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SUMMARY

EL 24955, Sandover, was granted to Arafura Resources NL on 7 September 2006 and transferred to NuPower Resources Ltd in 14 March 2007 as a result of the demerger of Arafura’s uranium assets into the newly formed company focussed on uranium.

There are no known mineral occurrences or prospects within the area.

The license was selected by Arafura Resources NL because of the potential for secondary sandstone hosted type uranium mineralisation in unconsolidated Tertiary basin sediments of the Ti-Tree Basin, derived by erosion of adjacent uraniferous basement granites and gneisses.

The basement of the Sandover region comprises rocks of the Arunta Region, a complex basement inlier in central Australia that has undergone a prolonged history of sedimentation, magmatism and tectonism extending from the Palaeoproterozoic to the Palaeozoic that is subdivided into three, largely fault bounded terranes with distinct geological histories; the Aileron, Warumpi and Irindina Provinces. The basement geology of Sandover comprises units of the Aileron Province consisting of 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 and Tennant Regions to the north.

Because of the high grade of metamorphism and the paucity of continuous outcrop across the Arunta Province, a reliable stratigraphy has not yet been constructed for the metasedimentary sequences and instead, the Early–Mid Proterozoic metamorphosed rocks have been subdivided into three Divisions, intruded by granites, on the basis of broad lithological correlations, in which Division 1 is regarded as the oldest and Division 3 as the youngest.

Minor isolated outcrops of deeply weathered rocks are mapped as Pre-Cambrian gneiss and schist in the western part of the Sandover area of uncertain affinity. Pre-Cambrian orthogneiss is exposed beneath units of the Ngalia Basin in the far west. Division 1 Palaeoproterozoic rocks consisting of pelitic, semi-pelitic, psammitic and calc-silicate gneisses and granulites, meta-gabbro, dolerite and mafic granulite of the Aileron Metamorphics crop out in the far western part of the license, north of Allungra Creek and further west around Aileron. These rocks are intruded by Proterozoic gneissic biotite granite. Aileron Metamorphics felsic granulites, gneisses and minor pelitic and mafic granulites also outcrop immediately south of the area near Bushy Park and West End Bore. They are cut off from the Mt Bleechmore Granulite further to the east by the Wallaby Knob Schist Zone comprising biotite gneiss, muscovite-biotite gneiss and minor amphibolite, kyanite schist and staurolite schist.

The Arunta Block is traversed by a series of WNE-NW trending faults that locally widen into extensive zones of shearing and retrogression comprising muscovite-quartz schist with extensive quartz veins and epidote-bearing rocks. These are evident in the regional airborne magnetic data.

South of Allungra Creek the Arunta Inlier is stratigraphically unconformably overlain, though structurally underlain because of thrusting, by sediments of the Ngalia Basin comprising Neoproterozoic to Ordovician shallow marine and fluvio-glacial clastic, carbonate and evaporitic rocks, overlain by Devonian and Carboniferous fluvial to continental sandstone, greywacke and siltstone. The basin was moderately deformed by Neoproterozoic and Carboniferous orogenies. This basin is an under-explored greenfields basin with significant sandstone hosted uranium potential. The largest known uranium deposit is at Bigryli, where a uranium-vanadium resource has been defined within steeply dipping carbonaceous sandstone of the Mount Eclipse Sandstone. Only the lower units are exposed at Sandover in the Hann Range comprising the lowermost Truer Member consisting of thin bedded fine sandstone siltstone and possible evaporates overlain by the Vaughan Springs Quartzite comprising a thickly bedded quartzite and conglomerate. This may be overlain by unexposed black, calcareous, micaceous, pyritic siltstones of the Naburula Formation.
Outliers of the Georgina Basin may underlie Cainozoic sediments in the north of the tenement, the stratigraphy of which comprises late Proterozoic-late Devonian basal quartz sandstones, quartzites and conglomerates overlain by transitional marine/continental and glacial tillites sandstones and boulder beds, siltstones, quartzite, arkose and shale. The upper part of the sequence comprises Cambrian and Ordovician sandstones, siltstones dolomite and chert overlain by Devonian cross-bedded sandstone, siltstone and conglomerate.

The southern NT forms a ‘basin and range’ province in which Proterozoic and Palaeozoic rocks form prominent ranges separated by broad valleys in which at least twenty major Cainozoic sedimentary basins have developed. The Sandover tenement covers portions of the eastern half of the Ti-Tree Basin that is known to be the best developed Cainozoic basin in the southern NT containing a sedimentary fill in excess of 300m thick, according to work carried out by NT Department of Water Resources/NRETAS. Historic and recent drilling results in basins elsewhere also indicate that they may contain very thick sedimentary packages and it is known that the Cainozoic fill of the Burt Basin exceeds 200m, that the Sixteen-Mile Basin contains at least 180m of sediment and that the Whitcherry and Waite Basins contain similar sediments in excess of 250m thick.

The stratigraphy of these basins is generally poorly known due to a lack of outcrop, strong weathering overprints, the paucity of drillholes and a lack of attention paid to the ‘cover’ overlying crystalline basement. Limited stratigraphic drilling by both the BMR and the NTGS during the 1960’s and 1970’s provides much of the regional stratigraphic information.

