Field sampling for indicator minerals:
How to choose and locate the correct medium and avoid anthropogenic contamination

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Workshop No. 3: Indicator Mineral Methods in Mineral Exploration
Gold Grain Dispersal Train Lengths and Gold Grain Diameters
Positive Characteristics of Glacial Till for Gold Grain Sampling

1. Unsorted with a large silt-sized component.

2. Abundant and can be of local provenance.
Rainy River Greenstone Belt

Map: OGS.
Till Overlying the Rainy River Greenstone Belt, Ontario

Labradorean Till

Keewatin Till
Reverse Circulation Drilling
MDNR Descriptions of Till Units

Meltout till: ... contains numerous well-rounded, coarse-grained cobble-to-boulder sized clasts of gneiss and granitoid.

Basal till: ... lies beneath the meltout till and (contains) an abundance of sharply angular clasts, mostly of supracrustal lithologies, contained in a clayey-to-clay-loam rich, often dark coloured matrix.
Meltout till = **Supraglacial till**

Basal till = **Subglacial till**
Boulder Lag on Exposed Bedrock High

Photo: Minnesota DNR.
Bedrock Rubble on Steep Slope of Bedrock High
Photo: Rainy River Resources.

Supraglacial Till
Desired Subglacial Till

Photo: Minnesota DNR.
<table>
<thead>
<tr>
<th>Survey</th>
<th>Dominant Sample</th>
<th>Gold Grain Counts*</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDNR</td>
<td>Supraglacial till</td>
<td>0-2</td>
</tr>
<tr>
<td>RRR</td>
<td>Subglacial till</td>
<td>7-10</td>
</tr>
</tbody>
</table>

* Constitutes background average; grains/sample normalized to 10 kg.
# Grain Sizes of Indicator Mineral Suites

<table>
<thead>
<tr>
<th>Commodity/Rock Type</th>
<th>Indicator Minerals</th>
<th>Dominant Grain Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gold</td>
<td>Gold grains</td>
<td>&lt;0.063 mm</td>
</tr>
<tr>
<td>Kimberlite</td>
<td>KIMs</td>
<td>0.25-1.0 mm</td>
</tr>
<tr>
<td>Base metals</td>
<td>Sulphides, silicates, oxides, phosphates</td>
<td>0.25-1.0 mm</td>
</tr>
</tbody>
</table>
Kimberlite Indicators Recovered from Various Sample Types
Options if Desired Material is Not Present
Options if Desired Material is Not Present

1. Move the sample site to the closest location with the desired medium.
Options if Desired Material is Not Present

1. Move the sample site to the closest location with the desired medium.
2. Take the poor quality sample anyway.
Options if Desired Material is Not Present

1. Move the sample site to the closest location with the desired medium.
2. Take the poor quality sample anyway.
3. Don’t take the sample.
Options if Desired Material is Not Present

1. Move the sample site to the closest location with the desired medium.
2. Take the poor quality sample anyway.
3. Don’t take the sample.
Sources of Contamination to Indicator Mineral Sampling

- Mining related infrastructure and operations (tailings, waste dumps, smelters)
- roads
- railways
- bridges
VMS Indicator Mineral Contamination

- Chalcopyrite
- Pyrite
- Gahnite

0.5 mm
Winston Lake Mine

179-MA-00
(Cpy, Sph, Py)

181-MA-00
(Ghn)

185-MA-00
(Cpy, Sph, Py, Ghn)

Zenmac Mine
Examples of Contamination in Ontario Alluvial Sediment Samples

Slag

Synthetic Corundum

0.5 mm
Ontario Railway Bridge – Contamination Source
Examples of Contamination in Ontario Alluvial Sediment Samples

Slag

Synthetic Corundum
Contamination Sources in OGS Survey Area

OGS Survey Area

IKO Quarry & Plant

Deloro Mine

Map showing the location of contamination sources in the OGS Survey Area.
Location of Gold-in-Humus Anomaly and Proximal Tailings Ponds, Kirkland Lake, Ontario
Mechanically Modified Gold Grain
Location of Gold-in-Humus Anomaly and Proximal Tailings Ponds, Kirkland Lake, Ontario
Dust Cloud from Lac des Iles Pd Mine

Photo: OGS.
Bullet Recovered from Basil Till Sample

0.5 cm
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