MCS 227

JOHNNIES REWARD PROSPECT

STRANGWAYS PROJECT, N.T.

Alice Springs 1:250 000 Map Sheet Area

FINAL REPORT

For the period
23 August 1994 to 1 September 2003

Author: A Mackie

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SUMMARY

MCS 227 (17 ha) is located 110 kilometres north east of Alice Springs. It covers the copper-gold prospect known as Johnnies Reward.

The main Johnnies Reward prospect is a structurally controlled magnetite-copper-gold metamorphogenic skarn deposit which crops out on the western boundary of a zone of copper-gold anomalism. It is classified as an iron oxide (Cu-Au) hydrothermal deposit belonging within the same classification as Ernest Henry (166 mt @ 1.1% Cu and 0.54 ppm Au), with which a valid comparison is made.

Exploration results have delineated a nine square kilometre area of gold and copper anomalism deemed highly prospective for potentially economic ore deposits. Within MCS 227 two discrete drill targets have been delineated.

The eastern boundary of the zone of Cu-Au anomalism is The Pinnacles ‘line of lode’ fault-infilled, vein quartz system some 2.5km long and up to 240 metres wide. It hosts numerous high grade oxidised copper deposits which were mined during the 1960s and have yet to be drill tested for primary copper sulphides beyond the zone of surface enrichment.

The exploration targets of the 2002 program were polymetallic metamorphosed massive sulphide deposits developed at or near the contact of a bimodal volcanic sequence and an overlying package of dominantly pelitic to calcareous sediments. Flinders Diamonds Limited’s joint venture partners reported, with the exception of known base metal occurrences, sampling results did not show any significant base metal anomalism.
1. **INTRODUCTION**

This report is a summary of all exploration conducted during the ten years of tenure of MCS 227 until its surrender on 1 September 2003.

2. **LOCATION & ACCESS**

MCS 227 is located 110 kilometres north east of Alice Springs on the LAUGHLLEN 1:100 000 map sheet area 5751 (Figure 1). Access is good via the Stuart Highway north of Alice Springs for 45km then east for 55km along the Arltunga Tourist road until The Pinnacles Bore is reached, then north for 10km along The Pinnacles – Mud Tank road.

3. **HISTORY OF TENURE**

MCS 227 was granted to Tennant Creek Gold NT Pty Ltd on 23 August 1994 and the transfer to Flinders Diamonds Limited (FDL) was registered on 3 November 2000.

On 16 July 2002 a Heads of Agreement was signed between Flinders Diamonds Limited and the BHP Billiton and Teck Cominco Alliance (the Alliance). Under the terms of the agreement the Alliance had the option to acquire 51% interest in certain tenements, which included MCS 227, after spending $2 million. Diamonds were exempted from the agreement. On 15 January 2003 the Alliance withdrew from the agreement due to discouraging results.

4. **NATIVE TITLE**

MCS 227 was located entirely within The Garden Pastoral Lease 662 and was not the subject of a land claim under the NT Land Rights Act (1976) or Native Title Act. No sacred sites have been identified within the area.

On 13 November 2002 an Indigenous Land Use Agreement and an Exploration Agreement were executed between FDL, the Alliance and the Central Land Council.

5. **PREVIOUS EXPLORATION**

1965 – 1966

AGSO flew an aeromagnetic survey over The Pinnacles – Johnnies Reward area in 1965. A strong dipolar anomaly was delineated over Johnnies Reward.

In 1965 Geopeko established a grid over the Johnnies Reward gossan and carried out ground magnetic and self-potential geophysical surveys. Testing of the confirmed anomaly resulted in one diamond drill hole intersecting 17 metres of mineralisation, averaging 0.45g/t Au and 0.26% Cu, from 62.8 metres down hole depth.

1967 – 1969

In 1967 AGSO conducted a number of ground geophysical surveys but the results of this program were not published until 1971. They constructed 3 grids and ground magnetic, IP and SP surveys were conducted over the entire Johnnies Reward grids; 9 lines of EM were also completed. Coincident anomalies from all 4 methods were delineated over the Johnnies Reward gossan.
In 1969 AGSO mapped the area of the 1965 aeromagnetic survey, to assist interpretation of AGSO geophysical surveys.

