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RAVENSTHORPE MANGANESE DEPOSITS

by

K.A. Townley.

CANBERRA.

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SUMMARY.

The Copper Mine Creek deposit is the only manganese deposit worthy of attention in the Ravensthorpe area. It is a bedded deposit enriched by supergene water, and has an estimated tonnage of 6,000 tons per vertical foot. The ore is in a number of beds interspersed with an approximately equal footage of decomposed schist. Two shafts indicate ore down to 40 feet, and it is thought that it may continue well below that level. ~~An exploitation programme is suggested.~~

INTRODUCTION.

The Ravensthorpe district, W.A., contains a number of manganese deposits and showings, described fully by Gray and Gleeson (Ann.Rep.Dep.Min.W.A., 1949, 112-118), and in part by Blatchford (Ann.Rep.Geol.Surv.W.A., 1918, p.11-12) and Montgomery (Ann.Rep.Dep.Min., 1914, p.21).

The present visit was made between 26th May and 30th May to reassess these deposits and to determine whether under present circumstances any are of economic importance. The time available for inspection was limited because of a vehicle breakdown; May 27th was spent in investigating the "Mt. Chester" and "Hammersley River" deposits, and 28th and 29th May the "Copper Mine Creek" deposit. The first two can be ignored: there is neither the extent nor the grade in either to make it worth considering. The "Copper Mine Creek" deposit was examined in rather more detail.

THE COPPER MINE CREEK DEPOSIT.

Introduction and Access.

The deposit is mostly enclosed within MC463H and MC464H, held by Westralian Ores Pty. Ltd. It is located 51 miles by road south-west from Ravensthorpe, at the head of Dempster's Inlet.

The road from Ravensthorpe is in very bad repair, and would be impassable to heavy transport except in continued fine weather. It can be discounted as a route for haulage. However, a route directly northward has been prospected, along which an all-weather track could be made on the ridges for 2 2 miles, reaching the Ongerup-Ravensthorpe road - a good graded surface - about 50 miles from Ongerup, which is the nearest railhead. Bell Bros., who would do the haulage from the deposit if it were worked, estimate that it would be cheaper and quicker to haul by road through to Albany, the nearest port, a total distance of about 150 miles.

Physiography, Vegetation, and Water Supply.

The deposit lies on two gently sloping hills between which, and intersecting the deposit, runs a small creek. The ridges of both hills are capped with a flat-lying flaggy sandstone, understood to be of the Plantagenet Series. The creek falls into Copper Mine Creek about ¼ mile below the deposit, and near its outflow into Dempster's Inlet. There is practically continuous soil cover, which appears however to be thin, and the hillsides are covered with a fairly thick growth ofmallee.

No water has been located near the deposits, which lies in uncultivated country; but it is probable that potable water could be found underground at no great distance if the area were systematically surveyed, and a catchment dam could be built on any of the small creeks round about - the soil is clayey - which in such a high rainfall area (approximately 25") would supply sufficient water for the men on the workings.

Regional Geology.

The regional geology has been described by Gray and Gleeson (1949, p.118) and no attempt was made to remap the area during the present visit owing to lack of time.

The country rock is decomposed schist and banded ironstone- replaced by manganese - striking broadly E-W, and dipping steeply north. Odd pebbles of basalt were found, whose source was not located. Except for the fold described by Gray and Gleeson (p.118) and some minor flexures in the crosscuts, there appears to be no distortion in the beds. The ridges at both ends of the deposit are capped by flaggy sandstones, said to be of the Plantagenet series of Tertiary or Quaternary age, and the continuation of the manganese is lost below this unconformable contact.

Manganese reappears on the same strike on the far side of the easterly ridge in an extensive outcrop, but the gap covered by the sandstones (about ½ mile) is too large to justify the assumption that the deposit is continuous through the ridge.

The Manganese Deposits.

