ARAFURA RESOURCES NL

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HELICOPTER-BORNE RECONNAISSANCE
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EL 23571 REYNOLDS RANGE
NORTHERN TERRITORY, AUSTRALIA

by

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1:250,000 – NAPPERBY SF 53-9
1:100,000 – Aileron 5552; Teatree 5553; Reynolds Range 5453.

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INTRODUCTION

BACKGROUND

Uranium prices have more than trebled in the last three years from US $8/lb to US $38/lb. The Reynolds Range area has significant potential for uranium and other commodities however the isolated location and difficulty of access have historically hindered exploration activities. Arafura Resources NL have a number of tenements in the area, including EL 23571 Reynolds Range; EL 23671 Aileron; EL 24548 Yalyirimbi Range; and EL 24741 Woodforde. Numerous exploration companies conducted activities in EL 23671, adjacent to EL 23571, and failed to realise the potential of the world-class Nolans Bore REE deposit, which has a defined total resource of 18.6Mt @ 3.1% REO, 14% P_2O_5 and 0.47 lb/t U_3O_8 (Goulevitch, 2005). This is encouraging for future exploration in the region because it indicates previously explored areas are not 'dead ground'.

The Reynolds Range area is prospective for numerous styles of mineralisation. Arafura Resources NL is interested in carbonatitic deposits for REE-P-U mineralisation, Tertiary basins and weathering profiles for Fe-U mineralisation, and contact metamorphic deposits in Palaeoproterozoic units for Fe mineralisation. Areas of interest were identified by the 1:250,000 BMR geology map and various radiometric images of the area. The purpose of this report is to describe the findings of helicopter and ground reconnaissance and to provide further recommendations for exploration.

LOCATION & ACCESS

Exploration Licence 23571 (Reynolds Range) is located 170 kilometres north-northwest of Alice Springs and 50 kilometres west-northwest of Aileron Roadhouse (Figure 1). The Stuart Highway is the main north-south arterial highway through the Northern Territory which passes near Aileron Roadhouse and through Ti-Tree township.

The licence encompasses some 78 kilometres of the length of the north-northwest trending Reynolds Range, which extends over a distance of 100 kilometres from the Stuart Highway southeast of Aileron, almost to Coniston Station in the northwest.

The eastern portion of the Range is accessible by numerous vehicle tracks and fence lines which leave the Stuart Highway between Aileron and Ti Tree. The main vehicle access heading west from the highway is the unsealed Pine Hill Road which tracks along the northeastern foothills of the Range and provides access to numerous other bush tracks heading south into the Range. This area is encompassed by EL 23671 which abuts EL 23571.

The central and western portion of Range, (west of Mount Freeling and the Woodforde River gorge), which is encompassed by EL 23571, is mostly inaccessible by vehicle due to high relief and rough terrain. Currently, this part of the Reynolds Range is only accessible by helicopter or by foot. Access by 4WD vehicles at least would be possible if a disused track which extends from the Pine Hill Road up the Woodforde River valley, along the southwest side of the Reynolds Range over a distance of 35-40 kilometres to Harverson Pass and then back to the Pine Hill Road were to be upgraded. Along the southwest side of the Reynolds Range numerous fencelines and disused tracks extend from this track to the Napperby Station Road located to the south of the Yalyirimbi Range which sub-parallels the Reynolds Range at some 15 kilometres distance.

CLIMATE

The climate is typical of the central arid zone of inland Australia. Summer seasons are long and the maximum temperature during a typical day commonly exceeds 40°C. Winter seasons are short and the minimum temperature during a typical night can diminish below 0°C, especially in elevated areas. The average annual rainfall for the Napperby/Reynolds Range Area, derived from Yuendemu and Alice Springs weather stations, is 250 to 350 millimetres. The heaviest rainfalls occur during the monsoon season from October to March but reasonable falls of rain can occur any time of the year.

TOPOGRAPHY & VEGETATION

The Reynolds Range in EL 23571 is a northwest trending belt of mountains, foothills and deeply incised valleys which range in height between 650 metres and 1100 metres above sea level. Landmark mountains within EL 23571 include Mt Thomas, (1116 metres), Mt Gardner (1000 metres) and Mt Dunkin (930 metres). Mt Freeling, (1005 metres), is just outside the eastern end of the licence. The southern end of the Yalyirimbi Range joins with the Reynolds Range between Mt Freeling and Mt Dunkin. To the north the Anmatjira Range parallels the Reynolds Range at about 15 kilometres distance.

Tower Creek, a tributary of Warburton Creek, Napperby Creek and Day Creek drain the southwest flank of the Range in EL 23571, and the Lander River and Hanson River drain the northeast flank.

A summary of the vegetation in the Arunta Province was found in Thevissen (1995);

> *Vegetation is predominantly scattered Mulga scrub in rocky areas but very dense Mulga in areas of sand plain making vehicular access difficult. Major drainages contain stands of Bloodwood eucalypts and lesser Beantree. The southern slope of most rocky ridges have characteristic stands of native Pine, although the main ranges are largely devoid of significant vegetation with only small species of Hakea and Melaleuca. The dominant grass species is spinifex.*

SUMMARY

Geological reconnaissance was carried out in the Reynolds Range (EL 23571) during October, 2005. Ironstone localities were derived from NTGS descriptions in the 1:250,000 Napperby map sheet and were identified and evaluated. NTGS geophysical data reprocessed by Southern Geoscience Consultants provided weak uranium channel anomalies that warranted further investigation.

Ironstone occurrences were of low grade and of limited extent. Samples were assayed for a selection of base metals, rare earth elements and radiogenic elements. Base metals were slightly enriched and rare earth elements and radiogenic elements were in background concentrations.

Kaolinitic occurrences in Tertiary weathered profiles and in Napperby gneiss were of significant extent. Samples were assayed for a selection of base metals, rare earth elements and radiogenic elements. Selected rare earth elements were enriched; radiogenic elements were slightly enriched in samples from the Napperby gneiss and in background concentrations in samples from Tertiary weathered profiles; and base metals were enriched in samples from Tertiary weathered profiles and in background concentrations in samples of Napperby gneiss.

Peak results from geochemical analyses were:

- 204ppm Cu
- 96.6ppm Pb
- 263ppm Zn
- 0.55ppm Ag
- 425ppm Ce
- 98ppm La
- 62ppm Nd
- 139ppm Th
- 13.9ppm U

The results are encouraging for uranium and carbonatite-hosted mineralisation. The results are discouraging for ferruginous mineralisation.

It is proposed to conduct further geological reconnaissance in EL 23571 to evaluate high Fe, U and REE occurrences discovered by PNC Exploration (Australia), conduct stream sediment sampling which can be guided by bore water analyses in the Reynolds Range area and surrounding Tertiary Basins, and evaluate further radiometric anomalies that have similar signatures as anomalies over Nolans Bore, (EL 23671 Aileron).

CONCLUSIONS

- After initial investigations, the iron potential of the Reynolds Range Region is poor. Cited ironstone occurrences by the NTGS are of poor grade and low tonnage.

- The *in situ* uranium potential of Palaeoproterozoic host rocks is dissappointing.

- Leaching of uraniferous basement and outflow into reduced/oxidised Tertiary basins proximal to the Reynolds Range provides an alternative potential for uranium mineralisation.

- Carbonatite-hosted deposits in the vicinity of the Napperby Gneiss remain a potential for exploration due to elevated concentrations of REE.

- Further reconnaissance is necessary to evaluate high grade ferruginous and radiogenic occurrences reported in historical data from PNC Exploration (Australia).

- Helicopter reconnaissance was effective but was time constrained and expensive. Further geological reconnaissance on foot is needed to adequately evaluate the variety of mineral potentials

RECOMMENDATIONS

- Conduct further ground reconnaissance in EL 23571.

- Establish reliable vehicle access across EL 23571..

- Investigate U/Th proportioned radiometric anomalies similar to the signature over Nolans Bore, (EL 23671 Aileron), for uraniferous- or carbonatitic-style deposits in EL 23571 Reynolds Range, EL 24548 Yalyirimbi Range and EL 23671 Aileron.

- Conduct literature review of Tertiary basin lithologies and bore water analyses for EL 23571 Reynolds Range, and the adjacent areas under EL 24741, EL 24955 and EL 24956 for indicators of uranium prospectivity.

- Conduct a stream sediment sampling program for a selection of radiogenic elements, rare earth elements, precious metals and base metals in EL 23571 and adjacent licences EL 23671 Aileron & EL 24548 Yalyirimbi Range. Sampling locations can be determined from attained hydrological analyses of bore waters.

TENURE

MINING/MINERAL RIGHTS

Norquest Mines PL applied for EL 23571 on behalf of Arafura Resources NL on the 18-04-2002. The licence was granted on the 8-12-2003 for a period of six years and transferred to Arafura Resources NL on the 2-04-2004. The tenement was initially granted over 141 blocks (447.70 square kilometres).

LAND TENURE

Land tenure under EL 23571 includes Perpetual Pastoral Leases 1096 (Coniston), 1177/1178 (Napperby), 1097 (Aileron), and 1030 (Pine Hill):

- Coniston Station, PPL 1096 – NT parcel 00690, owned by Max and Jacqueline Lines of Coniston Station, (Fax: 89568775).
- Napperby Station, PPL 1177/1178 – NT parcel 00748, owned by Roy Chisolm of Napperby Station (Hiraji Pty. Ltd. (ACN 009591664), (Fax: 89568660).
- Aileron Station, PPL 1097 – NT parcel 00703, owned by Garry Dan of Aileron Station (Waite River Holdings Pty. Ltd), (Fax: 89568535).
- Pine Hill Station, PPL 1030 – NT parcel 00725, owned by Gill Bowman of Pine Hill Station (Northern Territory Land Corporation), (Fax: 89569841).

