Detroit, MI NATTS Network Assessment Review

- Established 2003: Carbonyls, PM_{10} Metals, and VOCs
  - Chromium VI added in 2005; ended in in 2013
  - PAHs added in 2008
  - Ethylene oxide added in 2020
- For the NATTS Network Assessment (2003-2022):
  - 16 of 17 Method Quality Objective (MQO) Core HAPs were included in the national trends
    - Trichloroethylene: Completeness less than 75% for 2022
  - 319 of 328 pollutant datasets were suitable for trends analysis
  - Annual Average and 3-Year Rolling Average Concentrations were decreasing for acetaldehyde, arsenic (PM_{10}), benzene, beryllium (PM_{10}), 1,3-butadiene, cadmium (PM_{10}), lead (PM_{10}), manganese (PM_{10}), naphthalene, nickel (PM_{10}), and tetrachloroethylene.
  - 100% Reporting of Datasets
- Method Quality Objectives (MQO): 2003-2022
  - Completeness: Met 85% completeness in 315 of 328 pollutant datasets
  - Method Detection Limits: Met MDL Target Ratio of 1.00 in 319 of 330 pollutant datasets
  - Bias: Met ±25% for 265 of 278 pollutant datasets
  - Overall Method Precision: Met ≤15% CV for 163 of 281 pollutant datasets
  - Analytical Method Precision: Met ≤15% CV for 163 of 238 pollutant datasets
- Analytical Laboratories for 2022

VOC	Carbonyl	PM_{10} Metals	PAHs
ERG	ERG	MIDEQ	ERG

- Equipment Year Deployed

Equipment Type	VOC	Carbonyl	PM_{10} Metals	PAHs
Sampler	2015	2007	2014	2006
Analytical	2019	2018	2015	2021
Preconcentrator	2019	NA	NA	NA
Standards Preparation	1985	NA	NA	NA
Canister Cleaning	2010	NA	NA	NA
Extraction	NA	NA	2002	2019

National Summary: NATTS data were collected at 27 locations across the United States, with sites beginning in 2003 or later (Figure 1) for 20 core HAPs. Over 670,000 concentrations (primary, secondary, and replicate) were generated and analyzed for this assessment. Pollutant datasets were scored to assess whether they were suitable for trends analysis. Each pollutant dataset was evaluated against four MQOs: Completeness; Sensitivity; Bias; and Precision. Datasets that were suitable (A- or B-rated) for six consecutive years were used for national trends analysis (Table 1).

National trends were determined by comparing the most recent 3-year blocked averages (e.g., 2017-2019 vs. 2020-2022) to determine if the NATTS Trends DQO was being met:

To be able to detect a 15 percent difference (trend) between the annual mean concentrations of successive 3-year periods within acceptable levels of decision error.

Of the 20 core HAPs. 17 were assessed for the NATTS Trends DQO. Due to sampling and analytical issues, acrolein and ethylene were not considered for trends analysis (Table 2). Additionally, hexavalent chromium was discontinued as a required pollutant . The assessment showed that across the network, 11 of those 17 pollutants were decreasing between the 3-year blocks, while four of those pollutants were increasing between the 3-year blocks. Two pollutants did not exhibit a noticeable trend.

Figure 1. NATTS Site and Year Established

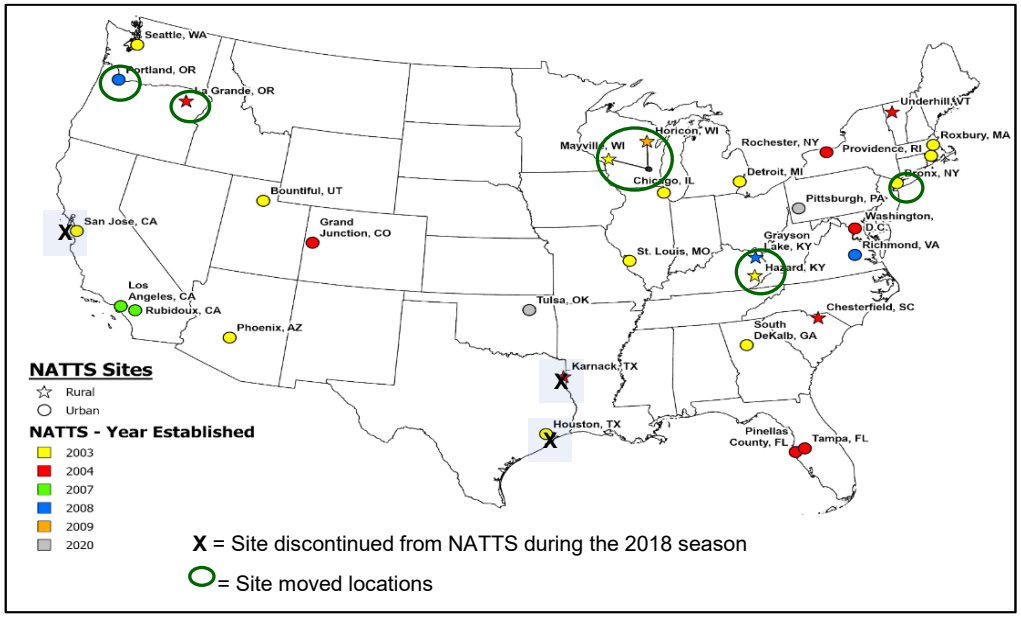


Table 1. NATTS Network Assessment: Count and Percentage of Suitable Datasets by Pollutant Group

Pollutant Group	A-rated		B-rated		Does Not Meet	
	#	%	#	%	#	%
VOCs	1,968	58%	864	25%	572	17%
Carbonyls	668	68%	231	24%	77	8%
PM_{10} Metals	1,906	66%	775	27%	217	7%
PAHs	571	77%	144	19%	29	4%
Total = 8,704	5,113	64%	2,014	25%	895	11%

Table 2. Three-Year Block Averages for National Trends

Pollutant[a,b]	Units	# Sites	Block 1	Block 2	% Difference
Acetaldehyde	$\mu g/m^3$	16	1.48	1.34	-9.2%
Arsenic (PM_{10})	ng/m^3	18	0.68	0.64	-6.6%
Benzene	$\mu g/m^3$	16	0.529	0.525	-0.8%
Benzo(a)pyrene	ng/m^3	18	0.086	0.072	-16.6%
Beryllium (PM_{10})	ng/m^3	18	0.008	0.010	15.0%
Butadiene, 1,3-	$\mu g/m^3$	15	0.057	0.054	-5.1%
Cadmium (PM_{10})	ng/m^3	20	0.087	0.090	3.7%
Carbon Tetrachloride	$\mu g/m^3$	15	0.53	0.50	-5.3%
Chloroform	$\mu g/m^3$	16	0.173	0.165	-4.8%
Formaldehyde	$\mu g/m^3$	15	2.809	2.482	-11.7%
Lead (PM_{10})	ng/m^3	20	2.44	2.43	-0.5%
Manganese (PM_{10})	ng/m^3	20	6.69	7.31	9.2%
Naphthalene	ng/m^3	17	42.00	35.10	-16.4%
Nickel (PM_{10})	ng/m^3	19	0.87	0.83	-3.7%
Tetrachloroethylene	$\mu g/m^3$	15	0.12	0.12	1.5%
Trichloroethylene	$\mu g/m^3$	14	0.019	0.022	16.3%
Vinyl Chloride	$\mu g/m^3$	16	0.004	0.001	-69.0%

[a] Acrolein and ethylene oxide were not assessed due to sampling and analytical issues

[b] Hexavalent chromium (not assessed) was discontinued in 2013

Site Information

Region	5
NATTS Site Type	Urban
County	Wayne
AQS Site Code	26-163-0033
NATTS Operating Agency	MI Dept. Environmental Quality
Latitude	42.30754
Longitude	-83.14961
AQS Land Use	Industrial
AQS Location Setting	Suburban
County Population (2023)	1,751,169

Figure 2. NATTS Site Location

Pollutant Datasets Evaluation: Suitable for Trends (Y=yes; Y(T)=yes, and used for DQO Trends; N=No; "--"=not rated)

Final Pollutant Name	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Acetaldehyde	Y	Y	Y	Y	N(a)	N(a)	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Arsenic (PM_{10})	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Benzene	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Benzo(a)pyrene	--	--	--	--	--	--	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Beryllium (PM_{10})	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Butadiene, 1,3-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Cadmium (PM_{10})	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Carbon tetrachloride	Y	N(b)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Chloroform	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Formaldehyde	Y	Y	Y	Y	N(a)	N(a)	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Lead (PM_{10})	Y	Y	Y	Y	Y	Y	Y	N(c)	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Manganese (PM_{10})	Y	Y	Y	Y	Y	Y	Y	N(c)	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Naphthalene	--	--	--	--	--	--	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Nickel (PM_{10})	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Tetrachloroethylene	N(a)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)
Trichloroethylene	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N(a)
Vinyl chloride	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)	Y(T)

[a]: Completeness was less than 75% based on 1-in-6 day sampling.

Table 3. NATTS Network Assessment Data (2003-2022) - National Distribution Statistics By Type[a]

Analyte	Units	Site Type	# Data Records	% Detections	Arithmetic Mean[b]	Percentile Value[c]						
						5th	10th	25th	50th	75th	90th	95th
Acetaldehyde	µg/m^3	Urban	22,000	100%	1.73 ± 0.02	0.50	0.65	0.95	1.42	2.15	3.19	3.96
	µg/m^3	Rural	6,392	100%	1.17 ± 0.03	0.36	0.45	0.65	0.92	1.35	1.98	2.67
	µg/m^3	All Sites	28,392	100%	1.61 ± 0.02	0.45	0.58	0.85	1.29	1.97	2.99	3.79
Arsenic (PM_{10})	ng/m^3	Urban	21,944	95%	0.87 ± 0.03	0.03	0.16	0.32	0.56	0.96	1.65	2.37
	ng/m^3	Rural	6,385	96%	0.49 ± 0.02	0.03	0.08	0.16	0.35	0.58	0.93	1.30
	ng/m^3	All Sites	28,329	96%	0.78 ± 0.02	0.03	0.13	0.27	0.51	0.87	1.51	2.16
Benzene	µg/m^3	Urban	22,246	99%	0.85 ± 0.01	0.23	0.29	0.42	0.64	1.02	1.62	2.20
	µg/m^3	Rural	5,932	90%	0.52 ± 0.01	ND	0.06	0.20	0.38	0.67	1.08	1.51
	µg/m^3	All Sites	28,178	97%	0.78 ± 0.01	0.16	0.23	0.36	0.58	0.95	1.52	2.07
Benzo(a)pyrene	ng/m^3	Urban	17,810	73%	0.10 ± 0.01	ND	ND	ND	0.04	0.10	0.23	0.35
	ng/m^3	Rural	4,735	37%	0.07 ± 0.01	ND	ND	ND	ND	0.02	0.19	0.38
	ng/m^3	All Sites	22,545	65%	0.09 ± 0.01	ND	ND	ND	0.03	0.09	0.22	0.35
Beryllium (PM_{10})	ng/m^3	Urban	21,786	77%	0.042 ± 0.004	ND	ND	0.0005	0.005	0.015	0.043	0.098
	ng/m^3	Rural	6,062	49%	0.018 ± 0.002	ND	ND	ND	ND	0.004	0.012	0.041
	ng/m^3	All Sites	27,848	71%	0.037 ± 0.003	ND	ND	ND	0.003	0.011	0.038	0.083
Butadiene, 1,3-	µg/m^3	Urban	22,220	78%	0.092 ± 0.002	ND	ND	0.018	0.051	0.110	0.215	0.317
	µg/m^3	Rural	5,940	29%	0.017 ± 0.001	ND	ND	ND	ND	0.011	0.054	0.104
	µg/m^3	All Sites	28,160	68%	0.076 ± 0.002	ND	ND	ND	0.039	0.092	0.190	0.283
Cadmium (PM_{10})	ng/m^3	Urban	21,954	93%	0.184 ± 0.014	ND	0.019	0.043	0.081	0.160	0.354	0.572
	ng/m^3	Rural	6,067	89%	0.092 ± 0.005	ND	ND	0.026	0.055	0.099	0.179	0.270
	ng/m^3	All Sites	28,021	92%	0.164 ± 0.011	ND	0.012	0.039	0.075	0.143	0.300	0.518
Carbon Tetrachloride	µg/m^3	Urban	22,202	98%	0.556 ± 0.002	0.336	0.423	0.486	0.550	0.638	0.725	0.784
	µg/m^3	Rural	5,909	84%	0.494 ± 0.010	ND	ND	0.342	0.533	0.629	0.728	0.807
	µg/m^3	All Sites	28,111	95%	0.543 ± 0.003	ND	0.363	0.475	0.547	0.636	0.726	0.788
Chloroform	µg/m^3	Urban	22,218	88%	0.243 ± 0.016	ND	ND	0.094	0.129	0.205	0.398	0.630
	µg/m^3	Rural	5,942	56%	0.062 ± 0.002	ND	ND	ND	0.049	0.098	0.134	0.228
	µg/m^3	All Sites	28,160	82%	0.205 ± 0.013	ND	ND	0.076	0.110	0.187	0.342	0.543

Table 3. NATTS Network Assessment Data (2003-2022) - National Distribution Statistics By Type[a]

Analyte	Units	Site Type	# Data Records	% Detections	Arithmetic Mean[b]	Percentile Value[c]						
						5th	10th	25th	50th	75th	90th	95th
Formaldehyde	µg/m^3	Urban	22,024	100%	3.03 ± 0.04	0.69	1.00	1.57	2.42	3.72	5.47	6.95
	µg/m^3	Rural	6,432	100%	2.16 ± 0.04	0.49	0.64	1.03	1.67	2.69	4.12	5.34
	µg/m^3	All Sites	28,456	100%	2.83 ± 0.03	0.61	0.86	1.42	2.25	3.50	5.22	6.65
Lead (PM_{10})	ng/m^3	Urban	21,955	100%	3.97 ± 0.10	0.70	0.95	1.46	2.49	4.34	7.87	11.16
	ng/m^3	Rural	6,066	99%	1.93 ± 0.14	0.34	0.45	0.75	1.27	2.14	3.59	4.96
	ng/m^3	All Sites	28,021	100%	3.53 ± 0.09	0.53	0.75	1.22	2.17	3.88	6.99	10.10
Manganese (PM_{10})	ng/m^3	Urban	21,906	100%	9.76 ± 0.25	1.06	1.49	2.53	4.96	10.43	20.40	30.79
	ng/m^3	Rural	6,067	99%	3.79 ± 0.12	0.48	0.74	1.34	2.48	4.49	8.08	11.64
	ng/m^3	All Sites	27,973	100%	8.47 ± 0.20	0.84	1.22	2.16	4.19	8.99	18.13	27.27
Naphthalene	ng/m^3	Urban	17,811	100%	67.25 ± 0.97	13.42	18.03	28.73	49.00	84.13	136.42	180.00
	ng/m^3	Rural	4,732	98%	21.76 ± 1.02	2.79	4.04	6.84	12.47	23.51	45.68	69.01
	ng/m^3	All Sites	22,543	100%	57.70 ± 0.83	5.92	9.77	20.41	40.15	74.11	124.40	167.26
Nickel (PM_{10})	ng/m^3	Urban	21,958	98%	1.76 ± 0.05	0.29	0.40	0.62	1.02	1.86	3.32	5.05
	ng/m^3	Rural	5,989	85%	0.56 ± 0.07	ND	ND	0.10	0.26	0.53	0.96	1.63
	ng/m^3	All Sites	27,947	95%	1.50 ± 0.04	0.00	0.17	0.45	0.84	1.59	2.92	4.47
Tetrachloroethylene	µg/m^3	Urban	22,209	84%	0.24 ± 0.05	ND	ND	0.05	0.12	0.22	0.43	0.68
	µg/m^3	Rural	5,936	38%	0.07 ± 0.02	ND	ND	ND	ND	0.04	0.12	0.31
	µg/m^3	All Sites	28,145	75%	0.21 ± 0.04	ND	ND	ND	0.08	0.20	0.38	0.61
Trichloroethylene	µg/m^3	Urban	22,204	43%	0.040 ± 0.008	ND	ND	ND	ND	0.043	0.096	0.152
	µg/m^3	Rural	5,922	19%	0.019 ± 0.003	ND	ND	ND	ND	ND	0.029	0.124
	µg/m^3	All Sites	28,126	38%	0.036 ± 0.006	ND	ND	ND	ND	0.033	0.085	0.148
Vinyl Chloride	µg/m^3	Urban	22,021	18%	0.0046 ± 0.0003	ND	ND	ND	ND	ND	0.0126	0.0251
	µg/m^3	Rural	5,940	13%	0.0070 ± 0.0008	ND	ND	ND	ND	ND	0.0125	0.0304
	µg/m^3	All Sites	27,961	17%	0.0051 ± 0.0003	ND	ND	ND	ND	ND	0.0126	0.0253

[a] Statistics presented are from pollutant datasets which were suitable for trends.

[b] The arithmetic mean is the average of all samples results which include actual measured values. If no chemical was registered, then a value of zero is used when calculating the mean.

[c] ND: No results of this chemical were registered by the laboratory analytical equipment.

Table 4. Summary Statistics for Detroit, MI

Analyte	Units	# Data Records	% Detection	Arithmetic Mean[a]	Percentile Value[b]						
					5th	10th	25th	50th	75th	90th	95th
Acetaldehyde	µg/m^3	1,133	100%	1.91 ± 0.07	0.88	1.05	1.34	1.73	2.26	2.84	3.22
Arsenic (PM_{10})	ng/m^3	1,238	100%	1.64 ± 0.09	0.38	0.50	0.81	1.32	2.07	3.02	3.73
Benzene	µg/m^3	1,164	100%	0.96 ± 0.04	0.37	0.43	0.56	0.76	1.08	1.62	2.24
Benzo(a)pyrene	ng/m^3	866	97%	0.16 ± 0.01	0.04	0.05	0.07	0.12	0.20	0.31	0.40
Beryllium (PM_{10})	ng/m^3	1,236	88%	0.029 ± 0.002	ND	ND	0.010	0.020	0.040	0.063	0.090
Butadiene, 1,3-	µg/m^3	1,163	89%	0.08 ± 0.01	ND	ND	0.04	0.07	0.10	0.17	0.22
Cadmium (PM_{10})	ng/m^3	1,238	100%	0.41 ± 0.03	0.05	0.07	0.13	0.26	0.50	0.94	1.24
Carbon Tetrachloride	µg/m^3	1,164	98%	0.65 ± 0.01	0.43	0.51	0.58	0.66	0.73	0.81	0.89
To be able to detect a	µg/m^3	1,164	90%	0.60 ± 0.03	ND	0.10	0.31	0.52	0.80	1.14	1.39
Formaldehyde	µg/m^3	1,133	100%	3.29 ± 0.14	1.31	1.59	2.08	2.81	3.97	5.46	6.46
Lead (PM_{10})	ng/m^3	1,231	100%	11.83 ± 0.83	1.94	2.57	4.31	7.72	13.91	23.78	34.65
Manganese (PM_{10})	ng/m^3	1,236	100%	45.09 ± 3.01	6.42	10.02	16.72	28.61	54.85	95.64	132.42
Naphthalene	ng/m^3	866	100%	105.81 ± 4.63	33.21	41.59	60.33	87.55	130.74	193.64	244.83
Nickel (PM_{10})	ng/m^3	1,238	100%	2.29 ± 0.26	0.48	0.66	0.95	1.45	2.48	4.19	5.64
Tetrachloroethylene	µg/m^3	1,151	93%	1.13 ± 0.93	ND	0.07	0.11	0.19	0.40	0.97	1.76
Trichloroethylene	µg/m^3	1,151	24%	0.02 ± 0.01	ND	ND	ND	ND	ND	0.06	0.10
Vinyl Chloride	µg/m^3	1,164	11%	0.0035 ± 0.0027	ND	ND	ND	ND	ND	0.00	0.0175

[a] :The arithmetic mean is the average of all samples results which included actual measured values. If no chemical was registered, then a value of zero is used.

[b] ND: No results of this chemical were registered by the laboratory analytical equipment.

