IRON ORE DEPOSITS OF TASMANIA

The following account represents an epitome of Mineral Resources No. 6. (at present out of print) which was written in 1919 by W.H. Twelvetrees then Government Geologist and A. McIntosh Reid then Assistant Government Geologist.

1. Iron Ore in the Beaconsfield District

Deposits of brown hematite and magnetic iron oxide have long been known to exist in the vicinity of Beaconsfield, namely, at Mt. Vulcan, Scotts Hill, Barnes Hill on Andersons Creek and on Brandy Creek as well as at the Sugar Loaf. Some of these have been worked in the past, to a small extent, as far back as 1876.

(a) Mt. Vulcan and Scotts Hill

The whole width of the belt of red soil which indicates the iron formation is about 1500 feet. At the foot of the northern slope of Mt. Vulcan is a quarry, which has been cut into the hill for a little over a chain, showing a face 170 feet in length. A chain and a half east of this is a smaller quarry in the same formation.

The slopes of the hills, as well as most of the country between them, are strewn with red hill drift consisting of brown hematite and magnetite. The drift passes downwards into layers of soft earthy hematite, sometimes hard and cellular, or partially crystallised and nodular, and into serpentine clay, the whole resting ultimately on solid serpentine, which may in places be bedrock, in others wall rock. Pieces of crystallised columnar magnetite are found in the red ocherous drift, and veins of the same material exist in the serpentine. The top of the hills show large boulders of iron ore lying upon and embedded in the ocherous clay and drift. This is a common feature of all the deposits, and the boulders are no doubt concretionary, and are exposed to the denudation of the surrounding soil.

The summit of Mt. Vulcan is 200 feet above creek level. As regards the persistence of the ore in depth down to the level of the creek, the old bores are really the only data which can be produced.

The register of No.1 or Scotts Bore, which was put down 176 feet is as follows,-

(see next page)

	ft.	ins.
Ironstone	24	0
Hematite	6	6
Ironstone	5	6
Heavey black sand, mostly iron	4	0
Soft ironstone	2	0
Heavy hard ironstone	2	6
Brown Hematite	7	6
Decomposed serpentine	30	6
Hard serpentine	5	6
Serpentine mixed with asbestos	6	6
Serpentine and asbestos with magnetite	2	0
Very hard serpentine and asbestos	2	6
Very hard serpentine	1	6
Very hard serpentine with magnetic veins	9	0
Ironstone	5	6
Greenstone	14	0
Serpentine with asbestos	13	0
Serpentine with asbestos and iron ore	9	0
Iron ore	0	2
Serpentine with veins of magnetite	16	4
Iron ore, very hard, dense and pure	6	5
Serpentine with asbestos	1	6
Serpentine	2	1
Total (feet)	178	0

This bore supports the view that the brown iron ore body consists of a mantle about 50 feet in thickness, lying at that depth on serpentine rock veined with magnetite, from which it has been derived by decomposition. It is highly probable that the mantle of iron ore is not more than 50 or 60 feet thick, in which case a generous estimate of the Mt. Vulcan deposits would not exceed half a million tons. The same quantity possibly exists on Scotts Hill so it is likely that nearly one million tons of ore cover these two hills.

Samples submitted to W.D. Reid at the Geological Survey Laboratory, Launceston, in 1919 for assay, resulted in the following:-

	Mt. Vulcan (Cemented material) per cent	Mt. Vulcan (lode material) per cent	Scotts Hill per cent
Iron	54.2	40.1	56.3
Alumina	6.93	19.22	5.87
Silica	3.30	7.60	2.96
Chrome oxide	2.53	2.71	1.80
Sulphur	0.16	0.09	0.12
Phosphorus	trace	trace	trace
Loss on Ignition	9.80	13.30	8.60

An analyses of the Mt. Vulcan pig iron was made by Mr. E. Riley, London, who was considered one of the best authorities on iron in England at that time (1877). The figures were as under:-

	per cent	percent
Carbon	4.200	3.270
Silicum	.976	.124
Sulphur	.207	.563
Phosphorus	.055	.054
Iron	88.343	91.362
Chromium	6.287	4.143
Manganese	Nil	Nil
Copper	Traces	Traces
	100.068	99.515

At present the only section leased is 7707/M, 20 acres held by the Serpentine Paint Company Ltd. covering Scotts Hill.

