North American Metals Council
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February 5, 2018

Via E-Mail

Mr. James Arnott
Mining and Processing Division
Environment and Climate Change Canada
Place Vincent Massey 351 Blvd St-Joseph, 18th Floor
Gatineau, Quebec K1A 0H3

Re: Input on Proposed Approach for Coal Mining Effluent Regulations

Dear Mr. Arnott:

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 (ECCC) November 2017 proposed approach for the coal mining effluent regulations consultation document.

ECCC has been conducting a ten-year review of the *Metal Mining Effluent Regulations (MMER)* (EC, 2012). It has been determined, based on this review and other information, that a federal effluent regulation for the coal mining sector will be established separately from the revised *MMERs*, which will apply only to the metal and diamond mining sectors.[3]

The primary aspects of the proposed *Coal Mining Effluent Regulation* include:

- Federal effluent limits for pH, total suspended solids (TSS), nitrate and Se;

[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

[2] The NAMC-SWG is engaged in technical research on issues pertaining to selenium (Se). Activities include the development of water quality tissue-based standards for selenium, 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.

[3] *See* http://www.gazette.gc.ca/rp-pr/p1/2017/2017-05-13/html/reg2-eng.html.

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- Non-acute lethality requirements (Rainbow Trout and *Daphnia magna*);
- Effluent monitoring reporting requirements (volumes and loadings); and,
- Program specifications for Environmental Effects Monitoring (EEM).

The document *"Proposed Approach for Coal Mining Effluent Regulations – Consultation Document, November 2017"* (ECCC, 2017) has recently been released and is the final of the three (3) documents released by ECCC during 2017. Unlike the previous two (2) documents, this most recent consultation document provided numerical effluent limits for parameters of concern, and in some cases, specific compliance strategies. The document was released and distributed to obtain feedback from diverse stakeholders across Canada; this distribution was followed up by informational sessions conducted during January 2018.

This submission, developed by members of the NAMC-SWG (http://www.namc.org/selenium.html), provides technical comments on ECCC's proposed limits and compliance approach; the focus of the review is on those sections of the ECCC (2017) document that relate specifically to the proposed regulation of Se.[4]

Much of the insight for this evaluation benefits from previously-submitted work for the:

- Coal Association of Canada (CAC), during which time Borealis Environmental Consulting Inc. (Borealis) acted as the CAC representative during the two-year (2013-2015) multi-stakeholder consultation regarding the 10-Year *Metal Mining Effluent Regulation (MMER)* Review (EC, 2012); and,
- American Petroleum Institute (API) and the NAMC-SWG: "Evaluation of the Effects of Updated Selenium Water Quality Criteria on Water Management in North America" (GEI Consultants/Windward Environmental/Borealis Environmental).

[4] Limits for other parameters (i.e., nitrate, TSS, pH), non-lethality requirements, effluent monitoring, and aspects of the EEM Program are not addressed herein.

Primary Comments

This section first highlights key comments from the NAMC-SWG. More detailed supporting comments then follow.

The proposed Se management approach for existing mines, provided as a flowchart in Section 1.4.4.2, is confusing because it does not appear to have a consistent logic for considering the relationship between fish tissue Se concentrations and effluent Se concentrations. For example, following the flowchart, if the fish tissue Se concentration does not exceed the trigger, the effluent Se concentration must meet 10 µg/L within a prescribed timeframe, and then a second fish tissue Se study must be conducted. If it had previously been demonstrated that the fish tissue Se concentration did not exceed the trigger, and then effluent Se concentrations were reduced to meet 10 µg/L (or otherwise maintained if effluent concentrations already met 10 µg/L), why would another fish tissue Se study be required? Additionally, if a second fish tissue Se study is conducted and the fish tissue trigger is again not exceeded, but the Final Discharge Point (FDP) is greater than 5 µg/L, yet a third fish tissue Se study would be required. In concept, this could lead to an endless cycle of fish tissue Se monitoring every three years until the FDP yields mean Se concentrations of less than 5 µg/L (even if fish tissue Se concentrations never exceed the trigger).

