

June 15, 2018

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(Transmission by email)

Dear Ms. Klevs and Ms. Mitchell,

On behalf of the 58 undersigned groups, we are providing these comments on the draft *Great Lakes Binational Strategy for Mercury Risk Management* (April 2018, hereafter “Mercury Strategy”). Note that these comments expand on comments submitted by Canadian Environmental Law Association, National Wildlife Federation and Toxics Free Great Lakes Network on this matter on May 25, 2018. The main additions are addition to item 1 on potential new mercury sources, a new item 3 on factors that can affect mercury cycling and exposures (including related to mercury methylation), an expanded recommendation on actions to discuss in Table A (Executive Summary) in new item 5, and in new item 10, additional reference to challenges with an emphasis on fish consumption advisories as a risk reduction approach for some communities, as well as reference to other relevant publications on health risks associated with mercury exposures.

We offer several general observations and recommendations to the Parties on the Mercury Strategy, as well as a few additional observations and recommendations, as summarized below.

- 1) Early on, the Mercury Strategy should identify ongoing concerns with mercury in the Great Lakes.

The Executive Summary of the Mercury Strategy would benefit from a paragraph outlining the ongoing concerns with mercury, including the extent of fish consumption advisories (as noted later in the Strategy), the potential human health and ecological concerns, and the fact that though progress has been made, more work needs to be done to reduce mercury levels in the Great Lakes ecosystem. In addition, the Executive Summary should note that even though reductions in mercury releases have occurred across a number of sectors in the recent past, there remains ongoing risks of new or increased mercury releases. For example, certain mining

operations can release mercury, and there is the potential for new or expanded mining operations in the region (Lake Superior Partnership, 2016. Lake Superior Lakewide Action and Management Plan, 2015-19.)

2) Reducing and virtually eliminating mercury requires a binational commitment to both Great Lakes Basin-specific actions and targets and tracking of progress.

The proposed Mercury Strategy emphasizes activities already underway in both countries to address mercury releases, and many activities are laudable. However, the Mercury Strategy should also more clearly indicate Great Lakes Basin-specific actions (whether regulatory or voluntary) that can be taken to reduce and eliminate mercury releases in the Basin. In addition, the Mercury Strategy should include specific reduction targets (which could be both for national action and Basin-specific activities) and an approach to track activities, to ensure progress is made towards virtual elimination of mercury releases due to human activities.

3) Additional emphasis is needed on factors that can affect mercury cycling and exposures, including methylmercury production and any potential for intervention measures.

There is limited discussion on mercury cycling in watersheds and waterbodies in the draft Strategy. Section 2.3 should include additional material (e.g. 1-2 paragraphs) on watershed cycling of mercury, including factors that can promote transformation of inorganic mercury to methylmercury (which in turn has a greater tendency to biomagnify in food webs). These factors include pH, dissolved organic matter content, redox conditions, microorganism populations, and presence of sulfur compounds (see e.g. Munthe, J., Bodaly, R.A., Branfireun, B.A., Driscoll, C.T., Gilmour, C.C., Harris, H., Horvat, M., Lucotte, M., Malm, O. 2007. Recovery of mercury contaminated fisheries, *Ambio*, 36(1):33-44). A recent experimental study in Minnesota confirmed the importance of sulfate loads in the process of mercury methylation by microorganisms, whereby increasing sulfate led to increased mercury and methylmercury levels in water, with the highest proportion of methylmercury found in cases of intermediate sulfur compound abundance (Myrbo, A., Swain, E. B., Johnson, N. W., Engstrom, D. R., Pastor, J., Dewey, B., Monson, P., Brenner, J., Dykhuizen Shore, M., Peters, E. B. 2017. Increase in nutrients, mercury, and methylmercury as a consequence of elevated sulfate reduction to sulfide in experimental wetland mesocosms. *Journal of Geophysical Research: Biogeosciences*, 122, 2769–2785.). Given the potential for ongoing or even increased sulfate loading in watersheds in Minnesota and more broadly (e.g., with increased metal mining), it is important to emphasize the potential for ancillary increasing mercury methylation (and thus fish tissue levels) in some areas.