### 1982 - 1988

In 1982 Alcoa drilled 5 diamond drill holes at Johnnies Reward to test the plunging surface ironstone. Approximately 500 one metre samples were assayed for Cu, Pb, Zn, Au and Ag. Best results were obtained in DDH E058-002 (50 metres @ 0.91 ppm Au, 21 metres @ 1.0% combined base metals [Cu + Pb + Zn]) and E058-005 (32 metres @ 0.74 ppm Au, 5.6 ppm Ag). ALCOA concluded from drilling there was a possible resource of 500,000 tonnes averaging between 0.1 and 1.0 ppm Au.

Fire assaying of the above intersections (previously AAS only) in 1988 by Tectonic Resources NL increased the gold value average to 1.83 ppm and 1.06 ppm respectively. They established a new grid orientated true north, centred on the Johnnies Reward gossan. Six hundred and sixty-two soil samples were collected and assayed for gold only. 15 RC drill holes (454 metres) were collared to test the resultant soil anomalies ranging from 10 to 100 ppb gold.

### 6. EXPLORATION DURING THE PERIOD 23/8/94 TO 1/9/03

#### 6.1 1996 Program

1. The 1988 Tectonic Resources NL grid was re-established (See Figure 2).

2. CRAE Pty Ltd conducted a ground magnetic survey over the above grid on E-W traverses, 40 metres apart, using 10 metre stations (18.57 line km, 79.75 ha), to further delineate the intense magnetic anomaly over the Johnnies Reward ironstone as indicated by the 1965 AGSO aeromagnetic survey (Tipper, 1966) and the subsequent follow up ground magnetic survey in 1967 (Haigh, 1971).

3. The grid was mapped at 1:1,000 scale to assist interpretation of the magnetic data (79.75 ha).

4. Alcoa’s DDHs E058002 and 005 were relogged.

#### 6.2 1997 Program

1. The 15 RC drill holes (454 metres) drilled by Tectonic Resources NL in 1988 were relogged and resampled. Four hundred and nine samples were assayed for Au, Cu, Bi and As, with a best result of 15 metres averaging 1.04 g/tonne Au and 0.81% Cu, commencing from 5 metres down hole depth in hole JR5.

2. DDH Geopeko 1 was relogged and confirmed that only the magnetite pyroxenite unit had been sampled and assayed (44.8 to 79.86m). The best gold intersections in the Alcoa DDHs were in the footwall gneisses which occur below the magnetite pyroxenite unit; therefore if possible the remaining 61 metres of the hole should be assayed.

3. Johnnies Reward Prospect was mapped at 1:500 scale (15 ha).

4. Two rock samples were thin sectioned and later described by Pontifex (JR2 and JR15).
6.3 1998 Program

1. Forty-two rock chip samples were taken over the general area of Johnnies Reward and The Pinnacles copper shows. They were assayed for Cu, Pb, Zn, Au, Ag, Bi, Sb, Mo and Cr. Twelve BLEG –2mm drainage samples were taken from creeks draining the same area.

2. CRAE digital magnetic data was reprocessed and delineated an arcuate, demagnetised zone on the western boundary of the grid.

3. The Tectonic Resources NL gold-in-soil data was digitised and reprocessed.

4. Landsat/SPOT located digital MSS data was purchased for the entire LAUGHLEN map sheet area to assist in regional and local mapping and structural interpretation.

6.4 1999 Program

1. The northern third of the main Johnnies Reward (JR) grid was extended 300 metres to the west.

2. Fifty-four rock chip samples were mainly on the footwall or western contact of the Johnnies Reward mineralised sequence and the demagnetised zone. All rock chip samples were assayed for Au, Ag, Cu, Pb, Zn and Bi.

3. To assist regional structural interpretation and the possibility of more Johnnies Reward analogues AGSO’s aeromagnetic data was digitised by Allender Exploration and reprocessed. No other regional dipolar magnetic anomalies were delineated.

4. An OMNI Star GPS Survey was undertaken to resolve ground location control difficulties. The OMNI Star system is accurate to 0.1 metres. Two hundred and seventy four points were logged over the JR-Pinnacles area. Only by using the OMNI Star was it possible to accurately relocate the AGSO grids. Even though they are 33 years old it was possible to relocate them because they had been very accurately surveyed originally.