The flowchart is ultimately driven by Se effluent limits, with site-specific fish tissue Se concentrations only influencing whether effluent Se concentrations must meet 5 µg/L or 10 µg/L within a prescribed timeframe and thereafter. Otherwise, under the proposed Se management approach, site-specific fish tissue Se concentrations are not used to provide any information on whether fish in a receiving water body may be at risk of adverse effects due to Se.[5] This approach is contrary to the application of water quality guidelines and criteria recently developed by jurisdictions such as the British Columbia Ministry of Environment (BCMOE) and the United States Environmental Protection Agency (USEPA), which specifically developed fish tissue-based guidelines and criteria for Se in recognition of the importance of this line of evidence. Fish tissue Se concentrations are the strongest indicators of potential effects (Janz *et al.,* 2010) and, for this reason, the USEPA's fish tissue-based Se criteria explicitly supersede water column-based Se criteria (USEPA, 2016).

[5] In addition, depending on the receiving environment and the status of species therein, there is potential for impact on fish populations from sampling (e.g., threatened and endangered species).

The NAMC-SWG strongly recommends that the proposed Se management approach be revised so that site-specific fish tissue Se concentrations are used explicitly to determine and establish Se effluent limits. Moreover, we recommend a longer timeframe between fish tissue sampling campaigns, as the recovery of Se in fish tissue is very slow (ECCC/HC, 2017). A tiered approach, such as the conceptual one outlined below, could consider a conservative water column Se trigger, which would determine the need for conducting a site-specific fish tissue Se study.

- Tier 1: Compare receiving water Se concentrations to a conservative water column Se guideline or criterion, such as those proposed in BCMOE (2014), USEPA (2016), and/or DeForest *et al*. (2017).

- Tier 2: If a conservative water column Se guideline or criterion is exceeded (Tier 1), conduct a fish tissue Se study and compare concentrations to an appropriate fish egg/ovary, whole body, or muscle Se trigger value.

- Tier 3: If a fish tissue Se concentration exceeds a trigger value, assess the need for an effluent limitation and if a limitation is necessary, develop a plan for reducing effluent Se concentrations within a prescribed timeframe. Site-specific Se bioaccumulation modeling may be used to develop water-column Se targets. Iterative fish tissue concentration monitoring (e.g., every three years (or more)), can be used to test whether reductions of effluent Se concentrations are sufficiently reducing Se concentrations in fish tissue.

Supporting Comments

General

There is a general lack of reference to some key literature that should be considered as part of the science/regulatory work upon which the regulation should be based. For instance, the NAMC-SWG recommends consideration of the following resources:

- Ohlendorf *et al.* (2011): This article proposes a phased approach for assessments of potential Se effects on fish and aquatic-dependent birds that can be applied in different environmental settings, with the goal of developing and interpreting a tissue-based Se value.

- DeForest *et al.* (2012): This article presents the derivation of, and proposes a Se fish tissue threshold for, (freshwater) egg/ovary tissue. The benchmark development applied a Canadian Council of Ministers of Environment (CCME) derivation protocol,[6] resulting in a tissue (egg/ovary)-based threshold of 20 µg/g dw.

- DeForest *et al.* (2017): This article proposes water-column Se screening concentrations for lentic (standing water) and lotic (flowing water) receiving waters. These proposed water Se screening concentrations could be used as the first tier of an assessment to determine whether fish tissue Se monitoring is necessary.

Rationale/derivation methodologies (and recent/relevant references, as appropriate) have not been provided in ECCC (2017) for various statements or limits/triggers proposed in the flow chart provided in Section 1.4.4.2 (e.g., 5 µg/L, 10 µg/L, 20 µg/L, etc.). More background -- specifically, outlining the rationale used to derive and/or select these criteria -- needs to be provided.

One U.S. state regulatory agency employs a tiered approach using both aqueous and tissue-based concentrations of Se for effluent compliance (Payne, RG/Kentucky of Environmental Protection, 2013; *see* below). If a permittee receives an effluent limitation for Se, any exceedance of the limit is disregarded if a subsequent fish tissue study indicates compliance with the state-wide whole body tissue criterion. While this latter document is cited in the ECCC (2017) document, the various principles used in the tiered approach, rationalized using current science, are neither adequately described nor considered. The State of Idaho also recently developed an approach to the development of site-specific criteria, which accounts for the species present in receiving waters (*see* explanation, below). We encourage the ECCC to review and consider this latter approach.

