EXPLORATION LICENCE 3671, ANNABURROO,
DARWIN 1:250 000 SHEET AREA, N.T.

ANNUAL REPORT FOR THE PERIOD
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OPEN FILE

NORTHERN TERRITORY
GEOLOGICAL SURVEY
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1. SUMMARY

The Annaburroo area was taken up primarily to explore for stratabound gold mineralisation and derived detrital deposits. Experience in the district suggests that anticlinal fold axial zones in South Alligator Group strata would be favourable for such mineralisation. Past exploration in the area, directed principally at uranium and base metals, had detected a scattering of localities with anomalous Pb, U, Ag, Cu, As and Au values, but no indications of commercial mineralisation had been obtained.

During 1982-1983, a detailed review of previous work was completed, and field geological reconnaissance was undertaken of the outcrop of the South Alligator Group.

On this basis, a number of areas of favourable stratigraphy and structure have been selected for more detailed exploration during 1984.

2. INTRODUCTION

Exploration Licence 3671 was granted to J.W. Shields and G.R. Orridge on 14th December 1982. It includes an area of 437 square kilometres and is situated on the sealed Arnhem Highway some 100 kilometres ESE of Darwin. The northern part consists of low lightly forested hills formed by good outcrop of Koolpin Formation and Gerowie Tuff. The southern part consists of extensive soil-covered areas, and alluvium of the Mary River Floodplain, underlain mainly by Mt. Bonnie and Burrell Creek Formations.
SECOND SCHEDULE
Plan of Area

EL 3671
136 BLOCKS
437 sq km

FIGURE 2
The area was considered prospective for stratabound gold mineralisation, associated with iron-rich sediments in the Koolpin and Mt. Bonnie Formations, and analogous to known deposits at Pig Hole (20 km to the west) and at Mt. Bonnie, Golden Dyke, Cosmo Howley and Spring Hill in the main Cullen Mineral Field some 80 km to the south. Possible potential exists for small scale underground, or medium scale open-pit orebodies, and detrital deposits derived from them. This potential has not been adequately tested in the past because of remoteness from the main gold mining centres and inaccessibility prior to the development of the Alligator Rivers uranium province. Recent exploration has been aimed at uranium and base metals. There has been no systematic exploration for gold.

Following the 1982-83 work programme the area of the Exploration Licence was reduced from 437 to 251 square kilometres mainly by relinquishment of areas underlain by Wildman Siltstone in the north, and areas of extensive alluvium over Burrell Creek Formation in the south.

3. WORK CARRIED OUT.

The objective of the 1982-1983 programme was to delineate areas of best potential which would be the targets for detailed testing in 1983-1984. To this end a comprehensive review was undertaken of all previous exploration in the area, and significant results were compiled on a 1:25 000 scale overlay to the geology.

An interpreted geological map at 1:25 000 scale was compiled, using all available data from Government and Company mapping, supplemented by the interpretation of 1:80 000 scale aerial photography and field observations.

Field traversing was undertaken on a selective basis in areas of critical interest indicated by the collations of previous data.
4. PREVIOUS SURVEYS AND EXPLORATION.

Between 1956 and 1959 the BMR carried out regional geological mapping which led to the publication firstly of 1 Mile Geological Series Sheet D52-4-48, Mount Bundey, and secondly of 1:250 000 Geological Series Sheet SD 52-4, Darwin.

In 1964 BMR flew detailed aeromagnetic surveys of the iron ore bodies near Mt. Bundey and Mt. Goyder and the results were presented in BMR Records 1965/61.

In about 1968-1969 Australian Geophysical undertook soil and rock chip geochemistry in a small area (the MC Grid) of Koolpin Formation in the extreme SE corner pf E.L. 3671. Some low order copper and copper-lead anomalies were identified but these were not tested by drilling. (Australian Geophysical AP 2226, C/R 69/3A).

Between 1973 and 1977 Geopeko completed regional exploration of an extensive area (EL 142) which included most of EL 3671. Their programme included airborne magnetic and radiometric surveys, with detailed ground surveys of the anomalies detected. Some rock chip geochemistry was also undertaken along the ferruginous outcrops of the Koolpin Formation. No significant mineralisation was detected in the present EL area although some moderately anomalous values in Pb, Zn, Ag, As, and Au were recorded in samples from the Koolpin Formation. Maximum values were 1350 ppm Pb, 6100 ppm Zn, 4.5 ppm Ag, 2239 ppm As and 0.15 ppm Au. These results are recorded in open file company reports 74/111, 74/150 and 75/121.

