PARTIAL RELINQUISHMENT REPORT
FOR
EXPLORATION LICENCES 7557, 7558, AND 7559
BARROW CREEK PROJECT, NT
PERIOD 12TH DECEMBER 1991 TO 11TH DECEMBER 1993

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MARCH 1994

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ABSTRACT

Western Mining Corporations Barrow Creek Project consists of ELs 7557, 7558, and 7559 all of which were granted on the 12th December 1991 for a period of 6 years. Exploration by WMC has included aerial photograph regolith interpretation, semi-regional gravity surveys, and image processing of BMR and NTDME aeromagnetic data.
1. INTRODUCTION

Exploration licences (EL) 7557, 7558, and 7559 in the Mt. Peake locality, N.T., were granted to Western Mining Corporation (WMC) on 12th December 1991. The ELs were contiguous and covered a total area of 1308 blocks (4212 km²). A 50% total area relinquishment was carried out at the end of the second year of tenure taking the total area to 651 blocks (2096 km²) - the relinquished areas of the ELs is shown in figure 1. NTDME project status has been granted for these tenements.

This report documents exploration activity and expenditure on the relinquished areas of all three tenements for the period 1991 to 1993.

2 REGIONAL INVESTIGATIONS

2.1 Introduction

WMC commenced its assessment of the Barrow Creek area in July 1991. A regional appraisal of the northern Arunta, Tanami, and Tennant Creek Blocks was carried out with the aim of identifying regional ore controlling features. The appraisal was spurred on by discussion with NTDME geologists who described findings of the then recently completed mapping project on the Barrow Creek 1:250 000 sheet and mapping in progress on the Mt. Doreen 1:250 000 sheet. On the basis of regional stratigraphic correlations, lineament studies, compilation of data on intrusive history, and interpretation of regional aeromagnetic and gravity data, several areas of interest were identified.

The target ore type in the Barrow Creek Project area is Au (Cu) associated with iron rich rocks.

2.2 Regional Geology

Relinquished portions of ELs 7557, 7558, and 7559 occur within the SE portion of the Mt. Peake 1:250 000 sheet and the SW portion of the Barrow Creek 1:250 000 sheet. These map sheets cover several major geological domains including parts of the northern Arunta Inlier, the southwestern Davenport Province of the Tennant Creek Inlier, and the southwestern and southern extremities of the Georgina and Wiso Basins respectively. Of interest to this study are the Early Proterozoic metamorphic and igneous rocks of the Arunta Inlier.

The Arunta Inlier has been subdivided both tectonically and stratigraphically (Shaw and Stewart, 1975a, b, Shaw, 1990). The tectonic subdivision recognises three east-west oriented structural zones (Northern, Central, and Southern). The Northern Zone, within which WMCs ELs are situated, is considered to be at least partly equivalent to the tectonic zones comprising the Tanami Block (to the NW) and the Tennant Creek Block (to the north). The stratigraphic subdivision, referred to as Divisions 1, 2, and 3, is based on lithological assemblages. Rocks belonging to Divisions 2 and 3 outcrop on Mt. Peake and Barrow Creek map sheets (figures 2, 4).

On Barrow Creek the Early Proterozoic rocks comprise orthogneiss, calc-silicate rocks, and the Bullion Schist unit. The Bullion Schist crops out in the regional vicinity of the Home of Bullion Cu-Pb-Zn-Ag mine. It consists of interbedded schist, minor micaceous arenite and metamorphosed felsic volcanic rocks (Haines et. al., 1991). It also contains amphibolite, which at the Home of Bullion mine is interpreted to be of volcanic origin. The Ledan Schist crops out near the southern edge of the Barrow Creek sheet and consists of biotite-muscovite-quartz schist with accessory tourmaline. Minor lithologies include medium-bedded quartzite, metamorphosed conglomerate, metamorphosed felsic volcanic rock, and amphibolite.

Within the context of the Division 1, 2, and 3 subdivision of the Arunta Inlier, the orthogneiss, calc-silicate rocks, and Bullion Schist Beds belong to Division 2, whereas the Ledan Schist belongs to Division 3. The Ledan Schist has been tentatively correlated with the Hatches Creek Group (Shaw and Warren, 1975).
The Bullion Schist is a correlative of the Lander Rock Beds of Arunta Division 2. The Lander Rock Beds outcrop on the Mt. Peake map sheet and consist of phyllite, schist, biotite gneiss and amphibolite.

The Barrow Creek Granite complex (Haines et. al., 1991) includes several intrusive phases consisting of medium to very coarse grained and porphyritic biotite granites and adamellites, and fine to medium grained tourmaline bearing biotite-muscovite leucogranite. The leucogranite varies from even-grained to porphyritic, with elongate feldspar phenocrysts up to about 5cm long. The granites are both foliated (and in places gneissic and mylonitised) and unfoliated. The granites have not been dated by the U-Pb zircon method, and K-Ar and Rb-Sr dates are most likely inaccurate.

Medium to very coarse grained pegmatite intrudes the granite complex, and the Bullion Schist Beds. The pegmatites contain feldspar phenocrysts to 30cm long. Small concentrations of muscovite, tin, tantalum and tungsten have been mined from the pegmatites.

The Ali Curung granite is an elongate multiphase intrusion comprising granite, porphyritic granite, leucogranite, and very weathered granodiorite. The granite intrudes the Middle Proterozoic Hatches Creek Group and is unconformably overlain by the Late Proterozoic Central Mount Stuart Formation.

Several outcrops of unnamed and undivided granitoids occur on Barrow Creek.

Granites on the Mt. Peake map sheet remain unnamed, but on the basis of lithological descriptions are probable correlatives with granites described from the Barrow Creek and Mt. Doreen sheets.

