BYRO SUB-BASIN AS A POTENTIAL DIAMOND-BEARING PROVINCE

C.L. GEACH Quicksilver Resources NL

Location and Regional Geology

The Byro prospect is located approximately 700 kilometres NNE of Perth, Western Australia.

The Western Gneiss terrain, a cratonised older component of the Yilgarn Block underlies the Permian aged Byro sub basin and an older Proterozoic sequence known as the Badgeradda Group.

The proximity of the Byro sub basin to the Yilgarn Block would suggest it lies as a Cratonic peripheral zone underlain by a cratonised, faulted basement of the same age as the Yilgarn Block (c.2.6-3.2 Ga).

Exploration

In 1988 during follow up work by Quicksilver Holdings Pty Ltd and Hardman Resources NL to two previous microdiamond finds, abundant chromite concentrations were located; indicating an ultrabasic source for some of the chromites. Chromite morphology exhibited fresh to fractured octahedra indicating limited travel. Bevelled and frosted edges on some of the grains were indicative of the more magnesian (lamproitic) chromites identified by geochemical cation ratio plots Cr/Cr+Al vs Mg/Mg+Fe2+.

The abundance of chromite, and the apparently fresh and often pristine chromite morphological characteristics suggests a provenance within the Byro sub basin. The near occurrence of a G-10 type pyrope, pyropic almandine as well as niobium (2%) enriched rutile and hafnium (5%) enriched zircon suggests a kimberlitic affinity. Chromites recovered from an initial 25 kg stream sediment sample programme over 53 sites produced a 78% chromite recovery rate.

Geophysical Study

Aeromagnetics were at 200 metre line spacing and nominal sensor height of 60 metres. Colour 1:20,000 scale photographs were used for ground control and navigation. The data was also digitally processed. Several magnetic anomalies were recognised as immediate targets.

Primary Magnetic Feature AN2

A localised, primary dipolar ground magnetic anomaly (AN2) was thought to be the source for chromites. AN2 can best be described as an EW trending tabloid. Subsequent pitting, aircore and diamond drilling around AN2 delineated an unexpected NE-SW trending palaeo-infill, part outcropping, consisting of fragmental and bouldery ingredients set in a clay bound silty matrix. The infill trends NE-SW and is offset from the centre of AN2. Chromite has been recovered throughout the depth of the infill to 41 metres. Some of the chromites exhibit lamproitic cation ratios in the diamond inclusion field.

Trace element geochemistry detracts from a kimberlitic source for the infill.

Petrography & Stratigraphy

Petrographic studies on 20 rock thin sections describe three major stratigraphic horizons.

Uppermost Unit: Two thin sections from surface rock samples at AN2 describe a superficial sediment, termed the Infill, of Miocene or younger age and composed of quartz fragments in a clay rock matrix, clastic in nature and slightly bedded.

Mineralogical study of Wilfley tabled concentrates from a 20kg+ specimen of infill produced six particles of gold which were mostly flakes of between 0.1 and 0.25mm. Heavy mineral observation of downhole samples of the infill recovered abundant (60+ grains) chromite and pyropic almandine out of 2-3 kg of air core sample to 27 metres. A diamond drill hole provided angular clay fragments one of which at 23.2 metres was indicative of a komatiltic type ultramafic origin.

Middle Unit: Claystone Grit Unit (regional exposed rock unit, considered part of a glacial Permian - Lyons Formation): described as a sandy siltstone with poor sorting containing lithic clasts to 2mm and a silt textured matrix. Clasts range from very coarse sand to coarse silt. The large diameter clasts are a mixture of quartz-rich rocks of igneous origin, both plutonic and volcanic textured examples.

The matrix stains very positively for K-feldspar, optically unresolvable. There is also extensive carbonate and some 0.1mm minerals, some of which have been determined as ilmenite, iron oxide, pyrite and a single grain of rounded chromite. This chromite has a very high Cr/Fe ratio and low Al and Si. It measures 62 microns.

SEM analysis identified various heavies, and garnet, of the almandine pyrope species. The opaques included iron oxides with a trace of Cr, Mn ilmenite and rare chromite. The chromite has Cr, Fe, significant Ti and very low Al and Mg.

Lowermost bedded Siltstone Unit: The description for this Upper Permian aged unit is a siltstone dominant in quartz and K-feldspar. Within the siltstone the feldspar content implies a tuff component. Quartz 30-40%, K-feldspar 30-40%, muscovite 5-20%, carbonate 2-3%. The accessories were identified by SEM. The opaques were all iron oxide with low Mn. The garnet was an almandine spessartite. The monazite is thorium bearing, less than 1%. Opaques were estimated to be 3-5%.

AN2 - Infill Age Determination

A palynological study was undertaken of drill core rock specimens from the AN2 area. Examined sample ARB-3 from the lower bedded unit described as a grey siltstone contained microfossil assemblages of Late Permian (230Ma) age, younger than the Upper Carboniferous - Lower Permian Lyons Formation (280Ma) thought to exist in the area. A second drill core sample ARB-1 from the infill deposit yielded microfossils of Miocene or younger age establishing a Miocene (25-7Ma) or younger age for the infill. The type of microfossils recovered supports a freshwater mode of deposition, however, the lower bedded unit may also have survived a brackish water environment.

Conclusions & Recommendations

The occurrence of many grains of fresh chromite exhibiting lamproitic cation ratios, together with a G-10 pyrope garnet from 25 kg stream sediment samples illustrates the opportunity for alkali and/or kimberlite style of intrusion to exist within the Byro sub basin. The results derived from this latest phase of diamond exploration goes far to verify that previous microdiamond finds made by another company in the Byro sub basin are real.

A younger Miocene aged unit termed the infill, contains abundant chromite, pyropic almandine and occasional gold and sulphides. The infill is a localised deposit and remnant of a previous larger palaeo-channel. It cross cuts all three stratigraphic units.

The highly potassic nature of the lower most bedded unit of Upper Permian age and the middle bedded unit of uncertain age cannot be explained wholly. Both units often resemble tuffaceous sediment derivatives probably from an acid intermediate volcanic terrain. The source for pyropic almandine and non kimberlitic chromite in the middle unit has not been established. Furthermore, pyropic almandine in one drill hole of the middle unit is coincident with a linear NE magnetic trend cutting across the G-10 pyrope occurrence. The linear feature may have been a progenator for intrusives of alkali-kimberlitic magmatic type.

Magnetic anomaly AN2 has been drilled and as yet the source of the anomaly remains unexplained. A dyke or sill source for the chromite is not to be ruled out. Slightly elevated magnetic susceptibilities in the lower bedded unit at depths between 40-65 metres may be confirming the source of the AN2 anomaly as sedimentary in origin similar to many other magnetic targets previously drilled.

Anomalous, magnesian chromite occurring within a Miocene aged deposit over the Byro sub basin in conjunction with interpreted structural trends and past diamond finds suggests a tectonic inter-relationship prevails in the Byro sub basin.

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