(b) Barnes Hill

This hill is about 1½ miles south east from Mt. Vulcan and ½ mile east of Andersons Creek. The nature of the occurrence is similar to that at Mt. Vulcan. There are no proper data available for estimating the thickness of the mantle of ore, and in the absence of these it will be best to refrain from attempts to calculate tonnages.

The ore is chromium-bearing , as will be gathered from the following analyses:-

	Per cent	Per cent
Iron	50.54	47.80
Silica	6.50	3.80
Sulphur	0.14	0.11
Phosphorous	Traces	Traces
Chromium Oxide	6.90	4.25
Alumina	4.00	11.88
Loss on ignition	8.70	11.81

Judging from the fine body of iron ore on this hill the magnetite whence it was derived must be unusually numerous, but to what extent they are developed can only be ascertained when the works bottom on the serpentine.

(c) Sugar Loaf

Two miles south east of the Barnes Hill deposit is the Blue Peaked Hill, or Sugar Loaf where there is a well-known lode of brown hematite which was worked by the Ilfracombe Iron Company in 1872-3. The lode course up the hill in a direction N30°E, and the outcrop shows some very large masses and boulders protruding through the

rather dense scrub. The latter prevents the actual width of the lode from being ascertained on an ordinary visit of inspection. Mr. Gould who reported on it is 1866, estimated the horizontal length of the outcrop as 286 yards, and its average width 66 feet. He calculated the tonnage above water level as 705,800 tons, or, deducting half for inferior quality, a net quantity of 350,000 tons of rich ore. The average quality of the ore over a large portion of the lode he estimated as being from 55 to 60 per cent. The quality deteriorates towards the upper end of the outcrop, and the lode also seems to be breaking up in that direction. The country rock being sandstone and grits the ore is, as might be expected, free from chromium. The Government Assayer's report of assay of samples is as follows:-

	per cent.
Ferric oxide	78.84 - Iron 55.2%
Alumina	3.28
Silica	6.20
Chromic oxide	Nil
Sulphur	0.08
Phosphorous	Trace
Loss on ignition	11.40
	100.80

2. Dial Range and Penguin Creek

(a) Dial Range

This iron ore outcrop is situated high up on the steep western flank of the Dial Range, within a couple of hundred feet of the crest, towards the south end of the range, and about 6 miles from the sea coast at Penguin. The orebody consists of red hematite (ferric oxide), non magnetic, and appears to be a replacement of the conglomerate bedded rock. It has a linear direction extending north and south, and showing outcrops at intervals. Its surface has not been exposed sufficiently to admit of accurate measurements of its width. A good deal of it seems to be 3 or 4 chains wide, but in places its width may be greater, as ferruginous soil is noticeable for several hundred feet. Numerous boulders show ore of variable quality, some of it very massive and good, but mixed with other stone of lower grade. In places boulders of dense hematite appear, showing occasionally specular iron ore. The ore will break in mining into good lump ore suitable for the furnaces, and the usual deleterious ingredients of many iron ores are distinctly low. The proportion of phosphorus on the whole does not exceed the Bessemar limit, and the sulphur percentage is quite low. Owing, however, to the orebody being the result of replacement of conglomerate, which has taken place to a variable extent throughout the ore-belt, some of it showing a complete substitution while in other parts the substitution is only partial, the relative proportions of iron oxide and silica vary irregularly. The result is that the grade is

far from uniform throughout the formation, and if any of the imperfectly transmuted stone is included in sampling, the silica percentage is at once augmented and the iron percentage diminished.