During the late 1970’s and early 1980’s the Hale Basin southeast of Sandover was explored extensively for coal and sedimentary uranium and has therefore become the best known Cainozoic Basin in the NT and although the succession is relatively thin it is considered to represent a generalised Tertiary stratigraphy for the region. It contains a broad two-fold stratigraphic subdivision comprising a restricted, fluvial palaeochannel dominated Palaeogene succession (Hale Formation) overlain by a more widespread, dominantly lacustrine Neogene succession (Waite Formation). Although the Cainozoic stratigraphic units were initially defined in separate, small and isolated Tertiary Basins, these units are now recognised as components of a much larger Tertiary palaeodrainage system, the extent and size of which has until now been vastly underappreciated.

Deposition of Cainozoic sediments was episodic and punctuated by hiatuses during which prolonged periods of weathering resulted in the formation of well-developed weathered profiles (palaeosols and duricrusts). Deep weathering was an ongoing process during the Tertiary but was enhanced at particular times during this time by the combination of periods of warm, humid climates, non-deposition and surface exposure. Three Palaeogene weathering events affecting the Arunta igneous and metamorphic basement rocks and the overlying Tertiary successions and two weathering events affecting the overlying Neogene successions have been recognised.

Overlying these sediments are unconsolidated Quaternary sediments including quartz sands, silts, red earths and clayey and sandy soils that record a complex history of deposition, erosion and redeposition due to climate changes and gentle tilting. The formation of calcretes, particularly within drainage channels overlying the Waite Formation, was also widespread during the Quaternary.

NuPower completed airborne electromagnetic (AEM) surveys over Sandover in 2007 and 2008 totalling 1727 line kilometres at a nominal 120m flight height on lines spaced 1km apart that formed part of a larger survey of NuPower’s tenements in the Aileron region, designed to explore for buried palaeochannels at the base of and within the Tertiary sedimentary package as potential hosts for secondary uranium. Concurrently water from station stock water bores was sampled and assayed for a suite of major and trace elements the results of which are expected to assist with targeting potential sites of uranium accumulation within the palaeochannel systems.

Results from the AEM surveys indicate that the technique was very successful in identifying the extent and previously unknown internal structure of the Ti-Tree Basin in the northern part of the
tenement and a feeder palaeochannel in the south. Two drill holes totalling 202m of drilling, to test a northwards flowing palaeochannel from the Strangways Ranges and the deeper part of the basin north of the that palaeochannel, intersected relatively thin and oxidised Tertiary sediments lacking anomalous gamma radiation activity. No samples were collected for assay although 100 samples were deposited with the NTGS core library. These holes failed to test the potential for reduced and therefore more prospective sediments in deeper parts of the Ti Tree Basin beneath Sandover and further scout drilling is warranted.

Results from four groundwater samples from the exploration drill holes that were progressively sampled over time to provide additional data for the regional groundwater sampling program were reported previously.

Results of the NTGS collaboration regional gravity survey over the Central Arunta region that included 377 stations spaced 2km apart on Sandover to provide data for basement structural interpretation were also received and reported and rehabilitation of the drill access tracks, drill sites, and drill holes was also completed in Year 3.

During Year 4, NuPower completed the program of progressive groundwater sampling from the exploration drill holes. Reassay of these samples and the station bore groundwater samples reported previously, the results of which are given here, showing that the groundwaters contain elevated Al, As, Ce, Co, Cr, Er, F, Ge, La, Nd, Pb, Sm, Th, V and Y and Yb. This suite of elements suggests that the geochemistry of the groundwaters has been influenced by granites, the presence of monazite in Cainozoic sediments and/or mafic basement rocks. There was no other on-ground exploration work.

No fieldwork was completed in Year 5. Some expenditure this period was made for the water sample re-assaying and for geophysical images for the relinquishment report (Davey, 2011) and for database management.

INTRODUCTION

BACKGROUND

Basement rocks of the Reynolds, Yalyirimb and Strangways Ranges contain elevated background levels of uranium and thorium and have been explored for gold, base metals, rare earth elements and uranium. Success came with the discovery of elevated levels of rare earth elements hosted by massive fluorapatite in the Nolan’s Bore area by PNC Exploration (Australia) Pty Ltd in 1995 (Thevissen, 1995). This occurred during follow-up of an airborne radiometric anomaly as part of that company’s uranium exploration program along the Reynolds Range.

As far back as 1972 it was recognised that while these rocks may host primary deposits of uranium that they also provided a potential source of uranium for secondary uranium deposits. The products of the weathering and erosion of these rocks since the beginning of the Tertiary have accumulated in flanking basins as thick sequences of unconsolidated material and provided a host for the precipitation of uranium from solution in meteoric groundwaters sourced from the upstanding ranges and percolating through the basinal sediments.

Arafura Resources, working with this target model, also recognised the potential of the Tertiary basins in the Aileron region on the flanks of the uraniferous basement rocks for secondary sandstone-hosted uranium deposits and applied for and was granted a number of exploration licenses here, including EL24955, Sandover, which covers part of the Ti-Tree Tertiary Basin.

LOCATION AND ACCESS

The Sandover Exploration Licence is located 100 kilometres north-northwest of Alice Springs and 1160 kilometres south-southeast of Darwin by the Stuart Highway in the southern part of the
Northern Territory of Australia (Figure 1). The Sandover Highway, leaving the Stuart Highway at Connor Well and running northeast, bisects the area before reaching Woodgreen Station. The Plenty River Highway, running eastwards passes just south of the area. Station roads and tracks connect waterbores with the main roads.

