

2020 ESTIMATES OF ANTHROPOGENIC MERCURY AIR EMISSIONS IN MICHIGAN



MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

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

www.michigan.gov/air

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EXECUTIVE SUMMARY

This report is a compilation of estimates from the 2020 triennial inventory of anthropogenic mercury emissions prepared by the Michigan Department of Environment, Great Lakes, and Energy (EGLE), Air Quality Division (AQD).

The estimates for many traditional sources, referred to as point sources, were obtained from the Michigan Air Emissions Reporting System (MAERS). Estimated emissions are reported annually to MAERS by approximately 1,700 facilities and are subject to limited quality assurance efforts by EGLE to identify, verify, and correct outlier data. Values were also obtained from the United States Environmental Protection Agency (USEPA) Toxics Release Inventory (TRI) and the 2020 National Emissions Inventory (NEI). Where facility-reported values were not available, the USEPA created estimates for the purposes of gap-filling for some sectors. In some instances, estimates have also been calculated by the AQD for the mercury inventory through application of emission factors or stack test emission rates to facility-reported throughput data.

In addition to point source estimates of mercury, values are included for nonpoint sources. The nonpoint category includes small industrial, commercial, and institutional facilities which are not large enough to trigger air emissions reporting requirements but may collectively have significant emissions statewide. Mercury calculations were prepared by the AQD for the stationary nonpoint sector based on county employment, population data, and other inputs. Values for some nonpoint categories and the mobile source sector were obtained from the NEI.

The triennial mercury inventory was prepared using the best available estimates at the time of the inventory's development. Due to the use of stack test-based calculations and emission factors obtained from published reports, the augmented inventory is considered more likely to represent the emissions from individual sources than values based on default emission factors. It should be noted that the enhanced estimates are not quality-assured by the facilities themselves.

A range of values is presented for the estimated nonpoint mercury emissions from solid waste collection and processing (handling) and from burn barrels (open burning of household waste). Calculations originally developed based on a 2002 study have been used to estimate mercury emissions for these categories in Michigan's previous anthropogenic mercury inventories. However, between 2002 and 2020 there was a substantial decrease in the quantity of mercury within the solid and household waste stream. While the 2020 mercury report includes calculations made with the 2002 factor to present conservative values, the report also includes updated calculations scaled by the decline in mercury content for these sectors. This is to present values which may better reflect the mercury reductions achieved in the solid and household waste stream in Michigan by 2020. Additionally, the 2020 NEI included the USEPA's own calculation of mercury emissions from burn barrels in Michigan. This value is substantially lower than the highest of the estimates prepared by Michigan.

Where the USEPA prepared nonpoint mercury calculations as part of the 2020 NEI, for automobile shredding, burn barrels, dental amalgam placement, fluorescent lamp breakage and recycling, and thermostats, those values have been accepted for the statewide total emissions summary as the most defensible estimates in place of Michigan's alternate calculations for those same source categories and pathways. This is due to the USEPA values being calculated by the latest emission estimation methodologies and factors. For transparency, and to enable comparison, the AQD's calculations for those categories based on the alternate methodologies are presented within the text of the report.

Statewide total emissions from the 2020 mercury inventory range from a low of 1,728 pounds to a high of 2,151 pounds. This is lower than the range of emissions from the 2017 mercury inventory of 1,901 to 2,345 pounds (a 9% reduction comparing the average emissions for each year). The largest decline in mercury emissions came from the Fuel Combustion and Industrial Sources sectors. Mobile Sources sector emissions declined slightly. Incineration and Nonpoint (Area) Sources sectors mercury emissions increased; however, the total increase is significantly less than the total decrease in emissions.

Contributing to the decline of mercury emissions in Michigan are: fuel switching and the retirement of coal-fired units at electric utilities and large industrial facilities; facility retirements and shutdowns; lower facility activity rates; more accurate estimation of mercury emissions by facilities through stack-testing and other site-specific methodologies; USEPA calculation methodology changes; removal of TRI mercury compounds from inventory; the gradual phase-out of mercury-containing products; and estimation of nonpoint mercury emissions by the USEPA with the latest emission factors and emission estimation tools which, in some cases, produced lower values than previous calculation methodologies used by the AQD.

The mercury emissions for 2020 for the low range of 1,727 pounds per year are close to the goal set by the statewide mercury Total Maximum Daily Load (TMDL) required under the Clean Water Act (CWA). The goal set in the statewide mercury TMDL of reducing mercury air emissions by 81% from a 2002 baseline of 7,213 pounds is 1,371 pounds per year.

The CWA requires states to develop TMDLs for all water bodies not meeting water quality standards (WQS) for a specific pollutant like mercury. The TMDL process establishes the maximum allowable loadings to a water body of a pollutant without exceeding WQS. The mercury TMDL covers all Michigan inland lakes primarily impacted by atmospheric deposition of mercury. Because mercury bioaccumulates in fish, a fish target was also set in addition to the mercury emission goal. For more details on the mercury TMDL go to: <https://www.michigan.gov/eglemercury>.

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Introduction

Table 1 presents the estimated values of mercury for different sectors and the statewide totals. For some categories more than one estimate was arrived at, based on different methodologies and information sources. In these instances, a range of values is presented.

Speciation profiles were applied to the mercury estimates to quantify the different forms of the pollutant for each sector. These forms are particulate mercury or Hg(P), Reactive Gaseous Mercury or RGM, and elemental mercury or Hg(0).

Table 1. 2020 Estimates of Anthropogenic Mercury

Emission Source	Hg (Lbs/Yr) in 2020	2020, Low Range	2020, High Range	Particulate Divalent Speciation Factor	Gaseous Divalent Speciation Factor	Elemental Gaseous Speciation Factor	Hg(p)	RGM	Hg(0)
FUEL COMBUSTION	NA	NA	NA	NA	NA	NA	NA	NA	NA
COAL COMBUSTION	NA	NA	NA	NA	NA	NA	NA	NA	NA
Electric Utilities	155.38	155.38	155.38	var	var	var	29.02	46.22	80.16
Residential	0.00	0.00	0.00	0.2	0.3	0.5	0.00	0.00	0.00
Industrial/commercial	1.55	1.55	1.55	0.2	0.3	0.5	0.31	0.47	0.78
Nonpoint Industrial, Institutional/Commercial	0.00	0.00	0.00	0.2	0.3	0.5	0.00	0.00	0.00
OIL COMBUSTION	NA	NA	NA	NA	NA	NA	NA	NA	0.00
Electric Utilities, Boiler	1.95	1.95	1.95	0.2	0.3	0.5	0.39	0.59	0.98
Electric Utilities, ICE	0.05	0.05	0.05	0.2	0.3	0.5	0.01	0.02	0.03
Residential	9.10	9.10	9.10	0.2	0.3	0.5	1.82	2.73	4.55
Industrial/Commercial Boilers	0.05	0.05	0.05	0.2	0.3	0.5	0.01	0.02	0.03
Industrial/Commercial, ICE	0.25	0.25	0.25	0.2	0.3	0.5	0.05	0.07	0.12
Nonpoint Industrial, Institutional/Commercial	1.60	1.60	1.60	0.2	0.3	0.5	0.32	0.48	0.80
NATURAL GAS COMBUSTION	NA	NA	NA	NA	NA	NA	NA	NA	NA
Electric Utilities, Boiler	1.26E-05	1.26E-05	1.26E-05	0.2	0.3	0.5	0.00	0.00	0.00
Electric Utilities, ICE	2.16E-04	2.16E-04	2.16E-04	0.2	0.3	0.5	0.00	0.00	0.00
Residential	2.43E-04	2.43E-04	2.43E-04	0.2	0.3	0.5	4.86E-05	7.29E-05	1.22E-04
Industrial/Commercial Boilers	7.06E-05	7.06E-05	7.06E-05	0.2	0.3	0.5	1.41E-05	2.12E-05	3.53E-05
Stationary Internal Combustion Engines	6.30E-06	6.30E-06	6.30E-06	0.2	0.3	0.5	1.26E-06	1.89E-06	3.15E-06
WOOD COMBUSTION	NA	NA	NA	NA	NA	NA	NA	NA	NA

Electric Utilities	8.83	8.83	8.83	0.2	0.3	0.5	1.77	2.65	4.42
Residential	101.22	101.22	101.22	0.2	0.3	0.5	20.24	30.37	50.61
Industrial/Commercial	2.52	2.52	2.52	0.2	0.3	0.5	0.50	0.76	1.26
Refuse-derived fuel	28.10	28.10	28.10	0.2	0.3	0.5	5.62	8.43	14.05
PETROLEUM REFINING	32.52	32.52	32.52	0.2	0.3	0.5	6.50	9.76	16.26
RESIDENTIAL LPG PROPANE COMBUSTION	4.77	4.77	4.77	0.2	0.3	0.5	0.95	1.43	2.39
TOTAL FUEL COMBUSTION	347.89	347.89	347.89	0	0	0	67.52	103.97	176.41
INCINERATION	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sewage Sludge Incineration	44.79	44.79	44.79	0.2	0.58	0.22	8.96	25.98	9.85
Municipal Waste Incineration	23.25	23.25	23.25	0.2	0.58	0.22	4.65	13.49	5.12
Hazardous Waste Incineration	0.53 - 1.39	0.53	1.39	0.2	0.58	0.22	0.11 - 0.28	0.31 - 0.81	0.12 - 0.31
Hospital Medical Infectious Waste Incineration	NA	NA	NA	0.2	0.75	0.05	0.00	0.00	0.00
Human Cremation (point source)	0.00	0.00	0.00	0.2	0.75	0.05	0.00	0.00	0.00
Animal Cremation (point source)	0.35	0.35	0.35	0.2	0.75	0.05	0.07	0.26	0.02
Pathological Waste Incineration	0.04	0.04	0.04	0.2	0.75	0.05	0.01	0.03	0.00
INCINERATION TOTALS	68.96 - 69.82	68.96	69.82	NA	NA	NA	13.69	39.76	14.99
INDUSTRIAL SOURCES	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cement Manufacturing	84.00	84.00	84.00	var	var	var	5.25	43.89	34.86
Taconite Processing	27.46	27.46	27.46	0.1	0.1	0.8	2.75	2.75	21.97
Lime Manufacturing	46.80	46.80	46.80	0.1	0.1	0.8	4.68	4.68	37.44
Dental Amalgam Manufacturing	4.00	4.00	4.00	0	0	1	0.00	0.00	4.00
Brick Manufacturing	0.26	0.26	0.26	0.1	0.1	0.8	0.03	0.03	0.21
Coke Production	0.02	0.02	0.02	0.1	0.1	0.8	0.00	0.00	0.02
Thermometer Manufacturing	0.00	0.00	0.00	0	0	1	0.00	0.00	0.00
Medical Waste Autoclave	0.45	0.45	0.45	0.2	0.75	0.05	0.09	0.34	0.02
Auto Switches - shredding of autos (point source)	18.61	18.61	18.61	0.1	0.1	0.8	1.86	1.86	14.89
Relay/Switch Manufacturing	1.00	1.00	1.00	0	0	1	0.00	0.00	1.00
PRODUCTION OF METALS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Primary metal production (Blast/BOF Steel Manufacturing)	35.10	35.10	35.10	0.1	0.1	0.8	3.51	3.51	28.08
EAFs in primary metal production (Steel Manufacturing)	23.70	23.70	23.70	0.1	0.1	0.8	2.37	2.37	18.96
EAFs & EIFs in secondary metal production (Steel Foundries)	9.18	9.18	9.18	0.1	0.1	0.8	0.92	0.92	7.34

Secondary metal production (Grey Iron), excluding EAFs	15.30 - 15.35	15.30	15.35	0.1	0.1	0.8	3.30 - 4.29	3.30 - 4.29	26.38 - 34.30
EAFs and EIFs in secondary metal production (grey iron)	30.70 - 92.68	30.70	92.68	0.1	0.1	0.8	3.39 - 9.59	3.39 - 9.59	27.12 - 76.69
INDUSTRIAL SOURCE TOTALS	296.58 - 358.61	296.58	358.61	0	0	0	37 - 44	60 - 67	297 - 354
NONPOINT (AREA) SOURCES	NA	NA	NA	NA	NA	NA	NA	NA	NA
MERCURY-CONTAINING PRODUCTS	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dental Amalgam	27.19	27.19	27.19	0	0	1	0.00	0.00	27.19
Auto Switches - shredding of autos (nonpoint source)	147.03	147.03	147.03	0.1	0.1	0.8	0.27 - 13.28	0.27 - 13.28	2.19 - 106.26
Switches and Relays	58.04	58.04	58.04	0	0	1	0.00	0.00	58.04
Measurement and Control Devices	22.44	22.44	22.44	0	0	1	0.00	0.00	22.44
Consumer Use of Bulk Mercury	1.92	1.92	1.92	0	0	1	0.00	0.00	1.92
Thermostats	7.13	7.13	7.13	0	0	1	0.00	0.00	7.13
Fluorescent and Non-Fluorescent Lamp Breakage	59.95	59.95	59.95	0	0	1	0.00	0.00	59.95
Drum-top Crushing	0.10 - 0.20	0.10	0.20	0	0	1	0.00	0.00	0.10 - 0.20
Thermometers	0.00	0.00	0.00	0	0	1	0.00	0.00	0.00
Laboratory Activities	24.59	24.59	24.59	0	0	1	0.00	0.00	24.59
WASTE DISPOSAL	NA	NA	NA	NA	NA	NA	NA	NA	NA
Volatilization during solid waste collection & processing	169 - 497	169.04	497.19	0.1	0.1	0.8	16.90 - 49.72	16.90 - 49.72	135.23 - 397.75
<i>Switches and Relays</i>	8.69	8.69	8.69	0	0	1	0.00	0.00	8.69
<i>Measurement and Control Devices</i>	0.26	0.26	0.26	0	0	1	0.00	0.00	0.26
<i>Thermometers</i>	0.00	0.00	0.00	0	0	1	0.00	0.00	0.00
<i>Bulk Mercury</i>	0.73	0.73	0.73	0	0	1	0.00	0.00	0.73
Landfill volatilization	56.78	56.78	56.78	0.1	0.1	0.8	5.68	5.68	45.42
<i>Switches and Relays</i>	4.01	4.01	4.01	0	0	1	0.00	0.00	4.01
<i>Measurement and Control Devices</i>	0.13	0.13	0.13	0	0	1	0.00	0.00	0.13
<i>Thermometers</i>	0.00	0.00	0.00	0	0	1	0.00	0.00	0.00
Disposal of products in burn barrels	184.50	184.50	184.50	0.2	0.3	0.5	36.90	55.35	92.25
<i>Switches and Relays</i>	17.28	17.28	17.28	0	0	1	0.00	0.00	17.28
<i>Measurement and Control Devices</i>	0.53	0.53	0.53	0	0	1	0.00	0.00	0.53
<i>Thermometers</i>	0.00	0.00	0.00	0	0	1	0.00	0.00	0.00
RECYCLING	NA	NA	NA	NA	NA	NA	NA	NA	NA
Volatilization during collection for recycling	NA	NA	NA	NA	NA	NA	NA	NA	NA

<i>Switches and Relays</i>	11.57	11.57	11.57	0	0	1	0.00	0.00	11.57
<i>Measurement and Control Devices</i>	0.13	0.13	0.13	0	0	1	0.00	0.00	0.13
Recycling	NA	NA	NA	NA	NA	NA	NA	NA	NA
<i>Switches and Relays</i>	11.35	11.35	11.35	0	0	1	0.00	0.00	11.35
<i>Measurement and Control Devices</i>	0.13	0.13	0.13	0	0	1	0.00	0.00	0.13
<i>Fluorescent and Non-Fluorescent Lamp Breakage</i>	0.00	0.00	0.00	0	0	1	0.00	0.00	0.00
OTHER	0.00	0.00	0.00	0	0	0	0.00	0.00	0.00
Cremation	193.91	193.91	193.91	0.2	0.58	0.22	38.78	112.47	42.66
Disposal of Bulk Hg to Clean Sweep Sites	0.73	0.73	0.73	0	0	1	0.00	0.00	0.73
Volatilization: land application of sludge	1.73	1.73	1.73	0.1	0.1	0.8	0.17	0.17	1.38
Contaminated Site Remediation	0.00	0.00	0.00	0.2	0.58	0.22	0.00	0.00	0.00
Oil and Gas Exploration and Production	0.00	0.00	0.00	NA	NA	NA	NA	NA	NA
NONPOINT (AREA SOURCE) TOTALS	1009.90 - 1338.15	1009.90	1338.15	0	0	0	103 - 137	179 - 212	716 - 985
MOBILE SOURCES	NA	NA	NA	NA	NA	NA	NA	NA	NA
Onroad	0.05 - 21.27	0.05	21.27	0.004	0.086	0.91	0.0 - 0.09	0.00 - 1.83	0.05 - 19.36
Nonroad Rail and Commercial Marine	2.57	2.57	2.57	0.15	0.29	0.56	0.39	0.75	1.44
Nonroad Coal-fired Car Ferry	0.24 - 10.80	0.24	10.80	0.15	0.29	0.56	0.04 - 1.62	0.07 - 3.13	0.13 - 6.05
Nonroad Equipment and Vehicles - Diesel	0.13	0.13	0.13	0.15	0.29	0.56	0.02	0.04	0.07
Nonroad Equipment and Vehicles - Gasoline	1.04	1.04	1.04	0.004	0.086	0.91	0.00	0.09	0.95
Nonroad Equipment and Vehicles - Other Fuel Types	0.31	0.31	0.31	NA	NA	NA	NA	NA	NA
MOBILE SOURCE TOTALS	4.34 - 36.12	4.34	36.12	0	0	0	0.61 - 2.29	1.28 - 6.40	3.36 - 31.12
TOTAL Hg AIR EMISSIONS	1727.67 - 2150.59	1727.67	2150.59	0	0	0	220.96 - 261.81	415.20 - 459.61	1091.26 - 1428.91

FUEL COMBUSTION

Coal Combustion

Electric Utilities

The estimated mercury released from coal-fired electric utilities was extracted from the USEPA's 2020 NEI. The point source mercury estimates from the NEI were predominantly from the Michigan Air Emissions Reporting System (MAERS) 2020 emissions inventory data. Where the electric utilities did not report mercury to MAERS, the NEI was gap-filled by the USEPA. Gap-filled data utilized unit-specific, and "bin" average emission factors collected in support of the Mercury and Air Toxics Standards (MATS) rule. Emission factors were applied against 2020 heat input data from the USEPA's Clean Air Markets Division Data.

Several of the 2020 NEI values are based on MAERS default emission estimates for mercury, in cases where a facility did not report a mercury value. For the 2020 AQD mercury report, staff of the AQD's Emissions Reporting and Assessment Unit (ERAU) created an alternate estimate by applying appropriate "bin" emission factors from the MATS rule to facility throughput values and heat input data from MAERS. The table below shows where those values were utilized for this report. Mercury estimates are presented alongside the eight-digit Source Classification Code (SCC) that indicates which processes at each facility were the source of the emissions.

The 2020 estimate of 155.38 lbs of mercury from coal-firing at electric utilities is lower than the 2017 estimate of 265.90 lbs for the utilities. This is due to fuel switching and retirement of coal-fired units.

Table 2. Electric Utilities, Coal Combustion

SRN	Facility Name	Emission Unit ID	SCC	Estimated mercury emissions from 2020 NEI (in lbs)	MATS emission factor-based estimate in place of MAERS default estimate	Final value for 2020 AQD mercury report (in lbs)
B1976	J.B. Sims Generating Station	EU0023	10100202	3.50	0.66	0.66
B2647	LBWL - Eckert Station & REO Town Plant	RG0023	10100222	0.04	NA	0.04
B2796	ST. CLAIR / BELLE RIVER POWER PLANT	EU0119	10100222	16.90	NA	16.90
B2796	ST. CLAIR / BELLE RIVER POWER PLANT	EU0120	10100222	14.40	NA	14.40
B2796	ST. CLAIR / BELLE RIVER POWER PLANT	EU0106	10100222	2.00	NA	2.00
B2796	ST. CLAIR / BELLE RIVER POWER PLANT	EU0107	10100222	2.60	NA	2.60
B2796	ST. CLAIR / BELLE RIVER POWER PLANT	EU0110	10100226	2.40	NA	2.40
B2796	ST. CLAIR / BELLE RIVER POWER PLANT	EU0111	10100226	3.30	NA	3.30
B2810	DTE Electric Company - River Rouge Power Plant	EU0040	10100226	1.20	NA	1.20
B2811	DTE Electric Company - Trenton Channel Power Plant	EU0035	10100222	0.80	NA	0.80
B2816	DTE Electric Company - Monroe Power Plant	EU0062	10100222	11.20	NA	11.20
B2816	DTE Electric Company - Monroe Power Plant	EU0068	10100222	10.70	NA	10.70
B2816	DTE Electric Company - Monroe Power Plant	EU0063	10100222	7.40	NA	7.40
B2816	DTE Electric Company - Monroe Power Plant	EU0064	10100222	7.20	NA	7.20
B2835	J. H. Campbell Plant	EU0059	10100226	6.67	NA	6.67

B2835	J. H. Campbell Plant	EU0061	10100202	0.00	NA	0.00
B2835	J. H. Campbell Plant	EU0061	10100222	7.79	NA	7.79
B2835	J. H. Campbell Plant	EU0062	10100202	0.00	0	0.00
B2835	J. H. Campbell Plant	EU0062	10100222	39.41	NA	39.41
B2840	Consumers Energy D.E. Karn Facility	EU0031	10100212	0.00	NA	0.00
B2840	Consumers Energy D.E. Karn Facility	EU0031	10100226	7.42	NA	7.42
B2840	Consumers Energy D.E. Karn Facility	EU0032	10100202	0.00	NA	0.00
B2840	Consumers Energy D.E. Karn Facility	EU0032	10100222	7.16	NA	7.16
B4001	LBWL, Erickson Station	EU0007	10100222	6.14	NA	6.14
Total	NA	NA	NA	NA	NA	155.38

Residential

Residential fuel combustion estimates were generated by the USEPA as part of the 2020 NEI. For residential coal combustion, an emission factor of 0.00042 lbs/ton was used, along with 2020 statewide fuel consumption data from the United States Department of Energy (USDoE), Energy Information Administration (EIA). As zero tons of residential coal consumption were reported, mercury emissions are assumed to be zero (EGLE, 2024).

Table 3. Residential Coal Combustion

Data Source	Mercury Emissions in Lbs	Nonpoint Sector
2020 NEI	0	Fuel Comb. - Residential Coal

Industrial/Commercial

Point source estimates, such as those for industrial and commercial combustion of coal, were collected from MAERS. These point source estimates were generated as part of Michigan's submittal to the USEPA's 2020 NEI (EGLE, 2024). The 2020 estimate of 1.5459 lbs of mercury emissions from this fuel combustion sector is substantially lower than the 2014 estimate of 214.54 lbs and the 2017 estimate of 45.331 lbs. A number of the facilities from the 2014 and 2017 inventories either reported zero coal-burning activity for the processes in 2020, or dismantled their equipment prior to 2020 (EGLE, 2024). The following industrial and commercial sources of coal combustion were included in the estimate:

Table 4. Industrial/Commercial Coal Combustion

SRN	Facility Name	SCC	Coal in Tons	Emission Factor in lb/Ton	Emission Basis	Estimated Emissions in Lbs
N0677	Steelcase Inc.- Kentwood Complex	10100204	0	4.16E-04	MAERS EF	0
N0677	Steelcase Inc.- Kentwood Complex	10100204	0	4.16E-04	MAERS EF	0
N1685	TES Filer City Station	10100204	209,117	NA	Other	0.77
B2873	Michigan Sugar Company - Sebewaing Factory	10100204	29,875	1.99E-05	Stack Test	0.594
A0884	Billerud Escanaba LLC	10200212	1,093	4.16E-04	MAERS EF	0.1819
Total:	NA	NA	NA	NA	NA	1.5459

Nonpoint Coal Combustion, Industrial and Commercial-Institutional

For the 2020 NEI, the USEPA estimated zero lbs of mercury emissions from nonpoint industrial and commercial-institutional sources that burned coal.

Table 5. Nonpoint Combustion of Coal from Industrial and Commercial-Institutional Sources

Data Source	Mercury Emissions in Lbs	Nonpoint Sector
2020 NEI	0	Fuel Comb. - Industrial & Comm/Institutional Coal

Oil Combustion

Electric Utilities, External Combustion Boilers

Mercury emissions from oil-fired electric utilities were estimated using data from MAERS as part of Michigan's submittal to the USEPA's 2020 NEI (EGLE, 2024). The oil combustion, or throughput, is expressed in thousands of gallons (E3GAL). The following sources were included in the estimate for oil-fired boilers:

Table 6. Electric Utilities, External Combustion Boilers

SRN	Facility Name	SCC	Factor in LB/E3GAL	Oil in E3GAL	Estimated Emissions in Lbs
B6145	DTE Electric Company - Greenwood Energy Center	10100401	1.13E-04	3.87	0.00
B2647	LBWL - Eckert Station & REO Town Plant	10100501	4.20E-04	3.023	0.00
B2796	ST. CLAIR / BELLE RIVER POWER PLANT	10100501	4.20E-04	2590.84	0.44
B2796	ST. CLAIR / BELLE RIVER POWER PLANT	10200501	4.20E-04	793.09	0.33
B2811	DTE Electric Company - Trenton Channel Power Plant	10100501	4.20E-04	385.12	0.06
B2816	DTE Electric Company - Monroe Power Plant	10100501	4.20E-04	2138.8	0.36
B2816	DTE Electric Company - Monroe Power Plant	10200501	4.20E-04	224.35	0.09
B2835	J. H. Campbell Plant	10100501	4.20E-04	1095.848	0.35
B2840	Consumers Energy D.E. Karn Facility	10100501	4.20E-04	495.937	0.20
B4001	LBWL, Erickson Station	10100501	4.20E-04	82.103	0.02
B4252	AEP COOK NUCLEAR PLANT	10100501	4.20E-04	11.75	0.00
B6145	DTE Electric Company - Greenwood Energy Center	10100501	4.20E-04	16.79	0.01
B6145	DTE Electric Company - Greenwood Energy Center	10200501	4.20E-04	0	0.00
M4148	DETROIT RENEWABLE POWER, LLC	10100501	4.20E-04	0	0.00
B2840	Consumers Energy D.E. Karn Facility	10100401	1.13E-04	733.575	0.08
Total	NA	NA	NA	NA	1.95

Electric Utilities, Stationary Internal Combustion Engines

Oil-fired, stationary internal combustion engines were separated from oil-fired, external combustion boilers in the report to provide greater clarity. Throughput and emissions from facilities with electric-generating units (EGUs) were presented below for 2020, based on data from MAERS and standard USEPA emission factors (EGLE, 2024). Mercury in the amount of 0.054 lbs was estimated for this sector.

Table 7. Electric Utilities, Stationary Internal Combustion Engines

SRN	Facility Name	SCC	Emission Factor in Lb/E3 GAL	Diesel Fuel in E3 GAL	Estimated Emissions in Lbs
B2806	DTE Electric Company - Superior Peaking Facility	20100101	1.64E-04	145.736	2.40E-02
B2808	DTE Electric Company - Northeast Peaking Facility	20100101	1.64E-04	109.534	1.80E-02
B4321	DTE Electric Company - Fermi Energy Center	20100101	1.64E-04	31.125	5.12E-03
N1430	Upper Peninsula Power Company - Gladstone	20100101	1.64E-04	4.5225	7.43E-04
N2586	Holland BPW, 48th Street Peaking Station	20100101	1.64E-04	0	0.00E+00
N5887	Marquette Board of Light & Power	20100101	1.64E-04	16.27252	2.68E-03
N6000	HOLLAND BOARD OF PUBLIC WORKS	20100101	1.64E-04	5.58	9.17E-04
N6171	Wolverine Power, Tower Power Plant	20100101	1.64E-04	13.514	2.22E-03

N6249	Wolverine Power, Vestaburg Power Plant	20100101	1.64E-04	0.228	3.75E-05
N8035	CAPITAL REGION AIRPORT AUTHORITY	20100101	1.64E-04	1.88	3.09E-04
P0068	Consumers Energy-Ludington Pumped Storage Facility	20200102	4.13E-05	0.0196	8.09E-07
Total	NA	NA	NA	NA	5.40E-02

Residential

For mercury emitted by residential oil combustion, the USEPA’s 2020 NEI calculation was utilized.

