COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1962/163

SCOTT RIVER MAGNETIC SURVEY, WESTERN AUSTRALIA 1962

by

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SUMMARY

A ground magnetic survey of the Scott River area, Western Australia, indicated that certain areas are magnetically disturbed, with anomalies rapidly varying in intensity over short distances (up to 23,000 gammas over a distance of 25 ft). It appears that the magnetic anomalies are due to the presence, at very shallow depth, of magnetic minerals associated with iron ore.

With test drilling data and geological control the data obtained from the magnetic survey may be of value in differentiating areas of no ore and very low-grade ore from areas of better ore.

1. INTRODUCTION

Heine Brothers (Australiasia) Pty Ltd is currently investigating the iron ore potential of the Scott River area. The Scott River area is situated approximately eight miles east-north-east of Augusta (Plate 1) on a direct line and 26 miles by road. There is good access to the area by car via the Brockman Highway.

A ground magnetic survey was made by the author, a geophysicist of the Bureau of Mineral Resources, in February and March 1962, to assist the company in their prospecting campaign. A preliminary survey had been made by the Bureau in 1961 (Stubbs, 1962).

2. GEOLOGY

Iron-bearing material is found in an area of about ten square miles, being approximately seven miles north-south by 1½ miles east-west. Probing, however, indicates that the deposit is not continuous.

The deposit varies in thickness from a foot to about five feet. It consists usually of three zones:

(a) Cap rock - hard consolidated material ranging in thickness from zero to a few feet, and containing approximately 35-50 percent iron;

(b) Intermediate zone - containing a small percentage of sand and a lower percentage of iron;

(c) Sandy zone - containing a large percentage of sand and as little as 8 percent iron.

All three zones are not always present.

The deposit weathers to a reddish coloured soil. Some areas of the deposit are covered with sand up to a thickness of five or more feet. In many places the outcrop is covered by a thin layer of 'gravel', consisting of rounded pebbles up to 1 cm across. Most of these pebbles are highly magnetic.

Little is known about the mineralogy of the deposit. Observations by the author show that:

(a) The cap rock is well consolidated and consists of rounded pebbles with a concretionary structure. These pebbles are cemented together with a limonitic matrix. Some of the pebbles are limonite, but others are a magnetic mineral (possibly maghemite);

(b) The intermediate zone is less consolidated and consists of a soft limonitic material with few concretionary pebbles. Sand is a noticeable constituent;

(c) The sandy zone is mainly sand consolidated with a ferruginous matrix.

A more detailed study of the mineralogy would be of great benefit in the interpretation of the magnetic data.

There is difference of opinion with regard to the origin of the deposit. It is considered to be either a lateritic or a bog iron deposit. The fact that the deposit closely follows the present contours favours the lateritic formation.

The company has sampled the central area (approximately 5 x 1 miles) by digging trenches on a 2000-ft grid. At present the company is carrying out a drilling programme on a 2000-ft grid using the same traverses as were used by the magnetic survey.

3. MAGNETIC SURVEY

The purpose of this survey was to differentiate between areas giving anomalous readings and areas which are magnetically undisturbed. Using data obtained from the present drilling programme as a control, the magnetic data will be a guide to areas that warrant further investigation and those that can be neglected. With this in mind a simple method of plotting data has been adopted (see Results).

Approximately 55 miles of traverse, with observations at 200-ft intervals and traverses spaced at 2000-ft intervals, were surveyed (Plate 1) using a Watts vertical force variometer No. 61519. In addition, readings at 50-ft intervals were taken on the base traverse from 1500W to 1500S and on the 00 traverse from 3000W to 3000E. Test traverses consisting of 25 observations each were made in the vicinity of ten sampled trenches.

The test traverses indicated that the vertical force varied as much as 10,500 gammas over a distance of five feet and up to 23,000 gammas over a distance of 25 feet. Tests also showed that an error of 10 degrees in orientation of the instrument and a difference of four inches in the height of the instrument gave an error of 25 and 35 gammas respectively on an anomaly of 6000 gammas. By neglecting diurnal variations a further possible error of $\pm$ 25 gammas is introduced. The total possible error is $\pm$ 85 gammas (i.e., less than 2 percent), which is sufficient accuracy for the purpose of the survey.

4. RESULTS

For the purpose of presentation of data the magnetic observations have been grouped into four divisions depending on the intensity (i.e. the numerical value, without regard to sign) of magnetic anomalys

Z - consistent values within 85 gammas of reference

C - anomalies between 85 and 300 gammas from reference

B - anomalies between 300 and 1200 gammas from reference

A - anomalies greater than 1200 gammas from reference

The reference is a value which refers to an area where no iron occurs and where the magnetic readings are uniform, e.g. at 4000N/8200W.

The results of this grouping are given on Plate 2, which shows also the approximate boundaries of the zones of strong and weak anomalies. In drawing these boundaries account has been taken of the results of Stubbs (1962). In view of the erratic nature of the anomalies, the drawing of the boundaries between traverses involves a considerable element of conjecture.

