M.I.M. Exploration

NOTE

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To : Steve Brown, Mgr., Western Queensland
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Summary of Buckley River Stable Isotope Results

This note summarises points presented by K. Hannan to the review of Buckley River EPM exploration (Thurs., April 29).

Attached is a list of the carbonate-carbon and -oxygen isotope data from RC and diamond holes (Table1). Cross-sections showing drill hole traces with plotted isotope results are kept on file (KWH). All the isotope data from the Buckley River EPM are also reported in a $\delta^{18}O$ - $\delta^{13}C$ plot which displays the idealised trend established for the Mount Isa Mine area (Fig.1).

Conclusion

The Buckley River EPM is prime isotope-grid terrain. The spatially restricted data available to us, and reported in this note, indicate the presence of fossil, structurally confined zones of hydrothermal alteration with NE to NNE trends. In some of these zones, the carbonate isotope systematics 'begin' to resemble those in the vicinity of Mount Isa Mine. Comprehensive 'isotope' coverage by means of a deep RAB program will help us identify prospect-scale targets within a region which has already been established as both geophysically and geochemically anomalous.

Summary Points

(1) Buckley River EPM $\delta^{18}O$ values (including those from the Johnson River prospect), display abundant evidence of a hydrothermal influence. Many values are less than 18 per mil in an area where the sedimentary host rock has a background dolomite $\delta^{18}O$ value of about 18-19 per mil.

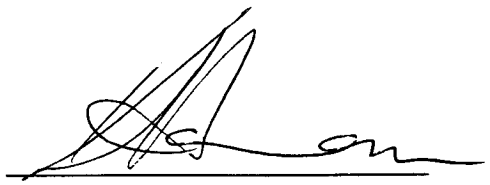
(2) The oxygen isotope results for vein-wall rock pairs differ by about 2-3 per mil. This contrasts with <1 per mil at Mount Isa and is similar to the 1.5-2 per mil observed in the data from Northwest Lakes. Thus, although hydrothermal fluid-rock interaction was widespread at Buckley River, it was not, in the areas sampled, as intense as that recorded at Mount Isa Mine.

(3) There is a clear spatial control on $\delta^{18}O$ values in the vicinity of the well-drilled and mineralised stromatolitic breccia horizon. The pattern of values suggests a NNE-trending structural influence on fluid movement. ***Such a pattern highlights the proven capability of isotope-gridding, at an EPM scale, to identify zones of fluid through-put for deeper, follow-up drilling.***

(4) $\delta^{13}C$ values are generally 'heavier' (i.e., less negative) at Buckley River than in the vicinity of Mount Isa Mine (see Fig.1). This pattern is maintained even in the *$\delta^{18}O$* depleted zone that cross-cuts the stromatolitic breccia (e.g., DDH BR11 data of Table 1). This suggests that the hydrothermal fluid contained minimal CO_2 or that any fluid CO_2 was derived from the host rock Paradise Creek Formation (or rocks of similar carbonate isotopic systematics). It is noted that carbonate $\delta^{13}C$ values of about -1 to 1 per mil are typical of ancient and modern marine sedimentary carbonate. The more negative background value of the more carbonaceous Urquhart Shale (-2 to -3 per mil) probably reflects the contribution of an organic component of carbon (<-10 per mil) to carbonate during diagenesis.

(5) At the bottom of BR7, a vein returned a $\delta^{13}C$ value of -5.5 per mil (i.e., Isa-like). Although the wall rock-vein analyses indicate considerable disequilibrium for this sample (see Table 1), the low $\delta^{13}C$ value may indicate that an Isa-like fluid was channelled in the vicinity of the Python Fault. Again, an isotope grid would probably be an expedient way of testing this possibility.

Similarly, $\delta^{13}C$ values are distinctly lighter in BR3 and BR1 than most Buckley River area values. BR1 was drilled across a mapped NE-trending fault. Could BR3 also be located near a structure with more depth extent than the stromatolitic horizon?