**CLIMATE AND VEGETATION**

The region has a semi-arid continental climate. This following description is drawn from Stewart (1982):

“The climate is characterised by long hot summers when temperatures regularly exceed 40°C, and short mild winters. The average rainfall is about 280mm, most of which falls between October and March, but both frequency and amount are erratic”. (Stewart, 1982)

Vegetation in the southwestern, southern and eastern parts of the license area comprises tall mulga open shrubland with a woolybutt open grassland understory. The central and northwestern parts comprise hummocky grassland with a tall acacia sparse shrubland overstorey. Tall mulga sparse shrubland with a grassland understory is present in the far western part (Wilson et. al. 1991)

**TOPOGRAPHY AND DRAINAGE**

Much of the area comprises a flat sandy plain rising gently southwards from 580 to 670m ASL, punctuated by Mt Bryne rising to 712mASL in the south. The eastern end of the Hann Range, rising to over 800mASL enters the western side of the license. Allungra Creek and its tributaries, located along the western edges of the license, drain the northern side of the Hann Range and an area of low hills. Creeks from the Strangways Ranges to the south of the license discharge northwards into the southern part of the area and tributaries of Mueller Creek enter from the east.
Figure 1 - EL 24955 Sandover Location.
LOGISTICS

Alice Springs (pop. 27,000) is serviced daily by jet aircraft from several Australian capital cities (Sydney, Adelaide, Perth and Darwin) and less regularly from Brisbane, Cairns and Broome. Because of its location mid-way between Adelaide and Darwin the town is also well serviced by road transport and interstate bus services.

The Adelaide-Darwin transcontinental railway, passing through Alice Springs, bisects the Sandover tenement.

The natural gas pipeline from the Amadeus Basin (west of Alice Springs) to Darwin passes near Aileron to the west.

The nearest service stations and accommodation are located at Gemtree, approximately 20 kilometres east from Bushy Park Station along the Plenty Highway, and the Aileron Roadhouse, 50km west of the centre of the area, on the Stuart Highway, 133 kilometres by road from Alice Springs. The nearest medical facilities are at the small township of Ti-Tree which lies 60 kilometres north by road from Aileron where there is a medical centre, school and police station.

The nearest station homesteads are Bushy Park located southeast of the tenement and accessed from the Plenty Highway, Yambah, located south and accessed from the Stuart Highway, and Aileron, adjacent to the Aileron Roadhouse on the Stuart Highway.
TENURE

Exploration Licence 24955 Sandover which currently comprises 495 graticule blocks covering 1552 square kilometres (Figure 2) was granted to Arafura Resources NL (ABN 22 080 933 455) on 7 September, 2006 for a period of 6 years. It was transferred to NuPower Resources Ltd (ABN 91 120 787 859) on 14 March 2007 as a result of the demerger of the uranium assets from Arafura to NuPower.

Since the license was not subject to reduction at the end of Year 1 no blocks were relinquished and all 495 blocks were renewed for the second year of the license.

The results of the AEM surveys are particularly encouraging and while data processing and interpretation were in progress it was not possible to select any areas for relinquishment at the end of Year 2 and a Waiver of Reduction was granted on 17th September 2008.

Since there was no drilling during Year 3 and it has not been possible to identify any blocks for relinquishment a further request for a waiver of reduction was made on 10th August 2009 and granted on 28th September 2009. Drilling was also not completed in Year 4, due to the company’s refocus of funds elsewhere in the Northern Territory, NuPower submitted a request to waive reduction on 9th August 2010, and is awaiting approval at the time of writing this report.

The Expenditure Covenant for the fourth year of the licence was $80,000. The actual expenditure was $4,763.32 which was substantially below the covenant and a request to vary covenant was delivered along with this report.

A request to waive reduction for Year 5 was submitted on 9th August 2010. The Department of Resources declined NuPower’s request for a waiver of reduction in December 2010 for the anniversary ending in 2010, and a further denial of a 14% reduction was received March 2011. Following this denial, 124 blocks, representing 25% of the granted area were recommended for relinquishment in late April and approved on 23rd June 2011.

A request to waive reduction for period ending 7th September 2011 was submitted 6th September 2011, which has been denied and the Department has requested a reduction of 50% which was in progress at the time of writing this report.

The license occupies the following perpetual pastoral leases:

- NT Portion 687 Bushy Park Station,
- NT Portion 703 Aileron Station.
Figure 2 - EL24955 Sandover.
Figure 3 - EL24955, Sandover, Area Relinquishment for period ending 2010
NATIVE TITLE

There are no registered Native Title Applications or Determinations over the land nor any registered Indigenous Land Use Agreements.

An Exploration Agreement has been negotiated between NuPower and the Central Land Council on behalf of the Traditional Owners of the land.

NuPower completed an Inspection of the Register of Sacred Sites held by AAPA, and received Sacred Site Clearances from the Central Land Council for the areas drilled.
GEOLOGY

REGIONAL SETTING

The Sandover license EL 24955 is situated in the Aileron Province of the Arunta Region in the southern part of the Northern Territory (Figure 4).

Figure 4 - Geological Regions of the Northern Territory and EL24955.
Deformed and metamorphosed Palaeoproterozoic orogenic rocks older than 1800 million years crop out as major tectonic units surrounded by younger rocks and essentially form the recognisable and inferred basement to the North Australian Craton. These Palaeoproterozoic rocks form the Pine Creek Orogen, Tanami Region, northern Arunta Province, and Tennant, Murphy and Arnhem Inliers. They include remnants of Archaean rocks, which have been dated at 2500 million years.

