Category	Note	Final 2005 Emissions (pounds)	Final 2008 Emissions (pounds)	Final 2011 Emissions (pounds)	Final 2014 Emissions (pounds)	Final 2015 Emissions (pounds)	Final 2016 Emissions (pounds)	Final 2017 Emissions (pounds)	Final 2017 Confidence	Final 2017 Comments
Major Category: Emissions Incidental to Energy Production										
Coal Use (Electric Utility)	1	1716.3	1263.5	938.0	834.9	359.8	172.9	181.7	High	Reductions due to controls installed, moving from coal to natural gas, and other strategies. Previous value was 169.5 lb due to a reporting error from Xcel Energy - Sherco.
Coal Use (Commercial/Institutional/ Industrial)	2	69.2	61.5	95.1	49.0	46.5	48.8	41.9	High	Improved emission estimates for coal boilers (i.e. stack tests to replace EPA default estimates) since 2015.
Volatilization (Coal Ash)	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Very Low	This category is included because changes in pollution control equipment and the use of coal ash may make this a significant category.
Petroleum Refining	4	12.9	4.6	38.3	20.7	2.8	3.7	3.5	Medium	Refining mercury estimates fluctuate from year to year.
Petroleum Product Utilization	5	27.1	77.7	66.6	43.2	38.7	88.9	85.5	Very Low	Switched to EPA emission factor in 2008. MPCA may improve confidence in the future.
Wood Combustion	6	30.5	35.6	52.4	79.3	102.7	29.9	28.2	Low	Data from a University of Minnesota study (Nater, Pang. Mercury in Wood - 1999) shows that mercury content of wood is considerably lower than EPA's estimate used for previous years.
Biomass other than Wood	7	0.0	0.0	8.7	0.0	4.4	1.1	0.6	Medium	This category was moved out of the 'Petroleum Product Utilization' category in 2014.
Natural Gas Combustion	8	0.3	0.6	2.0	3.0	3.2	2.7	7.6	Medium	Increases in emission likely due to the increased usage of natural gas as a result of moving away from coal-fired combustion.
Asphalt Manufacturing	30	4.3	3.3	5.6	4.6	4.1	4.1	4.0	Low	
Agriculture, Food, and Kindred Products	31	1.1	1.0	0.4	0.1	1.2	0.2	0.3	Low	
Miscellaneous Industrial Processes	33	0.2	0.2	0.8	0.0	1.9	1.8	1.5	Low	
Wood, Pulp/Paper, and Publishing Products	34	5.1	3.1	5.7	4.0	3.4	3.4	3.5	Low	Primarily emissions from boilers at paper mills.
Subtotal: Emissions Incidental to Energy Production		**1867.1**	**1451.3**	**1213.6**	**1038.8**	**568.7**	**357.5**	**358.2**		
% of Total State Emissions		56%	51%	45%	46%	37%	26%	23%		

Category	Note	Final 2005 Emissions (pounds)	Final 2008 Emissions (pounds)	Final 2011 Emissions (pounds)	Final 2014 Emissions (pounds)	Final 2015 Emissions (pounds)	Final 2016 Emissions (pounds)	Final 2017 Emissions (pounds)	Final 2017 Confidence	Final 2017 Comments
Major Category: Emissions due to the Purposeful Use of Mercury in Products										
Proportional to Mercury Content of Solid Waste										
Volatilization (Solid Waste Collection/Processing)	9	169.0	159.3	278.6	290	290	289.7	181.8	Medium	The previous mass balance study on waste incinerators was updated to include recent years of ash testing data to improve emission factor estimate.
Incineration (On-site Household Waste)	10	40.0	35.3	55	33.2	33.2	33.2	33.2	Low	
Volatilization (Spills/Land Dumping)	11	24.0	23.3	21.2	4.13	4.13	18.2	34.2	Very Low	MPCA was previously using a report by Ed Swain to estimate emissions that followed EPA's population based methodology. For 2014 nonpoint emissions, we used EPA's methodology with updated numbers for per capita emissions.
Volatilization (Landfills)	12	2.1	1.7	3.1	2.5	1	4.3	3.5	Very Low	EPA emission factor used in 2014 nonpoint emissions.
Volatilization (Land Application of Compost)	13	0.2	1.5	0.3	0.8	0.8	0.8	1.4	Low	EPA emission factor used in 2014 nonpoint emissions.
Proportional to Mercury Content of Liquid Waste										
Volatilization (Land Application of Sludge)	14	1.6	0.7	1.5	0.6	0.6	0.6	0.0	Low	
Recycling Activities										
Smelters/Electric Arc Furnaces (EAFs)	15.1	138.7	265.4	83.8	70.5	63.6	55.0	57.0	High	In 2011, one steel melter was separated into this new category from the 2008 combined category of shredding and melting.
Shredders that Recycle Cars/Appliances	15.2			7.66	8.6	4.7	4.7	6.8	Low	In 2011, steel shredders were separated from steel melters into this new category.
Recycling Mercury from Products within MN	16	65.0	1.2	0.02	0.02	0.02	1.2	1.2	Medium	Emissions from fluorescent lightbulb recycling. MPCA learned during mercury rulemaking process that the 2008 estimates were too high.
Non-Ferrous Metal Recycling (Al/Pb/etc.)	17	0.9	0.6	0.3	0.5	0.5	0.5	0.4	Low	

