

Victoria Island Kimberlites – A case study

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The kimberlite discoveries made in the early nineties in the Slave Province prompted geologists of Ascot Resources and Major General Resources to consider the diamond exploration possibilities of the adjacent islands of the High Arctic. Cominco acquired prospecting permits on Victoria Island at the centre of a gravity low in the south central part of Victoria Island and Ascot / Major General acquired permits to the south and west of the Cominco ground.

Kimberlitic indicator minerals were recovered from some sediment samples collected in the summer of 1994. Sample #476 yielded high counts of indicators, particularly garnet. This highly positive sample was followed up in a winter sampling program in April 1995. These follow-up samples confirmed the initial positive result. Mineral chemistry studies of these samples showed that the garnet population contained rare high Cr₂O₃ subcalcics and lacked the abundant subcalcic garnets associated with many of the diamondiferous kimberlites of the Slave Province. This cast doubt on the diamond potential of the source kimberlite, from which these indicators were derived.

An airborne geophysical survey was flown over the whole Ascot / Major General permit area and some follow-up ground geophysics was carried out. In retrospect it was found that, as a cost saving measure, the airborne geophysical data set was insufficiently processed to show kimberlite targets. However, a detailed heli-mag survey flown over a restricted area up-ice of high indicator count samples, suggested the presence of two magnetic lows that could be associated with kimberlites.

In 1995 an attempt was made to understand the true cratonic setting of the source kimberlite producing the abundant garnets recovered. Fifty randomly selected (unprobed) garnets and chromites were sent to the CSIRO in Australia for nickel and zinc thermometry determinations. This garnet population contained no subcalcic garnets and it was, therefore, concluded that the source kimberlite had intruded Proterozoic mantle, in spite of the data suggesting a cool geotherm. This suggestion of Proterozoic mantle had a negative effect on the funding of the project.

In December 1996 the author examined the available data for the project and concluded the garnet Ni-thermometry showed that the source kimberlite intruded along a cool cratonic geotherm (38 mWm⁻²). The garnet trace element data showed that the source kimberlite had sampled significantly depleted mantle. In addition, the low abundance of subcalcic garnets was not considered a negative indicator as the presence of eclogitic garnets suggested that both eclogitic and peridotitic mantle had been sampled. Both the garnet and chromite populations produced compositions that suggested sampling within the diamond stability field.

In 1997 the data set was packaged and shown to interested companies. In May 1998 a joint venture with De Beers / Monopros Limited was announced and in early June the

first kimberlite was drilled. Limited drilling and sampling was carried out on five kimberlites before the spring melt shut down the program. Samples of the five kimberlites were processed for indicator minerals and microdiamonds at De Beers laboratories in South Africa.

Electron microprobe results were reported for the following minerals, from each of the kimberlites:

Kimberlite	Garnet	Clinopyroxene	Ilmenite	Chromite
Phalarope	293	2	0	150
Whimbrel	0	0	4	4
Longspur	300	0	150	150
Golden Plover	300	48	150	150
Snowy Owl	533	8	190	400

The mineral recoveries documented above illustrate that there are significant differences in heavy mineral abundance between some of the kimberlites. It is assumed that 5 kg of rock was acid digested from each kimberlite. The mineral pickers have attempted to recover 300 garnets and 150 of each of clinopyroxene, ilmenite and chromite. The picking results show that very few indicators were recovered from the Whimbrel kimberlite. The low heavy mineral abundance of the sample from the Whimbrel kimberlite is consistent with its low diamond recovery. The Golden Plover kimberlite has high heavy mineral abundance for garnet, ilmenite and chromite, but only 48 clinopyroxenes were recovered. Garnet, ilmenite and chromite are abundant in the Longspur and Snowy Owl kimberlites, but clinopyroxene is rare.

These five Victoria Island kimberlites exhibit a range in indicator mineral abundance from the indicator poor Whimbrel kimberlite to the abundant garnets, chromites and ilmenites of the Longspur, Golden Plover and Snowy Owl kimberlites. Clinopyroxene is absent (Whimbrel and Longspur) or rare (Phalarope, Golden Plover and Snowy Owl).

The compositional similarities of the indicators from the Longspur, Golden Plover and Snowy Owl kimberlites suggest that they are closely related and may be parts of a larger kimberlite complex.

