ANNUAL REPORT FOR
EXPLORATION LICENCE 5199 (KINKEYBURTA)
YEAR ENDING 26TH MARCH 1988
TENNANT CREEK N.T.

A. MACKIE
PNC EXPLORATION (AUSTRALIA) PTY. LTD.
SYDNEY OFFICE
APRIL, 1988
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**FIGURES**

1. LOCATION MAP
2. STRATIGRAPHIC COLUMN

**PLATES**

1. TOTAL MAGNETIC INTENSITY 1:50,000 SCALE
2. BOUGUER ANOMALY CONTOUR PLAN 1:100,000 SCALE
1.0 SUMMARY

Exploration in EL 5199 for the year ending 26th March 1988, consisted of a fixed wing airborne magnetic/radiometric survey, a reconnaissance gravity survey and an RC percussion drilling which commenced in late March, 1988. This work was aimed at obtaining stratigraphic information about the poorly exposed basement rocks. The drilling has shown the SW part of EL 5199 to be underlain by the prospective Carraman Formation, in part intruded by granitoids.
2.0 INTRODUCTION

This report details exploration undertaken by PNC in EL 5199 during the initial year of tenure.

Tennant Creek is located near the centre of the Northern Territory. Access is via the Stuart Highway from the north and south, and via the Barkly Highway from the east. EL 5199 is located about 30 kilometres NE of the Tennant Creek township. Tennant Creek is a centre for mining and tourist industries and has a population slightly in excess of 3000.

The physiography varies from low ranges or isolated hills to the north and west of Tennant Creek, whilst other areas are flat sandy plains generally devoid of outcrop. EL 5199 fits into the latter category. There are a few low hills in the western half of EL 5199, most are capped with Cambrian chert, and although there are a few outcrops of Lower Proterozoic rocks, these tend to be ferruginised due to lateritic weathering.

Access within the EL 5199 is via station tracks, and two tracks graded by PNC for drilling profiles. EL 5199 can be readily traversed by 4-wheel drive vehicle although the incidence of staked tyres is high.

2.1 Tenure

Exploration Licence 5199 was granted to PNC on 27th March 1987 for a period of six years. The year 1 expenditure covenant is $70,000.

2.2 Previous Exploration

Systematic exploration of the Tennant Creek area for copper-gold-bismuth-selenium mineralisation similar to the known orebodies has been undertaken during the past 30 years. The exploration has been successful in delineating numerous orebodies. The principal companies involved have been Peko Mines (Geopeko) and Australian Development.

Much of the exploration has been poorly reported, however the basic technique employed has been drilling of magnetic anomalies. Surface geochemical techniques have been unsuccessful due to strong weathering and leaching. Recently, Australian Development are understood to have used detailed gravity with some success to delineate mineralised ironstones with poor magnetic expressions.
The only company to carry out significant exploration for uranium was Uranerz during the period 1976 to 1979. Marathon operated under joint venture with Australian Ores and Minerals and Uranerz from 1979 to 1981 and although uranium was included in the stated minerals being explored for, most work centred on magnetic anomalies and associated base metals.

Exploration by Uranerz concentrated on the Middle Proterozoic unconformity and hematitic shales between the Edna Beryl and North Star mines. Uranium was known to occur in chloritic shales beneath the North Star mine. The program consisted of footborne scintillometry, gridding, auger drilling (487 holes for 3,723 metres) and Track Etch surveys. It was concluded that lithologies in the vicinity of the unconformity were not favourable and no significant anomalies were detected. Subsequent reinterpretation of the stratigraphy by BMR geologists has repositioned the unconformity at a lower stratigraphic position (the base of unit PW4).

2.3 Exploration Target

The mineralisation mined to date at Tennant Creek consists of Au-Cu-Bi mineralisation contained within massive iron oxide bodies (magnetite and/or hematite), locally termed "ironstones". The ironstones are replacement bodies emplaced in dilational zones within the Lower Proterozoic Carraman Formation. The mineralisation and associated hydrothermal alteration is attributed by Large (1975) to acid igneous activity.

Uranium has been reported from a number of the mineralised ironstones. The association of uranium, gold and copper mineralisation with massive iron oxides related to volcanic hydrothermal activity, is similar to the currently favoured model for Olympic Dam.

3.0 REGIONAL GEOLOGY

A stratigraphic column for the Tennant Creek area is shown as Fig. 2. Au-Cu mineralisation is contained within the Carraman Formation of the Warramunga Group.