Category	Note	Final 2005 Emissions (pounds)	Final 2008 Emissions (pounds)	Final 2011 Emissions (pounds)	Final 2014 Emissions (pounds)	Final 2015 Emissions (pounds)	Final 2016 Emissions (pounds)	Final 2017 Emissions (pounds)	Final 2017 Confidence	Final 2017 Comments
Dental Mercury										
Dental Preparations	18	62.4	58.8	55.2	15.4	15.4	15.4	15.4	Medium	EPA emission factor used in 2014 nonpoint emissions.
Cremation	19	80.0	97.9	111.7	95	95	96.7	96.7	Medium	A study was performed in conjuction with the U of M to improve estimates for 2014 nonpoint emissions.
Incineration										
Municipal Solid Waste Combustion	20	49.2	30.8	26	33.3	32.1	32.0	25.2	High	Category had Hg emission controls installed prior to 2005.
Incineration (Sewage Sludge)	21.1	8.5	8.4	49.8	11.7	16.7	9.2	8.6	High	Category had Hg emission controls installed prior to 2005.
Incineration (Industrial Sludge)	21.2		0.7	0.01	0.0	0.0	0.0	0.0	High	Category had Hg emission controls installed prior to 2005.
Incineration (Medical Waste)	22	0.4	0.8	0.7	0.3	0.3	0.3	0.3	High	Category had Hg emission controls installed prior to 2005.
Incineration (Hazardous Waste)	23	0.3	0.2	0.05	0.01	0.01	0.4	0.6	High	Category had Hg emission controls installed prior to 2005.
Incineration (Industrial)	24	0.0	7.1	13.1	11.0	0.3	0.2	0.2	High	Category had Hg emission controls installed prior to 2005.
Manufacturing/Use of Non-Dental Mercury-Containing Products										
Mercury Product Manufacturing in MN	25	42.0	22.8	14.3	0.1	0.2	0.2	0.1	High	S J Electro Systems (switch manufacturer) performed emissions testing in 2014. Emissions reported under Toxic Release Inventory.
General Laboratory Use	26	10.0	8.9	7.7	7.9	7.9	7.7	9.3	Very Low	
Volatilization (Dissipative Use)	27	0.8	0.8	0.06	0.05	0.05	0.5	0.5	Low	EPA emission factor used in 2014 nonpoint emissions.
Subtotal: Associated to Purposeful Use of Mercury		**695.1**	**726.0**	**730.2**	**585.7**	**566.5**	**570.8**	**476.2**		
% of Total State Emissions		21%	26%	27%	26%	30%	41%	31%		

Category	Note	Final 2005 Emissions (pounds)	Final 2008 Emissions (pounds)	Final 2011 Emissions (pounds)	Final 2014 Emissions (pounds)	Final 2015 Emissions (pounds)	Final 2016 Emissions (pounds)	Final 2017 Emissions (pounds)	Final 2017 Confidence	Final 2017 Comments
Major Category: Emissions Incidental to Material Processing										
Ferrous Mining/Processing	28	734.8	648.5	745.4	651.9	509.0	441.0	683.0	High	Large production increase across the industry from 2016-2017 (~10m long tons more) 2017 production: ~37.7m long tons
Thermal treatment of soil	29	0.8	0.00	0.00	0.04	0.04	0.00	0.00	Low	
Mineral Products	32	13.8	17.2	16.2	3.0	8.5	9.0	13.1	High	Improved emission estimates since 2014 (i.e., emissions tests instead of EPA default factors).
Subtotal: Emissions Incidental to Material Processing		**749.4**	**665.8**	**761.6**	**655.0**	**517.5**	**450.0**	**696.0**		
% of Total State Emissions		23%	23%	28%	29%	33%	33%	45%		
STATEWIDE EMISSIONS TOTAL		**3,312**	**2,843**	**2,705**	**2,279**	**1,653**	**1,378**	**1,531**		

