NUPOWER RESOURCES LTD
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LAGOON CREEK PROJECT
EL 23573 LAGOON CREEK
ANNUAL REPORT FOR PERIOD ENDING 22\textsuperscript{ND} DECEMBER 2009
OPERATOR: LAGOON CREEK RESOURCES LIMITED

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Map
1:250,000 Calvert Hills SE 53-8
1:100,000 Seigal 6462

Distribution
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Table of Contents

SUMMARY ................................................................................................................................. 4
INTRODUCTION .......................................................................................................................... 5
  BACKGROUND ......................................................................................................................... 5
  LOCATION & ACCESS ............................................................................................................. 6
  CLIMATE .................................................................................................................................. 6
  TOPOGRAPHY AND VEGETATION ....................................................................................... 9
TENURE ...................................................................................................................................... 10
EXPLORATION LICENSE .......................................................................................................... 10
LAND TENURE .......................................................................................................................... 12
NATIVE TITLE ............................................................................................................................ 12
ABORIGINAL SACRED SITES .................................................................................................... 12
GEological SETTING ............................................................................................................... 13
REGIONAL GEOLOGY .............................................................................................................. 13
GEological HISTORY .............................................................................................................. 17
LOCAL GEOLOGY EL 23573 AREA ....................................................................................... 19
MINERALISATION EL 23573 AREA ........................................................................................... 20
  Type A .................................................................................................................................. 20
  Type B .................................................................................................................................. 20
  Type C .................................................................................................................................. 20
  Type D .................................................................................................................................. 20
PREVIOUS EXPLORATION ....................................................................................................... 23
WESTMORELAND REGION ........................................................................................................ 23
EL 23573 REGION – OTHER PARTIES .................................................................................... 23
EXPLORATION BY LAGOON CREEK RESOURCES UNDER THE JV ........................................ 24
  EXPLORATION COMPLETED 2005, YEAR 2 ....................................................................... 24
    AIRBORNE GEOPHYSICS ..................................................................................................... 24
    ABORIGINAL SACRED SITES SURVEY ................................................................................ 24
  EXPLORATION COMPLETED 2006, YEAR 3 ....................................................................... 25
    GIS DEVELOPMENT ........................................................................................................... 25
    GEOLOGICAL INTERPRETATION OF AIRBORNE GEOPHYSICAL DATA AND SATELLITE
      IMAGERY (wall) ................................................................................................................... 25
    HELICOPTER RECONNAISSANCE ...................................................................................... 25
    GEOLOGICAL MAPPING AND INTERPRETATION (HOLCOME) ......................................... 25
    ACCESS ESTABLISHMENT ................................................................................................. 25
    GROUND RADIOMETRIC SURVEYS ................................................................................... 26
    RC DRILLING NORTHEAST WESTMORELAND ............................................................... 26
  EXPLORATION COMPLETED 2007, YEAR 4 ....................................................................... 27
    RESULTS OF RC DRILLING 2006 ....................................................................................... 27
    ACCESS AND INFRASTRUCTURE ....................................................................................... 28
    HELICOPTER BOURNE REGIONAL STREAM SEDIMENT SURVEY .................................... 29
    DIAMOND CORE DRILLING NORTHEAST WESTMORELAND .......................................... 31
    DIAMOND CORE DRILLING EL HUSSEN SOUTH ............................................................... 35
  INTRODUCTION .................................................................................................................... 35
  DIAMOND DRILLING .............................................................................................................. 35
EXPLORATION COMPLETED 2008, YEAR 5 ........................................................................... 38
  INTERPRETATION OF 2007 REGIONAL STREAM SEDIMENT SURVEY ................................. 38
    Memo No.1 ......................................................................................................................... 38
    Memos No. 2-4 .................................................................................................................. 38
    Memo No.5 ....................................................................................................................... 38
    Memo No. 7 ....................................................................................................................... 38
    Memo No.8 ....................................................................................................................... 39
    Memo No. 9 ....................................................................................................................... 39
  REVIEW OF EXPLORATION POTENTIAL AND EXPLORATION MODELS ................. 40
EXPLORATION COMPLETED 2009, YEAR 6 ........................................................................... 41
CONCLUSIONS AND RECOMMENDATIONS ......................................................................... 43
EXPENDITURE STATEMENT, YEAR 6, 2009, PROPOSED PROGRAM YEAR 7, 2010 ........... 44
GROUND RELINQUISHMENT ......................................................................................... 44
REFERENCES/SOURCES OF INFORMATION .................................................................. 45
APPENDICES .................................................................................................................. 50
APPENDIX 1 – URANIUM POTENTIAL OF THE LAGOON CREEK LICENSE AREA, nt...... 51
APPENDIX 2 – EXPENDITURE REPORT ........................................................................ 89

Table of Figures

Figure 1 - Location Plan, EL 23573, Lagoon Creek......................................................... 7
Figure 2 - Regional Location and Access (Jones, 2005) ..................................................... 8
Figure 3 - Area Relinquished 02/02/09 ........................................................................... 11
Figure 4 - Geological Regions ....................................................................................... 14
Figure 5 - Generalised geology, Westmoreland area ...................................................... 15
Figure 6 - Simplified Stratigraphy in the Westmoreland Region ..................................... 16
Figure 7 - Locations of Principal Uranium Deposits, Westmoreland Region ................ 21
Figure 8 - Stream Sediment Uranium Anomalies ............................................................. 30
Figure 9 - Northeast Westmoreland 2006 and 2007 drilling ........................................... 32
Figure 10 - El Hussen South 2007 Drilling ..................................................................... 36
SUMMARY

Exploration License (EL) 23573 was granted to Arafura Resources NL on 23rd December 2003 for 6 years, comprising 67 blocks covering an area of 194 square kilometres of Wollogorang Station in the Gulf region of the NT. In May 2005 Arafura entered into an agreement with Laramide Resources via the wholly owned Australian subsidiary Lagoon Creek Resources Ltd whereby Lagoon Creek Resources can earn up to 60% interest by spending A$5.5M over 5 years. NuPower Resources Ltd acquired the property from Arafura on 14th March 2007 as a result of the demerger of certain uranium interests into the new company and is now the registered title holder.