General samples taken indifferently from all parts of the formation have been assayed by Mr. W.D. Reid, Govt. Assayer, as follows:-

Iron per cent	Silica per cent	Phosphorus per cent	Sulphur per cent	Mixture at 110°C per cent
50.86	23.40	0.05	0.095	0.15
63.84	8.60	0.08	0.03	0.02
54.50	19.20	0.001	0.085	0.12

As regards the quantities available for the furnace, no commercial calculations can be made until the actual width of the formation is ascertained, and the whole length exposed by clearing off the scrub from the surface and testing the outcrop all along by means of trenches and pits. Even then its behaviour in depth will be only imperfectly known.

(b) Penguin Creek Deposits

Along the course of the Penguin Creek, at about 3 miles from its mouth, a good deal of hematite ore is found in the stratified Silurian Quartzite or sandstone and slate west and north west of Dial Range. Samples taken showed a remarkably pure ore. They were assayed by Mr. W.D.Reid, Govt. Assayer, as follows:-

	per cent	percent
Iron	67.71	65.24
Silica	2.20	1.90
Sulphur	0.025	0.098
Phosphorus	0.026	0.03
Moisture at 110°C	0.13	0.13

Worked deposits extend for 1¼ miles along the creek in the form of replacement bodies or ore and boulders and nodules in a less pure soft ferruginous matrix extending from creek-level up to the surface of the basaltic table-land. The boulders sometimes attain a great size, some having been found weighing as much as 25 tons.

The value of the deposit seems to consist in its capacity as an adjunct to the Dial Range enterprise.

(c) Iron Cliffs Lode

This is a huge outcrop of brown hematite, about 150 feet in width, ½ a mile south-east of the Penguin Creek deposit. It is evidently a lode formation, and the hydrated oxide, which forms the part of the lode now accessible, is most probably the result of oxidation of

some metallic sulphide. As a brown iron ore its grade and quality are good. Samples from portion of the outcrop assayed by Mr. W.F. Ward, Govt. Analyst, yielded:-

	Per cent	Percent
Iron	48.0	57.0
Silica	18.4	7.2
Sulphur	0.15	Traces
Phosphorus	Traces	Traces

The whole of these deposits are capable of forming valuable auxiliaries to the Dial Range proposition.

The Iron Cliff lode is covered by section 9545/M, 54 acres in the names of W.J. and A.J. Ellis.

3. <u>The Blythe River Ore Deposit</u>

The Blythe River has at between 6 and 7 miles from its mouth at Heybridge intersected this large lode of hematite ore, excavating its channel and exposing the intersected lode down to over 600 feet below the general level of the table-land. Its bearing is N27°E and S27°W for an observed distance of fully one mile, and signs of its continuation are visible for a further distance. The outcrop dips at a high angle to the south east, and the lode appears to be conformable both instrike and dip with the enclosing sedimentary strata. The width of the lode north of the river and at different horizons varies a good deal. At the river itself it is not more than 30 feet wide, while higher up and some chains north of the river the width of the outcrop is 50 feet, and north of O'Keef's quarry the solid ore at surface at different points measures from 80 to 100 feet across, wideat at the northern end. On the south side of the river the lode occurs as lenses showing in the form of large crags, not always on the same line, and separated by areas of intervening country rock. The base of the lowest crag is between 140 and 150 feet wide. At the top of the crag a trench exposes the ore and ore ground for 4 chains. Speaking generally, there is, so much siliceous lode material and iron stained country rock on the south side of the river that a good deal of work is necessary in order to ascertain the boundaries and actual average quality of the orebodies.

The estimates of quantity which have been made by various observers at different times must be regarded as subject to the limitations which invariably attach to the consideration of imperfectly tested properties. They are as follows:-

1894 Mr. A. Montgomery, 30,000,000 tons gross.

1900 Mr. J.H. Darby, 24,500,000 tons net

1901 Mr. W.H. Twelvetrees from 17,000,000 to 23,000,000 tons net.

The estimate of 17,000,000 tons marketable ore made by Mr. W.H. Twelvetrees was based on a horizontal lode length of 90 chains, and average widths and height above river level for separate sections deducting 50%

for waste rock. Taking the lode length as a mile, and the width as 100 feet, nearly the same result is obtained.