Table 5. Analytical Labs Supporting this Site

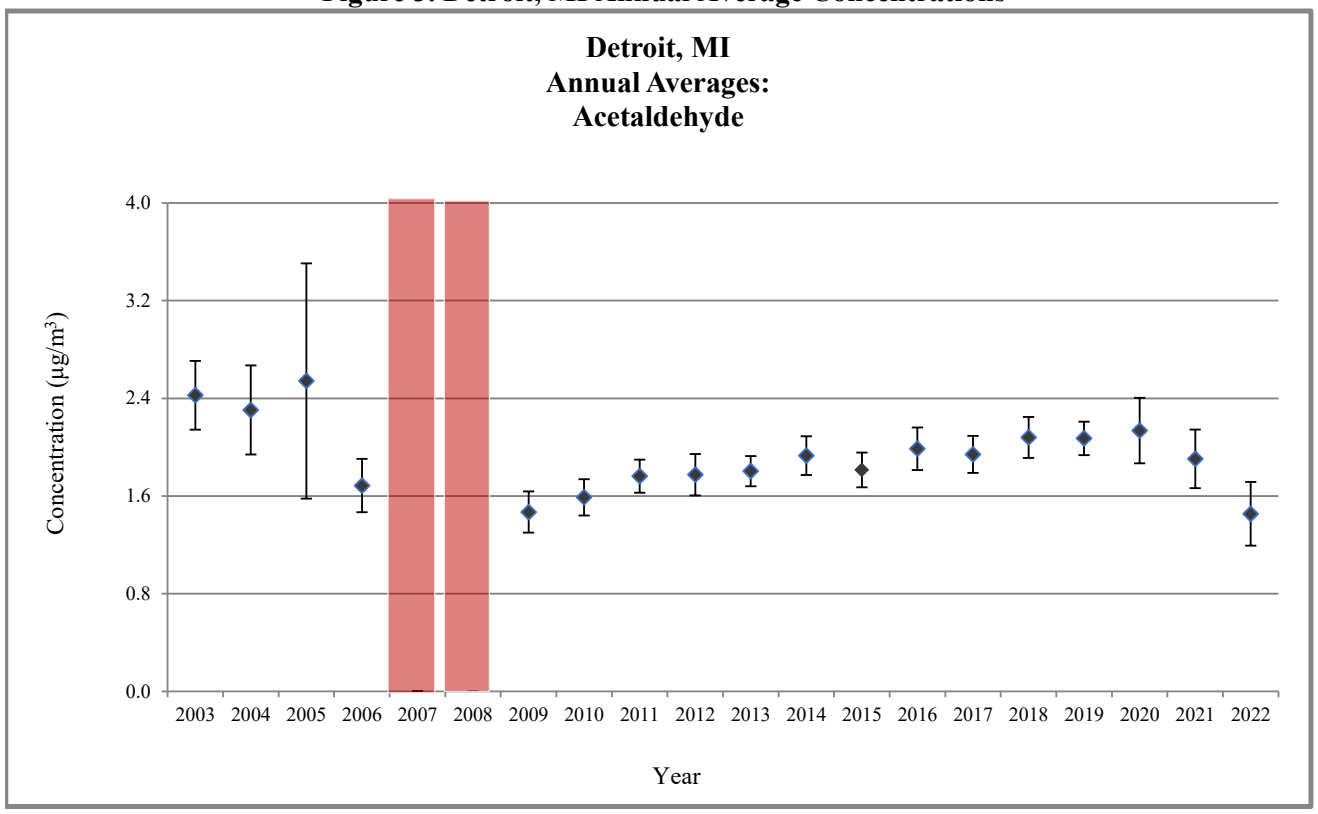
Pollutant Group	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
VOCs	ERG/ MIDEQ	ERG	MIDEQ	MIDEQ	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG
Carbonyls	ERG/ MIDEQ	MIDEQ	MIDEQ	MIDEQ	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG
PM_{10} Metals	MIDEQ	MIDEQ	MIDEQ	MIDEQ	MIDEQ	MIDEQ	MIDEQ	MIDEQ	MIDEQ	MIDEQ	MIDEQ	MIDEQ	MIDEQ	MIDEQ	MIDEQ	MIDEQ
PAHs						ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG	ERG

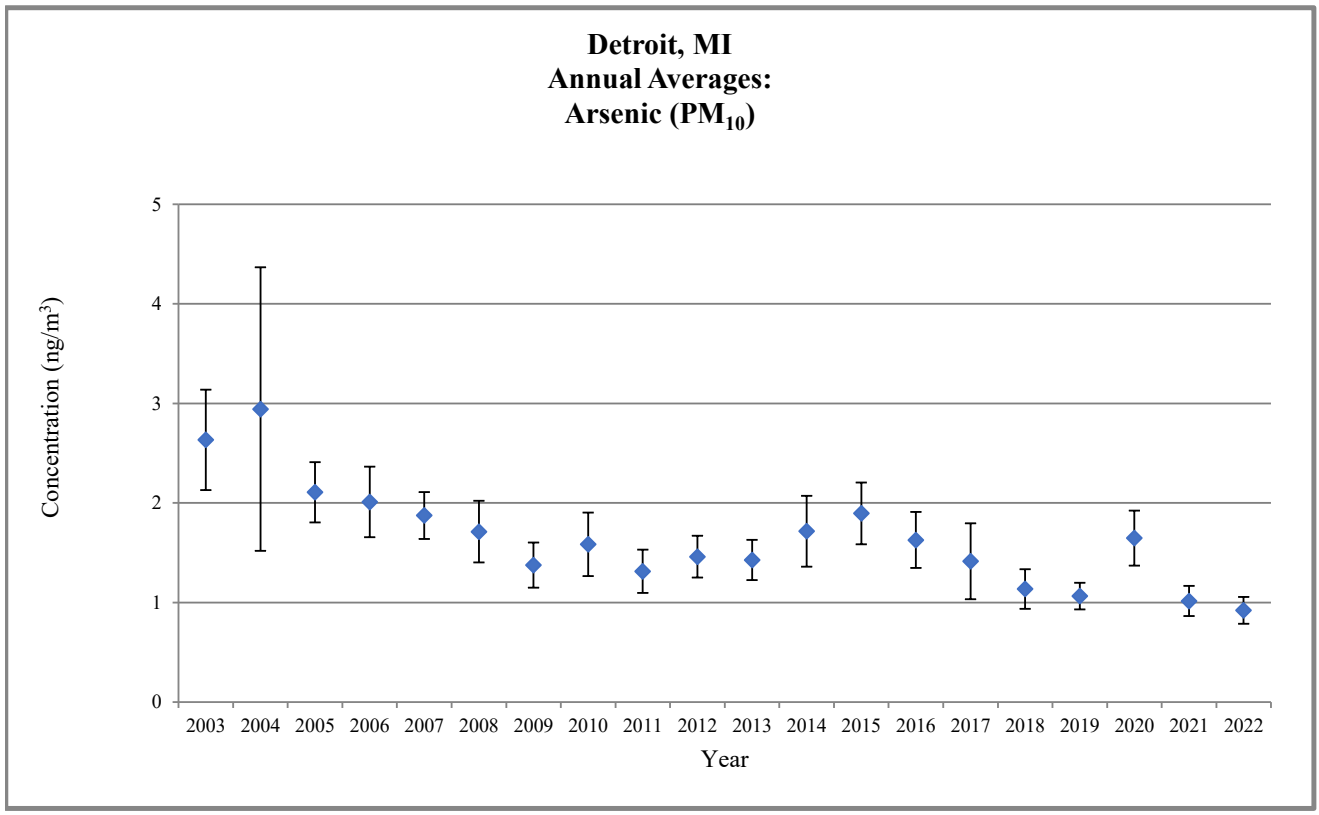
Pollutant Group	2019	2020	2021	2022
VOCs	ERG	ERG	ERG	ERG
Carbonyls	ERG	ERG	ERG	ERG
PM_{10} Metals	MIDEQ	MIDEQ	MIDEQ	MIDEQ
PAHs	ERG	ERG	ERG	ERG

ERG: Eastern Research Group

MIDEQ: Michigan Department of Environmental Quality

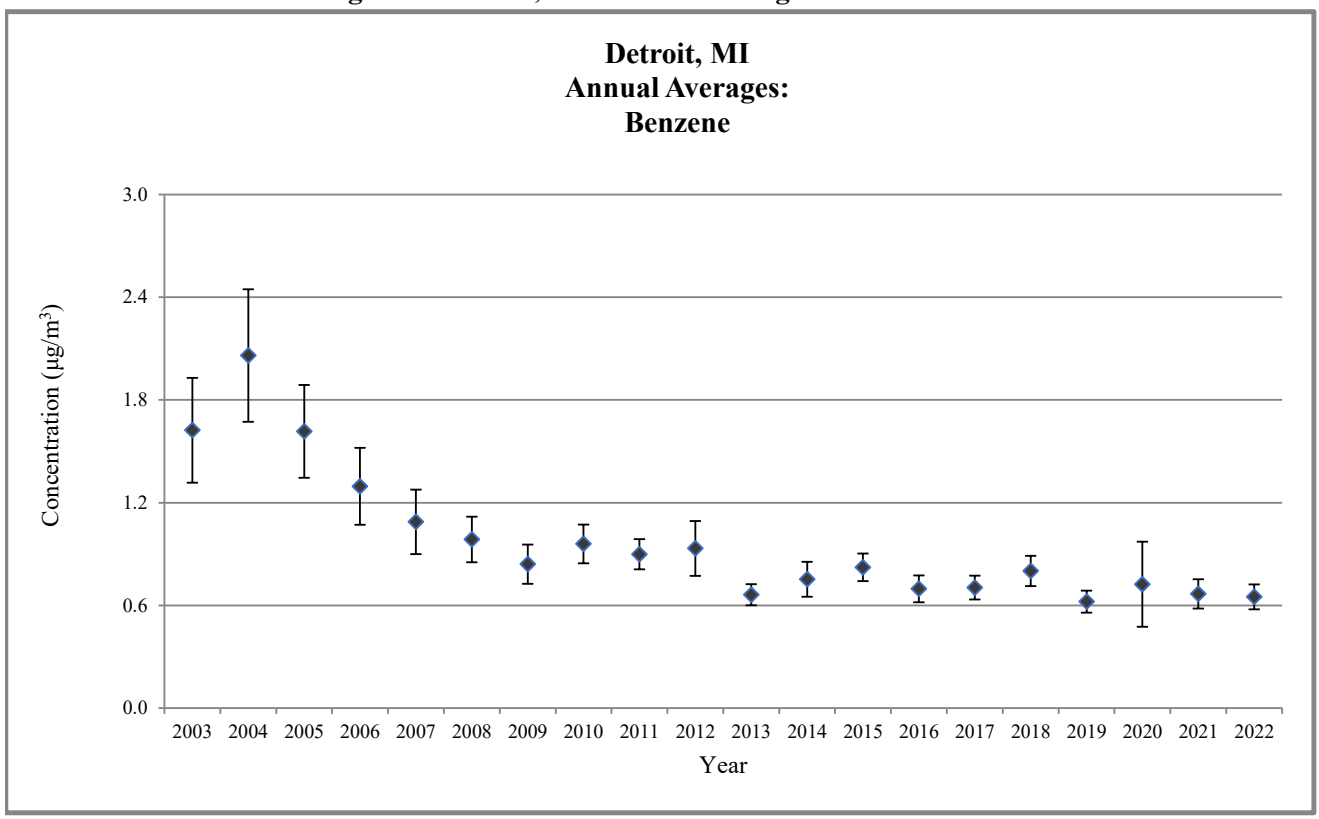
Figure 3. Detroit, MI Annual Average Concentrations

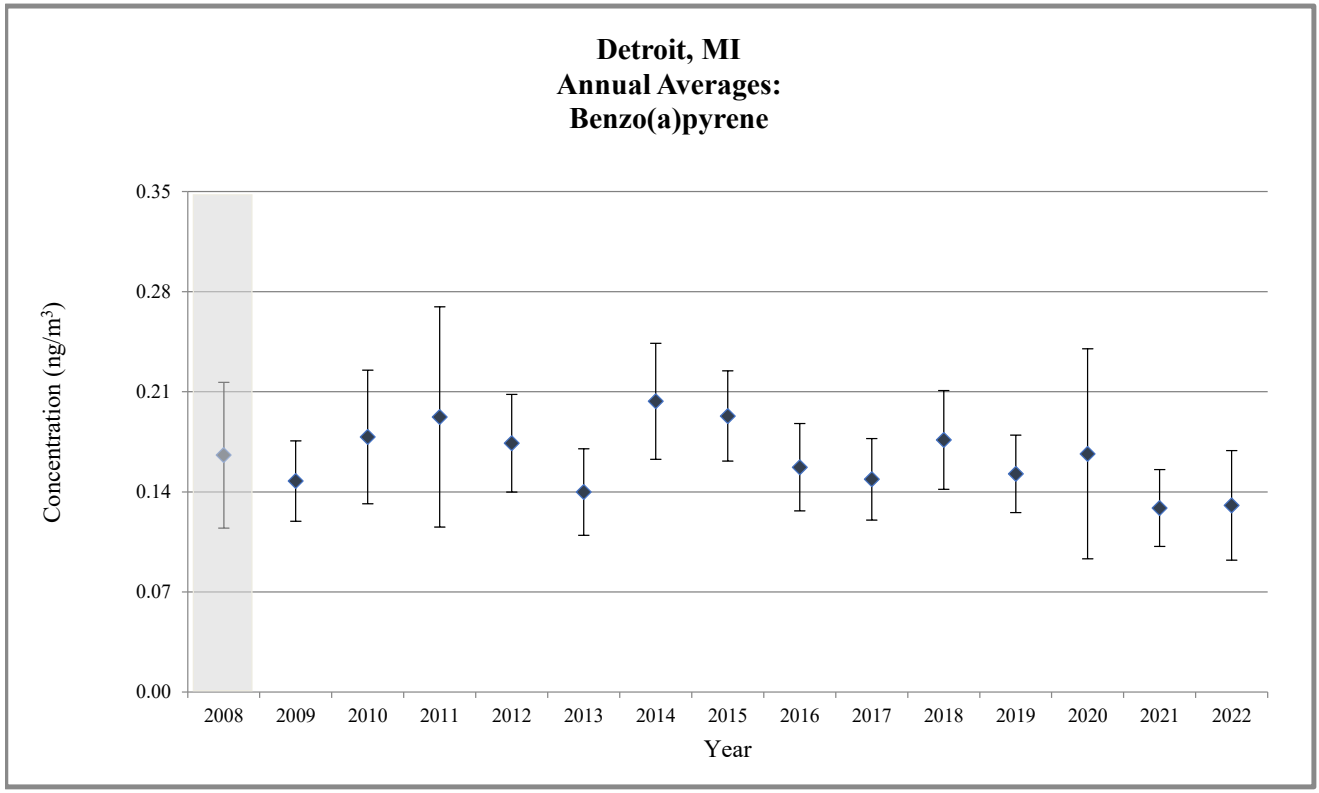




Sampling began midway through the year.
Does not meet MQO

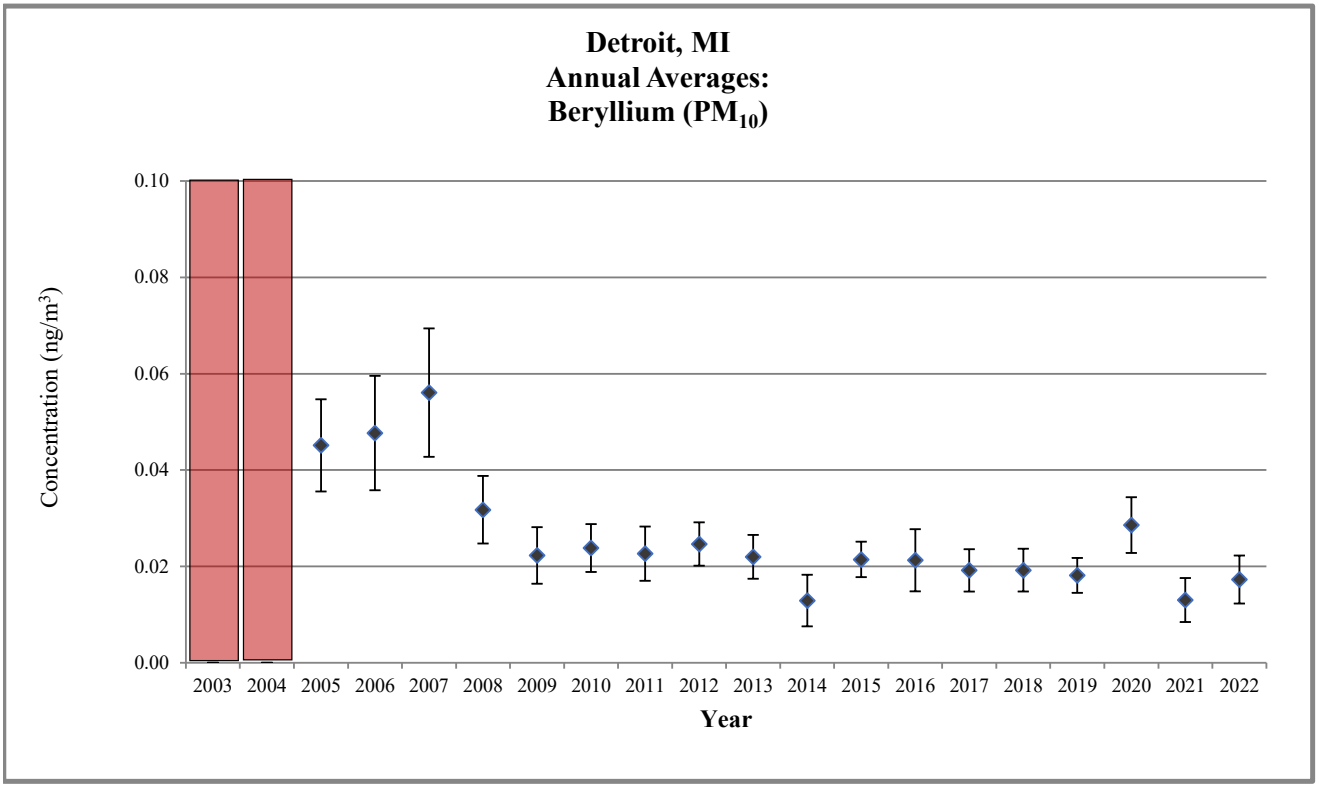
Figure 3. Detroit, MI Annual Average Concentrations