The Westmoreland region lies on the Palaeoproterozoic Murphy Tectonic Ridge that separates the Palaeoproterozoic Mt Isa Inlier from the Mesoproterozoic McArthur Basin and the flanking Neoproterozoic South Nicholson Basin. Early Proterozoic sediments, volcanics and intrusives of the Murphy Metamorphics are the oldest rocks exposed in the area and are overlain by two Proterozoic cover sequences. The oldest cover lying unconformably on the Inlier is the Cliffdale Volcanics comprising over 4000m of volcanics of probable sub-aerial origin, over half of which is ignimbrite and the rest of which is rhyolite. They are comagmatic with the Nicholson Granite and together comprise the Nicholson Suite. The Tawallah Group unconformably overlies the Nicholson Suite and is the oldest part of the southern McArthur Basin. The base contains conglomerates and sandstones of the Westmoreland Conglomerate that thin towards the southeast and are overlain by andesites, basalts agglomerates, tuffs and sandstones of the Seigal Volcanics. Together the Westmoreland Conglomerate and Seigal Volcanics make up two thirds of the total thickness of the Tawallah Group. Although not represented here the volcanics are in turn overlain by the McDermott Formation, the Sly Creek Sandstone, the Aquarium Formation and the Settlement Creek Volcanics.

Uranium mineralisation in the Westmoreland region is found in structural zones of the Murphy Metamorphics, in shear zones of the Cliffdale Volcanics close to the Westmoreland Conglomerate unconformity, at the reverse-faulted contact between Cliffdale Volcanics and Westmoreland Conglomerate, within the basal part of the Westmoreland Conglomerate, in Westmoreland Conglomerate close to the overlying Seigal Volcanics, in association with mafic dykes and sills and in shear zones within the Seigal Volcanics. Prospects within EL23573 include NE Westmoreland (Lagoon Creek, Mageera Zone, Contact Lode, Jackson Point, Jim Beam, Southern Comfort, Jacques), Duccios, El Hussen, Wide Reef, St. Barb, Terrace Mountain, Horse Pocket, White Label, Calvert North and Calvert South, Debbil Debbil Zone and Conglo.

The Joint Venture is exploring primarily for uranium and secondly for gold and has focussed to date on the extension of the Redtree Dyke Zone from Queensland southwestwards into the NE Westmorland area where uranium is localised around mafic dykes that intrude the shear zone and the adjacent Conglomerate and in structures of the El Hussen Fault Zone. An airborne radiometric and magnetics survey covering 100% of the area at 60m flight height on 100m spaced lines for a total of 21,500 line kilometres was completed in 2005 that identified several strong radiometric anomalies. In 2006 a geological interpretation using the airborne geophysical data and satellite imagery was undertaken and regional geological mapping was completed. Radiometric anomalies at Debbil Debbil, El Hussen and NE Westmoreland were ground located and followed up with ground radiometrics at 25m spaced stations on lines 100m apart. The same year 23 RC holes were drilled at NE Westmoreland for a total of 2814m. The exploration model for all the historical drilling was near flat-lying mineralisation either side of a major NE trending fault at the lower contact of a siltstone at the top of the Westmoreland Conglomerate immediately beneath Seigal Volcanics. However Laramide recognised that uranium mineralisation at Redtree occurred both at flat lying contacts and in association with steeply dipping mafic dykes. Sparse dyke material was also noted in the structure at NE Westmoreland and so the drilling was designed to test both flat lying and steeply dipping mineralisation. In 2007 further drilling included 9 new diamond core drill holes and 3 diamond tails to holes from the 2006 program for a total of 2126.5m at NE
Westmoreland, 5 diamond holes for 708m at El Hussen and a regional stream sediment sampling program of 160 sites at each of which 3 samples were collected.

Significant results from the drilling include; 4m at 0.21% U3O8 from 124m in NEWM204, 2m at 0.10% U3O8 from 75m in NEWM222, 1.5m at 0.19% U3O8 from 64.75m in NEMW205, 4.5m at 0.10% U3O8 from 120.75m in NEWM212 and 2.0m at 0.04% U3O8 from 60.25m in NEWM231 from NE Westmoreland and 5.5m at 0.02% U3O8 from 10.95m in EHS7 and 3.5m at 0.02% U3O8 from 17.35m in EHS7 from El Hussen.

The stream sediment sampling identified anomalies in the headwaters of Lagoon Creek and Breakneck Creek. These have not been followed up.

Drilling at NE Westmoreland and El Hussen has encountered minor uranium mineralisation associated with flat lying sedimentary contacts and in steeply dipping structures associated with mafic dykes, consistent with the historical results. No new discoveries have been made thus downgrading the potential for an economic uranium deposit of these styles of mineralisation.

Further exploration including drilling was suspended while a preliminary review of the exploration model was undertaken in 2008. This identified the potential for uranium mineralisation in specific fluvial sand and grit palaeochannels of the Westmoreland Conglomerate that may be independent of regional structures or mafic dykes, and the logging of selected drill core was recommended to better understand the controls on this style of mineralization. From this follow up of the radiometric and geochemical anomalies was recommended on the basis that they may represent leakage from mineralized palaeochannels of depth to be targeted by a limited number of well sited drill holes.

A further and more extensive review of the controls of the distribution and grade of uranium mineralization was undertaken in 2009 that reached a number of conclusions: proximity to the ultimate source rocks of basement Cliffdale Volcanics and the Nicholson Granite Suite is important, concentrations of uranium in fluvial palaeochannels of the Westmoreland Conglomerate are derived from weathering of basement lithologies, concentrations in the Magerra Siltstone at the unconformity between the Seigal Volcanics and Westmoreland Conglomerate represent accumulation in lakes or shallow soil-filled ephemeral depressions mobilization within sedimentary units by hydrothermal activity on the margins of mafic dykes has given rise to hybrid styles and higher grades of mineralization, and that widespread low grade superficial anomalies are derived by superficial precipitation of secondary uranium from groundwater in faults, shears, joints and bedding, derived from leaching of reduced uranium at depth from all types of uranium above.

Relogging of drill core, and in particular material from the Queensland deposits for comparative purposes, was again recommended to substantiate exploration models. Low order radiometric anomalies in the southeastern part of the license were recommended for follow up.