General Comments on the Feasibility and Achievability of Se Treatment and Management

The NAMC-SWG believes that the stated effluents limits for Se outlined in ECCC (2017) (i.e., 5 µg/L and 10 µg/L) do not take into account current commercial and technological realities associated with Se treatment and management. We suggest that ECCC

[6] Employing a Species Sensitivity Distribution (SSD) approach.

needs to consider the effluent limits proposed in November 2015 by USEPA for the U.S. steam electric power industry, based on the following:

- The USEPA proposed Se limits on flue gas desulfurization (FGD) wastewater at coal-fired power plants; it should be noted that FGD wastewater has many similarities to coal mining effluent;

- For this "Rule" (i.e., regulation), the proposed effluent limit for Se was established at 12 µg/L,[7] based on a monthly average (similar to what is being proposed in ECCC (2017));

- The effluent limits for Se and other constituents have been stayed by the USEPA based in large part on a petition from the Utility Water Act Group (UWAG), an unincorporated group of 163 energy companies and three national trade associations of energy companies. The UWAG petitioned against the Rule based upon the gross underestimate of the cost of compliance and the overambitious assumptions about the ability of facilities/operations to meet effluent limits with "best available technologies" (BAT);

- Many power companies who have piloted BAT for Se treatment have been unable to consistently meet a monthly average limit of 12 µg/L. Moreover, USEPA's proposed average Se limitation virtually requires the installation and operation of a biological reduction system (bioreactors). This technology has been installed in only a handful of coal-fired power plants and USEPA relied on treatment performance from only two of these facilities; and,

- The USEPA postponed the implementation of the Rule while it reviews the technical and economic basis for the original Rule.

Based on this, the NAMC-SWG recommends that ECCC consider the current action by the USEPA in finalizing the timing and FDG effluent limits for Se; it is noted that ECCC is suggesting BAT limits that are significantly lower than the limit discussed above.

Some NAMC-SWG members have installed coal mine effluent treatment systems for Se in advance of ECCC's proposed regulation. These installations have observed a number of

[7] The monthly average limit of 12 µg/L was developed as a technology-based (vs. risk-based) limit.

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. Vendors of the treatment systems will state they can meet the proposed Se limits, contingent upon influent and operating conditions, however, issues including management of waste by-product, consistency of outputs, and other technological challenges require further research and development. A reduction in total Se concentration may not necessarily translate into reduced Se bioaccumulation due to Se transformations within the treatment process. The scientific and vendor communities are just now starting to study and address these issues.

NAMC-SWG members believe that the state-of-science in North America does not support the proposed timing (i.e., fish tissue study frequency) or Se effluent limits proposed by ECCC in the consultation document. We therefore recommend that ECCC reconsider the effluent limits proposed in this regulation, and work with industry to develop an approach that is both achievable and cost effective.

Section 1.4.4.1 and Flow Chart in Section 1.4.4.2

NAMC-SWG agrees that potential biological effects due to Se are best predicted by fish tissue Se concentrations (Janz *et al*., 2010) and that fish tissue should be a key component of Se monitoring at coal mines. Based on this principle, and throughout the document, reference is made to the implementation of studies on Se in fish tissue at existing mines. However, the implementation of these studies does not appear to be triggered by the exceedance of aqueous Se concentrations (i.e., Se concentrations in final (FDP) effluent). Rather, the results of fish tissue studies (to be implemented within three years after the promulgation of the regulation) trigger the collection, analysis and evaluation of aqueous Se concentrations (i.e., Flow Chart in Section 1.4.4.2).

This framework/approach is in contrast to the hierarchy/tiering approach used by other jurisdictions, in which exceedance of aqueous Se concentrations trigger fish tissue studies to determine whether there are potential adverse effects to aquatic biota. This approach can be cost effective and may preclude the need to unnecessarily sacrifice fish; this is over and above what would be required for the biological monitoring of fish according to the EEM portion of the proposed regulation. Examples of tiered approaches for different jurisdictions are as follows:

- Province of British Columbia: i.e., exceedance of aqueous Se concentrations > 2 µg/L in receiving waters triggers sediment, invertebrate, and then fish and bird tissue monitoring[8] (Beatty & Russo, 2014);

- State of Kentucky: i.e., exceedance of an aqueous Se concentrations limitation (e.g., 5 µg/L) triggers fish tissue monitoring; whole-body Se concentrations should not exceed 19.3 µg/g dw (Payne/Kentucky, 2013); and,

- United States: *see* USEPA, 2017a,b (draft); guidance for implementation of Se criteria (USEPA, 2016).

