

Chapter 14

MINING

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Chapter 14

MINING

Mining in Tasmania began on the Tasman Peninsula with 61 tonnes of coal produced by convicts from Port Arthur. The mine operated for 10 years before it was closed down when better quality coal was discovered elsewhere. In 1849 gold was found near Lefroy and three years later at Mangana near Fingal.

Tin oxide was first discovered near Mt Bischoff in 1871, silver-lead ore in the Zeehan-Dundas area in 1882, and the discovery of the Iron Blow ore outcrop in 1883 led to the opening of the Mt Lyell copper field. These and later discoveries led to the establishment of Tasmania's mining industry which has had a significant impact on the State's development and economy.

Recently, world prices for mineral producers have been generally depressed and unstable. However, there have been a number of notable developments which have occurred recently in Tasmania's mining industry.

Mining history in Tasmania was made on 10 April 1989 with the official opening of Aberfoyle's mine at Hellyer. The Hellyer operation employs 190 people and is expected to process one million tonnes of zinc-lead-silver ore per year. Its annual output will include 100 000 tonnes of bulk lead-zinc concentrate, 170 000 tonnes of zinc concentrate, 45 000 tonnes of lead concentrate and 10 000 tonnes of copper-silver concentrate.

Most of the production is destined for mainland Australia and overseas refineries except for a large proportion of zinc concentrate which will be processed at the Pasminco Metals-E Z company's Risdon plant.



Stockpiling at Hellyer.

Photo: Mercury

By the end of 1989 Spectrum Resources had almost finished developing an underground tin mine at the former open cut Anchor Mine, 22 kilometres north-west of St Helens.

This revitalised mine represents the most significant mineral development in north-eastern Tasmania in recent years. It is expected to produce 400 tonnes of high grade tin concentrate from 100 000 tonnes of ore, per year.

Development of the Renison Goldfields Henty prospect has continued. A decline to acquire bulk ore samples was extended by 555 metres and 6800 metres of exploratory drilling was completed during the year.

In October 1988 Savage River Mines was advised by its Japanese customers that they did not intend to renew their sales contracts for iron ore pellets. The company decided to wind-down operations over the next two years.

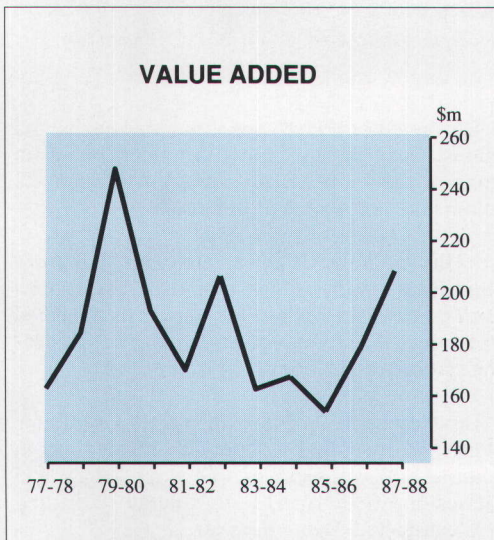
A feasibility study has since been undertaken to find out if the company could continue operating after September 1990 by reducing its scale of production.

Savage River Mines is actively seeking alternative markets. It is also costing the proposals to vary production levels. These actions could prolong the mine's life by approximately six years.

Renison, the largest Australian tin mine, reported a record production of 6940 tonnes of tin concentrate in 1988-89. However, tin prices remained depressed throughout most of the year and reduced the company's profitability.

Mt Lyell continued development work at its copper mine to extend the mine's life until 1994. Improvements in the price of copper assisted the company to a profitable year.

The Pasminco Metals-E Z company's Rosebery mine reported a lower than planned level of underground production. However, this was offset by an increase in the grade of ore extracted. The company continued an intensive mineral exploration program to locate new ore bodies to extend the life of its mines.