The surface extent of the westerly deposit, covering MC463H and a part of MC464H, is shown in Figure 1. The outline was plotted by pacing and compass survey; outcrop is extremely poor, and the boundaries are therefore approximate. The extent of the easterly body was not measured, but a few samples were taken from potholes.

Manganese is not continuous over the whole of the surface; a section cut by the creek, and partly plotted by Blatchford (1918), shows that beds of manganese of 5' to 20' are interbedded with barren schist. The creek section is incomplete, and the northern part of the orebody is not exposed.

A strike fault bounds the northern edge of the deposit for about 150' east of the creek, but no traces of it could be found elsewhere. It is conjectured that a number of small dip faults dislocate the body, but evidence is very meagre.

Two shafts have been sunk in the orebody. The easterly shaft is 39 feet deep. From it are cut two crosscuts, the northerly one being 21 feet long and the southerly one 18 feet. The westerly shaft is 30 feet deep; its crosscuts run 48 feet to the north and 58 feet to the south. The general appearance of ore in the crosscuts - both shafts are practically in solid ore throughout their depth - is similar to that presented by the creek section, that is, bands of ore up to 15 feet wide interspersed with decomposed schist. On the broken surface of the crosscuts the ore is considerably softer than on the surface or in the shafts, and the schist is decomposed to clay; but it is thought that this is a surface phenomenon only. The reasons for this area as follows; the shafts are over 40 years old, and the crosscuts are damp; moreover the south crosscut of the west shaft is wetter than the others and decomposition is more advanced in that crosscut than in the others, and is more advanced towards the end of the crosscut than near the shaft; and the tunnels, though now in soft rock, have the appearance on their undisturbed faces of being broken in hard rock.

The ore at the surface is a hard black mass of psilomelane (cryptomelane?) with occasional occurrences of ?pyrolusite. Vughs in the ore are coated, or in places filled, with limonite. Silica is rarely visible.

Sampling of Ore.

No samples were taken from the surface: it was

considered that the samples taken by Gray and Gleeson (1949, p.118) gave a sufficient cross-section of the surface material.

True channel sampling was found to be impracticable because of the hardness of the ore, but chip samples were taken as follows:

E. Shaft:

at 12 feet - N & W faces
at 28 feet - E, N, & W faces (S face is in decomposed schist)

E Shaft N Crosscut

W face - omitting 2 bands of country, each of 4-5 feet, a cut was taken along the whole length. South crosscut was not sampled (but see Gray and Gleeson, sample 6597 and 6598).

W Shaft

at 12 feet - all faces
at 21 feet - all faces

W Shaft S Crosscut.

Cuts were taken on W face at 58-50 feet, 42-34 feet, 26-18 feet, and 10-4 feet from shaft.

N Crosscut.

Cuts taken on W face 48-40 feet; 32-24 feet, and 8-0 feet from shaft. A band of clay occupied the 16-8 foot position.

Potholes and costeans.

1) A chip sample was taken along the costean, 30' long and approximately 3 ft. deep, running N-S, some 40' ENE of the E shaft.

2) From a small costean 20 feet N of the E shaft.

3) From Potholes A, B, and C, west of the Creek.

4) From the Creek bed (opposite the datum peg)

From the Eastern Deposit.

Chip samples were taken from three potholes, respectively 4, 6 and 8 feet deep, running S to N, and about 100 feet from A to B. They were situated 250-300 feet beyond the crest of the ridge.

Grade and Extent of Ore.

Gray and Gleeson's analysis of the surface ore is as follows:

Manganese dioxide	62.85)	
Manganese oxide	5.51)	Mn = 44.00
Silica	11.31	
Iron	5.21	
Phosphorus	0.09	
Cobalt	0.15	

The evidence of the shafts and crosscuts indicates that the ore continues in depth to 40'. A similar replacement deposit at Mt. Chester, which is not of economic grade or size, is cut by an adit at an estimated 120 feet below the surface, and is maintaining approximately the same grade at that level as at the surface (R. Collins, unpublished report for B.H.P. Ltd.)

