Development of a Long-Term Chorlide Water Quality Guideline Incorporating Harness-Modifying Factors

Anthony Knafla and Viktoria Winter, Equilibrium Environmental Inc.

Research on chloride (Cl) toxicity towards freshwater aquatic species, as a function of water hardness, was completed to support updating a long-term water quality guideline (WQG). Sensitive species from algae, amphibians, fish, mussels, and aquatic insects were tested. The data were used in combination with recently published studies (up to 2021) to derive WQGs in a manner parallel to CCME (2011). US EPA and CCME guidance for implementing hardness adjustments were incorporated. Cl guidelines ranged from 44 to 220 mg/L for a hardness range of 5 to 350 mg/L. As per CCME (2011), the updated WQGs used data on calcium and sodium chloride where the anion drives toxicity. Potassium and magnesium chloride data where toxicity is cation driven, were excluded. For sensitive endangered species and species of concern where toxicity limits occur at concentrations below the WQGs, the toxicity limits are applied as the WQG, based on an analysis of guideline protectiveness. Furthermore, a comparison between laboratory and field studies revealed an approximate 2-fold greater sensitivity in laboratory waters, implying an inherent safety factor for field waters. Recommendations are provided for water quality measurement locations and techniques related to guideline implementation. This research was made possible through funding provided by the Petroleum Technology Alliance Canada (PTAC).

Anthony Knafla

Mr. Knafla is the founder of Equilibrium, a company that provides services in risk assessment, liability management, Phase II investigations, and remediation. He has 27 years of experience in the fields of toxicology, contaminant fate and transport, risk assessment, regulatory hearing support, modelling, analytical techniques, risk management, environmental investigations, and remediation innovation. Mr. Knafla has developed toxicological profiles for Health Canada and provided scientific support to Environment Canada. He is a Diplomate of the American Board of Toxicology and a professional biologist in Alberta with educational backgrounds in medical science and biochemistry, as well as select courses in engineering. Mr. Knafla has innovated and managed the development of several environmental software tools used in the support of remediation, reclamation, and general decision making.

Viktoria Winter

Ms. Winter is an environmental scientist/toxicologist at Equilibrium Environmental Inc., and a professional biologist in Alberta. She has eleven years of experience in ecotoxicology studies and environmental industry. Her skillset includes toxicology, human health and ecological risk assessment, research in support of environmental toxicology, vegetation and wildlife surveys, and field investigation. She has worked on sites impacted by various industrial operations including upstream oil and gas, pesticide and fertilizers applications. Environmental toxicology experience included developing and validating of a new egg-injection protocol and multi-generational study of PBDE exposure in small songbirds, and plant and invertebrate toxicity testing for petroleum hydrocarbon impacted soils. Ms. Winter worked on the data gap analyses in ecotoxicology, bioavailability and bioaccessibility, phytoremediation and plant tolerance potential studies (TPH, lead, selenium), and assisted with building weight-of-evidence approach to redefine provincial ecological soil selenium guidelines.