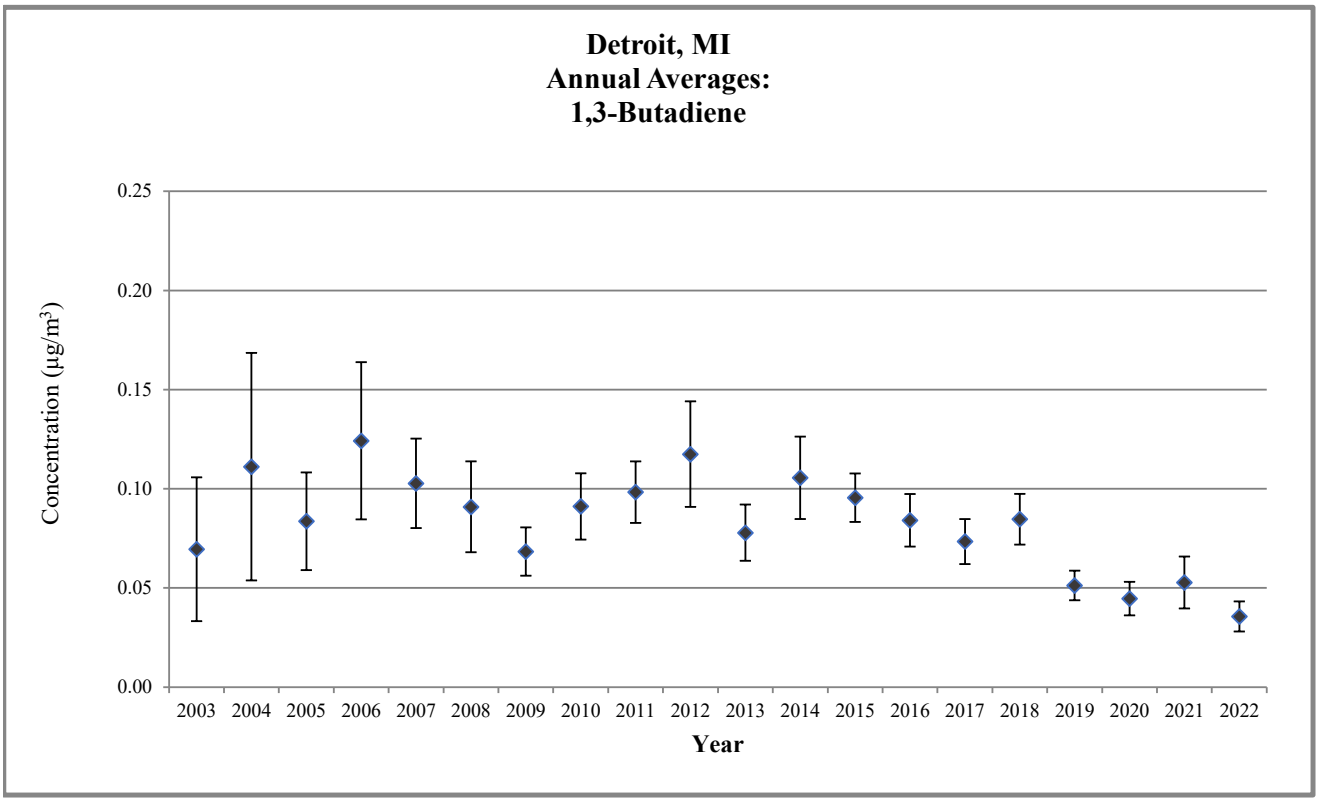




Sampling began midway through the year.
Does not meet MQO

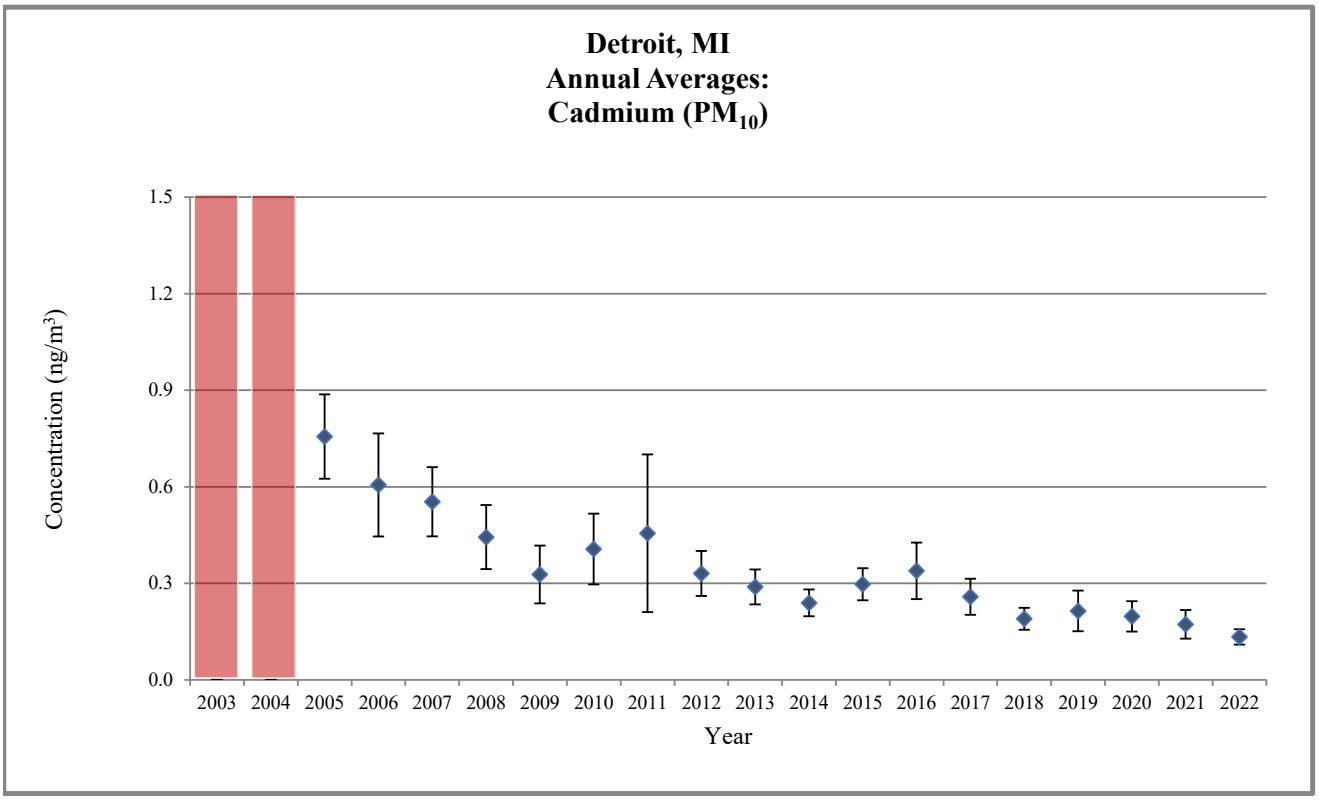
Figure 3. Detroit, MI Annual Average Concentrations

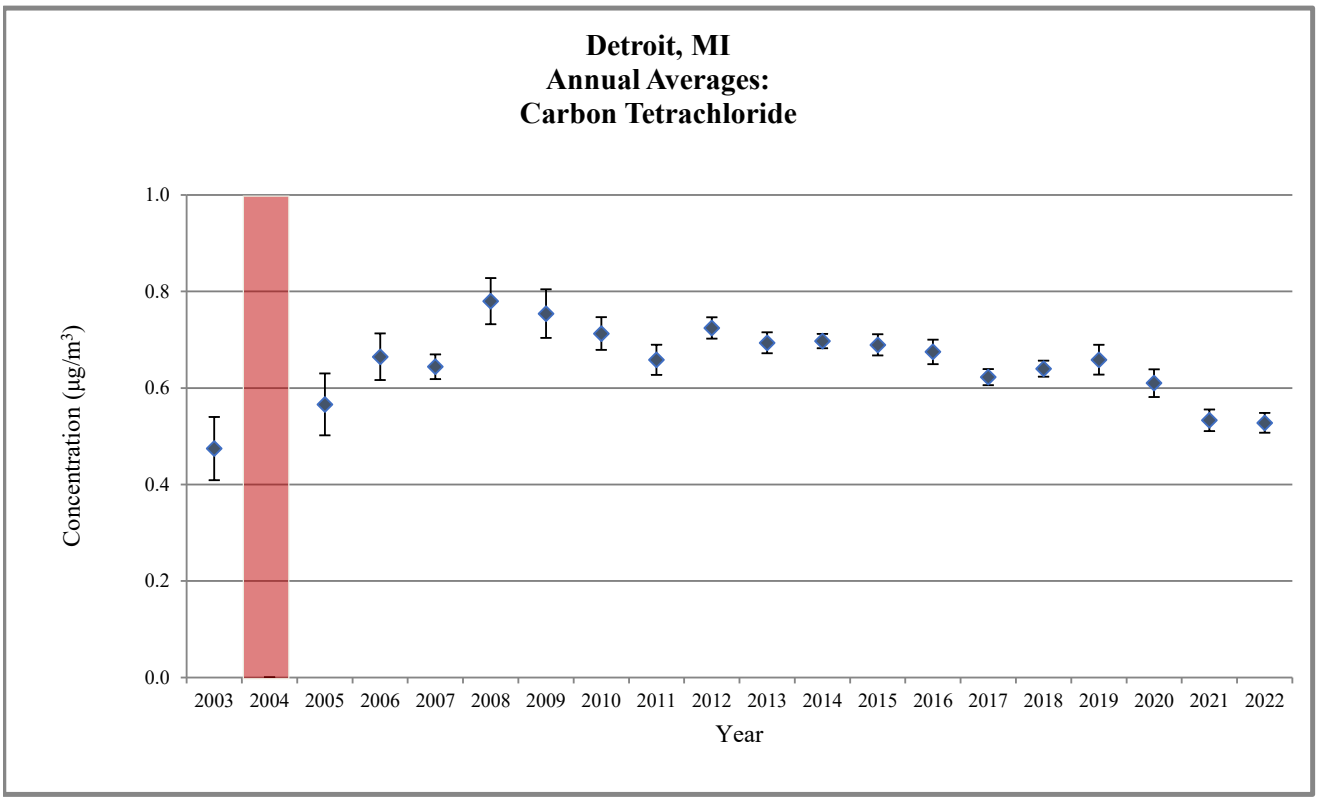




Sampling began midway through the year.
Does not meet MQO

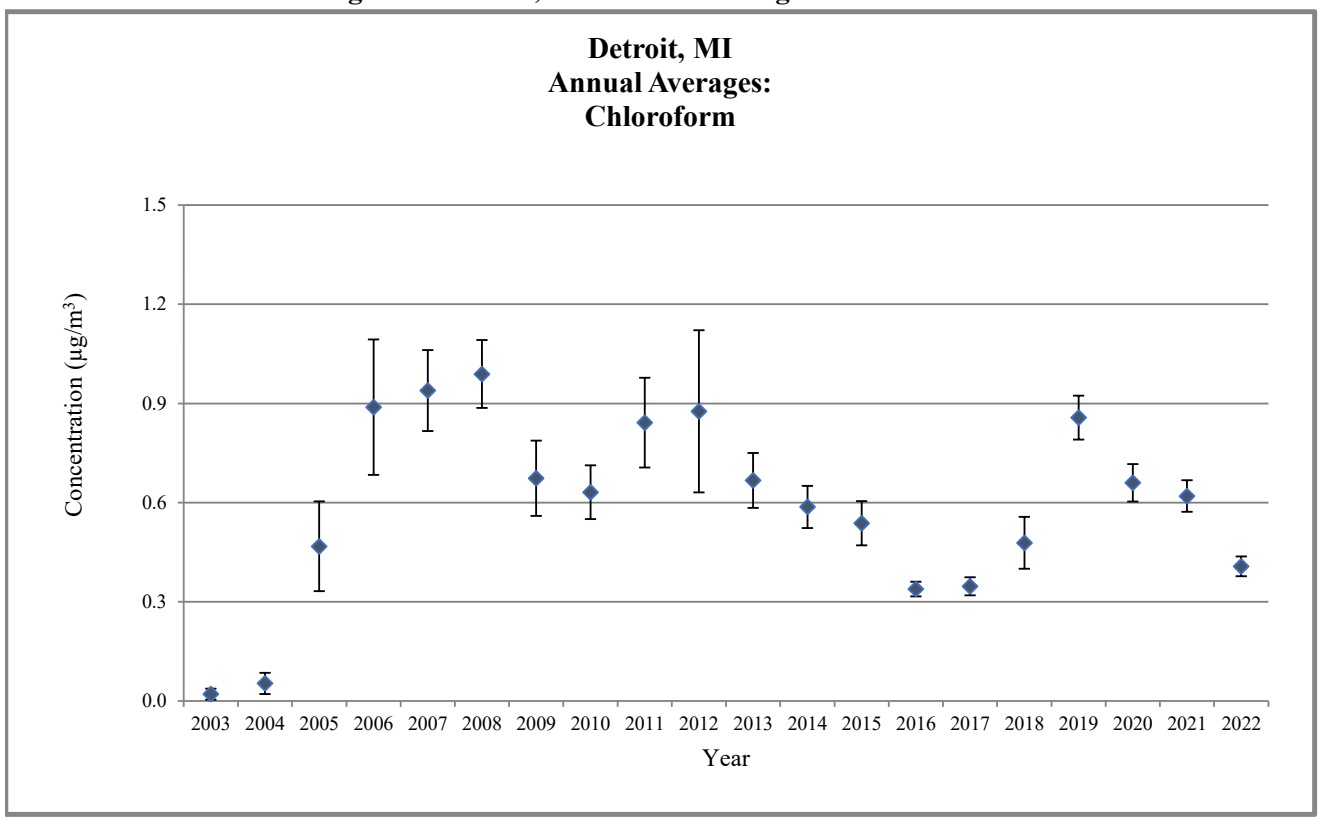
Figure 3. Detroit, MI Annual Average Concentrations

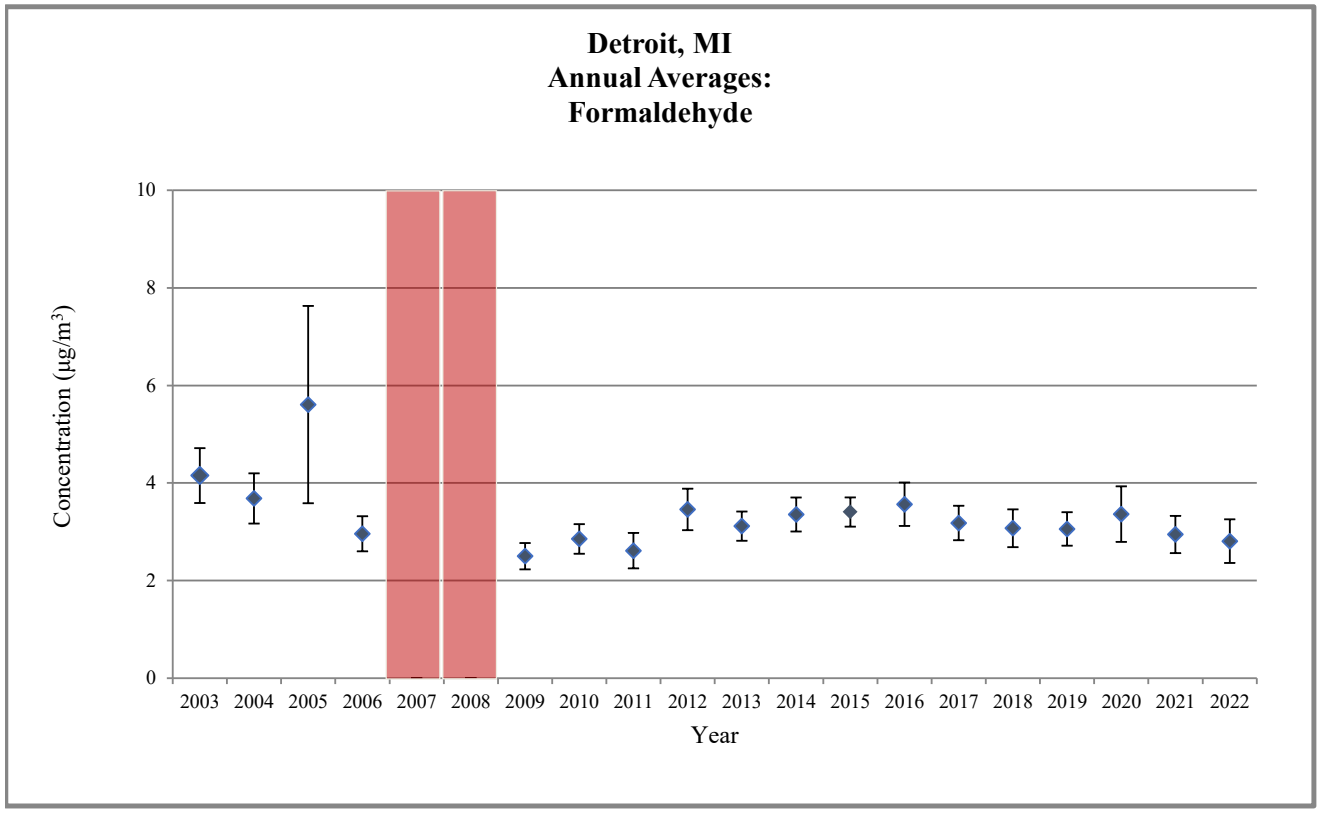




Sampling began midway through the year.
Does not meet MQO

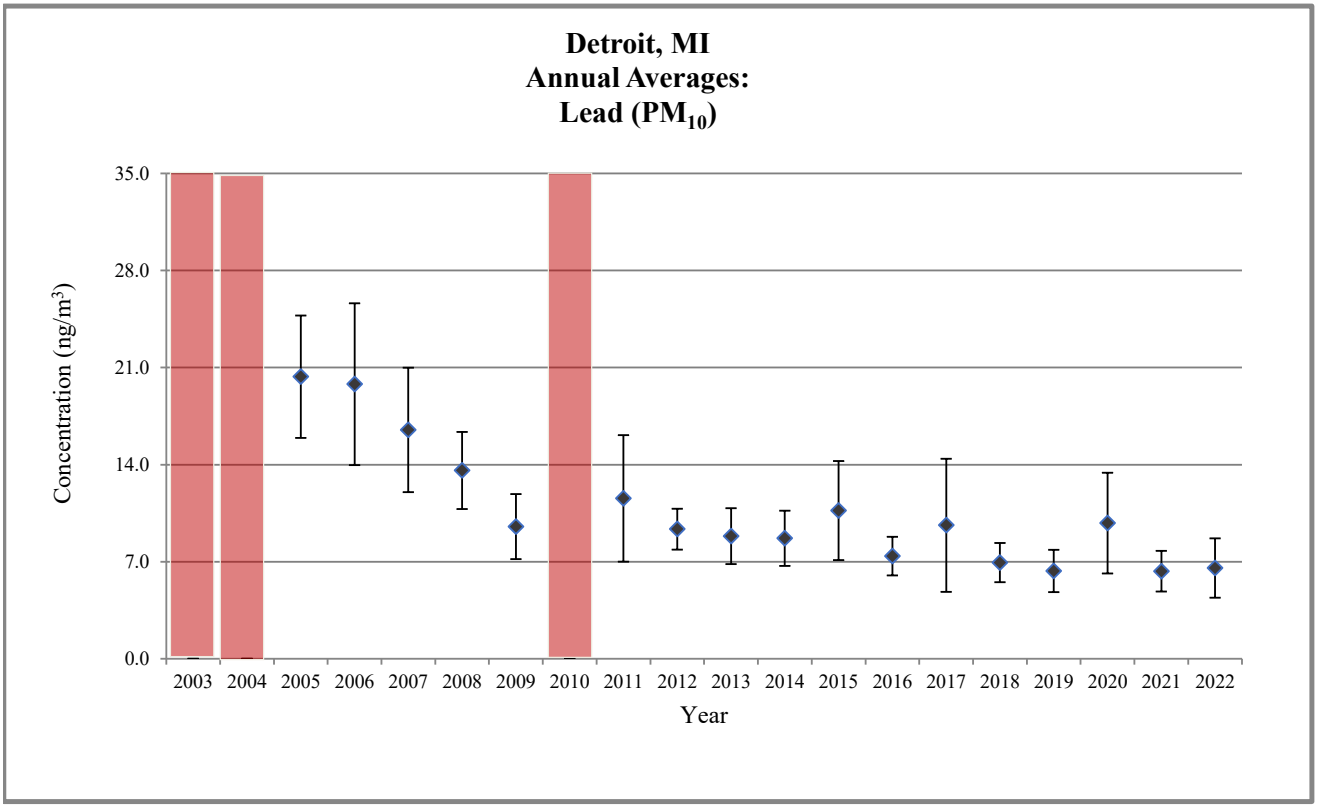
Figure 3. Detroit, MI Annual Average Concentrations

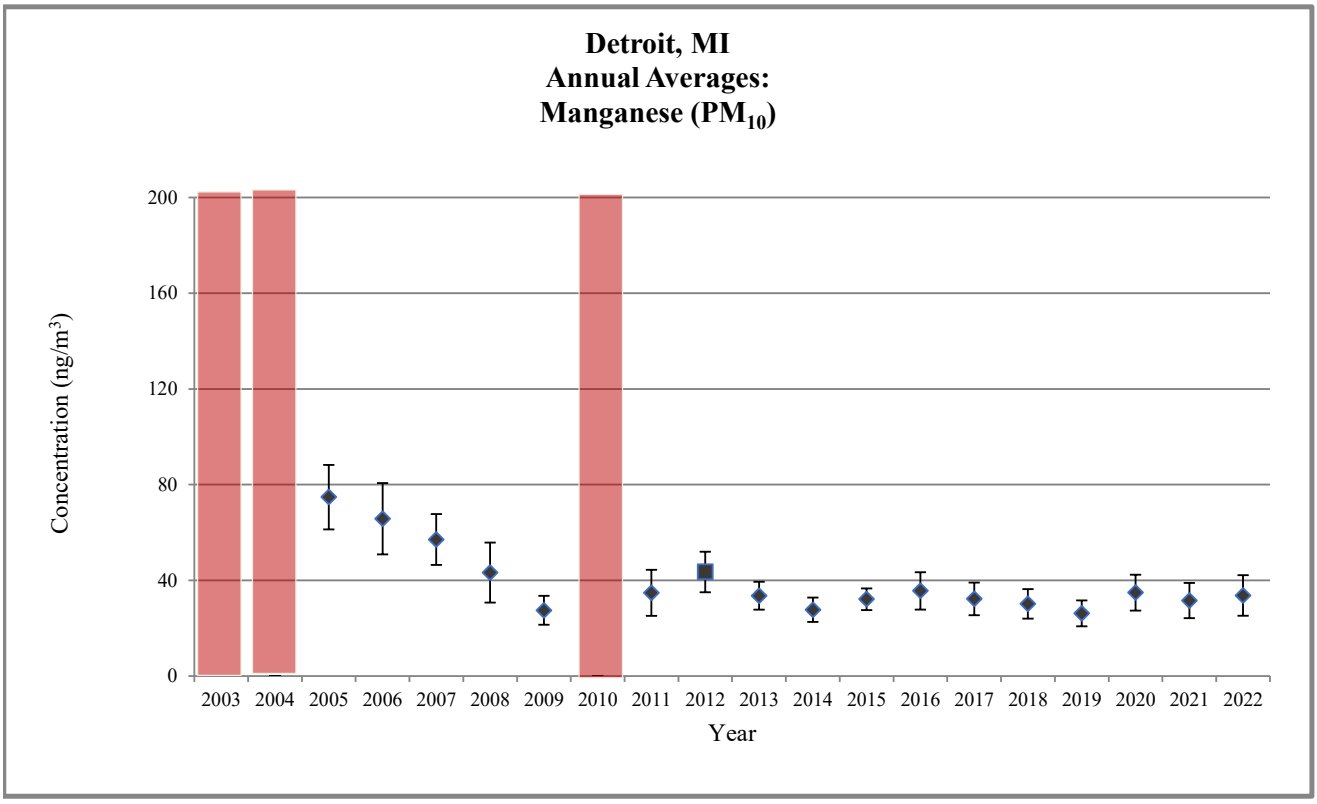




Sampling began midway through the year.
Does not meet MQO

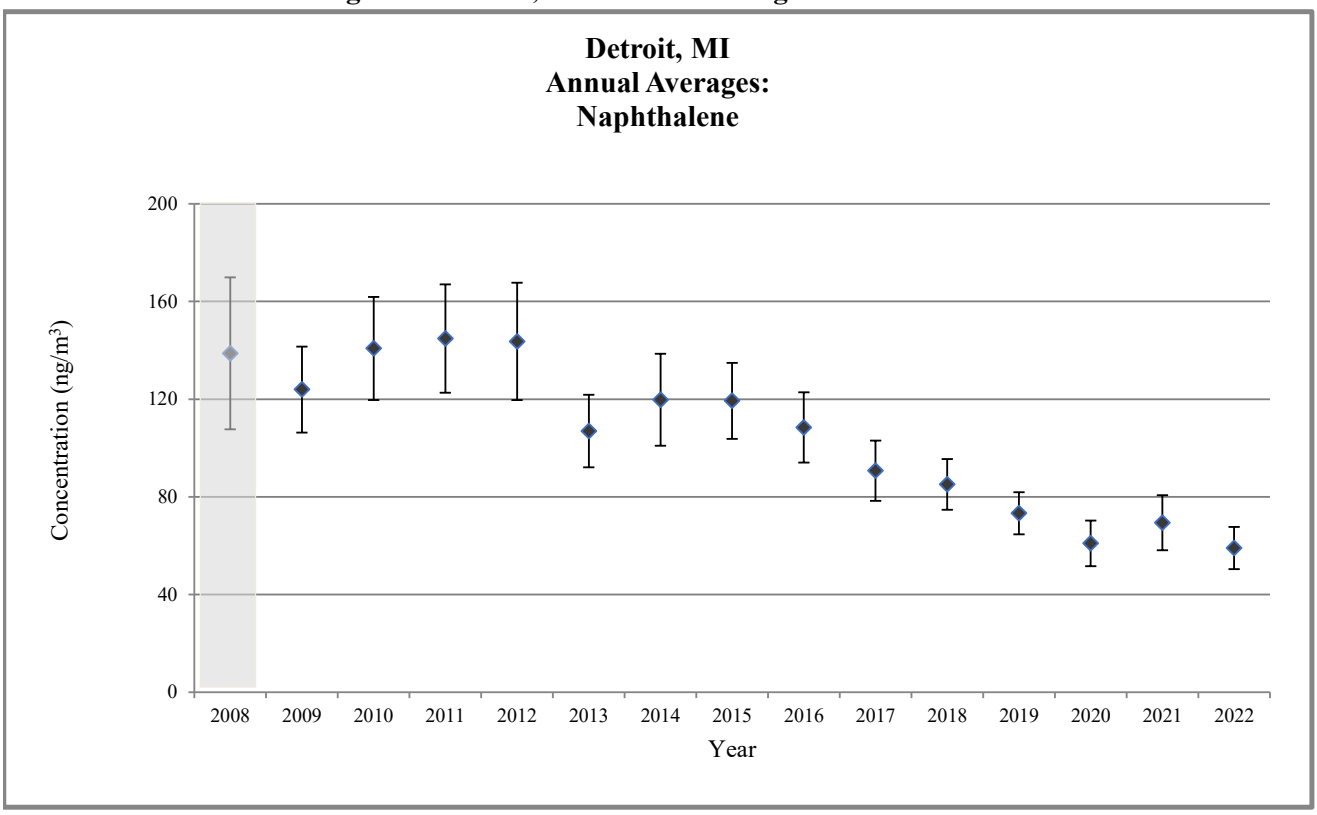
Figure 3. Detroit, MI Annual Average Concentrations