The indicator mineral compositions show that the Longspur, Golden Plover and Snowy Owl kimberlites have sampled both peridotitic and eclogitic mantle. The presence of subcalcic garnets, high Cr₂O₃ lherzolitic garnets and high Cr₂O₃ xenocrystic chromites suggest that the peridotitic mantle sampled by these three kimberlites is potentially diamondiferous. The presence of eclogitic garnets with elevated Na₂O and TiO₂ contents consistent with diamond inclusion compositions, suggests that the eclogitic mantle sampled by these three kimberlites is potentially diamondiferous. The microdiamond results confirm this conclusion.

The compositions of the prospecting sample indicators are consistent with the indicators recovered from the Snowy Owl kimberlite. Therefore it can be concluded that the Snowy

Owl kimberlite is the probable source for the indicators recovered from the prospecting samples. Examples of indicator mineral scatterplots from the Snowy Owl kimberlite and the prospecting samples are attached.

The following diamond results have been received from Monopros Ltd.:

Kimberlite	Weight Treated	Microdiamonds	Macrodiamonds
Phalarope	160 kg	6	0
Phalarope	20 kg	0	0
Whimbrel	160 kg	1	0
Whimbrel	20 kg	0	0
Longspur	80 kg	8	1
Longspur	10 kg	29	1
Golden Plover	20 kg	3	2
Golden Plover	160 kg	39	0
Snowy Owl	80 kg	75	0
Snowy Owl	8 kg	15	0
TOTALS	718 kg	177	3

The single diamond recovered from the Whimbrel kimberlite should be considered contamination until proven otherwise.

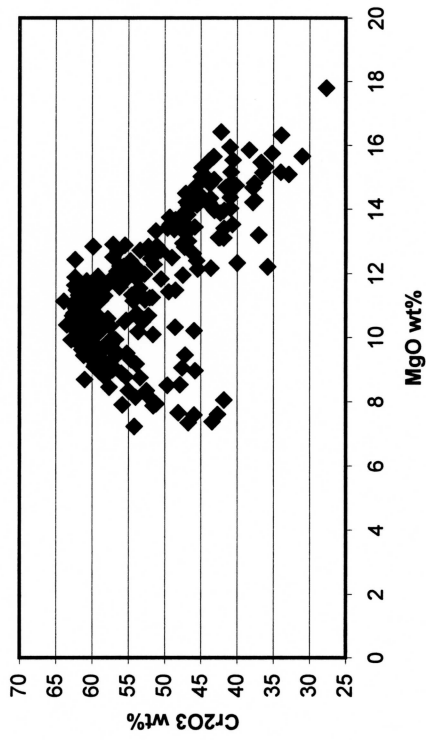
The significant diamond recoveries from the Longspur, Golden Plover and Snowy Owl kimberlites are consistent with the presence of high interest indicators (subcalcic garnets, eclogitic garnets and high Cr₂O₃ chromites) in the kimberlites. The Snowy Owl microdiamond recoveries are particularly significant.

The 1999 exploration to be program carried out by De Beers / Monopros Limited will included a detailed ground geophysical survey over the Snowy Owl, Golden Plover and Longspur kimberlites and 8 – 10 core holes to be drilled to 150 metres.

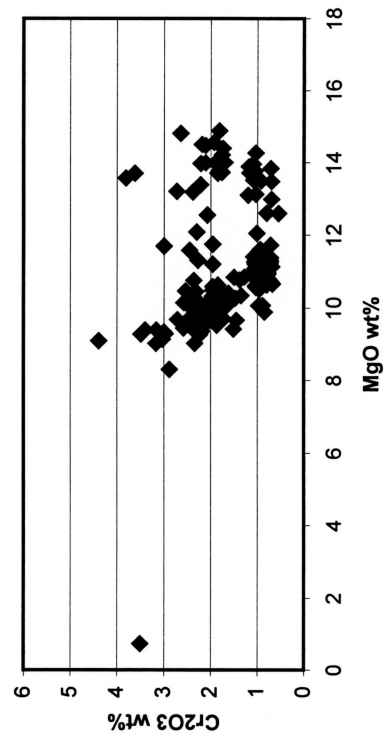
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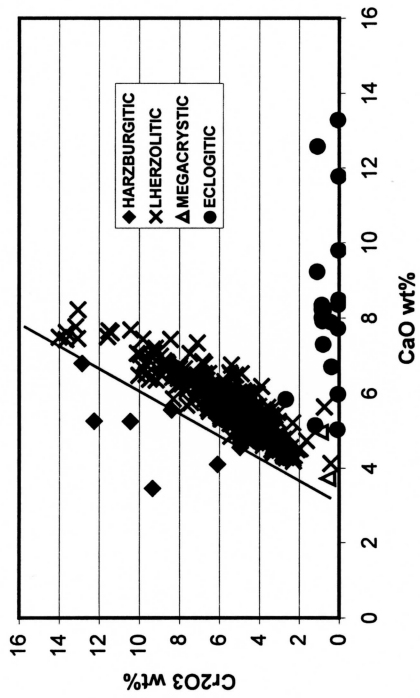
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Snowy Owl Kimberlite : Chromite