14.1 MINERAL PRODUCTION

The turnover of the mining industry in 1987-88 was \$457.4 million, two per cent more than in 1986-87. In the same period the industry's contribution to the Tasmanian economy (value added) increased by 17 per cent to \$208 million in 1987-88.

Employment in the mining industry continued to decrease in 1987-88. By the end of June 1988 there were 2771 persons employed, 4 per cent less than at June 1987. However, the wages and salaries paid in 1987-88 was \$102 million, 9 per cent more than in 1986-87.

14.1 SUMMARY OF OPERATIONS BY INDUSTRY SUBDIVISION, TASMANIA, 1987-88

Description	Employment at 30 June (no.)	Wages and salaries (\$m)	Turn-over (\$m)
Metallic minerals	2 496	96.0	420.2
Coal			
Construction materials	181	3.8	26.1
Other non-metallic minerals	94	2.2	11.1
Total -			
1987-88	2 771	102.0	457.4
1986-87	2 888	93.5	450.4
1985-86	3 098	92.3	389.5

14.1.1 Metallic Minerals

Aberfoyle Ltd commenced full scale production of lead, zinc, and silver concentrates at Hellyer in 1987-88.

There were significant increases in production of iron ore pellets by Savage River Mines and of lead-copper concentrate from the Rosebery mine.

14.2 PRODUCTION OF METALLIC MINERALS, TASMANIA, 1987-88

<i>Mineral</i>	<i>Unit</i>	<i>1986-87</i>	<i>1987-88</i>
Copper concentrate	'000 tonnes	92	84
Gold bullion	kg	431	145
Iron ore pellets	'000 tonnes	1 840	2 260
Iron oxide	'000 tonnes	n.p.	28
Lead concentrate	'000 tonnes	33	31
Lead-copper concentrate	'000 tonnes	29	33
Lead-zinc concentrate	'000 tonnes	-	53
Molybdenum concentrate	tonnes	25	19
Scheelite concentrate	tonnes	1 738	2 000
Tin	'000 tonnes	14	13
Zinc	'000 tonnes	153	152

14.1.2 Fuel Minerals (Coal)

Coal is the only fuel mineral mined in Tasmania. There are known deposits of coal throughout much of Tasmania but the most important are those located in the north-east in the Fingal and Mt Nicholas areas.

Most Tasmanian coal is produced from two collieries owned and operated by the Cornwall Coal Co. NL. These are the Duncan Colliery at Fingal and the Blackwood Colliery near St Marys. Both these mines produce coal by underground mining methods.

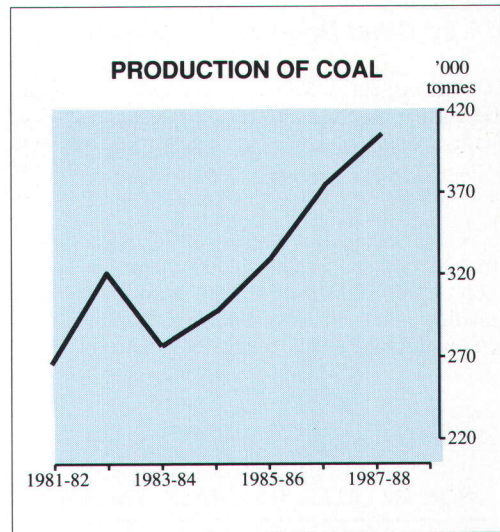
14.3 PRODUCTION OF COAL, TASMANIA

<i>Type</i>	<i>Unit</i>	<i>1986-87</i>	<i>1987-88</i>
Raw coal	'000 tonnes	623	581
Washed coal	'000 tonnes	375	405

A small quantity of coal is produced at the Merrywood Colliery, near Royal George, where pillars left by a former underground operation are now being extracted by open-cut mining.

The Tasmanian Coal Company has started initial development towards the opening of an open cut mine near Dublin Town on coal reserves defined several years ago by the Shell Company of Australia Ltd.