General Notes:
The Draft 2019 mercury emissions are a combination of 2019 point source emissions and 2017 non-point source emissions.
The Final 2018 mercury emissions are a combination of 2018 point source emissions and 2017 non-point source emissions.
The Revised 2017 mercury emissions are a combination of 2017 point source emissions and 2017 non-point source emissions.
The Final 2017 mercury emissions are a combination of 2017 point source emissions and 2014 non-point source emissions.
Confidence intervals: High +/- 10%; Medium +/- 25%; Low +/- 50%; Very Low +/- 100% or more.
The note numbers for each category correspond to the note numbers in the TMDL Implementation Plan Appendix 5, where descriptions of categories and estimates are

Mercury Emissions Projections Bar Chart Notes:
* This 2025 projection is based on the ferrous mining/processing facilities in northern MN meeting the required 72% reduction specified in Minn. R. 7007.0502.
** This 2025 projection is based on the emissions estimates contained in the mercury reduction plans submitted by the ferrous mining/processing facilities in northern MN.
*** This 2025 projection is based on the ferrous mining/processing industry's proposed reductions applied to the baseline emissions as calculated by MPCA.

Category	Note	Revised 2017 Emissions (pounds)	Revised 2017 Confidence	Revised 2017 Comments	Final 2018 Emissions (pounds)	Final 2018 Confidence	Final 2018 Comments	Draft 2019 Emissions (pounds)	Draft 2019 Confidence	Draft 2019 Comments
Major Category: Emissions Incidental to Energy Production										
Coal Use (Electric Utility)	1	181.7	High	Reductions due to controls installed, moving from coal to natural gas, and other strategies. Previous value was 169.5 lb due to a reporting error from Xcel Energy - Sherco.	166.6	High	Reductions due to controls installed, moving from coal to natural gas, unit retirements, and other strategies.	125.6	High	Reductions due to controls installed, moving from coal to natural gas, unit retirements, and other strategies. Larger decreases at Xcel Energy, Minnesota Power, and Northshore Mining facilities.
Coal Use (Commercial/Institutional/ Industrial)	2	33.7	High	Improved emission estimates for coal boilers (i.e. stack tests to replace EPA default estimates) since 2015.	33.6	High	Coal use fluctuates from year to year.	30.8	High	Coal use fluctuates from year to year.
Volatilization (Coal Ash)	3	0.0	Very Low	This category is included because changes in pollution control equipment and the use of coal ash may make this a significant category.	0.0	Very Low	This category is included because changes in pollution control equipment and the use of coal ash may make this a significant category.	0.0	Very Low	This category is included because changes in pollution control equipment and the use of coal ash may make this a significant category.
Petroleum Refining	4	3.5	Medium	Refining mercury estimates fluctuate from year to year.	3.4	Medium	Refining mercury estimates fluctuate from year to year.	3.2	Medium	Refining mercury estimates fluctuate from year to year.
Petroleum Product Utilization	5	47.0	Medium	LADCO created a thorough rail (locomotive and railyard) inventory for the 2017 National Emissions Inventory that updated fuel usage for locomotives and fixed errors in estimating emissions from railyards.	48.3	Medium	LADCO created a thorough rail (locomotive and railyard) inventory for the 2017 National Emissions Inventory that updated fuel usage for locomotives and fixed errors in estimating emissions from railyards.	47.5	Medium	LADCO created a thorough rail (locomotive and railyard) inventory for the 2017 National Emissions Inventory that updated fuel usage for locomotives and fixed errors in estimating emissions from railyards.
Wood Combustion	6	24.4	Low	Data from a University of Minnesota study (Nater, Pang. Mercury in Wood - 1999) shows that mercury content of wood is considerably lower than EPA's estimate used for previous years.	24.1	Low		21.8	Low	
Biomass other than Wood	7	0.6	Medium	This category was moved out of the 'Petroleum Product Utilization' category in 2014.	0.8	Medium		0.7	Medium	
Natural Gas Combustion	8	7.7	Medium	Increases in emission likely due to the increased usage of natural gas as a result of moving away from coal-fired combustion.	5.2	Medium	CEMS data for MN Power - Boswell Units 1 & 2 found lower emissions than previous years' estimates (~2 lb decrease).	3.3	Medium	MN Power - Boswell Units 1 & 2 shutdown in December 2018 (~2 lb decrease).
Asphalt Manufacturing	30	4.0	Low		3.7	Low		3.8	Low	
Agriculture, Food, and Kindred Products	31	0.3	Low		0.3	Low		0.2	Low	
Miscellaneous Industrial Processes	33	1.5	Low		1.1	Low		1.2	Low	
Wood, Pulp/Paper, and Publishing Products	34	3.5	Low	Primarily emissions from boilers at paper mills.	3.6	Low	Primarily emissions from boilers at paper mills.	3.7	Low	Primarily emissions from boilers at paper mills.
Subtotal: Emissions Incidental to Energy Production		**307.7**			**290.7**			**241.7**		
% of Total State Emissions		20%			20%			17%		

