5, 7/6, 7/7, 7/8, 7/9, 7/18
Benton Harbor	2020	10	6/18, 6/19, 6/20, 7/5, 7/6, 7/7, 7/8, 7/9, 7/18, 8/26
Detroit	2020	9	6/18, 6/19, 6/20, 7/5, 7/6, 7/7, 7/8, 7/9, 7/18
Flint	2020	2	6/19, 6/20
Grand Rapids	2020	10	6/18, 6/19, 6/20, 7/5, 7/6, 7/7, 7/8, 7/9, 7/18, 8/26
Kalamazoo	2020	2	6/19, 6/20
Ludington	2020	3	6/18, 6/19, 6/20
Traverse City	2020	2	6/19, 6/20

Air Quality Notification

EnviroFlash is a free service that provides automated air quality (AQI) and ultraviolet (UV) forecasts to subscribers. Those enrolled receive email or mobile phone text messages when the health level they select is predicted to occur. AIRNow iPhone and Android applications deliver ozone and fine particle air quality forecasts plus detailed real-time information that can be used to better protect health when planning daily activities. To learn more about this program, select the **MIair** button from Michigan's Air Quality page Michigan.gov/air. To receive notices, choose the "Air Quality Notification" tab and click the "Enroll in AQI EnviroFlash" link. Michigan's EnviroFlash network has the potential to reach up to 98 percent of the state's population.

AIRNow

EGLE supplies Michigan air monitoring data to AIRNow, the USEPA's nationwide air quality mapping system. Information about AIRNow is available at AirNow.gov or you can select the AIRNow hot link at the bottom of each **MIair** web page.

CHAPTER 2: CARBON MONOXIDE (CO)

Carbon monoxide is a gas formed during incomplete burning of fuel. CO is colorless, odorless, and tasteless, and is lethal at elevated concentrations. Levels peak during colder months primarily due to cold temperatures that affect combustion efficiency of engines. The CO NAAQS is 9 ppm for the second highest 8-hour average and 35 ppm for the second highest 1-hour average. Its sources and effects are provided below.

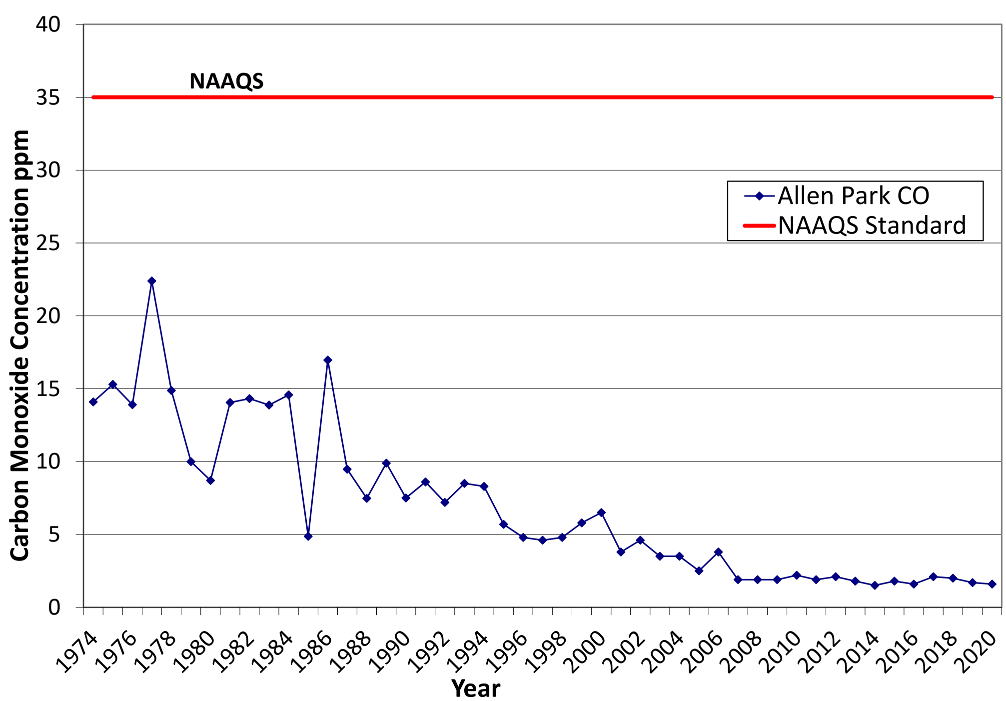
Sources: CO is given off whenever fuel or other carbon-based materials are burned. Outdoor exposure sources include automobile exhaust, industrial processes (metal processing and chemical production), and non-vehicle fuel combustion. Natural sources include volcanos, forest fires, and photochemical reactions in the atmosphere. Indoor exposure sources include wood stoves and fireplaces, gas ranges with continuous pilot flame ignition, unvented gas or kerosene heaters, and cigarette smoke.

Effects: CO enters the bloodstream through the lungs, where it displaces oxygen delivered to the organs and tissues. Elevated levels can cause visual impairment, interfere with mental acuity by reducing learning ability and manual dexterity, and can decrease work performance in the completion of complex tasks. In extreme cases, unconsciousness and death can occur. CO also alters atmospheric photochemistry contributing to the formation of ground-level O_3, which can trigger serious respiratory problems.

Population most at risk: Those who suffer from cardiovascular (heart and respiratory) disease, fetuses, infants, and the elderly are most at risk for exposure to elevated levels of CO. People with angina and peripheral vascular disease are especially at risk, as their circulatory systems are already compromised and less efficient at carrying oxygen; however, elevated CO levels can also affect healthy people.

Historical Trends: Southeast Michigan has been monitoring CO for 45 years. **Figure 2.1** shows the CO trend at Allen Park to be well below the 1-hour standard of 35 ppm. This standard has not changed since 1971.

Figure 2.1: Historical 1-hour CO Averages at Allen Park



Figures 2.2 and **2.3** show CO emission sources and CO emissions by county (courtesy of the USEPA's State and County Emission Summaries).

Figure 2.2: CO Emissions by Source Sector for Michigan 2017 in Tons (NEI 2017)

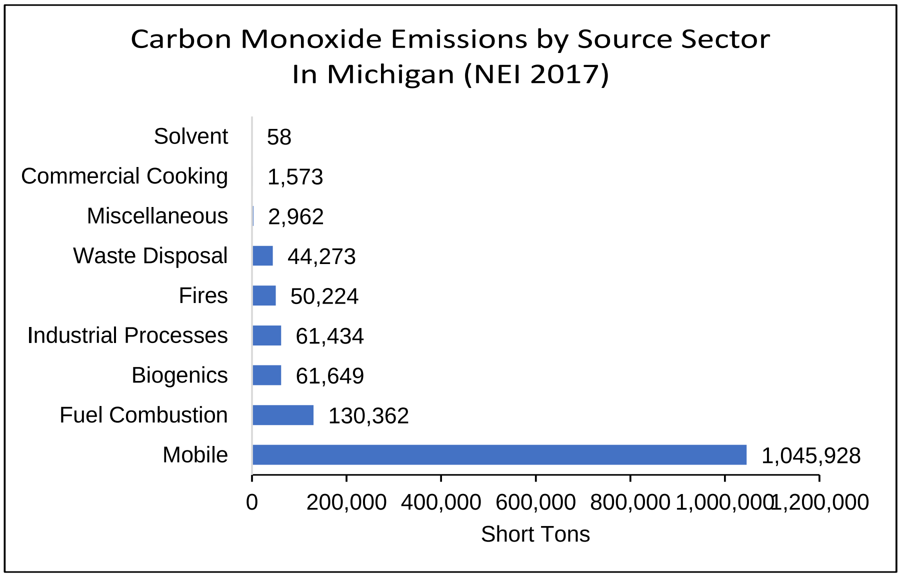


Figure 2.3: CO Emissions in 2017 (NEI)

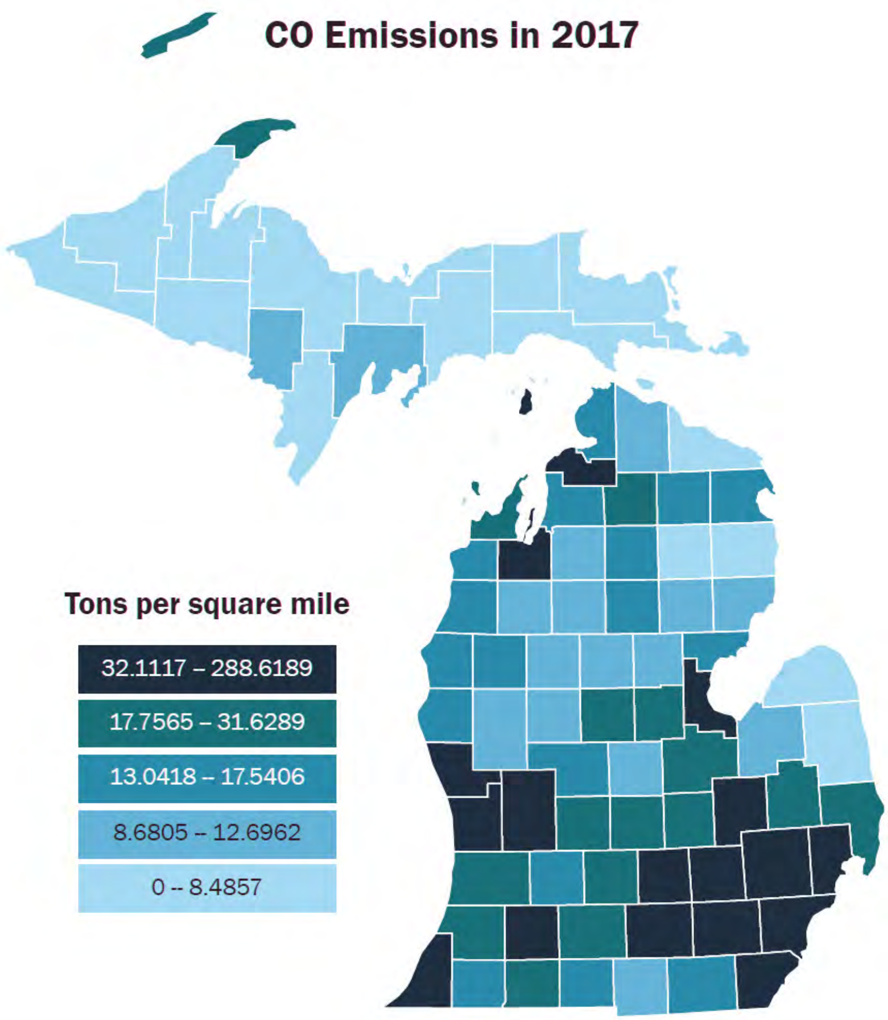


Figure 2.4 shows the location of each CO monitor that operated in 2020.

- Near-roadway network sites: Eliza Howell-NR.
- NCore Network: Grand Rapids and Allen Park measure trace CO (lower detection levels 1-50 ppm).
- GHIB project: DP4th and Trinity, started summer and fall 2018, respectively.

Figure 2.4: CO Monitors in 2020

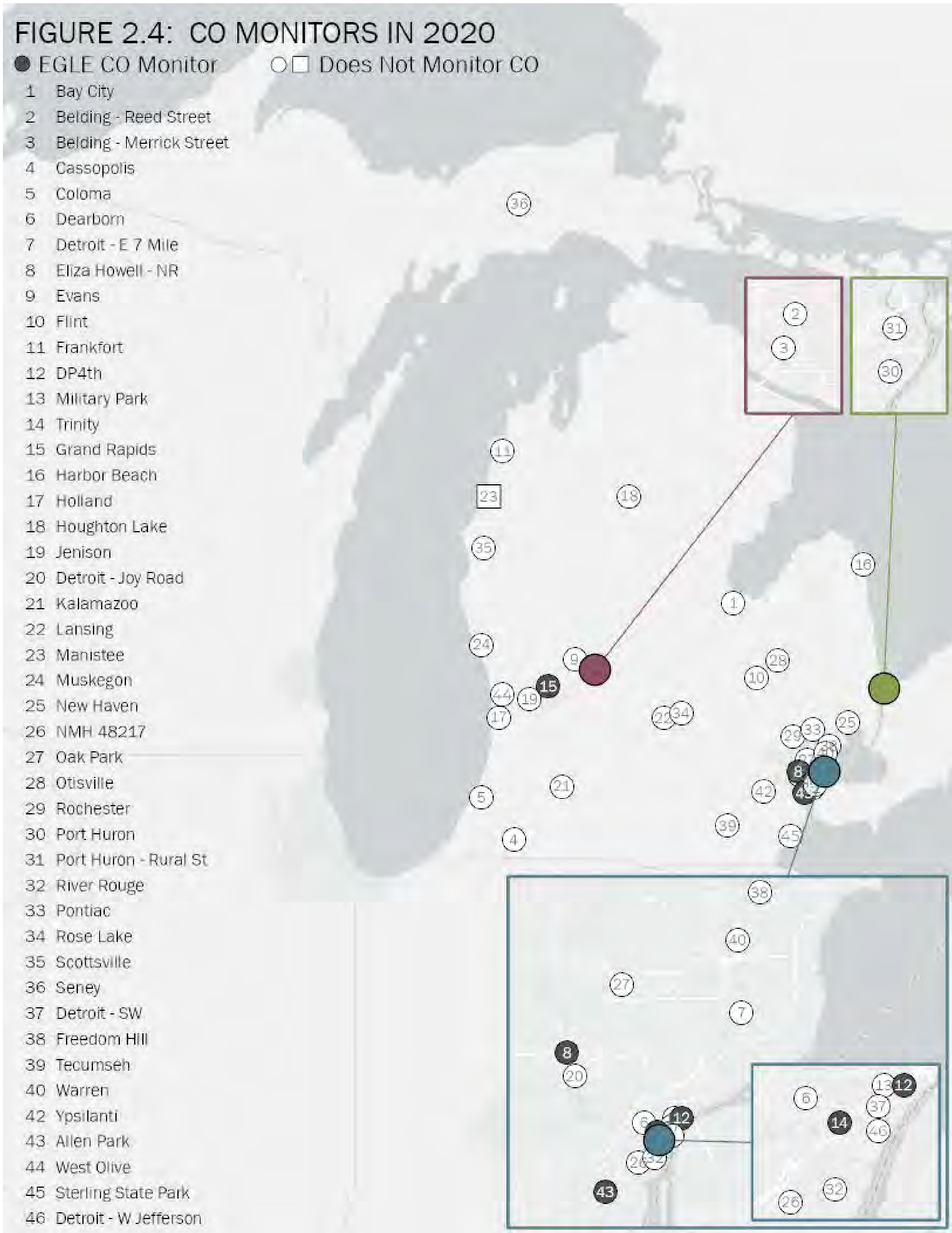


Figure 2.5 shows the second highest 1-hour CO concentrations for Michigan from 2015-2020, which demonstrates there have not been any exceedances of the 1-hour CO NAAQS.

Figure 2.5: CO Levels in Michigan from 2015-2020 (2nd Highest 1-Hour Maximum Values)

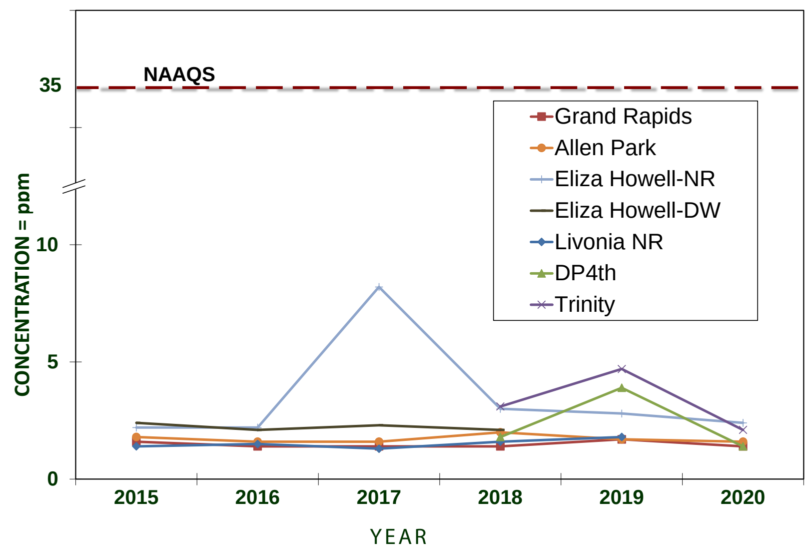
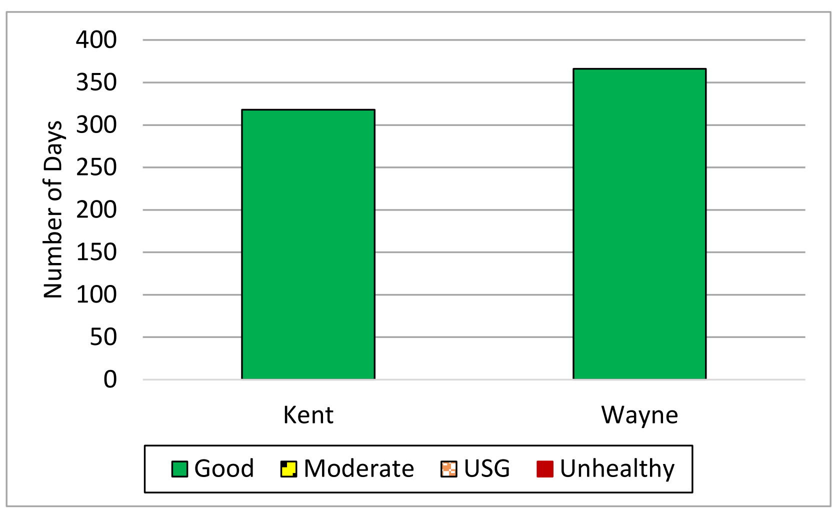


Figure 2.6 shows the AQI values per day in counties where CO is monitored. All days were in the good AQI range.

Figure 2.6: 2020 AQI Days for CO in Michigan Counties



CHAPTER 3: LEAD (PB)

Lead is a highly toxic metal found in coal, oil, and other fuels. It is also found in older paints, municipal solid waste, and sewage sludge, and may be released to the atmosphere during combustion. In 2008, the USEPA lowered the Pb NAAQS from a maximum quarterly average of 1.5 $\mu g/m^3$ to a 3-month rolling average of 0.15 $\mu g/m^3$. Its sources and effects are presented below.

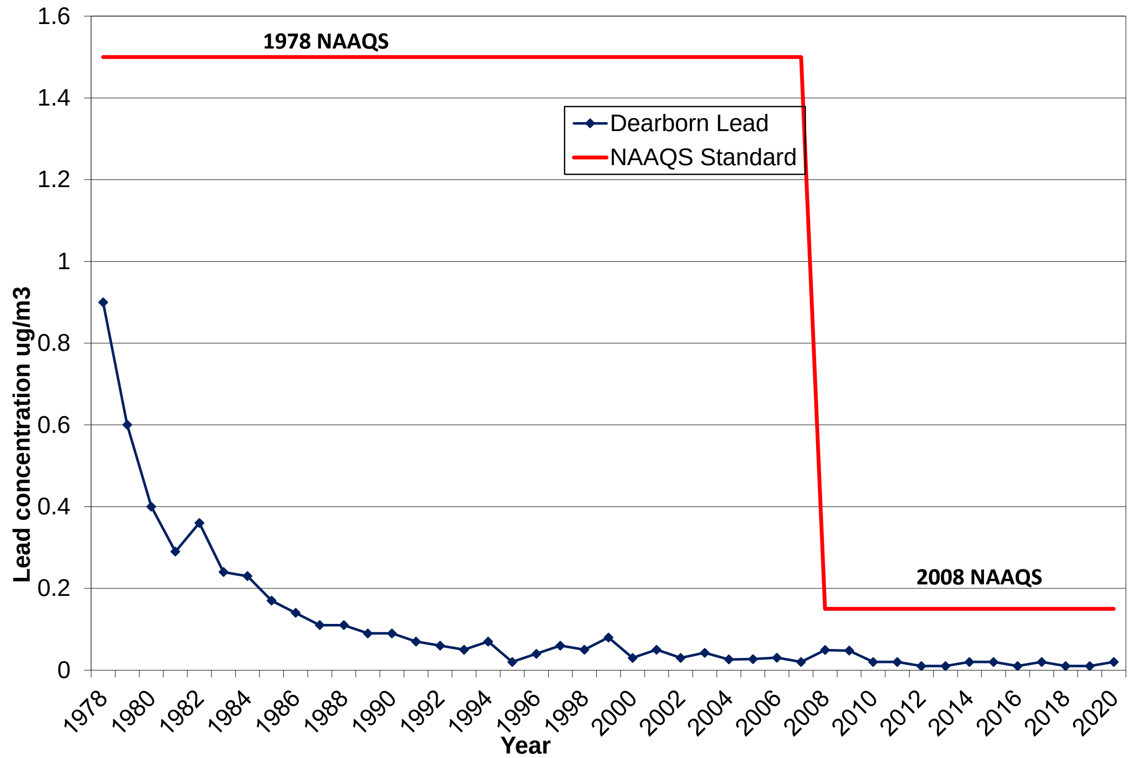
Sources: With the phase-out of leaded gas in the 1970s, the major sources of Pb emissions have been due to ore and metals processing and piston-engine aircraft operating on leaded aviation fuel. Other industrial sources include Pb acid battery manufacturers, waste incinerators, and utilities. The highest air concentrations of Pb are usually found near lead smelters.

Effects: Exposure occurs through the inhalation or ingestion of Pb in food, water, soil, or dust particles. Pb primarily accumulates in the body's blood, bones, and soft tissues, and adversely affects the nervous system as well as the cardiovascular system, reproductive system, blood, kidneys, and other organs.

Population most at risk: Fetuses and children are most at risk since low levels of Pb may cause central nervous system damage. Excessive Pb exposure during the early years of life is associated with lower IQ scores and neurological impairment (seizures, mental development, and behavioral disorders). Even at low doses, lead exposure is associated with changes in fundamental enzymatic, metabolic, and homeostatic mechanisms in the body, and Pb may be a factor in high blood pressure and subsequent heart disease.

Historical Trends: Southeast Michigan has been monitoring for lead for 40 years. **Figure 3.1** shows the trend for lead at Dearborn. The largest decrease in Pb in the air is due to the removal of Pb in gasoline. By 1975, most newly manufactured vehicles no longer required leaded gasoline, and as a result, there was a dramatic decrease in ambient Pb levels. In 1996, the USEPA banned the sale of leaded fuel for use in on-road vehicles. The graph also shows the decrease in the Pb standard that occurred in 2008.

Figure 3.1: Historical Quarterly / 3-month Averages for Lead at Dearborn



Figures 3.2 and **3.3** show Pb emission sources and Pb emissions by county (courtesy of the USEPA's State and County Emission Summaries).

Figure 3.2: Pb Emissions by Source Sector

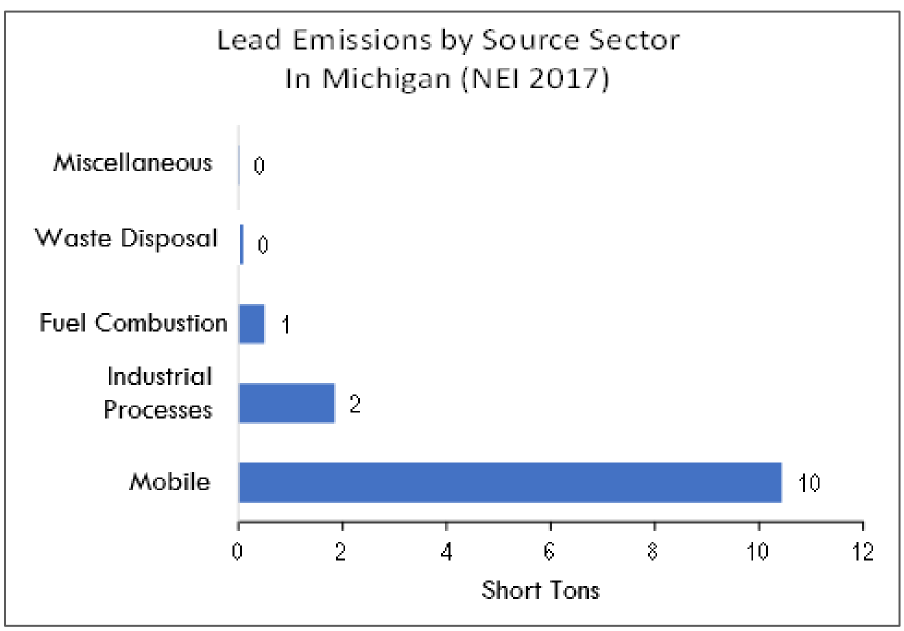


Figure 3.3: Pb Emissions in 2017 (NEI)

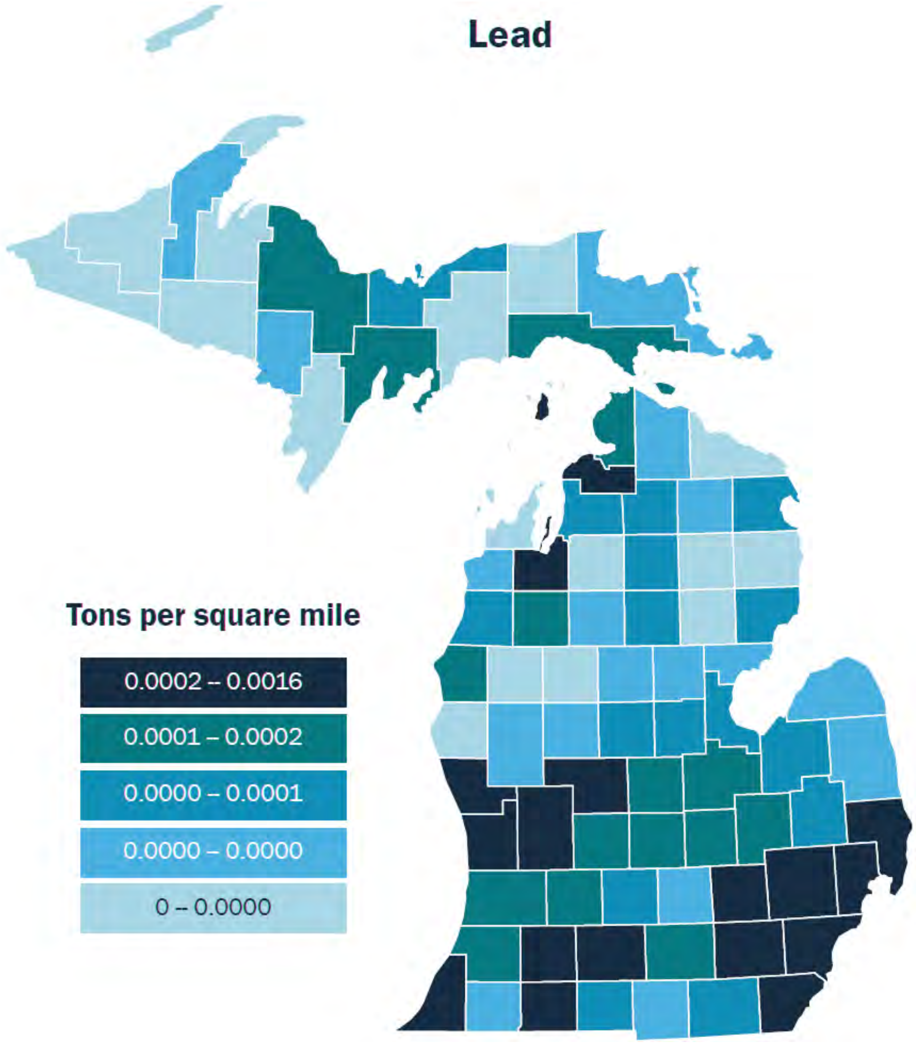


Figure 3.4 shows the location of the Pb monitors in the MASN in 2020. When the Pb NAAQS was lowered in 2008, the monitoring network was modified to consist of source-oriented monitors and population-oriented monitors. As part of the 2008 Pb NAAQS, EGLE must monitor near stationary sources emitting more than 1/2 ton of Pb per year.

- Source-oriented sites: Port Huron-Rural St. and Belding-Merrick St. The second site, Belding-Reed St. was shut down on January 1, 2019, since lead levels are below the standard and both sites are no longer necessary. The two sites in Belding previously were above the standard, but values for both the sites have been below the NAAQS for the past five years. Belding was designated to attainment on July 31, 2018.
- National Air Toxics Trend Sites (NATTS): Dearborn lead and trace metals, both as total suspended particulate (TSP) and PM_{10}. Lead measurements as $PM_{2.5}$ are also made throughout the $PM_{2.5}$ speciation network.
- NCore sites: Allen Park and Grand Rapids.
- Network consistency: River Rouge, Detroit-W. Jefferson, NMH 48217, and Detroit-SW. On January 1, 2018, lead sampling was started at all the TSP metals sites to maintain consistency and to be more protective of public health. Many older homes, which often contain lead-based paint, are being demolished in the Detroit area near these monitors.

- Secondary monitor: Port Huron-Rural St. to comply with the USEPA's collocation regulations.
- Gordie Howe International Bridge (GHIB) project: DP4th, Trinity, and Military Park.

Figure 3.4: Lead (Pb) Monitors in 2020

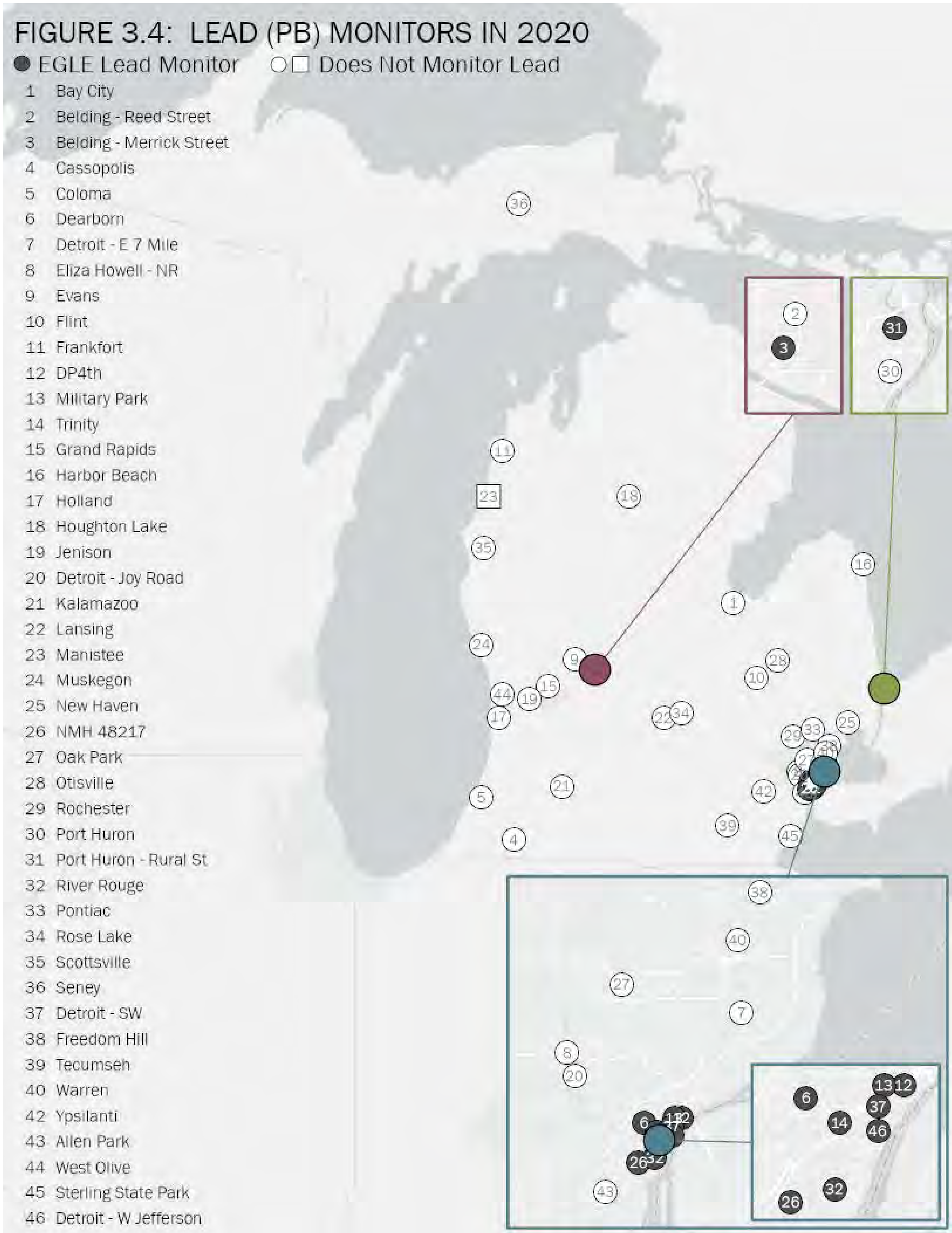
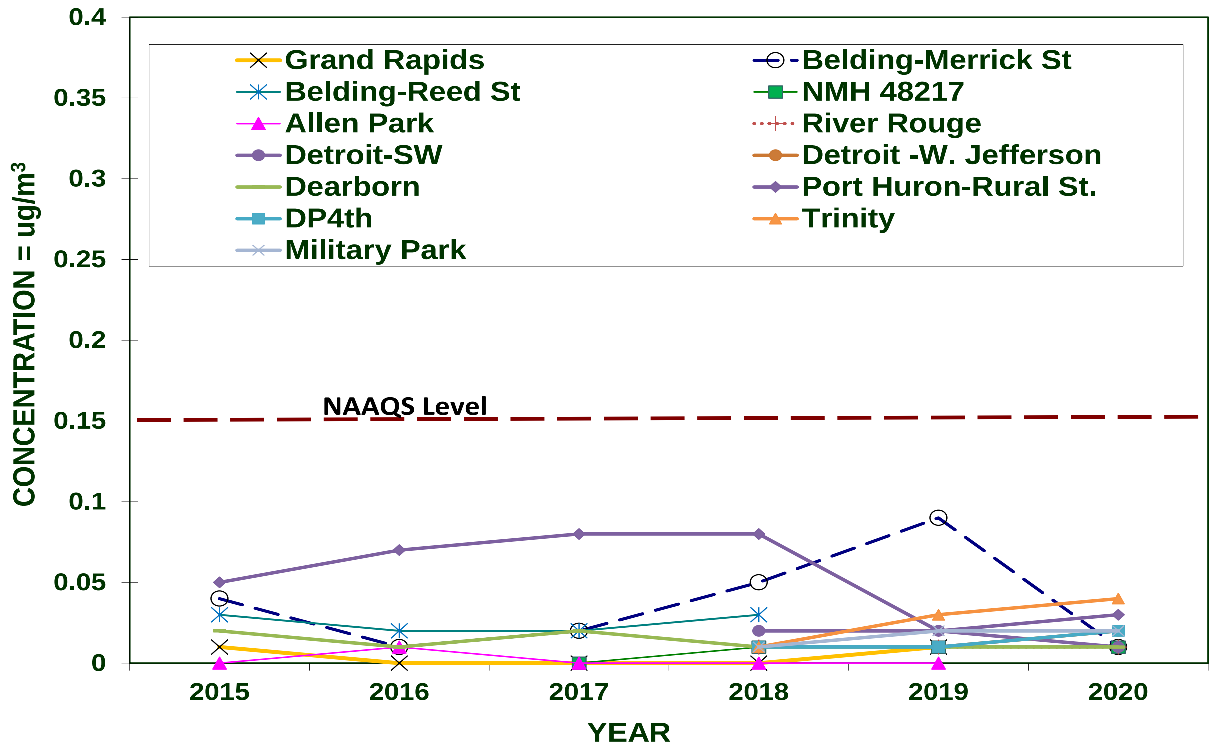


Figure 3.5 shows the maximum 3-month rolling average values for Pb from 2015 to 2020. All Pb monitor sites in Michigan are below the standard.

Figure 3.5: Lead Levels in Michigan from 2015-2020 (Maximum 3-month Average Values)



CHAPTER 4: NITROGEN DIOXIDE (NO_2)

Nitrogen dioxide is a reddish-brown, highly reactive gas formed through oxidation of nitric oxide (NO). Upon dilution, it becomes yellow or invisible. High concentrations produce a pungent odor and lower levels have an odor like bleach. NO_X is the term used to describe the sum of NO, NO_2, and other nitrogen oxides. NO_X can lead to the formation of O_3 and NO_2 and can react with other substances in the atmosphere to form particulate matter or acidic products that are deposited in rain (acid rain), fog, or snow. Since 1971, the primary and secondary standard for NO_2 was an annual mean of 0.053 ppm. In January 2010, the USEPA added a 1-hour NO_2 standard of 100 ppb, taking the form of the 98th percentile averaged over three years. The sources and effects of NO_2 are as follows:

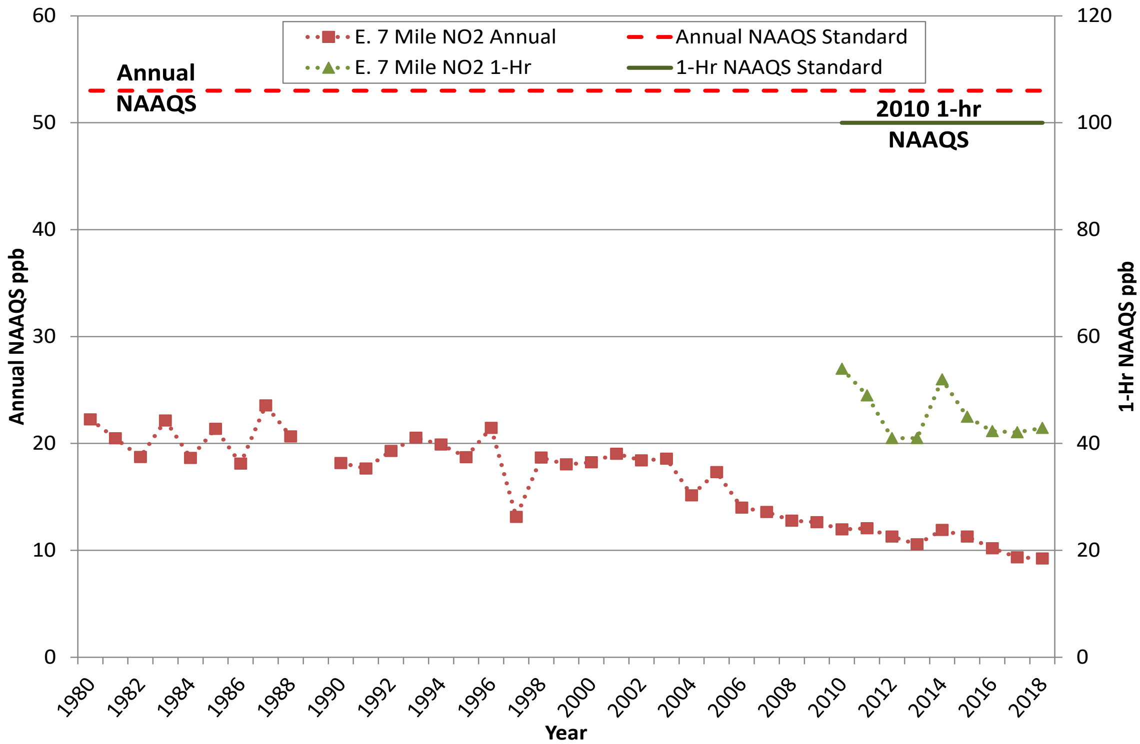
Sources: NO_X compounds and their transformed products occur both naturally and because of human activities. Natural sources of NO_X are lightning, forest fires, bacterial processes in soil, and stratospheric intrusion. Stratospheric intrusion is when the air upper atmosphere (stratosphere) descends towards the surface of the earth and mixes with the air at breathing level. Ammonia and other nitrogen compounds produced naturally are important in the cycling of nitrogen through the ecosystem. The major sources of man-made (anthropogenic) NO_x emissions come from high-temperature combustion processes such as those occurring in automobiles and power plants. Home heaters and gas stoves produce substantial amounts of NO_2 in indoor settings.

Effects: Exposure to NO_2 occurs through the respiratory system, irritating the lungs. Short-term NO_2 exposures (i.e., less than three hours) can produce coughing and changes in airway responsiveness and lung function. Evidence suggests that long-term exposures to NO_2 may lead to increased susceptibility to respiratory infection and may cause structural changes in the lungs. Exercise increases the ventilation rate and hence exposure to NO_2. Nitrate particles and NO_2 can block the transmission of light, resulting in visibility impairment (i.e., smog or haze). Nitrogen deposition can lead to fertilization, excessive nutrient enrichment, or acidification of terrestrial, wetland, and aquatic systems that can upset the delicate balance in those ecosystems.

Population most at risk: Individuals with pre-existing respiratory illnesses and asthmatics are more sensitive to the effects of NO_2 than the general population. Short-term NO_2 exposure can increase respiratory illnesses in children.

Historical Trends: Southeast Michigan has been monitoring for NO_2 for 40 years. **Figure 4.1** shows the trend for NO_2 at Detroit-E 7 Mile Road, which has been well below the annual standard of 53 ppb and shows a downward trend. In 2010, the USEPA added a 1-hour standard for NO_2, which has also remained well below the standard in Michigan. Southeast Michigan is highly industrialized; therefore, it is a good indicator of the air quality improvement for the rest of the state.

Figure 4.1: Historical Annual and 1-hour NO_2 at Detroit-E 7 Mile Road



Figures 4.2 and **4.3** show NO_2 emission sources and NO_2 emissions by county (courtesy of the USEPA's State and County Emission Summaries).

Figure 4.2: Nitrogen Oxide Emissions by Source Sector

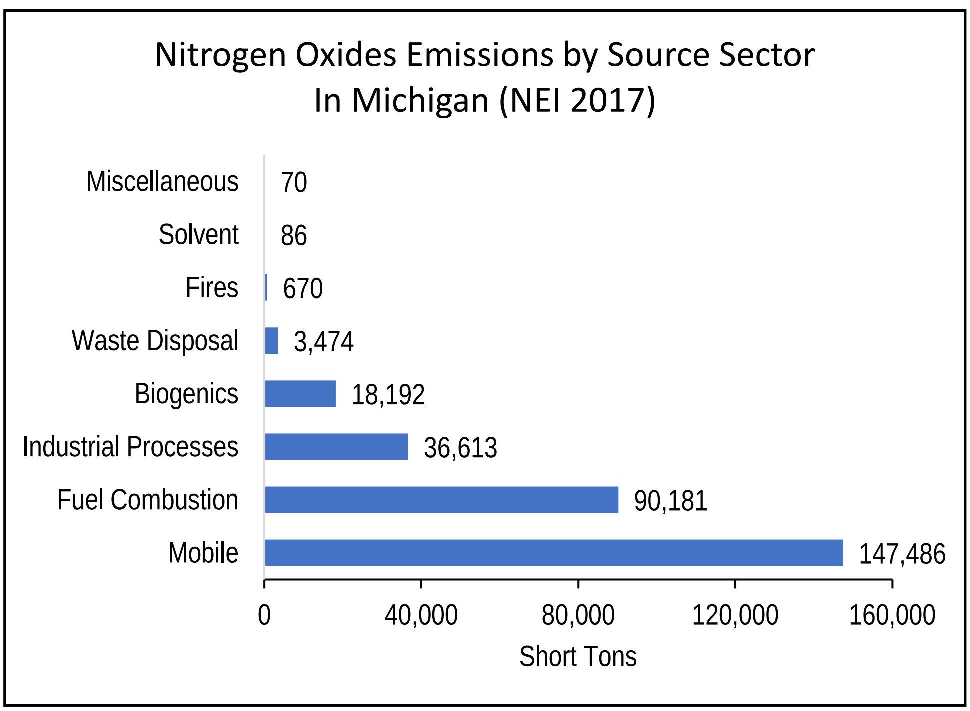


Figure 4.3: Nitrogen Oxide Emissions in 2017 (NEI)

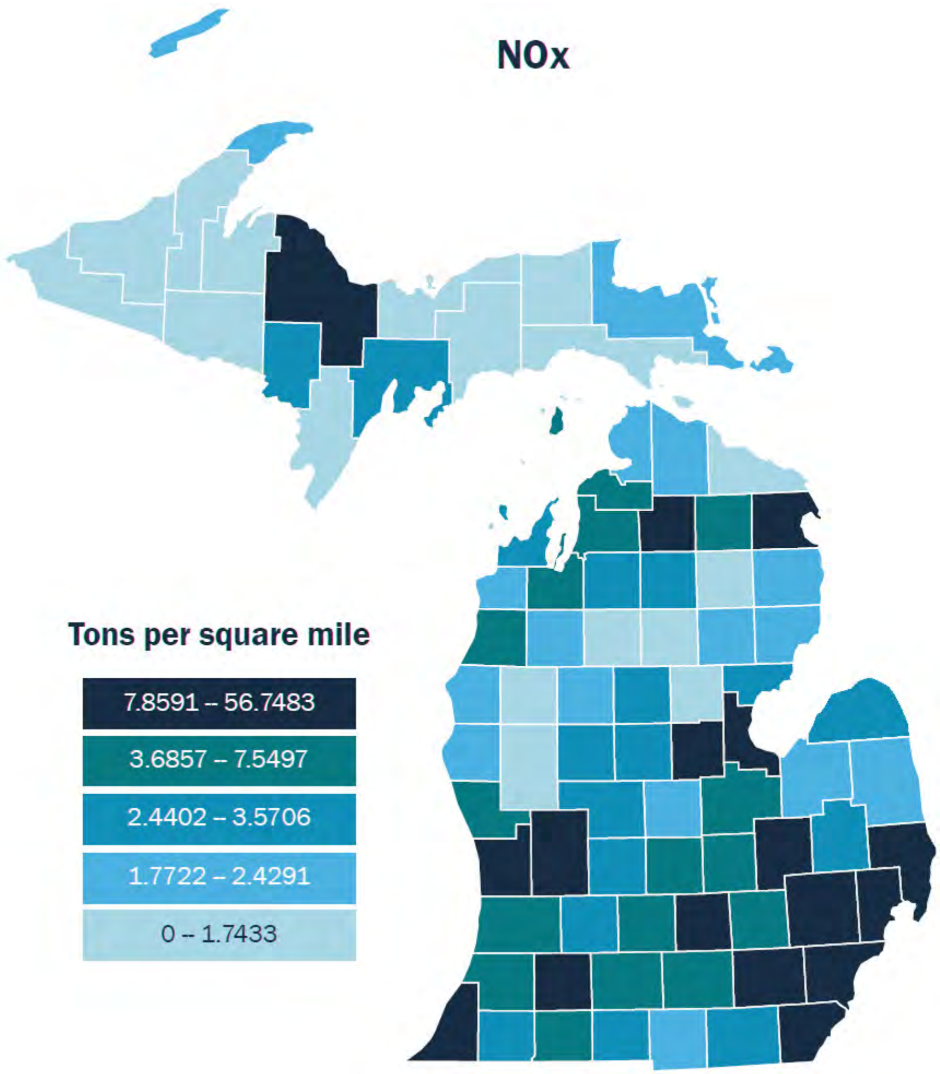
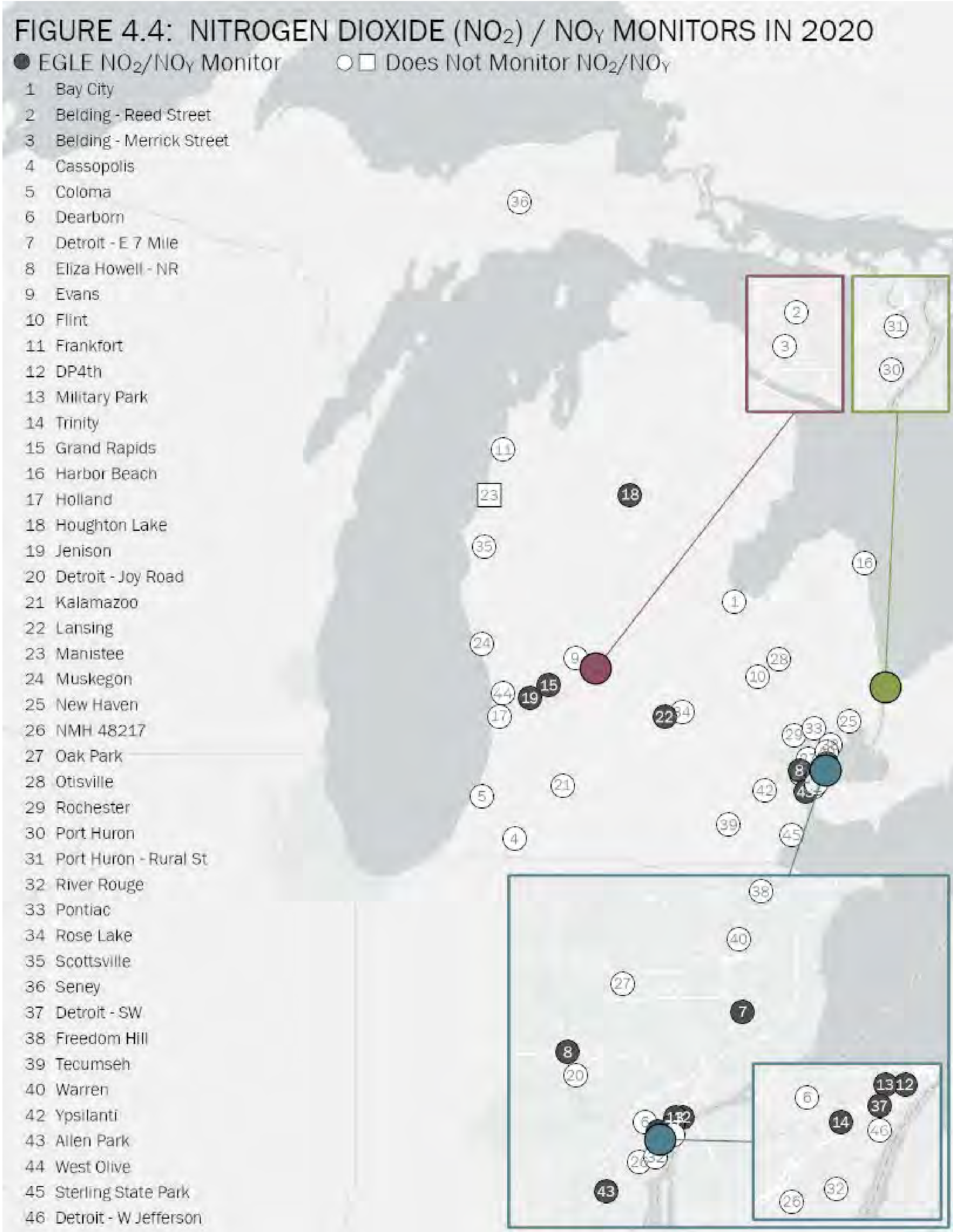


Figure 4.4 shows the location of all NO_2 monitors that operated in 2020.

- Downwind urban scale site: Detroit-E 7 Mile in Detroit and Jenison for the Grand Rapids area.
- Near-roadway Network sites: Detroit Eliza Howell-NR site, the downwind site was shut down since it is not necessary for the near-road network. The Livonia roadway site needed to be moved since EGLE lost site access. A suitable replacement has not been found.
- NCore sites: Grand Rapids and Allen Park, monitor NO_Y, which includes NO_X, nitric acid, and organic and inorganic nitrates (not used for attainment/nonattainment purposes).
- Photochemical Assessment Monitoring Station (PAMS) Network: The NOX monitor at Detroit-E 7 Mile was switched to a NOY for PAMS. Direct NO_2 will also be monitored at Detroit-E 7 Mile when the PAMS network is completely installed at this site.
- Background monitors for modeling: Lansing and Houghton Lake.
- GBIH project: Detroit-SW, DP4th, Trinity, and Military Park.

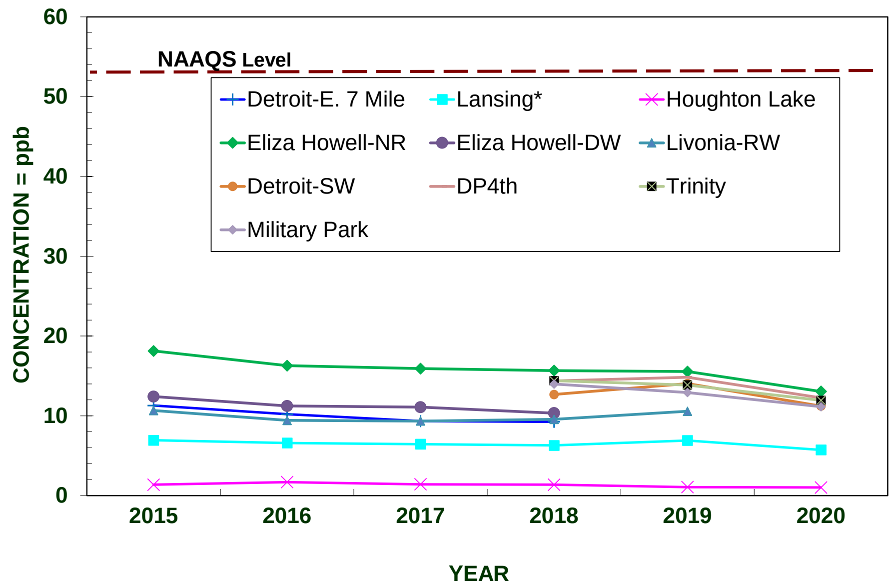
Figure 4.4: Nitrogen Dioxide (NO_2)/NO_Y Monitors in 2020



Michigan's ambient NO_2 levels have always been well below the NAAQS. Since March 3, 1978, all areas in Michigan have been in attainment for the annual NO_2 NAAQS. As shown in **Figure 4.5**, all monitoring sites have had an annual NO_2 concentration at less than half of the 0.053 ppm NAAQS.

Even though there are no nonattainment areas for NO_2 in Michigan and monitoring for attainment purposes is not required, monitors continue to operate to support photochemical model validation work.

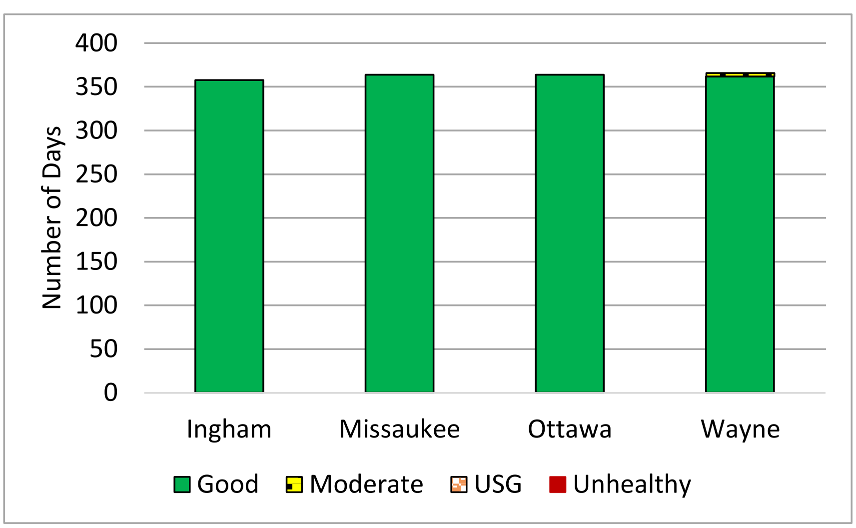
Figure 4.5: NO_2 Levels in MI from 2015-2020 (Annual Arithmetic Mean)**



*Indicates site was moved in 2018 and concentrations were averaged together for both locations.
**Since Allen Park and Grand Rapids are monitoring NO_Y, those sites are not included in graph.

Figure 4.6 shows the AQI values per day in counties where NO_2 is monitored. All days were in the good AQI range except for four days in Wayne County that were in the moderate AQI range.

Figure 4.6: 2020 AQI Days for NO_2 in Michigan Counties



CHAPTER 5: SULFUR DIOXIDE (SO_2)

Sulfur dioxide is a gas formed by the burning of sulfur-containing material. Odorless at typical ambient concentrations, SO_2 can react with other atmospheric chemicals to form sulfuric acid. At higher concentrations it has a pungent, irritating odor like a struck match. When sulfur-bearing fuel is burned, the sulfur is oxidized to form SO_2, which then reacts with other pollutants to form aerosols. These aerosols can form particles in the air causing increases in $PM_{2.5}$ levels. In liquid form, it is found in clouds, fog, rain, aerosol particles, and in surface films on these particles. In June 2010, the USEPA changed the primary SO_2 standard to a 99th percentile of 1-hour concentrations not to exceed 0.075 ppm, averaged over a 3-year period. The secondary standard has not changed and is a 3-hour average that cannot exceed 0.5 ppm once per year. Its sources and effects are presented below.

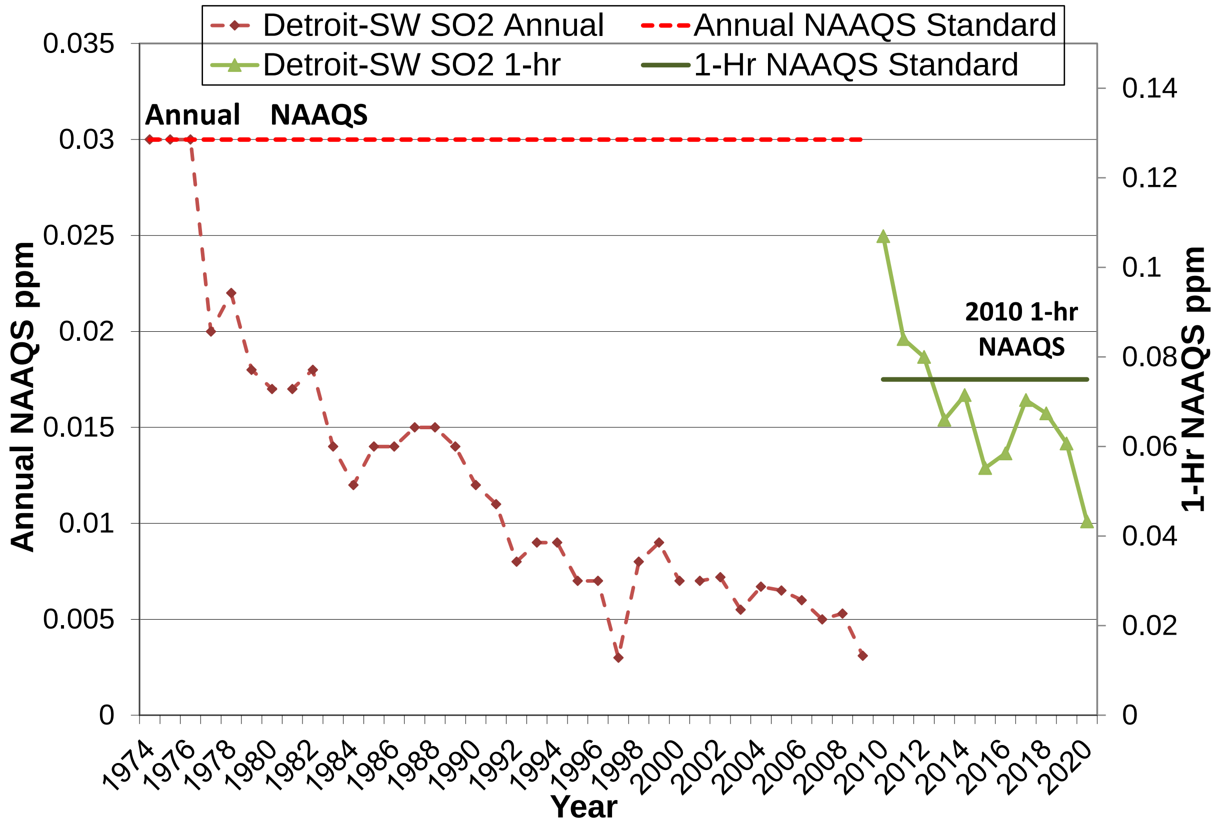
Sources: Coal-burning power plants are the largest source of SO_2 emissions. Other sources include industrial processes such as extracting metal from ore, and non-road transportation sources, and natural sources such as volcanoes. SO_2 and particulate matter are often emitted together.

Effects: Exposure to elevated levels can aggravate symptoms in asthmatics and cause respiratory problems in healthy groups. SO_2 and NOx together are the major precursors to acid rain and are associated with the acidification of soils, lakes, and streams, as well as accelerated corrosion of buildings and monuments.

Population most at risk: Asthmatics, children, and the elderly are especially sensitive to SO_2 exposure. Asthmatics receiving short-term exposures during moderate exertion may experience reduced lung function and symptoms, such as wheezing, chest tightness, or shortness of breath. Depending on the concentration, SO_2 may also cause symptoms in people who do not have asthma.

Historical Trends: Southeast Michigan has been monitoring for SO_2 for over 45 years. **Figure 5.1** shows the SO_2 trend for the old annual standard and the new 1-hour standard for Detroit-SW. Michigan had been in attainment for SO_2 since 1982 with levels consistently well below the annual SO_2 NAAQS. In 2010, when the USEPA changed the standard from an annual average to a 1-hour standard, a portion of Wayne County was designated nonattainment. In September 2016, a portion of St. Clair County was also designated as nonattainment by the USEPA based on emissions and modeling. Even though the areas are in nonattainment for the 1-hour SO_2 standard, SO_2 concentrations have decreased at these sites and are currently under the NAAQS, although modeling results are not below the NAAQS.

Figure 5.1: Historical Annual and 1-hour SO_2 Averages at Detroit-SW



Figures 5.2 and **5.3** show SO_2 emission sources and SO_2 emissions by county (courtesy of the USEPA's State and County Emission Summaries).

Figure 5.2: SO_2 Emissions by Source Sector

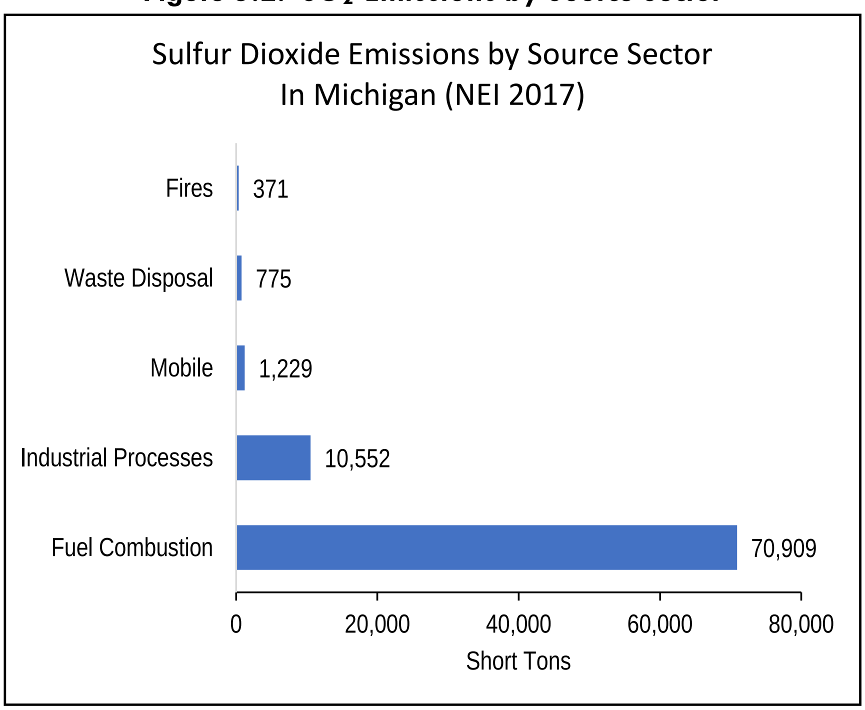


Figure 5.3: SO_2 Emissions in 2017 (NEI)

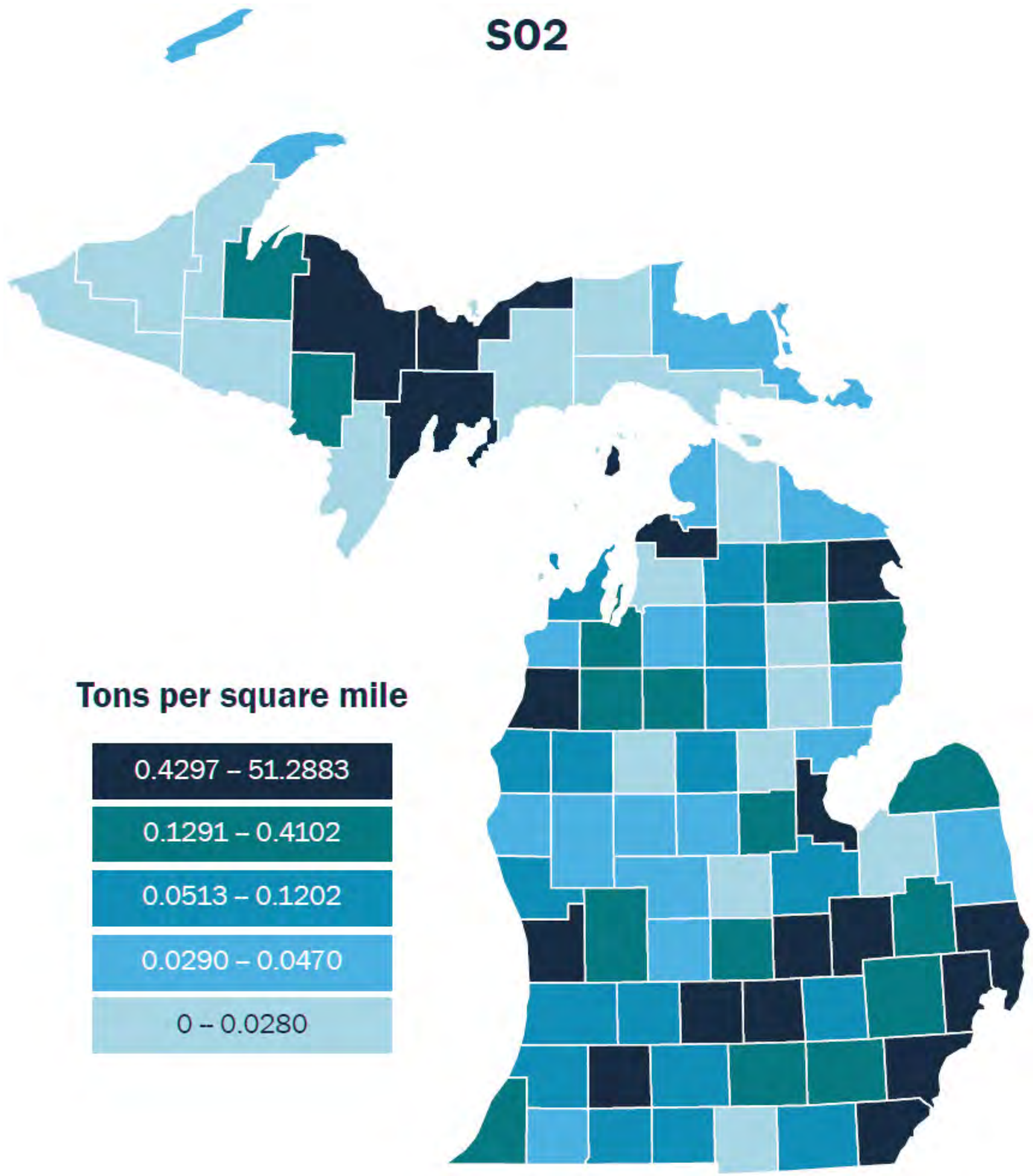


Figure 5.4 shows the location of each SO_2 monitor that operated in 2020.

- NCore sites: Allen Park and Grand Rapids have trace SO_2 monitors that have lower detection limits than traditional SO_2 monitors.
- Source-oriented sites: Lansing, Port Huron, Detroit-SW, Sterling State Park, West Olive.
- Community monitoring project: NMH 48217.
- GHIB project: DP4th, Trinity, and Military Park.

Figure 5.4: Sulfur Dioxide (SO_2) Monitors in 2020

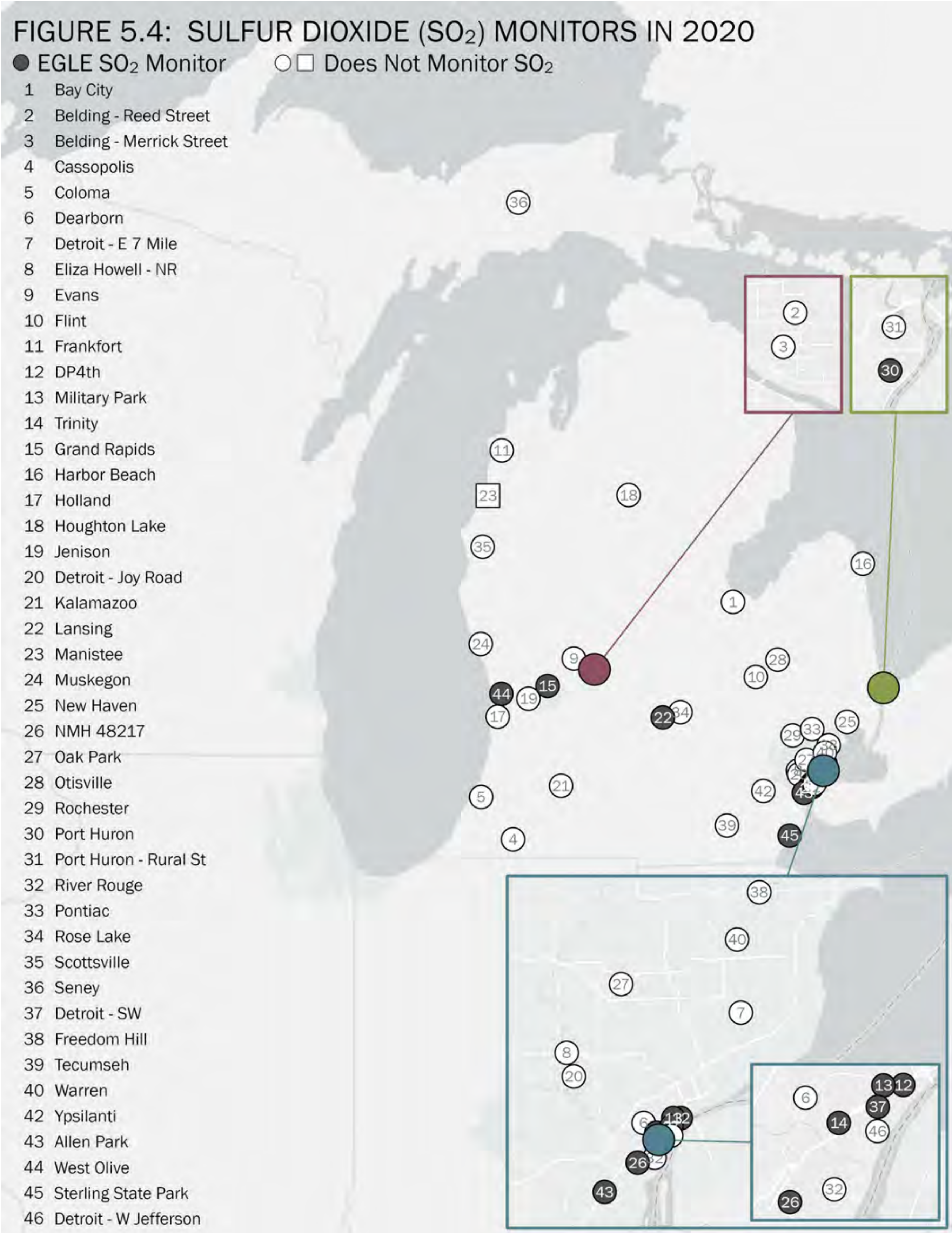


Figure 5.5 shows that all the SO_2 sites in Michigan are below the standard even though there is a nonattainment area for SO_2. The standard is a three-year average, therefore having one point above the NAAQS level line does not mean the monitor is over the standard. SO_2 pollution is extremely variable and would require a large monitoring network to designate areas as attainment. Therefore, SO_2 attainment depends on both emission modeling and monitoring data.

The NCore sites, Grand Rapids and Allen Park, monitor for trace SO_2. For trend purposes, all SO_2 data are graphed together in **Figure 5.5**.

Figure 5.5: SO_2 Level in Michigan from 2015-2020 (1-Hour 99th Percentile)

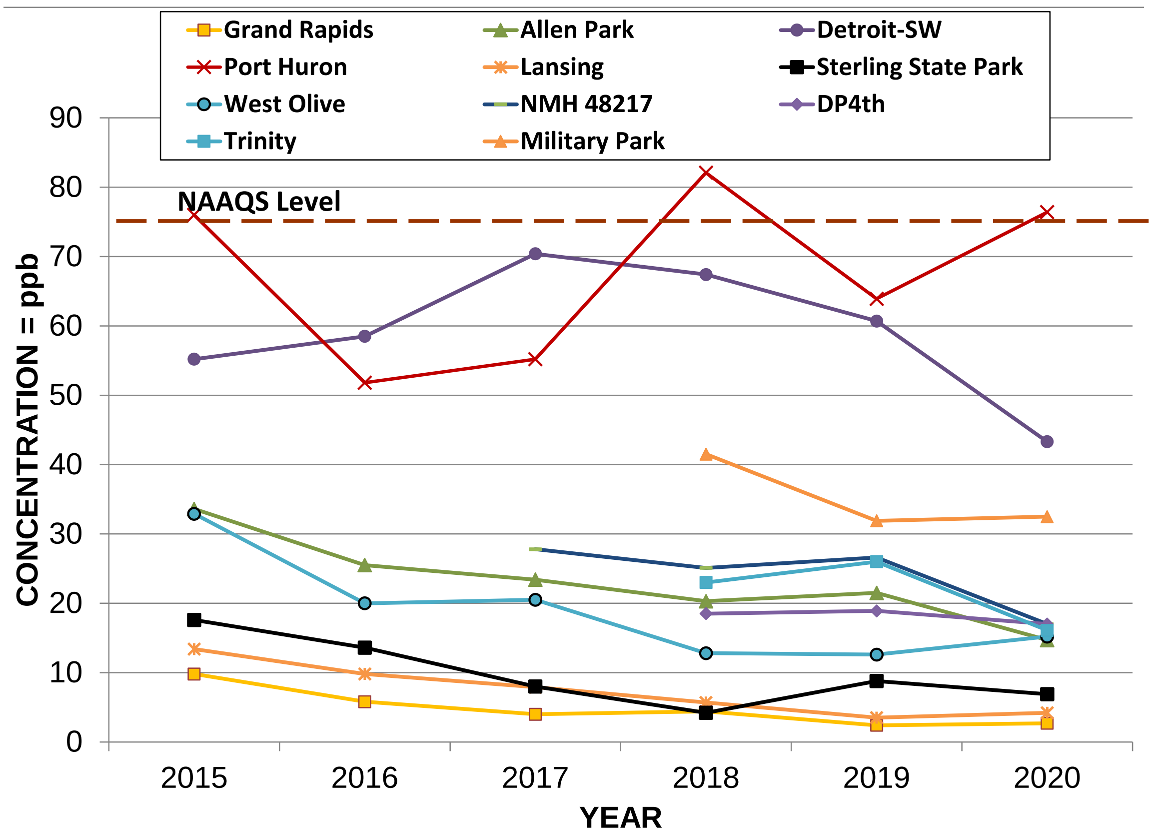
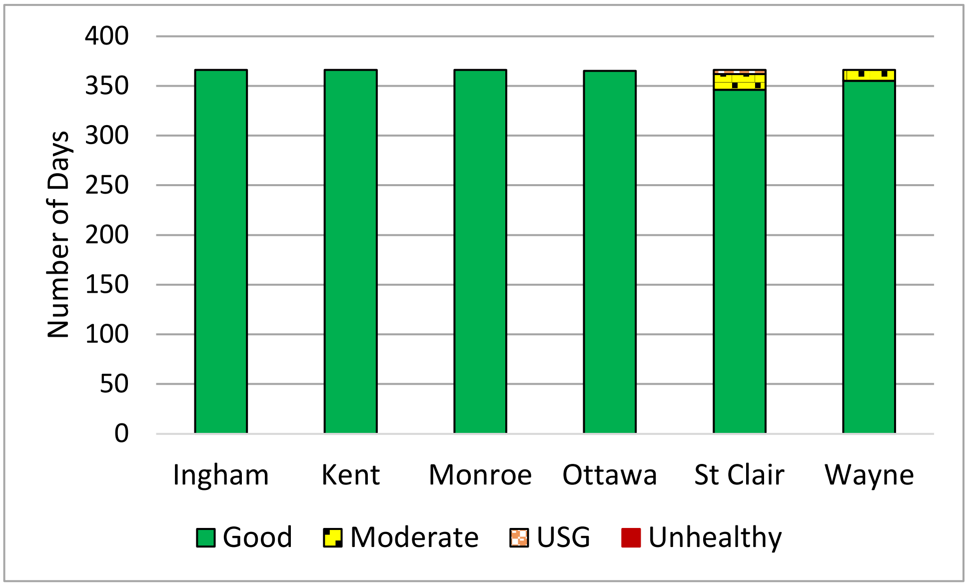
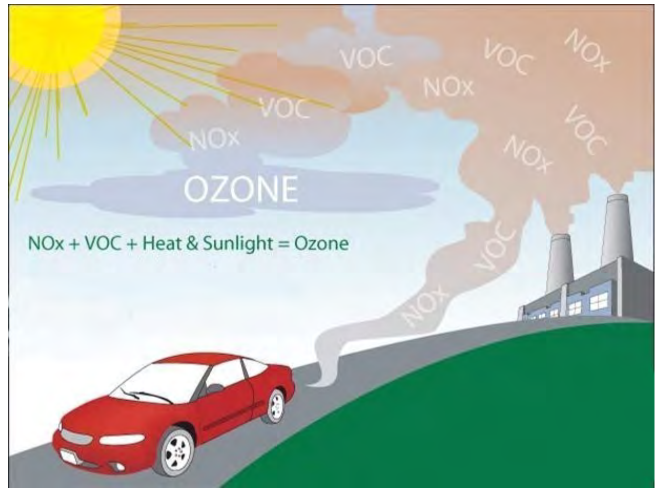


Figure 5.6 shows the AQI values per day in counties where SO_2 is monitored. All days were in the good AQI range except for 27 days in the moderate AQI range in St. Clair and Wayne Counties and four days in the Unsafe for Sensitive Groups (USG) in St. Clair County.

Figure 5.6: 2020 AQI Days for SO_2 in Michigan Counties



CHAPTER 6: OZONE (O_3)



Ground-level O_3 is created by reactions involving nitrogen oxides (NO_X) and volatile organic compounds (VOCs), or hydrocarbons, in the presence of sunlight as the illustration to the right depicts (image courtesy of the USEPA). These reactions usually occur during the hot summer months as ultraviolet radiation from the sun initiates a sequence of photochemical reactions. In Earth's upper atmosphere (the stratosphere), O_3 helps by absorbing much of the sun's ultraviolet radiation, but in the lower atmosphere (the troposphere), ozone is an air pollutant. O_3 is also a key ingredient of urban smog and can be transported hundreds of miles under certain meteorological conditions. Ozone levels are often higher in rural areas than in cities due to transport to regions downwind from the actual emissions of NO_X and VOCs. Shoreline monitors along Lake Michigan often measure high ozone concentrations due to transport from upwind states. The ozone NAAQS was revised by the USEPA and became effective in November 2015. It is a 3-year average of the 4th highest daily maximum 8-hour average concentration that must not exceed 0.070 ppm. The sources and effects of ozone follow.

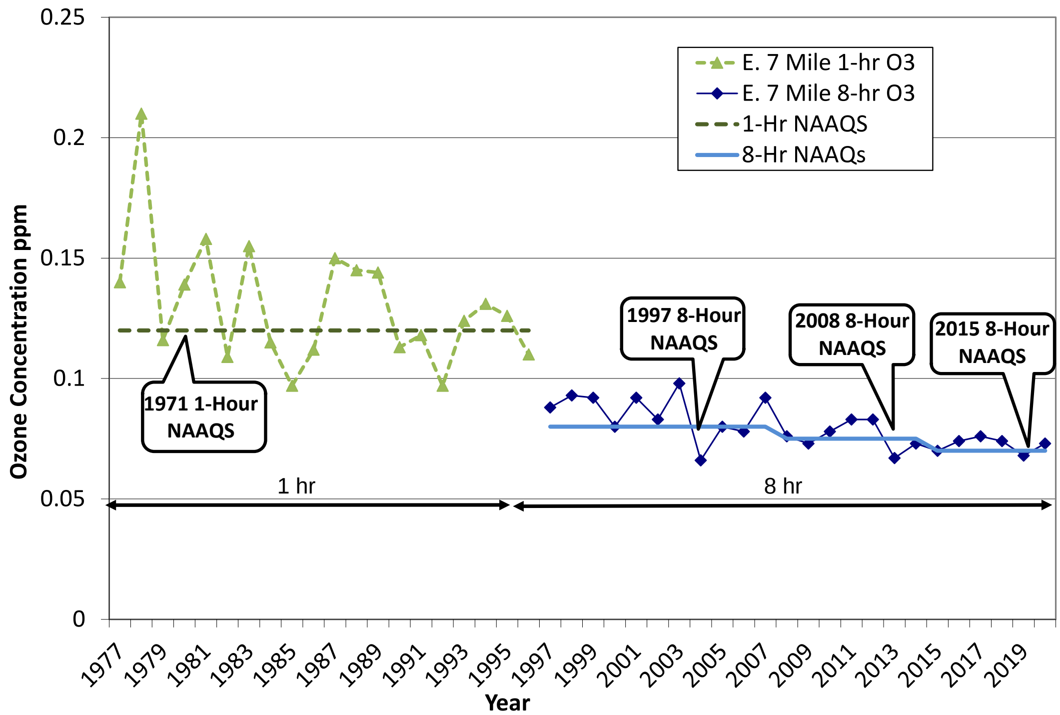
Sources: Major sources of NO_X and VOCs are engine exhaust, emissions from industrial facilities, combustion from power plants, gasoline vapors, chemical solvents, and biogenic emissions from natural sources. Ground-level O_3 can also be transported hundreds of miles under certain wind regimes. As a result, the long-range transport of air pollutants impacts the air quality of regions downwind from the actual area of formation.

Effects: Elevated O_3 exposure can irritate airways, reduce lung function, aggravate asthma and chronic lung diseases like emphysema and bronchitis, and inflame and damage the cells lining the lungs. Other effects include increased respiratory related hospital admissions with symptoms such as chest pain, shortness of breath, throat irritation, and cough. O_3 may also reduce the immune system's ability to fight off bacterial infections in the respiratory system, and long-term, repeated exposure may cause permanent lung damage. O_3 also impacts vegetation and forest ecosystems, including agricultural crop and forest yield reductions, diminished resistance to pests and pathogens, and reduced survivability of tree seedlings.

Population most at risk: Individuals most susceptible to the effects of O_3 exposure include those with a pre-existing or chronic respiratory disease, children who are active outdoors and adults who actively exercise or work outdoors.

Historical Trends: Southeast Michigan has been monitoring for ozone for over 40 years. **Figure 6.1** shows the ozone levels at the Detroit-E 7 Mile Road site. This graph shows how the standard changed from a 1-hour average of 0.120 ppm to an 8-hour average of 0.08 ppm in 1997. The standard was further lowered to 0.075 ppm in 2008 and to 0.070 ppm at the end of 2015. Ozone depends on weather conditions, so ozone concentrations are more variable than other pollutants. Ozone is also monitored primarily in warmer months. In the 2015 NAAQS, the ozone season was extended to by two months to March 1 to October 31.

Figure 6.1: Historical 1-hour and 8-hour Ozone at Detroit-E 7 Mile



Figures 6.2 and **6.3** show VOC emission sources and VOC emissions by county (courtesy of the USEPA's State and County Emission Summaries).

