GEOLOGY

The Moline regional setting and local geology have been described in previous Cyprus/Greenbushes reports. Briefly, the tenements cover parts of two major SE plunging anticlinorial structures with closures outlined by Namoona and/or South Alligator Group and Finnis River Group rocks (see Figure 2.).

The generally accepted subdivision of the relevant section of the Pine Creek Geosyncline stratigraphy is:

Unit	Lithologies	Thickness (metres)	Relationships to other units
<u>Finnis River Group</u>			
Burrell Creek Formation	greywacke, siltstone, shale	>3000	Gradational into Mt Bonnie Formation
<u>South Alligator Group</u>			
Mt. Bonnie Formation	greywacke, siltstone shale (commonly carbonaceous) + chert bands and nodules; banded sulphidic chert (BIF)	150-400	Mainly conformable and in places interbedded with Gerowie Tuff; sometimes conformable onto Koolpin Formation
Gerowie Tuff	cherty tuff, shale, tuffaceous greywacke, siliceous/carbonaceous, shale with chert bands and nodules, BIF.	200-400	conformable onto and in places interbedded with Koolpin Formation.
Koolpin	siltstone and shale commonly carbonaceous and pyritic/ pyrrhotitic and with chert bands and nodules, silicified, dolomite, BIF	100-500	Angular unconformity to disconformity at base.

Based on NTGS-BMR geological mapping of the Ranford Hill 5374 100,000 sheet and Cyprus work around Moline, it seems the Moline area contains SE plunging, overturned, isoclinal folds comprising units of the Koolpin Formation, Gerowie Tuff and Mt Bonnie Formation and bounded on the NE by Burrell Creek Formation units. Dips are typically to the west at high angles, though (because of recumbent folding?) very flat dips are often found in the NW regions.

Interpreted property stratigraphy is shown on figure 2 (1:100,000 scale) and enclosure 2 (1:25,000 scale) while enclosures 3 and 4 (1:10,000 scale) are essentially geological fact maps with major lithological subdivisions highlighted. With a little more field work in some areas these 1:10,000 scale maps could be upgraded to show stratigraphy.

Due to the difficulty in recognising unequivocal Gerowie Tuff (except in the NW part of the property) the true stratigraphic level of many important rock sequences - including the mineralized Moline Dam and Southern Hercules chert-shale dominant sequences - has previously been uncertain though they were considered probably part of the Mount Bonnie Formation. Mapping of thin (30-50 cm) siliceous tuff horizons in the Hercules and School pits and in "new" exposures on the re-located Kakadu Highway and a geological interpretation of the Tumbling Dice area tend to suggest, however, that they may be best correllated with the Gerowie Tuff.

EXPLORATION

Moline exploration in 1989 comprised a substantial amount of access track construction and significant gridding, geological mapping/rock chip geochemistry, soil geochemistry, costeaning plus air-trac and RC drilling programmes as well as limited HQ_3 diamond core drilling.

Access Trucks

All access track construction was approved and carried out by Mary River Station Pty Ltd using a bulldozer or grader as necessary for effective access to difficult areas with minimal environmental damage.

Gridding

Apart from a 7 km. base line through the Bonnie Line - EL Dollarado area which was constructed by Survey and Mapping Pty Ltd of Darwin, all gridding was carried out by a Cyprus staff surveyor with casual support. With the exception of the Northern Hercules - Highway - Kendergarden area, the grid system is ultimately tied to the original Moline Dam surveyed baseline.

Mapping and Sampling

All surface and costean geological mapping and soil/rock chip/costean sampling was carried out by Cyprus geologists/technical assistants.

Magnetometer Survey

A magnetometer survey of Tumbling Dice was carried out by a Cyprus technical assistant using a Geometrics G813 proton precession unit. The survey was carried out in loops off a base line for which values had previously been ascertained by repeat traversing. The survey area overlapped a 1987 survey area.

Costeaning

All costeaning was carried out by either Roche Bros of Darwin or Kindred Industries of Pine Creek, N.T. using excavators. The costeans were dug to an average depth of 1.5 metres and continuously channel sampled at 5 metre intervals (2.5 metres over anomalous zones), creating samples of 3-5 kg.

Drilling

All RC drilling was carried out by Rockdril Contractors Pty Ltd of Alice Springs N.T., using a Schramm or a Warman 1000 with a cyclone/splitter attached or by Civil Drilling of Perth, using a truck mounted CD350 rig. Rockdril's holes were 5.5 inch diameter, Civil's were 4.5 inch. Drill pads were constructed by Mary River Station or Roche Bros.