4) Timelines are needed to ensure progress and accountability regarding proposed actions.

The Mercury Strategy does not include timelines associated with activities proposed, noting "While the GLWQA does not provide timelines for strategy implementation, the strategy should be reviewed periodically. Please note that during the time frame of re-evaluation, no new

chemical nominations will be accepted." (Introduction of the strategy, p. 1). As we noted in comments on the draft strategy on polybrominated diphenyl ethers (PBDEs), we have concerns about implications of the statement concerning new chemical nominations. In addition, as also noted in previous comments, even though the GLWQA does not outline timelines in the measures to be considered, regular reporting is required, and we believe having timelines would obviously help in assessing progress through Strategy implementation.

5) Ensure all key existing activities in the U.S. and Canada affecting mercury are emphasized in the Strategy, including in the Executive Summary.

We see three related issues that should be addressed to better indicate how work through the Mercury Strategy will contribute to ultimate objectives concerning mercury in the Great Lakes Basin:

- A. The Executive Summary should summarize both key activities underway as well as new activities that will contribute to ultimate objectives concerning mercury in the Great Lakes Basin, rather than emphasizing the categories of strategy options, general aspects of mercury contamination, and gaps concerning better understanding mercury in the environment.
- B. Table A in the Executive Summary should highlight all key actions underway in both countries to address mercury, and relevant to loadings in the Basin. For example, in the first column on regulatory and other actions, there is reference to continuing actions to reduce mercury emissions from coal-fired power plants, but emphasizing only Canada rather than both countries. Given the significant efforts that have gone in to developing and implementing the U.S. Mercury and Air Toxics Standards rule, continuing progress on the coal-fired power plant sector in the U.S. should be noted in this section as well (as well as in the summary box on p. 24). In addition, reference could be made to other activities that can potentially contribute to reductions in mercury exposures, such as sufficient regulations on sectors (e.g. mining) to ensure reductions in sulfur releases that might otherwise contribute to increased methylmercury production via sulfate-reducing microorganisms, as noted above.
- C. While it is important to evaluate the effectiveness of existing programs (e.g. first two items in the regulatory and other actions in Table A), it is important that the Strategy also note that any significant gaps identified involving mercury releases will be addressed subsequently by both governments.

6) There should be comparable description of key programs addressing mercury for both countries.

In Section 3 covering mercury management and programs, there is decent discussion of programs in both countries. However, in the case of guidelines and standards, the U.S. section (3.1.5) simply references the table compiling guidelines and standards (Table 7), whereas for

Canada, Section 3.2.5 elaborates on Canadian guidelines and standards. It would be helpful to have similar elaboration for guidelines and standards on the U.S. side. In particular, Table 7 does not reference criteria developed through the Great Lakes Initiative process in the 1990s (which are still in place), including uniform water quality criteria guidelines for protection of human health and wildlife (https://www.epa.gov/sites/production/files/2015-12/documents/1995_water_quality_guidance_for_great_lakes_sid.pdf). These should be presented, including referenced in a brief narrative section in the main text.

As another example, in Section 3 on policies, regulations and programs, there is mention of Canadian work (Section 3.2) on products and mercury export relevant to commitments through the Minamata Convention, but there is no similar reference to these issues (in the context of the Convention) in Section 3.1 for the U.S.

One other area that should be further noted in the Strategy is the potential extent of sites with significant mercury contamination (e.g. in Areas of Concern, and, for example, Superfund sites on the U.S. side), and the extent to which they may be contributing to elevated mercury levels in some areas of the region, and may need additional remedial work.

7) Discussion on exceedances of criteria and guidelines should be binational, and recognize both some of the science and policy limitations as well as implications of exceedances.

