Lithogeochemistry in deep exploration

Critical to maximising the information return from deep drilling on geophysical anomalies is the ability to recognize lithologies and to correlate with established stratigraphy to develop a structural and geochemical picture of the anomaly. Since deep diamond drilling is costly it is sometimes advantageous to use lower cost RC drilling for initial exploration but this reduces the return on geological data particularly where textural information is required for correlation. In such programmes some of this otherwise lost lithological and alteration information can be retrieved by whole rock geochemical analysis. The practicality of this is now high and cost effective through the development of reliable low cost ICP whole rock analysis and, through PC based storage and data analysis, the ability to develop more rapid data interpretation methods.

In the Que River- Hellyer district this approach will require compilation of a lithogeochemical database for the whole range of lithologies present and recognition of the effects of alteration due to mineralization and any later events - through studies of VMS mineralization in the district the latter is well advanced through Pb-isotope data (Gemmell, 1990).

Andrew MacNeil and I have been working on the format for a geochemical data base and he has been accummulating available data. There are two routes through which to use these data; use of established petrochemical routines to produce comparative triangular or variation diagrams or use of free format 'exploratory data analysis incorporating statistical routines. The latter is likely to be most useful in analyzing trace element and alteration data and is a relatively new technique available through desktop computers. The discussion below on the strontium geochemistry uses the latter to partition and to analyze data from Jack(1979) for an alteration profile across Hellyer.

Alteration studies have been completed on Que River, Hellyer and Mount Charter(e.g. Bruce Gemmell: Reports to Aberfoyle on the Hellyer Stringer Zone Project, Theses by D. Jack, 1989, S. Rand, 1988). These focus on major element and mineralogical variations.

Less well advanced in the district is the recognition of chemical or isotopic vectors which may expand the drilling target. Most isotope approaches to date have been focussed on attempts to