INTRODUCTION

BACKGROUND

Exploration Licence 23573 was applied for on behalf of Arafura Resources NL in 2002 to secure tenure over known gold and uranium prospects in that portion of the Westmoreland uranium province which extends into the Northern Territory. Title was granted on 23rd December 2003. In 2005, Arafura entered an agreement with Lagoon Creek Resources, a 100% subsidiary of Toronto-based, Laramide Resources (TSX: LAM) whereby Lagoon Creek Resources can earn a 60% interest in EL 23573 by the expenditure of A$5.5 million over 5 years. Laramide was attracted to the property since they also hold title to the Westmoreland uranium deposits on adjacent titles across the border in Queensland.

Titles was transferred to NuPower on 14th March 2007 as a result of the demerger process and formation of the new company.
LOCATION & ACCESS

Exploration Licence 23573 (Lagoon Creek) is located about 235 km southeast of Borroloola and about 1250 km SE of Darwin (Figure 1 and Figure 2) and about 400 km NNW of Mt Isa. The eastern boundary of the EL runs along the state border with Queensland.

Access to EL 23573 from Borroloola, the nearest settlement of any size, is by the graded Carpentaria Highway from Borroloola to Burketown as far as Wollogorang Station (Figure 2). From the west end of the Wollogorang airstrip, LCRPL has re-established an access track to the northern portion of the licence area as well as a semi permanent camp at Caroline airstrip, around 7 kilometres to the north of the licence area (Figure 1), and approximately 23 kilometres south-south-west of Wollogorang. All operations within the tenement were based out of this camp.

CLIMATE

The area lies in the tropical monsoon rain belt of northern Australia. Annual rainfall is about 900 millimetres. The bulk of this falls between December and March. Pre-monsoon tropical storms occur in October and November and can restrict activities temporarily. Virtually no rain falls between the start of May and the end of August. Temperatures range from 20-38°C in summer (“wet season”) and 10-30°C in winter (“dry season”).
Figure 1 - Location Plan, EL 23573, Lagoon Creek
Figure 2 - Regional Location and Access (Jones, 2005)
TOPOGRAPHY AND VEGETATION

Topographically the area consists of strike ridges, plateaux and intervening valleys. Soil development is poor with lithosols and shallow siliceous sands present in the area. The creeks drain to the north and east.

Vegetation consists of scattered small trees, shrubs and spinifex. Larger trees occur along the water courses.
TENURE

EXPLORATION LICENSE

Arafura Resources NL was granted EL 23573 on 23 December, 2003, for 6 years. The tenement contained 67 blocks with an area of 194 sq km (Figure 1).

In May, 2005, Arafura entered an agreement with Toronto-based uranium explorer, Laramide Resources via the wholly owned Australian subsidiary Lagoon Creek Resources, whereby Lagoon Creek Resources can earn a 60% interest in EL 23573 by the expenditure of Au$5.5 million over 5 years.

NuPower acquired the tenement on 14th March 2007 as a result of the demerger by Arafura of some of its uranium interests into a new company focused solely on uranium exploration and NuPower is now the registered title holder.

Reductions due at the end of the second and third years of the license were waived by the Minister and the area remained at 67 blocks for Year 4.

NuPower applied for a reduction of area by the relinquishment of two blocks on 02/02/09 (Figure 3). This was accepted on 10/03/09 and the tenement now comprises 65 blocks covering an area of 190sqkm.

There are no pre-existing mineral claims or mining leases within the boundary of the EL.
Figure 3 - Area Relinquished 02/02/09
LAND TENURE

EL 23573 is situated on Wollogorang Station, Pastoral Lease 1113 (NT Portion 674).

NATIVE TITLE

EL 23573 is affected by Native Title Claim DC02/11, Wollogorang South, made on behalf of the Gudidiwalia and Binanda Garawa People and accepted for registration by the National Native Title Tribunal on 19/07/2002.

The southern boundary of EL 23573 abuts Aboriginal Freehold Land (NT Portion 2006) administered by the Waanyi/Garawa Land Trust.

ABORIGINAL SACRED SITES

In December, 2005, Lagoon Creek Resources was issued with AAPA Authority Certificate C2005/095 for EL 23573 for the purpose of

“exploration works including ground traversing, stream, rock and soil sampling, track clearing and drill pad construction, drilling of test holes”

The Certificate identifies Registered Sacred Site 6462-25 on the northern boundary of the licence area where “no ground disturbing works are to be carried out”. No other Registered or Recorded Sites were identified in the area of the EL.
GEOLOGICAL SETTING

REGIONAL GEOLOGY
(From Jones, 2005)

The Westmoreland region lies within the Palaeoproterozoic Murphy Tectonic Ridge, which separates the Palaeoproterozoic Mt Isa Inlier from the Mesoproterozoic McArthur Basin and the flanking Neoproterozoic South Nicholson Basin, (Figure 4).

The oldest rocks exposed in the area are early Proterozoic sediments, volcanics and intrusives which were deformed and regionally metamorphosed prior to 1875 Ma, (Figure 5). These Murphy Metamorphics (Yates et al., 1962) are represented mainly by phyllitic to schistose metasediments and quartzite. They are overlain by two Proterozoic cover sequences laid down after the early deformation and metamorphism of the basement, and before a period of major tectonism which began at about 1620 Ma. The oldest cover sequence is the Cliffdale Volcanics unit, which unconformably overlies the Murphy Metamorphics. The Cliffdale Volcanics contain over 4000 m thickness of volcanics of probably subaerial origin, more than half of which consist of crystal-rich ignimbrites with phenocrysts of quartz and feldspar. The remainder are rhyolite lavas, some of which are flow banded. The ignimbrites are more common in the lower part of the sequence, with the Billicumidjii Rhyolite Member occurring towards the top.

The Cliffdale Volcanics are comagmatic with the Nicholson Granite and together they comprise the Nicholson Suite. SHRIMP dating of both the Nicholson Granite and the Cliffdale Volcanics gave an age of 1850 Ma (Scott et al., 1997). The Nicholson Granite is predominantly I-type granodiorite in composition.
Figure 4 - Geological Regions

Compiled by D G Jones from published data
The Nicholson Suite shows little evidence of fractional crystallisation and on this basis the potential for forming large tonnage deposits is considered to be minor, although small tonnages of high grade are possible. In the vicinity of the granites there are no significant potential host rocks documented. Potential exists for small Sn and W deposits within the granite and for smaller Cu and Au deposits outside the granite (Budd et al., 2001).