Table 8. Residential Oil Combustion

Data Source	Mercury Emissions in Lbs	Nonpoint Sector
2020 NEI	9.10	Fuel Comb. - Residential Oil

Industrial/Commercial (External Combustion Boilers)

Point source estimates, such as those for industrial and commercial combustion of oil, were collected from MAERS (EGLE, 2024). These point source estimates were generated as part of Michigan’s submittal to the USEPA’s 2020 NEI. Mercury in the amount of 0.05 lbs was estimated for this sector. The following industrial and commercial oil-fired, external combustion boilers were included in the estimate:

Table 9. Industrial/Commercial (External Combustion Boilers)

SRN	Facility Name	SCC	Oil in E3 GAL	Emission Factor in Lb/E3 GAL	Estimated Emissions in Lbs
A0023	OTSEGO PAPER INC	10200501	0	4.20E-04	0.00E+00
A2402	ACCESS BUSINESS GROUP, LLC	10200501	0	4.20E-04	0.00E+00
A2849	WACKER CHEMICAL CORP	10200501	0	4.20E-04	0.00E+00
A5858	Mead Johnson & Company, LLC	10200501	0	4.20E-04	0.00E+00
A6218	Dunn Paper, Inc.	10200501	0	4.20E-04	0.00E+00
A6475	UP Paper LLC.	10200501	0	4.20E-04	0.00E+00
B1470	NEENAH PAPER - MICHIGAN INC	10200501	0	4.20E-04	0.00E+00
B1479	CERTAINTEED CEILINGS CORP	10200501	0	4.20E-04	0.00E+00
B1678	GRAPHIC PACKAGING INTERNATIONAL LLC	10200501	0	4.20E-04	0.00E+00
B1827	EMPIRE IRON MINING PARTNERSHIP	10200501	0	4.20E-04	0.00E+00
B2064	FORD MOTOR CO/RAWSONVILLE PLANT	10200501	0	4.20E-04	0.00E+00
B2460	General Motors LLC - Bay City	10200501	0	4.20E-04	0.00E+00
B2814	DETROIT THERMAL BEACON HEATING PLANT	10300501	0	4.20E-04	0.00E+00
B2934	Palisades Nuclear Plant	10200501	54.02	4.20E-04	2.27E-02
B3610	Pharmacia & Upjohn Co LLC, a subsidiary of Pfizer	10200501	0	4.20E-04	0.00E+00
B9181	Sunoco Partners Marketing & Terminals L.P - Owosso	10300504	0	NA	0.00E+00
C5704	Lakeland Medical Center (Former Memorial Hospital)	10300501	0.695	4.20E-04	2.92E-04

D8065	Dart Container Corporation of Michigan	10300501	0.39	4.20E-04	1.64E-04
H5877	EASTERN MI UNIVERSITY	10300501	0	4.20E-04	0.00E+00
K1271	HENRY FORD HOSPITAL	10300501	2.25	4.20E-04	9.45E-04
K2087	LAKELAND CORRECTIONAL FACILITY	10300501	9.16	4.20E-04	3.85E-03
K2460	Central Michigan University	10300501	0.8	4.20E-04	3.36E-04
K2688	B.O.P. FEDERAL CORRECTIONAL INSTITUTE	10300501	0.939	4.20E-04	3.94E-04
M0675	UNIVERSITY OF MICHIGAN	10300501	41.53	4.20E-04	1.74E-02
M1812	ASCENSION ST. JOHN HOSPITAL	10300501	2.619	4.20E-04	1.10E-03
M1954	COVENANT HEALTH CARE	10300501	0.12	4.20E-04	5.04E-05
M1968	McLaren Oakland	10300501	1.794	4.20E-04	7.54E-04
M3431	ST JOSEPH MERCY HOSPITAL	10300501	1.7	4.20E-04	7.14E-04
M3641	UNIVERSITY OF MICHIGAN FLINT	10200501	0	4.20E-04	0.00E+00
M3653	V A MEDICAL CENTER	10300501	2.214	4.20E-04	9.30E-04
M3792	NORTHERN MICHIGAN UNIVERSITY	10300501	0	4.20E-04	0.00E+00
M4132	Walter P. Reuther Psychiatric Hospital	10300501	0	4.20E-04	0.00E+00
M4174	DETROIT METROPOLITAN WAYNE COUNTY AIRPORT	10300501	0.6	4.20E-04	2.52E-04
N0780	LOUISIANA-PACIFIC CORP NEWBERRY PLANT	10200501	0.032	4.20E-04	1.34E-05
N5930	DELTA COLLEGE	10100501	0	4.20E-04	0.00E+00
N6016	ASCENSION GENESYS HOSPITAL	10300501	0.7	4.20E-04	2.94E-04
N7864	Umicore Autocat USA Inc.	10300503	0	NA	0.00E+00
Total	NA	NA	NA	NA	5.02E-02

Stationary Internal Combustion Engines (Oil-fired, Industrial/Commercial)

Oil-fired, stationary internal combustion engines were separated from oil-fired, external combustion boilers in the report to provide greater clarity. Throughput and emissions from commercial/industrial facilities are presented below for 2020, based on data from MAERS and standard USEPA emission factors. Mercury in the amount of 0.246 lbs was estimated for this sector.

Table 10. Stationary Internal Combustion Engines (Oil-fired, Industrial/Commercial)

SRN	Facility Name	SCC	Oil in E3 GAL	Emission Factor in Lb/E3 GAL	Estimated Emissions in Lbs
A0023	OTSEGO PAPER INC	20200102	0.1	4.1E-05	4.13E-06
A1641	General Motors Lansing Grand River Assembly	20200102	0.55	4.1E-05	2.27E-05
A3567	Ford Motor Company - Sterling Plant	20200102	0.793	4.1E-05	3.27E-05
A3569	Axalta Coating Systems USA LLC	20200102	1.548	4.1E-05	6.39E-05
A4043	Dow Silicones Corporation	20200102	2.19	4.1E-05	9.04E-05
A5262	General Motors LLC - Milford Proving Ground	20200102	1.3645	4.1E-05	5.63E-05
A5764	Ventra Evert, LLC	20200102	0.16	4.1E-05	6.61E-06
A5858	Mead Johnson & Company, LLC	20200102	0.0912	4.1E-05	3.77E-06

A7809	U S STEEL GREAT LAKES WORKS	20200102	1.8	4.1E-05	7.43E-05
A8638	DETROIT DIESEL CORPORATION	20200102	1	4.1E-05	4.13E-05
A8640	Cleveland-Cliffs Steel Corporation Dearborn Works	20200102	12.787	4.1E-05	5.28E-04
A8645	FORD MOTOR CO/ LIVONIA TRANSMISSION	20200102	0.7351	4.1E-05	3.04E-05
A8648	FORD MOTOR CO ROUGE COMPLEX	20200102	2.0688	4.1E-05	8.54E-05
B1476	Decorative Panels International	20200102	0.195	4.1E-05	8.05E-06
B1548	Post Foods	20200102	0.152	4.1E-05	6.28E-06
B1604	GM LLC Customer Care & Aftersales - Swartz Creek	20200102	0.305	4.1E-05	1.01E-03
B1606	General Motors LLC Flint Assembly	20200102	0.73452	4.1E-05	3.03E-05
B1607	GM FLINT ENGINE OPERATIONS	20200102	0.258	4.1E-05	1.07E-05
B1608	General Motors LLC Flint Metal Center	20200102	0.6552	4.1E-05	2.71E-05
B1677	Allnex USA Inc.	20200102	1.03	4.1E-05	4.25E-05
B1678	GRAPHIC PACKAGING INTERNATIONAL LLC	20200102	0.235	4.1E-05	9.70E-06
B1771	FORD MOTOR COMPANY-VAN DYKE PLANT	20200102	1.406	4.1E-05	5.81E-05
B1798	General Motors LLC - Warren Transmission Plant	20200102	0	4.1E-05	0.00E+00
B1846	Occidental Chemical Corporation	20200102	0.18673	4.1E-05	7.71E-06
B1855	Dunn Paper, Inc.	20200102	0.0962	4.1E-05	3.97E-06
B1991	GM LLC Saginaw Metal Casting Operations	20200102	0.7488	4.1E-05	3.09E-05
B2013	OX Engineered Products	20200102	0.48176	4.1E-05	1.99E-05
B2063	Faurecia Interior Systems Saline, LLC	20200102	1.04	4.1E-05	4.29E-05
B2064	FORD MOTOR CO/RAWSONVILLE PLANT	20200102	0.6	4.1E-05	2.48E-05
B2132	WYANDOTTE DEPT MUNI POWER PLANT	20200102	0.195	4.1E-05	8.05E-06
B2209	Eaton Corporation - Galesburg Campus	20200102	7.29	4.1E-05	3.01E-04
B2644	Hemlock Semiconductor Operations LLC	20200102	2.939	4.1E-05	1.21E-04
B2808	DTE Electric Company - Northeast Peaking Facility	20200102	0.069	4.1E-05	2.85E-06
B2816	DTE Electric Company - Monroe Power Plant	20200102	0.37913	4.1E-05	1.57E-05
B2835	J. H. Campbell Plant	20200102	0.693	4.1E-05	2.86E-05
B2840	Consumers Energy D.E. Karn Facility	20200102	1.774	4.1E-05	7.33E-05
B2869	FORD MOTOR COMPANY - ROMEO ENGINE PLANT	20200102	0.554	4.1E-05	2.29E-05
B2934	Palisades Nuclear Plant	20200102	0.568	4.1E-05	2.35E-05
B2956	FORD MOTOR CO NEW MODEL PROGRAM CTR	20200102	0.1571	4.1E-05	6.49E-06
B3241	FORD MOTOR CO BROWNSTOWN	20200102	1.287	4.1E-05	5.31E-05
B3350	FCA US LLC Trenton Engine Complex	20200102	0.976	4.1E-05	4.03E-05
B3472	VOSS INDUSTRIES-VOSS TAYLOR DIV	20200102	0.261	4.1E-05	1.08E-05
B3534	EDW. C. LEVY CO. PLANT 2 PORTABLE CRUSHER	20200102	0	4.1E-05	0.00E+00
B3610	Pharmacia & Upjohn Co LLC, a subsidiary of Pfizer	20200102	6.27	4.1E-05	2.59E-04
B4001	LBWL, Erickson Station	20200102	0.288	4.1E-05	1.19E-05
B4022	DOW Silicones Corporation	20200102	0.8121	4.1E-05	3.35E-05
B4032	General Motors LLC - Pontiac North Campus	20200102	0.51	4.1E-05	2.11E-05
B4058	RIETH RILEY CONSTRUCTION CO., INC.	20200102	11.287	4.1E-05	4.66E-04
B4072	WestRock California, LLC	20200102	0.077	4.1E-05	3.18E-06

B4102	U S GYPSUM CO	20200102	5.2729	4.1E-05	2.18E-04
B4147	RIETH RILEY CONSTRUCTION CO INC	20200102	18.4	4.1E-05	7.60E-04
B4164	BOLEN ASPHALT PAVING, INC.	20200102	13.3	4.1E-05	5.49E-04
B4252	AEP COOK NUCLEAR PLANT	20200102	5.695	4.1E-05	2.35E-04
B4288	Zoetis LLC	20200102	0.16644	4.1E-05	2.50E-03
B4383	Kasson Sand and Gravel	20200102	8.321	4.1E-05	3.44E-04
B5421	Wolverine Power Supply Cooperative	20200102	0.065	4.1E-05	2.68E-06
B5815	GENERAL MOTORS ROMULUS ENGINE PLANT	20200102	0.34	4.1E-05	1.40E-05
B6177	WIEGANDS CRUSHING, INC.	20200102	28.46121	4.1E-05	1.18E-03
B6230	FORD MOTOR CO RESEARCH & DEV CTR	20200102	1.17	4.1E-05	4.83E-05
B6527	Midland Cogeneration Venture	20200102	0	4.1E-05	0.00E+00
B6643	BASF Corporation	20200102	1.064	4.1E-05	4.39E-05
B7090	MICHIGAN MILK PRODUCERS ASSOCIATION	20100101	1.75	0.00016	2.88E-04
B7192	Billerud Quinnesec, LLC	20200102	0.616	4.1E-05	2.54E-05
B7227	GENERAL MOTORS LLC - ORION ASSEMBLY	20200102	0.608	4.1E-05	2.51E-05
B7302	WEYERHAEUSER NR COMPANY	20200102	0.72853	4.1E-05	3.01E-05
B8570	THE ANDERSONS MARATHON HOLDINGS LLC	20200102	1.651	4.1E-05	6.82E-05
D8065	Dart Container Corporation of Michigan	20200102	10.75	4.1E-05	4.44E-04
F3254	Selfridge Air National Guard Base	20300102	2.6	0.00016	4.27E-04
G7126	GRAND VALLEY STATE UNIVERSITY	20200102	1.3188	4.1E-05	5.45E-05
K2460	Central Michigan University	20200102	0.762	4.1E-05	3.15E-05
K3249	Michigan State University	20200102	36.96	4.1E-05	1.53E-03
M0675	UNIVERSITY OF MICHIGAN	20200103	92.067	0.00017	1.54E-02
M0675	UNIVERSITY OF MICHIGAN	20200102	2.765	4.1E-05	1.14E-04
M4174	DETROIT METROPOLITAN WAYNE COUNTY AIRPORT	20200102	4.517	4.1E-05	1.87E-04
M4175	FORD MOTOR CO	20200102	37.434	4.1E-05	1.55E-03
M4199	GENERAL MOTORS LLC DETROIT-HAMTRAMCK ASSEMBLY	20200102	1.49	4.1E-05	6.15E-05
M4731	AJAX PAVING INDUSTRIES, INC.	20200102	12	4.1E-05	4.96E-04
N0503	LYON SAND & GRAVEL CO - RAP PLANT	20200102	31.183	4.1E-05	1.29E-03
N0677	Steelcase Inc.- Kentwood Complex	20200102	18.7	4.1E-05	7.72E-04
N0780	LOUISIANA-PACIFIC CORP NEWBERRY PLANT	20200102	0.289	4.1E-05	1.19E-05
N0929	Ford Motor Company - Flat Rock Assembly	20200102	65.5035	4.1E-05	2.70E-03
N1192	DENSO Manufacturing Michigan, Inc.	20200102	0.34	4.1E-05	1.40E-05
N1316	Mayco International, LLC	20200102	4.726	4.1E-05	1.95E-04
N1336	BASF CORPORATION	20200102	0.178	4.1E-05	7.35E-06
N1357	RIETH-RILEY CONSTRUCTION CO INC	20200102	0	4.1E-05	0.00E+00
N1395	Cadillac Renewable Energy Facility	20200102	0.24	4.1E-05	9.91E-06
N1436	FCA US LLC - Chrysler Technology Center	20200102	0.275	4.1E-05	1.14E-05
N1685	TES Filer City Station	20200102	0.057	4.1E-05	2.35E-06
N1905	BOLEN ASPHALT PAVING, INC.	20200102	21.9	4.1E-05	9.04E-04
N1917	Ajax Paving Industries, Inc.	20200102	1	4.1E-05	4.13E-05

N2155	FCA US LLC - JEFFERSON NORTH ASSEMBLY PLANT	20200102	2619.2	4.1E-05	1.08E-01
N2184	RIETH RILEY CONSTRUCTION CO INC	20200102	31.7	4.1E-05	1.31E-03
N2388	GRAYLING GENERATING STATION LTD PTNR	20200102	1.821	4.1E-05	7.52E-05
N2586	Holland BPW, 48th Street Peaking Station	20200102	0.1705	4.1E-05	7.04E-06
N2627	Great Lakes Aggregates, HAZMAG Plant	20200102	47.068	4.1E-05	1.94E-03
N3152	AMERICAN AGGREGATES OF MICHIGAN ELJAY 54	20200102	0	4.1E-05	0.00E+00
N3177	AGGREGATE INDUSTRIES - AC3 PORTABLE PLANT	20200102	0	4.1E-05	0.00E+00
N3435	BALKEMA EXCAVATING/AGGREGATE RESOURCES PLANT 102	20200102	6.295	4.1E-05	2.60E-04
N3570	GENESEEE POWER STATION LIMITED PARTNERSHIP	20200102	0.1619	4.1E-05	6.69E-06
N3631	GMI Clinton	20200102	29.04	4.1E-05	1.20E-03
N3920	Consumers Energy - Freedom Compressor Station	20200102	0.1245	4.1E-05	5.14E-06
N5131	BALKEMA EXCAVATING/AGGREGATE RESOURCES PLANT 103	20200102	16.424	4.1E-05	6.78E-04
N5241	GREAT LAKES AGGREGATES, L.L.C. - SYLVANIA MINERALS	20200102	0	4.1E-05	0.00E+00
N5477	R E GLANCY INC	20200102	5.58	4.1E-05	2.30E-04
N5748	ELMERS CRANE AND DOZER, INC.	20200102	11.07	4.1E-05	4.57E-04
N5772	MATHY CONSTRUCTION CO PLANT 24	20200102	0	4.1E-05	0.00E+00
N5841	HALLIDAY SAND & GRAVEL INC - PLANT #2	20200102	24.4	4.1E-05	1.01E-03
N5842	HALLIDAY SAND & GRAVEL INC - PLANT #3	20200102	20	4.1E-05	8.26E-04
N5940	POTLATCHDELTIC LAND & LUMBER LLC.	20200102	0.1375	4.1E-05	5.68E-06
N5963	R E GLANCY INC	20200102	20.64	4.1E-05	8.52E-04
N5974	Fisher Construction Aggregates	20200102	6.1	4.1E-05	2.52E-04
N5998	AGGREGATE INDUSTRIES - NB1 PORTABLE PLANT	20200102	0	4.1E-05	0.00E+00
N6022	RIETH RILEY CONSTRUCTION CO., INC.	20200102	40.173	4.1E-05	1.66E-03
N6197	AGGREGATE INDUSTRIES - AC2 PORTABLE PLANT	20200102	9.0404	4.1E-05	3.73E-04
N6283	AGGREGATE INDUSTRIES - DAY ROAD	20200102	80.4792	4.1E-05	3.32E-03
N6306	Hanlee Equipment LLC	20200102	1	4.1E-05	4.13E-05
N6307	HALLIDAY SAND & GRAVEL, PLANT #1 225-97A	20200102	13	4.1E-05	5.37E-04
N6355	R.E. GLANCY, INC.	20200102	14.05	4.1E-05	5.80E-04
N6385	AMC-MID MICHIGAN MATERIALS, LLC	20200102	5.04	4.1E-05	2.08E-04
N6413	RIETH RILEY CONSTRUCTION CO., INC.	20200102	36.926	4.1E-05	1.53E-03
N6429	HALLIDAY SAND & GRAVEL (945 CONE)	20200102	12	4.1E-05	4.96E-04
N6430	HALLIDAY SAND AND GRAVEL-HAZMAG	20200102	0	4.1E-05	0.00E+00
N6432	TRI CITY AGGREGATES	20200102	7	4.1E-05	2.89E-04
N6448	MANTHEI DEVELOPMENT CORP/ MDC CONTRACTING, LLC	20200102	4.02	4.1E-05	1.66E-04
N6453	ELMERS CRANE AND DOZER, INC.	20200102	3.3534	4.1E-05	1.39E-04
N6488	SRM Concrete LLC	20200102	27.5	4.1E-05	1.14E-03
N6521	Consumers Energy Co. - Zeeland Generating Station	20200102	0.32	4.1E-05	1.32E-05
N6589	BALKEMA EXCAVATING, INC. -- PORTABLE PLANT 101	20200102	0	4.1E-05	0.00E+00
N6599	Florence Cement Company, Inc.	20200102	4.14	4.1E-05	1.71E-04
N6600	Florence Cement Co. Inc.	20200102	1.848	4.1E-05	7.63E-05
N6608	RIETH-RILEY CONSTRUCTION CO., INC.	20200102	26.791	4.1E-05	1.11E-03

N6614	KALIN CONSTRUCTION CO. INC.	20200102	28.436	4.1E-05	1.17E-03
N6626	Consumers Energy Co. - Jackson Generating Station	20200102	0.2496	4.1E-05	1.03E-05
N6631	DEARBORN INDUSTRIAL GENERATION	20200102	3.794	4.1E-05	1.57E-04
N6664	Custom Crushing & Recycle, Inc.	20200102	46.4	4.1E-05	1.92E-03
N6704	HUBSCHER & SON, INC. - PIONEER 50VE PORTABLE	20200102	5.5	4.1E-05	2.27E-04
N6705	HUBSCHER AND SON, INC- CEDARAPIDS 443	20200102	2.887	4.1E-05	1.19E-04
N6749	Carrick Trucking & Gravel, Inc.	20200102	8.456	4.1E-05	3.49E-04
N6750	ELMERS CRANE AND DOZER, INC.	20200102	5.319	4.1E-05	2.20E-04
N6762	Dykema Excavators Inc.	20200102	0	4.1E-05	0.00E+00
N6767	New Covert Generating Company, LLC	20200102	0.365	4.1E-05	1.51E-05
N6804	KLETT RECYCLE, INC.	20200102	35.7827	4.1E-05	1.48E-03
N6833	Wolverine Power, Gaylord Generating Station	20200102	0.937	4.1E-05	3.87E-05
N6837	ROCK RECYCLERS	20200102	51.429	4.1E-05	2.12E-03
N6849	Parker Excavating Gravel & Recycle Inc	20200102	4.777	4.1E-05	1.97E-04
N6850	Parker Excavating Gravel & Recycle Inc	20200102	4.87	4.1E-05	2.01E-04
N6851	Parker Excavating Gravel & Recycle Inc	20200102	6.778	4.1E-05	2.80E-04
N6861	Custom Crushing Lakeshore	20200102	18	4.1E-05	7.43E-04
N6880	Carr Brothers & Sons Inc. - Plant 2	20200102	13.272	4.1E-05	5.48E-04
N6883	Carr Brothers & Sons Inc. - Plant 1	20200102	11.376	4.1E-05	4.70E-04
N6901	Stoneco of Michigan, Portable 1 (MI Materials Agg)	20200102	21.63	4.1E-05	8.93E-04
N6913	Searles Construction - 45 Plant	20200102	159.89	4.1E-05	6.60E-03
N6914	Searles Construction - Wash Plant	20200102	6.5	4.1E-05	2.68E-04
N6950	General Motors LLC-Lansing Delta Township	20200102	1.291	4.1E-05	5.33E-05
N6957	Halliday Sand and Gravel Inc. (6000 CONE PLANT)	20200102	9.2	4.1E-05	3.80E-04
N7011	Grosso Trucking and Supply Company	20200102	8.7	4.1E-05	3.59E-04
N7151	Mid-Michigan Materials-Bechtel	20200102	2.24	4.1E-05	9.25E-05
N7168	American Aggregates-TelSmith 52G Portable Crusher	20200102	0	4.1E-05	0.00E+00
N7232	Carl Schlegel, Inc.	20200102	0	4.1E-05	0.00E+00
N7259	Alpena Aggregate Inc.	20200102	52.463	4.1E-05	2.17E-03
N7288	WEBER SAND AND GRAVEL, INC. - CEDAR RAPIDS	20200102	29.781	4.1E-05	1.23E-03
N7375	AMERICAN AGGREGATES OF MICHIGAN, INC. SANDVIK CONE	20200102	0	4.1E-05	0.00E+00
N7383	Valero Renewable Fuels Company, LLC	20200102	13.466	4.1E-05	5.56E-04
N7385	S&M Gravel, Inc.	20200102	1.43	4.1E-05	5.90E-05
N7390	BALKEMA EXCAVATING INC.-PLANT 104	20200102	17.964	4.1E-05	7.42E-04
N7392	Mack Truck & Wiegands Crushed Concrete	20200102	14.1194	4.1E-05	5.83E-04
N7407	BARBER CREEK SAND AND GRAVEL, INC.	20200102	6.199	4.1E-05	2.56E-04
N7595	Stoneco of Michigan, Portable Plant 2	20200102	19.57	4.1E-05	8.08E-04
N7618	GREAT LAKES AGGREGATES LLC TEREX FACILITY	20200102	40.513	4.1E-05	1.67E-03
N7688	Dicastal North America, Inc.	20200102	0.6	4.1E-05	2.48E-05
N7858	TRI CITY AGGREGATES	20200102	1	4.1E-05	4.13E-05
N7886	Hyundai America Technical Center Inc. (HATCI)	20200102	0.1548	4.1E-05	6.39E-06

N7996	FLORENCE CEMENT PLANT #741	20200102	3.688	4.1E-05	1.52E-04
N8066	CARL SCHLEGEL INC	20200102	0	4.1E-05	0.00E+00
N8162	CLAYTON UNIT CPF	20200102	0.491	4.1E-05	2.03E-05
N8252	BARBER CREEK SAND AND GRAVEL	20200102	3.015	4.1E-05	1.25E-04
P0138	Fisher Construction Aggregates	20200102	5.9	4.1E-05	2.44E-04
P0156	Fisher Construction Aggregates	20200102	17.6	4.1E-05	7.27E-04
P0197	BIERLEIN COMPANIES INC	20200102	0.098	4.1E-05	4.05E-06
P0232	KALIN CONSTRUCTION	20200102	18.368	4.1E-05	7.58E-04
P0269	Bierlein Companies, Inc.	20200102	0.795	4.1E-05	3.28E-05
P0377	FLORENCE CEMENT COMPANY	20200102	3.688	4.1E-05	1.52E-04
P0465	HOLLAND BOARD OF PUBLIC WORKS-Holland Energy Park	20200102	0.07	4.1E-05	2.89E-06
P0514	Consumers Energy - Grand Rapids Service Center	20200102	0.738	4.1E-05	3.05E-05
P0517	Maroa Farms, Inc. and Pepperco-USA, Inc.	20200102	21.67	4.1E-05	8.95E-04
P0526	Great Lakes Fusion, LLC	20200102	5.5	4.1E-05	2.27E-04
P0539	WEBER SAND & GRAVEL INC.-NORTH BRANCH	20200102	20.747	4.1E-05	8.57E-04
P0582	Wolverine Power Supply Co-op - Alpine Power Plant	20200102	0.69	4.1E-05	2.85E-05
P0594	MAGNA CLOSURES LIGHTING DIVISION	20200102	0.083	4.1E-05	3.43E-06
P0599	TOEBE CONSTRUCTION LLC - Brighton	20200102	17	4.1E-05	7.02E-04
P0608	JP Morgan Chase Bank, National Association	20200102	14.70762	4.1E-05	6.07E-04
P0627	JAMES PETERSON SONS, INC.	20200102	0	4.1E-05	0.00E+00
P0668	Marquette Board of Light and Power	20200102	47.5818	4.1E-05	1.96E-03
P0691	DYNAMIC CRUSHING LLC	20200102	85	4.1E-05	3.51E-03
P0699	ARAUCO NORTH AMERICA	20200102	2.015	4.1E-05	8.32E-05
P0724	Geddis Paving & Excavating	20200102	1.059	4.1E-05	4.37E-05
P0755	Weber Sand & Gravel, Inc. PT1 170-16	20200102	20.784	4.1E-05	8.58E-04
P0791	Lakeshore Sand LLC	20200102	0.05	4.1E-05	2.06E-06
P0798	Palmer Farms, Inc.	20200102	0.5	4.1E-05	2.06E-05
P0806	Fisher Construction Aggregates	20200102	11.8	4.1E-05	4.87E-04
P0825	DCF Recycling, Inc.	20200102	814.8	4.1E-05	3.36E-02
P0828	Wadell Stabilization	20200102	20.9	4.1E-05	8.63E-04
P0834	Kalin Construction Company, Inc.	20200102	10.928	4.1E-05	4.51E-04
P0886	Carr Brothers & Sons, Inc. Plant 3	20200102	1.568	4.1E-05	6.47E-05
P0907	GFL Lapeer	20200102	10.7	4.1E-05	4.42E-04
P0910	F G Angelo & Sons	20200102	2.495	4.1E-05	1.03E-04
P1007	BALKEMA EXCAVATING INC. - PLANT 107	20200102	12.679	4.1E-05	5.24E-04
P1016	Great Lakes Aggregates - Lippmann Plant	20200102	54.699	4.1E-05	2.26E-03
P1031	A & E Aggregates, Inc.	20200102	3.1	4.1E-05	1.28E-04
P1074	Base Sand & Gravel LLC	20200102	1.8	4.1E-05	7.43E-05
P1107	Lester Brothers, Inc.	20200102	13.2	4.1E-05	5.45E-04
P1135	C2 Excavating	20200102	26.5573	4.1E-05	1.10E-03
P1148	Burnash Wrecking, Inc.	20200102	0.2	4.1E-05	8.26E-06

P1176	Albrecht Sand and Gravel Co	20200102	13.35	4.1E-05	5.51E-04
Total	NA	NA	NA	NA	2.46E-01

Nonpoint Oil Combustion Industrial and Commercial-Institutional

Within the 2020 NEI, the USEPA estimated a total of 1.60 lbs of mercury emissions from nonpoint industrial and commercial-institutional sources that burned oil. This includes boilers and internal combustion engines. The value is higher than the 2017 NEI v2 estimate of 0.37 lbs.

