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SUMMARY

Exploration Licence 8126 covers the western portion of the prominent Burt Plain magnetic anomaly located about 40 kilometres north of Alice Springs in the Northern Territory.

The area is largely sand and soil covered, with hills of Arunta Block basement rocks and local veneers of Tertiary laterite derivatives. A photogeologic study has been completed over the magnetically anomalous area and major structural trends have been interpreted.

Of particular interest are four photogeological features with circular characteristics located close to deep seated structural breaks on the margins of the aeromagnetic anomaly. Two of these features are covered by EL 8126 and are considered valid exploration targets.
1. INTRODUCTION

The Sixteen Mile Exploration Licence EL 8126, is situated west of the Stuart Highway, some 40 kilometres north of Alice Springs (Figure 1).

The granted area is the western portion of the original application EL(A) 8126 which covered the whole of the Burt Plain magnetic anomaly: a cluster of high amplitude magnetic features associated with a pronounced regional gravity high.

The application was made to enable the assessment of the exploration potential for gold, base metals or other economic minerals in association with this anomalous magnetic feature in the Lower Proterozoic rocks of the Arunta Block.

Due to difficulties in granting the original area, EL(A) 8126, because of Aboriginal freehold titles and land claims along and east of the Stuart Highway, the application was amended to the present area of EL 8126 covering less than one half of the Burt Plain magnetic anomaly features.

A review of past exploration and a photo-interpretation over the original application area has been completed to place the geological and geophysical elements of EL 8126 in context with the whole of the Burt Plain anomalous magnetic pattern.

2. PAST EXPLORATION

The Sixteen Mile Creek area has attracted very little mineral exploration activity in the past, undoubtedly a function of the limited extent of outcrop, a relatively thick Tertiary sediment cover in places, and the absence of known mineralisation.

Geological impressions have been derived mainly from the B.M.R. aeromagnetic survey flown in 1965 (Figure 4). These data were upgraded with reprocessing in 1988.

White Range Gold NL held exploration title EL 6693 over much the same area as Roebuck's EL(A) 8126 in 1990 to investigate the complex Burt Plain magnetic anomaly with relief of up to 2500 nT (see Figure 4 and Appendix II). Various ideas were put forward to support the testing of this anomaly for a possible Mt. Weld (W.A.)-type carbonatite source, which was considered to have a similar magnetic response. A magnetite-bearing carbonatite was also known near Mud Tank on the Alice Springs sheet area, about 70 kilometres to the northeast of Sixteen Mile, and in general Arunta Block rocks may be relatively rich in rare earths (Murrell & Robinson, 1990).

Mention was made also of the Mordor alkaline igneous complex located about 60 kilometres east of the Sixteen Mile area (also the source of a magnetic anomaly high), and the fact that a diamond had been recovered 20 kilometres south from Mud Tank.
White Range chose to test the Burt Plain anomaly on its crest, where the Stuart Highway crosses over it. After establishing some ground magnetic control five RC percussion holes were drilled along a 650 metre traverse, about 4 kilometres south from McGrath Flat Dam (Figures 2 and 4).

Magnetite-bearing basic granulites were intersected beneath about 70 metres of Tertiary clay and sand sediments. These are biotite-hornblende-pyroxene-plagioclase gneisses with up to 12 percent magnetite, up to 3 percent apatite and in a few samples, elevated yttrium and lanthanum levels. They were interpreted as high grade metamorphosed basic igneous rocks (Murrell & Robinson, op. cit.).

In 1991, Stockdale Prospecting Limited secured EL 7570, which included an area of approximately 100 square kilometres now in the far northeast corner of Roebuck’s former EL(A) 8126, to check a number of BLEG gold anomalies (max. 47 ppb) resulting from prior coarse regional sampling of the Alice Springs 1:250,000 sheet (Whalan, 1991).

Stream sediment BLEG geochemistry, as well as some soil and rock-chip sampling, produced only five values in the 0.2-0.4 ppb Au range, and no positive indicator geochemistry. The source of gold anomaly was attributed to the Oolbra Orthogneiss, with little economic potential, and the programme was abandoned.

