## FINAL TECHNICAL REPORT

**EL 26924 – YEURALBA**

FOR THE PERIOD 8 DECEMBER 2008 TO 8 JANUARY 2013

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<th>Title holder</th>
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</tbody>
</table>
CONTENTS

EXECUTIVE SUMMARY

LOCATION, TOPOGRAPHY AND ACCESS

PREVIOUS EXPLORATION

GEOLOGY

GA AEM AIRBOURNE SURVEY

2010 - GA AIRBORNE GEOPHYSICS

REFERENCES

ATTACHMENTS:

1. GA AEM SYNTHETIC PROFILES – GA AEM FLIGHT LINES
2. GA MAGMAP V5 2010 – GA AEM FLIGHT LINES
3. GA RADMAP 2010 – URANIUM eU RADIOACTIVITY – GA AEM FLIGHT LINES
4. GA RADMAP 2010 – TC RADIOACTIVITY – GA AEM FLIGHT LINES
5. GOOGLE EARTH IMAGE – GA AEM FLIGHT LINES
6. NTGS GEOLOGY – GA AEM FLIGHT LINES
7. 90M SRTM DEM – GA AEM FLIGHT LINES
EXECUTIVE SUMMARY

This is the Final Technical Report for EL 26924.

In 2011 a review of the exploration potential of this tenement was completed. Utilising images (attached) from the GA Airborne geophysics, it was apparent that there is an almost universally low total count radiometric response over the Mamadawerre Sandstone. In addition there is a strong anomalism on the southern side of the unconformity with the underlying Tollis Formation, possibly associated with uranium mineralisation.

The eU radiometric image is similar and shows general coincidence of anomalies with total count radioactivity.

The significant conductors present on both flight lines warranted the consideration of infill EM lines at about 500m or less spacing. This work would provide a reasonably satisfactory 3D model from which viable drill targets could be assessed.

Gold, PGM, uranium and base metal mineralisation similar to Coronation Hill style in acid volcanics of the Tollis Formation, and perhaps also similar to those mined deposits (Carpentaria) in the adjacent Maude Creek Goldfield, could be explored for by detailed geochemical stream sediment and soil sampling.

There was no work completed on this tenement during the final year and the tenement was surrendered on 8 January 2013.

TENURE, LOCATION, TOPOGRAPHY AND ACCESS

EL26924 of 18 sub-blocks was originally granted to Softwood Plantations Pty Ltd on 8 December 2008. Preparatory to its ASX listing, Outback Metals Limited (OUM) made an outright purchase of Softwood Plantations. EL26924 was surrendered on the 8 December 2012.

The tenement is located about 290km south east of Darwin and immediately to the east of the Maude Creek Goldfield. The country is mainly very rugged hill country with prominent SE trends and deeply incised tablelands. The licence area lies immediately to the south of the Katherine Gorge National Park (Nitmiluk) and to the east of the Park Access Road where there were numerous 4WD tracks observed in 2011.

PREVIOUS EXPLORATION:

Mineral exploration using modern techniques has been carried out by:

- Pancontinental Mining in joint venture with Buka Minerals and Western Nuclear, 1972-75 on EL 145 for uranium, carried out an airborne radiometric survey but
mainly focussed on the known ABC Uranium Prospect NW of Katherine (Cox, 1975).

- Hunter Resources, 1987-88 on EL 4824 for gold and base metals. A regional geochemical stream sediment programme (39 samples assayed for gold, arsenic, copper, lead, zinc) was carried out with no results of particular interest with EL 26924 (Nicholson, 1988).

- Jettner and Trescale, 1988-91 on EL 6141 for gold and base metals. Geochemical soil and stream sediment sampling was carried out but there are no results of significance within EL 26924 (Jettner, 1991).

- Jettner and Trescale for RM Biddlecombe, 1988-93 on EL 6198 for gold and base metals by soil geochemical sampling and trenching mainly in the Maude Creek Goldfield outside of the EL (Jettner, 1992).

There are no mineral occurrences listed in the MODAT database within the boundaries of the tenement.

**GEOLOGY:**

EL26924 contains the complex geology of four major overlapping sedimentary basins overlain by Palaeogene sediments (Cainozoic sands and ferricrete):