NATIVE TITLE

There are no registered native title claims over the land which is subject to EL 23571 Reynolds Range

The license is not subject to an existing Native Title Agreement between Arafura Resources and the Central Land Council due to the absence of instructions to the CLC from potential native title claimants in the area.. In the absence of an exploration agreement, Native Title issues are considered according to Item 18 of the Schedule 2 Conditions provided during the grant process for EL 23571 Reynolds Range. Article 6a requires Arafura Resources convene a meeting with registered native title claimants before commencing exploration activities unless the activity is reconnaissance. Such a meeting with the native title claimants was not required.

ABORIGINAL SACRED SITES

The Aboriginal Areas Protection Authority (AAPA) register regarding EL 23571 was queried in 2002 and updated in 2005 as supplied by Capricorn Mining & Exploration Title Services Pty. Ltd. who had direct access to the AAPA Register.

Recorded and registered sites in or around tenements held by Arafura Resources NL totals 108, (Appendix D). Sites along the length of the Reynolds Range, included in EL 23571 and the northwestern isolated area of EL 23671, total nine. Sites are listed in Appendix D with a geographical description, site status and site type. It is important to note all sites are of a “recorded” type and further investigations are required.

SENSITIVE AREAS

Part of EL 23571 is covered by the Ti-Tree Water Control District which is a designated sensitive area. According to the Northern Territory of Australia Water Act as in force at 14th of January, 2004, subsection 7, mining and petroleum activities are permissable as according to the *Mine Management Act*.

GEOLOGICAL SETTING

REGIONAL GEOLOGY

The regional geology is taken from the NTGS website, the 1:250,000 Geological Series Explanatory Notes of the Napperby Sheet compiled by Stewart, (1982), a report on the uranium potential in the licence area for Arafura Resources NL compiled by Fabray, (2005), the SGGMP 2nd edition Field Guide to the Reynolds Range by Buick *et al.*, (1999), and the BMR 1:100,000 Reynolds Range Map Sheet compiled by Stewart, (1981).

The Arunta Region in central Australia covers an area of 200 000 square kilometres and is dominated by medium to high grade Palaeo- and Meso-proterozoic poly-metamorphic rocks. The Arunta Region is unconformably overlain by sediments of the Neoproterozoic to mid-Palaeozoic Ngalia, Georgina, Amadeus and Wiso Basins (Buick *et al.,* 1999).

The Arunta Region can be sub-divided into three, largely fault bounded terranes with distinct geological histories: the Aileron (*northern*), Warumpi (*southern*) and Irindina (*central*) Provinces, (Figure 7), (NTGS website; italicised names from Shaw *et al.,* 1984). The Aileron Province is relevant to this report.

The Aileron Province comprises greenschist to granulite facies metamorphic rocks with protolith ages in the range 1865 – 1710 Ma. It forms part of the North Australian Craton and is geologically continuous with the gold-bearing Tanami Region to the south and the Tennant Region to the north. The Aileron Province consists of three broad stratigraphic divisions which have been intruded by granites (Stewart, 1991). The majority of rock units in the Aileron Province were deposited or emplaced prior to the Strangways Orogeny, 1740-1690 Ma (Hand & Buick, 2001).

Figure 7: Geological Regions of the Northern Territory (Ahmad & Scrimgeour 2004).

STRATIGRAPHY

Palaeoproterozoic

The Lander Rock Package is a suite of dominantly quartzose and pelitic sediments with a facies transition in the northwest, to alternating pelites and psammites, in the Mt Stafford Beds. Major outcrops occur in the Lander River Valley north of the Reynolds Range and in the vicinity of Harverson Pass (Figure 8). The metamorphic grade varies from lower greenschist facies in the northwest of the Reynolds Range to granulite facies in the southeast. Minor sills or dykes of mafic rocks occur in the package. The timing of deposition of the Lander Rock Package still remains unclear although granite intrusives and inherent zircon derived U-Pb SHRIMP ages provide a rough estimate of 1806-1840 Ma (Hand & Buick 2001).

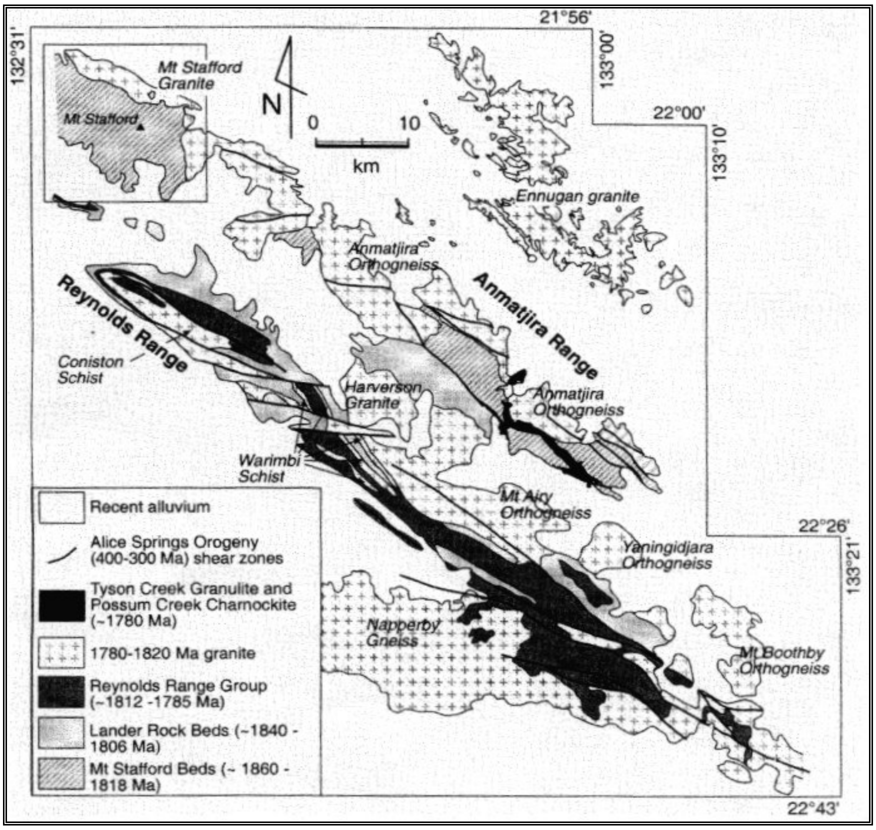

Figure 8: Generalised geology of the Reynolds-Anmatjira region (modified after Stewart, 1981). Magnetic data indicates that the bulk of the regions covered by recent alluvium are underlain by granite/granitic gneiss (*from* Hand & Buick 2001).

The Reynolds Range Group is sub-divided into four stratigraphic units (Buick *et al.* 1999). The basal Quartzite Unit, the Mt. Thomas Quartzite, is a mature orthoquartzite that unconformably overlies the Lander Rock Package in the northwest of the Reynolds Range (Figure 8). The unit varies in thickness from ~200 metres to 550 metres cropping out along the length of the range. The lower units are predominantly conglomeratic with minor pebbly arkose rocks. The upper intervals are pelitic and generally ferruginous. A lateral facies change occurs from the northeast to the southwest across the range from basal conglomerates into homogenous pelitic rocks. Relict sedimentary structures indicate a high-energy, intertidal depositional environment (Buick *et al.,* 1999).

The Lower Calcsilicate Unit forms the basal unit of the group in the southern margin of the Reynolds Range. This unit can be age constrained as an equivalent to the Mt Thomas Quartzite and by the intruding Napperby Gneiss metagranitoid. The unit is composed of finely layered, carbonate-poor calcsilicate rocks rich in clinopyroxene, plagioclase and grossular-andradite garnet locally interlayered with white quartzites and rare marbles. The unit is strongly metamorphosed and intensely deformed lacking sedimentary structures (Buick *et al.,* 1999).

The Pelite Unit which was previously part of the Pine Hill Formation achieves a minimum thickness of 500 metres to 600 metres. Pelitic rocks are interlayered with thin sheets of fine grained siltstone and sandstone interpreted as storm deposits (Buick *et al.* 1999).

The Upper Calcsilicate Unit encompasses the previously defined Algamba Dolomite Member and the Woodforde River Beds. The unit achieves a maximum thickness of about 250 metres to 300 metres along the length of the Reynolds Range except in the central part where the maximum thickness is only 20 metres. The unit occurs as a series of lenses within the Pelite Unit dominated by interlayered limestone and dolomite locally intercalated with pelites and psammites. Stromatolites and sedimentary structures, *i.e.* climbing ripples, are preserved where rocks are metamorphosed at a regional low grade (Buick *et al.,* 1999).

Neoproterozoic

Ngalia Basin rocks were emplaced between the Neoproterozoic to the Late Carboniferous (Wells & Moss, 1983). The rocks are an important component of the Arunta Region but do not occur in EL 23571.

Tertiary

Cainozoic sediments occur in sedimentary basins outside of EL 23571 and will not be discussed in this report.

Geological research in Tertiary basins, (Senior *et al.,* 1995), has defined three weathering events which affected Arunta igneous and metamorphic basement rocks and lacustrine and fluviatile Tertiary sedimentary rocks. The weathering events will be discussed herein.