Assays have been received of the following chip samples:

	Percentage by weight		
	Mn	Fe	SiO_2
E Shaft:			
At 12 feet	36.65	8.73	12.12
At 28 feet	34.20	9.24	18.00
North crosscut:			
picked ore from sample	36.15	4.36	22.20
remainder of sample	20.22	10.06	20.62
Unpicked sample	28.48	5.18	27.50
W Shaft			
At 12 feet	38.13	2.79	17.68
At 21 feet	39.90	3.55	13.94
South crosscut:			
58-50 feet	33.63	4.46	17.40

These assays show clearly that the surface grade quoted above is a thin skin of enriched ore, not representative of the deposit as a whole. The high silica content throughout, and the high non content in the East shaft, also militate against economic working.

Type of ore

The ore is a superficially enriched bedded body (see Appendix A, Microscopic Examination of ores): the cobalt content points to superfine enrichment, probably of a banded calcareous ironstone. No evidence of structural control, as suggested by Gray & Gleeson, was noticed apart from the fault mentioned above, which may cut off the northern extension of the orebody.

Estimate of Tonnage & Grade

The surface area of the deposit as plotted in Fig. 1, is about 12,000 square feet: about half of this is ore and the rest interbedded country rock, as may be seen from the creek and crosscut sections. The tonnage of ore is therefore about 6,000 tons per vertical foot. But not more than 10 feet, and not less than five, are of average grade more than 40% Mn. The total estimated payable ore is therefore 30,000-40,000 tons of 40% Mn. Below this, there are at least 40 feet of lower grade ore, gradually decreasing not only in grade but also in quantity: It is estimated that in the subsurface zone is 150,000 tons of average grade 35% Mn, 16% SiO_2 and 6% Fe.

Economic Possibilities.

The surface ore can be readily extracted, and the subsurface ore could be worked open-cut; but considering the low grade and the long road haul, it is not considered that the ore-body is worth developing.

Accordingly, no further exploratory work is recommended.

Acknowledgments.

Thanks are due to Mr. R.B. Synott and Mr. D. Bell, both of Westralian Ores Pty. Ltd., who provided transport, guidance, and plentiful assistance during the survey, and to the Mines Department, Western Australia, for technical discussion and topographic maps.

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Blatchford, T, 1918(a) - Manganese Deposits of the Hammersley River. Ann.Rep.geol.Surv.W.A., 1918, p.11.

_____, 1918(b) - The country between Hopetown and the Fitzgerald River. Ibid, idem, p.11,12.

Blatchford, T,1925 - Manganese Knob, MC321H. Ann.Rept.Dep. Min.,W.A., 1925, p.66

Gray, N., and Gleeson, J.S., 1949 - Report on Manganese Deposits in and adjacent to the Phillips River Goldfield. Ann.Rep.Dep.Min.,W.A., 1949, p.112-118.

APPENDIX A

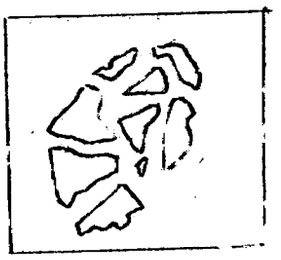
MICROSCOPIC EXAMINATION OF MANGANESE ORES FROM RAVENSTHORPE AREA, W.A.

by

W.M.B. Roberts.

Eight specimens were selected and polished from material brought from W.A.

The majority of the section showed numerous subhedral quartz grains 0.1 m.m. diameter, distributed evenly throughout, corroded along their boundaries and much fractured, and showing replacement along the fractures, e.g.:-



One Section, C.M. 4

showed a set of shears, at approx. 60° to the bands, displacing them laterally, along these shears a second generation of quartz had been deposited, this being much darker than the early quartz due to possible iron oxide.