Potentially mineable reserves of both black and brown coal have been delineated in other parts of the State following an intensive exploration phase initiated by the possibility of a coal-fired power station several years ago.



All of the coal mined in Tasmania is used by local manufacturers requiring steam generation, such as the paper mills, the cement works and fish canneries. Tasmanian coal is quite satisfactory as a boiler fuel, but is unsuitable for export because of its relatively high ash content.

14.1.3 Construction Materials

The production of construction materials is basic to all building activity, and consequently affects most parts of the economy. Whilst

buildings, roads and most services depend on the availability of construction materials, control of costs depends on their being produced locally.

14.4 PRODUCTION OF CONSTRUCTION MATERIALS (a), TASMANIA, ('000 tonnes)

<i>Mineral</i>	1986-87	1987-88
Dimension stone	2	2
Crushed and broken stone	2 372	2 361
Gravel (b)	919	314
Sand	565	713
Other road material	46	(b) 745

(a) Excludes quantities quarried by Government or semi-government authorities (e.g. HEC, Department of Construction, etc.) but includes quantities quarried by local government authorities for road material. (b) Mainly decomposed rock for road material (reclassified as other road material from 1987-88).

14.1.4 Other Non-metallic Minerals

The quarrying of limestone for cement production is the earliest recorded mining activity for non-metallic minerals other than coal in Tasmania, and is currently at a near record level.

Silica occurs in a number of locations in Tasmania, both as a high quality quartzite and as deposits of silica sand. Large quantities of high quality silica are sought for production of silicon metal by Pioneer Silicon at Electra.

14.5 PRODUCTION OF OTHER NON-METALLIC MINERALS, TASMANIA

<i>Mineral</i>	<i>Unit</i>	1986-87	1987-88
Clays and shale-			
Brick	'000 tonnes	160	87
Other	'000 tonnes	73	73
Dolomite	'000 tonnes	11	11
Limestone (a)	'000 tonnes	752	826
Peat moss	'000 tonnes	-	1
Pebbles	'000 tonnes	1	-
Silica	'000 tonnes	45	78

(a) Excludes quantities used directly as a building or road material.

14.1.5 Value of Production

The value of minerals produced from Tasmanian mines in 1987-88 was \$382.6 million, 16 per cent more than in 1986-87.

The largest contribution to total production came from production of metallic minerals and coal (89 per cent).

14.6 VALUE OF MINERALS PRODUCED, TASMANIA, (\$m)

<i>Mineral</i>	1986-87	1987-88
Metallic minerals and coal	295.4	339.4
Construction materials	24.9	27.6
Other non-metallic minerals	8.8	15.6
Total	329.1	382.6

14.2 EXPLORATION

14.2.1 Mineral Exploration

The continuous diminution of ore bodies inherent in mining activity means that ongoing exploration is necessary, not only to establish new mines but also to maintain a skilled labour force and to extend the productive life of capital equipment. Recent events, including the opening of the Hellyer mine with its forecast 20 year life on the one hand and the closure of the Cleveland and Hercules mines on the other, illustrate the dynamism of the industry.

Although the more mineralised regions of the State, such as the Queenstown-Zeehan-Rosebery area in western Tasmania, have been extensively explored on the surface, much of Tasmania remains relatively unexplored and the search for 'blind' mineral deposits is still in its infancy.

Mineral exploration today is aimed primarily at discovering 'blind' ore bodies that are concealed either by superficial overburden or overlying rocks that have not been removed by erosion.

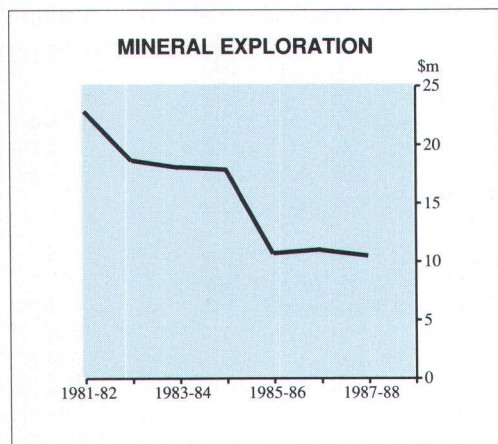
Modern mineral exploration programs demand a combination of many geological, geophysical and geochemical techniques and

applications and may take five, 10 or even 15 years to come to fruition. Only a very small proportion of mineral exploration programs are successful.

