Economic Geology

BULLETIN OF THE SOCIETY OF ECONOMIC GEOLOGISTS

VOL. 99 March–April 2004 NO. 2

Geology and Mineralization Styles of the George Fisher Zn-Pb-Ag Deposit, Mount Isa, Australia

LUCY H. CHAPMAN†

Economic Geology Research Unit, School of Earth Sciences, James Cook University, Townsville, Queensland 4811, Australia

Abstract

The George Fisher deposit contains one of the world's largest in situ Zn resources (108 Mt at 93 g/t Ag, 5.4% Pb, and 11.1% Zn). It is situated 25 km north of Mount Isa and is hosted by the ~1655 Ma Urquhart Shale in the Western fold belt of the Mount Isa inlier. George Fisher is Zn rich compared to Mount Isa and Hilton and is distinguished by a paucity of syn- to late-tectonic Cu mineralization and associated silica-dolomite alteration.

The deposit contains 11 mineralized stratigraphic intervals that include intercalated pyritic siltstones and banded mudstones with abundant layer-parallel nodular and planar carbonate bands, separated by thick, barren, medium-bedded mudstones. The Zn-Pb-Ag mineralization is hosted predominantly by pyritic siltstones within each stratigraphic interval and occurs as strata-bound lenses that subparallel bedding, bifurcate, and pinch out along the extent of the main economic zone. Four styles of mineralization have been differentiated at the deposit. Layer-parallel, disseminated sphalerite comprises low-grade occurrences of Zn, whereas the bulk of ore is contained within sphalerite and galena veins and breccias that record a prolonged and texturally complex history of ore emplacement.

The earliest mineralization is represented by bedding-parallel, vein-hosted sphalerite which was emplaced prior to earliest folding of the host-rock sequence (GFD_2). Layer-parallel disseminated sphalerite formed as a halo to veins as alteration and infill after secondary carbonates in host rocks and nodular carbonate layers that transgress stratigraphy at a district scale. Breccia-hosted sphalerite ore was emplaced during GFD_2 to GFD_4 fold development at the deposit and represents in situ deformed sphalerite veins and disseminated mineralization. Galena occurs as infill in veins and matrix of breccias that postdate the bulk of sphalerite and were emplaced during GFD_4, late in the tectonic history and in part synchronous with late tectonic Cu mineralization event in the district.

The continuity of ore lenses, covariation of Zn and Pb grades at the deposit scale, and similarities to other sediment-hosted ore systems discount the possibility that this paragenetic complexity represents separate Zn and Pb mineralization episodes prior to and at the culmination of regional folding at George Fisher, respectively. The late textural setting of galena is interpreted as the result of preferential concentration of Pb into new structural sites during deformation. The range of sphalerite and galena mineralization styles at George Fisher is interpreted to record subsurface emplacement of Zn and Pb, possibly during diagenesis or associated with early weak brittle deformation in at least semiconsolidated sediments, followed by extensive textural modification of the orebody during the folding history of the deposit.

† E-mail: Lucy.Chapman@jcu.edu.au

, Vol. 99, pp. 233–255
0361-0128/01/3408/000-23 $6.00