1. The hydrothermal fluid is of VHMS type, dominated by convective seawater. The fluid contains a mixture of reduced Cambrian seawater sulphate and scavenged volcanic rock sulphide, resulting in a fluid with lighter $\delta^{34}S$ than what would be predicted from straight reduction of Cambrian seawater sulphate. Gemmell and Large (1992), use this model to explain the lighter $\delta^{34}S$ found in the inner zone of the Hellyer footwall alteration pipe. The heavier $\delta^{34}S$ of the outer halo (at both Hellyer and Lake Newton) has the typical isotopic signature of reduced Cambrian seawater sulphate (Ohmoto and Rye, 1979).

2. The hydrothermal fluid is of magmatic origin ($\delta^{34}S = 0$) and demonstrates fluid mixing with reduced seawater sulphate in the zone of deposition and alteration. The lighter $\delta^{34}S$ of the inner halo suggests a higher magmatic sulphur/seawater sulphur ratio.

Deposition of metals as a result of fluid mixing between the hydrothermal fluid and cooler reduced seawater circulating through the permeable volcanics is apparent from the metal, alteration and $\delta^{34}S$ zonation using either model.

The single barite sample from SHD1 has heavier $\delta^{34}S$ (44.43‰) than contemporaneous Cambrian seawater (30‰, Ohmoto and Rye, 1979). Heavy $\delta^{34}S$ are also noted at both Rosebery (Green et. al., 1981) and Hellyer (Gemmell and Large, 1992). This phenomenom has been attributed to the incomplete reduction of seawater sulphate in the volcanic pile, resulting in partioning of heavier $\delta^{34}S$ into the remaining sulphate.

Although the sulphur isotopes do provide a vector towards hotter parts of the system, cheaper and more efficient vectors are provided by alteration mapping and routine analysis for the standard suite of metallic elements. Further sampling may provide subtle vectors but will probably be of more academic interest than of use to exploration.

Mt Julia

Earlier sulphur isotope studies of the Henty deposits have been documented by Yeats, (1989) and Taheri and Green (1992). Studies have not been extended to Mt Julia previously so four samples were submitted along with the South Henty samples as an orientation study. Two of the samples were analysed for both pyrite and chalcopyrite $\delta^{34}S$.

Most of the sulphur isotopes have the reduced Cambrian seawater signature ($\delta^{34}S$ = 8-12 ‰) with the exception of one sample with a negative $\delta^{34}S$ of -3.25 ‰. No obvious trend between $\delta^{34}S$ and gold grade is evident in Table 2.

BHID	Depth	Mineral	$\delta^{34}S$	Au g/t	Comments
MJ005A	913.2	pyrite	-3.25	2.9	MV/MQ
MJ005C	874.0	pyrite	9.94	1.0	MQ, minor MV
MJ005C	874.0	chalcopyrite	8.75	1.0	MQ, minor MV
MJ006A	955.7	pyrite	11.19	2.9	MV, cpy-py rich.
MJ006A	955.7	chalcopyrite	9.83	2.9	MV, cpy-py rich.
MJ006B	829.4	pyrite	7.72	8.7	MQ

Table 2. Mt Julia $\delta^{34}S$ and Au grade.

From the limited sampling conducted it would appear that most of the sulphur is derived from reduced Cambrian seawater . This is consistent with the $\delta^{34}S$ values for the Zone 96 and Sill