Weathering Event A occurred during the Late Cretaceous to Early Tertiary (Palaeocene). A trizonal profile was developed in basement rocks over a widespread area of the Arunta Region and at the base of surrounding Tertiary Basins. The trizonal profile consists of a basal kaolinitic zone up to 10 metres thick that grades into a multicoloured mottled zone up to 10 metres thick. The mottled zone is overlain by a ferruginous zone up to 8 metres thick (Senior *et al.,* 1995). The weathering profile is developed in basement rocks and the Mesozoic Hooray Sandstone, and is overlain by Palaeocene sediments in Tertiary basins.

Weathering Event B affects the upper part of the Ambalindum Sandstone Member immediately beneath the Delaney Mudstone Member in the Hale Basin, located in the eastern part of the NTGS Alice Springs 1:250,000 Geology Map Sheet. The upper part of the Ambalindum Sandstone Member is friable and yellow, having a mottled appearance in parts. The weathering event occurred prior to the Middle Eocene. Little evidence exists outside of the Hale Basin for this weathering event (Senior *et al.,* 1995).

Weathering Event C affects the upper part of the Tug Sandstone Member of the Hale Formation in the Hale Basin. The weathering event preceded deposition of the Waite Formation in the Waite Basin, or equivalents of the Waite Formation.

Quaternary

Further uplift in the Reynolds Region, and northern Arunta Region has resulted in deposition of red earth and alluvium from uplifted areas and continued movement of colluvium down present-day hill-slopes. Calcrete has precipitated along stream channels, evaporites have formed in playa lakes, and sand plains and Aeolian dunes have developed in low lying areas (Stewart, 1981).

IGNEOUS ROCKS

Palaeoproterozoic

The Harverson Granite is located in the central part of EL 23571 (Figure 8). It is a coarse grained, weakly deformed, K-feldspar megacrystic granite with an S-type composition. The granite intrudes the Lander Rock Package and produced a contact aureole characterised by andalusite in metapelites. The granite is grossly discordant to structural trends in adjacent country rocks (Buick *et al.,* 1999). SHRIMP U/Pb determinations on zircon gave an age of 1818±8 Ma (Collins & Williams, 1995).

The Yaningidjara Orthogneiss is located in the western part of EL 23571 (Figure 8). It is a coarse-grained, porphyritic, granitic gneiss with mantled megacrystic K-feldspars, and some sillimanite-garnet orthogneiss. The orthogneiss intruded the Lander Rock Package and underwent high-grade regional metamorphism (Buick *et al.,* 1999). Age determinations by SHRIMP U/Pb on zircon gave an emplacement age of 1806±6 Ma (Vry *et al.,* 1996).

The Mt. Airy Orthogneiss is located in the western part of EL 23571 (Figure 8). It is a coarse-grained, porphyritic, granitic, megacrystic K-feldspar augen gneiss with microgranite dykes. The orthogneiss intrudes the amphibolite-grade Lander Rock package (Buick *et al.* 1999). The Mt. Airy orthogneiss has not been dated but has been assigned a probable age of about 1820-1800 Ma (Buick *et al.* 1999)

The Yakalibadgi Microgranite overlies the Coniston Schist and intrudes the Lander Rock Package in the northwest Reynolds Range (Figure 8). There is an along strike transition from weakly deformed, porphyritic granite to strongly deformed quartz orthoschist. Both the Coniston Schist and the Yakalibadgi Microgranite are interpreted as shallow level intrusives derived from a granitic protolith (Buick *et al.,* 1999). The Yakalibadgi Microgranite was probably intruded during the time of major granite emplacement into the Reynolds Range Group, around 1780 Ma (Collins & Williams, 1995).

Mesoproterozoic

The Coniston Schist is located in the northern part of EL 23571 (Figure 8). It is an approximately 500 metre thick conformable layer of quartz-rich orthoschist directly above the Mt. Thomas Quartzite. Intensely developed foliation is characterised by sericite±biotite wrapped around augen of quartz and, rarely, feldspar. Foliation was developed during regional metamorphism at ~1590 Ma (Buick *et al.,* 1999).

The Warimbi Schist is located in the central and northern parts of EL 23571 (Figure 8). The schist occurs as a series of sills and lopolith-like bodies with a maximum thickness of about 1000 metres. The least deformed parts are a poorly foliated micro-adamellite rich in meta-sedimentary enclaves. More commonly it is an intensely deformed quartz augen orthoschist where foliation is defined by clots of recrystallised biotite (Buick *et al.,* 1999). Emplacement of the Warimbi Schist precursor was dated at 1785±22 Ma by a SHRIMP U/Pb study of zircon, (Collins & Williams, 1995), into the Reynolds Range Group.

The Napperby Gneiss crops out in the central and southeastern parts of EL 23571 (Figure 8). It underlies and locally intrudes the Lower Calcsilicate Unit and the Pelite Unit of the Reynolds Range Group. The gneiss has S-Type geochemical characteristics and a SHRIMP U/Pb zircon derived protolith emplacement age of 1780±10 Ma (Collins & Williams, 1995). Pooled ages of 1775±12 Ma, 1659±6 Ma and 1587±6 Ma in discrete zircon populations suggest either the protolith was emplaced at 1660 Ma and 1780 Ma zircon populations are inherited, or two igneous components were emplaced at 1780 Ma and 1660 Ma and both were deformed at 1590 Ma (Collins and Williams, 1995).

TABLE 1: Description of Palaeo- & Meso-proterozoic units in the Reynolds Range Region (refer Figure 8)

STRATIGRAPHIC UNITS	**AGE (Ma)**	**THICKNESS (m)** Buick *et al.,* 1999	**CODE** Stewart *et al*., 1980	**DESCRIPTION** Buick *et al*., 1999
Lander Rock Package	1806-1840	Unknown	Pll	Pelitic, calcareous or psammitic rocks with greenschist to granulite metamorphic grade
Reynolds Range Group	1812-1785	Maximum 1650m	Prt, Prp, Pra, Po	Mature quartzite, pelite, and carbonate, greenschist to granulite grade.
Harverson Granite	1818	Unknown	Pgh	Porphyritic muscovite-biotite granite, deuterically altered
Yaningidjara Orthogneiss	1806	Unknown	Pgy	Coarse granitic augen gneiss
Mt Airy Orthogneiss	1820-1800	Unknown	Pgr	Coarse granitic augen gneiss, porphyritic granite, microgranite
Yakalibadgi Microgranite	1780	Unknown	Pgk	Porphyritic microranite, medium granite, orthoschist
Napperby Gneiss	1590	Unknown	Pgn	Medium, layered granitic gneiss, minor porphyritic granite
Coniston Schist	1590	500m	Ppc	Orthoschist, minor microgranite, retrograde acid igneous flow/sill
Warimbi Schist	1590	1000m	Ppw	Orthoschist, retrograde adamellite

METAMORPHISM & STRUCTURAL GEOLOGY

The Arunta Region was shaped by two major intervals of tectonism. The first tectonic interval occurred during the Palaeo- to Mesoproterozoic, 1880-1560 Ma, and was associated with multiple episodes of regional medium to high temperature metamorphism and magmatism (Hand & Buick, 2001). The second tectonic interval occurred in the early to mid-Palaeozoic, about 490 to 300 Ma, and was associated with north-south intraplate extension and subsequent north-south convergent deformation (Hand & Buick, 2001). Regional structures produced during each period of tectonism in the Reynolds Range Region are discussed by Hand & Buick (2001).

The first tectonic interval is defined by three main tectonic events, the Stafford Tectonic Event *about*1820 Ma, the Strangways Orogeny *about.*1780-1770 Ma, and the Chewings Orogeny *about.*1595-1560 Ma.

The Stafford Tectonic Event is spatially associated with the 1818 Ma Mt. Stafford and Harverson Granites (Figure 9). In the northwest Reynolds Range, the Lander Rock Package around the Harverson Granite is characterised by the growth of andalusite and cordierite (Dirks *et al.,* 1991; Vry & Cartwright, 1998). The contact metamorphic porphyroblasts overprint a biotite-quartz-muscovite foliation which indicates prior regional deformation to granite emplacement. In other parts of the northwest Reynolds Range, muscovite±biotite bearing greenschist assemblages, (Dirks *et al.,* 1991), define a sub-vertical northwest-southeast trending foliation, (Stewart, 1981; Dirks & Wilson, 1990). Fold structures are truncated to the overlying Reynolds Range Group in an unconformity that dies to the southeast, indicating the Stafford Tectonic Event may have been localised in the northwestern part of the Reynolds Range, and Anmatjira Range, region (Hand & Buick, 2001).