Figure 5 - Generalised geology, Westmoreland area

Compiled by D G Jones from published data; for legend see Figure 6 below.
Figure 6 - Simplified Stratigraphy in the Westmoreland Region

Compiled by D G Jones from published data
Unconformably overlying the Nicholson Suite is the Tawallah Group (Yates et al., 1962). This is the oldest segment of the southern McArthur Basin. The base is a sequence of conglomerates and sandstones comprising the Westmoreland Conglomerate (Carter et al., 1958). The conglomerates thin out to the southeast and are in turn conformably overlain by the Seigal Volcanics (Grimes & Sweet, 1979), an andesitic to basic sequence containing interbedded agglomerates, tuffs and sandstones. Together these units comprise about two-thirds of the total thickness of the Tawallah Group. The volcanics are overlain in turn by the McDermott Formation, the Sly Creek Sandstone, the Aquarium Formation and the Settlement Creek Volcanics.

Uranium mineralisation has been recognised in the Westmoreland region in numerous structural and stratigraphic positions. These include:

1. associated with faults and fractures in Murphy Metamorphics;
2. in shear zones in the Cliffdale Volcanics near the Westmoreland Conglomerate unconformity;
3. at the reverse-faulted contact between Cliffdale Volcanics and Westmoreland Conglomerate;
4. within Westmoreland Conglomerate about 50m above its base;
5. in Westmoreland Conglomerate in close proximity to the overlying Seigal Volcanics;
6. in association with mafic dykes and sills; and
7. in shear zones within the Seigal Volcanics.

The most important uranium deposits occur on the northern dip slope of the Westmoreland Conglomerate in situation 5 above. The deposits represent thicker and higher grade concentrations of trace uranium mineralisation than is regionally common beneath the Seigal Volcanics-Westmoreland Conglomerate contact and along the flanks of the Redtree Dyke Zone. Mineralisation in other settings is only present in trace amounts (Rheinberger et al., 1998).

The deposits are associated with an altered basic dyke system intruded along faults. Mineralisation is present in both the sandstones and dyke rocks. To the north the Westmoreland Conglomerate is overlain by the Seigal Volcanics under Recent alluvium cover.

The Westmoreland Conglomerate is a flat-lying sequence dipping between 5° and 10° to the NNW. The dominant fault directions are WNW and NE. A prominent open joint system trending NE appears to have some control on the mineralisation.

Locally, the Westmoreland Conglomerate consists of a sequence of coarse to gritty feldspathic sandstone with local pebble and cobble lenses, overlaying a basal conglomerate bed containing abundant volcanic material.

Vesicular tholeiitic dykes have intruded along the fault zones in an en echelon pattern. The dykes weather more easily than the conglomerate and thus tend to be obscured at surface. Fresh dykes in core are brecciated and sheared, and extensively altered along the contact zones. The unaltered dyke is typically a dark green dolerite.

GEOLOGICAL HISTORY

Sands, muds and calcareous sediments were deposited prior to 1900 Ma over much or all of the regions shown in brown on Figure 3 above. The source area for the sediments was probably the Archaean granitic terrane to the west. Felsic and minor mafic volcanism related to accompanying intrusive activity affected some areas of the Murphy Tectonic Ridge.

During the Barramundi Orogeny (1860-1850 Ma) the basement rocks were tightly folded and regionally metamorphosed to greenschist facies, to form the Murphy Metamorphics. The tectonism resulted in uplift and erosion, and by 1875 Ma most of the region was probably a land area where large tracts of metamorphic rocks were exposed.
From 1840 to 1800 Ma, widespread felsic volcanic activity together with minor mafic volcanism and local clastic sedimentation took place to form the Cliffdale Volcanics. The abundance of ignimbrites indicates that the eruptions were predominantly subaerial. Comagmatic with the volcanics, granites of the Nicholson Granite Complex were emplaced. A suite of mafic dykes were intruded about the same time.

Some contact metamorphism and local folding, tilting and faulting accompanied the granite emplacement and volcanism, but no major region-wide deformation or regional metamorphism took place during this period. Most of the region was probably a land area subjected to erosion throughout this period. By 1800 Ma, parts of some granite plutons had become unroofed and metamorphic basement rocks were exposed.

Sudden regional subsidence in a linked array of basins controlled by segmented north-striking extensional faults resulted in rapid sedimentation re-commencing about 1790 Ma to form the Westmoreland Conglomerate, the basal unit of the Tawallah Group. The first sediments laid down were alluvial fan and braided stream deposits derived locally from the basement rocks. Rounded boulders of Nicholson Granite around 30 cm diameter are common in the basal conglomerates.

The fluvial sedimentation was followed by subaerial and possibly shallow-water felsic and mafic volcanism around 1680 Ma to form the Seigal Volcanics. After a short period of erosion, the volcanics were covered by near-shore marine and lagoonal dolomite, sandstone and siltstone of the McDermott Formation. The sea withdrew and there was a short hiatus in sedimentation; then sea level rose and sandstones and minor conglomerates of the Sly Creek Sandstone were laid down unconformably on the Seigal Volcanics and McDermott Formation. The Sly Creek Sandstone is overlain by poorly exposed sedimentary rocks of the Aquarium Formation and extrusives of the Settlement Creek Volcanics, which mark the top of the Tawallah Group in the Westmoreland area. The youngest internal SHRIMP zircon ages obtained for the Tawallah Group are 1713±7 Ma for the Tanumbirini Rhyolite and 1708±5 Ma for the Nyanantu Formation near the top of the group (Page and Sweet, 1998).

Major tectonism, involving thrusting, folding, faulting, mafic dyke emplacement and regional metamorphism affected the entire region between 1620 and 1550 Ma. Two main phases of deformation, D1 and D2, have been recognised. The first resulted in extensive thrusting and nappe formation, while the second was characterised by tight folding about northerly trending, steeply dipping to vertical axial planes. A later phase of deformation, D3, resulted in the formation of NNW and NNE-trending shear zones around 1480 Ma. Most of the mineral deposits in the region were probably formed during the deformation events in this period.