Figure 6.2: VOC Emissions by Source Sector

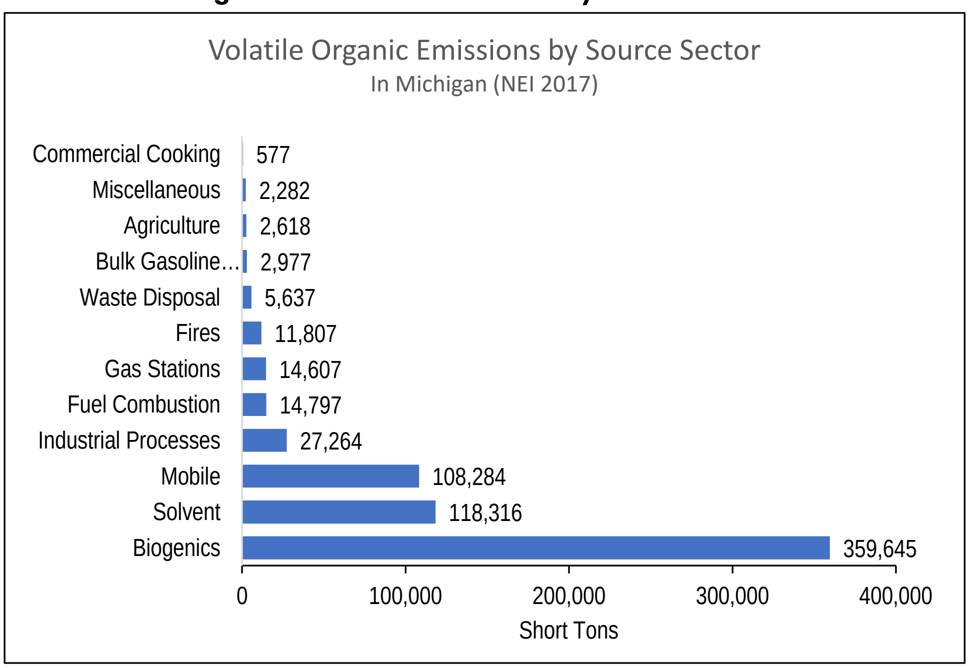


Figure 6.3: VOC Emissions in 2017

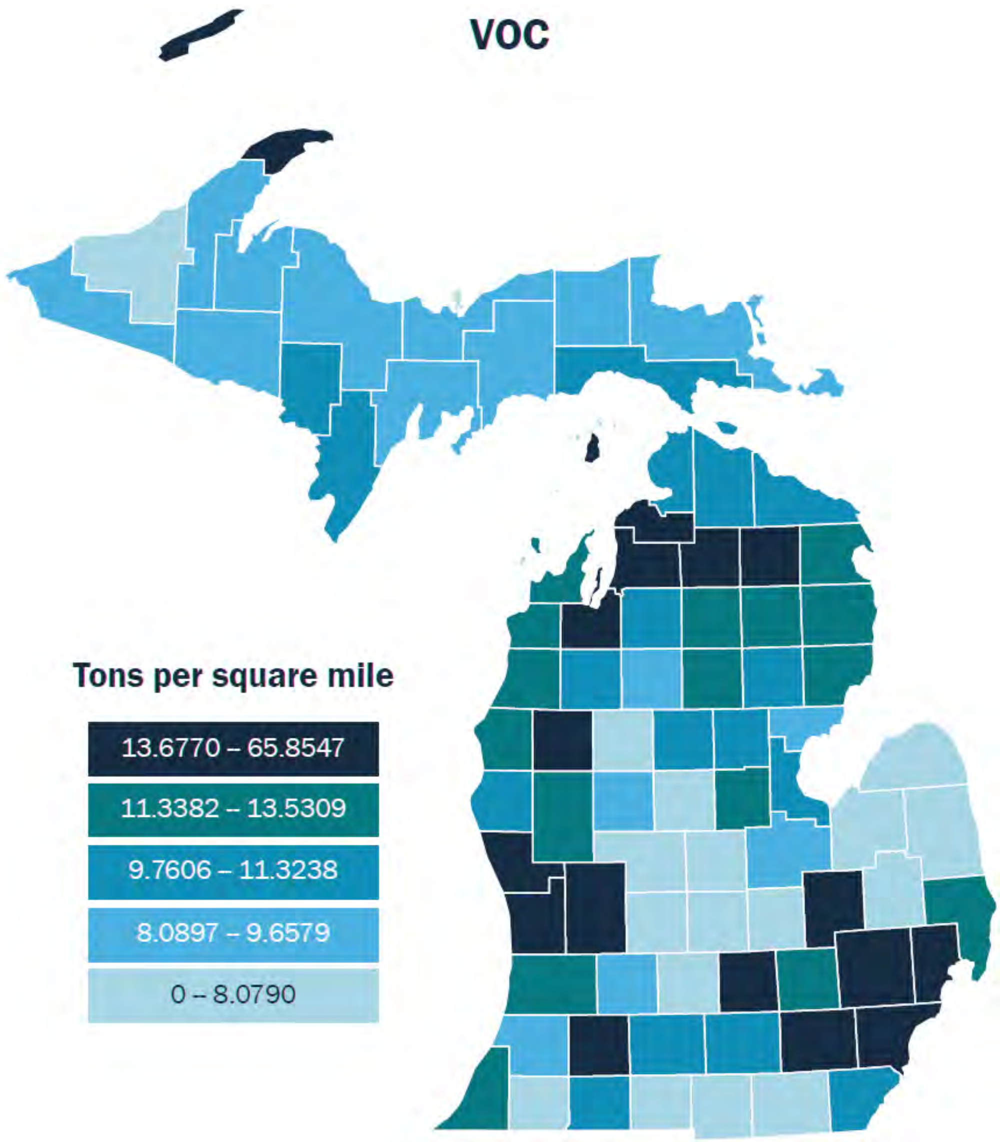


Figure 6.4 shows all O_3 air quality monitors active in Michigan at the beginning of the 2020 ozone season.

- Background site monitors: Houghton Lake, Scottville, Seney.
- Transport site monitors: Frankfort, Coloma, Harbor Beach, Holland, Muskegon, Tecumseh.
- Tribal site: Manistee
- Population-oriented monitors: All other sites.

Figure 6.4: Ozone Monitors in 2020

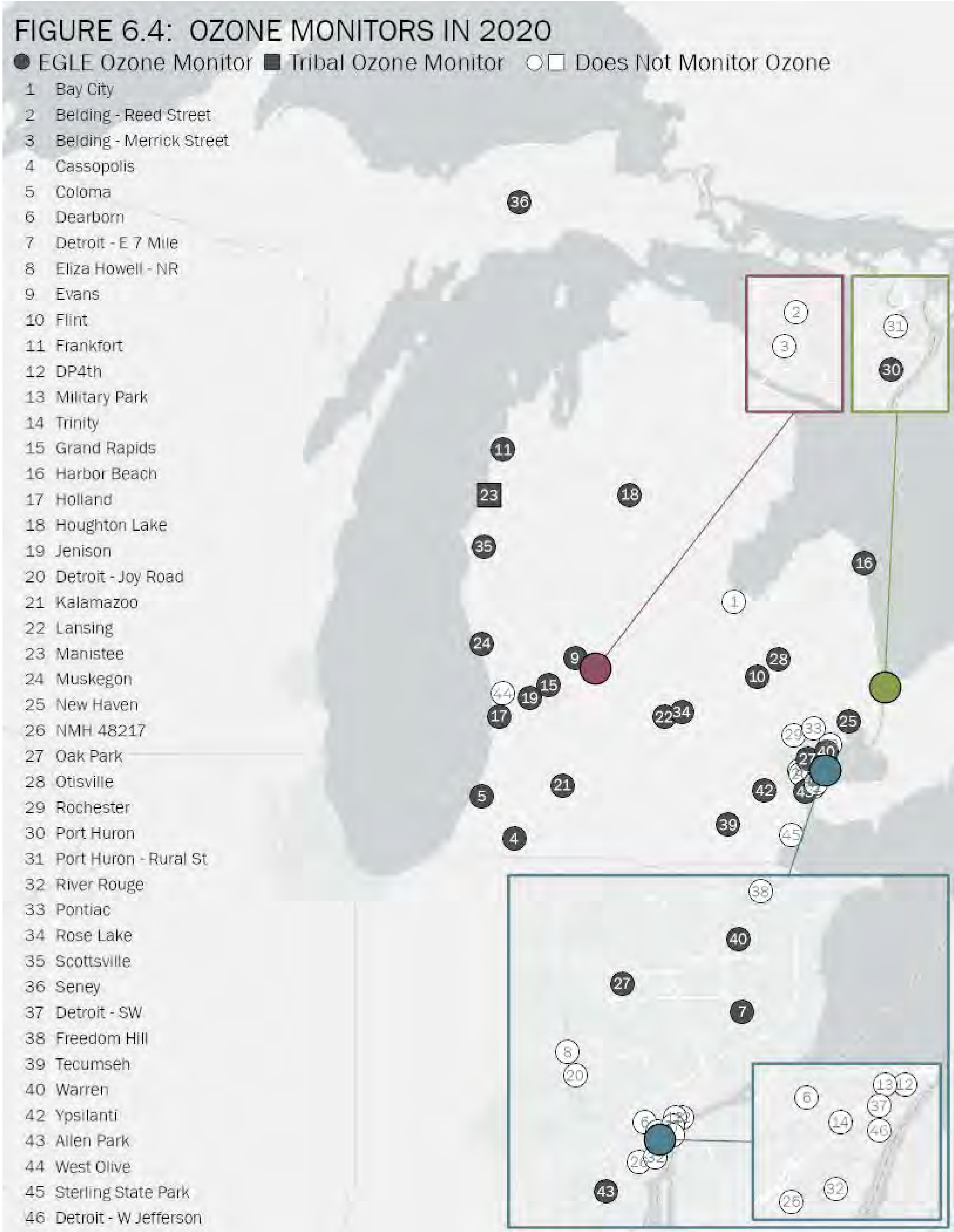


Table 6.1 shows the three-year averages of ozone. The USEPA uses these values (called design values) to determine attainment/nonattainment areas. The USEPA made their final designations for the 2015 standard on April 30, 2018 (effective August 3, 2018) based on 2014-2016 data. Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne Counties were designated nonattainment in Southeast Michigan; and all of Berrien County, and portions of Allegan and Muskegon Counties were designated nonattainment in Western Michigan. In 2019 Berrien County was below the standard and a redesignation request was submitted to the USEPA in January 2020. Berrien County experienced elevated ozone in 2020. The USEPA has not yet acted on the submitted redesignation request.

The O_3 monitoring season in Michigan is from March 1 through October 31. During this time O_3 monitoring data is available for the public via the AQD's website (discussed in **Chapter 1**). However, year-round O_3 monitoring is conducted at the following four sites: Allen Park, Grand Rapids, Houghton Lake, and Lansing. This data helps in attainment designations, urban air quality and population exposure assessments.

Table 6.1: 3-Year Average of the 4th Highest 8-hour Ozone Values from 2016-2018, 2017-2019, and 2018-2020 (concentrations in ppm)

Areas	County	Monitor Sites	2016-2018	2017-2019	2018-2020
Detroit-Ann Arbor	Lenawee	Tecumseh	0.068	0.065	0.065
Detroit-Ann Arbor	Macomb	New Haven	**0.072**	0.068	**0.071**
Detroit-Ann Arbor	Macomb	Warren	0.069	0.066	0.068
Detroit-Ann Arbor	Oakland	Oak Park	**0.073**	0.070	**0.072**
Detroit-Ann Arbor	St. Clair	Port Huron	**0.072**	**0.071**	**0.071**
Detroit-Ann Arbor	Washtenaw	Ypsilanti	0.069	0.066	0.067
Detroit-Ann Arbor	Wayne	Allen Park	0.068	0.066	0.067
Detroit-Ann Arbor	Wayne	Detroit-E 7 Mile	**0.074**	**0.072**	**0.071**
Flint	Genesee	Flint	0.068	0.064	0.065
Flint	Genesee	Otisville	0.068	0.063	0.065
Grand Rapids	Ottawa	Jenison	0.070	0.067	**0.071**
Grand Rapids	Kent	Grand Rapids	0.070	0.066	**0.071**
Grand Rapids	Kent	Evans	0.068	0.064	0.065
Muskegon Co	Muskegon	Muskegon	**0.076**	**0.074**	**0.076**
Allegan Co	Allegan	Holland	**0.073**	**0.072**	**0.073**
Huron	Huron	Harbor Beach	0.068	0.064	0.068
Kalamazoo-Battle Creek	Kalamazoo	Kalamazoo	**0.071**	0.066	0.068
Lansing-East Lansing	Ingham	Lansing	0.068*	0.063	0.062
Lansing-East Lansing	Clinton	Rose Lake	0.069*	0.062	0.063
Benton Harbor	Berrien	Coloma	**0.073**	0.069	**0.072**
Benzie Co	Benzie	Frankfort	0.068	0.063	0.064
Cass Co	Cass	Cassopolis	**0.074**	0.070	**0.071**
Mason Co	Mason	Scottville	0.068	0.063	0.064
Missaukee Co	Missaukee	Houghton Lake	0.067	0.062	0.064
Manistee Co	Manistee	Manistee	0.066	0.064	0.059
Schoolcraft Co	Schoolcraft	Seney	0.064	0.059	0.063

Numbers in bold indicate 3-year averages over the 2015 ozone standard of 0.070 ppm.
*The three-year average is using data averaged from sites that were moved.

Tables 6.2 and 6.3 highlight the number of days when two or more O_3 monitors exceeded 0.070 ppm. It also specifies in which month they occurred and the temperature range.

Table 6.2: 2020 West Michigan Ozone Season

Daily High Temperature Range	Mar Days	Mar O_3 Days	Apr Days	Apr O_3 Days	May Days	May O_3 Days	Jun Days	Jun O_3 Days	Jul Days	Jul O_3 Days	Aug Days	Aug O_3 Days	Sep Days	Sep O_3 Days	Oct Days	Oct O_3 Days
≥ 95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90 ≤94	0	0	0	0	1	0	3	2	10	1	3	1	0	0	0	0
85 ≤ 89	0	0	0	0	2	0	10	4	5	1	11	0	1	0	0	0
80 ≤ 84	0	0	0	0	1	0	7	0	16	0	8	0	3	0	0	0
75 ≤ 79	0	0	1	0	2	0	5	0	0	0	8	0	9	0	1	0
70 ≤ 74	0	0	1	0	6	0	4	0	0	0	1	0	5	0	2	0
65 ≤ 69	0	0	2	0	5	0	1	0	0	0	0	0	4	0	8	0
60 ≤ 64	3	0	6	0	6	0	0	0	0	0	0	0	8	0	1	0
55 ≤ 59	3	0	5	0	4	0	0	0	0	0	0	0	0	0	5	0
50 ≤ 54	5	0	5	0	2	0	0	0	0	0	0	0	0	0	8	0
49 ≤	20	0	10	0	2	0	0	0	0	0	0	0	0	0	6	0
Totals	**31**	**0**	**30**	**0**	**31**	**0**	**30**	**6**	**31**	**2**	**31**	**1**	**30**	**0**	**31**	**0**

Days: Number of days during month when the daily high temperature falls within the specified temperature range.
O_3 Days: Number of days, during specified temperature range, when two or more area monitors exceeded 70 ppb.

West Michigan had six O_3 exceedance days in June; two in July and one in August when ozone exceeded 0.070 ppm at two or more ozone monitors. The temperatures on those days ranged between 85°F and 94°F.

Table 6.3: 2020 Southeast Michigan Ozone Season

Daily High Temperature Range	Mar Days	Mar O_3 Days	Apr Days	Apr O_3 Days	May Days	May O_3 Days	Jun Days	Jun O_3 Days	Jul Days	Jul O_3 Days	Aug Days	Aug O_3 Days	Sep Days	Sep O_3 Days	Oct Days	Oct O_3 Days
≥ 95	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
0 ≤94	0	0	0	0	0	0	3	2	9	2	4	0	0	0	0	0
85 ≤ 89	0	0	0	0	3	0	9	2	13	0	10	0	1	0	0	0
80 ≤ 84	0	0	0	0	2	0	10	1	7	0	8	0	6	0	0	0
75 ≤ 79	0	0	0	0	1	0	4	0	1	0	9	0	7	0	3	0
70 ≤ 74	0	0	2	0	5	0	3	0	0	0	0	0	5	0	4	0
65 ≤ 69	1	0	3	0	8	0	1	0	0	0	0	0	7	0	4	0
60 ≤ 64	4	0	6	0	6	0	0	0	0	0	0	0	4	0	4	0
55 ≤ 59	1	0	8	0	2	0	0	0	0	0	0	0	0	0	7	0
50 ≤ 54	7	0	3	0	2	0	0	0	0	0	0	0	0	0	4	0
49 ≤	18	0	8	0	2	0	0	0	0	0	0	0	0	0	5	0
Totals	**31**	**0**	**30**	**0**	**31**	**0**	**30**	**5**	**31**	**3**	**31**	**0**	**30**	**0**	**31**	**0**

Days: Number of days during month when the daily high temperature falls within the specified temperature range.
O_3 Days: Number of days, during specified temperature range, when two or more area monitors exceeded 70 ppb.

Southeast Michigan had five O_3 exceedance days in June, and three in July when ozone exceeded 0.070 ppm at two or more ozone monitors. The temperature for those days ranged between 80°F and 95°F.

Table 6.4 gives a breakdown of the O_3 days and the specific monitors that went over the standard in western, central/upper, and eastern Michigan in 2020.

Table 6.4: 8-Hour Exceedance Days (>0.070 ppm) and Locations Monitors with Exceedances of the Ozone Standard

Date	Western Michigan	Central/Upper Mich.	Eastern Michigan	Total
5/26/2020			Harbor Beach	1
6/2/2020	Coloma, Evans, Grand Rapids, Holland, Jenison, Kalamazoo, Muskegon			7
6/4/2020			New Haven	1
6/5/2020	Cassopolis, Coloma		New Haven	3
6/9/2020		Houghton Lake	Flint, New Haven, Oak Park, Tecumseh, Ypsilanti	6
6/17/2020	Coloma, Cassopolis, Grand Rapids, Jenison, Kalamazoo	Seney	New Haven, Ypsilanti	8
6/18/2020	Frankfort, Cassopolis, Coloma, Grand Rapids, Holland, Jenison, Kalamazoo, Muskegon, Scottville	Seney	Harbor Beach, New Haven	12
6/19/2020	Frankfort, Cassopolis, Coloma, Evans, Grand Rapids, Holland, Jenison, Kalamazoo, Muskegon, Scottville	Seney	Harbor Beach, Oak Park	13
6/20/2020	Coloma, Grand Rapids, Holland, Jenison, Muskegon		Detroit-E 7 Mile, Harbor Beach, New Haven, Oak Park, Port Huron, Warren, Ypsilanti	12
7/2/2020			Detroit-E 7 Mile	1
7/6/2020			Detroit-E 7 Mile, Harbor Beach, New Haven, Oak Park, Warren	5
7/7/2020	Cassopolis, Kalamazoo		Allen Park, Detroit-E 7 Mile, New Haven, Oak Park, Tecumseh, Ypsilanti	8
7/9/2020			Allen Park, Harbor Beach, New Haven, Oak Park, Ypsilanti	5
7/15/2020			Harbor Beach	1
7/17/2020			New Haven	1
7/25/2020	Coloma, Holland			2
8/21/2020			New Haven	1
8/22/2020			New Haven	1
8/24/2020	Muskegon			1
8/26/2020	Grand Rapids, Holland, Jenison, Muskegon			4
			TOTAL	**93**

On July 19, 2020, there were 13 monitors and on June 18 and June 20, 2020, there were 12 monitor readings that exceeded the level of the standard. The site with the most exceedances in the western region of Michigan was Coloma with seven. The central/upper Michigan sites had Seney with 3 exceedances. New Haven had 12 exceedances each in eastern Michigan.

Figure 6.5 shows the 4th highest 8-hour O_3 values for Southeast Michigan monitoring sites from 2015-2020. Detroit-E 7 Mile, New Haven, Oak Park, and Port Huron site violated the 3-year standard.

Figure 6.6 shows the 4th highest 8-hour O_3 values for Grand Rapids-Muskegon-Holland CSA. Muskegon. Holland, Grand Rapids, and Jenison violated the 3-year standard.

Figure 6.7 shows 4th highest 8-hour O_3 values for mid-Michigan. Cassopolis and Coloma violated the 3-year standard.

Figure 6.8 shows 4th highest 8-hour O_3 values for Northern Lower and Upper Peninsulas. No sites violated the 3-year standard.

Figure 6.5: O_3 Levels in Detroit-Warren-Flint CSA from 2015-2020 - (4th Highest 8-Hour O_3 Values).

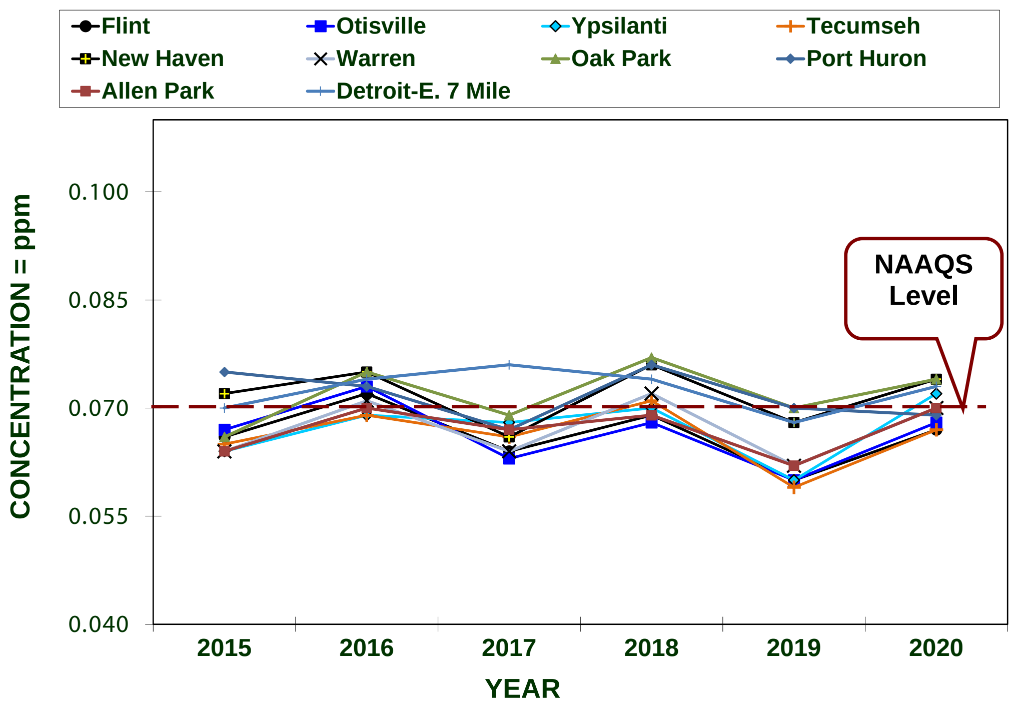


Figure 6.6: O_3 Levels in the Grand Rapids-Muskegon-Holland CSA from 2015-2020 (4th Highest 8-Hour O_3 Values)

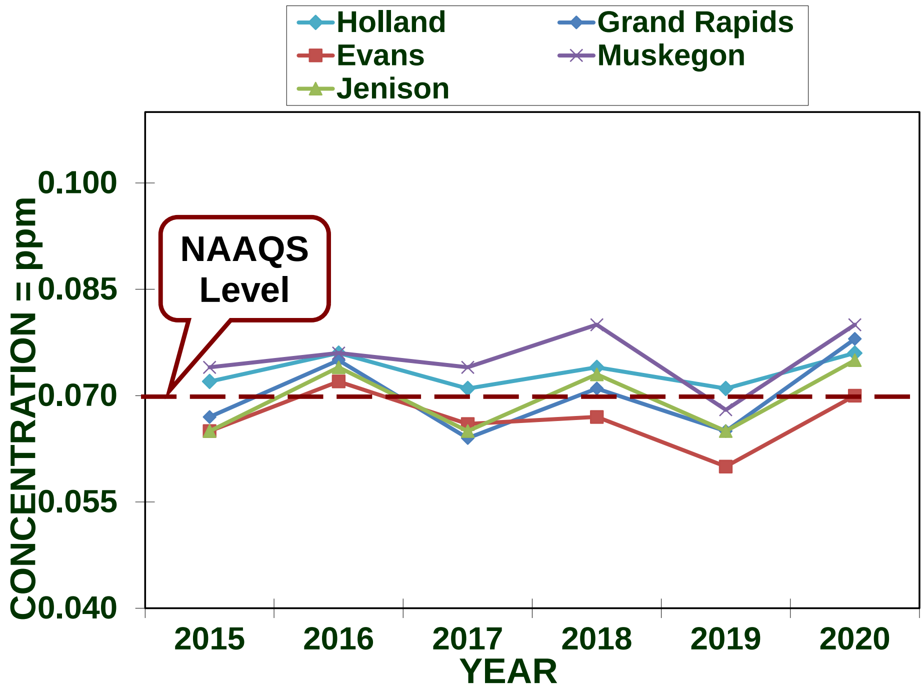


Figure 6.7: O_3 Levels in the Kalamazoo-Portage MSA, Lansing-E. Lansing-Owosso CSA, Niles-Benton Harbor MSA, & South Bend-Mishawaka (IN-MI) MSAs from 2015-2020 (4th Highest 8-Hour O_3 Values)

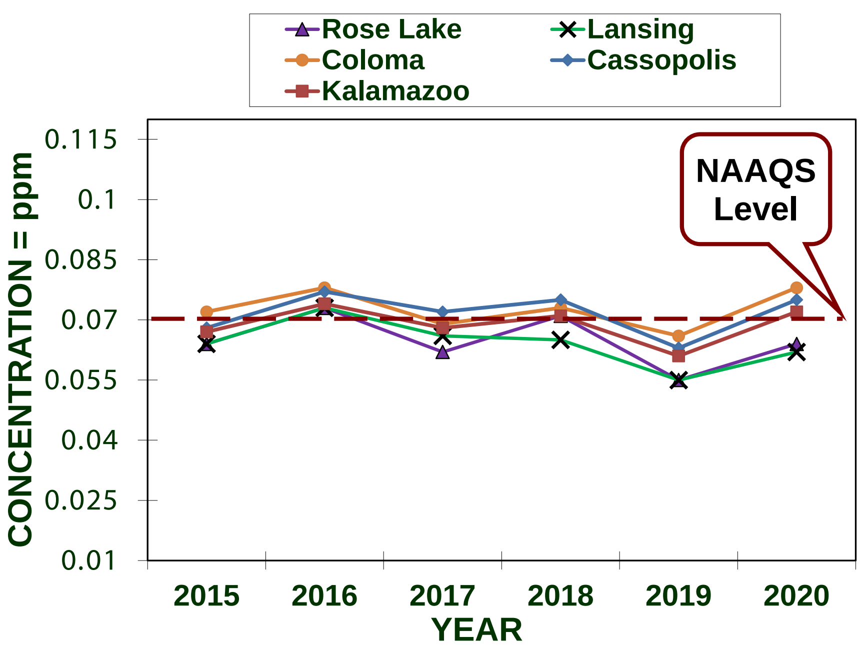


Figure 6.8: O_3 Levels in MI's Northern Lower and Upper Peninsula Areas from 2015-2020 (4th Highest 8-Hour O_3 Values)

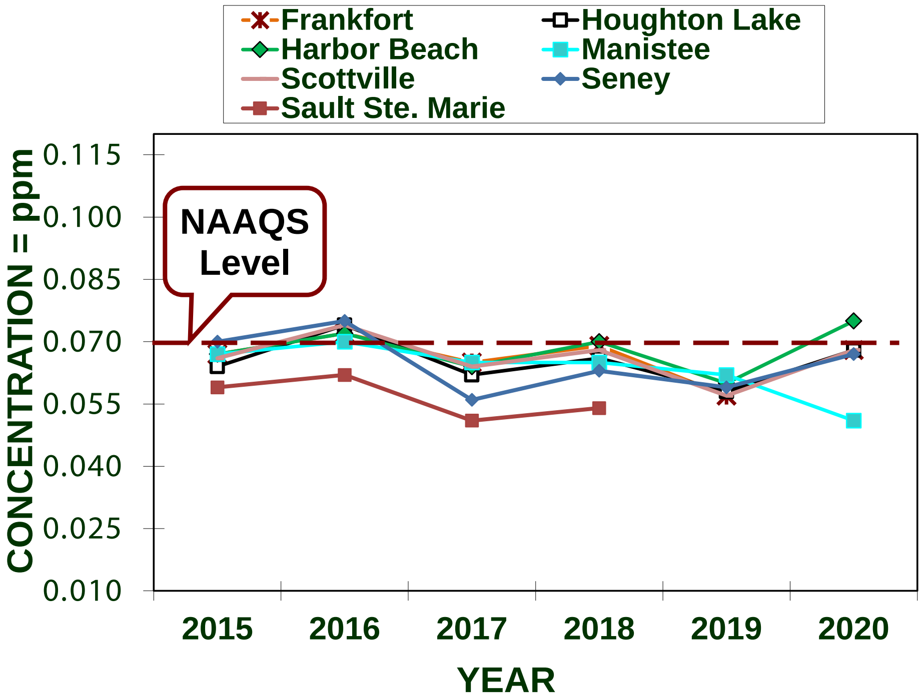
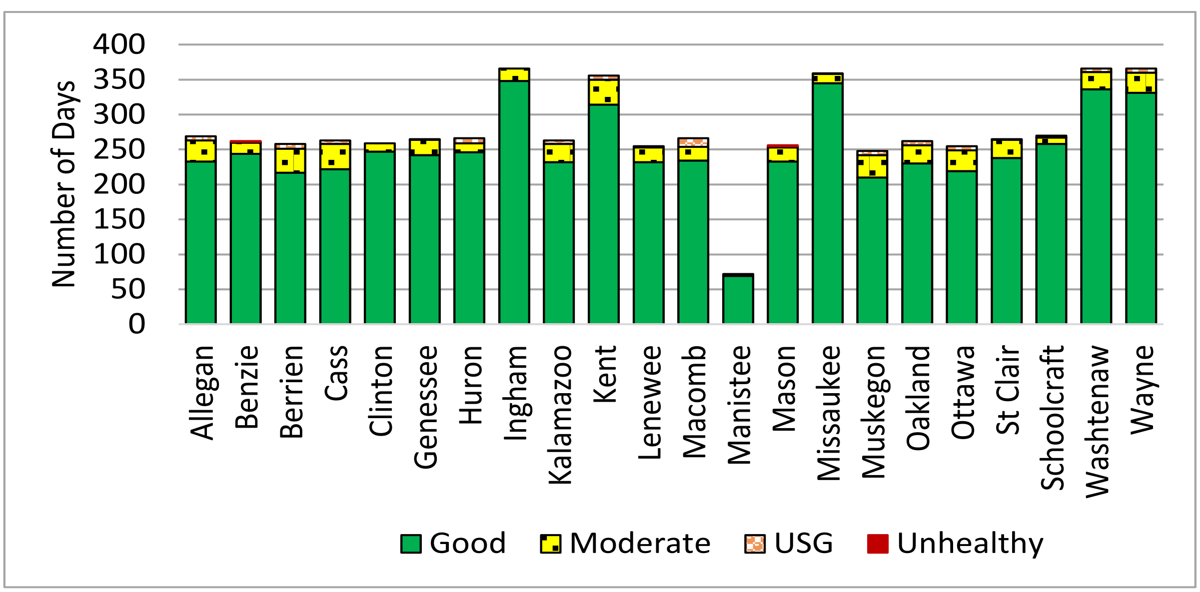


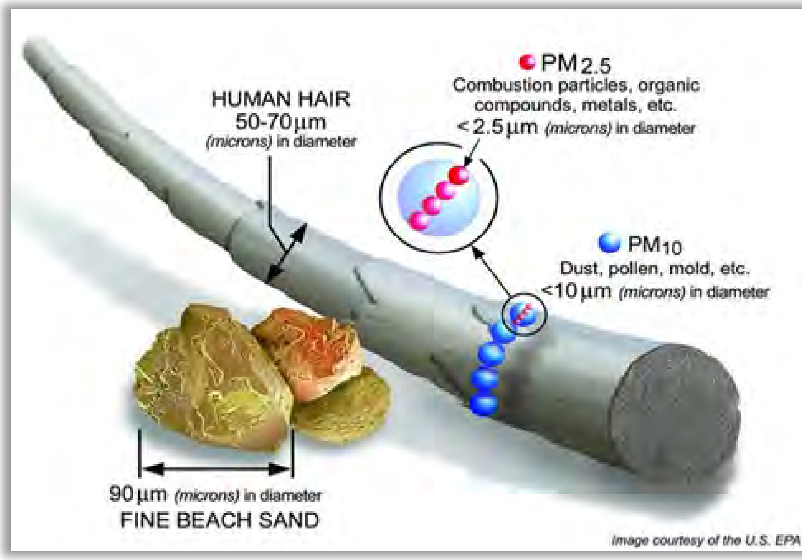
Figure 6.9 shows the AQI values per day in counties where ozone is monitored. Most days were in the good to moderate AQI range. Most counties had a few days in the USG range, Macomb County having the most USG days with 12 days. Two counties had one day each in the unhealthy AQI range: Benzie and Mason Counties.

Figure 6.9: 2020 AQI Days for Ozone in Michigan Counties



CHAPTER 7: PARTICULATE MATTER (PM_{10}, $PM_{10-2.5}$, $PM_{2.5}$, $PM_{2.5}$ CHEMICAL SPECIATION AND TSP)

Particulate matter (PM) is a general term used for a mixture of solid particles and liquid droplets (aerosols) found in the air. These are further categorized according to size; larger particles with diameters of less than 50 micrometers (µm) are classified as total suspended particulates (TSP). PM_{10} consists of "coarse particles" less than 10 µm in diameter (about one-seventh the diameter of a human hair) and $PM_{2.5}$ are much smaller "fine particles" equal to or less than 2.5 µm in diameter. PM_{10} has a 24-hour average standard of 150 µg/m^3 not to be exceeded more than once per year over 3 years. $PM_{2.5}$ has an annual average standard of 12 µg/m^3, and a 98th percentile 24-hour concentration of 35 µg/m^3 averaged over 3 years. The sources and effects of PM are as follows:



Sources: PM can be emitted directly (primary) or may form in the atmosphere (secondary). Most man-made particulate emissions are classified as TSP. PM_{10} consists of primary particles that can originate from power plants, various manufacturing processes, wood stoves and fireplaces, agriculture and forestry practices, fugitive dust sources (road dust and windblown soil), and forest fires. $PM_{2.5}$ can come directly from primary particle emissions or through secondary reactions that include VOCs, SO_2, and NO_X emissions originating from power plants, motor vehicles (especially diesel trucks and buses), industrial facilities, and other types of combustion sources.

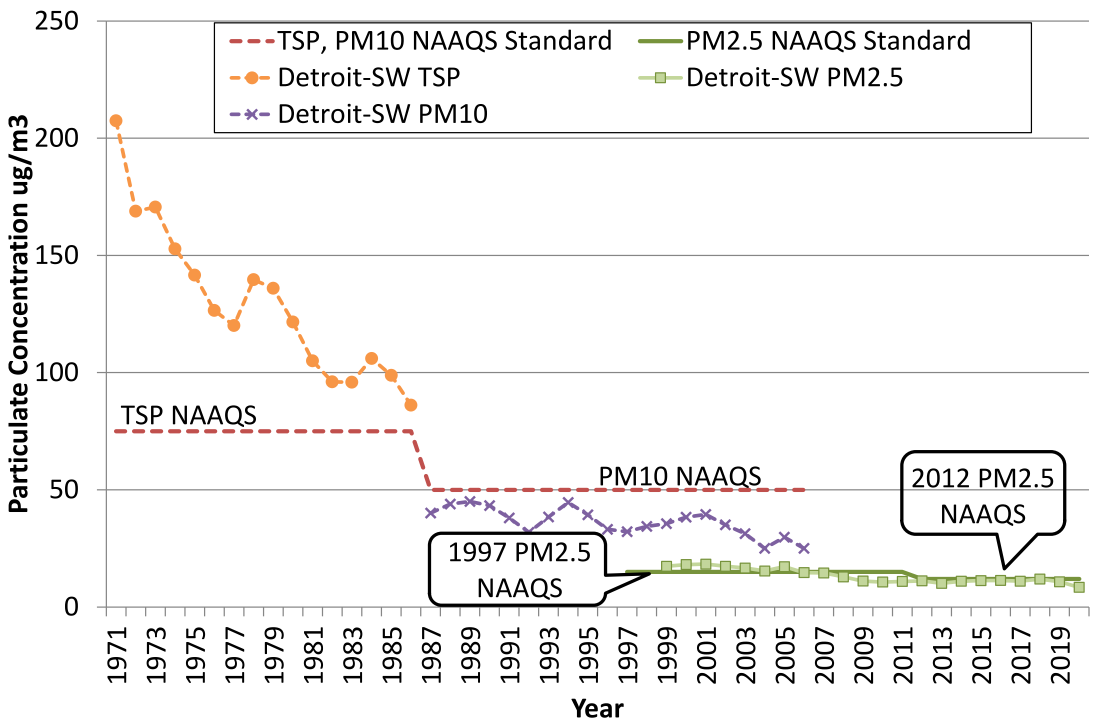
Effects: Exposure to PM can aggravate existing cardiovascular ailments and even cause death in susceptible populations. PM may affect breathing and the cellular defenses of the lungs and has been linked with heart and lung disease. Smaller particles (PM_{10} or smaller) pose the greatest problems, because they can penetrate deep in the lungs and possibly into the bloodstream. PM is the major cause of reduced visibility in many parts of the United States. $PM_{2.5}$ is considered a primary visibility-reducing component of urban and regional haze. Airborne particles impact vegetation ecosystems and damage paints, building materials and surfaces. Deposition of acid aerosols and salts increases corrosion of metals and impacts plant tissue.

Population most at risk: People with heart or lung disease, the elderly, and children are at highest risk from exposure to PM.

Historical Trends: Southeast Michigan has been monitoring for particulate for over 40 years. **Figure 7.1** shows the trends for particulate matter. In 1971, the USEPA promulgated an annual and 24-hour particulate standard based on total suspended particulates (TSP). In 1987, the USEPA changed the standard to PM_{10}. Health studies indicated that particles smaller than 10 microns affect respiration. In 1997, the USEPA added additional NAAQS for a smaller particle fraction size, $PM_{2.5}$, which can get deeper into the lungs and possibly into the blood stream. In 2006, the USEPA revoked the PM_{10} annual standard but kept the PM_{10} 24-hour standard. The $PM_{2.5}$ 24-hour standard was also reduced from 65 µg/m^3 to 35 µg/m^3. In 2012, the USEPA reduced the annual standard from 15 µg/m^3 to 12 µg/m^3.

Particulate trends show that particulate concentrations have decreased, and the state is in compliance for all particulate NAAQS; however, Michigan has had past nonattainment issues in Southeast Michigan for TSP, PM_{10} and $PM_{2.5}$.

Figure 7.1: Historical Annual Particulate Matter at Detroit-SW



PM$_{10}$

Figures 7.2 and **7.3** show PM$_{10}$ emission sources and PM$_{10}$ emissions by county (courtesy of the USEPA's State and County Emission Summaries).

Figure 7.2: PM$_{10}$ Emissions by Source Sector

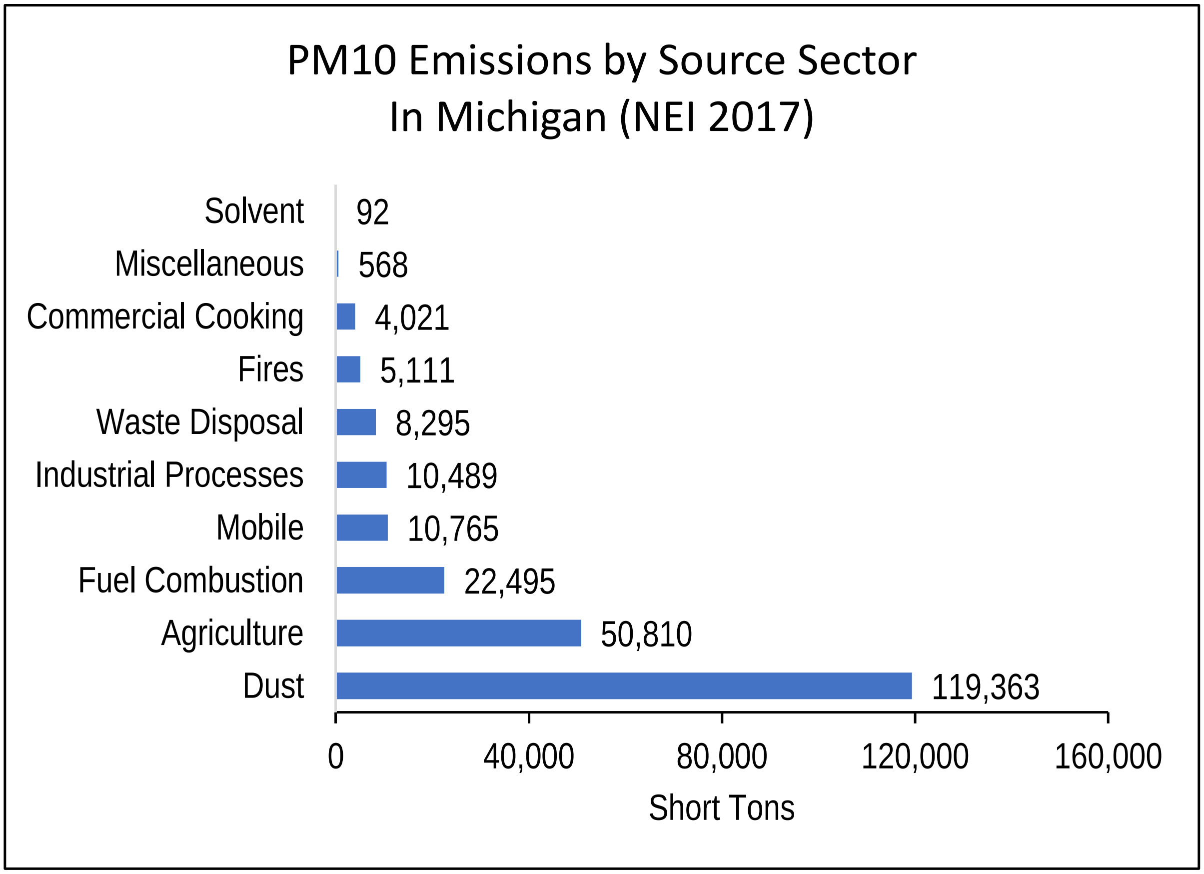
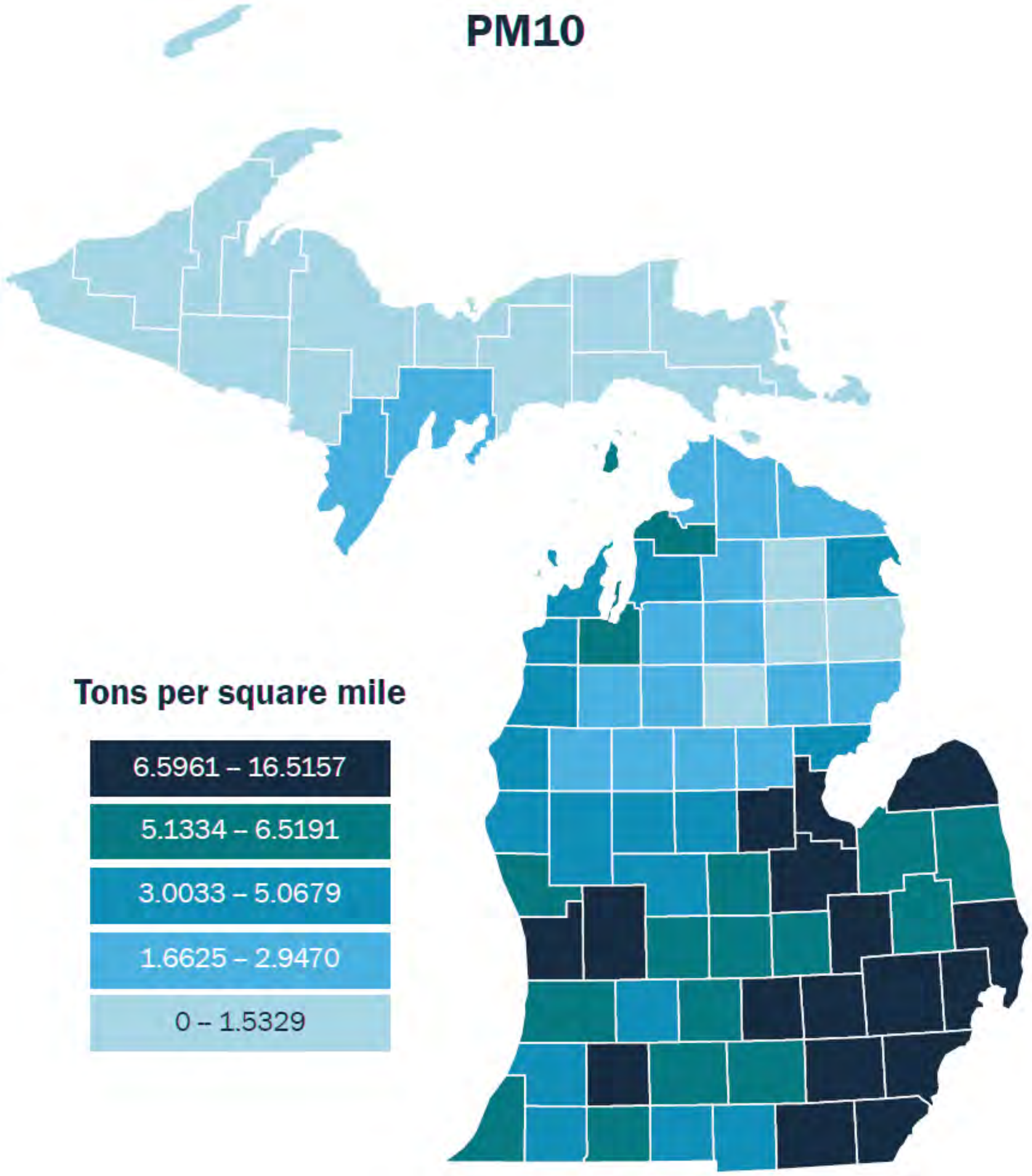


Figure 7.3: PM_{10} Emissions in 2017



Since October 1996, all areas in Michigan have been in attainment with the PM_{10} NAAQS. Due to the recent focus upon $PM_{2.5}$ and because of the relatively low concentrations of PM_{10} measured in recent years, Michigan's PM_{10} network has been reduced to a minimum level. Table 1.2 identifies the locations of PM_{10} monitoring stations that were operating in Michigan during 2020. These monitors are located mostly in the state's largest populated urban areas: three in the Detroit area and two in Grand Rapids. In late fall of 2020, Grand Rapids, Jenison, and Allen Park PM_{10} continuous monitors (T640X), which also collect $PM_{2.5}$ data, were installed. However, filter-based instruments were shut down on January 1, 2021, so the continuous instruments will not be reported in the 2020 report.

Figure 7.4 shows the location of each PM_{10} monitor. All PM_{10} monitors are population-oriented monitors. A second PM_{10} monitor was added to the Grand Rapids area in Jenison (**Figure 7.5**) based on the USEPA's population requirements.

Figure 7.4: PM$_{10}$ Monitors in 2020

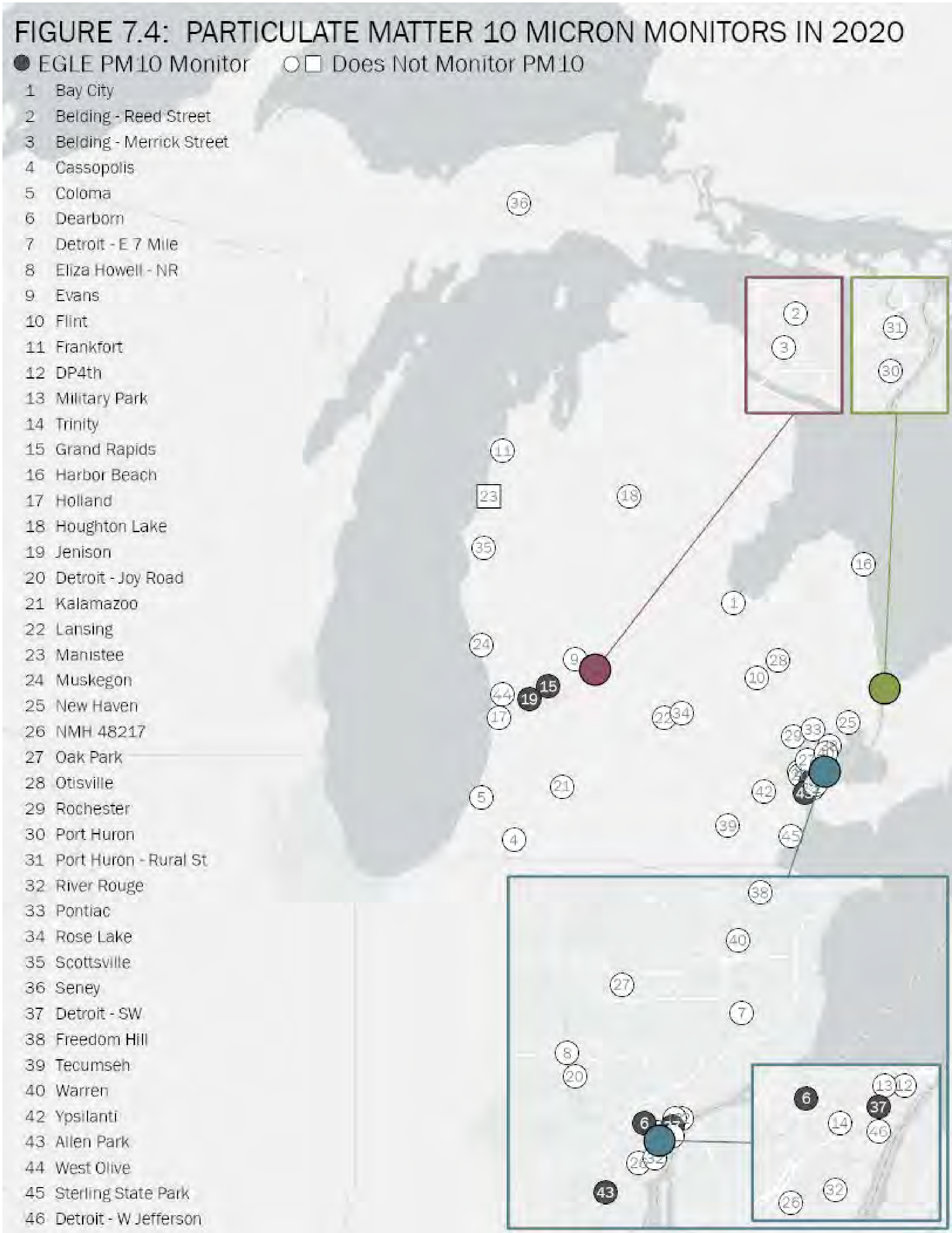


Figure 7.5 shows the PM_{10} levels in Michigan compared to the 24-hour average NAAQS of 150 μg/m^3. This standard must not be exceeded on average more than once per year over a 3-year period. The design value is the 4th highest value over a 3-year period. The PM_{10} levels at all sites in Michigan are well below the national standard.

Figure 7.5: 24-Hour PM_{10} Design Value

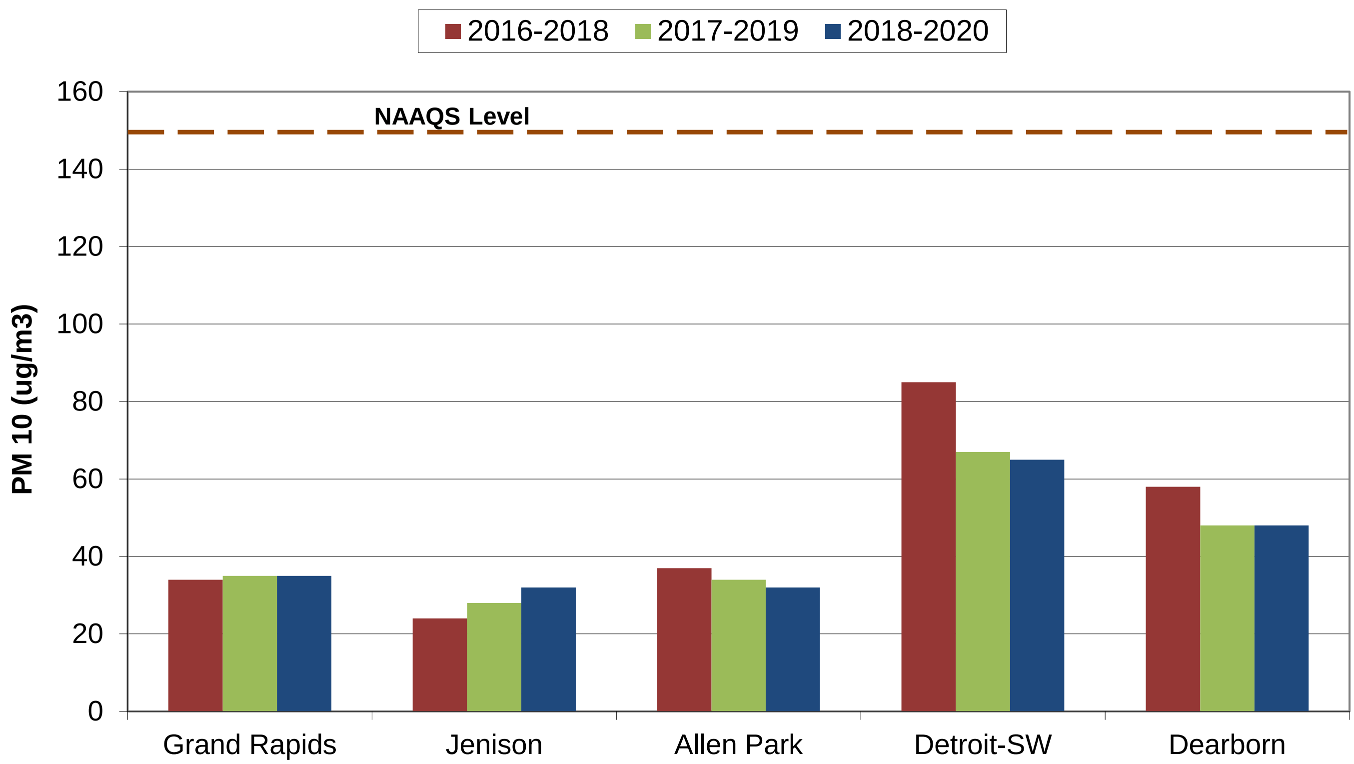
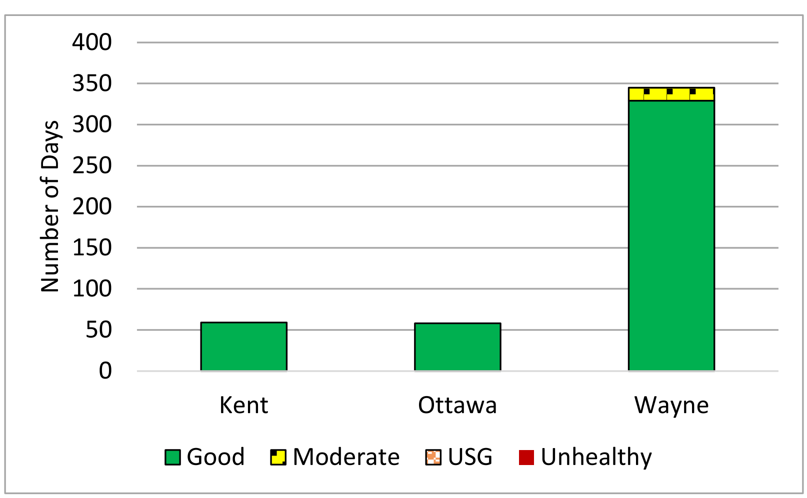


Figure 7.6 shows the AQI values per day in counties where PM_{10} is monitored. All days were in the good AQI range except for 16 days in the moderate AQI range in Wayne County.

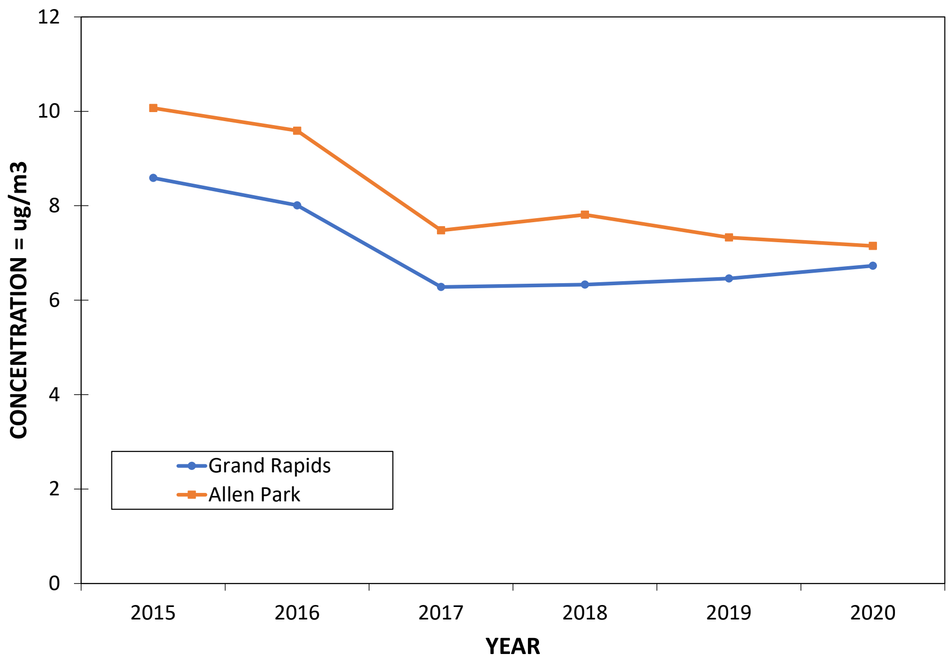
Figure 7.6: 2020 AQI Days for PM_{10} in Michigan Counties



$PM_{10-2.5}$

The 2006 amended air monitoring regulations specified that measurements of PM course ($PM_{10-2.5}$) needed to be added to the NCore sites.[7] EGLE began PM course monitoring at Allen Park and Grand Rapids in 2010. **Figure 7.7** shows the $PM_{10-2.5}$ levels in Michigan.

Figure 7.7: PM Coarse Levels in Michigan from 2015-2020 (Annual Arithmetic Mean)



$PM_{2.5}$

In December 2012, the USEPA revised the annual primary standard to 12 $\mu g/m^3$ while the annual secondary standard remained at 15 $\mu g/m^3$. The primary and secondary 24-hour standard remained at 35 $\mu g/m^3$. In December 2014, the USEPA determined that no area in Michigan violated the 2012 standard and the state was classified as unclassifiable/attainment.

Figures 7.8 and **7.9** show $PM_{2.5}$ emission sources and $PM_{2.5}$ emissions by county (from the USEPA's State and County Emission Summaries).

[7] Current information can be found at www3.epa.gov/ttn/amtic/ncoreguidance.html.

Figure 7.8: $PM_{2.5}$ Emissions by Source Sector

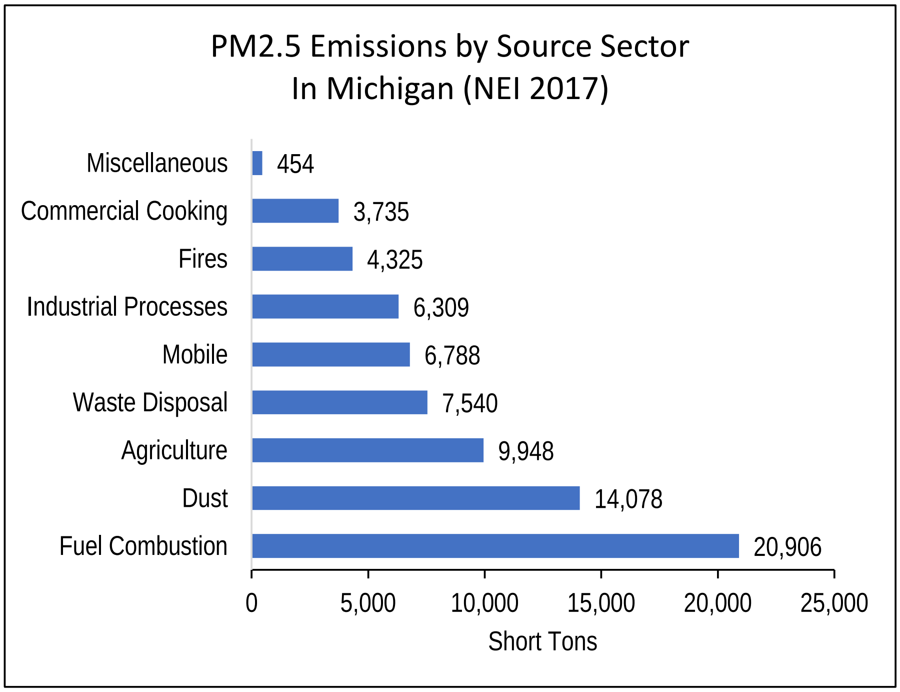
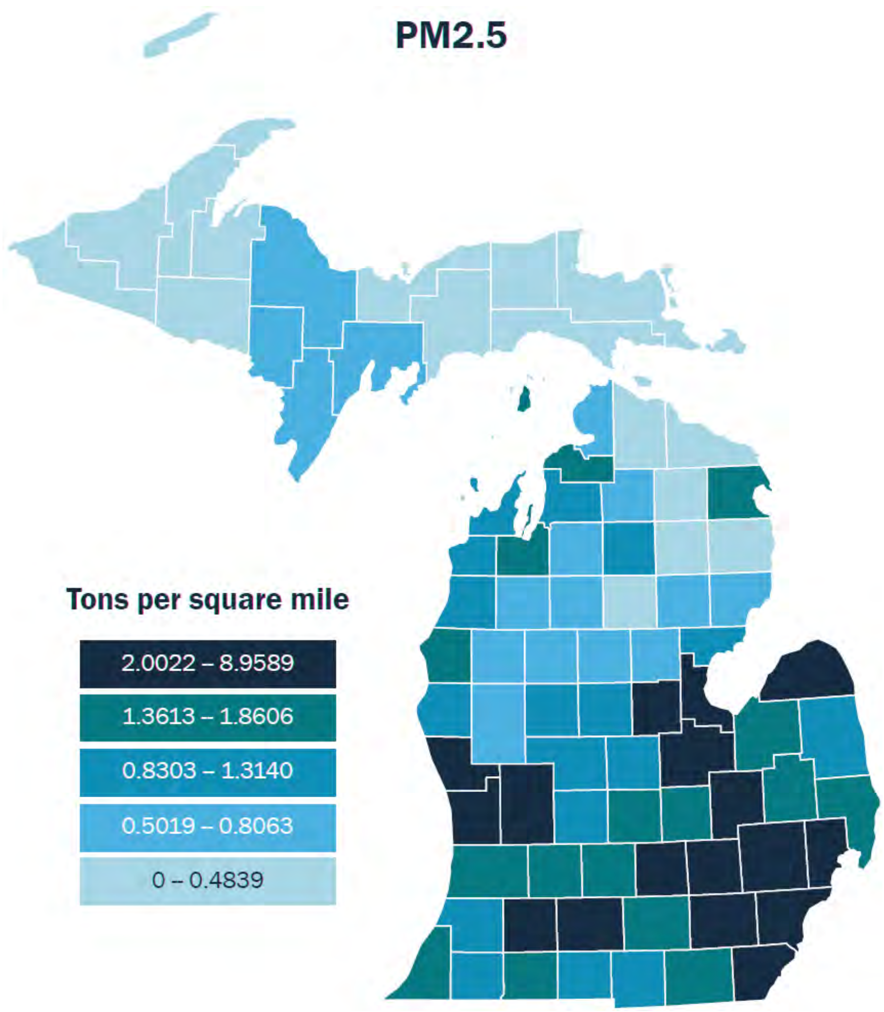


Figure 7.9: $PM_{2.5}$ Emissions in 2017



Fine particulate matter ($PM_{2.5}$) is measured using three techniques: a filter-based FRM, Continuous Methods, and Chemical Speciation Methods. These methods are described in more detail in Appendix A.

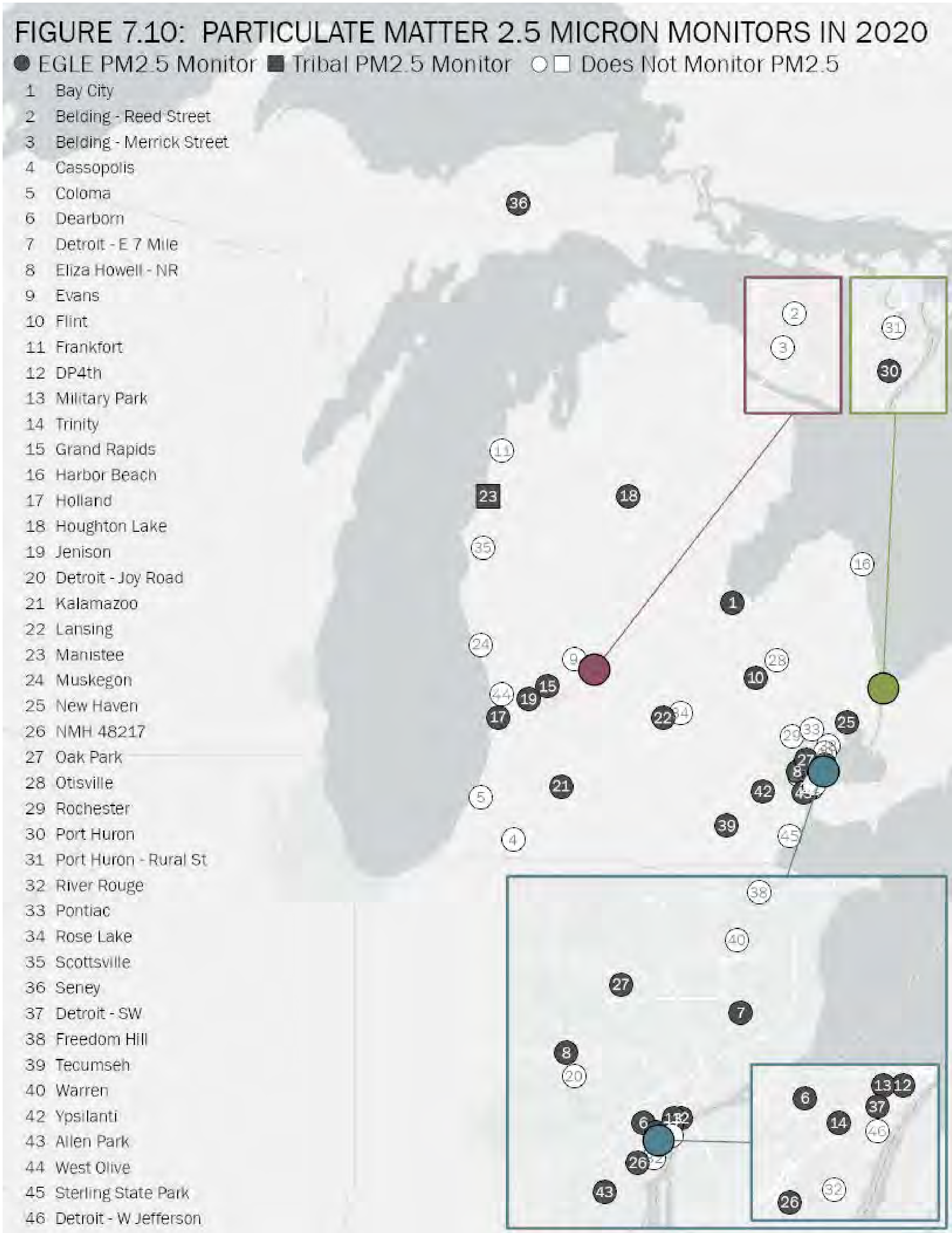
Figure 7.10 shows the location of each $PM_{2.5}$ monitor.

$PM_{2.5}$ FRM Monitoring Network: $PM_{2.5}$ FRM filter-based monitors are deployed to characterize background or regional $PM_{2.5}$ transport collectively from upwind sources as well as population-oriented sites. Several changes occurred in the FRM network in 2020.

- Loss of site access shut down: Livonia Near-road will be relocated, but a suitable replacement site has not been found yet.
- Collocation sites: Five $PM_{2.5}$ FRM monitoring sites are collocated with PM_{10} monitors to allow for $PM_{2.5}$ and PM_{10} comparisons.[8] Collocated PM_{10} and $PM_{2.5}$ sites include Dearborn and Detroit-SW. Allen Park, Grand Rapids, and Jenison also have collocated PM_{10} and $PM_{2.5}$ but monitors were switched from FRMs and TEOMs to continuous FEM T640X beginning January 1, 2021, which measure PM_{10}, $PM_{2.5}$ and PM coarse. The T640X particulate instruments determine the concentration of particulates in the air using a light scattering technique. The T640x is FEM for both $PM_{2.5}$ and PM_{10} and then it subtracts the two to get PM coarse.
- Switched FRM to BAMs: Holland, Bay City, and Ypsilanti (collocated with secondary FRM).
- Switched FRMs to T640s: Kalamazoo, New Haven, and Port Huron were switched to T640s in the fall, but FRMs were collocated at these sites until January 1, 2021. No T640 data is reported in 2020 for these sites. The T640 particulate instruments determine the concentration of particulates in the air using a light scattering technique, but the T640 primarily is used to measure $PM_{2.5}$.

[8] Requirements for $PM_{2.5}$ FRM sites are obtained from the Revised Requirements for Designation of Reference and Equivalent Methods for $PM_{2.5}$ and Ambient Air Quality Surveillance for PM [62 FR 38763]; Guidance for Using Continuous Monitors in $PM_{2.5}$ Monitoring Networks [EPA-454/R-98-012, May 1998]; and Appendix N to Part 50 - Interpretation of the National Ambient Air Quality Standards for PM [40 CFR Part 50, July 1, 1998].

Figure 7.10: PM$_{2.5}$ Monitors in 2020



Continuous $PM_{2.5}$ Network: Short-term measurements of $PM_{2.5}$ or PM_{10} are updated on an hourly basis using TEOM, BAM or T640 instruments. At least one continuous monitor is required at the NCore $PM_{2.5}$ monitoring site in a metropolitan area with a population greater than one million. Both Detroit (Allen Park) and Grand Rapids meet this requirement.[9] Under the revised 2006 air monitoring regulations, 50 percent of the FRM monitoring sites are now required to have a continuous $PM_{2.5}$ monitor. For Michigan, there are 13 FRM monitoring sites, 7 of which also had TEOMs or BAMs.

- T640 replaced TEOMS: Lansing switched to a T640 monitor in September 2020 and is running a collocated filter-based FRM. The T640 data will not be reported until 2021.
- GHIB project: DP4th, Trinity, Military Park and Detroit-SW were switched from BAMs to T640s in fall 2020. These T640 data are reported in the 2020 report.

Speciation Monitors: Speciation monitors consist of filter-based, 24-hour monitors and continuous speciation monitors, aethalometers. Continuous monitors are used to determine diurnal changes in $PM_{2.5}$ composition.

- 24-hour speciation monitors: Allen Park and Grand Rapids (NCore sites), Dearborn (NATTS site), and Detroit-SW. The Tecumseh speciation monitor was shut down in 2019. These monitors are placed in population-oriented stations in both urban and rural locations. $PM_{2.5}$ chemical speciation samples are collected over a 24-hour period and analyzed to determine various components of $PM_{2.5}$. The primary objectives of the chemical speciation monitoring sites are to provide data that will be used to determine sources of poor air quality and to support the development of attainment strategies. Historical speciation data for Michigan indicates that $PM_{2.5}$ is made up of 30 percent nitrate compounds, 30 percent sulfate compounds, 30 percent organic carbon,[10] and 10 percent unidentified or trace elements.
- Aethalometers: Allen Park, Dearborn, and the GHIB project (DP4th, Trinity, Military Park, and Detroit-SW started in 2018). These continuous monitors measure black carbon, a combustion by-product typical of transportation sources.

Table 1.2 in Chapter 1 shows all of Michigan's $PM_{2.5}$ FRM monitoring stations operating in 2020 and denotes which sites have TEOM, FEM, Speciation, or Aethalometer monitors in operation.

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[9] Under the Guidance for Using Continuous Monitors in $PM_{2.5}$ Monitoring Networks [EPA-454/R-98-012, May 1998].

[10] To better understand the chemical composition of the organic carbon fraction, several studies have been conducted in Southeast Michigan to further investigate organic carbon. Information can be found in the Michigan 2012 Ambient Air Monitoring Network Review, available at http://www.michigan.gov/documents/deq/deq-aqd-aqe-2012-Air-Mon-Network-Review_357137_7.pdf

Table 7.1 provides the design value, the 3-year average of the annual mean $PM_{2.5}$ concentrations for 2018-2020. Michigan's levels are below the 12 µg/m³ primary standard.[11]

Table 7.1: 3-Year Average of the Annual Mean $PM_{2.5}$ Concentrations for 2018-2020

Areas	County	Monitoring Sites	2018	2019	2020	2018-2020 Mean
Detroit-Ann Arbor	Lenawee	Tecumseh	8.4	8.5	8.2	8.3
Detroit-Ann Arbor	Macomb	New Haven	7.8	7.3	6.0	7.0
Detroit-Ann Arbor	Oakland	Oak Park	8.3	7.7	7.4	7.8
Detroit-Ann Arbor	St. Clair	Port Huron	8.1	7.6	6.7	7.5
Detroit-Ann Arbor	Washtenaw	Ypsilanti	8.3	8.4	8.2	8.3
Detroit-Ann Arbor	Wayne	Allen Park	9.1	8.7	7.5	8.4
Detroit-Ann Arbor	Wayne	Detroit-Linwood	8.86	--	--	8.9
Detroit-Ann Arbor	Wayne	Detroit-E 7 Mile	8.4	7.6	7.5	7.8
Detroit-Ann Arbor	Wayne	Detroit-SW	11.5	12.1	9.1	10.9
Detroit-Ann Arbor	Wayne	Detroit-W. Lafayette	8.9*	--	--	8.9
Detroit-Ann Arbor	Wayne	Wyandotte	8.0	--	--	8.0
Detroit-Ann Arbor	Wayne	Dearborn	10.6	9.9	9.4	10.0
Detroit-Ann Arbor	Wayne	Livonia	7.4*	--	--	7.4
Detroit-Ann Arbor	Wayne	Livonia-Roadway	9.0	8.4*	--	8.7
Detroit-Ann Arbor	Wayne	Eliza Howell-NR	--	--	10.6	10.6
Flint	Genesee	Flint	7.4	7.2	6.0	6.9
Grand Rapids	Ottawa	Jenison	8.3*	8.3	7.4	8.0
Grand Rapids	Kent	Grand Rapids	8.2	8.00	7.7	8.0
Allegan Co	Allegan	Holland	7.6	7.2	6.0	6.9
Kalamazoo-Battle Creek	Kalamazoo	Kalamazoo	8.4	7.2	7.6	7.8
Lansing-East Lansing	Ingham	Lansing	7.7**	7.3	7.1	7.4
Bay Co	Bay	Bay City	7.1	6.8	4.7	6.2
Missaukee Co	Missaukee	Houghton Lake	5.4	5.8	8.0	6.4
Manistee Co	Manistee	Manistee	6.1	4.9*	5.1*	5.4
Schoolcraft Co	Schoolcraft	Seney	4.1*	4.2	4.6*	4.3

*Indicates site does not have a complete year of data.

**Indicates site was moved during the year and concentrations were averaged together for both locations.

[11] For comparison to the standard, the average annual means is rounded to the nearest 0.1 µg/m³.

Table 7.2 provides the 24-hour 98th percentile $PM_{2.5}$ concentrations for 2018-2020 showing Michigan's levels are below the 35 µg/m^3 standard (3-year average).[12]

Table 7.2: 24-Hour 98th Percentile $PM_{2.5}$ Concentrations for 2018-2020

Areas	County	Monitoring Sites	2018	2019	2020	2018-2020 Mean
Detroit-Ann Arbor	Lenawee	Tecumseh	24.2	22.1	18.7	22
Detroit-Ann Arbor	Macomb	New Haven	18.9	18.7	15.5	18
Detroit-Ann Arbor	Oakland	Oak Park	20.1	18.2	23.3	21
Detroit-Ann Arbor	St. Clair	Port Huron	19.6	20.3	16.6	19
Detroit-Ann Arbor	Washtenaw	Ypsilanti	21.3	22.0	19.8	21
Detroit-Ann Arbor	Wayne	Allen Park	22.8	22.0	26.3	24
Detroit-Ann Arbor	Wayne	Detroit-Linwood	18.6	--	--	19
Detroit-Ann Arbor	Wayne	Detroit-E 7 Mile	21.5	19.6	17.7	20
Detroit-Ann Arbor	Wayne	Detroit-SW	28.1	30.6	24.1	28
Detroit-Ann Arbor	Wayne	Detroit-W. Lafayette	8.9*	--	--	8.9
Detroit-Ann Arbor	Wayne	Wyandotte	20.4	--	--	20
Detroit-Ann Arbor	Wayne	Dearborn	26.1	24.0	21.0	24
Detroit-Ann Arbor	Wayne	Livonia	18.1*	--	--	18
Detroit-Ann Arbor	Wayne	Livonia-Roadway	22.8*	29.0	--	26
Detroit-Ann Arbor	Wayne	Eliza Howell-NR	--	--	23.2	23
Flint	Genesee	Flint	22.2	18.9	14.5	19
Grand Rapids	Ottawa	Jenison	22.3*	24.4	17.9	22
Grand Rapids	Kent	Grand Rapids	18.9	23.2	17.6	20
Allegan Co	Allegan	Holland	21.2	18.2	13.1	18
Kalamazoo-Battle Creek	Kalamazoo	Kalamazoo	19.0	16.9	18.0	18
Lansing-East Lansing	Ingham	Lansing	23.5**	22.3*	21.6	22
Bay Co	Bay	Bay City	17.8	17.5	14.0	16
Missaukee Co	Missaukee	Houghton Lake	16.2	15.1	15.2	16
Manistee Co	Manistee	Manistee	16.9	14.9*	13.3*	15
Schoolcraft Co	Schoolcraft	Seney	19.0*	14.1	10.6*	15

*Indicates site does not have a complete year of data.

**Indicates site was moved during the year and concentrations were averaged together for both locations.

[12] The 98th percentile value was obtained from the USEPA AQS. For comparing calculated values to the standard, the 3-year, 24-hour average is rounded to the nearest 1 µg/m^3.

Figures 7.11 through **7.14** illustrate the current annual mean $PM_{2.5}$ trend for each monitoring site in Michigan. For clarity, the monitoring sites within the Detroit-Warren-Flint CSA have been broken down into two graphs.

Figure 7.11 shows the 2020 levels in Wayne County remained below the $PM_{2.5}$ NAAQS standard. Historically, Dearborn has had the highest concentrations in the state, but Detroit-SW now has the highest concentrations. All sites are below the annual $PM_{2.5}$ NAAQS standard. The Gordie Howe International Bridge sites are included in these graphs.

Figure 7.12 contains the remainder of those sites in the Detroit-Warren-Flint CSA that are outside of Wayne County. These sites also show readings in 2020 are below the $PM_{2.5}$ NAAQS.

Figure 7.13 combines the $PM_{2.5}$ monitoring sites located in West Michigan-Grand Rapids-Muskegon-Holland CSA, Kalamazoo, and Benton Harbor MSAs. All sites are below the annual $PM_{2.5}$ NAAQS.

Figure 7.14 displays the remaining monitoring sites in the Northern Lower and Upper Peninsulas. All sites are below the annual $PM_{2.5}$ NAAQS standard.

Figure 7.11: Detroit-Warren-Flint CSA (Wayne County Only)
Annual Arithmetic Means for $PM_{2.5}$ from 2015-2020

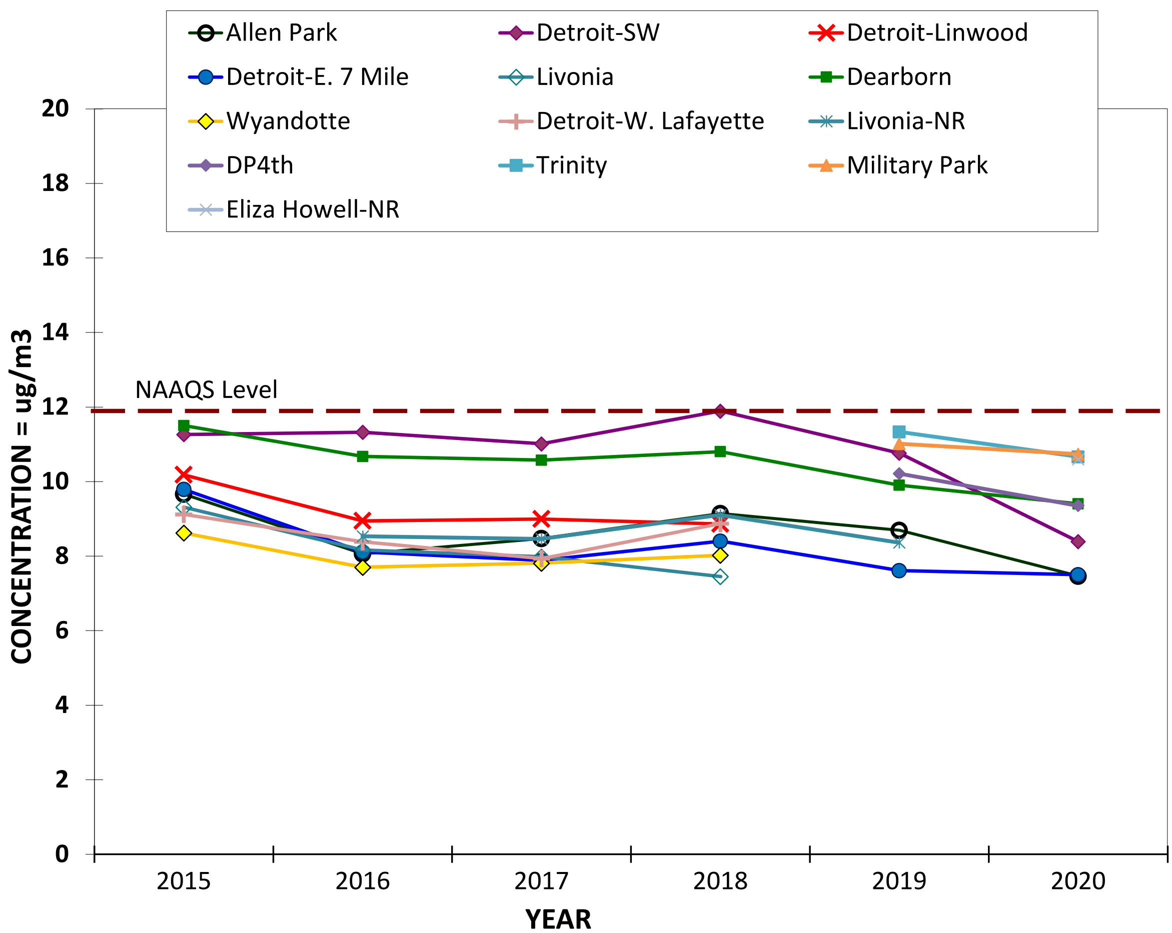


Figure 7.12: Detroit-Warren-Flint CSA (without Wayne County) Annual Arithmetic Means for $PM_{2.5}$ from 2015-2020

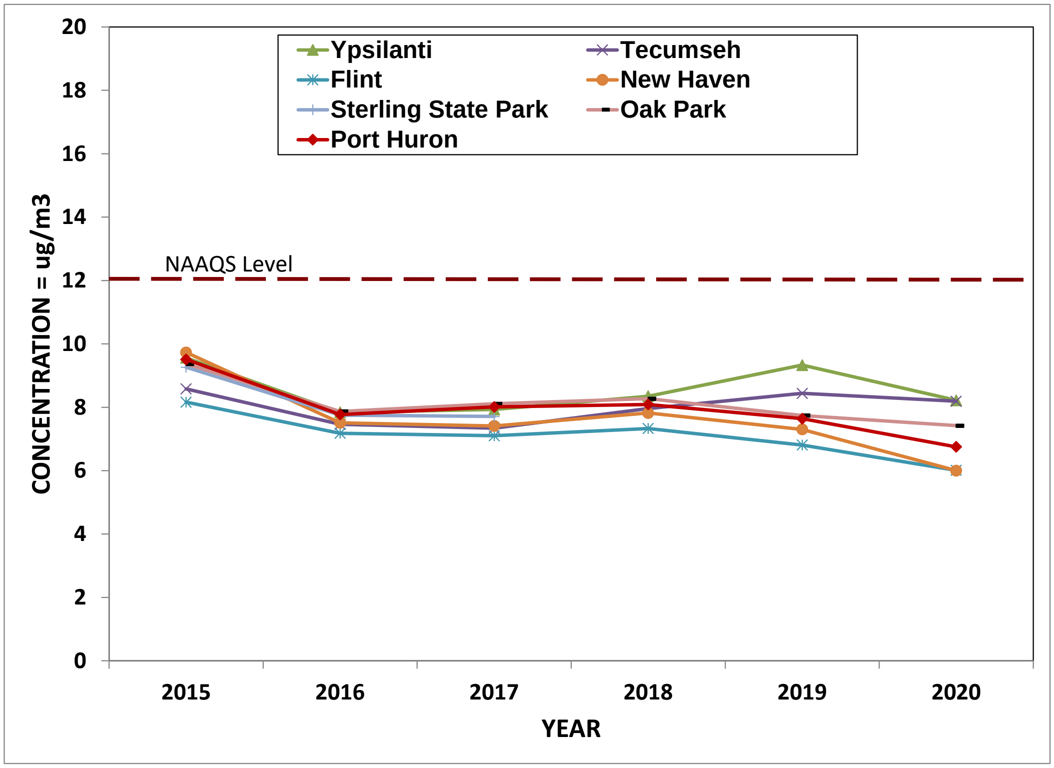


Figure 7.13: West MI - Grand Rapids-Muskegon-Holland CSA, Kalamazoo, and Benton Harbor MSAs Annual Arithmetic Means for $PM_{2.5}$ from 2015-2020

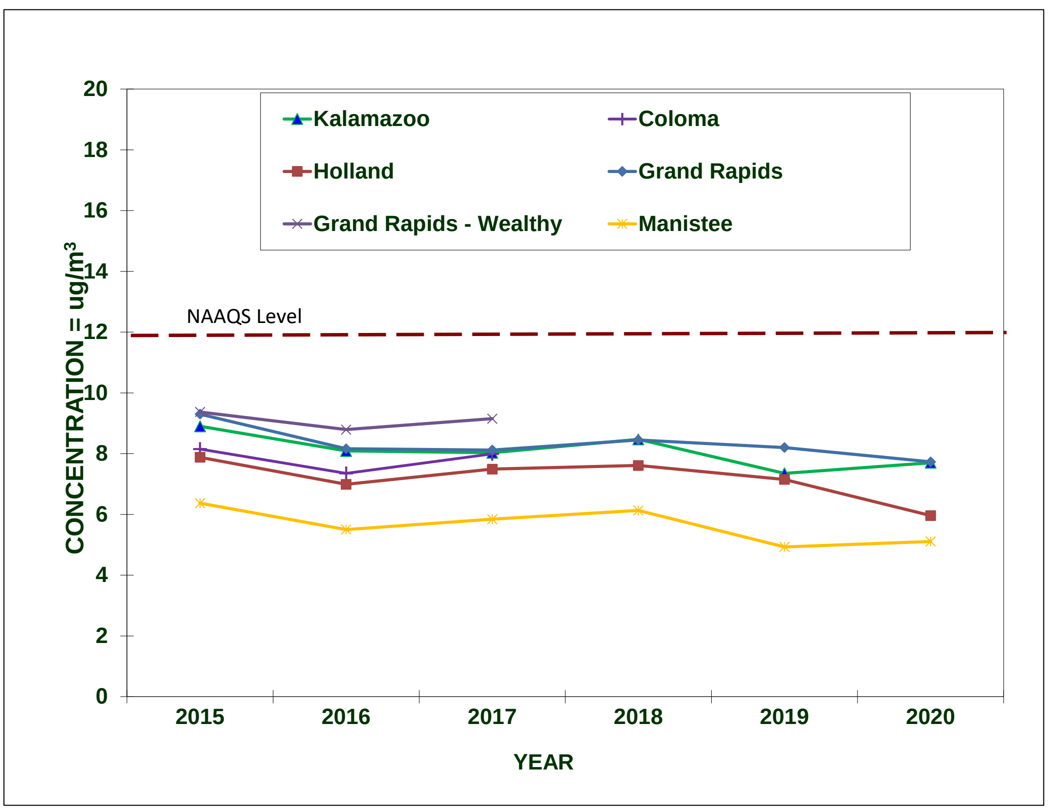


Figure 7.14: Lansing-E. Lansing CSA, Saginaw-Bay City CSA, Cadillac MSA and Upper Peninsula Annual Arithmetic Means for $PM_{2.5}$ from 2015-2020

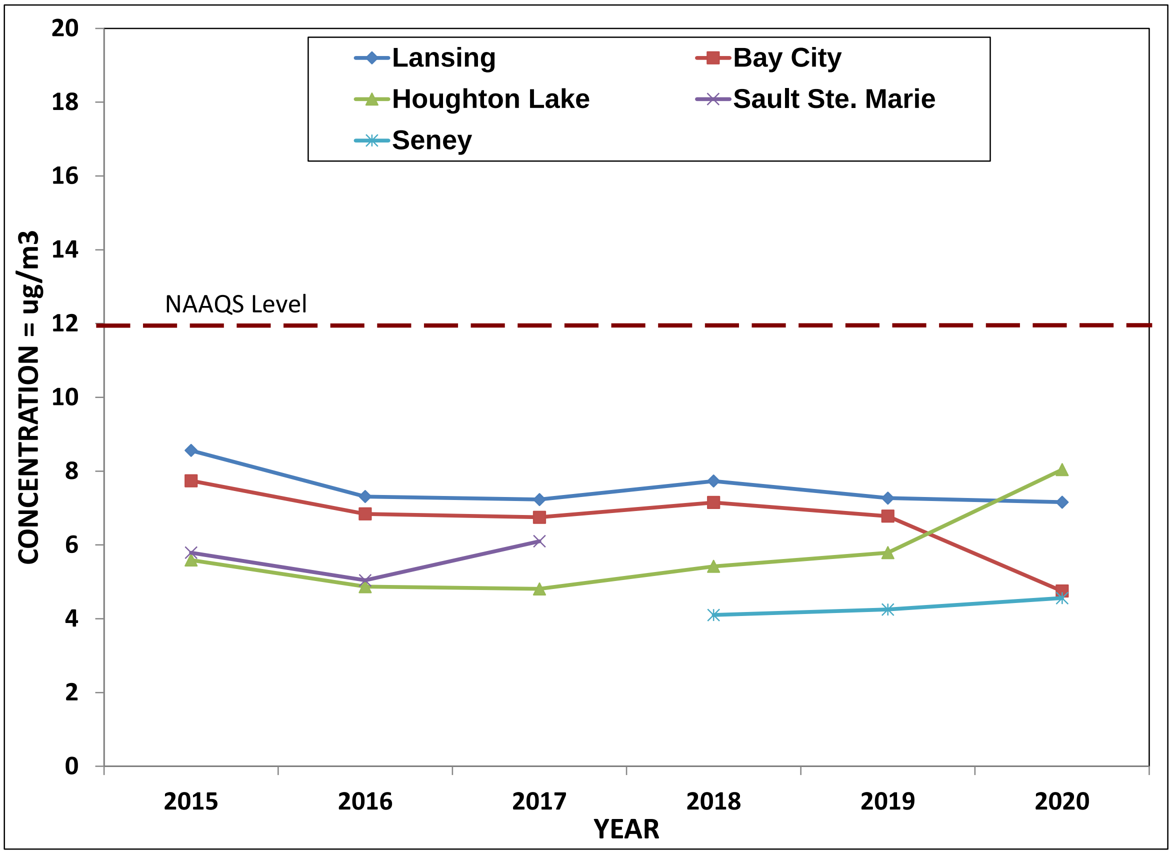
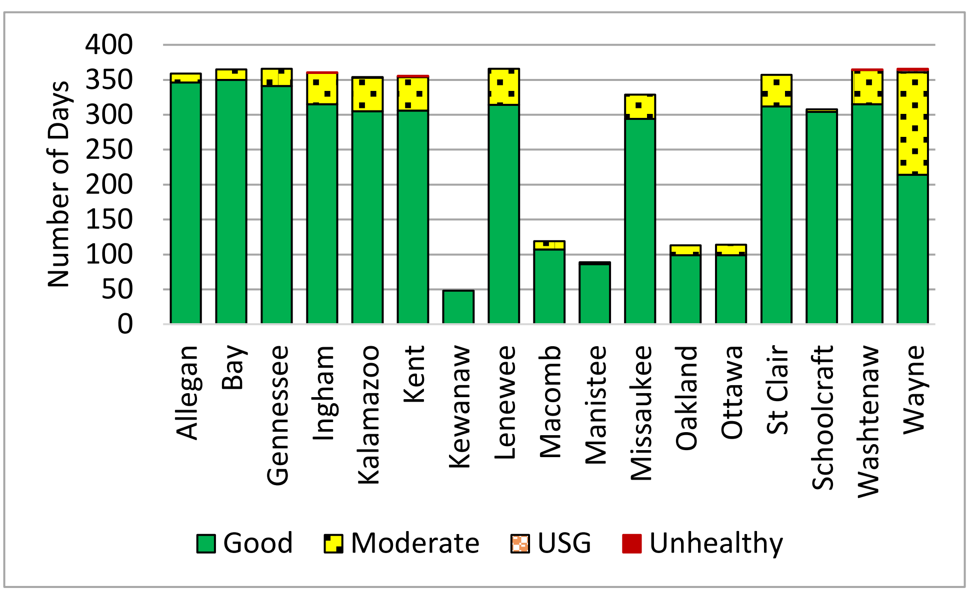


Figure 7.15 shows the AQI values per day in counties where $PM_{2.5}$ is monitored. Most days were in the good to moderate AQI range. Three counties had five days in the USG AQI range, Kalamazoo, and Kent County each had one day, and Wayne County had three days in the USG AQI range. Four counties had AQI values in the Unhealthy range; Ingham, Kent, and Washtenaw Counties had one day, and Wayne County had two days. All these days occurred on July 4th or 5th most likely due to fireworks.

