

Discovery of a new type of highly diamondiferous kimberlitic rock in the James Bay Lowlands, northern Ontario, Canada

by A.J.A.(Bram) Janse, Neil A. Novak and Donald A. MacFadyen
KWG Resources Inc., Montréal and Toronto

A new type of highly diamondiferous kimberlitic rock was discovered in the 1993/94 winter drilling season by KWG Resources, a diamond and gold explorer based in Montréal, Québec. The occurrence is located under a small lake, newly named Kyle Lake, approximately 15 km north-northwest of Missisa Lake, the largest lake in the James Bay Lowlands.

Two similar occurrences have been found on land at the end of the 1994/95 winter drilling season in the same general area. The discoveries are part of an on-going program of low-level airborne magnetic surveys, helicopter and ground magnetic surveys, followed by drilling on selected targets. All three occurrences are buried under glacial overburden and Palaeozoic limestones varying from 130 m to 30 m.

The Hudson Bay Lowlands along the southern margin of Hudson Bay, and the James Bay Lowlands to the west of James Bay are the on-land portion of the Hudson Bay Platform. This is a large shallow basin of about 1 million km² filled by mainly Palaeozoic and some Mesozoic sedimentary rocks which overlie parts of the Precambrian basement of the Superior Province, the Trans Hudson Orogen and the Hearne and Rae Provinces. Most of the platform is submerged below the waters of the Hudson Bay and its southern appendix, James Bay.

The James Bay Lowlands lie between 82° and 86° W and 50° and 54° N and extend for about 300 km west of James Bay from sealevel to about 200 m altitude. It forms a sub-arctic region of flat, poorly-drained land covered by sparse, low forest, muskeg, swamps, string bogs, few rivers, some small lakes and one large lake, Missisa Lake. The geological framework is formed by a succession of up to 800 m of limestones, dolostones, sandstones and shales, all of a shallow marine facies from Middle Ordovician to Upper Devonian in age, deposited in the Moose River Basin. The youngest rocks are non-marine Lower Cretaceous sandstones in the southern part of the basin, discordantly overlying the earlier formations and overlapping on to the Archaean basement along the southeastern border.

The northern border of the Moose River Basin is formed by the Cape Henrietta Arch in which Archaean granitic rocks outcrop as inliers in the Sutton Hills. The Palaeozoic and Mesozoic formations are covered by glacial deposits from nil to 150 m in thickness.

The tectonic framework is a Palaeozoic platform overlying a basement of Archaean granite-greenstone and gneisses forming part of the northern margin of the Superior Archon. The platform sediments have been preserved by downwarping and block faulting of the basement in a post-Upper Devonian/pre-Lower Cretaceous episode in which slightly tilted fault blocks expose Archaean rocks or Palaeozoic limestones at surface whereas at other places basement lies at at least 200 m below surface.

Magmatic activity is known in the southern part of the platform and in the adjacent part of the exposed Archaean basement from two ages of carbonatite intrusion at 1700 and 1100 Ma and from the occurrence of melilite-rich ultramafic lamprophyric sills and dykes near Coral Rapids exposed in the banks of the Abitibi River and buried alnoitic diatremes in the Ridge River area about 30 km north of Hearst (Janse et al, 1989). The age of intrusion of these melilitic rocks is between 180 to 150 Ma, similar to the age of the kimberlites in the Kirkland Lake area, located about 250 km south of the James Bay Lowlands, which are related to the Temiskaming Graben.

The geomorphology of the region, i.e. low-energy streams in a poorly developed drainage pattern, is not suitable for alluvial heavy mineral stream sampling, so that low-level airborne magnetic surveying was used. Donald MacFadyen, assisted by Scott Hogg and Steve Munro, was responsible for the interpretation of magnetic data and the selection of drill targets.

A field of 15 kimberlite pipes was discovered in 1988 by Monopros (De Beers exploration company in Canada) along the middle course of the Attawapiskat River at about 52°52' N, 82°57' W, some of which are apparently diamondiferous. Determination of their age of intrusion is in progress, their geological age is post-Upper Devonian and probably Mesozoic in the range of 180 to 150 Ma. One kimberlite is exposed in the bed of the Attawapiskat River, whereas the others are buried under glacial overburden varying from 30 m to 50 m. Their size varies from 75 m to 150 m in diameter. KWG Resources has discovered to-date two additional kimberlites in the same area.

At first one, and very recently two more buried kimberlite-like pipes were found by KWG Resources in an area north-northwest of Missisa Lake over 100 km west of the Attawapiskat field. Their geological age is pre-Middle Ordovician, determination of their radiometric age is in progress. The pipes are buried under glacial deposits and Palaeozoic limestones/dolomites, varying from 130 m to 30 m in combined thickness.

Drill core specimens have been studied by several petrologists and consensus as to exact petrological classification has not been reached. Conclusions vary from alnoite to strongly altered contaminated kimberlite.

In thin section the rocks show small clinopyroxene crystals in the groundmass, olivine in two generations, phlogopite and poorly crystallized andradite which is apparently a late-stage alteration product. Visual inspection of drill core shows 1) a complex dark-coloured kimberlitic diatreme rock containing half digested garnet peridotite inclusions as well as numerous half digested granite and gneiss fragments; 2) a pink granite/"kimberlite" diatreme breccia, intersected by 3) a late-stage light-coloured carbonate-rich "kimberlite" in small dykes and sills. Heavy mineral concentrates contain chrome pyrope (G10 with the typical methylated spirits colour), chrome diopside and chromite.

Determination of the diamond content through fusion with a strong base has shown that the Kyle Lake pipe 1 contains high grade portions, the best one being 22 kg containing 63 stones (23 over 0.5 mm); their combined weight would correspond to a grade of more than 8 carats per tonne. As of April 4th, 1995, a total of 370 diamonds have been recovered from 283 kg of rock; their combined weight would correspond to a **grade of 1.59 carats per tonne**. It should be noticed that these grades are very preliminary, based on small samples and on total diamond content and not on only commercial-sized stones.

However, 79 of the total 370 diamonds were more than 0.5 mm in size and 21 of these were in excess of 0.8 mm, including 2 of more than 2 mm. Two tonnes of drill core from Kyle Lake pipe 1 have been extracted by Ashton Mining of Canada Inc. during evaluation drilling completed in early March and will be processed in the next few months. Results of analyses of the heavy minerals recovered by KWG Resources from this pipe are not yet available at the time of writing this abstract, but are probably known by the time of the conference.

No results of preliminary diamond content, mineralogy or mineral chemistry are yet known from the recently discovered Kyle Lake pipes 2 and 3. Drilling will continue in the summer season from the end of May and will probably discover additional Kyle Lake-type pipes.

It can be concluded that KWG Resources has found a new highly diamondiferous "kimberlitic" province with a good possible economic potential and an academically interesting problem in petrology.

References:

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