To the south, the rocks of the North Australian Craton pass into the Central Australian Mobile Belts of the Proterozoic Orogens of the Arunta Region and Musgrave Block, consisting of granulite and amphibolite facies, metamorphosed sediments and mafic volcanics intruded by granitoids. In the southern Arunta Province, episodic igneous activity took place between 1880-1050 million years and deformation included a series of major tectonic events, including retrogressive metamorphism in the Proterozoic and Palaeozoic. These basement rocks are exposed in the northeast corner of the license and immediately to the southwest of the area.

Proterozoic-Palaeozoic basins form part of the North Australian Platform Cover and comprise mildly deformed, largely unmetamorphosed predominantly sedimentary successions unconformably overlying the Proterozoic Orogens. This includes the Ngalia and Georgina Basins in the Aileron region.

A system of major west-northwest trending and north-northeast dipping thrust faults and shear zones affects the Arunta Region and northern margin of the Ngalia Basin. The associated shear zones can be up to hundreds of meters in width and extend for several kilometres, and are thought to have formed during the 400-300 Ma Alice Springs Orogeny (Cartwright et al., 1999). The Palaeoproterozoic basement rocks of the Arunta Region have been thrust over the younger sediments of the Ngalia Basin along the Napperby and Yuendumu Thrusts.

LOCAL GEOLOGY

Pre-Cambrian-Proterozoic

According to the web-site of the NTGS (December, 2004) basement rocks in the Aileron region comprise part of:

“... the Arunta Region, a complex basement inlier in central Australia that has undergone a prolonged history of sedimentation, magmatism and tectonism extending from the Palaeoproterozoic to the Palaeozoic. The Arunta Region can be subdivided into the three, largely fault bounded terranes with distinct geological histories: the Aileron, Warumpi and Irindina Provinces.

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 and Tennant Regions to the north.

In contrast, the Warumpi Province comprises amphibolite to granulite facies rocks with protolith ages in the range 1690-1600 Ma, and is interpreted to be an exotic terrane that accreted to the southern margin of the North Australian Craton at 1640 Ma.

The Irindina Province in the Harts Range region comprises Neoproterozoic to Cambrian metasediments that formed in a major depocentre within the Centralian Superbasin. It underwent high-grade metamorphism and deformation during Ordovician (480 - 450 Ma)".

The Sandover tenement is underlain by basement rocks of the Aileron Province (Figure 4).

Because of the high grade of metamorphism and the relative paucity of continuous outcrop across the Arunta Province, a reliable stratigraphy has not yet been constructed for the metasedimentary sequences. Instead, the metamorphosed rocks of the area have been subdivided by Stewart (1981) into three “Divisions”, intruded by granites, on the basis of “broad lithological correlations”, Division 1 being regarded as the oldest and Division 3 as the youngest.
Minor isolated outcrops of deeply weathered rocks are mapped as Pre-Cambrian gneiss and schist in the western part of the Sandover area of uncertain affinity. Pre-Cambrian orthogneiss is exposed beneath units of the Ngalia Basin in the far west.

Mapped Division 1 Palaeoproterozoic rocks are the Aileron Metamorphics consisting of pelitic, semi-pelitic, psammitic and calc-silicate gneisses and granulites, meta-gabbro, dolerite and mafic granulite which crop out in the far western part of the license, north of Allungra Creek and further west around Aileron. These rocks are intruded by Proterozoic gneissic biotite granite (Figure 5).

Felsic granulites, gneisses and minor pelitic and mafic granulites, also of the Aileron Metamorphics, outcrop immediately south of the area near Bushy Park and West End Bore. They are cut off from the Mt Bleechmore Granulite further to the east by the Wallaby Knob Schist Zone comprising biotite gneiss, muscovite-biotite gneiss and minor amphibolite, kyanite schist and staurolite schist.

The middle division of the Aileron Province, consisting of a suite of pelitic and psammitic sediments metamorphosed at various grades from lower greenschist to lower granulite facies, is not represented here at surface.

The upper division of the Arunta Region is represented by the Reynolds Range Group which consists of metamorphosed quartzite, shale and carbonate. These rocks do not outcrop here.

**Proterozoic-Palaeozoic**

South of Allungra Creek the Arunta Inlier is stratigraphically unconformably overlain, though, because of thrusting, structurally underlain by Neoproterozoic and early Palaeozoic sediments of the Ngalia Basin. This is an east- trending intracratonic basin, that covers an area of 15 000 km² and contains about 6,000 metres of Palaeozoic and Neoproterozoic sediments, which are thickest near its northern margin. The succession consists of Neoproterozoic to Ordovician shallow marine and fluvo-glacial clastic, carbonate and evaporitic rocks, overlain by Devonian and Carboniferous fluvial to continental sandstone, greywacke and siltstone. The basin was moderately deformed by Neoproterozoic and Carboniferous orogenies.

The Ngalia Basin is an under-explored greenfields basin with significant sandstone hosted uranium potential. The largest known uranium deposit is at Bigrlyi, where a uranium-vanadium resource has been defined within steeply dipping carbonaceous sandstone of the Mount Eclipse Sandstone. The mineralisation is stratiform and tabular, and is likely to be controlled by the presence of reducing organic matter in the sandstone. A number of similar occurrences occur, mainly close to the northern margin of the basin. Tertiary sediments overlying the Ngalia and Georgina Basins also have potential for similar uranium deposits. Only the lower units are exposed here in the Hann Range comprising the lowermost Truer Member consisting of thin bedded fine sandstone siltstone and possible evaporates overlain by the Vaughan Springs Quartzite comprising a thickly bedded quartzite and conglomerate. (Freeman et al., 1990). This may be overlain by unexposed black, calcareous, micaceous, pyritic siltstones of the Naburula Formation.