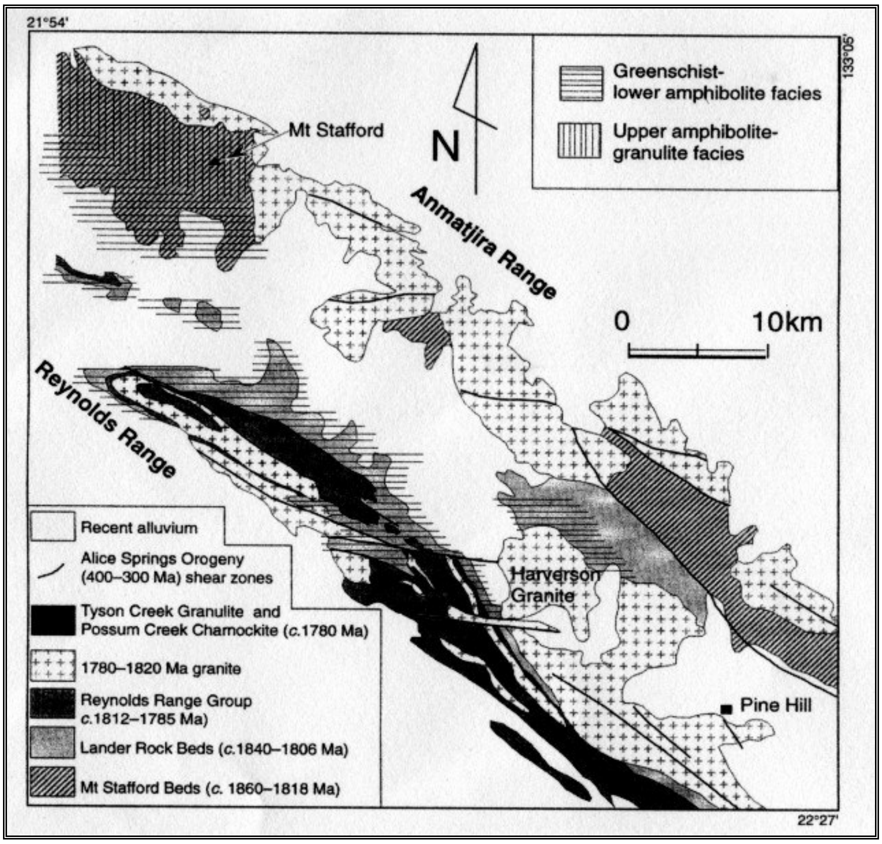

Figure 9: Regional distribution of metamorphism inferred to be associated with the Mt. Stafford Tectonic Event (*from* Hand & Buick, 2001).

The Strangways Orogeny produced much of the metamorphic and structural character in the central province of the Arunta Inlier during northeast-southwest shortening between *about* 1780-1720 Ma. The most obvious product of the Strangways Orogeny in the Reynolds Range region was the emplacement of the granitic precursors of the Warimbi Scist and Napperby Gneiss at *about* 1785 Ma (Hand & Buick, 2001). Also, the Reynolds Range Group was deposited after the Stafford Tectonic Event and was unmetamorphosed until metamorphism by the Strangways Orogeny. The northwestern part of the exposed Reynolds Range Group preserves the best evidence of Strangways associated metamorphism due to relatively low grade metamorphism during the Chewings Orogeny (Hand & Buick, 2001).

Contact metamorphic assemblages formed in the Reynolds Range Group around the granitic precursors of the Warimbi and Coniston Schists during intrusion around 1785 Ma (Collins & Williams 1995). Contact aureoles in meta-pelites adjacent to the Warimbi Scist are andalusite and cordierite bearing. The stability of assemblages indicate maximum P-T conditions of 550°C and 3.5 kilobars (Xu *et al.,* 1994; Mahar *et al.,* 1997). Scapolite porphyroblasts in anorthite-bearing marbles adjacent to the Coniston Schist also give maximum temperatures of 550°C (Buick & Cartwright, 1994). Contact metamorphic blasts surrounding the Warimbi Schist contain straight or gently curved internal foliations defined by muscovite-quartz±biotite. Curved inclusion trails indicates the growth of the contact metamorphic assemblages occurred during deformation. Inclusion trails are reported to show systematic changes in orientation defining gentle folds. The orientation of folding is not clear but has been postulated as a southeast trending foliation based on findings in other parts of the Arunta Inlier (Hand & Buick, 2001; Goscombe, 1991; Collins & Sawyer, 1996).

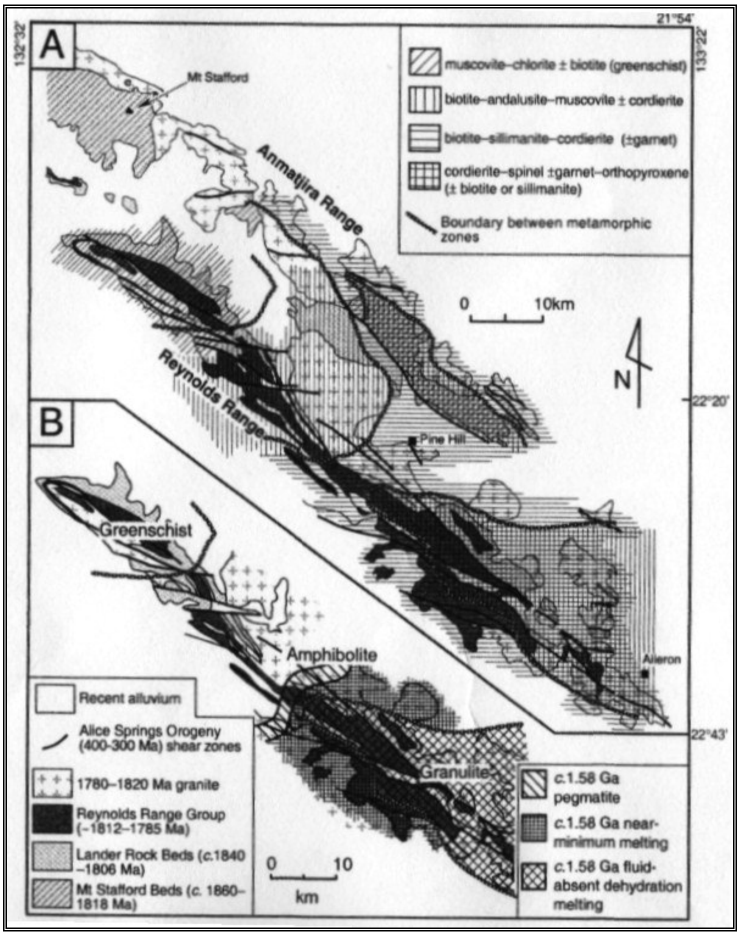

Figure 9: (a) Simplified geological map of the Reynolds-Anmatjira Range region showing the metamorphic zones associated with the approximate 1580 Ma Chewings Orogeny. (b) Metamorphic zones in the Reynolds Range defined by the assemblages produced during partial melting. Assemblages in the near minimum melting zone include ilmenite-magnetite-bearing leucosomes in migmatised granite. In the granulite zone, leucosomes contain cordierite ± garnet ± orthopyroxene (*from* Hand & Buick, 2001).

The Chewings Orogeny produced a continuous northeast-southwest transition in metamorphic grade from greenschist to granulite facies along the length of the Reynolds Range (Figure 9). Meta-pelitic rocks of the

Reynolds Range Group are transformed from phyllites to andalusite±cordierite-bearing schists to migmatitic granulites (Dirks *et al,.* 1991; Hand & Dirks, 1992; Williams *et al.,* 1996 & Buick *et al.,* 1998). The metamorphic field gradient is summarised by Hand and Buick, (2001), by the metamorphic zones: muscovite-chlorite±biotite; texturally stable Strangways Orogeny andalusite and cordierite; first appearance of sillimanite and; stable co-existence of cordierite-spinel assemblages.

The higher grade regions of the Reynolds Range are further sub-divided by Hand and Buick, (2001), based on the leucosome assemblages that formed during partial melting. Upper amphibolite regions show immediate upgrade of the sillimanite isograd, and volumetrically minor leucosomes are pegmatitic in character with simple mineralogies that reflect water-saturated melt (Buick *et al.,* 1998). At slightly higher grades leucosomes contain ilmenite-magnetite intergrowths that form via breakdown of biotite (Hand & Dirks, 1992). The highest grade granulite leucosomes contain cordierite and/or garnet or orthopyroxene and formed during fluid-absent dehydration reactions that consumed biotite and sillimimanite.

Partial melting assemblages overprint the gneissose layering suggesting high temperature metamorphism outlasted pervasive deformation (Hand & Buick, 2001). Granulite and upper amphibolite assemblages are aligned parallel to the axial surface of the regional, upright, southeast-trending, isoclinal folds (Hand & Buick, 2001). The upright folds reflect around 50% shortening and can be traced along the length of the Reynolds Range (Dirks & Wilson, 1990). Many of the macro-scale folds within northwest-southeast regional folds are doubly plunging, (Stewart *et al.,* 1980; Dirks & Wilson, 1990), which represents significant vertical extension (Hand & Buick, 2001). In the lower grade northwestern Reynolds Range, the axial surface fabric overprints approximately 1785 Ma contact metamorphic minerals formed during the Strangways Orogeny.

In the Reynolds Range, the regional fabric has been deformed on all scales by conjugate, steeply-dipping shear and crenulation bands that, in geometry, represent conjugate kink bands (Dirks & Wilson, 1990; Hand & Dirks, 1992). The dominant kink set trends approximately east-west plunging between 0° and 70° east. The subordinate kink set trends approximately north-south and plunges to the north (Hand & Buick, 2001). Zircons from leucosomes within the crenulation bands have been aged at 1570 Ma (Hand *et al.,* 1995; Williams *et al.,* 1996), which confirms development of structures during the Chewings Orogeny (Hand & Buick, 2001).