**Dunmarra Basin**

There is extensive cover of Cretaceous rocks over both the SE and SW parts of the tenement. Kruse et al (1994), Ferenczi et al, (2005) describe these as up to 40 m thick, forming tablelands and numerous mesas capping Pine Creek Orogen, Wiso and McArthur Basin rocks. Importantly they go on to say “These rocks were previously mapped as the now defunct Mullaman beds by Walpole (1963) and Skwarko (1966), and later correlated to parts of the Petrel Formation and Darwin Formation. 1988b). Stuart-Smith et al (1988a, subdivided the Cretaceous strata into three informal subunits: K1, K2 and K3 in RANFORD HILL and STOW. Stuart-Smith et al (1984) correlated the thin Cretaceous strata (equivalent to K1 and K2) in southern MUNDOGIE with the Petrel Formation. The relatively thin nature (eg K1 is typically >3 m thick) of the subunits recognised by Stuart-Smith et al (1988a, 1988b) are difficult to accurately portray on a geological map at 1:250 000 scale. These subunits have been combined into one undifferentiated early Cretaceous unit (K1) on the present map face. This arenite-dominated composite unit can be correlated with the lower Walker River Formation (Carpentaria Basin), present in south-western MOUNT MARUMBA (Sweet et al 1999b), and the Marligr Formation (Money Shoal Basin) in northern ALLIGATOR RIVER (Needham 1984, Henderson 1998).

The lower Cretaceous sedimentary rocks in MOUNT EVELYN contain Units 1 and 2 in the ‘Coastal Belt’ of Skwarko (1966). A 1–5 m-thick basal bed of dark brown, goethitic and limonitic pebbly quartz sandstone and cobble conglomerate(K1) is commonly preserved where Cretaceous strata unconformably overlie PCO metamorphic rocks. The sandstone is poorly sorted, porous and very coarse grained. Pebbles and cobbles
consist of vein quartz, quartzite and ferruginous slate fragments (Stuart-Smith et al 1988a). Overlying this bed is a 10–60 m-thick interval of massive white, friable, fine to coarse quartz sandstone and minor thin beds of micaceous siltstone (K2; Stuart-Smith et al 1988a, 1988b). The marine pelycepod Syncyclonema territorianum and plant fragments were obtained by Skwarko (1961, 1966) from this interval, at the only known macrofossil locality (TT40, at 218900mE 8476300mN) in MOUNT EVELYN. A highly ferruginised siltstone bed, 10–12 m thick, containing plant and wood fragments, was reported by Skwarko (1961) at this locality; the bed rapidly pinches out to the west.

The upper part (K3) is a 10–25 m-thick, massive, yellow to reddish brown, friable, poorly sorted, fine to medium quartz sandstone that is well exposed south of Bloomfield Springs and 5 km north of Keswick Spring. Up to 64 m of friable orange to grey-buff, fine to coarse, clayey, moderately well sorted sandstone has been intersected in drill hole 829/D5 at the headwaters of Turnoff Creek (western STOW).

Bedding in the Cretaceous strata is generally horizontal to subhorizontal, although dips up to 15° are present about 7 km south-southwest of Big Sunday (in STOW), where Palaeogene west-northwesterly faults have developed. Cretaceous sedimentary rocks have generally remained tectonically stable following lithification and have a well-developed laterite profile in most places. Taking into consideration the regional work by Skwarko (1961, 1966, 1973), Krassay (1994) and descriptions of Cretaceous sedimentary rocks in adjacent map sheets, the basal bed (K1) probably represents localised fluviatile valley-fill sediment, whereas the upper parts (K2, K3) are mainly paralic (shoreline) to shallow-marine sands and minor silts, deposited during the Aptian transgression.

Wiso and Daly Basins

There are two basal units of the basin occurring on EL26924 - the Kalkaringi Volcanics (formerly Antrim Plateau Volcanics) and the Jindare Formation as described by Kruse et al 1994:

Jindare Formation

Dark purple-brown sandstones overlying and often interbedded with the Kalkaringi Volcanics are referred to as the Jindare Formation. The Formation usually crops out as low hills or sinuous ridges, commonly more thickly vegetated than adjacent volcanic derived terrain. Individual outcrops are typically tabular benches of dark brown, dark purple or red-brown, fine- to coarse-grained quartzofeldspathic sandstone, often with characteristic low- or less commonly high-angle cross-beds in sets up to 1 m thick. Rarely, these sandstones may weather via orange-brown to almost white. Conglomerates of angular, rounded and tabular pebbles occur locally.

Kalkaringi Volcanics

The formation is exposed along the margin of the Daly Basin as bouldery outcrops or as scattered cobble and boulder rubble on sparsely vegetated, cracked black soils. Dark grey-green to purple-brown tholeiitic basalt and dolerite are the principal rock types. Typical basalts and dolerites have an intergranular to sub-ophitic texture of elongate plagioclase laths hosting interstitial equant clinopyroxene, quartzofeldspathic material and/or opaque oxides. Plagioclase is variably replaced by
sericite+chlorite±muscovite±epidote±calcite/dolomite. Primary clinopyroxene (?augite) is replaced by a locally zoned chlorite +opakes± ?actinolite+ quartz assemblage. Complete corrosion of primary minerals can generate coarse intergrowths of quartz+calcite+muscovite+chlorite. Apatite and sphene are accessory primary minerals.