Keith Hannan

copies: Stuart Robinson, Dugi Wilson, Ian Willis, Peter Stoker

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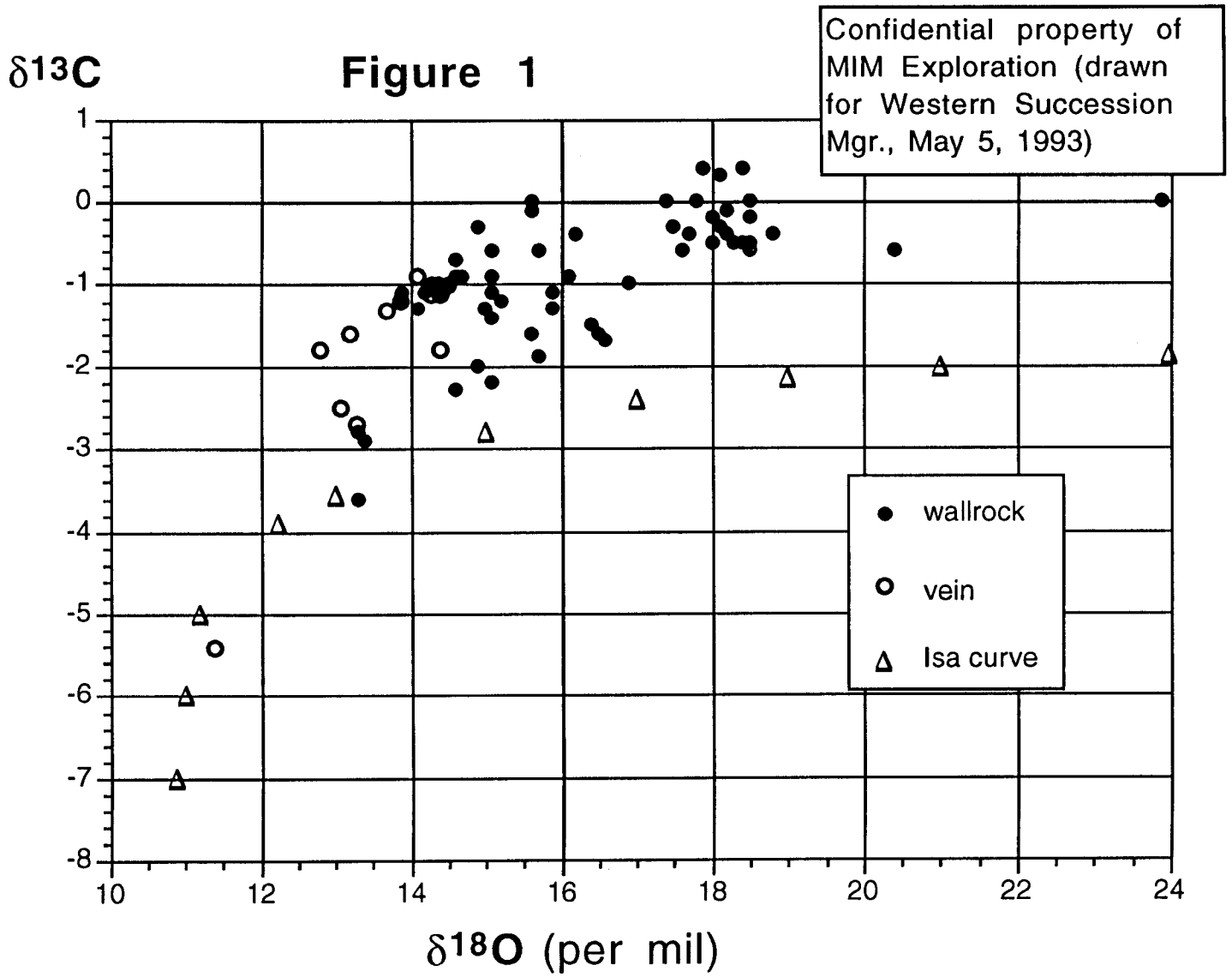
Table 1. Buckley River carbonate O- and C-isotope data

Drill hole	δ18O	δ13C	Drillhole	δ18O	δ13C
BR1,136	13.4	-2.9	BR23,148-150	17.4	0.0
BR1,169	13.3	-3.6	BR24,unknown	18.1	-0.3
BR1,190	13.3	-2.8	BR24,124-126	18.2	-0.4
BR3,153	14.6	-2.3	BR24,148-150	17.7	-0.4
BR3,209	15.1	-2.2	BR25,96-98	18	-0.5
BR3,209vein	13.1	-2.6	BR26,122-124	18.3	-0.5
BR3,256	14.9	-2.0	BR26,130-132	17.5	-0.3
BR3,256vein	13.3	-2.8	BR27,104-106	20.4	-0.6
BR3,276	15.6	-1.6	BR27,128-130	18.5	-0.5
BR4,147	16.1	-0.9	BR27,154-156	18	-0.2
BR7,153	16.9	-1.0	BR29,76-78	18.4	-0.5
BR7,203	13.2	-1.7	BR29,102-104	18.5	-0.2
BR7,203vein	14.3	-1.0	BR29,130-132	16.2	-0.4
BR7,300	14.7	-0.9	BR30,68-70	17.6	-0.6
BR7,300vein	12.8	-1.9	BR30,82-84	18.5	-0.6
BR7,349	15	-1.3	BR30,110-112	18.3	-0.5
BR7,400	15.9	-1.3	BR30,134-136	18.8	-0.4
BR7,456	16.5	-1.6	BR31,94-96	23.9	0.0
BR7,456vein	14.4	-1.9	BR31,126-128	18.1	0.3
BR7,505	16.6	-1.7	BR32,110-112	18.5	0.0
BR7,550	13.9	-1.2	BR32,134-136	17.9	0.4
BR7,602	14.1	-1.3	BR34,78-80	17.8	0.0
BR7,650	14.2	-1.1	BR34,102-104	15.7	-1.9
BR7,650vein	11.4	-5.5	BR34,142-144	18.1	0.3
BR7,700	16.4	-1.5	BR37,74-76	15.6	-0.1
BR8,92-94	15.7	-0.6	BR37,100-102	15.6	0.0
BR8,114-116	14.9	-0.3	BR37,124-126	15.1	-0.6
BR11,162	15.1	-0.9	BR37,148-150	14.6	-0.7
BR11,197	15.9	-1.1	BR37,376	15.1	-0.9
BR11,197vein	13.9	-1.3	BR37,376vein	14.1	-1.0
BR11,263	15.1	-1.4	BR37,425	14.4	-1.0
BR11,263vein	14.4	-1.2	BR37,474	14.4	-1.1
BR11,311	15.1	-1.1	BR37,526	14.6	-0.9
BR11,357	13.9	-1.1	BR37,526vein	13.7	-1.4
BR11,357vein	14.3	-1.2			
BR11,408	14.5	-1.0			
BR11,466	15.2	-1.2			
BR11,466vein	14.5	-1.1			
BR23,100-102	18.2	-0.1			
BR23,118-120	18.4	0.4			



Carbonate isotopic data from Buckley River

(most data derived from dolomite, Mount Isa Mine trend is idealised)