The Manganese Minerals present are Pyrolusite, Manganite and possibly Wad and Psilomelane, in that order of abundance. The average percentage of Pyrolusite present is in the region of 60 - 65% and is present as very fine grained aggregates, intersected by what appear as veins of a coarser grainsize showing a bladed structure within the vein, and chiefly as a colloform type banding with well developed crystal structure. The grainsize ranges from sub-microscopic to 1.5 m.m. in length. Some of the Pyrolusite examined by microchemical means gave positive tests for Cobalt and Iron.

The Manganite appears intimately associated with the very fine grained phases of the Pyrolusite and in places forms boundaries along the colloform bands.

Individual Sections:-

C.M.2 (E shaft, 28 ft.)

Colloform Texture, Pyrolusite coarse to very fine grained, grainsize sub-microscopic to 1.5 m.m. approx. percentage Pyrolusite 70. Subhedral quartz grains scattered evenly throughout. Manganite along edges of colloform banding.

Microchemical:-

Co .. negative
Fe .. negative.

C.M.4 (E shaft, N crosscut)

Subhedral quartz grains 0.1 m.m. diameter distributed evenly throughout section. Colloform banding. Shears cut bands at 60° and are filled with a later generation quartz, much darker than the early variety. Dark non-reflecting mineral tested for Mn quite strong, possibly wad. Chief Mn mineral Pyrolusite 40 - 50% present. Limonite present.

Microchemical:-

Fe .. positive strong
Mn .. positive strong (on dark non-reflecting mineral).

C.M.5 (W shaft, 12 ft.)

Irregular quartz grains much fractured, show replacement along fractures. Mineral present Pyrolusite, in fine grained aggregates and is coarse grained radiating crystals. Percentage Pyrolusite approx. 60.

C.M.6 (W shaft, 21ft.)

This specimen entirely very fine grained with what appear as small fractures filled with a coarser grained Pyrolusite. Quartz grains show much fracturing and replacement along fractures. Percentage Pyrolusite approx. 65.

Microchemical:

Co .. positive
Fe .. positive strong.

C.M.15 (Costean ENE of E shaft)

Pyrolusite occurs as the coarse grained variety, Grainsize 1.5 m.m. to very fine grains. Irregular patches of subhedral quartz grains Manganite appears along the edges of the very fine grained areas and as irregular patches therein, and is present only in these very fine grained areas. Percentage Pyrolusite approx. 70.

Microchemical:

Co .. negative
Fe .. positive (faint)

C.M.16 (Costean N of E shaft)

Pyrolusite occurs as very coarse grained bladed aggregates and as collections of fine grains. Fractural quartz grains show replacement along fractures. Manganite (very fine grained) intergrown with Pyrolusite. Percentage Pyrolusite approx. 70.

C.M.17 (Pothole W of creek)

Section is mainly finely crystalline aggregates intersected by veins of radiating crystals. Quartz grains much fractured show replacement along fractures. Percentage Pyrolusite approx. 60.

The main texture exhibited by the sections is of the colloform type, indicating deposition of the Manganese as a colloidal gel. As a rule deposition of this type requires open spaces for formation, such as openings in Limestone, which could be rapidly further enlarged by solution. The even distribution of subhedral quartz grains throughout the sections would suggest replacement of a limestone containing quartz of this nature; this quartz, as illustrated above, shows replacement by the Manganese along fractures and grain boundaries.

Some movement has affected the ore body subsequent to deposition, as evidenced by the set of small shears, cutting and displacing the banding, as shown in section C.M.4. This is assuming that the Manganese is not replacing a previously deposited Iron gel.