Some time after tectonism at 1450 Ma but before 1200 Ma, shallow-water sediments of the South Nicholson Group were deposited in the South Nicholson Basin. Some post-metamorphic NNE-trending mafic dykes were intruded around 1115 Ma. Vertical and lateral movements took place along the major faults of the region during the late Proterozoic, and gentle basin-and-dome folding affected the South Nicholson Group and underlying units.
LOCAL GEOLOGY EL 23573 AREA
(From Fabray, 2005)

The oldest rocks exposed in the tenement are flow-banded rhyolitic lavas and tuffs of the Billicumidji Rhyolite Member of the Cliffdale Volcanics (Murphy Inlier), (Figure 5 and Figure 6). These Palaeoproterozoic volcanics outcrop in two NE trending anticlinal windows and they are intruded by acid dykes. The volcanics have been dated at 1770 Ga (Ahmad and Wygralak, 1989).

The Cliffdale Volcanics are overlain unconformably by the 1400-1800 metres thick Westmoreland Conglomerate of the Tawallah Group (McArthur Basin). This formation consists of pebbly sandstone, sandstone and conglomerate. It dips gently (5-10º) to the northwest, except close to some faults where buckling has occurred. The formation has been divided into four sedimentary units, each representing a fining-upwards sedimentation cycle.

The basal unit of the Westmoreland Conglomerate was deposited unconformably on the Cliffdale Volcanics and consists of breccias and conglomerates grading upwards into sandstones and quartzite. The coarse units immediately above the unconformity are about 12 metres thick and contain large fragments and cobbles of volcanic rock.

The lower part of unit 2 consists of pebbly sandstones overlain by two cobble conglomerate beds, each about 40 metres thick, separated by sandstone. The sequence above the conglomerates consists of coarse sandstone. The overall thickness of unit 2 is about 500-800 metres.

Unit 3 is well exposed and in places forms a prominent scarp cliff e.g. El Hussen area. The basal part of this unit consists of cobble and boulder conglomerate interbedded with sandstone and pebbly sandstone. This sequence is followed by medium to coarse feldspathic sandstone which is overlain by the El Hussen Conglomerate (informal name). The latter consists of pebble, cobble and boulder conglomerates about 40-100 metres thick.

The uppermost unit of the Westmoreland Conglomerate, unit 4, is estimated to have a thickness of 200-250 metres and is the preferred sedimentary host for uranium mineralisation in the area. The unit consists of sandstones with some pebble beds and conglomerates. A distinctive conglomerate has been mapped in Queensland and the NT by Queensland Mines Ltd and Kratos Uranium N.L. and it occurs about 60 metres from the top of the unit. The Metre Conglomerate (informal name), it is about 1 metre thick, is a clast-supported cobble conglomerate with a distinctive white porcellaneous sandstone matrix. The rest of unit 4 consists of sandstone with some pebble beds. The uppermost 5 metres of the unit contains concretionary hematite nodules and is heavily hematised at the top. Anomalous radioactivity has been found in this hematitic zone.

The Seigal Volcanics conformably overlie the Westmoreland Conglomerate. In some areas the base of the volcanics is marked by a thin (1-2 metres) siltstone bed which may be radiometrically anomalous. The volcanics are about 1600 metres thick and consist of basic lavas with many thin bands of siltstone and fine sandstone. About halfway up the succession there is a marker sandstone (Carolina Sandstone Member) which is 20 metres thick. The lavas occur as flows which are generally less than 20 metres thick. The upper parts of the flows are amygdaloidal and the vesicles contain quartz, chalcedony, hematite and celadonite. The dolerite dykes which intrude the underlying rocks are thought to be feeders of the volcanics.

Flat-lying rocks of Mesozoic age occur as dissected plateaux and isolated mesa capping older rocks. These are the Mullaman Beds and they consist of basal conglomerate, sandstone and siltstone with a thickness of up to 70 metres.
MINERALISATION EL 23573 AREA
(From Fabray, 2005; refer Figure 7)

Uranium, uranium-gold and copper mineralisation occurs in the area.

Uranium was mined at the Cobar 2 and Eva mines in the 1950's; both these prospects are outside the current tenement. At the Eva (Pandanus Creek) Mine, pitchblende and secondary uranium minerals occurred in shears zones within strongly altered acid volcanics overlain unconformably by the Westmoreland Conglomerate (Sweet et al., 1981). Pitchblende was found in vertical shears and faults within the Seigal Volcanics close to their contact with underlying Westmoreland Conglomerate at the Cobar 2 mine.

Ahmad (1987) has classified the uranium occurrences in the tenement area into the following types:

Type A

These prospects lie at the volcanic (Seigal or Cliffdale) – Westmoreland Conglomerate contact. The volcanics and/or the conglomerate are mineralised. The contact can be a normal stratigraphic succession or a reverse fault as the conglomerate underlies the volcanics. Examples of this type include El Hussen, Duccios and Jim Beam.

Type B

In this type the uranium mineralisation occurs as sub-horizontal lenses in the Westmoreland Conglomerate, adjacent to basic dykes which can also be mineralised. This type contains the most important uranium deposits in the Westmoreland region. The dykes are up to 10 metres in width and occupy northeast trending fault zones. Three fault-associated dyke systems have been identified in the region. Two (Redtree and El Nashfa) are located in Queensland and are host to uranium deposits containing over 10,000 tonnes of U3O8 (Hills and Thakur, 1975). The Northeast Westmoreland dyke zone is situated within Arafura’s tenement and contains three prospects (Mageera, Intermediate and Oogoodoo).

Type C

Type C occurrences are found in the Cliffdale Volcanics and there are no prospects of this type within the EL 23573.

Type D

This type is associated with fractures in the basal part of the Seigal Volcanics. The contact with the underlying Westmoreland Conglomerate may be 100 to 200 metres below these occurrences. The Horsepocket prospect is an example of this type.
Figure 7 - Locations of Principal Uranium Deposits, Westmoreland Region

Compiled by D G Jones from published data.
There are two styles of uranium mineralisation:

1. Open-space filling and replacement of wallrock in the volcanics and rarely in sandstone.
2. Replacement of the matrix in sandstone.

Pitchblende is the most abundant primary uranium mineral. Torbernite, carnotite and meta-torbernite are the commonest secondary minerals. Hematite is invariably associated with the uranium mineralisation. Other alteration minerals include quartz, sericite, muscovite and chlorite. Gold has been reported from a number of the uranium prospects.
PREVIOUS EXPLORATION

WESTMORELAND REGION

A very detailed account of the exploration history of the Westmoreland region has been provided by Jones (2005). This account was reproduced in the previous annual report (Goulevitch, 2006).