Other company programmes in the Burt Plain region covered ground outside the original EL(A) 8126 application area.

C.R.A. Exploration flew a detailed aeromagnetic survey in the remote northwest corner of the Alice Springs 1:250,000 sheet, with an initial interest in anomalies with possible carbonatite sources. Several resulting discrete, high amplitude magnetic responses were interpreted as magnetite-bearing granulite sources (Harvey, 1983). Flat lying Tertiary sediments exceed 100 metres in thickness, and the licence was relinquished without drilling.

White Industries/B.H.P. Minerals (1983) flew a helicopter sampling programme for diamonds in the area around the south-western corner of former EL(A) 8126. No kimberlitic indicator minerals were found.

Several companies have explored the Harry Creek Cu-Zn prospect area, which is located 20 kilometres northeast of Coles Dam (Figure 2). This is a prominent ironstone outcrop above high grade meta-iron formation lithologies hosting a small Cu-Zn-Pb deposit. There is a strong magnetic signature. No significant extensions of this mineralisation have been found (Moore & Woyzbun, 1977; Harvey & Jenke, 1983; McMahon Construction, 1988).
3. PHOTO-INTERPRETATION

Stereoscopic interpretation of 1:25,000 colour prints, from photography flown in 1971, was completed by consultant geologist, T.B. Freytag. Freytag's description of the photointerpreted area, viz. the area of former EL(A) 8126, various interpreted features considered of exploration significance and comments on those features are given in sections 3.1, 3.2 and 3.3 below. A map with photointerpretation at 1:100,000 scale is presented in Figure 2.

3.1 GENERAL DESCRIPTION

Because of the flat surface topography and extensive sand and soil cover, emphasis was placed on the recognition of bedrock outcrop, lateritic areas, cultural details and structural features. There was no attempt to sub-divide the Quaternary cover materials.

Arunta basement areas were identified by their topographic relief and linear traces, expressing metamorphic or meta-sedimentary layering. The rocks were undifferentiated. Overall strike trends are west-northwest in the northeastern part of the area and east to northeast in the southwestern and central parts. Several areas of sand cover clearly show parallel linear traces, indicating basement subcrop.

Low, rounded hills of dark ferruginous rock are derivatives of Tertiary laterite. A large patch, some 50 square kilometres in area, remains along the northern boundary of the area, north of Coles Dam. Rocks underlying these iron-rich cappings have a distinctive photo-texture, which with more detailing, might be used to outline the extent of subcropping Tertiary sediments.

Small ferruginous cappings forming a line about 1.5 kilometres long in a highly sheared setting 6 kilometres southeast of Coles Dam are probably fault-aligned lateritic remnants. However, a possible lode development should not be overlooked.

3.2 INTERPRETED CIRCULAR FEATURES

Photogeological Feature "A" (Figures 2 and 3) is a distinct textural anomaly of near circular outline, 1.25 kilometres in diameter. There are suggestions of faint ring fractures, and it is located at the intersection of strong northwest and northeast striking structural lines.

The photo anomaly has a pock-marked texture which seems to be unique in the area. This could result from sub-surface solution cavities or shallow karst development, which would imply the presence of underlying carbonate-rich rock.
Photogeological Features "B" and "C" (Figure 2) have overall circular outlines, masked to some extent by sheetwash and the presence of Tertiary carbonate sediments.

Feature "B" is situated at the intersection of marked west-northwest and northeast striking geomorphic lineaments, as well as a less obvious north-northwest structural line. These features lie outside the boundaries of EL 8126.

Photogeological Feature "D" (Figure 2) is a complex structural centre evident on the floodplain of Sixteen Mile Creek, 2 kilometres west from the Stuart Highway. This location lies at the intersection of west-northwest and northwest geomorphic lineaments and on the projection of a northeast striking cross fault. The centre is cut by a set of fine north-south photo-linears.