Table 11. Nonpoint Combustion of Oil from Industrial and Commercial-Institutional Sources

Data Source	Mercury Emissions in Lbs	Nonpoint Sector
2020 NEI	1.60	Fuel Comb. - Industrial and Comm/Institutional Oil

Natural Gas Combustion

Electric Utilities

Mercury emissions from natural gas-fired electric utilities were estimated using an emission factor published by the Electric Power Research Institute (EPRI, 1996) for natural gas combustion. Throughput or natural gas consumption is expressed in millions of cubic feet (MMCF). The EPRI factor of 8.00E-10 lb/MMCF is several orders of magnitude lower than the USEPA emission factor of 2.6E-04 lb/MMCF used in previous inventory years in MAERS. The EPRI factor has since been added to MAERS as a state-specific emission factor, and the 2020 mercury values from MAERS were calculated accordingly. The estimated mercury emissions for this category were 1.26E-05 lbs statewide (EGLE, 2021).

The following sources are included in the estimate for emissions from natural gas-fired electric utilities boilers:

Table 12.a. Electric Utilities, Natural Gas Combustion, Boilers

SRN	Facility Name	SCC	Natural Gas in MMCF	MAERS Factor in Lb/MMCF	Estimated Emissions in Lbs from MAERS
B1976	J.B. Sims Generating Station	10100601	5	8.00E-10	1.60E-09
B2132	WYANDOTTE DEPT MUNI POWER PLANT	10100601	475.4	8.00E-10	3.81E-07
B2796	ST. CLAIR / BELLE RIVER POWER PLANT	10100601	306.89	8.00E-10	9.82E-08
B2796	ST. CLAIR / BELLE RIVER POWER PLANT	10100604	84.29	8.00E-10	2.70E-08
B2810	DTE Electric Company - River Rouge Power Plant	10100601	898.3	8.00E-10	2.88E-07
B2840	Consumers Energy D.E. Karn Facility	10100601	787.993	8.00E-10	6.30E-07
B2840	Consumers Energy D.E. Karn Facility	10100604	29.247	8.00E-10	2.20E-08
B4260	LANSE WARDEN ELECTRIC COMPANY LLC	10100601	1.04636	8.00E-10	3.35E-10
B6145	DTE Electric Company - Greenwood Energy Center	10100601	8586	8.00E-10	6.87E-06
B6527	Midland Cogeneration Venture	10100601	1657.63	8.00E-10	1.33E-06
N0890	National Energy of Lincoln LLC	10100601	13479	Stack Test	0.00E+00

N1160	National Energy of McBain LLC	10100601	5799	8.00E-10	1.86E-06
N1266	HILLMAN POWER CO	10100602	1.04	8.00E-10	3.33E-10
N1395	Cadillac Renewable Energy Facility	10100601	4.8	8.00E-10	1.54E-09
N1685	TES Filer City Station	10100601	1309.34	8.00E-10	1.05E-06
N2388	GRAYLING GENERATING STATION LTD PTNR	10100601	0.617	8.00E-10	1.97E-10
N3570	GENESEE POWER STATION LIMITED PARTNERSHIP	10100601	1.263	8.00E-10	4.04E-10
N7256	UNIVERSAL COATING INC.	10100602	18.046	8.00E-10	1.44E-08
P0879	Dearborn Energy Center	10100601	34.79	8.00E-10	2.78E-08
TOTAL	NA	NA	NA	NA	1.26E-05

Natural gas-fired, stationary internal combustion engines were separated from natural gas-fired boilers in the report to provide greater clarity. The EPRI factor was adopted in MAERS and produced a statewide estimate of 2.16E-04 lbs.

The following sources of natural gas combustion, stationary internal combustion engines were included in the estimate:

Table 12.b. Electric Utilities, Natural Gas Combustion, Stationary Internal Combustion Engines

SRN	Facility Name	SCC	Natural Gas in MMCF	MAERS Factor in Lb/MMCF	Estimated Emissions in Lbs from MAERS
B2647	LBWL - Eckert Station & REO Town Plant	20100201	5163	8.00E-10	4.13E-06
B2796	ST. CLAIR / BELLE RIVER POWER PLANT	20100201	12202.11	8.00E-10	9.76E-06
B2798	DTE Electric Company - Delray Power Plant	20100201	401.72	8.00E-10	3.22E-07
B2805	DTE Electric Company - Hancock Peaking Facility	20100201	66.85	8.00E-10	5.35E-08
B2808	DTE Electric Company - Northeast Peaking Facility	20100201	33.494	8.00E-10	2.68E-08
B4292	Lambda Energy Resources, LLC - KALKASKA GAS PLANT	20100201	433.998	8.00E-10	3.47E-07
B5421	Wolverine Power Supply Cooperative	20200201	50.9	8.00E-10	4.07E-08
B6145	DTE Electric Company - Greenwood Energy Center	20100201	1325.65	8.00E-10	1.06E-06
B6527	Midland Cogeneration Venture	20100201	78503.42	8.00E-10	6.28E-05
B8570	THE ANDERSONS MARATHON HOLDINGS LLC	20100201	7960	8.00E-10	6.37E-06
M4174	DETROIT METROPOLITAN WAYNE COUNTY AIRPORT	20100201	0.004	8.00E-10	3.20E-12
M4854	Sumpter Generating Plant	20100201	4167.46	8.00E-10	3.33E-06
N1436	FCA US LLC - Chrysler Technology Center	20100201	15.661	8.00E-10	1.25E-08
N2586	Holland BPW, 48th Street Peaking Station	20100201	1362.56	8.00E-10	1.09E-06
N2940	DCP Antrim Gas LLC	20100201	843	8.00E-10	6.74E-07
N5760	Wolverine Power Supply - Hersey	20100201	224.88	8.00E-10	1.80E-07
N6249	Wolverine Power, Vestaburg Power Plant	20100201	34.82	8.00E-10	2.79E-08
N6521	Consumers Energy Co. - Zeeland Generating Station	20100201	30829.9	8.00E-10	2.47E-05
N6526	CMS Generation, Livingston Generating Station	20100201	64.555	8.00E-10	5.16E-08
N6626	Consumers Energy Co. - Jackson Generating Station	20100201	13707.9	8.00E-10	1.10E-05
N6631	DEARBORN INDUSTRIAL GENERATION	20100201	33826	8.00E-10	2.71E-05
N6731	CMS Generation Kalamazoo River Generating Station	20100201	894.086	8.00E-10	7.15E-07

N6767	New Covert Generating Company, LLC	20100201	48416.07	8.00E-10	3.88E-05
N6833	Wolverine Power, Gaylord Generating Station	20100201	287.21	8.00E-10	2.30E-07
N6873	DTE Electric Company - Renaissance Power Plant	20100201	12002.23	8.00E-10	9.60E-06
N7113	Michigan Public Power Agency	20100201	222.169	8.00E-10	1.78E-07
N8035	CAPITAL REGION AIRPORT AUTHORITY	20100201	0.68	8.00E-10	5.44E-10
P0152	MICHIGAN DEPT OF TECHNOLOGY, MANAGEMENT AND BUDGET	20100201	20.38	8.00E-10	1.63E-08
P0375	LOWELL LIGHT & POWER (LL&P)	20100201	0.87	8.00E-10	6.96E-10
P0465	HOLLAND BOARD OF PUBLIC WORKS-Holland Energy Park	20100201	5762.49	8.00E-10	4.61E-06
P0582	Wolverine Power Supply Co-op - Alpine Power Plant	20100201	7897	8.00E-10	6.32E-06
P0879	Dearborn Energy Center	20100201	2491.73	8.00E-10	1.99E-06
TOTAL	NA	NA	NA	NA	2.16E-04

Residential

For residential natural gas combustion, the EPRI emission factor of 8.0E-10 lb/MMCF was used along with the 2020 statewide fuel consumption data from the EIA, USDoE to generate estimated emissions of mercury (EGLE, 2025). This resulted in statewide total emissions from this category of 2.43E-04 lbs, compared to an estimate of 79.04 lbs, which was based on the WebFIRE natural gas combustion factor of 2.60E-04 lb/MMCF.

Table 13. Residential Natural Gas Combustion

Category	Throughput in MMCF	Emission Factor in LB/MMCF	Mercury Emissions in Lbs
Residential Natural Gas Combustion	304,000	8.00E-10	2.43E-04

Industrial/Commercial Boilers

For natural gas combustion from industrial and commercial boilers, the EPRI emission factor of 8.0E-10 lb/MMCF was incorporated into MAERS as a state-specific factor and applied to the facility-reported 2020 activity data. The statewide total mercury emissions estimated for this category were 7.06E-05 lbs.

The following industrial and commercial sources of natural gas combustion were included in the estimate:

Table 14: Industrial/Commercial Boilers, Natural Gas Combustion

SRN	Facility Name	SCC	Natural Gas in MMCF	MAERS Factor in Lb/MMCF	Estimated Emissions in Lbs from MAERS
A0023	OTSEGO PAPER INC	10200601	0	8.00E-10	0.00E+00
A0402	MENASHA PACKAGING COMPANY,LLC - COLOMA PLANT	10200602	48.92	8.00E-10	3.91E-08

A0563	Kellogg USA Inc.	10200602	240.75	8.00E-10	1.93E-07
A0749	AMERIWOOD INDUSTRIES	10200602	36.5549	8.00E-10	2.92E-08
A0884	Billerud Escanaba LLC	10200601	3018.171	8.00E-10	2.38E-06
A0884	Billerud Escanaba LLC	10200602	2806.102	8.00E-10	8.98E-07
A1932	Royal Adhesives & Sealants	10300603	184.4	8.00E-10	1.48E-07
A1991	Kalsec, Incorporated	10200602	50.85	8.00E-10	4.07E-08
A2402	ACCESS BUSINESS GROUP, LLC	10200602	26.9	8.00E-10	2.15E-08
A2620	GM Components Holdings, LLC	10200602	187.25	8.00E-10	1.50E-07
A2849	WACKER CHEMICAL CORP	10200602	84.99	8.00E-10	6.80E-08
A3569	Axalta Coating Systems USA LLC	10200602	52.82	8.00E-10	4.23E-08
A4043	Dow Silicones Corporation	10200601	210	8.00E-10	1.68E-07
A4043	Dow Silicones Corporation	10200602	75	8.00E-10	6.00E-08
A4285	LORIN INDUSTRIES	10200602	16	8.00E-10	1.28E-08
A4338	GERBER PRODUCTS CO	10200602	316.249	8.00E-10	2.53E-07
A4741	MICHIGAN SEAMLESS TUBE, LLC	10200602	71.86	8.00E-10	5.75E-08
A5262	General Motors LLC - Milford Proving Ground	10300602	418.16	8.00E-10	3.35E-07
A5806	The Hillshire Brands Company	10200602	230.47	8.00E-10	1.84E-07
A5858	Mead Johnson & Company, LLC	10200602	192.91	8.00E-10	1.54E-07
A6175	Nexteer Automotive Corporation	10200601	460.8	8.00E-10	3.69E-07
A6175	Nexteer Automotive Corporation	10200602	95.61	8.00E-10	7.65E-08
A6218	Dunn Paper, Inc.	10200602	305.56	8.00E-10	2.44E-07
A6220	Intertape Polymer Group	10200602	115.31	8.00E-10	9.23E-08
A6240	CARGILL SALT - ST. CLAIR	10200601	1378.5	8.00E-10	1.10E-06
A6240	CARGILL SALT - ST. CLAIR	10200602	93.56	8.00E-10	7.04E-08
A6380	ABBOTT NUTRITION	10200602	425.322	8.00E-10	3.40E-07
A6475	UP Paper LLC.	10200602	967.9	8.00E-10	7.74E-07
A6902	DARLING INGREDIENTS INC	10200602	24.757	8.00E-10	1.98E-08
A7757	U S SILICA CO	10200602	77.03	8.00E-10	5.79E-08
A7809	U S STEEL GREAT LAKES WORKS	10200602	1772.21	8.00E-10	1.42E-06
A8638	DETROIT DIESEL CORPORATION	10200602	178.417	8.00E-10	1.43E-07
A8648	FORD MOTOR CO ROUGE COMPLEX	10200602	40.7372	8.00E-10	3.26E-08
A8650	FORD MOTOR CO/ WAYNE COMPLEX	10100602	176.18	8.00E-10	1.41E-07
A8651	FORD MOTOR COMPANY, WOODHAVEN STAMPING PLANT	10200602	16.67	8.00E-10	1.33E-08
A9365	AKWEL CADILLAC USA, INC.	10200602	41.66	8.00E-10	3.33E-08
B0070	Georgia-Pacific Corrugated LLC-Owosso Facility	10200602	67.4	8.00E-10	5.39E-08
B0785	Quaker Chemical Corp.	10200602	10.7	8.00E-10	8.56E-09
B1470	NEENAH PAPER - MICHIGAN INC	10200601	44.8	8.00E-10	3.58E-08
B1476	Decorative Panels International	10200602	1085	8.00E-10	3.47E-07
B1479	CERTAINTEED CEILINGS CORP	10200602	22.7	8.00E-10	1.82E-08
B1493	Michigan Sugar Company - Bay City	10200601	2168.37	8.00E-10	1.73E-06
B1526	DARLING INGREDIENTS INC.	10200602	384.718	8.00E-10	3.08E-07
B1534	GRAPHIC PACKAGING INTERNATIONAL, LLC	10200601	1145.7	8.00E-10	9.17E-07
B1548	Post Foods	10200601	252.8105	8.00E-10	2.02E-07

B1604	GM LLC Customer Care & Aftersales - Swartz Creek	10200602	153.93	8.00E-10	1.23E-07
B1633	Sensient Flavors, Inc.	10200602	138.51	8.00E-10	1.11E-07
B1677	Allnex USA Inc.	10100602	334.17	8.00E-10	2.67E-07
B1678	GRAPHIC PACKAGING INTERNATIONAL LLC	10200601	2305.29	8.00E-10	1.84E-06
B1678	GRAPHIC PACKAGING INTERNATIONAL LLC	10200602	131.18	8.00E-10	9.87E-08
B1729	GRAND RAPIDS WASTEWATER TREATMENT PLANT	10300602	0.8844	8.00E-10	7.08E-10
B1771	FORD MOTOR COMPANY-VAN DYKE PLANT	10200602	37.88	8.00E-10	3.03E-08
B1801	FCA US LLC, STERLING STAMPING PLANT	10100602	159.66	8.00E-10	1.28E-07
B1824	Morton Salt, Inc.	10100604	2.585	8.00E-10	9.86E-10
B1824	Morton Salt, Inc.	10200602	0	8.00E-10	0.00E+00
B1827	EMPIRE IRON MINING PARTNERSHIP	10200602	0	8.00E-10	0.00E+00
B1855	Dunn Paper, Inc.	10200602	371	8.00E-10	2.97E-07
B1889	HOWMET CORPORATION, Plants 1 & 3	10200602	164.8	8.00E-10	1.32E-07
B1912	RENK America	10200602	7.823	8.00E-10	6.26E-09
B1925	Aludyne Montague, LLC	10200602	15.1	8.00E-10	1.21E-08
B1945	QUIKRETE-FLINT	10200602	19.61	8.00E-10	1.48E-08
B1950	Clinton River WRRF	10300603	28.06	8.00E-10	2.25E-08
B1966	WHITE PINE ELECTRIC POWER LLC	10200602	0	8.00E-10	0.00E+00
B1976	J.B. Sims Generating Station	10200602	16.5	8.00E-10	1.32E-08
B2013	OX Engineered Products	10200602	265.7	8.00E-10	2.13E-07
B2014	Day International, Inc. a Flint Group Company	10200602	36.82	8.00E-10	2.95E-08
B2024	OX Paperboard White Pigeon Mill	10200601	0	8.00E-10	0.00E+00
B2024	OX Paperboard White Pigeon Mill	10200602	312	8.00E-10	2.50E-07
B2032	FCA US LLC	10200602	12.609	8.00E-10	1.01E-08
B2050	Charles River Laboratories (formerly MPI Research)	10300602	198.6	8.00E-10	1.59E-07
B2050	Charles River Laboratories (formerly MPI Research)	10300603	93.3	8.00E-10	7.46E-08
B2063	Faurecia Interior Systems Saline, LLC	10200602	150.17	8.00E-10	1.20E-07
B2064	FORD MOTOR CO/RAWSONVILLE PLANT	10200602	20.43	8.00E-10	1.63E-08
B2103	GLWA Water Resource Recovery Facility	10300602	35.074	8.00E-10	2.81E-08
B2132	WYANDOTTE DEPT MUNI POWER PLANT	10200602	84.216	8.00E-10	6.74E-08
B2158	BUCKEYE TERMINALS, LLC - Woodhaven Terminal	10300602	0	8.00E-10	0.00E+00
B2217	EATON RESEARCH CENTER	10300603	17.6814	8.00E-10	1.41E-08
B2329	Par Sterile Products LLC	10200602	0.54	8.00E-10	4.32E-10
B2331	Michigan State University - Bioeconomy Institute	10200602	38.4	8.00E-10	3.07E-08
B2359	ConAgra Foods Packaged Foods, LLC	10200602	36.098	8.00E-10	2.89E-08
B2429	FAURECIA INTERIOR SYSTEMS	10200602	9	8.00E-10	7.20E-09
B2561	PACKAGING CORPORATION OF AMERICA	10300602	66.66	8.00E-10	5.33E-08
B2589	MDOC - Jackson Complex	10300603	233.83	8.00E-10	1.87E-07
B2644	Hemlock Semiconductor Operations LLC	10200601	42.6	8.00E-10	3.41E-08
B2644	Hemlock Semiconductor Operations LLC	10200602	974.345	8.00E-10	7.79E-07
B2763	U.S. Army Garrison-Detroit Arsenal	10200602	1.173	8.00E-10	9.38E-10
B2763	U.S. Army Garrison-Detroit Arsenal	10300603	91.208	8.00E-10	7.30E-08
B2767	FCA US LLC WARREN TRUCK ASSEMBLY PLANT	10200601	371.16	8.00E-10	2.97E-07

B2767	FCA US LLC WARREN TRUCK ASSEMBLY PLANT	10200602	0	8.00E-10	0.00E+00
B2810	DTE Electric Company - River Rouge Power Plant	10200601	67.1	8.00E-10	5.37E-08
B2811	DTE Electric Company - Trenton Channel Power Plant	10200602	479.39	8.00E-10	3.84E-07
B2814	DETROIT THERMAL BEACON HEATING PLANT	10300601	3205.7	8.00E-10	2.56E-06
B2817	VERTELLUS ZEELAND LLC	10200602	62.6036	8.00E-10	5.01E-08
B2838	Vicinity Energy Grand Rapids, LLC	10300601	11.436	8.00E-10	9.15E-09
B2838	Vicinity Energy Grand Rapids, LLC	10300602	740.196	8.00E-10	5.92E-07
B2840	Consumers Energy D.E. Karn Facility	10200601	61.742	8.00E-10	4.94E-08
B2873	Michigan Sugar Company - Sebewaing Factory	10200602	343.783	8.00E-10	2.75E-07
B2875	Michigan Sugar Company, Caro Factory	10200601	334.809	8.00E-10	2.68E-07
B2875	Michigan Sugar Company, Caro Factory	10200602	303.783	8.00E-10	2.43E-07
B2876	Michigan Sugar Company, Croswell Factory	10200601	713.8135	8.00E-10	5.71E-07
B2876	Michigan Sugar Company, Croswell Factory	10200602	145.5943	8.00E-10	1.17E-07
B2952	SILBOND CORP	10200602	32.42	8.00E-10	2.59E-08
B3012	DETROIT THERMAL BLVD HEATING PLANT	10300602	2.946	8.00E-10	2.36E-09
B3037	FITZGERALD FINISHING LLC	10300603	109.83	8.00E-10	8.79E-08
B3241	FORD MOTOR CO BROWNSTOWN	10200602	37.131	8.00E-10	2.97E-08
B3291	GIBRALTAR NATIONAL CORP / QUIKRETE DETROIT	10100602	9.18	8.00E-10	7.34E-09
B3350	FCA US LLC Trenton Engine Complex	10200601	38.33	8.00E-10	3.07E-08
B3350	FCA US LLC Trenton Engine Complex	10200602	109.19	8.00E-10	8.74E-08
B3472	VOSS INDUSTRIES-VOSS TAYLOR DIV	10200602	57.56	8.00E-10	4.61E-08
B3610	Pharmacia & Upjohn Co LLC, a subsidiary of Pfizer	10200601	1282.1	8.00E-10	1.03E-06
B3692	Packaging Corporation of America - Filer City Mill	10200601	3908	8.00E-10	3.13E-06
B3721	ANR Pipeline - Reed City Compressor Station	10200602	5.315739	8.00E-10	4.25E-09
B3721	ANR Pipeline - Reed City Compressor Station	10300603	0.013381	8.00E-10	8.42E-06
B4032	General Motors LLC - Pontiac North Campus	10200602	156.5	8.00E-10	1.25E-07
B4045	Kraft Heinz Foods Company	10300602	81.58	8.00E-10	6.53E-08
B4049	GM Technical Center	10200602	473.25	8.00E-10	3.79E-07
B4072	WestRock California, LLC	10200601	884.6	8.00E-10	7.08E-07
B4131	MNP CORP	10300602	204.505	8.00E-10	1.64E-07
B4197	AAR Mobility Systems	10200602	74.8	8.00E-10	5.98E-08
B4238	FRENCH PAPER LLC	10200602	160.7	8.00E-10	1.29E-07
B4288	Zoetis LLC	10200601	0.04	8.00E-10	3.20E-11
B4288	Zoetis LLC	10200602	175.07	8.00E-10	1.40E-07
B4302	American Chemical Solutions, LLC	10200602	35.2	8.00E-10	2.82E-08
B4306	Gerdau Special Steel North America - Jackson Mill	10200602	25	8.00E-10	2.00E-08
B4311	ADM GRAIN CO - Ottawa Lake	10200602	15.17	8.00E-10	1.21E-08
B4359	BASF Corporation - Chemical Plants	10200602	553	8.00E-10	4.42E-07
B4395	KEEBLER CO	10200602	124.32	8.00E-10	9.95E-08
B4569	AWREY BAKERIES, INC.	10200602	3.67	8.00E-10	2.94E-09
B4569	AWREY BAKERIES, INC.	10300602	19.223	8.00E-10	1.54E-08
B4569	AWREY BAKERIES, INC.	10300603	6.49	8.00E-10	5.19E-09

B4752	Great Lakes Petroleum Terminal, LLC	10200601	81.2	8.00E-10	6.50E-08
B4885	TILDEN MINING COMPANY LC	10200601	1407	8.00E-10	1.13E-06
B4885	TILDEN MINING COMPANY LC	10200602	8.68	8.00E-10	6.94E-09
B4925	O-N Minerals(Michigan) Company dba Carneuse Lime	10200602	56.061	8.00E-10	4.49E-08
B4942	Corteva LLC	10200602	827.4686	8.00E-10	6.62E-07
B4977	Conagra Foods Packaged Foods LLC - Vlasic Pickles	10200602	200.13	8.00E-10	1.60E-07
B5162	Maksteel Processing LLC I A Union Partners Co.	10200602	3.054	8.00E-10	2.44E-09
B5417	DW-National Standard-Niles, LLC	10200602	65.3957	8.00E-10	5.23E-08
B5830	AJAX METAL PROCESSING INC.	10200602	113.98	8.00E-10	9.12E-08
B5853	Gannett Publishing Services	10100602	52.21	8.00E-10	4.18E-08
B5966	Sun Chemical Corp	10200602	80.29	8.00E-10	6.42E-08
B6027	Inteva Products Adrian Operations	10200602	37.83	8.00E-10	3.03E-08
B6145	DTE Electric Company - Greenwood Energy Center	10200602	18.38	8.00E-10	1.47E-08
B6179	LOCKHART CHEMICAL COMPANY	10200602	58.55	8.00E-10	4.68E-08
B6237	YPSILANTI COMM. UTILITIES AUTHORITY	10200602	2.018	8.00E-10	1.61E-09
B6420	E.B. EDDY PAPER INC.	10200601	1007.11	8.00E-10	8.06E-07
B6420	E.B. EDDY PAPER INC.	10200602	45.21	8.00E-10	3.62E-08
B6519	W. R. Grace & Co.-Conn.	10200602	16.915	8.00E-10	1.35E-08
B6569	HENKEL US Operations Corporation	10200602	32.016	8.00E-10	2.56E-08
B6608	THELAMCO INC	10200602	3.378	8.00E-10	2.70E-09
B6619	Tiara Yachts Division of S2 Yachts	10300603	60.03	8.00E-10	4.80E-08
B6620	COLDWATER VENEER, INC.	10300603	0.3	8.00E-10	2.40E-10
B6633	AMERICAN AXLE & MANUFACTURING, INC	10200602	120.21	8.00E-10	9.62E-08
B6636	Consumers Energy - Ray Compressor Station	10200602	0.1129	8.00E-10	9.03E-11
B6636	Consumers Energy - Ray Compressor Station	10300602	38.6048	8.00E-10	3.09E-08
B6636	Consumers Energy - Ray Compressor Station	10300603	0.0125	8.00E-10	1.00E-11
B6637	Consumers Energy - St. Clair Compressor Station	10200602	12.6747	8.00E-10	1.01E-08
B6637	Consumers Energy - St. Clair Compressor Station	10300602	18.2988	8.00E-10	1.46E-08
B6637	Consumers Energy - St. Clair Compressor Station	10300603	0.6005	8.00E-10	4.80E-10
B6643	BASF Corporation	10200602	224.44	8.00E-10	1.80E-07
B7038	Continental Dairy Facilities, LLC	10200602	663	8.00E-10	5.30E-07
B7090	MICHIGAN MILK PRODUCERS ASSOCIATION	10200602	268.76	8.00E-10	2.15E-07
B7192	Billerud Quinnesec, LLC	10200601	430.814	8.00E-10	3.45E-07
B7192	Billerud Quinnesec, LLC	10200602	257.514	8.00E-10	8.24E-08
B7196	ANR Storage Company - Excelsior Compressor Station	10300602	7.516274	8.00E-10	6.01E-09
B7196	ANR Storage Company - Excelsior Compressor Station	10300603	21.984	8.00E-10	1.76E-08
B7197	ANR -- Rapid River Compressor Station	10300603	17.9494	8.00E-10	1.44E-08
B7198	ANR Pipeline-Cold Sprngs12 /Blue Lk/ Cold Springs 1	10200602	7.533088	8.00E-10	6.03E-09
B7198	ANR Pipeline-Cold Sprngs12 /Blue Lk/ Cold Springs 1	10300603	89.263	8.00E-10	7.14E-08
B7220	ANR Pipeline Co - Woolfolk Compressor Station	10300603	120.544	8.00E-10	9.64E-08
B7227	GENERAL MOTORS LLC - ORION ASSEMBLY	10200601	27	8.00E-10	2.16E-08
B7227	GENERAL MOTORS LLC - ORION ASSEMBLY	10200602	101	8.00E-10	8.08E-08