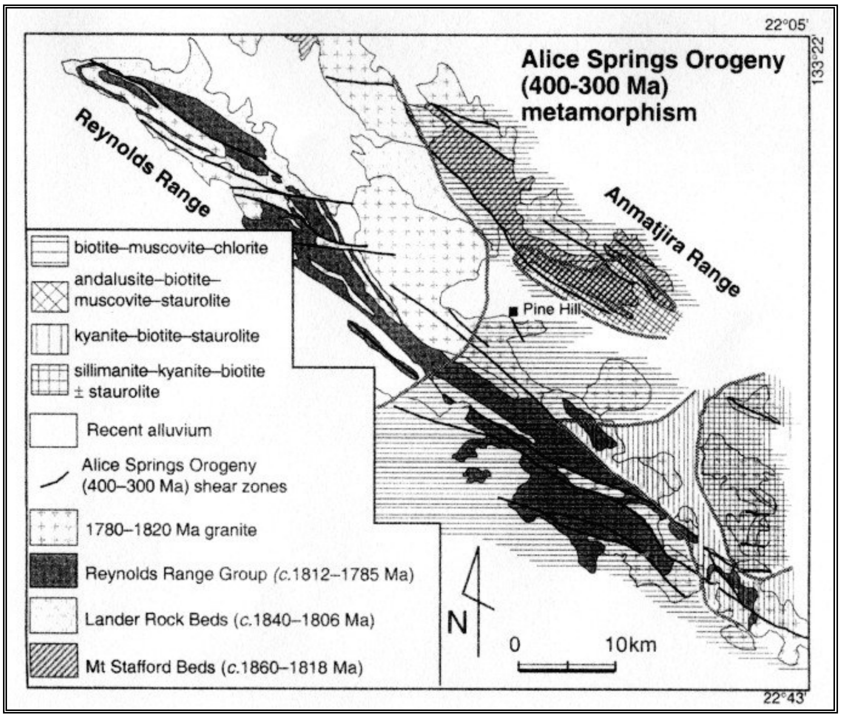

Figure 10: Metamorphic zones defined by mid-Palaeozoic metapelitic shear zone assemblages in the Reynolds-Anmatjira Range region (*from* Hand & Buick 2001).

Proterozoic structures in the Reynolds Range are heavily dissected by southeast and east trending shear zones associated with the 400-300 Ma Alice Springs Orogeny (Hand & Buick, 2001). Micaceous greenschist to lower amphibolite assemblages are dated to 330-320 Ma (Cartwright *et al.,* 1999).

Collins and Teyssier, (1989), interpret the overall geometry of the Reynolds-Anmatjira Ranges to have formed in a transpressional setting with a northeast-plunging lineation representing a component of sinistral movement during the Alice Springs Orogeny, resulting in juxtaposition of granulites against lower grade rocks in the southwestern Reynolds Range (Dirks *et al,.* 1991).

The metamorphic grade increases to the southwest so that shear zones in the southwest of the Reynolds Range contain kyanite, staurolite and sillimanite-bearing assemblages in metapelite, (Dirks *et al.,* 1991) with P-T conditions of 5-5.5 kilobars and 550-600°C. In the southeastern Anmatjira Ranges, the shear zones contain andalusite and staurolite assemblages in meta-pelite, with P-T conditions of 4 kilobars and 580°C (Xu *et al.,* 1994). In the central and northwest Reynolds Range the shear zoneas are associated with greenschist or lower-grade metamorphism (Dirks *et al.,* 1991). Accompanying the increase in metamorphic grade is an increase in the number and width of the shear zones, with zones in the southeastern Reynolds Range up to 300m wide (Hand & Buick 2001).

Episodic mild uplift and warping consisting of limited upward doming of ranges and minor tilting continued through the Palaeozoic and Cainozoic to present day (Senior *et al.,* 1995).

MINERALISATION

Relevant company reports and descriptions of the Reynolds Range region by the NTGS describe numerous occurrences of mineralisation. These include copper-lead-zinc, gold, tungsten, tin, tantalum, rare earth elements, mica, nickel, chromium, semi-precious stones, talc, iron and uranium. A variety of mineralisation styles have potential in the Reynolds Range region but few mineralisation styles have proven prospective.

Prospective deposits known to present day include the Nolan,s Bore Phosphate-Rare Earth Element-Uranium deposit currently being investigated at the feasibility stage of activities by Arafura Resources NL within EL 23671 Aileron (Goulevitch, 2005). In addition, Poseidon Gold discovered a zone of gold-arsenic-antimony mineralisation called the Sabre Prospect, located north of Mount Thomas. Further details of Poseidon Gold's findings and activities are contained in the 'Previous Investigations' section.

PREVIOUS INVESTIGATIONS

EXPLORATION PRIOR TO 1996

(*After* Drummond 2003)

Reference is made to historic EL 9672 Dragons Lair and contemporary ELs 23671 Aileron, 23571 Reynolds Range and 24548 Yalyirimbi Range in the following exploration summaries. EL 9672 Dragons Lair covered most of the area of EL 23571 Reynolds Range and also covered the head water areas of the Lander and Hanson Rivers. EL 23671 Aileron was mostly covered by EL 9672 Dragons Lair. EL 24548 Yalyirimbi Range is 15-20 kilometres south of EL 23571 Reynolds Range, and hence outside of EL 9672 Dragons Lair, and is not relevent to this report. Included historic exploration summaries may not be explicitly associated with EL 23571 Reynolds Range but are relevent when considering regional prospectivity.

CSR minerals (1977-1978) EL 1294. CR79-0198

The licence covered most of EL 23571 Aileron and the north central portion of EL 24548 Yalyirimbi Range. The historic licence area was considered prospective for base metals, tungsten and uranium. An airborne radiometric survey was flown in 1977. Thirty seven airborne radiometric anomalies were checked along with stream sediment sampling and rock chip sampling. None of the anomalies were considered prospective.

Otter Exploration (1977-1979) EL 1444. CR79-0021, 80-0056, 80-0252

EL 1444 was located 2 kilometres north of the central portion of EL 23571 Reynolds Range and covered the northern portion of EL 23671 Aileron. The area was considered prospective for skarn-hosted base metal and tin-tungsten deposits. Additionally the Reynolds Range, Lander River valley and Anmatjira Range were prospective for hydrothermal skarn uranium deposits. Otter Exploration commissioned an airborne radiometric survey and identified eighteen radiometric anomalies worth further investigation. Ground truthing of radiometric anomalies was carried out using a scintillometer along traverses. Bore waters in the licence area were analysed for uranium. Several enriched uranium and Rare Earth Element (REE) occurrences were located but the extent was small. Both leases were relinquished.

BHP Exploration (1981-1983) ELs 2942, 3075, 3084 and 3088s. CR83-0015, 83-0289

The tenements were taken up principally in a diamond search, with base metals a secondary consideration. BHP withdrew in the light of negative results. Two stream sediment samples were anomalous for cerium (Ce) and lanthanum (La): they drained an area near Mt Finniss in the north-west corner of EL 23671 Aileron, and which hosts a mapped REE-(U) prospect. This demonstrates the ability to use stream geochemistry in a search for further REE deposits in Arafura's tenements.

J Weir (1982-1983) EL3506. CR83-216

Via a scintillometer search, Weir located an allanite-bearing pegmatite vein near Mt Boothby, which is 5 km north-east of Nolans Bore and within EL23671 Aileron. The pegmatite is of limited extent and assayed : Ce 4250 ppm, La 3100 ppm and Yttrium (Y) 70 ppm.

BHP Exploration (1983-1984) EL4188. CR84-117

The western half of that tenement lay within the eastern margin of EL 23671 Aileron. BHP reviewed the BMR 1:250 000 total magnetic intensity contour map for the Napperby Sheet and identified a "bullseye" shaped anomaly of nearly 1 000 nT, the source of which was considered to be a possible carbonatite. It lies just north-east of EL 23671 Aileron, with a possible repetition inside Arafura's licence. Without any outcrop to explain it, the area was applied for and BHP carried out an aeromagnetic survey and follow-up ground magnetometer and gravity traverses. These confirmed the size and location of the anomaly and identified a five to six milligal gravity anomaly. The geophysical anomalies were drill tested by hole OG-1 (total depth

256 metres) which intersected non-magnetic "basement" rocks at 94 metres, and weakly magnetic hornblende-quartz-feldspar gneiss at 213 metres. It was considered that these rocks belonged to the Arunta Complex and were the source of the geophysical anomaly. Analysis for base metals proved negative.

Colchis Mining Corporation Pty Ltd (1987-1990) EL5511. CR89-020, 90-366

This tenement occupied the western part of EL 23671 Aileron. Colchis targeted both Au and base metal mineralisation. It undertook a review of previous data, interpreted aerial photography and Landsat imagery, and carried out an intensive mapping programme. Rock chip samples (45) and stream sediment sampling (210 samples, not BLEG Au) did not indicate any anomalism warranting Colchis' further work.

Track Minerals Pty Ltd (1988-1989) EL5901. CR89-704

EL5901 occupied the south-eastern part of EL9672 Dragons Lair and subsequently EL 23671 Aileron. Track searched for Au in the Aileron Metamorphics, which there consist of a calc-silicate, meta carbonate and meta arenite suite. It focused on areas proximal to granitic intrusions, thrust faulting and shearing. Stream sediment sampling with BLEG Au and base metal analysis, geological traverses and rock-chip geochemistry did not provide any encouragement. However, Drummond considers that its 27 sample stream geochemical programme could not be considered an adequate test of the ±300 sq km that Track endeavoured to evaluate.

Poseidon Gold Ltd and Exodus Minerals N L (1993 - 1999) EL7343:Relinquished Section. CR99-225

The original large tenement was centred on the Lander River Valley, and almost all of it lay well north to north-west of EL23571 Reynolds Range near the Harverson Pass. The target was structurally controlled Au and base metal mineralisation. Open File records only relate to the data gathered on areas subsequently relinquished. Strong programmes were undertaken, including airborne geophysical surveys, stream and lag sampling, RAB drilling and geomorphological interpretation, and successive statutory partial relinquishments of the tenement were made. Although Posgold considered that no anomalous geochemical systems had been defined, Exodus states that "… the relinquished portion … is not unprospective…": this comment, presumably, being applicable to the Harverson Pass area.

Tidegate Pty Ltd (1993-1994) EL8117. CR94-589

Aileron roadhouse lies in the north-west part of this tenement, which covered the eastern part of EL9672 Dragons Lair and the southerly lobe of EL 23671 Aileron. Work consisted of taking BLEG Au samples, soil samples and rock chip samples near a known nickel (Ni)-chrome (Cr) prospect, and the amphibolite at Harry's Yard (both of these lie to the south-east of Arafura's tenements). Exploration target was Au in greenstones but results were discouraging.