Fish populations sometimes do not reside at or near the FDP; however, the document does not provide an indication of the general location(s) at which fish might be collected for Se fish tissue monitoring during the above-mentioned studies (e.g., how far downstream of the FDP is acceptable/appropriate?) This is critical to understanding the potential aquatic ecological risk, based on the dilution of effluent prior to entering the receiving environment. Furthermore, the consultation document is silent regarding situations in which there are existing permitted discharges that release Se. In these situations, it will be necessary to distinguish incremental contributions of Se from various discharges to fish tissue concentrations.

In paragraph 2 of this section, there does not appear to be any "prioritization" of the various fish tissues. Based on the existing state-of-science and statistical comparisons, prioritization of these tissues can be rationalized (i.e., egg/ovary being the most preferred, followed by muscle tissue or whole-body fish tissue); this is discussed in the USEPA's guidance for implementation of Se criteria (USEPA, 2017a,b (draft)).

The "additional requirements" cited in paragraph 3 of this section should be provided in the form of guidance for consideration in the design of fish tissue monitoring. A great deal of information has been developed in this regard, and should be referenced: guidance provided in Ohlendorf *et al*. (2011) and the draft USEPA's guidance for implementation of Se criteria currently under development (USEPA, 2017a,b (draft)).

[8] The fish tissue thresholds are as follows: 11 µg/g (dw) for egg/ovary and 4 µg/g (dw) for whole body. The bird egg tissue threshold is: 6 µg/g (dw) (Beatty & Russo, 2014).

Flow Chart in Section 1.4.4.2

It is our opinion that compliance monitoring should commence with the evaluation of aqueous concentrations in the receiving environment (i.e., Se concentrations in water) with scientifically-defensible surface water benchmarks (that consider assimilative capacity/Initial Dilution Zone (IDZ)), and, should those be exceeded, evaluation of Se concentrations in fish tissue (e.g., Se concentrations in fish egg/ovary or muscle or whole body) would then be required. Examples of these tiered approaches are provided above. If ECCC retains the sequence illustrated in the flow chart (i.e., fish tissue Se concentrations triggering monitoring of Se concentrations in effluent), scientific/operational rationale(s) should be provided, since the flow chart is contrary to current standard practice in regulatory programs in North America.

We assert that the flow chart could incorporate the concept of collecting both fish tissue and water Se (should the water Se concentrations trigger be exceeded) to define Se bioaccumulation potential at a site. That would provide a mechanism for defining aqueous Se concentrations at a site that would also be protective of a fish tissue Se limit (rather than reliance only on generic Se limits).

The values proposed in the flow chart are not scientifically or practically defensible for end-of-pipe/FDP limits. The limit/trigger values proposed (i.e., monthly means of 5 and 10 μg/L; grab sample limits of 10 and 20 μg/L) are in the range that would likely be considered reasonable for ambient water quality guidelines for Se (*see* Table 1 below) rather than effluent/FDP limits, *per se*. The values listed in ECCC (2017) would be more appropriately applied at in-stream/downstream locations (i.e., ECP), past the edge of the IDZ.

Based on the above, our recommendations for modification of the flow chart would be as follows:

- Ambient water Se concentrations (in waters where fish reside) be the first tier of monitoring;
- Fish tissue Se concentrations should be the second tier; and
- Any resulting effluent Se limit should be based on site-specific bioaccumulation potential.

It is acknowledged that, while fish can reside near FDPs, based on the current science, the mixing zone needs to be defined and considered on a site-specific basis. The definition of the IDZ would have to consider the use of the immediate receiving environment by all fish life stages.

Table 1. Summary of Aquatic Life Water Quality Guidelines/Criteria in North America (modified from Gilron & Downie, 2016).

Jurisdiction	Guideline/ Criterion (µg/L)	Reference	Notes on changes
United States (federal)	Lotic: 3.1 Lentic: 1.5	USEPA (2016)	Decreased from previous criterion of 5 µg/L. Now distinguishes between lentic and lotic systems.
Canada (national)	1	CCREM (1987) (CCME)	No change pending. Derived using outdated approach (i.e., based on field data from lake studies; derivation associated with mortality and developmental effects in offspring of fish based on Se bioaccumulation in the food chain).
British Columbia (provincial)	2	Beatty and Russo (2014)	The guideline document has been updated recently, but still has the same value
Kentucky (state)	5	Payne, Kentucky Energy and Environment Cabinet (2013)	Applied using a tiered approach with fish tissue concentration measured and evaluated after an aqueous Se limitation is exceeded.