B7244	JBS Plainwell, Inc.	10200602	278.4	8.00E-10	2.23E-07
B7248	FCA US LLC Sterling Heights Assembly plant	10100602	90	8.00E-10	7.20E-08
B7248	FCA US LLC Sterling Heights Assembly plant	10200602	345.45	8.00E-10	2.76E-07
B7248	FCA US LLC Sterling Heights Assembly plant	10300601	39	8.00E-10	3.12E-08
B7248	FCA US LLC Sterling Heights Assembly plant	10300602	187.3	8.00E-10	1.50E-07
B7248	FCA US LLC Sterling Heights Assembly plant	10300603	113.1	8.00E-10	9.05E-08
B7276	L PERRIGO CO	10200602	290.38	8.00E-10	2.32E-07
B7302	WEYERHAEUSER NR COMPANY	10200602	24.23	8.00E-10	1.94E-08
B8573	Great Lakes Gas Trans Station #11 (TransCanada #11)	10300603	36.17	8.00E-10	2.89E-08
B8574	EVERGREEN PACKAGING INC.	10100602	8.75	8.00E-10	7.00E-09
B8863	ADM Grain Company - Webberville	10200602	0.9	8.00E-10	7.20E-10
B9080	Valicor Environmental Services	10300603	7.8454	8.00E-10	6.28E-09
C5704	Lakeland Medical Center (Former Memorial Hospital)	10300602	10.8139	8.00E-10	8.65E-09
C5728	ANDREWS UNIVERSITY	10300602	112.59	8.00E-10	9.01E-08
D3598	Hurley Medical Center	10300602	155.6921	8.00E-10	1.25E-07
D3699	MCLAREN FLINT	10200602	118.65	8.00E-10	9.49E-08
D6394	MyMichigan Medical Center Alma	10300603	65.15441	8.00E-10	5.21E-08
D8065	Dart Container Corporation of Michigan	10200602	138.252	8.00E-10	1.11E-07
E4437	NORTHWEST HARDWOODS	10200602	29.8	8.00E-10	2.38E-08
E4569	Arkema, Inc.	10200602	46.36	8.00E-10	3.71E-08
E5094	Hutchinson Antivibration Systems, Inc.	10200602	73.292	8.00E-10	5.86E-08
E6807	SPECTRUM HEALTH BLODGETT CAMPUS	10300603	116.22	8.00E-10	9.30E-08
F3254	Selfridge Air National Guard Base	10300603	97.2	8.00E-10	7.78E-08
F8375	Mercy Health Hackley Campus	10300602	63.47	8.00E-10	5.08E-08
G5066	ST JOSEPH MERCY HOSPITAL	10300602	156	8.00E-10	1.25E-07
G5067	WILLIAM BEAUMONT HOSPITAL	10300602	527.64	8.00E-10	4.22E-07
G5067	WILLIAM BEAUMONT HOSPITAL	10300603	15.1	8.00E-10	1.21E-08
G5252	Oakland Co. Service Center	10300602	134	8.00E-10	1.07E-07
G7126	GRAND VALLEY STATE UNIVERSITY	10300602	145.19	8.00E-10	1.16E-07
G7126	GRAND VALLEY STATE UNIVERSITY	10300603	78.18	8.00E-10	6.25E-08
H5877	EASTERN MI UNIVERSITY	10300601	193.617	8.00E-10	1.55E-07
J4912	Beaumont Hospital - Dearborn	10300602	187.4	8.00E-10	1.50E-07
K1260	Beaumont Hospital - Wayne	10300602	57	8.00E-10	4.56E-08
K1271	HENRY FORD HOSPITAL	10300602	407.9	8.00E-10	3.26E-07
K1276	DMC Sinai Grace Hospital	10200602	147	8.00E-10	1.18E-07
K1283	Beaumont Health Trenton Hospital	10300602	45.9	8.00E-10	3.67E-08
K2087	LAKELAND CORRECTIONAL FACILITY	10300602	90.69	8.00E-10	7.26E-08
K2120	MDOC IONIA FACILITIES	10300602	242.52	8.00E-10	1.94E-07
K2131	Western Michigan University	10300602	318.1	8.00E-10	2.54E-07
K2153	Marquette Branch Prison	10300602	81.44	8.00E-10	6.52E-08
K2155	FERRIS STATE UNIVERSITY	10300602	331	8.00E-10	2.65E-07
K2155	FERRIS STATE UNIVERSITY	10300603	0.00936	8.00E-10	7.49E-12
K2460	Central Michigan University	10300601	165	8.00E-10	1.32E-07

K2460	Central Michigan University	10300602	148.39	8.00E-10	1.15E-07
K2688	B.O.P. FEDERAL CORRECTIONAL INSTITUTE	10300602	101.86	8.00E-10	8.15E-08
K2729	Beaumont Hospital Farmington Hills	10300602	88.38	8.00E-10	7.07E-08
K3249	Michigan State University	10200602	13.01	8.00E-10	1.04E-08
K3249	Michigan State University	10300601	5392.71	8.00E-10	3.99E-06
K3249	Michigan State University	10300603	16.659	8.00E-10	1.33E-08
K5375	UNIVERSITY MI DEARBORN	10300602	60.7	8.00E-10	4.86E-08
K5375	UNIVERSITY MI DEARBORN	10300603	26.6	8.00E-10	2.13E-08
M0037	MERCY HEALTH	10300602	72.46	8.00E-10	5.80E-08
M0239	WAYNE STATE UNIVERSITY	10300602	547.0051	8.00E-10	4.38E-07
M0239	WAYNE STATE UNIVERSITY	10300603	22.012	8.00E-10	1.76E-08
M0675	UNIVERSITY OF MICHIGAN	10200602	279.0133	8.00E-10	2.23E-07
M0675	UNIVERSITY OF MICHIGAN	10300601	1571.09	8.00E-10	1.26E-06
M0675	UNIVERSITY OF MICHIGAN	10300602	98.069	8.00E-10	7.85E-08
M0675	UNIVERSITY OF MICHIGAN	10300603	453.635	8.00E-10	3.63E-07
M1812	ASCENSION ST. JOHN HOSPITAL	10300602	90.691	8.00E-10	7.26E-08
M1952	Acension St. Marys Saginaw	10300602	88.93	8.00E-10	7.11E-08
M1954	COVENANT HEALTH CARE	10300602	175	8.00E-10	1.40E-07
M1967	ASCENTION PROVIDENCE SOUTHFIELD HOSPITAL	10300602	131.299	8.00E-10	1.05E-07
M1968	McLaren Oakland	10300602	58.89719	8.00E-10	4.71E-08
M2032	SPECTRUM HEALTH-BUTTERWORTH CAMPUS	10300602	258.36	8.00E-10	2.07E-07
M2032	SPECTRUM HEALTH-BUTTERWORTH CAMPUS	10300603	1.412	8.00E-10	1.13E-09
M3431	ST JOSEPH MERCY HOSPITAL	10300602	219.9	8.00E-10	1.76E-07
M3546	Battle Creek VA MEDICAL CENTER	10300602	158	8.00E-10	1.26E-07
M3641	UNIVERSITY OF MICHIGAN FLINT	10300602	75.38	8.00E-10	6.03E-08
M3641	UNIVERSITY OF MICHIGAN FLINT	10300603	14.8	8.00E-10	1.18E-08
M3653	V A MEDICAL CENTER	10300602	177.51	8.00E-10	1.42E-07
M3792	NORTHERN MICHIGAN UNIVERSITY	10300602	403.523	8.00E-10	2.71E-07
M3912	ADM Grain Company - Grand Ledge	10200602	20.38	8.00E-10	1.63E-08
M4086	TOYOTA MOTOR NORTH AMERICA	10300603	0	8.00E-10	0.00E+00
M4174	DETROIT METROPOLITAN WAYNE COUNTY AIRPORT	10300602	262.9	8.00E-10	2.10E-07
M4175	FORD MOTOR CO	10300602	123.576	8.00E-10	9.89E-08
M4199	GENERAL MOTORS LLC DETROIT-HAMTRAMCK ASSEMBLY	10200602	108.41	8.00E-10	8.67E-08
M4204	Zeeland Farm Services, Inc.	10300602	96.272	8.00E-10	7.70E-08
M4232	Huron Valley - Sinai Hospital	10200602	51.6	8.00E-10	4.13E-08
M4347	LINDE INC.	10200602	70.1	8.00E-10	5.61E-08
M4547	FRITZ PRODUCTS	10200602	57.07	8.00E-10	4.57E-08
M4732	AmCane Sugar LLC	10200602	47.931	8.00E-10	3.83E-08
M4752	JOHN D DINGELL VA MEDICAL CENTER	10300602	197.27	8.00E-10	1.58E-07
M4764	FORD MOTOR CO ELM STREET BOILERHOUSE	10200601	98.519	8.00E-10	7.88E-08
M4764	FORD MOTOR CO ELM STREET BOILERHOUSE	10200602	189.269	8.00E-10	1.51E-07
M4768	FLAT ROCK METAL INC	10200602	72	8.00E-10	5.76E-08

M4772	WAYNE CO COMM COLLEGE WESTERN	10300603	11.7	8.00E-10	9.36E-09
M4773	WAYNE CO COMM COLLEGE DOWNRIVER	10300603	11.5	8.00E-10	9.20E-09
M4774	WAYNE CO COMM COLLEGE EASTERN	10300603	7.7	8.00E-10	6.16E-09
M4833	WAYNE CO COMM COLLEGE NORTHWEST	10300603	11.4	8.00E-10	9.12E-09
N0034	MOLDED PLASTIC INDUSTRIES, INC.	10300603	4.2767	8.00E-10	3.42E-09
N0547	Darling Ingredients Inc.	10200602	300.675	8.00E-10	2.41E-07
N0677	Steelcase Inc.- Kentwood Complex	10200602	216.326	8.00E-10	1.73E-07
N0731	Nortru, LLC	10300603	0	8.00E-10	0.00E+00
N0780	LOUISIANA-PACIFIC CORP NEWBERRY PLANT	10200602	14.654	8.00E-10	1.07E-08
N0802	ALBAR INDUSTRIES, INC.	10200602	41.917	8.00E-10	3.35E-08
N0842	Gage Products Company	10200602	38	8.00E-10	3.04E-08
N0923	Ventra Ionia Main, LLC	10200602	95.87	8.00E-10	7.67E-08
N0929	Ford Motor Company - Flat Rock Assembly	10200602	810.3465	8.00E-10	6.48E-07
N1099	Consumers Energy - Northville Compressor Station	10300603	24.6514	8.00E-10	1.97E-08
N1192	DENSO Manufacturing Michigan, Inc.	10200602	13.284	8.00E-10	1.06E-08
N1237	Bakelite Chemicals LLC	10200602	10.217	8.00E-10	8.17E-09
N1315	LOUISIANA-PACIFIC CORP SAGOLA PLANT	10200602	12.05	8.00E-10	9.64E-09
N1336	BASF CORPORATION	10200602	37.1	8.00E-10	2.97E-08
N1436	FCA US LLC - Chrysler Technology Center	10200602	380.3	8.00E-10	3.04E-07
N1461	WELCH FOODS INC	10200602	98.6	8.00E-10	7.89E-08
N1581	Tribar Technologies Inc. (Plant 1)	10300603	12.2	8.00E-10	9.76E-09
N1604	Kent County Waste to Energy Facility	10300602	14.2779	8.00E-10	1.14E-08
N1622	POLLARD (U.S.) LTD	10200602	58.103	8.00E-10	4.65E-08
N1701	Morbark, LLC	10200602	51.74	8.00E-10	4.14E-08
N1781	Magna Mirrors Corporation	10300603	54.148	8.00E-10	4.33E-08
N1784	ADA COGENERATION LLC	10100602	136.9	8.00E-10	1.10E-07
N1794	Atlas EPS, a Division of Atlas Roofing Corp.	10200602	1.04	8.00E-10	8.32E-10
N1966	Michigan Automotive Compressor Inc.	10300603	156.6	8.00E-10	1.25E-07
N2155	FCA US LLC - JEFFERSON NORTH ASSEMBLY PLANT	10200602	97.32	8.00E-10	7.79E-08
N2432	A G SIMPSON (USA), Inc.	10100602	18.8	8.00E-10	1.50E-08
N2614	NBHX Trim USA Corporation	10200602	21.73	8.00E-10	1.74E-08
N2915	TOYOTA MOTOR NORTH AMERICA R&D	10300603	148.92	8.00E-10	1.19E-07
N2954	Cargill Salt - Hersey	10200602	60.158	8.00E-10	4.81E-08
N2955	KINROSS CORRECTIONAL FACILITY	10300602	12.86	8.00E-10	1.03E-08
N3022	Eaton Rapids Gas Storage System	10200602	24.0441	8.00E-10	1.92E-08
N3225	KENT CAREER TECHNICAL CENTER	10300602	22.63	8.00E-10	1.81E-08
N3391	DT Midstream - Washington 10 Compressor Station	10200602	83.25	8.00E-10	6.66E-08
N3417	LYMTAL INTERNATIONAL, INC.	10200601	4.554	8.00E-10	3.64E-09
N3422	OAKLAND UNIVERSITY	10300602	15.2958	8.00E-10	1.22E-08
N3655	Bronson Battle Creek	10300602	75.667	8.00E-10	6.05E-08
N3929	RESOLUTE FOREST PRODUCTS - MENOMINEE	10200601	540.945	8.00E-10	4.33E-07
N3987	WILLIAM BEAUMONT HOSPITAL	10300602	192.8	8.00E-10	1.54E-07
N4975	Michigan Power Limited Partnership	10200601	26.63	8.00E-10	2.13E-08

N5053	USA JET	10300603	1.5375	8.00E-10	1.23E-09
N5056	Magna Mirrors North America	10300603	11.9	8.00E-10	9.52E-09
N5226	QUINCY STREET, INC.	10200602	32	8.00E-10	2.56E-08
N5572	Howell Compressor Station	10200602	0.3251	8.00E-10	2.60E-10
N5573	Consumers Energy - White Pigeon Compressor Station	10300603	4.861	8.00E-10	3.89E-09
N5575	ANR Pipeline Company - Bridgman Compressor Station	10300603	17.3337	8.00E-10	1.39E-08
N5688	Perrigo Holland, Inc.	10200602	100.6	8.00E-10	8.05E-08
N5747	PIONEER METAL FINISHING INDUSTRIAL HWY	10300603	56.979	8.00E-10	4.56E-08
N5797	Boars Head Provisions Co., Inc.	10300602	105.04	8.00E-10	8.40E-08
N5866	METAL TECHNOLOGIES, INC., RAVENNA DUCTILE IRON	10200602	46	8.00E-10	3.68E-08
N5930	DELTA COLLEGE	10300602	57.5	8.00E-10	4.60E-08
N5930	DELTA COLLEGE	10300603	0	8.00E-10	0.00E+00
N5940	POTLATCHDELTIC LAND & LUMBER LLC.	10200602	85.34	8.00E-10	6.83E-08
N5940	POTLATCHDELTIC LAND & LUMBER LLC.	10300602	101.37	8.00E-10	8.11E-08
N6013	CONTINENTAL ALUMINUM	10200602	144	8.00E-10	1.15E-07
N6016	ASCENSION GENESYS HOSPITAL	10300602	124.976	8.00E-10	1.00E-07
N6226	Brembo North America, Inc.	10200602	100	8.00E-10	8.00E-08
N6358	DETROIT THERMAL HENRY HEATING PLANT	10300602	2.38	8.00E-10	1.90E-09
N6388	PIONEER METAL FINISHING - STEPHENS ROAD	10200602	26.096	8.00E-10	2.09E-08
N6452	ADVANCED HEAT TREAT CORP	10200601	2.102	8.00E-10	1.68E-09
N6521	Consumers Energy Co. - Zeeland Generating Station	10200602	2.996	8.00E-10	2.40E-09
N6577	ND Industries, Inc.	10300603	5.811	8.00E-10	4.65E-09
N6631	DEARBORN INDUSTRIAL GENERATION	10200601	1857.1	8.00E-10	1.49E-06
N6726	Heat Treating Services Corp - Plant 3	10200602	160.72	8.00E-10	1.29E-07
N6767	New Covert Generating Company, LLC	10200602	1.36	8.00E-10	1.09E-09
N6866	Georgia Pacific Corrugated LLC	10200602	63.65	8.00E-10	5.09E-08
N6950	General Motors LLC-Lansing Delta Township	10200602	79.5	8.00E-10	6.36E-08
N6976	HUNTINGTON FOAM LLC	10200602	61.07	8.00E-10	4.89E-08
N6980	WMU Energy Resource Center	10300602	61.54	8.00E-10	4.92E-08
N6996	POET Biorefining - Caro, LLC	10200602	1709	8.00E-10	1.37E-06
N7096	Heat Treating Services Corp of America - Plant 1	10200602	107.06	8.00E-10	8.57E-08
N7132	Sun Gro Horticulture	10100602	24.9	8.00E-10	1.99E-08
N7202	Tribar Technologies Inc (Plant 3)	10300603	32.6	8.00E-10	2.61E-08
N7256	UNIVERSAL COATING INC.	10300603	0.47796	8.00E-10	3.82E-10
N7289	Sonoco Protective Solutions, Inc.	10200602	204.71	8.00E-10	1.64E-07
N7298	DOMESTIC UNIFORM RENTAL	10200602	18	8.00E-10	1.44E-08
N7303	Bluewater Gas Storage Facility - Columbus	10200602	2.88	8.00E-10	2.30E-09
N7383	Valero Renewable Fuels Company, LLC	10200602	0	8.00E-10	0.00E+00
N7411	SMR Automotive Systems USA, Inc.	10300603	21.53	8.00E-10	1.72E-08
N7493	MARYSVILLE ETHANOL, LLC	10200601	1484	8.00E-10	1.19E-06
N7602	UniFirst Corporation	10200602	6.85	8.00E-10	5.48E-09
N7688	Dicastal North America, Inc.	10200602	320.73	8.00E-10	2.57E-07

N7809	Tribar Technologies Inc (Plant 4)	10200602	34.5	8.00E-10	2.76E-08
N7886	Hyundai America Technical Center Inc. (HATCI)	10200602	26.488	8.00E-10	2.12E-08
N8035	CAPITAL REGION AIRPORT AUTHORITY	10300603	14.05	8.00E-10	1.12E-08
N8192	Request Foods, Inc.	10200602	166.187	8.00E-10	1.33E-07
N8265	Hearthside Food Solutions LLC	10300603	10.076	8.00E-10	8.06E-09
N8270	HEARTHSIDE FOOD SOLUTIONS	10300603	23.54	8.00E-10	1.88E-08
N8273	ASCENSION PROVIDENCE PARK HOSPITAL	10300602	86.03	8.00E-10	6.88E-08
N8308	ALCO Products, LLC	10300603	1.7372	8.00E-10	1.64E-09
P0087	LG Energy Solution Michigan Inc.	10200602	124.15	8.00E-10	9.93E-08
P0117	Roskam Baking Co	10300602	403.25	8.00E-10	3.23E-07
P0152	MICHIGAN DEPT OF TECHNOLOGY, MANAGEMENT AND BUDGET	10200602	3.31	8.00E-10	2.65E-09
P0243	Beaumont Information Technology Center	10300603	1.87	8.00E-10	1.50E-09
P0336	HENRY FORD WEST BLOOMFIELD HOSPITAL	10300602	114	8.00E-10	9.12E-08
P0448	POSTLE ALUMINUM	10200602	50.72	8.00E-10	4.06E-08
P0465	HOLLAND BOARD OF PUBLIC WORKS-Holland Energy Park	10200602	122.17	8.00E-10	9.77E-08
P0468	NEWBERRY CORRECTIONAL FACILITY	10300602	80.77	8.00E-10	6.46E-08
P0517	Maroa Farms, Inc. and Pepperco-USA, Inc.	10200602	612.06	8.00E-10	4.90E-07
P0585	CLEMENS FOOD GROUP	10200602	306.214	8.00E-10	2.45E-07
P0615	Toyota Motor North America R&D	10300603	14.3312	8.00E-10	1.15E-08
P0625	MDOC-Muskegon Complex	10300602	82.29	8.00E-10	6.58E-08
P0637	MDOC Women's Huron Valley Correctional Facility	10300602	100.72	8.00E-10	8.06E-08
P0640	MDOC Chippewa Complex	10300602	93.64	8.00E-10	7.49E-08
P0699	ARAUCO NORTH AMERICA	10200602	94	8.00E-10	7.52E-08
P0727	Tribar Technologies Inc (Plant 5)	10200602	37.7	8.00E-10	3.02E-08
P0758	UNIFIRST CORPORATION	10200602	5.52	8.00E-10	4.42E-09
P0788	ZFS Ithaca, LLC	10300602	652.198	8.00E-10	5.22E-07
P0915	Jackson Metal Cleaning	10300603	0.0012	8.00E-10	9.60E-13
P0954	MWC (Michigan) LLC.	10200601	59.262	8.00E-10	4.74E-08
P0954	MWC (Michigan) LLC.	10200602	22.06	8.00E-10	1.77E-08
P1028	Corteva Agriscience LLC	10200601	10	8.00E-10	8.00E-09
TOTAL	NA	NA	NA	NA	7.06E-05

Stationary Internal Combustion Engines (Natural gas-fired, Industrial/Commercial)

Natural gas-fired, stationary internal combustion engines were separated from natural gas-fired boilers in the report to provide greater clarity. Stationary internal combustion engine emissions were calculated similarly to industrial/commercial boilers that combust natural gas. The EPRI factor was adopted in MAERS and produced a statewide estimate of 6.30E-06 lbs.

The following sources of natural gas combustion were included in the estimate:

Table 15. Stationary Internal Combustion Engines, Natural Gas

SRN	Facility Name	SCC	Natural Gas in MCF	MAERS Factor in Lb/MCF	Estimated Emissions in Lbs from MAERS
A3900	Martin Marietta Magnesia Specialties, LLC	20200202	0.458	8.00E-10	3.66E-10
A3934	Great Lakes Castings LLC	20200202	0.017	8.00E-10	1.36E-11
A5858	Mead Johnson & Company, LLC	20200202	0.01772	8.00E-10	1.42E-11
A6220	Intertape Polymer Group	20200202	0.075	8.00E-10	6.00E-11
A8638	DETROIT DIESEL CORPORATION	20200202	0	8.00E-10	0.00E+00
A8645	FORD MOTOR CO/ LIVONIA TRANSMISSION	20200202	0.04239	8.00E-10	3.39E-11
A8648	FORD MOTOR CO ROUGE COMPLEX	20200202	0.1197	8.00E-10	9.58E-11
A8650	FORD MOTOR CO/ WAYNE COMPLEX	20200202	0	8.00E-10	0.00E+00
A9365	AKWEL CADILLAC USA, INC.	20200202	0.000884	8.00E-10	7.07E-13
B1771	FORD MOTOR COMPANY-VAN DYKE PLANT	20200202	0.0832	8.00E-10	6.66E-11
B3350	FCA US LLC Trenton Engine Complex	20200202	0.158	8.00E-10	1.26E-10
B4049	GM Technical Center	20200202	0.92	8.00E-10	7.36E-10
B4282	Marysville Hydrocarbons, LLC.	20200201	0.06	8.00E-10	4.80E-11
B4292	Lambda Energy Resources, LLC - KALKASKA GAS PLANT	20200201	0.025	8.00E-10	2.00E-11
B6230	FORD MOTOR CO RESEARCH & DEV CTR	20200202	0.2809	8.00E-10	2.25E-10
B6478	DTE Gas Co. - Belle River Mills Compressor Station	20200201	564.49	8.00E-10	4.52E-07
B6636	Consumers Energy - Ray Compressor Station	20200201	14.176	8.00E-10	1.13E-08
B6637	Consumers Energy - St. Clair Compressor Station	20200201	28.625	8.00E-10	2.29E-08
B7221	DTE Gas Company - Milford Compressor Station	20200201	905.47	8.00E-10	7.24E-07
B8573	Great Lakes Gas Trans Station #11 (TransCanada #11)	20200201	214.75	8.00E-10	1.72E-07
K2153	Marquette Branch Prison	20200202	0.16	8.00E-10	1.28E-10
K3249	Michigan State University	20200202	3.08	8.00E-10	2.46E-09
M4174	DETROIT METROPOLITAN WAYNE COUNTY AIRPORT	20200202	0.49	8.00E-10	3.92E-10
M4780	ROUSH INDUSTRIES	20200202	0.3263	8.00E-10	2.61E-10
N0677	Steelcase Inc.- Kentwood Complex	20200202	0.10296	8.00E-10	8.24E-11
N1192	DENSO Manufacturing Michigan, Inc.	20200202	0.0034	8.00E-10	2.72E-12
N1216	Westside Recycling and Disposal Facility	20200202	105.36	8.00E-10	8.43E-08
N1652	West Branch Production Gathering & Compressor Stat	20200202	24.723	8.00E-10	1.98E-08

N1685	TES Filer City Station	20200202	0.042	8.00E-10	3.36E-11
N2037	DENSO AIR SYSTEMS MI, INC.	20200202	0.00145	8.00E-10	1.16E-12
N2155	FCA US LLC - JEFFERSON NORTH ASSEMBLY PLANT	20200202	0.008219	8.00E-10	6.58E-12
N2168	GREAT LAKES GAS TRANSMISSION STATION #7	20200201	332.96	8.00E-10	2.66E-07
N2901	Consumers Energy - Muskegon River Compressor Stat	20200201	64.03	8.00E-10	5.12E-08
N2954	Cargill Salt - Hersey	20200201	539.6	8.00E-10	4.32E-07
N3391	DT Midstream - Washington 10 Compressor Station	20200202	386.8	8.00E-10	3.10E-07
N3392	DTE Gas Company - Taggart Compressor Station	20200202	593.71	8.00E-10	4.75E-07
N3758	GREAT LAKES GAS TRANSMISSION STATION #10	20200201	430.91	8.00E-10	3.45E-07
N3759	GREAT LAKES GAS TRANSMISSION STATION #9	20200201	22.22	8.00E-10	1.78E-08
N3760	GREAT LAKES GAS TRANSMISSION STATION #8	20200201	473.37	8.00E-10	3.79E-07
N3818	Great Lakes Gas Transmission Station #13	20200201	424.0676	8.00E-10	3.39E-07
N5574	ANR Pipeline Company - Hamilton Compressor Station	20200201	337.2375	8.00E-10	2.70E-07
N5575	ANR Pipeline Company - Bridgman Compressor Station	20200201	149.1687	8.00E-10	1.19E-07
N5576	ANR Pipeline Co. - Goodwell Compressor Station	20200201	74.73622	8.00E-10	5.98E-08
N5576	ANR Pipeline Co. - Goodwell Compressor Station	20200202	0.06938	8.00E-10	5.55E-11
N5578	ANR Pipeline Co. - Winfield Compressor Station	20200202	11.5591	8.00E-10	9.25E-09
N5581	Great Lakes Gas - Farwell Compressor Station 12	20200201	7.71	8.00E-10	6.17E-09
N5724	CITY OF ST. LOUIS	20200202	0.0015	8.00E-10	1.20E-12
N5798	Core Energy LLC - Chester 10 CO2 Recovery	20200202	131.4	8.00E-10	1.05E-07
N6242	HRF Exploration & Production - West Ossinekee 9	20200202	50.8	8.00E-10	4.06E-08
N6266	FEDERAL MOGUL POWERTRAIN INC	20200202	0.08221	8.00E-10	6.58E-11
N6838	Vector Pipeline L.P., Highland Compressor Station	20200201	787.073	8.00E-10	6.30E-07
N6950	General Motors LLC-Lansing Delta Township	20200202	0.067	8.00E-10	5.36E-11
N7421	DTE Gas Company - Willow Run Compressor Station	20200201	10.8	8.00E-10	8.64E-09
N7624	VECTOR PIPELINE L.P. Washington Compressor Station	20200201	586.92	8.00E-10	4.69E-07
N8151	VECTOR PIPELINE L.P., Athens Compressor Station	20200201	7.219	8.00E-10	5.78E-09
P0486	Savoy Energy L.P. (Adrian 25 CPF)	20200202	0	8.00E-10	0.00E+00
P0668	Marquette Board of Light and Power	20200202	0.014	8.00E-10	1.12E-11
P0796	Upper Michigan Energy Resources -A.J. Mihm G.S.	20200202	0.366	8.00E-10	2.93E-10
P0797	Upper Michigan Energy Resources -F.D. Kuester G.S.	20200202	591.213	8.00E-10	4.73E-07
TOTAL	NA	NA	NA	NA	6.30E-06

Wood Combustion

Electric Utilities

Mercury emissions from wood-fired electric utilities were estimated using data from MAERS as part of Michigan's submittal to the USEPA's 2020 NEI (EGLE, 2025). Wood consumption, or throughput, is expressed in tons. The default MAERS emission factor was utilized except for Genesee Power Station Limited Partnership, which reported mercury based on stack-testing data. Between the more accurate stack test-based estimates for this one facility, and a decline in wood-firing, the emissions from this sector dropped from 12.34 lbs estimated for 2017 to 8.83 lbs in 2020.