Aberfoyle Resources Ltd (1995-1998) EL9146. CR96-692, 97-688

This tenement covered the south-eastern portion of EL 23671 Aileron. Aberfoyle considered that the poorly outcropping sequences in the tenement could host Granites-Tanami style Au mineralisation, and that the latter may be associated with magnetic anomalies. An early RAB drill programme (6 holes, 299 metres) established that Cainozoic cover thickness was not prohibitive (between 12 and 38 metres). A detailed aeromagnetic survey was flown and several magnetic anomalies located which Aberfoyle considered worthy of follow-up. Apparently this was not undertaken, and the tenement was relinquished.

PNC Exploration (Australia) Pty Ltd (1994-1996) EL8411. CR95-266, 96-187

PNC acquired EL8411 so that it could seek uranium. It covered Arafura's relinquished tenement EL9672 Dragons Lair and extended north-westerly well beyond it along the Reynolds Range, now EL 23571 Reynolds Range and EL 23671 Aileron. In its exploration it discovered the Nolans Bore apatite-REE deposit. Via regional reconnaissance, airborne radiometrics and ground traversing, PNC found numerous prospects, many of which it considered were of Mary Kathleen or East Alligator style. However, they were apparently too small to justify more detailed work. Despite the discovery of Nolans Bore, PNC relinquished the tenement.

EXPLORATION BY ARAFURA RESOURCES NL FROM 1996 TO 2004

(*After* Drummond 2003)

Homestake Gold of Australia Pty. Ltd. (1996 – 1998) EL 9672.

EL 9672 Dragons Lair was granted on the 25-11-1996 and farmed out to Homestake Gold of Australia Ltd. Homestake perceived potential for Granites-Tanami style mineralisation associated with a major fluid pathway, the Trans-Tanami structural zone. It was encouraged by the small Au and Cu prospects in the tenement, and by the proximity to the Sabre Province (Cu-Ag & Cu-Pb-Zn).

The ±1500 sq km of the tenement were covered by 235 BLEG Au samples. Results were disappointing, with only 15 samples attaining 0.1 ppb or better. Six of those were clustered near the Harverson Pass, with a maximum value of 34.6 ppb and three others attaining 0.3 ppb or better. The anomalous area was followed up with detailed stream BLEG sampling (114 samples) and 10 chip samples of rocks with encouraging appearance. Essentially all BLEG samples recorded results below the level of detection. Homestake then withdrew, apparently unaware of PNC's Nolans Bore discovery. Drummond, (2003), considered a minus 4mm fraction BLEG program, and a follow-up minus 2mm fraction BLEG program was ineffective, accounting for poor duplication in results.

Ironstone occurrences were investigated in the Harverson Pass and upper Woodforde River areas by Lindsay-Park,(1998), and Goulevitch, (1999). Lindsay-Park, (1998), described haematitic beds in a zone 50-100 metres wide at a stratigraphic change from arenitic units, (now mica schist), to coarser arenitic units, (now quartzite) in the Harverson Pass area. The highest assay result for iron was 21.4%. Goulevitch, (1999), investigated goethitic ironstone occurrences in the upper Woodforde River area that were surficial developments in a major marble/limestone unit of the Woodforde River Beds, (upper Reynolds Range Group). Assay of the grab samples yielded 46.10% Fe, and slightly elevated base metals.

NORTHERN TERRITORY GEOLOGICAL SURVEY

The Napperby-Hermannsberg 1:250,000 map sheet areas were surveyed in late 1997 by the Northern Territory Geological Survey (NTGS). Flight line spacings were 400 metres on a north-south line orietation. Readings were taken at 70 metre intervals for radiometrics and 7 metre intervals for magnetics. The survey was navigated using Differential GPS at an average terrain clearance of 60 metres. Data was collected by the World Geoscience Corporation.

WORK COMPLETED 2005

REPROCESSING NTGS GEOPHYSICAL DATABASE

Southern Geoscience Consultants (SGC) reprocessed the Napperby/Hermannsberg map sheets survey and the Alice Springs/Alcoota map sheets survey as part of the Arunta Database held by the NTGS. SGC provided an atlas of reprocessed images in hard- and digital-copy included in Appendix F.

GEOLOGICAL RECONNAISSANCE

Helicopter-borne reconnaissance exploration was carried out during the 26th and 27th of October, 2005, in EL 23571 Reynolds Range. Observations were made by Mr John Goulevitch, Exploration Manager for Arafura Resources NL, and the author. A Bell Jet Ranger VH-JWS supplied by Australian National Helicopters and piloted by Chris Collins was used for transportation. Two labourers were hired from the Anmatjere Council to assist with placing and collecting fuel supplies at Pine Hill Station prior to and at the conclusion of survey operations.

Outcropping haematite occurrences in haematitic quartzite units of the Mount Thomas Quartzite and Pine Hill Formation of the Reynolds Range Group were located and sampled. Reconnaissance was guided by BMR 1:250,000 and 1:100,000 published geological maps and aeromagnetic signatures in NTGS geophysical data reprocessed by SGC.

The haematitic units of the Mount Thomas Quartzite and Pine Hill Formation are mapped over a distance of 75 kilometres from the Woodforde River in the east, (approximately 133° 10’ E), to beyond Mount Gardiner in the west, (132° 35’ E). Mapped haematite occurrences have mainly been recorded over a 25 kilometre section of the Range centred on Mount Thomas, northwest of Harverson Pass, but magnetic signatures suggest iron occurrences are more widespread along the Range.

The additional objective was to reconnoitre weak but discrete uranium anomalies identified in the SGC reprocessed NTGS database in the headwaters of Napperby Creek. Reconnaissance was guided by previously mentioned geological maps, NTGS airborne data and historical exploration reports of uranium and REE prospects compiled by Fabray, (2005).

ROCK GRAB SAMPLES

Ten rock grab samples, (up to 3 kilograms each), were collected from various sites in the licence area. Rock samples were taken from various parts of the weathered profile in mesas or from kaolinised gneissose basement. Sample localities and descriptions are included as Appendix B. Sample sites were positioned using a GPS and were flagged for later recovery. These are plotted on Figure 5.

No samples were collected from sacred sites listed in the current AAPA register, or from the vicinity of additional sites notified by the CLC.

GEOCHEMICAL ANALYSES

Sample Submission sheets to North Australian Laboratories (NAL) and Northern Territory Environmental Laboratories (NTEL) are included as Appendix A.

Samples were crushed and pulverised in a Keegor Mill in their entirety by NAL in Pine Creek.

Pulps were submitted to NTEL in Darwin and analysed for Ag, Ce, Cu, Nd, Pb, Th, U, Zn using a three acid digest, (HNO_3/HCl/$HClO_4$), followed by ICP-MS determinations. Lanthanum concentrations were determined using a similar acid digest and were analysed using ICP-OES .

RESULTS OF 2005 RECONNAISSANCE

GEOLOGICAL RECONNAISSANCE

NTGS geological map sheets show several haematite iron occurrences in the Reynolds Range without grade and distribution. The reconnaissance conducted in October, 2005, revealed that most of the occurrences are actually goethite with only haematite in the upper ferruginous zone of Tertiary weathering profiles. At other recorded occurrences on the Mount Thomas Quartzite only dark hematite staining was present on exposed surfaces (Photograph 6). No massive haematite was located in the quartzite.

Deep weathering profiles developed during the Tertiary are best preserved in scattered mesa landforms in the licence area (Photograph 1). The deep weathering profile is generally trizonal, of variable thickness and at various elevations in the Reynolds Range (Photograph 2). Mesas were only observed on lithologies of the Reynolds Range Group (RRG).

The basal kaolinitic zone was observed on Napperby Gneiss and on RRG lithologies. On granite/gneiss basement the intensity of kaolinisation grades from fresh basement gneiss/granite, to selective K-feldspar altered gneiss/granite, to completely altered massive kaolinite with pegmatitic veins of muscovite and quartz. Although alteration is mineralogically similar to the kaolinite profile on RRG lithologies, it is texturally different and it is locally developed amongst areas of fresh rock (Photographs 7 & 8). On RRG lithologies the basal zone is completely altered from the lower to the upper boundaries and it is regionally developed. The zone is easily identified by the bright white appearance.

The middle mottled zone was rarely observed in mesas. The mottled zone overlies the kaolinite zone and provides a distinct colour contrast from white to red/orange. The upper boundary of the mottled zone is gradational to the ferruginous zone. Ferruginisation increases in intensity up through the profile occurring at first as disseminated and fracture-controlled alteration progressing to complete alteration of the matrix and arenaceous clasts (Photograph 3). Sub-horizontal Tertiary relict bedding can be seen in the mottled zone whereas breccias with basement clasts dominate the ferruginous zone.

Ferruginised remnants of Tertiary sediments occur on the Reynolds Range Group at higher elevations than the upper profile of mesas. The remnants are generally thin, 2-5 metres, but can achieve widths up to 20 metres. Alteration does not extend into the basement rock (Photograph 4). There is no mottled or kaolinised zone present. Some remnants have relict sub-vertical bedding which indicates a basement protolith (Photograph 5).

Uranium channel and total count radiometric anomalies were tested at 15 to 20 metres above ground level with a Scintrex BGS-4 scintillometer. If there was an adequate gamma response ground reconnaissance and grab sampling of outcropping rocks was conducted in that vicinity.

