LEAD / ZINC DEPOSITS IN THE KIMBERLEY

On 4 March 1999, the Society heard from Stuart Hall, who has worked as a geologist for 30 years in Africa and Australia and is now General Manager, Exploration, Western Metals Limited (WML). Western Metals Limited has existed in various names since 1986. In August 1994, when it was known just as Western Metals, $35,000,000 was raised through the issue of 70 million shares to purchase and develop the assets of BHP and Shell in the Lennard Shelf area of the West Kimberley. In August 1998, WML took over Aberfoyle, offering $3 per share in a bid valued at $300 million (debt and equity mix). This effectively doubled the size of the company and, hence, the spread of operations.

WML is one of the largest private employers in the Kimberley and, in particular, of people living in the Kimberley. Its Australian operations employ 850 people and, of the 420 employees in the Kimberley, approximately 50% live in Broome, Derby or Fitzroy Crossing. Ten per cent of the WML work force is female, about 6% is Aboriginal, and local contractors, e.g. CADENG (Broome) and Cockatoo Earthmoving, are also employed. The main commute is out of Broome and Derby. Staff work five days on and two off, miners work seven on and seven off, and the remainder work two weeks on and one week off. The wage bill for Lennard Shelf WML employees is approximately $16-18 million per year.

Stuart illustrated his talk with many excellent self-explanatory slides. One showed detail on the mining tenements in relation to the mining operations. In particular, it showed major faulting and the Devonian limestone in relation to the orebodies. There are nearly 100 kilometres of strike in the Devonian Limestones.

The Lennard Shelf geological feature extends some 400 kilometres east of Derby, although the company's operations are centred about 75 kilometres south-east of Fitzroy Crossing. Lennard Shelf carbonate orebodies typically occur in district clusters and produce clean, high grade concentrates which are in demand world-wide. Western Metals holds 2400 square kilometres of prospective ground in granted tenements on the Lennard Shelf. Historical and current ore resources and reserves are around 4,000,000 tonnes of contained metal. Approximately 20% or 800,000 tonnes of metal have been recovered since operations commenced in 1988.

The Lennard Shelf comprises the northern margin of the Canning Basin formed many years ago between the ancient blocks of the Kimberley and the Pilbara. Part of the northern margin is bounded by the Kimberley basement and to the south by the Fitzroy Trough (a sub-basin within the Canning), a major graben structure subject to subsidence and infill with 10 kilometres Palaeozoic sediment (Ordovician) - 450- 500 million years ago. In Devonian times, i.e. 350- 380 million years ago, coral reefs developed in the vast shallow sea on the margins of this

Basin and were lithified into the limestones much in evidence around Cadjebut today. These became the host rocks of the lead/zinc mineralisation that forms the mines of the Lennard Shelf.

The faults were also active in this period along the margins of the Basin. Major ones in the area are the Pinnacles fault with estimated throws of 4,000- 6,000 metres and the Cadjebut fault with throws of up to 500 metres. These formed the major conduits for the metal rich brines that were forced up the faults to find the porous brittle limestones particularly good hosts and very receptive to the deposition of the metal sulphides that form the basis of mineralisation.

Since the Cadjebut mine closed in 1997 (the Cadjebut mill remained operational), Goongewa and Kapok have become Western Metal's main sources of ore for the Cadjebut processing plant, averaging around 18,000 tonnes of ore per week, grading 8% zinc and 5% lead. The Goongewa orebody occurs as a series of irregularly shaped pods located between depths of 100 and 250 metres below the surface.

The ore is mined using a room and pillar open stoping method followed by open stoping to extract the pillars. Underground access to the mine is by decline and the ore, broken by drilling and blasting, is hauled to the surface using articulated trucks. The ore body at Kapok is much narrower (typically 2.5 metres) and mining is by sub-level uphole bench stoping. The ore is crushed underground and brought to the surface via a 2,800 metre long conveyor system.

The Cadjebut treatment plant operates at a capacity of 0.9 million tonnes per year, sourced equally from Goongewa and Kapok. In future, it will be fed by new mines to be established at Kapok East, Kapok West and Kutarta (located between Cadjebut and Goongewa). The plant combines crushing, primary and secondary ball milling, flotation and filtration. Recoveries are typically 95% for zinc and 87% for lead. Zinc concentrates grade 60- 62% zinc, and lead concentrates typically 75- 80% lead.

Pillara mine and plant: The new stand-alone 1.5 million tonne per year Pillara mine and processing plant opened in 1998. Located 60 kilometres west of Cadjebut, the Pillara orebody comprised two main mineralised fault structures dipping towards each other at around 60° and extending to a depth of around 700 metres. Orebody thickness varies from 2 to 20 metres, averaging around 5 metres. The host limestone rock is very competent and allows low cost bulk underground mining methods. In addition to the two main fault structures, parallel splay faults are developed which are also mineralised to ore grades.

Underground access to the mine is by decline and 50 tonne trucks haul ore to the surface. The mining method is sub-level uphole bench stoping, similar to Kapok.

The Pillara operation is already Western Metal's largest producing mine on the Lennard Shelf and will become bigger when it achieves full capacity this year.

The Pillara processing plant combines crushing and S.A.G. milling with conventional flotation, concentrate storage and loadout facilities. Metallurgical recoveries and concentrate grades are similar to Cadjebut. At full capacity, Pillara will produce 165,000 tonnes of zinc concentrate and 35,000 tonnes of lead concentrate per annum. Pillara will continue to mine ore for at least 10 years, taking WML into 2008.

In 1997, WML developed a unique barging operation at the Derby port. The Derby Export Facility incorporates a 20,000 tonne (currently being expanded to 40,000 tonne) concentrate storage shed and covered conveyor to load a specially designed 4,500 tonne barge. The barge uses the extraordinary 11 metre tides to transport the concentrates to ships waiting in the deep waters of King Sound. WML exports the bulk of its lead and zinc concentrates to smelters in Asia and the United States. Zinc is used mainly as a galvaniser and lead in batteries.

Stuart brought in, displayed and described four specimens of typical rocks found in the area and containing the precious metals, lead in galena, and zinc in sphalerite, a zinc sulphide. In fact, all the ores mined are sulphides. Other common minerals are marcasite = iron sulphide, same as pyrite, and calcite, calcium carbonate. There is also significant values of silver.

Overall, WML has plans for 10 years of mining. After the mining the area will be dehabilitated and the disturbed areas will be carefully revegetated. Stuart answered many questions put to him and was thanked in the usual way for a very interesting and well-presented talk.

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