White Pine Electric Power LLC (B1966) permanently shutdown SCC 10200905 in 2020 and are therefore not included in the 2020 inventory.

The following wood-fired electric utilities were included in the estimate.

Table 16. Electric Utilities, Wood Combustion

SRN	Facility Name	SCC	Factor in Lb/Ton	Wood in Tons	Estimated Emissions in Lbs
B4260	LANSE WARDEN ELECTRIC COMPANY LLC	10100903	3.64E-05	97257.2	1.42
N0890	National Energy of Lincoln LLC	10100902	3.64E-05	158130	2.30
N1266	Hillman Power Company L.L.C.	10100902	3.64E-05	788	0.01
N1395	Cadillac Renewable Energy Limited Partnership	10100902	3.64E-05	149442	2.18
N2388	Grayling Generating Station LTD PTNR	10100902	3.64E-05	116891	1.70
N3570	GENESEE POWER STATION LIMITED PARTNERSHIP	10100911	8.35E-06	142458.2	1.22
Total	NA	NA	NA	NA	8.83

Industrial/Commercial Wood Combustion

Point source estimates such as those for industrial and commercial combustion of wood were collected from MAERS (EGLE, 2024). These point source estimates were generated as part of Michigan’s submittal to the USEPA’s 2020 NEI.

Michigan Maple Block Co. permanently shutdown in 2020 and are therefore not included in the 2020 inventory.

Table 17. Industrial/Commercial, Wood Combustion

SRN	Facility Name	SCC	Wood in Tons	Emission Factor in Lbs	Estimated Emissions in Lbs
A0749	AMERIWOOD INDUSTRIES	10300903	0	3.64E-5	0.000
A5937	Howard Miller Company	10200906	167.1	5.15E-6	0.001
B1471	TIMBER PRODUCTS MICHIGAN	10200905	31858	5.15E-6	0.164
B1476	Decorative Panels International	10200903	7850	3.536E-6	0.028
B6001	Herman Miller, Inc	10200907	0	5.15E-6	0.000
B6620	COLDWATER VENEER, INC.	10300903	2600	3.64E-5	0.095
B7099	CONNOR AGA SPORTS FLOORING LLC	10200905	2188.25	5.15E-6	0.011
B7192	Verso Quinnesec, LLC	NA	NA	NA	0.050
B8603	JELD-WEN Interior Door - Grand Rapids	10300903	0	3.64E-5	0.000
E4437	NORTHWEST HARDWOODS	10200906	1255	5.15E-6	0.006
K2460	Central Michigan University	10300903	0	3.64E-5	0.000
M3546	Battle Creek VA MEDICAL CENTER	10200907	0	5.15E-6	0.000
N0780	LOUISIANA-PACIFIC CORP NEWBERRY PLANT	10200905	9884	5.15E-6	0.051
N1271	FIBER CHAR CORP	10200910	152	NA	0.102
N1315	LOUISIANA-PACIFIC CORP SAGOLA PLANT	10200904	15869	5.15E-6	0.033

N1722	BIEWER SAWMILL INC	10300903	35005	3.64E-5	0.510
N2206	BANKS HARDWOODS, INC.	10200906	8058.56	5.15E-6	0.042
N2454	Wolverine Hardwoods Inc.	10100903	1026	3.64E-5	0.037
N5940	POTLATCHDELTIC LAND & LUMBER LLC.	10200905	37936	5.15E-6	0.195
N6034	WOOD ISLAND WASTE MANAGEMENT	10100908	56.5	5.38E-5	0.003
P0699	ARAUCO NORTH AMERICA	10200902	35209	3.395E-5	1.195
TOTAL	NA	NA	NA	NA	2.523

Residential, Wood Combustion

Residential wood combustion sector includes estimates for freestanding woodstoves (USEPA certified catalytic and non-catalytic, and non-certified), inserts (USEPA certified catalytic and non-catalytic, and non-certified), fireplaces burning cordwood, indoors wood furnaces, outdoors hydronic heaters, wood pellet stoves, and miscellaneous woodburning devices not elsewhere classified. Estimated emissions are based on inputs and emission factors included in the USEPA’s Residential Wood Combustion Tool. The 2020 NEI activity data used the regression results from 2017, which developed appliance fractions and burn rates for each county based on the Commission on Environmental Cooperation (CEC) survey and EPA statistical regression analysis. For the 2017 NEI, two EPA adjustment factors were applied to the wood-burning activity estimates. These adjustment factors were applied to the 2020 NEI with updated data. The first adjustment factor corrected the state-level residential-wood burning activity predicted by the tool to the amount predicted by SEDS. The second adjustment factor corrected the predicted amount of wood burned based on the housing density in each county for central heaters and outdoor recreational equipment (USEPA, 2023).

For residential wood combustion, the USEPA’s estimate of mercury emissions from the 2020 NEI was utilized. The USEPA calculated that 101.22 lbs of mercury was emitted from residential wood burning in Michigan. This is an increase since the 2017 estimate of 56.68 lbs of mercury emissions from this sector. The change is due to four updates made to the 2020 NEI activity-related data and methodology: (1) Prior to 2018, State Energy Data System (SEDS) used state-level data from the 2009 Residential Energy Consumption Survey (RECS) and used American Community Survey (ACS) data on housing units for the states that did not have RECS data. Since 2018, SEDS has used national-level wood combustion data from the Monthly Energy Review (MER). The change in methodology resulted in more residential wood consumption and an emission increase in the northern states and a decrease in the southern states. (2) Housing unit data was updated to the Spring 2022 U.S. Census Bureau’s 2016-2020 American Community Survey 5-Year Estimate. (3) Default wood density factors used USDA data on firewood density by tree species and USDA surveys with county-level counts of trees for the 2020 NEI. The 2017 NEI cord wood density factors were based on the 2009 U.S. Forest Service Time Products Output report. (4) An incorrect default distribution factor for indoor pellet furnaces was corrected to 0.03 for the 2020 NEI. The 2017 NEI default distribution factor of 0.37 was incorrect (USEPA, 2023).

Table 18. Residential Wood Combustion

Data Source	Mercury Emissions in Lbs	Nonpoint Sector
2020 NEI	101.22	Fuel Comb. - Residential Wood

Tire-Derived Fuel Combustion

Several facilities utilized tire-derived fuel (TDF) to fire their boilers. National Energy of Lincoln, LLC reported their own mercury estimates based on stack testing (EGLE, 2025). The other facilities' values are default MAERS estimates based on a USEPA emission factor. The emissions estimate of 28.10 lbs for 2020 is higher than the estimate of 22.75 lbs from 2017. This is due to the National Energy of McBain, LLC and Genesee Power Station Limited Partnership mercury estimates submitted in 2020 were based on MAERS emission factor whereas in 2017 the estimates were based on stack testing or other calculations.

Michigan Hub, LLC (B6611) permanently shutdown in 2017 and are therefore not included in the 2020 inventory.

Table 19. TDF Boilers

SRN	Facility Name	Emission Unit ID	SCC	Emission Estimation Basis	Tire-Derived Fuel in Tons	Estimated Emissions in Lbs
B4260	LANSE WARDEN ELECTRIC COMPANY LLC	EU0009	10201201	MAERS Emission Factor	1802.7	2.79
N0890	National Energy of Lincoln LLC	EU0003	10101201	Stack Test	12099	0.00
N1160	National Energy of McBain LLC	EU0003	10101201	MAERS Emission Factor	10772	16.65
N2388	GRAYLING GENERATING STATION LTD PTNR	EU0008	10101201	MAERS Emission Factor	1893	2.93
N3570	GENESEE POWER STATION LIMITED PARTNERSHIP	EU0009	10101201	MAERS Emission Factor	3712.3	5.74
Total	NA	NA	NA	NA	30279	28.10

Petroleum Refining

Marathon Ashland Petroleum (A9831), the only petroleum refinery in the state, emitted 32.52 lbs of mercury in 2020 according to data gathered from MAERS as part of Michigan's submittal to the USEPA's 2020 NEI (EGLE, 2025).

Table 20. Petroleum Refining

SRN	Facility Name	SCC	Process Gas in MCF	Emission factor in Lb/MCF	Estimated Emissions in Lbs
A9831	Marathon Petroleum Company LP	30600106	11911.32	2.73E-03	32.52

Residential LPG (Propane) Combustion

Residential fuel combustion estimates for Liquefied Petroleum Gas (LPG) or propane combustion were prepared by ERAU for the mercury inventory, as they were not generated by the USEPA as part of the 2020 NEI. For residential propane, an emission factor of 1.20E-05 lbs/1,000 gallons was selected. This factor was originally used in Michigan’s 2002 NEI submittal, and as part of the 2002 air toxics inventory prepared in collaboration with the Great Lakes Commission and other Great Lakes states. It was applied to 2020 statewide fuel consumption data from the EIA, USDoE to generate estimated emissions of mercury for 2020 (EGLE, 2025). LPG consumption, or throughput, is expressed in thousands of gallons.

Table 21. Residential Propane Combustion

Category	Throughput in E3 GAL	Emission Factor in LB/E3 GAL	Mercury Emissions in Lbs
Residential LPG (Propane) Combustion	397,362	1.20E-05	4.77

INCINERATION

Sewage Sludge Incineration

According to MAERS, 35,408.2 tons of biosolids (sewage sludge) were incinerated at the GLWA Water Resource Recovery Facility in 2020. Using an emission factor derived from a 2012 stack test at the facility, 38.24 lbs of mercury were likely released to the air in 2020 (Chamberlain, 2025). This represents an increase of 9,573.5 tons of sludge processed by the facility compared to 2017, resulting in an estimated increase of 10.34 lbs of mercury emissions.

In the 2020 NEI, emission estimates from incineration at the Warren Wastewater Treatment Plant were augmented by the USEPA in accordance with an ERAU-estimated mercury value based on the facility’s stack testing data. The emission estimates from the Ypsilanti Community Utilities Authority (YCUA) were also augmented within the 2020 NEI, with a facility-reported mercury value based on stack testing. The values were mapped by the USEPA to representative SCC codes for the two facilities, to 50100802 and 50100803, which indicate governmental facilities with sewage sludge incineration via multiple hearth incinerator and fluidized bed combustor, respectively. The SCC code used by the facilities within MAERS was more generic and specified “Other Incineration” rather than “Sewage Sludge Incineration.”

The following sewage sludge incinerators were included in the calculation.

Table 22. Sewage Sludge Incinerators

SRN	Facility Name	SCC	Sludge in Tons	Best Estimate in Lbs	Notes for 2020 Calculations
B1792	Warren Wastewater Treatment Plant	50100515	4571	6.30	EPA augmentation under SCC 50100802, per ERAU calculation based on facility stack test and hourly operations.
B6237	Ypsilanti Comm. Utilities Authority	50100516	4129	0.25	EPA augmentation under SCC 50100803, per facility-reported value based on stack test.
B2103	GLWA Water Resource Recovery Facility	50200506	35408.2	38.24	ERAU calculation based on stack test
TOTAL	NA	NA	NA	44.79	NA

Trends for Mercury in Michigan Biosolids (EGLE, 2025).

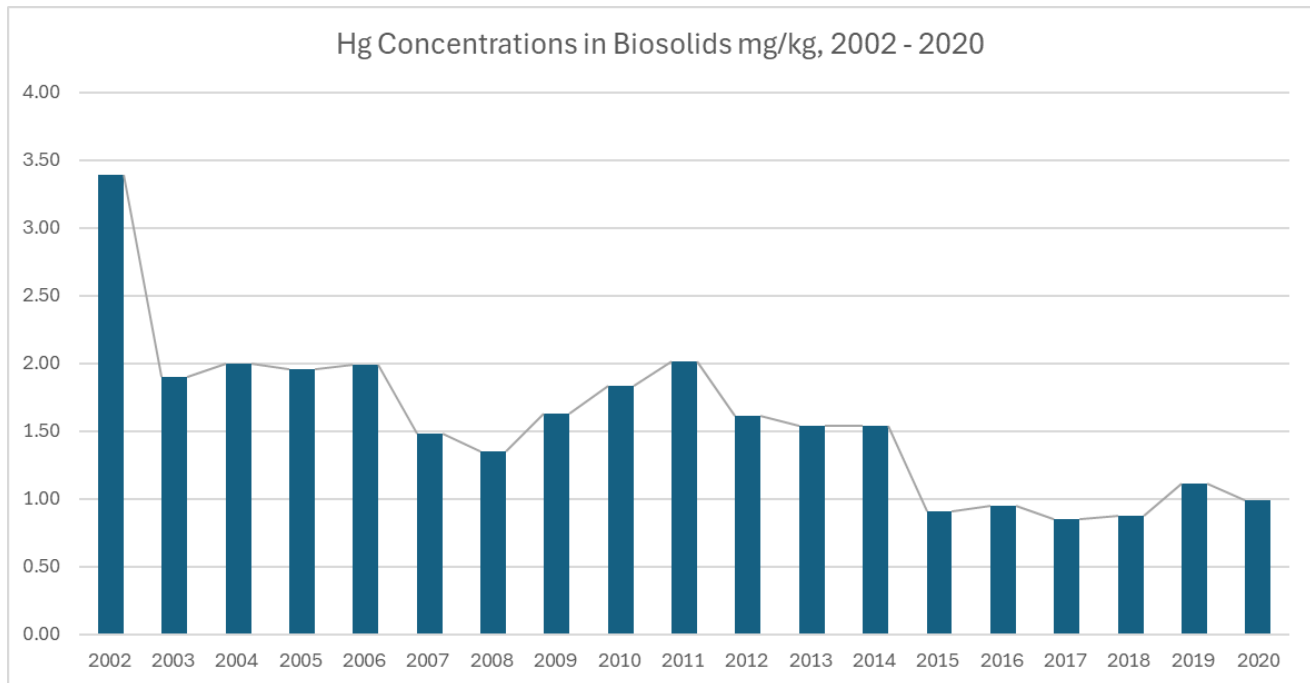
Table 23. Mercury Concentrations in Biosolids, 2002-2020

Year	Hg Concentrations in Biosolids mg/kg
2002	3.39
2003	1.9
2004	2.0
2005	1.96
2006	1.99
2007	1.48
2008	1.35
2009	1.63
2010	1.83
2011	2.01
2012	1.61
2013	1.54
2014	1.54
2015	0.91
2016	0.95
2017	0.85
2018	0.87
2019	1.11
2020	0.99

In an email on February 19, 2014, Michael Person indicated, "...please note that this is the average concentration in land applied biosolids not sewage sludge that is incinerated. It is probably fairly close, but I do not have the Hg concentration of incineration only facilities."

Historic and current trends in biosolids are shown below, as documented by EGLE's Water Resources Division (EGLE, 2021). The Water Resources Division did not publish a report for mercury in biosolids for 2020. An estimated mercury concentration in biosolids for 2020 has been calculated using available raw data collected by the Water Resources Division's Biosolids Program (Chamberlain 2025).

Table 24. Mercury Concentration Trends in Biosolids, 2002 - 2020



Municipal Waste Incineration

A single municipal waste combustor was operating in Michigan in 2020. Kent County Waste-to-Energy submitted facility-verified estimates of 23.25 lbs of mercury to MAERS for the 2020 operating year based on stack testing (EGLE, 2024).

Detroit Renewable Power, LLC (formerly Greater Detroit Resource Recovery Facility) was shut down on March 26, 2019, and the facility boilers have not operated on refuse-derived fuel since that date (Zynda, 2020).

Table 25. Municipal Waste Incineration

SRN #	Facility Name	Emission Unit Name	SCC	Stack Test factor (lb/hour)	Hours/year	Refuse in Tons	Reported to MAERS in Lbs
N1604	Kent County Waste To Energy Facility	EU-UNIT-01	50100102	1.22E-04	8760	91459	0.98
N1604	Kent County Waste To Energy Facility	EU-UNIT-02	50100102	2.78E-03	8760	94946	22.27
TOTAL	NA	NA	NA	NA	NA	NA	23.25

Hazardous Waste Incineration

One facility, Dow Chemical (A4033), operates a hazardous waste incinerator in Michigan. In 2003, Dow began operating a new incinerator, the 32 Incinerator, to replace the existing 830 Building and 703 Building Incinerators. Based on stack testing conducted on the 32 Incinerator in 2009, for Dow’s HWC MACT Notification of Compliance and Comprehensive Performance Test, less than 1.59E-04 lbs of mercury per hour were emitted from this facility under test conditions year-round design to simulate extreme operating parameters. Based on the continuous year-round operating schedule reported to MAERS in 2020, this extrapolates to annual emissions of 1.39 lbs of mercury. Actual emissions were likely less as the performance test simulates adverse rather than routine operating conditions. The most recent stack testing for the Incinerator HWC MACT Notification of Compliance and Comprehensive Performance Test was in November 2019. Based on those results, year-round emissions of 0.53 lbs were estimated (McGeen 2021).

Table 26. Hazardous Waste Incineration, Dow Chemical

SRN	Facility Name	Emission Factor in Lb/Hour	Estimate in Lbs	Comments
A4033	Dow Chemical	1.59E-04	1.39	Based on 2009 stack test
A4033	Dow Chemical	6.05E-05	0.53	Based on 2019 stack test

Hospital Medical Infectious Waste Incineration

There is not currently any medical waste incineration facility operating in Michigan. City Medical Waste (M4139) in Hamtramck was a hospital medical infectious waste incinerator, which stopped operating on July 28, 2008. This was per the date of a court order, which required the company to cease operation of the facility (McLemore, 2010). The ROP was voided on December 15, 2008 (Foy, 2010).

Human Cremation (Point Source)

Wayne State University, which reported the incineration of human remains in 2014, reported zero tons of human remains incinerated in 2020. Of the three incinerators that make up EUINCINERATORFG, only one is still in place. That incinerator has not reported any operations since 2016. Accordingly, a value of zero emissions is presented for this category. Incinerators at other universities have been included under animal cremation or pathological waste incineration as appropriate.

Table 27. Human Cremation, Point Sources

SRN	Facility Name	Emission Unit Name	Emission Unit Description	SCC in MAERS	Human remains in tons	Emission Basis	Estimate in Lbs
M0239	Wayne State University	EUINCINERATORFG	Emission Unit covers all 3 Incinerators (2 @ Scott Hall & 1 @ Mott) in FGINCIN of PTI No. 80-06. A combined throughput has been entered for all units.	50200505	0.00	MAERS Emission Factor	0.00

Animal Cremation

Two incinerators at Michigan State University (MSU), identified in MAERS as EUCREMATORY and EUDCPAHINC01, were used for cremation of small animals and animals tested for tuberculosis, respectively (McGeen, Daniel, 2020). No human remains are cremated at MSU, although it would be permissible at EUDCPAHINC01 under the facility's ROP. A third incinerator, EUFLRINC01, has been moved to the pathological waste incinerator category as it is not used for cremations. Instead, it incinerates animal waste and bedding, wood infested by emerald ash borers, pharmaceuticals, and low-level radioactive waste.

Three facilities which cremate animal remains (Monroe County Animal Control, Rainbow Bridge, and Union Lake Veterinary Hospital) were removed from the annual MAERS reporting requirement after 2005 but still conduct cremations. Therefore, estimates were made using 2005 throughput values as surrogates.

For estimation of mercury from animal cremations, a 2012 emission factor prepared by Reindl was utilized. This emission factor is based on a study of mercury emissions from blood and tissue (but not teeth) from humans. In the absence of cremation emission factors specific to animals, this factor is used as a surrogate. It is likely to be more representative of animal cremations than factors based on cremation of humans with mercury dental amalgam due to the absence of amalgams in animals (McGeen, 2021).

Table 28. Animal Cremation, Point Source

SRN	Facility Name	Emission Unit Name	Emission Unit Description	SCC in MAERS	Animal remains in tons	Emission Basis	Estimate in Lbs
K3249	Michigan State University	EUDCPAHINC01	ASC design incinerator located at new DCPAH facility on Bennett Rd. Gas-fired with 1200 lb/hr capacity at 1800 F and 1 second retention time in secondary chamber.	50200505	401.8	EPA augmentation for 2017 NEI	0.295
K3249	Michigan State University	EUCREMATORY	Small animal crematorium located at DCPAH	50200505	7.811	EPA augmentation for 2017 NEI	0.006
N6543	Monroe County Animal Control	EU00001	ANIMAL CREMATORY INCINERATOR	50200505	1.41	Reindl emission factor (1.50E-03 lb/ton)	0.002
N7158	Rainbow Bridge	EU002	NA	50200505	2.50	Reindl emission factor (1.50E-03 lb/ton)	0.004
N6494	Union Lake Veterinary Hospital	EU00001	NA	50200505	27.00	Reindl emission factor (1.50E-03 lb/ton)	0.041
TOTAL	NA	NA	NA	NA	NA	NA	0.348

Pathological Waste Incineration

Zoetis P&U LLC (N3519), a medical research and development facility, previously operated a pathological waste incinerator which was shutdown in November 2019 and did not operate in 2020.

The laboratory animal waste incinerator at Ferris State University reported 0.04 tons of animal waste incinerated. This was under the SCC code of 50200505, which designates infectious waste disposed of in a medical waste incinerator.

The waste incinerator at MSU, which operates under the emission unit EUFLRNIC, was identified as a pathological waste incinerator. Per AQD district staff, this incinerator does not incinerate human, or animal remains. It incinerates animal waste and bedding, wood from trees infested with the emerald ash borer, pharmaceuticals, and low-level radioactive waste (McGeen, Daniel, 2020).

Table 29. Pathological Waste Incineration

SRN	Facility Name	Throughput in Tons	Default MAERS Emission Factor in Lb/Ton	Estimated Emissions in Lbs
K2155	Ferris State University	0.04	7.34E-04	2.94E-05
K3249	Michigan State University	56.46	7.34E-04	0.04144
TOTAL	NA	NA	NA	0.04147

Industrial Sources

Cement Manufacturing

There are two cement manufacturing facilities in Michigan: Lafarge, and St. Marys Cement, Inc. (US). Throughput values for both of the facilities were obtained from MAERS. Lafarge's own 2020 estimate of mercury from their cement manufacturing facility was 43.90 lbs, as reported to MAERS. Speciation data for kiln emissions, and raw materials grinding and drying, was obtained from a 2007 report prepared for Lafarge (Advanced Environmental Management Group, 2007).

Table 30. Cement Manufacturing Speciation Profiles

Facility Name	2020 Mercury Emissions Reported to MAERS (in lbs)	Particulate divalent speciation factor	Gaseous divalent speciation factor	Elemental gaseous speciation factor	Hg(p)	RGM	Hg(0)	Comments
Lafarge	43.90	var	var	var	0.44	38.68	4.78	LaFarge speciation profiles are from report of 11/01/07.
St. Marys Cement Inc. (US)	40.10	0.12	0.13	0.75	4.81	5.21	30.08	NA
Totals	84.00	NA	NA	NA	5.25	43.89	34.86	NA

A facility-submitted MAERS value was available for St. Marys Cement Inc. (US) for 2020. A total of 84.00 lbs of mercury was estimated from cement manufacturing in Michigan in 2020. The following cement manufacturing facilities were included in the inventory:

Table 31. Cement Manufacturing

SRN	Facility	Throughput in Tons	MAERS Estimate in Lbs	Source for Best Estimate	Lbs Hg Emitted, Best Estimate
B1477	Lafarge	1,829,245	43.90	Facility-reported value in MAERS, 2020	43.90
B1559	St. Marys Cement Inc. (US)	1,670,632	40.10	Facility-reported value in MAERS, 2020	40.10
TOTAL	NA	NA	NA	NA	84.00

Taconite Processing

Michigan has two taconite processing plants: Empire Iron Mining Partnership (Empire) and Tilden Mining Company LLC (Tilden), located in the Marquette Range of the Upper Peninsula. Cleveland-Cliffs is the owner of both Tilden and Empire.

Tilden processes both hematite and magnetite. A 2002 stack test for Tilden (B4885) found it emitted 71.83 lbs/year of mercury, based on reported continuous operation of 8,760 hours (Tilden, 2002). More recent stack testing is not available for mercury. Based on the 2002 factor and the 2020 operating schedule for coal-fired and gas-fired production from Tilden, an estimate of 27.46 lbs was created for 2020.

Empire (B1827) only produces taconite from magnetite. Based on the facility being idled in 2020, zero lbs of mercury was estimated from Empire for 2020. Empire has continued to be idle since 2017.

Total estimated mercury emissions from taconite processing amount to 27.46 lbs for 2020.

Table 32. Taconite Production

SRN	Facility Name	Estimated Emissions in Lbs
B1827	Empire Iron Mining Partnership	0.00
B4885	Tilden Mining Company LC	27.46

Dental Amalgam Manufacturing

In 2020 there was one dental amalgam manufacturer in Michigan: Kerr Industries (B2658). Based on the average mercury concentration inside the building and the ventilation rate of the building, one can estimate that less than four pounds of mercury are emitted from this facility every year. Lumex RA915+ monitoring inside the building yielded an estimated average mercury concentration of approximately 500 ng/m³ for the entire building, which has a volume of 44,309 m³ and has nine air exchanges per hour (MDEQ, 2009).

Table 33. Dental Amalgam Manufacturing

Year	Facility	Estimated Emissions in Lbs	Estimate Basis
2020	Kerr Industries	< 4	AQD calculation from 2009 based on Lumex RA915+ monitoring inside facility.

Lime Manufacturing

Throughput values for facilities with lime kilns were obtained from MAERS. These throughputs were then multiplied by an emission factor to estimate mercury emissions. The emission factor of 1.2 x 10⁻⁴ lbs of mercury per ton of lime produced corresponds to facilities that manufacture lime (Pilgrim, 1998). The emission factor from WebFIRE for lime kilns used by the paper manufacturing industry (2.90 x 10⁻⁷ lbs of mercury per ton of lime produced) was used to estimate emissions from Billerud Escanaba LLC and Billerud Quinnesec LLC. Using the WebFIRE and Pilgrim emission factors it is estimated that 46.80 lbs of mercury was emitted to the air in 2020 from lime manufacturing kilns (Chamberlain 2025). The following lime kilns were included in the calculation:

Table 34. Lime Manufacturing

¹ For Billerud Escanaba LLC and Billerud Quinnesec LLC, the throughput was reported in tons of unbleached paper.

² 1.2E-04 lb/ton of lime from Pilgrim; 2.9E-07 lb/ton of unbleached pulp from WebFIRE.

³ The 2017 EPA augmentation values were included in this table for comparison. The 2020 NEI did not include augmentation values for these sources.

⁴ In previous years, emission values reported to the Toxics Release Inventory were used as a best estimate value for some sources. In the 2020 TRI, no lime manufacturing sources reported mercury emission. In place of TRI reported values, ERAU calculations have been used as the best estimate values, resulting in a significant increase in estimated emissions.