Outliers of the Georgina Basin may underlie Cainozoic sediments in the north of the tenement. The stratigraphy if this basin comprises basal quartz sandstones, quartzites and conglomerates of the Grant Bluff Formation overlain by transitional marine/continental and glacial red and white sandstones and siltstones, quartzite, arkose, shale, conglomerate with basal tillites, boulder beds and ferruginous pebbly sandstones of the Central Mount Stuart Formation. These in turn are unconformably overlain by Cambrian and Ordovician sandstones, siltstones dolomite and chert of the Tomahawk Beds. The youngest rocks in the basin are of Devonian age and consist of cross-bedded sandstone, siltstone and conglomerate of the Dulcie Sandstone.
Cainozoic

Pre-Cambrian-Proterozoic basement rocks and Proterozoic-Palaeozoic basinal sediments in the Sandover license are largely covered by unconsolidated Cainozoic sediments derived by weathering of the surrounding basement terrains.

The southern NT forms a ‘basin and range’ province with Proterozoic and Palaeozoic forming prominent mountain ranges separated by broad valleys. Cainozoic sedimentary basins are widespread and well-developed within these intervening topographic depressions with at least twenty major basins outlined by Senior et al., 1995.

The Sandover tenement covers portions of the eastern half of the Ti-Tree Basin (Figure 6). That is known to be the best developed Cainozoic basin in the southern NT containing a sedimentary fill in excess of 300m thick, according to work carried out by NT Department of Water Resources/NRETA.

The stratigraphy of the intermontane Cainozoic basins of the southern NT region is generally poorly known. This can be attributed to a lack of outcrop and strong weathering overprints, paucity of drillholes and a lack of attention paid to the ‘cover’ overlying crystalline basement. Knowledge of the
distribution and extent of the Cainozoic has been largely gained through accidental intersections in
water bores or in drillholes seeking mineralisation under cover.

Limited stratigraphic drilling undertaken in the southern NT region by both the BMR (now Geoscience Australia) and the NTGS during the late 1970’s and early 1980’s has provided the
majority of the stratigraphic information on the Cainozoic succession. Senior et al. (1995) compiled a
summary of the available information and defined a two-fold stratigraphic subdivision that broadly
 corresponds with the observed pattern of Cainozoic sedimentation elsewhere in southern Australia.

Broadly speaking the Cainozoic can be subdivided into a restricted, fluvial palaeochannel dominated
Palaeogene succession (Hale Formation) and a more widespread, dominantly lacustrine Neogene
succession (Waite Formation).

The Hale Basin (Figure 6) was explored extensively for coal (lignite) and sedimentary uranium
during the late 1970’s and early 1980’s and is considered to be the best known Cainozoic in the NT.
Whilst initially defined in individual Tertiary Basins, the Hale and Waite Formations are components
of a much larger Tertiary palaeodrainage system, the extent and size of which has until now been
vastly underappreciated. The Waite Basin forms a tributary to the Ti-Tree Basin whilst the Hale
Basin can essentially be considered to be an isolated outlier of the Ti-Tree Basin that lies further to
the southeast along the extension of the Ti-Tree Fault (informal name). Application of these
Formation names is particularly useful in understanding the regional geological framework.

Deposition of Cainozoic sediments was episodic and punctuated by hiatuses during which
prolonged periods of weathering resulted in the formation of well-developed weathered profiles
(palaeosols and duricrusts). Senior et al. (1995) defined three weathering events which affected
Arunta igneous and metamorphic basement rocks and the overlying Tertiary succession:

Senior et al.’s (1995) 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 meters thick that grades into a multicoloured mottled zone up to 10 meters
thick. The mottled zone is overlain by a ferruginous (ferricrete) zone up to 8 meters thick (Senior et
al., 1995).

Following uplift and partial truncation of the deeply weathered basement rocks, sedimentation began
in the surrounding Tertiary basins in the Palaeocene with thick colluvium including fanglomerates
flanking the ranges, followed by deposition during the Early to Middle Eocene of alluvial and
lacustrine sand, silt and clay (locally carbonaceous) and lignite of the Lower Hale Formation in the
Ti-Tree and Burt Basins. Locally this includes a basal lacustrine green and grey pyritic mudstone,
white mudstone and siltstone, and red iron oxide stained siltstone and siltstone.

Weathering Event B, recorded in the Hale Basin in the eastern part of the ALICE SPRINGS
1:250,000 Geology Map Sheet, occurred prior to the Middle Eocene, although there is little evidence
elsewhere for this weathering event (Senior et al., 1995). This resulted in formation of a second
ferricrete and lithification of colluvium to fanglomerate.

Deposition of sandstones of the Upper Hale Formation took place during the Late Eocene and these
sediments were subsequently overprinted by Weathering Event C which marking widespread
exposure and surficial weathering in response to a prolonged period of non-deposition during the
Oligocene.