The metamorphic grade of the Lander Rock Beds and regional equivalents is greenschist to lower or middle amphibolite facies. Zones of hornfels occur adjacent to some intrusives.

Haines et. al. (1991) discuss three major structural divisions on the Barrow Creek sheet. This division applies equally well to the Mt. Peake sheet, and consists of

(a) extensively deformed Early Proterozoic rocks of the Arunta Inlier.
(b) tightly folded and extensively faulted rocks of the Hatches Creek Group.
(c) faulted and tilted, but only weakly folded rocks of the Georgina Basin.

The Lander Rock Beds and regional equivalents are strongly cleaved, faulted and isoclinaly folded. Many fault zones are marked by upstanding quartz veins and breccias. Cleavage orientations are variable and are usually steeply dipping.

2.3 Regional Data Sets Compiled by WMC

Regional data sets covering the northern Arunta Inlier which have, or are being compiled by WMC, include

(a) a regional mosaic of BMR and NTDME aeromagnetic data. NTDME aeromagnetic data from the Barrow 1:100 000 sheet were purchased and image processed.
(b) a semi-regional plan of contour gravity data (figure 11).
(c) regional mosaics of published geological data to assist with interpretation of geophysical data sets.
(d) image processing of landsat TM data over the Barrow Creek - Mt. Peake sheets.

Compilation and interpretation of all data sets is ongoing.
3. **EXPLORATION RESULTS**

3.1 **Geological Investigations**

No systematic geological mapping has been completed in the relinquished areas.

3.2 **Geochemical Investigations**

To assist with interpretation of reconnaissance geochemical sampling programs a regolith map was compiled. Regolith maps were prepared from air photo interpretation of black and white RC 9 photos and compiled on standard 1:100 000 sheets.

The regolith has been subdivided into two major groups:

i) depositional – deposition is greater than erosion

ii) erosional – erosion is greater than deposition

The depositional regolith has been further subdivided into:

- **alluvium** – recent material deposited mainly by rivers and creeks.
- **older alluvium** – this is older alluvium that can be distinguished from the recent alluvium either by its relative height, colour or stratigraphic position.
- **calcreted drainage sediments** – this is calcrete that has formed in current or "fossil" drainages. It is characterised by a "poikilitic" appearance on the photographs.
- **ferruginised drainage sediments** – this is ferricrete that has formed by precipitation in current or "fossil" drainages.
- **ferricreted alluvium** – this is ferricrete that has formed by precipitation of iron in alluvium and alluvial fans adjacent to hills or positions where hills used to be. Note that it is often misidentified as residual ferricrete.
- **alluvial fans** – these are outwash fans where creeks and/or rivers leaving hills have a sharp drop in gradient and dump most of their load of coarse sediment.
- **playa sediments** – these are ancient to recent sediments that have been deposited in permanent or ephemeral lakes.
- **colluvium** – this is the equivalent of an outwash fan for sheet wash. The material is generally not deposited in the form of a discrete fan, but rather as an annulus around higher ground.
- **mature plain** – this is an area where deposition is quite slow now. Most deposition currently occurs in the form of wind-blown sand or dust.

The erosional regolith has been further subdivided into:

- **mottled zone/residual ferricrete** – this is the top of a strongly weathered profile. It resembles ferricreted alluvium, but is characterised
by kaolinitic mottles when seen in outcrops in the field.

**pallid zone** -  
this consists of highly oxidised and kaolinitic bedrock.  
It has a characteristic "bright white" colour on the RC9 photographs.

**saprolitic zone** -  
this consists of oxidised bedrock in which relict textures can be seen. Sometimes granitic saprolites can be distinguished on aerial photographs by outcrops of core stones.

**fresh zone** -  
this consists of weakly oxidised and/or silicified bedrock. Sometimes granitic outcrops can be distinguished by their tors and fracture patterns.

**anthropogenic modification** -  
whenever man modifies the environment, he generally causes erosion. In this area the effects are quite limited.

Because only black and white RC9 aerial photographs were available, it was very difficult to map the boundary between ferricreted alluvium and mature plain. Colour is the best guide for doing this.

It was sometimes quite difficult to distinguish between mature plain (mainly sandy surface) and alluvium (mainly silty surface) on the aerial photographs. As mentioned above, distinguishing between alluvium and mature plain was made even more complicated by recent faults which upthrow the alluvium to the level of mature plain. The reverse is not seen since any down-thrown mature plain quickly gets a veneer of alluvium over it.

### 3.3 Geophysical Investigations

As discussed above, available aeromagnetic data (BMR, NTDME) were obtained and spliced into a regional mosaic (figure 5).

A semi-regional gravity survey was completed over most of the original project area. The survey comprised collection of gravity data along fence lines, tracks and cross country on 1km spaced stations. The data were processed to produce a Bouguer contour plot (figure 11). Digital data over relinquished areas are available on request.
4. **EXPENDITURE**

Approximated expenditure for the period 1st December 1991 to 30th November 1993 is tabulated below.

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5. **REFERENCES**


### Stratigraphic Summary

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**Western Mining Corporation Limited - Exploration Division**

- **Map Ref.**
- **Date:** FEB 94
- **Author:** MSN
- **Revised:**

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**Barrow Creek Project**

**Stratigraphic Summary**

**Scale:**

**Figure No.:** 2

**Plan No.:**
BARROW CREEK PROJECT N.T.
SCHEMATIC REGIONAL GEOLOGY

Fig. 4

PAS.4.3.8/5/92
FIGURE 5
SCALE 1:500000
BARROW CREEK PROJECT

EL 7557
EL 7558
EL 7559