SRN	Facility	Lime or unbleached pulp in tons ¹	WebFIRE and Pilgrim Emission Factors ²	MAERS Default (Mercury Estimate in Lbs)	2017 EPA augmentation ³	ERAU Calculations	Best Estimate ⁴
A0884	Billerud Escanaba LLC	77659	2.90E-07	0.02	NA	0.02	0.02
A3900	Martin Marietta Magnesia Specialties, LLC	16273	1.20E-04	0.72	NA	1.95	1.95
B2169	Carmeuse Lime Inc, River Rouge Operation	161709	1.20E-04	NA	1.88	19.41	19.41
B7192	Billerud Quinnesec, LLC	466499	2.90E-07	0.13	NA	0.14	0.14
N7362	Graymont Western Lime, Inc.	209021	1.20E-04	NA	NA	25.08	25.08
Totals	NA	NA	NA	0.86	NA	NA	46.80

Phosphate Mills

Michigan does not have any phosphate mills. Based on a query of the SCCs involving phosphates, superphosphates, and ammonium phosphates, the only facility in MAERS associated with the use of phosphates is B1989, Advanced Micronutrient Products, Inc. (EGLE 2025). This facility's NAICS code of 325314 indicates "Fertilizer (Mixing Only) Manufacturing."

Brick Manufacturing

Hanson Brick (A6497) in Corunna, emitted 0.26 lbs from its two gas-fired kilns in 2020, based on the facility reported throughput and the application of a standard USEPA default emission factor by the MAERS emission estimator (EGLE, 2025).

Table 35. Brick Manufacturing

SRN	Facility	Emission Unit Name	Throughput Tons	Emission Factor	Lbs Emitted
A6497	Meridian Brick	EUKILN01	73000	7.50E-06	0.26
A6497	Meridian Brick	EUKILN02	0	7.50E-06	0.00
Total	NA	NA	NA	NA	0.26

Coke Production

Michigan has one coke battery, the EES Coke Battery, LLC (P0408). This facility was formerly part of US Steel (A7809) on Zug Island, River Rouge, until it was permitted as a separate stationary source (P0408). In a permit application submitted in June 2014, EES Coke estimated a maximum emission rate for mercury of 0.006 lb/hr (Brunner, 2014). Accordingly, a maximum annual estimate of 52.56 lbs has been estimated by the AQD (McGeen, 2014). In the 2020 NEI, the USEPA augmented the facility's data with a mercury estimate of 0.02 lbs. This is based on the facility's reporting of fugitive mercury emissions to the TRI. The emissions were assigned to the miscellaneous SCC code of 3999999 since the USEPA was not able to assign the facility-wide mercury value to a single process. The USEPA's 2020 NEI value, based on the facility-reported estimate, is used for the purposes of the AQD's mercury inventory as the most defensible number.

Table 36. Coke Production

¹ Maximum estimated hourly emission rate from 2014 permit application.

² USEPA augmentation for 2020 NEI, based on facility-reported mercury estimate to TRI under the Form R reporting.

Year	Facility	AQD-Estimated Emissions in Lbs ¹	TRI Value in Lbs ²	Best Estimate in Lbs
2020	EES Coke	52.56	0.02	0.02

Medical Waste Autoclave

A review of permits to install issued by AQD was undertaken to identify any medical waste autoclaves operating in Michigan in 2020. Two medical waste autoclaves were identified. The autoclave at Hospital Network Healthcare (N7127) is a dynamic autoclave where no mercury emissions are expected, based on design and operational practices to prevent the formation and release of mercury emissions. The autoclave at Daniels Sharpsmart Inc (P0083) has the potential for release of mercury emissions, with a maximum calculated release of 0.45 lbs of mercury per year (EGLE, 2021).

Table 37. Medical Waste Autoclaves

SRN	Company	Permit Approved Date	Process	Description	Estimated Mercury Emissions in Lbs
N7127	Hospital Network Healthcare	12-Jun-17	Vacuum autoclave	Dynamic autoclave; utilizes design and permitting requirements and operational practices to prevent generation and release of mercury emissions.	0.00
P0083	Daniels Sharpsmart, Inc.	29-Sep-10	Autoclave system	Maximum estimated mercury emissions of 0.45 lbs/year noted in Evalform by AQD permits engineer.	0.45
Total	NA	NA	NA	NA	0.45

PRODUCTION OF METALS

Basic Oxygen Furnaces in Primary Metal Production (Steel Manufacturing)

Basic Oxygen Furnaces (BOFs) are used to make steel from molten metal and scrap. The input material is typically 70% molten pig iron and 30% scrap (Grinstern, 2010). Input material is refined by injecting high-purity oxygen into a furnace; oxygen reacts with carbon and other impurities in the metal to remove them from the metal. Basic oxygen process steelmaking is executed in large, refractory-lined, pear-shaped furnaces (USEPA, 1986).

There is one facility in Michigan that makes steel using the basic oxygen process: Cleveland-Cliffs Steel Corporation Dearborn Works (known in 2017 as AK Steel – Dearborn Works (A8640), For 2020 operations, Cleaveland-Cliffs Steel Corporation Dearborn Works reported 35.10 lbs of mercury emissions to MAERS based on stack testing and other calculations.

US Steel Great Lakes Works (A7809) was removed from the 2020 mercury inventory. US Steel Great Lakes Works does not report mercury emissions to MAERS. For the 2017 mercury inventory, the 2014 facility-wide TRI mercury compound value was used to gap-fill for missing mercury value. It has since been decided that the facility-wide TRI mercury compound value is not an accurate representation of mercury emissions from a source and therefore should not be used in the mercury inventory (Alberts, 2024).

Table 38. Steel Manufacturing

SRN#	site name	SCC	Steel in Tons	Process Description	Emission Estimation Basis	Emission Rate in Lb/Hour	Reported 2020 Emissions in Lbs
A8640	Cleveland-Cliffs Steel Corporation Dearborn Works	30301526	1736447	BOF: Open Hood-Stack - ESP Emissions	Stack Test	3.12E-03	17.8
A8640	Cleveland-Cliffs Steel Corporation Dearborn Works	30301528	1383131	Charging: BOF - Roof Emissions	Stack Test	3.67E-05	1.02
A8640	Cleveland-Cliffs Steel Corporation Dearborn Works	30301529	1736447	Tapping: BOF - Roof Emissions	Other	0.00E+00	0
A8640	Cleveland-Cliffs Steel Corporation Dearborn Works	30301564	208500	Steel furnace slag tapping and dumping - Roof fugitive emissions	Other	0.00E+00	0
A8640	Cleveland-Cliffs Steel Corporation Dearborn Works	30301599	1736447	BOF Secondary Emission Baghouse Emissions	Stack Test	2.85E-03	16.28
A8640	Cleveland-Cliffs Steel Corporation Dearborn Works	30301581	1383131	Blast Heating Stoves	Other	0.00E+00	0
A8640	Cleveland-Cliffs Steel Corporation Dearborn Works	30301517	1383131	Hot Metal Transfer - Roof emissions not collected by baghouse	Other	0.00E+00	0
TOTAL	NA	NA	NA	NA	NA	NA	35.10

Electric Arc Furnaces in Primary Metal Production (Steel Manufacturing)

Electric Arc Furnaces (EAFs) are the most common type of furnace used for the electric production of steel. EAFs are capable of melting small amounts of iron scrap, pig iron, and direct reduced iron, but primarily melt scrap (Energy International, 2005). According to the AP-42 Compilation of Emission Factors, about 57% of total steel produced in the United States comes from EAFs in operations called minimills (USEPA, 2009). Minimills use 100% scrap charge (Metals Advisor).

Ervin Amasteel (B1754) conducted stack testing in 2013 on their EAF baghouse exhaust. The emission rate of 3.04E-07 gr/dscf was utilized by the ERAU to estimate annual emissions of 6.16 lbs of mercury from the facility (McGeen, 2021). The estimated annual emissions remained the same as 2017 levels.

Gerdau Special Steel North America – Jackson Mill (B4306) in Jackson, Michigan reported emissions based on the facility’s 2014 stack test emission factor of 4.00-03 lb/hr, and the 2020 operating schedule of 5,472 hours reported to MAERS (Alberts, 2025).

Gerdau MacSteel Monroe (B7061) estimated in their 2020 MAERS report that their mercury emissions for the year were 7.84 lbs. This is based on facility stack test data from 2016.

Table 39. Electric Arc Furnaces in Michigan

SRN	Facility Name	SCC	Throughput in Tons Iron or Steel	Emission Factor	Hours Per Year	Basis	Estimated Emissions in Lbs
B1754	Ervin Amasteel Division	30400701	83741	3.04e-07 gr/dscf	4112	ERAU estimate based on facility's 2013 stack test.	6.16
B4306	Gerdau Special Steel North America - Jackson Mill	30301536	84758	4.00E-03 lb/hour	5472	Facility estimate based on stack test.	9.70
B7061	Gerdau MacSteel Monroe Mill	30301544	429146.02	1.50E-03 lb/hour	6768	Facility estimate based on stack test.	7.84
Total	NA	NA	NA	NA	NA	NA	23.70

EAFs and Electric Induction Furnaces in Secondary Metal Production (Steel Foundries)

EAFs and Electric Induction Furnaces (EIFs) are used by the steel industry to melt and formulate steel. EAFs are large, welded steel, cylindrical vessels with removable roofs through which three retractable carbon electrodes are lowered. Metal charge is melted by the resistive heating generated from electrical current flowing among the electrodes and through the charge. EAFs are used to produce carbon and alloy steel. The input material to an EAF is typically 100% scrap (USEPA, 1986).

EIFs are cylindrical or cup-shaped vessels that are surrounded by electrical coils. The coils are energized with an alternating current to produce a fluctuating magnetic field that heats the metal charge (USEPA, 1986).

Throughput information for secondary metal production (steel foundries) was obtained from MAERS. Since WebFIRE was lacking an emission factor for this category, a post-baghouse control emission factor from stack testing at Barber Steel in 2013 and 2014 is applicable to Huron Casting, Inc (Blue Diamond Steel Casting) (B7013) and Ervin Technologies (N3246). Both sources have baghouse control on the melting furnaces. The post-baghouse control emission factor was not applicable to Eagle Alloy (B7870), Barron Cast (N2631), and Temperform (B7357). Eagle Alloy (B7870) and Barron Cast (N2631) have no control on the melting furnaces. Temperform (B7357) has wet scrubbers (Grinstern, 2024). An emission factor from “*Toxics in Vehicles: Mercury*” was applied to these three sources (Ecology Center & Great Lakes United, 2001). The emission factor from “*Toxics in Vehicles: Mercury*” is likely an overestimate but was included as an alternative to having no estimate for the sources (Alberts, 2025).

Ervin Technologies (N3246) was not required to report emissions to MAERS in 2020. The 2020 throughput value provided by the facility was 3,529 tons (Merle, 2025).

Michigan Steel (B1929) and Ancast, Inc. (N7276) closed permanently in 2012 and are therefore not included in the 2017 and 2020 inventory. Barber Steel Foundry Corporation (B1961) closed and therefore not included in the 2020 inventory. Barron Industries, Inc. was removed from the MAERS reporting requirement in 2012. The facility’s 2011 reported throughput is used as the basis for an estimate in the absence of more recent information (McGeen, 2021).

Cannon Muskegon Corp. (A4315) was not included for mercury estimates since they do not melt any automotive or common white goods scrap. They only use high quality/purity metals due to the products they produce; therefore, any mercury emitted would have to come from the metal itself as opposed to contamination from mercury switches (Grinstern, 2010).

The emissions reporting for Cadillac Casting, Inc (B2178) includes a process under the SCC of 30400705 which some facilities use for the reporting of mercury emissions. However, district staff have verified that for Cadillac Casting, Inc (B2178) the process they list under this SCC is not a source of mercury emissions as it only contains a reheated metal to keep it in a liquid state that is later processed on the molding or casting line. (Alberts, 2024).

The 2020 estimate decreased since the 2017 inventory, due to the “*Toxics in Vehicles: Mercury*” emission factor overestimating emissions in previous inventories and the Barber Steel being a more accurate representation of the mercury emissions in this sector.

The following EAFs and EIFs in steel foundries were included in the calculation:

Table 40. EAFs and EIFs in Michigan

¹Emission factor from "Toxics In Vehicles: Mercury" (Ecology Center & Great Lakes United, 2001) is likely an overestimate but was included as an alternative to having no estimate for the sources.

SRN	Facility Name	Emission Unit Name	SCC	Iron in Tons	Emission factor in lb/ton ¹	Estimated Emissions in Lbs
B7013	Huron Casting, Inc (Blue Diamond Steel Casting)	RG-POUR	30400705	23830	5.00E-07	0.01
B7357	TEMPERFORM LLC	EUSCRUBBER1	30400705	961	6.90E-04	0.66
B7870	EAGLE ALLOY INC	RG02	30400705	10806.1	6.90E-04	7.46
B7870	EAGLE ALLOY INC	RG08	30400705	606.5	6.90E-04	0.42
N2631	Barron Cast Inc.	EU-E I Furn	30400705	910	6.90E-04	0.63
N3246	Ervin Technologies	EU_INDUCTIONR1	30400705	3,529	5.00E-07	0.002
Total	NA	NA	NA	NA	NA	9.18

Table 41. Supporting Data from "Toxics in Vehicles: Mercury" (Ecology Center & Great Lakes United, 2001)

Note: Except for NSS, estimated mercury emissions are based on actual stack test data for pounds of mercury emitted per hour times the allowable operating hours per year. NSS mercury emissions are based on actual stack test data times the annual hours the EAF is under power.

^a Except for NSS, production data capacity from Iron & Steel Maker, EAF Roundup, May 2000.

^b Based on 1998 estimated production instead of capacity.

Company	State	Production Capacity Short Tons/Yr ^a	Estimated Hg Emissions Low Lbs/Yr	Estimated Hg Emissions High Lbs/Yr	Average Estimated Hg Emissions Lbs/Yr	Lbs Hg/ton (Average Emission Factor)	Kg Hg/metric ton (Average Emission Factor)
Marion Steel	OH	365,000	371	572	514	0.0014	0.0007
Co-Steel Sayreville	NJ	750,000	24	4730	597	0.00080	0.00040
North Star Steel	MN	465,000 ^b	136	136	136	0.00029	0.00011
Co-Steel Raritan	NJ	800,000	129	323	224	0.00028	0.00014
Overall average emission factor	NA	NA	NA	NA	NA	0.00069	0.00035

Secondary Metal Production (Grey Iron)

Grey iron is a type of cast iron with a 3.5% carbon content and is used in industry. Much of the carbon in this type of cast iron separates out as graphite, which gives grey iron its grey appearance (Dictionary.com). This broad grouping includes the following two categories: cupolas in secondary metal production (grey iron), and EAFs and EIFs in secondary metal production (grey iron).

Cupolas in Secondary Metal Production (Grey Iron)

The cupola is a type of furnace used in the iron foundry industry. It uses coke as a fuel and is typically composed of a cylindrical steel shell with a refractory-lined or water-cooled inner wall (USEPA, 1986).

For Grede, LLC (B1577), CWC Textron (B1909), and Cadillac Casting, Inc. (B2178), recent stack test data was available per ton of throughput and used for updated calculations. Emission rates in lbs/hour were also used where applicable. The resulting values were several times lower than the MAERS default estimates and the estimates were based on the New Jersey or WebFIRE emission factors (McGeen, 2021).

Stack testing data from other cupolas engaged in secondary metal production of grey iron were not available. Where knowledge was available on control information, a controlled factor from WebFIRE was selected. The “New Jersey” emission factor was generated based on stack tests from three facilities between 1993 and 1999 (Ecology Center & Great Lakes United, 2001). Cupolas emitted an estimated 15.30 to 15.35 lbs of mercury in 2020.

According to MiEnviro, EJ USA, Inc. (A0767) permanently shutdown as of 2020 and are therefore not included in the 2020 inventory (Alberts, 2024).

The following cupolas, engaged in the production of grey iron, were included in the inventory:

Table 42. Cupolas, Grey Iron

¹B1909 stack test on September 12, 2017

²B1577 stack test on April 16-18 & 23-25, 2019

³B2178 stack test on July 28, 2021, which resulted in an hourly emission rate and a lb/ton emission rate, producing two different emission estimates

⁴Emission factor of 2.50E-04 lb/ton from New Jersey study applied to A3934 calculation

SRN	Facility Name	Iron in Tons	Default 2020 NEI estimates in lbs ¹	Estimated Emissions from Stack Testing, NJ Emission Factors and NEI ^{2,3,4}	Estimated Emissions from Stack Testing, NJ Emission Factors, Controlled FIRE Factors and NEI
A3934	Great Lakes Castings LLC	44345.61	14.51	11.09	11.09
B1577	Grede LLC - Iron Mountain	23708	5.24	0.74	3.77
B1909	CWC Textron	63709	0.1733	0.17	0.17
B2178	Cadillac Casting, Inc	87059	0.3186	0.27 - 0.32	0.27 - 0.32
Total	NA	NA	20.2419	12.27 - 12.32	15.30 - 15.35

Table 43. Supporting Data from “Toxics in Vehicles: Mercury” (Ecology Center & Great Lakes United, 2001)

Source: Agrawal, Sunila, NJ DEP, October 30, 2000.

Facility	Permitted Production Capacity (short tons per year)	Mercury Permit Limit (lbs/yr)	Stack Test Date	Mercury Emissions (lbs/yr)	Average Mercury Emission Factor (lbs/short ton)	Average Mercury Emission Factor (kg/metric ton)
Atlantic States Iron Pipe Co.	234,000	137	Nov. 1993	40	0.0032	0.000016
NA	NA	NA	Nov. 1999	108	NA	NA
Griffin Pipe Co.	182,000	312	Sept. 1997	10	0.000055	0.000027
US Pipe and Foundry, Inc.	262,964	80	Sept. 1997	96	0.00037	0.00018
Average Emission Factor					0.00025	0.00012

EAFs and EIFs in Secondary Metal Production (Grey Iron)

An EAF is a large, welded steel, cylindrical vessel with a removable roof through which three retractable carbon electrodes are lowered and energized, creating arcs that melt metallic charged with their heat. EIFs are cylindrical or cup-shaped vessels that are surrounded by electrical coils, which are energized to produce an electromagnetic field that heats the metal charge (USEPA, 1986).

Stack testing was not available for several EAFs and EIFs involved in the secondary metal production of grey iron. Throughput information was obtained from MAERS. An emission factor of 2.70E04 lb/ton was obtained from the Indiana Department of Environmental Management’s “Summary of Mercury Emissions from Non-Electric Generating Units (IDEM, 2004).” This emission factor was then compared to the emission factor of 7.20E-05 lb/ton corresponding to grey iron production from WebFIRE to generate a range of emissions. Mercury estimates for the Michigan facilities which did conduct their own stack testing were one to two orders of magnitude lower than the estimates calculated with the IDEM and WebFIRE factors (McGeen, 2021).

The following EAFs and EIFs engaged in the production of grey iron in 2020 were included in the calculations:

Table 44. EAFs and EIFs, Grey Iron

¹Emission Factor borrowed from similar SCC 30400304

SRN	Facility Name	SCC	Iron in Tons	Stack Test Rate in Lb/Hour	Stack Test-Based Estimate in Lbs	Estimate in Lbs per FIRE Factor ¹	Estimate in Lbs per IDEM Factor	Estimate in Lbs per Stack Test and IDEM Factors
A0171	Hastings Manufacturing Company	30400303	1276.8	NA	NA	0.09	0.34	0.34
B1709	Federal-Mogul Powertrain Systems	30400303	7377	NA	NA	0.53	1.99	1.99
B1716	Betz Industries Inc	30400303	20653	< 4.969E-05	0.11	1.49	5.58	0.11
B1737	Kent Foundry Co	30400303	4737	NA	NA	0.34	1.28	1.28
B2015	Metal Technologies, Inc. Three Rivers Gray Iron	30400303	144719	NA	NA	10.42	39.07	39.07
B4538	PSG Grand Rapids (Previously Blackmer, A Dover Co)	30400303	219.29	NA	NA	0.02	0.06	0.06
N5814	Asama Coldwater Manufacturing, Inc	30400303	63069	6.11E-06	0.04	4.54	17.03	0.04
N5866	Metal Technolotics, Inc., Ravenna Ductile Iron	30400303	66344	NA	NA	4.78	17.91	17.91
N6226	Brembo North America, Inc.	30400303	118027	NA	NA	8.50	31.87	31.87
Totals	NA	NA	NA	NA	NA	30.70	115.13	92.68

EAFs and EIFs engaged in the production of grey iron likely produced between 30.70 and 92.68 lbs of mercury emissions in 2020 (Alberts and McGeen, 2025).

Auto Switches – Shredding of Autos (Point Source)

Mercury emissions from the shredding of automobiles have a point source component (from permitted facilities) as well as a nonpoint source component from unpermitted facilities.

Table 45. Shredding of Autos

¹USEPA’s methodology accounts for state collection of automobile switches which is documented in the ELVS Mercury Switch Recovery Program Reporting.

Year	Flow Diagram Estimate in Lbs	2020 NEI Estimate in Lbs ¹	Subset
2020	18.61	165.64	Shredding
2020	76.12	NA	Auto fluff
2020	NA	NA	Storage, transit and transfer (MSW)
2020	NA	NA	Storage, transit and transfer (recycling)
2020	NA	NA	Landfills
2020	NA	NA	Recycling
2020	NA	NA	Mass burning and RDF
2020	NA	NA	Burn barrels
TOTAL	94.73	165.64	Area source and point source totals
NA	76.12	147.03	Area source total
NA	18.61	18.61	Point source total
Assignment in TABLE 1	NA	2020 NEI Estimate in Lbs ¹	Subset
TABLE 1	NA	147.03	MERCURY-CONTAINING PRODUCTS
TABLE 1	NA	18.61	Point source deduction entry

Using Michigan data about scrapped vehicles, a range of emissions from 94.7 lbs to 165.64 lbs of mercury were emitted statewide to the atmosphere from shredding (Alberts, 2025). It was estimated that a maximum of 18.61 lbs were emitted by point sources in 2020 per the table below. Estimates were based on the availability of stack test data and permitted hours of operation, or Lumex monitoring.

In the nonpoint source section, the methodology for estimating the nonpoint source component of auto shredding emissions (76.12 lbs to 147.03 lbs) will be presented.

The USEPA estimated a nonpoint emissions value of mercury from auto shredding for Michigan in the 2020 NEI, of 147.03 lbs. That calculation is based on the latest USEPA methodology and factor. Therefore, it considered to be the most defensible emissions value for the nonpoint component of auto shredding.

Table 46. Point Source Auto Shredding

Company	SRN	Emission Control Equipment	Emissions (lbs/yr)	Comments
Louis Padnos Iron & Metal Co., 2001 Turner Ave NW, Grand Rapids, MI 49504	A2457	Shredder has "water only" spray in the hammer mill.	11.44	2008 stack test
SLC Recycling, Inc. (Ferrous Processing & Trading)	A4750	Baghouse	0.4	2001 stack test; EU-SHREDDER currently permitted under 309-00B which has mercury limit of 0.0012 lbs/hour mercury and restriction for 6240 hours of annual operation

Company	SRN	Emission Control Equipment	Emissions (lbs/yr)	Comments
Louis Padnos Iron & Metal Co., 120 S. River Avenue, Holland, MI 49423	B1982	Multicyclone, water injection	NA	365-98A, active, for AUTOMOBILE SHREDDER-WATER INJECTION SYSTEM/REVISE.
Jackson Iron & Metal, 810 Lewis Street, Jackson, MI 49201	B2281	Shredder has "water only" spray in the hammer mill.	2.01	PTI 93-04 voided on 1/06/2005. PTI 93-04A issued on 1/06/2005 and is currently active; FG-SHREDDERAPC has limit of 0.02 lbs Hg/hour. EUSHREDDER has limit of 3120 hours per rolling 12-month time period. Per inspection report of 7/03/2019, 2005 stack test report had results of 0.008 lb/hr Hg from EU-SHREDDER. At 3120 hours per year, this results in a calculation of 24.96 lbs of Hg emissions annually. However, per an 8/04/2015 inspection report, 2500 to 3000 cars are shredded annually at this facility. The total available mercury in vehicle switches for those automobiles ranges from 3 to 4 lbs. Utilizing the same emission factors as for the area source calculations, up to 2.01 lbs of mercury are estimated to have been released from the 2500 to 3000 vehicles processed annually at this facility.
Fritz Enterprises, 23550 Pennsylvania Rd, Taylor, MI 48180	B3240	Water spray and cyclone on shredder.	1	2003 Lumex Monitoring (assuming 8-hour workday/ 365 days/yr)
FPT-Pontiac Division LLC, 500 Collier Rd, Pontiac, MI 48056	B4146	Emissions from EUOLDSHREDDER are controlled by a water injection system and fabric filter system. Material handling systems downline are controlled by cyclones. EUSHREDDER emissions are controlled by a water and foam injection system along a particulate control system, consisting of a precipitator, cyclone, high efficiency aerosol filtration (HEAF) system, and mist eliminator, operated in series.	NA	120-80C (currently active) lists EUOLDSHREDDER being superseded by EUSHREDDER and all associated conditions will be voided upon trail operation of the replacement fabric filter system.
Sturgis Iron & Metal, 70675 Centerville, Sturgis, MI 49091	B4372	Shredder ducted to a cyclone and cyclones on material handling.	NA	25-03A for aluminum shredder (particulate limits), voided on 07/25/2023. 355-79A (particulate limits), voided on 06/30/2011.
Louis Padnos Iron & Metal Co., 1900 West Willow, Lansing, MI 48917	B4884	Shredder has "water only" spray in the hammer mill.	NA	100-18 for new shredder voided on 8/18/2020. 205-75 and 52-75 still active.
Huron Valley Steel Corp., 41000 Huron River Dr., Belleville MI 48111	B6178	Two cyclones	NA	No stack test, TRI, permit or MAERS data available for mercury emissions

Company	SRN	Emission Control Equipment	Emissions (lbs/yr)	Comments
West Michigan Iron and Metal, 1845 Chicago Dr. SW, Wyoming, MI 49509	B7634	Shredder enclosed by a metal hood and ducted to a cyclone followed by a wet scrubber.	NA	1094-80, 15 CAT/HOUR FRAGMENTIZER WITH WET SCRUBBER AND CYCLONE
Rifkin Scrap Iron & Metal, 1445 N. Niagara Street, Saginaw, MI 48602	N0844	Shredder enclosed by a metal hood and ducted to a cyclone followed by a wet venturi scrubber.	2.7	2004 stack test at baghouse (assuming operating 24 hr/d, 365 d/yr)
Portland Iron & Metal, 3130 Knoll Rd, Portland, MI 48875	N1340	Water spray on shredder. Z-box with cyclone for material separation.	NA	PTI 2-15, PM emission limit only. 381-98, opacity limits.
Kalamazoo Metal Recyclers, 1525 King Highway, Kalamazoo, MI 49001	N1373	Shredder enclosed by a metal hood and ducted to a cyclone followed by a wet venturi scrubber.	NA	PTI 364-78
E. Kingsford Iron and Metal, 100 Superior Avenue, Kingsford, MI 49801	N3753	NA	NA	New shredder permitted and installed in 2015 under PTI 16-15 replacing old shredder. Permit for new shredder requires removal of batteries, fluids and mercury witches from vehicles.
Strong Steel Products, 6464 Strong, Detroit, MI 48211	N6293	Shredder has water added to control emissions.	1	2005 Lumex Monitoring (5008 max. operating hours)
S & S Metal Processing, 5032 Dort Highway, Flint, MI 48505	N6823	Shredder (60 ton/hr thruput) enclosed by a metal hood and ducted to a cyclone followed by a wet cyclonic scrubber.	6.13E-02	2011 stack test data associated with PTI 92-00B (currently active) found in 2015 MACES inspection report for Fritz Enterprises of Flint, SRN# N6823. Limit of 0.0022 lb/hour and stack testing results showed emissions of 7.0e-06 lb/hour. Based on that hourly rate, emissions of 6.13e-02 lbs would result from continuous year-round operation. .
A & L Iron and Metal, 2000 Milbocker Rd., P.O. Box 834, Gaylord, MI 49734 (Contact: Mr. Mike Fitzgerald)	N7508	Shredder (40 ton/hr thruput) enclosed by a metal hood and ducted to a cyclone followed by a dry scrubber (closed-loop system), converted to computerized water injection and removed closed-loop system.	NA	No stack test available for shredder. PTI 176-05B v1.0 (currently active) operation limits found in 2020 On-Site Inspection report limits EU-SHREDDER operation to 4,576 hours per 12-month rolling time period.
TOTAL	NA	NA	18.61	NA

Relay Manufacturers

MDI (Mercury Displacement Industry, SRN N5886) operates in Edwardsburg, Michigan. According to the facility's TRI report, it emitted 1 lb of mercury in 2020. MDI reported 83.4 lbs to the 2014 TRI. According to the 2005 NATA, mercury emissions from MDI are elemental mercury.