Expenditure on private mineral exploration peaked in 1981-82. Since that time exploration funding in the State has declined substantially.

Major exploration interests are centred on four main areas:

- The Mt Read Volcanics region from Elliott Bay to Que River, where there are excellent prospects for more zinc-lead-copper-gold-silver deposits;
- The Mt Bischoff - Savage River - Pieman River - Zeehan region, where prospects are high for tin, tungsten, lead, zinc, silver, gold, nickel, osmiridium, iron, copper, asbestos and chromium;
- The Hampshire - Sheffield region, where the attractions are tungsten, tin, zinc, lead, copper, silver, gold, iron and molybdenum and
- North-eastern Tasmania, bounded by Scamander - Avoca - Lefroy, which has long been prospected for gold, tin, tungsten, silver and lead.



14.2.2 Petroleum Exploration

Offshore

There was a very low level of exploration for petroleum in 1988-89. There were no new seismic surveys undertaken nor wells drilled and no new seismic surveys undertaken in this period.

During the year a marine geochemical 'sniffer' survey was conducted by Amoco and partners in the Bass Basin.

In April 1989 four Tasmanian offshore areas (three in the Bass Basin and one in the Sorell Basin) were made available for exploration tender.

Onshore

Conga Oil continued their exploration activities in Tasmania during 1988-89.

Chinese Tin Miners

In 1874, prior to the discovery of tin, the north-east of Tasmania was a sparsely populated region with only approximately 7000 people engaged mainly in agriculture. All the major tin deposits were discovered in the north-east between 1874-1877. Most of the early mines were small co-operative ventures employing the pick, shovel, barrow and sluice box method. This type of mining suited the Chinese as it required very little capital which enabled them to compete well with Europeans. Mine owners adopted the tribute system which involved letting their claims to miners who were paid a fixed price for the tin raised. The mines were let to the lowest bidder and the Chinese as well as being more co-operative were willing to take a lower price than European miners. By 1878 the Chinese were present in all major tin mining centres of the north-east with the exception of Derby, the richest tin mine in the region. In 1879 the Chinese presence on the tin fields was further consolidated when many European miners left the diggings for the more lucrative gold fields, the Chinese miners remained taking up ground on tribute and buying tin leases from the Europeans who wanted to leave. The price of tin began to fall in 1879 then increased again giving the Chinese good profits which enabled them to take up their own claims or to work for Chinese contributors or lease-holders. By 1882 there were more Chinese miners than European miners in all but two fields in the Ringarooma district. A feature of Chinese life was the joss house, a house of worship and many were built in the large Chinese communities, in the region. As tin mining dwindled so did the Chinese population. The last joss house, at Welborough was brought to the Queen Victoria Museum in Launceston in 1934 to save it from vandalism and to preserve an important part of Tasmania's mining history.

14.3 CREATION OF A MINE - THE HELLYER PROJECT

(The following section was prepared by Aberfoyle Ltd.)

The west coast of Tasmania is one of Australia's richest mining regions and the Hellyer project is helping to maintain that tradition. For more than a century, the harsh mountainous west coast of Tasmania has yielded a wealth of tin, gold, silver, lead, zinc, copper and iron. It is a tradition that dates back to 1871 when James 'The Philosopher' Smith discovered the world's richest tin deposit at Mt Bischoff. From this followed the discovery of some of the nation's best known orebodies - Mt Lyell, Renison Bell, Zeehan and Rosebery.

