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DEPARTMENT OF MINES
SOUTH AUSTRALIA

SUMMARY
OF
KNOWN IRON ORE DEPOSITS
IN
SOUTH AUSTRALIA
outside the Middleback Ranges

The accompanying resume of current knowledge of Iron Ore Deposits in South Australia has been prepared from departmental files for general distribution. The survey specifically excludes the Middleback Ranges where The Broken Hill Proprietary Company Limited has sole rights.

The report is in two parts. The first gives references, summarises geology and metallurgical results and tabulates reserves for five groups of deposits which because of tonnage, grade or location appear significant.

The second part, for assumed annual productions of 200,000 - 500,000 tons, estimates mining and transportation costs for each deposit based on current Australian costs. It is possible that lower rail freight rates may be secured for continuous bulk ore transport. Port Adelaide and Port Pirie, because of their facilities, are assumed to be the exporting ports.

Additional more detailed information is available from departmental files and the S.A. Department of Mines actively assists investigation of such deposits. Small bulk samples can be made available immediately from the Mt. Christie, Wilgena Hill and Razorback Ridge deposits.

December, 1960.

NAME: MT. CHRISTIE DISTRICT

(5-20 M tons averaging 45% + Fe)

LOCATION: 30 miles, north and northwest of Malbooma, East West Railway.

ACCESS: Malbooma is 337 miles by Standard gauge rail from Port Pirie.

REFERENCE: (i) "Geological Reconnaissance of The Tarcoola Four-Mile Sheet and Eleven Adjoining One-Mile Sheets", Whitten, G.F., 1960. Unpublished Geological Survey Branch Report (50/162), S.A. Dept. of Mines.

(ii) "Iron Ore near Mt. Christie", A.R. Crawford, "Mining Review" 104, 1957.

TITLE: Minerals reserved to Crown.

GEOLOGY: Archaean iron formations of the Lake Superior Type occur in a predominantly igneous terrane. The jaspilites average 45% + iron varying from 34% to 60%. The iron was precipitated as 2-10 micron flakes of hematite or goethite, less frequently as magnetite, the whole being recrystallised as magnetite during dynamic metamorphism. Grain size now varies from 100 microns in the Muckanippie Group to 350 microns in the West Well Group and 350-500 microns in the Mt. Christie Group.

The beds vary from 10' to perhaps 100' in thickness over strike lengths of 100-2000'. The outcrops occur as low (100' high) hills in plain country.

WORKINGS: Nil.

TESTING: Detailed geological mapping and geophysical surveys are proposed to evaluate the deposits and to search for extensions. Surface sampling for preliminary metallurgical work has been carried out at Mt. Christie itself. Diamond drilling to prove ore in

depth and to provide subsurface metallurgical samples is proposed for early in 1961.

METALLURGY: Surface weathering has partly converted the 100-500 micron magnetite to martite and minor limonite.

Preliminary tests on surface samples of Mt. Christie ore at 18-20 mesh suggest good recoveries by dry magnetic methods with a concentrate grade of 60-65% iron. Spirals have produced higher grade concentrates but the limonite present in surface samples shows a tendency to slime. The amount of limonite is expected to decrease with depth while the amount of magnetite may increase. Water supply requires investigation.

RESERVES } Mt. Christie Group: 2-5 million tons above plain level at 56% Fe.

GRADE } West Well Group: ?2-5 million tons above plain level at 45% Fe(?).

Muckanippie Group: 2-10 Million tons above plain level at 50% Fe(?).

Total - 5-10 million tons with a possible maximum of 10-20 million tons.

REMARKS: Refer also Wilgena Hill in the same general area.

PLAN: Locality 1.

NAME: WILGENA HILL
(60 M tons, 40% Fe)

LOCATION: 2 miles north of East West Railway and 8 miles east of Tarcoola.

ACCESS: Tarcoola is 314 miles by Standard gauge rail from Port Pirie.

REFERENCE: "Geological Reconnaissance of the Tarcoola Four-Mile Sheet and Eleven Adjoining One-Mile Sheets", Whitten G.F., 1960, Unpublished Geological Survey Branch Report (50/162), S.A. Dept. of Mines.

TITLE: Minerals reserved to Crown.

GEOLOGY: Archaean iron ore formation of the Lake Superior type. The deposit consists of one large hill of jaspilite (4000' NW-SE by 1000' SW-NE by 200-300' high) and three smaller ones (maximum, 1000' by 500' by 200'). The jaspilite consists of ¼" to 1" (usually ¼" to ½") bands of red jasper separated by similar sized bands of martite after magnetite. The jaspilite beds are 5-80' wide (usually 20-40') separated by (10-200') (usually 30-50') bands of limonite stained quartzite. One quarter to one third of the hill is jaspilite.