Samples of good hematite exposed at different parts of the lode were assayed by Mr. W.D. Reid, Govt. Assayer, with the following results:-

	Northern Samples	South of River	River Band South Sides
	per cent	per cent	per cent
Iron	66.10	69.00	64.36
Silica	5.20	1.20	6.20
Sulphur	0.063	0.057	0.07
Phosphorus	0.007	0.02	0.002
Moisture at 110°C	0.12	0.14	0.08

4. Long Plains Iron Ore Field

(a) Rio Tinto deposits

This portion of the field lies 25 miles by road south westward from Waratah, and 20 miles from the port of Corinna, on the Pieman River. This magnetite ore-field is the largest in Tas. It consists of a number of enormous disconnected lenticular masses, extending almost continuously for 3 miles with other lenses at long intervals. The ore consists chiefly of magnetite, and subordinately of hematite. Associated with some of the deposits are small quantities of pyrite, pyrrhotite, chalcopyrite and ores of nickel and cobalt; with also a little gold and silver. The length of the largest lens is 2000 feet, and the width about 100 feet. Others extend along the strike 1500 feet, for over 400 feet along the dip, and are from 40 to 60 feet thick.

The ore, as a rule, is fairly coarse grained, very compact and hard. In the massive portions of the orebodies magnetite commonly occurs in perfectly formed rhombic dodecahedra, and, rarely in octohedra. Towards the centre of the deposits the ore presents an extremely dense crystalline appearance. At many points, as in the outcrops, however, alteration to hematite and limonite has taken place. The area in which the oreboby is contained is held under lease by Hoskin's Iron and Steel Co. Ltd. and comprises 7 sections in all.

The composition of the ore may be gathered from the following analyses made by Mr. W.D. Reid, Govt. Assayer, in the Geological Survey Laboratory:-

	Iron	Silica	Phosphoric Acid
	per cent	per cent	per cent
Hematite	63.4	0.40	0.04
Magnetite	69.31	0.38	Trace

Under working conditions it is considered that the average grade will not exceed 65% iron. There is sufficient information available to serve as a basis for safe calculation of quantities. It is probably that the quantities given below are much too small for the estimates are based on a vertical extent of only 300 feet; and care has been exercised in restricting the superficial dimensions to the outlines of the unbroken orebodies.

The large quantity of float ore strewn over the surface, therefore has not been taken into the consideration of the available supplies. In the following statement no account has been taken of the quantities available from those deposits containing pyrite orebodies. Under these conditions the probable high grade ore amounts to 20,500,000 tons.

(b) Rocky River Deposits

At the Rocky River Mine, situated in the angle formed by the junction of the Whyte and Rocky Rivers, and about 10 miles south of the Rio Tinto, extensive underground bearing magnetite workings have been made into large copper bearing magnetite deposits contained in the southern portion of the igneous schist belt. The orebody outcrops on the ridge of a high hill in a series of large lenticular masses of magnetite iron, and appears to be of remarkable purity. It has been developed for its copper-gold content by an adit sent in from river bank for 800 feet in direction 12 degrees east of south. From the adit several crosscuts have been sent in at intervals to determine the extent and nature of the magnetite orebody. These works, 360 feet below the outcrop, show it to be a lenticular mass of magnetite, attaining a maximum diameter of 30 feet, and coinciding in strike and dip with the schist. In this locality are many other deposits of lesser extent, some of which are difficult of access, and are not considered of sufficient importance to warrant an elaborate description.

5 Iron ore Deposits in the Zeehan District

These deposits are contained in a small area lying near the western boundary of the Zeehan district, at the foot of Mt. Agnew, the most easterly peak of the Heemskirk Range.

Zeehan township is 5 miles distant to the east. The area is, for the most part, held under lease by Hoskins Iron and Steel Co.Ltd. as section 8730/M, 496 acres.