Holes were generally drilled at 15m spacings on drill sections 25 to 50 metres apart, depressed at 60^{o} angle to horizontal and oriented grid east.

All RC drillholes were sampled at one metre intervals, 3-4 kilograms were split off for analysis and the remainder of the sample left in 60 x 90 cm plastic or polywoven (for wet samples) bags on site. Plastic or polywoven bags containing significantly mineralized material were subsequently relocated to Cyprus' exploration base in Pine Creek.

In the early part of the year mineralized intervals likely to comprise ore zones were re-assayed for gold and analysed for arsenic-silver-copper-lead and zinc; 3-4 kg samples were (riffle) split off the large bag contents. Although this re-sampling process did not continue through the year, the large bags holding the mineralised intervals have been kept in good condition for this purpose.

Geochemical Analyses

All drillhole, costean and surface rock chip sample analyses were carried out by Australian Assay Laboratories Pty. Ltd. (AAL) at Pine Creek. Drillhole samples were completely pulverised and a 50 gram split fire assayed for gold. Costean and surface rock chip samples were prepared the same way and analysed for gold by fire assay and arsenic and silver by AAS. Rock chip samples were also analysed (AAS) for copper, lead and zinc. Analytical methods and levels of detection were:

Element	Code	Level of Detection
Gold	FA 50	0.01 ppm
Arsenic	AAS D100	100 ppm
Silver	AAS D100	1 ppm
Copper	AAS D100	2 ppm
Lead	AAS D100	5 ppm
Zinc	AAS D100	2 ppm

Repeat gold and/or arsenic-silver-copper-lead-zinc analyses of mineralized drillhole samples were carried out by AAL or by Analabs, Darwin. Analabs analytical methods and levels of detection were:

Element	Code	Level of Detection
Gold	Fire Assay 313	.005 ppm
Arsenic	AAS 101	100 ppm
Silver	AAS 101	5 ppm
Copper	AAS 101	5 ppm
Lead	AAS 101	5 ppm
Zinc	AAS 101	5 ppm

Available repeat gold and arsenic-silver-copper-lead-zinc-analyses for mineralized drillhole samples are listed in Appendix 5. No statistical treatment of the additional analyses has been carried out.

All soil samples were collected from 15cm deep holes, and after sieving through a 6mm (1/4") mesh, a 1 kg sample was bagged and sent to Analabs Pty.Ltd. in Darwin. Each sample was totally pulverised to -200 mesh and a 50 gram split analysed for gold, arsenic, silver, copper, lead and zinc. Analytical methods and levels of detection were:

Element	Code	Level of Detection
Gold	AAS 334 plus AAS 329	0.001 ppm (1 ppb) 0.02 ppm (for samples with > 100 ppb)
Arsenic	AAS 101	100 ppm
Silver	AAS 101	0.05 ppm
Copper	AAS 101	5 ppm
Lead	AAS 101	5 ppm
Zinc	AAS 101	5 ppm

Magnetic Susceptibilities

RC drill cuttings were routinely measured for magnetic susceptibility with a Geoinstruments meter measuring 10^{-5}S.I. units. The values are listed on the drill logs (Appendix 3). Cuttings were measured in 3-4 kg calico bags prior to being pulverized or in the large residue bags remaining on the drill sites.

Geological Ore Resource Calculations

Preliminary geological ore resources for Tumbling Dice, Trig and Highway were computed using a digital planimeter. The areas of ore blocks on drill sections were measured and multiplied by an S.G. of 2.4 for oxide ore or 2.75 for sulphide ore (based on previous Moline data) and by the along-strike length of influence.

The ore blocks were defined by a 0.5 g/t gold cut off with the grade being an arithmetic average of the individual assays inside them after grade cutting to 10 g.t. The individual assays are original rather than later repeat or average data. Original assays are often an average of two or more readings shown on the original assay report.

The along-strike length of influence is an average of the distances to adjacent sections. The length of influence could, accordingly, be 50, 37.5 or 25 metres: 50 metres where drill sections were 50 metres apart; 37.5 metres where a lode was tested 50 metres along strike in one direction and 25 metres along strike in the other direction from the section in question; 25 metres where a lode was drill tested on 25 metre spaced sections.

As indicated on the drill sections, ore blocks were considered to continue half way (i.e. normally 7.5 to 10 metres) between mineralized and unmineralised holes on sections and the same distance below the deepest intersection on each section.