



## Simplistic Modeling Methods for Nitrate in Groundwater: Case Study Obtaining Regulatory Closure

Erik Martin, Vertex Resource Group Ltd

In Alberta, nitrate concentrations in groundwater at contaminated agricultural sites often exceed Tier 1 Guidelines. The source(s) of the nitrate is not always known, however, elevated nitrate concentrations in groundwater can often be attributed to historical agricultural use of nitrogen fertilizers. Other anthropogenic (e.g., biosolids, manure, irrigation water) and natural (e.g., soil nitrogen, ammonium-bearing clays, decaying plant material) sources can also contribute to nitrate in groundwater. When seeking regulatory closure for a contaminated site, unaccounted for elevated nitrate concentrations in groundwater can result in a reclamation certificate application being rejected.

To address elevated nitrate in groundwater at contaminated agricultural sites, groundwater modeling can be completed. Modeling should be completed for all of the exposure pathways of concern including protection of freshwater aquatic life and potable water. While several complex groundwater models are available, more simplistic and readily available models can also be used including i) the dilution factor 4 (DF4) equation used by Alberta Environment and Parks, ii) Subsoil Salinity Tool, and iii) the ATRANS analytical model. This presentation will demonstrate how we used DF4 and a modified version of the DF4 equation to represent dilution factor 2 (DF2) to address elevated nitrate in groundwater at a former wellsite. The DF4 equation was used for evaluation of potential impacts to freshwater aquatic life receptors, while the modified DF4 equation was used for evaluation of potential impacts to an underlying domestic use aquifer. This modeling approach, in addition to other lines of evidence, resulted in the site obtaining regulatory closure. This presentation will also show and compare the modeling results using the SST and the ATRANS analytical model to address nitrate in groundwater for the subject site.

### Erik J. Martin

Erik J. Martin, Ph.D., D.A.B.T., P.Biol. is a board-certified Toxicologist with Vertex Resource Group Ltd. Dr. Martin's technical expertise includes environmental and mechanistic toxicology, and environmental risk assessment. Dr. Martin leads a team of technical specialists who primarily implement risk-based approaches in management of contaminated sites.