Recently, with increased concern regarding potential aquatic risk from coal mine effluents, site-specific Se criteria have been developed in British Columbia. For example:

- Two site-specific Se criteria developed in northern BC: a site performance objective (SPO) for Anglo American's proposed Roman metallurgical coal mine; and two "working" SPOs for a developing gold/copper mine, the Red Chris mine; both of these SPOs would be considered ECPs; and,

- A set of site-specific Se criteria developed in the southeast region of the province (i.e., short-, medium-, and long-term targets for Teck Resources' Elk Valley metallurgical coal mines); part of the Elk Valley Water Quality Plan (EVWQP; Teck Resources, 2014).

It should be noted that these criteria (i.e., SPOs and targets) are based on receiving/in-stream compliance limits (i.e., at ECPs), rather than effluent (FDP-based) limits. The scientific approach and results used in the above-mentioned scenarios -- specifically, multi-generational toxicity studies conducted to develop and derive SPOs -- should be fully considered in the development of the Se framework for a proposed federal *Coal Mining Effluent Regulation*.

One relevant case example (as indicated above) relates to the discharges from Teck's five Elk Valley mines in British Columbia. Many of the "discharges" are actually seeps and creeks that emerge from cross-valley fills from across the sites/operations, and are not actually controlled discharge points as usually defined under federal regulations. We note that the current permitted concentrations under the provincially-mandated EVWQP are science-based in-stream (i.e., ECP) concentration thresholds. The proposed effluent limits would, therefore, be a clear departure from existing, relevant science-based limits that have already been established in British Columbia.

Guidance regarding how to distinguish between "exposure" and "reference" areas is required. In the flow chart, it is not clear how "exposure" and "reference" areas are defined operationally, with specific reference to Se concentrations in fish. In some scenarios, it might seem obvious what "exposure" vs. "reference" is, but in others, it needs to be properly defined. For example, as we noted earlier, in situations where there are existing Se sources, the monitoring design would have to carefully consider how to address incremental Se exposure. Presumably, these areas are not defined in the same way they are for the EEM studies, as they have been designed for metal mines. For example, given the documented mobility of Westslope cutthroat trout, mountain whitefish and bull trout in the Elk River system, a "reference"

condition would likely need to be represented by fish in another system (e.g., Bull River) which is not impacted by coal mine effluent. This is not clarified in this section/flow chart.

Effluent Limit/Fish Tissue Trigger Table in Section 1.4.4.2

The fish tissue trigger values cited in ECCC (2017) (i.e., 2.9 µg /g dw and 11.8 µg/g, for muscle/whole body and egg/ovary, respectively) were extracted from the *Draft Screening Assessment Report (DSAR) for Selenium and its Compounds* (Environment Canada/Health Canada, 2015), which was recently released in final on December 16, 2017. It is assumed -- based on the relevant footnote provided in ECCC (2017) -- that the modified values (i.e., 6.7 µg /g dw and 14.7 µg/g dw, for muscle/whole body and egg/ovary, respectively) would be used as triggers in place of the DSAR values presented in ECCC/HC (2017). Has ECCC comprehensively considered the various viewpoints regarding the above-mentioned PNECs discussed during the *DSAR* consultation in the context of the Se effluent limits proposed for the new coal regulation? If so, how will this impact their use?

Our understanding is that the egg/ovary Se value of 14.7 µg/g dw was derived using an SSD approach, in which white sturgeon was the most sensitive species (and hence the "driver" of the final benchmark). The USEPA's egg/ovary Se criterion is likewise developed using an SSD-based approach in which white sturgeon is the most sensitive species. The U.S. State of Idaho is in the process of updating its Se criterion, and its approach may be relevant for consideration of fish tissue Se triggers in the proposed *Coal Mining Effluent Regulations*. Idaho is nearing the completion of a rule-making to update the Se criterion used in its water quality standards.[9] As approved by the Board of Environmental Quality, and if approved by its legislature in early 2018, Idaho would adopt the USEPA's fish tissue-based criteria of 15.1, 8.5, and 11.3 µg/g dw for egg/ovary, whole body, and muscle, respectively, as well as alternative sub-basin-specific criteria, depending on the fish species present.