3.1 Archaean

Metamorphic rocks (amphibolite facies) of probable Archaean age have been identified approximately 30 km west of Tennant Creek. At surface these rocks consist of rubbly hematite quartzite, whilst gneiss, schist and amphibolite have been intersected in drillholes. Sm-Nd dating of
HELEN SPRINGS VOLCANICS

RISING SUN CONGLOMERATE

MIDDLE TO UPPER HATCHES CREEK GROUP

TOMKINSON CREEK BEDS

LOWA HATCHES CREEK GROUP

WARRAMUNGA GROUP

CARRAMAN FORMATION

BERNBOURGH FORMATION

WHIPPET FORMATION

ARCHAEAN BASEMENT

Approx. Thickness (metres)

15

Laves and pyroclastics.

? Conglomerate, quartzite and sandstone

? Orthoquartzite, sandstone, minor pebble beds

>10,000 Quartz sandstone, feldspathic quartz sandstone and conglomerate.

Diorite and dolerite which Intrude Warramunga Group and Tomkinson Creek Beds.

Lithic and feldspathic arenite, Conglomerate

Greywacke, lithic greywacke and minor shales.

Iron-free facies

Hematite facies

500 to 1500 Felsic turbidites, tuffaceous greywacke, argillaceous iron formations (b.i.f.'s), thylilitic pyroclastics, ash-flow tuffs.

Magnetite facies

500 Felsic turbidites, chloritic siltstones, argillaceous iron formations (b.i.f.'s).

0 to 700 Rhyolitic lavas, pyroclastics, tuffs and shales.

300 Massive sandstones, minor greywackes and shales.

Gneisses, schists, amphibolites.

Unconformity

Fig. 2

GEOPKO
TENNANT CREEK NORTHERN TERRITORY

PROJECT

AREA

TENNANT CREEK

DATA

STRATIGRAPHIC COLUMN

DRAGEN

COMPILN

SCALE

PAGE, REG.

PJ Castle

PAgnet E/81

N/A

TF 3130
amphibolite core suggests a possible minimum age of 2300 Ma, which was
subsequently reset during metamorphism at 1920±60 Ma. (Black and
McCulloch, 1984).

3.2 Warramunga Group

The Warramunga Group consists of a eugeosynclinal sequence of
interbedded sedimentary and volcanic rocks, and is widespread in the
Tennant Creek region. The lowermost formation (Whippet Formation)
consists of massive sandstone with minor greywacke and shale. The
Bernborough Formation is dominated by acid volcanics consisting of
rhyolitic lavas and pyroclastics.

The Carraman Formation consists of turbidites (greywacke, shale, siltstone)
with some chemical sediments (jasper, argillaceous BIF) and a volcanic
component consisting of tuff and quartz-feldspar porphyry.

The Warramunga Group has been tentatively subdivided into seven units
(Pw₁-Pw₇) by Mendum and Tonkin (1976), on the basis of the proportions
of siltstone, greywacke and shale. Limited field investigations by PNC
indicate the units cannot be readily distinguished in the field and some
are of doubtful validity.

Unit Pw₄ has been reinterpreted by Blake (1984) as resting
unconformably on the Warramunga Group, and is correlated with the
Lower Hatches Creek Group to the south of Tennant Creek.

Volcanics from the Bernborough Formation have been dated at between
1819 and 1849 Ma (Black, 1981). The main regional folding event has
been dated at 1810 Ma, whilst syn or post orogenic granitoids which
extensively intrude the Warramunga Group range in age from about 1800
to 1450 Ma. (Black 1981).

3.3 Hatches Creek Group/Tomkinson Creek Beds

The Middle Proterozoic Hatches Creek Group outcrops to the south of
Tennant Creek in the Davenport and Murchison Ranges, where it overlies
the Warramunga Group with a marked angular unconformity. The
dominant lithology is quartz arenite, although felsic and basic volcanics
are also present.

To the north of Tennant Creek the Warramunga Group is unconformably
overlain by feldspathic arenite and siltstone which Blake (1984) correlates
with the lower part of the Hatches Creek Group (this was formerly included as unit Pw4 of the Warramunga Group). This unit is in turn unconformably overlain by the Tomkinson Creek Beds which consist dominantly of quartz arenite (orthoquartzite).

3.4 Cambrian

EL 5199 contains a number of outliers of chert mapped as the Gum Ridge Formation of Cambrian age which generally outcrop as low rises or small hills. The chert is generally greenish-grey or yellow-brown and is almost invariably fractured and brecciated. The chert is sometimes stained with iron oxides. Weathered basalt of the Helen Springs Volcanics underlies the chert in the SW part of EL 5199.