Uranium-channel radiometric highs generally coincide with deep-weathered, kaolinised basement gneiss shown as Napperby Gneiss on published geological maps. Weak uranium anomalies also occur in meta-quartzite, meta-sandstone and schists of the Mt Thomas Quartzite, carbonates of the Wickstead Creek Package and overlying Quaternary sediments.

A small percentage of elevated uranium anomalies and most elevated total count anomalies occur in EL 23671 and EL 24548. Analytical results from these licences are included in this report although detailed locality and geological descriptions are omitted and will be reported elsewhere.

GEOCHEMICAL RESULTS

Analytical results sheets are included as Appendix C. Sample locations are displayed in Figure 5 and located data is included as Appendix B.

The highest results include:

- 204ppm Cu
- 96.6ppm Pb
- 263ppm Zn
- 0.55ppm Ag
- 425ppm Ce
- 98ppm La
- 62ppm Nd
- 139ppm Th
- 13.9ppm U

The element distribution in ferruginised and kaolinised samples are illustrated in Figure 12 and 13, respectively. Ferruginised samples are mildly enriched in base metals whereas analysed Rare Earth Elements and radiogenic elements are in background concentrations. Sample T508 is moderately enriched in cerium compared to the rest of the sample group.

Kaolinised samples are slightly elevated from background concentrations in analysed REE, particularly cerium. Analysed radiogenic elements are slightly enriched in samples from Napperby gneiss and in background concentrations in samples from Tertiary Weathering Profiles. Base metals are in background concentrations.

Collected samples were not analysed for iron due to poor visual grade and limited lateral extent.

DISCUSSION

GEOLOGICAL RECONNAISSANCE

To accurately evaluate the prospectivity of EL 23571 for further exploration it was necessary to determine if Tertiary weathering profiles were developed in Palaeoproterozoic Reynolds Range Group basement and/or in Late Cretaceous–Early Tertiary sediments. Additionally, it was important to determine if extensively developed kaolinisation in the Napperby Gneiss was caused by Tertiary weathering or some hydrothermal event.

Review of relevant literature indicates three weathering profiles were developed during the Tertiary. Weathering Event A is developed in the upper 30-40 metres of basement exposed during that period. Profiles are described as trizonal consisting of a lower kaolinite zone, a middle mottled zone, and an upper ferruginous zone (Senior *et al.* 1995). This description is consistant with profiles seen during recent reconnaissance however contrary evidence exists in mesas as to whether basement or later lithologies were affected by this weathering event.

In mesas overlying units of the Reynolds Range Group the kaolinite zone has a distinct unconformable lower boundary. An example of this is located at 289538E/7517429N where basement quartzite is unconformably overlain by white kaolinite clay. Alteration did not extend into basement quartzite. This may be because the overlying sediment was amenable to kaolinisation and basement quartzites were not, which suggests the overlying sediment was not basement. The kaolinite zone is completely altered and original textures in the overlying sediments are completely destroyed. Therefore, altered sediments must have been in place before Late Cretaceous – Early Tertiary Weathering Event A.

Kaolinite alteration in scattered areas of the Napperby Gneiss may be the product of Weathering Event A, hydrothermal alteration developed after emplacement and metamorphism, or prolonged, acidic and oxidised groundwater circulation along open structures in the gneiss.

Altered parts of the Napperby Gneiss retain the original gneissose fabric although the potassic feldspar component is with completely decomposed. The transition from fresh basement to completely altered basement is typical of Weathering Event A profiles known from drill holes which intersected basement beneath various Tertiary Basins in the southern areas of the Northern Territory. The middle and upper zones produced during Weathering Event A however are completely absent, possibly having been completely eroded away, or not developed at all.

Hydrothermal processes in the Napperby Gneiss could have produced the mineral assemblage and the irregular distribution of alteration present today. However hydrothermal activity cannot be allocated to any one particular diastrophic event, and may have occurred during either the Chewings Orogeny, Ordovician metamorphism or the Alice Springs Orogeny.

The Late Cretaceous to Early Tertiary palaeoclimate changed from arid to wet by the Middle to Late Eocene. This is derived from extensive basinal deposition of alluvial to lacustrine sediments divided by Weathering Event B and derived from the development of lignite above Weathering Event B (Senior *et al.* 1995). The depositional setting suggests groundwater levels were at similar depths or higher than today's mean groundwater level.

It is plausible to suggest that kaolinite alteration can be caused by each above mentioned process. However kaolinite alteration cannot be attributed to any one process, and in fact may have been caused by a combination of these processes. Further investigation is necessary to make any conclusions.

In any case, kaolinite altered areas of the Napperby gneiss have potential for REE-P-U mineralisation similar to Nolans Bore (EL 23671 Aileron). Nolans Bore deposit is hosted by a large east-west shear-, mylonite-, zone, hosted within the Mt. Boothby Orthogneiss. East-west shear zones were developed during the Chewings Orogeny and reworked by the Alice Springs Orogeny across the Reynolds Range region (Hand & Buick, 2001). In the northwestern and central parts of the range the shear zones are expressed by east-west kink crenulations. At Nolan's Bore, in the southeastern part of the range, an eastwest mylonite has resulted from these movements. Kaolinite is a large component of the mylonite zone. It is reasonable to believe other mylonite zones occur elsewhere in the Mt. Boothby orthogneiss and potentially the Napperby Gneiss. There is also potential for U mineralisation in leached parts of the Napperby gneiss. Although the Napperby Gneiss has a relatively high background uranium concentration, kaolinised parts are yet to be proven as a good host for uranium mineralisation.

The occurrence of mesas as a dissected land surface represents substantial erosion during the Tertiary which would have removed detritus downstream to Tertiary basins. Tertiary basins may have potential for sandstone-hosted, rollfront uranium mineralisation. This interpretation is consistent with findings of previous explorers in the region, *e.g.* Tanganyika Holdings Pty. Ltd. (Wells 1972).

Numerous ferruginous targets occur in the Reynolds Range. Stewart, (1981), cites haematitic lenses or pods in the Mount Thomas Quartzite and the upper boundary of the Warimbi Schist, though none of these were located during reconnaissance in 2005. Limonitic ironstones developed over the Algamba Dolomite Member and limonitic ironstone laterites in Tertiary weathering profiles were also cited. Haematite lenses are high grade, ~50% Fe total, but they are of limited extent. Limonitic ironstone occurrences, which may be the product of Tertiary weathering or supergene enrichment, are generally of low grade and of limited extent.

Ferenczi, (2001), cites a number of limonitic occurrences developed over marble and calc-silicate intervals within the Woodforde River beds, and limonitic ironstone lenses hosted within quartz mica schists of the Lander Rock beds. The genesis of the ironstones is uncertain but is believed to be supergene enrichment. The deposits are of low grade and of limited extent. The Woodforde River ironstones assayed 375ppm Zn and 65ppm Pb which is of interest. Goulevitch, (1999), further investigated the occurrences in the upper Woodforde River area and submitted a sample for assay that yielded 46.10% Fe.

Further ferruginous targets are reported by PNC Exploration, (Thevisson 1995), which should be followed up in the next exploration season.

GEOCHEMICAL RESULTS

There are numerous ferruginous occurrences in the Reynolds Range which are individually sub- to un-economic as iron ore resources. The collective tonnages are moderate but the occurrences are spread across a vast area. Although samples were not analysed for Fe-total by Arafura Resources NL Fe grades can be found in historical reports from the relevant areas. The analyses that were carried out for this report show elevated base metals, which is consistent with Ferenczi's, (2001), analyses of various ironstone deposits from the Reynolds Range area. Base metals are not a primary target for Arafura Resources NL but it would be unwise to ignore the results.

Sample T508 was taken from ferruginised subcrop which was surrounded by a white precipitate. The white precipitate could have been recently developed kaolinite or a Mg-precipitate. Hence the elevated cerium may have been hosted within the minor kaolinitic portion of the grab sample, which is consistent with analyses of other kaolinised samples.

Kaolinitic samples from weathered profiles in mesas and from altered areas in Napperby gneiss are consistently elevated in REE. The kaolinitic alteration product seems to be a suitable host for relatively mobile REE's. Uranium and Thorium levels are higher in altered areas in the Napperby gneiss.

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Clifton Todd McGilvray
BSc (Hons.)
17th March 2006

REFERENCES AND SOURCES OF INFORMATION

Buick, I. S., & Cartwright, I., 1994. The significance of early scapolite in greenschist facies marbles from the Reynolds Range Group, central Australia. *Journal of Geological Society of London*, **151**, pp. 803-812.

Buick, I. S., Cartwright, I., & Harley, S. L., 1998. The retrograde P-T-t path for low-pressure granulites from the Reynolds Range, central Australia; petrological constraints and implications for low-P/high-T metamorphism. *Journal of Metamorphic Geology,* **16**, pp. 511-529.

Buick, I. S., Hand, M., Vry, J., Cartwright, I., and Read, C., 1999. Polymetamorphism and reactivation of the Reynolds Range area, northern Arunta Inlier, central Australia: petrological, geochronological, geochemical and structural constraint. *Specialist Group in Geochemistry, Mineralogy and Petrology Field Guide No. 2, Geol. Soc. of Aus.*

Cartwright, I., Buick, I. S., Foster, D. A., and Lambert, D. D., 1999. Alice Springs age shear zones from the southeastern Reynolds Range, central Australia. *Australian Journal of Earth Sciences*, **46**, pp. 355-363.

Collins, W. J., and Sawyer, E., 1996. Pervasive granitoid magma transfer through the lower-middle crust during non-coaxial compressional deformation. *Journal of Metamorphic Geology*, **14**, pp. 565-579.