Figure 7.15: 2020 AQI Days for $PM_{2.5}$ in Michigan



CHAPTER 8: TOXIC AIR POLLUTANTS

In addition to the six criteria pollutants discussed in previous chapters, the AQD monitors for a wide variety of substances classified as toxic air pollutants, and/or Hazardous Air Pollutants (HAPs). Under the Clean Air Act, the USEPA specifically addresses a group of 187 HAPs. Under Michigan's air regulations, Toxic Air Contaminants (TACs) are defined as all non-criteria pollutants that may be "*…harmful to public health or the environment when present in the outdoor atmosphere in sufficient quantities and duration.*" The definition of TACs lists 42 substances that are not TACs, indicating that all others are TACs. The sources and effects of toxics are as follows:

Sources: Air toxics come from a variety of mobile, stationary, and indoor man-made sources as well as outdoor natural sources. Mobile sources include motor vehicles, stationary sources include industrial factories and power plants, indoor sources include household cleaners, and natural sources include forest fires and eruptions from volcanoes.

Effects: Once air toxics enter the body, there is a wide range of potential health effects. They include: the aggravation of asthma; irritation to the eyes, nose, and throat; carcinogenicity; developmental toxicity (birth defects); nervous system effects; and various other effects on internal organs. Some effects appear after a shorter period of exposure, while others may appear after long-term exposure or after a long period of time has passed since the exposure ended. Most toxic effects are not unique to one substance, and some effects may be of concern only after the substance has deposited to the ground or to a water body (e.g., mercury, dioxin), followed by exposure through an oral pathway such as the eating of fish or produce. This further complicates the assessment of air toxics concerns due to the broad range of susceptibility that various people may have.

Population most at risk: People with asthma, children, and the elderly are generally at the highest risk for health effects from exposure to air toxics.

Air Toxics can be categorized as:

- **Metals:** Examples include aluminum, arsenic, beryllium, barium, cadmium, chromium, cobalt, copper, iron, mercury, manganese, molybdenum, nickel, lead, vanadium, and zinc.
- **Organic Substances:** Further divided into sub-categories that include –
  - VOCs, include benzene (found in gasoline), perchloroethylene (emitted from some dry-cleaning facilities), and methylene chloride (a solvent and paint stripper used by industry);
  - carbonyl compounds (formaldehyde, acetone, and acetaldehyde);
  - semi-volatile compounds (SVOCs);
  - polycyclic aromatic hydrocarbons (PAHs)/polynuclear aromatic hydrocarbons (PNAs);
  - pesticides and;
  - polychlorinated biphenyls (PCBs).
- **Other substances:** Asbestos, dioxin, and radionuclides such as radon.

Because air toxics are such a large and diverse group of substances, regulatory agencies sometimes further refine these classifications to address specific concerns.

For example:

- Some initiatives have targeted those substances that are persistent, bioaccumulative and toxic (PBT), such as mercury, which accumulates in body tissues.
- The USEPA has developed an Integrated Urban Air Toxics Strategy with a focus on 30 substances (the Urban HAPs List).[13]

The evaluation of air toxics levels is difficult due to several factors.

- There are no health-protective NAAQS. Instead, air quality assessments utilize various short- and long-term screening levels and health-based levels estimated to be safe considering the critical effects of concern for specific substances.
- There is incomplete toxicity information for many substances. For some air toxics, the analytical detection limits are too high to consistently measure the amount present, and in some cases, the risk assessment-based levels are below the detection limits.
- Data gaps are present regarding the potential for interactive toxic effects for co-exposure to multiple substances present in emissions and in ambient air. Air toxics also pose a challenge due to monitoring and analytical methods that are either unavailable for some compounds or cost-prohibitive for others (e.g., dioxins).

These factors make it difficult to accurately assess the potential health concerns of all air toxics. Nevertheless, it is feasible and important to characterize the potential health hazards and risks associated with many air toxics.

Table 8.1 shows the monitoring stations and what air toxic was monitored at each station in 2020. This table can also be found in **Appendix B** with the Air Toxics Monitoring Summary.

[13] USEPA's Air Toxics website: Urban Strategy is located at www.epa.gov/urban-air-toxics.

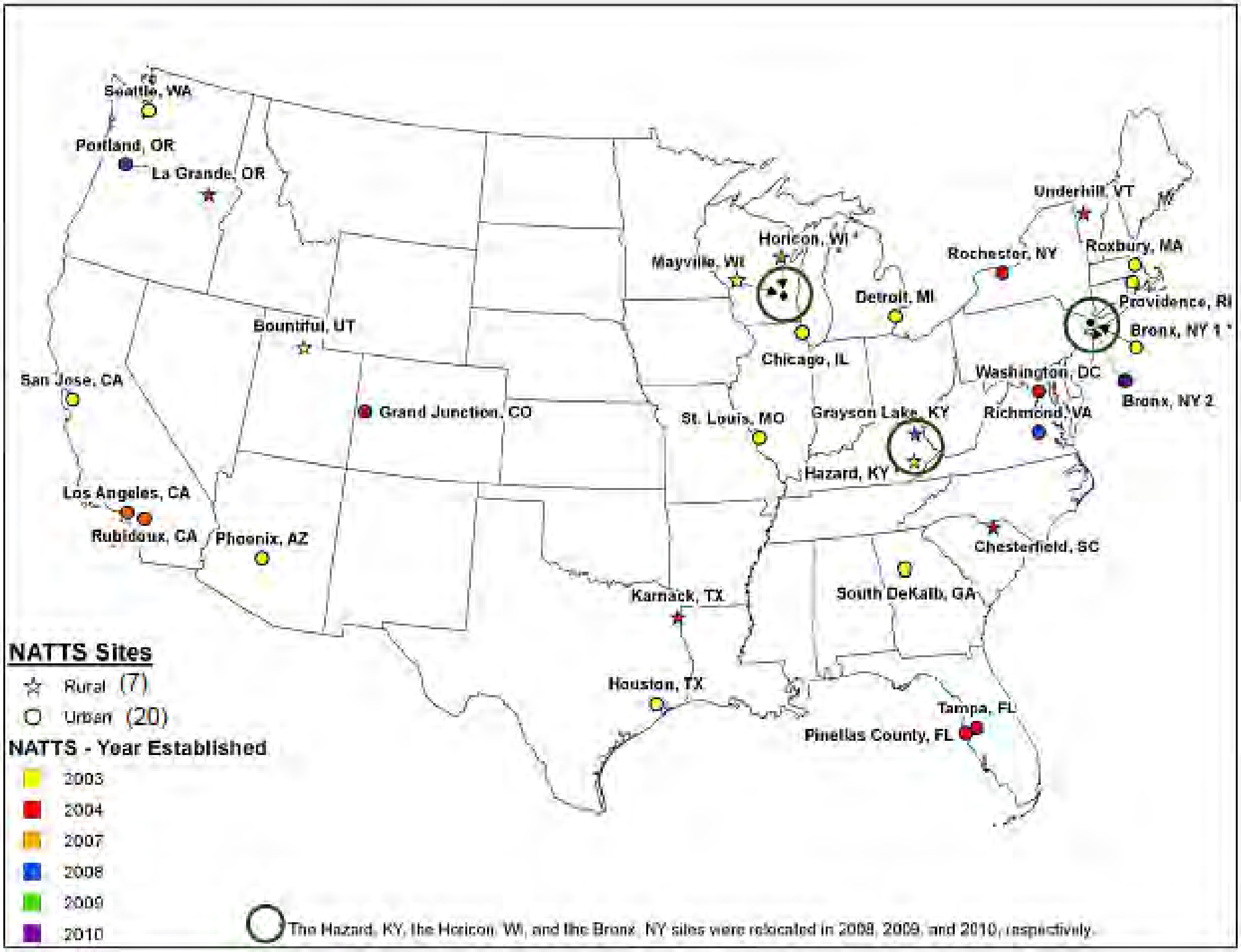
Table 8.1: 2019 Toxics Sampling Sites

Site Name	VOC	Carbonyl	PAHs	Metals TSP	Metals PM_{10}	Speciated $PM_{2.5}$
Allen Park				x		x
Dearborn	x	x	x	x	x	x
Detroit-SW	x	x		x		x
Detroit-W. Jefferson				x		
Grand Rapids				x		x
Belding-Merrick St.				x		
NMH 48217				x		
Port Huron-Rural St.				x		
River Rouge		x		x		
DP4th				x		
Military Park				x		
Trinity				x		

National Monitoring Efforts and Data Analysis

The USEPA administers national programs that identify air toxics levels, detect trends, and prioritize air toxics research. EGLE participates in these programs. In addition, the AQD operates a site in Dearborn that is part of the USEPA's NATTS. The purpose of the NATTS network is to detect trends in high-risk air toxics such as benzene, formaldehyde, chromium, and 1,3-butadiene and to measure the progress of air toxics regulatory programs at the national level. Currently, the NATTS network contains 27 stations; 20 urban and 7 rural (see **Figure 8.1**). The USEPA requires that the NATTS sites measure VOCs, carbonyls, PAHs, and trace metals on a once-every-six-day sampling schedule. The Dearborn NATTS site measures trace metals as TSP, PM_{10}, and $PM_{2.5}$.

Figure 8.1: National Air Toxics Trends Sites



CHAPTER 9: METEOROLOGICAL INFORMATION

Figures 9.1 through **9.3** show average daily temperatures, and **Figures 9.4** through **9.6** show total monthly precipitation amounts compared to their climatic norms for sites in the Northern Lower, Southern Lower, and Upper Peninsulas. These figures were constructed by averaging data from several National Weather Service stations and therefore are not meant to be representative of any one single location in Michigan. Instead, they are intended to depict the regional trends that occurred during the year 2020.

Figure 9.1: Southern Lower Peninsula Observed Average Monthly Temperatures vs. Normal Average Monthly Temperatures

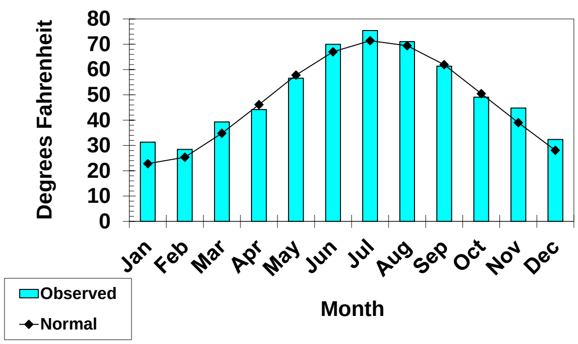


Figure 9.2: Northern Lower Peninsula Observed Average Monthly Temperatures vs. Normal Average Monthly Temperatures

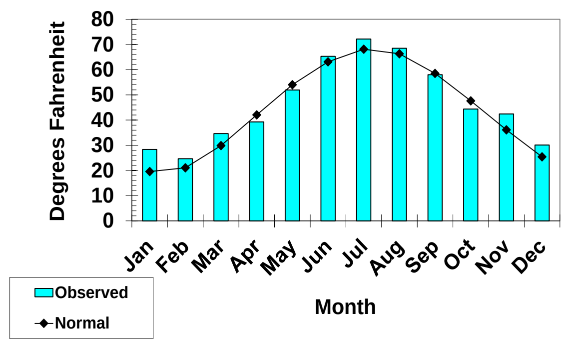


Figure 9.3: Upper Peninsula Observed Average Monthly Temperatures vs. Normal Average Monthly Temperatures

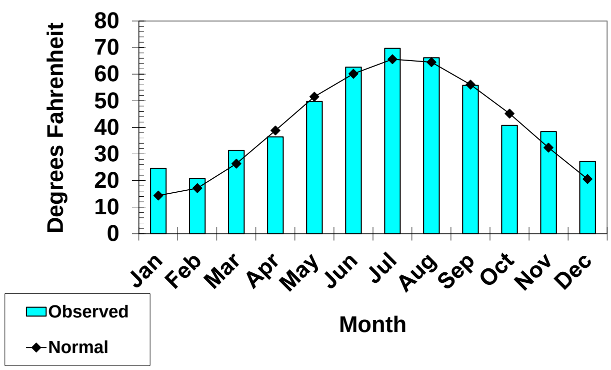


Figure 9.4: Southern Lower Peninsula Observed Monthly Precipitation vs. Normal Monthly Precipitation

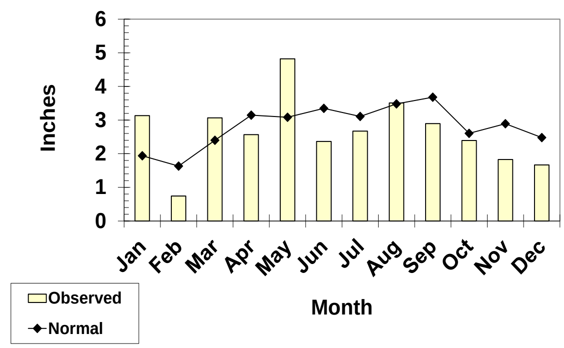


Figure 9.5: Northern Lower Peninsula Observed Monthly Precipitation vs. Normal Monthly Precipitation

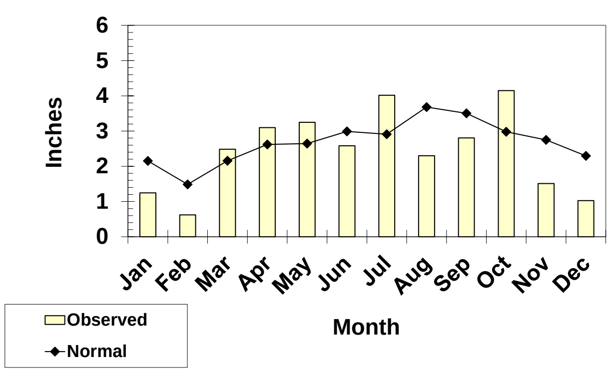
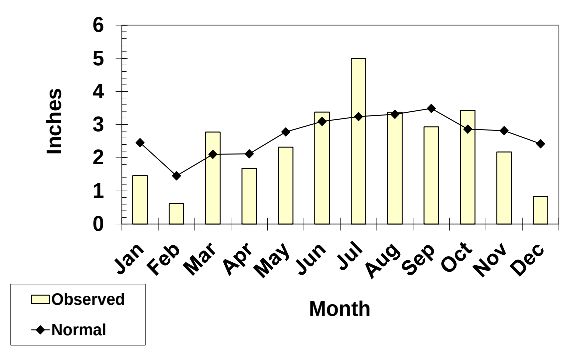


Figure 9.6: Upper Peninsula Observed Monthly Precipitation vs. Normal Monthly Precipitation



CHAPTER 10: SPECIAL PROJECTS

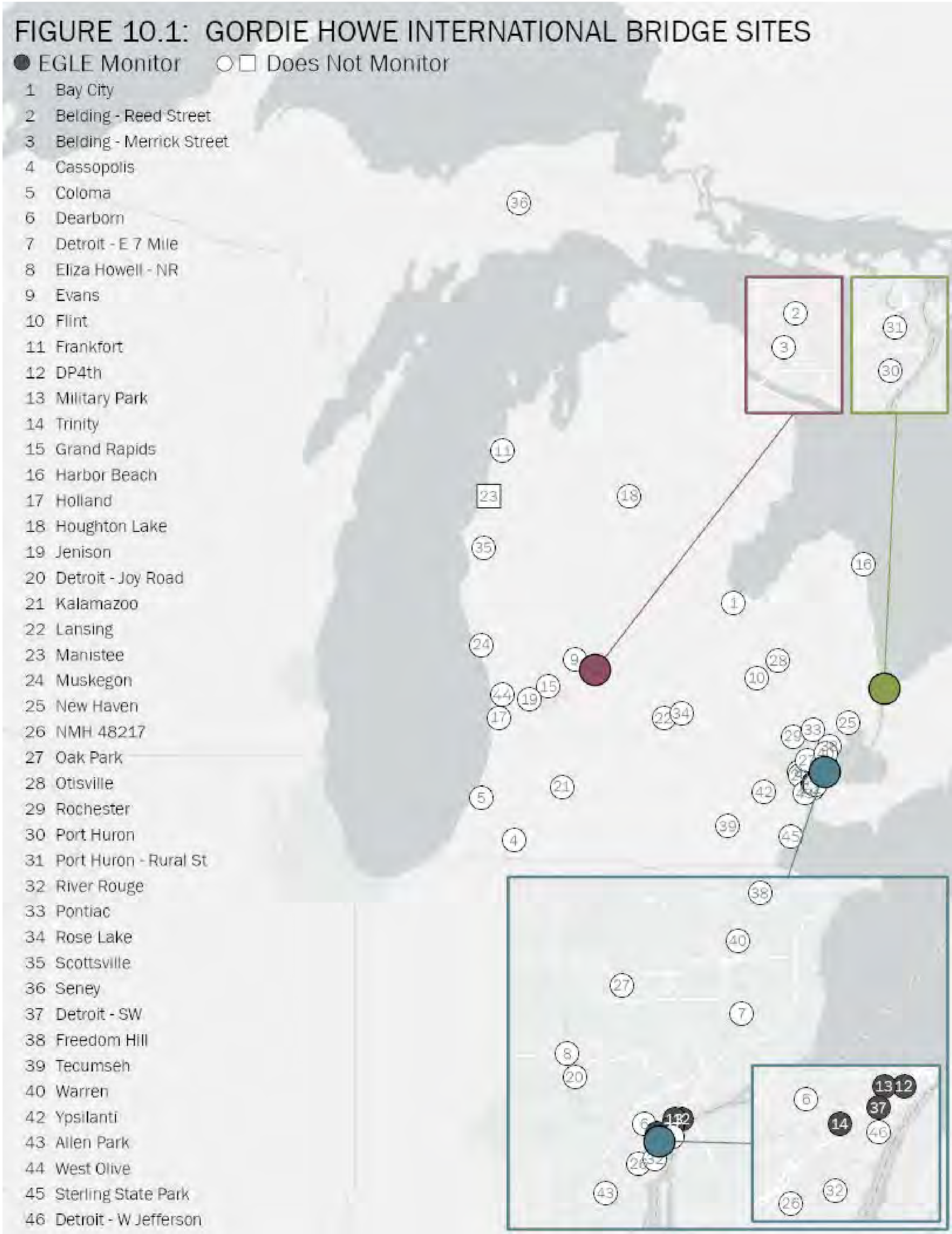
EGLE continues the sampling for the Gordie Howe International Bridge (GHIB). This project is a joint Canadian-American venture. The GHIB will be built linking Windsor, Ontario and Detroit, Michigan. Construction is slated to occur between 2018-2024. For additional information, go to: GordieHoweInternationalBridge.com.

EGLE is conducting ambient air quality monitoring in the Delray community to ascertain air pollution levels in the community. The three new sites will monitor air pollutants before, during, and after construction of the bridge. In addition, NOx, continuous $PM_{2.5}$, and black carbon were added to the Detroit-SW (261630015) monitoring site for this project.

- **Trinity (261630098)**: Meteorological parameters, NOx, SO_2, CO, continuous $PM_{2.5}$, black carbon, and five trace metals (Pb, Mn, As, Cd, and Ni).
- **DP4TH (261630099)**: NOx, SO_2, CO, continuous $PM_{2.5}$, black carbon, and five trace metals (Pb, Mn, As, Cd, and Ni).
- **Military Park (261630100)**: NOx, SO_2, continuous $PM_{2.5}$, black carbon, and five trace metals (Pb, Mn, As, Cd, and Ni).
- **Detroit-SW (261630015):** Meteorological parameters, NOx, SO_2, continuous $PM_{2.5}$, $PM_{2.5}$ Speciated, PM_{10}, black carbon, VOCs, carbonyls, and five trace metals (Pb, Mn, As, Cd, and Ni).

The data from these sites is reported along with the other sites in the previous chapters and in the following appendices.

Figure 10.1: Gordie Howe International Bridge Sites



APPENDIX A: CRITERIA POLLUTANT SUMMARY FOR 2020

Appendix A utilizes the USEPA's 2020 Air Quality System (AQS) Quick Look Report Data to present a summary of ambient air quality data collected for the criteria pollutants at monitoring locations throughout Michigan. Concentrations of non-gaseous pollutants are generally given in µg/m^3 and in ppm for gaseous pollutants. The following define some of the terms listed in the **Appendix A** reports.

Site I.D.: The AQS site ID is the USEPA's code number for these sites.

POC: The Parameter Occurrence Code or POC is used to assist in distinguishing different uses of monitors, i.e., under Pb, NO_2, and SO_2, POC #1-5 are used to help differentiate between individual monitors. For PM, the POC numbers are used more for the type of monitoring, such as:

- 1 – FRM or FEM;
- 2 - Typicaly collocated FRM;
- 3 - TEOM hourly PM_{10} and $PM_{2.5}$ measurements; and
- 5 - $PM_{2.5}$ speciation monitors (shown at right is a Met One SASS – speciation air sampling system).

 # OBS: For Pb, TSP, $PM_{2.5}$, and PM_{10}, the # OBS (number of observations) refers to the number of valid 24-hour values gathered.

For continuous monitors (CO, NO_2, O_3, $PM_{2.5}$ TEOM, BAM and SO_2), # OBS refers to the total valid hourly averages obtained from the analyzer.

Values: The value is listed for each criteria pollutant per its NAAQS (primary and secondary). The number of exceedances per site for the primary and secondary standards utilize running averages for continuous monitors (except for O_3) and does not include averages considered invalid due to limited sampling times. For example, a particulate-mean based only on six months could not be considered as violating the annual standard. As noted, each site is allowed one short-term standard exceedance before a violation is determined.

Criteria Pollutant Summary For 2020

CO measured in ppm

Site ID	POC	City	County	Year	# OBS	1-hr Highest Value	1-hr 2nd Highest Value	1-hr OBS > 35	8-hr Highest Value	8-hr 2nd Highest Value	8-hr OBS > 9
260810020	1	Grand Rapids	Kent	2020	7136	1.5	1.4	0	1.1	1.1	0
261630001	1	Allen Park	Wayne	2020	8259	1.7	1.6	0	1.2	1.2	0
261630093	1	Eliza Howell-NR	Wayne	2020	8191	2.4	2.4	0	2.1	1.8	0
261630098	1	DP4th	Wayne	2020	8349	1.4	1.4	0	1.1	1.1	0
261630099	1	Trinity	Wayne	2020	8367	2.3	2.1	0	1.4	1.3	0

*Indicates site does not have a complete year of data.

Pb (24-hour) measured in µg/m³

Site ID	POC	City	County	Year	# OBS	Highest rolling 3-month Arith Mean	Highest Value (24-hr)	2nd Highest Value (24-hr)
260670003	1	Belding-Merrick St.	Ionia	2020	60	0.01	.028	.009
261470031	1	Port Huron-Rural St.	St. Clair	2020	61	0.03	0.121	0.119
261630005	1	River Rouge	Wayne	2020	61	0.01	0.014	0.013
261630015	1	Detroit-SW	Wayne	2020	61	0.01	0.021	0.020
261630027	1	Detroit-W. Jefferson	Wayne	2020	61	0.02	0.086	0.031
261630033	1	Dearborn	Wayne	2020	60	0.01	0.093	0.051
261630097	1	NMH 48217	Wayne	2020	61	0.01	0.020	0.017
261630098	1	DP4th	Wayne	2020	61	0.02	0.103	0.052
261630099	1	Trinity	Wayne	2020	62	0.04	0.056	0.030
261630100	1	Military Park	Wayne	2020	61	0.02	0.096	0.079

NO_2 measured in ppb

Site ID	POC	City	County	Year	# OBS	1-Hr Highest Value	1-Hr 2nd Highest Value	98th Percentile 1-hr	Annual Arith Mean
260650018	1	Lansing	Ingham	2020	8178	39.5	35.1	33.0	5.73
261130001	1	Houghton Lake	Missaukee	2020	8327	13.7	11.1	3.4	1.02
261390005	1	Jenison	Ottawa	2020	8318	29.7	29.7	28.2	4.71
261630015	1	Detroit-SW	Wayne	2020	8094	47.1	45.6	38.2	11.23
261630093	1	Eliza Howell-NR	Wayne	2020	8101	42.9	41.8	39.1	13.05
261630098	1	DP4th	Wayne	2020	8278	80.0	47.1	43.6	12.25
261630099	1	Trinity	Wayne	2020	7908	59.6	49.3	39.9	11.94
161630100	1	Military Park	Wayne	2020	7847	75.4	70.4	43.3	11.14

*Indicates site does not have a complete year of data.

NO_Y measured in ppb

Site ID	POC	City	County	Year	# OBS	1-Hr Highest Value	1-Hr 2nd Highest Value	Annual Arith Mean
260810020	1	Grand Rapids	Kent	2020	6392	181.5	154.6	10.29
261630001	1	Allen Park	Wayne	2020	8270	206.4	202.1	12.55
261630019	1	Detroit-E 7 Mile	Wayne	2020	7538	132.1	128.0	9.50

O_3 (1-hour) measured in ppm

Site ID	POC	City	County	Year	Num Meas	Num Req	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	Day Max >/= 0.125 Measured	Values >/= 0.125 Estimated	Missed Days < 0.125 Standard
260050003	1	Holland	Allegan	2020	245	245	0.092	0.090	0.083	0.081	0	0	0
260190003	1	Frankfort	Benzie	2020	244	245	0.097	0.080	0.076	0.074	0	0	1
260210014	1	Coloma	Berrien	2020	245	245	0.097	0.087	0.086	0.081	0	0	0
260270003	2	Cassopolis	Cass	2020	236	245	0.080	0.080	0.079	0.079	0	0	2
260370002	2	Rose Lake	Clinton	2020	239	245	0.076	0.073	0.071	0.068	0	0	0
260490021	1	Flint	Genesee	2020	245	245	0.101	0.083	0.075	0.075	0	0	0
260492001	1	Otisville	Genesee	2020	243	245	0.076	0.075	0.074	0.074	0	0	0
260630007	1	Harbor Beach	Huron	2020	245	245	0.107	0.102	0.090	0.083	0	0	0
260650018	1	Lansing	Ingham	2020	239	245	0.071	0.069	0.068	0.068	0	0	0
260770008	1	Kalamazoo	Kalamazoo	2020	245	245	0.078	0.078	0.078	0.076	0	0	0
260810020	1	Grand Rapids	Kent	2020	353	366	0.095	0.083	0.083	0.082	0	0	5
260810022	1	Evans	Kent	2020	245	245	0.084	0.081	0.077	0.076	0	0	0
260910007	1	Tecumseh	Lenawee	2020	245	245	0.082	0.073	0.072	0.072	0	0	0
260990009	1	New Haven	Macomb	2020	245	245	0.089	0.088	0.088	0.086	0	0	0
260991003	1	Warren	Macomb	2020	245	245	0.083	0.083	0.081	0.079	0	0	0
261010922	1	Manistee	Manistee	2020	69	245	0.073	0.069	0.061	0.058	0	0	0
261050007	1	Scottville	Mason	2020	238	245	0.092	0.077	0.076	0.075	0	0	0
261130001	1	Houghton Lake	Missaukee	2020	232	245	0.079	0.074	0.072	0.071	0	0	2

Site ID	POC	City	County	Year	Num Meas	Num Req	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	Day Max >/= 0.125 Measured	Values >/= 0.125 Estimated	Missed Days < 0.125 Standard
261210039	1	Muskegon	Muskegon	2020	243	245	0.098	0.097	0.090	0.085	0	0	2
261250001	2	Oak Park	Oakland	2020	244	245	0.086	0.083	0.081	0.081	0	0	1
261390005	1	Jenison	Ottawa	2020	245	245	0.090	0.090	0.083	0.083	0	0	0
261470005	1	Port Huron	St. Clair	2020	245	245	0.085	0.083	0.081	0.077	0	0	0
261530001	1	Seney	Schoolcraft	2020	244	245	0.082	0.080	0.077	0.072	0	0	1
261610008	1	Ypsilanti	Washtenaw	2020	243	245	0.086	0.082	0.081	0.078	0	0	2
261630001	2	Allen Park	Wayne	2020	342	366	0.106	0.084	0.081	0.080	0	0	2
261630019	2	Detroit-E 7 Mile	Wayne	2020	239	245	0.086	0.083	0.081	0.080	0	0	4

* Indicates site was moved from Lansing (260650012) to Lansing on Filley St (260650018).

O_3 (8-hour) measured in ppm

Site ID	POC	City	County	Year	% OBS	Valid Days Measured	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	Day Max > 0.070
260050003	1	Holland	Allegan	2020	100	245	0.081	0.079	0.078	0.076	6
260190003	1	Frankfort	Benzie	2020	100	245	0.091	0.078	0.069	0.068	2
260210014	1	Coloma	Berrien	2020	100	245	0.085	0.082	0.079	0.078	7
260270003	2	Cassopolis	Cass	2020	95	233	0.077	0.075	0.075	0.075	5
260370002	1	Rose Lake	Clinton	2020	97	238	0.068	0.067	0.065	0.064	0
260490021	1	Flint	Genesee	2020	100	245	0.078	0.069	0.068	0.067	1
260492001	1	Otisville	Genesee	2020	100	244	0.070	0.069	0.068	0.068	0
260630007	1	Harbor Beach	Huron	2020	100	245	0.085	0.083	0.078	0.075	7
260650018	1	Lansing	Ingham	2020	97	238	0.064	0.063	0.062	0.062	0
260770008	1	Kalamazoo	Kalamazoo	2020	100	244	0.075	0.074	0.073	0.072	5
260810020	1	Grand Rapids	Kent	2020	96	353	0.083	0.080	0.079	0.078	6
260810022	1	Evans	Kent	2020	100	244	0.076	0.071	0.070	0.070	2
260910007	1	Tecumseh	Lenawee	2020	100	245	0.077	0.071	0.068	0.067	2
260990009	1	New Haven	Macomb	2020	100	245	0.078	0.076	0.075	0.074	12
260991003	1	Warren	Macomb	2020	100	245	0.077	0.071	0.070	0.070	2
261010922	1	Manistee	Manistee	2020	69	245	0.064	0.061	0.059	0.051	0
261050007	1	Scottville	Mason	2020	96	236	0.089	0.074	0.068	0.068	2
261130001	1	Houghton Lake	Missaukee	2020	93	229	0.072	0.069	0.069	0.068	1
261210039	1	Muskegon	Muskegon	2020	98	241	0.083	0.083	0.083	0.080	6
261250001	2	Oak Park	Oakland	2020	98	241	0.078	0.077	0.076	0.074	6
261390005	1	Jenison	Ottawa	2020	100	244	0.085	0.081	0.077	0.075	6
261470005	1	Port Huron	St. Clair	2020	100	245	0.072	0.070	0.070	0.069	1
261530001	1	Seney	Schoolcraft	2020	99	243	0.080	0.076	0.073	0.067	3
261610008	1	Ypsilanti	Washtenaw	2020	99	243	0.074	0.073	0.072	0.072	5
261630001	2	Allen Park	Wayne	2020	93	339	0.073	0.071	0.070	0.070	2
261630019	2	Detroit-E 7 Mile	Wayne	2020	97	238	0.076	0.075	0.074	0.073	4

$PM_{2.5}$ (24-hour) FRM measured in $\mu g/m^3$ at local conditions

Site ID	POC	Monitor	City	County	Year	# OBS	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	98%	Wtd. Arith. Mean
260490021	1	FRM	Flint	Genesee	2020	61	22.0	15.6	15.2	13.7	15.6	6.56
260650018	1	FRM	Lansing	Ingham	2020	60	31.8	21.6	16.9	16.5	21.6	7.06
260770008	1	FRM	Kalamazoo	Kalamazoo	2020	111	38.3	27.4	18.0	17.7	18.0	7.70
260770008	2	FRM	Kalamazoo	Kalamazoo	2020	61	26.0	17.4	15.3	14.3	17.4	7.11
260810020	1	FRM	Grand Rapids	Kent	2020	116	47.9	19.3	17.6	16.4	17.6	7.73
260990009	1	FRM	New Haven	Macomb	2020	119	16.7	16.5	15.5	15.1	15.5	6.00
261010922	1	FRM	Manistee	Manistee	2020	88	14.2	13.3	12.7	11.7	13.3	5.11*
261250001	1	FRM	Oak Park	Oakland	2020	112	29.0	25.3	23.3	17.7	23.3	7.42
261390005	1	FRM	Jenison	Ottawa	2020	114	33.2	17.9	17.9	16.8	17.9	7.39
261470005	1	FRM	Port Huron	St. Clair	2020	119	24.5	17.9	16.6	16.2	16.6	6.75
261610008	1	FRM	Ypsilanti	Washtenaw	2020	60	32.8	16.9	15.0	14.4	16.9	7.17
261630001	1	FRM	Allen Park	Wayne	2020	117	41.9	29.4	26.3	18.2	26.3	7.46
261630015	1	FRM	Detroit-SW	Wayne	2020	122	30.3	26.8	19.5	17.6	19.5	8.39
261630019	1	FRM	Detroit-E 7 Mile	Wayne	2020	116	28.4	17.9	17.7	17.0	17.7	7.50
261630033	1	FRM	Dearborn	Wayne	2020	120	37.6	30.4	21.0	21.0	21.0	9.40
261630033	2	FRM	Dearborn	Wayne	2020	57	30.8	21.4	20.9	19.8	21.4	9.08

*Indicates the site does not have a complete year of data.

$PM_{2.5}$ (24-hour) FEM measured in µg/m³ at local conditions

Site ID	POC	Monitor	City	County	Year	# OBS	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	98%	Wtd. Arith. Mean
260050003	3	BAM	Holland	Allegan	2020	359	30.4	21.7	15.8	14.7	13.1	5.96
260170014	3	BAM	Bay City	Bay	2020	365	23.1	15.6	14.7	14.3	14.0	4.75
260490021	3	BAM	Flint	Genesee	2020	366	33.3	21.4	19.1	17.4	14.5	6.01
260910007	3	BAM	Tecumseh	Lenawee	2020	366	30.4	30.4	29.0	28.9	18.7	8.19
261130001	3	BAM	Houghton Lake	Missaukee	2020	329	19.3	19.3	16.4	16.2	15.2	8.04*
261530001	3	BAM	Seney	Schoolcraft	2020	282	17.3	15.4	14.5	13.1	10.6	4.56*
261610008	3	BAM	Ypsilanti	Washtenaw	2020	365	67.8	34.2	31.8	27.9	19.8	8.22
261630015	3	BAM/ T640	Detroit-SW**	Wayne	2020	289	38.5	35.6	34.1	30.2	25.9	9.57*
261630093	3	BAM	Eliza Howell-NR	Wayne	2020	356	108.9	45.8	40.7	34.2	23.2	10.59

* Indicates the site does not have a complete year of data.

**TIECO BAMs were switched out to T640s in the fall of 2020.

$PM_{2.5}$ Continuous, Non-Regulatory (1-hour) measured in µg/m³

Site ID	POC	Monitor	City	County	Year	# OBS	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	Wtd. Arith. Mean
260650012	3	TEOM	Lansing	Ingham	2020	6106	455.1	384.5	306.5	224.7	7.44
260770008	3	TEOM	Kalamazoo	Kalamazoo	2020	6907	169.0	162.9	144.5	126.9	7.38
260810020	3	TEOM	Grand Rapids	Kent	2020	6513	715.8	249.1	241.9	228.2	7.73
261470005	3	TEOM	Port Huron	St. Clair	2020	7373	122.7	56.6	45.6	44.3	7.22
261630001	3	TEOM	Allen Park	Wayne	2020	6400	216.0	208.0	174.0	144.0	8.34
261630015	3	BAM/T640	Detroit-SW**	Wayne	2020	8345	270.6	227.9	188.8	183.8	12.60
261630033	3	TEOM	Dearborn	Wayne	2020	8284	342.0	217.1	165.7	100.9	9.19
261630097	3	TEOM	NMH 48217	Wayne	2020	8495	450.7	343.8	319.9	88.9	8.33
261630098	3	BAM/T640	DP4th**	Wayne	2020	8735	95.0	93.4	85.4	80.0	9.59
261630099	3	BAM/T640	Trinity**	Wayne	2020	8308	270.6	162.3	120.9	101.3	10.75
261630100	3	BAM/T640	Military Park**	Wayne	2020	7552	220.6	214.5	159.0	120.5	10.76

* Indicates the site does not have a complete year of data.

**TIECO BAMs were switched out to T640s in the fall of 2020.

PM10 (24-hour) measured in µg /m3

Site ID	POC	Monitor	City	County	Year	# OBS	# Req.	Valid Days	% OBS	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	Wtd Arith Mean
260810020	1	GRAV	Grand Rapids	Kent	2020	59	61	58	95	28	27	26	24	8.6
261390005	1	GRAV	Jenison	Ottawa	2020	58	61	57	93	22	21	21	21	7.2
261630001	1	GRAV	Allen Park	Wayne	2020	62	61	59	97	34	27	26	23	9.6
261630015	1	GRAV	Detroit-SW	Wayne	2020	58	61	57	93	59	48	47	46	16.3
261630033	1	GRAV	Dearborn	Wayne	2020	60	61	59	97	53	49	48	47	22.9
261630033	9	GRAV	Dearborn	Wayne	2020	29	31	29	94	59	50	47	44	24.2

PM_{10} TEOM (1-hour) measured in µg/m^3

Site ID	POC	Monitor	City	County	Year	# OBS	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	Wtd. Arith. Mean
261630033	3	TEOM	Dearborn	Wayne	2020	8086	57	50	49	44	16.9

$PM_{10-2.5}$ (24-hour) measured in µg/m^3

Site ID	Monitor	City	County	Year	# OBS	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	Wtd. Arith. Mean
260810020	GRAV	Grand Rapids	Kent	2020	107	25.5	22.5	17.5	17.2	6.73
261630001	GRAV	Allen Park	Wayne	2020	102	21.3	20.9	19.9	19.2	7.15

SO_2 measured in ppb

Site ID	POC	City	County	Year	# OBS	1-hr Highest Value	1-hr 2nd Highest Value	99th %ile: 1-hr	24-hr Highest Value	24-hr 2nd Highest Value	OBS >0.5	Arith Mean
260650018	1	Lansing	Ingham	2020	8379	5.5	4.6	4.2	2.1	1.9	0	1.32
260810020	2	Grand Rapids	Kent	2020	8409	11.0	3.0	2.7	1.4	1.2	0	0.49
261150006	1	Sterling State Park	Monroe	2020	8302	8.7	7.0	6.9	2.4	2.3	0	0.59
261390011	1	West Olive	Ottawa	2020	8278	18.6	16.7	15.2	10.5	5.8	0	0.69
261470005	1	Port Huron	St. Clair	2020	8382	106.3	104.3	76.4	26.4	17.1	0	1.88
261630001	1	Allen Park	Wayne	2020	8337	18.2	17.2	14.7	3.1	2.8	0	0.49
261630015	1	Detroit-SW	Wayne	2020	8380	5437	45.3	43.3	27.0	14.6	0	2.34
261630097	1	NMH 48217	Wayne	2020	8251	24.8	21.7	17.0	3.7	3.7	0	0.60
261630098	1	DP4th	Wayne	2020	8353	31.1	28.3	17.0	4.3	4.1	0	1.14
261630099	1	Trinity	Wayne	2020	8258	21.4	18.8	16.1	9.0	6.2	0	0.71
261630100	1	Military Park	Wayne	2020	8199	40.8	36.0	32.5	13.0	12.4	0	1.61

APPENDIX B: 2020 AIR TOXICS MONITORING SUMMARY FOR METALS, VOCS, CARBONYL COMPOUNDS, PAHS, HEXAVALENT CHROMIUM & SPECIATED $PM_{2.5}$

Appendix B provides summary statistics of ambient air concentrations of various substances monitored in Michigan during 2020. At each monitoring site, air samples were taken over a 24-hour period (midnight to midnight). These air samples represent the average air concentration during that 24-hour period. The frequency of air samples collected is typically done once every 6 or 12 days. Sometimes the sampled air concentration is lower than the laboratory's analytical method detection level (MDL). When the concentration is lower than the MDL, two options are used to estimate the air concentration. The calculation of the minimum average ("Average (ND=0)") uses 0.0 $\mu g/m^3$ for a value less than the MDL. In the calculation of the maximum average ("Average (ND=MDL/2)") the MDL divided by 2 (i.e., ½ the MDL) is substituted for air concentrations less than the MDL.

Table B shows the monitoring stations and what types of air toxics were monitored at each station in 2020. The following terms and acronyms are used in **Appendix B-1** and **B-2** data tables:

- Num Obs: Number of Observations (number of daily air samples taken during the year)
- Obs>MDL: Number of daily samples above the MDL
- Average (ND=0): average air concentration in 2020, assuming daily samples below MDL were equal to 0.0 $\mu g/m^3$.
- Average (ND=MDL/2): average air concentration in 2020, assuming daily samples below MDL were equal to one half the MDL.
- MDL: Analytical MDL in units of $\mu g/m^3$
- Max1: Highest daily air concentration during 2020
- Max2: Second highest daily air concentration during 2020
- Max3: Third highest daily air concentration during 2020
- $\mu g/m^3$: Micrograms per cubic meter (1,000,000 μg = 1 g)

Table B: 2019 Toxics Sampling Sites

SITE NAME	VOC	Carbonyl	PAHs	Metals TSP	Metals PM_{10}	Speciated $PM_{2.5}$
Allen Park				x	x	x
Dearborn	x	x	x	x	x	x
Detroit-SW	x	x		x		x
Detroit-W. Jefferson				x		
Grand Rapids				x		x
Belding-Merrick St.				x		
NMH 48217				x		
Port Huron-Rural St.				x		
River Rouge		x		x		
DP4th				x		
Military Park				x		
Trinity				x		

VOC = volatile organic compound; PAHs = polycyclic aromatic hydrocarbon; TSP = total suspended particulate
PM_{10} = particulate matter with aerodynamic diameter less than 10 µm; Mn = manganese.

APPENDIX B-1 DATA TABLES

Dearborn (261630033) Concentrations in micrograms per cubic meter (µg/m3)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
1,1,2,2-Tetrachloroethane	58	1	0.00102	0.059	0.118	0.059	0	0
1,1,2-Trichloro-1,2,2-Trifluoroethane	58	58	0.529	0.529	0.0649	0.716	0.614	0.598
1,1,2-Trichloroethane	58	1	9.41E-05	0.0257	0.0523	0.0055	0	0
1,1-Dichloroethane	58	0	0	0.0215	0.0429	0	0	0
1,1-Dichloroethylene	58	0	0	0.0305	0.061	0	0	0
1,2,4-Trichlorobenzene	58	6	0.00371	0.178	0.387	0.0668	0.0468	0.043
1,2,4-Trimethylbenzene	58	58	0.389	0.389	0.0519	2.37	2.34	1.72
1,2-Dichlorobenzene	58	5	0.000611	0.0389	0.084	0.0132	0.0084	0.0078
1,2-Dichloropropane	58	6	0.00163	0.0295	0.0616	0.0185	0.0176	0.0166
1,3,5-Trimethylbenzene	58	58	0.109	0.109	0.0255	0.654	0.551	0.472
1,3-Butadiene	58	58	0.0422	0.0422	0.026	0.158	0.122	0.11
1,3-Dichlorobenzene	58	2	0.000228	0.032	0.0653	0.0078	0.0054	0
1,4-Dichlorobenzene	58	45	0.025	0.0364	0.0782	0.142	0.114	0.092
Acenaphthene (Tsp) Stp	62	53	0.00568	0.0057	0.00017	0.0343	0.0233	0.0201
Acenaphthylene (Tsp) Stp	62	60	0.000728	0.000728	1.12E-05	0.0139	0.0117	0.006
Acetaldehyde	70	70	2.02	2.02	0.0374	5.13	4.75	4.66
Acetone	70	70	3.4	3.4	0.403	16.5	13	12.4
Acetonitrile	58	58	0.497	0.497	0.0745	2.64	1.31	1.27
Acetylene	58	58	0.342	0.342	0.248	1.18	1.1	0.975
Acrolein - Verified	56	0	0			0	0	0
Acrylonitrile	57	5	0.0103	0.0228	0.0279	0.247	0.103	0.102
Anthracene (Tsp) Stp	62	62	0.000429	0.000429	2.85E-05	0.0037	0.003	0.0014
Arsenic (Tsp) Stp	92	91	0.00186	0.00186	4.76E-05	0.0085	0.0061	0.0055
Arsenic Pm10 Lc	93	93	0.00164	0.00164		0.006	0.0052	0.0034

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Arsenic Pm10 Stp	93	93	0.00166	0.00166	7.41E-05	0.006	0.0053	0.0034
Barium (Tsp) Stp	92	91	0.0241	0.0241	0.00759	0.0892	0.0735	0.0721
Barium Pm10 Lc	93	93	0.0144	0.0144		0.0688	0.0661	0.0332
Barium Pm10 Stp	93	93	0.0146	0.0146	0.00066	0.0679	0.0652	0.0327
Benzaldehyde	70	70	0.407	0.407	0.043	4.6	4.02	3.35
Benzene	58	58	0.678	0.678	0.0324	6.71	1.28	1.13
Benzo[A]Anthracene (Tsp) Stp	62	62	0.000208	0.000208	1.18E-05	0.00232	0.00193	0.0016
Benzo[A]Pyrene (Tsp) Stp	62	62	0.000174	0.000174	1.43E-05	0.0017	0.0014	0.001
Benzo[B]Fluoranthene (Tsp) Stp	60	60	0.000549	0.000549	7.12E-06	0.00564	0.00375	0.0032
Benzo[E]Pyrene (Tsp) Stp	62	62	0.000288	0.000288	5.94E-06	0.00348	0.00162	0.0014
Benzo[G,H,I]Perylene (Tsp) Stp	62	61	0.000224	0.000224	5.71E-06	0.0012	0.00096	0.0009
Benzo[K]Fluoranthene (Tsp) Stp	61	59	0.000146	0.000146	1.26E-05	0.00131	0.00068	0.0006
Beryllium (Tsp) Stp	92	91	8.70E-05	8.70E-05	3.16E-05	0.00038	0.00025	0.0002
Beryllium Pm10 Lc	93	91	2.87E-05	2.93E-05		0.00011	0.00011	0.0001
Beryllium Pm10 Stp	93	93	2.92E-05	2.92E-05	9.69E-06	0.00011	0.00011	0.0001
Bromochloromethane	58	1	0.000228	0.0315	0.0636	0.0132	0	0
Bromodichloromethane	55	0	0	0.0386	0.0771	0	0	0
Bromoform	58	45	0.0116	0.0331	0.196	0.0279	0.0248	0.0217
Bromomethane	58	58	0.0392	0.0392	0.0677	0.205	0.144	0.118
Butyraldehyde	69	69	0.466	0.466	0.0522	1.83	1.81	1.7
Cadmium (Tsp) Stp	92	91	0.000264	0.000264	2.11E-05	0.00183	0.00095	0.0009
Cadmium Pm10 Lc	93	93	0.000194	0.000194		0.00096	0.00094	0.0008
Cadmium Pm10 Stp	93	93	0.000197	0.000197	2.08E-05	0.00098	0.00098	0.0009
Carbon Disulfide	58	58	0.0598	0.0598	0.118	0.299	0.274	0.164
Carbon Tetrachloride	58	58	0.577	0.577	0.103	0.749	0.73	0.723

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Chlorobenzene	58	52	0.0256	0.0282	0.05	0.423	0.0414	0.0373
Chloroethane	58	46	0.0237	0.0282	0.0438	0.29	0.0995	0.0712
Chloroform	58	58	0.627	0.627	0.0643	1.47	1.39	0.84
Chloromethane	58	58	0.98	0.98	0.0628	1.36	1.32	1.26
Chloroprene	58	0	0	0.0241	0.0483	0	0	0
Chromium (Tsp) Stp	92	91	0.00596	0.00596	0.00167	0.0215	0.0211	0.0203
Chromium Pm10 Lc	93	93	0.00335	0.00335		0.023	0.0216	0.007
Chromium Pm10 Stp	93	93	0.00341	0.00341	0.00225	0.0238	0.0223	0.0073
Chrysene (Tsp) Stp	23	23	0.000759	0.000759	7.69E-06	0.00448	0.00312	0.0027
Cis-1,2-Dichloroethene	58	0	0	0.0275	0.0551	0	0	0
Cis-1,3-Dichloropropene	58	0	0	0.0223	0.0446	0	0	0
Cobalt (Tsp) Stp	92	91	0.00026	0.00026	3.16E-05	0.00056	0.00053	0.0005
Cobalt Pm10 Lc	93	93	0.000158	0.000158		0.00049	0.00046	0.0004
Cobalt Pm10 Stp	93	93	0.00016	0.00016	3.15E-05	0.00051	0.00048	0.0004
Copper (Tsp) Stp	92	91	0.0198	0.0198	0.00168	0.0745	0.0719	0.0695
Copper Pm10 Lc	93	93	0.0205	0.0205		0.148	0.0947	0.0749
Copper Pm10 Stp	93	93	0.0209	0.0209	0.000799	0.151	0.0976	0.0771
Coronene (Tsp) Stp	62	62	0.000104	0.000104	3.68E-06	0.000462	0.000434	0.00043
Crotonaldehyde	42	42	0.278	0.278	0.00851	1.13	0.927	0.911
Dibenzo[A,H]Anthracene (Tsp) Stp	62	38	4.13E-05	4.40E-05	1.38E-05	0.000441	0.000365	0.00027
Dibromochloromethane	58	11	0.00109	0.0579	0.14	0.0111	0.00937	0.00767
Dichlorodifluoromethane	58	58	2.12	2.12	0.0827	2.55	2.54	2.51
Dichloromethane	58	58	2.71	2.71	0.0787	11	8.89	8.27
Ethyl Acrylate	58	0	0	0.0258	0.0516	0	0	0
Ethylbenzene	58	58	0.205	0.205	0.0468	1.11	0.521	0.512
Ethylene Dibromide	58	0	0	0.0517	0.103	0	0	0
Ethylene Dichloride	58	57	0.0725	0.0729	0.0418	0.118	0.117	0.106

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Ethylene Oxide	57	50	0.223	0.232	0.147	1.05	0.726	0.602
Fluoranthene (Tsp) Stp	62	62	0.00368	0.00368	4.20E-05	0.0183	0.0145	0.0136
Fluorene (Tsp) Stp	62	62	0.00537	0.00537	8.45E-05	0.0274	0.0212	0.0198
Formaldehyde	70	70	3.26	3.26	0.0524	9.15	8.85	8.82
Freon 114	58	58	0.103	0.103	0.101	0.132	0.122	0.121
Hexachlorobutadiene	58	4	0.000736	0.0767	0.167	0.0256	0.00746	0.00533
Hexanaldehyde	67	67	0.2	0.2	0.0109	1.69	1.59	1.28
Indeno[1,2,3-Cd]Pyrene (Tsp) Stp	62	62	0.000231	0.000231	1.15E-05	0.00132	0.00122	0.00104
Iron (Tsp) Stp	92	91	1.27	1.27	0.027	5.7	4.88	3
Iron Pm10 Lc	93	93	0.696	0.696		2.22	1.94	1.8
Iron Pm10 Stp	93	93	0.706	0.706	0.0109	2.32	1.91	1.81
Lead (Tsp) Lc Frm/Fem	92	92	0.0128	0.0128		0.0978	0.0939	0.0516
Lead Pm10 Lc	93	93	0.0108	0.0108		0.11	0.102	0.0539
M/P Xylene	58	58	0.618	0.618	0.0559	3.6	1.78	1.68
Manganese (Tsp) Stp	92	91	0.0774	0.0774	0.000926	0.407	0.324	0.24
Manganese Pm10 Lc	93	93	0.0346	0.0346		0.149	0.126	0.118
Manganese Pm10 Stp	93	93	0.0351	0.0351	0.00037	0.156	0.127	0.119
Methyl Chloroform	58	47	0.0134	0.0208	0.0782	0.0338	0.0284	0.024
Methyl Ethyl Ketone	61	61	0.372	0.372	0.0853	0.746	0.687	0.675
Methyl Isobutyl Ketone	53	52	0.207	0.207	0.0614	0.635	0.586	0.5
Methyl Methacrylate	58	10	0.00439	0.0964	0.228	0.0446	0.0377	0.0373
Methyl Tert-Butyl Ether	58	6	0.00117	0.0217	0.0457	0.0209	0.0126	0.0101
Molybdenum (Tsp) Stp	92	91	0.00413	0.00413	0.000164	0.136	0.128	0.00889
Molybdenum Pm10 Lc	93	93	0.00379	0.00379		0.131	0.122	0.00817
Molybdenum Pm10 Stp	93	93	0.0039	0.0039	0.000293	0.135	0.126	0.0085
Ethylene Oxide	57	50	0.223	0.232	0.147	1.05	0.726	0.602
Naphthalene (Tsp) Stp	62	62	0.0577	0.0577	0.00176	0.152	0.143	0.137

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Nickel (Tsp) Stp	92	91	0.00272	0.00272	0.000894	0.0268	0.0259	0.00688
Nickel Pm10 Lc	93	93	0.00215	0.00215		0.0298	0.0278	0.00718
Nickel Pm10 Stp	93	93	0.00219	0.00219	0.00144	0.0308	0.0288	0.00713
N-Octane	58	58	0.105	0.105	0.104	0.432	0.265	0.258
O-Xylene	58	58	0.234	0.234	0.069	0.947	0.76	0.677
Perylene (Tsp) Stp	62	38	2.31E-05	2.61E-05	1.56E-05	0.000216	0.000191	0.00015
Phenanthrene (Tsp) Stp	62	62	0.0109	0.0109	0.000176	0.0526	0.0431	0.0391
Propionaldehyde	70	70	0.419	0.419	0.101	1.41	1.35	1.04
Propylene	58	58	0.415	0.415	0.221	1.76	1.6	1.06
Pyrene (Tsp) Stp	62	62	0.00191	0.00191	3.86E-05	0.00861	0.00749	0.00613
Styrene	58	57	0.372	0.373	0.0756	1.98	1.18	1.02
Tert-Amyl Methyl Ether	58	0	0	0.0227	0.0453	0	0	0
Tert-Butyl Ethyl Ether	58	0	0	0.0179	0.0358	0	0	0
Tetrachloroethylene	58	58	0.664	0.664	0.0864	8.55	6.92	2.64
Toluene	58	58	1.01	1.01	0.0698	4.22	3.16	2.8
Trans-1,2-Dichloroethylene	58	15	0.0025	0.0208	0.0493	0.0174	0.0155	0.0139
Trans-1,3-Dichloropropene	58	1	0.000517	0.0333	0.0667	0.03	0	0
Trichloroethylene	58	51	0.0383	0.0414	0.0514	0.155	0.0811	0.0758
Trichlorofluoromethane	58	58	1.19	1.19	0.0728	1.48	1.47	1.47
Valeraldehyde	70	70	0.149	0.149	0.0041	0.768	0.756	0.653
Vanadium (Tsp) Stp	92	91	0.00322	0.00322	6.30E-05	0.0228	0.0226	0.0105
Vanadium Pm10 Lc	93	93	0.00184	0.00184		0.0192	0.0184	0.00349
Vanadium Pm10 Stp	93	93	0.00187	0.00187	4.58E-05	0.0198	0.019	0.00365
Vinyl Chloride	58	5	0.00078	0.0181	0.0371	0.0245	0.0128	0.00332
Zinc (Tsp) Stp	92	91	0.114	0.114	0.00535	1.07	1.04	0.452
Zinc Pm10 Lc	93	93	0.0856	0.0856		1.02	0.883	0.485
Zinc Pm10 Stp	93	93	0.0877	0.0877	0.00226	1.07	0.923	0.488

Detroit-SW (W. Fort St., N. Delray-SWHS) (261630015) Concentrations in micrograms per cubic meter (µg/m³)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
1,1,2,2-Tetrachloroethane	28	0	0	0.162	0.323	0	0	0
1,1,2-Trichloroethane	28	0	0	0.0491	0.0981	0	0	0
1,1-Dichloroethane	28	0	0	0.0852	0.17	0	0	0
1,1-Dichloroethylene	28	0	0	0.0784	0.157	0	0	0
1,2,4-Trichlorobenzene	28	0	0	0.698	1.4	0	0	0
1,2,4-Trimethylbenzene	28	1	0.0218	0.171	0.309	0.61	0	0
1,2-Dichlorobenzene	28	0	0	0.185	0.37	0	0	0
1,2-Dichloropropane	28	0	0	0.55	1.1	0	0	0
1,3,5-Trimethylbenzene	28	0	0	0.12	0.24	0	0	0
1,3-Butadiene	28	0	0	0.06	0.12	0	0	0
1,3-Dichlorobenzene	28	0	0	0.143	0.286	0	0	0
1,4-Dichlorobenzene	28	0	0	0.194	0.388	0	0	0
2,2,4-Trimethylpentane	28	1	0.0186	0.0905	0.149	0.52	0	0
Acetaldehyde	30	30	2.72	2.72		4.27	4.26	4.18
Acetone	30	30	2.44	2.44		4.48	3.55	3.51
Acetonitrile	28	21	0.702	0.765	0.503	1.5	1.4	1.2
Acrolein - Unverified	30	28	0.0714	0.0765		0.134	0.114	0.108
Acrylonitrile	28	0	0	0.399	0.798	0	0	0
Arsenic (Tsp) Stp	61	61	0.00172	0.00172	4.54E-05	0.00582	0.00426	0.00322
Benzaldehyde	30	30	0.203	0.203		0.386	0.373	0.359
Benzene	28	25	0.596	0.601	0.0957	1.6	0.94	0.94
Bromodichloromethane	28	0	0	0.075	0.15	0	0	0
Bromoform	28	0	0	0.175	0.35	0	0	0

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Bromomethane	28	0	0	0.11	0.22	0	0	0
Cadmium (Tsp) Stp	61	61	0.000151	0.000151	2.02E-05	0.00035	0.00034	0.00031
Carbon Tetrachloride	28	0	0	0.115	0.23	0	0	0
Chlorobenzene	28	0	0	0.105	0.209	0	0	0
Chloroethane	28	0	0	0.06	0.12	0	0	0
Chloroform	28	1	0.0204	0.0789	0.121	0.57	0	0
Chloromethane	28	28	1.29	1.29	0.159	1.6	1.5	1.5
Cis-1,2-Dichloroethene	28	0	0	0.0641	0.128	0	0	0
Cis-1,3-Dichloropropene	28	0	0	0.0679	0.136	0	0	0
Crotonaldehyde	30	0	0			0	0	0
Dibromochloromethane	28	0	0	0.148	0.296	0	0	0
Dibromochloromethane	28	0	0	0.148	0.296	0	0	0
Dichlorodifluoromethane	28	27	2.18	2.19	0.25	2.5	2.5	2.5
Dichloromethane	28	11	0.159	0.266	0.349	0.55	0.47	0.43
Ethylbenzene	28	0	0	0.147	0.293	0	0	0
Ethylene Dibromide	28	0	0	0.15	0.3	0	0	0
Ethylene Dichloride	28	0	0	0.0984	0.197	0	0	0
Formaldehyde	30	30	2.27	2.27		5.66	4.43	4.11
Hexanaldehyde	30	30	0.165	0.165		0.352	0.339	0.335
Lead (Tsp) Lc Frm/Fem	61	61	0.00784	0.00784		0.0216	0.0206	0.0205
M/P Xylene	28	6	0.201	0.492	0.739	1.3	1	0.93
Manganese (Tsp) Stp	61	61	0.0501	0.0501	0.000883	0.246	0.177	0.155
Methacrolein	30	30	0.124	0.124		0.442	0.231	0.203
Methyl Chloroform	28	0	0	0.105	0.211	0	0	0
Methyl Ethyl Ketone	28	7	0.386	0.798	1.1	2.5	1.9	1.6

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Methyl Isobutyl Ketone	28	0	0	0.434	0.868	0	0	0
Methyl Tert-Butyl Ether	28	0	0	0.095	0.19	0	0	0
N-Hexane	28	17	0.758	0.775	0.0872	4.5	2.5	2.5
Nickel (Tsp) Stp	61	61	0.00204	0.00204	0.000852	0.00495	0.00479	0.00468
O-Xylene	28	1	0.0179	0.178	0.332	0.5	0	0
Pm10 Total 0-10um Stp	58	40	16.9	24.5		59	48	47
Propionaldehyde	30	30	0.353	0.353		0.61	0.606	0.576
Styrene	28	3	0.0939	0.439	0.773	0.89	0.88	0.86
Tetrachloroethylene	28	0	0	0.117	0.235	0	0	0
Tolualdehydes	30	18	0.048	0.0801		0.115	0.107	0.105
Toluene	28	25	0.764	0.787	0.445	2.4	1.6	1.4
Trans-1,2-Dichloroethylene	28	0	0	0.075	0.15	0	0	0
Trans-1,3-Dichloropropene	28	0	0	0.0452	0.0905	0	0	0
Trichloroethylene	28	0	0	0.0848	0.17	0	0	0
Trichlorofluoromethane	28	28	1.29	1.29	0.232	1.4	1.4	1.4
Valeraldehyde	30	30	0.223	0.223		0.42	0.39	0.359
Vinyl Chloride	28	0	0	0.065	0.13	0	0	0

Detroit-W. Jefferson, South Delray (261630027) Concentrations in micrograms per cubic meter (µg/m^3)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Arsenic (Tsp) Stp	61	61	0.00196	0.00196	4.64E-05	0.00885	0.00454	0.00451
Cadmium (Tsp) Stp	61	61	0.000242	0.000242	2.00E-05	0.00141	0.00073	0.00063
Lead (Tsp) Lc Frm/Fem	61	61	0.0106	0.0106		0.0867	0.0318	0.0225
Manganese (Tsp) Stp	61	61	0.162	0.162	0.000893	0.896	0.584	0.527
Nickel (Tsp) Stp	61	61	0.00236	0.00236	0.000862	0.00848	0.00834	0.00797

Port Huron-Rural St. (261470031), Speciated $PM_{2.5}$ (µg/m^3)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Arsenic (Tsp) Stp	92	92	0.0014	0.0014	4.53E-05	0.00796	0.00607	0.00554
Cadmium (Tsp) Stp	92	92	0.000229	0.000229	2.00E-05	0.00141	0.00114	0.00113
Lead (Tsp) Lc Frm/Fem	92	92	0.0203	0.0203		0.146	0.122	0.120
Manganese (Tsp) Stp	92	92	0.00952	0.00952	0.000882	0.0313	0.0285	0.0276
Nickel (Tsp) Stp	92	92	0.000776	0.000776	0.00085	0.00224	0.00188	0.00187

River Rouge (261630005) Concentrations in micrograms per cubic meter (µg/m^3)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Acetaldehyde	31	31	2.58	2.58		6.58	4.61	3.71
Acetone	31	31	2.67	2.67		6.3	4.5	4.34
Acrolein - Unverified	31	30	0.0934	0.0965		0.252	0.196	0.179
Arsenic (Tsp) Stp	61	61	0.00163	0.00163	4.54E-05	0.00851	0.00517	0.00479
Benzaldehyde	31	30	0.175	0.181		0.661	0.318	0.308
Cadmium (Tsp) Stp	61	61	0.000191	0.000191	2.00E-05	0.00049	0.00042	0.00039
Crotonaldehyde	31	0	0			0	0	0
Formaldehyde	31	31	3.37	3.37		7.6	6.65	6.33
Hexanaldehyde	31	31	0.17	0.17		0.515	0.507	0.35

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Lead (Tsp) Lc Frm/Fem	61	61	0.00592	0.00592		0.014995	0.013	0.0129
Manganese (Tsp) Stp	61	61	0.0318	0.0318	0.000877	0.0873	0.0871	0.0719
Methacrolein	31	31	0.154	0.154		0.444	0.437	0.337
Nickel (Tsp) Stp	61	61	0.00117	0.00117	0.000846	0.00484	0.00312	0.00237
Propionaldehyde	31	31	0.354	0.354		0.734	0.664	0.62
Tolualdehydes	31	20	0.0766	0.119		0.279	0.258	0.209
Valeraldehyde	31	30	0.174	0.18		0.419	0.364	0.355

Belding-Merrick St. (260670003) Concentrations in micrograms per cubic meter (µg/m^3)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Arsenic (Tsp) Stp	60	60	0.00159	0.00159	4.62E-05	0.0242	0.00412	0.00396
Cadmium (Tsp) Stp	60	60	9.05E-05	9.05E-05	2.00E-05	0.00071	0.00038	0.00016
Lead (Tsp) Lc Frm/Fem	60	60	0.00396	0.00396		0.0284	0.00929	0.00882
Manganese (Tsp) Stp	60	60	0.0084	0.0084	0.000886	0.0242	0.0227	0.02
Nickel (Tsp) Stp	60	60	0.000605	0.000605	0.000854	0.00152	0.00116	0.00113

NMH 48217 (261630097) Concentrations in micrograms per cubic meter (µg/m^3)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Arsenic (Tsp) Stp	61	61	0.00151	0.00151	4.46E-05	0.00867	0.00537	0.00529
Cadmium (Tsp) Stp	61	61	0.000133	0.000133	2.00E-05	0.00041	0.00031	0.00031
Lead (Tsp) Lc Frm/Fem	61	61	0.00509	0.00509		0.0207	0.0179	0.0135
Manganese (Tsp) Stp	61	61	0.0196	0.0196	0.000866	0.0611	0.0445	0.0415
Nickel (Tsp) Stp	61	61	0.00103	0.00103	0.000836	0.00271	0.00237	0.00205

DP4th (261630098) Concentrations in micrograms per cubic meter (µg/m^3)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Arsenic (Tsp) Stp	61	61	0.00141	0.00141	4.51E-05	0.00531	0.00304	0.00278

Cadmium (Tsp) Stp	61	61	0.000145	0.000145	2.00E-05	0.00037	0.00034	0.00032
Lead (Tsp) Lc Frm/Fem	61	61	0.00978	0.00978		0.104	0.0525	0.029
Manganese (Tsp) Stp	61	61	0.0435	0.0435	0.000881	0.162	0.102	0.101
Nickel (Tsp) Stp	61	61	0.00193	0.00193	0.000849	0.00527	0.00433	0.00398

Military Park (261630100) Concentrations in micrograms per cubic meter (µg/m^3)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Arsenic (Tsp) Stp	61	61	0.0019	0.0019	0.0000452	0.00828	0.00764	0.00587
Cadmium (Tsp) Stp	61	61	0.00021	0.00021	0.00002	0.00073	0.00055	0.00046
Lead (Tsp) Lc Frm/Fem	61	61	0.0156	0.0156		0.0962	0.0796	0.0687
Manganese (Tsp) Stp	61	61	0.0442	0.0442	0.000875	0.153	0.126	0.108
Nickel (Tsp) Stp	61	61	0.0016	0.0016	0.000843	0.00584	0.00344	0.00313

Trinity (261630099) Concentrations in micrograms per cubic meter (µg/m^3)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Arsenic (Tsp) Stp	61	61	0.00194	0.00194	4.43E-05	0.00768	0.00575	0.00486
Cadmium (Tsp) Stp	61	61	0.000222	0.000222	2.00E-05	0.00104	0.00053	0.00047
Lead (Tsp) Lc Frm/Fem	61	61	0.0109	0.0109		0.0541	0.0301	0.0276
Manganese (Tsp) Stp	61	61	0.0655	0.0655	0.00087	0.177	0.164	0.14
Nickel (Tsp) Stp	61	61	0.00291	0.00291	0.000839	0.00985	0.00799	0.00717

APPENDIX B-2 Data Tables

Allen Park (261630001), Speciated $PM_{2.5}$ (µg/m³)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND= MDL/2)	MDL	Max 1	Max 2	Max 3
Aluminum Pm2.5 Lc	118	87	0.026	0.026	0.0229	0.533	0.135	0.112
Ammonium Ion Pm2.5 Lc	119	119	0.52	0.52	0.0129	3.73	3	2.18
Antimony Pm2.5 Lc	118	68	0.00529	0.00529	0.016	0.0313	0.0248	0.0241
Arsenic Pm2.5 Lc	118	37	2.52E-05	3.07E-05	0.0001	0.00028	0.00027	0.00026
Barium Pm2.5 Lc	118	73	0.0147	0.0148	0.0283	0.47	0.0795	0.0505
Bromine Pm2.5 Lc	118	38	0.000544	0.000589	0.000136	0.00708	0.00637	0.00555
Cadmium Pm2.5 Lc	118	68	0.00401	0.00407	0.0137	0.0274	0.0235	0.0198
Calcium Pm2.5 Lc	118	118	0.0616	0.0616	0.00981	0.377	0.301	0.299
Cerium Pm2.5 Lc	118	55	0.00766	0.00766	0.0361	0.0499	0.0463	0.0462
Cesium Pm2.5 Lc	118	58	0.00703	0.00703	0.0271	0.047	0.0396	0.0388
Chlorine Pm2.5 Lc	119	118	0.108	0.108	0.0251	2.53	0.652	0.635
Chromium Pm2.5 Lc	118	100	0.0232	0.0232	0.00394	1.96	0.0584	0.0442
Cobalt Pm2.5 Lc	118	90	0.00218	0.00218	0.00228	0.0164	0.0147	0.0106
Copper Pm2.5 Lc	118	32	0.000253	0.000253	0.00157	0.0033	0.00319	0.00186
Ec Csn_Rev Unadjusted Pm2.5 Lc Tot	118	97	0.00767	0.00767	0.00421	0.283	0.0257	0.0256
Indium Pm2.5 Lc	121	121	0.416	0.416	0.00032	2.25	1.58	1.17
Iron Pm2.5 Lc	118	71	0.00504	0.00504	0.0147	0.0296	0.0268	0.0268
Lead Pm2.5 Lc	118	118	0.0704	0.0704	0.00845	0.229	0.221	0.218
Magnesium Pm2.5 Lc	118	90	0.00407	0.00407	0.00659	0.0164	0.0162	0.0146
Manganese Pm2.5 Lc	118	62	0.0225	0.0265	0.045	0.81	0.106	0.101
Nickel Pm2.5 Lc	118	91	0.00254	0.00254	0.00296	0.0136	0.00949	0.00918
Oc Csn_Rev Unadjusted Pm2.5 Lc Tot	118	92	0.000894	0.000894	0.00122	0.00539	0.0042	0.00402

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND= MDL/2)	MDL	Max 1	Max 2	Max 3
Phosphorus Pm2.5 Lc	121	121	1.99	1.99	0.643	10.7	5.1	4.3
Potassium Ion Pm2.5 Lc	118	101	0.000149	0.000261	0.00196	0.00439	0.00306	0.00217
Potassium Pm2.5 Lc	119	118	0.109	0.109	0.0129	8.82	0.307	0.287
Rubidium Pm2.5 Lc	118	118	0.129	0.129	0.00539	8.59	0.404	0.332
Selenium Pm2.5 Lc	118	61	0.000944	0.000956	0.00315	0.00502	0.00499	0.00491
Silicon Pm2.5 Lc	118	75	0.00126	0.00126	0.00244	0.012	0.00633	0.00502
Silver Pm2.5 Lc	118	116	0.0582	0.0582	0.0136	0.301	0.252	0.248
Sodium Ion Pm2.5 Lc	119	119	0.035	0.035	0.014	0.466	0.406	0.221
Sodium Pm2.5 Lc	118	85	0.0355	0.0355	0.0801	0.223	0.158	0.134
Strontium Pm2.5 Lc	118	79	0.00307	0.0031	0.00292	0.205	0.0111	0.00886
Sulfate Pm2.5 Lc	119	118	1.01	1.01	0.0294	8.11	4.75	2.31
Sulfur Pm2.5 Lc	118	117	0.357	0.357	0.00104	2.5	1.65	0.908
Tin Pm2.5 Lc	118	69	0.00542	0.00542	0.0155	0.023	0.0222	0.022
Titanium Pm2.5 Lc	118	106	0.00337	0.00337	0.00291	0.0453	0.00961	0.00933
Total Nitrate Pm2.5 Lc	119	118	1.53	1.53	0.0383	11.7	9.05	6.89
Vanadium Pm2.5 Lc	118	43	0.000244	0.00048	0.000708	0.00273	0.00228	0.00212
Zinc Pm2.5 Lc	118	118	0.0138	0.0138	0.00172	0.0894	0.0473	0.0391
Zirconium Pm2.5 Lc	118	65	0.00436	0.00436	0.014	0.0306	0.0259	0.0231

Dearborn (261630033), Speciated $PM_{2.5}$ ($\mu g/m^3$)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Aluminum Pm2.5 Lc	60	40	0.0218	0.0218	0.0228	0.122	0.0904	0.0856
Ammonium Ion Pm2.5 Lc	60	60	0.53	0.53	0.0129	3.56	2.32	2.28
Antimony Pm2.5 Lc	60	28	0.00281	0.00281	0.016	0.0256	0.0192	0.0107
Arsenic Pm2.5 Lc	60	16	7.57E-05	8.15E-05	0.0001	0.00337	0.00033	0.00028
Barium Pm2.5 Lc	60	30	0.00856	0.00856	0.0283	0.0441	0.0382	0.0356
Bromine Pm2.5 Lc	60	20	0.000705	0.000752	0.000135	0.00614	0.00587	0.00444
Cadmium Pm2.5 Lc	60	27	0.00352	0.00352	0.0138	0.0218	0.0212	0.0149
Calcium Pm2.5 Lc	60	60	0.0936	0.0936	0.00978	0.369	0.355	0.286
Cerium Pm2.5 Lc	60	37	0.0118	0.0118	0.0363	0.0475	0.044	0.0433
Cesium Pm2.5 Lc	60	33	0.00668	0.00668	0.027	0.0376	0.0331	0.0264
Chlorine Pm2.5 Lc	60	60	0.179	0.179	0.0251	2.56	0.523	0.49
Chromium Pm2.5 Lc	60	54	0.0261	0.0261	0.00393	0.204	0.163	0.131
Cobalt Pm2.5 Lc	59	48	0.00483	0.00483	0.00228	0.122	0.0268	0.0183
Copper Pm2.5 Lc	59	22	0.000411	0.000411	0.00159	0.00422	0.00255	0.00217
Ec Csn_Rev Unadjusted Pm2.5 Lc Tot	59	58	0.0135	0.0135	0.00424	0.0838	0.0492	0.0479
Indium Pm2.5 Lc	61	60	0.55	0.55	0.00032	1.72	1.5	1.37
Iron Pm2.5 Lc	60	33	0.00415	0.00415	0.0148	0.0267	0.0207	0.017
Lead Pm2.5 Lc	59	58	0.285	0.285	0.00843	3.29	1.75	0.781
Magnesium Pm2.5 Lc	60	51	0.00777	0.00777	0.0066	0.116	0.0439	0.0159
Manganese Pm2.5 Lc	60	50	0.00576	0.00576	0.00297	0.0233	0.0222	0.0181
Nickel Pm2.5 Lc	59	47	0.00238	0.00238	0.00122	0.0587	0.00641	0.0059
Oc Csn_Rev Unadjusted Pm2.5 Lc Tot	61	61	2.32	2.32	0.643	4.87	4.59	4.17
Phosphorus Pm2.5 Lc	60	54	0.00049	0.000556	0.00196	0.00649	0.00473	0.00431
Potassium Ion Pm2.5 Lc	60	58	0.0445	0.0445	0.0129	0.221	0.18	0.174
Potassium Pm2.5 Lc	60	60	0.0611	0.0611	0.00544	0.207	0.194	0.192

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Rubidium Pm2.5 Lc	60	25	0.00065	0.000699	0.00316	0.00385	0.00373	0.00356
Selenium Pm2.5 Lc	60	41	0.00124	0.00124	0.00243	0.0116	0.00523	0.00522
Silicon Pm2.5 Lc	60	59	0.0616	0.0616	0.0138	0.234	0.226	0.172
Silver Pm2.5 Lc	60	30	0.00463	0.00463	0.0129	0.0238	0.0214	0.0213
Sodium Ion Pm2.5 Lc	60	60	0.0492	0.0492	0.0141	0.25	0.218	0.168
Sodium Pm2.5 Lc	60	45	0.0618	0.0626	0.0805	0.488	0.223	0.173
Strontium Pm2.5 Lc	60	39	0.00105	0.00105	0.00291	0.00358	0.00358	0.00349
Sulfate Pm2.5 Lc	60	60	1.08	1.08	0.0294	2.94	2.22	2.19
Sulfur Pm2.5 Lc	60	59	0.37	0.37	0.00105	1.1	0.855	0.785
Tin Pm2.5 Lc	60	28	0.00488	0.00488	0.0155	0.0501	0.0253	0.0199
Titanium Pm2.5 Lc	60	49	0.00269	0.0027	0.00292	0.0112	0.00743	0.00734
Total Nitrate Pm2.5 Lc	60	59	1.43	1.43	0.0386	11.8	7.03	6.78
Vanadium Pm2.5 Lc	60	26	0.000628	0.000826	0.000713	0.0178	0.00211	0.00204
Zinc Pm2.5 Lc	60	59	0.0506	0.0506	0.00172	0.654	0.271	0.268
Zirconium Pm2.5 Lc	60	28	0.00352	0.00352	0.0139	0.0213	0.0181	0.0139

Detroit-SW, (W Fort St., N. Delray-SWHS) (261630015), Speciated $PM_{2.5}$ ($\mu g/m^3$)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Aluminum Pm2.5 Lc	59	47	0.0402	0.0402	0.023	0.254	0.24	0.141
Ammonium Ion Pm2.5 Lc	59	59	0.552	0.552	0.0129	4.2	2.32	2.31
Antimony Pm2.5 Lc	59	38	0.0068	0.0068	0.0159	0.0329	0.0325	0.0323
Arsenic Pm2.5 Lc	59	18	1.42E-05	1.76E-05	0.0001	0.00022	0.00007	0.00006
Barium Pm2.5 Lc	59	38	0.0108	0.0108	0.0284	0.0572	0.0477	0.0373
Bromine Pm2.5 Lc	59	28	0.000913	0.000957	0.000136	0.00513	0.00448	0.00418
Cadmium Pm2.5 Lc	59	32	0.00382	0.00382	0.0137	0.0215	0.0187	0.0177
Calcium Pm2.5 Lc	59	59	0.204	0.204	0.00984	1.87	1.55	1.35
Cerium Pm2.5 Lc	59	32	0.00873	0.00873	0.0362	0.0527	0.0333	0.0321
Cesium Pm2.5 Lc	59	31	0.00816	0.00816	0.0271	0.0596	0.0355	0.032
Chloride Pm2.5 Lc	59	59	0.198	0.198	0.0254	1.48	1.04	0.928
Chlorine Pm2.5 Lc	59	54	0.0285	0.0285	0.00391	0.561	0.157	0.136
Chromium Pm2.5 Lc	59	42	0.00171	0.00173	0.00229	0.0139	0.00851	0.0078
Cobalt Pm2.5 Lc	59	18	0.000167	0.000178	0.00158	0.00136	0.00116	0.00113
Copper Pm2.5 Lc	59	59	0.0123	0.0123	0.00423	0.0658	0.0288	0.0277
Ec Csn_Rev Unadjusted Pm2.5 Lc Tot	58	58	0.526	0.526	0.00032	1.19	1.12	1.11
Indium Pm2.5 Lc	59	35	0.00463	0.00463	0.0148	0.0229	0.0163	0.0162
Iron Pm2.5 Lc	59	59	0.133	0.133	0.00846	0.627	0.535	0.411
Lead Pm2.5 Lc	59	49	0.00558	0.00558	0.0066	0.0255	0.0214	0.0203
Magnesium Pm2.5 Lc	59	37	0.0266	0.0295	0.045	0.223	0.223	0.12
Manganese Pm2.5 Lc	59	49	0.00476	0.00476	0.00298	0.0249	0.0245	0.0204
Nickel Pm2.5 Lc	59	44	0.000964	0.000964	0.00122	0.00654	0.00385	0.00286
Oc Csn_Rev Unadjusted Pm2.5 Lc Tot	58	58	2.26	2.26	0.644	4.92	4.38	4.32
Phosphorus Pm2.5 Lc	59	54	0.000357	0.000409	0.00196	0.00577	0.00375	0.00206

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Potassium Ion Pm2.5 Lc	59	59	0.0374	0.0374	0.0129	0.214	0.168	0.135
Potassium Pm2.5 Lc	59	59	0.0658	0.0658	0.00541	0.379	0.19	0.189
Rubidium Pm2.5 Lc	59	29	0.000877	0.000877	0.00316	0.00558	0.00504	0.00461
Selenium Pm2.5 Lc	59	39	0.00114	0.00114	0.00244	0.00553	0.00482	0.00453
Silicon Pm2.5 Lc	59	59	0.129	0.129	0.0136	0.92	0.916	0.522
Silver Pm2.5 Lc	59	29	0.00362	0.00362	0.0128	0.0216	0.0159	0.0146
Sodium Ion Pm2.5 Lc	59	59	0.0279	0.0279	0.0141	0.125	0.0839	0.0709
Sodium Pm2.5 Lc	59	42	0.0426	0.0426	0.0803	0.42	0.171	0.163
Strontium Pm2.5 Lc	59	37	0.00191	0.00191	0.00292	0.0109	0.00845	0.00778
Sulfate Pm2.5 Lc	59	59	1.11	1.11	0.0294	2.91	2.43	2.29
Sulfur Pm2.5 Lc	59	59	0.401	0.401	0.00105	1.01	0.988	0.925
Tin Pm2.5 Lc	59	35	0.00486	0.00486	0.0156	0.0311	0.0199	0.0192
Titanium Pm2.5 Lc	59	47	0.00399	0.00399	0.00292	0.0258	0.0209	0.0117
Total Nitrate Pm2.5 Lc	59	59	1.37	1.37	0.0385	11.6	6.67	6.18
Vanadium Pm2.5 Lc	59	29	0.000383	0.000573	0.000718	0.00234	0.00177	0.00151
Zinc Pm2.5 Lc	59	59	0.0201	0.0201	0.00172	0.0995	0.0646	0.0638
Zirconium Pm2.5 Lc	59	30	0.00324	0.00324	0.014	0.0172	0.0142	0.0141

Grand Rapids (260810020), Speciated $PM_{2.5}$ (µg/m³)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Aluminum Pm2.5 Lc	121	66	0.0146	0.0146	0.0322	0.146	0.142	0.134
Ammonium Ion Pm2.5 Lc	121	120	0.686	0.686	0.00692	4.44	4.23	3.56
Antimony Pm2.5 Lc	121	69	0.00517	0.00517	0.0388	0.0333	0.0289	0.0256
Arsenic Pm2.5 Lc	121	56	0.0000193	0.000165	0.00186	0.00011	0.00011	0.00011
Barium Pm2.5 Lc	121	71	0.0111	0.0111	0.0801	0.132	0.0759	0.0643
Bromine Pm2.5 Lc	121	27	0.000379	0.00215	0.00454	0.00651	0.00518	0.00514
Cadmium Pm2.5 Lc	121	70	0.00465	0.00465	0.0158	0.0248	0.0246	0.0242
Calcium Pm2.5 Lc	121	121	0.0298	0.0298	0.00885	0.162	0.0926	0.0876
Cerium Pm2.5 Lc	121	61	0.0119	0.0119	0.0954	0.0644	0.0593	0.0583
Cesium Pm2.5 Lc	114	65	0.00807	0.00807	0.0271	0.053	0.0373	0.0369
Chloride Pm2.5 Lc	113	113	0.116	0.116	0.0249	4.3	0.279	0.267
Chlorine Pm2.5 Lc	114	89	0.0319	0.0319	0.00389	3.04	0.242	0.0271
Chromium Pm2.5 Lc	111	81	0.00167	0.00167	0.00229	0.0172	0.0106	0.00803
Cobalt Pm2.5 Lc	111	35	0.000269	0.000269	0.00158	0.00383	0.00309	0.0024
Copper Pm2.5 Lc	111	91	0.00706	0.00706	0.0041	0.366	0.0705	0.0195
Ec Csn_Rev Unadjusted Pm2.5 Lc Tot	111	111	0.386	0.386	0.00032	1.55	1.53	1.15
Indium Pm2.5 Lc	114	64	0.00533	0.00541	0.0146	0.0237	0.0228	0.0222
Iron Pm2.5 Lc	111	111	0.0553	0.0553	0.00839	0.191	0.172	0.15
Lead Pm2.5 Lc	114	70	0.00356	0.00356	0.00659	0.0334	0.0169	0.0149
Magnesium Pm2.5 Lc	114	61	0.0275	0.0322	0.0452	1.21	0.108	0.0932
Manganese Pm2.5 Lc	114	86	0.00221	0.00221	0.00296	0.0127	0.00965	0.00842
Nickel Pm2.5 Lc	111	86	0.000768	0.000773	0.00121	0.00411	0.00348	0.00288
Oc Csn_Rev Unadjusted Pm2.5 Lc Tot	111	111	2.17	2.17	0.638	8.59	5.98	5.75
Phosphorus Pm2.5 Lc	114	101	0.000265	0.000338	0.00203	0.00679	0.00611	0.0046

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Potassium Ion Pm2.5 Lc	113	113	0.173	0.173	0.0129	14.4	0.776	0.284
Potassium Pm2.5 Lc	114	114	0.166	0.166	0.00544	11.9	0.747	0.357
Rubidium Pm2.5 Lc	114	65	0.00117	0.00117	0.00317	0.00874	0.00854	0.00628
Selenium Pm2.5 Lc	114	70	0.00088	0.00088	0.00247	0.00495	0.00454	0.00406
Silicon Pm2.5 Lc	114	101	0.0376	0.0376	0.0139	0.231	0.221	0.131
Silver Pm2.5 Lc	114	69	0.00419	0.00419	0.0128	0.0259	0.0225	0.0221
Sodium Ion Pm2.5 Lc	113	112	0.0193	0.0193	0.014	0.0892	0.0844	0.0754
Sodium Pm2.5 Lc	114	82	0.0362	0.0362	0.0791	0.29	0.213	0.143
Strontium Pm2.5 Lc	114	76	0.00346	0.00346	0.00292	0.244	0.00847	0.00608
Sulfate Pm2.5 Lc	113	113	0.982	0.982	0.0292	13.1	3.57	2.5
Sulfur Pm2.5 Lc	114	114	0.331	0.331	0.00102	3.63	1.23	0.95
Tin Pm2.5 Lc	114	58	0.00498	0.00498	0.0155	0.029	0.0249	0.0236
Titanium Pm2.5 Lc	114	98	0.00387	0.00387	0.00292	0.0572	0.0199	0.0172
Total Nitrate Pm2.5 Lc	113	113	1.44	1.44	0.0388	7.89	6.65	6.26
Vanadium Pm2.5 Lc	114	25	0.000113	0.000382	0.000697	0.00346	0.00144	0.00102
Zinc Pm2.5 Lc	114	114	0.0153	0.0153	0.00173	0.416	0.0414	0.0359
Zirconium Pm2.5 Lc	114	64	0.00401	0.00401	0.014	0.027	0.0227	0.0165

APPENDIX C - SUMMARY

Appendix C summarizes the development of the NAAQS and how compliance with these standards is determined. Also included is the variety of monitoring techniques, requirements used to ensure quality data is obtained, and a history of NAAQS changes that have occurred since the inceptions of the CAA.