WORKINGS: Nil

TESTING: Surface sampling (7 tons) for metallurgical testing only. In addition 5000' of grab sampling for grade.

METALLURGY: The major constituents quartz, hematite and magnetite occur in the 5-30 micron size range. On a surface sample assaying 43.4% Fe anionic flotation recovered 83% Fe at 56% grade and 60% Fe at 60% grade. Cationic flotation gave comparable results with cleaner and faster flotation.

RESERVES
GRADE } Approx. 5000' of preliminary surface sampling indicates a grade of 40-41% iron and 41-42% insolubles. Tonnage is estimated at 60 Million tons above plain level.

REMARKS: Development of this Deposit logically would follow development of the smaller higher grade and coarser grained deposits near Mt. Christie.

PLAN: Locality 2.

NAME: RAZORBACK RIDGE

(200 M tons at 28-30% Fe).

LOCATION: 30 miles south of Yunta, Broken Hill Line.

ACCESS: Yunta is 136 miles by 3'6" gauge railway from Port Pirie.

REFERENCE: (i) S.A. Dept. of Mines, Geological Atlas, 1 Mile Series, Manunda Sheet.

(ii) "Beneficiation of Low Grade Iron Ores, Braemar Ironstone (Surface Samples)", Weir & Hosking, 1959. Unpublished Research and Development Branch, Report RD 97, S. A. Dept. of Mines.

(iii) "Low Grade Iron Ores, Braemar Ironstone, (Diamond Drill Samples)," Weir & Hosking 1960. Unpublished Australian Mineral Development Laboratories Report to S.A. Dept. of Mines.

TITLE: Minerals reserved to Crown.

GEOLOGY: Proterozoic glacial sediments contain hematite and magnetite siltstones (banded iron formation) and hematite and magnetite tillite (tillitic iron formation) formed by chemical deposition of magnetite euhedra in a finer grained hematite ground mass. This is contaminated by fine clastic material. The tillitic iron formation also includes erratics in varying proportions and bedding is not visible. These rocks are part of the Braemar Iron Formation which occurs at the one horizon in various parts of the Olary Province. The major known deposit is Razorback Ridge, where beds dipping 40° aggregate up to 500' in thickness over a length of up to 12,000'. The outcrop is 200-300' above plain level with no overburden problems.

WORKINGS: Nil

TESTING: The Deposit has been mapped at a scale of 400' to 1 inch. Following surface sampling for preliminary

metallurgical work, three diamond drill holes aggregating 633' have recovered material for metallurgical testing. The exposure is such that testing to confirm tonnage is not required while grade is related directly to ore type which has been mapped in outcrop.

METALLURGY: The magnetite is present as euhedra at 40 microns grain size while the hematite is present at 1-10 microns.

Magnetic, electrostatic and flotation methods have been tried as well as direct reduction. Magnetic separation on a feed where hematite has been converted to magnetite recovered 90% of the iron from banded iron formation (Grade 37.6% Fe) in a concentrate containing approximately 51% iron. The tillitic ore with the same treatment gave 67% recovery at a concentrate grade of 41% Fe from a feed averaging 27% iron. Preliminary direct reduction work has been encouraging but further investigation is required to coalesce small iron grains into larger grains capable of being recovered economically by a subsequent concentration process.

RESERVES: 100 million tons above plain level plus 35 million tons per 100' below plain level. Smaller additional tonnages are available in the district.

GRADE:		
	Banded iron formation	35-40% Fe
	Tillitic iron formation	25-30% Fe
	Average iron possibly	28-30% Fe.

PLAN: Locality 3.

OLARY PROVINCE IRON OCCURRENCES (Plan Locality 4)

The following deposits occur astride the Broken Hill Railway line in the Radium Hill area. Radium Hill is 191 rail miles from Port Pirie, 3'6" gauge.

While individually not large these deposits may be capable of being worked as a group. In addition, a number of deposits of banded hematite-magnetite siltstones of Braemar type occur in the area and simple quarrying operations could produce additional small tonnages of say 40% ore which also could be treated at a central plant.

(1) CUTANA AREA (Grants, Cutana and Alberts Quarries)

LOCATION: 10 miles S. of Mingary railway siding and 6-10 miles NE of Radium Hill.

REFERENCE: Geol. Survey S. Aust. Bull. 9 (R.L. Jack), 1922, pages 61-67.

TITLE: Minerals reserved to Crown.

GEOLOGY: Numerous small quarries worked pisolitic and earthy limonites capping Proterozoic hematite sandstones.

DEVELOPMENT / PRODUCTION: Operated about 1892 to provide flux for smelters at Broken Hill.

RESERVES / GRADE: Estimated by Jack as approx. 1,000,000 tons averaging 45% Fe ranging from 36.6% Fe to 59.8% Fe.