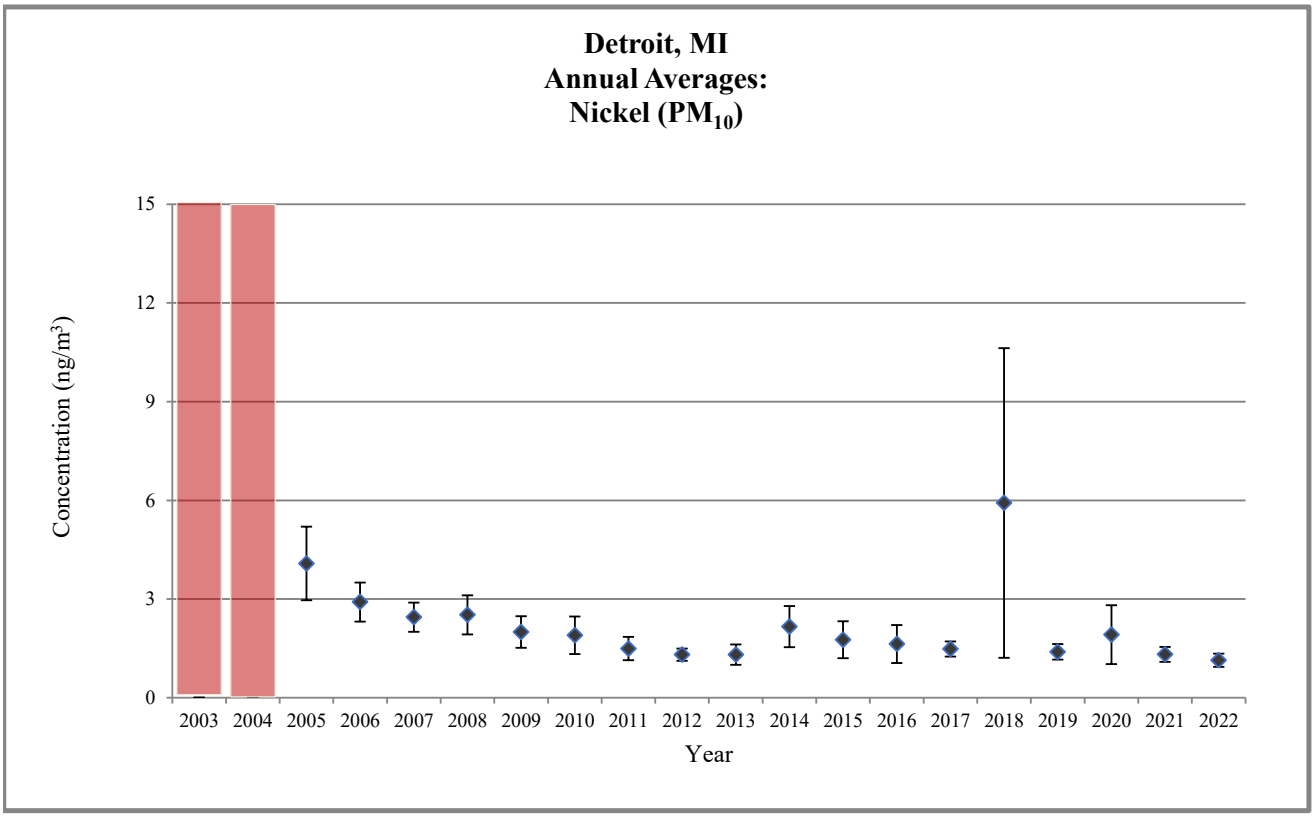




Sampling began midway through the year.
Does not meet MQO

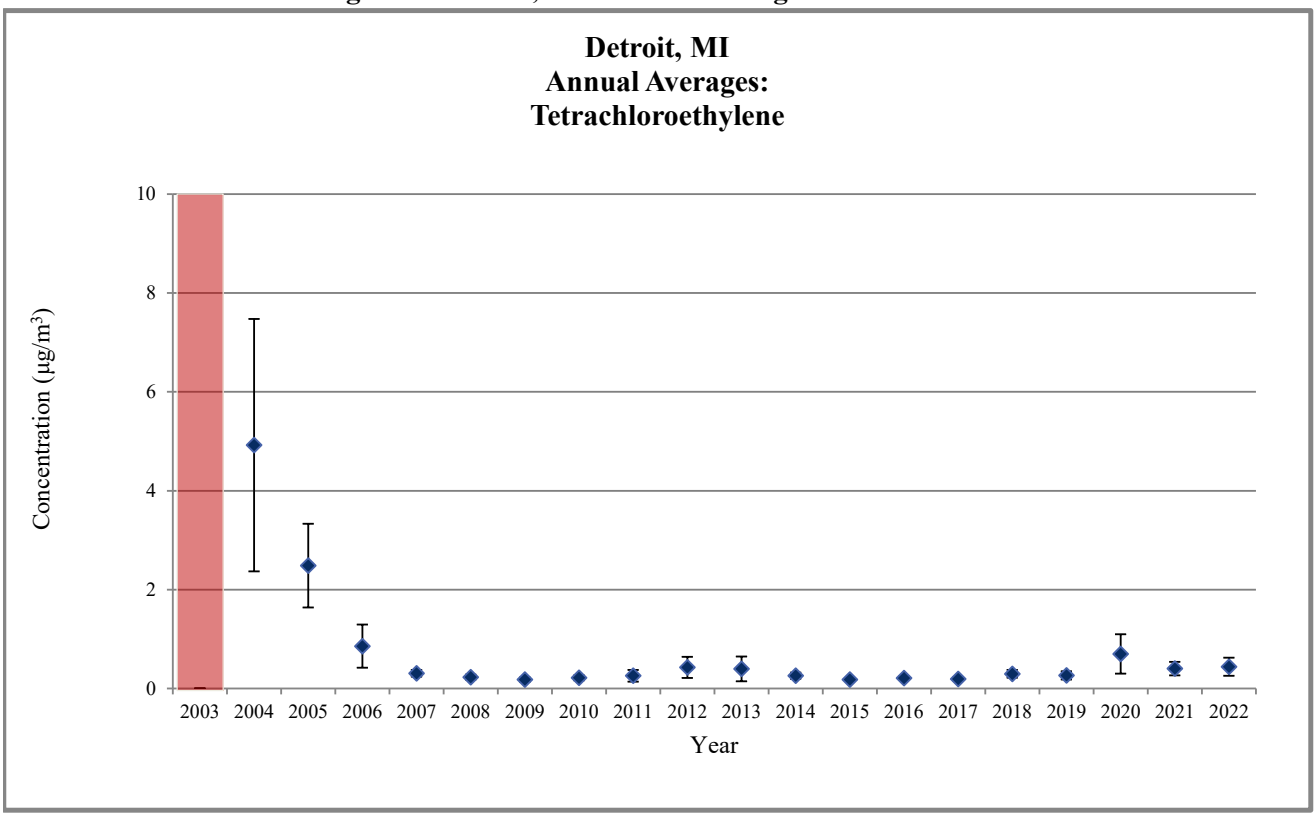
Figure 3. Detroit, MI Annual Average Concentrations

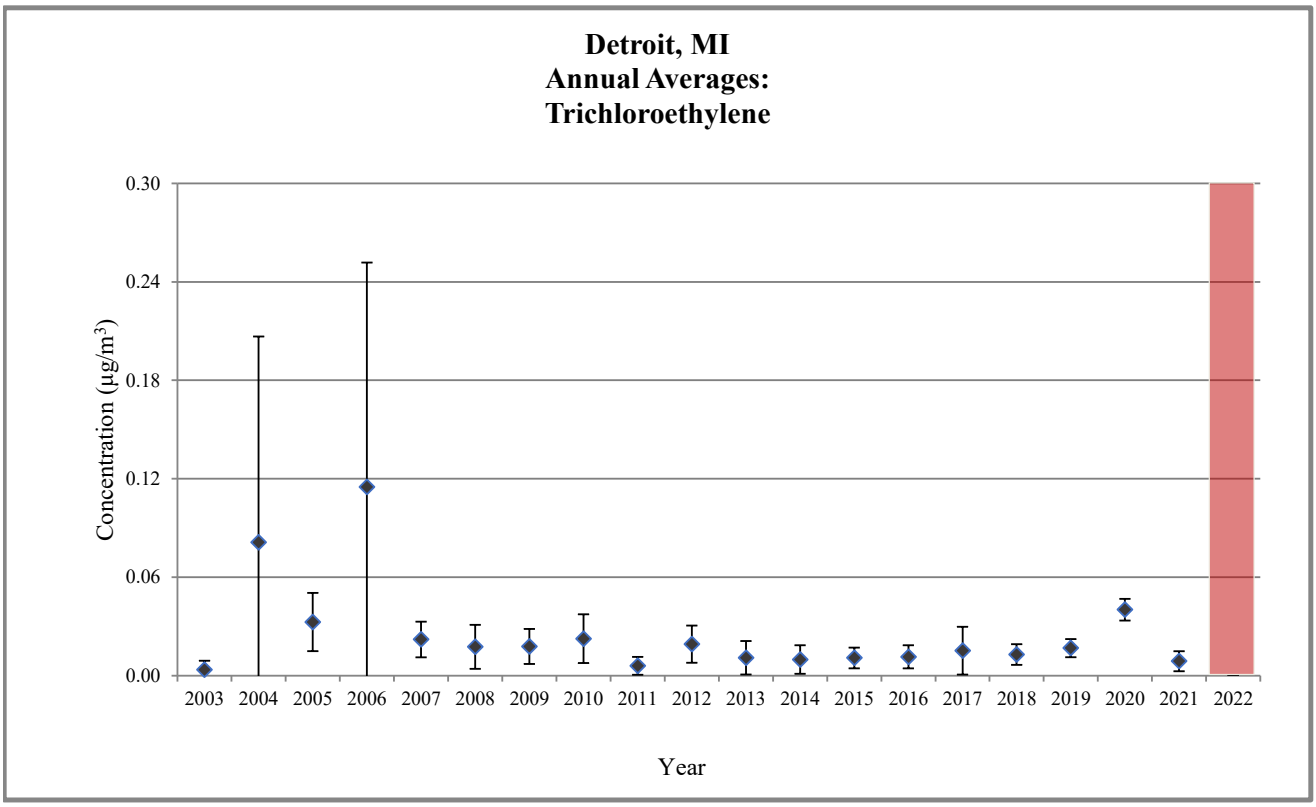




Sampling began midway through the year.
Does not meet MQO

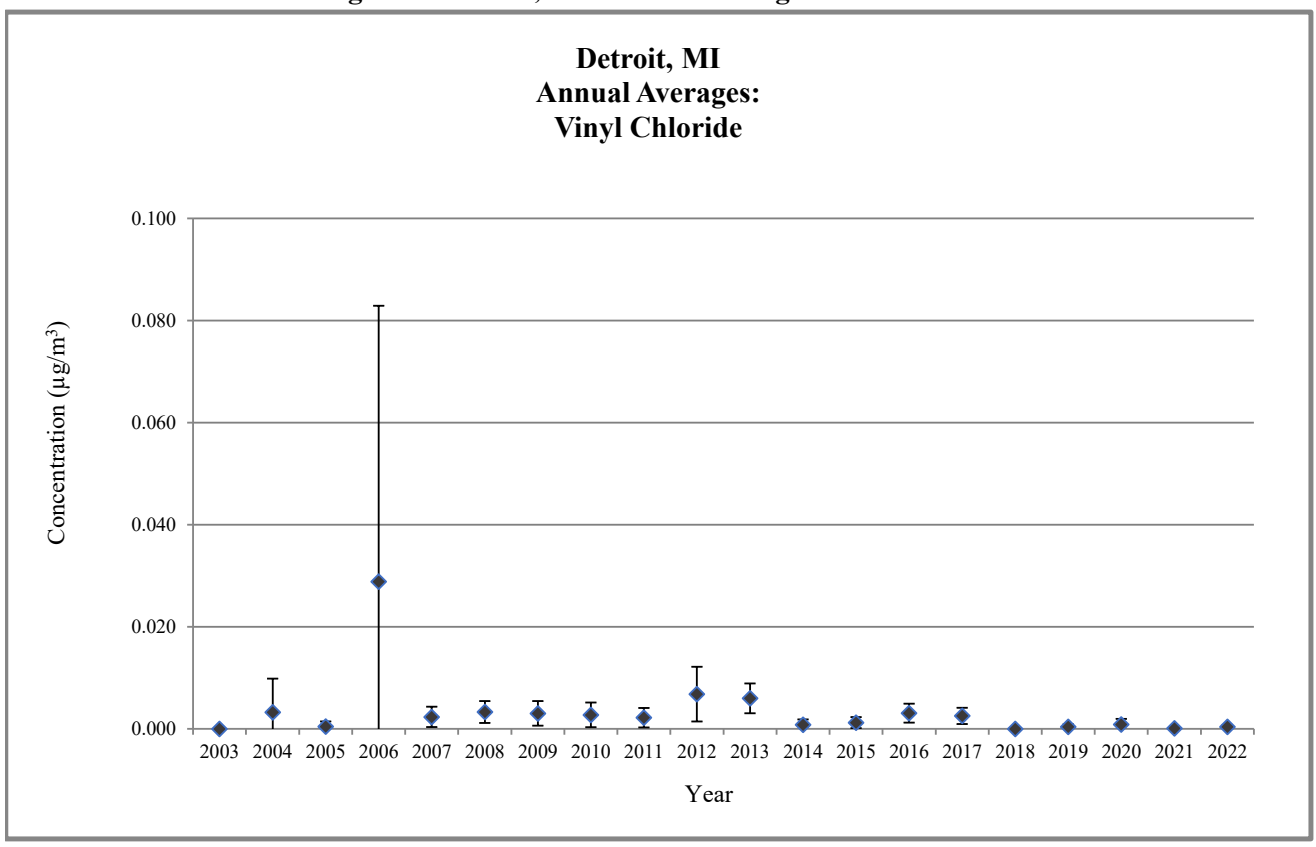
Figure 3. Detroit, MI Annual Average Concentrations





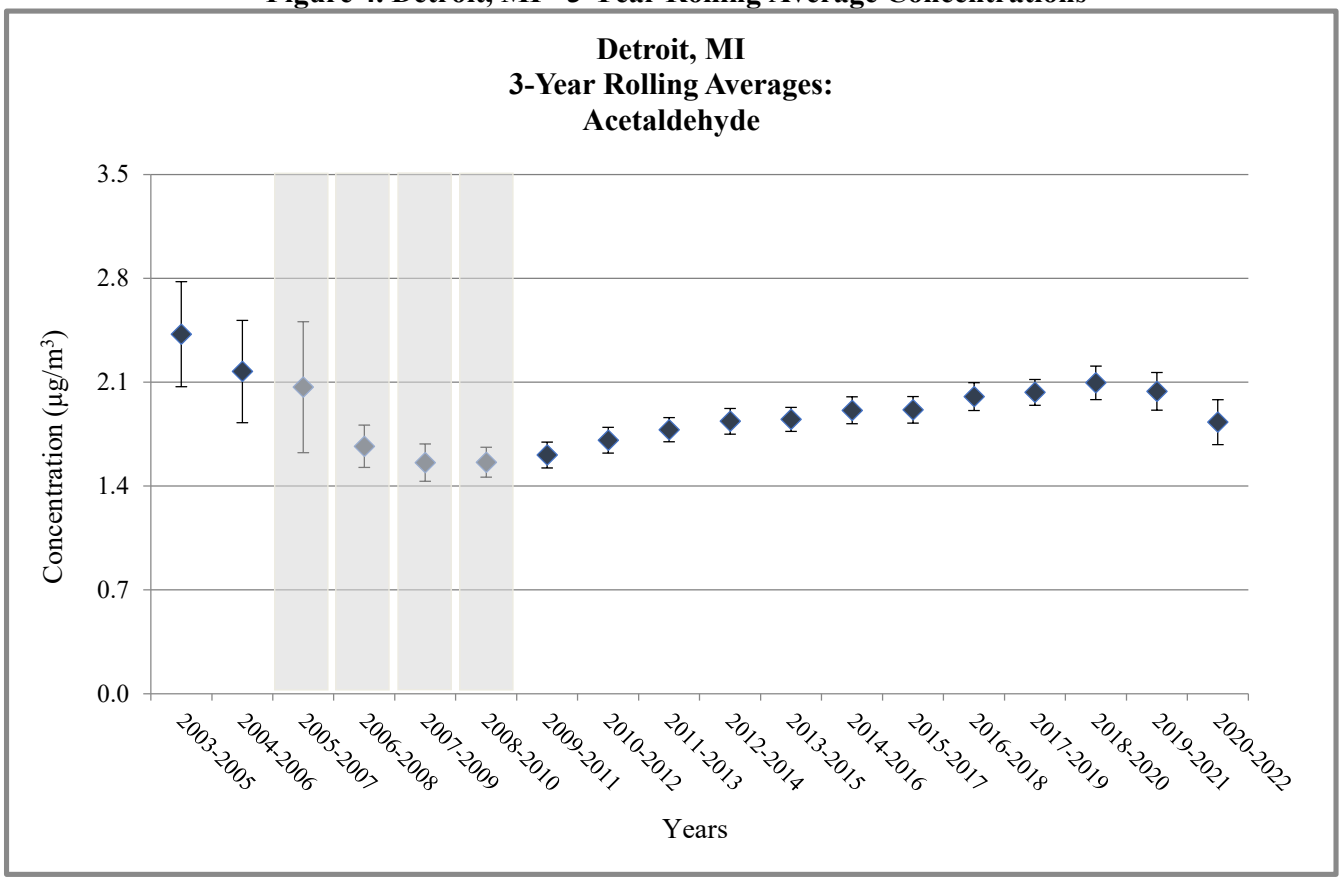
Sampling began midway through the year.
Does not meet MQO