The USEPA's fish tissue-based criteria are derived based on the 5th percentile of the SSD. The most sensitive species in the SSD, and the "driver" of the 5th percentile, is white sturgeon. The white sturgeon EC10 for eggs/ovaries, as derived in USEPA (2016), is 15.6 µg/g dw. The next most sensitive species in the USEPA's SSD is bluegill (EC10 = 20.6 µg/g dw), and three salmonid species (i.e., brown trout, rainbow trout, and Westslope cutthroat trout), which yield egg/ovary EC10s of 21.0, 24.5, and 26.2 µg/g dw, respectively. Because white sturgeon only occurs in some Idaho waters, and all other fish species have EC10s that are at least 32%

[9] *See* http://www.deq.idaho.gov/laws-rules-etc/deq-rulemakings/docket-no-58-0102-1701/.

greater than the white sturgeon EC10, sub-basin-specific criteria were developed for receiving waters in which white sturgeon habitat does not exist. In this case, site-specific criteria were either recalculated with white sturgeon removed or set to be equal to the most sensitive species relevant to a given water body (generally, brown trout or rainbow trout), with the resulting site-specific criteria ranging from 19.0 to 24.5 µg/g Se dw.

We recommend that a similar concept be incorporated into ECCC's proposed *Coal Mining Effluent Regulations*, as this will ensure that the fish tissue trigger is meaningful to the site and receiving water bodies of interest/concern. White sturgeon only occurs in select Canadian receiving waters and is not closely related to other Canadian fish species. Based on this, use of an unnecessarily low fish tissue trigger could result in a needlessly high expenditure of resources to address perceived environmental risk that does not exist.

The fish trigger values for muscle and whole body (i.e., 6.7 µg/g Se dw; modified per December 16, 2017 final document (ECCC/HC, 2017)) are listed as the same. This is not aligned with the state-of-science or regulatory guidelines. For example:

- British Columbia: Muscle -- no value; Whole Body -- 4 µg/g dw; and,
- USEPA: Muscle -- 11.3 µg/g dw; Whole Body -- 8.5 µg/g dw.

Our understanding is that egg/ovary-to-whole body Se conversion factors from USEPA (2016) were used to translate the egg/ovary Se SSD to a whole-body SSD. Because the USEPA compiled both egg/ovary-to-whole body and egg/ovary-to-muscle Se conversion factors, and thus developed separate muscle and whole body Se criteria of 11.3 µg/g dw and 8.5 µg/g dw, respectively, it is recommended that scientific justification for setting the muscle Se value equal to the whole-body Se value should be provided.

Section 4.6.2

With respect to non-point source discharges, it is unclear what the source of the "2 µg/L goal for local receiving water by 2050" is. It is assumed that the 2 µg/L value is based on the BCMOE ambient aquatic life guideline (i.e., the only (and recent) provincial aquatic life guideline for Se). Again, since this guideline is meant to apply to ambient/receiving water conditions, it is not appropriate for use as the goal for an effluent limit in a federal regulation. Moreover, the term "local receiving water" is vague. It is important to delineate where "local receiving water" would be collected for the evaluation of the 2 µg/L threshold (i.e., how far

downstream would this need to be measured?). There should be a provision for modification of the 2 µg/L "goal," for cases in which background Se concentrations exceed the aquatic life guideline.

The source of the upper limit value of 50 µg/L used in this reduction framework is unclear, as is the source of the value of 8 µg/L. These seem like arbitrary values, and arbitrary reduction targets. What rationale/derivation method/calculation was/were used to develop these values?

National (i.e., CCME, 2003) and provincial (e.g., BCMOE, 2013) guidance on site-specific water quality objectives (SSWQO) provide the context for the position that direct application of a water quality guideline (WQG) to an effluent discharge limit is not appropriate and not consistent with both federal and provincial policies related to the use of these guidelines.

ANNEX B

The following table (Table 2) provides several comments related to the four factors listed as "key factors" considered for including the regulated parameters, in this case, Se.

Table 2. Comments on factors listed in Annex B of ECCC (2017) used to consider/rationalize the need for effluent limits for parameters of concern for the Proposed ECCC Coal Regulation.