(2) BILLEROO IRONSTONE DEPOSIT

LOCATION: 12 miles NNE of Plumbago Homestead and 35 miles NW of Olary Railway Station and 50 miles NW of Radium Hill.

REFERENCE: Geol. Survey S. Aust. Bull. 9 (R.L. Jack), 1922, pages 59-61.

TITLE: Minerals reserved to crown.

GEOLOGY: Of Archaean age, three ridges of banded magnetite-hematite rock could possibly provide 400,000 tons of 50% Fe Ore to 100' below plain level.

(3) KOOLKA AREA

LOCATION: 6 miles N of Bimbowrie Homestead and 29 miles NNW of Olary Railway Station.

REFERENCE: Geol. Survey S. Aust. Bull. 9 (R.L. Jack) 1922, page 67-69.

TITLE: Minerals reserved to Crown.

GEOLOGY: Of Archaean age, two pinnacles of magnetite and hematite are capable of yielding 70,000 tons of 66% Fe ore above plain level.

NAME: MALCOLM CREEK DEPOSITS

LOCATION: Sec. 32, Hd. Para Wirra; 4½ miles south of Williamstown.

ACCESS: The Deposit is approx. 30 road miles from Port Adelaide.

REFERENCES: Plan 53-39, S 746.

TITLE: Mineral rights vested in the owner.

GEOLOGY: The deposit is a sedimentary concentration of hematite in basal beds of the Proterozoic Aldgate sandstone. The bed averages 50' in thickness and dips 50° East. Best outcrop is 1500' in length rising to 100' above creek level. Discontinuous outcrops occur southerly over a distance of one mile.

WORKINGS: Nil

TESTING: Mapping of Sec. 32 at 80' to one inch.
Preliminary surface sampling.

RESERVES } In Sec. 32,- 450,000 tons above creek level
GRADE } averaging 55-56% Fe

Southerly, possibly 2 M tons per 100' vertical depth over a mile averaging 40% Fe

REMARKS: This deposit is on the edge of the South Para Reservoir.

PLAN: Locality 5.

SOUTH AUSTRALIA IRON ORE DEPOSITS

MINING AND TRANSPORTATION COSTS

Based on an annual output range of 200,000 to 500,000 tons, current Australian mining and crushing costs, inclusive of overhead charges, would be within the range 2/6 to 5/- per ton. Overburden removal would approximate 1/6 per cubic yard.

Current South Australian Railways (Government operated) freight charges for full trainloads of bulk mineral material are 3.9 pence per ton mile. It is possible that a lower rate may be secured for continuous bulk ore freight trains.

Commonwealth Railways freight rate on ore from Malbooma to Pt. Pirie, a distance of 337 miles would be 56/9 per ton, i.e. a rate of 2.0d. per ton mile.

MOUNT CHRISTIE - WILGENA HILL DEPOSITS

The iron ore deposits in this district are remotely located 320 to 360 miles by rail from Port Pirie the nearest deep water shipping port.

All of the separate deposits are amenable to open cut mining, but some overburden removal would be necessary, ranging from a ratio of 1 to 1 up to 1 to 3 as the orebody was mined in depth below plain level.

Ore beneficiation would be necessary. Metallurgical investigations, still in progress, are not sufficiently advanced to form an estimate of cost at this stage.

Mining costs are likely to be within the range 4/- to 8/- per ton depending upon the topography of the deposit and amount of overburden removal necessary.

Rail freight to Pt. Pirie would approximate 2.0d. per ton mile.

RAZORBACK RIDGE (BRAEMAR) IRON ORE DEPOSIT

This deposit is remotely located 166 miles from Pt. Pirie and 30 miles from the nearest railway station at Yunta.

The deposit stands in elevation from 150 to 300 feet above the surrounding plain, and is readily amenable to quarry

benching on large scale, without the necessity for overburden removal. Mining cost could be as low as 2/6 per ton.

Ore beneficiation would be necessary. Metallurgical investigations, still in progress, are not sufficiently advanced to form an estimate of cost at this stage.

Rail freight to Pt. Pirie on State Government Railways would approximate 55/- per ton at 4.0d. per ton mile.

OLARY PROVINCE IRON ORE DEPOSITS

There are a number of small medium to high grade deposits in this district amenable to open cut mining which could be worked collectively.

The deposits are a mean rail distance of 210 miles from Pt. Pirie and at a mining cost of 5/- per ton could be delivered at approximately £3. 15. 0. per ton to Pt. Pirie.

WILLIAMSTOWN IRON ORE DEPOSIT

This deposit is situated ten miles from rail connection, which in turn is 30 miles from Pt. Adelaide, to which transport cost would be of the order of 14/- per ton.

The deposit is amenable to open cut mining and costs should be low as the material is soft. Overburden removal in the ratio 1 to 1 would be necessary. Mining cost is visualized as 5/- per ton or less.