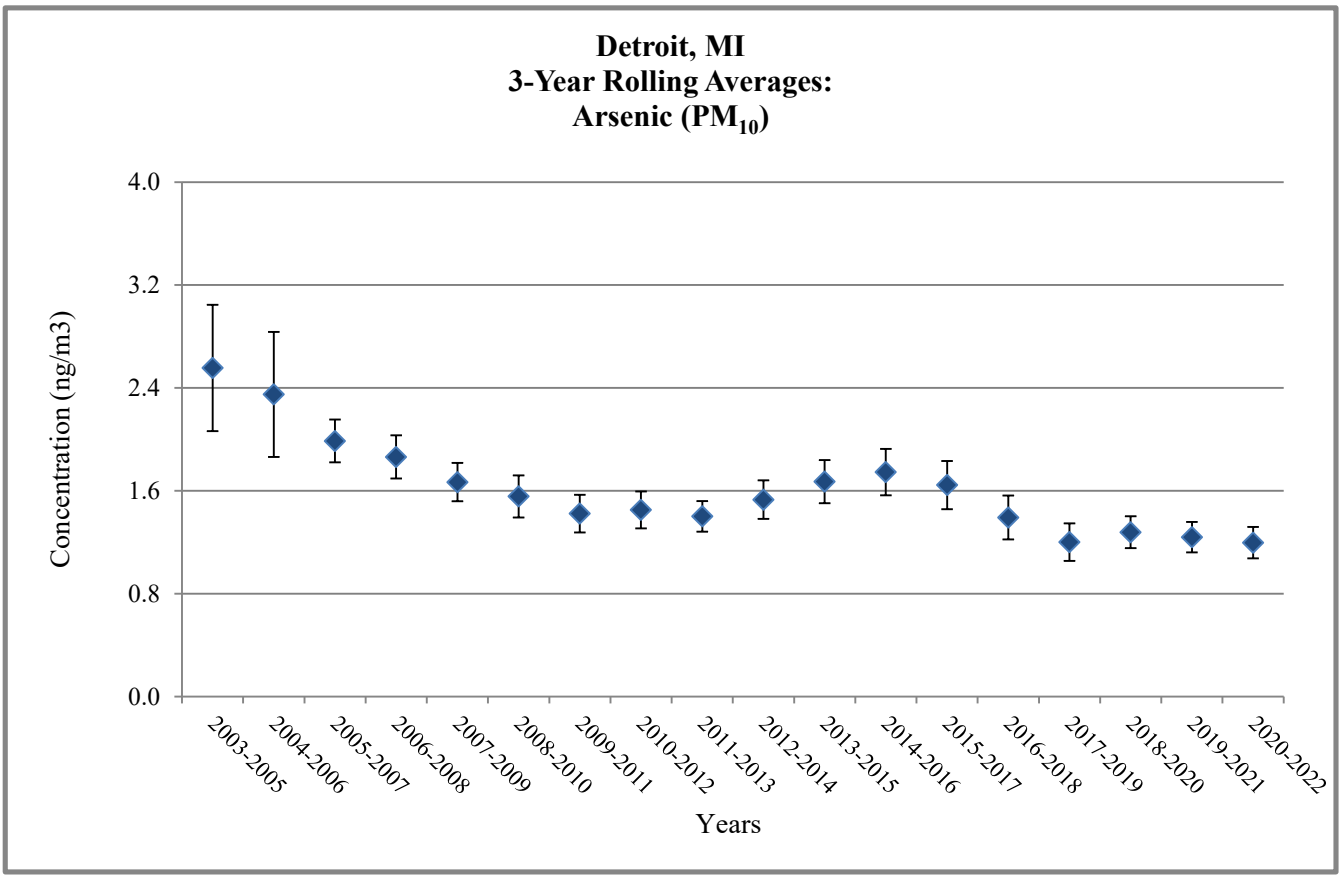
Figure 3. Detroit, MI Annual Average Concentrations



Sampling began midway through the year.
Does not meet MQO

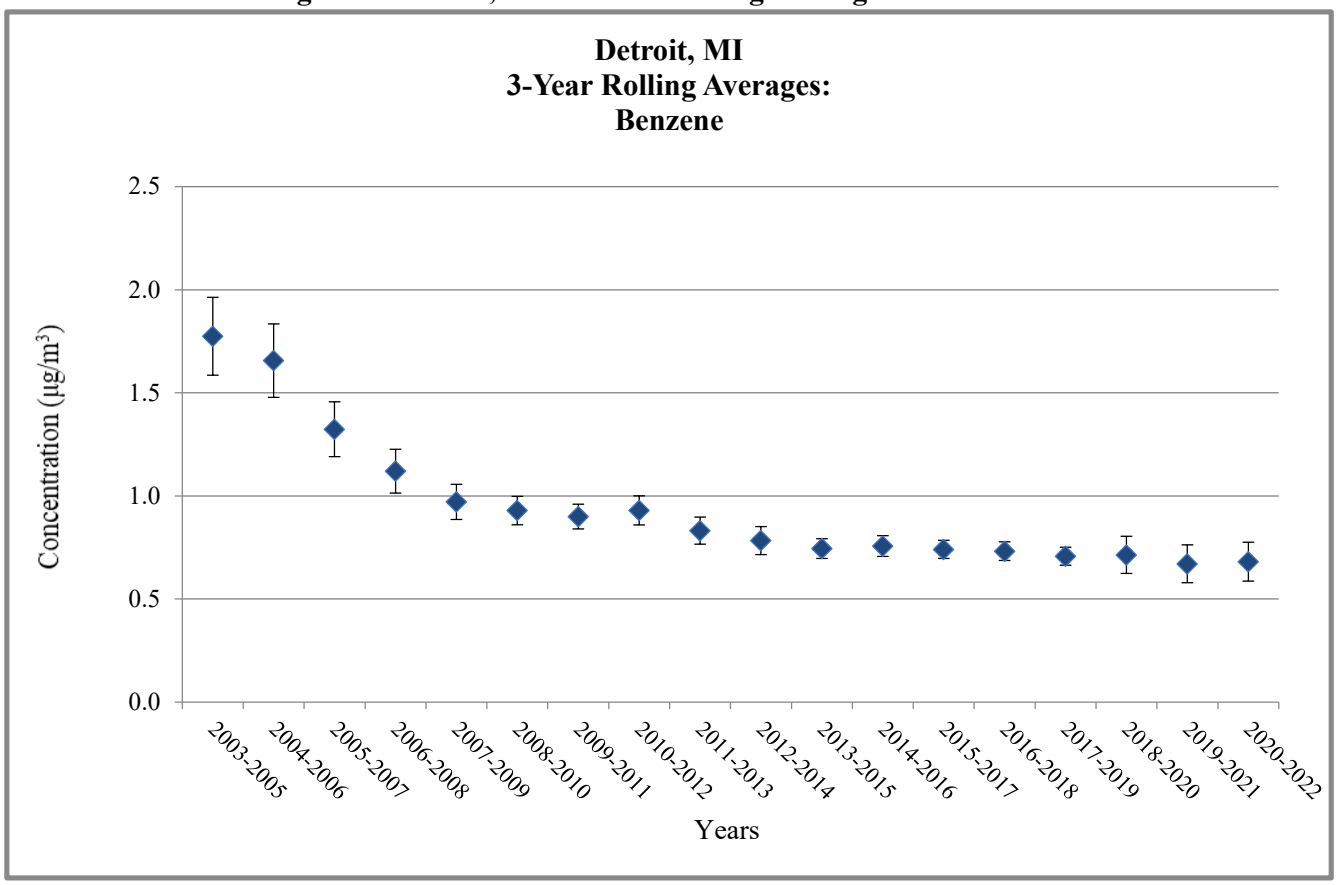
Figure 4. Detroit, MI - 3-Year Rolling Average Concentrations

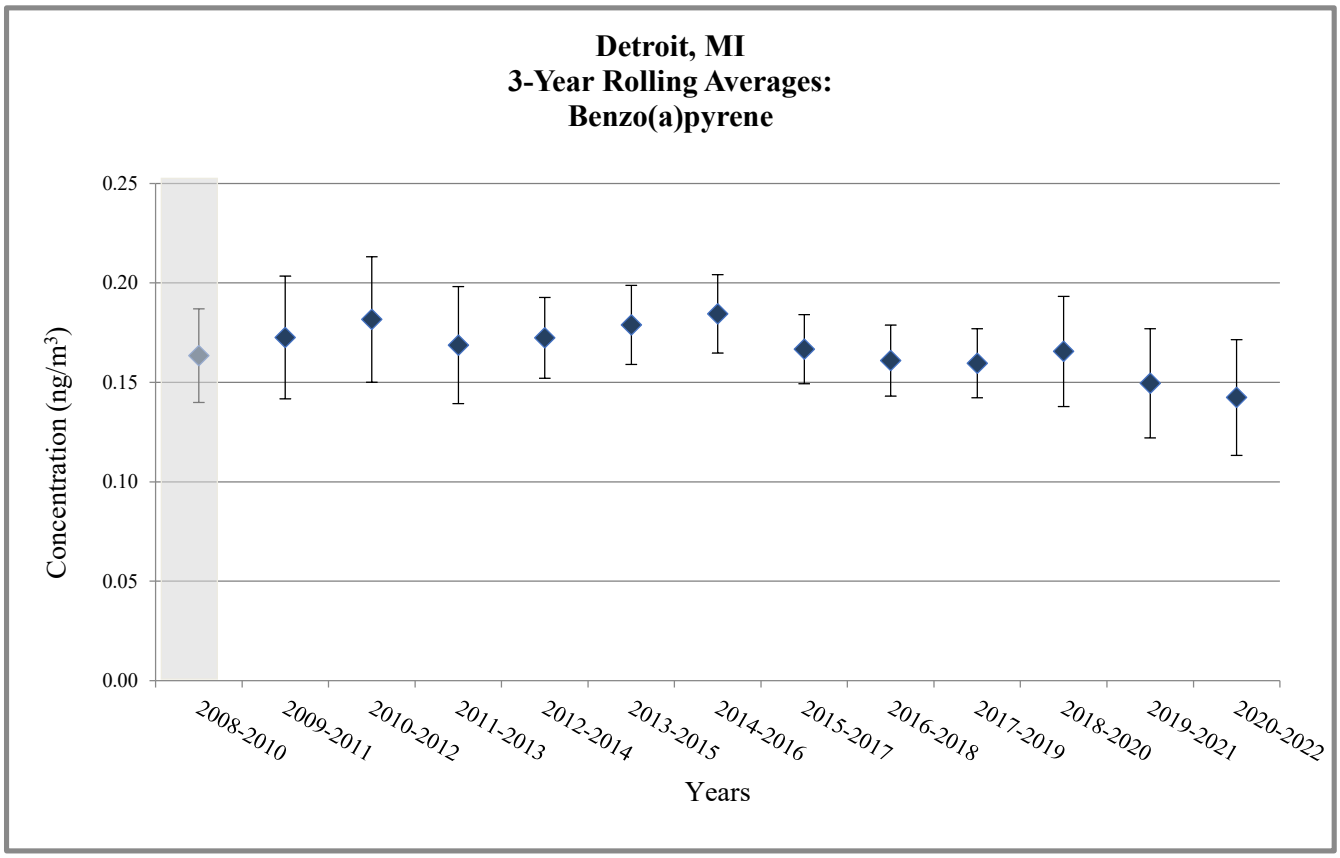




Does not meet MQO or wasn't able to collect enough samples

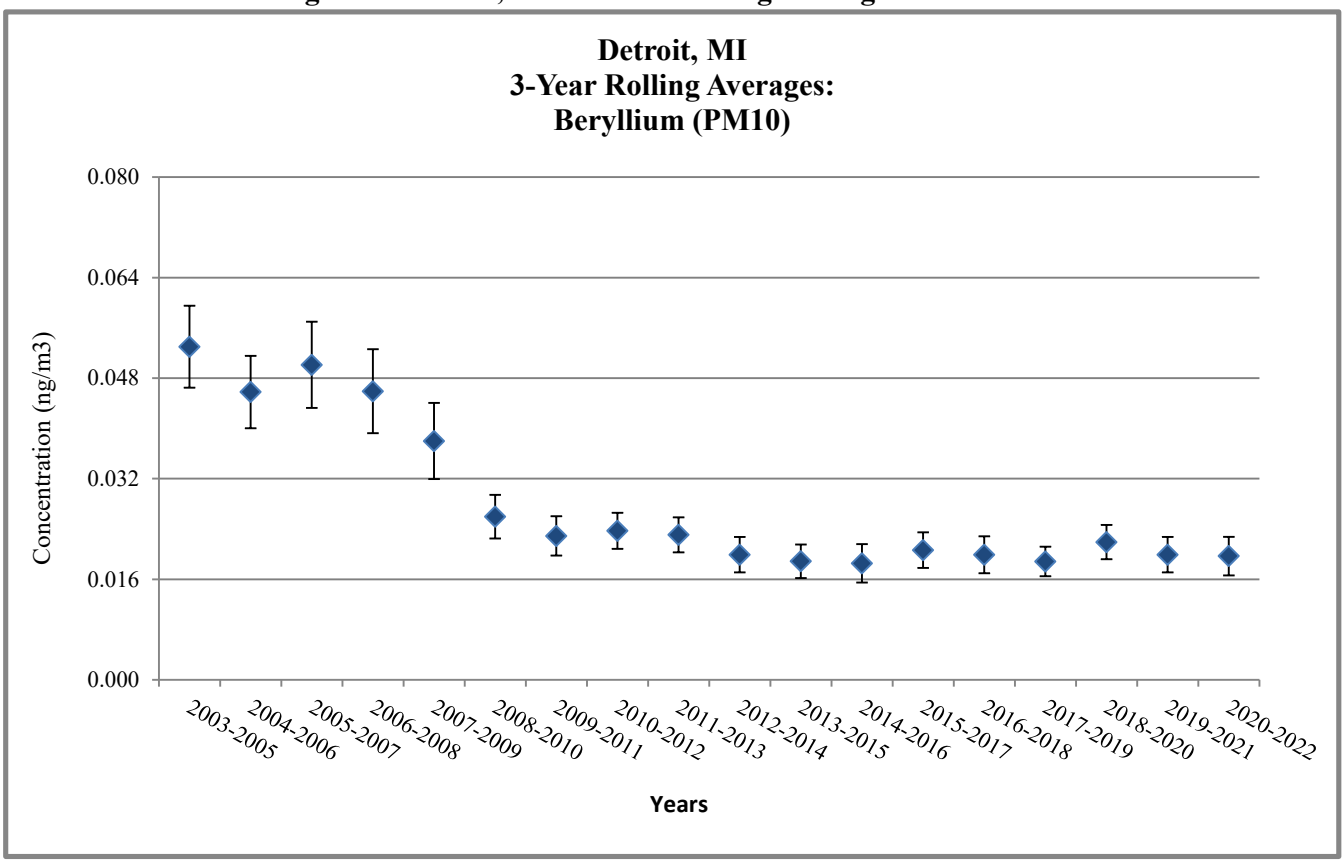
Figure 4. Detroit, MI - 3-Year Rolling Average Concentrations

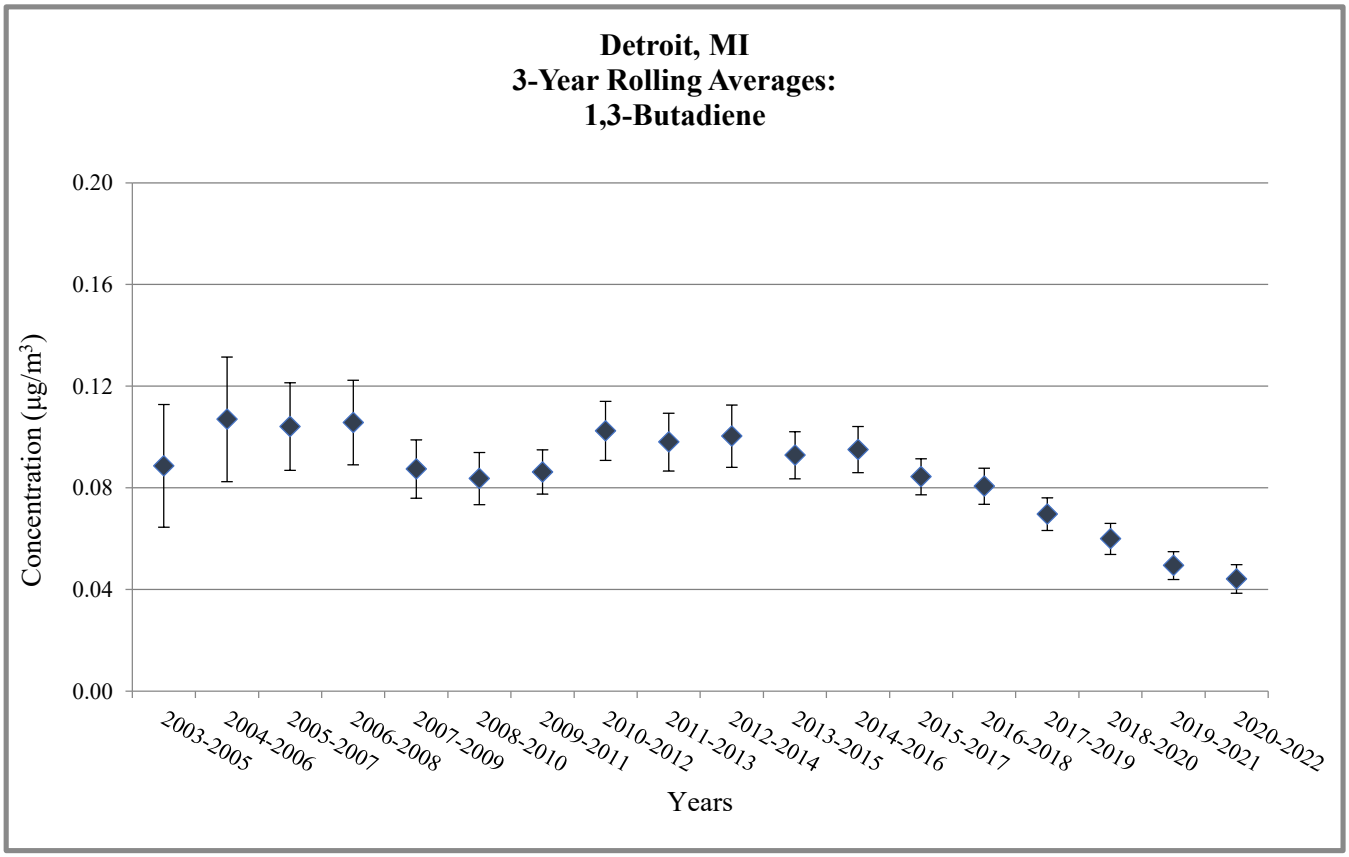




Does not meet MQO or wasn't able to collect enough samples

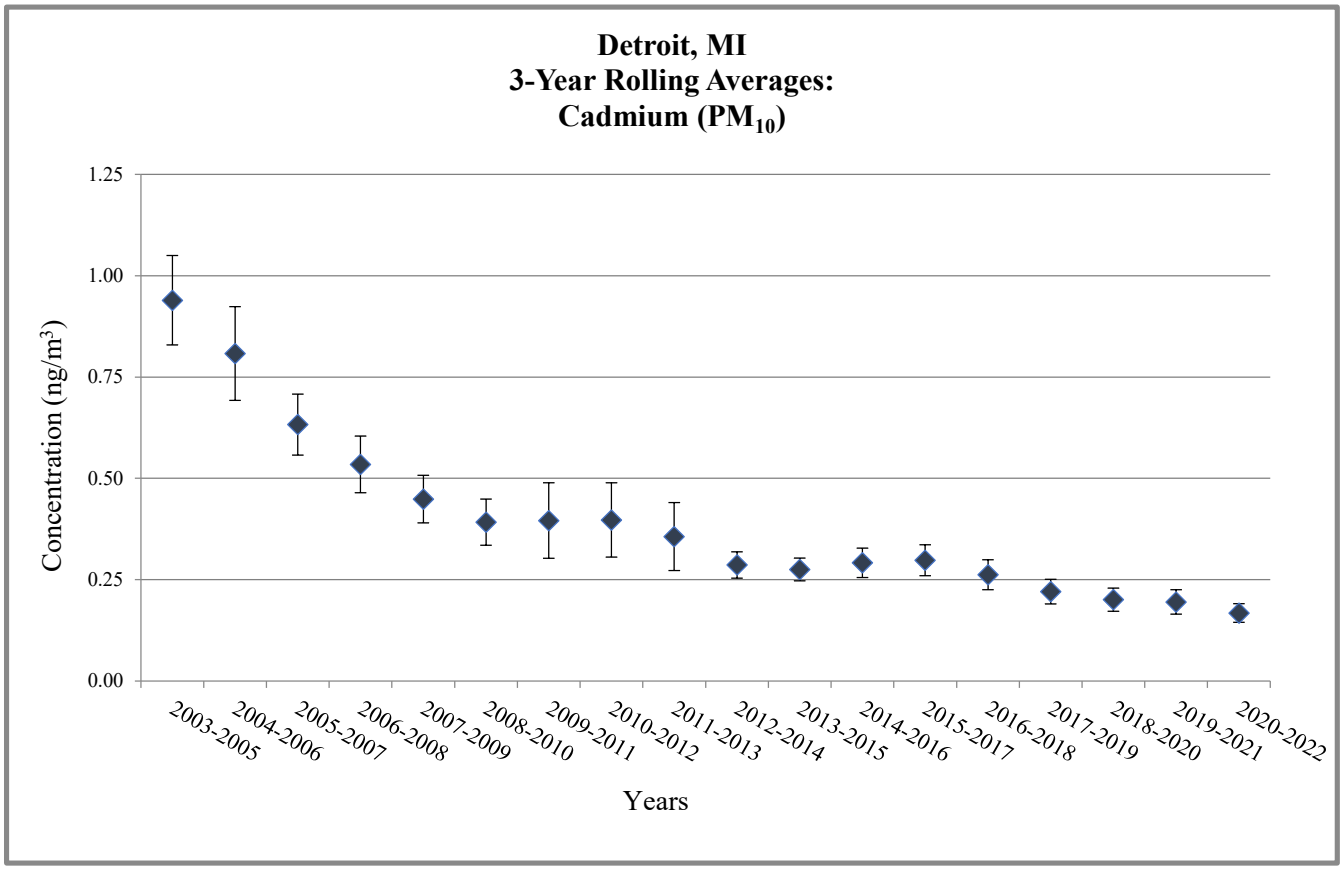
Figure 4. Detroit, MI - 3-Year Rolling Average Concentrations