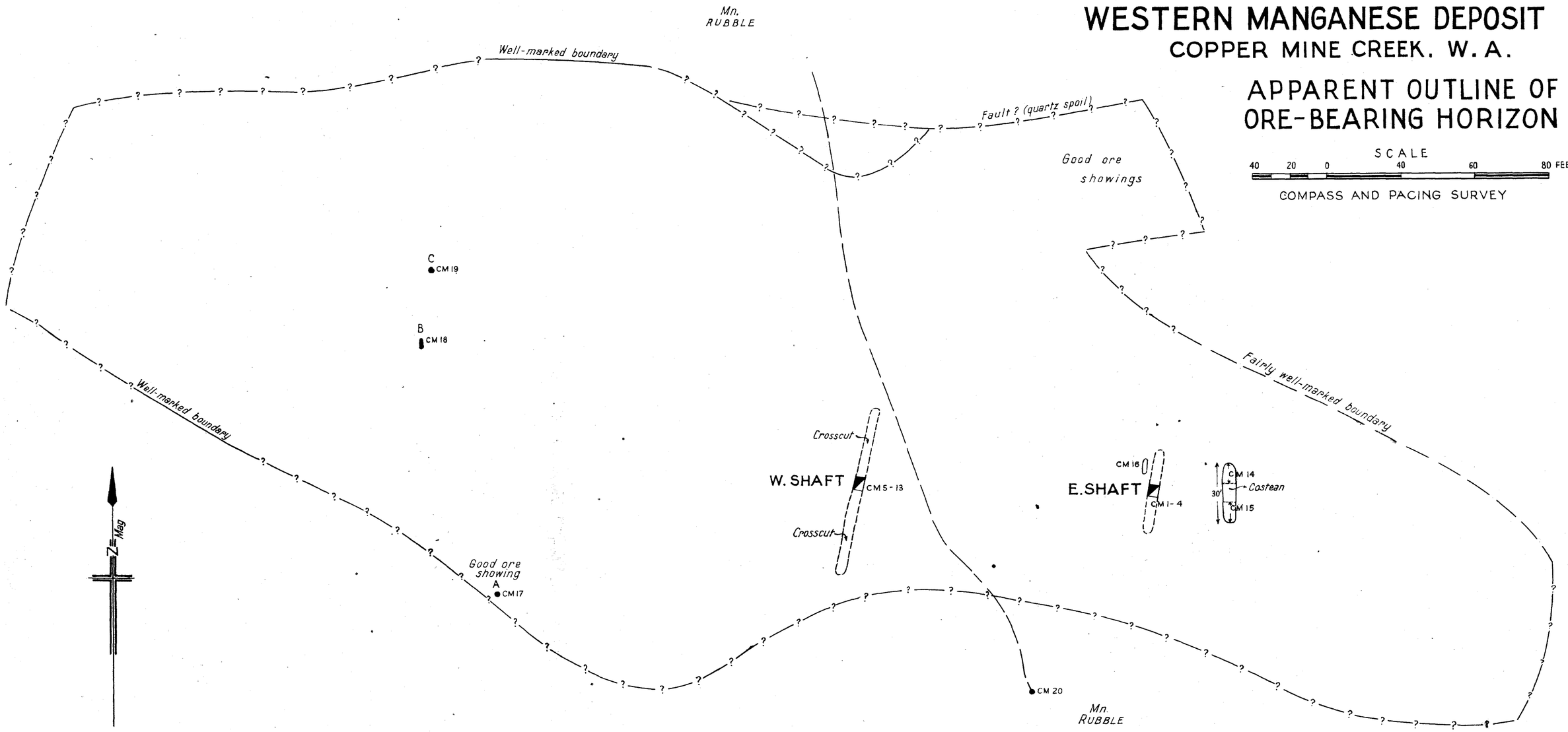
The relationship between the Manganite and Pyrolusite is obscure. Psilomelane may be present in the very fine grained aggregates of Pyrolusite, but this was not determined. It is thought that the non-reflecting soft mineral which showed a strong reaction for Mn in microchemical tests is Wad.

WESTERN MANGANESE DEPOSIT
COPPER MINE CREEK. W. A.

APPARENT OUTLINE OF ORE-BEARING HORIZON

SCALE
40 20 0 40 60 80 FEET

COMPASS AND PACING SURVEY



WA 51-1 H.E.S.