Factor	Comment	Reference
Regulated substances and permitted effluent limits in other domestic and international coal producing jurisdictions	Se grab sample range of 50-500 µg/L: 1. The range is very wide, and the scientific defensibility of these values is questionable; and, 2. This reference (BCMOE 1979) is very out of date; it should be noted that this document was rescinded in 2006. The international limits listed in the table provided (i.e., "Summary of International Limits for Selenium in Codes and Regulations") are not comparable to one other (e.g., one is a trigger, one is based on dissolved (not total) Se, one is for all industrial sectors (not just coal), and are not comparable to the ones proposed in the ECCC (2017) document. Moreover, it should be noted that the proposed Se limits/triggers for the coal sector – in the format proposed - would be the first of their kind in the world.	BCMOE (1979)
Performance of existing coal mines	More information should be provided regarding where these data came from (i.e., source(s) not cited). CAC data collected in support of an evaluation as part of the *MMER* ten-year review provide up-to-date summary statistics for 18 Canadian coal mines; the values presented in ECCC (2017) do not align with the CAC-supplied values.	
Performance achieved by treatment technology that has been commercially proven at the industrial scale	The MEND BATEA report indicates that there are very few Se commercially-proven treatment technologies at the industrial scale. The recent experience and challenges at the West Line Creek treatment plant provides evidence of this.	Hatch (2014)
Potential aquatic	There have been historical accounts of fish	Borealis

Factor	Comment	Reference
effects of harmful substances	population extirpations over 30 years ago in the United States (e.g., Hyco Lake, Belews Lake, and Kesterson Reservoir; the basis for the CCREM (1987) guideline), and 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, evidence of population-level effects (i.e., hazards and/or reproductive effects on birds and fish) due to elevated Se concentrations in the receiving environment have not been demonstrated in any field studies conducted in Canada. This statement is based only on the fact that concentrations measured in the field -- in certain cases -- have exceeded thresholds and/or regulatory guidelines developed/derived from laboratory-based toxicity tests, rather than actual demonstrated effects in field populations, including changes to biodiversity.	Environmental Consulting Inc. (2017)

ANNEX C Table

The Annex C table summarizes various Se guidelines from different North American jurisdictions. The table includes a fish egg/ovary Se threshold of 11.8 µg/g dw and a whole-body Se threshold of 2.9 µg/g dw, as previously reported in EC/HC (2015). As commented on earlier, it is our understanding that the egg/ovary and whole-body Se thresholds will be updated to 14.7 and 6.7 µg/g dw, respectively, based on ECCC/HC (2017). As such, we assume that this Annex C table will be updated to reflect that. It would be useful to have a brief note to explain/rationalize the basis for the various guidelines. For example, most of the guidelines in the table, especially with inclusion of the updated values from ECCC/HC (2017), are derived based on the 5th percentile of the SSD (differences in value are attributable to the species included in the SSD, different interpretations of the toxicity thresholds for each species, and the statistical approach for calculating the 5th percentile). The exceptions are the values from BCMOE (2014), in which, for example, a safety factor of two was applied to derive the egg/ovary Se guideline. It is important to be clear about the basis of these values and the level of

protection they represent, especially for an element like Se, which has a narrow range between concentrations that are essential and toxic.

Response to Focus Questions

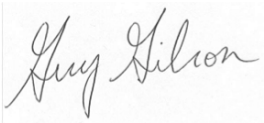
Do you support ECCC's proposed effluent limits and triggers for total Se, total nitrate and TSS? Is there any additional information that ECCC should consider for establishing limits for existing or new mines and expansions?

The NAMC-SWG does not support the Se limits and triggers without consideration of site-specific data to support them. Limit/trigger values in the range of 5-10 μg/L and the compliance limit of 2 μg/L for non-point source effluent may be unnecessarily conservative for sites with low Se bioaccumulation potential. Rather, we believe that a tiered approach should be used, in which a conservative water column trigger (which incorporates consideration of elevated natural background concentrations and/or recovery efforts) would be used to identify whether measurement of fish tissue Se concentrations is warranted. If the conservative water column trigger is not exceeded, it would not be necessary to expend unnecessary resources on fish tissue sampling, or have potential impacts to local fish populations. If the conservative water column trigger is exceeded, measurement of fish tissue Se concentrations and comparison to fish tissue triggers would be warranted. Although we appreciate that updated fish egg/ovary and whole-body Se triggers of 14.7 and 6.7 μg/g dw (derived using an SSD-based approach) are being considered, we believe that alternative fish tissue Se concentrations may be warranted on a site-specific basis (for example, in receiving waters that do not support white sturgeon, or when resident species-specific toxicity data are available).

The NAMC-SWG strongly supports the need for reasonable and scientifically-defensible effluent limits, BATEA and acceptable risk.

Thank you for the opportunity to provide these comments.

Sincerely,



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