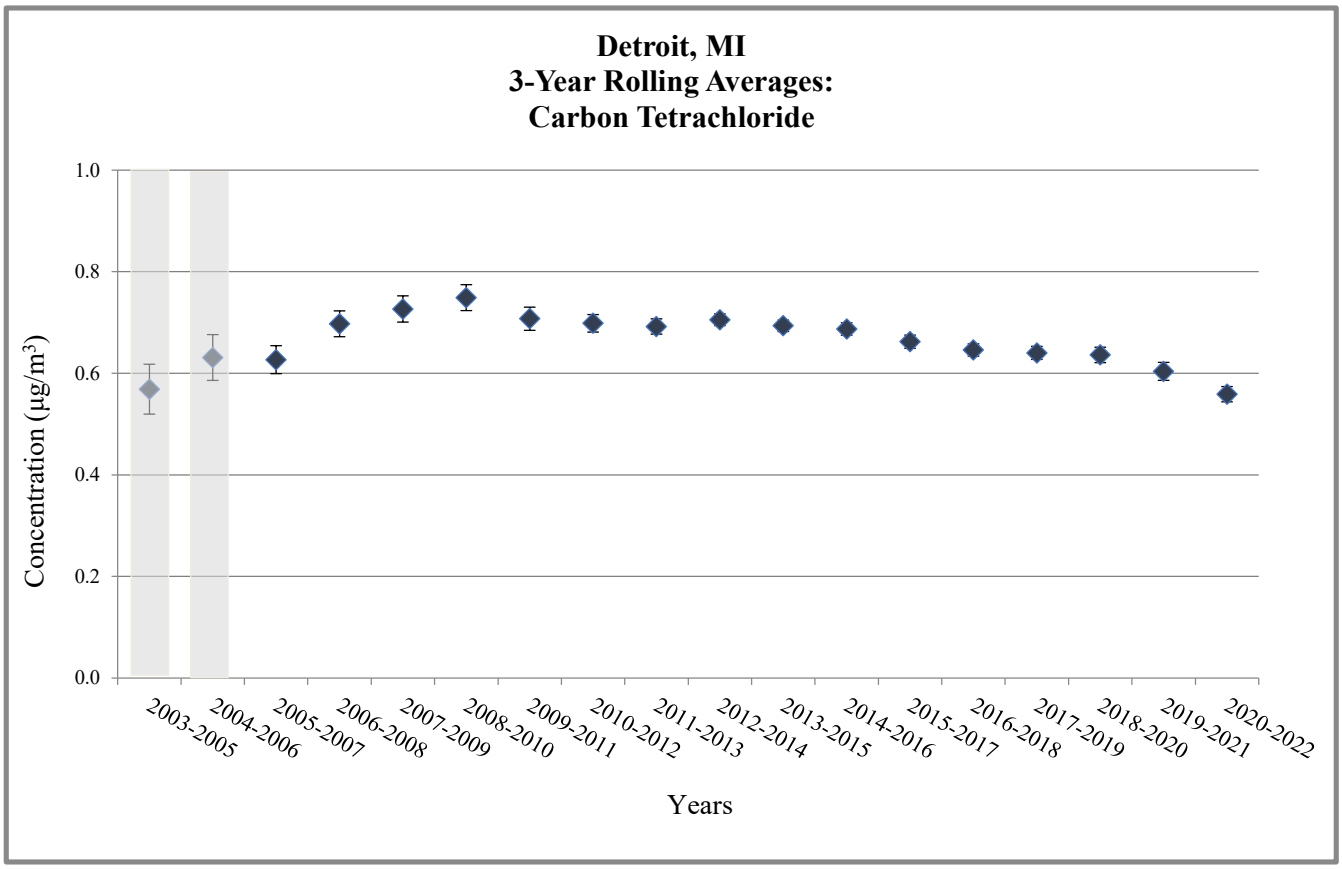




Does not meet MQO or wasn't able to collect enough samples

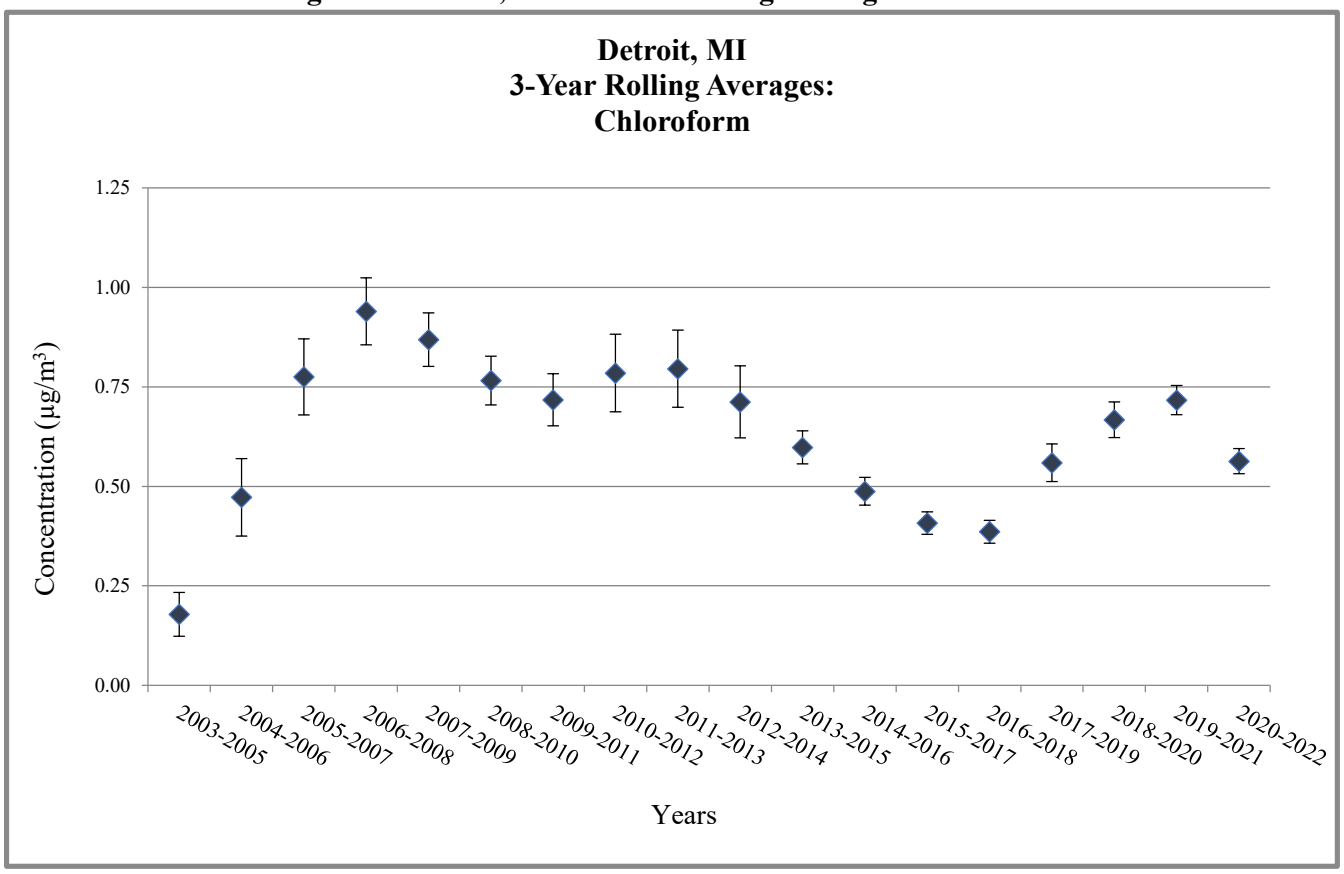
Figure 4. Detroit, MI - 3-Year Rolling Average Concentrations

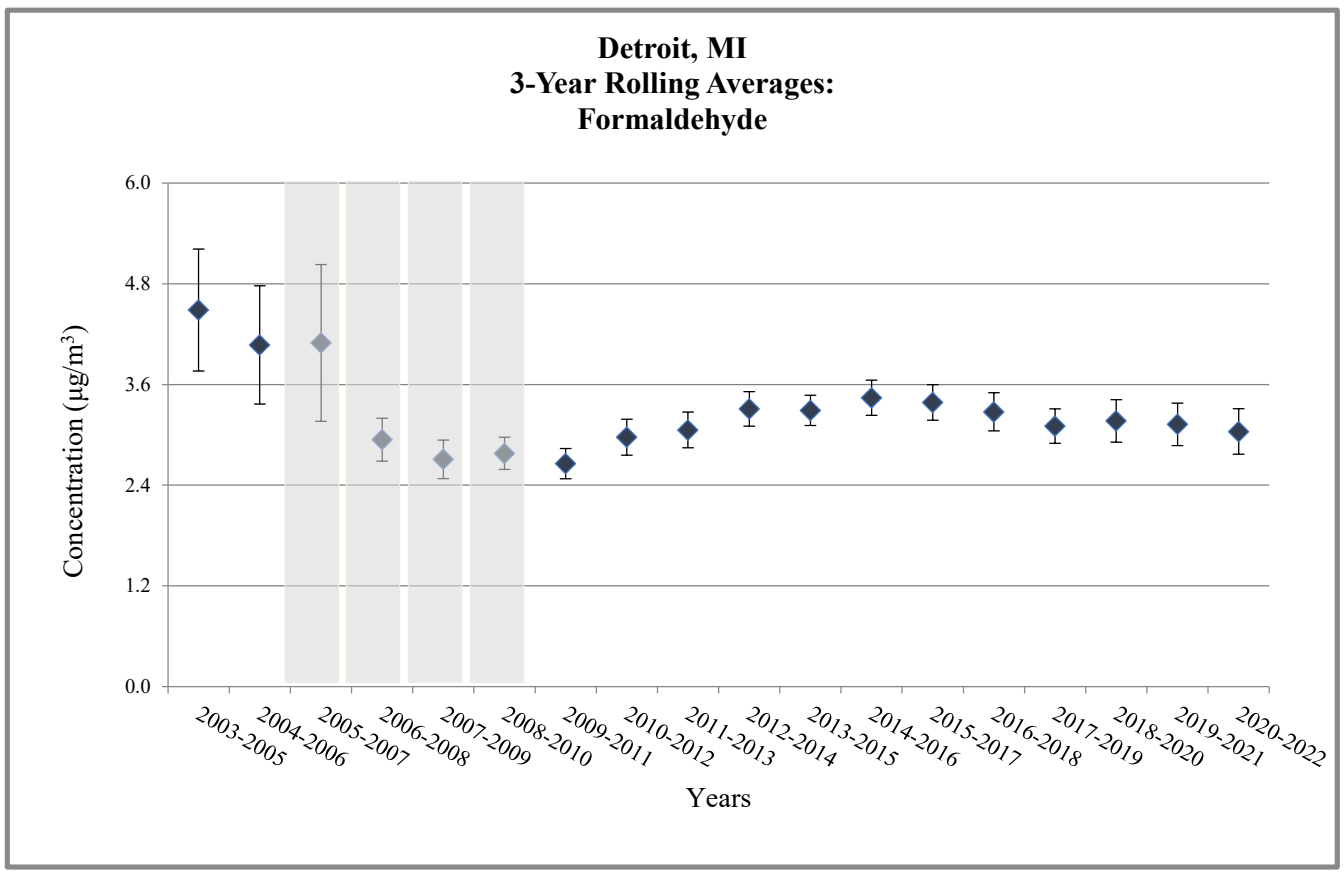




Does not meet MQO or wasn't able to collect enough samples

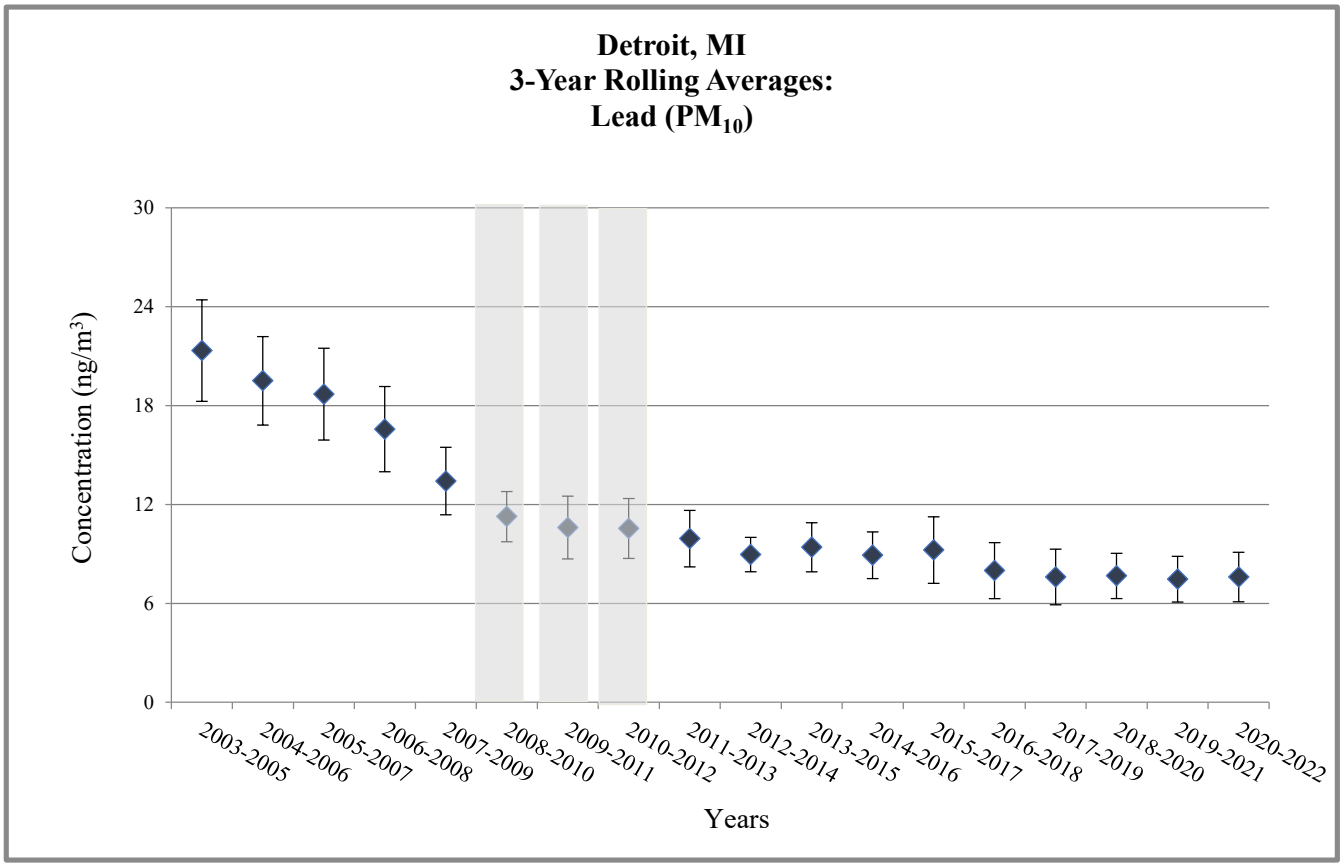
Figure 4. Detroit, MI - 3-Year Rolling Average Concentrations

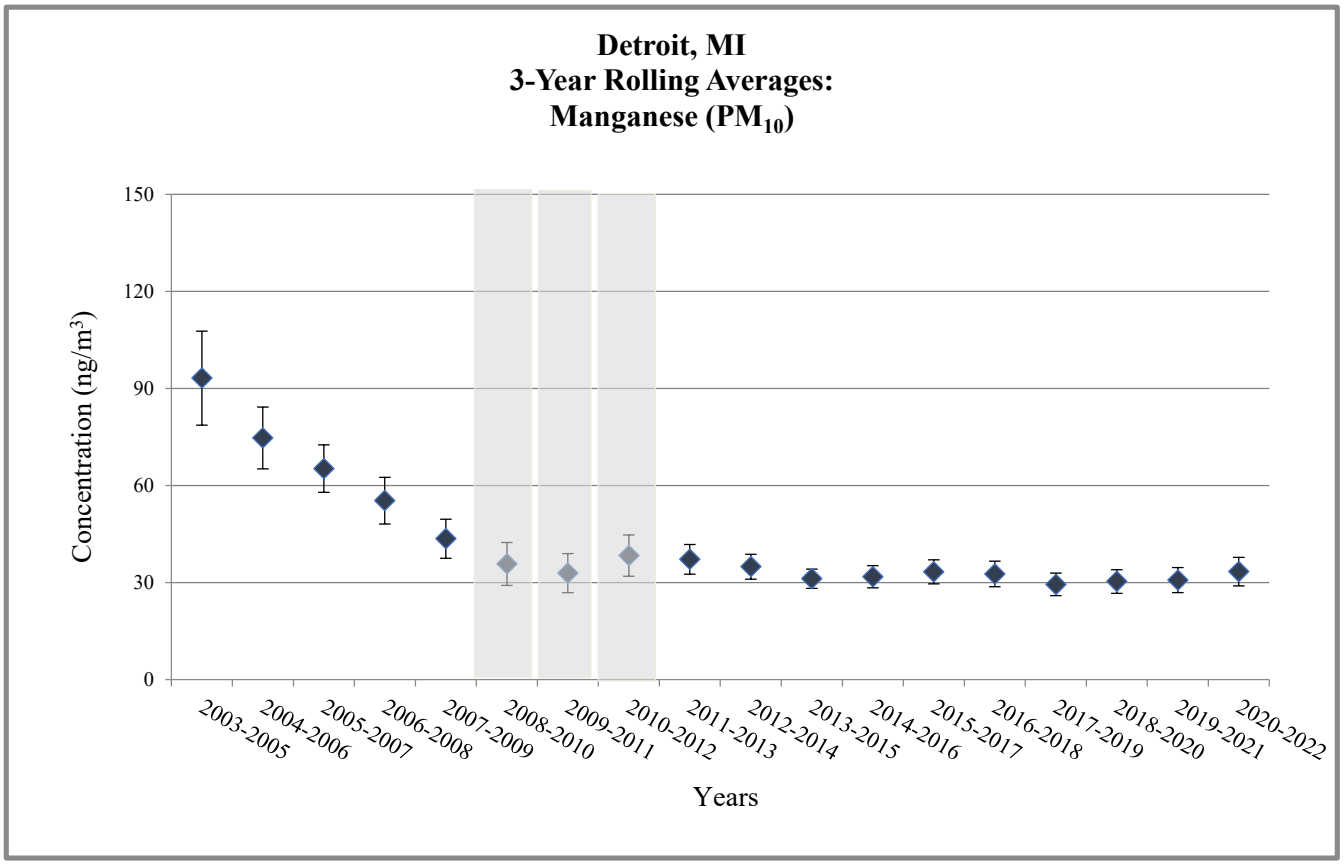




Does not meet MQO or wasn't able to collect enough samples

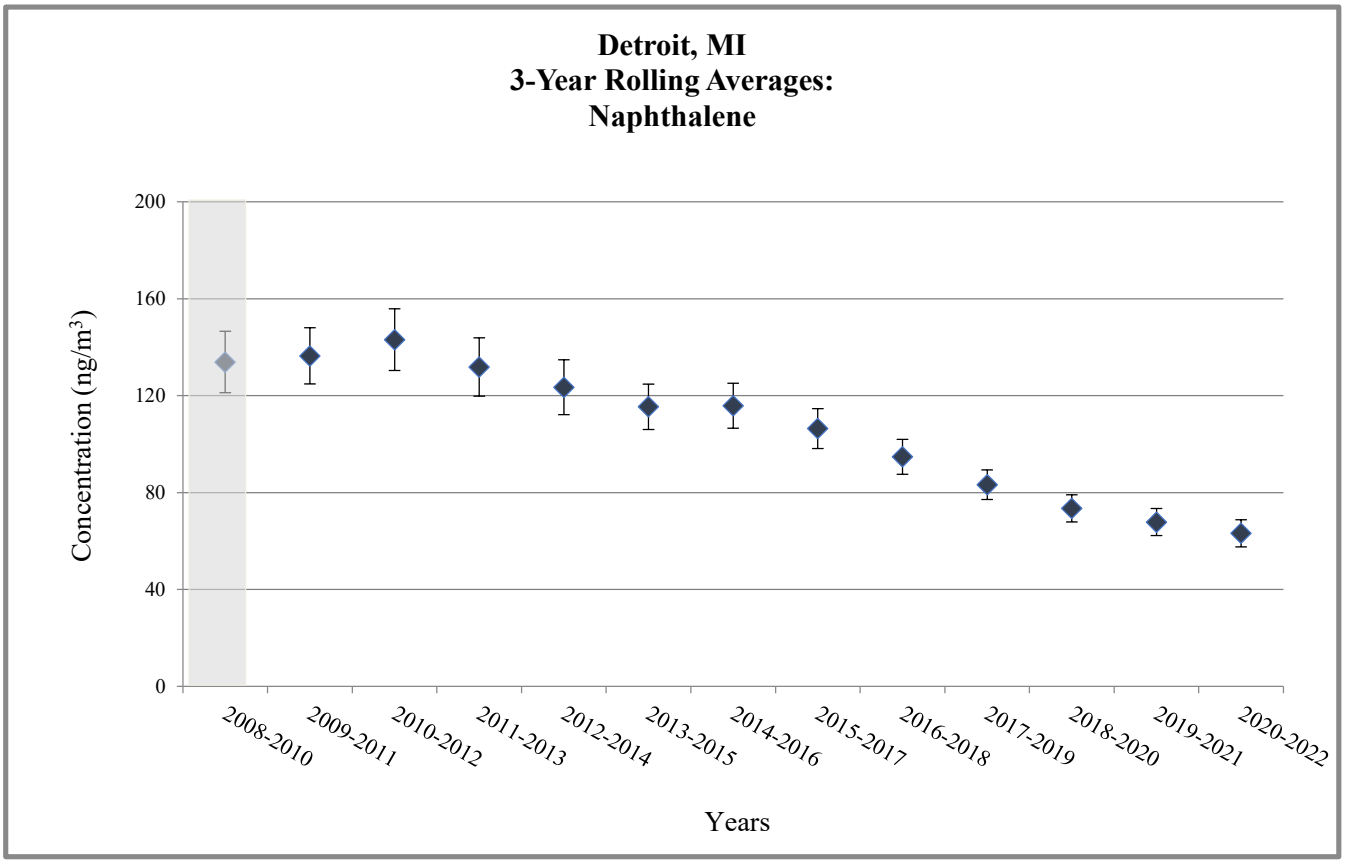
Figure 4. Detroit, MI - 3-Year Rolling Average Concentrations

