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# Isotopic constraints on fluid evolution and ore precipitation in a sediment-hosted Pb-Ag-Ba-Zn-Cu-Au deposit in the Capricorn Orogen, Western Australia

Holly R. Meadows<sup>1\*</sup>, Steven M. Reddy<sup>1</sup>, Chris Clark<sup>1</sup>, Chris Harris<sup>2</sup>, Laure Martin<sup>3</sup>, Alistair J. R. White<sup>4</sup>

<sup>1</sup>The Institute for Geoscience Research (TIGeR), School of Earth and Planetary Sciences, Curtin University, GPO Box U1987, Perth, WA, 6845, Australia \*Email address of corresponding author: h.meadows@postgrad.curtin.edu.au

<sup>2</sup>Department of Geological Sciences, University of Cape Town, Rondebosch 7701, South Africa

<sup>3</sup>Centre for Microscopy, Characterisation and Analysis, The University of Western Australia, Perth, 6009, Western Australia

<sup>4</sup>CSIRO Mineral Resources, Australian Resources Research Centre, 26 Dick Perry Avenue, Kensington, WA, 6151, Western Australia

## Abstract

The Abra Pb-Ag-Ba-Zn-Cu-Au deposit in the Capricorn Orogen, Western Australia is primarily a lead and silver resource currently estimated at 47.8 Mt (indicated and inferred) of 7.3-10.1 % Pb and 18-28 gt<sup>-1</sup> Ag, although significant Cu-Au zones are also identified. The deposit is unique within sediment-hosted Pb-Zn deposits for its low Zn content, significant Cu-Au zone and high Fe content, providing a case study where the source of fluid and ore-forming processes are contentious. The combination of whole-rock hydrogen and oxygen isotope data, in situ oxygen isotope data in quartz, and in situ sulphur isotope data of pyrite and chalcopyrite, has been used to reconstruct a complex history of overprinting, involving stages of sedimentation, diagenesis and hydrothermal activity. The host sedimentary rocks consist of detrital quartz ( $\delta^{18}\text{O}$  ~11-18 ‰) and whole rock  $\delta^{18}\text{O}$  values (~9-16 ‰) reflecting the combined composition of detrital and authigenic minerals, diagenetic-metamorphic exchange, chlorite and iron content. Quartz in recrystallised chemical sedimentation, quartz cementation, and quartz-barite veins at low temperatures (~100-250°C) involved

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