Climatic amelioration during the Early Miocene rejuvenated the palaeodrainage systems and led to
the deposition of fluvial sands at the base of the Waite Formation. A change from fluvial to lacustrine
sedimentation followed during the Middle to Late Miocene and resulted in the accumulations of over
300 meters of fluviatile and lacustrine chalcedonic limestone, sands, muds, and sandy conglomerate
in localised depocentres.
The upper portions of the Waite Formation are dominated by regionally widespread dolomitic clays and clays that reflect the extensive development of broad, shallow evaporitic lakes throughout southern Australia as the continent drifted further northwards and became progressively more arid and seasonal.

The Waite Formation interfingers with and is conformably overlain by a moderately thick (<60m) succession of oxidised colluvial material shed of the ranges in response to neotectonism during the (?Late) Pliocene. A broadly coarsening upwards alluvial fan succession was eroded off the rejuvenated ranges and can be recognised throughout the region. This unit is informally referred to as the Napperby Formation and comprises a succession of oxidised and haematitic, clayey sands, sandy clays and minor conglomerates.

The Napperby Formation is capped by Quaternary red earth, alluvial sands and gravels and aeolian sand accumulated downslope from the uplifted areas. Calcrete precipitated along stream channels, evaporites formed in playa lakes, and sand plains and aeolian dunes developed in low lying areas (Stewart, 1981).
Figure 6 - Tertiary Basins (shown in yellow) in the Sandover – Alice Springs area.
PREVIOUS EXPLORATION

Records of systematic exploration in the Reynolds Range west of the Sandover tenement date back as early as 1948 (Thevissen, 1995) but most investigations date from about 1965 (Stewart, 1982). Base metals, tin and tungsten were mainly targeted prior to 1973 when uranium exploration gathered momentum. This commodity dominated the exploration in the area for the next 15 years, both in the metamorphic and granitic rocks of Reynolds Range and also in the sandstones of the Ngalia Basin to the south. Since 1990, with the advent of the BLEG geochemical technique more attention has been directed towards gold exploration though some uranium exploration activity still persisted.

CRA Exploration Pty Ltd A-P 3360, 1972, (EL 723, 1973)

Drilling by NTA Water Resources in 1966 in the Ti-Tree Basin (Edworthy 1966, 1967) to examine the aquifer potential identified anomalous uranium and radon in the ground waters of the basin, particularly those waters close to the Reynolds Range. In 1972 CRA recognised the potential of the basement rocks surrounding the basin as a source for secondary uranium deposits within the basin, compiled available data, assayed small samples of the available cuttings from the Water Resources bores, resampled the waters from various station and Water Resources bores and carried out a ground scintillometer survey along accessible roads in that part of the basin immediately northwest of the Sandover tenement. This showed higher radioactivity in the vicinity of all basement outcrops wanning towards the centre of the basin and along the stream banks.

Previous drilling showed that the basin comprises up to 30 meters of Quaternary silts, sands and rare conglomerates overlying up to 80 meters of Tertiary arenaceous and argillaceous sediments. This generally overlies highly weathered basement rocks. In the deeper parts of the basin the Tertiary sediments are underlain by argillaceous grey-green claystones, and pyritic carbonaceous shales of upper Cretaceous-Tertiary age. Locally the Ti-Tree basin sediments exceed 300 meters in thickness. The lowermost carbonaceous shale unit was considered the most prospective for uranium mineralisation and of the cuttings assayed the highest uranium assays were from this unit.

Uranium results from the bore waters were highest from the bores in the southern part of the basin, closest to the Reynolds Range. Eh values were all positive indicative of oxidising conditions and pH showed the waters to be mildly alkaline. Some of the bores were surveyed with a gamma logger that showed that the gamma activity was about twice that from a similar survey in the Burt Basin. Sediments from Kerosene Camp Creek and Woodforde River that feed into the basin from the south (including the Nolan’s Bore deposit) were sampled by shallow auger and assayed. Six cored stratigraphic holes were drilled to test the most prospective sediments.

Otter Exploration NL EL1457, 1977-1978

Otter carried out a broad spaced (1km line spacing) airborne radiometric survey in the vicinity of Wallaby Knob, immediately south of the NuPower tenement, using a 4 channel gamma spectrometer. Five radiometric anomalies were followed up along with reconnaissance for base and other metals. The results were disappointing and although one of the radiometric anomalies coincided with porphyroblastic schist one assay reported only 46ppm U. The area was relinquished.

PNC Exploration (Australia) Pty Ltd, EL8411, 1994-1995

PNC Exploration explored the Reynolds Range for Mary Kathleen-style uranium occurrences hosted by metasomatised calc-silicate gneiss during 1994-1995 (Thevissen, 1995). Using detailed airborne radiometrics, PNC discovered the Nolan’s Bore rare earths/phosphorus prospect and explored in some detail, three significant uranium prospects at Mt Dunkin, 22 kilometres west-northwest of
Nolan’s Bore; at Napperby Creek, 50 kilometres west-northwest of Nolan’s Bore; and at Mt Freeling, 15 kilometres west of Nolan’s Bore.

PNC also sampled a minor occurrence of ‘apatite’ (reportedly similar to the Nolan’s Bore apatite) hosted by orthogneiss at their MB05 anomaly, 7 kilometres north of Nolan’s Bore. The sample assayed 3.9% P, 1.9% Ba, 2.1% La, 4.6% Ce, and 1.8% Nd but only 1.0% Ca which suggests that monazite rather than apatite hosts the rare earths. They withdrew from the area in early 1996.

