Project 2011-05: Optimisation of till data for exploration, Phase 2

The objective of the second phase of the till data optimisation project was to determine the optimal methodology for detecting gold mineralisation.

There are three main methods for analysing till in gold exploration:

1. analysing the fine fraction (<63 microns);
2. counting and characterising gold grains, and
3. analysing the nonmagnetic heavy mineral concentrate.

A series of private and public till data, containing at least two of the three analytical methods mentioned above for each sample, was compiled or provided by CONSOREM's partners. The collected data cover areas containing known gold mineralisation.

Survey/area	Scale	N total	Fine fraction	Heavy chemical analyses	Charact. gold grains
Red Lake (CGC)	Regional	269	Yes	Yes	Yes
Beardmore-Geraldton (CGC)	Regional	502	Yes	Yes	Yes
Peterlong-Radisson (OGS)	Regional	413	Yes	No	Yes
Swayze (OGS)	Regional	767	Yes	No	Yes
Matheson (OGS)	Regional	300	Yes	Yes	Yes
La Grande Sud	Local	650	No	Yes	Yes
Matachewan Mine	Local	60	Yes	No	Yes
Kenty-Joburke Swayze deposits	Local	100	No	Yes	Yes
Éléonore	Local	800/37	No	Yes	Yes
Meadowbank	Local	450/98	Yes	No	Yes

Regional till surveys studied in this project. The surveys cover areas containing known gold mineralisation.

The method performance from the various surveys was assessed visually and quantitatively. The quantitative method is based on the calculation of the conditional probability of association between the anomalies and the presence of a known mineralisation anomalies up-ice from the sampling site.

The various analyses have shown that counting and characterising the gold grains is the most reliable method for detecting gold mineralisation. In some cases, gold pathfinder elements (As, Sb) can also be effective. The reduced effectiveness of directly analysing for gold with respect to grain counting is probably due to the nugget effect, which is important in geochemical analyses.

Optimal analysis of a till sample collected on the surface (depth <2 m) should consist of counting the gold grains in the heavy mineral concentrate, and analysing the fine fraction for both gold and gold pathfinder elements. In till samples collected at depth, fine fraction analysis can be replaced by concentrate analysis.

There are several ways of lowering the importance of the nugget effect in existing or future geochemical analyses. One is prioritising weak or moderate spatially associated anomalies instead of isolated strong anomalies. Another is using an enhancement method such as U-statistics. Changing analytical protocols to analyse a larger quantity of material in the laboratory (ex: cyanidation of large samples) also reduces the nugget effect.

Project 2011-05: Summary	
Objectives	• To determine the optimal analytical and data processing methods for detecting gold mineralisation in tills.
Results	• Counting gold grains: the most reliable method for detecting mineralisation. • Optimal approach for till samples collected on the surface: linking grain counting with chemically analysis for gold and its pathfinder elements (As, Sb) in the fine fraction. • For chemical gold anomalies (fine fraction and concentrate): consider groups of low to moderate rather than isolated high values. Can be done visually or mathematically (U-statistics). • Adaptability to future analytical developments for gold in till (cyanidation).
Innovations	• First objective, systematic and quantitative assessment of the effectiveness of processing methods for gold in till.