Collins, W. J., and Teyssier, C., 1989. Crustal scale ductile fault systems in the Arunta Inlier, central Australia. *Tectonophysics*, **158**, pp. 49-66.

Collins, W. J., and Williams, I. S., 1995. SHRIMP ionprobe dating of short-lived Proterozoic tectonic cycles in the northern Arunta Inlier, central Australia. *Precambrian Research*, **71**, pp. 69-90.

Dirks, P. H. G. M., and Wilson, C. J. L., 1990. The geological evolution of the Reynolds Range, Central Australia: Evidence for three distinct structural/metamorphic cycles. *Journal of Structural Geology*, **12**, pp. 651-665.

Dirks, P. H. G. M., Hand, M., and Powell, R., 1991. The P-T-deformation path for a mid-Proterozoic, low-pressure terrain: the Reynolds Range, central Australia. *Journal of Metamorphic Geology*, **9**, pp. 641-661.

Drummond, A. J., 2003. Independent Consulting Geologists Report. *Arafura Resources N.L. Prospectus dated 25/08/2003*.

Fabray, J., 2005. The Uranium Potential of the Reynolds Range & Yalyirimbi Range Regions (EL 23571, EL 23671 and ELA 24548), Aileron Project. *Unpubl. Report EPL-05/173.*

Ferenczi, P. A., 2001. Iron ore, manganese and bauxite deposits of the northern Territory. *Northern Territory Geological Survey, Report 13.*

Freeman, M. J., Shergold, J. H., Morris, D. G., and Walter, M. R., 1990. Late Proterozoic and Palaeozoic Basins of Central and Northern Australia. *Geology of the Mineral Deposits of Australia and Papua New Guinea (Ed. F.E. Hughes), AusIMM,* pp. 1125-1134.

Goscombe, B., 1991. Intense non-coaxial shear and the development of mega-scale sheath folds in the Arunta Block, central Australia. *Journal of Structural Geology*, **13**, pp. 299-318.

Goulevitch, J, 1999. Annual Report for the period 25/11/98-24/11/99 Year 3. EL9672 Dragon's Lair, Aileron, Northern Territory. *Unpublished Company Report for Exploremin Pty. Ltd., EPL-99/103.*

Goulevitch, J, 2005.

Hand, M., and Buick, I. S., 2001. Tectonic evolution of the Reynolds-Anmatjira Ranges: a case study in terrain reworking from the Arunta Inlier, central Australia. *In* J. A. Miller, R. E. Holdsworth, I. S. Buick and M. Hand, Continental Reactivation and Reworking. *Geological Society Special Publication No. 184*.

Hand, M., and Dirks, P. H. G. M., 1992. The influence of deformation on the formation of axial planar leucosomes and the segregation of small melt bodies within the migmatiticNapperby Gneiss, Central Australia. *Journal of Structural Geology*, **14**, pp. 591-604.

Hand, M., Fanning, C. M., and Sandiford, M., 1995. Low-P High metamorphism and the role of high-heat producing granites in the northern Arunta Inlier. *Australian Geological Society*, *Abstracts*, **40**, pp. 60-61.

Mahar, E. M., Baker, J. M., Powell, R., Holland, T. J. B., and Howell, N., 1997. The effect of Mn on mineral stability in metapelites. *Journal of Metamorphic Geology*, **15**, pp. 223-238.

Senior, B. R., Truswell, E. M., Idnurm, M., Shaw, R. D., and Warren, R. G., 1995. Cainozoic sedimentary basins in the eastern Arunta Block, Alice Springs Region, central Australia. *Australian Geological Survey Organisation - Journal of Australian Geology & Geophysics*, **15(4)**, pp. 421-444.

Shaw, R. D., Stewart, A. J., and Black, L. P., 1984. The Arunta Inlier, a complex ensialic mobile belt in central Australia, Part 2 Tectonic history. *Australian Journal of Earth Sciences*, **31**, pp. 457-484.

Stewart, A. J., 1981. Reynolds Range Region, Northern Territory. *BMR 1:100,000 Geological Map Series Commentary. Bur. Min. Res. Geol. & Geophys.*, Canberra, Australia.

Stewart, A. J., 1981. Reynolds Range Region, Northern Territory. *BMR 1:100,000 Geological Map Series. Bur. Min. Res. Geol. & Geophys.*, Canberra, Australia.

Stewart, A. J., 1991. NAPPERBY – Sheet SF/53-9. *BMR 1:250,000 Geological Map Series Commentary. Bur. Min. Res. Geol. & Geophys.*

Stewart, A. J., 1991. NAPPERBY – Sheet SF/53-9. *BMR 1:250,000 Geological Map Series. Bur. Min. Res. Geol. & Geophys.*

Stewart, A. J., Offe, L. A., Glikson, A. J., Warren, R. G., and Black, L. P., 1980. *Geology of the northern Arunta Block, Northern Territory.* Australian Bureau of Mineral Resources, Geology and Geophysics Record, **1980/83**.

Thevisson, J, 1995. Napperby Annual Report EL8411 1995 field season. *PNC Exploration (Australia) Pty Ltd unpublished report NTDME CR96/187.*

Vry, J. K., and Cartwright, I., 1998. Stable isotopic evidence for fluid infiltration during contact metamorphism in a multiply-metamorphosed terrane: the Reynolds Range, Arunta Block, central Australia. *Journal of Metamorphic Geology*, **16**, pp. 749-765.

Vry, J. K., Compston, W., and Cartwright, I., 1996. SHRIMP II dating of zircons and monazites: reassessing the timing of high-grade metamorphism and fluid flow in the Reynolds Range, northern Arunta Block, Australia. *Journal of Metamorphic Geology*, **14**, pp. 335-350.

Wells, R. G., 1972. Annual Report, 1972. *Tanganyika Holdings Pty. Ltd. Unpublished Company Report: CR1972-0063.*

Wells, A.T., and Moss, F. J., 1983. The Ngalia Basin, Northern Territory: stratigraphy and structure. *Bur. Min. Res. Geol. & Geophys.*, *Bulletin 212*, pp. 4-7.

Williams, I. S., Buick, I. S., and Cartwright, I., 1996. An extended episode of early Mesoproterozoic metamorphic fluid flowin the Reynolds Range, central Australia. *Journal of MetamorphicGeology*, **14**, pp. 29-48.

Xu, G., Will, T. M., and Powell, R., 1994. A calculated petrogenetic grid for the system K_2O-FeO-MgO-Al_2O_3-SiO_2-H_2O with particular reference to contact-metamorphosed pelites. *Journal of Metamorphic Geology*, **12**, pp. 99-119.

NTGS OPEN FILE COMPANY REPORTS

CR1979-0021 Otter Exploration NL, Annual Report 1978 EL 1444.
CR1979-0198 CSR minerals, Annual Report 1978-1979, EL 1294.
CR1980-0056 Otter Exploration NL, Final Report, EL 1444.
CR1980-0252 Otter Exploration NL, Report on various Els, including EL 1444.
CR1983-0015 BHP Exploration, Annual Report 1983, ELs 2942, 3075, 3084 and 3088s.
CR1983-0216 J Weir, Annual Report 1983, EL3506.
CR1983-0289 BHP Exploration, Final Report 1983, ELs 2942, 3075, 3084 and 3088s.
CR1984-0117 BHP Exploration, Final Report 1984, EL4188.
CR1989-0020 Colchis Mining Corporation, Annual Report 1988, EL5511.
CR1989-0704 Track Minerals, Annual & Relinquishment Report 1989, EL5901.
CR1990-0366 Colchis Mining Corporation, Final Report 1990 EL5511.
CR1993-0410 Poseidon Gold, Final Report 1993, Els 7344 & 7345.
CR1994-0589 Tidegate, First & Final Report 1994, EL8117.
CR1995-0266 PNC Exploration (Australia), Annual Report 1994, EL8411.
CR1996-0187 PNC Exploration (Australia), Annual Report 1995, EL8411.
CR1996-0692 Aberfoyle Resources, Annual Report 1996, EL9146.
HGA-1997/045 Homestake Gold of Australia, Annual Report 1997, EL 9672.
CR1997-0688 Aberfoyle Resources, Annual Report 1997, EL9146.
EPL-1998/100 Exploremin, Annual Report 1998, EL 9672.
EPL-1999/031 Exploremin, Partial Reliquishment Report 1999, EL 9672.
EPL-1999/101 Exploremin, Annual Report 1999a, EL 9672.
EPL-1999/103 Exploremin, Annual Report 1999b, EL 9672.
EPL-2000/124 Exploremin, Annual Report 2000a, EL 9672.
EPL-2000/128 Exploremin, Annual Report 2000b, EL 9672.
EPL-2001/131 Exploremin, Annual Report 2001a, EL 9672.
EPL-2001/133 Exploremin, Annual Report 2001a, EL 9672.
CR2001-0225 Poseidon Gold and Exodus Minerals N.L. Final Report 2001, EL7343.
EPL-2003/145 Exploremin, Annual Report 2002, EL 9672.
EPL-2005/173 Exploremin, Technical Report, ELs 23571, 23671 and 24548.

FIGURES

Figure 7

Ahmad, M., and Scrimgeour, I. R., 2004. Geological Map of the Northern Territory, 1:250,000 scale. *Northern Territory Geological Survey, Darwin*.

Figures 8-11

Hand, M., and Buick, I. S., 2001. Tectonic evolution of the Reynolds-Anmatjira Ranges: a case study in terrain reworking from the Arunta Inlier, central Australia. *In* J. A. Miller, R. E. Holdsworth, I. S. Buick and M. Hand, Continental Reactivation and Reworking. *Geological Society Special Publication No. 184*.