EL 23573 REGION – OTHER PARTIES
(From Fabray, 2005)

The area has been subjected to three periods of intensive exploration (Ahmad and Wygralak, 1989):

1956-1960: An intensive phase of uranium exploration following the discovery of the Rum Jungle and the South Alligator River uranium deposits.
1968-1971: Exploration mainly for uranium but also for copper in the Redbank area.
1978-: Most exploration has been directed towards uranium, gold and diamonds.

Full details were provided by Fabray (2005) and reproduced in the previous annual report (Goulevitch, 2006).
EXPLORATION BY LAGOON CREEK RESOURCES UNDER THE JV

EXPLORATION COMPLETED 2005, YEAR 2

AIRBORNE GEOPHYSICS

Lagoon Creek Resources completed a state of the art, low level, high resolution airborne magnetics and radiometrics survey over its Northern Australian project area including the entire area of EL 23573 in August-September, 2005.

The survey was conducted by UTS Geophysics of Perth with a crop duster airplane. The survey was flown at 60 metres flight height on 100 metres spaced lines for a total of 21,500 line kilometres.

The aerial survey conducted over Arafura’s EL 23573 identified several strong uranium anomalies (Goulevitch, 2006).

ABORIGINAL SACRED SITES SURVEY

Lagoon Creek Resources applied to the NT Aboriginal Areas Protection Authority for an Authority Certificate for purpose of exploration over the whole of the area of EL 23573. In December, Lagoon Creek Resources was issued with AAPA Authority Certificate C2005/095 for the purpose of

“exploration works including ground traversing, stream, rock and soil sampling, track clearing and drill pad construction, drilling of test holes”

across the area of EL 23573. The Certificate identifies Registered Sacred Site 6462-25 on the northern boundary of the licence area where “no ground disturbing works are to be carried out”. No other Registered or Recorded Sites were identified in the area of the EL.
EXPLORATION COMPLETED 2006, YEAR 3

GIS DEVELOPMENT

Historical exploration data were collected, organised, digitised and subsequently incorporated into a GIS database together with the data from the 2005 airborne geophysical survey, acquired satellite imagery and published geological and topographical maps.

This GIS was used as a base for the geological interpretation and mapping exercises described below and it was used to construct plans and sections from which the 2006 RC drill program was developed.

GEOLOGICAL INTERPRETATION OF AIRBORNE GEOPHYSICAL DATA AND SATELLITE IMAGERY (WALL)

LCRPL commissioned Dr Vic Wall of Taylor Wall & Associates to generate a geological interpretation of the entire Westmoreland area including the area of EL 23573. Wall's interpretation was developed from detailed analysis of the 2005 aeromagnetic data, satellite imagery and 2005 airborne radiometric data and assessment of that data in conjunction with published geological maps and historical exploration information.

HELICOPTER RECONNAISSANCE

Subsequent to the completion of Wall's interpretation, LCRPL accompanied Wall on a helicopter-borne geological reconnaissance survey of the area of EL 23573 in May-June, 2006. During this survey several uranium anomalies which had been identified in the data from the 2005 airborne geophysical survey were located and assessed in a preliminary fashion with a view to determining exploration priorities for the impending 2006 field season.

GEOLOGICAL MAPPING AND INTERPRETATION (HOLCOME)

Dr Rod Holcome of Holcome Coughlin & Associates undertook regional mapping in EL 23573 in August-September, 2006, as part of a more wide ranging exercise over all of the Westmoreland titles of Lagoon Creek Resources. The purposes of the investigation were to evaluate the structural context of the Lagoon Creek/Westmoreland uranium project; to guide the initial mapping program and establish quality control on subsequent mapping procedures and data acquisition and management; and to start establishing the regional and structural framework of the prospects with a view to setting regional targeting criteria.

ACCESS ESTABLISHMENT

A vehicle access track was re-established to the Lagoon Creek area from the Savannah Highway at Wollogorang. This was necessary to improve project infrastructure and allow more efficient transportation of drilling equipment and support personnel to and from the area. Both the Wollogorang airstrip and Caroline airstrips are connected to this access track. This work was undertaken from August to October with ongoing upgrade and maintenance continuing into November after the arrival of the drill rig.

An exploration camp was constructed at Crocodile Waterhole on Doctors Creek just to the NW of the boundary of EL 23573.

Other earthmoving activities undertaken included refreshing old tracks across the northern part of the licence and constructing drill pads at the Northeast Westmoreland prospect.
GROUND RADIOMETRIC SURVEYS

Systematic ground radiometric surveys were conducted over the Debbil (4 separate areas), El Hussen and Northeast Westmoreland (2 separate areas) (including Mageera) Zones using a Gamma Surveyor spectrometer. Readings were taken at nominal 25 metres intervals on lines spaced nominally 100 metres apart.

Peak values of 61 ppm eU, 21 ppm eU and 153 ppm eU were measured at Debbil, El Hussen and Northeast Westmoreland respectively. The anomaly at Northeast Westmoreland was subsequently tested with RC holes NEWM 200-203.

RC DRILLING NORTHEAST WESTMORELAND

This zone has been subject to exploration activities since the late 1970’s. During the historical exploration period approximately 90 holes were drilled into the zone which extends over a strike length of 3-4 kilometres.

Initial drilling by LCRPL in the Northeast Westmoreland area was undertaken in October-November. A total of 2814 metres was drilled in 23 RC percussion drill holes. Drilling was completed by Tom Browne Drilling using an UDR 600 rig with a 135 mm face sampling hammer.

The exploration model for the historical drill holes appears to have been shallowly dipping, nearly flat-lying contact mineralization and most holes were therefore designed as vertical holes. These holes were drilled to either side of a northeast trending, steeply westward dipping fault to test for mineralization along the lower contact of a thin siltstone layer which is underlain by Westmoreland conglomerates and overlain by the Seigal volcanics.

Upon review of Westmoreland mineralization at the Redtree deposit by LCRPL and its consultants, both flat lying contact mineralization and also steeply dipping mineralization along mafic dykes were recognized in the historical data. At northeast Westmoreland there is some evidence from previous drill holes that sparse dyke material occurs along the major northeast trending fault which passes through the prospect area (Northeast Westmoreland Fault/JN Fault/Lagoon Creek fault). These occurrences of dyke material tend to coincide with richer uranium mineralization.