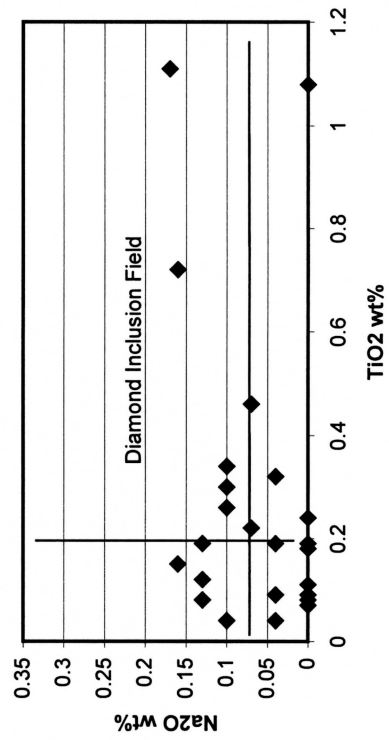
Major General Resources Ltd :
Snowy Owl Kimberlite : Ilmenite



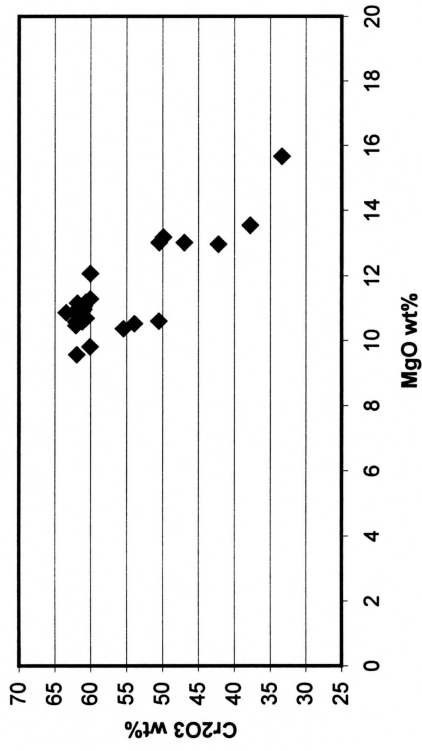
Major General Resources Ltd :
Snowy Owl Kimberlite : Garnet Parageneses



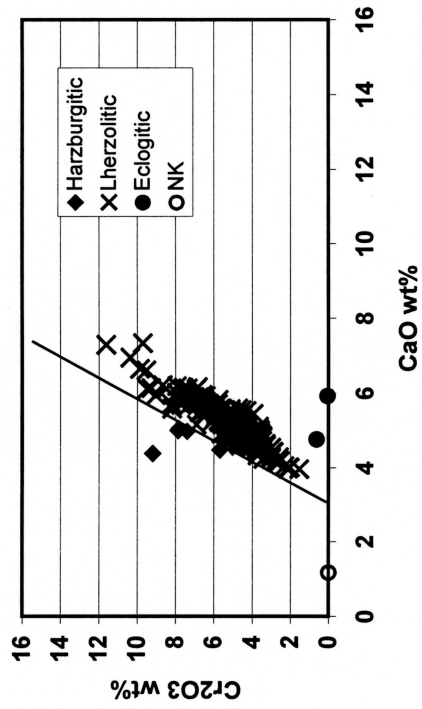
Major General Resources Ltd :
Snowy Owl Kimberlite : Eclogitic Garnets



Major General Resources Ltd :
Prospecting Samples : Chromites



Major General Resources Ltd :
Prospecting Samples : Garnet Parageneses



Major General Resources Ltd :
Prospecting Samples : Ilmenites