The same region of Tasmania also gave birth to Aberfoyle's Cleveland tin mine, Que River and Hellyer zinc-lead-silver mines.

The Que River - Hellyer area was first prospected for minerals in 1928 by Thomas McDonald who discovered the ore body at Rosebery.

Ten years later, the Tasmanian Government Geological Survey recommended drilling in the Que River - Hellyer area, but this was not done. Some limited exploration by successive property holders was undertaken over the following 30 years but the area was abandoned in 1968.

A year later, Aberfoyle Limited and Paranga Mining and Exploration Company Limited acquired a 190 sq. km exploration licence covering the Que River - Hellyer area which later became known as the Mackintosh Joint Venture.

Reconnaissance geological traverses and stream sediment sampling led to a drilling program which, in 1974, intersected zinc, lead and silver mineralisation. This marked the discovery of the Que River ore body. Underground exploration at Que River began in 1975 and production commenced in 1981.

Continued exploration of the region using a combination of geophysical and geochemical techniques and detailed electromagnetic surveys eventually identified a drilling target three kilometres from Que River which led to the discovery of the Hellyer ore body in 1983.

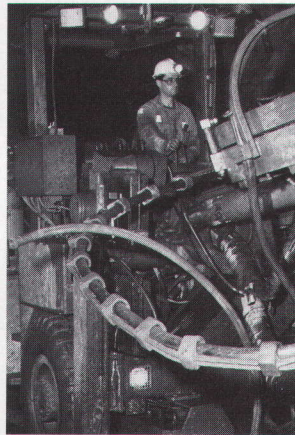
The orebody is 100 metres below the surface at its southern end, plunging to a depth of 500 metres at its northern end. It is a single irregular pod of ore extending 850 metres north-south and 150 metres east-west. Its average vertical thickness is 40 metres.

The large tonnage and high grade is exceptional for this type of mineral deposit. It is estimated at 16 million tonnes, containing 13 per cent zinc, 7 per cent lead, 0.5 per cent copper and 156 grams of silver per tonne. This is sufficient to maintain production through to early next century at a rate of one million tonnes a year.

Development

Like Que River, Hellyer is part of the highly mineralised Mt Read volcanic belt which runs down Western Tasmania. It is ranked as a world-class ore body.

The discovery of Hellyer in 1983 was followed by an intensive three-year program of exploratory drilling and development, and metallurgical testwork.

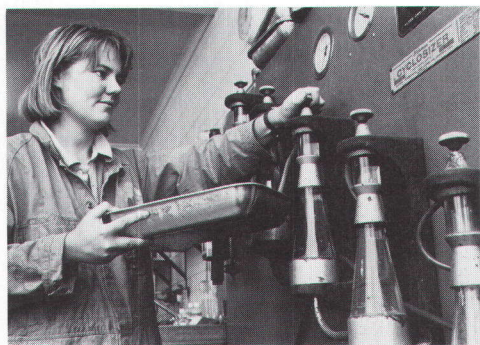


*Underground drilling at Hellyer.
Photo: Aberfoyle Ltd.*

The first tasks were to continue drilling to outline the size and metals content of the orebody and, by laboratory testwork on the drill cores, to gain an early indication of the technology likely to be needed for successful mining and processing in order to produce marketable products. This work continued throughout 1984. By the end of the year more than 21 000 metres of diamond drilling had been accomplished and a broad program of metallurgical testing was showing results.

The Hellyer orebody was very large and promised high grades of zinc, lead and silver. Testing of the core indicated good rock strengths which would permit safe and low cost mining methods to be used.

However, when laboratory metallurgical testwork commenced the complexity of the ore revealed itself. It was a very fine grained and intimately interwoven mixture of the various minerals which contained the metals. To separate them and economically produce marketable concentrates was not going to be easy. Work continued at Aberfoyle's laboratories at Burnie in Tasmania, at the CSIRO's Institute of Energy and Earth Resources and at other Australian and overseas laboratories.



