Project Title:

Lupin Mine Environmental Effects Monitoring Phase 4 Study

Researcher's Name and Affiliation:

Golder Associates Ltd.

Overview:

The Lupin Mine is located on the west shore of Contwoyto Lake, Nunavut at 65° 46" N and 111° 15' W. The monitoring program is a requirement for Lupin Mine under the Metal Mining Effluent Regulations, which is part of the federal *Fisheries Act* (Environment Canada 2012). The monitoring program will document the health of fish exposed to treated mine effluent and compare it to areas without effluent (reference areas). Data will be collected in August 2013 for approximately 14 days.

The surveys will be conducted within one Exposure Area and two Reference Areas. The program will consist of a Ninespine Stickleback and juvenile Arctic Grayling survey, a benthic invertebrate community survey, and supporting environmental information (e.g., water and sediment quality).

Methods:

Fish will be captured using active and passive fishing gear (e.g., backpack electrofishing unit, small mesh seine net). All non-target species will be identified, counted, and immediately live released. Field surveys will be completed in the Exposure Area and two Reference Areas.

Lethal Ninespine Stickleback Survey: The goal of this lethal survey is to capture 30 adult male, 30 adult female, and 30 juveniles from each area. Lethally sampled adult fish will be measured for length, weight, age (otolith removal), external condition, gender, life stage, state-of maturity, internal condition, gonad weight, liver weight, carcass weight, stomach fullness, parasite presence/absence, and parasite weight.

Non-lethal Arctic Grayling Survey: The goal of this non-lethal survey is to capture a minimum of 100 young of the year to a maximum of 400 young of the year from each area. Non-lethally sampled fish will be measured for: length, weight, and external condition. Scales will be retained for non-lethal fish ageing. A sub-set of Arctic Grayling will be sacrificed for collection of otoliths to validate using scales as the primary ageing structure.

Benthic invertebrate samples will be collected at five stations from each sampling area. Samples will be using a standard (6 in x 6 in x 6 in) Ekman grab. Samples will be used for taxonomic identification and enumeration of benthic invertebrate communities.

Collection of key supporting environmental information during fish and benthic invertebrate surveys is required. These supporting data include:

- habitat description;
- seasonal water temperature;
- field water quality variables (e.g., dissolved oxygen);
- water chemistry variables (e.g., metals); and
- sediment quality (e.g., total organic carbon).

Data:

Under Metal Mining Effluent Regulations, data will be analyzed and presented in an interpretive report to Environment Canada. All data will also be entered into the latest version of Environment Canada's Environmental Effects Monitoring Metal Mining Data Entry Software. This is a requirement of all programs under these regulations. Data are used by Environment Canada to analyze national patterns for all metal mines in Canada. The Final Report, submitted to Environment Canada in June 2014, will be made available to all interested parties.

References:

Environment Canada. 2012. Metal Mining Technical Guidance for Environmental Effects Monitoring. Ottawa, ON. 550 p.