5. DISCUSSION OF RESULTS

In the following discussion, the word 'ore' is used in a rather loose sense. Strictly speaking 'ore' means material that can be economically mined and treated. However, the determination of ore grade involves the study of a number of economic factors, which in the case of deposits such as those at Scott River are quite complex. It has not yet been established that the deposits contain any material of ore grade in the strict sense. For convenience, though, the word 'ore' is used in the present context as meaning potential ore, in the sense that, by world standards, it could be economically exploited under the most favourable circumstances, and would thus be worth including in an assessment of possible reserves.

The value of magnetic surveys depends on establisning a relation between intensity of magnetic anomalies and iron content. From the results of previous testing, it appears that magnetic minerals are mainly concentrated in the cap rock, but that all the cap rock is not necessarily magnetic. In general the cap rock consists of good-grade ore but good-grade ore can also be present below the cap rock. From this, it may be concluded that anomalies of groups A and B probably indicate the presence of cap rock, and therefore of material of good grade, and should be tested on this basis. Anomalies of group C may be due to the following causes:

(a) cap rocks under soil cover of greater thickness,

(b) cap rocks with a smaller content of magnetic minerals,

(c) ore with a thinner covering of cap rock.

Anomalies of group Z indicate either the complete absence of ore, or the presence of ore without cap rock.

The establishment of a relation between intensity of magnetic anomalies, and thickness or grade of ore, would require sampling of a scale sufficient to permit of statistical treatment of the results. Testing of a large number of samples would be necessary.

From Plate 2, it appears that anomalies of groups A and B are confined to a restricted area. This area must be considered as having the best prospects of containing ore. However, the prospect of the deposit containing large tonnages depends on anomalies of group C being associated with ore, and the results of testing these anomalies will be of great significance.

6. CONCLUSIONS AND RECOMMENDATIONS

At the present stage, it is not possible to relate the magnetic anomalies to grade or quantity of ore. It is recommended that areas containing anomalies of groups A and B be considered as probably ore-bearing and be tested on this basis. Areas containing anomalies of group C should be thoroughly tested to establish their significance, as the value of these areas is a major factor in the assessment of the deposit. Areas containing anomalies of group Z should be tested on a scale sufficient to provide a statistically significant evaluation of their potential.

7. ACKNOWLEDGEMENTS

It is desired to acknowledge the assistance of surveyors of the Department of Mines, Perth, and of Mr W. Burns, geologist in charge of testing operations.

8. REFERENCES

STUBBS, R.C. 1962 Scott River geophysical survey for bog iron, WA 1961. Bur. Min. Resour. Aust. Rec. 1962/30.

PLATE 1

20,000N

18,000 N

16,000 N

14,000 N

12,000 N

10,000 N

8000 N

6000 N

4000 N

2000 N

00

2000 S

4000 S

6000 S

8000 S

10,000 S

12,000 S

+4°

M.N.

T.N.

Christmas bush

4254

No.1 BORE

Ironstone

Wyvern Ck.

Jarrah

4257

Jarrah

4259

2970

2971

2972

Jarrah
Redgum
Banksia

4168

4153

Redgum

2973

2974

4975

4264

Surface Sand and Ironstone

Open Plains

4263

To 15,800'

78

74

79

4261

Poor Country

Two Chain Road

Plain

359° T.N.

Three Chain Road

To 14,000'

Sandy Country

4262

TRAVERSE

4260

BASE

Three Chain Road

56

4154

52

14

4156

1129 1.33

12

11

25

4155

10

GOVERNOR BROOME SWAMP

Banksia
Blackboys

Scott River

Sandy Plain

Sandy Plain

1344

Road To Nannup

Blackwood R.

Road To Busselton

W. A

PERTH

Brockman Hwy

Karridale

34°15'

SURVEY AREA

Scott R.

Augusta

115°15'

Reference to Australian 4-Mile Series (Augusta sheet)

LEGEND

Traverse

o 14 Trench

2972 Lease Number

Road

Track

GEOPHYSICAL SURVEY OF THE SCOTT RIVER IRON DEPOSITS, W A 1962

TRAVERSES AND TRENCHES

SCALE IN FEET

2000 0 2000 4000 6000

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PLATE 2

20,000 N

18,000 N

16,000 N

14,000 N

12,000 N

10,000 N

8000 N

6000 N

4000 N

2000 N

00

2000 S

4000 S

6000 S

8000 S

10,000 S

12,000 S

TRAVERSE 359° T. N.

BASE

To 15,800'

To 14,000'

VERTICAL MAGNETIC FORCE ANOMALIES

FEET

1000 0 1000 2000 3000 4000

LEGEND

Magnetic traverse

Magnetic Anomalies

A Large Anomalies Numerically Greater Than 1200 gammas

B Medium, 300 to 1200 gammas

C Small, 85 to 300 ,,

Z Non-Anomalous, Numerically Less Than 85 gammas

Boundary of magnetically disturbed area

" " " strongly disturbed area

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