In 1978 CRAE carried out reconnaissance geochemical soil traverses in EL 1469 which covered the north-south belt of Koolpin Formation in the southeast of EL 3671.
Soil samples were taken at 50 metre spacing on traverses 1 km apart and the -80 mesh fraction was analysed for Cu, Pb, Zn only. Maximum values were 92 ppm Cu, 76 ppm Pb and 32 ppm Zn. Four statistical anomalies were identified, but were not regarded as indicating base metal mineralisation (reference CR 78/113).

In 1979-80 the area was explored by a Pan D'Or - Aquitaine - Jimberlana Joint Venture, under ELs 1653, 1654 and 1655. Their results are recorded in company reports 80/241A, 80/242 and 80/243.

The programme included airborne magnetics and radiometrics, false colour infrared photography, 1:10 000 geological mapping and reconnaissance rock chip geochemistry.

A number of radiometric anomalies were identified and followed up on the ground with ground radiometrics, rock, soil and water sampling. None proved to be of economic significance. The magnetic data was not compiled.

The rock chip geochemistry yielded a number of samples with anomalous values in U, Pb, Cu and Ag.

The main anomalies of interest from these exploration programmes are compiled in Figure 3.

5. GEOLOGY AND MINERALISATION.

The area is situated in the northern margin of a complex regional synclinorium. The stratigraphy consists of Lower Proterozoic sediments and volcanics of the Mount Partridge, South Alligator and Finniss River Groups. These are folded into a series of tight, gently south plunging folds. An intrusive plug of Mount Goyder Syenite is present in the northwest corner of the Licence area.
The stratigraphy is summarised as follows:

**FINNISS RIVER GROUP**

- **Burrell Creek Formation**
  - Shale, siltstone and phyllite with minor massive greywacke.

**SOUTH ALLIGATOR GROUP**

- **Mount Bonnie Formation**
  - Shale and siltstone with minor chert, banded iron formation, tuff, greywacke and limestone.

- **Gerowie Tuff**
  - Tuffaceous chert, tuff, and minor shale, siltstone and greywacke.

- **Koolpin Formation**
  - Ferruginous shale, siltstone and chert.

**MOUNT PARTRIDGE GROUP**

- **Wildman Siltstone**
  - Pyritic and carbonaceous shale, siltstone, quartz sandstone and minor andesite

The Wildman Siltstone forms generally low undulating country, with poor outcrop, to the north of the Arnhem Highway. To the south this gives way to low hill ranges formed by prominently outcropping ironstones in the Koolpin Formation and resistant cherts of the Gerowie Tuff. Further south the dominantly argillaceous Mount Bonnie and Burrell Creek Formations produce low-lying soil or alluvium-covered areas with little outcrop.

On the opposite side of the synclinorium, some 70 km south, there is a concentration of gold mines and prospects in the Howley, Brocks Creek and Grove Hill areas. The structures and stratigraphy of these areas is very similar to Annaburroo, although the latter contains fewer granite intrusions and is apparently lacking in the mafic sills (Zamu Dolerite) which abound further south.
Known mineralisation around the Mount Bundey Granite, immediately west of EL 3671, consists of a considerable number of small lead-zinc-silver-uranium prospects in minor shears and fissures, and gold in bedded "reefs" and quartz veins at Pig Hole.

The bedded mineralisation at Pig Hole consists of several thin sulphidic siltstone horizons near the base of the Mount Bonnie Formation. In places these contain high gold values, in addition to anomalous Zn, Pb, Co, Ag and As; the best values seem to be at the closures of south plunging anticlines.

Gold mineralisation occurs in comparable stratigraphic-structural settings elsewhere in the Pine Creek Geosyncline, notably at Spring Hill, Yam Creek and Big Howley.

This provides a model for exploration for exploration of the South Alligator Group at Annaburroo.


Seven areas, having potentially favourable stratigraphy and structure, have been selected for detailed investigation. These areas are shown in figure 3.

Each area will be subjected to detailed geological mapping, gossan and ironstone sampling, drainage geochemistry and prospecting for gold by panning of loams and creek gravels. Positive indications will be followed up by systematic soil geochemistry, loaming or rock chip sampling as appropriate for the outcrop conditions.

It is anticipated that expenditures on this work will be as follows:-
Geological Office and Field Work   9,600
Technical Assistant Wages       1,600
Vehicle & Fuel Costs            1,520
Purchase Aerial Photography     120
Drafting and Typing Services    300
Analytical Work                 300
Field Consumables               50
Office Consumables              50

$13,540

7. EXPENDITURES

Expenditures on EL 3671 during 1982-83 are estimated as follows:

Geological Office and Field Work 7980
Vehicle Costs and Fuel           820
Purchase Maps & Photos           185
Drafting Materials, Stationery etc.  140

$9,125

All this expenditure was incurred from the Darwin Office of Geonorth.