
**The partial extraction of soil samples across a Pb-Zn
deposit via a cation exchange mechanism**

AMANDA M. ISNOR

*Department of Chemistry, Acadia University,
Wolfville, Nova Scotia B4P 2R6*

Most mineral deposits that are exposed at the surface have already been found by mining companies over the last 50 years. The ones that have not been discovered are typically buried by some form of surficial materials such as gravels, tills,

or volcanic ash. This material makes mineral deposits difficult to detect and therefore causes difficulties during exploration. However, groundwater can travel through the deposit and transport metal ions from the mineral deposit to the surface where they can absorb onto organic matter and Fe-Mn oxyhydroxides will be present in the soil. Extracting the labile components of the soil could detect these metal ions, and thereby detect mineralization at depth.

Samples were collected along a soil traverse over the Northwest orebody at the Gays River Pb-Zn mine in Shubenacadie, Nova Scotia. The B-horizon of the soils was sampled because of the abundance of possible cation exchange sites at that level. Metals were solubilised from these soil samples using experiments involving weak chloride salt extractions (KCl, NaCl, MgCl₂ and CaCl₂). The reagent cation and the salt concentration (0.001, 0.01 and 0.1 M) differed in each experiment, and so splits of each sample were analyzed 13 times using the ICP-MS, as DI water was employed as a control. This allowed for the concentration of metals present in the soils to be measured.

The cation in the reagent was expected to 'push' the metal ions off of the surface of the soil via a cation exchange process; the strength of this 'push' would depend on its concentration and the size-to-charge ratio of the cation. As a result, MgCl₂ at a concentration of 0.1 M would be expected to extract the highest concentration of metal ions. Unexpectedly, the CaCl₂ extractants solubilized the largest amounts of metal ions. Anomalies were present very close to (but just south of) the location of mineralization, and these occurred in consistent locations for each reagent. These anomalies are thus located immediately downhill and down-ice of the vertical projection of mineralization, suggesting that soil creep and glaciation may have contributed to the minor displacement of the geochemical anomalies away from mineralization.