**McArthur Basin**

The basal unit of the Kombolgie Subgroup, the Mamadawerre Sandstone, which was previously known as informal ‘member’ PLhk1 of the Kombolgie Formation (Needham 1984, 1988a) outcrops in the northern part of the EL. Further to the north it is overlain by the Nungbalgarri Volcanics, also elevated to formation rank from its former member status. The ‘upper sandstone’ not occurring on EL 26924, previously designated PLhk2, was split into two formations (Gumarrirnbang and Marlgowa Sandstones) by Carson *et al* (1999), based on the presence of the intervening Gilruth Volcanic Member (also not present on the EL). Ferenczi and Sweet (2005) describe the Mamadawerre Sandstone as comprising medium to coarse, quartz-rich sandstone, subordinate granule and pebbly sandstone, and minor siltstone and conglomerate. It is the most widely exposed formation of the Kombolgie Subgroup, forming extensive outcrops in the Arnhem Land Plateau. Thickness estimates of the Mamadawerre Sandstone on the main Arnhem Land Plateau vary up to more than 1000m but on EL 26924 it is less than 100m.

**Pine Creek Orogen (PCO)**

The Palaeoproterozoic Tollis Formation as identified by Needham *et al* in 1986 is a member of the Finniss River Group. It is typified by thin to thick beds of alternating greywacke and (meta)mudstone, tuff and minor conglomerate, altered mafic to intermediate volcanic rocks and banded ironstone. Poorly sorted, coarse- to fine-grained, and less common gritty or pebbly (<1 em), volcanolithic greywacke is the dominant rock type, forming massive, commonly graded beds up to 1 m thick. The greywacke consists of angular to subrounded clasts of felsic volcanics (pitchstone, rhyolite and minor vitric tuff), sericitised plagioclase, K-feldspar, minor quartz (<20%) and secondary chlorite, sericite, epidote, carbonate and iron oxides. Colour-laminated green, grey and reddish-brown mudstone to meta-mudstone forms thin interbeds in the greywacke and tuff and includes sericite, chlorite and minor quartz and secondary iron oxides.

In the far NW part of the EL Basaltic lavas, tuff and sills of the Dorothy Volcanic Member form a 200m-thick unit sporadically exposed southeast of Maud Creek. Kruse *et al* describe the basalt as strongly altered, with secondary quartz and sericite and some primary pyroxene and plagioclase phenocrysts. Tuffaceous rocks are sericitised with fibrous actinolite replacing angular to subhedral clinopyroxene crystal fragments.

The Burrell Creek Formation also of the Finniss River Group does not crop out in the EL but is suspected to underlie the Tollis Formation here. Kruse *et al* describe it as consisting of interbedded mudstone and greywacke and significantly it is lacking in volcanolithic rocks seen elsewhere in the PCO. Elsewhere on KATHERINE map sheet Kruse *et al* describe laminated to thin-bedded, well cleaved, olive green to brown, grey
and red siltstone and sandy siltstone comprising 50-75% of the formation. Ripple
cross-laminations and sole markings are common, while pyritic and carbonaceous
laminae are rare. Within the outer albite-epidote hornfels facies these rocks are green,
bearing recrystallised, foliated or patchy chlorite and small, rounded cordierite and
andalusite porphyroblasts that are invariably chloritised and sericitised.

**Intrusives**
Massive medium-grained, dark grey quartz dolerite dykes of the Maud Dolerite intrude
the Tollis Formation in the far NW part of the EL near Maud Creek, where it forms
irregular bodies up to 200m across (Needham et al, 1986). Gold and copper
mineralisation in quartz-filled shear zones is known within the dolerite at Maud Creek
and at the Carpentaria prospect WNW and NW of the EL respectively.

**GA AEM AIRBORNE SURVEY:**
The 2009 GA AEM survey was funded under the Australian Government’s Onshore
Energy Security Program, and was managed and interpreted by Geoscience
Australia’s Airborne Electromagnetic Acquisition and Interpretation Project. This
Kombolgie survey area, in the Pine Creek Orogen of the Northern Territory, covered
sections of the Cobourg Peninsula, Junction Bay, Alligator River, Milingimbi, Mount
Evelyn, Katherine, and Urapunga 1:250 000 map sheets. It covered a total of 8 800
line km and an area of 32 000 km2. The data were acquired under contract by
Geotech Airborne Pty. Ltd. using its VTEM TM helicopter-borne electromagnetic
system. These data were inverted using a layered earth inversion algorithm being the
GA-LEI layered-earth inversion software developed at Geoscience Australia. The main
products which have been utilised on EL 26924 are geo-referenced images of pseudo-
sections of conductivity.