Table 47. Relay Manufacturers

Year	Point Source Sector	Estimated Emissions in Lbs	Estimate Basis
2020	Relay Manufacturers	1.00	2020 TRI

NONPOINT SOURCES

Mercury in Products

Incineration of wastes contaminated with mercury-containing products has been known for some time to release mercury to the air, but other pathways for atmospheric mercury emissions from products have received little attention. Emissions from products in this inventory were calculated using the flow model approach. The flow pathway technique was pioneered by the Swedish Nation Chemicals Inspectorate (KEMI), which estimated releases from batteries, fluorescent lamps, and sewage sludge. Barr Engineering Company (Barr) and Minnesota Pollution Control Agency (MPCA) used the KEMI approach to estimate the quantity of mercury releases from products in Minnesota. The Minnesota study expanded the KEMI technique to include additional release pathways and additional products. The Minnesota study looked at releases to air, water, and land. The flow model developed during the Minnesota study has since been used to estimate emissions in studies conducted by the Wisconsin Department of Natural Resources and USEPA Region 5. Michigan-specific data was incorporated into the model when possible. Since the purpose of this inventory is to quantify air emissions, releases to land and water were not included. The methodology used for each specific product is described below.

Dental Amalgam

In the 2020 NEI, the USEPA estimated nonpoint mercury emissions of 27.19 lbs for Michigan from dental amalgam. This covers dental office emissions from the placement and replacement of mercury dental amalgam, as well as consumer "in use" emissions. As the factors and methodologies used by the USEPA are considered the most recent, this value will be utilized within Michigan's mercury inventory for placement, replacement and "in use" emissions from dental amalgam. For comparison, the range of values estimated by Michigan through use of the USEPA Mercury Flow Diagram will be described below.

Substituting Michigan data for national data in the USEPA Mercury Flow Diagram, emissions from dental amalgam were calculated (Chamberlain, 2025). Emissions in this category can be further subdivided into four categories: emissions from the dental office, emissions from the consumer "in use," emissions from recycling, and emissions from dental amalgam in the solid waste stream.

Emissions from dental offices are based on the Interstate Mercury Education & Reduction Clearinghouse fact sheet: Mercury Use in Dental Amalgam (IMERC, 2018). According to the December 2018 version of the fact sheet, there were 22,074 total lbs of mercury sold nationally in dental amalgam in 2016. The 2020 calculation assumes that 2020 sales were identical to 2016. Michigan’s proportion of the national sales was determined by population (3.04% of the national value). Furthermore, it was assumed that all amalgams sold within the year were used. Accordingly, 671.04 lbs was assumed for the weight of dental amalgam prepared in Michigan in 2020.

This corresponds to 45.94 lbs of mercury emissions, assuming that 7% of the mercury in an amalgam volatilizes to the air during placement.

Additionally, it was estimated that 373.55 lbs of mercury returned to the dental office in the form of mercury amalgam which was replaced with new amalgam. Seven percent of the replaced amalgam or 25.57 lbs of mercury was emitted from the dental office in the form of air emissions.

Consumer “in use” emissions were estimated through the flow diagram to be 9.70 lbs. This estimate was based on the assumption that 76% of the mercury input to dental offices goes to the consumer. A release factor of 0.02% was used to estimate the amount of mercury that would be exhaled to the air.

Mercury from storage, transit, and transfer en route to municipal solid waste (MSW) landfills was estimated at 00.20 lbs. Mercury from disposal at MSWs was estimated at 1.15 lbs.

Mercury in the amount of 4.34 lbs from mass burn and refuse derived fuel (RDF) was estimated by the flow diagram but since this category is already accounted for in the point source inventory, this estimate was not included in the Michigan 2020 mercury inventory.

Through use of the USEPA Flow Diagram, mercury emissions in the amount of 81.21 lbs were estimated in total for the category of dental amalgam in 2020, for the placement of dental amalgam and consumer “in use” emissions. An additional value for mercury in the amount of 1.35 lbs was estimated for the waste stream, as noted above. These values do not include the emission estimates from cremation, which is a separate nonpoint source category.

Table 48. Dental Amalgam

Year	Flow Diagram estimate in lbs	2017 NEI estimate in lbs	subset
2020	25.57	27.19	Emissions from replacement (removal) of dental amalgam
2020	45.94	27.19	Emissions from placement of dental amalgam
2020	9.70	27.19	Consumer "in use" emissions
2020	0.20	NA	Storage, transit and transfer (MSW)
2020	1.15	NA	Landfills
2020	NA	NA	Recycling
2020	NA	NA	Mass burning and RDF (accounted for under point sources)
2020	NA	NA	Burn barrels
TOTALS	82.56	27.19	NA
Assignment in Table 1	NA	2017 NEI estimate in lbs	Subset

Year	Flow Diagram estimate in lbs	2017 NEI estimate in lbs	subset
Table 1	NA	27.19	MERCURY-CONTAINING PRODUCTS

Fluorescent and Non-Fluorescent Lamps

In the 2020 NEI, the USEPA estimated recycling and non-recycling related mercury emissions from the breakage of fluorescent bulbs in Michigan. This covers emissions from recycling and non-recycling breakage. As the factors and methodologies used by the USEPA are considered the most recent, this value will be utilized within Michigan's mercury inventory. Total emissions from non-recycling breakage of bulbs were 56.95 lbs from the 2020 NEI, and recycling-related breakage emissions were estimated at 1.96E-03 lbs.

The range of values estimated by Michigan for recycling and non-recycling breakage of fluorescent bulbs, through use of the USEPA Mercury Flow Diagram, is described below. The flow diagram estimates 2.45 lbs of mercury emissions from production, and retail and consumer breakage of bulbs. The flow diagram estimate for recycling-related emissions was 21.61 lbs.

Substituting Michigan data for national data in the USEPA Mercury Flow Diagram, an emissions estimate for fluorescent lamp breakage was calculated (Chamberlain, 2025). In 2016, 3.1 tons of mercury was present in lamp sales based on data from IMERC's Mercury Use in Products fact sheet (IMERC, 2018). This represents a 71% decline since 2001 and a 64% decline since 2010. The fact sheet notes that mercury use in lamps is expected to decline with the increased availability and usage of LED lamps, as an alternative to fluorescents lamps. The IMERC data was presented for lamp manufacturing as a whole and did not apportion the number into values for fluorescent and non-fluorescent lighting. Accordingly, the two categories have been grouped together for the 2020 mercury report.

For the estimation of Michigan's 2020 emissions, it was assumed that 2020 lamp sales in the United States were the same as in 2016. Using Michigan and national population data for 2020, it was assumed that Michigan received a proportionate percentage of the lamps containing mercury (3.04% or 10,695,254 lamps). This number was increased to account for an additional 0.5% broken at retail locations for 10,748,731 lamps), and an additional 5.0% broken prior to delivery to retail locations (production total of 11,286,167 lamps). The quantity of lamps in retail and the quantity of lamps purchased by consumers were then multiplied by release factors to estimate the amount of mercury emitted when a fraction of these lamps was broken. The release factor for breakage during retail was 0.002%, and the release factor for consumer breakage was 0.01%. It was assumed that each lamp manufactured capped the total mercury content in Compact Fluorescent Lamps (CFLs) at less than 25 watts at 5 milligrams (mg) per unit. CFLs that use 25 to 40 watts of electricity were capped at 6 mg per unit (NEKA, 2007). The proportion of CFL to full-size fluorescent bulb sales was not available. Therefore, the more conservative assumption of 8 mg per unit is still being used for purposes of the 2020 emissions estimation for this nonpoint source category. This method yielded an emissions estimate of 0.37 lbs of mercury emitted from lamp breakage by retailers, and 1.90 lbs emitted from lamp breakage by consumers. An additional 0.18 lbs of mercury from lamps broken at production facilities were calculated for a total of 2.45 lbs directly from lamp breakage, as estimated by the USEPA Flow Diagram

The USEPA Flow Diagram was also used to estimate emissions from the disposal of lamps in the MSW stream. Of the total number of disposed fluorescent lamps (194.51 lb/yr in Michigan based on an estimate of lamps being discharged at the end of their life expectancy in 2020), 78% or 151.72 lbs likely ended up in the solid waste stream. Assuming 10% of the mercury in each lamp was released while in transit, 15.17 lbs of mercury emissions would be attributable to the collection and processing of lamp-containing MSW.

Assuming 84% of lamps in MSW end up in landfills, and 1% of the mercury is released, 1.08 lbs of mercury emissions can be attributed to landfill emissions from disposed lamps. Another 2.07 lbs of emissions were likely due to the 2% of lamps in MSW that are burned in burn barrels, assuming a 90% release factor. Emissions in the amount of 8.97 lbs were estimated from lamps incinerated in mass burn/RDF combustion. However, Michigan’s 2020 mercury inventory already accounts for solid waste incineration under point sources, so the 8.97 lbs of nonpoint source mercury emissions estimated by the USEPA Mercury Flow Diagram for mass burn/RDF has been omitted from the Michigan 2020 inventory.

Using the USEPA Mercury Flow Diagram and assuming that Michigan recycles fluorescent lamps at the same rate as the national average, 22%, about 4.2 million lamps should have been recycled in Michigan in 2020. Approximately 0.42 lbs of mercury were likely released during the transport of lamps to the recycling facility based on a 1% release factor. Another 0.42 lbs was estimated to have been emitted from recycling itself, via the USEPA Mercury Flow Diagram.

It can be estimated that the three companies permitted in Michigan in 2020 with fluorescent lamp recyclers emit 1.69 lbs of mercury per year, assuming they are emitting the maximum amount allowed by their permit conditions. These three facilities are not required to report to MAERS. Therefore, it was not known how many hours they operated, or in the case of the source permitted as both a stationary and portable facility, where it operated and emitted in 2020.

Table 49. Fluorescent Lamp Recyclers

SRN	Company	Portable or Stationary	Permit Limit	Maximum Emitted Lbs
N5948	USA Lamp & Ballast Recycling	Stationary	0.08 g/hr	1.50
N6821	Reliable Relamping, Inc.	Facility is permitted as both a stationary and a portable source.	0.01 g/hr	0.19
P0621	3S International, LLC	Stationary	The permittee shall not process more than 9,636 tons of fluorescent light bulbs per year in FGRECYCLERS per 12-month rolling time period.	NA
Total	NA	NA	NA	1.69

Hence, fluorescent and non-fluorescent lamp breakage, recycling, and the solid waste stream are estimated with the USEPA Flow Diagram to have released 21.61 lbs of mercury to the atmosphere in 2020. Lamp breakage is estimated to have released 2.45 lbs of mercury by itself, and the remaining disposal activities (storage, transfer, transit, and recycling) are estimated to have released 19.16 lbs. of the disposal activities, the subset of fluorescent lamp recycling and recycling-related activities account for 0.84 lbs.

The USEPA's 2020 NEI contains a relatively close estimate for Michigan of 59.95 lbs from non-recycling breakage and 1.96E-03 lbs from recycling breakage. Ultimately, the 2020 NEI value has been used for the report as the most defensible calculation. Michigan's estimate of 1.69 lbs of mercury emissions from permitted lamp recyclers has been added to the mercury inventory under lamp recycling, based on information obtained from the individual permits.

Table 50. Fluorescent and Non-Fluorescent Lamps

Year	Flow Diagram Estimate in Lbs	2017 NEI Estimate in Lbs	subset
2017	0.18	56.95	Production breakage
2017	0.37	56.95	Retail breakage
2017	1.90	56.95	Consumer breakage
2017	15.17	56.95	Storage, transit and transfer (MSW)
2017	1.08	56.95	Landfills
2017	0.42	1.96E-03	Storage, transit and transfer (recycling)
2017	0.42	1.96E-03	Recycling
2017	NA	NA	Mass burning and RDF
2017	2.07	NA	Burn barrels
TOTALS	21.61	56.95	NA
Assignment in Table 1	NA	2017 NEI Estimate in Lbs	subset
Table 1	NA	59.95	MERCURY-CONTAINING PRODUCTS
Table 1	NA	1.96E-03	All other values (recycling, and storage, transfer and transit en route to recycling) are included under Recycling

Drum Top Crushers

As of 2020, there were 8 active permits issued by EGLE for drum top crushers (DTCs) with a 9th permit voided, but the process rolled into the facility’s ROP. Accordingly, there were 9 permitted DTCs operating in 2020. The information available for these sources is summarized below. Based on the maximum allowed number of lamps to be crushed each year (5,000 per facility with 90% control for carbon filters, and a range of 10 to 20 mg of mercury per lamp per Joy Taylor Morgan, EGLE), the amount emitted from this category in 2020 can be estimated at a minimum of 0.10 lbs and a maximum of 0.20 lbs (Chamberlain, 2025).

Table 51. Drum Top Crushers

Permit No	SRN	Company	Location	Approved	Voided	Comments
170-13	B8747	Johnson Matthey Vehicle Testing & Development	Taylor	12/11/2013	2/10/2020	Include in 2020 calculation
112-10	N0929	Auto Alliance International	Flat Rock	6/9/2010	5/19/2011	Rolled into ROP
117-10	N5245	Marquette County Solid Waste Management	Marquette	7/19/2010	NA	NA
138-06	N7614	Shaheen Chevrolet, Inc.	Lansing	7/13/2006	NA	NA
16-14	P0500	Sebewaing Light & Water Dept	Sebewaing	2/14/2014	8/18/2020	Include in 2020 calculation
101-18	A4420	Kimberly LED Lighting	Clarkston	6/18/2018	NA	NA
80-19	M4174	Detroit Metropolitan Wayne County Airport	Detroit	6/3/2019	NA	NA
147-19	P1082	Beaudoin Electrical Construction	Saint Joseph	9/11/2019	2/2/2021	Include in 2020 calculation
127-19	P1072	Beaudoin Electrical Construction	Sodus	9/27/2019	NA	NA

Auto Switches – Shredding of Autos (Nonpoint Sources)

The USEPA estimated a nonpoint emissions value of mercury from auto shredding for Michigan in the 2020 NEI of 147.03 lbs. This is an increase from the 2017 NEI value of 132.83 lbs. In 2020 there were 3,338 switches recovered while in 2017 there were 12,500 switches recovered. The significant decrease in switches recovered in 2020 lead to the increase in emissions (Cooley and Mason, 2025). The NEI calculation is based on the latest USEPA methodology and factor, and it also accounts for mercury switch recovery in Michigan. It is seen as the most defensible emissions value for the nonpoint component of auto shredding and is used in the mercury inventory accordingly.

It was estimated that a maximum of 18.61 lbs were emitted by point source automobile shredders per the table below, resulting in a statewide estimate of 165.64 lbs if the NEI nonpoint value is used.

For comparison, calculations made with the USEPA Mercury Flow Diagram are presented. Using Michigan data about scrapped vehicles, 94.73 lbs of mercury emissions were estimated statewide by point and non-point sources from automobile shredding (Alberts, 2025).

Using Michigan data in the USEPA Mercury Flow Diagram, an estimated 94.73 lbs of mercury was emitted to the atmosphere from shredding, in total, with 18.61 lbs of that accounted for by point source facilities. It was estimated that 534.61 lbs of mercury was present in switches in end-of-life vehicles in Michigan in 2020, based on the estimated number of vehicles scrapped in Michigan (5.62% or 475,478 vehicles). Previous mercury inventories assumed an average of 0.54 switches per vehicle with an average of 1 gram of mercury per switch. Ninety-nine percent of these vehicles were assumed to be sent to scrap yards/dismantlers, with the remaining 1% being disposed of in some other manner.

The number of vehicles with mercury switches has declined as the vehicle population ages. As documented by End-of-Life Vehicle Solutions, vehicles manufactured in the 2003 model year and beyond do not contain mercury convenience switches (ELVS, 2007). The average age of vehicles in the U.S. has been increasing over time. In 2017 the average age was 11.7 years and in 2020 the average age was 11.9 years (Bureau of Transportation Statistics, 2024).

Based on End-of-Life Vehicle Solutions' report, 7.34 lbs of mercury was recovered from mercury switches in 2020 (Republic Services, 2025). Sixty-six percent of the vehicles sent to scrap yards/dismantlers were assumed to be shredded. Per the USEPA Flow Diagram, it was estimated that of the total 94.73 lbs of mercury from the auto shredding category, 75.78 lbs will be released during the shredding process, assuming a 22% release factor. This release factor was based on the *North Star Steel Mercury Mass Balance Report*, prepared by Barr in 1999. Another 18.95 lbs of mercury should be released from auto fluff, assuming a 25% release factor per the Barr report.

Furthermore, of the total 94.73 lbs of mercury emissions, it was estimated that 18.61 lbs were from the point source sector. The remaining 76.12 lbs of mercury were from the nonpoint sector.

The following table presents the range of emissions estimated for the nonpoint component of auto switches (automobile shredding). As noted earlier, the 2020 NEI estimate has been accepted as the final value for the mercury inventory.

Table 52. Auto Shredders Nonpoint

¹ USEPA's methodology accounts for state-level collection of automobile switches from the ELVS Mercury Switch Recovery Program Reporting

Year	Flow Diagram Estimate in lbs	2020 NEI value ¹	Subset
2017	18.61	165.64	Shredding
2017	76.12	NA	Auto fluff
2017	NA	NA	Storage, transit and transfer (MSW)
2017	NA	NA	Storage, transit and transfer (recycling)
2017	NA	NA	Landfills
2017	NA	NA	Recycling
2017	NA	NA	Mass burning and RDF
2017	NA	NA	Burn barrels
TOTAL	94.73	165.64	Area source and point source totals
NA	76.12	147.03	Area source total
NA	18.61	18.61	Point source total
Assignment in Table 1	NA	2020 NEI value¹	Subset
TABLE 1	NA	147.03	MERCURY-CONTAINING PRODUCTS
TABLE 1	NA	18.61	Point source deduction entry

Switches and Relays

Using national data in the USEPA Flow Diagram, emissions from switches and relays were estimated as a proportion of national emissions (McGeen, 2021). Michigan accounted for 3.04% of the United States population in 2020 so national values were scaled down to reflect Michigan's proportion of the national population.

Approximately 0.41 kg (0.90 lbs) of mercury were emitted from the retail of switches and relays, assuming 0.1% of mercury in switches and relays is released during retail in 2020. The quantity of mercury sold annually in switches and relays nationally was based on the 2010 figure from the most

recent IMERC fact sheet: Mercury Use in Switches and Relays (IMERC, 2014). The 2010 value was adjusted for an annual 4% decline by 2020.

For consumer breakage of switches and relays, a 0.05% release factor was used. It is estimated that 57.14 lbs of mercury was emitted from consumer breakage in 2020, for a total of 58.04 lbs from the consumer and retail category.

During the storage, transit, and transfer of MSW, 8.89 lbs of mercury was likely released assuming a 1.5% release factor. Another 11.57 lbs of mercury was released in 2020 during the storage and transfer of switches and relays bound for recycling. Approximately 40% of the mercury in discarded switches and relays is sent on for recycling.

The switches and relays in MSW which reach landfills contributed 4.01 lbs of mercury emissions under the assumption that 1% of the mercury is released. Another 11.35 lbs of mercury was likely released due to recycling switches and relays assuming a 1% release factor and is reported under recycling. The mercury model projected that 56.33 lbs more would be lost due to mass burning and RDF combustion, but this was not included in the switch and relay nonpoint source estimate as the incineration category has already been accounted for under point sources. Three percent of switches and relays in MSW were likely burned in burn barrels, releasing 90% of the mercury contained in them, or 17.28 lbs.

In total, 110.96 lbs of mercury was likely released from activities associated with mercury-containing switches and relays in 2020. This includes the solid waste stream.

Mercury in the amount of 58.05 lbs is listed in Table 1 for the switches and relays component of the mercury-containing products category. This includes only the emissions from retail and consumer breakage. The remaining emissions from activities such as storage, transfer, transit, and recycling are reported in Table 1 under the Waste Disposal category.

Table 53. Switches and Relays

Year	Flow Diagram Estimate in lbs	subset
2020	0.90	Retail breakage
2020	57.14	Consumer breakage
2020	8.69	Storage, transit and transfer (MSW)
2020	11.57	Storage, transit and transfer (recycling)
2020	4.01	Landfills
2020	11.35	Recycling
2020	NA	Mass burning and RDF
2020	17.28	Burn barrels
TOTALS	110.96	NA
Assignment in Table 1	Flow Diagram Estimate in lbs	Assignment in Table 1 - subset
Table 1	58.05	MERCURY-CONTAINING PRODUCTS
Table 1	52.91	All other values (storage, transfer, transit and recycling) are included under subsets of Waste Disposal category

Thermostats

Emissions from thermostats were estimated by substituting Michigan data for national data in the USEPA Flow Diagram (McGeen, 2020). Emissions were estimated from production, retail, and consumers.

The fact sheet, Mercury Use in Thermostats, provided an estimate of total mercury sold nationally in electro-mechanical thermostats (IMERC, 2018). This fact sheet indicates that 102 lbs of mercury was sold nationally in thermostats in 2013 and 0 lbs in 2016. According to the IMERC fact sheet, the great decline nationally is due, in large part, to state laws banning the sale of thermostats containing mercury and the availability of non-mercury digital thermostats with programmable features that are sought after by consumers. As thermostats have a life expectancy of 30 to 50 years, emissions from discarded thermostats will occur for some years into the future.

Assuming that mercury use in 2020 thermostats sold is equal to 2016 levels of zero, no thermostats containing mercury were sold in Michigan in 2020.

Based on state and national population data, and national estimates for the number of thermostats replaced, an estimated 106,400 mercury-containing thermostats were replaced (discarded by consumers) in Michigan in 2017. This estimate assumes that Michigan accounted for an even percentage of the national number of thermostats replaced, that thermostats contain an average of 3.67 g mercury per unit, and that 70% of the thermostats removed contained mercury (an increasing share of replaced thermostats is expected to be non-mercury based on the gradual increase since the 1990s in the sale of non-mercury thermostats). An estimated 8.42 lbs of mercury was emitted from consumer breakage of the replaced thermostats. During consumer use, 1% of the mercury in

thermostats was expected to have volatilized due to breakage. The total emission estimate from retail and consumer breakage is 8.42lbs.

Based on the estimated 106,400mercury-containing thermostats discarded by consumers in 2020, 18.17 lbs of mercury was contained in the 2% of thermostats that were recycled.

Per the USEPA Mercury Flow Diagram, 0.35 lbs of mercury was estimated to be emitted during storage, transit, and transfer on the way to recycling. Mercury in the amount of 0.18 lbs was estimated to be emitted during recycling.

Mercury in the amount of 756.63 lbs in thermostats entered the solid waste stream. During the storage, transit, and transfer of MSW, thermostats contributed 11.35 lbs of emissions. Three percent of thermostats in MSW were likely burned in burn barrels emitting 90% or 22.58 lbs of the mercury they contained. Mercury in the amount of 5.25 lbs was likely released due to the 75% of thermostats in the MSW stream that were landfilled, assuming 1% of mercury would volatilize.

An additional 83.78 lbs of mercury was present in the 10% of thermostats which ended up under demolition debris disposal. Mercury in the amount of 0.86 lbs was emitted during the storage, transit, and transfer to demolition debris landfills. Additional mercury in the amount of 1.61 lbs was emitted after disposal in the demolition debris landfills.

There are also wastewater treatment and sludge disposal emission components for thermostats which enter the MSW stream. Mercury emissions in the amount of 0.88 lbs were estimated from wastewater treatment. Another 0.44 lbs was estimated from land application air emissions, but this category has been estimated as a separate nonpoint source. Mercury in the amount of 0.88 lbs, estimated by the USEPA Mercury Flow Diagram for WWTP incineration, was not included since this category is addressed under point sources.

Not including the emissions from wastewater treatment and land application, 50.60 lbs of mercury was likely emitted due to thermostats in 2020. Of this, 8.42 lbs was emitted directly from consumer breakage.

The USEPA's 2020 NEI includes an estimated 7.13 lbs of mercury emissions in Michigan from thermostats and thermometers under SCC 2650000000. The USEPA's methodology specifies that these emissions are "the portion that emit mercury prior to disposal at landfills or incinerators." The 2020 NEI calculation does not account for estimated emissions occurring at the numerous steps in the products disposal path, therefore the NEI v2 value is accepted as the most defensible value for consumer breakage, and the calculations from the USEPA Mercury Flow Diagram are utilized for the different waste and recycling outputs.

Table 54. Thermostats

Year	Flow Diagram Emissions in Lbs	2020 NEI Emissions in Lbs	Subset
2020	0.00	0.00	Production losses
2020	8.42	7.13	Consumer breakage
2020	0.00	0.00	Retail breakage
2020	11.35	NA	Storage, transit and transfer (MSW)
2020	0.86	NA	Storage, transit and transfer (demolition debris landfills)
2020	0.35	NA	Storage, transit and transfer (recycling)
2020	5.25	NA	Landfills
2020	1.61	NA	Landfills (demolition debris)
2020	0.18	NA	Recycling
2020	NA	NA	Mass burning and RDF
2020	22.58	NA	Burn barrels
TOTAL	50.60	7.13	NA
Assignment in TABLE 1	NA	2020 NEI Emissions in Lbs	Assignment in TABLE 1 - subset
TABLE 1	NA	7.13	MERCURY CONTAINING PRODUCTS

Measurement and Control Devices

Emissions from measurement and control devices were estimates as a proportion of national emissions using the USEPA Flow Diagram (McGeen, 2021). According to the IMERC fact sheet, Mercury Use in Measuring Devices, 0.77 tons of mercury was contained in measuring devices sold nationally in 2016 (IMERC, 2018). While an increase since 2013 when 0.58 tons was contained in measuring devices sold nationally, this still represents an 84% decline since 2001 when measuring devices sold contained 5.12 tons of mercury. Much of the decline comes from the discontinuation of mercury in barometers and dairy manometers, and the reduction of mercury used in thermometers. Based on the USEPA’s assessment that mercury thermometers have an average life span of five years, the same assumption will be made for mercury manometers until data can be found indicating otherwise. Michigan accounted for 3.04% of the U.S. population so national values were adjusted accordingly to generate Michigan-specific values.

Approximately 0.04 lbs of mercury was emitted from the retail measurement and control devices assuming 0.1% of mercury in measurement and control devices is released during retail. For consumer breakage of measurement and control devices, a 0.2% release factor was used. Mercury in the amount of 22.408 lbs was emitted from consumer breakage in 2020, for a total of 22.44lbs from retail and consumer breakage.

During the storage, transit, and transfer of measurement and control devices as MSW, 0.26 lbs of mercury was likely released assuming a 1.5% release factor. Approximately 40% of the mercury in discarded measurement and control devices is sent on for recycling. Mercury in the amount of 0.13 lbs was released during storage and transfer of measurement and control devices bound for recycling. Another 0.13 lbs of mercury was likely released due to recycling, assuming a 1% release factor.

Three percent of measurement and control devices in MSW were likely burned in burn barrels releasing 90% of the mercury contained in them. Accordingly, 0.53 lbs of mercury was released due to measurement and control devices being burned in burn barrels. Seventy-five percent of measurement and control devices in MSW are sent to landfills. They contribute 0.13 lbs of mercury emissions assuming 1% of the mercury is released.

In total, 23.63 lbs of mercury was likely released from all activities associated with mercury-containing measurement and control devices in 2020.