National Ambient Air Quality Standards (NAAQS)

Under Section 109 of the CAA, the USEPA established a primary and secondary NAAQS for each pollutant for which air quality criteria have been issued. The primary standard is designed to protect the public health with an adequate margin of safety, including the health of the most susceptible individuals in a population, such as children, the elderly, and those with chronic respiratory ailments. Factors in selecting the margin of safety for the primary standard include the nature and severity of the health effects involved and the size of the sensitive population at risk. Secondary standards are chosen to protect public welfare (personal comfort and well-being) and the environment by limiting economic damage, impacts on visibility and climate, and harmful effects on soil, water, crops, vegetation, wildlife, and buildings.

In addition, the NAAQS have various averaging times to address health impacts. Short averaging times reflect the potential for acute (immediate) effects, whereas long-term averaging times are designed to protect against chronic (long-term) effects.

NAAQS have been established for CO, Pb, NO_2, PM, O_3, and SO_2. **Table C1.1** lists the primary and secondary NAAQS, averaging time and concentration level for each criteria pollutant in effect in 2018. The concentrations are listed as parts per million (ppm), micrograms per cubic meter (µg/m^3), and/or milligrams per cubic meter (mg/m^3).

Table C1.1:

Pollutant	Primary (health) Level	Primary Averaging Time	Secondary (welfare) Level	Secondary Averaging Time
Carbon Monoxide (CO) 8-hour average	9 ppm (10 mg/m^3)	8-hour average, not to be exceeded more than once per year *(1971)*	None*	None*
Carbon Monoxide (CO) 1-hour average	35 ppm (40 mg/m^3)	1-hour average, not to be exceeded more than once per year *(1971)*	None*	None*
Lead (Pb)	0.15 µg/m^3	Maximum rolling 3-month average *(2008)*	Same as Primary	Same as Primary
Nitrogen Dioxide (NO_2) Annual mean	0.053 ppm (100 µg/m^3)	Annual mean *(1971)*	Same as Primary	Same as Primary
Nitrogen Dioxide (NO_2) 1-hour average	0.100 ppm	98th percentile of 1-hour average, averaged over 3 years *(2010)*	Same as Annual	Same as Annual
Particulate Matter (PM_{10})	150 µg/m^3	24-hour average, not to be exceeded more than once per year over 3 years *(1987)*	Same as Primary	Same as Primary
Particulate Matter ($PM_{2.5}$) Annual average	12.0 µg/m^3	Annual mean averaged over 3 years *(2012)*	15.0 µg/m^3	Annual mean
Particulate Matter ($PM_{2.5}$) 24-hour average	35 µg/m^3	98th percentile of 24-hour concentration, averaged over 3 years *(2006)*	Same as Primary	Same as Primary
Ozone (O_3)	0.070 ppm	Annual 4th highest 8-hour daily max averaged over 3 years *(2015)*	Same as Primary	Same as Primary
Sulfur Dioxide (SO_2)	0.075 ppm	99th percentile of 1-hour daily max averaged over 3 years *(2010)*	0.5 ppm	3 hours

*In 1985, the USEPA revoked the secondary standard for CO (for public welfare) due to a lack of evidence of adverse effects on public welfare at or near ambient concentrations.

To demonstrate compliance with the NAAQS, the USEPA has defined specific criteria for each pollutant, which are summarized in **Table C1.2.**

Table C1.2: Criteria for the Determination of Compliance with the NAAQS

Pollutant	Criteria for Compliance
CO	Compliance with the CO standard is met when the second highest, non-overlapping, 35 ppm, 1-hour average standard and/or the 9 ppm, 8-hour average standard is not exceeded more than once per year.
Pb	Compliance with the Pb standard is met when daily values collected for three consecutive months are averaged and do not exceed the 0.15 µg/m^3 standard.
NO_2	Compliance is met when the annual arithmetic mean concentration does not exceed the 0.053 ppm standard and the 98th percentile* of the daily maximum 1-hour concentration averaged over 3 years does not exceed 100 ppb.
PM_{10}	The 24-hour PM_{10} primary and secondary standards are met when 150 µg/m^3 is not exceeded more than once per year on average over 3 years.
$PM_{2.5}$	The annual $PM_{2.5}$ primary and secondary standards are met when the annual arithmetic mean concentration is less than or equal to 12 µg/m^3 and 15 µg/m^3, respectively. The 24-hour $PM_{2.5}$ primary and secondary standards are met when the 3-year average of the 98th percentile** 24-hour concentration is less than or equal to 35 µg/m^3.
O_3	The 8-hour O_3 primary and secondary standards are met when the 3-year average of the 4th highest daily maximum 8-hour average concentration is less than or equal to 0.070 ppm.
SO_2	To determine compliance, the 99th percentile*** 1-hour concentration averaged over a 3-year period does not exceed 0.075 ppm, and the 3-hour average concentration shall not exceed 0.5 ppm more than once per calendar year.

**98th percentile daily maximum 1-hour value* is the value below which nominally 98 percent of all daily maximum 1-hour concentration values fall, using the ranking and selection method specified in section 5.2 of appendix S of CFR Part 50.

** *98th percentile* is the daily value out of a year of $PM_{2.5}$ monitoring data below which 98 percent of all daily values fall using the ranking and selection method specified in section 4.5(a) of appendix N of CFR Part 50.

*** *99th percentile daily maximum 1-hour value* is the value below which nominally 99 percent of all daily maximum 1-hour concentration values fall, using the ranking and selection method specified in section 5 of appendix T of CFR Part 50.

As part of the USEPA's grant to EGLE, the AQD provides an annual Network Review document[14] of all monitoring data collected from the previous year and recommendations on any network changes. These recommendations are based on each monitor's exceedance history, changes in population distribution, and modifications to federal monitoring requirements under the CAA. Under the amended air monitoring regulations that began in 2007, states are required to solicit public comment (in May of each year) on their future air monitoring network design prior to submitting the annual review to the USEPA in July.

[14] Most recent Network Reviews

Types of Monitors

Federal Reference Method (FRM): method of sampling and analyzing the ambient air for an air pollutant that USEPA uses as the "gold standard" for measuring that pollutant. FRM monitors are used to designate attainment/nonattainment areas. The gaseous pollutants CO, NO_2, O_3, and SO_2 are measured with continuous FRM monitors that provide real-time hourly data. The FRM for PM and Pb requires a filter that measure concentrations over a 24-hour period. These filters must be further analyzed in a laboratory; therefore, the samples results are delayed.

Rural background monitors: measure background air quality in non-urban areas

Aethalometers: measure carbon black, a combustion by-product typical of transportation sources, by concentrating particulate on a filter tape and measuring changes in optical transmissivity and absorption.

EC/OC instruments measure elemental carbon using pyrolysis coupled with a nondispersive infrared detector to separate the elemental and organic carbon fractions.

Federal Equivalent Method (FEM): method for measuring the concentration of an air pollutant in the ambient air that has been designated as equivalent to the FRM.

Continuous Monitors: measure data in real-time, meaning concentrations of the air pollutant are usually available within an hour on the MIair website.

TEOM: tapered element oscillating monitors (TEOMs) are continuous PM monitor that is used only for real-time data indications since they are not FEMs and cannot be used for attainment/nonattainment designations.

BAM: Beta attenuation monitors (BAMs) are real-time, continuous PM2.5 monitor that is FEM, thus can be used for attainment/nonattainment designation.

T640: A continuous PM2.5 monitor that uses a light scattering technique to measure particulates. This FEM method can be used for attainment/nonattainment designation.

T640X: A continuous monitor that measures PM2.5, PM10 and PM coarse that uses a light scattering technique to measure particulates. This FEM method can be used for attainment/nonattainment designation.

$PM_{2.5}$ FRM Monitoring: The concentrations of $PM_{2.5}$ measured over a 24-hour time period are determined using the filter-based gravimetric FRM. Data generated by the FRM monitors are used for comparisons to the NAAQS in Michigan. The sites are located in urban, commercial, and residential areas where people are exposed to $PM_{2.5}$.

Chemical Speciation Monitoring: Speciated monitoring provides a better understanding of the chemical composition of $PM_{2.5}$ material and better characterizes background levels. Single event Met-One Speciation Air Sampling System (SASS) monitors are used throughout Michigan's speciation network.

National Air Toxics Trend Station (NATTS): Network developed to fulfill the need for long-term hazardous air pollutants (HAPs) monitoring data of consistent quality. Among the principal objectives are assessing trends and emission reduction program effectiveness, assessing and verifying air quality models.

NCore Network: Began January 1, 2011, as part of the USEPA's 2006 amended air monitoring requirements. National Core (NCore) sites provide a full suite of measurements at one location. NCore stations collect the following measurements: ozone, SO2 (trace), CO (trace), NOY (reactive oxides of nitrogen), PM2.5 FRM, continuous PM2.5, speciated PM2.5, wind speed, wind direction, relative humidity, and ambient temperature. In addition, filter-based measurements are required for PM coarse (PM10-2.5) on a once every three-day sampling frequency. This information will support scientific studies ranging across technological, health, and atmospheric process disciplines. Michigan has two NCore sites; Allen Park and Grand Rapids.

Near-road Monitoring Network: Focuses on vehicle emissions and how they disperse near-roadways, was approved by USEPA in 2011. This network, now referred to as the near-roadway network, is focused on high traffic urban roads in Core-Based Statistical Areas (CBSAs) with more than one million people.

Population-Oriented Monitors: Monitors that are located in an area where many people live, also considered ambient air.

Transport monitors: Measure air pollutants that that have travelled a distance from the emission sources and are formed in the atmosphere when certain pollutants are present, like ozone.

Source-Oriented/Point-Source Monitors: Monitors that are located near a specific emissions source (e.g., factory) of a pollutant.

Primary Monitor: Data from these monitors are used to compare to the NAAQS and must meet quality assurance criteria.

Secondary/Precision/Collocated Monitor: Two or more air samplers, analyzers, or other instruments that are operated simultaneously while located side by side. These are used for quality assurance purposes.

Urban Scale Monitors: Measures air pollution concentrations in more populated urban areas.

Quality Assurance

The AQD's Air Monitoring Unit (AMU) ensures that all data collected and reported is of high quality and meets federal requirements. The AMU has a quality system in place that includes a Quality Assurance Project Plan (QAPP), standard operating procedures (SOPs), standardized forms and documentation policies, and a robust audit and assessment program.

The monitoring network adheres to the requirements in Title 40 of the Code of Federal Regulations (CFR), Parts 50, 53, and 58. This ensures that the monitors are correctly sited, operated in accordance with the Federal Reference Methods, and adhere to the quality assurance requirements.

Quality assurance checks are conducted by site operators at the frequencies required in the regulations and unit procedures. Independent audits are conducted by the AMU's Quality Assurance (QA) Team, which has a separate reporting line of supervision. The quality assurance checks and audits are reported to the USEPA each quarter.

External audits are conducted annually by the USEPA. The USEPA conducts Performance Evaluation Program (PEP) audits for $PM_{2.5}$ samplers and the National Performance Audit Program (NPAP) checks for the gaseous monitors. The USEPA also conducts program-wide Technical Systems Audits (TSAs) 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 certain analytical techniques using performance evaluation samples.

Historical NAAQS Changes

CO

1971 1-hour: Second highest average does not exceed 35 in a year

8-hour: Second highest average does not exceed 9 ppm in a year.

Lead

1978 Calendar quarter values averaged does not exceed 1.5 µg/m^3

2008 3-month values averaged does not exceed 0.15 µg/m^3

NO_2

1971 Annual average of 53 ppb or less

2010 98th percentile of the 1-hour concentration averaged over 3 yrs. is 100 ppb or less

Ozone

1971 Total photochemical oxidants: 1-hour max of 0.08 ppm not exceeded once per yr

1979 1-hour: 1-hour maximum concentration is 0.12 ppm one or less hour per yr

1997 8-hour: 4th highest daily maximum 8-hour concentration averaged over 3 yrs. is 0.08 ppm or less

2008 8-hour: 4th highest daily maximum 8-hour concentration averaged over 3 yrs. is 0.075 ppm or less

2015 8-hour: 4th highest daily maximum 8-hour concentration averaged over 3 yrs. is 0.070 ppm or less

PM

1971 TSP: 24-hour average not to exceed 260 µg/m^3 more than once per yr

Annual geometric mean of 75 µg/m^3

1987 PM_{10}: Indicator for PM changed from TSP to PM10

24-hour average not to exceed 150 µg/m^3 more than once per yr over a 3-yr period

Annual mean of 50 µg/m^3 or less average over 3 yrs.

1997 $PM_{2.5}$: Annual mean of 15.0 µg/m^3 or less average over 3 yrs.

98th percentile of 24-hour average of 65 µg/m^3 or less averaged over 3 yrs.

2006 PM_{10}: Annual average revoked

24-hour average retained

$PM_{2.5}$: Annual mean retained

98th percentile of 24-hour average of 35 µg/m^3 or less averaged over 3 yrs.

2012 $PM_{2.5}$: Annual mean of 12.0 µg/m^3 or less average over 3 yrs.

SO_2

1971 24-Hour concentration of 0.14 ppm not exceeded more than once per year

Annual average of 0.03 ppm or less.

2010 1-hour average of 99th percentile is 75 ppb or less, averaged over 3 yrs.

Previous standards revoked

APPENDIX D: ACRONYMS AND THEIR DEFINITIONS

> .... Greater than
< .... Less than
≥ .... Greater than or equal to
≤ .... Less than or equal to
%........................ Percent
$\mu g/m^3$ .... Micrograms per cubic meter
µm...................... Micrometer
AIRS ID............. Aerometric Information Retrieval System Identification Number
AMU .... Air Monitoring Unit
AQD .... Air Quality Division
AQES................. Air Quality Evaluation Section
AQI .... Air Quality Index
AQS................... Air Quality System (EPA air monitoring data archive)
As .... Arsenic
BAM................... Beta Attenuation Monitor (hourly $PM_{2.5}$ measurement monitor)
BC .... Black Carbon
BTEX .... Benzene, Toluene, Ethylbenzene and Xylene
CAA .... Clean Air Act
CBSA................. Core-Based Statistical Area
Cd .... Cadmium
CFR .... Code of Federal Regulations
CO .... Carbon monoxide
CSA .... Consolidated Statistical Area
DW .... Downwind
EC/OC.............. Elemental carbon/Organic carbon
EGLE.................. Michigan Department of Environment, Great Lakes and Energy
FDMS................. Filter Dynamic Measurement System
FEM.................... Federal Equivalent Method
FIA...................... Family Independence Agency
FR .... Federal Register
FRM .... Federal Reference Method
GHIB.................. Gordie Howe International Bridge
HAP .... Hazardous Air Pollutant
hr .... Hour
Lc........................ Local Conditions

MASN .... Michigan Air Sampling Network
MDL .... Method Detection Limit
mg/m^3 .... Milligrams per meter cubed
MI .... Michigan
MiSA .... Micropolitan Statistical Area
Mn .... Manganese
MSA .... Metropolitan Statistical Area
NAAQS .... National Ambient Air Quality Standard
NAMS .... National Air Monitoring Station
NATTS .... National Air Toxics Trend Sites
NCore .... National Core Monitoring Sites
ND .... Non-detect
NEI .... National Emission Inventory
Ni .... Nickel
NMH 48217 ... New Mount Hermon 48217 ZIP code monitoring site
NO .... Nitric Oxide
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
NR .... Near Road
O_3 .... Ozone
Obs/OBS .... Observations
PAMS .... Photochemical Assessment Monitoring Station
PAH .... Polynuclear Aromatic Hydrocarbon
Pb .... Lead
PBT .... Persistent, Bioaccumulative and Toxic
PCB .... Polychlorinated Biphenyls
PEP .... Performance Evaluation Program
PM .... Particulate Matter
$PM_{2.5}$ .... Particulate Matter with an aerodynamic diameter less than or equal to 2.5 microns
PM_{10} .... Particulate Matter with a diameter of 10 microns or less
$PM_{10-2.5}$ .... Coarse PM equal to the concentration difference between PM_{10} and $PM_{2.5}$
PNA .... Polynuclear Aromatic Hydrocarbons
POC .... Parameter Occurrence Code
ppb .... Parts Per Billion
ppm .... Parts Per Million = mg/kg, mg/L, µg/g (1 ppm = 1,000 ppb)
QA .... Quality Assurance
QAPP .... Quality Assurance Project Plan

SASS.................. Speciation Air Sampling System ($PM_{2.5}$ Speciation Sampler)
SO_2 .... Sulfur Dioxide
SOP .... Standard Operating Procedures
STN.................... Speciation Trend Network ($PM_{2.5}$)
Stp .... Standard Temperature and Pressure
SVOC................ Semi-Volatile Compound
SW .... Southwest
SWHS............... Southwestern High School
TAC.................... Toxic Air Contaminant
TEOM................ Tapered element oscillating microbalance (hourly $PM_{2.5}$ measurement monitor)
tpy .... Ton per year
TRI...................... Toxic Release Inventory
TSA .... Technical Systems Audit
TSP..................... Total Suspended Particulate
US .... United States
USEPA............... United States Environmental Protection Agency
UV...................... Ultra-violet
VOC .... Volatile Organic Compounds

ACKNOWLEDGMENTS

This publication was prepared utilizing information provided by the Air Quality Evaluation Section (AQES) and other staff of the Michigan Department of Environment, Great Lakes, and Energy; Air Quality Division. Copies can be obtained online at: Michigan.gov/Air, under "Monitoring," then "Annual Air Quality Reports," or call 517-284-6747 to request a hard copy.

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The Air Quality Division also wishes to acknowledge the many significant contributions of Mitch Toonstra of the **City of Grand Rapids, Air Pollution Control Division**, which operates and maintains air monitoring equipment in West Michigan.

EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

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MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

AIR QUALITY ANNUAL REPORT

2020

Michigan Department of Environment, Great Lakes, and Energy
Michigan.gov/EGLE | 800-662-9278

Air Quality Annual Report

2020

EXECUTIVE SUMMARY

This report gives an overview of the air quality for 2020. Current data for Michigan can be found on MIair (deqmiair.org) and Air Quality alerts can be delivered directly to email by signing up for the Michigan EnviroFlash program (http://miair.enviroflash.info/). Data in this report are collected by the Michigan Department of Environment, Great Lakes, and Energy (EGLE).

The federal Clean Air Act (CAA) requires the United States Environmental Protection Agency (USEPA) to establish National Ambient Air Quality Standards (NAAQS) for six criteria pollutants considered harmful to public health and the environment.

The six pollutants monitored by EGLE, Air Quality Division (AQD) are:

1. Carbon monoxide (CO)
2. Lead (Pb)
3. Nitrogen dioxide (NO_2)
4. Ozone (O_3)
5. Particulate matter smaller than 10 and 2.5 microns in diameter (PM_{10} and $PM_{2.5}$, respectively)
6. Sulfur dioxide (SO_2)

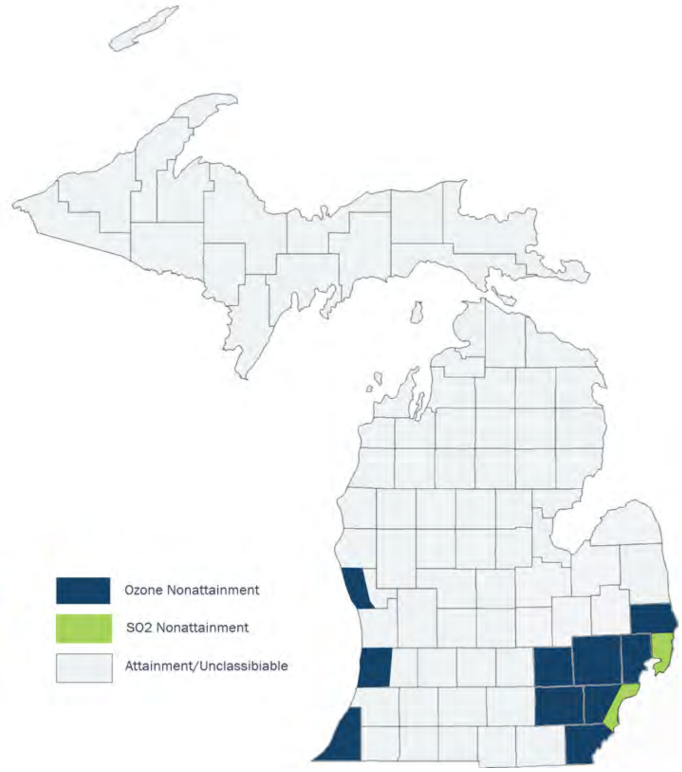
EGLE has established a network of more than 40 monitoring sites throughout the state that monitor for one or more of the criteria pollutants (Figure 1.1 and Table 1.2).

Congress passed the CAA in 1970; however, Michigan has had a long-standing history of environmental awareness well before the Act was established. In 1887, Detroit was the first city in Michigan to adopt an air quality ordinance, which declared that the dense smoke from burning coal was a public nuisance.

The USEPA reviews the criteria pollutant standards every five years. Over time, based upon health data, the standards have been tightened to better protect public health (see Appendix C). Areas that meet the NAAQS are considered in "attainment." Locations where air pollution levels persistently exceed the NAAQS may be designated as "nonattainment." The tightening standards are why some areas in the state may be designated to nonattainment from attainment even though monitoring shows that air quality continues to improve.

Since EGLE began monitoring in the early 1970s, criteria pollutant levels have continually decreased (see Chap. 2-7). The air is much cleaner today than when the CAA began. The entire state of Michigan is in attainment for CO, Pb, NO_2, and particulate matter. Although portions of the state are in nonattainment for SO_2 and O_3, as illustrated in the figure, levels of these pollutants are still decreasing. The NAAQS levels have also decreased recently, which prompted these nonattainment areas. EGLE is currently working on State Implementation Plans (SIPs) to reduce pollutants further and bring the entire state into attainment for SO_2 and ozone.

Attainment Status for the National Ambient Air Quality Standards



Several changes to the monitoring network occurred during 2020.

- The TSPs were shut down at Allen Park and Grand Rapids since they were no longer required for NCore sites (Chap. 7).
- Several changes were made to the $PM_{2.5}$ network, exchanging Federal Reference Method (FRM) manual filter-based monitors and/or non-regulatory continuous monitors for continuous, federal equivalent method (FEM) monitors due to funding changes. Sites that were affected were Eliza Howell-Near Road (Eliza Howell-NR), Bay City, Holland, Kalamazoo, Lansing, Port Huron, and New Haven. Several of these changes occurred at the end of 2020 and data will not be available until the 2021 report (Chap. 7).
- $PM_{2.5}$, PM_{10} and PM coarse measurements at Allen Park, Grand Rapids, and Jenison were switched to T640X instruments that accomplish the same measurements with one instrument.
- The Livonia-Near Road (Livonia-NR) monitor is in the process of moving since site access was lost in July 2019.
- The NOx monitor at Detroit-E 7 Mile was switched to an NOy and a NOx monitor was added to Jenison.
- Sampling continues for the Gordie Howe International Bridge (GHIB) project special study.
- The Detroit-W. Fort St. site name is being changed to Detroit-Southwest (Detroit-SW).

TABLE OF CONTENTS

INTRODUCTION

Air quality regulations in Michigan are based on National Ambient Air Quality Standards (NAAQS) established by United States Environmental Protection Agency (USEPA) based on the federal Clean Air Act (CAA). The NAAQS designates six criteria pollutants considered harmful to public health and the environment. The USEPA must describe the characteristics and potential health and welfare effects for these criteria pollutants. These standards define the maximum permissible concentration of criteria pollutants in the air (see Table 1.1).

The Michigan Department of Environment, Great Lakes, and Energy (EGLE), Air Quality Division (AQD) monitors the six criteria pollutants, which are:

- Carbon monoxide (CO);
- Lead (Pb);
- Nitrogen dioxide (NO_2);
- Ozone (O_3);
- Particulate matter smaller than 10 and 2.5 microns in diameter (PM_{10} and $PM_{2.5}$, respectively); and
- Sulfur dioxide (SO_2).

Chapters 2 through **7** provide information on each of the six criteria pollutants and include:

- Michigan's monitoring requirements for 2020;
- Attainment / nonattainment status;
- Monitoring site locations (tables and maps show all the monitors active in 2020); and
- Air quality trends from 2015-2020 broken down by location.[1]

The 2020 data for each criteria pollutant is available in **Appendix A.** COVID-19 did not impact air quality data collection in Michigan.

The AQD also monitors air toxics. Air toxics are other hazardous air pollutants that can affect human health and the environment.[2] This data can be found in **Appendix B.**

The purpose of this report is to provide a snapshot of Michigan's 2020 air quality data, air quality trends, overview of the monitoring network (available in much greater detail in the 2020 Network Review),[3] air toxics monitoring program, and other AQD programs, such as MIair and the Emissions Inventory.[4]

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1 Air quality trends are based on actual statewide monitored readings, which are also listed in the USEPA's Air Quality Subsystem Quick Look Report Data at www3.epa.gov/airtrends/ .

2 An Overview of Michigan Air Toxic Rules is available on the AQD website at www.michigan.gov/air (select "Permits," then "Toxics Laws and Rules.")

3 Available online at Michigan's 2020 Ambient Air Monitoring Network Review

4 Online information about criteria pollutants and air toxics, along with this and previous Annual Air Quality Reports, are available via the AQD's website at www.michigan.gov/air (select "Monitoring.")

CHAPTER 1: BACKGROUND INFORMATION

This section summarizes the development of the NAAQS (see **Appendix C** for further details) and how compliance with these standards is determined. Also included is an overview of Michigan's air sampling network, attainment status of the state, and information on MIair and the Air Quality Index (AQI).

National Ambient Air Quality Standards (NAAQS)

Under the CAA, the USEPA established a primary and secondary NAAQS for each criteria pollutant. The primary standard is designed to protect public health with an adequate margin of safety, including the health of the most susceptible individuals in a population, such as children, the elderly, and those with chronic respiratory ailments. Secondary standards are chosen to protect public welfare (personal comfort and well-being) and the environment.

In addition, the NAAQS have various averaging times to address health impacts. Short averaging times reflect the potential for acute (immediate) effects, whereas long-term averaging times are designed to protect against chronic (long-term) effects.

NAAQS have been established for CO, Pb, NO_2, PM, O_3, and SO_2. **Table 1.1** lists the primary and secondary NAAQS, averaging time, and concentration level for each criteria pollutant in effect in 2020. The concentrations are listed as parts per million (ppm), micrograms per cubic meter ($\mu g/m^3$), and/or milligrams per cubic meter (mg/m^3).

Table 1.1: NAAQS in Effect during 2020 for Criteria Pollutants

Pollutant	Primary (health) Level	Primary Averaging Time	Secondary (welfare) Level	Secondary Averaging Time
CO 8-hour average	9 ppm (10 mg/m^3)	8-hour average, not to be exceeded more than once per year *(1971)*	None*	None*
CO 1-hour average	35 ppm (40 mg/m^3)	1-hour average, not to be exceeded more than once per year *(1971)*	None*	None*
Lead	0.15 $\mu g/m^3$	Maximum rolling 3-month average *(2008)*	Same as Primary	Same as Primary
NO_2 Annual mean	0.053 ppm (100 $\mu g/m^3$)	Annual mean *(1971)*	Same as Primary	Same as Primary
NO_2 1-hour average	0.100 ppm	98th percentile of 1-hour average, averaged over 3 years *(2010)*	Same as Annual	Same as Annual
PM_{10}	150 $\mu g/m^3$	24-hour average, not to be exceeded more than once per year over 3 years *(1987)*	Same as Primary	Same as Primary
$PM_{2.5}$ Annual average	12.0 $\mu g/m^3$	Annual mean averaged over 3 years *(2012)*	15.0 $\mu g/m^3$	Annual mean
$PM_{2.5}$ 24-hour average	35 $\mu g/m^3$	98th percentile of 24-hour concentration, averaged over 3 years *(2006)*	Same as Primary	Same as Primary
Ozone	0.070 ppm	Annual 4th highest 8-hour daily max averaged over 3 years *(2015)*	Same as Primary	Same as Primary
SO_2	0.075 ppm	99th percentile of 1-hour daily max averaged over 3 years *(2010)*	0.5 ppm	3 hours

*In 1985, the USEPA revoked the secondary standard for CO (for public welfare) due to a lack of evidence of adverse effects on public welfare at or near ambient concentrations.

Michigan Air Sampling Network

EGLE's AQD operates the Michigan Air Sampling Network (MASN), along with other governmental agencies. For instance, the O_3 and $PM_{2.5}$ monitor in Manistee County is a tribal monitor operated by the Little River Band of Ottawa Indians. **Figure 1.1** is a picture of the Lansing site. **Figure 1.2** is a picture of the Military Park (GHIB) site. **Figure 1.3** shows a map of the 2020 MASN monitoring sites.

The MASN consists of federal reference method (FRM) monitors that enable continuous monitoring for the gaseous pollutants CO, NO_2, O_3, and SO_2 providing real-time hourly data. PM and Pb monitors measure concentrations over a 24-hour period. In addition, continuous $PM_{2.5}$ and PM_{10} monitors provide real-time hourly data for PM. $PM_{2.5}$ chemical speciation monitors determine the chemical composition of $PM_{2.5}$. The MASN data is also used to provide timely reporting to EGLE's air quality reporting web page (Mlair, see later in this chapter). The types of monitoring conducted in 2020 and the MASN locations are shown in **Table 1.2.**

Figure 1.1: Lansing site

Figure 1.2: Military Park site

The **NCore network** began January 1, 2011, as part of the USEPA's 2006 amended air monitoring requirements. NCore is a multi-pollutant network that integrates several advance measurement systems for particles, pollutant gases, and meteorology. Michigan has two NCore sites, Allen Park and Grand Rapids. Further information on this network is provided in **Chapters 2** through **7**.

The **Near-road Monitoring Network** focuses on vehicle emissions and how they disperse near roadways. Data from these sites are presented in **Chapters 2, 5,** and **7.**

Figure 1.3: 2020 MASN Monitoring Sites

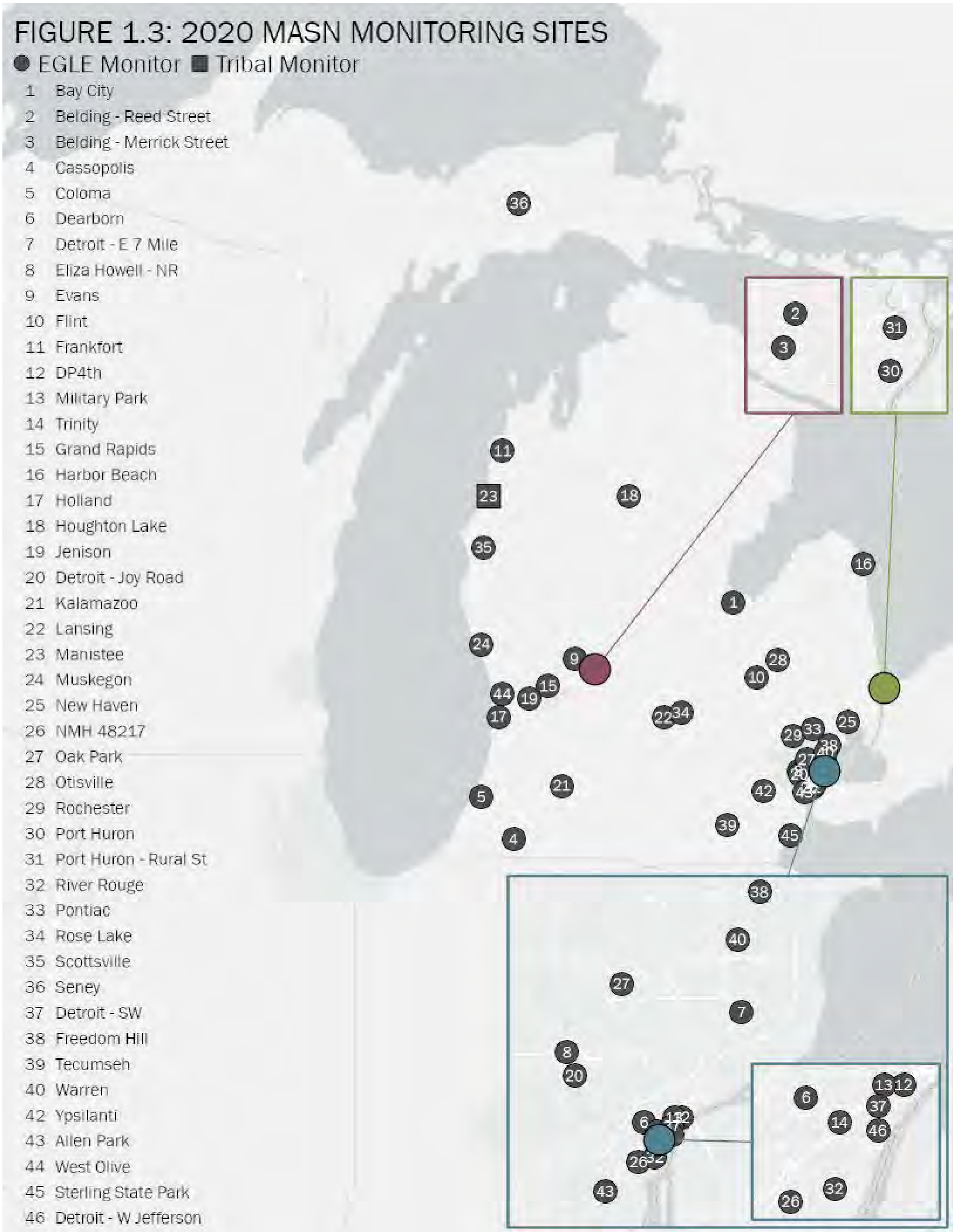


Table 1.2a: Types of Monitoring Conducted in 2020 and MASN Locations in Detroit-Ann Arbor Area.

Airs ID	Site Name	CO	NO_2	Trace NO_y	O_3	PM_{10}	$PM_{2.5}$ FRM	$PM_{2.5}$ Continuous	$PM_{2.5}$ Speciation	SO_2	VOC	Carbonyls	Trace Metals (As, Cd, Mn, Ni, Pb)	Wind Speed & Direction, Temp.	Relative Humidity	Solar Radiation	Barometric Pressure
260910007	Tecumseh				√			√F						√			√
260990009	New Haven				√		√							√	√	√	
260991003	Warren				√												
261250001	Oak Park				√		√							√			
261470005	Port Huron				√		√	√T		√				√			
261470031	Port Huron-Rural St.												√				
261610008	Ypsilanti				√			√F						√			√
261630001	Allen Park	√*		√	√	√	√	√T	√+A	√*				√	√		√
261630005	River Rouge											√	√	√			
261630015	Detroit-SW[5]		√			√	√	√F	√+A	√	√	√	√	√	√		√
261630019	Detroit-E 7 Mile			√	√		√							√	√		√
261630027	Detroit-W. Jefferson												√				
261630033	Dearborn					√^	√	√T	√+A		√	√	√#	√	√		√
261630093	Eliza Howell-NR	√	√					√F						√			
261630097	New Mount Herman (NMH) 48217							√T		√			√				
261630098	Detroit Police 4th Precinct (DP4th)	√	√					√F	A	√			√				
261630099	Trinity	√	√					√F	A	√			√	√			
261630100	Military Park		√					√F	A	√			√				

√ = Data Collected

= 9 additional metals sampled: Ba, Be, Cr, Co, Cu, Fe, Mo, V, Zn

F = FEM continuous $PM_{2.5}$ monitor

T = TEOM (non-FEM) continuous $PM_{2.5}$ monitor

* = Trace monitor

^ = Continuous PM_{10} monitor

A = Aethalometer monitor

[5] Detroit-SW is renamed from Detroit-W. Fort St., SWHS, Southwestern High School, N. Delray to reflect the site more accurately and maintain some continuity from its previous names.

Table 1.2b: Types of Monitoring Conducted in 2020 and MASN Locations in other Michigan CSAs.

Area (CSA)	Airs ID	Site Name	CO	NO_2	Trace NO_y	O_3	PM_{10}	$PM_{2.5}$ FRM	$PM_{2.5}$ Continuous	$PM_{2.5}$ Speciation	SO_2	VOC	Carbonyls	Trace Metals (As, Cd, Mn, Ni, Pb)	Wind Speed & Direction, Temp.	Relative Humidity	Solar Radiation	Barometric Pressure
Flint	260490021	Flint				√		√	√F						√			√
Flint	260492001	Otisville				√									√			
Grand Rapids	261390005	Jenison		√		√	√	√							√			
Grand Rapids	261390011	West Olive									√				√			
Grand Rapids	260810020	Grand Rapids	√*		√	√	√	√	√T	√	√*				√			√
Grand Rapids	260810022	Evans				√									√			
Lansing/E. Lansing	260650018	Lansing		√		√		√	√F		√				√			√
Lansing/E. Lansing	260370002	Rose Lake				√												

√ = Data Collected

F = FEM continuous $PM_{2.5}$ monitor

T = TEOM (non-FEM) continuous $PM_{2.5}$ monitor

* = Trace monitor

Table 1.2c: Types of Monitoring Conducted in 2020 and MASN Locations in Michigan Counties.

County	Airs ID	Site Name	CO	NO_2	Trace NO_y	O_3	PM_{10}	$PM_{2.5}$ FRM	$PM_{2.5}$ Continuous	$PM_{2.5}$ Speciation	SO_2	VOC	Carbonyls	Trace Metals (As, Cd, Mn, Ni, Pb)	Wind Speed & Direction, Temp.	Relative Humidity	Solar Radiation	Barometric Pressure
Monroe	261150006	Sterling State Park									√				√			
Huron	260630007	Harbor Beach				√									√			
Bay	260170014	Bay City							√F						√			
Missaukee	261130001	Houghton Lake		√		√			√F						√			√
Allegan	260050003	Holland				√			√F						√	√	√	√
Benzie	260190003	Frankfort[6]				√												
Berrien	260210014	Coloma				√									√			
Cass	260270003	Cassopolis				√									√			
Kalamazoo	260770008	Kalamazoo				√		√	√T						√			
Manistee	261010922	Manistee (tribal)				√		√							√		√	√
Mason	261050007	Scottville				√									√			
Muskegon	261210039	Muskegon				√									√			
Schoolcraft	261530001	Seney				√			√F						√	√	√	√
Ionia	260670002	Belding-Reed St.													√			
Ionia	260670003	Belding-Merrick St.												√				

√ = Data Collected

F = FEM continuous $PM_{2.5}$ monitor

T = TEOM (non-FEM) continuous $PM_{2.5}$ monitor

[6] Also called Benzonia.

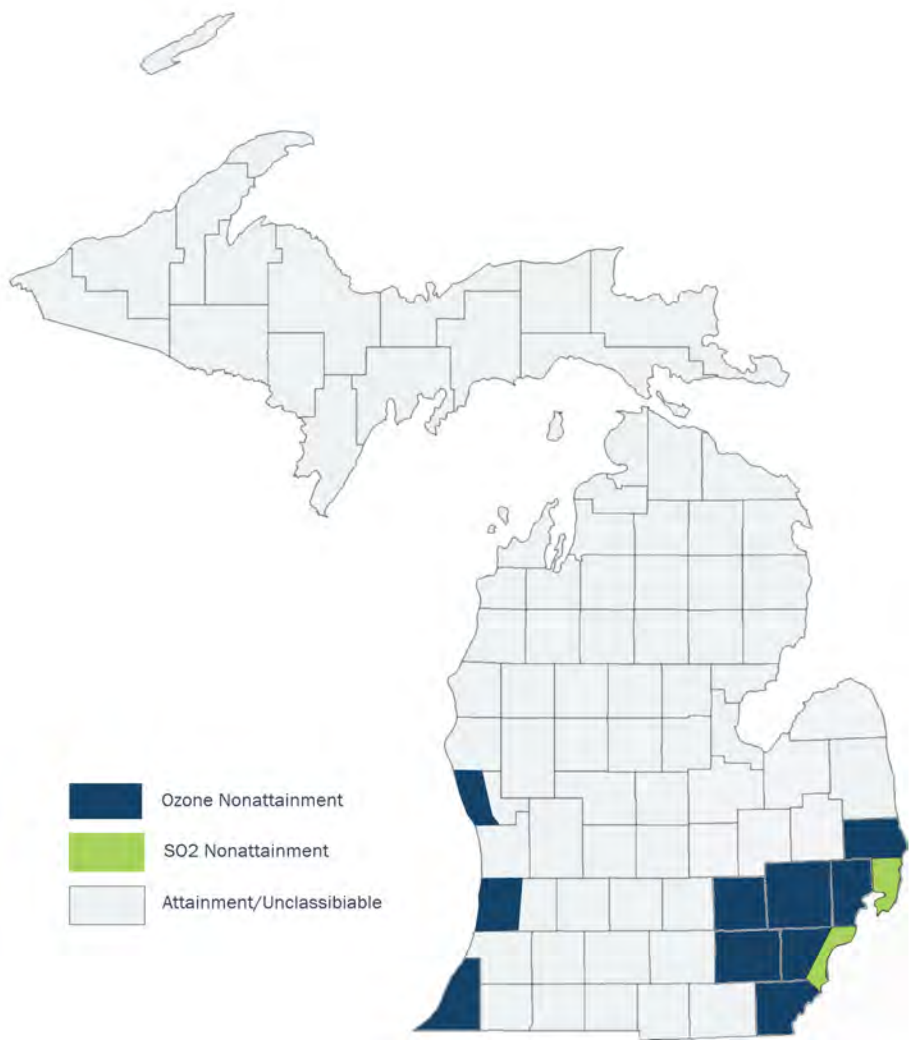
Current Attainment Status

Areas of the state that are below the NAAQS concentration level are called attainment areas. The entire state of Michigan is in attainment for the following pollutants:

- CO
- Pb
- NO_2
- Particulate Matter

Nonattainment areas are those that have been classified by the USEPA as having concentrations over the NAAQS level. Portions of the state are in nonattainment for SO_2 and O_3 (see **Figure 1.4**). The SO_2 nonattainment area includes a portion of Wayne County and a portion of St. Clair County. Ozone nonattainment areas include a portion of Allegan County, all of Berrien County, a portion of Muskegon County and the 7-county area of Southeast Michigan, which includes Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne Counties. Nonattainment status for O_3 was effective on August 3, 2019.

Figure 1.4: Attainment Status for the National Ambient Air Quality Standards

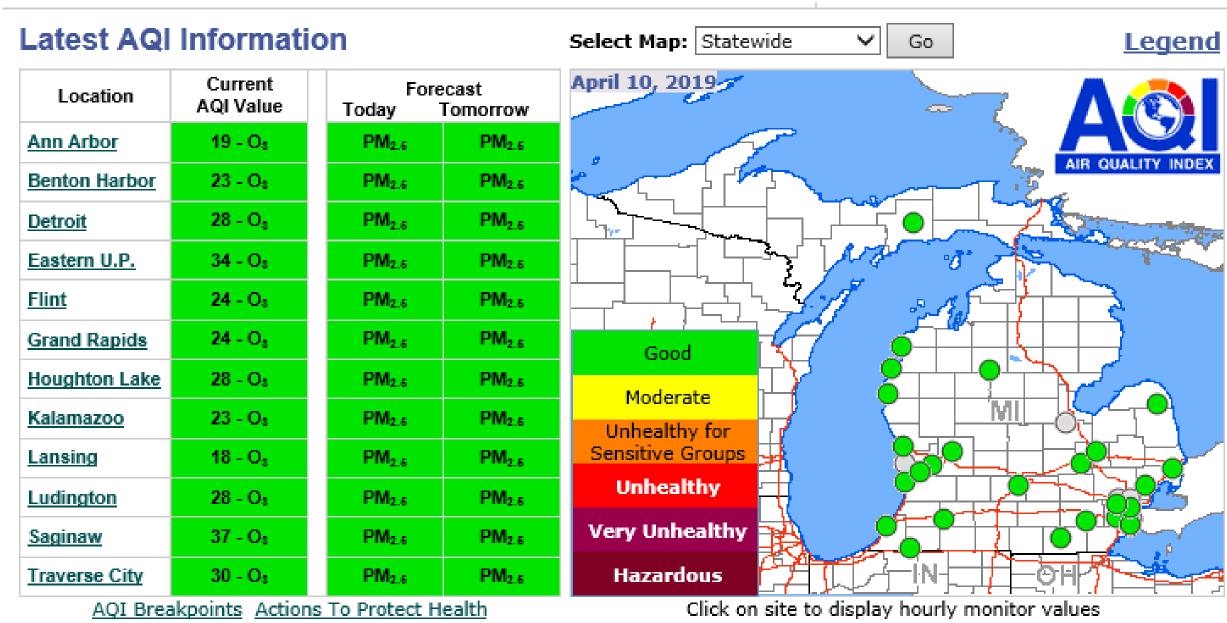


MIair – Air Quality Information in Real-Time

MIair is the internet tool that provides real-time air quality information via EGLE's web page. The deqmiair.org hotlink opens to the current Air Quality Index (AQI) map and displays air quality forecasts for "today" and "tomorrow." **MIair** also hosts EnviroFlash, the automated air quality notification system.

Air Quality Index

The Air Quality Index (AQI) is a simple tool developed to communicate current air quality information to the public. The current day's color-coded AQI values, ranging from Good to Hazardous (see **Table 1.3**), are displayed in a forecast table and as dots on a Michigan map (see example below).



As can be seen from the AQI bar graphs for the Detroit-Warren-Dearborn area (Figure 1.5) and the Grand Rapids-Wyoming area (Figure 1.6), air quality in Michigan is generally in the Good or Moderate range. An area will occasionally fall into the Unhealthy for Sensitive Groups range, but rarely reaches Unhealthy levels.

In the Detroit area, only two days were in the Unhealthy range, both for $PM_{2.5}$ on July 4 and 5, due to fireworks. In the Unhealthy for Sensitive Groups (USG), 15 days were due to ozone, five were due to $PM_{2.5}$ and four were due to SO_2. In Detroit area, $PM_{2.5}$ leads the AQI 220 days, meaning that pollutant has the highest AQI value of all the pollutants measured per day.

In the Grand Rapids area, only one day was in the Unhealthy range, for $PM_{2.5}$ on July 4, due to fireworks. In the Unhealthy for Sensitive Groups (USG), six days were due to ozone, one was due to $PM_{2.5}$ (on July 5th). In Grand Rapids area, ozone leads the AQI 247 days, meaning that pollutant has the highest AQI value of all the pollutants measured per day.

Figure 1.5: 2020 AQI Days per Pollutant for Detroit-Warren-Dearborn MSA, numbers next to categories are for the Overall AQI Value (First Bar on Graph)

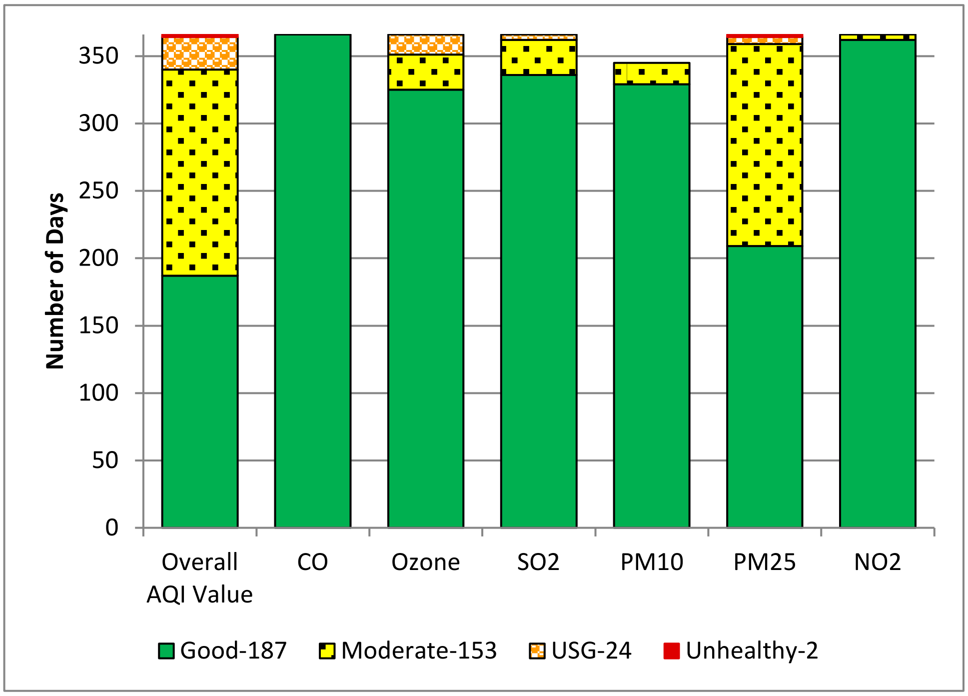
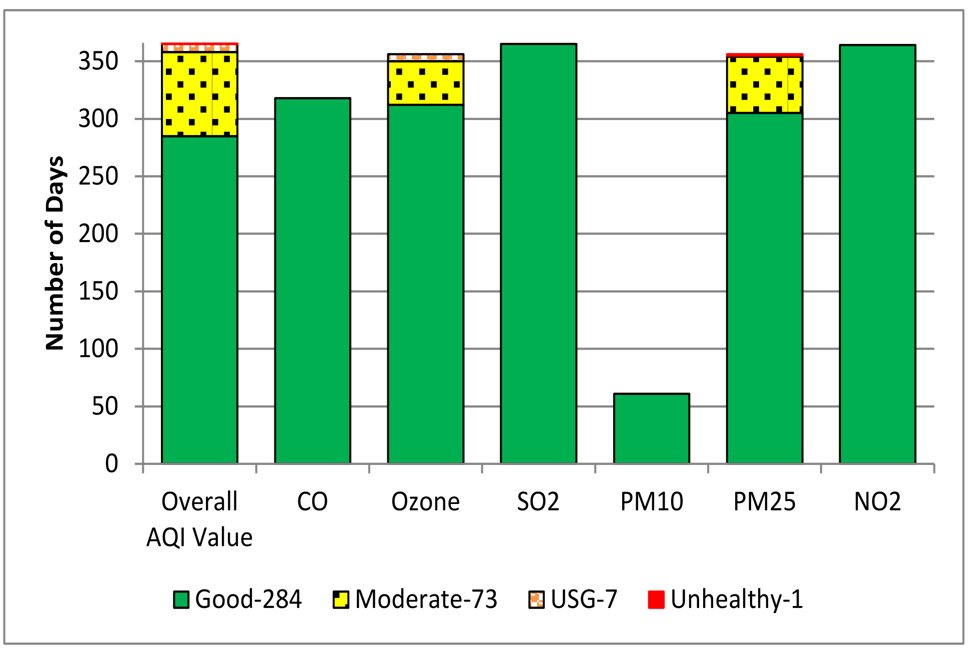


Figure 1.6: 2020 AQI Days Per Pollutant for Grand Rapids-Wyoming MSA, numbers next to categories are for the Overall AQI Value (First Bar on Graph)



MIair includes an "Air Quality Index Fact Sheet" link: michigan.gov/documents/deq/deq-aqd-aqifacts_273090_7.pdf, which contains activity recommendations based on the AQI levels (also **Table 1.3**).

Table 1.3: AQI Colors and Health Statements

AQI Color, Category and Value	Particulate Matter (µg/m³) 24-hour	Ozone (ppm) 8-hour / 1-hour	Carbon Monoxide (ppm) 8-hour	Sulfur Dioxide (ppm) 24-hour	Nitrogen Dioxide (ppm) 1-hour
GREEN: Good 1- 50	None	None	None	None	None
YELLOW: Moderate 51- 100	Unusually sensitive people should consider reducing prolonged or heavy exertion.	Unusually sensitive people should consider reducing prolonged or heavy exertion.	None	None	Unusually sensitive people should consider limiting prolonged outdoor exertion
ORANGE: Unhealthy for Sensitive Groups 101- 150	People with heart or lung disease, children, teens, & older adults should reduce prolonged or heavy exertion.	People with heart or lung disease, children, teens, & older adults, and people who are active outdoors should reduce prolonged or heavy exertion.	People with heart disease, such as angina, should reduce heavy exertion & avoid sources of CO, such as heavy traffic.	People with asthma should consider reducing outdoor exertion.	People with lung disease, children, & older adults should limit prolonged outdoor exertion
RED: Unhealthy 151- 200	People with heart or lung disease, children, teen, & older adults should avoid prolonged or heavy exertion. Everyone should reduce prolonged or heavy exertion.	People with heart or lung disease, children, teens & older adults, and people who are active outdoors should avoid prolonged or heavy exertion. Everyone should reduce prolonged or heavy exertion.	People with heart disease, such as angina, should reduce moderate exertion & avoid sources of CO, such as heavy traffic.	Children, asthmatics, & people with heart or lung disease should reduce outdoor exertion.	People with lung disease, children, & older adults should avoid prolonged outdoor exertion. Everyone should limit prolonged outdoor exertion.
PURPLE: Very Unhealthy 201- 300	People with heart or lung disease, children, teens, & older adults should avoid all physical activity outdoors. Everyone else should avoid prolonged or heavy outdoor exertion.	People with heart or lung disease, children & older adults, and people who are active outdoors should avoid all physical activity outdoors. Everyone else should limit outdoor exertion.	People with heart disease, such as angina, should avoid exertion & sources of CO, such as heavy traffic.	Children, asthmatics, & people with heart or lung disease should avoid outdoor exertion. Everyone should reduce outdoor exertion.	People with lung disease, children, & older adults should avoid all outdoor exertion. Everyone else should limit prolonged outdoor exertion.
MAROON: Hazardous 301- 500	People with heart or lung disease, children, teens, & older adults should remain indoors. Everyone should avoid all physical activity outdoors.	People with heart or lung disease, children, and older adults should remain indoors. Everyone should avoid all physical activity outdoors.	People with heart disease, such as angina, should avoid exertion & CO sources, such as heavy traffic. Everyone should limit heavy exertion.	Children, asthmatics, & people with heart or lung disease should remain indoors. Everyone should avoid outdoor exertion.	Children and People with respiratory disease, such as asthma, should avoid outdoor exertion.

Air Quality Forecasts

AQD meteorologists provide air pollution forecasts to alert the public when air pollution levels may become elevated. *Action!* Days are declared when levels are expected to reach or exceed the Unhealthy for Sensitive Groups AQI health indicator. On Action! Days, businesses, industry, government, and the public are encouraged to reduce air pollution levels by limiting vehicle use, refueling only after 6 PM, carpooling, walking, biking, or taking public transit, deferring the use of gasoline-powered lawn and recreation equipment, limiting the use of volatile chemicals, and curtailing all burning. More information on voluntary air pollution control measures can be found under the Action! Days tab on **MIair**.

The weather plays a significant role in air quality (see **Chapter 9** for an annual weather summary) and can either help increase or decrease the amount of pollution in the air. High temperatures, sun, and longer days (i.e., more daylight hours) are conducive to ozone formation, whereas rain tends to wash pollutants out of the air. *Action!* Days are declared when meteorological conditions are conducive for the formation of elevated ground-level O_3 or $PM_{2.5}$ concentrations.

Table 1.4 shows that there were some *Action!* Days declared during the summer of 2020.

Table 1.4: *Action!* Days Declared During Summer 2020

Location	Year	Number	Dates
Ann Arbor	2020	9	6/18, 6/19, 6/20, 7/5, 7/6, 7/7, 7/8, 7/9, 7/18
Benton Harbor	2020	10	6/18, 6/19, 6/20, 7/5, 7/6, 7/7, 7/8, 7/9, 7/18, 8/26
Detroit	2020	9	6/18, 6/19, 6/20, 7/5, 7/6, 7/7, 7/8, 7/9, 7/18
Flint	2020	2	6/19, 6/20
Grand Rapids	2020	10	6/18, 6/19, 6/20, 7/5, 7/6, 7/7, 7/8, 7/9, 7/18, 8/26
Kalamazoo	2020	2	6/19, 6/20
Ludington	2020	3	6/18, 6/19, 6/20
Traverse City	2020	2	6/19, 6/20

Air Quality Notification

EnviroFlash is a free service that provides automated air quality (AQI) and ultraviolet (UV) forecasts to subscribers. Those enrolled receive email or mobile phone text messages when the health level they select is predicted to occur. AIRNow iPhone and Android applications deliver ozone and fine particle air quality forecasts plus detailed real-time information that can be used to better protect health when planning daily activities. To learn more about this program, select the **MIair** button from Michigan's Air Quality page Michigan.gov/air. To receive notices, choose the "Air Quality Notification" tab and click the "Enroll in AQI EnviroFlash" link. Michigan's EnviroFlash network has the potential to reach up to 98 percent of the state's population.

AIRNow

EGLE supplies Michigan air monitoring data to AIRNow, the USEPA's nationwide air quality mapping system. Information about AIRNow is available at AirNow.gov or you can select the AIRNow hot link at the bottom of each **MIair** web page.

CHAPTER 2: CARBON MONOXIDE (CO)

Carbon monoxide is a gas formed during incomplete burning of fuel. CO is colorless, odorless, and tasteless, and is lethal at elevated concentrations. Levels peak during colder months primarily due to cold temperatures that affect combustion efficiency of engines. The CO NAAQS is 9 ppm for the second highest 8-hour average and 35 ppm for the second highest 1-hour average. Its sources and effects are provided below.

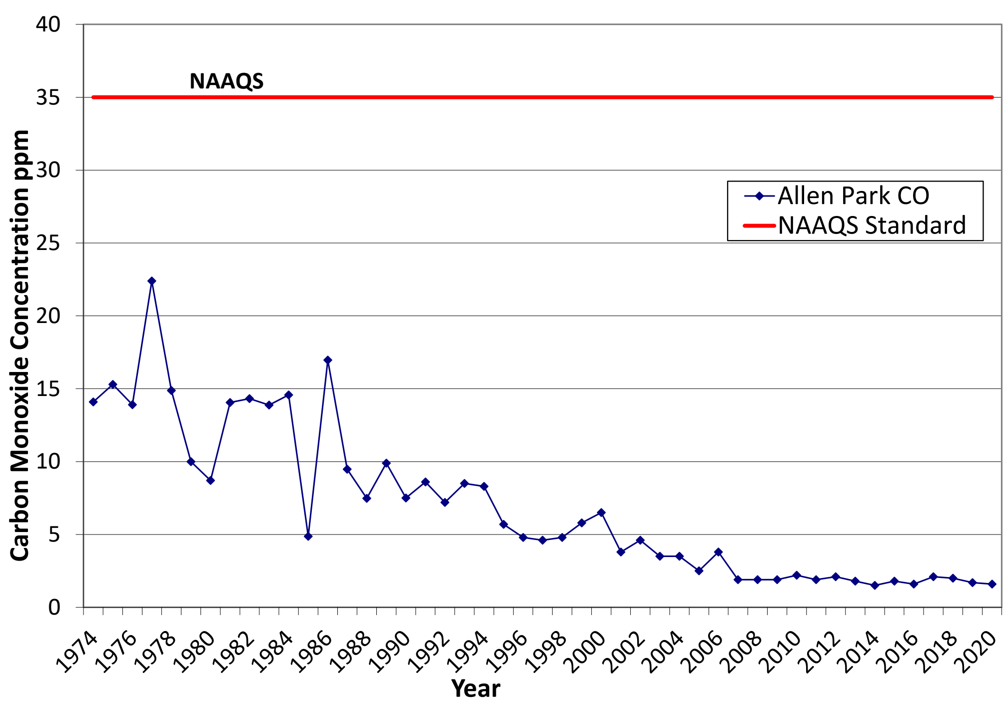
Sources: CO is given off whenever fuel or other carbon-based materials are burned. Outdoor exposure sources include automobile exhaust, industrial processes (metal processing and chemical production), and non-vehicle fuel combustion. Natural sources include volcanos, forest fires, and photochemical reactions in the atmosphere. Indoor exposure sources include wood stoves and fireplaces, gas ranges with continuous pilot flame ignition, unvented gas or kerosene heaters, and cigarette smoke.

Effects: CO enters the bloodstream through the lungs, where it displaces oxygen delivered to the organs and tissues. Elevated levels can cause visual impairment, interfere with mental acuity by reducing learning ability and manual dexterity, and can decrease work performance in the completion of complex tasks. In extreme cases, unconsciousness and death can occur. CO also alters atmospheric photochemistry contributing to the formation of ground-level O_3, which can trigger serious respiratory problems.

Population most at risk: Those who suffer from cardiovascular (heart and respiratory) disease, fetuses, infants, and the elderly are most at risk for exposure to elevated levels of CO. People with angina and peripheral vascular disease are especially at risk, as their circulatory systems are already compromised and less efficient at carrying oxygen; however, elevated CO levels can also affect healthy people.

Historical Trends: Southeast Michigan has been monitoring CO for 45 years. **Figure 2.1** shows the CO trend at Allen Park to be well below the 1-hour standard of 35 ppm. This standard has not changed since 1971.

Figure 2.1: Historical 1-hour CO Averages at Allen Park



Figures 2.2 and **2.3** show CO emission sources and CO emissions by county (courtesy of the USEPA's State and County Emission Summaries).

Figure 2.2: CO Emissions by Source Sector for Michigan 2017 in Tons (NEI 2017)

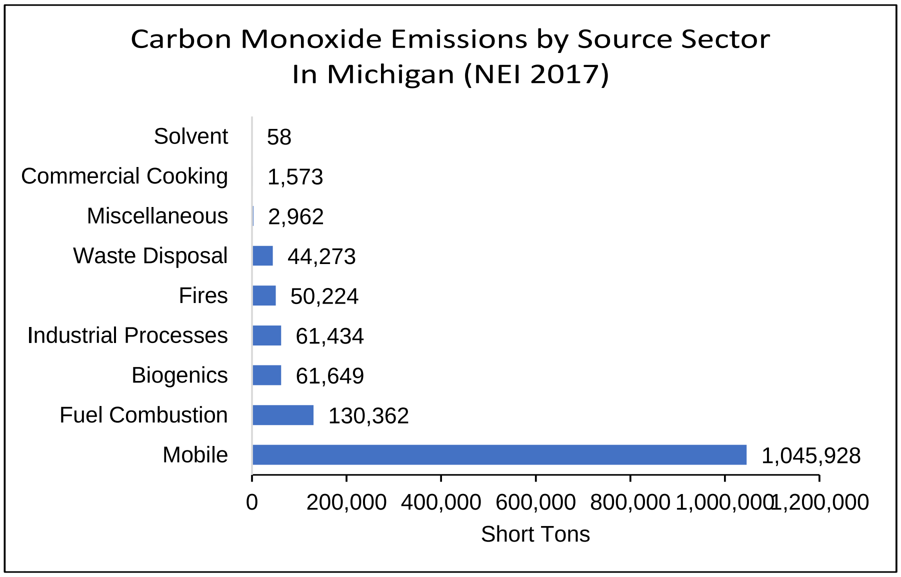


Figure 2.3: CO Emissions in 2017 (NEI)

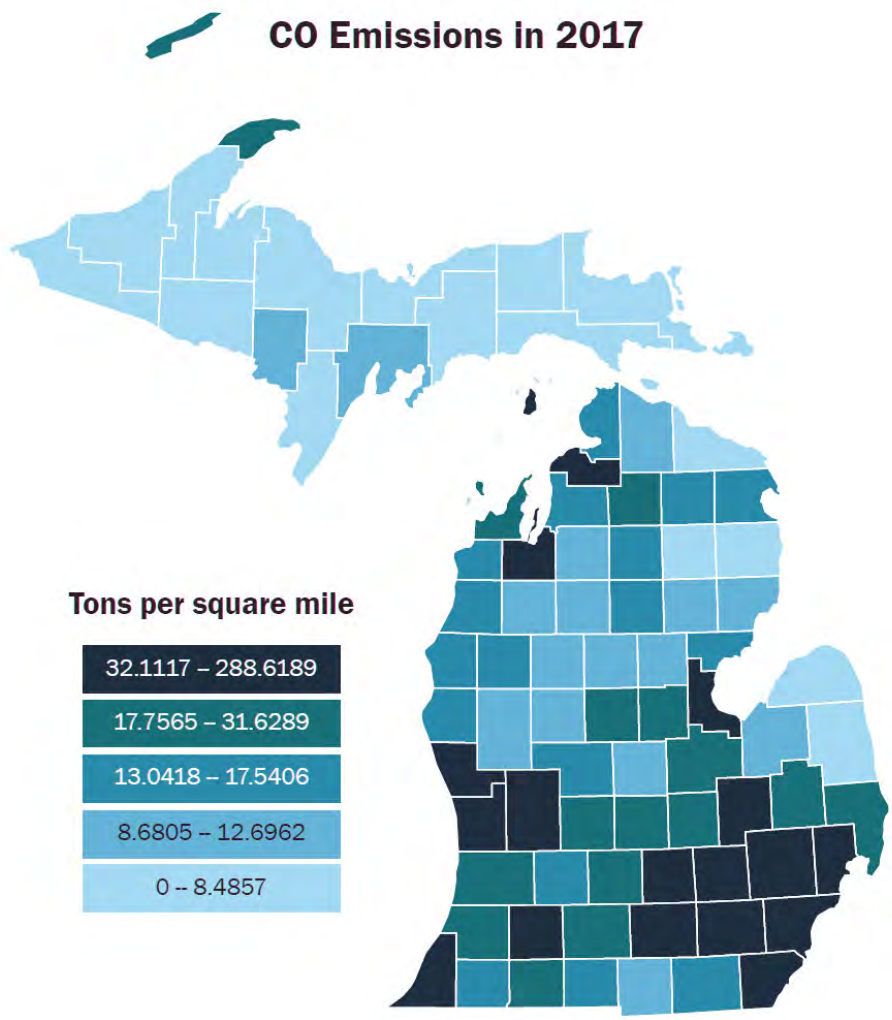


Figure 2.4 shows the location of each CO monitor that operated in 2020.

- Near-roadway network sites: Eliza Howell-NR.
- NCore Network: Grand Rapids and Allen Park measure trace CO (lower detection levels 1-50 ppm).
- GHIB project: DP4th and Trinity, started summer and fall 2018, respectively.

Figure 2.4: CO Monitors in 2020

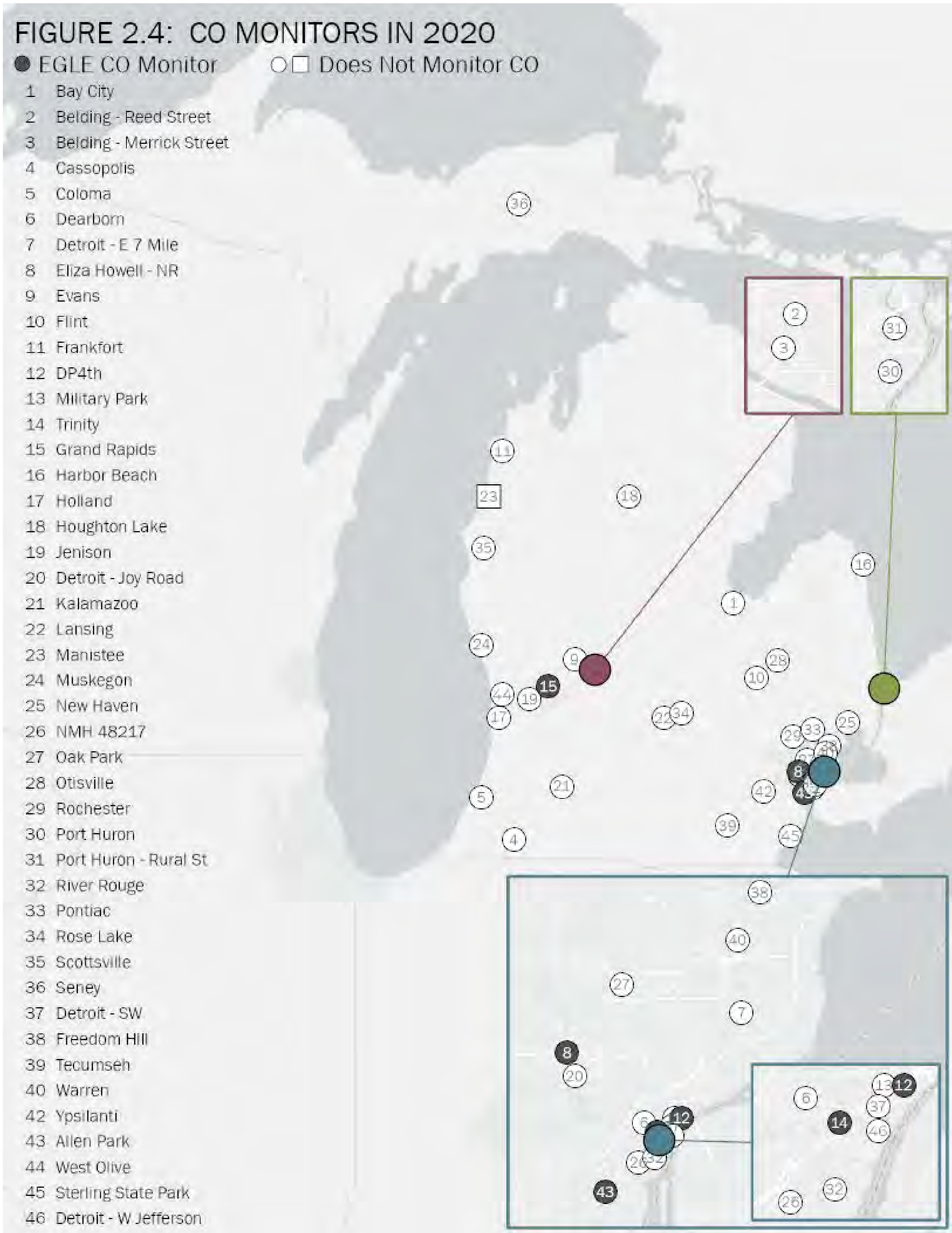


Figure 2.5 shows the second highest 1-hour CO concentrations for Michigan from 2015-2020, which demonstrates there have not been any exceedances of the 1-hour CO NAAQS.

Figure 2.5: CO Levels in Michigan from 2015-2020 (2nd Highest 1-Hour Maximum Values)

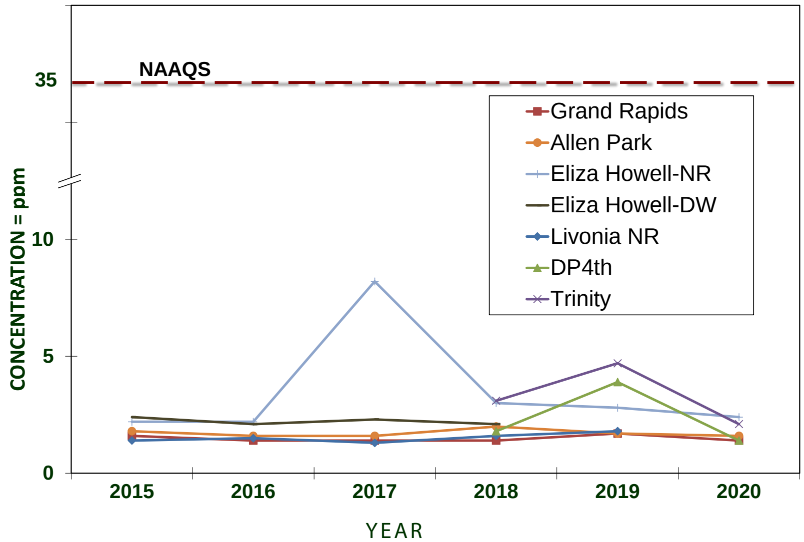
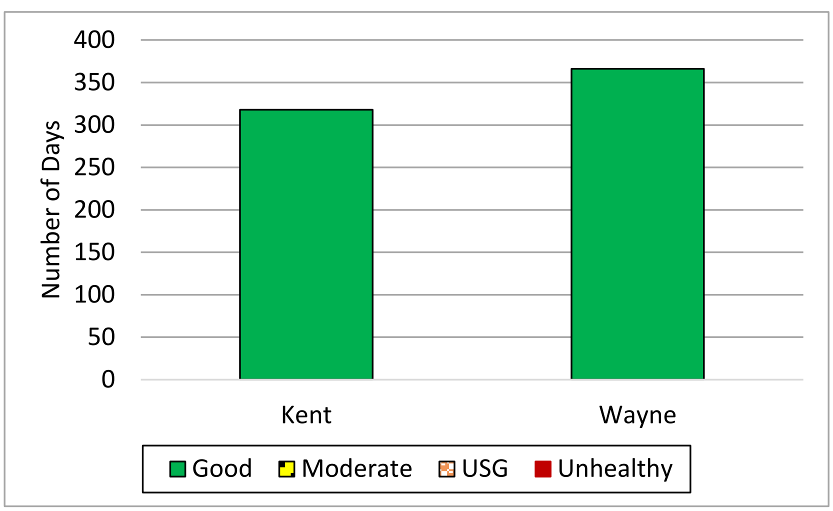


Figure 2.6 shows the AQI values per day in counties where CO is monitored. All days were in the good AQI range.

Figure 2.6: 2020 AQI Days for CO in Michigan Counties



CHAPTER 3: LEAD (PB)

Lead is a highly toxic metal found in coal, oil, and other fuels. It is also found in older paints, municipal solid waste, and sewage sludge, and may be released to the atmosphere during combustion. In 2008, the USEPA lowered the Pb NAAQS from a maximum quarterly average of 1.5 $\mu g/m^3$ to a 3-month rolling average of 0.15 $\mu g/m^3$. Its sources and effects are presented below.

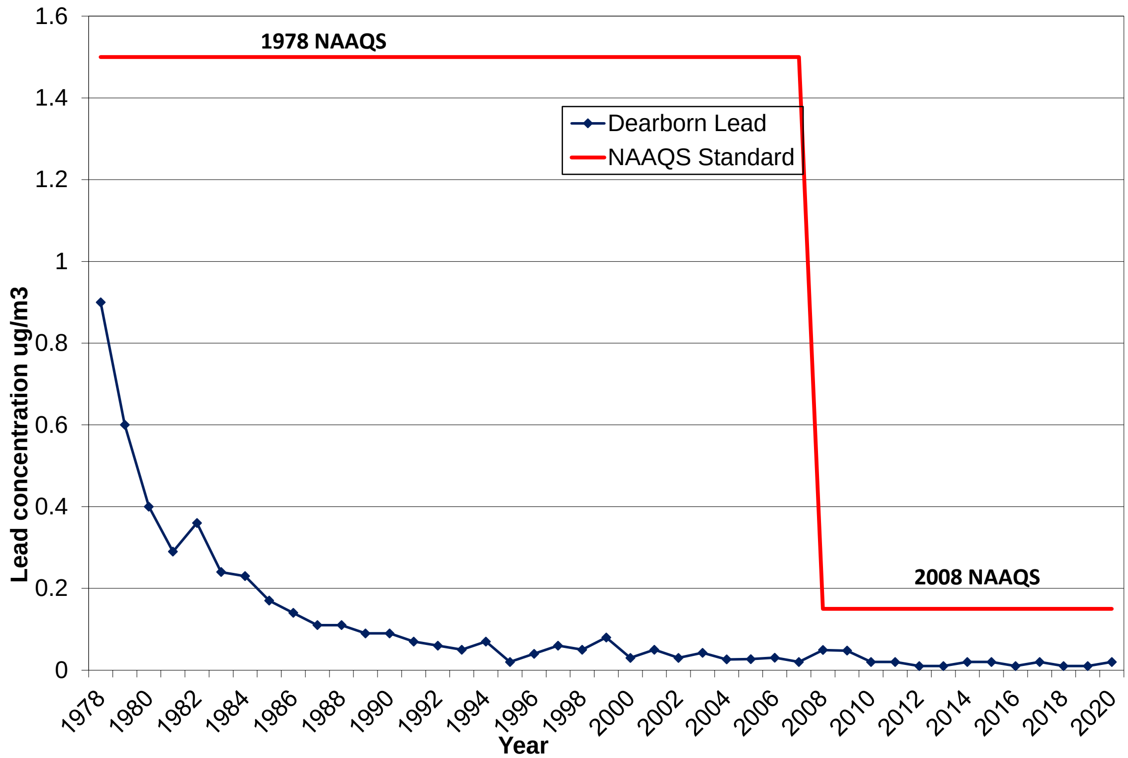
Sources: With the phase-out of leaded gas in the 1970s, the major sources of Pb emissions have been due to ore and metals processing and piston-engine aircraft operating on leaded aviation fuel. Other industrial sources include Pb acid battery manufacturers, waste incinerators, and utilities. The highest air concentrations of Pb are usually found near lead smelters.

Effects: Exposure occurs through the inhalation or ingestion of Pb in food, water, soil, or dust particles. Pb primarily accumulates in the body's blood, bones, and soft tissues, and adversely affects the nervous system as well as the cardiovascular system, reproductive system, blood, kidneys, and other organs.

Population most at risk: Fetuses and children are most at risk since low levels of Pb may cause central nervous system damage. Excessive Pb exposure during the early years of life is associated with lower IQ scores and neurological impairment (seizures, mental development, and behavioral disorders). Even at low doses, lead exposure is associated with changes in fundamental enzymatic, metabolic, and homeostatic mechanisms in the body, and Pb may be a factor in high blood pressure and subsequent heart disease.

Historical Trends: Southeast Michigan has been monitoring for lead for 40 years. **Figure 3.1** shows the trend for lead at Dearborn. The largest decrease in Pb in the air is due to the removal of Pb in gasoline. By 1975, most newly manufactured vehicles no longer required leaded gasoline, and as a result, there was a dramatic decrease in ambient Pb levels. In 1996, the USEPA banned the sale of leaded fuel for use in on-road vehicles. The graph also shows the decrease in the Pb standard that occurred in 2008.

Figure 3.1: Historical Quarterly / 3-month Averages for Lead at Dearborn



Figures 3.2 and **3.3** show Pb emission sources and Pb emissions by county (courtesy of the USEPA's State and County Emission Summaries).