Section 4.2 (p. 23) discusses examples of exceedances of environmental quality guidelines or other criteria. Several points should be recognized here: 1. Canadian environmental quality guidelines may not be protective of all aquatic biota potentially at risk from mercury exposure (e.g. higher trophic level fish, or wildlife consuming fish, as noted in the guidelines documents themselves – e.g., CCME, Canadian Water Quality Guidelines for the Protection of Aquatic Life – Mercury, 2003); 2. There is appropriate reference to widespread presence of fish consumption advisories – with mercury levels exceeding thresholds, though it would be good to note the possibility that not all states on the U.S. side are necessarily using the same protocol for advisory issuance; 3. It is important to note on the U.S. side that exceedance of certain thresholds (e.g. of a water concentration-based water quality criterion or a fish tissue criterion) should lead to placement of water bodies on the state's list of impaired waters under the Clean Water Act (and thus needing total maximum daily load development).

8) Discussion on fish consumption risks and advisories should recognize more recent levels of concern.

The discussion on mercury in biota (Section 2.4.3.4) references the large number of fish sampled that fall below the threshold identified in the 1987 Great Lakes Water Quality Agreement. However, as discussed elsewhere in the report, the U.S. EPA subsequently developed a threshold that is lower (0.3 ppm in fish tissue), and a number of states and Ontario have had yet lower thresholds for beginning to issue fish consumption advisories. Further, epidemiological and other studies continue to identify health risks from what otherwise may

seem to be “low” exposures, so it would be preferred if this section recognizes some of this more recent work (see further discussion below).

9) The Parties need to highlight resource needs to carry out Annex 3 activities.

The Mercury Strategy notes that through the GLWQA, “...the Parties’ respective obligations are subject to the appropriation of funds in accordance with their respective procedures.” (Introduction section, page 1). Again as we noted in the recent comments on the PBDE Strategy, given the binational commitment the Parties have made through the GLWQA to address Great Lakes threats, it is important that the Parties highlight the importance of funding programs to meet objectives of the GLWQA. It is reasonable to ensure that those making decisions related to authorizing and appropriating funds recognize the importance of funding programs addressing mercury and other CMCs in the Great Lakes Basin.

10) Miscellaneous comments.

We have several specific comments on other aspects of the Mercury Strategy, as noted below.

Attention to nomenclature: The authors should review the document to ensure consistent use of terms and symbols. For example, in Section 2.3 (Sources and Releases of Mercury in the Great Lakes, p. 3, second paragraph), there is reference to a “... 30% decrease in anthropogenic Hg⁰ emission...” (globally), whereas the authors are presumably referencing elemental mercury, which should be indicated as either Hg⁰ or Hg(0).

Attribution of mercury sources: In the brief discussion on sources and cycling (P. 3, second full paragraph), it is important to note in citing Lepak et al. 2015 that there is some conflating of vectors and sources. For example, there is reference to atmospheric, industrial, and watershed-derived sources. But it is important to note that mercury emitted from an industrial source (e.g. a chlor-alkali plant, or a coal-fired power plant, if considered among “industrial sources”) can be transported through the atmosphere, and then be deposited on a water body (e.g. a Great Lakes). Some alternative terminology may be helpful (e.g., “direct industrial”).

Sources can release mercury in multiple forms: The Mercury Strategy (p. 4, fifth paragraph) notes that for taconite processing facilities, a substantial fraction of mercury released is in the gaseous form (which is less likely to deposit locally). This appears to be the case for these facilities, but it should be noted this assertion in the cited report was based on testing at only one facility, and other work has noted that taconite facilities can potentially be the source of some regionally deposited mercury (Engstrom et al. 2007, *Limnology and Oceanography*, 52(6): 2467-2483).

