

3. Mercury

An area of focus in developing the 1999 Great Lakes regional inventory consisted of improving the quality of our current mercury emission estimates. The work involved: 1) the addition of area source categories associated with mercury emissions, 2) the identification of source categories and processes from which mercury emissions were likely (e.g., coal combustion), but where no emission factors were available for calculating emissions, 3) identification of sources with processes associated with mercury, but for which emissions were not estimated, 4) corrections to previously reported data based on new information and assessments, and 5) the identification of improvements in reporting requirements. Some of these efforts varied from state to state, depending on reporting requirements and resources. Please refer to the individual state's summaries for additional information.

The first step in identifying mercury sources in the region was to compare each of the state and province reported source/process with mercury emissions, to sources with like processes, having mercury emission factors in FIRE, but with no reported mercury emissions. Fifty-one process codes (SCC) were identified in this category, and submitted for corrections. The corrections resulted in significant changes in the total emissions from some states, but not for others. For example, the emission estimation from these sources in Wisconsin resulted in only 19 pounds from 107 facilities.

Forty-seven reported process codes (SCC), associated with mercury emissions and included in the states' inventories, were identified as having no emission factors for mercury in FIRE. Those process codes are presented in Table 3-1. Although there were no mercury emission factors for these processes, some states already had emission estimates based on stack tests and other state/facility specific information. The mercury emissions from these processes could be significant, and an effort should be made to provide adequate emission factor information for these processes. For example, Illinois estimated the mercury emissions from processes lacking emission factors by applying state specific emission factors from similar sources. The emissions resulted in an additional 1,376 pounds.

TABLE 3-1: Processes associated with Mercury Emissions without Emission Factors in FIRE

SCC/AMS Codes	Process Category	Industrial Group	Emission Source
10100204	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal
10100205	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal
10100217	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal
10100224	External Combustion Boilers	Electric Generation	Bituminous/Subbituminous Coal
10101201	External Combustion Boilers	Electric Generation	Solid Waste

SCC/AMS Codes	Process Category	Industrial Group	Emission Source
10200204	External Combustion Boilers	Industrial	Bituminous/Subbituminous Coal
10200205	External Combustion Boilers	Industrial	Bituminous/Subbituminous Coal
10200206	External Combustion Boilers	Industrial	Bituminous/Subbituminous Coal
10200207	External Combustion Boilers	Industrial	Bituminous/Subbituminous Coal
10200217	External Combustion Boilers	Industrial	Bituminous/Subbituminous Coal
10200401	External Combustion Boilers	Industrial	Residual Oil
10200603	External Combustion Boilers	Industrial	Natural Gas
10200604	External Combustion Boilers	Industrial	Natural Gas
10200903	External Combustion Boilers	Industrial	Wood/Bark Waste
10300207	External Combustion Boilers	Commercial / Institutional	Bituminous/Subbituminous Coal
10300208	External Combustion Boilers	Commercial / Institutional	Bituminous/Subbituminous Coal
10300209	External Combustion Boilers	Commercial / Institutional	Bituminous/Subbituminous Coal
10300222	External Combustion Boilers	Commercial / Institutional	Bituminous/Subbituminous Coal
10300225	External Combustion Boilers	Commercial / Institutional	Bituminous/Subbituminous Coal
10300401	External Combustion Boilers	Commercial / Institutional	Residual Oil
10500105	External Combustion Boilers	Space Heaters (oil)	Industrial
10500106	External Combustion Boilers	Space Heaters (Natural Gas)	Industrial
10500205	External Combustion Boilers	Space Heaters (oil)	Commercial/Institutional
10500206	External Combustion Boilers	Space Heaters (Natural Gas)	Commercial/Institutional
20100102	Internal Combustion Engines	Electric Generation	Distillate Oil (Diesel)
20100201	Internal Combustion Engines	Electric Generation	Natural Gas
20100202	Internal Combustion Engines	Electric Generation	Natural Gas
20200253	Internal Combustion Engines	Industrial	Natural Gas
20200254	Internal Combustion Engines	Industrial	Natural Gas
20300201	Internal Combustion Engines	Commercial / Institutional	Natural Gas
20300202	Internal Combustion Engines	Commercial / Institutional	Natural Gas
2104002000	Stationary Source Fuel Combustion	Residential	Bituminous/Subbituminous Coal
30400109	Industrial Processes	Secondary Metal Production	Aluminum
30400301	Industrial Processes	Secondary Metal Production	Grey Iron Foundries