**Homestake Gold of Australia Limited, EL9672, 1996-1998**

Homestake explored for gold in various parts of the Reynolds Range from 1996-1998. Their work comprised mainly regional BLEG stream sediment sampling with some limited geological reconnaissance to follow up one elevated gold value which was not replicated by later sampling. Results of Homestake’s programmes are detailed by Stewart (1997) and Lindsay-Park (1998).

**NTDME Geophysical Surveys, 1997**

Detailed aeromagnetic and radiometric surveys were completed over the Reynolds Range area in 1997 as part of a more extensive survey which included all of the Napperby 1:250,000 Sheet area as well as the northern half of the adjacent Hermannsburg 1:250,000 Sheet to the south. The survey was flown at a line spacing of 400 meters and a mean terrain clearance of 60 meters. All primary data and gridded data as well as some plotted products from this survey are available freely from the Department.

**Tanami Exploration NL Exploration EL9801, 2003-2005**

In 1997, Tanami Exploration NL identified the potential for Tanami-style gold-only, iron oxide copper-gold and Tennant Creek-style copper-gold mineralisation in the Alcoota district of the Arunta region from the NTDME surveys. They acquired a significant tenement package to form the Alcoota Project. EL 9801, of 1585km2 and covering a large part of the Sandover license was granted in 2003. Exploration consisted of a regional desk top study of the Alcoota project area that suggested that the westernmost area was either granitic or sediments of the Ngalia Basin, based on a subdued magnetic signature. The rest of EL 9801 was interpreted as Lander Rock Bed equivalents of low metamorphic grade, under cover. Field examination however supported the NTGS mapping where outcrop in the southwestern part of the tenement is invariably granitic or relatively high-grade metasedimentary lithologies, at odds with the magnetic signature. Ten rock chip samples of quartz veins were taken on EL 9801 during a brief reconnaissance trip but based on the regional assessment and the assay results EL 9801 was relinquished.
NUPOWER EXPLORATION ACTIVITIES COMPLETED, YEARS 2 & 3, 2008 & 2009

AIRBORNE ELECTROMAGNETIC (AEM) SURVEY

NuPower completed airborne electromagnetic (AEM) surveys over Sandover in 2007 and 2008 totalling 1727 line kilometres at a nominal 120m flight height on lines spaced 1km apart that formed part of a larger survey of NuPower’s tenements in the Aileron region, designed to explore for buried palaeochannels at the base of and within the Tertiary sedimentary package as potential hosts for secondary uranium.

The areas flown and flight line directions composited flight lines and a composite of the modelled basement from the 2007 and 2008 surveys have been reported previously (Rafferty & Higgins, 2009).

The Logistics Report and final data together with summary time window and magnetic images for the 2007 survey were reported previously (Higgins, 2008). The Logistics Report, and final data and processed images from the 2008 survey combined with the 2007 data were reported previously (Rafferty & Higgins, 2009).
AIRBORNE REGIONAL GRAVITY SURVEY

During 2008 the NTGS conducted a helicopter-borne regional gravity survey over the central Arunta Region with survey points 4km apart. NuPower contributed to the program in order to obtain more detailed, 2km spaced data, over 377 stations over its Aileron Project tenements. The logistics report outlining survey details was reported previously (Higgins, 2008).

Survey data for the Central Arunta Gravity Survey (CAGS) were reported previously (Rafferty & Higgins, 2009). Survey stations and an image of the Bouguer gravity anomaly for Sandover were reported previously (Rafferty & Higgins, 2009).

STATION BORE WATER SAMPLING

Results for the station ground water sampling program have been previously reported, (Rafferty & Higgins, 2009).

Results of water samples collected progressively over time from two drill holes, S0001, S0002 have been reported previously, (ibid).

EXPLORATION DRILLING

NuPower completed two rotary mud drill holes for a total of 202m on Sandover. A total of 100 cuttings samples were submitted to the NTGS core library in Alice Springs. Drillhole detail, drill hole and geophysical logs have been reported previously (Rafferty & Higgins, 2009).

Tertiary sediments were intersected in both holes, thereby validating the interpreted airborne EM data. However, the sedimentary succession was much thinner than anticipated and the sediments were largely oxidised. No anomalous gamma was intersected. The Tertiary sediments are overlain by a thick colluvial blanket of Quaternary pebbly, haematitic and pisolitic material shed off the Strangways Ranges.

The distribution of sediments suggests an uplifted shelf of crystalline basement flanking the Stangways Metamorphic Complex to the south. Shallow, northwards draining palaeochannels are incised into this basement and are infilled with Eocene sediments. Younger Miocene clays infill the deeper topographic lows further to the north on the southern edge of the Ti-Tree Basin and were either never deposited on the uplifted shelf further south, or (more likely) have since been removed by continued uplift and erosion. The thick blanket of oxidised colluvial sediments observed in the region tends to suggest the recent uplift has been considerable.

Regional drilling indicates that the Eocene Hale Formation forms the primary exploration target in the region. Examination of the 2008 AEM data suggests that two well-developed sub-basins of the Ti-Tree Basin occur on Sandover. Drilling targeted the margins of the southern sub-basin which now appears to continue to deepen further to the north. Reduced and carbonaceous Eocene sediments have the potential to occur north and northwest of SO002 within the deeper portion of the southern sub-basin, and should be targeted by follow up drilling. The northern sub-basin and associated palaeochannels are likely to contain considerable thicknesses of the Hale Formation and should also be targeted by future drilling. Areas where palaeochannels identified by the EM surveys enter the Ti-Tree Basin should also be investigated as they have the potential to contain reduced sediments.
NUPOWER EXPLORATION ACTIVITIES COMPLETED, YEAR 4, 2010

No on-ground exploration was carried out in the current period, apart from the collection of two groundwater samples from NuPower rotary mud drill holes completed on 10th & 12th October 2008.