Fish consumption advisories: Both the Executive Summary and the pollution prevention summary box (p. 26) reference efforts to “enhance public outreach and educate the public on how to obtain and implement site- specific fish consumption advisories.” We have several

issues with the recommendation: 1. Overall efforts on fish consumption advisory outreach are important, but they would not be considered “pollution prevention” efforts, given they are recommendations individuals should take because of pollution present. 2. It is really agencies that “implement” fish consumption advisories, and the public would heed or follow the advice. Thus, we believe the description of needed efforts should be modified accordingly. 3. The challenges with addressing mercury contamination via an emphasis on fish consumption advisories should be recognized, in particular for those communities (which may include low income or First Nations, Métis, and Tribal communities) that may have a heavy reliance on fishing and fish consumption (for reasons including sustenance, cultural, or both).

Overview of risk: In the High Level Summary of Risks section (Section 2.5), it is worth briefly mentioning a few of the other human health and ecological concerns with mercury exposures; it is these concerns in particular that motivate efforts to reduce mercury uses and releases to the environment. Though earlier publications, two reviews that address both of these topics are Mergler, D., Anderson, H.A., Chan, L.H.M., Mahaffey, K.R., Murray, M., Sakamoto, M., Stern, A.H. 2007. Methylmercury exposure and health effects in humans: A worldwide concern, *Ambio*, 33(1):3-11; Scheuhammer, A., Meyer, M.W., Sandheinrich, M.B. Murray, M.W. 2007. Effects of environmental methylmercury on the health of wild birds, mammals, and fish, *Ambio*, 33(1):12-18. Other work could be cited more specific to the region. For example, research from that period included a review and analysis of Health Canada reports on potential links between environmental exposures and various health outcomes, finding increased rates of male cerebral palsy hospitalizations in some Areas of Concern (in comparison to remainder of province, and with potential elevated methylmercury exposures in the former) (see Gilbertson, 2004). Male cerebral palsy hospitalization as a potential indicator of neurological effects of methylmercury exposure in Great Lakes communities, *Environmental Research*, 95:375-384); and Gilbertson, 2009. Index of congenital Minamata Disease in Canadian Areas of Concern in the Great Lakes: An eco-social epidemiological approach, *Journal of Environmental Science and Health Part C*, 27:246-275). Finally, potential for elevated mercury exposure via fish consumption in the Basin should be noted; for example, a study of 1,465 infants born in the Lake Superior Basin showed eight percent with elevated mercury levels (i.e., above that corresponding to EPA’s reference dose for methylmercury) (McCann, 2012. Mercury levels in blood from newborns in the Lake Superior Basin, GLNPO ID 2007-942, Final Report, November 30, 2011.)

Work under the Binational Toxics Strategy: While the Mercury Strategy appropriately notes the work of the earlier Binational Toxics Strategy (BTS) (p. 18), it is worth noting there was a separate Mercury Work Group that carried out a number of activities, including specific projects and extended workshops at BTS meetings.

Review data/information compilation in tables: In Table 1 (p. 34), reference should be made to “Henry’s Law Constant” rather than “Henri’s Law”); in addition “constant” is the more conventional term rather than “coefficient”. In Table 5 (p. 36), the summary references PCBs rather than mercury. In Table 7 on standards and guidelines, as noted in point #5 above, there is no reference to criteria developed through the Great Lakes Initiative process in the 1990s

(which are still in place), including uniform water quality criteria guidelines for protection of human health and wildlife. These criteria should be referenced in the table (https://www.epa.gov/sites/production/files/2015-12/documents/1995_water_quality_guidance_for_great_lakes_sid.pdf).

In summary, we appreciate the opportunity to provide these comments on the Mercury Strategy. As we have noted in comments on earlier strategy documents (including most recently on PBDEs), it is important that these early strategy documents set the right tone for activities to be undertaken to meet objectives for chemicals of mutual concern under the Great Lakes Water Quality Agreement. We believe addressing the comments above can result in actions more likely to address ongoing concerns with mercury in the Great Lakes Basin.

Sincerely,



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ISBN #: 978-1-77189-908-6

Publication Number: 1202