SCC/AMS Codes	Process Category	Industrial Group	Emission Source
30400403	Industrial Processes	Secondary Metal Production	Lead
30500201	Industrial Processes	Mineral Products	Asphalt Concrete
30500252	Industrial Processes	Mineral Products	Asphalt Concrete
30500258	Industrial Processes	Mineral Products	Asphalt Concrete
30500606	Industrial Processes	Mineral Products	Cement Manufacturing (Dry Process)
30600106	Industrial Processes	Petroleum Industry	Process Heaters
50100103	Waste Disposal	Solid Waste Disposal – Government	Municipal Incineration
50100401	Waste Disposal	Solid Waste Disposal – Government	Landfill Dump
50100515	Waste Disposal	Solid Waste Disposal – Government	Other Incineration
50100601	Waste Disposal	Solid Waste Disposal – Government	Fire Fighting
50100602	Waste Disposal	Solid Waste Disposal – Government	Fire Fighting
50300501	Waste Disposal	Solid Waste Disposal – Industrial	Incineration
50300601	Waste Disposal	Solid Waste Disposal – Industrial	Landfill Dump

Mercury emissions from the eight Great Lakes states and the province of Ontario totaled 47,198 pounds in 1999. These emissions are associated with 556 industrial and area source categories, 327 distinct process codes (SCC), and 107 process categories. About 95 percent of the mercury emissions come from industrial point sources, while 5 percent come from non-point area sources (Table 2-1).

Table 3-2 presents a summary of total mercury emissions from the Great Lakes region by source category (SIC). Of the 556 source categories inventoried, 12 categories account for 88 percent of the emissions while the remaining 544 account for 12 percent.

Of the four top categories, the Electric Services sector account for approximately 55 percent of the total emissions. The majority of the emissions result from the combustion of coal. The other top categories are Refuse Systems, Chloride Alkali manufacturing facilities, and Hospitals. The emissions from Refuse Systems result from the incineration of solid waste, while those from hospitals are mainly from the incineration of medical waste. The Electric, Refuse Systems and Hospital sectors also dominated the regional emissions of mercury in 1998.

Table 3-2: 1999 Great Lakes States Mercury Emission Summary by Source Category

SIC	Category Name	Emissions (pounds)	Percentage (%)
4911	Electric services	25796.48	54.66
4953	Refuse systems	4975.25	10.54
2812	Alkalies and chlorine	2742.63	5.81
8062	General medical & surgical hospitals	2571.78	5.45
4931	Electric and other services combined	879.45	1.86
1011	Iron ores	859.93	1.82
2046	Wet corn milling	835.41	1.77
3241	Cement, hydraulic	735.86	1.56
4952	Sewerage systems	711.54	1.51
LAMP BREAKAGE	Lamp Breakage	657.64	1.39
3321	Gray and ductile iron foundries	643.31	1.36
Others	Sum of other categories that have emissions less than 1% of total	5789.44	12.26
TOTAL		47198.72	100.00

A summary of mercury emissions by process category is presented in Table 3-3. Of the 107 process categories inventoried in the Great Lakes region, 9 account for 90 percent of the emissions. Consistent with the emissions by source category, coal combustion, incineration and Chloro-Alkali facilities account for the bulk of the emissions.