WATER SAMPLING RESULTS

Results for the station groundwater sampling program have been reported previously (Rafferty & Higgins, 2009). Assay results were found to be spurious and re-assay data, together with bore data and geochemical thresholds based on the entire Aileron ground water dataset are provided here, (Appendix 2), locations are plotted in Figure 7.

Water samples were also collected progressively over time from two NuPower rotary mud drill holes, S0001, S0002. Previously reported assay results were also found to be spurious and data for the most recent set of samples is given in Appendix 2.

While interpretation of the Aileron regional groundwater data is in progress the following initial comments are made;

1) Groundwater from the 9 station bores on EL24955 exhibit elevated concentrations of As, F, Ge, Nb, Pb, Sm, U and Yb.

2) Groundwaters from the 2 rotary mud samples, taken 12 months later show elevated Al, Ce, Co, Cn, Er, La, Nd, Se, Th, U, Y and Yb.

Uranium values are not anomalous. Elevated F is indicative of groundwaters derived from granites. Elevated Ce, La, Th, Nd and the remaining REE may be indicative of the presence of detrital monazite in the Cainozoic sediments, derived from the basement, and accessory monazite in basement rocks. Elevated Co, Cr are probably indicative of mafic basement rocks.
Figure 7 - EL24955, Sandover, NuPower Drillholes, Station Bores, Water Samples
NUPOWER EXPLORATION ACTIVITIES COMPLETED, YEAR 5, 2011

No fieldwork was done in this period with expenditure having been made for bore water re-assaying (reported previously, Davey 2011), geophysical images for the relinquishment report, period ending September 2010 (ibid) and for database management.

EXPENDITURE STATEMENT, YEAR 5, 2011

Expenditure details for Year 5, 2011 and the covenant and proposed exploration activities for Year 6, 2012 are given as an attachment in Appendix 1.

The Expenditure Covenant was $50,000.

Expenditure for Year 5 was $1,303.41 and therefore the covenant was not satisfied and a letter requesting a variation of covenant was submitted along with this report.

Grant Davey  
BSc, PGDipSci  
6 October 2011
REFERENCES


LINDSAY-PARK, K, 1998, Annual report for Year 2, Exploration Licence 9672, Dragons Lair, Northern Territory, Australia. Exploremin Pty Ltd unpublished report EPL-98/100


WYCHE S. 1983 Coal and Lignite Occurrences in the Southern part of the Northern Territory. NTGS Tech Report GS83/14.
APPENDIX 1 – EXPENDITURE REPORT
NORTHERN TERRITORY EXPLORATION EXPENDITURE FOR MINERAL TENEMENT

Section 1. Tenement type, number and operation name: (One licence only per form even if combined reporting has been approved)

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Section 2. Period covered by this return:

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<td>Covenant for the reporting period:</td>
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Section 3. Give title of accompanying technical report:

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<th>Annual Report, EL24955 Sandover, Northern Territory</th>
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Section 5. Work program for the next twelve months:

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<th>Drilling and/or costeasing</th>
<th>Literature review</th>
<th>Airborne geophysics</th>
<th>Geological mapping</th>
<th>Ground geophysics</th>
<th>Rock/soil/stream sediment sampling</th>
<th>Other:</th>
<th>Estimated Cost:</th>
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Section 6. Summary of operations and expenditure:

Please include salaries, wages, consultants fees, field expenses, fuel and transport, administration and overheads under the appropriate headings below. Mark the work done for the appropriate subsections with an “X”. Complete the right-hand columns to indicate the data supplied with the Technical Report.

Do not include the following as expenditure (if relevant, these may be discussed in Section 7):

- Insurance
- Company Prospectus
- Rent & Department Fees
- Bond
- Transfer costs
- Title Search
- Legal costs
- Advertising
- Land Access Compensation
- Meetings with Land Councils
- Payments to Traditional Owners
- Fines

This form should accompany any Annual or Final Report

Email to: Geoscience.info@nt.gov.au

Last update: 04/10/11
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## Geochemical Surveying and Geochronology

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**Ground Exploration Subtotal:** $182.84

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**Subtotal:** $ 

## Other Operations

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**Subtotal:** $ 

## Access and Rehabilitation

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**Subtotal:** $ 

**TOTAL EXPENDITURE:** $1,303.41
Section 7. Comments on your exploration activities:

The Year 5 program was disjointed due to confusion relating to the status of the tenement particularly the areas required to be relinquished. During 2010 further interpretation of water sampling and survey programs has taken place with a view to carrying out additional field work in late 2011/early 2012.

The program for Year 6 is to complete the integration of basement geology, magnetics and gravity with groundwater geochemistry and airborne electromagnetic surveys to define potential targets for scout drilling. With this proposed program the company proposes a covenant of $50,000 for Year 6.

I certify that the information contained herein, is a true statement of the operations carried out and the monies expended on the above mentioned tenement during the period specified as required under the Northern Territory Mining Act and the Regulations thereunder.

[ ] I have attached the Technical Report

1. Name: Grant Davey
   Position: Senior Geologist
   Signature:

2. Name: 
   Position: 
   Signature:

Date: 04 October 2011