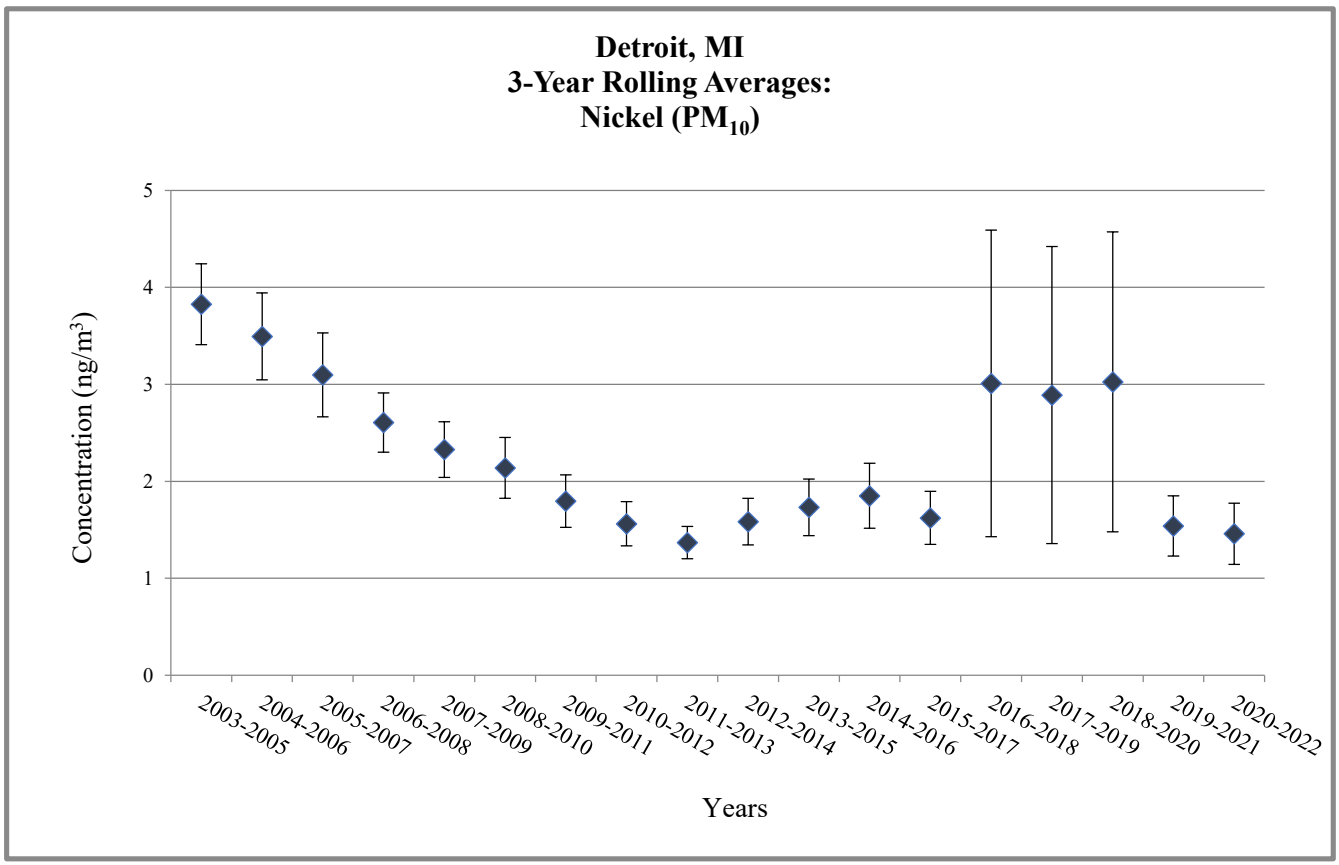




Does not meet MQO or wasn't able to collect enough samples

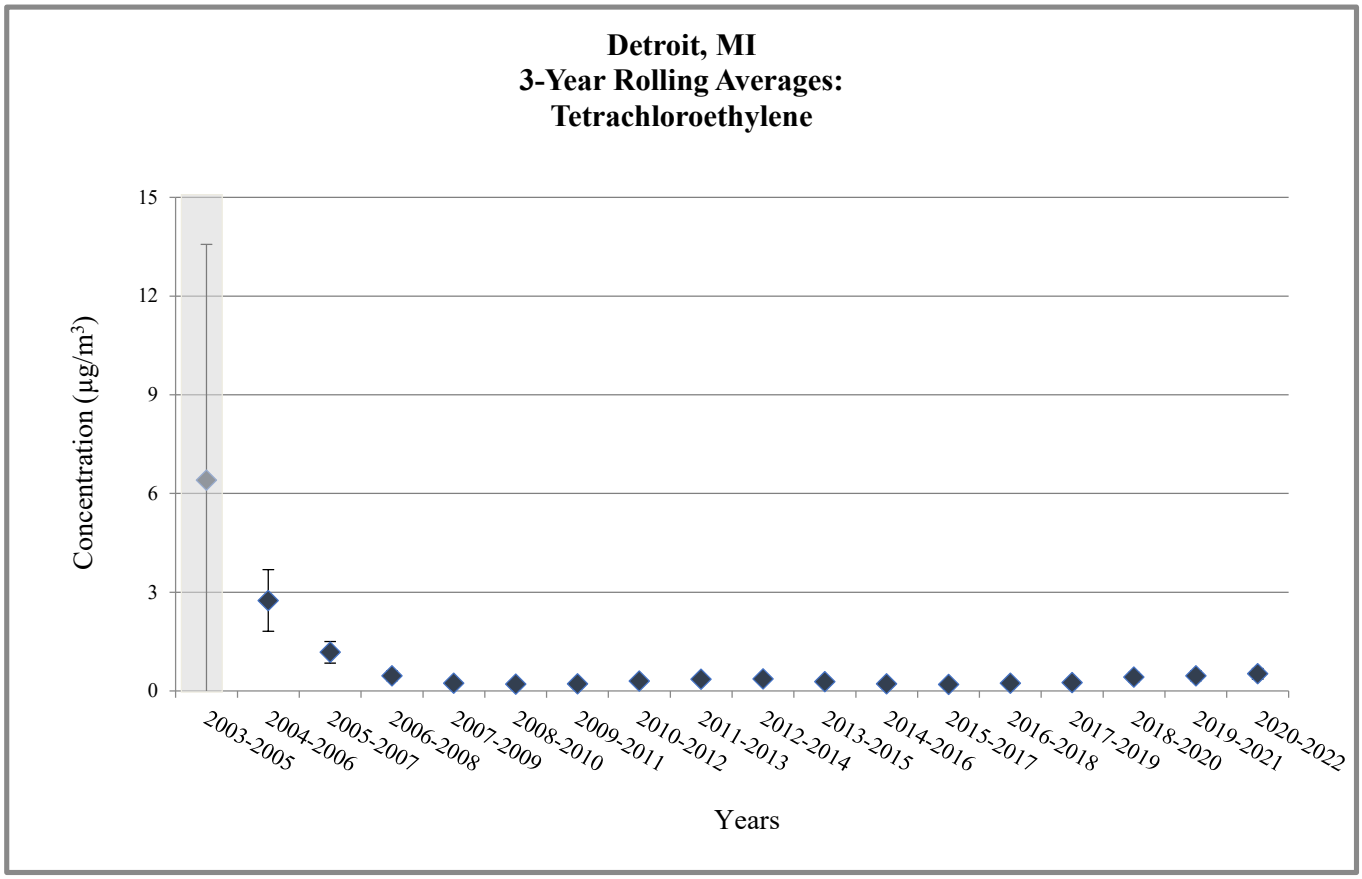
Figure 4. Detroit, MI - 3-Year Rolling Average Concentrations

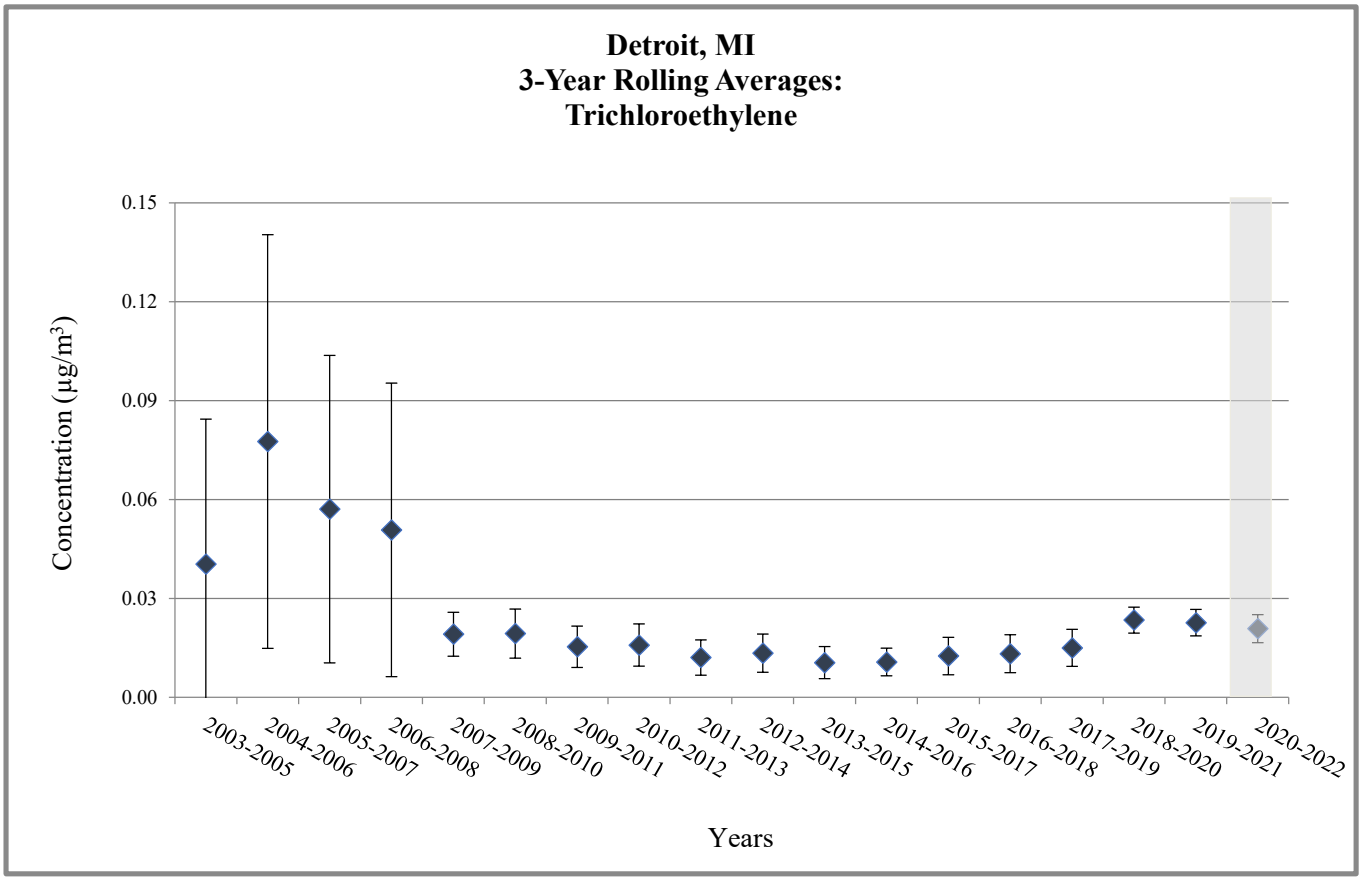




Does not meet MQO or wasn't able to collect enough samples

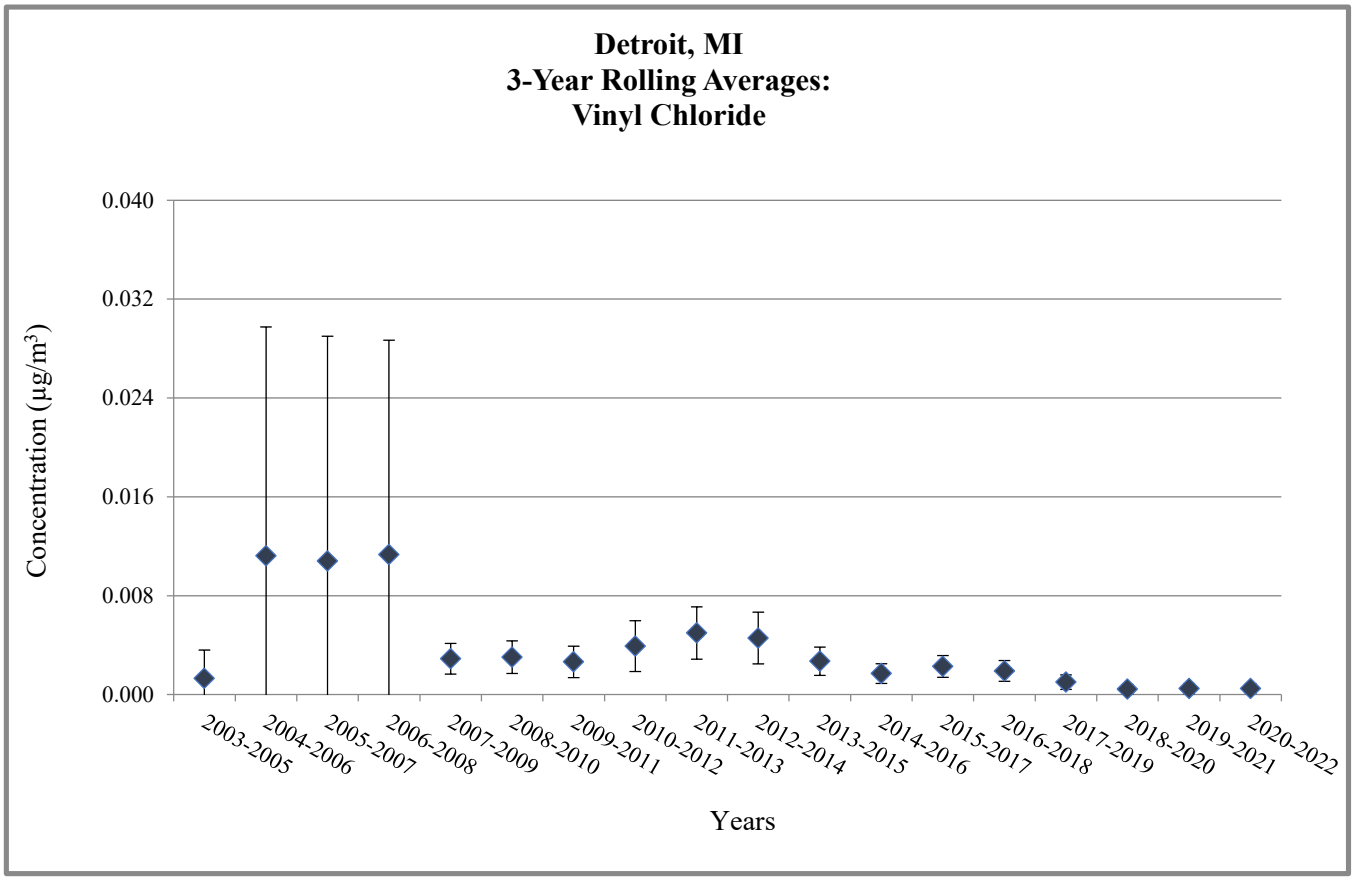
Figure 4. Detroit, MI - 3-Year Rolling Average Concentrations





Does not meet MQO or wasn't able to collect enough samples

Figure 4. Detroit, MI - 3-Year Rolling Average Concentrations



Does not meet MQO or wasn't able to collect enough samples

Table 6. NATTS Network Assessment: MQO#1 - Completeness Percentage at Detroit, MI

Year	Benzene	Butadiene, 1,3-	Carbon tetrachloride	Chloroform	Tetrachloroethylene	Trichloroethylene	Vinyl chloride	Acetaldehyde	Formaldehyde	Arsenic (PM10)	Beryllium (PM10)	Cadmium (PM10)	Lead (PM10)	Manganese (PM10)	Nickel (PM10)	Benzo(a)pyrene	Naphthalene
	VOCs							Carbonyls		PM10 Metals						PAHs	
Detroit, MI (AQS Site Code: 26-163-0033)																	
2003	85	85	85	85	66	85	85	90	90	102	98	102	102	98	102	--	--
2004	93	92	93	93	93	93	93	95	95	95	95	95	95	95	95	--	--
2005	87	87	87	87	87	87	87	95	95	100	100	100	100	100	100	--	--
2006	95	95	95	95	95	95	95	98	98	95	95	95	95	95	95	--	--
2007	98	98	98	98	98	98	98	20	20	125	125	125	125	125	125	--	--
2008	100	100	100	100	100	100	100	74	74	100	100	100	100	100	100	--a	--a
2009	97	97	97	97	97	97	97	97	97	102	102	102	102	102	102	100	100
2010	100	100	100	100	100	100	100	98	98	97	97	97	103	97	97	97	97
2011	103	103	103	103	103	103	103	102	102	100	100	100	100	100	100	98	98
2012	103	103	103	103	103	103	103	98	98	100	100	100	100	100	100	98	98
2013	102	102	102	102	102	102	102	100	100	108	108	108	98	108	108	98	98
2014	98	98	98	98	98	98	98	100	100	100	100	100	102	100	100	98	98
2015	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	103	103
2016	98	98	98	98	98	98	98	100	100	100	100	100	100	100	100	100	100
2017	98	98	98	98	98	98	98	97	97	100	100	100	100	100	100	97	97
2018	92	92	92	92	92	92	92	100	100	100	100	100	102	100	100	102	102
2019	95	95	95	95	95	95	95	98	98	108	108	108	107	108	108	92	92
2020	95	95	95	95	95	95	95	100	100	102	102	102	102	102	102	93	93
2021	82	82	82	82	80	80	82	97	97	100	100	100	100	100	100	90	90
2022	89	89	89	89	89	69	89	100	100	100	100	100	90	100	100	87	87

A-rated: ≥85%
B-rated: Between 75% to 85%
Does not meet: ≤75%
-- No data available

[a]: Scheduled sampling began midway through the year, thus, the site did not have the opportunity to collect enough samples to meet the 85% MQO.