Figure 3.2: Pb Emissions by Source Sector

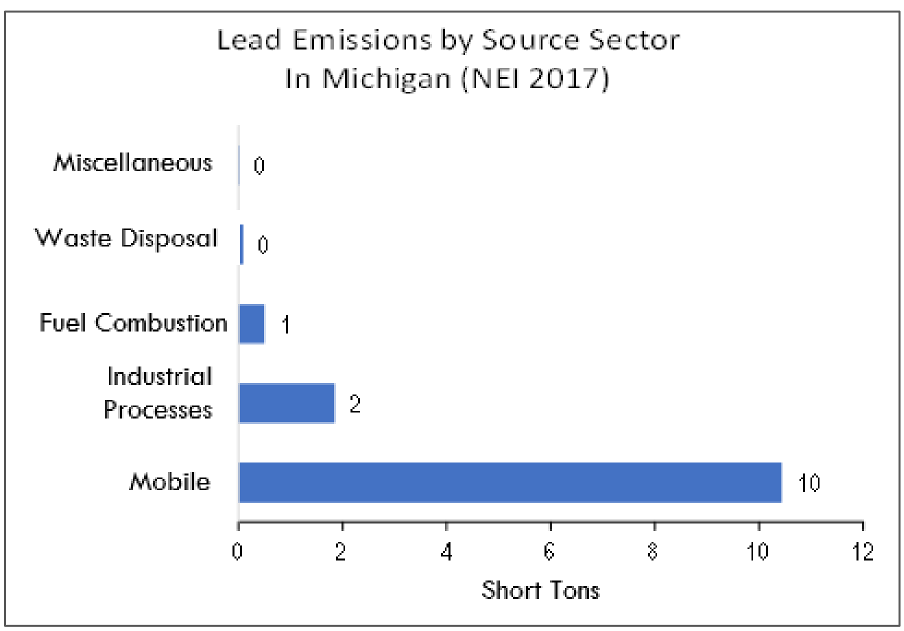


Figure 3.3: Pb Emissions in 2017 (NEI)

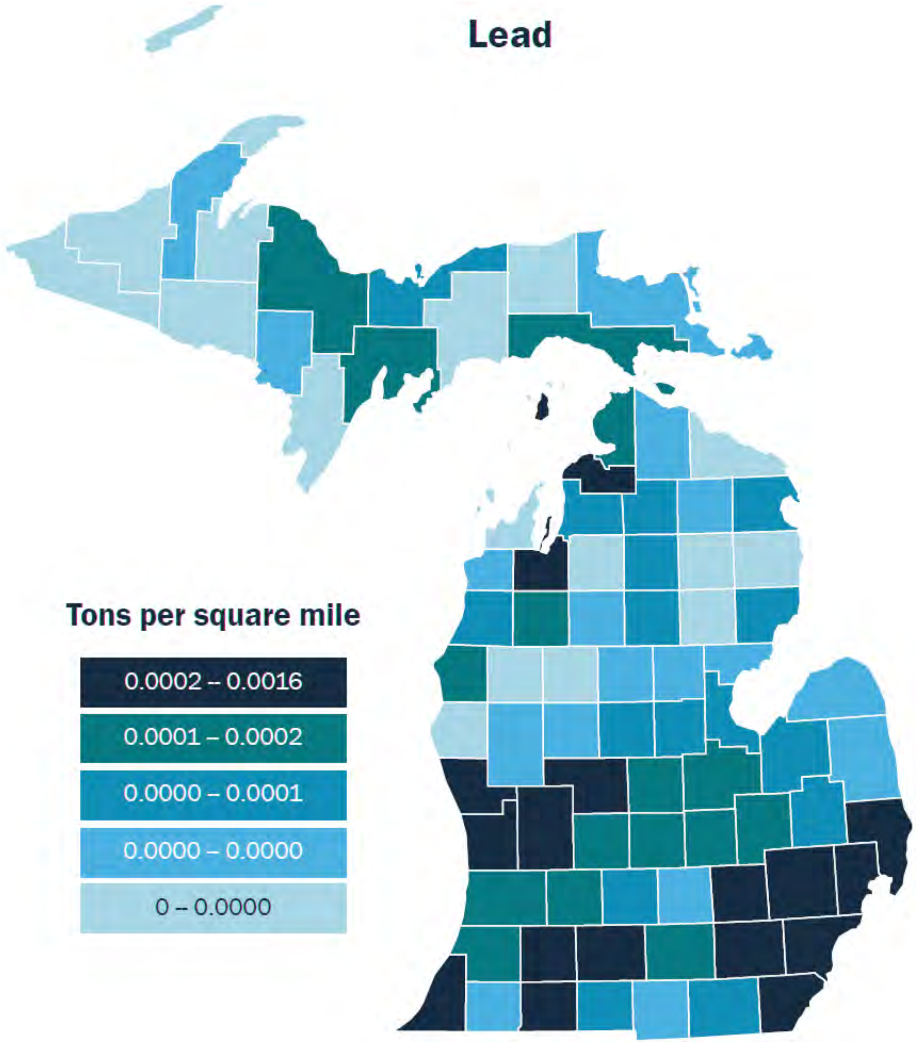


Figure 3.4 shows the location of the Pb monitors in the MASN in 2020. When the Pb NAAQS was lowered in 2008, the monitoring network was modified to consist of source-oriented monitors and population-oriented monitors. As part of the 2008 Pb NAAQS, EGLE must monitor near stationary sources emitting more than 1/2 ton of Pb per year.

- Source-oriented sites: Port Huron-Rural St. and Belding-Merrick St. The second site, Belding-Reed St. was shut down on January 1, 2019, since lead levels are below the standard and both sites are no longer necessary. The two sites in Belding previously were above the standard, but values for both the sites have been below the NAAQS for the past five years. Belding was designated to attainment on July 31, 2018.
- National Air Toxics Trend Sites (NATTS): Dearborn lead and trace metals, both as total suspended particulate (TSP) and PM_{10}. Lead measurements as $PM_{2.5}$ are also made throughout the $PM_{2.5}$ speciation network.
- NCore sites: Allen Park and Grand Rapids.
- Network consistency: River Rouge, Detroit-W. Jefferson, NMH 48217, and Detroit-SW. On January 1, 2018, lead sampling was started at all the TSP metals sites to maintain consistency and to be more protective of public health. Many older homes, which often contain lead-based paint, are being demolished in the Detroit area near these monitors.

- Secondary monitor: Port Huron-Rural St. to comply with the USEPA's collocation regulations.
- Gordie Howe International Bridge (GHIB) project: DP4th, Trinity, and Military Park.

Figure 3.4: Lead (Pb) Monitors in 2020

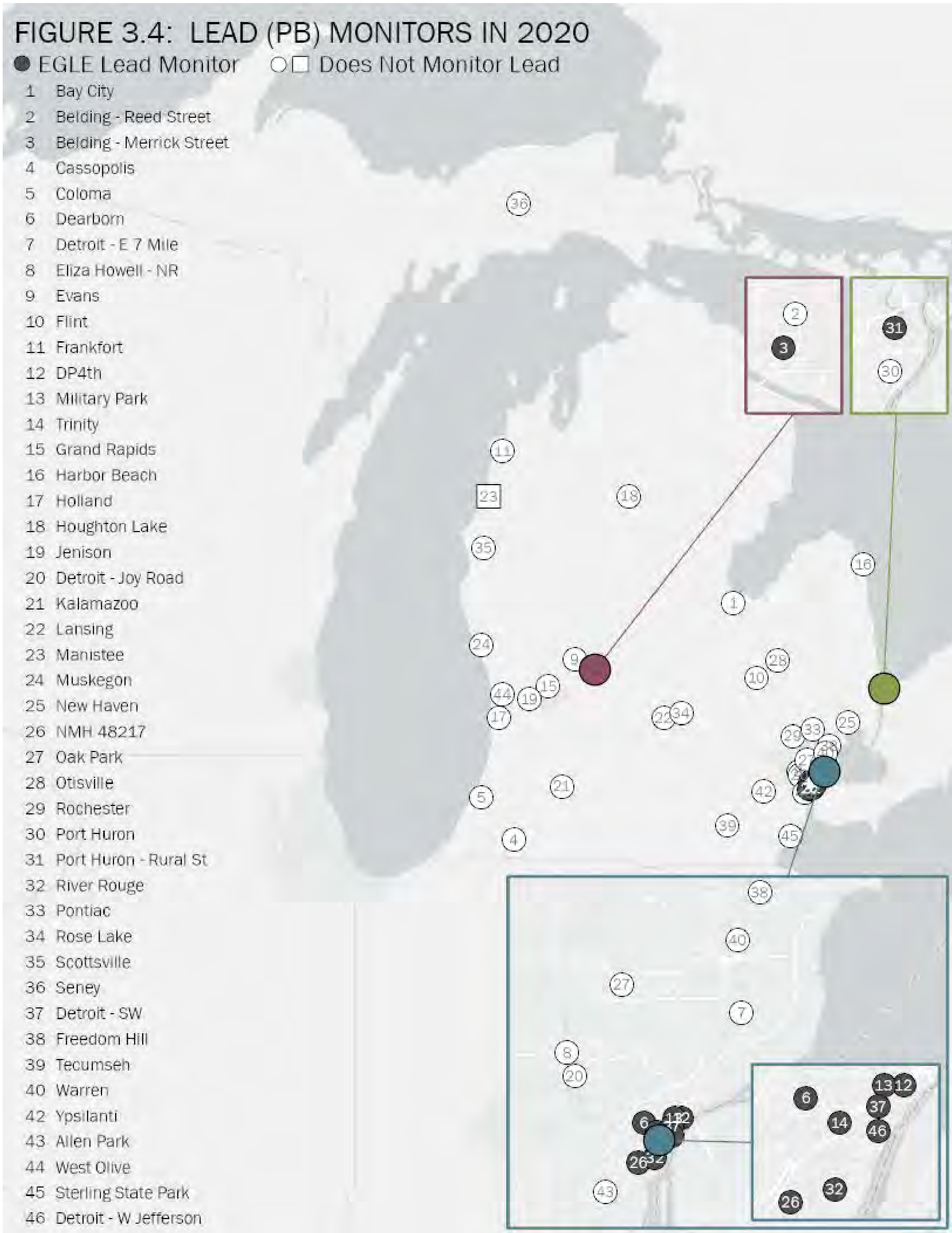
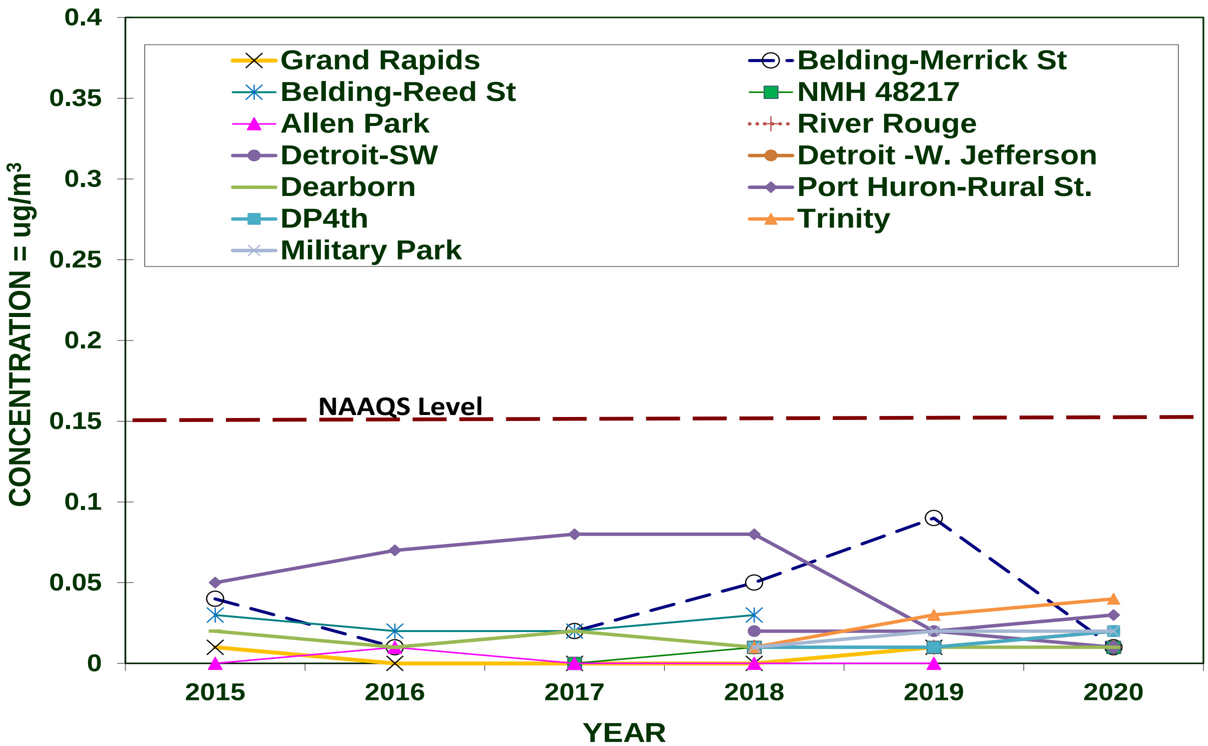


Figure 3.5 shows the maximum 3-month rolling average values for Pb from 2015 to 2020. All Pb monitor sites in Michigan are below the standard.

Figure 3.5: Lead Levels in Michigan from 2015-2020 (Maximum 3-month Average Values)



CHAPTER 4: NITROGEN DIOXIDE (NO_2)

Nitrogen dioxide is a reddish-brown, highly reactive gas formed through oxidation of nitric oxide (NO). Upon dilution, it becomes yellow or invisible. High concentrations produce a pungent odor and lower levels have an odor like bleach. NO_X is the term used to describe the sum of NO, NO_2, and other nitrogen oxides. NO_X can lead to the formation of O_3 and NO_2 and can react with other substances in the atmosphere to form particulate matter or acidic products that are deposited in rain (acid rain), fog, or snow. Since 1971, the primary and secondary standard for NO_2 was an annual mean of 0.053 ppm. In January 2010, the USEPA added a 1-hour NO_2 standard of 100 ppb, taking the form of the 98th percentile averaged over three years. The sources and effects of NO_2 are as follows:

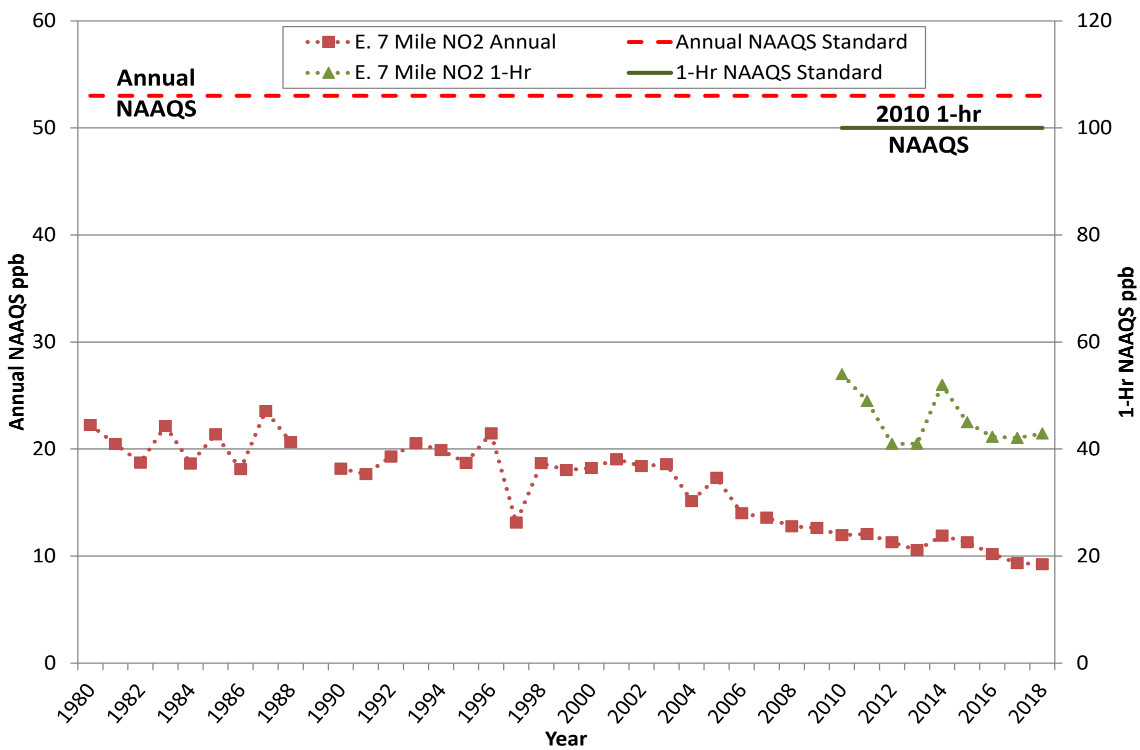
Sources: NO_X compounds and their transformed products occur both naturally and because of human activities. Natural sources of NO_X are lightning, forest fires, bacterial processes in soil, and stratospheric intrusion. Stratospheric intrusion is when the air upper atmosphere (stratosphere) descends towards the surface of the earth and mixes with the air at breathing level. Ammonia and other nitrogen compounds produced naturally are important in the cycling of nitrogen through the ecosystem. The major sources of man-made (anthropogenic) NO_x emissions come from high-temperature combustion processes such as those occurring in automobiles and power plants. Home heaters and gas stoves produce substantial amounts of NO_2 in indoor settings.

Effects: Exposure to NO_2 occurs through the respiratory system, irritating the lungs. Short-term NO_2 exposures (i.e., less than three hours) can produce coughing and changes in airway responsiveness and lung function. Evidence suggests that long-term exposures to NO_2 may lead to increased susceptibility to respiratory infection and may cause structural changes in the lungs. Exercise increases the ventilation rate and hence exposure to NO_2. Nitrate particles and NO_2 can block the transmission of light, resulting in visibility impairment (i.e., smog or haze). Nitrogen deposition can lead to fertilization, excessive nutrient enrichment, or acidification of terrestrial, wetland, and aquatic systems that can upset the delicate balance in those ecosystems.

Population most at risk: Individuals with pre-existing respiratory illnesses and asthmatics are more sensitive to the effects of NO_2 than the general population. Short-term NO_2 exposure can increase respiratory illnesses in children.

Historical Trends: Southeast Michigan has been monitoring for NO_2 for 40 years. **Figure 4.1** shows the trend for NO_2 at Detroit-E 7 Mile Road, which has been well below the annual standard of 53 ppb and shows a downward trend. In 2010, the USEPA added a 1-hour standard for NO_2, which has also remained well below the standard in Michigan. Southeast Michigan is highly industrialized; therefore, it is a good indicator of the air quality improvement for the rest of the state.

Figure 4.1: Historical Annual and 1-hour NO_2 at Detroit-E 7 Mile Road



Figures 4.2 and **4.3** show NO_2 emission sources and NO_2 emissions by county (courtesy of the USEPA's State and County Emission Summaries).

Figure 4.2: Nitrogen Oxide Emissions by Source Sector

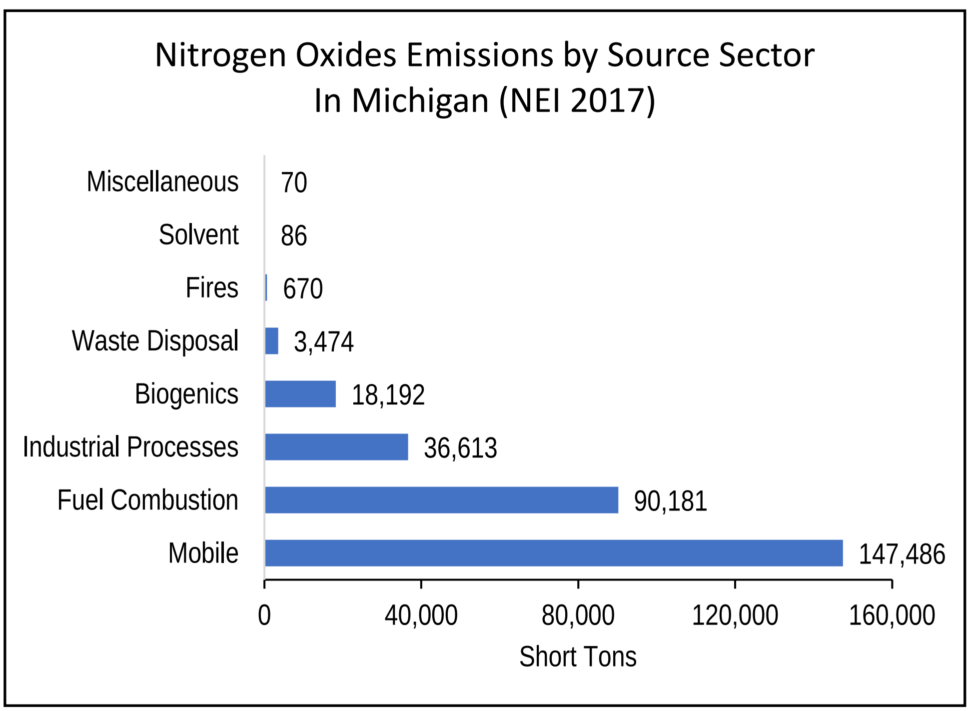


Figure 4.3: Nitrogen Oxide Emissions in 2017 (NEI)

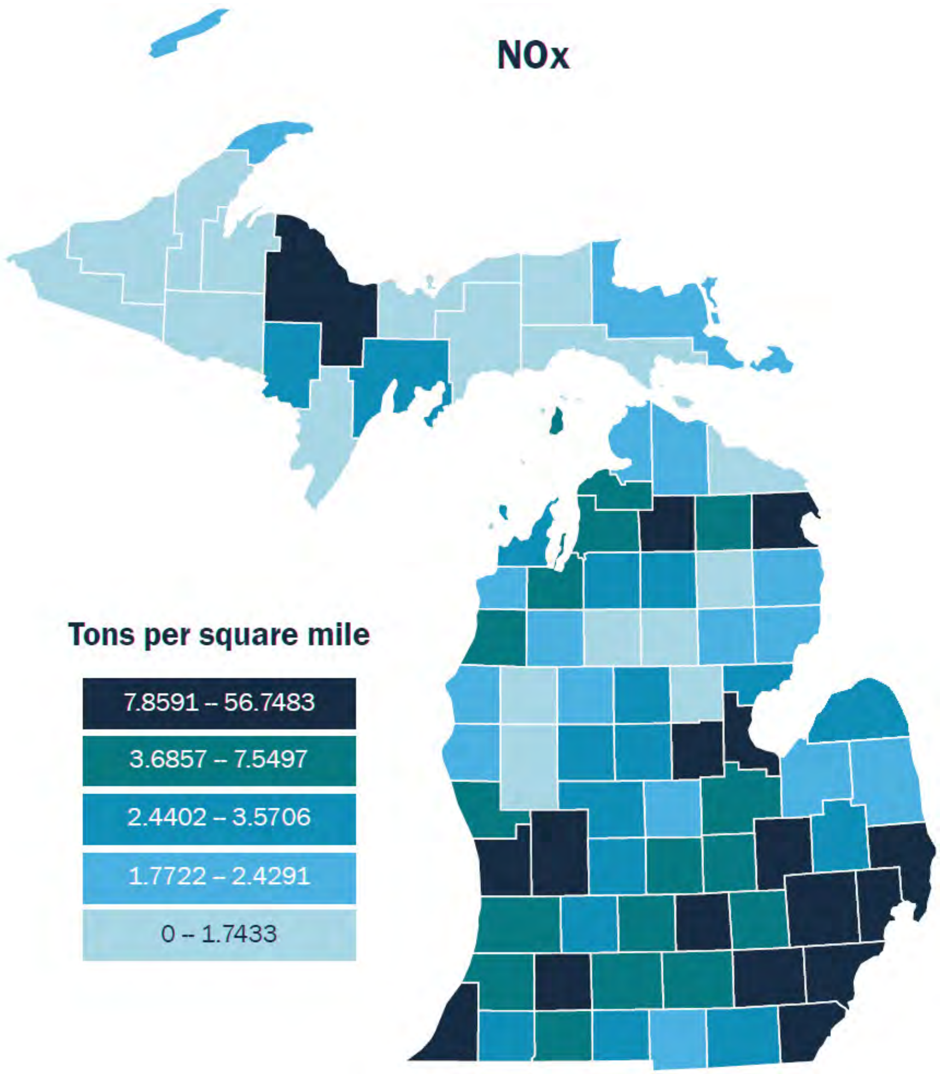
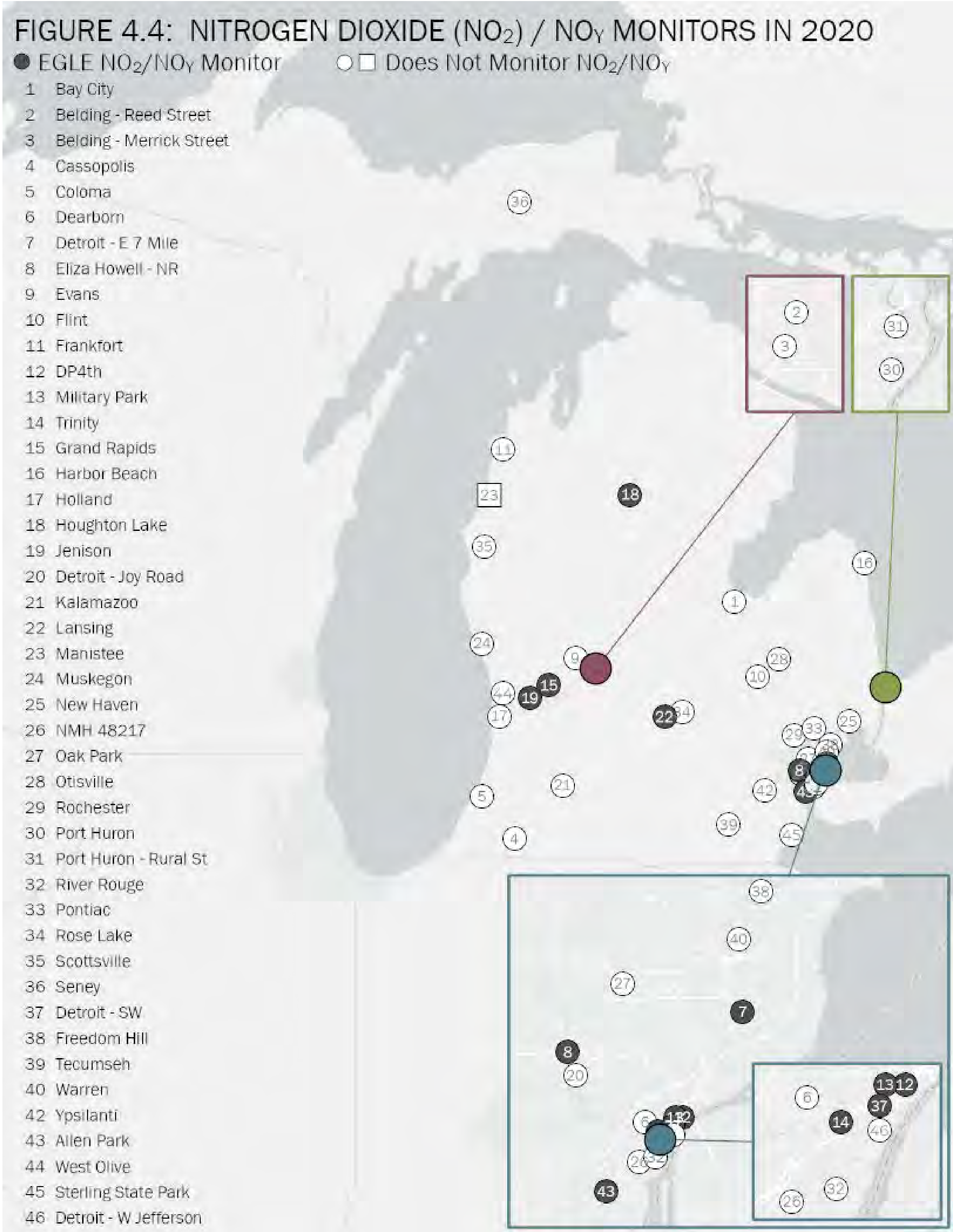


Figure 4.4 shows the location of all NO_2 monitors that operated in 2020.

- Downwind urban scale site: Detroit-E 7 Mile in Detroit and Jenison for the Grand Rapids area.
- Near-roadway Network sites: Detroit Eliza Howell-NR site, the downwind site was shut down since it is not necessary for the near-road network. The Livonia roadway site needed to be moved since EGLE lost site access. A suitable replacement has not been found.
- NCore sites: Grand Rapids and Allen Park, monitor NO_Y, which includes NO_X, nitric acid, and organic and inorganic nitrates (not used for attainment/nonattainment purposes).
- Photochemical Assessment Monitoring Station (PAMS) Network: The NOX monitor at Detroit-E 7 Mile was switched to a NOY for PAMS. Direct NO_2 will also be monitored at Detroit-E 7 Mile when the PAMS network is completely installed at this site.
- Background monitors for modeling: Lansing and Houghton Lake.
- GBIH project: Detroit-SW, DP4th, Trinity, and Military Park.

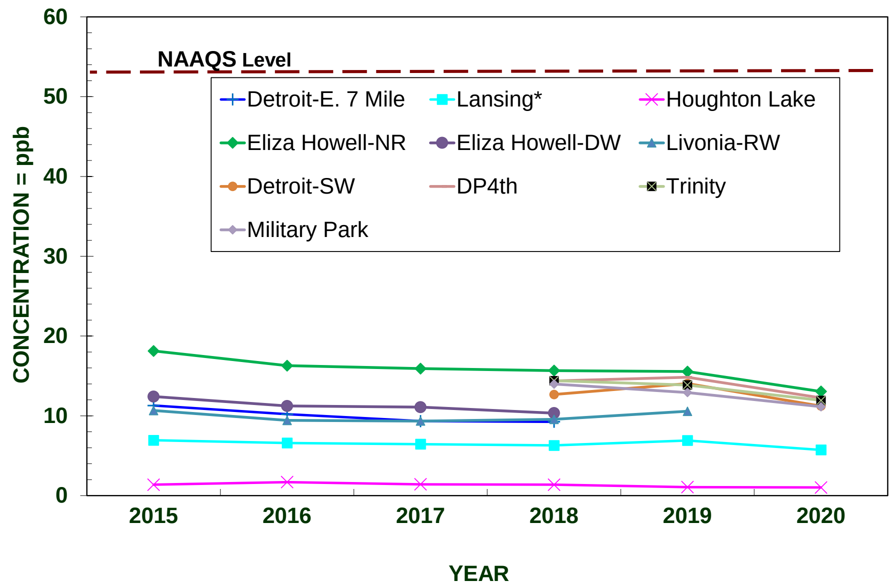
Figure 4.4: Nitrogen Dioxide (NO_2)/NO_Y Monitors in 2020



Michigan's ambient NO_2 levels have always been well below the NAAQS. Since March 3, 1978, all areas in Michigan have been in attainment for the annual NO_2 NAAQS. As shown in **Figure 4.5**, all monitoring sites have had an annual NO_2 concentration at less than half of the 0.053 ppm NAAQS.

Even though there are no nonattainment areas for NO_2 in Michigan and monitoring for attainment purposes is not required, monitors continue to operate to support photochemical model validation work.

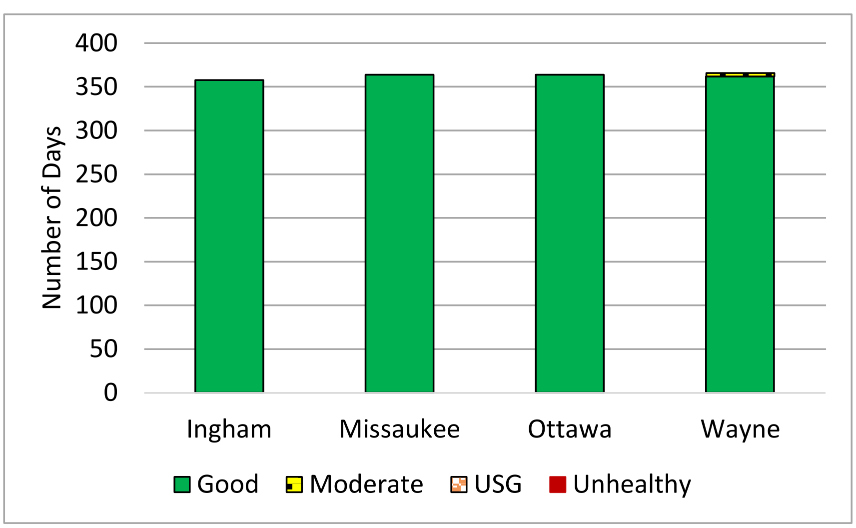
Figure 4.5: NO_2 Levels in MI from 2015-2020 (Annual Arithmetic Mean)****



*Indicates site was moved in 2018 and concentrations were averaged together for both locations.
**Since Allen Park and Grand Rapids are monitoring NO_Y, those sites are not included in graph.

Figure 4.6 shows the AQI values per day in counties where NO_2 is monitored. All days were in the good AQI range except for four days in Wayne County that were in the moderate AQI range.

Figure 4.6: 2020 AQI Days for NO_2 in Michigan Counties



CHAPTER 5: SULFUR DIOXIDE (SO_2)

Sulfur dioxide is a gas formed by the burning of sulfur-containing material. Odorless at typical ambient concentrations, SO_2 can react with other atmospheric chemicals to form sulfuric acid. At higher concentrations it has a pungent, irritating odor like a struck match. When sulfur-bearing fuel is burned, the sulfur is oxidized to form SO_2, which then reacts with other pollutants to form aerosols. These aerosols can form particles in the air causing increases in $PM_{2.5}$ levels. In liquid form, it is found in clouds, fog, rain, aerosol particles, and in surface films on these particles. In June 2010, the USEPA changed the primary SO_2 standard to a 99th percentile of 1-hour concentrations not to exceed 0.075 ppm, averaged over a 3-year period. The secondary standard has not changed and is a 3-hour average that cannot exceed 0.5 ppm once per year. Its sources and effects are presented below.

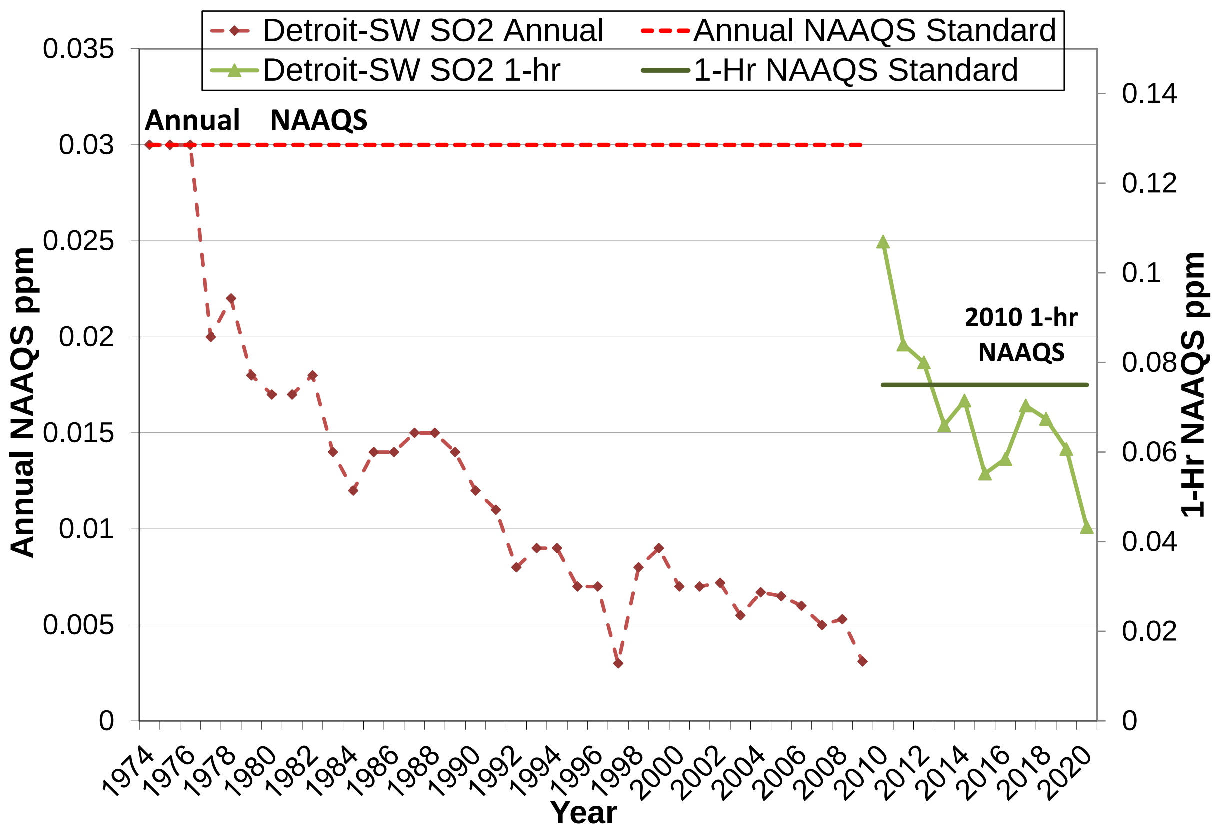
Sources: Coal-burning power plants are the largest source of SO_2 emissions. Other sources include industrial processes such as extracting metal from ore, and non-road transportation sources, and natural sources such as volcanoes. SO_2 and particulate matter are often emitted together.

Effects: Exposure to elevated levels can aggravate symptoms in asthmatics and cause respiratory problems in healthy groups. SO_2 and NOx together are the major precursors to acid rain and are associated with the acidification of soils, lakes, and streams, as well as accelerated corrosion of buildings and monuments.

Population most at risk: Asthmatics, children, and the elderly are especially sensitive to SO_2 exposure. Asthmatics receiving short-term exposures during moderate exertion may experience reduced lung function and symptoms, such as wheezing, chest tightness, or shortness of breath. Depending on the concentration, SO_2 may also cause symptoms in people who do not have asthma.

Historical Trends: Southeast Michigan has been monitoring for SO_2 for over 45 years. **Figure 5.1** shows the SO_2 trend for the old annual standard and the new 1-hour standard for Detroit-SW. Michigan had been in attainment for SO_2 since 1982 with levels consistently well below the annual SO_2 NAAQS. In 2010, when the USEPA changed the standard from an annual average to a 1-hour standard, a portion of Wayne County was designated nonattainment. In September 2016, a portion of St. Clair County was also designated as nonattainment by the USEPA based on emissions and modeling. Even though the areas are in nonattainment for the 1-hour SO_2 standard, SO_2 concentrations have decreased at these sites and are currently under the NAAQS, although modeling results are not below the NAAQS.

Figure 5.1: Historical Annual and 1-hour SO_2 Averages at Detroit-SW



Figures 5.2 and **5.3** show SO_2 emission sources and SO_2 emissions by county (courtesy of the USEPA's State and County Emission Summaries).

Figure 5.2: SO_2 Emissions by Source Sector

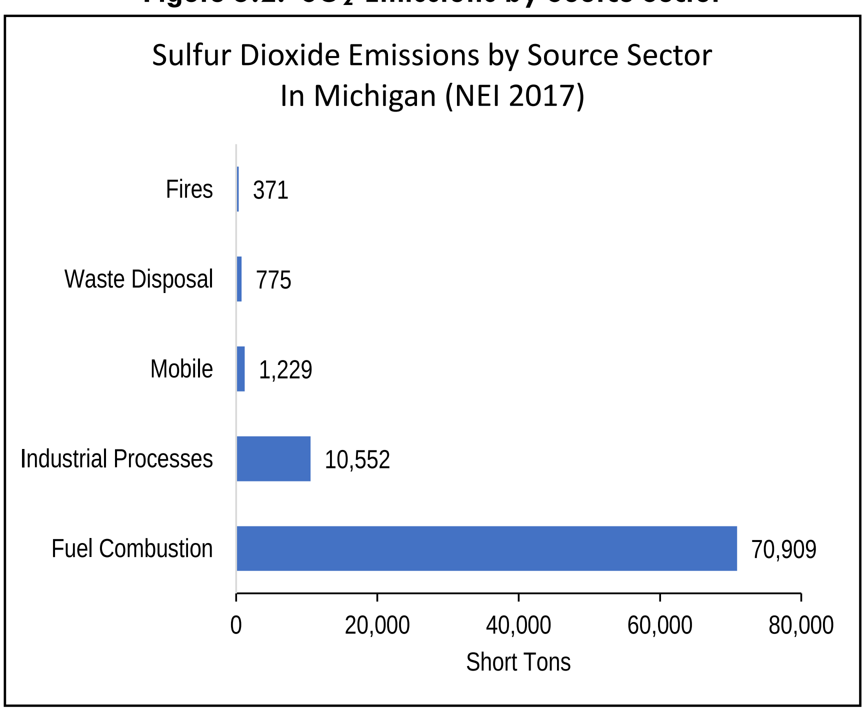


Figure 5.3: SO_2 Emissions in 2017 (NEI)

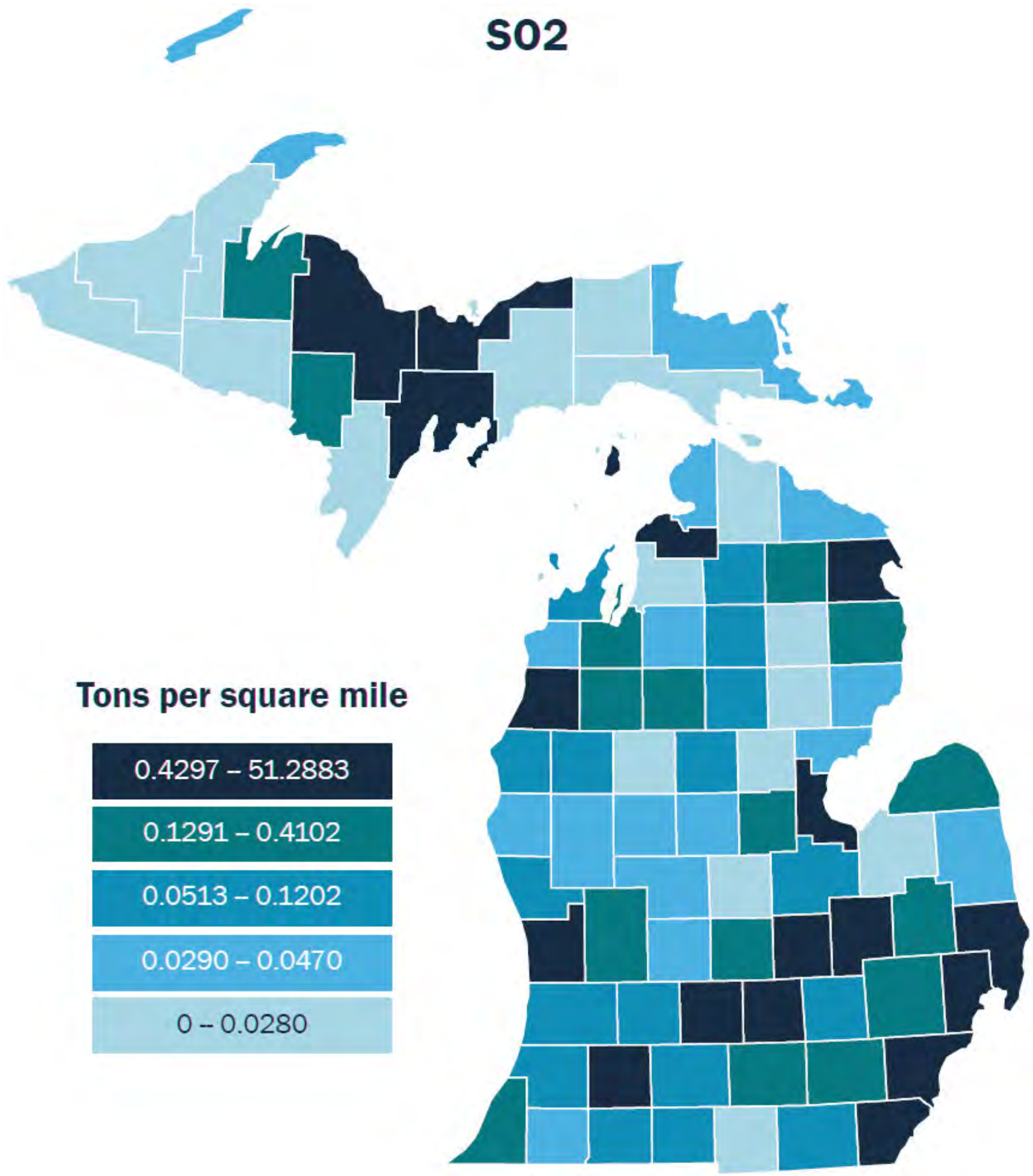


Figure 5.4 shows the location of each SO_2 monitor that operated in 2020.

- NCore sites: Allen Park and Grand Rapids have trace SO_2 monitors that have lower detection limits than traditional SO_2 monitors.
- Source-oriented sites: Lansing, Port Huron, Detroit-SW, Sterling State Park, West Olive.
- Community monitoring project: NMH 48217.
- GHIB project: DP4th, Trinity, and Military Park.

Figure 5.4: Sulfur Dioxide (SO_2) Monitors in 2020

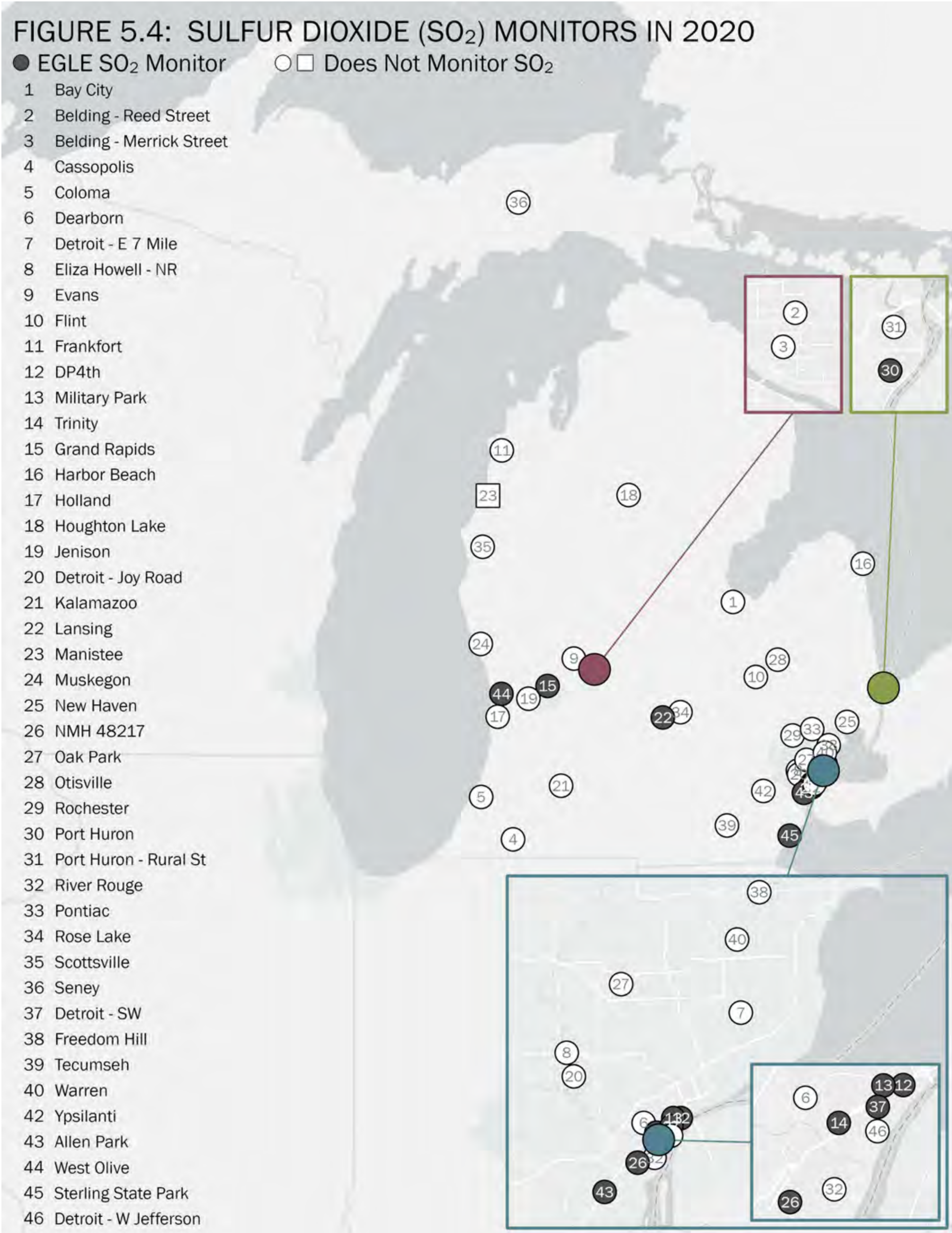


Figure 5.5 shows that all the SO_2 sites in Michigan are below the standard even though there is a nonattainment area for SO_2. The standard is a three-year average, therefore having one point above the NAAQS level line does not mean the monitor is over the standard. SO_2 pollution is extremely variable and would require a large monitoring network to designate areas as attainment. Therefore, SO_2 attainment depends on both emission modeling and monitoring data.

The NCore sites, Grand Rapids and Allen Park, monitor for trace SO_2. For trend purposes, all SO_2 data are graphed together in **Figure 5.5**.

Figure 5.5: SO_2 Level in Michigan from 2015-2020 (1-Hour 99th Percentile)

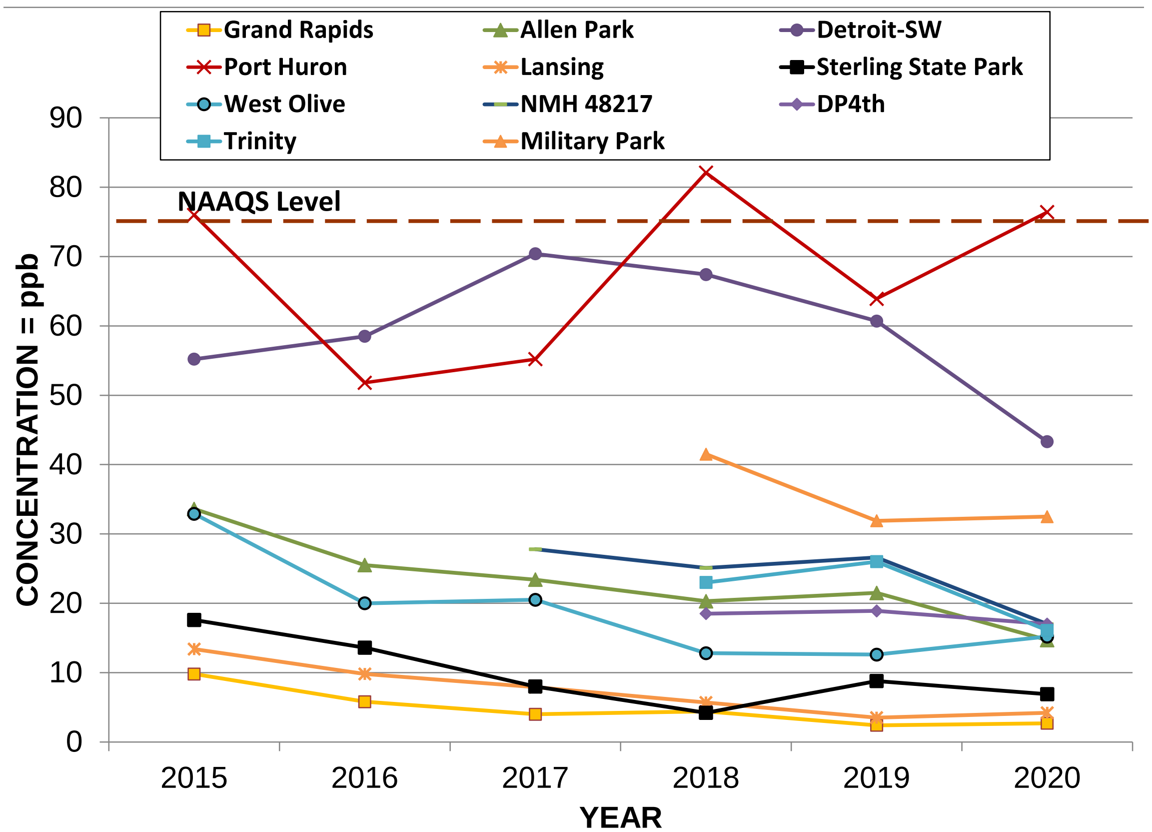
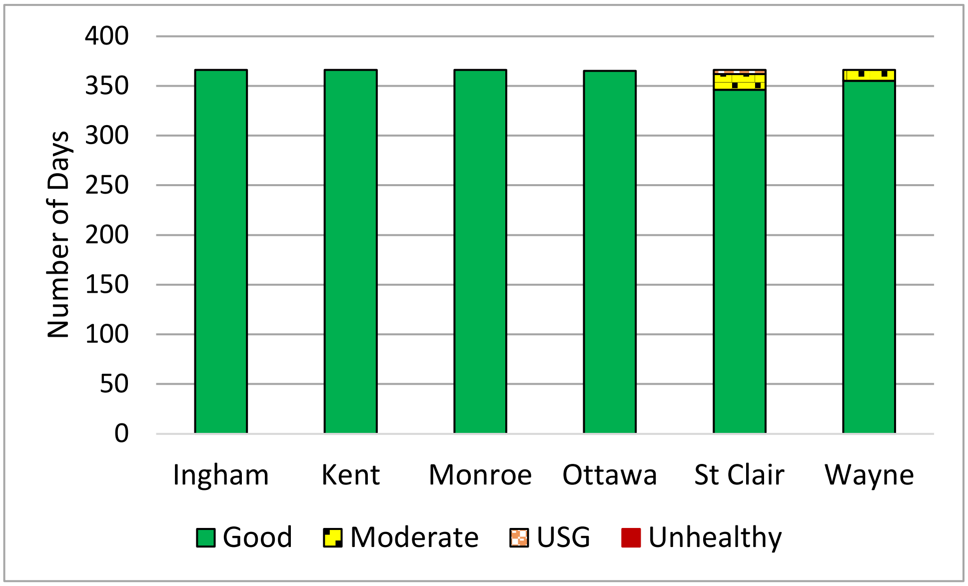
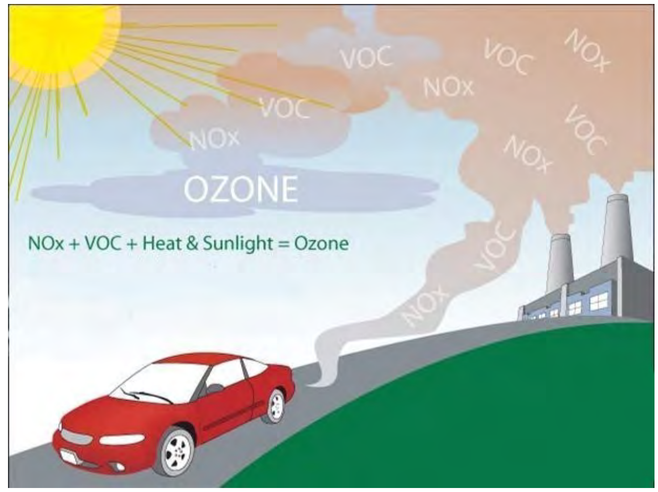


Figure 5.6 shows the AQI values per day in counties where SO_2 is monitored. All days were in the good AQI range except for 27 days in the moderate AQI range in St. Clair and Wayne Counties and four days in the Unsafe for Sensitive Groups (USG) in St. Clair County.

Figure 5.6: 2020 AQI Days for SO_2 in Michigan Counties



CHAPTER 6: OZONE (O_3)



Ground-level O_3 is created by reactions involving nitrogen oxides (NO_X) and volatile organic compounds (VOCs), or hydrocarbons, in the presence of sunlight as the illustration to the right depicts (image courtesy of the USEPA). These reactions usually occur during the hot summer months as ultraviolet radiation from the sun initiates a sequence of photochemical reactions. In Earth's upper atmosphere (the stratosphere), O_3 helps by absorbing much of the sun's ultraviolet radiation, but in the lower atmosphere (the troposphere), ozone is an air pollutant. O_3 is also a key ingredient of urban smog and can be transported hundreds of miles under certain meteorological conditions. Ozone levels are often higher in rural areas than in cities due to transport to regions downwind from the actual emissions of NO_X and VOCs. Shoreline monitors along Lake Michigan often measure high ozone concentrations due to transport from upwind states. The ozone NAAQS was revised by the USEPA and became effective in November 2015. It is a 3-year average of the 4th highest daily maximum 8-hour average concentration that must not exceed 0.070 ppm. The sources and effects of ozone follow.

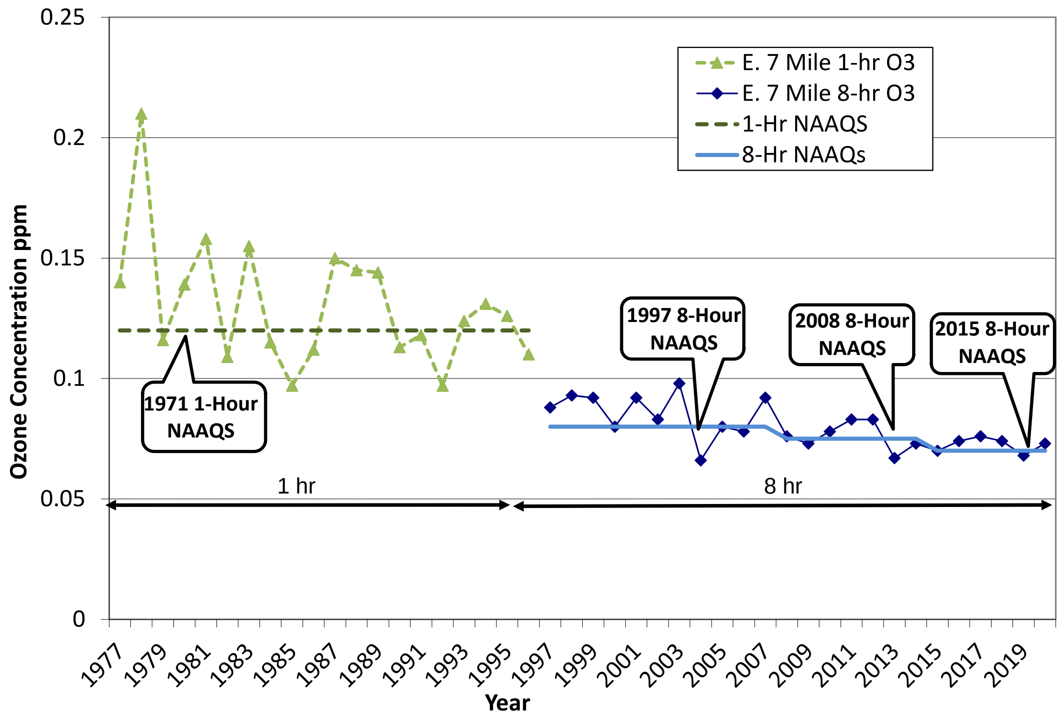
Sources: Major sources of NO_X and VOCs are engine exhaust, emissions from industrial facilities, combustion from power plants, gasoline vapors, chemical solvents, and biogenic emissions from natural sources. Ground-level O_3 can also be transported hundreds of miles under certain wind regimes. As a result, the long-range transport of air pollutants impacts the air quality of regions downwind from the actual area of formation.

Effects: Elevated O_3 exposure can irritate airways, reduce lung function, aggravate asthma and chronic lung diseases like emphysema and bronchitis, and inflame and damage the cells lining the lungs. Other effects include increased respiratory related hospital admissions with symptoms such as chest pain, shortness of breath, throat irritation, and cough. O_3 may also reduce the immune system's ability to fight off bacterial infections in the respiratory system, and long-term, repeated exposure may cause permanent lung damage. O_3 also impacts vegetation and forest ecosystems, including agricultural crop and forest yield reductions, diminished resistance to pests and pathogens, and reduced survivability of tree seedlings.

Population most at risk: Individuals most susceptible to the effects of O_3 exposure include those with a pre-existing or chronic respiratory disease, children who are active outdoors and adults who actively exercise or work outdoors.

Historical Trends: Southeast Michigan has been monitoring for ozone for over 40 years. **Figure 6.1** shows the ozone levels at the Detroit-E 7 Mile Road site. This graph shows how the standard changed from a 1-hour average of 0.120 ppm to an 8-hour average of 0.08 ppm in 1997. The standard was further lowered to 0.075 ppm in 2008 and to 0.070 ppm at the end of 2015. Ozone depends on weather conditions, so ozone concentrations are more variable than other pollutants. Ozone is also monitored primarily in warmer months. In the 2015 NAAQS, the ozone season was extended to by two months to March 1 to October 31.

Figure 6.1: Historical 1-hour and 8-hour Ozone at Detroit-E 7 Mile



Figures 6.2 and **6.3** show VOC emission sources and VOC emissions by county (courtesy of the USEPA's State and County Emission Summaries).

Figure 6.2: VOC Emissions by Source Sector

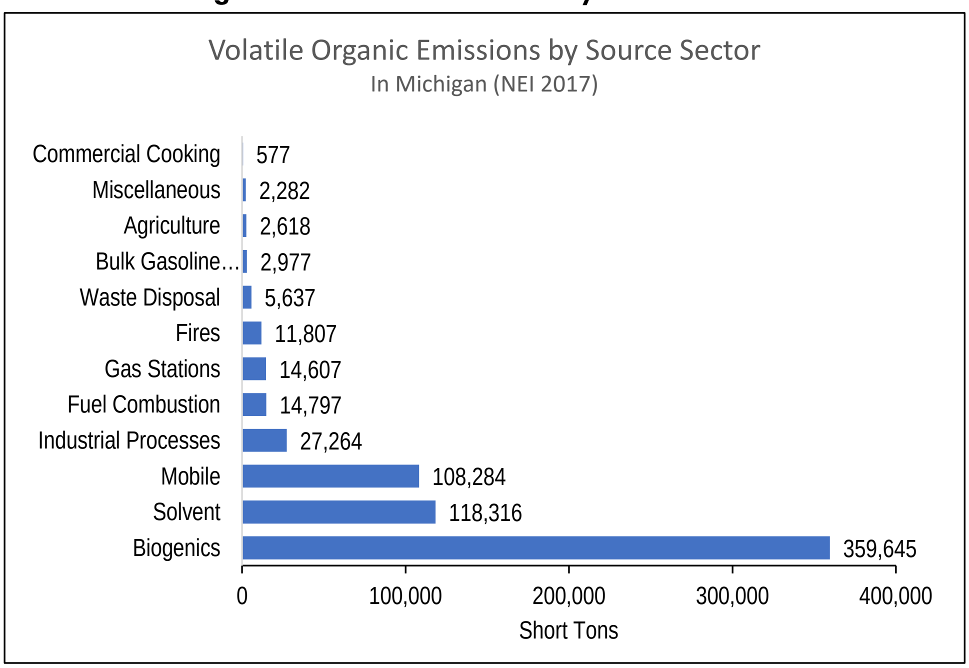


Figure 6.3: VOC Emissions in 2017

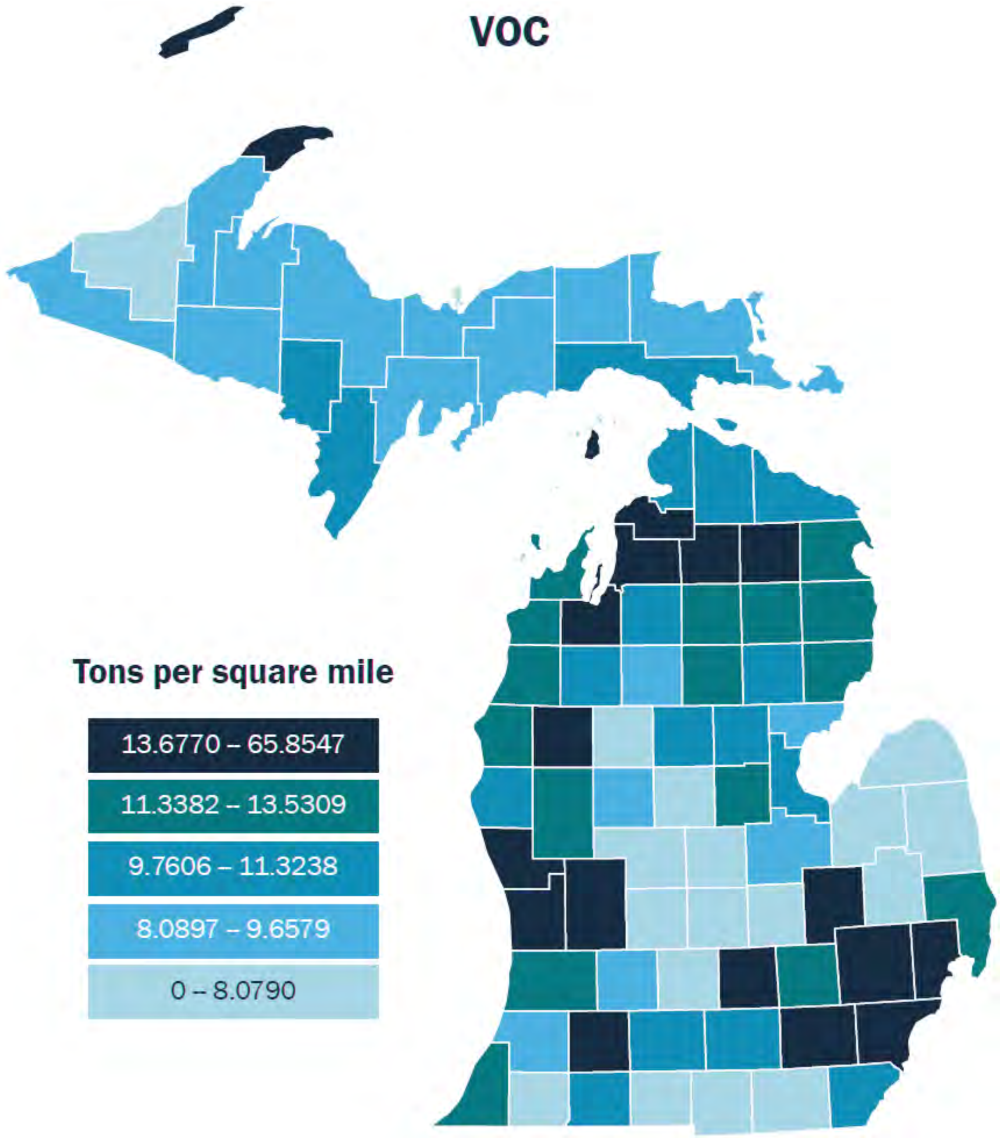


Figure 6.4 shows all O_3 air quality monitors active in Michigan at the beginning of the 2020 ozone season.

- Background site monitors: Houghton Lake, Scottville, Seney.
- Transport site monitors: Frankfort, Coloma, Harbor Beach, Holland, Muskegon, Tecumseh.
- Tribal site: Manistee
- Population-oriented monitors: All other sites.

Figure 6.4: Ozone Monitors in 2020

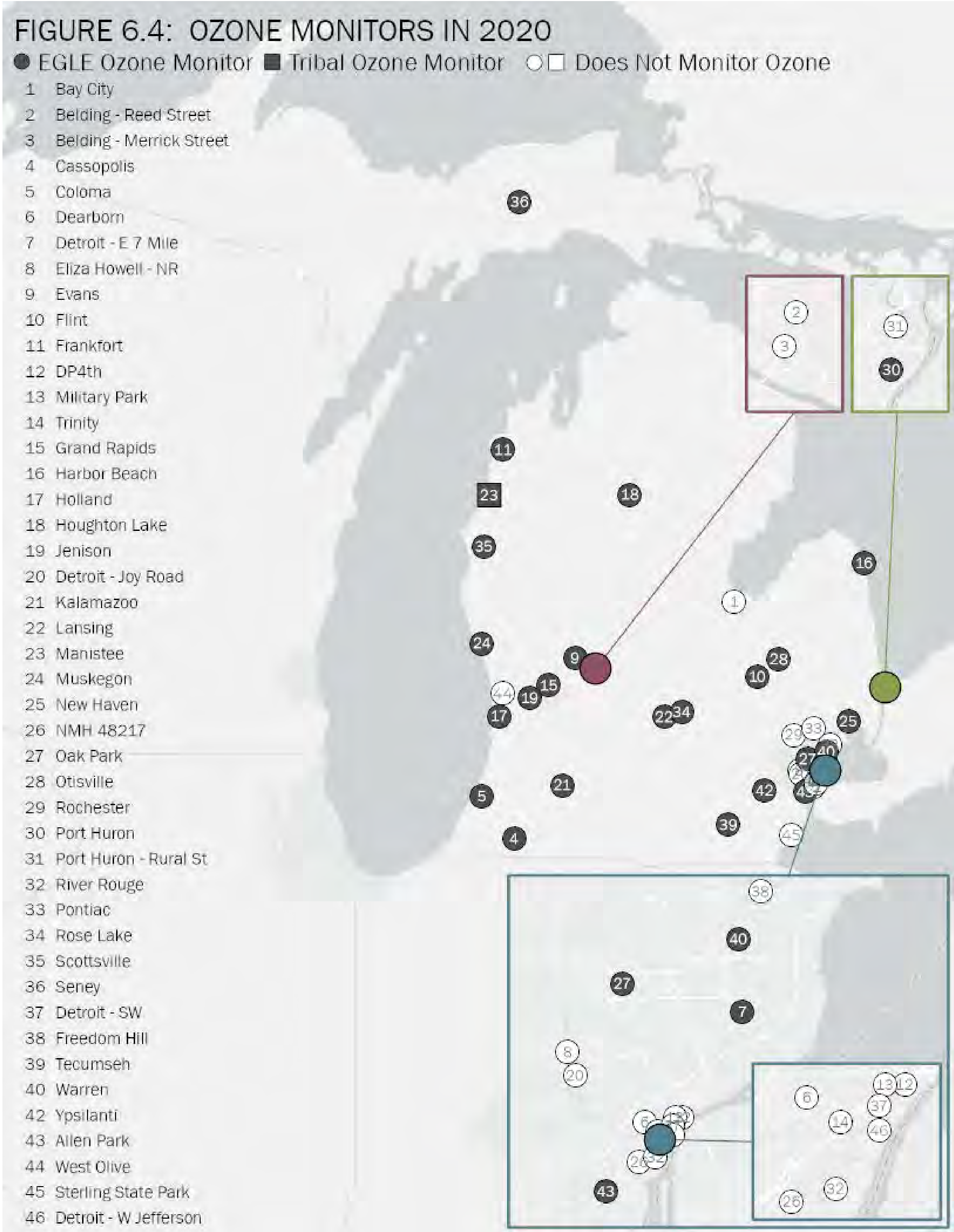


Table 6.1 shows the three-year averages of ozone. The USEPA uses these values (called design values) to determine attainment/nonattainment areas. The USEPA made their final designations for the 2015 standard on April 30, 2018 (effective August 3, 2018) based on 2014-2016 data. Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne Counties were designated nonattainment in Southeast Michigan; and all of Berrien County, and portions of Allegan and Muskegon Counties were designated nonattainment in Western Michigan. In 2019 Berrien County was below the standard and a redesignation request was submitted to the USEPA in January 2020. Berrien County experienced elevated ozone in 2020. The USEPA has not yet acted on the submitted redesignation request.

The O_3 monitoring season in Michigan is from March 1 through October 31. During this time O_3 monitoring data is available for the public via the AQD's website (discussed in **Chapter 1**). However, year-round O_3 monitoring is conducted at the following four sites: Allen Park, Grand Rapids, Houghton Lake, and Lansing. This data helps in attainment designations, urban air quality and population exposure assessments.

Table 6.1: 3-Year Average of the 4th Highest 8-hour Ozone Values from 2016-2018, 2017-2019, and 2018-2020 (concentrations in ppm)

Areas	County	Monitor Sites	2016-2018	2017-2019	2018-2020
Detroit-Ann Arbor	Lenawee	Tecumseh	0.068	0.065	0.065
Detroit-Ann Arbor	Macomb	New Haven	**0.072**	0.068	**0.071**
Detroit-Ann Arbor	Macomb	Warren	0.069	0.066	0.068
Detroit-Ann Arbor	Oakland	Oak Park	**0.073**	0.070	**0.072**
Detroit-Ann Arbor	St. Clair	Port Huron	**0.072**	**0.071**	**0.071**
Detroit-Ann Arbor	Washtenaw	Ypsilanti	0.069	0.066	0.067
Detroit-Ann Arbor	Wayne	Allen Park	0.068	0.066	0.067
Detroit-Ann Arbor	Wayne	Detroit-E 7 Mile	**0.074**	**0.072**	**0.071**
Flint	Genesee	Flint	0.068	0.064	0.065
Flint	Genesee	Otisville	0.068	0.063	0.065
Grand Rapids	Ottawa	Jenison	0.070	0.067	**0.071**
Grand Rapids	Kent	Grand Rapids	0.070	0.066	**0.071**
Grand Rapids	Kent	Evans	0.068	0.064	0.065
Muskegon Co	Muskegon	Muskegon	**0.076**	**0.074**	**0.076**
Allegan Co	Allegan	Holland	**0.073**	**0.072**	**0.073**
Huron	Huron	Harbor Beach	0.068	0.064	0.068
Kalamazoo-Battle Creek	Kalamazoo	Kalamazoo	**0.071**	0.066	0.068
Lansing-East Lansing	Ingham	Lansing	0.068*	0.063	0.062
Lansing-East Lansing	Clinton	Rose Lake	0.069*	0.062	0.063
Benton Harbor	Berrien	Coloma	**0.073**	0.069	**0.072**
Benzie Co	Benzie	Frankfort	0.068	0.063	0.064
Cass Co	Cass	Cassopolis	**0.074**	0.070	**0.071**
Mason Co	Mason	Scottville	0.068	0.063	0.064
Missaukee Co	Missaukee	Houghton Lake	0.067	0.062	0.064
Manistee Co	Manistee	Manistee	0.066	0.064	0.059
Schoolcraft Co	Schoolcraft	Seney	0.064	0.059	0.063

Numbers in bold indicate 3-year averages over the 2015 ozone standard of 0.070 ppm.
*The three-year average is using data averaged from sites that were moved.

Tables 6.2 and 6.3 highlight the number of days when two or more O_3 monitors exceeded 0.070 ppm. It also specifies in which month they occurred and the temperature range.

Table 6.2: 2020 West Michigan Ozone Season

Daily High Temperature Range	Mar Days	Mar O_3 Days	Apr Days	Apr O_3 Days	May Days	May O_3 Days	Jun Days	Jun O_3 Days	Jul Days	Jul O_3 Days	Aug Days	Aug O_3 Days	Sep Days	Sep O_3 Days	Oct Days	Oct O_3 Days
≥ 95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90 ≤94	0	0	0	0	1	0	3	2	10	1	3	1	0	0	0	0
85 ≤ 89	0	0	0	0	2	0	10	4	5	1	11	0	1	0	0	0
80 ≤ 84	0	0	0	0	1	0	7	0	16	0	8	0	3	0	0	0
75 ≤ 79	0	0	1	0	2	0	5	0	0	0	8	0	9	0	1	0
70 ≤ 74	0	0	1	0	6	0	4	0	0	0	1	0	5	0	2	0
65 ≤ 69	0	0	2	0	5	0	1	0	0	0	0	0	4	0	8	0
60 ≤ 64	3	0	6	0	6	0	0	0	0	0	0	0	8	0	1	0
55 ≤ 59	3	0	5	0	4	0	0	0	0	0	0	0	0	0	5	0
50 ≤ 54	5	0	5	0	2	0	0	0	0	0	0	0	0	0	8	0
49 ≤	20	0	10	0	2	0	0	0	0	0	0	0	0	0	6	0
Totals	**31**	**0**	**30**	**0**	**31**	**0**	**30**	**6**	**31**	**2**	**31**	**1**	**30**	**0**	**31**	**0**

Days: Number of days during month when the daily high temperature falls within the specified temperature range.
O_3 Days: Number of days, during specified temperature range, when two or more area monitors exceeded 70 ppb.

West Michigan had six O_3 exceedance days in June; two in July and one in August when ozone exceeded 0.070 ppm at two or more ozone monitors. The temperatures on those days ranged between 85°F and 94°F.

Table 6.3: 2020 Southeast Michigan Ozone Season

Daily High Temperature Range	Mar Days	Mar O_3 Days	Apr Days	Apr O_3 Days	May Days	May O_3 Days	Jun Days	Jun O_3 Days	Jul Days	Jul O_3 Days	Aug Days	Aug O_3 Days	Sep Days	Sep O_3 Days	Oct Days	Oct O_3 Days
≥ 95	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
0 ≤94	0	0	0	0	0	0	3	2	9	2	4	0	0	0	0	0
85 ≤ 89	0	0	0	0	3	0	9	2	13	0	10	0	1	0	0	0
80 ≤ 84	0	0	0	0	2	0	10	1	7	0	8	0	6	0	0	0
75 ≤ 79	0	0	0	0	1	0	4	0	1	0	9	0	7	0	3	0
70 ≤ 74	0	0	2	0	5	0	3	0	0	0	0	0	5	0	4	0
65 ≤ 69	1	0	3	0	8	0	1	0	0	0	0	0	7	0	4	0
60 ≤ 64	4	0	6	0	6	0	0	0	0	0	0	0	4	0	4	0
55 ≤ 59	1	0	8	0	2	0	0	0	0	0	0	0	0	0	7	0
50 ≤ 54	7	0	3	0	2	0	0	0	0	0	0	0	0	0	4	0
49 ≤	18	0	8	0	2	0	0	0	0	0	0	0	0	0	5	0
Totals	**31**	**0**	**30**	**0**	**31**	**0**	**30**	**5**	**31**	**3**	**31**	**0**	**30**	**0**	**31**	**0**

Days: Number of days during month when the daily high temperature falls within the specified temperature range.
O_3 Days: Number of days, during specified temperature range, when two or more area monitors exceeded 70 ppb.

Southeast Michigan had five O_3 exceedance days in June, and three in July when ozone exceeded 0.070 ppm at two or more ozone monitors. The temperature for those days ranged between 80°F and 95°F.

Table 6.4 gives a breakdown of the O_3 days and the specific monitors that went over the standard in western, central/upper, and eastern Michigan in 2020.

Table 6.4: 8-Hour Exceedance Days (>0.070 ppm) and Locations Monitors with Exceedances of the Ozone Standard

Date	Western Michigan	Central/Upper Mich.	Eastern Michigan	Total
5/26/2020			Harbor Beach	1
6/2/2020	Coloma, Evans, Grand Rapids, Holland, Jenison, Kalamazoo, Muskegon			7
6/4/2020			New Haven	1
6/5/2020	Cassopolis, Coloma		New Haven	3
6/9/2020		Houghton Lake	Flint, New Haven, Oak Park, Tecumseh, Ypsilanti	6
6/17/2020	Coloma, Cassopolis, Grand Rapids, Jenison, Kalamazoo	Seney	New Haven, Ypsilanti	8
6/18/2020	Frankfort, Cassopolis, Coloma, Grand Rapids, Holland, Jenison, Kalamazoo, Muskegon, Scottville	Seney	Harbor Beach, New Haven	12
6/19/2020	Frankfort, Cassopolis, Coloma, Evans, Grand Rapids, Holland, Jenison, Kalamazoo, Muskegon, Scottville	Seney	Harbor Beach, Oak Park	13
6/20/2020	Coloma, Grand Rapids, Holland, Jenison, Muskegon		Detroit-E 7 Mile, Harbor Beach, New Haven, Oak Park, Port Huron, Warren, Ypsilanti	12
7/2/2020			Detroit-E 7 Mile	1
7/6/2020			Detroit-E 7 Mile, Harbor Beach, New Haven, Oak Park, Warren	5
7/7/2020	Cassopolis, Kalamazoo		Allen Park, Detroit-E 7 Mile, New Haven, Oak Park, Tecumseh, Ypsilanti	8
7/9/2020			Allen Park, Harbor Beach, New Haven, Oak Park, Ypsilanti	5
7/15/2020			Harbor Beach	1
7/17/2020			New Haven	1
7/25/2020	Coloma, Holland			2
8/21/2020			New Haven	1
8/22/2020			New Haven	1
8/24/2020	Muskegon			1
8/26/2020	Grand Rapids, Holland, Jenison, Muskegon			4
			TOTAL	**93**

On July 19, 2020, there were 13 monitors and on June 18 and June 20, 2020, there were 12 monitor readings that exceeded the level of the standard. The site with the most exceedances in the western region of Michigan was Coloma with seven. The central/upper Michigan sites had Seney with 3 exceedances. New Haven had 12 exceedances each in eastern Michigan.

Figure 6.5 shows the 4th highest 8-hour O_3 values for Southeast Michigan monitoring sites from 2015-2020. Detroit-E 7 Mile, New Haven, Oak Park, and Port Huron site violated the 3-year standard.

Figure 6.6 shows the 4th highest 8-hour O_3 values for Grand Rapids-Muskegon-Holland CSA. Muskegon. Holland, Grand Rapids, and Jenison violated the 3-year standard.

Figure 6.7 shows 4th highest 8-hour O_3 values for mid-Michigan. Cassopolis and Coloma violated the 3-year standard.

Figure 6.8 shows 4th highest 8-hour O_3 values for Northern Lower and Upper Peninsulas. No sites violated the 3-year standard.

Figure 6.5: O_3 Levels in Detroit-Warren-Flint CSA from 2015-2020 - (4th Highest 8-Hour O_3 Values).

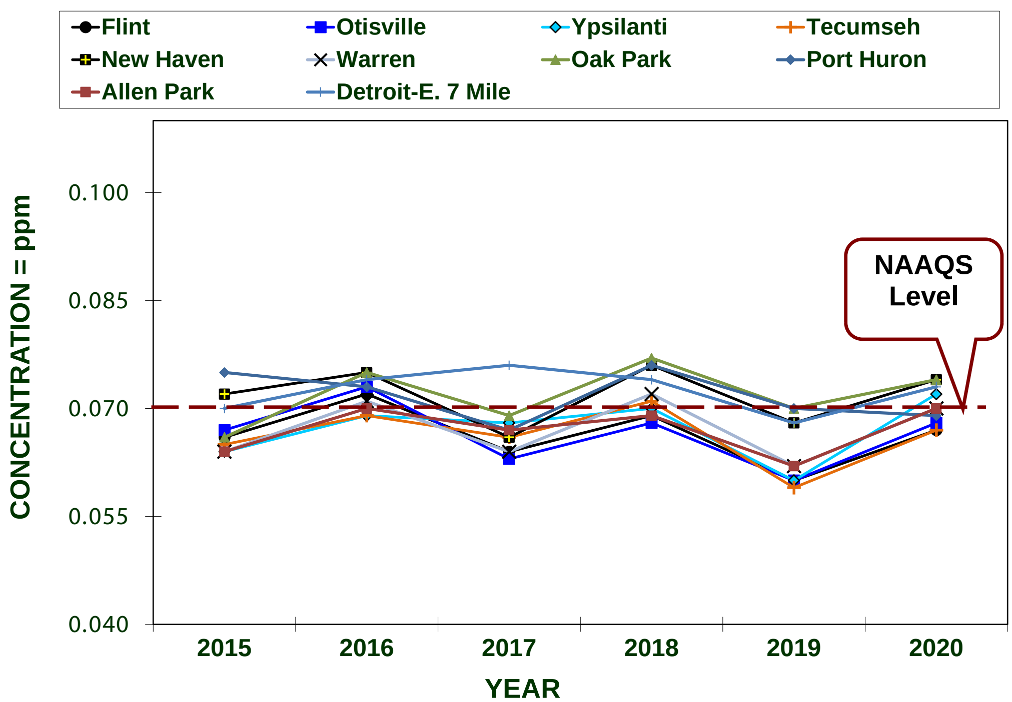


Figure 6.6: O_3 Levels in the Grand Rapids-Muskegon-Holland CSA from 2015-2020 (4th Highest 8-Hour O_3 Values)

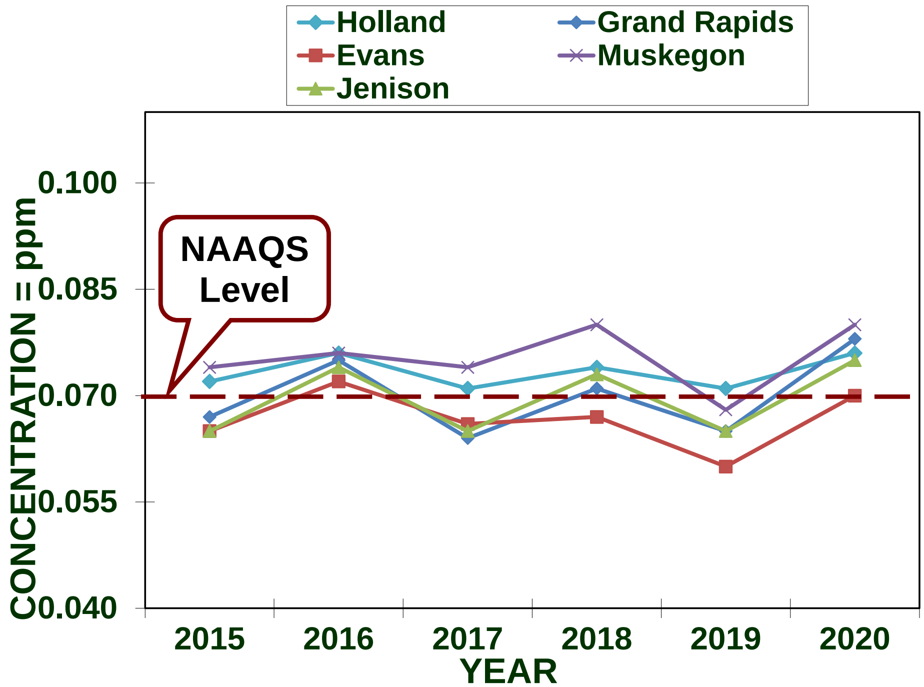


Figure 6.7: O_3 Levels in the Kalamazoo-Portage MSA, Lansing-E. Lansing-Owosso CSA, Niles-Benton Harbor MSA, & South Bend-Mishawaka (IN-MI) MSAs from 2015-2020 (4th Highest 8-Hour O_3 Values)

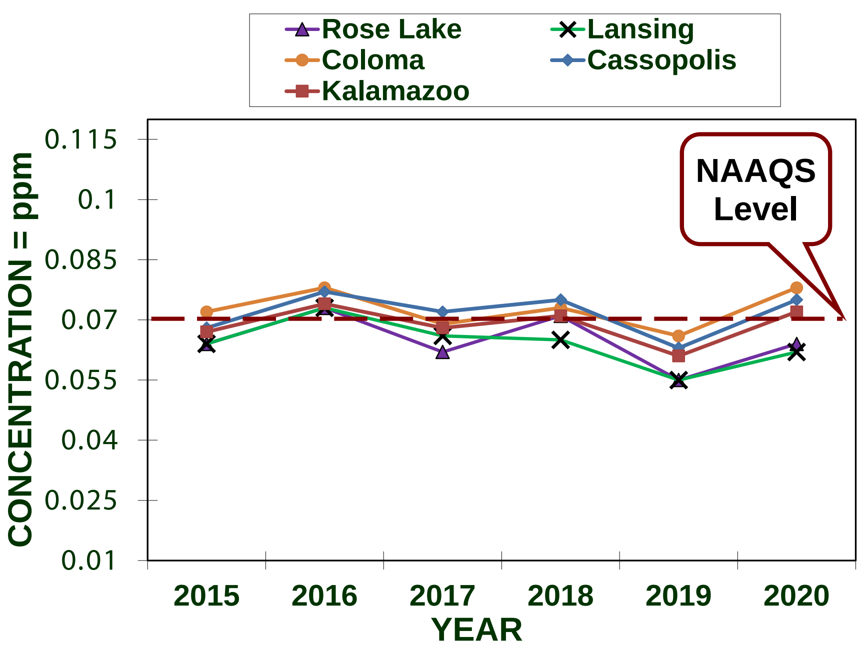


Figure 6.8: O_3 Levels in MI's Northern Lower and Upper Peninsula Areas from 2015-2020 (4th Highest 8-Hour O_3 Values)

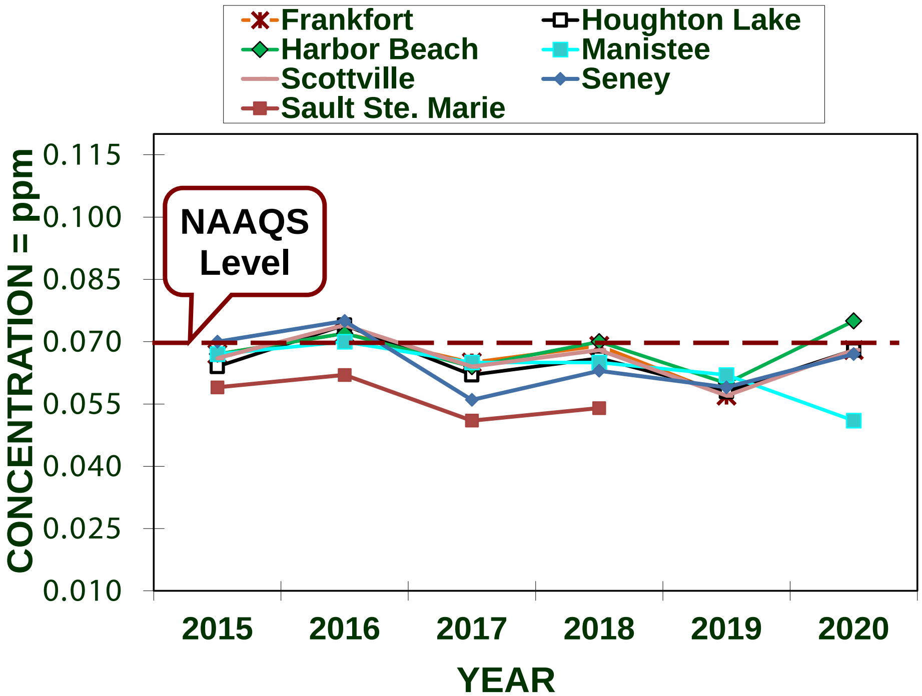
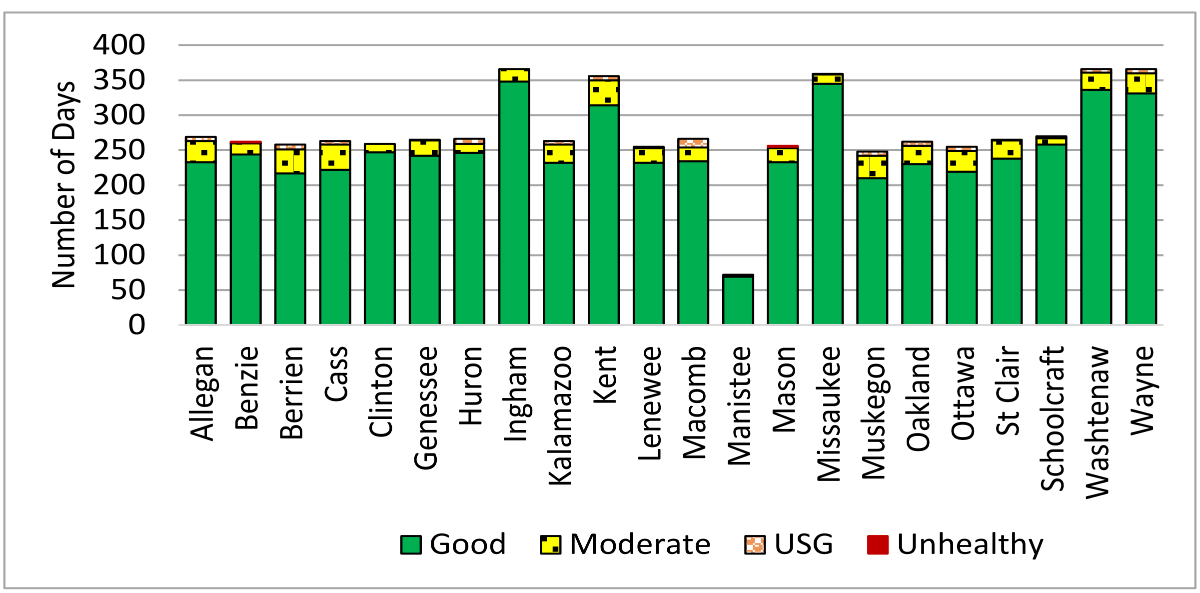


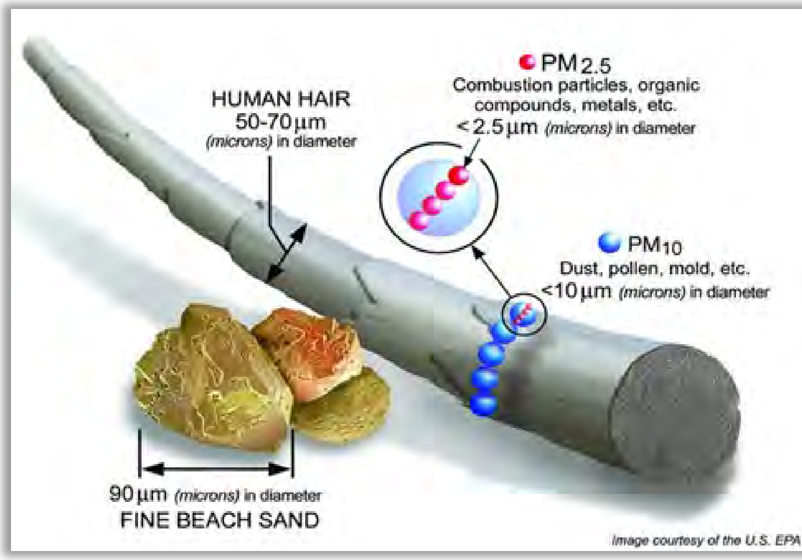
Figure 6.9 shows the AQI values per day in counties where ozone is monitored. Most days were in the good to moderate AQI range. Most counties had a few days in the USG range, Macomb County having the most USG days with 12 days. Two counties had one day each in the unhealthy AQI range: Benzie and Mason Counties.