Category	Note	Revised 2017 Emissions (pounds)	Revised 2017 Confidence	Revised 2017 Comments	Final 2018 Emissions (pounds)	Final 2018 Confidence	Final 2018 Comments	Draft 2019 Emissions (pounds)	Draft 2019 Confidence	Draft 2019 Comments
Major Category: Emissions due to the Purposeful Use of Mercury in Products										
Proportional to Mercury Content of Solid Waste										
Volatilization (Solid Waste Collection/Processing)	9	215.2	Medium	The previous mass balance study on waste incinerators was updated to include recent years of ash testing data to improve emission factor estimate. The amount of solid waste produced and collected went up roughly 19% from 2014 to 2017.	215.2	Medium	The amount of solid waste collected and processed increased ~19% from 2014 to 2017.	215.2	Medium	The amount of solid waste collected and processed increased ~19% from 2014 to 2017.
Incineration (On-site Household Waste)	10	29.7	Low		29.7	Low		29.7	Low	
Volatilization (Spills/Land Dumping)	11	33.9	Very Low	MPCA was previously using a report by Ed Swain to estimate emissions that followed EPA's population based methodology. For 2017 nonpoint emissions, we used EPA's methodology with updated numbers for per capita emissions.	33.9	Very Low	For 2017 nonpoint emissions, we used EPA's emissions estimation methodology with updated numbers for per capita emissions.	33.9	Low	For 2017 nonpoint emissions, we used EPA's emissions estimation methodology with updated numbers for per capita emissions.
Volatilization (Landfills)	12	1.7	Very Low	EPA emission factor used in 2017 nonpoint emissions.	1.8	Very Low		1.9	Low	
Volatilization (Land Application of Compost)	13	7.8	Low	EPA emission factor used in 2017 nonpoint emissions. Composting greatly increased from 2014 to 2017 (overall state total went from 43K tons to 660K tons) with most composting occuring in the metro counties.	7.8	Low	EPA emission factor used in 2017 nonpoint emissions. Composting greatly increased from 2014 to 2017 (overall state total went from 43K tons to 660K tons) with most composting occuring in the metro counties.	7.8	Low	EPA emission factor used in 2017 nonpoint emissions. Composting greatly increased from 2014 to 2017 (overall state total went from 43K tons to 660K tons) with most composting occuring in the metro counties.
Proportional to Mercury Content of Liquid Waste										
Volatilization (Land Application of Sludge)	14	0.0	Low		0.0	Low		0.0	Low	
Recycling Activities										
Smelters/Electric Arc Furnaces (EAFs)	15.1	57.0	High	In 2011, one steel melter was separated into this new category from the 2008 combined category of shredding and melting.	11.6	High	Significant reduction in mercury emissions due to installation of activated carbon injection at Gerdau Ameristeel (53 lb to 5 lb).	5.9	High	Further reductions at Gerdau Ameristeel (5 lb to 2 lb) and lower production at Prospect Foundry.
Shredders that Recycle Cars/Appliances	15.2	6.8	Low	In 2011, steel shredders were separated from steel melters into this new category.	6.3	Low		3.9	Low	Further reductions at Gerdau Ameristeel (6 lb to 4 lb).
Recycling Mercury from Products within MN	16	1.2	Medium	Emissions from fluorescent lightbulb recycling. No updates to 2017 non-point inventory estimates.	1.2	Medium		1.2	Medium	
Non-Ferrous Metal Recycling (Al/Pb/etc.)	17	0.4	Low		2.0	Low	Increase due to new stack test data from one facility (Spectro Alloys) in 2018.	1.9	Medium	