Table 7. NATTS Network Assessment: MQO#2 - Reported Method Detection Limits (MDLs) at Detroit, MI

Year	Benzene	Butadiene, 1,3-	Carbon tetrachloride	Chloroform	Tetrachloroethylene	Trichloroethylene	Vinyl chloride	Acetaldehyde	Formaldehyde	Arsenic (PM10)	Beryllium (PM10)	Cadmium (PM10)	Lead (PM10)	Manganese (PM10)	Nickel (PM10)	Benzo(a)pyrene	Naphthalene
	VOCs							Carbonyls		PM10 Metals						PAHs	
Detroit, MI (AQS Site Code: 26-163-0033)																	
2003	1.12	2.00	1.06	0.32	1.59	0.43	0.71	0.03	0.02	0.01	0.05	0.02	0.002	0.03	0.12	--	--
2004	0.77	0.60	2.22	0.39	1.99	0.54	0.45	0.04	0.02	0.01	0.05	0.01	0.002	0.03	0.12	--	--
2005	0.49	1.02	1.18	0.27	0.80	0.43	0.93	0.04	0.02	0.01	0.05	0.01	0.002	0.03	0.07	--	--
2006	0.12	0.13	0.33	0.04	0.44	0.11	0.19	0.01	0.01	0.56	0.30	0.23	0.01	0.05	0.09	--	--
2007	0.59	0.40	0.56	0.17	0.44	0.19	0.56	0.01	0.01	0.49	0.26	0.20	0.01	0.05	0.08	--	--
2008	0.25	0.11	0.15	0.07	0.24	0.04	0.12	0.02	0.01	0.69	0.54	0.27	0.01	0.08	0.07	0.08	0.02
2009	0.15	0.07	0.07	0.02	0.12	0.02	0.05	0.02	0.01	0.70	0.54	0.27	0.01	0.08	0.07	0.07	0.01
2010	0.47	0.22	0.89	0.17	0.44	0.18	0.30	0.02	0.00	0.16	0.03	0.05	0.002	0.05	0.07	0.04	0.01
2011	0.71	0.15	0.89	0.09	0.72	0.27	0.19	0.02	0.01	0.16	0.03	0.05	0.002	0.05	0.07	0.04	0.004
2012	1.50	0.24	0.89	0.14	0.80	0.24	0.26	0.02	0.01	0.17	0.02	0.05	0.002	0.05	0.07	0.06	0.005
2013	0.47	0.24	0.59	0.15	0.56	0.43	0.26	0.02	0.17	0.04	0.02	0.05	0.002	0.01	0.02	0.06	0.01
2014	0.37	0.29	0.63	0.14	0.52	0.46	0.28	0.02	0.14	0.04	0.02	0.05	0.002	0.01	0.01	0.03	0.01
2015	0.96	0.31	0.37	0.16	0.56	0.46	0.19	0.02	0.17	0.04	0.01	0.02	0.002	0.01	0.01	0.13	0.01
2016	0.52	0.58	0.59	0.12	0.64	0.43	0.74	0.02	0.14	0.04	0.01	0.02	0.002	0.01	0.03	0.06	0.03
2017	0.64	0.44	0.85	0.19	1.24	0.94	0.40	0.08	0.69	0.04	0.02	0.02	0.02	0.01	0.03	0.03	0.07
2018	0.36	0.43	0.49	0.13	0.58	0.40	0.30	0.08	0.69	0.04	0.14	0.02	0.02	0.01	0.03	0.01	0.06
2019	0.24	0.24	0.40	0.08	0.35	0.33	0.24	0.07	0.64	0.04	0.01	0.02	0.002	0.01	0.02	0.02	0.04
2020	0.24	0.24	0.40	0.08	0.49	0.24	0.24	0.07	0.57	0.27	0.02	0.03	0.01	0.06	0.57	0.02	0.03
2021	0.25	0.26	0.41	0.07	0.49	0.24	0.20	0.07	0.56	0.27	0.02	0.03	0.01	0.06	0.56	0.01	0.03
2022	0.25	0.37	0.41	0.07	0.73	0.33	0.18	0.08	0.58	0.13	0.05	0.05	0.004	0.06	1.18	0.01	0.03

A-rated: MDL to Target MDL ratio ≤ 1

B-rated" MDL to Target MDL ratio between 1 and 2

Does Not Meet MDL to Target MDL ratio>2

-- No data available

Table 8. NATTS Network Assessment: MQO#3 - Bias Percent Difference at Detroit, MI

Year	Benzene	Butadiene, 1,3-	Carbon tetrachloride	Chloroform	Tetrachloroethylene	Trichloroethylene	Vinyl chloride	Acetaldehyde	Formaldehyde	Arsenic (PM10)	Beryllium (PM10)	Cadmium (PM10)	Lead (PM10)	Manganese (PM10)	Nickel (PM10)	Benzo(a)pyrene	Naphthalene
	VOCs							Carbonyls		PM10 Metals						PAHs	
Detroit, MI (AQS Site Code: 26-163-0033)																	
2004	-5.6	10.4	32.2	-6.4	-2.1	10.7	-5.4	18.0	4.7	-24.9	-33.0	-23.8	-17.9	-15.8	-16.5	--	--
2005	7.5	-1.3	15.9	2.5	-3.7	-1.4	-5.9	5.4	4.7	2.8	-16.4	-12.2	-3.7	-2.9	0.1	--	--
2006	-2.8	4.8	-6.2	-11.4	-11.1	0.8	1.9	4.1	1.0	0.6	6.5	-5.6	-0.2	4.2	-2.6	--	--
2007	-5.8	2.5	10.4	9.1	-3.7	5.5	1.1	-1.9	-3.2	0.0	9.3	-3.0	-8.3	-0.7	-12.8	--	--
2008	-1.5	7.8	16.5	4.3	0.0	5.3	-14.1	24.6	14.4	-14.4	-11.8	-11.6	-10.3	-19.8	-4.2	--a	--a
2009	6.2	-0.5	1.9	5.4	1.1	2.7	-0.1	-10.1	-7.8	-22.7	-11.9	-17.9	-32.2	-11.3	-18.6	-1.7	-7.7
2010	-13.2	-3.7	31.6	1.0	-16.1	-6.4	-14.1	0.7	-2.8	-2.0	0.0	-10.6	47.4	98.0	2.0	-2.3	-17.1
2011	10.2	10.9	25.4	-9.7	0.8	-8.3	0.3	3.0	-3.4	--b	--b	--b	--b	--b	--b	-2.1	-13.9
2012	--a	--a	--a	--a	--a	--a	--a	--a	--a	-7.5	-6.0	-9.4	-1.0	-2.2	-17.5	25.2	21.4
2013	-3.3	0.6	13.3	-2.4	-9.5	3.0	-8.1	0.1	-0.5	-6.7	-1.6	-3.8	5.2	-12.9	-15.9	-5.7	25.5
2014	18.1	-8.1	24.2	8.5	-1.8	-0.3	10.0	-4.3	-2.2	-8.7	--c	--c	0.5	--d	--e	-16.3	0.7
2015	-5.3	-22.0	40.2	10.3	-14.6	-10.0	-7.1	--a	--a	--a	--a	--a	--a	--a	--a	-14.2	-11.4
2016	5.2	-10.1	53.5	8.1	-5.5	-9.5	1.5	-5.4	-19.1	-6.0	-20.5	-12.0	-8.3	-17.4	17.5	-10.5	-9.5
2017	14.6	3.9	26.5	9.2	13.0	9.6	-3.3	3.6	-5.3	8.6	-17.2	-6.8	-6.5	1.2	23.6	-22.4	-11.6
2018	-11.8	-6.6	0.0	-7.5	-3.8	-14.6	-2.7	-8.7	-3.7	-4.1	0.6	-7.9	-6.3	9.2	17.3	-14.8	-20.7
2019	18.5	2.2	23.8	11.2	13.5	8.4	3.5	-3.1	-5.8	-1.0	0.0	-4.6	-12.5	-3.4	3.8	29.3	18.5
2020	-1.6	-11.6	16.4	4.9	6.8	-4.9	-3.7	1.6	-1.9	0.9	0.6	-1.4	2.7	7.0	-0.7	13.1	15.8
2021	1.5	1.2	12.1	9.0	10.3	5.9	6.7	-9.5	-11.2	-3.1	0.2	-5.6	1.7	1.5	-4.1	0.1	-2.0
2022	9.7	-19.3	6.9	2.0	5.6	-1.0	-8.6	-1.5	-1.0	--a	--a	--a	--a	--a	--a	--a	--a

A-rated:±25%

B-rated: Between 25% to 35% or between -25% to -35%

Does not meet:>35% or <35%

-- No data available

[a]: No Proficiency Test samples were sent for this pollutant and year.

[b]: Pollutant was sampled at this site and year, but no bias data were reported.

[c]: The Proficiency Test sample for this pollutant was 0; the site reported a concentration as "< MDL", rather than 0. EPA accepted this result.

[d]: The site reported an upper value that was greater than 25% difference for this pollutant, but less than 35%. EPA accepted this result.

[e]: Although a Proficiency Test sample was sent to the lab supporting this site and year, the results were nullified by EPA due to QA issues.

Table 9. NATTS Network Assessment: MQO#4 - Overall Method Precision %CV at Detroit, MI

Year	Benzene	Butadiene, 1,3-	Carbon tetrachloride	Chloroform	Tetrachloroethylene	Trichloroethylene	Vinyl chloride	Acetaldehyde	Formaldehyde	Arsenic (PM10)	Beryllium (PM10)	Cadmium (PM10)	Lead (PM10)	Manganese (PM10)	Nickel (PM10)	Benzo(a)pyrene	Naphthalene
	VOCs							Carbonyls		PM10 Metals						PAHs	
Detroit, MI (AQS Site Code: 26-163-0033)																	
2003	6.4	11.0	10.5	--a	6.6	--a	--a	25.7	26.6	15.7	29.9	32.1	21.0	28.7	21.0	--	--
2004	33.4	25.1	9.0	15.7	31.1	--a	--a	11.1	23.9	9.9	17.0	24.6	8.3	33.1	15.3	--	--
2005	19.7	25.3	13.5	60.5	24.5	--a	--a	23.2	30.1	10.0	20.8	25.9	8.6	32.7	18.6	--	--
2006	16.5	16.1	26.6	47.9	23.9	0.0	--a	26.2	27.9	20.3	21.6	20.4	30.9	31.0	32.6	--	--
2007	17.3	3.2	6.7	44.8	4.5	--a	--a	4.4	16.9	10.9	27.2	10.9	8.4	24.8	10.9	--	--
2008	3.9	9.7	5.7	40.1	5.2	10.5	--a	4.0	9.9	9.3	--a	7.5	13.3	26.1	27.2	21.5	7.1
2009	9.3	10.5	3.8	39.4	6.9	15.5	0.0	3.8	5.3	12.2	--a	11.7	10.5	7.8	20.3	13.8	5.3
2010	5.2	2.0	6.1	45.8	2.0	5.5	--a	7.8	5.8	19.3	15.5	20.5	27.6	42.8	34.5	7.9	3.0
2011	4.2	6.7	7.9	34.7	6.0	--a	--a	10.1	11.7	8.4	8.7	26.0	19.4	26.0	33.4	4.4	8.6
2012	7.8	5.6	7.0	29.0	4.7	--a	--a	6.6	11.2	10.2	22.2	10.7	22.0	6.8	9.3	14.9	6.0
2013	28.1	12.1	8.9	49.0	15.0	--	--	6.8	8.9	16.1	29.1	21.0	30.1	12.7	10.7	11.6	6.2
2014	10.3	2.7	2.4	27.6	8.1	--a	--a	12.0	8.4	20.6	30.2	18.5	23.1	16.1	20.0	7.6	11.2
2015	--	--	--	--	--	--	--	7.7	8.8	19.1	25.1	18.7	12.3	8.2	12.0	13.0	4.9
2016	--	--	--	--	--	--	--a	22.1	14.4	9.9	28.0	11.3	13.3	8.9	8.2	5.5	4.3
2017	4.8	7.0	8.3	14.1	4.0	--a	--a	14.9	9.7	38.2	51.0	49.6	32.6	45.6	42.3	13.3	2.6
2018	12.2	11.6	5.0	24.9	1.9	--a	--a	6.3	10.6	12.1	17.7	12.3	8.7	7.9	44.3	8.4	8.4
2019	4.7	2.8	3.3	49.3	4.5	--a	--a	12.8	8.5	6.9	21.5	11.6	13.8	18.5	7.1	4.5	2.8
2020	2.1	11.9	3.6	23.2	5.8	--a	--a	46.5	47.5	6.1	21.9	10.4	9.1	12.3	3.7	15.1	8.2
2021	3.9	4.8	49.4	38.4	1.2	--a	--a	22.9	18.3	20.0	45.6	32.5	24.3	26.5	6.0	5.4	7.6
2022	9.4	--a	10.6	32.3	7.8	--a	--a	3.1	6.3	9.8	28.7	18.3	6.7	24.2	2.8	51.7	26.0

Green = precision ≤ 15%

Yellow = precision > 15% to ≤ 25%

Red = precision > 25%

-- Gray = dataset was not rated

[a]: The primary and/or replicate value were less than the MDL, so no calculation could be made.

Table 10. NATTS Network Assessment: MQO#4 - Analytical Method Precision %CV at Detroit, MI

Year	Benzene	Butadiene, 1,3-	Carbon tetrachloride	Chloroform	Tetrachloroethylene	Trichloroethylene	Vinyl chloride	Acetaldehyde	Formaldehyde	Arsenic (PM10)	Beryllium (PM10)	Cadmium (PM10)	Lead (PM10)	Manganese (PM10)	Nickel (PM10)	Benzo(a)pyrene	Naphthalene
	VOCs							Carbonyls		PM10 Metals						PAHs	
Detroit, MI (AQS Site Code: 26-163-0033)																	
2003	12.1	20.1	4.8	--a	16.1	--a	--	1.6	1.0	--	--	--	--	--	--	--	--
2004	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2005	7.6	7.7	6.2	0.0	3.4	--a	--a	1.0	0.6	--	--	--	--	--	--	--	--
2006	4.8	13.6	5.6	4.7	2.7	0.0	0.0	0.4	0.6	--	--	--	--	--	--	--	--
2007	3.9	2.4	3.2	4.7	5.2	--a	--a	0.9	0.6	--	--	--	--	--	--	--	--
2008	6.1	13.8	3.1	7.2	4.5	12.9	--a	0.5	0.8	--	--a	--	--	--	--	3.5	1.3
2009	2.2	5.1	4.6	4.7	5.0	0.0	0.0	0.1	0.5	--	--	--	--	--	--	4.3	0.9
2010	2.6	11.7	1.8	5.5	4.4	3.2	--	0.5	0.5	--	--	--	--	--	--	1.5	0.7
2011	7.6	7.5	7.1	3.7	4.6	--a	--	0.4	1.4	--	--	--	--	--	--	4.2	2.1
2012	5.5	5.2	5.1	4.4	4.2	--a	--a	0.7	1.3	--b	--b	--b	--b	--b	--b	3.0	2.4
2013	3.1	7.6	5.2	5.4	6.5	--b	--b	0.6	0.6	--b	--b	--b	--b	--b	--b	3.5	2.7
2014	3.2	4.7	2.2	2.9	3.4	--a	--b	0.4	0.8	--b	--b	--b	--b	--b	--b	3.3	2.4
2015	18.7	9.4	5.2	22.0	7.0	--a	--a	7.0	7.2	--b	--b	--b	--b	--b	--b	3.8	0.7
2016	12.6	12.5	7.4	18.7	4.7	--a	--a	22.0	11.6	--b	--b	--b	--b	--b	--b	0.7	2.6
2017	8.0	9.1	12.2	7.5	3.9	--a	--a	0.7	0.6	--b	--b	--b	--b	--b	--b	1.2	1.3
2018	6.2	8.9	3.7	5.3	4.4	--a	--a	0.5	0.5	--b	--b	--b	--b	--b	--b	1.0	2.1
2019	7.4	9.8	5.9	9.1	5.8	--a	--a	0.5	0.7	--b	--b	--b	--b	--b	--b	1.0	1.6
2020	2.0	3.6	9.0	3.9	1.3	0.5	--a	0.5	0.4	--b	--b	--b	--b	--b	--b	2.2	0.6
2021	0.9	6.0	0.8	1.3	1.1	--a	--a	0.4	0.5	--b	--b	--b	--b	--b	--b	1.7	0.3
2022	12.2	1.0	11.8	12.2	7.1	--a	--a	0.8	1.8	--b	--b	--b	--b	--b	--b	1.1	0.2

A-rated:≤ 15% CV

B-rated: Between 15%CV to25% CV

Does Not Meet: >25% CV or did not report Precision (required in the NATTS Workplan Template since 2012)

-- No data available

[a]: The primary and/or replicate value were less than the MDL, so no calculation could be made.

[b]: Per the NATTS Workplan template, analytical replicates were required to be reported to AQS for this sampling year.

Appendix A. Equipment Inventory

Pollutant Type	Year(s)	Manufacturer/Model, Extraction Type, and Year
Sampling Equipment		
Carbonyls	2003-2006	Custom-built (Year Deployed: 1995)
	2007-2022	ATEC 100 Sampler (Year Deployed: 2007)
PAHs	2008-2014	Thermo Andersen GPS-1 PUF Sampler (Year Deployed: 2006)
	2015-2022	Thermo Andersen Hi-Vol (2) (Year Deployed: 2006)
PM_{10} Metals	2003-2003	Custom-built (Year Deployed: 1995)
	2004-2013	Thermo Andersen High Volume Sampler (Year Deployed: <1990)
	2015-2022	Anderson Brushless HiVol Samplers (Year Deployed: 2014)
VOCs	2003-2004	Nutech 8549 Field Canister Sampler (Year Deployed: unknown)
	2005-2014	Anderson A97-323A Sampler (Year Deployed: 2001)
	2015-2022	Thermo Andersen AVOCS (Year Deployed: 2015)
Analytical Equipment		
Carbonyls	2003-2006	Waters 2695 HPLC/ PDA detection (Year Deployed: 2000)
	2007-2017	Waters Alliance 2695 HPLC /model 2487 Dual Absorbance (Year Deployed: 2003)
	2018-2022	Waters Alliance e2695 HPLC /model 2489 Dual Asorbance UV/Vis (Year Deployed: 2018)
PAHs	2008-2014	HP/Agilent 5890/5971 GC/MS (Year Deployed: 2008)
	2015-2020	HP/Agilent 7890B/5975C GC/MS (Year Deployed: 2015)
	2021-2022	HP/Agilent 6890/5973 GC/MS (Year Deployed: 2021)
PM_{10} Metals	2003-2014	PE ELAN 9000 ICP-MS (Year Deployed: 2002)
	2015-2022	Perkin Elmer NexION 300x ICP-MS (Year Deployed: 2015)
VOCs	2003	HP/Agilent 5890-II/5972 GC/MS (Year Deployed: 1997)
	2004	HP/Agilent 5890/5971 GC/MS (Year Deployed: 1990)
	2005-2006	HP/Agilent 6890/5973 GC/MS, Agilent 6890/5975N GC/MS (Year Deployed: 2006)
	2007-2009	HP/Agilent 6890/5973 GC/MS (Year Deployed: 2005)
	2010	HP/Agilent 5890/5971 GC/MS (Year Deployed: 2008)
	2011-2019	HP/Agilent 6890/5975 GC/MS (Year Deployed: 2010)
	2020-2022	HP/Agilent 8890/5977B GC/MS (Year Deployed: 2019)
Preconcentrator Equipment		
VOCs	2003	Entech 7100 (1), Entech 7016A (2) (Year Deployed: 2003)
	2004-2004	Entech 7100 (Dynamic Dilution) (Year Deployed: 2003)
	2005-2005	Entech 7100 (Year Deployed: 1997)
	2006-2006	Entech 7100 (Year Deployed: 2006)
	2007-2018	Entech 7100A (Year Deployed: 2007)
	2019	Entech 7100A (Year Deployed: 2007); Entech 7200A (Year Deployed: 2019)
	2020-2022	Entech 7200A (Year Deployed: 2019)
Standards Preparation Equipment		
VOCs	2003-2005	Entech 4600 (dynamic dilution) (Year Deployed: 1998)
	2006	Entech 4600 (dynamic dilution) (Year Deployed: 2006)
	2007-2022	Custom-built (dynamic dilution) (Year Deployed: 1985)
Canister Cleaning Equipment		
VOCs	2003	Custom-built (Cold) (Year Deployed: 1985)
	2004-2005	Entech 3000SL (Hot) (Year Deployed: 1997)
	2006-2010	Custom-built (Cold) (Year Deployed: 2006)
	2011-2012	Custom-built (cold) (Year Deployed: 2003)
	2013-2022	Wasson-ECE TO-Clean (Hot) (Year Deployed: 2010)

Appendix A. Equipment Inventory

Pollutant Type	Year(s)	Manufacturer/Model, Extraction Type, and Year
PM_{10} Extraction Equipment		
PM_{10} Metals	2003-2022	SLP Science/Digi Prep MS (hotblock) (Year Deployed: 2002)
PAHs Extraction Equipment		
PAHs	2008-2018	Dionex -300 (ASE) (Year Deployed: 2004)
	2019-2022	Dionex -350 (ASE) (Year Deployed: 2019)