



North American Metals Council

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February 14, 2018

Via E-Mail

Ms. Aimee Zweig
M. Olivier Marois
Ms. Alison Dickson
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Chemicals Management Division
Gatineau, Quebec
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Re: *Comments on Proposed Risk Management Approach for Selenium and its Compounds under the Selenium-containing Substance Grouping (Canada Gazette, Part I, Vol. 151, No. 50 -- December 16, 2017)*

Dear Ms. Zweig, M. Marois, and Ms. Dickson:

The North American Metals Council (NAMC)¹ and the NAMC Selenium Work Group (NAMC-SWG)² submit these comments on the Environment and Climate Change Canada/Health Canada document (ECCC/HC, 2017a) relating to the proposed *Risk Management Approach for Selenium and its Compounds under the Selenium-containing Substance Grouping*.

As part of the second phase of the Chemicals Management Plan (CMP), the Government of Canada (*i.e.*, ECCC and HC) jointly conducted a scientific assessment of Se and

¹ NAMC is an unincorporated, not-for-profit group formed to provide a collective voice for North American metals producers and users (*i.e.*, the North American “metals industry”) on science- and policy-based issues that affect metals in a generic way. NAMC members include trade associations as well as individual companies.

² The NAMC-SWG (<http://www.namc.org/selenium.html>) is engaged in technical research on issues pertaining to selenium (Se). Activities include the development of water and tissue-based standards for Se, the implementation of such standards, the development of effects thresholds, and the identification of analytical methods pertinent to such standards. As part of its ongoing efforts, the NAMC-SWG develops papers on these topics and shares them publicly on its website or through the peer-reviewed scientific literature.



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its compounds in Canada under Sections 68 and 74 of the Canadian Environmental Protection Act (CEPA), and under the Selenium-containing Substance Grouping of the CMP Substance Groupings Initiative. A notice summarizing the scientific considerations of the final screening assessment report (FSAR) for these substances was published in the *Canada Gazette, Part I*, on December 16, 2017 (ECCC/HC, 2017b). These risk assessments have resulted in having met criteria under Section 64(a) and (c) of CEPA, because they may be entering the environment in a quantity or concentration or under conditions that have or may have an immediate or long-term harmful effect on the environment or its biological diversity, and constitute or may constitute a danger in Canada to human life or health. In parallel with, and following up from this initiative, ECCC and HC have developed the Risk Management Approach document (ECCC/HC, 2017a; revised from initial Risk Management Scope document; EC/HC, 2015), which is the subject of the comments provided herein.

The NAMC-SWG acknowledges that the recently-published FSAR (ECCC/HC, 2017b) incorporated many of the technical (and other) comments and suggested revisions submitted by the NAMC-SWG and other stakeholders, in particular, modifications to the Predicted-No-Effect-Concentration (PNEC) benchmarks for fish tissue; moreover, we acknowledge various improvements from the initial draft scope document released two years prior (EC/HC, 2015) to the recent Risk Management Approach document (ECCC/HC, 2017a). We note that more relevant context has been provided for the consideration of Se as a chemical of potential concern in different Canadian mining sectors (*i.e.*, metals and coal mining, and base metal smelting).

This submission, developed by members of the NAMC-SWG, provides comments on the Risk Management Approach document ECCC/HC (2017a); the focus of our comments is on those sections of the document specific to risk management measures relating to Se within the context of various relevant guidelines, regulations, and proposed regulations:

- **Coal mining:** Development of a regulatory approach for limiting Se discharges from coal mines;³

³ A separate proposed coal mine effluent regulation is currently undergoing stakeholder consultation (ECCC, 2017); NAMC-SWG recently submitted technical comments on this document, which included specific comments on the use of the PNECs from the FSAR (ECCC/HC, 2017) as trigger levels for fish tissue (NAMC-SWG, 2018).



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- **Metal mining:** Enhancement of information-gathering specifications (*i.e.*, under Schedule 5) under the Metal Mining Effluent Regulations (MMER) to determine the need for additional risk management; and
- **Base metals smelting and refining:** addressing facilities that report to the MMER through the action proposed for metal mining and working with industry to gather additional information through a voluntary initiative with remaining facilities.

We provide the following feedback on key aspects of the *Risk Management Approach for Selenium and its Compounds under the Selenium-containing Substance Grouping* (ECCC/HC, 2017a) that NAMC-SWG recommends ECCC and HC consider in the finalization of the document:

Clarifications

The following statements made in the document require clarification:

- *Section 5.2.1 states: “Available and selected studies on selenium levels in the vicinity of coal mines were mostly conducted in Alberta and British Columbia, where most of the Canadian facilities are located. High selenium concentrations in fish eggs and ovaries, in fish tissues, and in sediments near some coal mining sites show a potential risk to harm aquatic and benthic organisms.”*

We acknowledge that there have been historical accounts of fish population extirpations over 30 years ago in the United States (*e.g.*, Hyco Lake, Belews Lake, and Kesterson Reservoir; the basis for the Canadian Council of Resource and Environment Ministers (CCREM) (1987) guideline), and that Se hazard and reproductive effects have been documented in field-collected fish in Canada (Holm *et al.*, 2005; Muscatello *et al.*, 2006; Rudolph *et al.*, 2008; Nautilus, 2011, etc.).

