DEPOSIT DESCRIPTION

DATA METALLOGENICA

Beltana - Aroona Zinc Deposit – South Australia

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Deposit name: Beltana - Aroona

Location: 470km north of Adelaide, SA (6603500N 254200E)

Ownership: Pasminco/Perilya

Exploration History: Anaconda located the Beltana Deposit via stream sediment sampling in 1967 with a peak of 300ppm Zn. The potential of the outcropping willemite was underestimated and the tenements were relinquished. EZ gained tenure over the area and drilled the Beltana deposit in 1967; mining operations began in 1974. Stream sediment sampling in the surrounding area was redone using a coarser fraction to remove aeolian material and the Aroona Deposit was located. Pasminco took over the project and have mined the Beltana Deposit an a campaign basis, with the final cut scheduled for 2002. Mining at Aroona commenced in 1990. Perilya Limited has an option over the project and has defined significant additional resource beneath and south of the current Beltana pit design.

Deposit type: Epigenetic structurally controlled willemite deposit. Similar deposits include Vazante in Brazil (fault-hosted epigenetic willemite-sphalerite deposit) and Kabwe in Zambia (pipe like structurally controlled sphalerite-willemite).

Resource:

- Beltana - 863,000 t @ 38% Zn and 2.2 % Pb (1974 – pre mining)

The final ore reserve was completed using a 7.5m-spaced grid of vertical RC drill holes. Overall waste to ore ratio was calculated at 5:1. Recent work puts the total pre mining resource at over 1Mt.

- Aroona – 150 000 t @ 34.4% Zn and 1.6% Pb (pre mining).

Regional Setting: Beltana/Aroona is situated in the north-western part of the Adelaide Geosyncline, a deformed sedimentary basin of Late Proterozoic to Middle Cambrian age, flanked by crystalline basement complexes of the Gawler and Curnamona Cratons. Zinc and lead mineralisation is found throughout the Geosyncline, generally associated with Cambrian marine shelf-carbonate lithologies. NW and NE trending crustal structures are dominant throughout the northern Adelaide Geosyncline.

Deposit Setting: Beltana is hosted in highly fossiliferous Cambrian Wilkawillina Limestone. The Beltana Mine lies east of an anticlinal basement high of Willourian Callana Beds (called the 'Northern Beltana Diapir'). This caused marked stratigraphic thinning of the overlying Neoproterozoic and Cambrian sequences. The topographic high and proximity to the shelf margin has long been regarded as a favourable zone for ore fluid migration. The deposit is located 2km south of the Norwest Fault adjacent to the N-S trending Beltana Fault. The Aroona Deposit is hosted in the basal Cambrian Woodendinna Dolomite on the Aroona Fault. The deposit is located 100m south of the Norwest Fault.

Deposit Geology: The Beltana and Aroona willemite deposits are 11km apart within a major NW trending corridor of zinc-lead mineralisation. Both deposits are structurally controlled and extremely complex. Importantly, both deposits are associated with low angle NW verging thrust structures and have a quartzite hangingwall overlain by Callana Beds. The principal ore mineral is willemite, which is surrounded by an intense haematite-dolomite alteration halo. The footwall of the Beltana Deposit is intensely brecciated.

Ore Mineralogy and Textures: The major ore minerals are Willemite (Zn_2SiO_3), Smithsonite **(**$ZnCO_3$), Coronadite ($MnPbMn_6O_{14}$), Hedyphane (Ca, Pb)$_5$($As0_4$)Cl) and Mimetite (Pb_5($As0_4$)Cl). Willemite ore textures (listed in order of decreasing importance) include massive red amorphous willemite, multiphase breccias, crustiform and colloform banding, fine willemite laminates (internal sediments), radiating clusters, zebra textures and direct replacement of fossils and algal laminates. Lead mineralisation crosscuts willemite as fractures and void infilling and is late in the paragenesis.

Alteration: Hydrothermal dolomitisation, haematite and low grade zinc (1-3%) is present as an intense alteration halo in a radius of up to 400m around the Beltana deposit and as a less intense halo for over a kilometre along strike. The zinc is harboured within the dolomite crystal matrix, while haematite is present as a fine grained dusting along cleavage planes and crystal boundaries, bestowing a pink to purple-red colouration on the dolomite. A broader dolomite alteration halo envelops the zone of haematite alteration, and persists for several kilometres away from the Beltana Deposit. Haematite alteration around Aroona is more restricted as a result of the lower reactivity of the early dolomite of the Woodendinna Dolomite

Structure: The key structural elements at Beltana are:

1. The N-S trending Beltana Fault; a faulted synclinal axis and probable graben structure in the western wall of the pit.
2. Low angle thrusts (20 to 45 degree dip) control the ore geometry. The deformed Callana Beds are overthrust onto the Cambrian sequence and form an impermeable hangingwall.
3. Vertical WNW trending structures truncate the ore and have provided a major fluid pathway (associated with Pb deposition).
4. A shallow south-east plunge to ore, alteration, brecciation and geochemical halo is evident.

The main controlling structure at Aroona is the 45-degree north dipping Aroona Fault and associated low angle thrust faults. Aroona sits 100m south of the regional NW Fault. The ore body is a cigar shaped, flat plunging body controlled by the intersection of favourable stratigraphy and the Aroona Fault.

Genesis: There has been much controversy over the origin of the mineralisation, with two past theories for the genesis of the willemite-rich ore:

1. Supergene enrichment of a sphalerite-galena MVT massive sulphide ore body (Muller 1972) and;
2. Epigenetic willemite related to sedimentary breccia (diapiric) intrusion (Grubb 1967).

The current model invokes structurally controlled epigenetic willemite mineralisation deposited during the Delamerian Orogeny in a palaeo-high. Precipitation of willemite and the surrounding haematite-Zn-dolomite alteration resulted from deep-seated saline oxidising acid ore solution permeating structures (lower temperature limit of 150°C). Mineralisation occurred in open spaces formed via hydrothermal corrosion and hydrothermal brecciation possibly aided by tectonic brecciation of the host limestone. The mineralising event was long-lived; multi-phase replacement, open-space filling and brecciation occurred. Coronadite was deposited late in the genesis along the controlling structures.

Willemite is largely preserved in the weathering profile, but is occasionally weathered to smithsonite or re-precipitated as willemite.

References:

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