The 2006 drill program was therefore designed to test both flat lying and steeply dipping mineralization. Most holes were designed to be drilled -55° to the southeast (135°). In addition, magnetic lineaments trending roughly 075° were found to coincide with higher scintillometer readings where they cross the main fault. Several holes were designed at -55° dip to the south to test these zones. A third drill target occurs to the southern end of the prospect within the Westmoreland conglomerates. The target coincides with a strong airborne radiometric anomaly. Drilling on this target was designed to test the lower siltstone contact and holes were drilled at -55°, to the southeast.

Most of the 2006 percussion holes were drilled at an azimuth of 135° or 180°, with an inclination ranging from -55° to -75°. Hole depths ranged from 51 metres to 204 metres. Twelve holes failed to reach their planned target depths and of these 6 failed to reach the target siltstone horizon due mainly to excessive inflows of groundwater.
EXPLORATION COMPLETED 2007, YEAR 4

RESULTS OF RC DRILLING 2006

Assays from the 2006 drill holes that were sampled (NEWM 200, 201, 204, 206-07, 209, 211, 214-19 and 222), reported previously (Lagoon Creek Resources Pty Ltd), are summarized in Table 1.

Drill hole locations for the 2006 percussion drilling program (NEWM200-222) are given in Figure 8. Drill logs for these holes have been reported previously, (Lagoon Creek Resources Pty Ltd).

One hundred and five samples were assayed on the basis of scintillometer readings and of these 28 samples returned assay results equalling or exceeding 100ppm (0.01%) U3O8 and a further 15 samples returned values between 50 and 100ppm U3O8. The highest uranium result was 1.0m @ 0.41% U3O8 from 127m in NEWM 204. Significant intervals of uranium mineralisation using a 0.01% U3O8 cut-off are given in Table 1.

Encouraging results from the 2006 percussion drilling program include:

- 4 metres @ 0.21% U3O8 (incl. 2m @ 0.33% U3O8) from 124 metres in NEWM 204.
- 2 metres @ 0.10% U3O8 from 75 metres in NEWM 222.
Table 1 - Northeast Westmoreland 2006 RC Assay Summary.

ACCESS AND INFRASTRUCTURE

Re-establishment of the access road from the Savannah Highway was undertaken after the wet season. This work was undertaken by Hewlitt and Sons from Cloncurry, who stayed on site throughout the dry season to maintain the tracks. LCRPL installed a new semi-permanent camp at the historic Caroline airstrip, to be used as Lagoon Creek’s exploration base for its projects within the gulf region. Hewlitt and Sons were also contracted to re-instate the Caroline airstrip. This is now in regular use and has been registered with the Royal Flying Doctor Service.
HELICOPTER BOURNE REGIONAL STREAM SEDIMENT SURVEY

LCRPL undertook a regional stream sediment survey of the tenement in association with neighbouring tenements EL’s 24358, 10335 and 22579 (Lagoon Creek Resources and Gulf Mines Joint Venture.)

A total of 160 sites were visited within the NuPower Resources tenement. Three samples were sieved on site; one x 5kg -2mm mesh sample for bulk cyanide leach, and two x 2kg samples of - #80 mesh, one for multi element ICP analysis and one as a duplicate for storage in Mt Isa.

The BCL and ICP samples were assayed by ALS in Townsville. Results have been reported previously, (Lagoon Creek Resources Pty Ltd).

The highest uranium value of 11.05ppm U is from the creek draining the El Hussen prospect. This result may in due in part to contamination from exploration, (Figure 8).
Figure 8 - Stream Sediment Uranium Anomalies
DIAMOND CORE DRILLING NORTHEAST WESTMORELAND

Drilling by LCRPL began at Northeast Westmoreland in 2006 but 4 holes were abandoned prior to reaching target depths due to high water inflows.

The 2007 drilling campaign was aimed at further testing of flat lying mineralisation associated with the contact between the upper Westmoreland Conglomerate (PTW4) and Seigal Volcanics (PTS), and further testing of the potential for mineralisation associated with vertical dykes.

Nine diamond drill holes were completed at Northeast Westmoreland in addition to three diamond tails added to holes from the 2006 RC campaign, in total 2126.5m of NQ core (Figure 9, Table 2).
Figure 9 - Northeast Westmoreland 2006 and 2007 drilling
Drill Hole | Easting AGD84 | Northing AGD84 | Azimuth | Dip | Meters Drilled 2007
--- | --- | --- | --- | --- | ---
NEWM205 tail | 817149 | 8059159 | 135 | -55 | 81
NEWM210 tail | 817767 | 8059742 | 135 | -55 | 122
NEWM212 tail | 817742 | 8059768 | 135 | -55 | 116
NEWM223 | 817951 | 8060015 | 135 | -55 | 200
NEWM224 | 818003 | 8059967 | 135 | -55 | 300
NEWM225 | 816882 | 8058890 | 135 | -55 | 200
NEWM226 | 816899 | 8058870 | 135 | -55 | 221
NEWM227 | 817137 | 8059173 | 135 | -55 | 201
NEWM228 | 817101 | 8059212 | 135 | -55 | 152
NEWM229 | 817717 | 8059793 | 135 | -55 | 152
NEWM230 | 817817 | 8059692 | 135 | -57 | 200
NEWM231 | 816842 | 8058928 | 135 | -55 | 181.5
TOTAL | | | | | 2126.5m

Table 2 - Northeast Westmoreland 2007 Drill Hole Locations

Following geological logging, the core was scanned using a “GF Instruments Gamma Surveyor” scintillometer. Using a cut off of 50ppm eU3O8 the core was divided into 0.5m intervals for assay. An extra 0.5m was included either side of the mineralised zones. These sections were split with a diamond core saw and half samples were sent to ALS Chemex in Townsville for analysis by method ME-MS61. This involves a four acid (HF, HNO3, HClO4 and HCL) “near total” digestion followed by a 48 element ICPMS scan, giving a detection range of 0.1-10,000ppm for uranium. The remaining half is stored at the LCRPL Caroline site.

One hundred and one samples were assayed on the basis of scintillometer readings and of these 36 samples returned assay results equalling or exceeding 100ppm (0.01%) U3O8 and a further 20 samples returned values between 50 and 100ppm U3O8. The highest uranium result was 0.5m @ 0.45% U3O8 from 65.75m in NEWM 205. Significant intervals of uranium mineralisation using a 0.01% U3O8 cut-off are given in Table 3.