Table 55. Measurement and Control Devices

Year	Flow Diagram Estimate in lbs	subset
2020	0.04	Retail breakage
2020	22.40	Consumer breakage
2020	0.26	Storage, transit and transfer (MSW)
2020	0.13	Storage, transit and transfer (recycling)
2020	0.13	Landfills
2020	0.13	Recycling
2020	NA	Mass burning and RDF
2020	0.53	Burn barrels
TOTALS	23.63	NA
Assignment in Table 1	Flow Diagram Estimate in lbs	Assignment in Table 1 - subset
Table 1	22.44	MERCURY-CONTAINING PRODUCTS
Table 1	1.19	All other values (storage, transfer and transit en route to MSW and recycling, and actual landfilling and recycling) are included under subsets of Waste Disposal category

Thermometers

In 2003, Michigan Public Act 578 banned the sale of mercury thermometers in Michigan, or for use in the state of Michigan. The only exceptions are if a mercury thermometer is sold or offered for one of the following:

- a. A use for which a mercury thermometer is required by state or federal statute, regulation, or administrative rule;
- b. Pharmaceutical research purposes; or
- c. By prescription.

Mercury thermometers in household use are assumed to have a 5-year lifespan prior to breakage and disposal. Therefore, it is assumed that household use and breakage of mercury thermometers in 2017 is negligible, based on the ban on sales since 2003. Mercury thermometers used in hospitals were assumed to have a 1-year life span prior to breakage and disposal; therefore, it was assumed no hospital mercury thermometers were in use in 2017. Accordingly, mercury emissions

from breakage and disposal of mercury thermometers are assumed to be minimal in 2017 and zero emissions have been calculated (McGeen, 2021).

Table 56. Thermometers

Year	Estimated Emissions in Lbs	Nonpoint Sector
2017	0.00	Thermometers

Bulk Mercury

Household hazardous waste collection sites operated by county and city health departments collected 72.20 lbs of elemental free-flowing mercury in 2020 (Chamberlain, 2025). The USEPA Flow Model estimates that 1% or 0.73 lbs of this mercury was released to the air. A total of 72.20 lbs of bulk mercury was also transported as waste in 2020. One percent or 72.20 lbs of this bulk mercury was expected to be released during waste transport. Approximately 962.67 lbs of mercury was calculated as the total consumer input by extrapolating from the total waste estimates. Mercury from consumers had an expected release factor of 0.2%, resulting in emissions of approximately 1.92 lbs of elemental mercury in 2020. Therefore, approximately 3.37 lbs of mercury was likely released from all aspects of the bulk mercury category in 2020 (Chamberlain, 2025).

Table 57. Consumer Use of Bulk Mercury

Year	Flow Diagram emissions in lbs	subset
2020	0.73	Released from collection of bulk mercury emissions (Clean Sweep sites)
2020	1.92	Consumer and retail
2020	0.73	Storage, transit and transfer (MSW)
2020	NA	Landfills
2020	NA	Recycling
2020	NA	Mass burning and RDF
2020	NA	Burn barrels
TOTALS	3.37	NA
Assignment in Table 1	Flow Diagram emissions in lbs	Assignment in Table 1 - subset
Table 1	1.92	MERCURY-CONTAINING PRODUCTS
Table 1	0.73	See CLEAN SWEEP SITES entry
Table 1	0.73	All other values (storage, transfer, transit as MSW) are included under subsets of Waste Disposal Category

Volatilization During Solid Waste Collection and Processing

Although the USEPA Mercury Flow Diagram includes calculations for emissions from solid waste processing (handling) for each product type, the AQD has prepared an in-house calculation for each triennial mercury inventory to represent any emissions that may occur above and beyond the Flow Diagram calculations.

The estimate for volatilization during solid waste collection and processing was based on the assumption that 1.5% of the mercury in solid waste is volatilized during collection, transportation, and mechanical processing (MPCA, 2001). In prior mercury reports, a mercury value was estimated for composted municipal solid waste in Michigan. However, since then it has been clarified that composting in Michigan consists almost entirely of yard waste. Yard waste was once sent to landfills but resulted in numerous odor issues and even fire hazards as it decomposed. Accordingly, it is kept separate from the MSW stream and is highly unlikely that batteries or mercury-containing devices would contaminate the yard waste compost (Hiday, 2020). Based on this information, composted yard waste is not included as a source of mercury emissions in the 2020 mercury report.

The quantity of solid waste combusted was calculated using MAERS throughput values (see Municipal Waste Incineration). Landfill data from 2020 was obtained from the Materials Management Division (EGLE, 2025). For this estimate, only Type II in-state waste (municipal solid waste) was considered. The value was 24,324,545 cubic yards and a weight of 0.333 tons per yard was assumed for an estimate of 8,100,073.49 tons. Since out-of-state waste is not likely to be transported to a transfer station in Michigan, it was not included in this estimate. It is assumed that the mercury concentration of MSW is approximately 0.004 lbs of mercury per ton of solid waste (van Veizen, 2002). Mercury in the amount of 497.19 lbs was estimated due to volatilization during the collection and processing of MSW in 2020 based on this method (Chamberlain, 2025).

The van Veizen emission factor from 2002 may not reflect trends by 2020 in the solid waste stream for mercury products and devices. Within the USEPA Flow Diagram mercury emissions estimated from solid waste collection and processing declined from 53 lbs to 17.84 lbs, or a decrease of 66%. If this information is used to scale the calculation based on the van Veizen factor, an adjusted estimate of 169.04 lbs of mercury from solid waste collection and processing is calculated for 2020. This AQD estimate may still be partially duplicative of the 17.84 lbs estimated mercury emissions from the flow diagram for solid waste collection and processing for different mercury-containing products.

Table 58. Solid Waste Collection and Processing

Fate of Municipal Solid Waste (MSW)	Amount	Reference
Resource Recovery (incineration in tons)	186,405.00	From 2020 Point Source MSW Incineration Sector
Landfill Type II In-State Waste (Tons)	8,100,073.49	EGLE, Report of Solid Waste Landfilled in Michigan, October 1, 2019 - September 20, 2020
Total landfill, and combusted	8,286,478.49	NA
Calculated mercury content (lb/ton)	0.004	van Veizen (2002)
Mercury content in lbs of SW (excluding recycling)	33,145.91	NA
Volatilization in handling and transport, equals 1.5% of total content from waste landfilled and incinerated.	497.19	Emissions rate obtained from US EPA Mercury Flow Diagram
Scaled estimate in lb, based on 66% decline in mercury content in solid waste inputs from 2002 through 2014	169.04	2002 through 2014 product use and waste inputs within US EPA Mercury Flow Diagram

Landfill Volatilization

The USEPA’s 2020 NEI estimated that 56.78 lbs of mercury emissions were emitted from the working face of landfills. The USEPA’s estimate is seen as the most defensible and is used for the mercury inventory, although the range of calculations used by Michigan for previous mercury inventories is presented below with alternate 2020 estimates for comparison.

Michigan’s alternate estimate for volatilization during placement of solid waste in landfills was based on the assumption that 0.1% of the mercury in landfilled solid waste is volatilized per year based on studies of MSW emissions in Florida (Lindberg and Price, 1999).

To estimate the quantity of MSW landfilled in Michigan in 2020, a Michigan-specific figure from the EGLE’s Materials Management Division was utilized (EGLE 2021). For this estimate, total landfilled Type II (in-state and out-of-state) waste (34,591,466 cubic yards) was considered and a weight of 0.333 tons per yard was assumed. For this calculation it was assumed that the mercury concentration of MSW is approximately 0.004 lbs of mercury per ton of solid waste (van Veizen, 2002). From this method, approximately 46.08 lbs of mercury was likely emitted due to volatilization from landfilled MSW in 2020 (EGLE, 2025).

The emission factor utilized for landfill volatilization from the 2014 NEI v2 was applied to the 2020 landfilled Type II waste for Michigan to create an alternate estimate of 63.47 lbs.

The different calculations for mercury emissions from volatilization at the working faces of landfills range from 46.08 lbs to 63.47 lbs. The 2020 NEI calculation of 56.78 lbs for Michigan is utilized as the final value for the mercury inventory.

Table 59. Landfill Volatilization

Fate of Municipal Solid Waste	Amount	Reference
Total landfilled in-state and out-state Type II Waste (Municipal & Commercial Waste) in cubic yards, 2020	34,591,466	EGLE, Materials Management Division, Report of Solid Waste Landfilled in Michigan (October 1, 2019 - September 30, 2020)
Total landfilled Type II Waste in tons (assumes 0.333 tons/yd), 2020	11,518,958	EGLE, Materials Management Division
Calculated mercury content (lb/ton)	0.0040	van Veizen (2002)
Mercury content in lb of solid waste (excluding recycling)	46,076	NA
Estimated 2020 mercury emissions using 2014 NEI v2 volatilization rate for MSW, and Michigan Type II waste in tons	46.08	Emission rate from EPA 2014 NEI v2, Documentation for Estimation of 2014 Nonpoint Mercury Emissions (0.1% of mercury in MSW volatilizes)
Hg emissions rate in lb/ton (specific to landfill working face)	5.51E-06	2014 NEI v2 (Lindberg 2002)
Estimated 2020 mercury emissions from landfill working face using 2014 NEI v2 factor (Lindberg 2002) and Michigan Type II waste in tons	63.47	This calculation presents an alternate value using the 2020 activity data with the emission factor utilized in the 2014 NEI v2.
EPA's 2020 NEI mercury estimate in lbs for Michigan, for landfill working face	56.78	3.63E-03 lb/ton emission factor from US EPA Landfills Tool v1.1, run by EPA on 2/15/2020

Burn Barrels

For the 2020 NEI, the USEPA calculated an estimate of mercury emissions from open burning of solid waste (burn barrels) in Michigan of 184.50 lbs. The calculation was based on the USEPA’s Construction Dust and Open Burning Tool, v1.1. While the 2020 NEI value for Michigan of 184.50 lbs is accepted for the mercury inventory as the most defensible estimate, Michigan’s alternate calculations are described below for comparison.

While the USEPA Mercury Flow Diagram includes calculations for emissions from burn barrels (open burning of MSW) for each product type, the AQD has prepared an in-house burn barrel calculation for each triennial mercury inventory to represent emissions, which may occur above and beyond the flow diagram estimates.

A methodology from Michigan’s 2005 mercury inventory was utilized to estimate 111.89 lbs of mercury from the open burning of MSW in 2020. The methodology was from USEPA’s Appendix A of *Documentation for the Final 2002 Nonpoint Sector (Feb 06 Version) National Emissions Inventory for Criteria and Hazardous Air Pollutants*. The ratio of urban to rural population was obtained from 2010 US Census data and then multiplied by a 2020 US Census Bureau estimate of the county population in Michigan to obtain an estimate of rural population in 2017. The USEPA’s estimate of 3.37 lbs of solid waste per person per day was used to calculate total solid waste generated. It was assumed that MSW has a mercury content of 0.0040 lb/ton (van Veizen, 2002). Per an estimate by Minnesota Pollution Control Agency (MPCA, 2008), 2% of MSW was assumed to be disposed of in burn barrels, resulting in the estimate of 111.89 lbs (Alberts, 2025).

From the USEPA’s open burning estimates in the 2020 NEI, an estimated 211,103 tons of MSW were burned. Using this activity data, burn barrel emissions of mercury for 2020 are estimated at 844.41 lbs utilizing the van Veizen emission factor and the throughput from the 2020 NEI (Alberts, 2025). This value is substantially higher due to the assumption of a larger quantity of available waste being burned. The number of mercury-containing devices in use has declined since the 2002 study was conducted by van Veizen, therefore this calculation may overestimate the quantity of mercury emissions from open burning of MSW in 2020.

In addition, an emissions component from burn barrels of 42.46 lbs has already been estimated for several of the mercury product use categories such as thermostats, switches and relays, and fluorescent and non-fluorescent bulbs based on the USEPA's Mercury Flow Diagram. These product types account for the likeliest sources of mercury in MSW in burn barrels, with the exception of mercury-containing batteries for which calculation methodologies are not available. For 2020, there is an estimated 73% less mercury emissions from burn barrels than the 2002 calculation from the USEPA's Mercury Flow Diagram. Therefore, the AQD calculations, utilizing the 2002 van Veizen factor, and waste inputs per MPCA's assumptions or the 2020 NEI, and the resulting emissions estimates of 111.89 lbs and 844.41 lbs, may be overestimated based on the reduced presence of mercury in the solid waste stream in 2020.

Scaling the AQD calculations, based on the 73% decline of mercury from the USEPA's Flow Diagram, produces an adjusted range of 30.21 lbs and 227.99 lbs for 2020. Even these values may pose some overlap with the 42.46 lbs of burn barrel emissions from other mercury-containing products in the flow diagram, but they are more likely to reflect current trends in the waste stream.

While the 2020 NEI value for Michigan of 184.50 lbs is accepted for the mercury inventory as the final value, Michigan's alternate calculations are presented below in table format.

Table 60. Open Burning of Solid Waste (Burn Barrels)

Methodology	Assumptions	Emission Estimation Basis	Estimated Emissions from Burn Barrel in Lbs
MPCA waste assumptions	2% of solid waste is assumed to be burned in barrels	Van Veizen emission factor (2002)	111.89
2017 NEI inputs with Van Veizen factor	Quantity of solid waste in burn barrels was estimated by USEPA	Van Veizen emission factor (2002)	844.41
Scaled estimate based on MPCA assumptions	73% estimated decline in open burning of solid waste (burn barrels), based on product and waste inputs in USEPA Mercury Flow Diagram from 2002 through 2017	Van Veizen emission factor (2002)	30.21
Scaled estimate based on 2017 NEI inputs and Van Veizen factor	73% estimated decline in open burning of solid waste (burn barrels), based on product and waste inputs in USEPA Mercury Flow Diagram from 2002 through 2017	Van Veizen emission factor (2002)	227.99
2020 NEI	EPA estimate	USEPA's Construction Dust and Open Burning Tool v1.1, run on 2/15/2020	184.50

Human Cremation

From the 2020 NEI, Michigan’s estimated nonpoint emissions of mercury from human cremation are 193.91 lbs. Different emission factors were developed by the USEPA for each age group based on the average quantity of mercury dental amalgam per person within that age group. Human deaths increased 29% nationally between 2017 and 2020, resulting in a significant increase in emissions (USEPA, 2023).

In 2020, there were 162 active permits in Michigan for crematories, located at 115 facilities. Human cremation was listed as the application reason for 67 of the permits. Animal, pet or veterinary cremations were listed as the application reason for 65 of the remaining permits.

Table 61. Human Cremation, Nonpoint

Year	Estimated Emissions in Lbs	Nonpoint Sector
2020	193.91	Human Cremation

Volatilization: Land Application of Sewage Sludge

Sewage sludge in the amount of 69,105 dry English tons was land applied in Michigan in 2020 according to estimates from the Biosolids Program of EGLE’s Water Resources Division (EGLE, 2021). Sewage sludge had an average concentration of 0.99 ppm of mercury in 2020. Assuming 1% of mercury applied to the surface of the land volatilized within one year (MPCA, 2004), but not taking into account any carryover from previous years, 1.37 lbs of mercury was likely emitted via volatilization from surface-applied sewage sludge in 2020 (Chamberlain, 2025).

Table 62. Land Application of Biosolids

Year	Estimated Emissions in Lbs	Nonpoint Sector
2020	1.37	Land Application of Biosolids

Contaminated Site Remediation

The only known source of atmospheric mercury emissions from the clean-up of a contaminated site in Michigan was the dredging of the BASF Riverview site in Detroit. Site dredging began in late 2006 and was completed in the second week of 2007 (Sadoff, 2006). Therefore, in 2020, there are no known air emissions of mercury from contaminated site remediation.

Table 63. Contaminated Site Remediation

Year	Estimated Emissions in Lbs	Nonpoint Sector
2020	0.00	Contaminated Site Remediation

General Laboratory Activities

The USEPA's 2020 NEI does not contain an estimate for mercury emissions from general laboratory activities in Michigan. The USEPA's 2017 NEI estimate for Michigan of 24.59 lbs of mercury emissions from general laboratory activities is used as a surrogate for 2020. This value was pulled forward from the 2008 NEI. The last survey on mercury use in laboratories was conducted in 2002. Accordingly, there is uncertainty as to whether the underlying assumptions used for the 2008 calculation are still representative of laboratory use of mercury in 2017. While the survey data may not be representative of laboratory activities in 2017, it has been included in this report as the best available estimate

Table 64. Laboratory Activities

Year	Estimated Emissions in Lbs	Nonpoint Sector
2020	24.59	Laboratory Activities

Oil and Gas Exploration and Production

In the 2020 NEI, the USEPA estimated mercury emissions for the nonpoint category of oil and gas exploration and production. The calculations were prepared with the USEPA's 2020 Nonpoint Oil and Gas Emissions Estimate Tool, version 1.2.

Table 65. Oil and Gas Exploration and Production

Year	Estimated Emissions in Lbs	Nonpoint Sector
2020	1.58E-05	Oil and Gas Exploration and Production - Drill Rigs
2020	0.00	Oil and Gas Exploration and Production - Hydraulic Fracturing Engines
Total	1.58E-05	NA

MOBILE SOURCES

On-road

The calculation from the USEPA's 2020 NEI suggests that 21.27 lbs of mercury was emitted from on-road vehicles in Michigan. Vehicle Miles Traveled (VMT) was obtained from the USEPA's documentation to provide a breakout by sector. In the 2011 and 2014 mercury inventories, the VMT for Michigan was only accessible as a total number and not by sector, therefore the individual sectors for those years were apportioned out based on 2008 on-road data. The 2020 VMT numbers were available by sector and provide a more accurate depiction of the miles traveled by each fuel and vehicle type. Alternative fuel vehicle miles are also included.

Table 66. 2017 Michigan Statewide Vehicle Miles Traveled and Estimated Mercury Emissions from 2017 NEI

On-road Sector	Vehicle Miles Traveled (in million miles)	Hg emissions in lbs from 2020 NEI
Light-duty Gasoline	78811.62	20.83
Heavy-duty Gasoline	924.77	0.03
Light-duty diesel	1552.75	0.04
Heavy-duty Diesel	5000.97	0.12
Compressed Natural Gas	7.85	0.00
Ethanol	177.62	0.05
Electric	71.42	0.00
Total VMT in Michigan	86546.99	21.27

The USEPA and the University of Michigan (U of M) Air Quality Laboratory collaborated on a pilot project in 2002 to investigate motor vehicle mercury emissions (Hoyer et al., 2004). The project produced significantly different emission factors than those previously used to estimate mobile source mercury emissions from on-road vehicles. Michigan's 2002 mercury emissions inventory estimated on-road mobile source emissions using emission factors that were the detection limit cut in half from Coordinating Research Council (CRC) data. The emission factors produced by the USEPA/U of M pilot project were several orders of magnitude lower than the estimate based on the CRC factor.

Table 67. Estimated On-road Emissions, CRC and USEPA/U of M Emission Factors

Year	Total on-road Hg emissions in lbs (CRC factor)	Total on-road low range Hg emissions in lbs (EPA/U of M factor)	Total on-road high range Hg emissions in lbs (EPA/U of M factor)	EPA NEI Hg estimate for on-road (in lbs)
2020	1130.80	0.14	0.41	21.27

Table 68. Comparison of 1999 (CRC) and 2002 (USEPA/U of M) Emission Factors

Vehicle Type	1999 Emission Factor	2002 Emission Factor
Light Duty Diesel	6,579 ng/mi	6.4 - 11.1 ng/mi
Heavy Duty Diesel	86,577 ng/mi	6.4 - 11.1 ng/mi
Light Duty Gasoline	875 ng/mi	0.3 - 1.4 ng/mi
Heavy Duty Gasoline	839 ng/mi	0.3 - 1.4 ng/mi

The Light-duty Gasoline Vehicles emission factor from USEPA/U of M was applied to all gasoline vehicles for 2020 and the Heavy-duty Diesel Vehicles emission factor from USEPA/U of M was applied to all diesel vehicles. The resulting 2020 estimate prepared by Michigan suggests that <1 lbs of mercury was emitted from on-road vehicles (0.14 to 0.41 lbs).

It should be noted that the USEPA/U of M pilot project did not measure reactive gaseous mercury and because this was a pilot project, few vehicles were studied. Further research is needed to estimate emissions from mobile sources with the desired degree of certainty. The pilot study tested light-duty gasoline and heavy-duty diesel vehicles. These estimates only include mercury from tailpipe emissions and do not address other potential mercury sources from on-road vehicles, such as mercury in brake pads. Brake wear was identified as a potentially significant source of mercury emissions from mobile sources during the pilot study (Hoyer et al., 2004).

The estimate from the USEPA's 2020 NEI indicates that 21.27 lbs of mercury was likely emitted from on-road vehicles. Michigan's own calculations, with other factors, suggest a possible range of 0.14 to 0.41 lbs.

Non-road

The 2020 mercury inventory includes several non-road categories. These are off-road vehicles and equipment (diesel and gasoline powered), commercial marine vessels, and railroads.

The estimate from the USEPA's 2020 NEI non-road inventory estimates that 1.49 lbs of mercury was emitted from off-road vehicles and equipment. This includes snowmobiles, ATVs, agricultural, construction, mining, lawn and garden equipment, and railroad maintenance of way equipment. Mercury in the amount of 0.13 lbs was from diesel equipment and vehicles, and 1.04 lbs of mercury was from gasoline-powered vehicles and equipment, with 0.31 lbs emitted by other fuel types (USEPA, 2020 NEI).

Table 69. Non-road Emissions

Source of Nonroad Estimate	Fuel Type	Estimated Mercury Emissions in Lbs
2020 NEI	Non-Road Gasoline	1.04
2020 NEI	Non-Road Diesel	0.13
2020 NEI	Other	0.31
Total	NA	1.49

The USEPA's 2020 NEI nonpoint inventory estimates that 0.0128 lbs of mercury was emitted from commercial marine vessels. This includes port and underway emissions for the marine vessels.

Table 70. Commercial Marine Vessel Emissions

¹USEPA classifies marine diesel engines of < 30-liter displacement per cylinder, and > 800 horsepower, as Category 1 (C1) or Category 2 (C2) engines. Category 3 (C3) engines are the largest marine diesel engines. They have ≥ 30 liter displacement per cylinder and are typically rated at 3,000 to 100,000 horsepower.

Source of Marine Estimate	Commercial Marine Vessel Category ¹	Estimated Mercury Emissions in Lbs
2020 NEI	C1C2 Port emissions: Main Engine	6.47E-06
2020 NEI	C1C2 Port emissions: Auxiliary Engine	6.59E-04
2020 NEI	C3 Port emissions: Main Engine	1.87E-06
2020 NEI	C3 Port emissions: Auxiliary Engine	5.06E-05
2020 NEI	C1C2 Underway emissions: Main Engine	4.98E-03
2020 NEI	C1C2 Underway emissions: Auxiliary Engine	1.80E-03
2020 NEI	C3 Underway emissions: Main Engine	4.85E-03
2020 NEI	C3 Underway emissions: Auxiliary Engine	4.83E-04
Total	NA	1.28E-02

The 2020 NEI Nonpoint for line haul and 2020 NEI Point for yard locomotives inventory estimates that 2.56 lbs of mercury were emitted by railroad locomotives in Michigan. This includes emissions from line-haul locomotives for Class I, II, and III railroads (large carriers, regional railroads, and short lines, respectively) and yard locomotives.

Table 71. Rail Emissions (Line Haul and Yard Locomotives)

Source of Rail Estimate	Rail Category	Estimated Mercury Emissions in Lbs
2020 NEI	Line Haul Locomotives: Class I Operations	1.28
2020 NEI	Line Haul Locomotives: Class II / III Operations	0.95
2020 NEI	Line Haul Locomotives: Passenger Trains (Amtrak)	0.14
2020 NEI	Yard Locomotives	0.19
Total	NA	2.56

An estimate of between 0.24 and 10.80 lbs of mercury emitted per year was generated for Michigan’s only coal-burning ferry, the S.S. *Badger*, owned by Lake Michigan Carferry Service. The *Badger* burns 12,000 tons of bituminous coal per year on average, according to the USEPA (USEPA, 2013). Using the range of mercury concentration in bituminous coal of 0.01-0.45 ppm (MMEUW, 2005), the range of emissions was created (McGeen, 2014). Efforts to estimate other emissions from this source sector and other non-road mobile sources have not been conducted to date.

Table 72. Coal-burning Ferry

Year	Non-road Sector	Estimated Mercury Emissions in Lbs, Low Estimate	Estimated Mercury Emissions in Lbs, High Estimate
2020	Coal-burning Ferry	0.24	10.8

The statewide total emissions from the 2020 mercury inventory range from a low of 1,727 lbs to a high of 2,151 lbs per year.

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Acronyms and Glossary

CMV:

Commercial Marine Vessels (CMVs) are a component of the mobile source emissions inventory.

Emission factor:

This is an emission rate that specifies what quantity of an air pollutant is estimated per unit of material throughput. For example, USEPA's emission factor for Sulfur Dioxide from SCC 1-01-002-02 is 3.8E+01 lb/ton. This indicates that for every ton of coal burned at the process represented by the eight-digit SCC code, 38 lbs of sulfur dioxide are emitted.

ICE:

This acronym refers to an internal combustion engine, in which fuel is burned to provide power, propulsion or movement.

MAERS:

The Michigan Air Emissions Reporting System (MAERS) is the web-based air emissions reporting application maintained by the Air Quality Division (AQD) of the Michigan Department of Environment, Great Lakes, and Energy (EGLE). MAERS is used by over 1700 facilities each year in the fulfillment of their air emissions reporting obligations. The activity data and emissions estimates provided by the facilities to MAERS are audited and submitted to USEPA to satisfy AQD's requirement to provide an annual inventory of point sources to the National Emissions Inventory (NEI).

Mobile sources:

These are mobile sources of air pollutants. The mobile source category includes both on-road vehicles such as light and heavy-duty diesel and gasoline vehicles. Mobile sources also include non-road equipment such as snowmobiles farm and construction equipment.

NEI:

The [National Emissions Inventory](#) (NEI) is an annual emissions inventory of point sources prepared by the USEPA, based on data submitted by state, local and tribal agencies in fulfillment of federal air emission reporting requirements. Every three years, USEPA also prepares a comprehensive triennial inventory for the NEI, which includes stationary nonpoint sources as well as mobile sources (on-road and non-road). The triennial inventory is prepared in collaboration with state, local and tribal agencies, and multi-jurisdictional planning organizations.

Nonpoint sources:

Nonpoint sources are those sources of air pollutants which are relatively small in quantity of emissions and do not trigger air pollution reporting requirements by themselves, but collectively the emissions from the aggregate group of sources are significant at a broader level such as statewide. When the term nonpoint is used it generally refers to stationary nonpoint sources, as mobile

nonpoint sources such as automobiles or riding lawnmowers or grouped under on-road and non-road emissions.

Non-road sources:

These are motorized mobile sources of air pollutants which operate off roadways. Farm and construction equipment are included, as are snowmobiles and recreational all-terrain vehicles.

On-road sources:

These are motor vehicles, and the category includes automobiles, trucks, buses and recreational vehicles such as motor homes. The vehicles may be gasoline or diesel-powered, or they may use electricity or other alternative fuels such as compressed natural gas.

Point source:

Point sources are traditional sources of air pollution such as electric utilities and industrial facilities. Commercial and institutional facilities can also be included if they meet or exceed air emission reporting thresholds. Point sources in Michigan are required to submit an annual report of air emissions to MAERS if they satisfy the conditions in AQD Policy and Procedures Document [AQD-013](#).

SCC:

[Source Classification Codes](#) (SCCs) are eight-digit numeric codes specified by USEPA for designating different types of industrial processes. The SCC codes are commonly used within air emissions inventories to specify activity and equipment types. An example is the SCC 1-01-002-02 which represents External Combustion > Electric Generation > Bituminous/Subbituminous Coal > Boiler, Dry Bottom. Emission factors, where available, are associated with SCC codes for the purpose of estimating air emissions of pollutants including mercury.

TRI:

The [Toxics Release Inventory](#) (TRI) is a repository of toxics information submitted annually by facilities to USEPA in fulfillment of federal reporting requirements. The TRI was established under Section 313 of the federal Emergency Planning and Community Right-to-Know Act. The information for chemical emissions to air, water and land is submitted at a facility-wide level. While the air emissions estimates are not provided at the more detailed process level, the TRI reporting can be of value for supplementing available information in air emissions inventories.

WebFIRE:

[WebFIRE](#) is USEPA's web-based version of the Factor Information Retrieval system, a compendium of emission factors utilized for estimating air emissions.