Category	Note	Revised 2017 Emissions (pounds)	Revised 2017 Confidence	Revised 2017 Comments	Final 2018 Emissions (pounds)	Final 2018 Confidence	Final 2018 Comments	Draft 2019 Emissions (pounds)	Draft 2019 Confidence	Draft 2019 Comments
Dental Mercury										
Dental Preparations	18	15.6	Medium	EPA emission factor used in 2017 nonpoint emissions.	15.6	Medium		15.6	Medium	
Cremation	19	110.4	Medium	Increase due to an increase in the expected number of cremations (still using the study performed with the U of M for emission factors).	110.4	Medium	Increase due to an increase in the expected number of cremations (still using the study performed with the U of M for emission factors).	110.4	Medium	Increase due to an increase in the expected number of cremations (still using the study performed with the U of M for emission factors).
Incineration										
Municipal Solid Waste Combustion	20	25.2	High	Category had Hg emission controls installed prior to 2005.	25.4	High	Category had Hg emission controls installed prior to 2005.	18.0	High	Great River Energy decomissioned and began demolition of their three existing refuse-derived fuel (RDF) combustion units in 2019 (~8.5 pound decrease).
Incineration (Sewage Sludge)	21.1	8.6	High	Category had Hg emission controls installed prior to 2005.	9.0	High	Category had Hg emission controls installed prior to 2005.	8.3	High	
Incineration (Industrial Sludge)	21.2	0.0	High	Category had Hg emission controls installed prior to 2005.	0.0	High	Category had Hg emission controls installed prior to 2005.	0.0	High	
Incineration (Medical Waste)	22	0.3	High	Category had Hg emission controls installed prior to 2005.	0.3	High	Category had Hg emission controls installed prior to 2005.	0.3	High	
Incineration (Hazardous Waste)	23	0.6	High	Category had Hg emission controls installed prior to 2005.	0.7	High	Category had Hg emission controls installed prior to 2005.	0.4	High	
Incineration (Industrial)	24	0.2	High	Category had Hg emission controls installed prior to 2005.	0.2	High	Category had Hg emission controls installed prior to 2005.	0.8	High	
Manufacturing/Use of Non-Dental Mercury-Containing Products										
Mercury Product Manufacturing in MN	25	0.1	High	S J Electro Systems (switch manufacturer) performed emissions testing in 2014. Emissions reported under Toxic Release Inventory.	0.1	High		0.1	High	
General Laboratory Use	26	9.5	Very Low		9.5	Very Low		9.5	Very Low	
Volatilization (Dissipative Use)	27	0.4	Low	EPA emission factor used in 2014 nonpoint emissions.	0.4	Low		0.4	Low	
Subtotal: Associated to Purposeful Use of Mercury		**524.7**			**481.3**			**465.6**		
% of Total State Emissions		34%			33%			33%		

Category	Note	Revised 2017 Emissions (pounds)	Revised 2017 Confidence	Revised 2017 Comments	Final 2018 Emissions (pounds)	Final 2018 Confidence	Final 2018 Comments	Draft 2019 Emissions (pounds)	Draft 2019 Confidence	Draft 2019 Comments
Major Category: Emissions Incidental to Material Processing										
Ferrous Mining/Processing	28	683.0	High	Large production increase across the industry from 2016-2017 (~10m long tons more) 2017 production: ~37.7m long tons	695.6	High	Small production increase across the industry from 2017-2018 (~2m long tons more) 2018 production: ~39.1m long tons	676.3	High	Small production decrease across the industry from 2018-2019 (~2m long tons less) 2019 production: ~37.1m long tons
Thermal treatment of soil	29	0.00	Low		0.00	Low		0.00	Low	
Mineral Products	32	13.1	High	Improved emission estimates since 2014 (i.e., emissions tests instead of EPA default factors).	12.5	High		11.7	High	
Subtotal: Emissions Incidental to Material Processing		**696.0**			**708.0**			**688.0**		
% of Total State Emissions		46%			48%			49%		
STATEWIDE EMISSIONS TOTAL		**1,528**			**1,480**			**1,395**		

General Notes:

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The Final 2017 mercury emissions are a combination of 2017 point source emissions and 2014 non-point source emissions.
Confidence intervals: High +/- 10%; Medium +/- 25%; Low +/- 50%; Very Low +/- 100% or more.
The note numbers for each category correspond to the note numbers in the TMDL Implementation Plan Appendix 5, where descriptions of categories and estimates are identified.

Mercury Emissions Projections Bar Chart Notes:

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