*Cyclosizing samples at the Hellyer concentrator.
Photo: Aberfoyle Ltd.*

By late 1984, much progress had been made and the next significant step was taken. It was decided to drive a 1.1 km adit, or tunnel, to reach the orebody some 300 metres below the surface and then to drive tunnels within the orebody for further exploration and to provide ore for pilot plant trials.

The adit was driven from the Southwell River valley and reached the ore zone in April 1986. While it was being driven, Aberfoyle's tin operations at the Cleveland mine, 50 kilometres away, were closed down and the Cleveland mill was converted to a large-scale pilot plant for Hellyer ore.

As it would take two years to design and construct a mill and to develop the mine for large-scale production Aberfoyle decided to expand the pilot plant immediately to full-scale commercial production. Whilst this generated revenue, it also provided valuable experience in the start-up of a large operation.

Construction of the concentrator at Hellyer was begun in January 1988. Associated facilities constructed during 1988 included a tailings storage, water and power supplies, roads from the mine to the mill and a new 12 kilometre rail spur of the Emu Bay rail line which now carries the concentrates to the port of Burnie for shipment.

Much of Hellyer's initial mine equipment fleet comprised items transferred from the company's other mines. Modern hydraulic rock drilling equipment, high capacity diesel load-haul-dump units and 50 tonne capacity diesel trucks have been added to achieve high productivity and low mining costs.

Operating The Mine

The orebody is divided up into a series of stopes from which the ore will be mined initially. The stopes are separated by pillars which will be extracted after mining of the adjacent stopes had been completed. Stopes are usually mined progressively until exhausted and then the pillars are mass blasted in a single blast into the open stope. At any one time, ore is extracted from a number of different stopes which permits it to be blended, ensuring continuity in grade and quality.

The ore is trucked along the adit and then to the treatment plant. The ore treatment plant, located on the plateau above the orebody, operates continuously producing zinc, lead, bulk lead-zinc and copper-silver concentrates.



*A Hellyer mining trainee makes the work face safe.
Photo: Aberfoyle Ltd.*

The production process requires very fine grinding followed by four stages of flotation. This is achieved with high capacity equipment including large but conventional primary and

secondary grinding mills, Tower Mills for regrinding and large automated pressure filters.

The concentrates are transported from Hellyer to the coastal port of Burnie by the Emu Bay Railway.

A large proportion of the zinc concentrate produced at Hellyer is sold to the Risdon smelter near Hobart. The remaining concentrates are sold to other smelters in Australia, Europe, Japan and South Korea.

Mining normally takes place five days a week around the clock in three shifts with milling operating on a continuous seven days a week basis.

Environmental Concerns

Aberfoyle and the Tasmanian Department of the Environment have worked closely to ensure that as little as possible of the natural environment will be disturbed and that the impact on the surrounding environment will be acceptable.

In keeping with these aims all mining and construction work has been carried out to plans which have specified which areas can be used and the rehabilitation and revegetation which must follow.

The mill tailings, the main waste product, are impounded behind a dam. Water flowing from the tailings dam is filtered over specially constructed wetlands before joining the natural river system.

These wetlands make use of the ability of certain species of grasses and mosses to absorb the minute quantities of impurities in the water so that when the water joins the natural river system it meets the required environmental standards.

Summary

Hellyer represents a major new development for the Australian mining industry and is also the largest project undertaken by Aberfoyle in its 66-year history.

From one million tonnes of ore each year the mine produces an average of 100 000 tonnes of

bulk lead/zinc concentrate, 170 000 tonnes of zinc concentrate, 45 000 tonnes of lead concentrate, and 10 000 tonnes of copper/silver concentrate.

The mine provides direct employment for 190 people. Many additional jobs have also been created in other enterprises providing goods and services to the Hellyer project.

The development of Hellyer from a drill hole to a major mining and treatment operation was achieved in less than six years and involved a total investment by Aberfoyle of \$157 million.

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