Figure 6.9: 2020 AQI Days for Ozone in Michigan Counties



CHAPTER 7: PARTICULATE MATTER (PM_{10}, $PM_{10-2.5}$, $PM_{2.5}$, $PM_{2.5}$ CHEMICAL SPECIATION AND TSP)

Particulate matter (PM) is a general term used for a mixture of solid particles and liquid droplets (aerosols) found in the air. These are further categorized according to size; larger particles with diameters of less than 50 micrometers (µm) are classified as total suspended particulates (TSP). PM_{10} consists of "coarse particles" less than 10 µm in diameter (about one-seventh the diameter of a human hair) and $PM_{2.5}$ are much smaller "fine particles" equal to or less than 2.5 µm in diameter. PM_{10} has a 24-hour average standard of 150 µg/m^3 not to be exceeded more than once per year over 3 years. $PM_{2.5}$ has an annual average standard of 12 µg/m^3, and a 98th percentile 24-hour concentration of 35 µg/m^3 averaged over 3 years. The sources and effects of PM are as follows:



Sources: PM can be emitted directly (primary) or may form in the atmosphere (secondary). Most man-made particulate emissions are classified as TSP. PM_{10} consists of primary particles that can originate from power plants, various manufacturing processes, wood stoves and fireplaces, agriculture and forestry practices, fugitive dust sources (road dust and windblown soil), and forest fires. $PM_{2.5}$ can come directly from primary particle emissions or through secondary reactions that include VOCs, SO_2, and NO_X emissions originating from power plants, motor vehicles (especially diesel trucks and buses), industrial facilities, and other types of combustion sources.

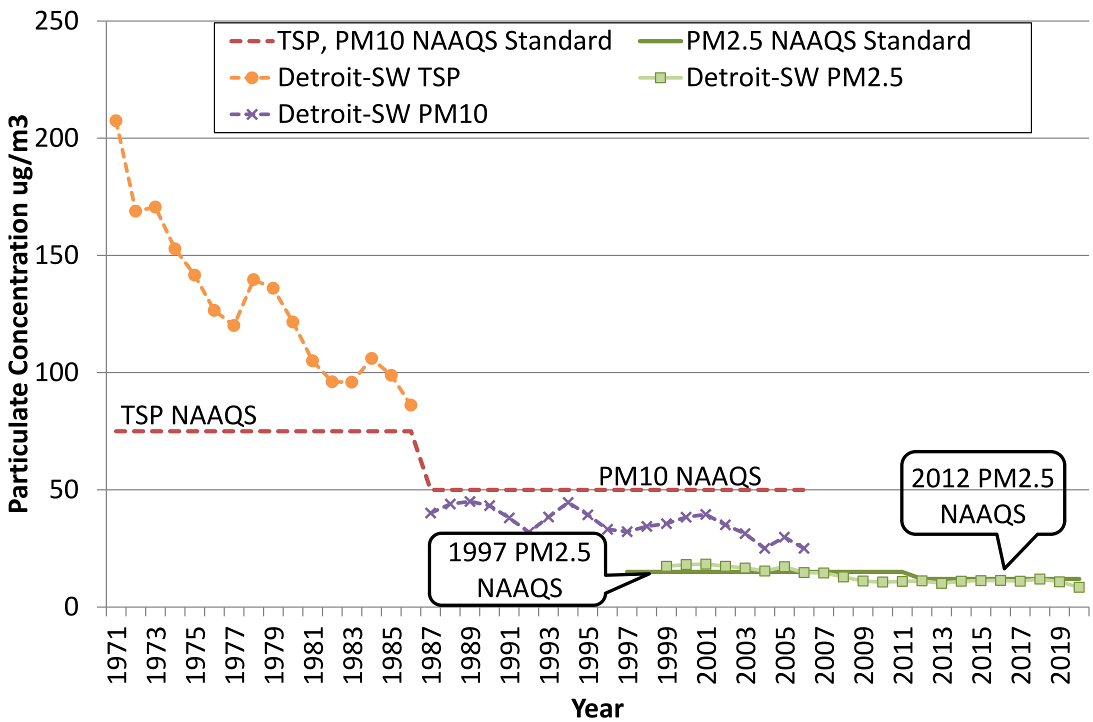
Effects: Exposure to PM can aggravate existing cardiovascular ailments and even cause death in susceptible populations. PM may affect breathing and the cellular defenses of the lungs and has been linked with heart and lung disease. Smaller particles (PM_{10} or smaller) pose the greatest problems, because they can penetrate deep in the lungs and possibly into the bloodstream. PM is the major cause of reduced visibility in many parts of the United States. $PM_{2.5}$ is considered a primary visibility-reducing component of urban and regional haze. Airborne particles impact vegetation ecosystems and damage paints, building materials and surfaces. Deposition of acid aerosols and salts increases corrosion of metals and impacts plant tissue.

Population most at risk: People with heart or lung disease, the elderly, and children are at highest risk from exposure to PM.

Historical Trends: Southeast Michigan has been monitoring for particulate for over 40 years. **Figure 7.1** shows the trends for particulate matter. In 1971, the USEPA promulgated an annual and 24-hour particulate standard based on total suspended particulates (TSP). In 1987, the USEPA changed the standard to PM_{10}. Health studies indicated that particles smaller than 10 microns affect respiration. In 1997, the USEPA added additional NAAQS for a smaller particle fraction size, $PM_{2.5}$, which can get deeper into the lungs and possibly into the blood stream. In 2006, the USEPA revoked the PM_{10} annual standard but kept the PM_{10} 24-hour standard. The $PM_{2.5}$ 24-hour standard was also reduced from 65 $\mu g/m^3$ to 35 $\mu g/m^3$. In 2012, the USEPA reduced the annual standard from 15 $\mu g/m^3$ to 12 $\mu g/m^3$.

Particulate trends show that particulate concentrations have decreased, and the state is in compliance for all particulate NAAQS; however, Michigan has had past nonattainment issues in Southeast Michigan for TSP, PM_{10} and $PM_{2.5}$.

Figure 7.1: Historical Annual Particulate Matter at Detroit-SW



PM_{10}

Figures 7.2 and **7.3** show PM_{10} emission sources and PM_{10} emissions by county (courtesy of the USEPA's State and County Emission Summaries).

Figure 7.2: PM_{10} Emissions by Source Sector

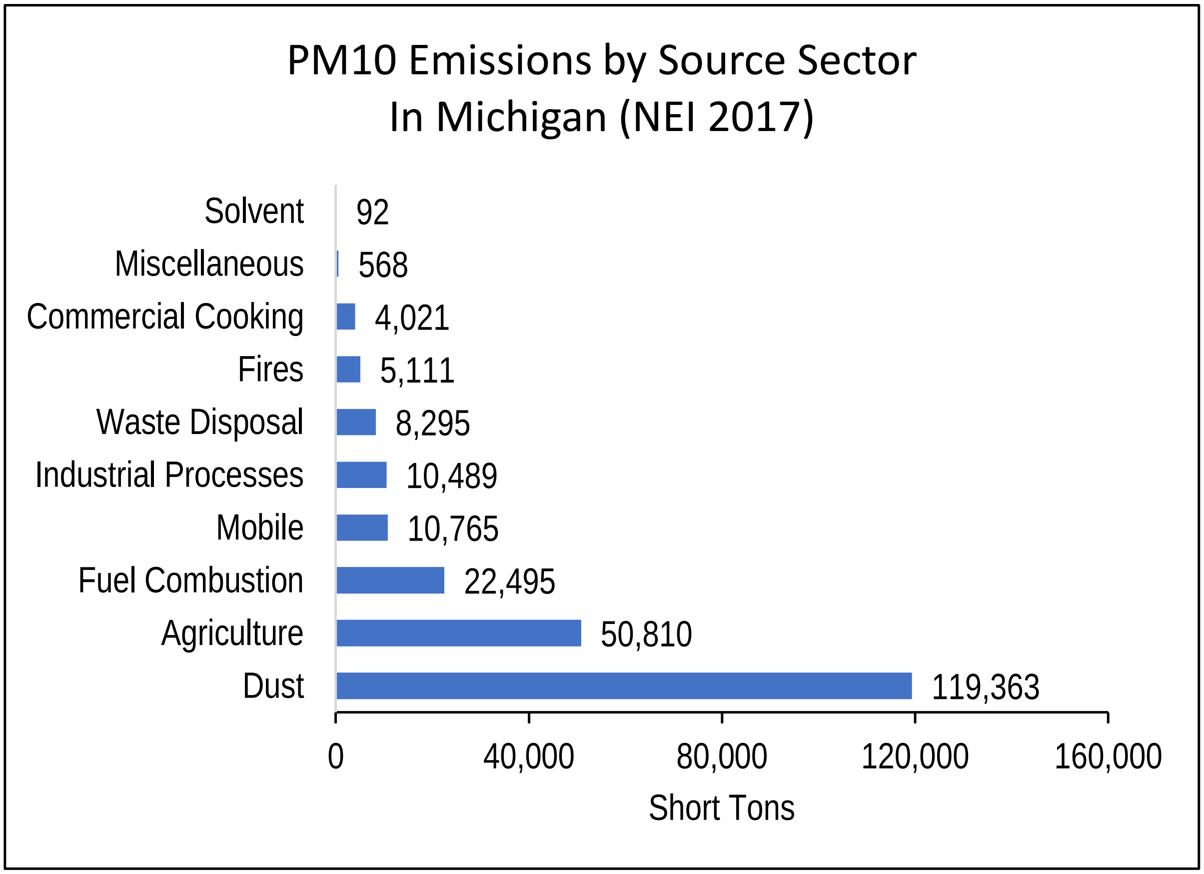
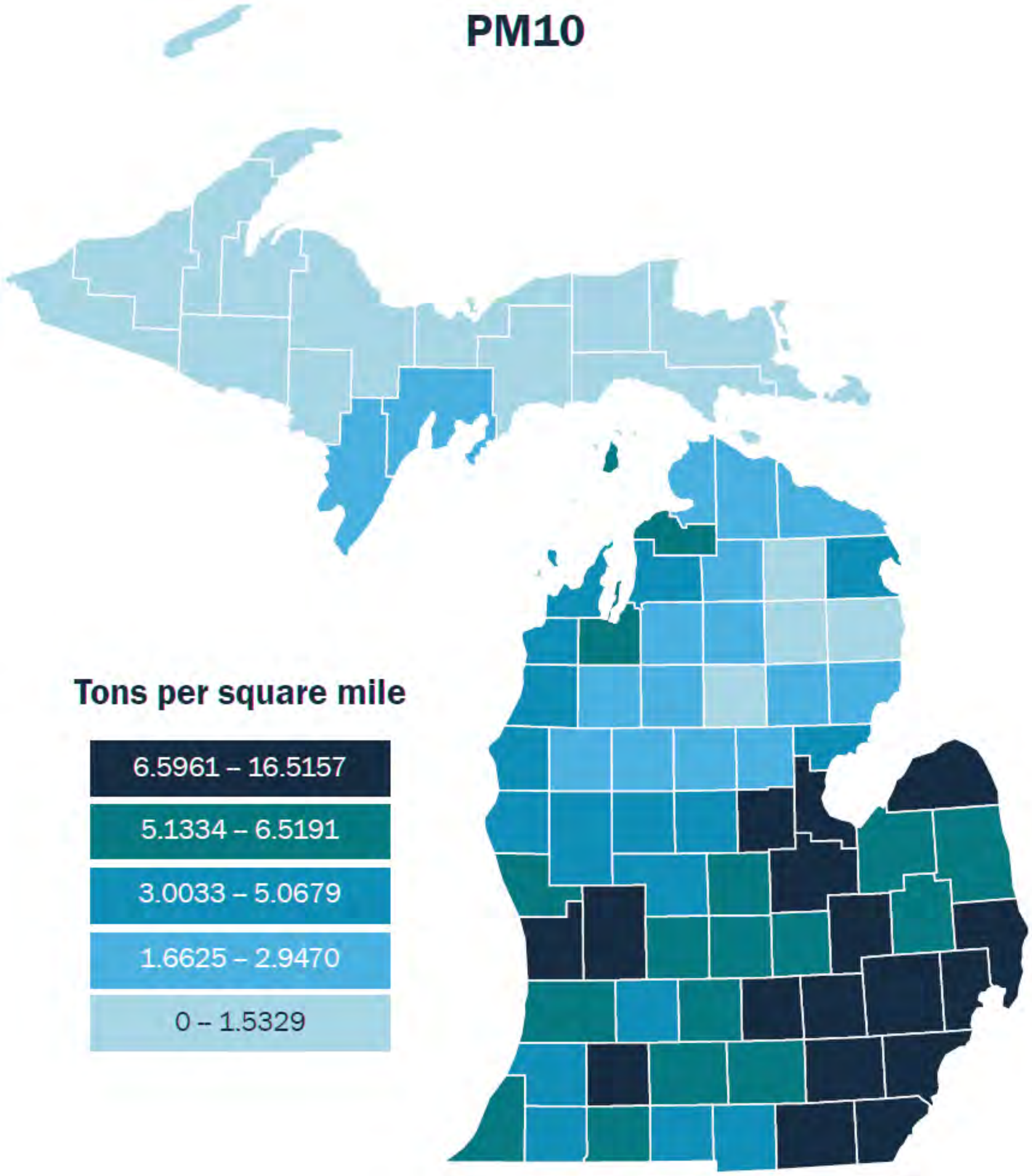


Figure 7.3: PM_{10} Emissions in 2017



Since October 1996, all areas in Michigan have been in attainment with the PM_{10} NAAQS. Due to the recent focus upon $PM_{2.5}$ and because of the relatively low concentrations of PM_{10} measured in recent years, Michigan's PM_{10} network has been reduced to a minimum level. Table 1.2 identifies the locations of PM_{10} monitoring stations that were operating in Michigan during 2020. These monitors are located mostly in the state's largest populated urban areas: three in the Detroit area and two in Grand Rapids. In late fall of 2020, Grand Rapids, Jenison, and Allen Park PM_{10} continuous monitors (T640X), which also collect $PM_{2.5}$ data, were installed. However, filter-based instruments were shut down on January 1, 2021, so the continuous instruments will not be reported in the 2020 report.

Figure 7.4 shows the location of each PM_{10} monitor. All PM_{10} monitors are population-oriented monitors. A second PM_{10} monitor was added to the Grand Rapids area in Jenison (**Figure 7.5**) based on the USEPA's population requirements.

Figure 7.4: PM_{10} Monitors in 2020

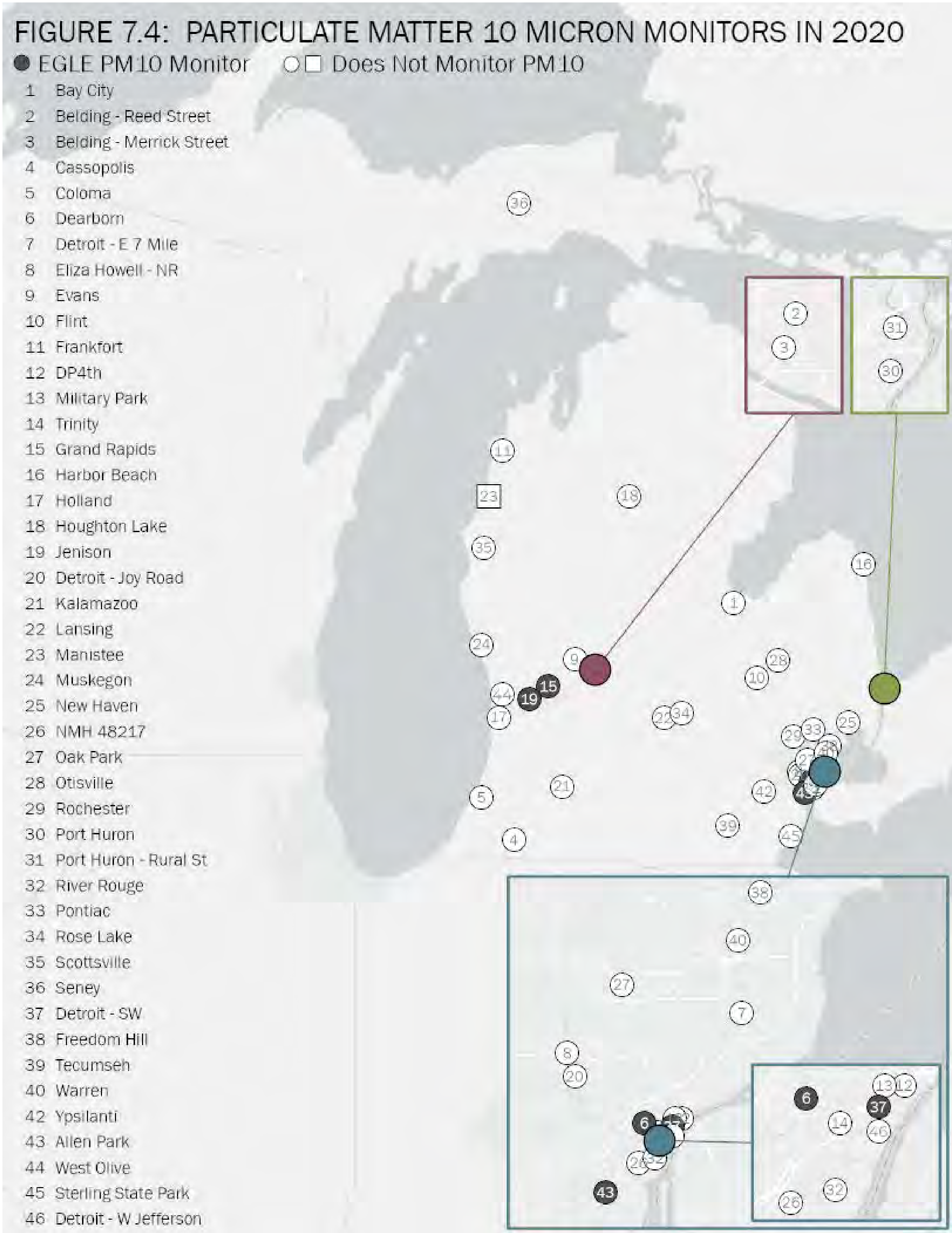


Figure 7.5 shows the PM_{10} levels in Michigan compared to the 24-hour average NAAQS of 150 µg/m^3. This standard must not be exceeded on average more than once per year over a 3-year period. The design value is the 4th highest value over a 3-year period. The PM_{10} levels at all sites in Michigan are well below the national standard.

Figure 7.5: 24-Hour PM_{10} Design Value

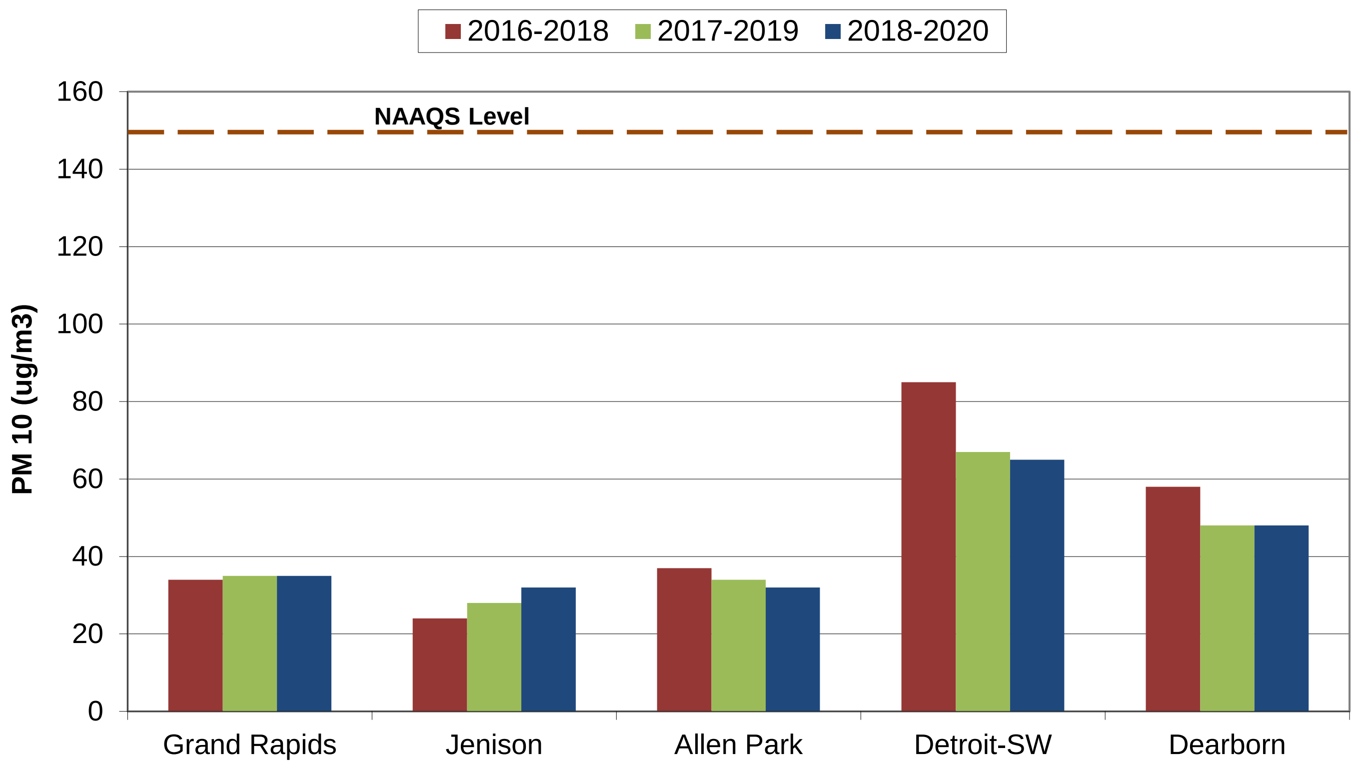
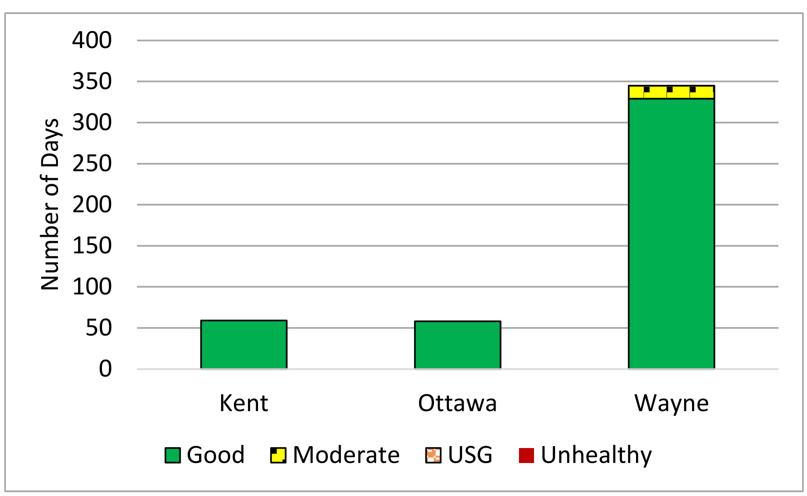


Figure 7.6 shows the AQI values per day in counties where PM_{10} is monitored. All days were in the good AQI range except for 16 days in the moderate AQI range in Wayne County.

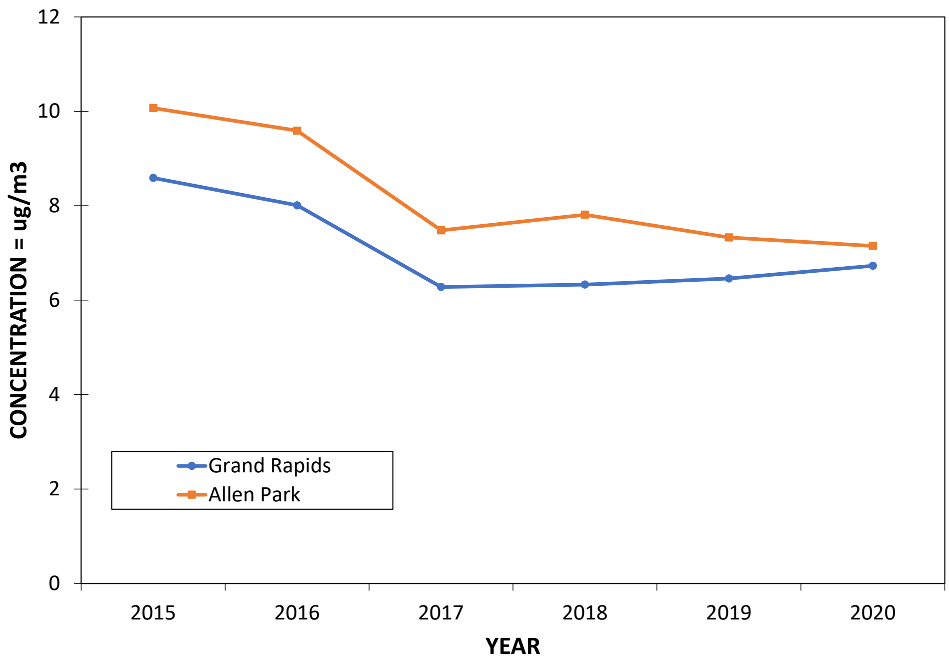
Figure 7.6: 2020 AQI Days for PM_{10} in Michigan Counties



$PM_{10-2.5}$

The 2006 amended air monitoring regulations specified that measurements of PM course ($PM_{10-2.5}$) needed to be added to the NCore sites.[7] EGLE began PM course monitoring at Allen Park and Grand Rapids in 2010. **Figure 7.7** shows the $PM_{10-2.5}$ levels in Michigan.

Figure 7.7: PM Coarse Levels in Michigan from 2015-2020 (Annual Arithmetic Mean)



$PM_{2.5}$

In December 2012, the USEPA revised the annual primary standard to 12 µg/m³ while the annual secondary standard remained at 15 µg/m³. The primary and secondary 24-hour standard remained at 35 µg/m³. In December 2014, the USEPA determined that no area in Michigan violated the 2012 standard and the state was classified as unclassifiable/attainment.

Figures 7.8 and **7.9** show $PM_{2.5}$ emission sources and $PM_{2.5}$ emissions by county (from the USEPA's State and County Emission Summaries).

[7] Current information can be found at www3.epa.gov/ttn/amtic/ncoreguidance.html.

Figure 7.8: $PM_{2.5}$ Emissions by Source Sector

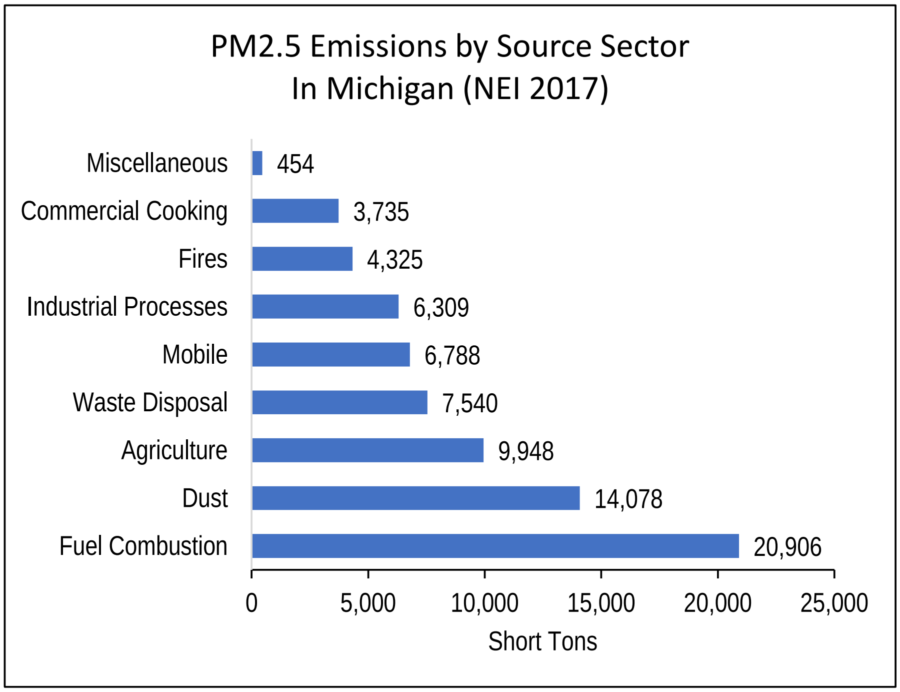
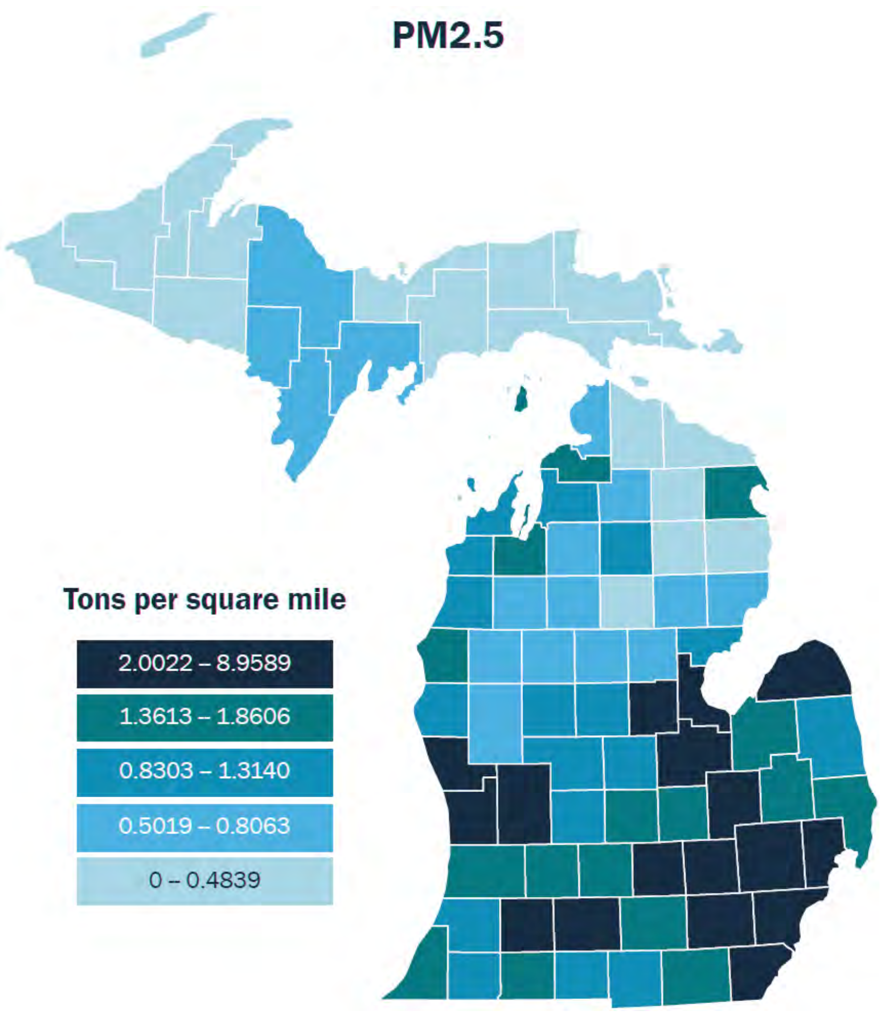


Figure 7.9: $PM_{2.5}$ Emissions in 2017



Fine particulate matter ($PM_{2.5}$) is measured using three techniques: a filter-based FRM, Continuous Methods, and Chemical Speciation Methods. These methods are described in more detail in Appendix A.

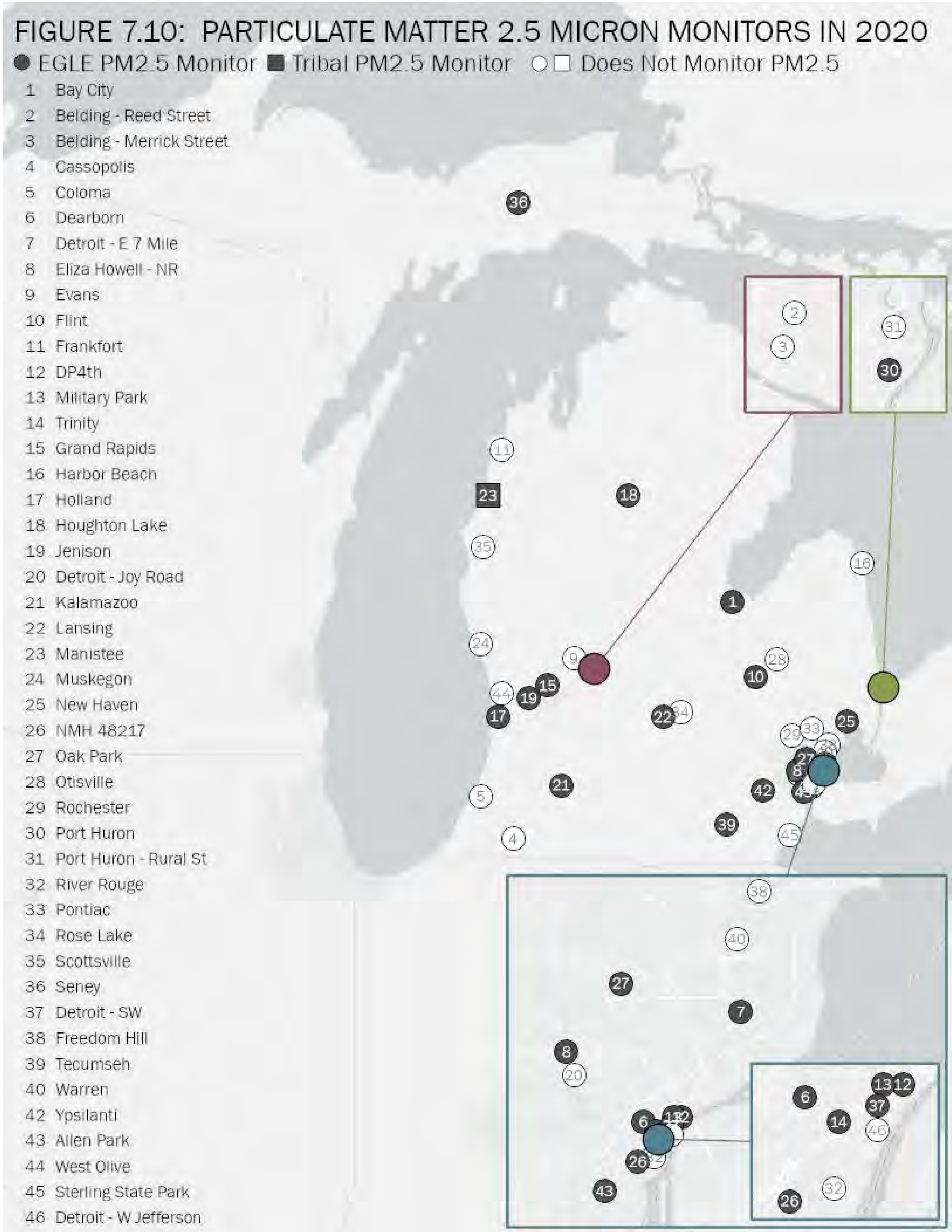
Figure 7.10 shows the location of each $PM_{2.5}$ monitor.

$PM_{2.5}$ FRM Monitoring Network: $PM_{2.5}$ FRM filter-based monitors are deployed to characterize background or regional $PM_{2.5}$ transport collectively from upwind sources as well as population-oriented sites. Several changes occurred in the FRM network in 2020.

- Loss of site access shut down: Livonia Near-road will be relocated, but a suitable replacement site has not been found yet.
- Collocation sites: Five $PM_{2.5}$ FRM monitoring sites are collocated with PM_{10} monitors to allow for $PM_{2.5}$ and PM_{10} comparisons.[8] Collocated PM_{10} and $PM_{2.5}$ sites include Dearborn and Detroit-SW. Allen Park, Grand Rapids, and Jenison also have collocated PM_{10} and $PM_{2.5}$ but monitors were switched from FRMs and TEOMs to continuous FEM T640X beginning January 1, 2021, which measure PM_{10}, $PM_{2.5}$ and PM coarse. The T640X particulate instruments determine the concentration of particulates in the air using a light scattering technique. The T640x is FEM for both $PM_{2.5}$ and PM_{10} and then it subtracts the two to get PM coarse.
- Switched FRM to BAMs: Holland, Bay City, and Ypsilanti (collocated with secondary FRM).
- Switched FRMs to T640s: Kalamazoo, New Haven, and Port Huron were switched to T640s in the fall, but FRMs were collocated at these sites until January 1, 2021. No T640 data is reported in 2020 for these sites. The T640 particulate instruments determine the concentration of particulates in the air using a light scattering technique, but the T640 primarily is used to measure $PM_{2.5}$.

[8] Requirements for $PM_{2.5}$ FRM sites are obtained from the Revised Requirements for Designation of Reference and Equivalent Methods for $PM_{2.5}$ and Ambient Air Quality Surveillance for PM [62 FR 38763]; Guidance for Using Continuous Monitors in $PM_{2.5}$ Monitoring Networks [EPA-454/R-98-012, May 1998]; and Appendix N to Part 50 - Interpretation of the National Ambient Air Quality Standards for PM [40 CFR Part 50, July 1, 1998].

Figure 7.10: PM$_{2.5}$ Monitors in 2020



Continuous $PM_{2.5}$ Network: Short-term measurements of $PM_{2.5}$ or PM_{10} are updated on an hourly basis using TEOM, BAM or T640 instruments. At least one continuous monitor is required at the NCore $PM_{2.5}$ monitoring site in a metropolitan area with a population greater than one million. Both Detroit (Allen Park) and Grand Rapids meet this requirement.[9] Under the revised 2006 air monitoring regulations, 50 percent of the FRM monitoring sites are now required to have a continuous $PM_{2.5}$ monitor. For Michigan, there are 13 FRM monitoring sites, 7 of which also had TEOMs or BAMs.

- T640 replaced TEOMS: Lansing switched to a T640 monitor in September 2020 and is running a collocated filter-based FRM. The T640 data will not be reported until 2021.
- GHIB project: DP4th, Trinity, Military Park and Detroit-SW were switched from BAMs to T640s in fall 2020. These T640 data are reported in the 2020 report.

Speciation Monitors: Speciation monitors consist of filter-based, 24-hour monitors and continuous speciation monitors, aethalometers. Continuous monitors are used to determine diurnal changes in $PM_{2.5}$ composition.

- 24-hour speciation monitors: Allen Park and Grand Rapids (NCore sites), Dearborn (NATTS site), and Detroit-SW. The Tecumseh speciation monitor was shut down in 2019. These monitors are placed in population-oriented stations in both urban and rural locations. $PM_{2.5}$ chemical speciation samples are collected over a 24-hour period and analyzed to determine various components of $PM_{2.5}$. The primary objectives of the chemical speciation monitoring sites are to provide data that will be used to determine sources of poor air quality and to support the development of attainment strategies. Historical speciation data for Michigan indicates that $PM_{2.5}$ is made up of 30 percent nitrate compounds, 30 percent sulfate compounds, 30 percent organic carbon,[10] and 10 percent unidentified or trace elements.
- Aethalometers: Allen Park, Dearborn, and the GHIB project (DP4th, Trinity, Military Park, and Detroit-SW started in 2018). These continuous monitors measure black carbon, a combustion by-product typical of transportation sources.

Table 1.2 in [Chapter 1](#) shows all of Michigan's $PM_{2.5}$ FRM monitoring stations operating in 2020 and denotes which sites have TEOM, FEM, Speciation, or Aethalometer monitors in operation.

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[9] Under the Guidance for Using Continuous Monitors in $PM_{2.5}$ Monitoring Networks [EPA-454/R-98-012, May 1998].
[10] To better understand the chemical composition of the organic carbon fraction, several studies have been conducted in Southeast Michigan to further investigate organic carbon. Information can be found in the Michigan 2012 Ambient Air Monitoring Network Review, available at http://www.michigan.gov/documents/deq/deq-aqd-aqe-2012-Air-Mon-Network-Review_357137_7.pdf

Table 7.1 provides the design value, the 3-year average of the annual mean $PM_{2.5}$ concentrations for 2018-2020. Michigan's levels are below the 12 μg/m³ primary standard.[11]

Table 7.1: 3-Year Average of the Annual Mean $PM_{2.5}$ Concentrations for 2018-2020

Areas	County	Monitoring Sites	2018	2019	2020	2018-2020 Mean
Detroit-Ann Arbor	Lenawee	Tecumseh	8.4	8.5	8.2	8.3
Detroit-Ann Arbor	Macomb	New Haven	7.8	7.3	6.0	7.0
Detroit-Ann Arbor	Oakland	Oak Park	8.3	7.7	7.4	7.8
Detroit-Ann Arbor	St. Clair	Port Huron	8.1	7.6	6.7	7.5
Detroit-Ann Arbor	Washtenaw	Ypsilanti	8.3	8.4	8.2	8.3
Detroit-Ann Arbor	Wayne	Allen Park	9.1	8.7	7.5	8.4
Detroit-Ann Arbor	Wayne	Detroit-Linwood	8.86	--	--	8.9
Detroit-Ann Arbor	Wayne	Detroit-E 7 Mile	8.4	7.6	7.5	7.8
Detroit-Ann Arbor	Wayne	Detroit-SW	11.5	12.1	9.1	10.9
Detroit-Ann Arbor	Wayne	Detroit-W. Lafayette	8.9*	--	--	8.9
Detroit-Ann Arbor	Wayne	Wyandotte	8.0	--	--	8.0
Detroit-Ann Arbor	Wayne	Dearborn	10.6	9.9	9.4	10.0
Detroit-Ann Arbor	Wayne	Livonia	7.4*	--	--	7.4
Detroit-Ann Arbor	Wayne	Livonia-Roadway	9.0	8.4*	--	8.7
Detroit-Ann Arbor	Wayne	Eliza Howell-NR	--	--	10.6	10.6
Flint	Genesee	Flint	7.4	7.2	6.0	6.9
Grand Rapids	Ottawa	Jenison	8.3*	8.3	7.4	8.0
Grand Rapids	Kent	Grand Rapids	8.2	8.00	7.7	8.0
Allegan Co	Allegan	Holland	7.6	7.2	6.0	6.9
Kalamazoo-Battle Creek	Kalamazoo	Kalamazoo	8.4	7.2	7.6	7.8
Lansing-East Lansing	Ingham	Lansing	7.7**	7.3	7.1	7.4
Bay Co	Bay	Bay City	7.1	6.8	4.7	6.2
Missaukee Co	Missaukee	Houghton Lake	5.4	5.8	8.0	6.4
Manistee Co	Manistee	Manistee	6.1	4.9*	5.1*	5.4
Schoolcraft Co	Schoolcraft	Seney	4.1*	4.2	4.6*	4.3

*Indicates site does not have a complete year of data.

**Indicates site was moved during the year and concentrations were averaged together for both locations.

[11] For comparison to the standard, the average annual means is rounded to the nearest 0.1 μg/m³.

Table 7.2 provides the 24-hour 98th percentile $PM_{2.5}$ concentrations for 2018-2020 showing Michigan's levels are below the 35 µg/m^3 standard (3-year average).[12]

Table 7.2: 24-Hour 98th Percentile $PM_{2.5}$ Concentrations for 2018-2020

Areas	County	Monitoring Sites	2018	2019	2020	2018-2020 Mean
Detroit-Ann Arbor	Lenawee	Tecumseh	24.2	22.1	18.7	22
Detroit-Ann Arbor	Macomb	New Haven	18.9	18.7	15.5	18
Detroit-Ann Arbor	Oakland	Oak Park	20.1	18.2	23.3	21
Detroit-Ann Arbor	St. Clair	Port Huron	19.6	20.3	16.6	19
Detroit-Ann Arbor	Washtenaw	Ypsilanti	21.3	22.0	19.8	21
Detroit-Ann Arbor	Wayne	Allen Park	22.8	22.0	26.3	24
Detroit-Ann Arbor	Wayne	Detroit-Linwood	18.6	--	--	19
Detroit-Ann Arbor	Wayne	Detroit-E 7 Mile	21.5	19.6	17.7	20
Detroit-Ann Arbor	Wayne	Detroit-SW	28.1	30.6	24.1	28
Detroit-Ann Arbor	Wayne	Detroit-W. Lafayette	8.9*	--	--	8.9
Detroit-Ann Arbor	Wayne	Wyandotte	20.4	--	--	20
Detroit-Ann Arbor	Wayne	Dearborn	26.1	24.0	21.0	24
Detroit-Ann Arbor	Wayne	Livonia	18.1*	--	--	18
Detroit-Ann Arbor	Wayne	Livonia-Roadway	22.8*	29.0	--	26
Detroit-Ann Arbor	Wayne	Eliza Howell-NR	--	--	23.2	23
Flint	Genesee	Flint	22.2	18.9	14.5	19
Grand Rapids	Ottawa	Jenison	22.3*	24.4	17.9	22
Grand Rapids	Kent	Grand Rapids	18.9	23.2	17.6	20
Allegan Co	Allegan	Holland	21.2	18.2	13.1	18
Kalamazoo-Battle Creek	Kalamazoo	Kalamazoo	19.0	16.9	18.0	18
Lansing-East Lansing	Ingham	Lansing	23.5**	22.3*	21.6	22
Bay Co	Bay	Bay City	17.8	17.5	14.0	16
Missaukee Co	Missaukee	Houghton Lake	16.2	15.1	15.2	16
Manistee Co	Manistee	Manistee	16.9	14.9*	13.3*	15
Schoolcraft Co	Schoolcraft	Seney	19.0*	14.1	10.6*	15

*Indicates site does not have a complete year of data.

**Indicates site was moved during the year and concentrations were averaged together for both locations.

[12] The 98th percentile value was obtained from the USEPA AQS. For comparing calculated values to the standard, the 3-year, 24-hour average is rounded to the nearest 1 µg/m^3.

Figures 7.11 through **7.14** illustrate the current annual mean $PM_{2.5}$ trend for each monitoring site in Michigan. For clarity, the monitoring sites within the Detroit-Warren-Flint CSA have been broken down into two graphs.

Figure 7.11 shows the 2020 levels in Wayne County remained below the $PM_{2.5}$ NAAQS standard. Historically, Dearborn has had the highest concentrations in the state, but Detroit-SW now has the highest concentrations. All sites are below the annual $PM_{2.5}$ NAAQS standard. The Gordie Howe International Bridge sites are included in these graphs.

Figure 7.12 contains the remainder of those sites in the Detroit-Warren-Flint CSA that are outside of Wayne County. These sites also show readings in 2020 are below the $PM_{2.5}$ NAAQS.

Figure 7.13 combines the $PM_{2.5}$ monitoring sites located in West Michigan-Grand Rapids-Muskegon-Holland CSA, Kalamazoo, and Benton Harbor MSAs. All sites are below the annual $PM_{2.5}$ NAAQS.

Figure 7.14 displays the remaining monitoring sites in the Northern Lower and Upper Peninsulas. All sites are below the annual $PM_{2.5}$ NAAQS standard.

Figure 7.11: Detroit-Warren-Flint CSA (Wayne County Only)
Annual Arithmetic Means for $PM_{2.5}$ from 2015-2020

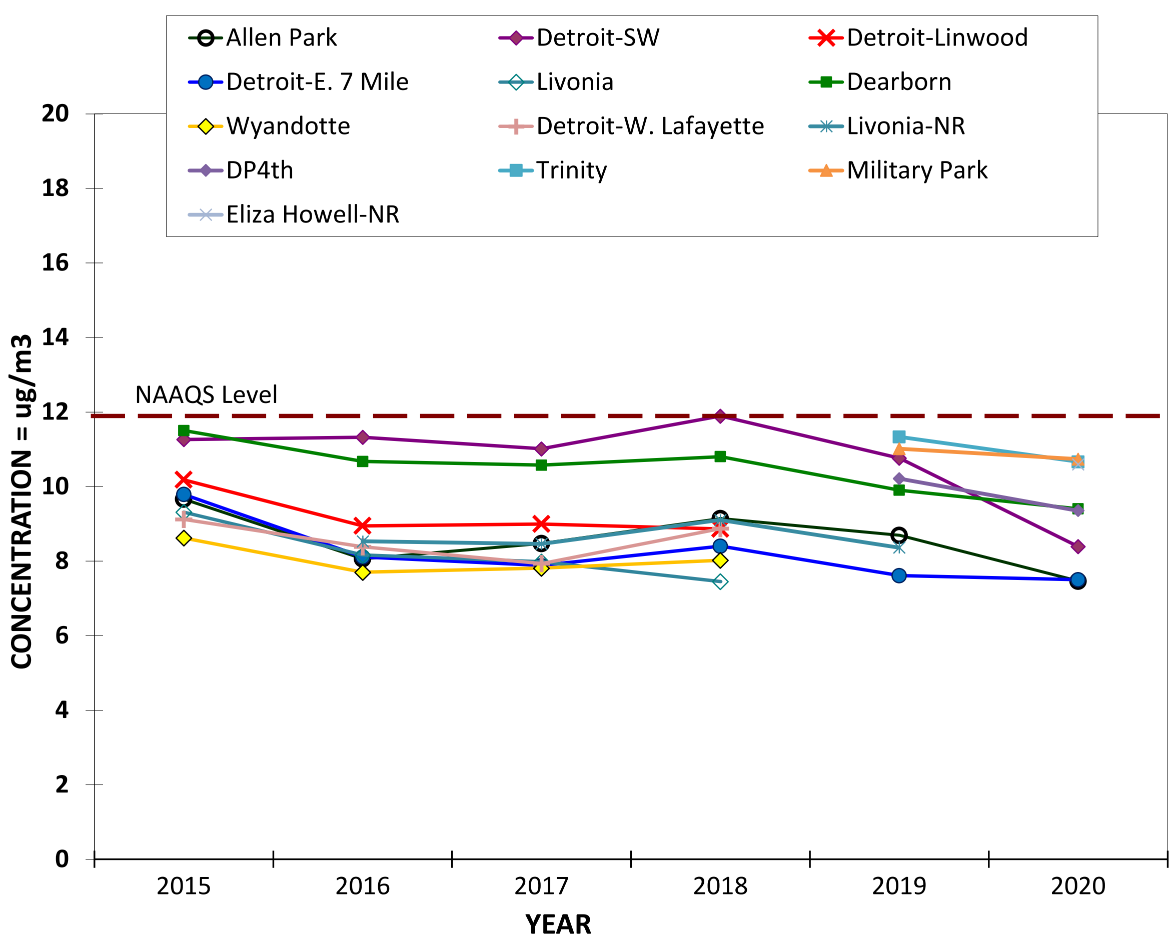


Figure 7.12: Detroit-Warren-Flint CSA (without Wayne County) Annual Arithmetic Means for $PM_{2.5}$ from 2015-2020

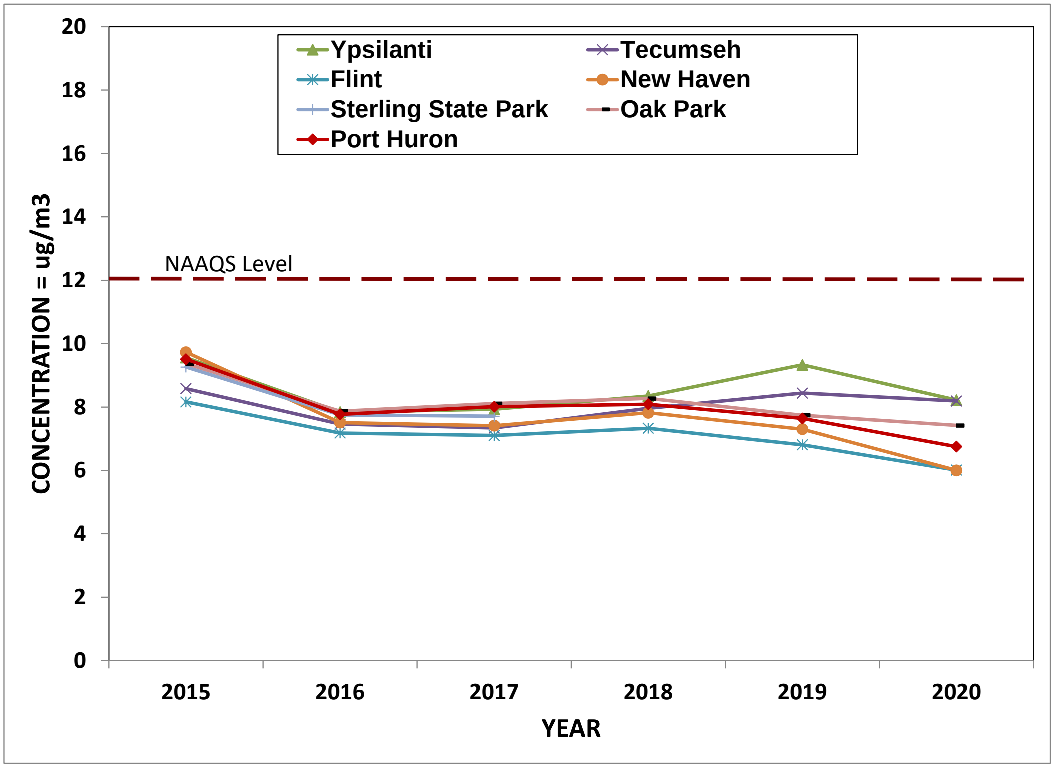


Figure 7.13: West MI - Grand Rapids-Muskegon-Holland CSA, Kalamazoo, and Benton Harbor MSAs Annual Arithmetic Means for $PM_{2.5}$ from 2015-2020

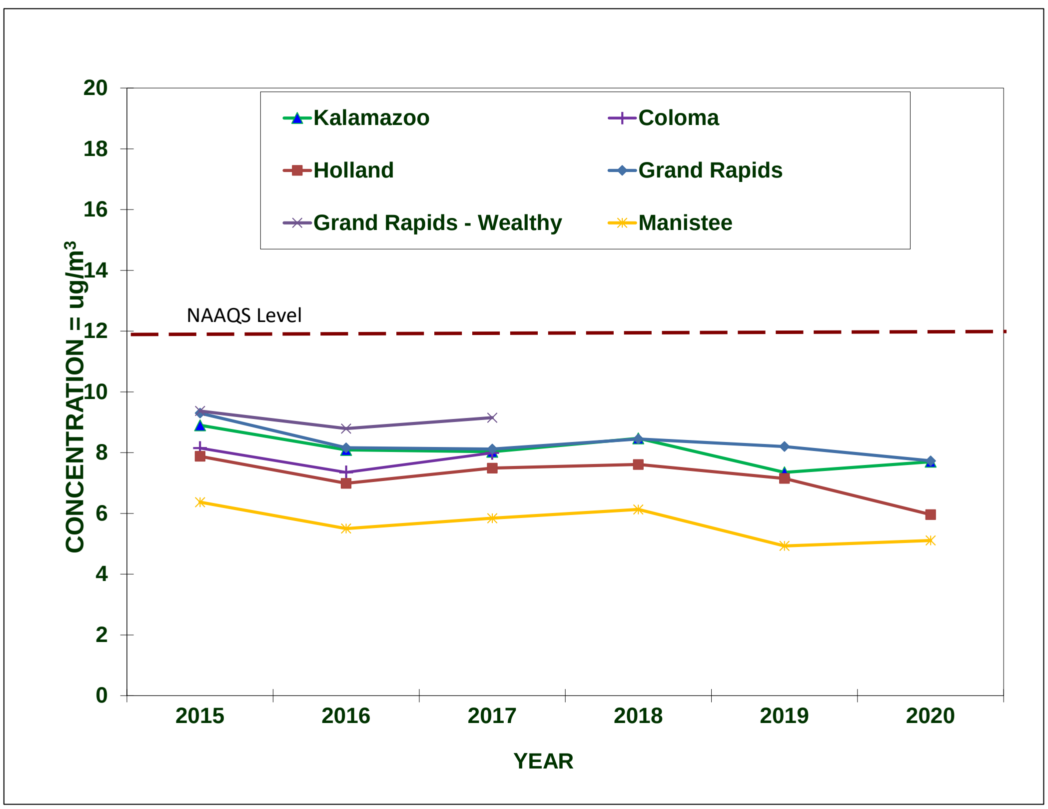


Figure 7.14: Lansing-E. Lansing CSA, Saginaw-Bay City CSA, Cadillac MSA and Upper Peninsula Annual Arithmetic Means for $PM_{2.5}$ from 2015-2020

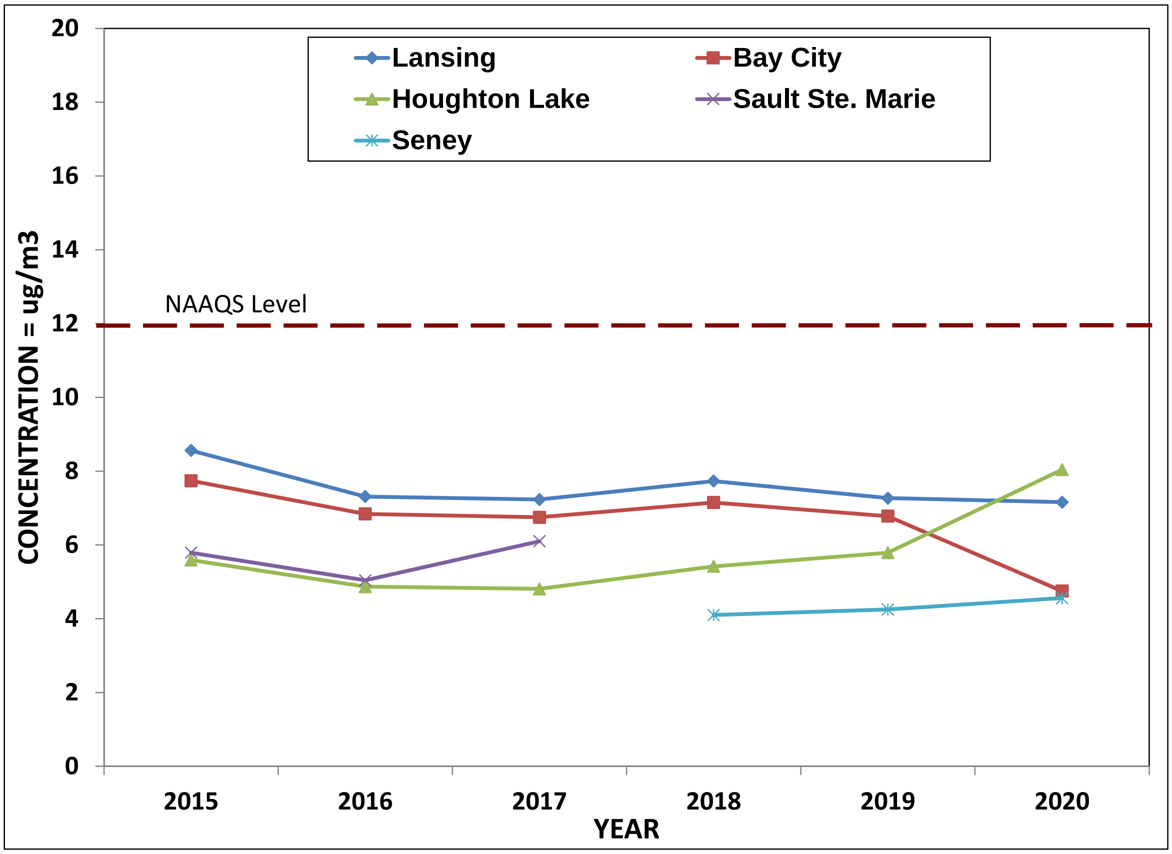
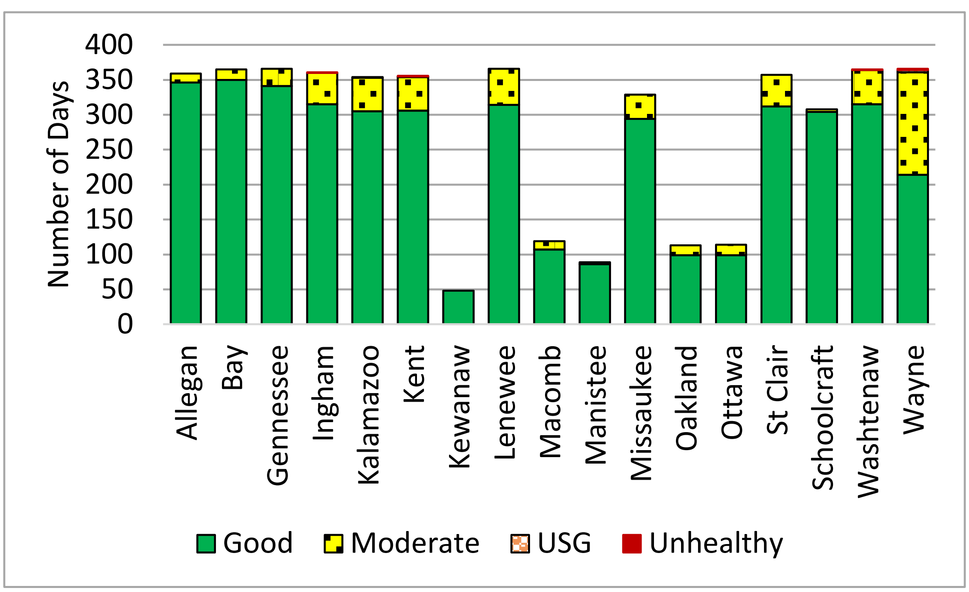


Figure 7.15 shows the AQI values per day in counties where $PM_{2.5}$ is monitored. Most days were in the good to moderate AQI range. Three counties had five days in the USG AQI range, Kalamazoo, and Kent County each had one day, and Wayne County had three days in the USG AQI range. Four counties had AQI values in the Unhealthy range; Ingham, Kent, and Washtenaw Counties had one day, and Wayne County had two days. All these days occurred on July 4th or 5th most likely due to fireworks.

Figure 7.15: 2020 AQI Days for $PM_{2.5}$ in Michigan



CHAPTER 8: TOXIC AIR POLLUTANTS

In addition to the six criteria pollutants discussed in previous chapters, the AQD monitors for a wide variety of substances classified as toxic air pollutants, and/or Hazardous Air Pollutants (HAPs). Under the Clean Air Act, the USEPA specifically addresses a group of 187 HAPs. Under Michigan's air regulations, Toxic Air Contaminants (TACs) are defined as all non-criteria pollutants that may be "*…harmful to public health or the environment when present in the outdoor atmosphere in sufficient quantities and duration.*" The definition of TACs lists 42 substances that are not TACs, indicating that all others are TACs. The sources and effects of toxics are as follows:

Sources: Air toxics come from a variety of mobile, stationary, and indoor man-made sources as well as outdoor natural sources. Mobile sources include motor vehicles, stationary sources include industrial factories and power plants, indoor sources include household cleaners, and natural sources include forest fires and eruptions from volcanoes.

Effects: Once air toxics enter the body, there is a wide range of potential health effects. They include: the aggravation of asthma; irritation to the eyes, nose, and throat; carcinogenicity; developmental toxicity (birth defects); nervous system effects; and various other effects on internal organs. Some effects appear after a shorter period of exposure, while others may appear after long-term exposure or after a long period of time has passed since the exposure ended. Most toxic effects are not unique to one substance, and some effects may be of concern only after the substance has deposited to the ground or to a water body (e.g., mercury, dioxin), followed by exposure through an oral pathway such as the eating of fish or produce. This further complicates the assessment of air toxics concerns due to the broad range of susceptibility that various people may have.

Population most at risk: People with asthma, children, and the elderly are generally at the highest risk for health effects from exposure to air toxics.

Air Toxics can be categorized as:

- **Metals:** Examples include aluminum, arsenic, beryllium, barium, cadmium, chromium, cobalt, copper, iron, mercury, manganese, molybdenum, nickel, lead, vanadium, and zinc.
- **Organic Substances:** Further divided into sub-categories that include –
    - VOCs, include benzene (found in gasoline), perchloroethylene (emitted from some dry-cleaning facilities), and methylene chloride (a solvent and paint stripper used by industry);
    - carbonyl compounds (formaldehyde, acetone, and acetaldehyde);
    - semi-volatile compounds (SVOCs);
    - polycyclic aromatic hydrocarbons (PAHs)/polynuclear aromatic hydrocarbons (PNAs);
    - pesticides and;
    - polychlorinated biphenyls (PCBs).
- **Other substances:** Asbestos, dioxin, and radionuclides such as radon.

Because air toxics are such a large and diverse group of substances, regulatory agencies sometimes further refine these classifications to address specific concerns.

For example:

- Some initiatives have targeted those substances that are persistent, bioaccumulative and toxic (PBT), such as mercury, which accumulates in body tissues.
- The USEPA has developed an Integrated Urban Air Toxics Strategy with a focus on 30 substances (the Urban HAPs List).[13]

The evaluation of air toxics levels is difficult due to several factors.

- There are no health-protective NAAQS. Instead, air quality assessments utilize various short- and long-term screening levels and health-based levels estimated to be safe considering the critical effects of concern for specific substances.
- There is incomplete toxicity information for many substances. For some air toxics, the analytical detection limits are too high to consistently measure the amount present, and in some cases, the risk assessment-based levels are below the detection limits.
- Data gaps are present regarding the potential for interactive toxic effects for co-exposure to multiple substances present in emissions and in ambient air. Air toxics also pose a challenge due to monitoring and analytical methods that are either unavailable for some compounds or cost-prohibitive for others (e.g., dioxins).

These factors make it difficult to accurately assess the potential health concerns of all air toxics. Nevertheless, it is feasible and important to characterize the potential health hazards and risks associated with many air toxics.

Table 8.1 shows the monitoring stations and what air toxic was monitored at each station in 2020. This table can also be found in **Appendix B** with the Air Toxics Monitoring Summary.

[13] USEPA's Air Toxics website: Urban Strategy is located at www.epa.gov/urban-air-toxics.

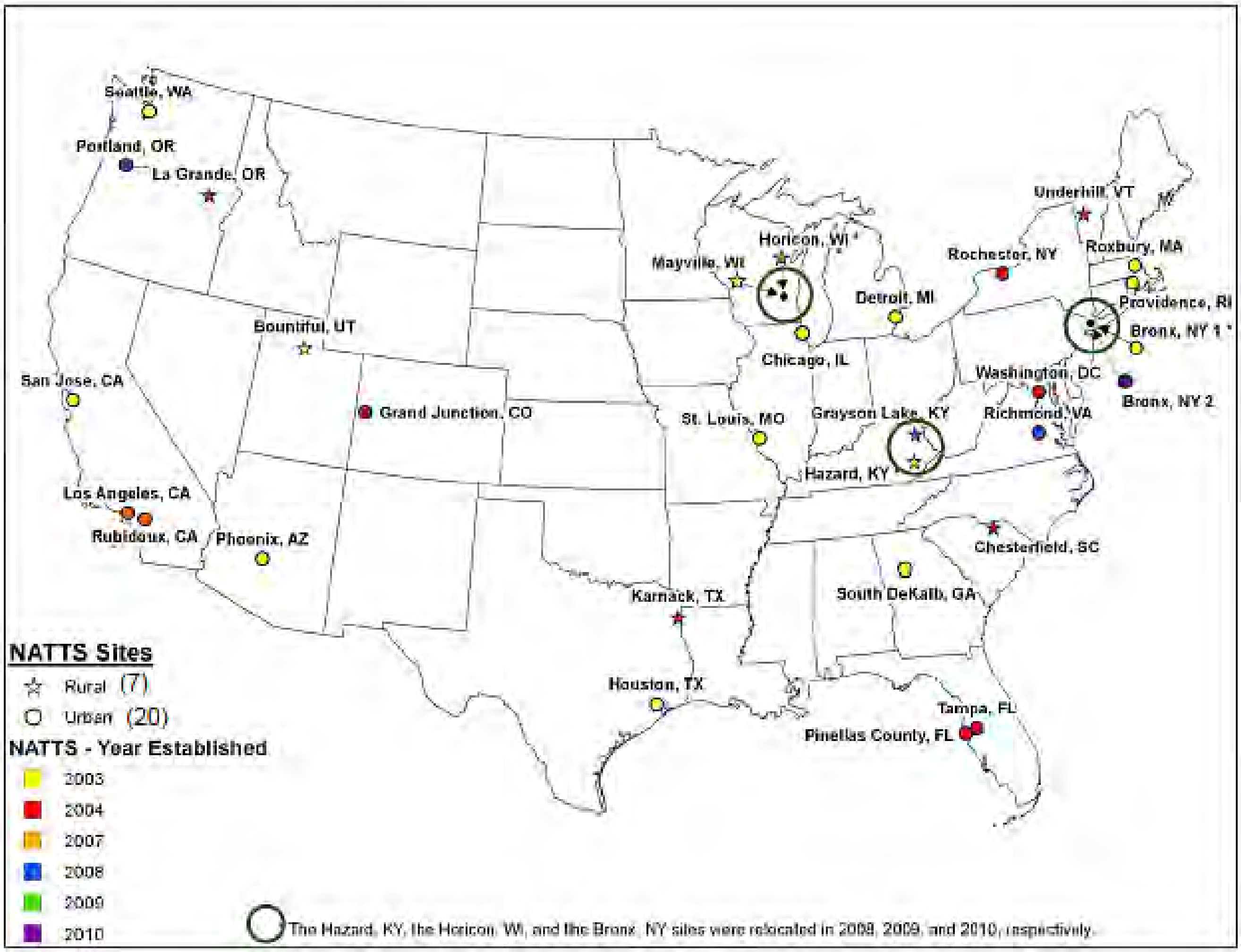
Table 8.1: 2019 Toxics Sampling Sites

Site Name	VOC	Carbonyl	PAHs	Metals TSP	Metals PM_{10}	Speciated $PM_{2.5}$
Allen Park				x		x
Dearborn	x	x	x	x	x	x
Detroit-SW	x	x		x		x
Detroit-W. Jefferson				x		
Grand Rapids				x		x
Belding-Merrick St.				x		
NMH 48217				x		
Port Huron-Rural St.				x		
River Rouge		x		x		
DP4th				x		
Military Park				x		
Trinity				x		

National Monitoring Efforts and Data Analysis

The USEPA administers national programs that identify air toxics levels, detect trends, and prioritize air toxics research. EGLE participates in these programs. In addition, the AQD operates a site in Dearborn that is part of the USEPA's NATTS. The purpose of the NATTS network is to detect trends in high-risk air toxics such as benzene, formaldehyde, chromium, and 1,3-butadiene and to measure the progress of air toxics regulatory programs at the national level. Currently, the NATTS network contains 27 stations; 20 urban and 7 rural (see **Figure 8.1**). The USEPA requires that the NATTS sites measure VOCs, carbonyls, PAHs, and trace metals on a once-every-six-day sampling schedule. The Dearborn NATTS site measures trace metals as TSP, PM_{10}, and $PM_{2.5}$.

Figure 8.1: National Air Toxics Trends Sites



CHAPTER 9: METEOROLOGICAL INFORMATION

Figures 9.1 through **9.3** show average daily temperatures, and **Figures 9.4** through **9.6** show total monthly precipitation amounts compared to their climatic norms for sites in the Northern Lower, Southern Lower, and Upper Peninsulas. These figures were constructed by averaging data from several National Weather Service stations and therefore are not meant to be representative of any one single location in Michigan. Instead, they are intended to depict the regional trends that occurred during the year 2020.

Figure 9.1: Southern Lower Peninsula Observed Average Monthly Temperatures vs. Normal Average Monthly Temperatures

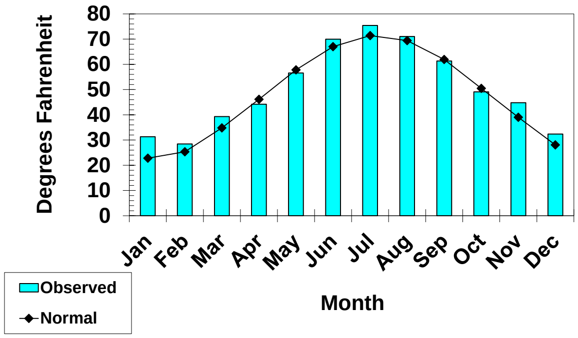


Figure 9.2: Northern Lower Peninsula Observed Average Monthly Temperatures vs. Normal Average Monthly Temperatures

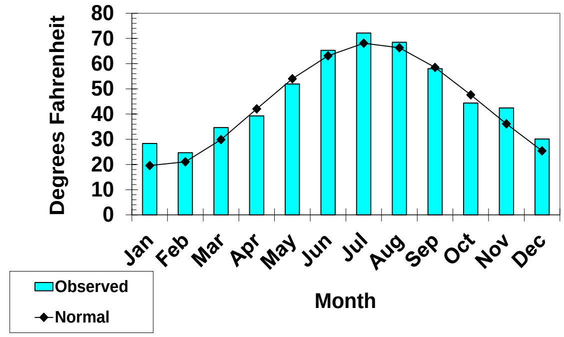


Figure 9.3: Upper Peninsula Observed Average Monthly Temperatures vs. Normal Average Monthly Temperatures

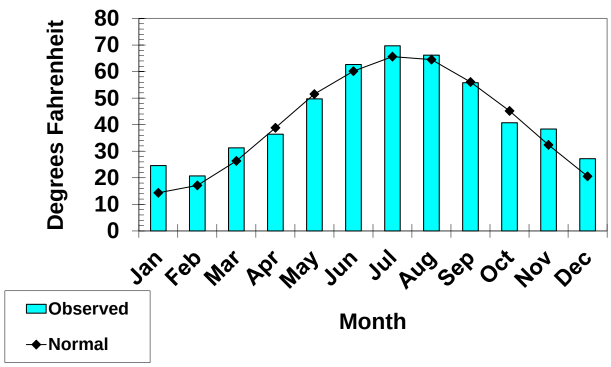


Figure 9.4: Southern Lower Peninsula Observed Monthly Precipitation vs. Normal Monthly Precipitation

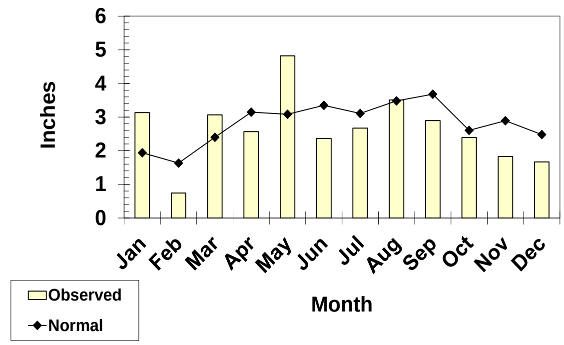


Figure 9.5: Northern Lower Peninsula Observed Monthly Precipitation vs. Normal Monthly Precipitation

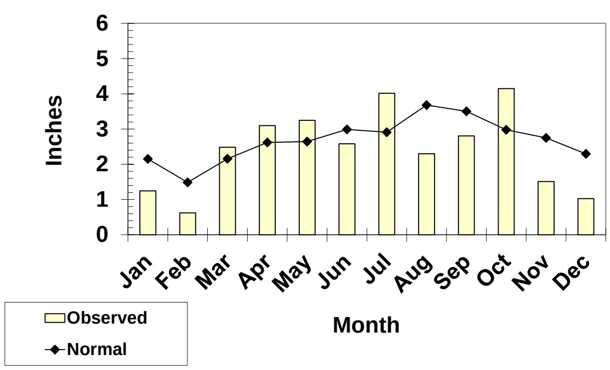
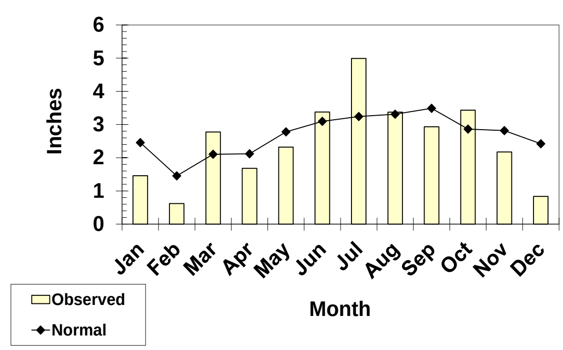


Figure 9.6: Upper Peninsula Observed Monthly Precipitation vs. Normal Monthly Precipitation



CHAPTER 10: SPECIAL PROJECTS

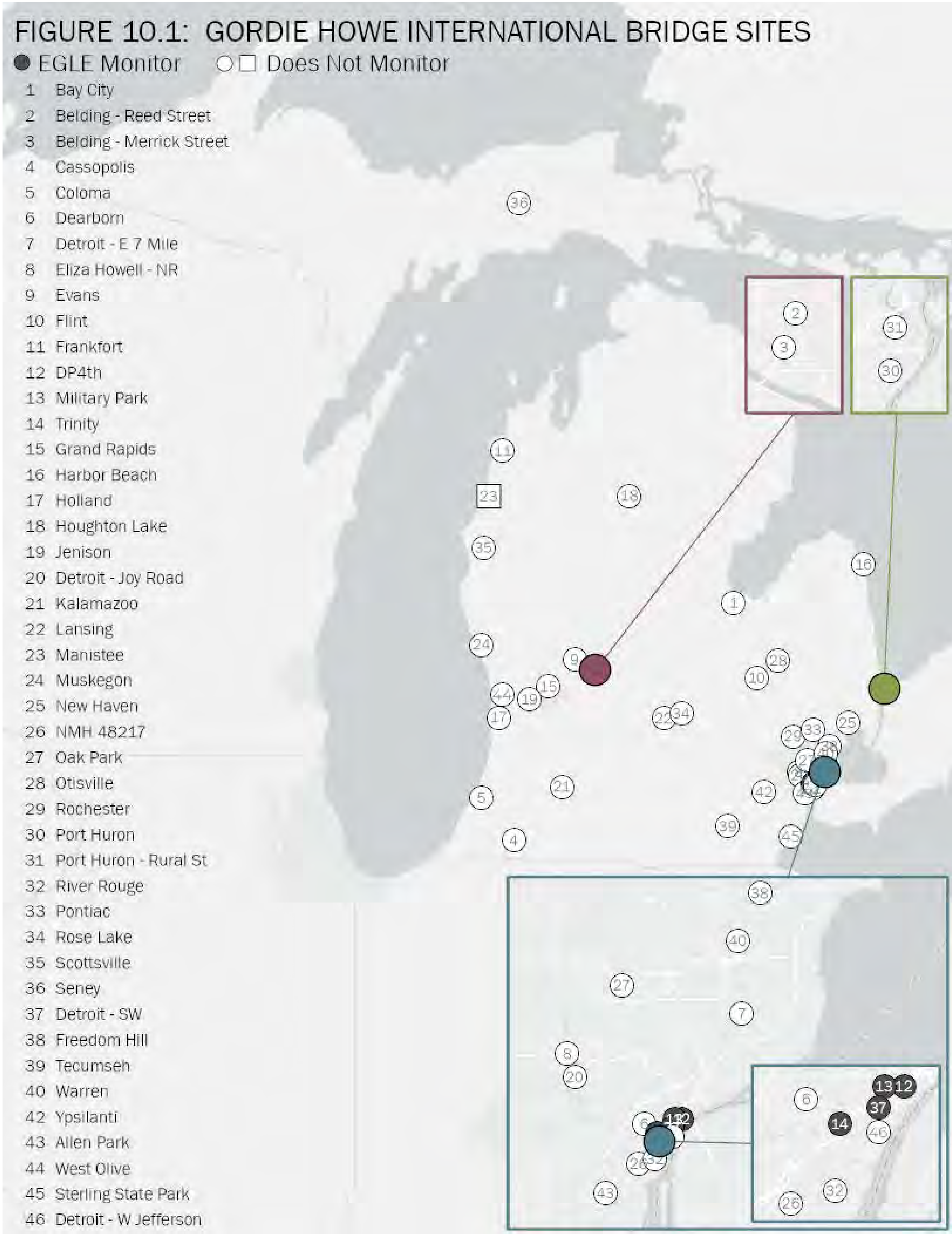
EGLE continues the sampling for the Gordie Howe International Bridge (GHIB). This project is a joint Canadian-American venture. The GHIB will be built linking Windsor, Ontario and Detroit, Michigan. Construction is slated to occur between 2018-2024. For additional information, go to: GordieHoweInternationalBridge.com.

EGLE is conducting ambient air quality monitoring in the Delray community to ascertain air pollution levels in the community. The three new sites will monitor air pollutants before, during, and after construction of the bridge. In addition, NOx, continuous $PM_{2.5}$, and black carbon were added to the Detroit-SW (261630015) monitoring site for this project.

- **Trinity (261630098)**: Meteorological parameters, NOx, SO_2, CO, continuous $PM_{2.5}$, black carbon, and five trace metals (Pb, Mn, As, Cd, and Ni).
- **DP4TH (261630099)**: NOx, SO_2, CO, continuous $PM_{2.5}$, black carbon, and five trace metals (Pb, Mn, As, Cd, and Ni).
- **Military Park (261630100)**: NOx, SO_2, continuous $PM_{2.5}$, black carbon, and five trace metals (Pb, Mn, As, Cd, and Ni).
- **Detroit-SW (261630015):** Meteorological parameters, NOx, SO_2, continuous $PM_{2.5}$, $PM_{2.5}$ Speciated, PM_{10}, black carbon, VOCs, carbonyls, and five trace metals (Pb, Mn, As, Cd, and Ni).

The data from these sites is reported along with the other sites in the previous chapters and in the following appendices.