5. Nine rocks were sent to IR Pontifex for petrological description. The rock samples were a representative section from footwall to hanging wall (west to east) across the Johnnies Reward gossan sequence. From these he was able to identify a north-south trending zone of greenschist facies retrogression about 200 metres wide centred on the outcropping ironstone or gossan.

6.5 2000 Program

1. Alcoa rock chip sampling results, centred on Johnnies Reward gossan (30), were digitised.

2. AGSO ground geophysical survey data was re-evaluated. The relevant plans were digitised and redrafted using 1999 OMNI Star survey co-ordinates to accurately locate and tie into the AMG the various grids i.e. Johnnies Reward, Pinnacles, New Folly and the anomalies delineated.

3. The 1:20,000 scale colour aerial photography was obtained from ALCOA who flew the area (480 km²) in 1982. The relevant frames covering the Johnnies Reward copper shows were digitised (2). A detailed photo-structural interpretation was completed.
4. The Landsat/SPOT satellite MSS data sets were combined to produce high resolution images at scales of 1:5,000, 1:10,000, 1:25,000 and 1:50,000 of the Johnnies Reward area. Geological and structural interpretations of the images were completed.

5. The Johnnies Reward ground magnetic data sets (CRAE and Allender Exploration) were re-interpreted using the following images:
   - CRAE and AE combined TMI R to P
   - CRAE TMI North Illumination
   - CRAE TMI East Illumination

6. Tectonic Resources NL gold-in-soil results taken over the Johnnies Reward grid were digitised and reprocessed.

6.6 2002 Program

Geo Discovery Group Pty Ltd was commissioned by Teck Cominco Australia and BHP Billiton (the Alliance) to undertake mineral exploration activities on a number of tenements that the Alliance had access to through a joint venture agreement with Flinders Diamonds Limited. MCS 227 was one of those tenements.

The areas for reconnaissance-based field work were selected on the basis of the following criteria:

- intense magnetic anomalies that may relate to large lithogeochemical alteration zones capable of hosting significant massive sulphide systems
- presence of supporting geochemical anomalism from open-file drainage sampling data
- indications of metamorphosed alteration in the form of cordierite-bearing lithologies presented in existing geological maps
- the occurrence of known Zn-Cu mineralisation, in particular the Johnnies Reward prospect

The work completed during 2002 included:

- an evaluation of all previous exploration
- selection of follow-up areas
- ground magnetic surveying
- rock-chip sampling
- soil sampling
- geological prospecting
- collation and interpretation of results

6.6.1 Geochemical Sampling Details

All rock-chip samples were analysed for a suite of elements by ALS Chemex using its MS-ICP61 method. Elements analysed for were Ag, Al, As, Ba, Bi, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Sr, Ti, V, W, Zn, Zr and Rb. Selected samples were assayed for Au using a fire assay method.
Soil samples were analysed for a smaller suite of elements by method MS-ICP61. Elements analysed for were Ca, Cu, Fe, Mg, Mn, Pb and Zn. Complete results are presented in Appendix 2 of their report (McLean and Walters).

6.6.2 Ground Magnetic Surveying Details

The ground magnetic surveying was undertaken by Euro Exploration Services of Adelaide during the first two weeks of October 2002.

6.6.3 Johnnies Reward - MCS 227

The Johnnies Reward Cu-Au-Zn-Ag prospect occurs near the contact of a felsic gneiss sequence and metasediments (Figure 5). The mineralised zone is hosted by a distinctive sequence of garnet-spotted sillimanite-bearing gneiss and quartz-feldspar-garnet-biotite gneiss, which may represent stratabound alteration. The unit is 100 m to 200 m thick and is traceable along strike for several kilometres. The upper contact of this sequence defines a prospective horizon that has received minimal previous exploration.

A field program was designed to assess the base metal potential of the sequence, along strike from known mineralisation, by five rock-chip sampling traverses. The results are presented in Figures 3 and 4. Both Cu and Zn exhibit strong anomalism in the vicinity of known mineralisation and around the Johnnies Reward gossan. They also highlight a trend extending approximately 700m north to the Johnnies Reward North anomaly. However, sampling failed to delineate any significant anomalism on the traverses north and south of the prospect.