However, it is important to note that evidence of population-level effects (*i.e.*, hazards and/or reproductive effects on fish) due to elevated Se



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concentrations in the receiving environment have not been demonstrated in any field studies conducted in Canada. The statement above -- we believe -- is based only on comparisons of concentrations measured in the field, in certain cases, to thresholds and/or regulatory guidelines which have been developed/derived from laboratory-based toxicity tests, rather than actual demonstrated effects in field populations, including changes to biodiversity.

- *Section 5.2.2 (Coal Mining) states: “For this sector, selenium in fish eggs and ovaries, in fish tissues, and in sediment near sources of releases may exceed predicted no-effect levels for aquatic organisms and benthic organisms (Environment and Climate Change Canada, 2017c).*

We believe that this statement is speculative, and is based solely on elevated Se concentrations in effluent or receiving waters. Selenium has been deemed a parameter of concern at metal and coal mine sites based on elevated Se concentrations in effluent and downstream receiving water bodies. While we acknowledge that concentrations in the other media cited (*i.e.*, fish eggs and ovaries, fish tissues, and sediment) may be elevated, we are not aware of the database upon which the above statement has been made. Given the significance of this statement, we recommend that these data be presented, and that this point be clarified. Moreover, the specific “predicted no-effect levels” exceeded are not cited (*i.e.*, it is unclear whether this refers to the PNECs in the FSAR (ECCC/HC, 2017b) or other no-effect values/thresholds).

Key Issues for Consideration

1. The current Canadian national Se water quality guideline is outdated.

In order for a national risk management approach to be effective, it is necessary for there to be adequate benchmarks for evaluating the effectiveness of risk management measures. The foundation of this -- in particular, for protection of the aquatic environment -- is having a water quality guideline (WQG) based on the best available science. The current Canadian Se WQG for freshwater aquatic life (*i.e.*, 1 µg/L Se) -- the foundation of evaluating aquatic ecological effects -- has been in place, unrevised, for over 25 years. Specifically, the



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basis of this guideline and the guideline derivation rationale released by the CCREM (CCREM 1987) references research of Aquatic Ecosystem Objectives Committee of the International Joint Commission (IJC) (IJC 1981), and was officially adopted by the Canadian Council for Ministers of the Environment (CCME) almost 26 years ago.

A crucial impetus for the revision of this guideline is that the science of Se ecotoxicology has advanced significantly during the period since the establishment of the current guideline; most importantly, it is widely recognized that the basis of understanding Se risk is more appropriately evaluated through the analysis and evaluation of fish tissue concentrations, as opposed to surface water concentrations (Chapman *et al.*, 2010). While recently-published guidelines have incorporated fish tissue as part of an overall Se WQG,⁴ the current Canadian national (CCME) guideline does not.

We understand that currently, Se is not a parameter prioritized for revision of, or development of, a national WQG, under CCME and ECCC, respectively. A commitment to this would remedy the issue of an outdated national Se WQG.

Based on this, NAMC-SWG recommends that a contributed guideline process⁵ be implemented, so that this initiative can move forward, and that expertise from various appropriate and qualified stakeholders be integrated into that effort.

2. For Se, site-specific and/or area-wide regulation of Se is more appropriate than a generic and/or sector-specific approach.

A number of factors, including (among others): background lithology in differing geographic regions of Canada,⁶ various receiving environment modifying factors (*e.g.*, lentic vs.

⁴ USEPA (2016), Beatty & Russo (2014), Payne/Kentucky (2013).

⁵ See https://www.ccme.ca/files/Resources/envIRON_qual_guid/contrib.gdlneproc_final_e.pdf.

⁶ This is acknowledged in the ECCC/HC (2017a) document: “*Mines vary significantly in the nature of the ore and waste rock they extract. Mines therefore have varied levels of selenium in their effluent, ranging from insignificant to potentially high enough to be a source of concern.*”



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lotic systems, sulphate concentrations), Se speciation, and the variability in sensitivity of various aquatic species to Se, all influence the potential ecological risk of Se.

A more appropriate approach for the evaluation and management of Se would be site-specific, rather than generic/national. For the various case examples in Canada, in which Se is being regulated and managed (*e.g.*, the coal mining sector in the province of British Columbia), site-specific/area-wide regulations and approaches are being applied, and these approaches incorporate most of the factors listed above. We recommend that the overall Risk Management Approach proposed by the Government of Canada allow for the implementation of Se risk evaluation and management on a site-specific basis.

3. Economic factors need to be considered in the Risk Management Approach.

The NAMC-SWG believes that commercial and technological realities associated with Se treatment and management have not been adequately taken into account in the overall Risk Management Approach, specifically as it relates to the setting of effluent limits. The approach promotes Se management based on treatment technology (*i.e.*, Best Available Technology-Economically Achievable (BATEA)) vs. ecological risk.

For example, some NAMC-SWG members have installed coal mine effluent treatment systems for Se in advance of ECCC's proposed coal regulation (ECCC, 2017). These installations have observed a number of operating and maintenance challenges that were not manifested during the pilot-testing phase. There are currently few operating facilities in the world and the body of literature on full-scale operating facilities is limited. The limited number of full-scale treatment plants utilize biological treatment. This presents a significant challenge for northern operations in cold-weather climates. Further, there is evidence that a reduction in total Se concentration by biological treatment may not necessarily translate into reduced Se bioaccumulation due to Se transformations within treatment processes resulting in organic forms of Se. The scientific and technology vendor communities are just now starting to study and address these issues.



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The NAMC-SWG strongly supports the need for reasonable and scientifically-defensible guidelines, regulations, approaches, BATEA, and acceptable risk.

Thank you for the opportunity to provide these comments.

Sincerely,

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