Figure 10.1: Gordie Howe International Bridge Sites



APPENDIX A: CRITERIA POLLUTANT SUMMARY FOR 2020

Appendix A utilizes the USEPA's 2020 Air Quality System (AQS) Quick Look Report Data to present a summary of ambient air quality data collected for the criteria pollutants at monitoring locations throughout Michigan. Concentrations of non-gaseous pollutants are generally given in $\mu g/m^3$ and in ppm for gaseous pollutants. The following define some of the terms listed in the **Appendix A** reports.

Site I.D.: The AQS site ID is the USEPA's code number for these sites.

POC: The Parameter Occurrence Code or POC is used to assist in distinguishing different uses of monitors, i.e., under Pb, NO_2, and SO_2, POC #1-5 are used to help differentiate between individual monitors. For PM, the POC numbers are used more for the type of monitoring, such as:

- 1 – FRM or FEM;
- 2 - Typicaly collocated FRM;
- 3 - TEOM hourly PM_{10} and $PM_{2.5}$ measurements; and
- 5 - $PM_{2.5}$ speciation monitors (shown at right is a Met One SASS – speciation air sampling system).

 # OBS: For Pb, TSP, $PM_{2.5}$, and PM_{10}, the # OBS (number of observations) refers to the number of valid 24-hour values gathered.

For continuous monitors (CO, NO_2, O_3, $PM_{2.5}$ TEOM, BAM and SO_2), # OBS refers to the total valid hourly averages obtained from the analyzer.

Values: The value is listed for each criteria pollutant per its NAAQS (primary and secondary). The number of exceedances per site for the primary and secondary standards utilize running averages for continuous monitors (except for O_3) and does not include averages considered invalid due to limited sampling times. For example, a particulate-mean based only on six months could not be considered as violating the annual standard. As noted, each site is allowed one short-term standard exceedance before a violation is determined.

Criteria Pollutant Summary For 2020

CO measured in ppm

Site ID	POC	City	County	Year	# OBS	1-hr Highest Value	1-hr 2nd Highest Value	1-hr OBS > 35	8-hr Highest Value	8-hr 2nd Highest Value	8-hr OBS > 9
260810020	1	Grand Rapids	Kent	2020	7136	1.5	1.4	0	1.1	1.1	0
261630001	1	Allen Park	Wayne	2020	8259	1.7	1.6	0	1.2	1.2	0
261630093	1	Eliza Howell-NR	Wayne	2020	8191	2.4	2.4	0	2.1	1.8	0
261630098	1	DP4th	Wayne	2020	8349	1.4	1.4	0	1.1	1.1	0
261630099	1	Trinity	Wayne	2020	8367	2.3	2.1	0	1.4	1.3	0

*Indicates site does not have a complete year of data.

Pb (24-hour) measured in µg/m³

Site ID	POC	City	County	Year	# OBS	Highest rolling 3-month Arith Mean	Highest Value (24-hr)	2nd Highest Value (24-hr)
260670003	1	Belding-Merrick St.	Ionia	2020	60	0.01	.028	.009
261470031	1	Port Huron-Rural St.	St. Clair	2020	61	0.03	0.121	0.119
261630005	1	River Rouge	Wayne	2020	61	0.01	0.014	0.013
261630015	1	Detroit-SW	Wayne	2020	61	0.01	0.021	0.020
261630027	1	Detroit-W. Jefferson	Wayne	2020	61	0.02	0.086	0.031
261630033	1	Dearborn	Wayne	2020	60	0.01	0.093	0.051
261630097	1	NMH 48217	Wayne	2020	61	0.01	0.020	0.017
261630098	1	DP4th	Wayne	2020	61	0.02	0.103	0.052
261630099	1	Trinity	Wayne	2020	62	0.04	0.056	0.030
261630100	1	Military Park	Wayne	2020	61	0.02	0.096	0.079

NO_2 measured in ppb

Site ID	POC	City	County	Year	# OBS	1-Hr Highest Value	1-Hr 2nd Highest Value	98th Percentile 1-hr	Annual Arith Mean
260650018	1	Lansing	Ingham	2020	8178	39.5	35.1	33.0	5.73
261130001	1	Houghton Lake	Missaukee	2020	8327	13.7	11.1	3.4	1.02
261390005	1	Jenison	Ottawa	2020	8318	29.7	29.7	28.2	4.71
261630015	1	Detroit-SW	Wayne	2020	8094	47.1	45.6	38.2	11.23
261630093	1	Eliza Howell-NR	Wayne	2020	8101	42.9	41.8	39.1	13.05
261630098	1	DP4th	Wayne	2020	8278	80.0	47.1	43.6	12.25
261630099	1	Trinity	Wayne	2020	7908	59.6	49.3	39.9	11.94
161630100	1	Military Park	Wayne	2020	7847	75.4	70.4	43.3	11.14

*Indicates site does not have a complete year of data.

NO_Y measured in ppb

Site ID	POC	City	County	Year	# OBS	1-Hr Highest Value	1-Hr 2nd Highest Value	Annual Arith Mean
260810020	1	Grand Rapids	Kent	2020	6392	181.5	154.6	10.29
261630001	1	Allen Park	Wayne	2020	8270	206.4	202.1	12.55
261630019	1	Detroit-E 7 Mile	Wayne	2020	7538	132.1	128.0	9.50

O_3 (1-hour) measured in ppm

Site ID	POC	City	County	Year	Num Meas	Num Req	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	Day Max >/= 0.125 Measured	Values >/= 0.125 Estimated	Missed Days < 0.125 Standard
260050003	1	Holland	Allegan	2020	245	245	0.092	0.090	0.083	0.081	0	0	0
260190003	1	Frankfort	Benzie	2020	244	245	0.097	0.080	0.076	0.074	0	0	1
260210014	1	Coloma	Berrien	2020	245	245	0.097	0.087	0.086	0.081	0	0	0
260270003	2	Cassopolis	Cass	2020	236	245	0.080	0.080	0.079	0.079	0	0	2
260370002	2	Rose Lake	Clinton	2020	239	245	0.076	0.073	0.071	0.068	0	0	0
260490021	1	Flint	Genesee	2020	245	245	0.101	0.083	0.075	0.075	0	0	0
260492001	1	Otisville	Genesee	2020	243	245	0.076	0.075	0.074	0.074	0	0	0
260630007	1	Harbor Beach	Huron	2020	245	245	0.107	0.102	0.090	0.083	0	0	0
260650018	1	Lansing	Ingham	2020	239	245	0.071	0.069	0.068	0.068	0	0	0
260770008	1	Kalamazoo	Kalamazoo	2020	245	245	0.078	0.078	0.078	0.076	0	0	0
260810020	1	Grand Rapids	Kent	2020	353	366	0.095	0.083	0.083	0.082	0	0	5
260810022	1	Evans	Kent	2020	245	245	0.084	0.081	0.077	0.076	0	0	0
260910007	1	Tecumseh	Lenawee	2020	245	245	0.082	0.073	0.072	0.072	0	0	0
260990009	1	New Haven	Macomb	2020	245	245	0.089	0.088	0.088	0.086	0	0	0
260991003	1	Warren	Macomb	2020	245	245	0.083	0.083	0.081	0.079	0	0	0
261010922	1	Manistee	Manistee	2020	69	245	0.073	0.069	0.061	0.058	0	0	0
261050007	1	Scottville	Mason	2020	238	245	0.092	0.077	0.076	0.075	0	0	0
261130001	1	Houghton Lake	Missaukee	2020	232	245	0.079	0.074	0.072	0.071	0	0	2

Site ID	POC	City	County	Year	Num Meas	Num Req	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	Day Max >/= 0.125 Measured	Values >/= 0.125 Estimated	Missed Days < 0.125 Standard
261210039	1	Muskegon	Muskegon	2020	243	245	0.098	0.097	0.090	0.085	0	0	2
261250001	2	Oak Park	Oakland	2020	244	245	0.086	0.083	0.081	0.081	0	0	1
261390005	1	Jenison	Ottawa	2020	245	245	0.090	0.090	0.083	0.083	0	0	0
261470005	1	Port Huron	St. Clair	2020	245	245	0.085	0.083	0.081	0.077	0	0	0
261530001	1	Seney	Schoolcraft	2020	244	245	0.082	0.080	0.077	0.072	0	0	1
261610008	1	Ypsilanti	Washtenaw	2020	243	245	0.086	0.082	0.081	0.078	0	0	2
261630001	2	Allen Park	Wayne	2020	342	366	0.106	0.084	0.081	0.080	0	0	2
261630019	2	Detroit-E 7 Mile	Wayne	2020	239	245	0.086	0.083	0.081	0.080	0	0	4

* Indicates site was moved from Lansing (260650012) to Lansing on Filley St (260650018).

O_3 (8-hour) measured in ppm

Site ID	POC	City	County	Year	% OBS	Valid Days Measured	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	Day Max > 0.070
260050003	1	Holland	Allegan	2020	100	245	0.081	0.079	0.078	0.076	6
260190003	1	Frankfort	Benzie	2020	100	245	0.091	0.078	0.069	0.068	2
260210014	1	Coloma	Berrien	2020	100	245	0.085	0.082	0.079	0.078	7
260270003	2	Cassopolis	Cass	2020	95	233	0.077	0.075	0.075	0.075	5
260370002	1	Rose Lake	Clinton	2020	97	238	0.068	0.067	0.065	0.064	0
260490021	1	Flint	Genesee	2020	100	245	0.078	0.069	0.068	0.067	1
260492001	1	Otisville	Genesee	2020	100	244	0.070	0.069	0.068	0.068	0
260630007	1	Harbor Beach	Huron	2020	100	245	0.085	0.083	0.078	0.075	7
260650018	1	Lansing	Ingham	2020	97	238	0.064	0.063	0.062	0.062	0
260770008	1	Kalamazoo	Kalamazoo	2020	100	244	0.075	0.074	0.073	0.072	5
260810020	1	Grand Rapids	Kent	2020	96	353	0.083	0.080	0.079	0.078	6
260810022	1	Evans	Kent	2020	100	244	0.076	0.071	0.070	0.070	2
260910007	1	Tecumseh	Lenawee	2020	100	245	0.077	0.071	0.068	0.067	2
260990009	1	New Haven	Macomb	2020	100	245	0.078	0.076	0.075	0.074	12
260991003	1	Warren	Macomb	2020	100	245	0.077	0.071	0.070	0.070	2
261010922	1	Manistee	Manistee	2020	69	245	0.064	0.061	0.059	0.051	0
261050007	1	Scottville	Mason	2020	96	236	0.089	0.074	0.068	0.068	2
261130001	1	Houghton Lake	Missaukee	2020	93	229	0.072	0.069	0.069	0.068	1
261210039	1	Muskegon	Muskegon	2020	98	241	0.083	0.083	0.083	0.080	6
261250001	2	Oak Park	Oakland	2020	98	241	0.078	0.077	0.076	0.074	6
261390005	1	Jenison	Ottawa	2020	100	244	0.085	0.081	0.077	0.075	6
261470005	1	Port Huron	St. Clair	2020	100	245	0.072	0.070	0.070	0.069	1
261530001	1	Seney	Schoolcraft	2020	99	243	0.080	0.076	0.073	0.067	3
261610008	1	Ypsilanti	Washtenaw	2020	99	243	0.074	0.073	0.072	0.072	5
261630001	2	Allen Park	Wayne	2020	93	339	0.073	0.071	0.070	0.070	2
261630019	2	Detroit-E 7 Mile	Wayne	2020	97	238	0.076	0.075	0.074	0.073	4

$PM_{2.5}$ (24-hour) FRM measured in µg/m³ at local conditions

Site ID	POC	Monitor	City	County	Year	# OBS	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	98%	Wtd. Arith. Mean
260490021	1	FRM	Flint	Genesee	2020	61	22.0	15.6	15.2	13.7	15.6	6.56
260650018	1	FRM	Lansing	Ingham	2020	60	31.8	21.6	16.9	16.5	21.6	7.06
260770008	1	FRM	Kalamazoo	Kalamazoo	2020	111	38.3	27.4	18.0	17.7	18.0	7.70
260770008	2	FRM	Kalamazoo	Kalamazoo	2020	61	26.0	17.4	15.3	14.3	17.4	7.11
260810020	1	FRM	Grand Rapids	Kent	2020	116	47.9	19.3	17.6	16.4	17.6	7.73
260990009	1	FRM	New Haven	Macomb	2020	119	16.7	16.5	15.5	15.1	15.5	6.00
261010922	1	FRM	Manistee	Manistee	2020	88	14.2	13.3	12.7	11.7	13.3	5.11*
261250001	1	FRM	Oak Park	Oakland	2020	112	29.0	25.3	23.3	17.7	23.3	7.42
261390005	1	FRM	Jenison	Ottawa	2020	114	33.2	17.9	17.9	16.8	17.9	7.39
261470005	1	FRM	Port Huron	St. Clair	2020	119	24.5	17.9	16.6	16.2	16.6	6.75
261610008	1	FRM	Ypsilanti	Washtenaw	2020	60	32.8	16.9	15.0	14.4	16.9	7.17
261630001	1	FRM	Allen Park	Wayne	2020	117	41.9	29.4	26.3	18.2	26.3	7.46
261630015	1	FRM	Detroit-SW	Wayne	2020	122	30.3	26.8	19.5	17.6	19.5	8.39
261630019	1	FRM	Detroit-E 7 Mile	Wayne	2020	116	28.4	17.9	17.7	17.0	17.7	7.50
261630033	1	FRM	Dearborn	Wayne	2020	120	37.6	30.4	21.0	21.0	21.0	9.40
261630033	2	FRM	Dearborn	Wayne	2020	57	30.8	21.4	20.9	19.8	21.4	9.08

*Indicates the site does not have a complete year of data.

$PM_{2.5}$ (24-hour) FEM measured in µg/m³ at local conditions

Site ID	POC	Monitor	City	County	Year	# OBS	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	98%	Wtd. Arith. Mean
260050003	3	BAM	Holland	Allegan	2020	359	30.4	21.7	15.8	14.7	13.1	5.96
260170014	3	BAM	Bay City	Bay	2020	365	23.1	15.6	14.7	14.3	14.0	4.75
260490021	3	BAM	Flint	Genesee	2020	366	33.3	21.4	19.1	17.4	14.5	6.01
260910007	3	BAM	Tecumseh	Lenawee	2020	366	30.4	30.4	29.0	28.9	18.7	8.19
261130001	3	BAM	Houghton Lake	Missaukee	2020	329	19.3	19.3	16.4	16.2	15.2	8.04*
261530001	3	BAM	Seney	Schoolcraft	2020	282	17.3	15.4	14.5	13.1	10.6	4.56*
261610008	3	BAM	Ypsilanti	Washtenaw	2020	365	67.8	34.2	31.8	27.9	19.8	8.22
261630015	3	BAM/ T640	Detroit-SW**	Wayne	2020	289	38.5	35.6	34.1	30.2	25.9	9.57*
261630093	3	BAM	Eliza Howell-NR	Wayne	2020	356	108.9	45.8	40.7	34.2	23.2	10.59

* Indicates the site does not have a complete year of data.

**TIECO BAMs were switched out to T640s in the fall of 2020.

$PM_{2.5}$ Continuous, Non-Regulatory (1-hour) measured in µg/m³

Site ID	POC	Monitor	City	County	Year	# OBS	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	Wtd. Arith. Mean
260650012	3	TEOM	Lansing	Ingham	2020	6106	455.1	384.5	306.5	224.7	7.44
260770008	3	TEOM	Kalamazoo	Kalamazoo	2020	6907	169.0	162.9	144.5	126.9	7.38
260810020	3	TEOM	Grand Rapids	Kent	2020	6513	715.8	249.1	241.9	228.2	7.73
261470005	3	TEOM	Port Huron	St. Clair	2020	7373	122.7	56.6	45.6	44.3	7.22
261630001	3	TEOM	Allen Park	Wayne	2020	6400	216.0	208.0	174.0	144.0	8.34
261630015	3	BAM/T640	Detroit-SW**	Wayne	2020	8345	270.6	227.9	188.8	183.8	12.60
261630033	3	TEOM	Dearborn	Wayne	2020	8284	342.0	217.1	165.7	100.9	9.19
261630097	3	TEOM	NMH 48217	Wayne	2020	8495	450.7	343.8	319.9	88.9	8.33
261630098	3	BAM/T640	DP4th**	Wayne	2020	8735	95.0	93.4	85.4	80.0	9.59
261630099	3	BAM/T640	Trinity**	Wayne	2020	8308	270.6	162.3	120.9	101.3	10.75
261630100	3	BAM/T640	Military Park**	Wayne	2020	7552	220.6	214.5	159.0	120.5	10.76

* Indicates the site does not have a complete year of data.

**TIECO BAMs were switched out to T640s in the fall of 2020.

PM10 (24-hour) measured in µg /m3

Site ID	POC	Monitor	City	County	Year	# OBS	# Req.	Valid Days	% OBS	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	Wtd Arith Mean
260810020	1	GRAV	Grand Rapids	Kent	2020	59	61	58	95	28	27	26	24	8.6
261390005	1	GRAV	Jenison	Ottawa	2020	58	61	57	93	22	21	21	21	7.2
261630001	1	GRAV	Allen Park	Wayne	2020	62	61	59	97	34	27	26	23	9.6
261630015	1	GRAV	Detroit-SW	Wayne	2020	58	61	57	93	59	48	47	46	16.3
261630033	1	GRAV	Dearborn	Wayne	2020	60	61	59	97	53	49	48	47	22.9
261630033	9	GRAV	Dearborn	Wayne	2020	29	31	29	94	59	50	47	44	24.2

PM_{10} TEOM (1-hour) measured in µg/m³

Site ID	POC	Monitor	City	County	Year	# OBS	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	Wtd. Arith. Mean
261630033	3	TEOM	Dearborn	Wayne	2020	8086	57	50	49	44	16.9

$PM_{10-2.5}$ (24-hour) measured in µg/m³

Site ID	Monitor	City	County	Year	# OBS	Highest Value	2nd Highest Value	3rd Highest Value	4th Highest Value	Wtd. Arith. Mean
260810020	GRAV	Grand Rapids	Kent	2020	107	25.5	22.5	17.5	17.2	6.73
261630001	GRAV	Allen Park	Wayne	2020	102	21.3	20.9	19.9	19.2	7.15

SO_2 measured in ppb

Site ID	POC	City	County	Year	# OBS	1-hr Highest Value	1-hr 2nd Highest Value	99th %ile: 1-hr	24-hr Highest Value	24-hr 2nd Highest Value	OBS >0.5	Arith Mean
260650018	1	Lansing	Ingham	2020	8379	5.5	4.6	4.2	2.1	1.9	0	1.32
260810020	2	Grand Rapids	Kent	2020	8409	11.0	3.0	2.7	1.4	1.2	0	0.49
261150006	1	Sterling State Park	Monroe	2020	8302	8.7	7.0	6.9	2.4	2.3	0	0.59
261390011	1	West Olive	Ottawa	2020	8278	18.6	16.7	15.2	10.5	5.8	0	0.69
261470005	1	Port Huron	St. Clair	2020	8382	106.3	104.3	76.4	26.4	17.1	0	1.88
261630001	1	Allen Park	Wayne	2020	8337	18.2	17.2	14.7	3.1	2.8	0	0.49
261630015	1	Detroit-SW	Wayne	2020	8380	5437	45.3	43.3	27.0	14.6	0	2.34
261630097	1	NMH 48217	Wayne	2020	8251	24.8	21.7	17.0	3.7	3.7	0	0.60
261630098	1	DP4th	Wayne	2020	8353	31.1	28.3	17.0	4.3	4.1	0	1.14
261630099	1	Trinity	Wayne	2020	8258	21.4	18.8	16.1	9.0	6.2	0	0.71
261630100	1	Military Park	Wayne	2020	8199	40.8	36.0	32.5	13.0	12.4	0	1.61

APPENDIX B: 2020 AIR TOXICS MONITORING SUMMARY FOR METALS, VOCS, CARBONYL COMPOUNDS, PAHS, HEXAVALENT CHROMIUM & SPECIATED $PM_{2.5}$

Appendix B provides summary statistics of ambient air concentrations of various substances monitored in Michigan during 2020. At each monitoring site, air samples were taken over a 24-hour period (midnight to midnight). These air samples represent the average air concentration during that 24-hour period. The frequency of air samples collected is typically done once every 6 or 12 days. Sometimes the sampled air concentration is lower than the laboratory's analytical method detection level (MDL). When the concentration is lower than the MDL, two options are used to estimate the air concentration. The calculation of the minimum average ("Average (ND=0)") uses 0.0 $\mu g/m^3$ for a value less than the MDL. In the calculation of the maximum average ("Average (ND=MDL/2)") the MDL divided by 2 (i.e., ½ the MDL) is substituted for air concentrations less than the MDL.

Table B shows the monitoring stations and what types of air toxics were monitored at each station in 2020. The following terms and acronyms are used in **Appendix B-1** and **B-2** data tables:

- Num Obs: Number of Observations (number of daily air samples taken during the year)
- Obs>MDL: Number of daily samples above the MDL
- Average (ND=0): average air concentration in 2020, assuming daily samples below MDL were equal to 0.0 $\mu g/m^3$.
- Average (ND=MDL/2): average air concentration in 2020, assuming daily samples below MDL were equal to one half the MDL.
- MDL: Analytical MDL in units of $\mu g/m^3$
- Max1: Highest daily air concentration during 2020
- Max2: Second highest daily air concentration during 2020
- Max3: Third highest daily air concentration during 2020
- $\mu g/m^3$: Micrograms per cubic meter (1,000,000 μg = 1 g)

Table B: 2019 Toxics Sampling Sites

SITE NAME	VOC	Carbonyl	PAHs	Metals TSP	Metals PM_{10}	Speciated $PM_{2.5}$
Allen Park				x	x	x
Dearborn	x	x	x	x	x	x
Detroit-SW	x	x		x		x
Detroit-W. Jefferson				x		
Grand Rapids				x		x
Belding-Merrick St.				x		
NMH 48217				x		
Port Huron-Rural St.				x		
River Rouge		x		x		
DP4th				x		
Military Park				x		
Trinity				x		

VOC = volatile organic compound; PAHs = polycyclic aromatic hydrocarbon; TSP = total suspended particulate
PM_{10} = particulate matter with aerodynamic diameter less than 10 µm; Mn = manganese.

APPENDIX B-1 DATA TABLES

Dearborn (261630033) Concentrations in micrograms per cubic meter (µg/m3)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
1,1,2,2-Tetrachloroethane	58	1	0.00102	0.059	0.118	0.059	0	0
1,1,2-Trichloro-1,2,2-Trifluoroethane	58	58	0.529	0.529	0.0649	0.716	0.614	0.598
1,1,2-Trichloroethane	58	1	9.41E-05	0.0257	0.0523	0.0055	0	0
1,1-Dichloroethane	58	0	0	0.0215	0.0429	0	0	0
1,1-Dichloroethylene	58	0	0	0.0305	0.061	0	0	0
1,2,4-Trichlorobenzene	58	6	0.00371	0.178	0.387	0.0668	0.0468	0.043
1,2,4-Trimethylbenzene	58	58	0.389	0.389	0.0519	2.37	2.34	1.72
1,2-Dichlorobenzene	58	5	0.000611	0.0389	0.084	0.0132	0.0084	0.0078
1,2-Dichloropropane	58	6	0.00163	0.0295	0.0616	0.0185	0.0176	0.0166
1,3,5-Trimethylbenzene	58	58	0.109	0.109	0.0255	0.654	0.551	0.472
1,3-Butadiene	58	58	0.0422	0.0422	0.026	0.158	0.122	0.11
1,3-Dichlorobenzene	58	2	0.000228	0.032	0.0653	0.0078	0.0054	0
1,4-Dichlorobenzene	58	45	0.025	0.0364	0.0782	0.142	0.114	0.092
Acenaphthene (Tsp) Stp	62	53	0.00568	0.0057	0.00017	0.0343	0.0233	0.0201
Acenaphthylene (Tsp) Stp	62	60	0.000728	0.000728	1.12E-05	0.0139	0.0117	0.006
Acetaldehyde	70	70	2.02	2.02	0.0374	5.13	4.75	4.66
Acetone	70	70	3.4	3.4	0.403	16.5	13	12.4
Acetonitrile	58	58	0.497	0.497	0.0745	2.64	1.31	1.27
Acetylene	58	58	0.342	0.342	0.248	1.18	1.1	0.975
Acrolein - Verified	56	0	0			0	0	0
Acrylonitrile	57	5	0.0103	0.0228	0.0279	0.247	0.103	0.102
Anthracene (Tsp) Stp	62	62	0.000429	0.000429	2.85E-05	0.0037	0.003	0.0014
Arsenic (Tsp) Stp	92	91	0.00186	0.00186	4.76E-05	0.0085	0.0061	0.0055
Arsenic Pm10 Lc	93	93	0.00164	0.00164		0.006	0.0052	0.0034

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Arsenic Pm10 Stp	93	93	0.00166	0.00166	7.41E-05	0.006	0.0053	0.0034
Barium (Tsp) Stp	92	91	0.0241	0.0241	0.00759	0.0892	0.0735	0.0721
Barium Pm10 Lc	93	93	0.0144	0.0144		0.0688	0.0661	0.0332
Barium Pm10 Stp	93	93	0.0146	0.0146	0.00066	0.0679	0.0652	0.0327
Benzaldehyde	70	70	0.407	0.407	0.043	4.6	4.02	3.35
Benzene	58	58	0.678	0.678	0.0324	6.71	1.28	1.13
Benzo[A]Anthracene (Tsp) Stp	62	62	0.000208	0.000208	1.18E-05	0.00232	0.00193	0.0016
Benzo[A]Pyrene (Tsp) Stp	62	62	0.000174	0.000174	1.43E-05	0.0017	0.0014	0.001
Benzo[B]Fluoranthene (Tsp) Stp	60	60	0.000549	0.000549	7.12E-06	0.00564	0.00375	0.0032
Benzo[E]Pyrene (Tsp) Stp	62	62	0.000288	0.000288	5.94E-06	0.00348	0.00162	0.0014
Benzo[G,H,I]Perylene (Tsp) Stp	62	61	0.000224	0.000224	5.71E-06	0.0012	0.00096	0.0009
Benzo[K]Fluoranthene (Tsp) Stp	61	59	0.000146	0.000146	1.26E-05	0.00131	0.00068	0.0006
Beryllium (Tsp) Stp	92	91	8.70E-05	8.70E-05	3.16E-05	0.00038	0.00025	0.0002
Beryllium Pm10 Lc	93	91	2.87E-05	2.93E-05		0.00011	0.00011	0.0001
Beryllium Pm10 Stp	93	93	2.92E-05	2.92E-05	9.69E-06	0.00011	0.00011	0.0001
Bromochloromethane	58	1	0.000228	0.0315	0.0636	0.0132	0	0
Bromodichloromethane	55	0	0	0.0386	0.0771	0	0	0
Bromoform	58	45	0.0116	0.0331	0.196	0.0279	0.0248	0.0217
Bromomethane	58	58	0.0392	0.0392	0.0677	0.205	0.144	0.118
Butyraldehyde	69	69	0.466	0.466	0.0522	1.83	1.81	1.7
Cadmium (Tsp) Stp	92	91	0.000264	0.000264	2.11E-05	0.00183	0.00095	0.0009
Cadmium Pm10 Lc	93	93	0.000194	0.000194		0.00096	0.00094	0.0008
Cadmium Pm10 Stp	93	93	0.000197	0.000197	2.08E-05	0.00098	0.00098	0.0009
Carbon Disulfide	58	58	0.0598	0.0598	0.118	0.299	0.274	0.164
Carbon Tetrachloride	58	58	0.577	0.577	0.103	0.749	0.73	0.723

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Chlorobenzene	58	52	0.0256	0.0282	0.05	0.423	0.0414	0.0373
Chloroethane	58	46	0.0237	0.0282	0.0438	0.29	0.0995	0.0712
Chloroform	58	58	0.627	0.627	0.0643	1.47	1.39	0.84
Chloromethane	58	58	0.98	0.98	0.0628	1.36	1.32	1.26
Chloroprene	58	0	0	0.0241	0.0483	0	0	0
Chromium (Tsp) Stp	92	91	0.00596	0.00596	0.00167	0.0215	0.0211	0.0203
Chromium Pm10 Lc	93	93	0.00335	0.00335		0.023	0.0216	0.007
Chromium Pm10 Stp	93	93	0.00341	0.00341	0.00225	0.0238	0.0223	0.0073
Chrysene (Tsp) Stp	23	23	0.000759	0.000759	7.69E-06	0.00448	0.00312	0.0027
Cis-1,2-Dichloroethene	58	0	0	0.0275	0.0551	0	0	0
Cis-1,3-Dichloropropene	58	0	0	0.0223	0.0446	0	0	0
Cobalt (Tsp) Stp	92	91	0.00026	0.00026	3.16E-05	0.00056	0.00053	0.0005
Cobalt Pm10 Lc	93	93	0.000158	0.000158		0.00049	0.00046	0.0004
Cobalt Pm10 Stp	93	93	0.00016	0.00016	3.15E-05	0.00051	0.00048	0.0004
Copper (Tsp) Stp	92	91	0.0198	0.0198	0.00168	0.0745	0.0719	0.0695
Copper Pm10 Lc	93	93	0.0205	0.0205		0.148	0.0947	0.0749
Copper Pm10 Stp	93	93	0.0209	0.0209	0.000799	0.151	0.0976	0.0771
Coronene (Tsp) Stp	62	62	0.000104	0.000104	3.68E-06	0.000462	0.000434	0.00043
Crotonaldehyde	42	42	0.278	0.278	0.00851	1.13	0.927	0.911
Dibenzo[A,H]Anthracene (Tsp) Stp	62	38	4.13E-05	4.40E-05	1.38E-05	0.000441	0.000365	0.00027
Dibromochloromethane	58	11	0.00109	0.0579	0.14	0.0111	0.00937	0.00767
Dichlorodifluoromethane	58	58	2.12	2.12	0.0827	2.55	2.54	2.51
Dichloromethane	58	58	2.71	2.71	0.0787	11	8.89	8.27
Ethyl Acrylate	58	0	0	0.0258	0.0516	0	0	0
Ethylbenzene	58	58	0.205	0.205	0.0468	1.11	0.521	0.512
Ethylene Dibromide	58	0	0	0.0517	0.103	0	0	0
Ethylene Dichloride	58	57	0.0725	0.0729	0.0418	0.118	0.117	0.106

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Ethylene Oxide	57	50	0.223	0.232	0.147	1.05	0.726	0.602
Fluoranthene (Tsp) Stp	62	62	0.00368	0.00368	4.20E-05	0.0183	0.0145	0.0136
Fluorene (Tsp) Stp	62	62	0.00537	0.00537	8.45E-05	0.0274	0.0212	0.0198
Formaldehyde	70	70	3.26	3.26	0.0524	9.15	8.85	8.82
Freon 114	58	58	0.103	0.103	0.101	0.132	0.122	0.121
Hexachlorobutadiene	58	4	0.000736	0.0767	0.167	0.0256	0.00746	0.00533
Hexanaldehyde	67	67	0.2	0.2	0.0109	1.69	1.59	1.28
Indeno[1,2,3-Cd]Pyrene (Tsp) Stp	62	62	0.000231	0.000231	1.15E-05	0.00132	0.00122	0.00104
Iron (Tsp) Stp	92	91	1.27	1.27	0.027	5.7	4.88	3
Iron Pm10 Lc	93	93	0.696	0.696		2.22	1.94	1.8
Iron Pm10 Stp	93	93	0.706	0.706	0.0109	2.32	1.91	1.81
Lead (Tsp) Lc Frm/Fem	92	92	0.0128	0.0128		0.0978	0.0939	0.0516
Lead Pm10 Lc	93	93	0.0108	0.0108		0.11	0.102	0.0539
M/P Xylene	58	58	0.618	0.618	0.0559	3.6	1.78	1.68
Manganese (Tsp) Stp	92	91	0.0774	0.0774	0.000926	0.407	0.324	0.24
Manganese Pm10 Lc	93	93	0.0346	0.0346		0.149	0.126	0.118
Manganese Pm10 Stp	93	93	0.0351	0.0351	0.00037	0.156	0.127	0.119
Methyl Chloroform	58	47	0.0134	0.0208	0.0782	0.0338	0.0284	0.024
Methyl Ethyl Ketone	61	61	0.372	0.372	0.0853	0.746	0.687	0.675
Methyl Isobutyl Ketone	53	52	0.207	0.207	0.0614	0.635	0.586	0.5
Methyl Methacrylate	58	10	0.00439	0.0964	0.228	0.0446	0.0377	0.0373
Methyl Tert-Butyl Ether	58	6	0.00117	0.0217	0.0457	0.0209	0.0126	0.0101
Molybdenum (Tsp) Stp	92	91	0.00413	0.00413	0.000164	0.136	0.128	0.00889
Molybdenum Pm10 Lc	93	93	0.00379	0.00379		0.131	0.122	0.00817
Molybdenum Pm10 Stp	93	93	0.0039	0.0039	0.000293	0.135	0.126	0.0085
Ethylene Oxide	57	50	0.223	0.232	0.147	1.05	0.726	0.602
Naphthalene (Tsp) Stp	62	62	0.0577	0.0577	0.00176	0.152	0.143	0.137

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Nickel (Tsp) Stp	92	91	0.00272	0.00272	0.000894	0.0268	0.0259	0.00688
Nickel Pm10 Lc	93	93	0.00215	0.00215		0.0298	0.0278	0.00718
Nickel Pm10 Stp	93	93	0.00219	0.00219	0.00144	0.0308	0.0288	0.00713
N-Octane	58	58	0.105	0.105	0.104	0.432	0.265	0.258
O-Xylene	58	58	0.234	0.234	0.069	0.947	0.76	0.677
Perylene (Tsp) Stp	62	38	2.31E-05	2.61E-05	1.56E-05	0.000216	0.000191	0.00015
Phenanthrene (Tsp) Stp	62	62	0.0109	0.0109	0.000176	0.0526	0.0431	0.0391
Propionaldehyde	70	70	0.419	0.419	0.101	1.41	1.35	1.04
Propylene	58	58	0.415	0.415	0.221	1.76	1.6	1.06
Pyrene (Tsp) Stp	62	62	0.00191	0.00191	3.86E-05	0.00861	0.00749	0.00613
Styrene	58	57	0.372	0.373	0.0756	1.98	1.18	1.02
Tert-Amyl Methyl Ether	58	0	0	0.0227	0.0453	0	0	0
Tert-Butyl Ethyl Ether	58	0	0	0.0179	0.0358	0	0	0
Tetrachloroethylene	58	58	0.664	0.664	0.0864	8.55	6.92	2.64
Toluene	58	58	1.01	1.01	0.0698	4.22	3.16	2.8
Trans-1,2-Dichloroethylene	58	15	0.0025	0.0208	0.0493	0.0174	0.0155	0.0139
Trans-1,3-Dichloropropene	58	1	0.000517	0.0333	0.0667	0.03	0	0
Trichloroethylene	58	51	0.0383	0.0414	0.0514	0.155	0.0811	0.0758
Trichlorofluoromethane	58	58	1.19	1.19	0.0728	1.48	1.47	1.47
Valeraldehyde	70	70	0.149	0.149	0.0041	0.768	0.756	0.653
Vanadium (Tsp) Stp	92	91	0.00322	0.00322	6.30E-05	0.0228	0.0226	0.0105
Vanadium Pm10 Lc	93	93	0.00184	0.00184		0.0192	0.0184	0.00349
Vanadium Pm10 Stp	93	93	0.00187	0.00187	4.58E-05	0.0198	0.019	0.00365
Vinyl Chloride	58	5	0.00078	0.0181	0.0371	0.0245	0.0128	0.00332
Zinc (Tsp) Stp	92	91	0.114	0.114	0.00535	1.07	1.04	0.452
Zinc Pm10 Lc	93	93	0.0856	0.0856		1.02	0.883	0.485
Zinc Pm10 Stp	93	93	0.0877	0.0877	0.00226	1.07	0.923	0.488

Detroit-SW (W. Fort St., N. Delray-SWHS) (261630015) Concentrations in micrograms per cubic meter (µg/m³)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
1,1,2,2-Tetrachloroethane	28	0	0	0.162	0.323	0	0	0
1,1,2-Trichloroethane	28	0	0	0.0491	0.0981	0	0	0
1,1-Dichloroethane	28	0	0	0.0852	0.17	0	0	0
1,1-Dichloroethylene	28	0	0	0.0784	0.157	0	0	0
1,2,4-Trichlorobenzene	28	0	0	0.698	1.4	0	0	0
1,2,4-Trimethylbenzene	28	1	0.0218	0.171	0.309	0.61	0	0
1,2-Dichlorobenzene	28	0	0	0.185	0.37	0	0	0
1,2-Dichloropropane	28	0	0	0.55	1.1	0	0	0
1,3,5-Trimethylbenzene	28	0	0	0.12	0.24	0	0	0
1,3-Butadiene	28	0	0	0.06	0.12	0	0	0
1,3-Dichlorobenzene	28	0	0	0.143	0.286	0	0	0
1,4-Dichlorobenzene	28	0	0	0.194	0.388	0	0	0
2,2,4-Trimethylpentane	28	1	0.0186	0.0905	0.149	0.52	0	0
Acetaldehyde	30	30	2.72	2.72		4.27	4.26	4.18
Acetone	30	30	2.44	2.44		4.48	3.55	3.51
Acetonitrile	28	21	0.702	0.765	0.503	1.5	1.4	1.2
Acrolein - Unverified	30	28	0.0714	0.0765		0.134	0.114	0.108
Acrylonitrile	28	0	0	0.399	0.798	0	0	0
Arsenic (Tsp) Stp	61	61	0.00172	0.00172	4.54E-05	0.00582	0.00426	0.00322
Benzaldehyde	30	30	0.203	0.203		0.386	0.373	0.359
Benzene	28	25	0.596	0.601	0.0957	1.6	0.94	0.94
Bromodichloromethane	28	0	0	0.075	0.15	0	0	0
Bromoform	28	0	0	0.175	0.35	0	0	0

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Bromomethane	28	0	0	0.11	0.22	0	0	0
Cadmium (Tsp) Stp	61	61	0.000151	0.000151	2.02E-05	0.00035	0.00034	0.00031
Carbon Tetrachloride	28	0	0	0.115	0.23	0	0	0
Chlorobenzene	28	0	0	0.105	0.209	0	0	0
Chloroethane	28	0	0	0.06	0.12	0	0	0
Chloroform	28	1	0.0204	0.0789	0.121	0.57	0	0
Chloromethane	28	28	1.29	1.29	0.159	1.6	1.5	1.5
Cis-1,2-Dichloroethene	28	0	0	0.0641	0.128	0	0	0
Cis-1,3-Dichloropropene	28	0	0	0.0679	0.136	0	0	0
Crotonaldehyde	30	0	0			0	0	0
Dibromochloromethane	28	0	0	0.148	0.296	0	0	0
Dibromochloromethane	28	0	0	0.148	0.296	0	0	0
Dichlorodifluoromethane	28	27	2.18	2.19	0.25	2.5	2.5	2.5
Dichloromethane	28	11	0.159	0.266	0.349	0.55	0.47	0.43
Ethylbenzene	28	0	0	0.147	0.293	0	0	0
Ethylene Dibromide	28	0	0	0.15	0.3	0	0	0
Ethylene Dichloride	28	0	0	0.0984	0.197	0	0	0
Formaldehyde	30	30	2.27	2.27		5.66	4.43	4.11
Hexanaldehyde	30	30	0.165	0.165		0.352	0.339	0.335
Lead (Tsp) Lc Frm/Fem	61	61	0.00784	0.00784		0.0216	0.0206	0.0205
M/P Xylene	28	6	0.201	0.492	0.739	1.3	1	0.93
Manganese (Tsp) Stp	61	61	0.0501	0.0501	0.000883	0.246	0.177	0.155
Methacrolein	30	30	0.124	0.124		0.442	0.231	0.203
Methyl Chloroform	28	0	0	0.105	0.211	0	0	0
Methyl Ethyl Ketone	28	7	0.386	0.798	1.1	2.5	1.9	1.6

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Methyl Isobutyl Ketone	28	0	0	0.434	0.868	0	0	0
Methyl Tert-Butyl Ether	28	0	0	0.095	0.19	0	0	0
N-Hexane	28	17	0.758	0.775	0.0872	4.5	2.5	2.5
Nickel (Tsp) Stp	61	61	0.00204	0.00204	0.000852	0.00495	0.00479	0.00468
O-Xylene	28	1	0.0179	0.178	0.332	0.5	0	0
Pm10 Total 0-10um Stp	58	40	16.9	24.5		59	48	47
Propionaldehyde	30	30	0.353	0.353		0.61	0.606	0.576
Styrene	28	3	0.0939	0.439	0.773	0.89	0.88	0.86
Tetrachloroethylene	28	0	0	0.117	0.235	0	0	0
Tolualdehydes	30	18	0.048	0.0801		0.115	0.107	0.105
Toluene	28	25	0.764	0.787	0.445	2.4	1.6	1.4
Trans-1,2-Dichloroethylene	28	0	0	0.075	0.15	0	0	0
Trans-1,3-Dichloropropene	28	0	0	0.0452	0.0905	0	0	0
Trichloroethylene	28	0	0	0.0848	0.17	0	0	0
Trichlorofluoromethane	28	28	1.29	1.29	0.232	1.4	1.4	1.4
Valeraldehyde	30	30	0.223	0.223		0.42	0.39	0.359
Vinyl Chloride	28	0	0	0.065	0.13	0	0	0

Detroit-W. Jefferson, South Delray (261630027) Concentrations in micrograms per cubic meter (µg/m³)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Arsenic (Tsp) Stp	61	61	0.00196	0.00196	4.64E-05	0.00885	0.00454	0.00451
Cadmium (Tsp) Stp	61	61	0.000242	0.000242	2.00E-05	0.00141	0.00073	0.00063
Lead (Tsp) Lc Frm/Fem	61	61	0.0106	0.0106		0.0867	0.0318	0.0225
Manganese (Tsp) Stp	61	61	0.162	0.162	0.000893	0.896	0.584	0.527
Nickel (Tsp) Stp	61	61	0.00236	0.00236	0.000862	0.00848	0.00834	0.00797

Port Huron-Rural St. (261470031), Speciated $PM_{2.5}$ (µg/m³)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Arsenic (Tsp) Stp	92	92	0.0014	0.0014	4.53E-05	0.00796	0.00607	0.00554
Cadmium (Tsp) Stp	92	92	0.000229	0.000229	2.00E-05	0.00141	0.00114	0.00113
Lead (Tsp) Lc Frm/Fem	92	92	0.0203	0.0203		0.146	0.122	0.120
Manganese (Tsp) Stp	92	92	0.00952	0.00952	0.000882	0.0313	0.0285	0.0276
Nickel (Tsp) Stp	92	92	0.000776	0.000776	0.00085	0.00224	0.00188	0.00187

River Rouge (261630005) Concentrations in micrograms per cubic meter (µg/m³)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Acetaldehyde	31	31	2.58	2.58		6.58	4.61	3.71
Acetone	31	31	2.67	2.67		6.3	4.5	4.34
Acrolein - Unverified	31	30	0.0934	0.0965		0.252	0.196	0.179
Arsenic (Tsp) Stp	61	61	0.00163	0.00163	4.54E-05	0.00851	0.00517	0.00479
Benzaldehyde	31	30	0.175	0.181		0.661	0.318	0.308
Cadmium (Tsp) Stp	61	61	0.000191	0.000191	2.00E-05	0.00049	0.00042	0.00039
Crotonaldehyde	31	0	0			0	0	0
Formaldehyde	31	31	3.37	3.37		7.6	6.65	6.33
Hexanaldehyde	31	31	0.17	0.17		0.515	0.507	0.35

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Lead (Tsp) Lc Frm/Fem	61	61	0.00592	0.00592		0.014995	0.013	0.0129
Manganese (Tsp) Stp	61	61	0.0318	0.0318	0.000877	0.0873	0.0871	0.0719
Methacrolein	31	31	0.154	0.154		0.444	0.437	0.337
Nickel (Tsp) Stp	61	61	0.00117	0.00117	0.000846	0.00484	0.00312	0.00237
Propionaldehyde	31	31	0.354	0.354		0.734	0.664	0.62
Tolualdehydes	31	20	0.0766	0.119		0.279	0.258	0.209
Valeraldehyde	31	30	0.174	0.18		0.419	0.364	0.355

Belding-Merrick St. (260670003) Concentrations in micrograms per cubic meter (µg/m^3)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Arsenic (Tsp) Stp	60	60	0.00159	0.00159	4.62E-05	0.0242	0.00412	0.00396
Cadmium (Tsp) Stp	60	60	9.05E-05	9.05E-05	2.00E-05	0.00071	0.00038	0.00016
Lead (Tsp) Lc Frm/Fem	60	60	0.00396	0.00396		0.0284	0.00929	0.00882
Manganese (Tsp) Stp	60	60	0.0084	0.0084	0.000886	0.0242	0.0227	0.02
Nickel (Tsp) Stp	60	60	0.000605	0.000605	0.000854	0.00152	0.00116	0.00113

NMH 48217 (261630097) Concentrations in micrograms per cubic meter (µg/m^3)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Arsenic (Tsp) Stp	61	61	0.00151	0.00151	4.46E-05	0.00867	0.00537	0.00529
Cadmium (Tsp) Stp	61	61	0.000133	0.000133	2.00E-05	0.00041	0.00031	0.00031
Lead (Tsp) Lc Frm/Fem	61	61	0.00509	0.00509		0.0207	0.0179	0.0135
Manganese (Tsp) Stp	61	61	0.0196	0.0196	0.000866	0.0611	0.0445	0.0415
Nickel (Tsp) Stp	61	61	0.00103	0.00103	0.000836	0.00271	0.00237	0.00205

DP4th (261630098) Concentrations in micrograms per cubic meter (µg/m^3)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Arsenic (Tsp) Stp	61	61	0.00141	0.00141	4.51E-05	0.00531	0.00304	0.00278

Cadmium (Tsp) Stp	61	61	0.000145	0.000145	2.00E-05	0.00037	0.00034	0.00032
Lead (Tsp) Lc Frm/Fem	61	61	0.00978	0.00978		0.104	0.0525	0.029
Manganese (Tsp) Stp	61	61	0.0435	0.0435	0.000881	0.162	0.102	0.101
Nickel (Tsp) Stp	61	61	0.00193	0.00193	0.000849	0.00527	0.00433	0.00398

Military Park (261630100) Concentrations in micrograms per cubic meter (µg/m^3)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Arsenic (Tsp) Stp	61	61	0.0019	0.0019	0.0000452	0.00828	0.00764	0.00587
Cadmium (Tsp) Stp	61	61	0.00021	0.00021	0.00002	0.00073	0.00055	0.00046
Lead (Tsp) Lc Frm/Fem	61	61	0.0156	0.0156		0.0962	0.0796	0.0687
Manganese (Tsp) Stp	61	61	0.0442	0.0442	0.000875	0.153	0.126	0.108
Nickel (Tsp) Stp	61	61	0.0016	0.0016	0.000843	0.00584	0.00344	0.00313

Trinity (261630099) Concentrations in micrograms per cubic meter (µg/m^3)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Arsenic (Tsp) Stp	61	61	0.00194	0.00194	4.43E-05	0.00768	0.00575	0.00486
Cadmium (Tsp) Stp	61	61	0.000222	0.000222	2.00E-05	0.00104	0.00053	0.00047
Lead (Tsp) Lc Frm/Fem	61	61	0.0109	0.0109		0.0541	0.0301	0.0276
Manganese (Tsp) Stp	61	61	0.0655	0.0655	0.00087	0.177	0.164	0.14
Nickel (Tsp) Stp	61	61	0.00291	0.00291	0.000839	0.00985	0.00799	0.00717

APPENDIX B-2 Data Tables

Allen Park (261630001), Speciated $PM_{2.5}$ ($\mu g/m^3$)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND= MDL/2)	MDL	Max 1	Max 2	Max 3
Aluminum Pm2.5 Lc	118	87	0.026	0.026	0.0229	0.533	0.135	0.112
Ammonium Ion Pm2.5 Lc	119	119	0.52	0.52	0.0129	3.73	3	2.18
Antimony Pm2.5 Lc	118	68	0.00529	0.00529	0.016	0.0313	0.0248	0.0241
Arsenic Pm2.5 Lc	118	37	2.52E-05	3.07E-05	0.0001	0.00028	0.00027	0.00026
Barium Pm2.5 Lc	118	73	0.0147	0.0148	0.0283	0.47	0.0795	0.0505
Bromine Pm2.5 Lc	118	38	0.000544	0.000589	0.000136	0.00708	0.00637	0.00555
Cadmium Pm2.5 Lc	118	68	0.00401	0.00407	0.0137	0.0274	0.0235	0.0198
Calcium Pm2.5 Lc	118	118	0.0616	0.0616	0.00981	0.377	0.301	0.299
Cerium Pm2.5 Lc	118	55	0.00766	0.00766	0.0361	0.0499	0.0463	0.0462
Cesium Pm2.5 Lc	118	58	0.00703	0.00703	0.0271	0.047	0.0396	0.0388
Chlorine Pm2.5 Lc	119	118	0.108	0.108	0.0251	2.53	0.652	0.635
Chromium Pm2.5 Lc	118	100	0.0232	0.0232	0.00394	1.96	0.0584	0.0442
Cobalt Pm2.5 Lc	118	90	0.00218	0.00218	0.00228	0.0164	0.0147	0.0106
Copper Pm2.5 Lc	118	32	0.000253	0.000253	0.00157	0.0033	0.00319	0.00186
Ec Csn_Rev Unadjusted Pm2.5 Lc Tot	118	97	0.00767	0.00767	0.00421	0.283	0.0257	0.0256
Indium Pm2.5 Lc	121	121	0.416	0.416	0.00032	2.25	1.58	1.17
Iron Pm2.5 Lc	118	71	0.00504	0.00504	0.0147	0.0296	0.0268	0.0268
Lead Pm2.5 Lc	118	118	0.0704	0.0704	0.00845	0.229	0.221	0.218
Magnesium Pm2.5 Lc	118	90	0.00407	0.00407	0.00659	0.0164	0.0162	0.0146
Manganese Pm2.5 Lc	118	62	0.0225	0.0265	0.045	0.81	0.106	0.101
Nickel Pm2.5 Lc	118	91	0.00254	0.00254	0.00296	0.0136	0.00949	0.00918
Oc Csn_Rev Unadjusted Pm2.5 Lc Tot	118	92	0.000894	0.000894	0.00122	0.00539	0.0042	0.00402

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND= MDL/2)	MDL	Max 1	Max 2	Max 3
Phosphorus Pm2.5 Lc	121	121	1.99	1.99	0.643	10.7	5.1	4.3
Potassium Ion Pm2.5 Lc	118	101	0.000149	0.000261	0.00196	0.00439	0.00306	0.00217
Potassium Pm2.5 Lc	119	118	0.109	0.109	0.0129	8.82	0.307	0.287
Rubidium Pm2.5 Lc	118	118	0.129	0.129	0.00539	8.59	0.404	0.332
Selenium Pm2.5 Lc	118	61	0.000944	0.000956	0.00315	0.00502	0.00499	0.00491
Silicon Pm2.5 Lc	118	75	0.00126	0.00126	0.00244	0.012	0.00633	0.00502
Silver Pm2.5 Lc	118	116	0.0582	0.0582	0.0136	0.301	0.252	0.248
Sodium Ion Pm2.5 Lc	119	119	0.035	0.035	0.014	0.466	0.406	0.221
Sodium Pm2.5 Lc	118	85	0.0355	0.0355	0.0801	0.223	0.158	0.134
Strontium Pm2.5 Lc	118	79	0.00307	0.0031	0.00292	0.205	0.0111	0.00886
Sulfate Pm2.5 Lc	119	118	1.01	1.01	0.0294	8.11	4.75	2.31
Sulfur Pm2.5 Lc	118	117	0.357	0.357	0.00104	2.5	1.65	0.908
Tin Pm2.5 Lc	118	69	0.00542	0.00542	0.0155	0.023	0.0222	0.022
Titanium Pm2.5 Lc	118	106	0.00337	0.00337	0.00291	0.0453	0.00961	0.00933
Total Nitrate Pm2.5 Lc	119	118	1.53	1.53	0.0383	11.7	9.05	6.89
Vanadium Pm2.5 Lc	118	43	0.000244	0.00048	0.000708	0.00273	0.00228	0.00212
Zinc Pm2.5 Lc	118	118	0.0138	0.0138	0.00172	0.0894	0.0473	0.0391
Zirconium Pm2.5 Lc	118	65	0.00436	0.00436	0.014	0.0306	0.0259	0.0231

Dearborn (261630033), Speciated $PM_{2.5}$ (µg/m^3)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Aluminum Pm2.5 Lc	60	40	0.0218	0.0218	0.0228	0.122	0.0904	0.0856
Ammonium Ion Pm2.5 Lc	60	60	0.53	0.53	0.0129	3.56	2.32	2.28
Antimony Pm2.5 Lc	60	28	0.00281	0.00281	0.016	0.0256	0.0192	0.0107
Arsenic Pm2.5 Lc	60	16	7.57E-05	8.15E-05	0.0001	0.00337	0.00033	0.00028
Barium Pm2.5 Lc	60	30	0.00856	0.00856	0.0283	0.0441	0.0382	0.0356
Bromine Pm2.5 Lc	60	20	0.000705	0.000752	0.000135	0.00614	0.00587	0.00444
Cadmium Pm2.5 Lc	60	27	0.00352	0.00352	0.0138	0.0218	0.0212	0.0149
Calcium Pm2.5 Lc	60	60	0.0936	0.0936	0.00978	0.369	0.355	0.286
Cerium Pm2.5 Lc	60	37	0.0118	0.0118	0.0363	0.0475	0.044	0.0433
Cesium Pm2.5 Lc	60	33	0.00668	0.00668	0.027	0.0376	0.0331	0.0264
Chlorine Pm2.5 Lc	60	60	0.179	0.179	0.0251	2.56	0.523	0.49
Chromium Pm2.5 Lc	60	54	0.0261	0.0261	0.00393	0.204	0.163	0.131
Cobalt Pm2.5 Lc	59	48	0.00483	0.00483	0.00228	0.122	0.0268	0.0183
Copper Pm2.5 Lc	59	22	0.000411	0.000411	0.00159	0.00422	0.00255	0.00217
Ec Csn_Rev Unadjusted Pm2.5 Lc Tot	59	58	0.0135	0.0135	0.00424	0.0838	0.0492	0.0479
Indium Pm2.5 Lc	61	60	0.55	0.55	0.00032	1.72	1.5	1.37
Iron Pm2.5 Lc	60	33	0.00415	0.00415	0.0148	0.0267	0.0207	0.017
Lead Pm2.5 Lc	59	58	0.285	0.285	0.00843	3.29	1.75	0.781
Magnesium Pm2.5 Lc	60	51	0.00777	0.00777	0.0066	0.116	0.0439	0.0159
Manganese Pm2.5 Lc	60	50	0.00576	0.00576	0.00297	0.0233	0.0222	0.0181
Nickel Pm2.5 Lc	59	47	0.00238	0.00238	0.00122	0.0587	0.00641	0.0059
Oc Csn_Rev Unadjusted Pm2.5 Lc Tot	61	61	2.32	2.32	0.643	4.87	4.59	4.17
Phosphorus Pm2.5 Lc	60	54	0.00049	0.000556	0.00196	0.00649	0.00473	0.00431
Potassium Ion Pm2.5 Lc	60	58	0.0445	0.0445	0.0129	0.221	0.18	0.174
Potassium Pm2.5 Lc	60	60	0.0611	0.0611	0.00544	0.207	0.194	0.192

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Rubidium Pm2.5 Lc	60	25	0.00065	0.000699	0.00316	0.00385	0.00373	0.00356
Selenium Pm2.5 Lc	60	41	0.00124	0.00124	0.00243	0.0116	0.00523	0.00522
Silicon Pm2.5 Lc	60	59	0.0616	0.0616	0.0138	0.234	0.226	0.172
Silver Pm2.5 Lc	60	30	0.00463	0.00463	0.0129	0.0238	0.0214	0.0213
Sodium Ion Pm2.5 Lc	60	60	0.0492	0.0492	0.0141	0.25	0.218	0.168
Sodium Pm2.5 Lc	60	45	0.0618	0.0626	0.0805	0.488	0.223	0.173
Strontium Pm2.5 Lc	60	39	0.00105	0.00105	0.00291	0.00358	0.00358	0.00349
Sulfate Pm2.5 Lc	60	60	1.08	1.08	0.0294	2.94	2.22	2.19
Sulfur Pm2.5 Lc	60	59	0.37	0.37	0.00105	1.1	0.855	0.785
Tin Pm2.5 Lc	60	28	0.00488	0.00488	0.0155	0.0501	0.0253	0.0199
Titanium Pm2.5 Lc	60	49	0.00269	0.0027	0.00292	0.0112	0.00743	0.00734
Total Nitrate Pm2.5 Lc	60	59	1.43	1.43	0.0386	11.8	7.03	6.78
Vanadium Pm2.5 Lc	60	26	0.000628	0.000826	0.000713	0.0178	0.00211	0.00204
Zinc Pm2.5 Lc	60	59	0.0506	0.0506	0.00172	0.654	0.271	0.268
Zirconium Pm2.5 Lc	60	28	0.00352	0.00352	0.0139	0.0213	0.0181	0.0139

Detroit-SW, (W Fort St., N. Delray-SWHS) (261630015), Speciated $PM_{2.5}$ ($\mu g/m^3$)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Aluminum Pm2.5 Lc	59	47	0.0402	0.0402	0.023	0.254	0.24	0.141
Ammonium Ion Pm2.5 Lc	59	59	0.552	0.552	0.0129	4.2	2.32	2.31
Antimony Pm2.5 Lc	59	38	0.0068	0.0068	0.0159	0.0329	0.0325	0.0323
Arsenic Pm2.5 Lc	59	18	1.42E-05	1.76E-05	0.0001	0.00022	0.00007	0.00006
Barium Pm2.5 Lc	59	38	0.0108	0.0108	0.0284	0.0572	0.0477	0.0373
Bromine Pm2.5 Lc	59	28	0.000913	0.000957	0.000136	0.00513	0.00448	0.00418
Cadmium Pm2.5 Lc	59	32	0.00382	0.00382	0.0137	0.0215	0.0187	0.0177
Calcium Pm2.5 Lc	59	59	0.204	0.204	0.00984	1.87	1.55	1.35
Cerium Pm2.5 Lc	59	32	0.00873	0.00873	0.0362	0.0527	0.0333	0.0321
Cesium Pm2.5 Lc	59	31	0.00816	0.00816	0.0271	0.0596	0.0355	0.032
Chloride Pm2.5 Lc	59	59	0.198	0.198	0.0254	1.48	1.04	0.928
Chlorine Pm2.5 Lc	59	54	0.0285	0.0285	0.00391	0.561	0.157	0.136
Chromium Pm2.5 Lc	59	42	0.00171	0.00173	0.00229	0.0139	0.00851	0.0078
Cobalt Pm2.5 Lc	59	18	0.000167	0.000178	0.00158	0.00136	0.00116	0.00113
Copper Pm2.5 Lc	59	59	0.0123	0.0123	0.00423	0.0658	0.0288	0.0277
Ec Csn_Rev Unadjusted Pm2.5 Lc Tot	58	58	0.526	0.526	0.00032	1.19	1.12	1.11
Indium Pm2.5 Lc	59	35	0.00463	0.00463	0.0148	0.0229	0.0163	0.0162
Iron Pm2.5 Lc	59	59	0.133	0.133	0.00846	0.627	0.535	0.411
Lead Pm2.5 Lc	59	49	0.00558	0.00558	0.0066	0.0255	0.0214	0.0203
Magnesium Pm2.5 Lc	59	37	0.0266	0.0295	0.045	0.223	0.223	0.12
Manganese Pm2.5 Lc	59	49	0.00476	0.00476	0.00298	0.0249	0.0245	0.0204
Nickel Pm2.5 Lc	59	44	0.000964	0.000964	0.00122	0.00654	0.00385	0.00286
Oc Csn_Rev Unadjusted Pm2.5 Lc Tot	58	58	2.26	2.26	0.644	4.92	4.38	4.32
Phosphorus Pm2.5 Lc	59	54	0.000357	0.000409	0.00196	0.00577	0.00375	0.00206

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Potassium Ion Pm2.5 Lc	59	59	0.0374	0.0374	0.0129	0.214	0.168	0.135
Potassium Pm2.5 Lc	59	59	0.0658	0.0658	0.00541	0.379	0.19	0.189
Rubidium Pm2.5 Lc	59	29	0.000877	0.000877	0.00316	0.00558	0.00504	0.00461
Selenium Pm2.5 Lc	59	39	0.00114	0.00114	0.00244	0.00553	0.00482	0.00453
Silicon Pm2.5 Lc	59	59	0.129	0.129	0.0136	0.92	0.916	0.522
Silver Pm2.5 Lc	59	29	0.00362	0.00362	0.0128	0.0216	0.0159	0.0146
Sodium Ion Pm2.5 Lc	59	59	0.0279	0.0279	0.0141	0.125	0.0839	0.0709
Sodium Pm2.5 Lc	59	42	0.0426	0.0426	0.0803	0.42	0.171	0.163
Strontium Pm2.5 Lc	59	37	0.00191	0.00191	0.00292	0.0109	0.00845	0.00778
Sulfate Pm2.5 Lc	59	59	1.11	1.11	0.0294	2.91	2.43	2.29
Sulfur Pm2.5 Lc	59	59	0.401	0.401	0.00105	1.01	0.988	0.925
Tin Pm2.5 Lc	59	35	0.00486	0.00486	0.0156	0.0311	0.0199	0.0192
Titanium Pm2.5 Lc	59	47	0.00399	0.00399	0.00292	0.0258	0.0209	0.0117
Total Nitrate Pm2.5 Lc	59	59	1.37	1.37	0.0385	11.6	6.67	6.18
Vanadium Pm2.5 Lc	59	29	0.000383	0.000573	0.000718	0.00234	0.00177	0.00151
Zinc Pm2.5 Lc	59	59	0.0201	0.0201	0.00172	0.0995	0.0646	0.0638
Zirconium Pm2.5 Lc	59	30	0.00324	0.00324	0.014	0.0172	0.0142	0.0141

Grand Rapids (260810020), Speciated $PM_{2.5}$ ($\mu g/m^3$)

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Aluminum Pm2.5 Lc	121	66	0.0146	0.0146	0.0322	0.146	0.142	0.134
Ammonium Ion Pm2.5 Lc	121	120	0.686	0.686	0.00692	4.44	4.23	3.56
Antimony Pm2.5 Lc	121	69	0.00517	0.00517	0.0388	0.0333	0.0289	0.0256
Arsenic Pm2.5 Lc	121	56	0.0000193	0.000165	0.00186	0.00011	0.00011	0.00011
Barium Pm2.5 Lc	121	71	0.0111	0.0111	0.0801	0.132	0.0759	0.0643
Bromine Pm2.5 Lc	121	27	0.000379	0.00215	0.00454	0.00651	0.00518	0.00514
Cadmium Pm2.5 Lc	121	70	0.00465	0.00465	0.0158	0.0248	0.0246	0.0242
Calcium Pm2.5 Lc	121	121	0.0298	0.0298	0.00885	0.162	0.0926	0.0876
Cerium Pm2.5 Lc	121	61	0.0119	0.0119	0.0954	0.0644	0.0593	0.0583
Cesium Pm2.5 Lc	114	65	0.00807	0.00807	0.0271	0.053	0.0373	0.0369
Chloride Pm2.5 Lc	113	113	0.116	0.116	0.0249	4.3	0.279	0.267
Chlorine Pm2.5 Lc	114	89	0.0319	0.0319	0.00389	3.04	0.242	0.0271
Chromium Pm2.5 Lc	111	81	0.00167	0.00167	0.00229	0.0172	0.0106	0.00803
Cobalt Pm2.5 Lc	111	35	0.000269	0.000269	0.00158	0.00383	0.00309	0.0024
Copper Pm2.5 Lc	111	91	0.00706	0.00706	0.0041	0.366	0.0705	0.0195
Ec Csn_Rev Unadjusted Pm2.5 Lc Tot	111	111	0.386	0.386	0.00032	1.55	1.53	1.15
Indium Pm2.5 Lc	114	64	0.00533	0.00541	0.0146	0.0237	0.0228	0.0222
Iron Pm2.5 Lc	111	111	0.0553	0.0553	0.00839	0.191	0.172	0.15
Lead Pm2.5 Lc	114	70	0.00356	0.00356	0.00659	0.0334	0.0169	0.0149
Magnesium Pm2.5 Lc	114	61	0.0275	0.0322	0.0452	1.21	0.108	0.0932
Manganese Pm2.5 Lc	114	86	0.00221	0.00221	0.00296	0.0127	0.00965	0.00842
Nickel Pm2.5 Lc	111	86	0.000768	0.000773	0.00121	0.00411	0.00348	0.00288
Oc Csn_Rev Unadjusted Pm2.5 Lc Tot	111	111	2.17	2.17	0.638	8.59	5.98	5.75
Phosphorus Pm2.5 Lc	114	101	0.000265	0.000338	0.00203	0.00679	0.00611	0.0046

Chemical Name	Num Obs	Obs > MDL	Average (ND=0)	Average (ND=MDL/2)	MDL	Max 1	Max 2	Max 3
Potassium Ion Pm2.5 Lc	113	113	0.173	0.173	0.0129	14.4	0.776	0.284
Potassium Pm2.5 Lc	114	114	0.166	0.166	0.00544	11.9	0.747	0.357
Rubidium Pm2.5 Lc	114	65	0.00117	0.00117	0.00317	0.00874	0.00854	0.00628
Selenium Pm2.5 Lc	114	70	0.00088	0.00088	0.00247	0.00495	0.00454	0.00406
Silicon Pm2.5 Lc	114	101	0.0376	0.0376	0.0139	0.231	0.221	0.131
Silver Pm2.5 Lc	114	69	0.00419	0.00419	0.0128	0.0259	0.0225	0.0221
Sodium Ion Pm2.5 Lc	113	112	0.0193	0.0193	0.014	0.0892	0.0844	0.0754
Sodium Pm2.5 Lc	114	82	0.0362	0.0362	0.0791	0.29	0.213	0.143
Strontium Pm2.5 Lc	114	76	0.00346	0.00346	0.00292	0.244	0.00847	0.00608
Sulfate Pm2.5 Lc	113	113	0.982	0.982	0.0292	13.1	3.57	2.5
Sulfur Pm2.5 Lc	114	114	0.331	0.331	0.00102	3.63	1.23	0.95
Tin Pm2.5 Lc	114	58	0.00498	0.00498	0.0155	0.029	0.0249	0.0236
Titanium Pm2.5 Lc	114	98	0.00387	0.00387	0.00292	0.0572	0.0199	0.0172
Total Nitrate Pm2.5 Lc	113	113	1.44	1.44	0.0388	7.89	6.65	6.26
Vanadium Pm2.5 Lc	114	25	0.000113	0.000382	0.000697	0.00346	0.00144	0.00102
Zinc Pm2.5 Lc	114	114	0.0153	0.0153	0.00173	0.416	0.0414	0.0359
Zirconium Pm2.5 Lc	114	64	0.00401	0.00401	0.014	0.027	0.0227	0.0165

APPENDIX C - SUMMARY

Appendix C summarizes the development of the NAAQS and how compliance with these standards is determined. Also included is the variety of monitoring techniques, requirements used to ensure quality data is obtained, and a history of NAAQS changes that have occurred since the inceptions of the CAA.

National Ambient Air Quality Standards (NAAQS)

Under Section 109 of the CAA, the USEPA established a primary and secondary NAAQS for each pollutant for which air quality criteria have been issued. The primary standard is designed to protect the public health with an adequate margin of safety, including the health of the most susceptible individuals in a population, such as children, the elderly, and those with chronic respiratory ailments. Factors in selecting the margin of safety for the primary standard include the nature and severity of the health effects involved and the size of the sensitive population at risk. Secondary standards are chosen to protect public welfare (personal comfort and well-being) and the environment by limiting economic damage, impacts on visibility and climate, and harmful effects on soil, water, crops, vegetation, wildlife, and buildings.

In addition, the NAAQS have various averaging times to address health impacts. Short averaging times reflect the potential for acute (immediate) effects, whereas long-term averaging times are designed to protect against chronic (long-term) effects.

NAAQS have been established for CO, Pb, NO_2, PM, O_3, and SO_2. **Table C1.1** lists the primary and secondary NAAQS, averaging time and concentration level for each criteria pollutant in effect in 2018. The concentrations are listed as parts per million (ppm), micrograms per cubic meter (µg/m^3), and/or milligrams per cubic meter (mg/m^3).

Table C1.1:

Pollutant	Primary (health) Level	Primary Averaging Time	Secondary (welfare) Level	Secondary Averaging Time
Carbon Monoxide (CO) 8-hour average	9 ppm (10 mg/m^3)	8-hour average, not to be exceeded more than once per year *(1971)*	None*	None*
Carbon Monoxide (CO) 1-hour average	35 ppm (40 mg/m^3)	1-hour average, not to be exceeded more than once per year *(1971)*	None*	None*
Lead (Pb)	0.15 µg/m^3	Maximum rolling 3-month average *(2008)*	Same as Primary	Same as Primary
Nitrogen Dioxide (NO_2) Annual mean	0.053 ppm (100 µg/m^3)	Annual mean *(1971)*	Same as Primary	Same as Primary
Nitrogen Dioxide (NO_2) 1-hour average	0.100 ppm	98th percentile of 1-hour average, averaged over 3 years *(2010)*	Same as Annual	Same as Annual
Particulate Matter (PM_{10})	150 µg/m^3	24-hour average, not to be exceeded more than once per year over 3 years *(1987)*	Same as Primary	Same as Primary
Particulate Matter ($PM_{2.5}$) Annual average	12.0 µg/m^3	Annual mean averaged over 3 years *(2012)*	15.0 µg/m^3	Annual mean
Particulate Matter ($PM_{2.5}$) 24-hour average	35 µg/m^3	98th percentile of 24-hour concentration, averaged over 3 years *(2006)*	Same as Primary	Same as Primary
Ozone (O_3)	0.070 ppm	Annual 4th highest 8-hour daily max averaged over 3 years *(2015)*	Same as Primary	Same as Primary
Sulfur Dioxide (SO_2)	0.075 ppm	99th percentile of 1-hour daily max averaged over 3 years *(2010)*	0.5 ppm	3 hours

*In 1985, the USEPA revoked the secondary standard for CO (for public welfare) due to a lack of evidence of adverse effects on public welfare at or near ambient concentrations.

To demonstrate compliance with the NAAQS, the USEPA has defined specific criteria for each pollutant, which are summarized in **Table C1.2.**

Table C1.2: Criteria for the Determination of Compliance with the NAAQS

Pollutant	Criteria for Compliance
CO	Compliance with the CO standard is met when the second highest, non-overlapping, 35 ppm, 1-hour average standard and/or the 9 ppm, 8-hour average standard is not exceeded more than once per year.
Pb	Compliance with the Pb standard is met when daily values collected for three consecutive months are averaged and do not exceed the 0.15 µg/m^3 standard.
NO_2	Compliance is met when the annual arithmetic mean concentration does not exceed the 0.053 ppm standard and the 98th percentile* of the daily maximum 1-hour concentration averaged over 3 years does not exceed 100 ppb.
PM_{10}	The 24-hour PM_{10} primary and secondary standards are met when 150 µg/m^3 is not exceeded more than once per year on average over 3 years.
$PM_{2.5}$	The annual $PM_{2.5}$ primary and secondary standards are met when the annual arithmetic mean concentration is less than or equal to 12 µg/m^3 and 15 µg/m^3, respectively. The 24-hour $PM_{2.5}$ primary and secondary standards are met when the 3-year average of the 98th percentile** 24-hour concentration is less than or equal to 35 µg/m^3.
O_3	The 8-hour O_3 primary and secondary standards are met when the 3-year average of the 4th highest daily maximum 8-hour average concentration is less than or equal to 0.070 ppm.
SO_2	To determine compliance, the 99th percentile*** 1-hour concentration averaged over a 3-year period does not exceed 0.075 ppm, and the 3-hour average concentration shall not exceed 0.5 ppm more than once per calendar year.

**98th percentile daily maximum 1-hour value* is the value below which nominally 98 percent of all daily maximum 1-hour concentration values fall, using the ranking and selection method specified in section 5.2 of appendix S of CFR Part 50.

** *98th percentile* is the daily value out of a year of $PM_{2.5}$ monitoring data below which 98 percent of all daily values fall using the ranking and selection method specified in section 4.5(a) of appendix N of CFR Part 50.

*** *99th percentile daily maximum 1-hour value* is the value below which nominally 99 percent of all daily maximum 1-hour concentration values fall, using the ranking and selection method specified in section 5 of appendix T of CFR Part 50.

As part of the USEPA's grant to EGLE, the AQD provides an annual Network Review document[14] of all monitoring data collected from the previous year and recommendations on any network changes. These recommendations are based on each monitor's exceedance history, changes in population distribution, and modifications to federal monitoring requirements under the CAA. Under the amended air monitoring regulations that began in 2007, states are required to solicit public comment (in May of each year) on their future air monitoring network design prior to submitting the annual review to the USEPA in July.

[14] Most recent Network Reviews

Types of Monitors

Federal Reference Method (FRM): method of sampling and analyzing the ambient air for an air pollutant that USEPA uses as the "gold standard" for measuring that pollutant. FRM monitors are used to designate attainment/nonattainment areas. The gaseous pollutants CO, NO_2, O_3, and SO_2 are measured with continuous FRM monitors that provide real-time hourly data. The FRM for PM and Pb requires a filter that measure concentrations over a 24-hour period. These filters must be further analyzed in a laboratory; therefore, the samples results are delayed.

Rural background monitors: measure background air quality in non-urban areas

Aethalometers: measure carbon black, a combustion by-product typical of transportation sources, by concentrating particulate on a filter tape and measuring changes in optical transmissivity and absorption.

EC/OC instruments measure elemental carbon using pyrolysis coupled with a nondispersive infrared detector to separate the elemental and organic carbon fractions.

Federal Equivalent Method (FEM): method for measuring the concentration of an air pollutant in the ambient air that has been designated as equivalent to the FRM.

Continuous Monitors: measure data in real-time, meaning concentrations of the air pollutant are usually available within an hour on the MIair website.

TEOM: tapered element oscillating monitors (TEOMs) are continuous PM monitor that is used only for real-time data indications since they are not FEMs and cannot be used for attainment/nonattainment designations.

BAM: Beta attenuation monitors (BAMs) are real-time, continuous PM2.5 monitor that is FEM, thus can be used for attainment/nonattainment designation.

T640: A continuous PM2.5 monitor that uses a light scattering technique to measure particulates. This FEM method can be used for attainment/nonattainment designation.

T640X: A continuous monitor that measures PM2.5, PM10 and PM coarse that uses a light scattering technique to measure particulates. This FEM method can be used for attainment/nonattainment designation.

$PM_{2.5}$ FRM Monitoring: The concentrations of $PM_{2.5}$ measured over a 24-hour time period are determined using the filter-based gravimetric FRM. Data generated by the FRM monitors are used for comparisons to the NAAQS in Michigan. The sites are located in urban, commercial, and residential areas where people are exposed to $PM_{2.5}$.

Chemical Speciation Monitoring: Speciated monitoring provides a better understanding of the chemical composition of $PM_{2.5}$ material and better characterizes background levels. Single event Met-One Speciation Air Sampling System (SASS) monitors are used throughout Michigan's speciation network.

National Air Toxics Trend Station (NATTS): Network developed to fulfill the need for long-term hazardous air pollutants (HAPs) monitoring data of consistent quality. Among the principal objectives are assessing trends and emission reduction program effectiveness, assessing and verifying air quality models.

NCore Network: Began January 1, 2011, as part of the USEPA's 2006 amended air monitoring requirements. National Core (NCore) sites provide a full suite of measurements at one location. NCore stations collect the following measurements: ozone, SO2 (trace), CO (trace), NOY (reactive oxides of nitrogen), PM2.5 FRM, continuous PM2.5, speciated PM2.5, wind speed, wind direction, relative humidity, and ambient temperature. In addition, filter-based measurements are required for PM coarse (PM10-2.5) on a once every three-day sampling frequency. This information will support scientific studies ranging across technological, health, and atmospheric process disciplines. Michigan has two NCore sites; Allen Park and Grand Rapids.

Near-road Monitoring Network: Focuses on vehicle emissions and how they disperse near-roadways, was approved by USEPA in 2011. This network, now referred to as the near-roadway network, is focused on high traffic urban roads in Core-Based Statistical Areas (CBSAs) with more than one million people.

Population-Oriented Monitors: Monitors that are located in an area where many people live, also considered ambient air.

Transport monitors: Measure air pollutants that that have travelled a distance from the emission sources and are formed in the atmosphere when certain pollutants are present, like ozone.

Source-Oriented/Point-Source Monitors: Monitors that are located near a specific emissions source (e.g., factory) of a pollutant.

Primary Monitor: Data from these monitors are used to compare to the NAAQS and must meet quality assurance criteria.

Secondary/Precision/Collocated Monitor: Two or more air samplers, analyzers, or other instruments that are operated simultaneously while located side by side. These are used for quality assurance purposes.

Urban Scale Monitors: Measures air pollution concentrations in more populated urban areas.

Quality Assurance

The AQD's Air Monitoring Unit (AMU) ensures that all data collected and reported is of high quality and meets federal requirements. The AMU has a quality system in place that includes a Quality Assurance Project Plan (QAPP), standard operating procedures (SOPs), standardized forms and documentation policies, and a robust audit and assessment program.

The monitoring network adheres to the requirements in Title 40 of the Code of Federal Regulations (CFR), Parts 50, 53, and 58. This ensures that the monitors are correctly sited, operated in accordance with the Federal Reference Methods, and adhere to the quality assurance requirements.

Quality assurance checks are conducted by site operators at the frequencies required in the regulations and unit procedures. Independent audits are conducted by the AMU's Quality Assurance (QA) Team, which has a separate reporting line of supervision. The quality assurance checks and audits are reported to the USEPA each quarter.

External audits are conducted annually by the USEPA. The USEPA conducts Performance Evaluation Program (PEP) audits for $PM_{2.5}$ samplers and the National Performance Audit Program (NPAP) checks for the gaseous monitors. The USEPA also conducts program-wide Technical Systems Audits (TSAs) 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 certain analytical techniques using performance evaluation samples.

Historical NAAQS Changes

CO

1971 1-hour: Second highest average does not exceed 35 in a year

8-hour: Second highest average does not exceed 9 ppm in a year.

Lead

1978 Calendar quarter values averaged does not exceed 1.5 µg/m^3

2008 3-month values averaged does not exceed 0.15 µg/m^3

NO_2

1971 Annual average of 53 ppb or less

2010 98th percentile of the 1-hour concentration averaged over 3 yrs. is 100 ppb or less

Ozone

1971 Total photochemical oxidants: 1-hour max of 0.08 ppm not exceeded once per yr
1979 1-hour: 1-hour maximum concentration is 0.12 ppm one or less hour per yr
1997 8-hour: 4th highest daily maximum 8-hour concentration averaged over 3 yrs. is 0.08 ppm or less

2008 8-hour: 4th highest daily maximum 8-hour concentration averaged over 3 yrs. is 0.075 ppm or less

2015 8-hour: 4th highest daily maximum 8-hour concentration averaged over 3 yrs. is 0.070 ppm or less

PM

1971 TSP: 24-hour average not to exceed 260 µg/m^3 more than once per yr
Annual geometric mean of 75 µg/m^3
1987 PM_{10}: Indicator for PM changed from TSP to PM10
24-hour average not to exceed 150 µg/m^3 more than once per yr over a 3-yr period
Annual mean of 50 µg/m^3 or less average over 3 yrs.
1997 $PM_{2.5}$: Annual mean of 15.0 µg/m^3 or less average over 3 yrs.
98th percentile of 24-hour average of 65 µg/m^3 or less averaged over 3 yrs.
2006 PM_{10}: Annual average revoked

24-hour average retained

$PM_{2.5}$: Annual mean retained
98th percentile of 24-hour average of 35 µg/m^3 or less averaged over 3 yrs.
2012 $PM_{2.5}$: Annual mean of 12.0 µg/m^3 or less average over 3 yrs.

SO_2

1971 24-Hour concentration of 0.14 ppm not exceeded more than once per year

Annual average of 0.03 ppm or less.

2010 1-hour average of 99th percentile is 75 ppb or less, averaged over 3 yrs.
Previous standards revoked

APPENDIX D: ACRONYMS AND THEIR DEFINITIONS

>	Greater than
<	Less than
≥	Greater than or equal to
≤	Less than or equal to
%	Percent
$\mu g/m^3$	Micrograms per cubic meter
µm	Micrometer
AIRS ID	Aerometric Information Retrieval System Identification Number
AMU	Air Monitoring Unit
AQD	Air Quality Division
AQES	Air Quality Evaluation Section
AQI	Air Quality Index
AQS	Air Quality System (EPA air monitoring data archive)
As	Arsenic
BAM	Beta Attenuation Monitor (hourly $PM_{2.5}$ measurement monitor)
BC	Black Carbon
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CAA	Clean Air Act
CBSA	Core-Based Statistical Area
Cd	Cadmium
CFR	Code of Federal Regulations
CO	Carbon monoxide
CSA	Consolidated Statistical Area
DW	Downwind
EC/OC	Elemental carbon/Organic carbon
EGLE	Michigan Department of Environment, Great Lakes and Energy
FDMS	Filter Dynamic Measurement System
FEM	Federal Equivalent Method
FIA	Family Independence Agency
FR	Federal Register
FRM	Federal Reference Method
GHIB	Gordie Howe International Bridge
HAP	Hazardous Air Pollutant
hr	Hour
Lc	Local Conditions

MASN .... Michigan Air Sampling Network
MDL .... Method Detection Limit
mg/m^3 .... Milligrams per meter cubed
MI .... Michigan
MiSA .... Micropolitan Statistical Area
Mn .... Manganese
MSA .... Metropolitan Statistical Area
NAAQS .... National Ambient Air Quality Standard
NAMS .... National Air Monitoring Station
NATTS .... National Air Toxics Trend Sites
NCore .... National Core Monitoring Sites
ND .... Non-detect
NEI .... National Emission Inventory
Ni .... Nickel
NMH 48217 ... New Mount Hermon 48217 ZIP code monitoring site
NO .... Nitric Oxide
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
NR .... Near Road
O_3 .... Ozone
Obs/OBS .... Observations
PAMS .... Photochemical Assessment Monitoring Station
PAH .... Polynuclear Aromatic Hydrocarbon
Pb .... Lead
PBT .... Persistent, Bioaccumulative and Toxic
PCB .... Polychlorinated Biphenyls
PEP .... Performance Evaluation Program
PM .... Particulate Matter
$PM_{2.5}$ .... Particulate Matter with an aerodynamic diameter less than or equal to 2.5 microns
PM_{10} .... Particulate Matter with a diameter of 10 microns or less
$PM_{10-2.5}$ .... Coarse PM equal to the concentration difference between PM_{10} and $PM_{2.5}$
PNA .... Polynuclear Aromatic Hydrocarbons
POC .... Parameter Occurrence Code
ppb .... Parts Per Billion
ppm .... Parts Per Million = mg/kg, mg/L, µg/g (1 ppm = 1,000 ppb)
QA .... Quality Assurance
QAPP .... Quality Assurance Project Plan

SASS.................. Speciation Air Sampling System ($PM_{2.5}$ Speciation Sampler)
SO_2 .... Sulfur Dioxide
SOP .... Standard Operating Procedures
STN .... Speciation Trend Network ($PM_{2.5}$)
Stp .... Standard Temperature and Pressure
SVOC................ Semi-Volatile Compound
SW .... Southwest
SWHS .... Southwestern High School
TAC.................... Toxic Air Contaminant
TEOM................ Tapered element oscillating microbalance (hourly $PM_{2.5}$ measurement monitor)
tpy .... Ton per year
TRI .... Toxic Release Inventory
TSA .... Technical Systems Audit
TSP..................... Total Suspended Particulate
US .... United States
USEPA............... United States Environmental Protection Agency
UV...................... Ultra-violet
VOC .... Volatile Organic Compounds

ACKNOWLEDGMENTS

This publication was prepared utilizing information provided by the Air Quality Evaluation Section (AQES) and other staff of the Michigan Department of Environment, Great Lakes, and Energy; Air Quality Division. Copies can be obtained online at: Michigan.gov/Air, under "Monitoring," then "Annual Air Quality Reports," or call 517-284-6747 to request a hard copy.

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Other units within the AQES: Strategy Development Unit, BioWatch Unit, Toxics Unit, and the Emissions Reporting & Assessment Unit.

Other units in EGLE: The Environmental Support Division

The Air Quality Division also wishes to acknowledge the many significant contributions of Mitch Toonstra of the **City of Grand Rapids, Air Pollution Control Division**, which operates and maintains air monitoring equipment in West Michigan.

EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
Michigan.gov/air

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7953 Adobe Road
Kalamazoo, MI 49009-5026
269-567-3500 Fax: 269-567-3555

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P.O. Box 30242
Constitution Hall, 525 W. Allegan St., 1 South
Lansing, MI 48909-7760
517-284-6651 Fax: 517-241-3571

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Bay City, MI 48708
989-894-6200 Fax: 989-891-9237

Counties: Arenac, Bay, Clare, Gladwin, Huron, Iosco, Isabella, Midland, Ogemaw, Saginaw, Sanilac, and Tuscola

Warren District
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27700 Donald Court
Warren, MI 48092-2793
586-753-3700 Fax: 586-753-3731

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Marquette District
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1504 West Washington Street
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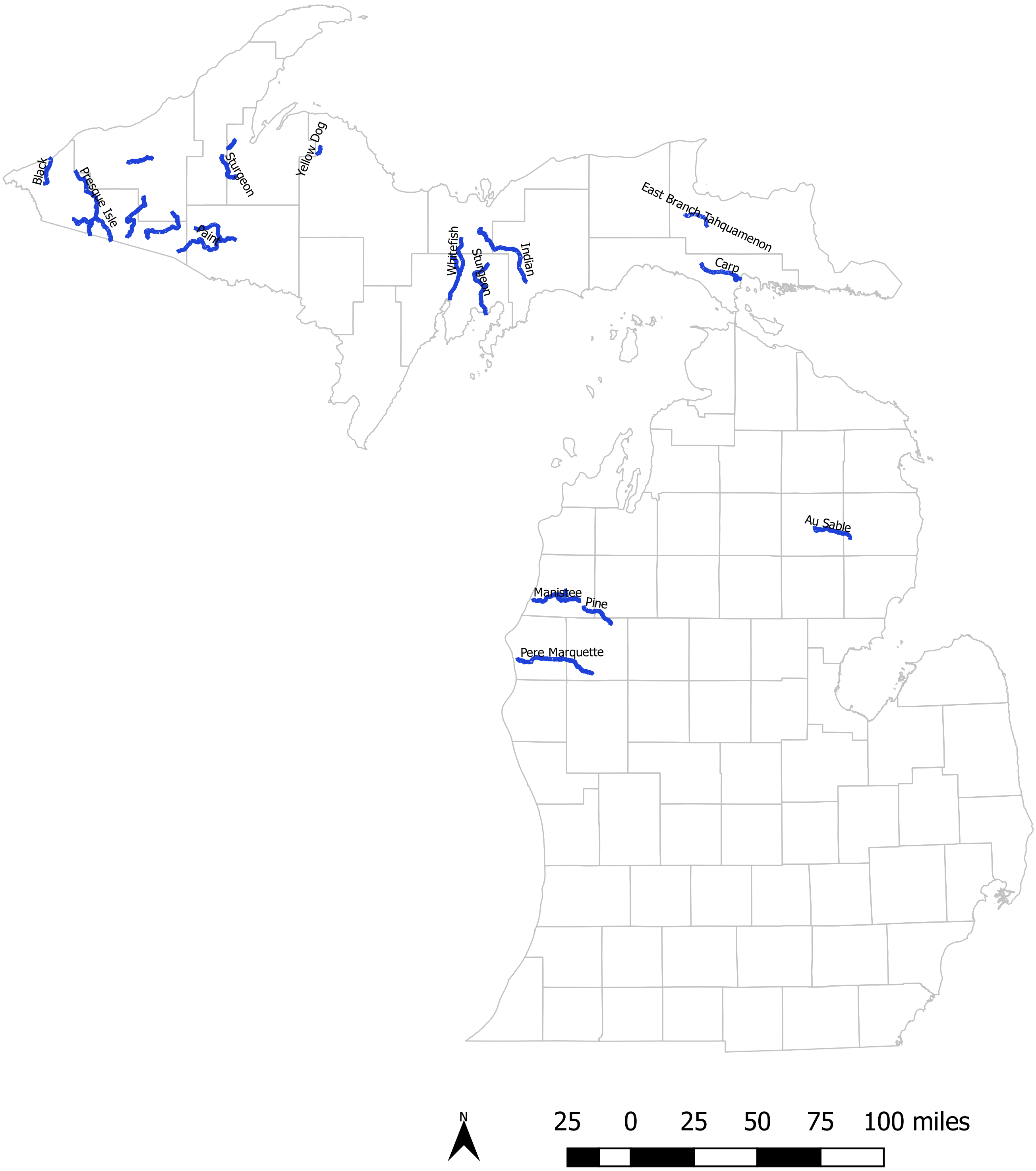
906-228-4853 Fax: 906-228-4940

Counties: All counties in the Upper Peninsula

Michigan Wild and Scenic Rivers



Legend

National Wild and Scenic Rivers System

Source: National Wild and Scenic Rivers System Website (https://www.rivers.gov/mapping-gis.php).

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4/2018

MICHIGAN STATE UNIVERSITY | Extension

Jenny Hamel
Mannik Smith Group
2365 S Haggerty Road
Canton, MI 48188

August 26, 2022

Re: Rare Species Review #3258 – Environmental Assessment Project, Detroit, Wayne County, MI.

Hello Jenny:

The location for the proposed project was checked against known localities for rare species and unique natural features, which are recorded in the Michigan Natural Features Inventory (MNFI) natural heritage database. This continuously updated database is a comprehensive source of existing data on Michigan's endangered, threatened, or otherwise significant plant and animal species, natural plant communities, and other natural features. Records in the database indicate that a qualified observer has documented the presence of special natural features. The absence of records in the database for a site may mean that the site has not been surveyed. The only way to obtain a definitive statement on the status of natural features is to have a competent biologist perform a complete field survey.

Under Act 451 of 1994, the Natural Resources and Environmental Protection Act, Part 365, Endangered Species Protection, "a person shall not take, possess, transport, …fish, plants, and wildlife indigenous to the state and determined to be endangered or threatened," unless first receiving an Endangered Species Permit from the Michigan Department of Natural Resources (MDNR), Wildlife Division. Responsibility to protect endangered and threatened species is not limited to the lists below. Other species may be present that have not been recorded in the database.

There are known occurrences of at-risk species within 1.5 miles of the project site but it is unlikely that negative impacts will occur. This response reflects a desktop review of the database and MNFI cannot fully evaluate this project without visiting the area. MNFI offers several levels of Rare Species Reviews, including field surveys which I would be happy to discuss with you.

Sincerely,

Michael A. Sanders

Michael A. Sanders
Environmental Review Specialist/Zoologist
Michigan Natural Features Inventory

MSU EXTENSION

Michigan Natural Features Inventory

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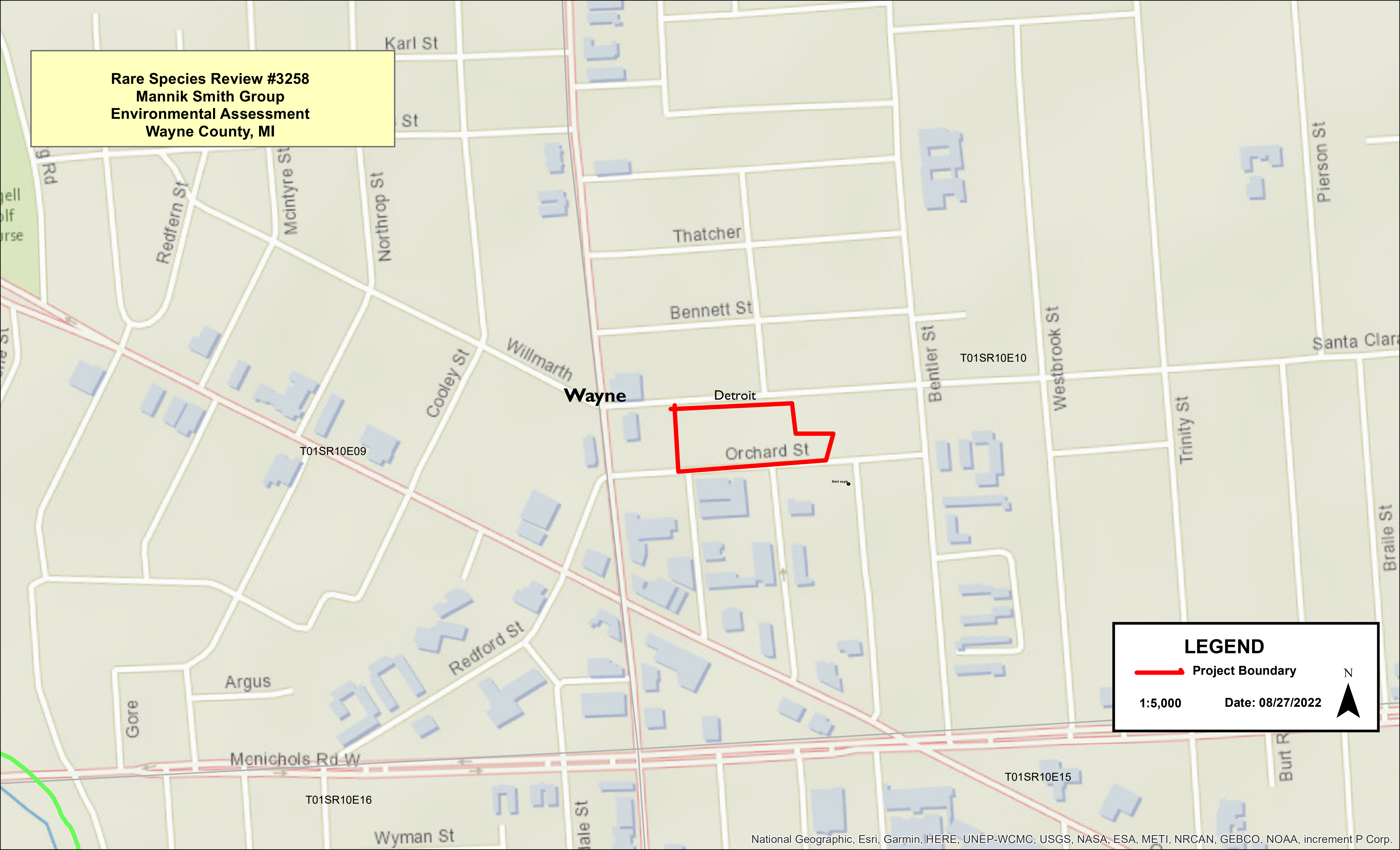
Fax (517) 373-9566

mnfi.anr.msu.edu


Rare Species Review #3258
Mannik Smith Group
Environmental Assessment
Wayne County, MI
Karl St
Thatcher
Bennett St
Willmarth
Wayne
Detroit
Orchard St
Santa Clara
Redfern St
Mcintyre St
Northrop St
Cooley St
Bentler St
Westbrook St
Trinity St
Pierson St
Braile St
Redford St
Argus
Gore
Menichols Rd W
Wyman St
Burt R
T01SR10E10
T01SR10E09
T01SR10E15
T01SR10E16
LEGEND
Project Boundary
1:5,000
Date: 08/27/2022
N
National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

Comments for Rare Species Review #3258:

It is important to note that it is the applicant's responsibility to comply with both state and federal threatened and endangered species legislation. Therefore, if a state listed species occurs at a project site, and you think you need an endangered species permit please contact: Casey Reitz, DNR-Wildlife Division, 517-284-6210, or ReitzC@michigan.gov. If a federally listed species is involved and, you think a permit is needed, please contact Jessica Pruden, U.S. Fish and Wildlife Service, East Lansing office, 517-351-8316, or Jessica_Pruden@fws.gov.

NOTE: special concern species and natural communities are not protected under endangered species legislation, but efforts should be taken to minimize any or all impacts. Please consult MNFI's Rare Species Explorer for additional information on Michigan's rare plants and animals.

Table 1: Occurrences of threatened and endangered species within 1.5 miles of project site

ELCAT	SNAME	SCOMNAME	USESA	SPROT	G_RANK	S_RANK	FIRSTOBS	LASTOBS
Plant	*Galearis spectabilis*	Showy orchis		T	G5	S2	1916	1916-05-26
Plant	*Nelumbo lutea*	American lotus		T	G4	S2	1897	1897-07-09

Comments for Table 1:

No concerns. The occurrences are Historic and/or far removed from the project site.

Table 2: Occurrences of threatened and endangered species within 1.5 miles of project site

ELCAT	SNAME	SCOMNAME	USESA	SPROT	G_RANK	S_RANK	FIRSTOBS	LASTOBS
Plant	*Adlumia fungosa*	Climbing fumitory		SC	G4	S3	1929	1929-07-09
Plant	*Jeffersonia diphylla*	Twinleaf		SC	G5	S3	1880 ?	1933-SP

Comments for Table 2:

No concerns. The occurrences are Historic and/or far removed from the project site.

Codes to Accompany Occurrence Tables:

State Protection Status Code Definitions (SPROT)
E: Endangered
T: Threatened
SC: Special concern

Federal Protection Status Code Definitions (USESA)
LE = listed endangered
LT = listed threatened
LELT = partly listed endangered and partly listed threatened
PDL = proposed delist
E(S/A) = endangered based on similarities/appearance
PS = partial status (federally listed in only part of its range)
C = species being considered for federal status

Global Heritage Status Rank Definitions (GRANK)
The priority assigned by NatureServe's national office for data collection and protection based upon the element's status throughout its entire world-wide range. Criteria not based only on number of occurrences; other critical factors also apply. Note that ranks are frequently combined.
G1 = critically imperiled globally because of extreme rarity (5 or fewer occurrences range-wide or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
G2 = imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.
G3: Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g. a single western state, a physiographic region in the East) or because of other factor(s) making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100.
G4: Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
G5: Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
Q: Taxonomy uncertain

State Heritage Status Rank Definitions (SRANK)
The priority assigned by the Michigan Natural Features Inventory for data collection and protection based upon the element's status within the state. Criteria not based only on number of occurrences; other critical factors also apply. Note that ranks are frequently combined.
S1: Critically imperiled in the state because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation in the state.
S2: Imperiled in state because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from the state.
S3: Rare or uncommon in state (on the order of 21 to 100 occurrences).
S4 = apparently secure in state, with many occurrences.
S5 = demonstrably secure in state and essentially ineradicable under present conditions.
SX = apparently extirpated from state.

Rare Species Review #3258 – Section 7 Comments
Mannik Smith Group
Environmental Assessment Project
City of Detroit
Wayne County, MI
August 26, 2022

For projects involving federal funding or a federal agency authorization

The following information is provided to assist you with Section 7 compliance of the Federal Endangered Species Act (ESA). The ESA directs all Federal agencies "to work to conserve endangered and threatened species. Section 7 of the ESA, called "Interagency Cooperation," is the means by which Federal agencies ensure their actions, including those they authorize or fund, do not jeopardize the existence of any listed species."

Federally Endangered

Indiana bat – there does not appear to be suitable habitat within the 1.5-mile search buffer. Indiana bats (*Myotis sodalis*) are found only in the eastern United States and are typically confined to the southern three tiers of counties in Michigan. Indiana bats that summer in Michigan winter in caves in Indiana and Kentucky. This species forms colonies and forages in riparian and mature floodplain habitats. Nursery roost sites are usually located under loose bark or in hollows of trees near riparian habitat. Indiana bats typically avoid houses or other artificial structures and typically roost underneath loose bark of dead elm, maple and ash trees. Other dead trees used include oak, hickory and cottonwood. Foraging typically occurs over slow-moving, wooded streams and rivers as well as in the canopy of mature trees. Movements may also extend into the outer edge of the floodplain and to nearby solitary trees. A summer colony's foraging area usually encompasses a stretch of stream over a half-mile in length. Upland areas isolated from floodplains and non-wooded streams are generally avoided.

Management and Conservation: the suggested seasonal tree cutting range for Indiana bat is between October 1 and March 31 (i.e., no cutting April 1-September 30). This applies throughout the Indiana bat range in Michigan.

Piping plover - there does not appear to be suitable habitat within 1.5-miles of the project site. In the Great Lakes region, the federally and state endangered piping plover *(Charadrius melodus)* prefers to nest and forage on sparse or non-vegetated sand-pebble beaches with less than 5% vegetative cover. Nests are simple depressions in the sand are generally placed in level areas between the water's edge and the first dune. Associated bodies of water and interdunal wetlands enhance these areas by increasing food availability. Optimal foraging areas are especially crucial along Lake Superior, where shoreline and benthic invertebrate communities are known to be naturally sparse. While feeding, open shoreline is preferred to vegetated beach areas. Piping plovers begin arriving in mid- to late-April. The nesting season is under way by mid-May and lasts until mid-August.

Management and Conservation - this species is declining throughout the Midwest due to habitat destruction and disturbance. The nests are simple depressions in the sand and are difficult to see. People walking on the beach may inadvertently destroy nests. Dogs on the beach can be especially dangerous for chicks and adults. Piping plovers are protected under the Federal Endangered Species Act and are very sensitive to human disturbance. Please avoid activity along the shoreline in this compartment between May and September.

Snuffbox – there does not appear to be suitable habitat within 1.5 miles of the project site. The snuffbox mussel (*Epioblasma triquetra)* inhabits rivers and streams with cobble, gravel, or sand bottoms in swift currents and usually is deeply buried in the substrate. Freshwater mussels require a fish host to complete their life cycle. Eggs are fertilized and develop into larvae within the gills of the female mussel. These larvae, called glochidia, are released into the water and must attach to a suitable fish host to survive and transform into the adult mussel. In Michigan, the only host fish known for snuffbox is the log perch (*Percina caprodes*). In other parts of their range the banded sculpin (*Cottus carolinae*) is also a known host. After completing the parasitic stage and reaching adulthood, this mussel remains relatively sessile on the river bottom, living between 8-10 years. The best time to survey for snuffbox is April through September.

Management and Conservation: this mussel is sensitive to river impoundment, siltation and disturbance, due to its requirement for clean, swift current and relative immobility as an adult. To maintain the current populations in Michigan, rivers need to be protected to reduce silt loading and run-off. Maintaining or establishing vegetated riparian buffers can aid in controlling many of the threats to mussels. Control of zebra mussels is critical to preserving native mussels. And as with all mussels, protection of their hosts habitat is also crucial. Because the life cycle of the snuffbox is inherently linked with that of the logperch in Michigan, conservation and management of this fish species is needed to ensure that of the snuffbox.

Rayed bean mussel – there does not appear to be suitable habitat within 1.5 miles of the project. The federally and state endangered rayed bean mussel *(Villosa fabalis)* occurs in fine mud substrates and riffles among roots of aquatic vegetation. Limits of the breeding season are not known but gravid specimens have been found in May.

Management and Conservation: like other mussels, threats to the rayed bean include: natural flow alterations, siltation, channel disturbance, point and non-point source pollution, and exotic species. Maintenance or establishment of vegetated riparian buffers can help protect mussel habitats from many of their threats. Control of zebra mussels is critical to preserving native mussels. And as with all mussels, protection of their hosts habitat is also crucial.

Federally Threatened

Northern long-eared bat - Northern long-eared bat (*M. septentrionalis*) numbers in the northeast US have declined up to 99 percent. Loss or degradation of summer habitat, wind turbines, disturbance to hibernacula, predation, and pesticides have contributed to declines in Northern long-eared bat populations. However, no other threat has been as severe to the decline as White-nose Syndrome (WNS). WNS is a fungus that thrives in the cold, damp conditions in caves and mines where bats hibernate. The disease is believed to disrupt the hibernation cycle by causing bats to repeatedly awake thereby depleting vital energy reserves. This species was federally listed in May 2015 primarily due to the threat from WNS.

Although no known hibernacula or roost trees have been documented within 1.5 miles of the project site, this activity occurs within the designated WNS zone (i.e., within 150 miles of positive counties/districts impacted by WNS. Also, there is suitable habitat within the 1.5-mile search buffer.

Also called northern bat or northern myotis, this bat is distinguished from other *Myotis* species by its long ears. In Michigan, northern long-eared bats hibernate in abandoned mines and caves in the Upper Peninsula; they also commonly hibernate in the Tippy Dam spillway in Manistee County. This species is a regional migrant with migratory distance largely determined by locations of suitable hibernacula sites.

Northern long-eared bats typically roost and forage in forested areas. During the summer, these bats roost singly or in colonies underneath bark, in cavities or in crevices of both living and dead trees. Roost trees are selected based on the suitability to retain bark or provide cavities or crevices. Common roost trees in southern Lower Michigan include species of ash, elm and maple. Foraging occurs primarily in areas along woodland edges, woodland clearings and over small woodland ponds. Moths, beetles, and small flies are common food items. Like all temperate bats this species typically produces only 1-2 young per year.

Management and Conservation: **when there are no known roost trees or hibernacula in the project area, we encourage you to conduct tree-cutting activities and prescribed burns in forested areas during October 1 through March 31. When that is not possible, we encourage you to remove trees prior to June 1 or after July 31, as that will help to protect young bats that may be in forested areas but are not yet able to fly.**

Rufa red knot – there does not appear to be suitable habitat within 1.5 miles of the project site. The federally threatened rufa red knot (*Calidris canutus rufa*) is one of the longest-distance migrants in the animal kingdom, flying some 18,000 miles annually between its breeding grounds in the Canadian Arctic to the wintering grounds at the southern-most tip of South America. Primarily occurring along the Atlantic and Gulf coasts, small groups of this shorebird regularly use the interior of the United States such as the Great Lakes during the annual migration. The Great Lakes shorelines provide vital stopover habitat for resting and refueling during their long annual journey.

The largest concentration of rufa red knots is found in May in Delaware Bay, where the birds stop to gorge on the eggs of spawning horseshoe crabs; a spectacle attracting thousands of birdwatchers to the area. In just a few days, the birds nearly double their weight to prepare for the final leg of their long journey to the Arctic. This species may be especially vulnerable to climate change which affects coastal habitats due to rising sea levels.

Management and Conservation: applies to actions that occur along coastal areas during the Red Knot migratory window of MAY 1 - SEPTEMBER 30.

Eastern massasauga rattlesnake (EMR) – **this activity falls outside of Tier 1 and Tier 2 EMR habitat as designated by the US Fish & Wildlife Service**. The federally threatened and state special concern eastern massasauga rattlesnake *(Sistrurus catenatus)* is Michigan's only venomous snake and is found in a variety of wetland habitats including bogs, fens, shrub swamps, wet meadows, marshes, moist grasslands, wet prairies, and floodplain forests. Eastern massasaugas occur throughout the Lower Peninsula but are not found in the Upper Peninsula. Populations in southern Michigan are typically associated with open wetlands, particularly prairie fens, while those in northern Michigan are better known from lowland coniferous forests, such as cedar swamps. These snakes normally overwinter in crayfish or small mammal burrows often close to the groundwater level and emerge in spring as water levels rise. During late spring, these snakes move into adjacent uplands they spend the warmer months foraging in shrubby fields and grasslands in search of mice and voles, their favorite food.

Often described as “shy and sluggish”, these snakes avoid human confrontation and are not prone to strike, preferring to leave the area when they are threatened. However, like any wild animal, they will protect themselves from anything they see as a potential predator. Their short fangs can easily puncture skin and they do possess potent venom. Like many snakes, the first human reaction may be to kill the snake, but it is important to remember that all snakes play vital roles in the ecosystem. Some may eat harmful insects. Others like the massasauga consider rodents a delicacy and help control their population. Snakes are also a part of a larger food web and can provide food to eagles, herons, and several mammals.

Management and Conservation: any sightings of these snakes should be reported to the Michigan Department of Natural Resources, Wildlife Division. If possible, a photo of the live snake is also recommended.

Candidate Species

Monarch Butterfly (*Danaus plexipuss*) on December 15, 2020, the U.S. Fish and Wildlife Service announced that listing the monarch as endangered or threatened under the Endangered Species Act is warranted but precluded by higher priority listing actions. The decision is the result of an extensive status review of the monarch that compiled and assessed the monarch’s current and future status. The monarch is now a candidate under the Endangered Species Act; we will review its status annually until a listing decision is made.

Management and Conservation: neither section 7 of the Endangered Species Act nor the implementing regulations for section 7 contain requirements for federal agencies with respect to candidate species. Habitat loss and fragmentation has occurred throughout the monarch’s range. Pesticide use can destroy the milkweed monarchs need to survive. A changing climate has intensified weather events which may impact monarch populations.

See USFWS’ Section 7 Consultation Technical Assistance for direction. The website offers step-by-step instructions to guide you through the Section 7 consultation process with prepared templates for documenting “no effect.” as well as requesting concurrence on "may affect, but not likely to adversely affect" determinations.

Michael Sanders, Environmental Review Specialist/Zoologist
Michigan Natural Features Inventory
Sander75@msu.edu
Cell: 517-980-5632


Regina
Winnipeg
Lake Superior
North Dakota
Minnesota
Minneapolis
Wisconsin
South Dakota
Lake Huron
Quebec
Ottawa
Montreal
Maine
Toronto
Lake Ontario
Milwaukee
Grand Rapids
Michigan
Buffalo
Rochester
New York
Albany
Boston
Detroit
Chicago
Cleveland
Providence
Iowa
Nebraska
New York
Pennsylvania
Ohio
Pittsburgh
Denver
UNITED STATES
Indianapolis
Columbus
Philadelphia
Kansas City
Indiana
Cincinnati
West Virginia
Washington
Colorado
St Louis
Kansas
Missouri
Louisville
Kentucky
Virginia
Richmond
Norfolk
Esri, HERE, Garmin, NGA, USGS

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

GRETCHEN WHITMER
GOVERNOR

EGLE

LIESL EICHLER CLARK
DIRECTOR

September 26, 2022

City of Detroit
Housing Revitalization Department
2 Woodward Avenue, Suite 908
Detroit, Michigan 48226

Dear City of Detroit:

Subject: Orchard Village Housing Project in Detroit, Michigan

The Michigan Department of Environment, Great Lakes, and Energy (EGLE) has reviewed the federal regulations related to general conformity of projects with state implementation plans (SIP) for air quality. In particular, 40 Code of Federal Regulations (CFR) Section 93.150 et seq, which states that any federally funded project in a nonattainment or maintenance area must conform to the Clean Air Act requirements, including the State's SIP, if they may constitute a significant new source of air pollution.

On August 3, 2018, Wayne County was designated nonattainment for the 2015 ozone standard; and thus, general conformity must be evaluated when completing construction projects of a given size and scope. EGLE is currently working to complete the required SIP submittals for this area; therefore, an alternative evaluation was completed to assess conformity. Specifically, EGLE considered the following information from the United States Environmental Protection Agency's (USEPA) general conformity guidance, which states "historical analysis of similar actions can be used in cases where the proposed projects are similar in size and scope to previous projects."

EGLE has reviewed the Orchard Village Housing Project located in Detroit, Michigan, which is proposed to be completed with federal grant monies, including the development of multi-family housing on parcels of vacant residential land between Santa Clara and Orchard Streets at Burgess in Wayne County, Michigan. The long-term goal of the project is to enhance the quality of life of residents and regional economic development opportunities through the development of affordable housing, the creation of a community center for residents and the surrounding neighborhood, and provision of financial literacy services for those in need. The development will be located on parcels with the following addresses: 21556, 21566, 21604, 21610, 21624, 21636, 21636, and 21652 Orchard Street; and 21525, 21535, 21515 Santa Clara and associated abandoned rights-of-way in Detroit. Construction is expected to begin in May/June 2023 and will last approximately 16 to 18 months.

In reviewing the *"Air Quality and Greenhouse Gas Study: Uptown Orange Apartments in Orange, California,"* dated December 2012, prepared for KTGY Group, Inc. by UltraSystems Environmental, Inc., it was determined that emission levels for the project were below the de minimis levels for general conformity.

The Uptown Orange Apartments project and related parking structure construction was estimated to take 33 months to complete, would encompass an area of 5.57 acres, and included two four-story residential units with a total of 334 apartments, and two parking structures with a total of 494 and 679 parking stalls, respectively.

The size, scope, and duration of the proposed Orchard Village Housing Project construction project is much smaller in scale than the Uptown Orange Apartments project described above and should not exceed the de minimis levels included in the federal general conformity requirements. Therefore, it does not require a detailed conformity analysis.

If you have any further questions regarding this matter, please contact me at 517-648-6314; BukowskiB@Michigan.gov; or EGLE, AQD, P.O. Box 30260, Lansing, Michigan 48909-7760.

Sincerely,

Breanna Bukowski

Breanna Bukowski
Environmental Quality Analyst

cc: Michael Leslie, USEPA Region 5
Cheryl McHallam, CHN Housing Partners
Jenny Hamel, Mannik Smith Group

Orchard & Santa Clara

21624 Orchard Street,
Detroit, MI

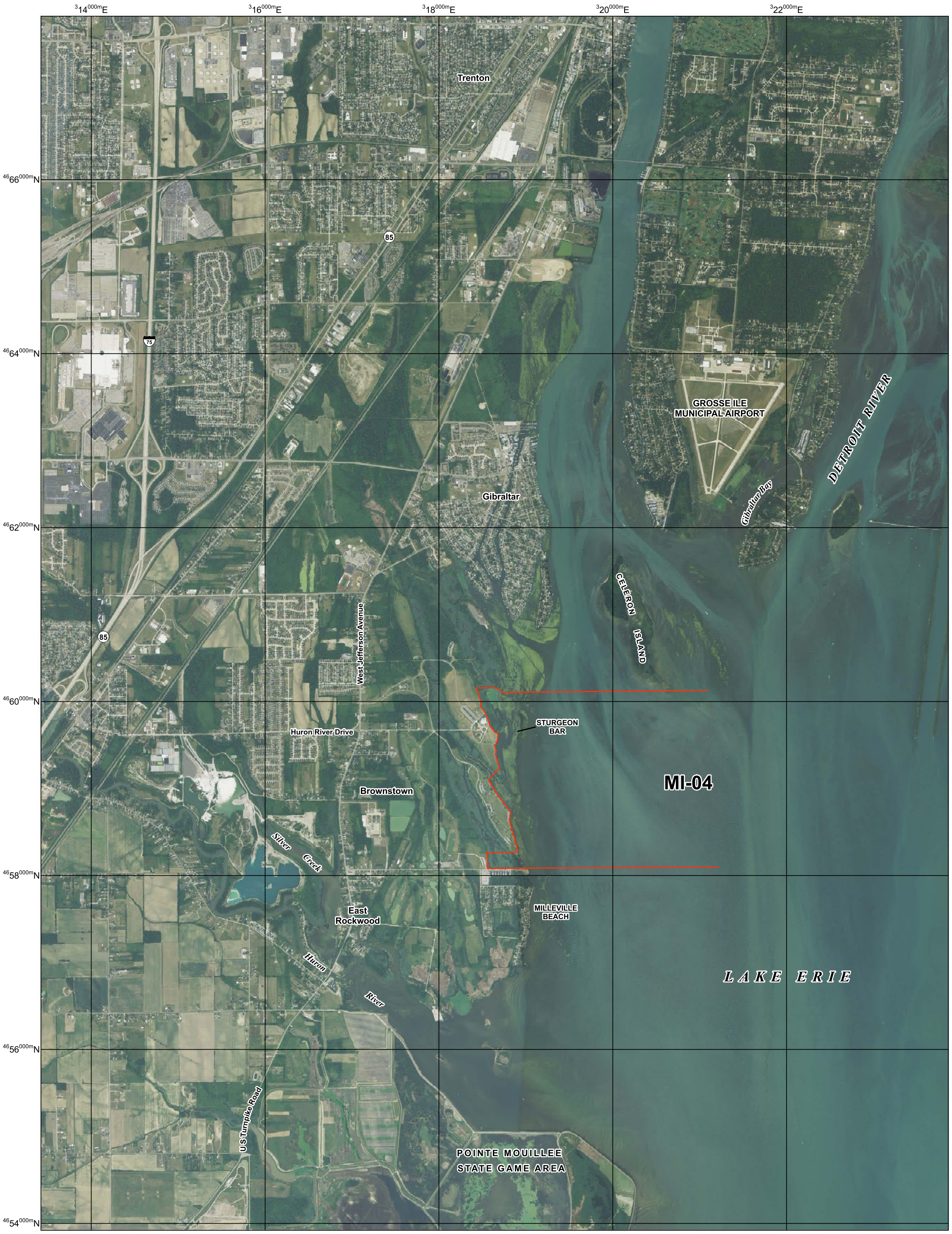
0 37.5 75 150 Feet

N

ASTI Environmental

Created for: CHN Housing Partners
Created by: RMH, February 14, 2022, ASTI Project 12206

Site Features Map



JOHN H. CHAFEE COASTAL BARRIER RESOURCES SYSTEM

Sturgeon Bar Unit MI-04

This map has been produced by the U.S. Fish and Wildlife Service as authorized by Section 4(c) of the Coastal Barrier Resources Act (CBRA) of 1982 (Pub. L. 97-348), as amended by the Coastal Barrier Improvement Act of 1990 (Pub. L. 101-591). The CBRA requires the Secretary of the Interior to review the maps of the Coastal Barrier Resources System (CBRS) at least once every 5 years and make any minor and technical modifications to the boundaries of the CBRS units as are necessary solely to reflect changes that have occurred in the size or location of any CBRS unit as a result of natural forces.

The seaward side of the CBRS unit includes the entire sand-sharing system, including the beach and nearshore area. The sand-sharing system of coastal barriers is normally defined by the 30-ft bathymetric contour. In large coastal embayments and the Great Lakes, the sand-sharing system is defined by the 20-ft bathymetric contour or a line approximately one mile seaward of the shoreline, whichever is nearer the coastal barrier.

For additional information about the CBRA or CBRS, please visit www.fws.gov/cbra.

N

1:24,000

0 0.25 0.5 1 1.5 2 Miles

0 1,000 2,000 4,000 6,000 8,000 Feet

0 0.25 0.5 1 1.5 2 Kilometers

System Unit Boundary

Otherwise Protected Area (OPA) Boundary; OPAs are identified on the map by the letter "P" following the unit number

Approximate State Boundary

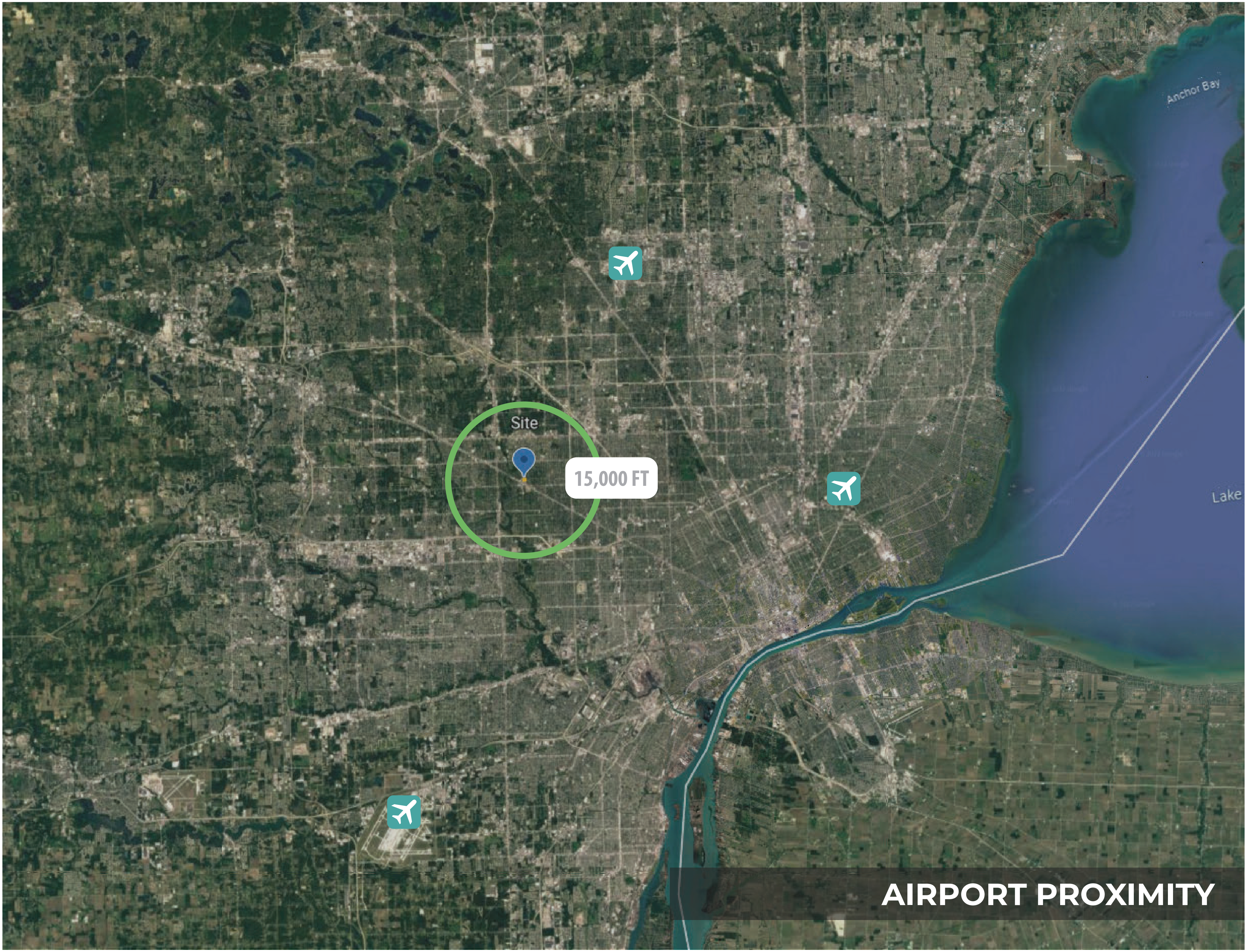
$^{36}54^{000m}$N 2000- meter Universal Transverse Mercator grid values, Zone 17 North

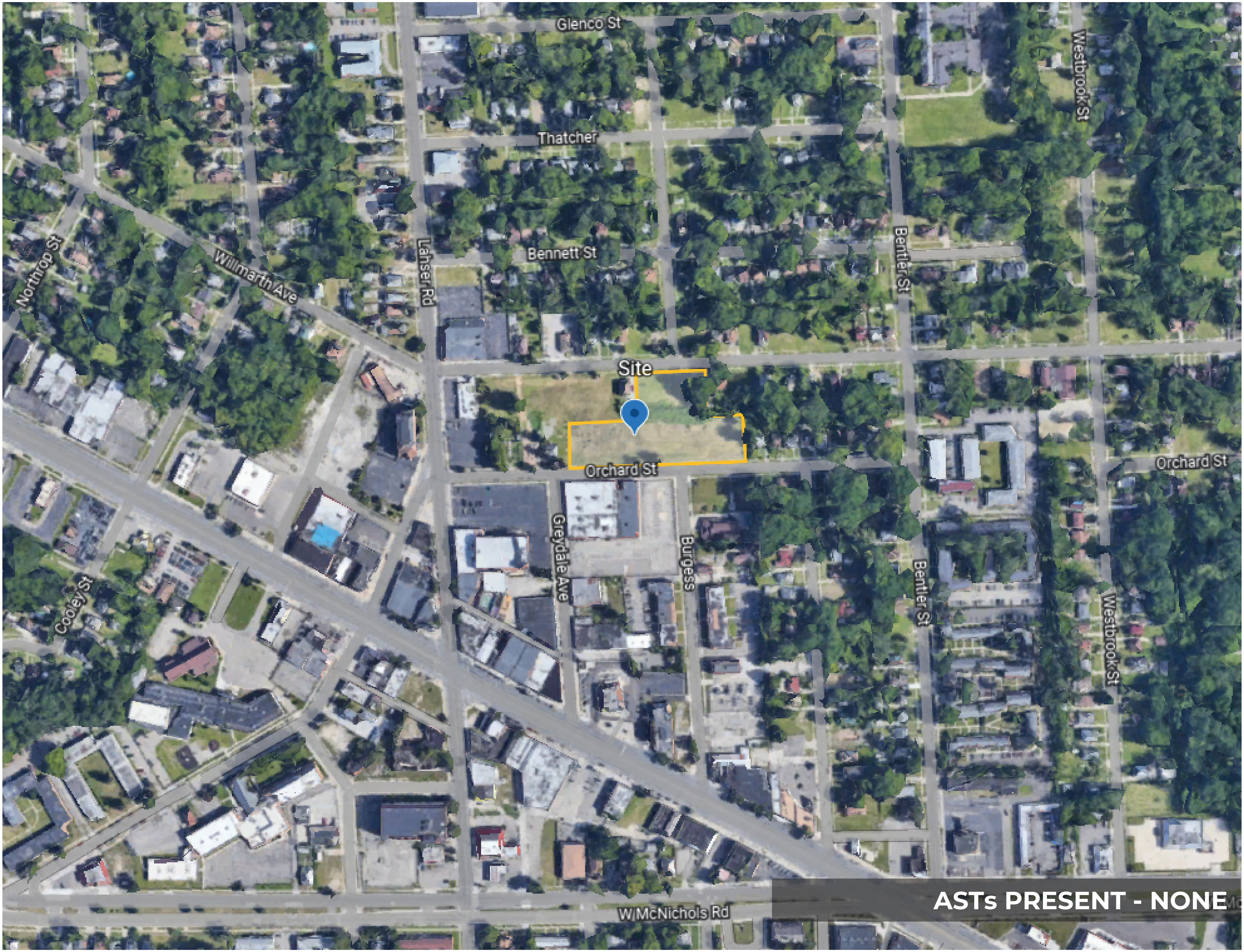
Imagery Date(s): 2012

Imagery Source(s): National Agriculture Imagery Program United States Department of Agriculture

Coordinate System: North American Datum 1983 Universal Transverse Mercator, Zone 17 North

Map 26-003A **January 11, 2016**


Anchor Bay
Site
15,000 FT
Lake
AIRPORT PROXIMITY


Glenco St
Thatcher
Bennett St
Willmarth Ave
Northrop St
Lahser Rd
Bentler St
Westbrook St
Site
Orchard St
Greydale Ave
Burgess
Cooley St
W McNichols Rd
ASTs PRESENT - NONE

Public Services

January 5, 2022

Laura Gray
ASTI Environmental
FOIA@asti-env.com

Re: Freedom of Information Act Request[1] of December 22, 2021 for 21652, 21636, 21624, 21610, 21604, 21566, and 21556 Orchard and 21661, 21653, 21535, and 21525 Santa Clara, Detroit

Dear Ms. Gray:

Wayne County Department of Public Services Environmental Services Division received the following request on December 22, 2021 by email:

> Requests any reports or information pertaining to landfilling activity, spills/releases, 201 sites, aboveground storage tanks, underground storage tanks, soil or water contamination etc.

Your request is denied. After a diligent search for the requested records, we have determined and certify the records do not exist.

If you can provide more specific information, your request will be reviewed to determine whether the desired records exist.

You have the right to do either of the following with regard to the denial of your request:

(1) Submit a written appeal to the County Executive, which specifically states the word "appeal" and states the reason or reasons the denial should be reversed.

OR

(2) Commence an action in the circuit court to compel disclosure. Should you prevail, you will be entitled to have reasonable attorneys' fees, costs and disbursements assessed against the County by the court. If you or the County prevails in part, the court may, in its discretion, award you all or an appropriate portion of reasonable attorneys' fees, costs, and disbursements. If the court determines that the County has been arbitrary and capricious in its denial, you will also be entitled to punitive damages in the amount of $1,000.00.

1 The legally required posting of the "Wayne County Freedom of Information Act Procedures & Guidelines," as well as the "Wayne County Summary of FOIA Procedures & Guidelines," are available for viewing under the "Public Records" section of the County's website at the following web address: http://waynecounty.com/county/foia.htm

If you have any questions please do not hesitate to contact me at (734) 326-3936.

Sincerely,

Patrick C. Cullen, FOIA Officer
Department of Public Services
Environmental Services Division

Denial approved:

Patricia Moore, w/consent, DL

Patricia Moore
Office of Corporation Counsel
Date: January 5, 2022

cc: Candice Smith-Parker

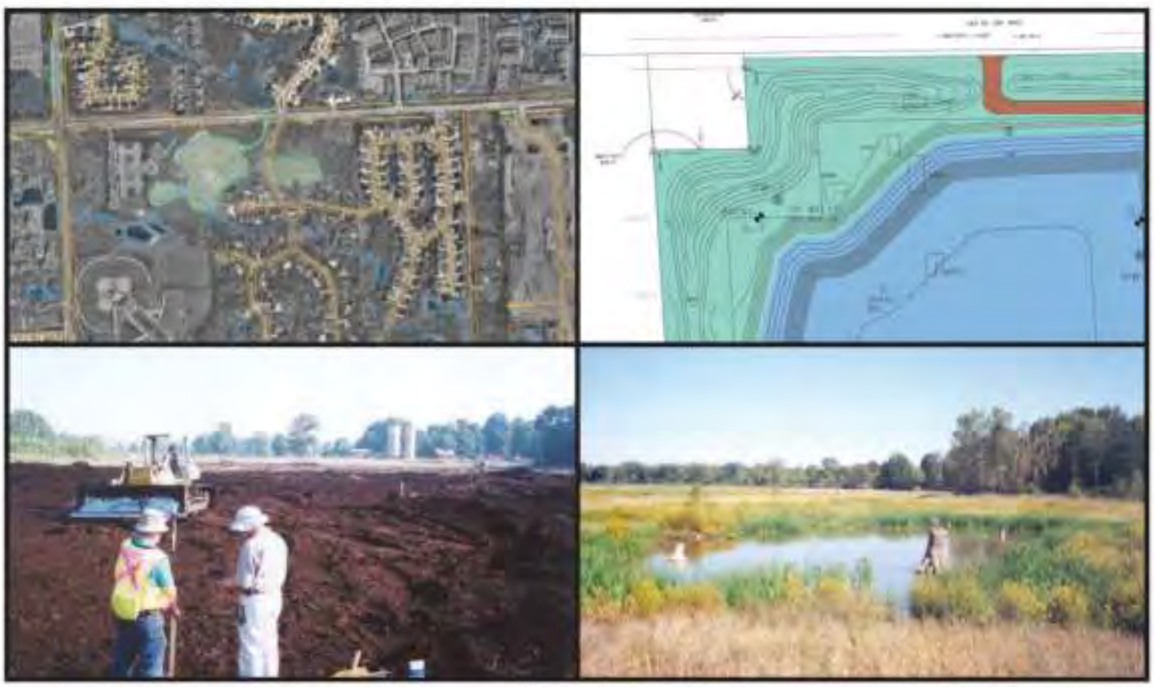
21-567

Noise Assessment
Orchard and Santa Clara
Multiple Sites in the Old Redford Neighborhood
Detroit, Michigan

CHN Housing Partners

January 18, 2021

ASTI ENVIRONMENTAL



Noise Assessment
Orchard and Santa Clara
Detroit, Michigan

January 18, 2022

Report Prepared For:

CHN Housing Partners
2999 Payne Avenue, Suite 134
Cleveland, Ohio 44114

Report Prepared By:

ASTI Environmental
10448 Citation Drive, Suite 100
Brighton, Michigan 48116
800-395-ASTI

ASTI Project No. 12206

Report Prepared by:

Christopher Yelonek
Associate I / Architectural Historian

Report Reviewed by:

Pamela Chapman, PE, EP
Phase I Group Leader

TABLE OF CONTENTS

1.0 INTRODUCTION

CHN Housing Partners proposes the development of eleven vacant lots utilizing funding provided from the Michigan State Housing Development Authority of Orchard and Santa Clara, Multiple Sites: 21652, 21636, 21624, 21610, 21604, and 21566 Orchard Street and 21535, and 21525 Santa Clara, Detroit, Michigan, referred to herein as “Subject Property”.

This assessment was conducted to provide the noise level and associated noise category at each designated Noise Assessment Location (NAL) at the Subject Property. This assessment does not include an evaluation of noise attenuation but general guidance is provided at the end of this assessment.

This evaluation was conducted per guidelines set forth in 24 CFR 51B. This noise analysis evaluates the Subject Property’s exposure to three major sources of noise: aircraft, roadways, and railways. If identified, additional non-transportation noise sources such as loud impulse sounds from nearby industry are also evaluated.

The following three sources of transportation noise and their applicable search distances are outlined below when evaluating noise at a site.

1. Aircraft - All military and FAA-regulated civil airfields within 15 miles of the Subject Property.
2. Roadways - Major roadways and limited access highways/freeways within 1,000 feet of the Subject Property utilizing a 10-year projection. Roadways considered are generally based on number of lanes, speed limit, presence of stop signs or lights, overall traffic counts, and/or number of medium or heavy trucks.
3. Railroad - All active railroads within 3,000 feet of the Subject Property.

The noise level calculated at a NAL is known as the day-night average sound level or DNL. A calculated DNL can fall within three categories as follow.

1. Acceptable - DNL not exceeding 65 decibels (dB)
2. Normally Unacceptable - DNL above the 65 dB threshold but not exceeding 75 dB
3. Unacceptable - DNL above 75 dB

One NAL (NAL #1) was selected on the Subject Property for this analysis based on proximity to noise sources. A map with the Subject Property boundaries and NAL location is included as Attachment A.

The following is a summary of the applicable noise sources identified at the NAL.

NAL #1

Noise Source with Applicable Distance	Name	Distance to NAL
Airport(s)	Coleman A. Young International Airport	12.27 Miles
	Detroit Metropolitan Wayne County Airport	13.65 Miles
Busy Road(s)	Grand River Avenue	817 Feet
	Lahser Road	418 Feet
	Redford Street	481 Feet
	Bentler Street	892 Feet
Railroad(s)	None	NA
Non-Transportation	None	NA

2.0 EVALUATION OF NOISE SOURCES

2.1 Airports

Coleman A. Young International Airport is approximately 12.27 miles distant. Based on the Noise Contour Map for the airport, (Attachment B), the site is not within a distance of concern.

Detroit Metropolitan Wayne County Airport is approximately 13.65 miles distant. Based on the Noise Contour Map for the airport, (Attachment B), the site is not within a distance of concern.

2.2 Busy Roadways

The major roadways are:

- Grand River Avenue
- Lahser Road
- Bentler Street
- Redford Street

Grand River Avenue is a 6-lane road with a center median/turn lane. The speed limit is 35 mph near the Subject Property. The roadway is an approximate effective distance of 817 feet from the southwestern corner of the proposed southwest building (NAL #1).

Lahser Road is a 2-lane road. The speed limit is 30 mph near the Subject Property. The roadway is an approximate effective distance of 418 feet from the southwestern corner of the proposed southwest building (NAL #1).

Redford Street is a 2-lane road. The speed limit is 25 mph near the Subject Property. The roadway is an approximate effective distance of 481 feet from the southwestern corner of the proposed southwest building (NAL #1).

Bentler Street is a 2-lane road. The speed limit is 25 mph near the Subject Property. The roadway is an approximate effective distance of 892 feet from the southwestern corner of the proposed southwest building (NAL #1).

Traffic counts were obtained through MDOT. Projections were done through 2032. After review of the traffic count information of each street, a growth rate of 1% per year compounded was judged appropriate as traffic levels are expected to remain relatively stable or increase slightly. Traffic projections are included in Attachment C.

2.3 Railroads

Not applicable.

2.4 Non-Transportation Sources

Not applicable.

3.0 CALCULATIONS

A Noise DNL calculator worksheet for NAL 1 is provided in Attachment D.

Using the HUD DNL calculator, the noise level at NAL #1, as predicted in 2032, is calculated to be 59 dB and within the Acceptable range.

4.0 CONCLUSIONS

The following is a summary of the findings of this assessment.

NAL #	Combined Source DNL (dB)	Category
1	59	Acceptable

5.0 REFERENCES

- 24 CFR Part 51 Subpart B
- The Noise Guidebook, U.S. Department of Housing and Urban Development,
- U.S. DOT
- https://mdot.ms2soft.com/
- https://fragis.fra.dot.gov/GISFRASafety/
- https://safetydata.fra.dot.gov/OfficeofSafety/PublicSite/Crossing/Crossing.aspx
- https://www.hudexchange.info/programs/environmental-review/dnl-calculator/

HUD ATTENUATION GUIDANCE

https://www.hudexchange.info/programs/environmental-review/noise-abatement-and-control/

All sites whose environmental or community noise exposure exceeds the day night average sound level (DNL) of 65 decibels (dB) are considered noise-impacted areas. For new construction that is proposed in high noise areas, grantees shall incorporate noise attenuation features to the extent required by HUD environmental criteria and standards contained in Subpart B (Noise Abatement and Control) of 24 CFR Part 51. The interior standard is 45 dB.

The "Normally Unacceptable" noise zone includes community noise levels from above 65 dB to 75 dB. Approvals in this noise zone require a minimum of 5 dB additional sound attenuation for buildings having noise-sensitive uses if the day-night average sound level is greater than 65 dB but does not exceed 70 dB, or a minimum of 10 dB of additional sound attenuation if the day-night average sound level is greater than 70 dB but does not exceed 75 dB.

Locations with day-night average noise levels above 75 dB have “Unacceptable” noise exposure. For new construction, noise attenuation measures in these locations require the approval of the Assistant Secretary for Community Planning and Development (for projects reviewed under Part 50) or the Responsible Entity’s Certifying Officer (for projects reviewed under Part 58). The acceptance of such locations normally requires an environmental impact statement.

The environmental review record should contain **one** of the following:

- Documentation the proposed action is not within 1000 feet of a major roadway, 3,000 feet of a railroad, or 15 miles of a military or FAA-regulated civil airfield.
- If within those distances, documentation showing the noise level is *Acceptable* (at or below 65 DNL).
- If within those distances, documentation showing that there’s an effective noise barrier (i.e., that provides sufficient protection).

- Documentation showing the noise generated by the noise source(s) is *Normally Unacceptable (66 – 75 DNL)* and identifying noise attenuation requirements that will bring the interior noise level to 45 DNL and/or exterior noise level to 65 DNL.

ATTACHMENT A

NAL Location Map

Orchard & Santa Clara

21624 Orchard Street,
Detroit, MI

0 37.5 75 150 Feet

N

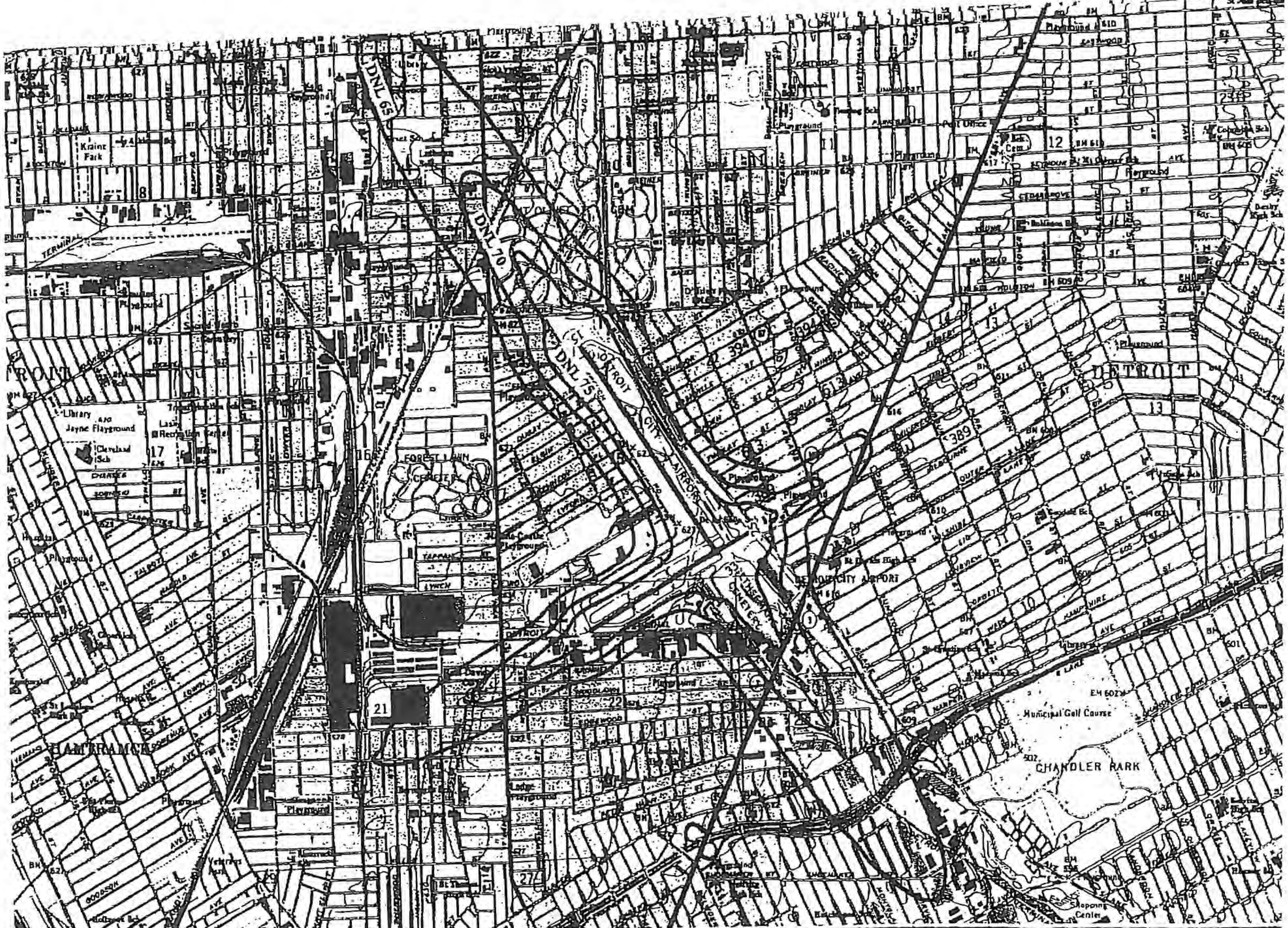
ASTI Environmental

Created for: CHN Housing Partners
Created by: RMH, January 5, 2022, ASTI Project 12206

Site Features Map

ATTACHMENT B

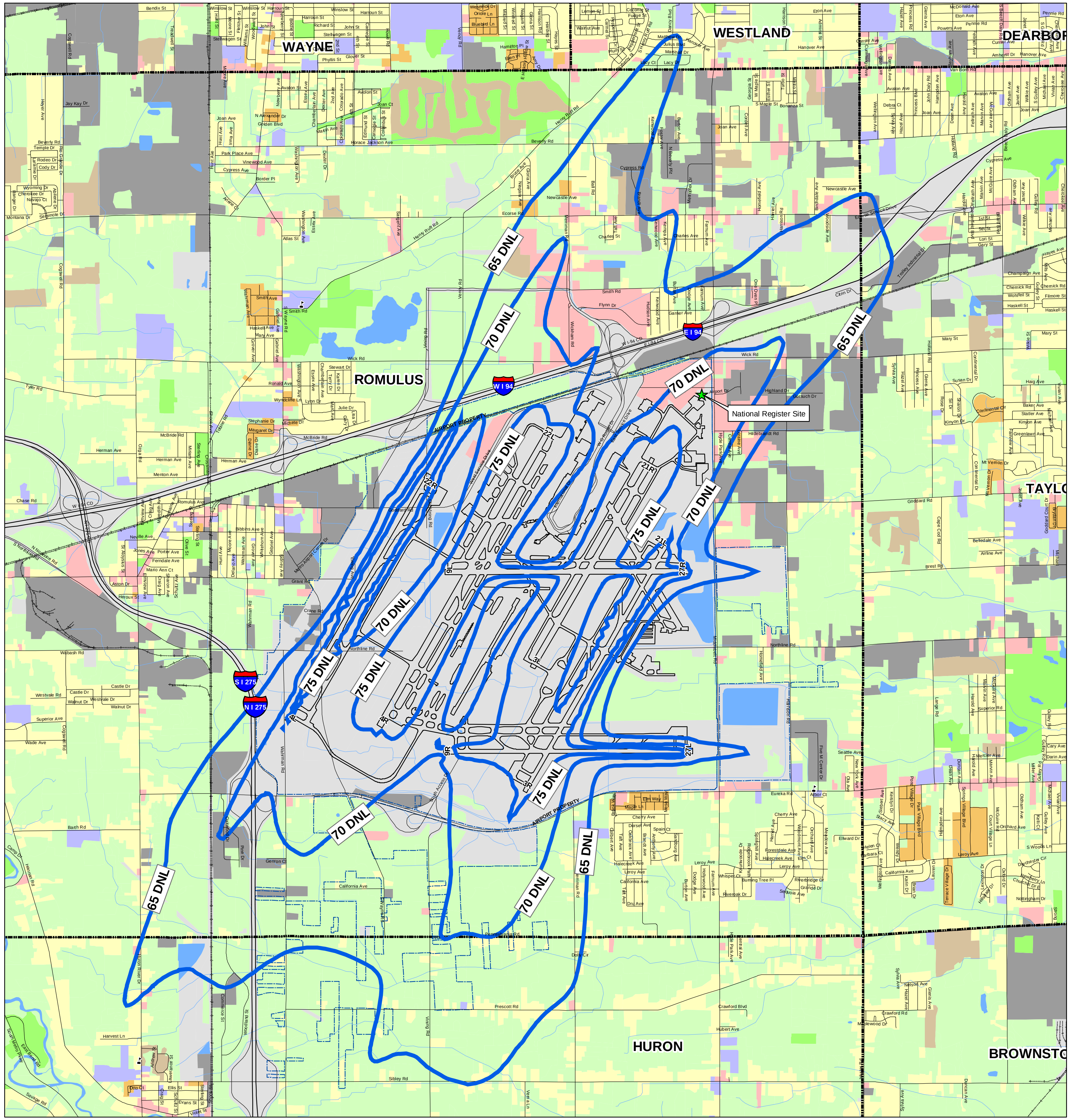
Airport Noise Contour Maps



ITY OF DETROIT
RPORT DEPARTMENT

1996 BAS E
NOISE EXPOSUR ONTOURS

Figure D25 **Existing (2004) Noise Exposure Map**



Land Use Legend

- Single-family residential
- Residential areas with 25% or more vacant land
- Multiple-family residential
- Commercial and office
- Industrial
- Institutional
- Transportation, communication, and utility
- Under development
- Cultural, outdoor recreation, and cemetery
- Woodland and wetland
- Active agriculture
- Extractive and barren
- Grassland, and shrub
- Vacant nonresidential
- Water
- City Limits Boundary
- Schools

	Existing (2004)	
65-70 DNL	Population	Housing
Huron Township	160	60
Romulus	1,060	490
Taylor	10	10
Westland	110	50
Subtotal	1,340	610
70-75 DNL		
Romulus	40	20
Subtotal	40	20
65 DNL & Greater		
Huron Township	160	60
Romulus	1,100	510
Taylor	10	10
Westland	110	50
Subtotal	1,380	630
60 DNL & Greater*		
Dearborn Heights	1,100	360
Huron Twp.	2,460	920
Inkster	4,420	1,870
Romulus	4,340	1,810
Sumpter Twp.	40	10
Taylor	3,860	1,500
Westland	2,970	1,250
Total	19,190	7,720

Source: 2000 US Census   Numbers rounded to the nearest 10 – for digits less than 5, rounded to 10.
Note: no residential uses are located in the 75 DNL and greater contours.
* includes the 65 DNL & Greater

The 65 DNL contour contains approximately 9,475 acres, 750 residential structures and 1,400 people.

The 70 DNL contour contains approximately 4,505 acres, 30 residential structures and 40 people.

The 75 DNL contour contains approximately 1,580 acres, no residential structures and no people.

Planning jurisdictions are shown on the map.

Noise measurement sites and flight tracks are depicted on the Noise Measurement Sites and Flight Tracks Maps.

Residential land use, as defined by FAR Part 150, is an incompatible use without proper sound attenuation within the 65 DNL or greater contour.

The Noise Exposure Maps and accompanying documentation for the Noise Exposure Map for Detroit Metropolitan Wayne County Airport, submitted in accordance with FAR Part 150 with the best available information, are hereby certified as true and complete to the best of my knowledge and belief.

In addition, it is hereby certified that the public was afforded the opportunity to review and comment on the document and its contents.

Signed ______ Date 3-6-06

Based on 522,641 operations.

0 1,000 2,000 4,000 Feet

N

March 1, 2006

DETROIT METROPOLITAN WAYNE COUNTY AIRPORT

Source: Michigan Department of Natural Resources, SEMCOG

ATTACHMENT C

AADT Information

Auto and Heavy Truck 10-year ADT Projections

Grand River Avenue

	Cars	% Change	Trucks	% Change
2016	22590		427	
2017	20587	-8.9	405	-5.2
2018	20572	-0.1	420	3.7
2019	19272	-6.3	381	-9.3
2020	15405	-20.1	298	-21.8
	Avg % change:	-8.8	Avg % change:	-8.13
	Avg % change (Last 5-yr Trend):	-20.1	Avg % change (Last 5-yr Trend):	-21.78
	% Change/Year Assumption	1	**%/Year Change Assumption**	1

2032 Projections

	Cars	Trucks
2020	15405	298
2021	15559	301
2022	15715	304
2023	15872	307
2024	16031	310
2025	16191	313
2026	16353	316
2027	16516	319
2028	16681	323
2029	16848	326
2030	17017	329
2031	17187	332
2032	17359	336

Predicted 2032 Auto ADT	Predicted 2032 Truck ADT
17359	336

Auto and Heavy Truck 10-year ADT Projections

Lahser Road

	Cars	% Change	Trucks	% Change
2017	7693		239	
2018	7717	0.3	215	-10.0
2019	7584	-1.7	308	43.3
2020	6415	-15.4	325	5.5
	Avg % change:	-5.6	Avg % change:	12.91
	Avg % change (Last 5-yr Trend):	-5.6	Avg % change (Last 5-yr Trend):	282.67
	% Change/Year Assumption	1	**%/Year Change Assumption**	1

2032 Projections

	Cars	Trucks
2020	6415	325
2021	6479	328
2022	6544	332
2023	6609	335
2024	6675	338
2025	6742	342
2026	6810	345
2027	6878	348
2028	6947	352
2029	7016	355
2030	7086	359
2031	7157	363
2032	7229	366

Predicted 2032 Auto ADT	Predicted 2032 Truck ADT
7229	366

Auto and Heavy Truck 10-year ADT Projections

Redford Street

	Cars	% Change	Trucks	% Change
2016	1452		0	
2017	927	-36.2	46	
2018	947	2.2	26	-43.5
2019	929	-1.9	39	50.0
2020	768	-17.3	59	51.3
	Avg % change:	-13.3	Avg % change:	19.27
	Avg % change (Last 5-yr Trend):	-17.3	Avg % change (Last 5-yr Trend):	51.28
	% Change/Year Assumption	1	**%/Year Change Assumption**	1

2032 Projections

	Cars	Trucks
2020	768	59
2021	776	60
2022	783	60
2023	791	61
2024	799	61
2025	807	62
2026	815	63
2027	823	63
2028	832	64
2029	840	65
2030	848	65
2031	857	66
2032	865	66

Predicted 2032 Auto ADT	Predicted 2032 Truck ADT
865	66

Auto and Heavy Truck 10-year ADT Projections

Bentler Street

	Cars	% Change	Trucks	% Change
2016	1659		0	
2017	1970	18.7	79	
2018	1996	1.3	53	-32.9
2019	1958	-1.9	81	52.8
2020	1620	-17.3	121	49.4
	Avg % change:	0.2	Avg % change:	23.10
	Avg % change (Last 5-yr Trend):	-17.3	Avg % change (Last 5-yr Trend):	49.38
	% Change/Year Assumption	1	**%/Year Change Assumption**	1

2032 Projections

	Cars	Trucks
2020	1620	121
2021	1636	122
2022	1653	122
2023	1669	123
2024	1686	125
2025	1703	126
2026	1720	127
2027	1737	128
2028	1754	130
2029	1772	131
2030	1789	132
2031	1807	134
2032	1825	135

Predicted 2032 Auto ADT	Predicted 2032 Truck ADT
1825	135

ATTACHMENT D

Day-Night Level Electronic Assessments

Home (/) > **Programs (/programs/)** > **Environmental Review (/programs/environmental-review/)** > DNL Calculator

DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the **Day/Night Noise Level Calculator Electronic Assessment Tool Overview (/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/)**.

Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	12206
Record Date	12/22/2021
User's Name	ASTI Environmental NAL 1

Road # 1 Name:	**Grand River Avenue**

Road #1

Vehicle Type	Cars ☑	Medium Trucks ☐	Heavy Trucks ☑
Effective Distance	817		817
Distance to Stop Sign			
Average Speed	35		35
Average Daily Trips (ADT)	17359		336
Night Fraction of ADT	15		15
Road Gradient (%)			2
Vehicle DNL	48	0	51
Calculate Road #1 DNL	53	Reset	

Road # 2 Name: **Lahser Road**

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☐	Heavy Trucks ☑
Effective Distance	418		418
Distance to Stop Sign			
Average Speed	30		30
Average Daily Trips (ADT)	7229		366
Night Fraction of ADT	15		15
Road Gradient (%)			2
Vehicle DNL	47	0	56
Calculate Road #2 DNL	57	Reset	

Road # 3 Name:	**Redford Street**

Road #3

Vehicle Type	**Cars** ☑	**Medium Trucks** ☐	**Heavy Trucks** ☑
Effective Distance	481		481
Distance to Stop Sign	461		461
Average Speed	25		25
Average Daily Trips (ADT)	865		66
Night Fraction of ADT	15		15
Road Gradient (%)			2
Vehicle DNL	34	0	50
Calculate Road #3 DNL	50	Reset	

Road # 4 Name:	**Bentler Street**

Road #4

Vehicle Type	**Cars** ☑	**Medium Trucks** ☐	**Heavy Trucks** ☑
Effective Distance	892		892
Distance to Stop Sign			
Average Speed	25		25
Average Daily Trips (ADT)	1825		135
Night Fraction of ADT	15		15

Road Gradient (%)			2
Vehicle DNL	35	0	47
Calculate Road #4 DNL	47	Reset	

Add Road Source Add Rail Source

Airport Noise Level	
Loud Impulse Sounds?	◯Yes ◉No

Combined DNL for all Road and Rail sources	**59**
Combined DNL including Airport	**N/A**
Site DNL with Loud Impulse Sound	

Calculate Reset

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location

- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

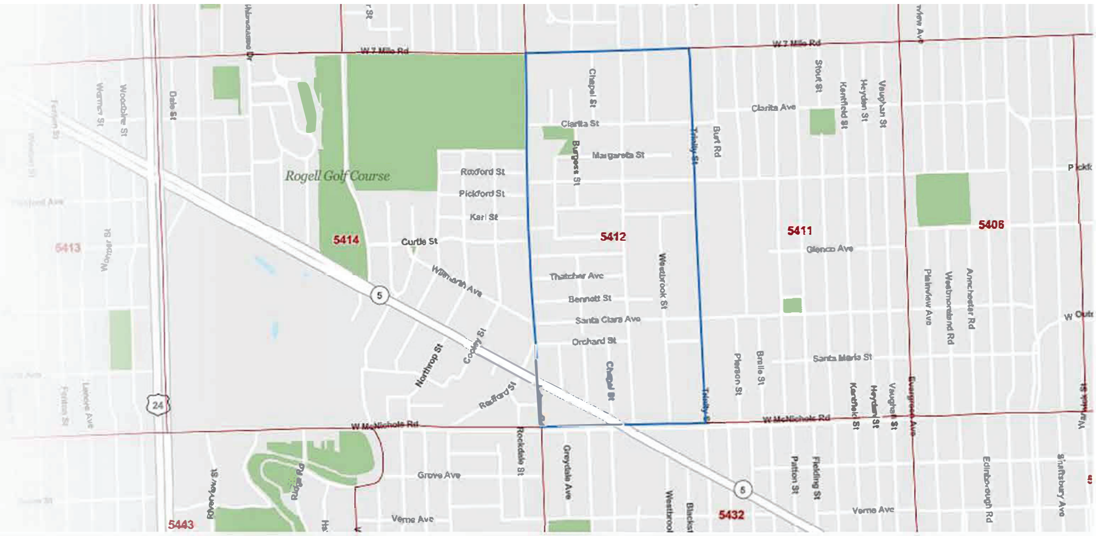
Day/Night Noise Level Assessment Tool User Guide (/resource/3822/day-night-noise-level-assessment-tool-user-guide/)

Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

Tract

Census Tract 5412, Wayne County, Michigan

Census Tract 5412, Wayne County, Michigan is a Tract located in Wayne County, Michigan.



// United States / Wayne County, Michigan / Census Tract 5412, Wayne County, Michigan

Display Sources

Populations and People
Total Population
2,046
P1 | 2020 Decennial Census

Income and Poverty
Median Household Income
$25,771
S1901 | 2020 American Community Survey 5-Year Estimates

Education
Bachelor's Degree or Higher
12.2%
S1501 | 2020 American Community Survey 5-Year Estimates

Employment
Employment Rate
41.1%
DP03 | 2020 American Community Survey 5-Year Estimates

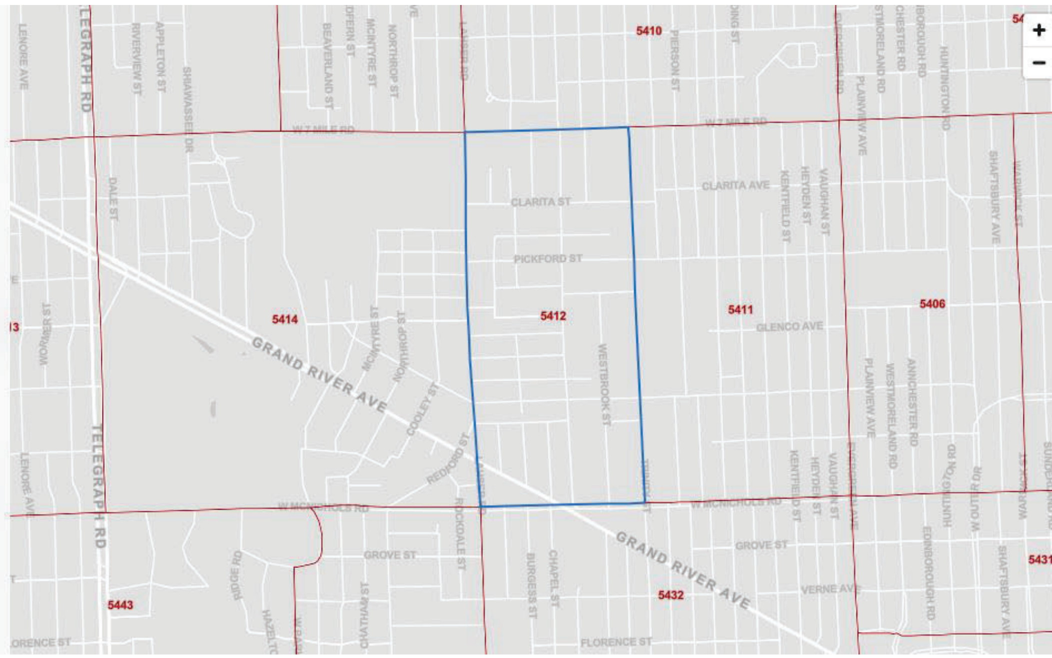
Housing
Total Housing Units
1,124
H1 | 2020 Decennial Census

Health
Without Health Care Coverage
12.6%
S2701 | 2020 American Community Survey 5-Year Estimates

Families and Living Arrangements
Total Households
959
DP02 | 2020 American Community Survey 5-Year Estimates

Race and Ethnicity
Hispanic or Latino (of any race)
38
P2 | 2020 Decennial Census

Income and Poverty



Income and Earnings

$25,771 +/- $5,746
Median Household Income in Census Tract 5412, Wayne County, Michigan

$49,359 +/- $485
Median Household Income in Wayne County, Michigan

S1901 | *2020 American Community Survey 5-Year Estimates*

Poverty

33.3% +/- 11.0%
Poverty, All people in Census Tract 5412, Wayne County, Michigan

21.3% +/- 0.4%
Poverty, All people in Wayne County, Michigan

S1701 | *2020 American Community Survey 5-Year Estimates*

RACE

United States Census Bureau

Note: This is a modified view of the original table produced by the U.S. Census Bureau. This download or printed version may have missing information from the original table.

Label	Census Tract 5412, Wayne County, Michigan
Total:	2,046
Population of one race:	1,980
White alone	110
Black or African American alone	1,844
American Indian and Alaska Native alone	7
Asian alone	5
Native Hawaiian and Other Pacific Islander alone	0
Some Other Race alone	14
Population of two or more races:	66

Table Notes

COMMUTING CHARACTERISTICS BY SEX

Note: This is a modified view of the original table produced by the U.S. Census Bureau. This download or printed version may have missing information from the original table.

	Census Tract 5412, Wayne County, Michigan		
	Total		Male
Label	Estimate	Margin of Error	Estimate
Workers 16 years and over	697	±184	308
MEANS OF TRANSPORTATION TO WORK			
Car, truck, or van	80.9%	±9.6	65.6%
Public transportation (excluding taxicab)	9.0%	±6.2	19.8%
Walked	1.6%	±2.4	3.6%
Bicycle	0.0%	±3.9	0.0%
Taxicab, motorcycle, or other means	4.6%	±5.0	2.3%
Worked from home	3.9%	±5.7	8.8%
PLACE OF WORK			
Workers 16 years and over who did not work from home	670	±188	281
VEHICLES AVAILABLE			
PERCENT ALLOCATED			

Table Notes

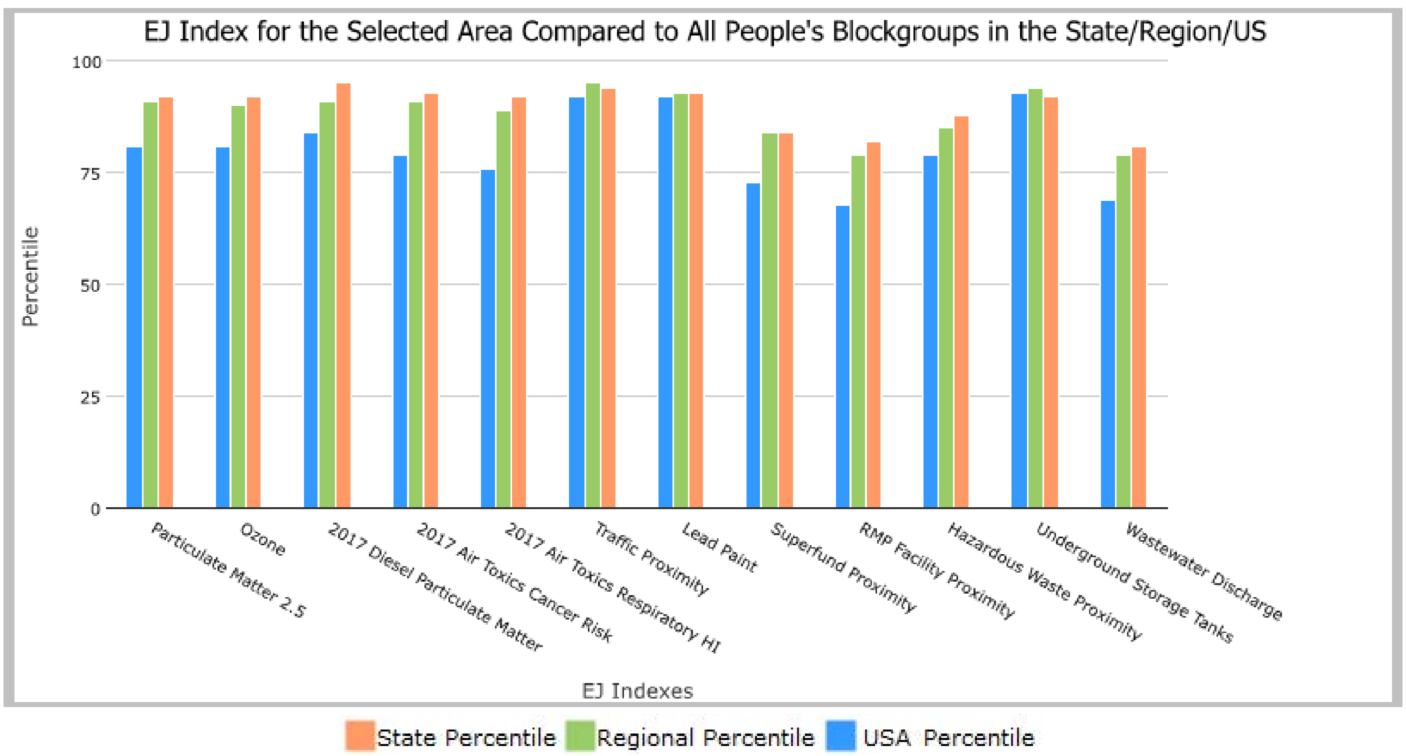
EJScreen Report (Version 2.0)

1 mile Ring Centered at 42.418319,-83.255454, MICHIGAN, EPA Region 5

Approximate Population: 13,482

Input Area (sq. miles): 3.14

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
Environmental Justice Indexes			
EJ Index for Particulate Matter 2.5	92	91	81
EJ Index for Ozone	92	90	81
EJ Index for 2017 Diesel Particulate Matter*	95	91	84
EJ Index for 2017 Air Toxics Cancer Risk*	93	91	79
EJ Index for 2017 Air Toxics Respiratory HI*	92	89	76
EJ Index for Traffic Proximity	94	95	92
EJ Index for Lead Paint	93	93	92
EJ Index for Superfund Proximity	84	84	73
EJ Index for RMP Facility Proximity	82	79	68
EJ Index for Hazardous Waste Proximity	88	85	79
EJ Index for Underground Storage Tanks	92	94	93
EJ Index for Wastewater Discharge	81	79	69



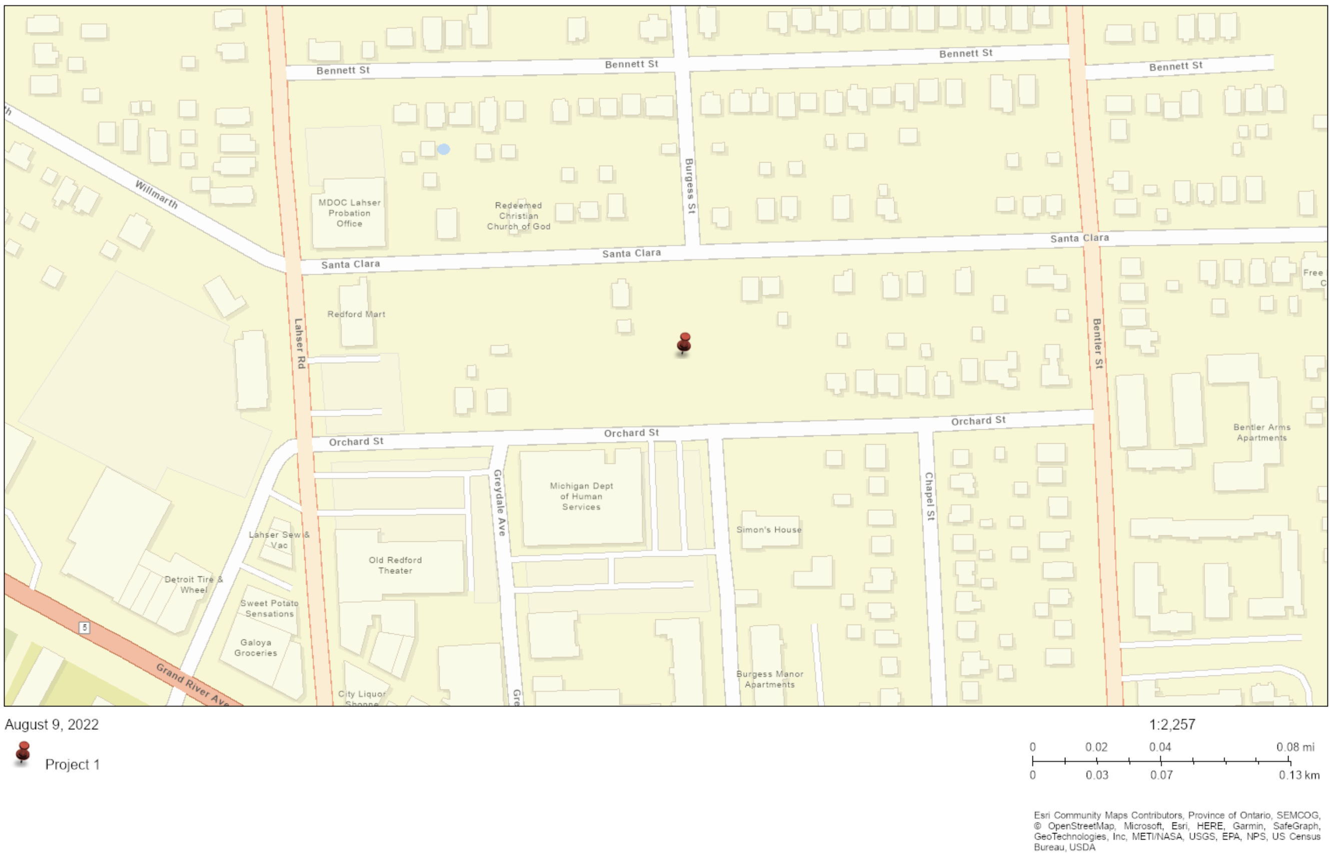
This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

EJScreen Report (Version 2.0)

1 mile Ring Centered at 42.418319,-83.255454, MICHIGAN, EPA Region 5

Approximate Population: 13,482

Input Area (sq. miles): 3.14



Sites reporting to EPA	
Superfund NPL	0
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	0

EJScreen Report (Version 2.0)

1 mile Ring Centered at 42.418319,-83.255454, MICHIGAN, EPA Region 5

Approximate Population: 13,482

Input Area (sq. miles): 3.14

Selected Variables	Value	State Avg.	%ile in State	EPA Region Avg.	%ile in EPA Region	USA Avg.	%ile in USA
Pollution and Sources							
Particulate Matter 2.5 (μg/m^3)	9.95	8.75	90	8.96	82	8.74	83
Ozone (ppb)	45.2	43.8	82	43.5	74	42.6	77
2017 Diesel Particulate Matter* (μg/m^3)	0.418	0.209	97	0.279	80-90th	0.295	80-90th
2017 Air Toxics Cancer Risk* (lifetime risk per million)	30	23	99	24	95-100th	29	80-90th
2017 Air Toxics Respiratory HI*	0.3	0.25	99	0.3	70-80th	0.36	<50th
Traffic Proximity (daily traffic count/distance to road)	1600	830	85	610	91	710	89
Lead Paint (% Pre-1960 Housing)	0.77	0.37	85	0.37	87	0.28	92
Superfund Proximity (site count/km distance)	0.035	0.15	15	0.13	27	0.13	31
RMP Facility Proximity (facility count/km distance)	0.13	0.53	33	0.83	19	0.75	23
Hazardous Waste Proximity (facility count/km distance)	1.1	1.1	64	1.8	55	2.2	59
Underground Storage Tanks (count/km^2)	12	7.3	78	4.8	88	3.9	91
Wastewater Discharge (toxicity-weighted concentration/m distance)	3.2E-05	0.41	24	9	22	12	24
Socioeconomic Indicators							
Demographic Index	77%	28%	95	28%	96	36%	94
People of Color	95%	25%	95	26%	96	40%	92
Low Income	60%	32%	88	29%	90	31%	89
Unemployment Rate	23%	6%	97	5%	97	5%	98
Linguistically Isolated	1%	2%	68	2%	62	5%	47
Less Than High School Education	18%	9%	87	10%	85	12%	76
Under Age 5	7%	6%	70	6%	67	6%	65
Over Age 64	13%	17%	36	16%	41	16%	45

*Diesel particular matter, air toxics cancer risk, and air toxics respiratory hazard index are from the EPA's 2017 Air Toxics Data Update, which is the Agency's ongoing, comprehensive evaluation of air toxics in the United States. This effort aims to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that the air toxics data presented here provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. Cancer risks and hazard indices from the Air Toxics Data Update are reported to one significant figure and any additional significant figures here are due to rounding. More information on the Air Toxics Data Update can be found at: https://www.epa.gov/haps/air-toxics-data-update.

For additional information, see: www.epa.gov/environmentaljustice