7. REHABILITATION

All drill holes were rehabilitated by Arnhem Exploration Services in 2000.

All PVC drill collars were cut off at ground level and plugged.

The cased diamond drill holes were also plugged.

No other ground disturbance was carried out during the tenure period.

8. SUMMARY OF EXPENDITURE

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</tr>
<tr>
<td>2002</td>
<td>17,800</td>
</tr>
<tr>
<td>2003</td>
<td>200</td>
</tr>
<tr>
<td>Total</td>
<td><strong>231,600</strong></td>
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9. DISCUSSION

9.1 General

Johnnies Reward is an iron oxide Cu-Au hydrothermal skarn deposit, separated from The Pinnacles vein-type high grade copper deposits by 1.5 square kilometres of alluvial plain which requires bedrock geochemistry drill testing. A bedrock sampling program may well explain the relationship between these two areas of distinctive style copper mineralisation. Within the area of Cu-Au anomalism five discrete drill targets have been delineated.

9.2 Drill Targets

Drill targets are shown in Figures 2 and 5.

1. Previous drilling of the main Johnnies Reward magnetic anomaly has been restricted to 3 DDHs. These holes were designed to intersect a stratiform planar body of mineralisation dipping east. However Johnnies Reward is a pipe-like, cylindrical, brecciated body plunging at 50 degrees ENE hence none of these holes has actually tested the anomaly normal to the direction of plunge (210º) nor have they tested the entire mineralised sequence from hanging wall to footwall. Infill drilling orientated at 210º is recommended between the collars of ALCOA 002 and 005 DDHs, a distance of 63 metres.

2. The geochemically anomalous gossan and magnetite skarn cropping out north of an interpreted thrust fault has never been drill tested. It may be a repeat of the main Johnnies Reward breccia albeit smaller. A north east trending fault separates the two. This structure is coincident with a sharp decrease in soil gold values and an interpreted shear zone delineating the SE extent of the main Johnnies Reward magnetic anomaly.

3. The Johnnies Reward North magnetic anomaly underlying an outcropping geochemically anomalous gossanous magnetite skarn adjacent to a major ESE – trending structure (interpreted as a thrust fault) has never been drill tested. Although smaller, this dipolar anomaly is very similar to the main Johnnies Reward anomaly.

4. This is a geochemical target (100ppb gold, soil anomaly) however there is also a magnetic anomaly (as yet unexplained) slightly east of the soil anomaly.

5. This is also a soil anomaly (50ppb gold). However, it may be sheet wash contamination.

9.3 Main Johnnies Reward Prospect

Is Johnnies Reward an Ernest Henry Analogue? There is compelling evidence to suggest that the Cu-Au mineralisation occurring at Johnnies Reward may belong to the same family of Fe-oxide (Cu-Au) deposits as the Ernest Henry deposit (166MT averaging 1.1% Cu and 0.54 grams/tonne Au) located in the Cloncurry District of the Paleoproterozoic Mt Isa Block in western Queensland.

Common characteristics of Ernest Henry and Johnnies Reward

- Similar chemistry and age of protoliths (1740 – 1780ma).
- Middle to upper amphibolite facies metamorphism.
- Dominated by hydrothermally-derived magnetite.
- Regional aeromagnetic dipolar anomalies.
• Mineralisation structurally controlled, forming brecciated pipe-like bodies elongated parallel to direction of plunge.
• Timing of mineralisation postdates peak metamorphism by at least 200 Ma – time lag important for pre-ore brittle fracture of depositional site.
• Loci of repeated metamorphic and/or hydrothermal fluid flow.
• Fe oxide (Cu-Au) hydrothermal systems (precipitated from sulphur-bearing oxidised fluids).
• Strong presence of carbonate (by inference skarn – type deposit affinities) both as protoliths and introduced hydrothermal alteration activity.
• Mixed ore fluid derivation (magmatic and metamorphic components).

10. REFERENCES


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Johnnies Reward Area
Copper rock chip geochemistry
1:25,000

Cu in rock chips (ppm)
- 0 - 50
- 51 - 100
- 101 - 250
- 251 - 500
- 501 - 1000
- 1001 - 100000
- Open tile rock chips