About 7 percent of the emissions come from unidentified processes. This could be the result of the lack of appropriate SCC to describe a process, confidential facility information, voluntary reporting, or oversight. Emissions from Fluorescent Lamp Breakage and recycling are two categories that were added to the inventory effort. The emissions from lamp breakage totaled 657.64 pounds, or close to 1.4 percent of the regional total. Although the contribution to the regional total is small, the emission estimates are higher than other point sources. Fluorescent Lamp Recycling amounted to only 0.05 pounds.

Table 3-3: 1999 Great Lake States Mercury Emission Summary by Process Category

Process Category	Emissions (pounds)	Percentage (%)
COAL COMBUSTION	27163.06	57.55
INCINERATION	6814.83	14.44
UNSPECIFIED	3523.27	7.46
CHLORO-ALKALI	1081.71	2.29
SITE REMEDIATION	946.00	2.00
SOLID WASTE COMBUSTION	800.62	1.70
CEMENT MFG	733.97	1.56
LAMP BREAKAGE	657.64	1.39
GRAY IRON FOUNDRY	643.51	1.36
Others	4834.12	10.24
TOTAL	47198.72	100.00

Mercury emissions from point and area sources in 1999 are 26,027 pounds lower than those reported in 1998. Point source emissions decreased by 18,173 pounds, while area sources decreased by 7,854 pounds. The changes in emissions from point sources were driven by emission reductions in the Refuse Systems and in the General Medical and Surgical Hospital sectors. The decrease in emissions from area sources was driven by Residential Oil Combustion. This source category was one of the most significant in 1998.

Table 3-4 presents a comparison of the mercury emissions from the main source categories in the Great Lakes region for 1999 and 1998. Emissions from the new categories of Fluorescent Lamp Breakage and Fluorescent Lamp Recycling were added to the list for comparison purposes.

Table 3-4: 1998-1999 Emission Comparison by Top SIC Category.

SIC	Category Name	1998 Emissions (pounds)	1999 Emissions (pounds)	Percent Change
4911	Electric services	21158.63	25796.48	22%
4953	Refuse systems	9453.6	4975.25	-47%
2812	Alkalies and chlorine	1083.75	2742.63	153%
8062	General medical & surgical hospitals	12765.54	2571.78	-80%
4931	Electric and other services combined	404.17	879.45	118%
1011	Iron ores	2179.86	859.93	-61%
2046	Wet corn milling	52.97	835.41	1477%
3241	Cement, hydraulic	3547.2	735.86	-79%
4952	Sewerage systems	201.15	711.54	254%
---	Lamp Breakage	0.00	657.64	---
---	Fluorescent Lamp Recycling	0.00	0.05	---
---	Residential Oil Combustion	9006.58	248.69	-97%
3321	Gray and ductile iron foundries	469.33	643.31	37%
TOTAL		60322.79	41658.02	

The increase in mercury emissions in the Chloride-Alkali category results from the inclusion of another manufacturing facility missing in the 1998 regional inventory. There are only two facilities of this sort in the Great Lakes region. The decrease in emissions from hospital incineration result from corrections to the emission estimates from 1998. The decrease in emissions from residential oil combustion is due to a change in emission factors used by some states.

The mercury emission estimates presented above are based on the best available data and on the efforts by the Great Lakes states and the province of Ontario to improve the regional emission inventory. Because of reporting requirements, some states are not able to gather all the information needed to obtain a more complete account of the regional mercury emissions. Some states still depend on the information reported by facilities to the TRI database to collect some of the toxic emissions estimates. The TRI only includes a limited number of industries, allows the reporting of emission ranges, and has a higher reporting threshold than other states. For the year 1999, the mercury-reporting threshold was 25,000 pounds for manufacturing facilities, and 10,000 pounds for industries using mercury-containing materials. Electric Utilities is one of the categories affected by the

reporting threshold. The TRI reporting threshold for mercury was lowered to 10 pounds in the year 2000; therefore, we could expect more complete information from a number of states in the next regional inventory update. In addition, the emissions of mercury from a number of processes could not be estimated due to a lack of generic emission factors in FIRE. These emissions could be significant, and it is recommended to include those process categories in the next FIRE update.