3.3 COMMENTS ON INTERPRETED PHOTO-FEATURES

The characteristics of the features described above suggest the presence of steep, pipe-like intrusive bodies, such as carbonatites and kimberlites, and they are viable exploration targets. Barraclough (see Appendix I) as resident geologist at Alice Springs, considered the possibility of kimberlite and carbonatite occurrence, amongst other things, associated with the Burt Plain magnetic anomaly (Figure 4). He drew on analogies with the Mordor Complex, a potassic igneous intrusion 70 kilometres to the east, and the Palabora Igneous Complex in South Africa.

There is a carbonatite precedent in the Arunta Block, at Mud Tank in the Strangways Range (Gellatly, 1959) about 60 kilometres to the northeast of Burt Plain. Three separate bodies occur along a distance of about 2 kilometres (Tipper, 1969), composed of coarsely crystalline carbonate and carbonate-biotite rocks with subordinate magnetite, apatite and zircon. Each has a magnetic high signature, as defined in Tipper's detailed airborne survey, but there is no sign of these anomalies on the 1:250,000 B.M.R. 1965 TM1 contour map, the nearest flight line having passed almost a kilometre to the south of the Mud Tank occurrence.

None of the four Burt Plain photo anomalies described in this report are seen to have associated magnetic highs on the 1:250,000 contour map (TM1 profiles were not available to the writer). The nearest flight line to anomaly "A" passed half a kilometre to the south. Flight lines passed over the vicinity of the other three, however, all four photo features are positioned on relatively steep magnetic gradients (Figure 4). They have an interesting tectonic setting (Figure 5). There is a strong underlying west-northwest-east-southeast structural grain, evident in:

the elongation of the Burt Plain aeromagnetic anomaly;

the Sixteen Mile creek drainage lineament; and

west-northwest airphoto lineaments associated with both of these.
Contour break alignments in the aeromagnetic data (1965) define deep-seated structural breaks and intersections, to which the photo anomalies are closely related.

6. REFERENCES


FIGURE 3

Photogeological Feature "A"

with selected interpretive data.

Burt Survey 5651, 10-5-71
Run 8, Frame 2893
Scale 1:25,000
APPENDIX I

Possible Geological Interpretations of the Burt Plain Magnetic Anomaly (D. Barraclough, Dept. of Mines & Energy)
POSSIBLE GEOLOGICAL INTERPRETATIONS OF THE BURT PLAIN MAGNETIC ANOMALY

A magnetic anomaly near Sixteen Mile Creek on the Burt Plain, north of Alice Springs, occurs near a magnetic lineament, and reflects a marked contrast between the surrounding rocks and the causative body. This anomaly is the largest within a cluster of six similar magnetic anomalies which occur over an area of 30 km by 15 km.

Coincident with the magnetic anomalies is a pronounced regional gravity-high, that together suggest the causative body or bodies must be both magnetic and dense, and may contain a relatively high proportion of mafic minerals such as magnetite, ilmenite, sulphide or ferro-magnesian silicates. Mafic granulites, mafic and ultramafic intrusives, gneiss and schist containing a high proportion of magnetite or hematite may be such causative bodies.

A magnetic anomaly of about half amplitude to the Burt Plain anomaly occurs over the Mordor Complex, 70 kilometres to the east, and is associated with a deep-seated fracture or fault. The complex is a differentiated potassic igneous intrusive with affinities to kimberlite, an ultramafic rock which sometimes contains diamond. The Mordor Complex has been investigated by the Department of Mines & Energy (formerly Mines Branch) and was found to contain only very minor amounts of chromium, nickel, barium and phosphorus (Barraclough 1975).

The Palabora Igneous Complex in Transvaal, Republic of South Africa, is similar chemically, structurally and lithologically to the Mordor Complex but also contains carbonatite which forms the host for economic concentration of copper sulphides. Economic vermiculite mineralization and concentrations of apatite occur in the ultramafic core of the Palabora Complex. Some other differentiated potassic intrusives throughout the world have economic concentrations of rare-earth metals such as niobium.

However, the causative body of the Burt Plain anomaly may be a large mafic or ultramafic intrusive. These intrusives often contain economic concentrations of nickel, chromium and platinum group of elements. One type known as the "layered intrusive" contains layers and groups of layers of great vertical regularity and wide lateral extent. A few of these layered intrusives contain the bulk of the world's supplies of chromium.

