Development of EcoContact Soil Selenium Guidelines

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Selenium is a naturally occurring trace metal essential to life (Zhao, et al, 2005) however the concentrations at which it is toxic and the levels at which it is essential to life are quite close (Bronkinkowski, et al, 2000). Natural soil selenium concentrations range up to 4.7 mg/kg in Canada (CCME, 2009) and up to 2.3 mg/kg in Alberta (Penny, 2004). Current soil selenium guidelines in Canada and Alberta are 1 mg/kg and are set to protect ecological pathways, such as plant uptake and are based on the selenate [6+] valence form (CCME, 2009). If the guideline is 1 mg/kg and there are natural concentrations up to 4.7 mg/kg in Canada, are guidelines accurate? If there is remediation conducted to the current guideline, is there unnecessary remediation without risk liability reduction?

Preliminary research conducted by Prediger et al (2012), indicates the selenate-based soil guideline is overprotective, if sulfate is present in the soil. This further supported by Hurd-Karrer (1938); Dhillon & Dhillon, 2000; Gupta & Gupta, 2000; Mikkelsen, et al, 1988; and Terry et al, 2000. Furthermore,

selenium is not always present as selenate. The valence form is based on the pH and Eh of the soils (ATSDR, 2003) and selenite [+4)], which is less toxic than selante (ATSDR, 2003) is also common throughout mineral soils in Canada. The objective of this proposed research is to develop an ecocontact soil selenium guideline for Alberta and Canada. It is proposed to conduct toxicity testing to develop the guideline, generally following Environment Canada methodology.

Industry, consultants, general public, and government will all benefit from this work. A more accurate understanding of the relationship between selenium toxicity, as a function of sulphate co-exposure, will provide a more effective means for determining whether remediation activities should be conducted, and identifying areas where selenium soil concentrations may potentially pose a health risk to crops, native plants, and livestock.

Policy Issue
Regulatory Guidelines/Directives/Policies/Criteria

Knowledge Gap

Inorganics (salinity, metals)

- Natural salt distribution,
- Fate and transport assessment
- Appropriate protection of various exposure pathways,

- SCARG criteria evaluation
- Risk-based soil quality guidelines for selected trace metals
- Knowledge on background concentrations of inorganics

2014 AITF_Selenium Presentation
2014 AITF and EQM_Development of EcoContact Soil Selenium Guideline
2018 Report
2016 AITF and EQM_Selenium Update Presentation