EL 26924 has partial VTEM coverage by two E-W flight lines spaced about 5km apart:

**Line 12550**
This line is in the northern part of the EL and traverses mainly Tollis Formation but a
short 1.15km tongue of the Mamadawerre Sandstone (formerly Lower Kombolgie
Formation) is included. From near surface to about 75m depth there is an undulating
zone of weak to moderate conductivity which is interpreted as the depth of weathering
and groundwater in the Tollis Formation. The zone passes under the Mamadawerre
Sandstone and probably approximates the unconformity with the Tollis Formation.

Below this there is a 200m thick undulating zone of moderate to strong conductivity the
cause of which is not clear but it might be a concealed intrusion of the Maude Creek
Dolerite at the Tollis Formation/Burrell Creek Formation contact. The zones of strong
conductivity might be caused by accumulations of base metal sulphides with gold
mineralisation. However at about 500m and more depth they are marginal deep drill
targets.
Line 12560
This line is located at the far southern part of the EL and similarly has a near surface zone of conductors but which are much stronger than on Line 12550 probably indicating an increase in groundwater salinity. Below and merging with this zone are many inverted "U" and "V" shaped zones of moderate to very strong conductors which are strongly folded and faulted. The cause of these is not clear but they could be sulphide rich horizons +/- gold possibly in the Burrell Creek Formation or iron stones or BIFs at the base of the Tollis Formation. Some of these are at a sufficiently shallow depth to warrant drill testing.

GA AIRBORNE GEOPHYSICS:

The EL is covered by the Mary River 2000 airborne survey carried out by Kevron Geophysics for GA and NTGS. Flight lines were E-W at 400m spacing. These data have been recently re-processed by NTGS and GA and integrated into levelled National datasets as described below:

GA 2010 Magnetics
The TMI image shown was cut from the GA 5th edition full-colour Magnetic Anomaly Map of Australia at 1:5 million scale, and accompanying composite dataset with cell resolution of 3 seconds of arc, have been compiled. GA estimated that 27 million line-kilometres of survey data was acquired to produce this new edition, which is eight million line-kilometres more than for the previous edition released in 2004. New independent airborne total-field magnetic data acquired in 2007 during the AWAGS have been used to increase the accuracy of intermediate wavelengths of the continental-scale merge of the grids.

The TMI image shows that EL is located in a moderately disturbed magnetic zone transected by two prominent ENE trending magnetic linears which may be concealed mafic dykes coeval with the Maude Creek Dolerite sill.

Within the NE corridor formed by the above mentioned linears there are three SE trending linear magnetic dipoles. Although these may well be mafic intrusions, perhaps older than the Maud Creek Dolerite, into the Tollis Formation, it is suspected that they are probably magnetic responses from magnetite rich material in the overlying Kalkaringi Volcanics.

GA 2010 Radiometrics
The TC and eU images were cut from the new 2010 GA radioelement map of Australia, the Radiometric Map of Australia, which was compiled showing the distribution of airborne measured potassium (percent K), uranium (ppm equivalent U) and thorium (ppm equivalent Th) over 80 percent of the Australian continent at 100 metre resolution (Minty et. al., 2009). The map was calibrated with the AWAGS to adjust all the public-domain radiometric surveys in Australia to the International Atomic Energy Agency's (IAEA) Global Radioelement Datum. The new datum provides a baseline for all current and future airborne gamma-ray spectrometric surveys in Australia.
In the appraisal of the images it was noted that there is an almost universally low total count radiometric response over the Mamadawerre Sandstone. However immediately on the southern side of the unconformity with the underling Tollis Formation there is a moderately strong anomalism and some anomalism may be caused by unconformity related uranium mineralisation. Further to the south of the unconformity there are SE trending ridges of anomalies which appear to cut across both topographic and geological trends. At this stage it is suspected that some of these anomalies may be related to the erosion and NE retreat of the Mamadawerre Sandstone unconformity but the fact that they continue and persist into outcrop of Kalkaringi Volcanics is somewhat puzzling.

The eU radiometric image is similar and shows general coincidence of anomalies with total count radioactivity. However there is some uranium anomalism within the Kombolgie Formation but the cause is not understood.

CONCLUSIONS

The tenement was relinquished to enable Outback Metals to focus on more prospective areas, particularly the Mt Wells project (EL 22301).

REFERENCES:


Jetner AW 1991 - Final report Maud Creek exploration licence for Trescabe. OFCR 1991-0035


Nicholson PM 1988 - Initial exploration EL 4824 Maranboy area, NT. Hunter Resources OFCR 1988-0242


**ATTACHMENTS:**

1. GA AEM SYNTHETIC PROFILES – GA AEM FLIGHT LINES
2. GA MAGMAP V5 2010 – GA AEM FLIGHT LINES
3. GA RADMAP 2010 – URANIUM eU RADIOACTIVITY – GA AEM FLIGHT LINES
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