Another type of mafic intrusive contains sulphide ores and is host to the world's major nickel sulphide ores. This type tends to be more highly mafic than the layered intrusive and may contain notable quantities of the platinum group of elements. As a class, these sulphide-rich intrusives display a wide variety of form, most commonly occurring as thin distorted sheets localised along the contact of the associated intrusion with the intruded rock. Some of the sulphide-rich intrusives are in the form of dykes or sulphide-cemented breccia zones forming offsets from the main intrusive body.

Both types of mafic intrusive appear to be injected into comparatively stable tectonic environments and emplaced late in the tectonic history of the area concerned. Their original emplacement does not seem to have been grossly influenced by major faults. Such intrusives occur in Canada and South Africa but the sulphide type also occurs in Western Australia.
Potassic intrusives, such as the Mordor Complex, often occur in groups as in Canada and South Africa but to date no other potassic intrusives have been recognised within central Australia. The cluster of magnetic anomalies over Burt Plain, which are about twice the amplitude of the anomaly over the Mordor Complex, may represent such a group of potassic intrusives.

Reference:


D. BARRACLough
Geologist
Alice Springs Office
Dept. of Mines & Energy

12th February, 1979
APPENDIX II

Interpretations of Burt Plain Magnetic Anomaly
(C. Anderson and Assoc. for White Range Gold N.L.)
BMR aeromagnetic data have outlined a NW trending zone of complex magnetic relief up to 2500 nT in magnitude, in the northwestern portion of the Alice Springs 1:250,000 sheet area. The data are qualitatively compatible with a carbonatite source lithology in either a large elongate body or, more possibly, two or more separate sources.

The BMR data were acquired at 240 metre altitude and 3.2 kilometre spacing, and the anomalous zone is defined by only six lines. Contoured data (Figure 1) show the poor resolution of magnetic relief at this line spacing.

Five local highs are indicated in a zone which is approximately 30 by 8 kilometres in areal extent. Stacked profiles of the magnetic data indicate significant internal complexity within this zone, which is not expressed in the contours. This complexity supports the possibility that the zone represents one or more carbonatite-style intrusives, although similar magnetic relief could result from complex structure within a meta-sedimentary/volcanic sequence (BIF's and/or basic volcanics).

The dimensions to the magnetic zone are larger than would be normally expected for a single (carbonatite) intrusive, but this may be due to either multiple intrusives or an unusually large intrusive. For comparative purposes, magnetic data over four known carbonatite sources in Canada are shown at similar scale in Figure 2 and indicate that intrusives of up to 10-15 kms maximum dimension are likely. The Palabora intrusive complex (Figure 3) has a maximum length of approximately 6.5 kms. Figures 4A and 4B show some possible alternative positions for intrusives within the broader zone of magnetic relief, and the quality of the existing data does not allow any distinction between these likelihoods.
The positions for the main magnetite concentrations, as they can be determined from the existing data, are shown in Figure 5, taken from the Alice Springs 1:250,000 published geology. Of these 5 possible intrusive centres, the central feature is 3-4 times higher in amplitude than the other four, and although this may be partly due to poor resolution of the magnetic data, this apparent increase in magnetite content suggests this area as the highest priority target.

RECOMMENDATION

The location of the central magnetic high should be ground checked with ground magnetic traverses as indicated in Figure 5. An initial NNW trending line could be established along the indicated fence-line, and cross-line(s) established through the observed peak in magnetic readings. Additional cross-lines may be required if the NS profile is complex.

Results from BMR DH’s SH14 and SH15 should also be checked if available.
FIGURE 2
Canadian Examples of Relatively Large Carbonatitic Intrusives
1:250,000 Scale
FIGURE 2
The geology of the Palabora Igneous Complex (modified after Marshall et al., 1968).

FIGURE 3
Palabora Intrusive
1:50,000 Scale
FIGURE 4A
Alice Springs 1:250,000 sh.
2 Intrusives
FIGURE 5

Location Summary
and Traverse Location
1:250,000 Scale
APPENDIX III

Location of Stockdale Prospecting Ltd., 1991
BLEG Anomaly Area