The iron ores occur in four main masses which are dealt with separately hereunder.

(a) This is portion of the original Tenth Legion property the orebody of which consists of a very large lenticular mass of magnetite, extending from a point 3 chains inside the Kynance western boundary to the bank of Pine Creek. The length of this lens along the outcrop is 1400 feet and the actual width about 50 feet. The apparent width, as determined by the talus material, is much greater. In some parts the ore is coarse grained; in others, it is hard and dense, and remarkably pure. An idea of the quality of the ore may be gathered from the following analyses:-

Kind of ore	Iron	Phosphoric Acid	Sulphur	Silica
	%	%	%	%
Magnetite	60.18	Trace	0.20	2.12
Magnetite	70.7	Trace	0.10	-
Magnetite	69.6	Trace	-	0.47

It is impossible to arrive at a close estimate of the quantity or ore extractable by quarrying, for there are no reliable data upon which a safe calculation can be based.

Under the circumstances, it has been decided to consider the amount recoverable from the orebody to a depth of only 200 feet. At this depth the quantity works out at 1,900,000 tons. Eastwards in the Kynance property are several smaller orebodies; and westward just over Pine Creek, another deposit projects above the level of the plain. They are not important.

(b) This is situated 15 chains north west from the Tenth Legion and consists of a large dome shaped mass of magnetite-hematite ore standing out 60 feet above the level of the button-grass plain. The hill, 350 feet long and 250 feet wide, is composed wholly of hard dense ore of remarkable purity. The quantity of ore recoverable above drainage level is 160,000 tons. A grab sample of pieces of ore taken indiscriminately from the outcrop contained:-

Iron	66.72	per cent
Alumina	1.37	" "
Phosphorid Acid	Trace	
Sulphur	0.49	" "
Silica	2.57	" "

(c) The deposit lies ½ mile south from the Tenth Legion MIne, and appears to be of precisely the same type as those already described. This orebody is about 40 feet wide, and fully 1000 feet long. Above the 150 feet contour it is computed there are 800,000 tons of high grade ore.

(d) This may be seen about a mile west of south of the Tenth Legion; where a large body of massive magnetite is exposed. The dimensions of this deppsit have not been ascertained, owing partly to the heavy vegetable cover; but it outcrops prominently here and there for 1000 feet, and appears to be fully 40 feet wide. Float ore forms a deep talus over a far greater area. This orebody can be easily exploited to a depth of 200 feet, at which level there exists 850,000 tons of fairly high grade magnetite.

Conclusion

From the preceding it will be gathered that Tas. possesses deposits of iron ore of a varied nature in

different parts of the island. With 3 exceptions, however, no commercial use has so far been made of them. These are the chromiferous ores of Andersons Creek, the brown hematites of Brandy Creek, and the high grade hematites of the Penguin Creek Valley. The metal from the Andersons Creek beds was placed on the market for a short time, until the increasing chromium content interferred with the sales. Small quantities of the Brandy Creek iron were disposed of satisfactorily, but, with a drop in the market, the outlook was not encouraging enough for the owners to continue their venture. The demand for the Penguin ores fell off when the buyers found more convenient source of supplies of flux on the Mainland, and the difficulties with landowners hastened the suspension of operations. In the utilisation of the potential stocks of iron ore in Tasmania the provision of electric energy by means of the State hydro-electric installation must always be regarded as an indispensable factor, as the future of the deposits in inextricably bound up with electric smelting and electric steel production. Electric furnace units of moderate size can easily be installed at various centres, thus responding to the needs of widely separated deposits. The Government is prepared to arrange for the delivery of power at reasonable prices. The costs of fuel and flux will not be prohibitive, though the question of fuel will involve anxious consideration. The quantities required for electric furnaces do not necessitate the enormous tonnages customary in blast furnace practise, and in one locality or another, according to all appearances, it is safe to say that enough ore exists to support the industry in Tasmania for very many years.

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