4.0 EXPLORATION RESULTS

4.1 Gravity

A reconnaissance gravity survey was completed over EL 5199 by Wongela Geophysical. The survey consisted of four E-W traverses and three N-S traverses, for a total of 186 stations. The station spacing was 1 km. A La Coste-Romberg gravity meter was used along with a barometer for altitude determinations. A barometer and wet/dry bulb thermometer reading was taken every 15 minutes from a base station in Tennant Creek to correct for temperature and atmospheric variation.

The data was tied into the existing BMR regional grid using the established base station at Tennant Creek airport. A Bouguer Anomaly contour compilation of all available data is included. The main feature of note is a NW trending gravity ridge which transects EL 5199, and approximately parallels the regional strike.

4.2 Airborne Survey

A fixed wing airborne magnetometer/spectrometer survey was flown over EL 5199 by Kevron Geophysics Pty. Ltd in June/July, 1987. Line spacing for N-S lines was 500 metres, whilst EW tie lines were spaced at 1 km, mean terrain clearance was 80 metres.

Spectrometer data was corrected but not contoured since no uranium channel anomalies were anticipated or encountered due to the surficial cover and deep weathering, although a number of discrete thorium
anomalies are present. The thorium is possibly contained in surface laterite.

Within EL 5199 one of the main features is a ridge of high magnetic intensity which trends broadly NW, although it swings to westerly near the western boundary of EL 5199. The magnetic ridge roughly parallels the gravity high noted in the previous section, but is offset from it.

The NE portion of EL 5199 is an area of low magnetic activity, which is noteworthy for five discrete dipole anomalies which have a magnetic character similar to that of magnetite-rich ironstones which host Cu-Au+/U mineralisation on the main Tennant Creek Field.

4.3 Percussion Drilling

A reverse circulation percussion drilling program was completed in EL 5199 during March. The drilling was undertaken by Rockdrill Contractors Pty. Ltd. using a Bourne 3000 rig.

The program was designed to acquire stratigraphic information about areas devoid of outcrop. Thirteen holes totaling 938 metres were drilled along two profiles. The holes were sited to test units postulated from the gravity and magnetic data. Ground magnetic traverses along both profiles were used to precisely locate magnetic peaks which were subsequently drilled (KK3, KK9).

The drilling commenced on the 20th March and was completed on the 29th March 1988, which overlaps year 1 and year 2 of tenure for EL 5199. Consequently much of the information pertaining to this drilling is not available at the time of writing and will be reported in detail in the next annual report. The pre-Phanerozoic lithologies are summarised below:

KK 1: Interbedded shale and greywacke
KK 2: abandoned at 38m due to bad ground, lithology appears to be a siliceous green siltstone.
KK 3: biotite rich granitoid (diorite?)
KK 4: brown shale
KK 5: dark green chloritic shale
KK 6: leucocratic granite
KK 7: Interbedded greywacke and shale
KK 8: leucocratic granite
KK 9: greywacke and shale, minor granite.
KK10: siliceous siltstone/fine sandstone with weathered brown siltstone.
KK11: siliceous siltstone/fine sandstone with weathered brown siltstone or shale.
KK13: weathered micaceous, brown siltstone, minor fine sandstone.
KK15: porphyritic acid volcanic.

Drillhole sites KK 12 and KK 14 were not drilled due to budgetary constraints.

Lithologies intersected in KK1, KK4, KK5, KK7 KK9, and probably KK2 belong to the prospective Carraman Formation. The sediments intersected in KK10, 11 and 13 appear to be relatively undeformed and the gamma log suggests the sediments are flat lying. They are probably part of a sedimentary basin, possibly the edge of the Georgina Basin. The acid volcanics from KK15 probably belong to the Bernborough Formation.
5. REFERENCES

Black, L.P., 1981, Age of the Warramunga Group, Tennant Creek Block, Northern Territory. BMR Journal of Australia Geology & Geophysics, 6, 253-257.


Blake, D.H., 1984, Stratigraphic correlations in the Tennant Creek region, central Australia: Warramunga Group, Tomkinson Creek Beds, Hatches Creek Group, and Rising Sun Conglomerate. BMR Journal of Australian Geology & Geophysics, 9, 41-47.

Large, R.R., 1975, Zonation of hydrothermal minerals at the Juno Mine, Tennant Creek Goldfield, Central Australia. Economic Geology, 70, 1387-413.

## Statement of Expenditure

**Year Ending 26th March, 1988**

**Exploration Licence 5199 (Kinkeyburta)**

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