
**Bedrock and till indicator minerals of the
Halfmile Lake Zn-Pb-Cu volcanogenic
massive sulphide deposit, New Brunswick**

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Indicator minerals have become an important exploration method in the past 30 years and now include suites for detecting a variety of ore deposit types including diamonds, gold, Ni-Cu-PGE, porphyry Cu, massive sulphide, and tungsten deposits. An indicator mineral is a mineral or suite of minerals that suggest the presence of a particular deposit type. Ideally, an indicator mineral is visually and chemically distinct, moderate to high density, medium sand-sized (0.25–2.0 mm), abundant, survives weathering and/or glacial transport, and is readily recoverable. Glacial till and bedrock sampling were conducted during the summer of 2007 around the Halfmile Lake Zn-Pb-Cu volcanogenic massive sulphide (VMS) deposit, Bathurst Mining Camp as part of the Geological Survey of Canada's Targeted Geoscience Initiative-3 (TGI3). This project is a collaborative effort between the Geological Survey of Canada, the New Brunswick Department of Natural Resources, and Queen's University. The purpose of conducting this study is to document the till indicator mineral and geochemical signature of the Halfmile Lake Zn-Pb-Cu VMS deposit.

The Halfmile Lake deposit consists of massive, breccia, and stockwork Zn-Pb-Cu sulphide mineralization hosted by the volcano-sedimentary sequence of the Ordovician Tetagouche Group. Sulphide minerals in the deposit include sphalerite, galena, chalcopyrite, pyrrhotite, and pyrite. Subcropping pre-glacial gossan is preserved over parts of the deposit. Epiclastic rocks, interbedded fine-grained felsic pyroclastic rocks, crystal-rich felsic tuffs, quartz-feldspar porphyritic intrusions, and intermediate and basic dikes are the main rock types found surrounding the Halfmile Lake deposit.

A thin (<2 m) layer of silty sand, locally derived subglacial till covers most of the deposit area. The till contains 20–40% pebble to cobble sized clasts that are angular-subangular in shape. Till sample sites for this study were selected based on previously defined east, northeast, and southeast ice-flows that crossed the study area and the east-trending till geochemical dispersal train from the deposit.

Till and bedrock samples were processed at Overburden Drilling Management Ltd.'s heavy mineral processing lab in Ottawa to recover indicator minerals. A preliminary set of indicators identified in various bedrock lithologies include chalcopyrite, pyrite, galena, sphalerite, ferro- and nonferromagnetic pyrrhotite, ilmenite, goethite, beudantite, and

jarosite. Indicator minerals identified in till include chalcopyrite, pyrite, gold, goethite, and beudantite.