Encouraging results from the 2007 diamond drilling program include:

- 1.5 metres at 0.19% U3O8 from 64.75 metres in NEWM 205
- 4.5 metres at 0.10% U3O8 from 120.75 metres in NEWM 212
- 2.0 metres at 0.04% U3O8 from 60.25 metres in NEWM 231

Additionally 11 samples returned gold values of greater that 0.1ppm, the highest being 0.5m @ 0.33ppm Au in NEWM212 from 110.75m.
<table>
<thead>
<tr>
<th>Drill Hole</th>
<th>Sample Number</th>
<th>From (m)</th>
<th>To (m)</th>
<th>Assay U₃O₈ (ppm)</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEWM 205</td>
<td>R038</td>
<td>64.75</td>
<td>65.25</td>
<td>542.5</td>
<td>1.5m @ 0.19 %U₃O₈</td>
</tr>
<tr>
<td></td>
<td>R039</td>
<td>65.25</td>
<td>65.75</td>
<td>672.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R040</td>
<td>65.75</td>
<td>66.25</td>
<td>4516.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R041</td>
<td>66.75</td>
<td>67.25</td>
<td>172.8</td>
<td>0.5m @ 0.02 %U₃O₈</td>
</tr>
<tr>
<td></td>
<td>R085</td>
<td>106.25</td>
<td>106.75</td>
<td>108.6</td>
<td>1m @ 0.04 %U₃O₈</td>
</tr>
<tr>
<td></td>
<td>R086</td>
<td>106.75</td>
<td>107.25</td>
<td>790.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R051</td>
<td>112.25</td>
<td>112.75</td>
<td>813.7</td>
<td>0.5m @ 0.08 %U₃O₈</td>
</tr>
<tr>
<td></td>
<td>R065</td>
<td>119.25</td>
<td>119.75</td>
<td>138.0</td>
<td>0.5m @ 0.01 %U₃O₈</td>
</tr>
<tr>
<td></td>
<td>R068</td>
<td>120.75</td>
<td>121.25</td>
<td>255.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R069</td>
<td>121.25</td>
<td>121.75</td>
<td>978.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R070</td>
<td>121.75</td>
<td>122.25</td>
<td>1544.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R071</td>
<td>122.25</td>
<td>122.75</td>
<td>3219.3</td>
<td></td>
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<tr>
<td></td>
<td>R075</td>
<td>124.25</td>
<td>124.75</td>
<td>445.8</td>
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</tr>
<tr>
<td></td>
<td>R076</td>
<td>124.75</td>
<td>125.25</td>
<td>527.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R090</td>
<td>112.75</td>
<td>113.25</td>
<td>778.3</td>
<td>0.5m @ 0.08 %U₃O₈</td>
</tr>
<tr>
<td></td>
<td>R093</td>
<td>135.25</td>
<td>135.75</td>
<td>157.4</td>
<td>0.5m @ 0.02 %U₃O₈</td>
</tr>
<tr>
<td></td>
<td>R105</td>
<td>126.25</td>
<td>126.75</td>
<td>1957.5</td>
<td>1m @ 0.1 %U₃O₈</td>
</tr>
<tr>
<td></td>
<td>R106</td>
<td>126.75</td>
<td>127.25</td>
<td>214.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R134</td>
<td>66.75</td>
<td>67.25</td>
<td>172.2</td>
<td>1m @ 0.03 %U₃O₈</td>
</tr>
<tr>
<td></td>
<td>R135</td>
<td>67.25</td>
<td>67.75</td>
<td>451.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R120</td>
<td>67.75</td>
<td>68.25</td>
<td>719.3</td>
<td>1m @ 0.04 %U₃O₈</td>
</tr>
<tr>
<td></td>
<td>R121</td>
<td>68.25</td>
<td>68.75</td>
<td>114.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R124</td>
<td>167.75</td>
<td>168.25</td>
<td>129.7</td>
<td>1m @ 0.01 %U₃O₈</td>
</tr>
<tr>
<td></td>
<td>R125</td>
<td>168.25</td>
<td>168.75</td>
<td>152.1</td>
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<tr>
<td></td>
<td>R127</td>
<td>169.25</td>
<td>169.75</td>
<td>183.4</td>
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<tr>
<td></td>
<td>R128</td>
<td>169.75</td>
<td>170.25</td>
<td>133.3</td>
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<tr>
<td></td>
<td>R129</td>
<td>170.25</td>
<td>170.75</td>
<td>265.3</td>
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<tr>
<td></td>
<td>R130</td>
<td>170.75</td>
<td>171.25</td>
<td>171.6</td>
<td></td>
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<tr>
<td></td>
<td>R131</td>
<td>171.25</td>
<td>171.75</td>
<td>103.9</td>
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</tr>
<tr>
<td></td>
<td>R111</td>
<td>60.25</td>
<td>60.75</td>
<td>419.8</td>
<td>2.5m @ 0.02 %U₃O₈</td>
</tr>
<tr>
<td></td>
<td>R112</td>
<td>60.75</td>
<td>61.25</td>
<td>403.3</td>
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<tr>
<td></td>
<td>R113</td>
<td>61.25</td>
<td>61.75</td>
<td>162.1</td>
<td>2m @ 0.04 %U₃O₈</td>
</tr>
<tr>
<td></td>
<td>R114</td>
<td>61.75</td>
<td>62.25</td>
<td>754.7</td>
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</tr>
</tbody>
</table>

Table 3 - Northeast Westmoreland 2007 Diamond Drill Assay Summary
DIAMOND CORE DRILLING EL HUSSEN SOUTH

INTRODUCTION

Mineralisation in the El Hussen prospect area was discovered in 1957 by North Australian Uranium Corporation and evidence of extensive historic costeanning and some drilling is still present. However historic drill data from the percussion and diamond drilling is limited.

Geologically the area is characterized by PtW2 conglomerates of the Westmoreland Group, thrust against PtW4 conglomerates and sandstones, also of the Westmoreland Group. Locally, the northwest trending, easterly dipping thrust fault displaces PtW2 conglomerate against the Seigal Volcanics. The mineralisation model for the El Hussen Prospect is that of flat lying mineralisation along the base of the Seigal Volcanics and high-angle mineralization along the thrust fault, as demonstrated by previous drilling. In addition to the main thrust fault, there are minor northeasterly trending faults to the south that offset the lithological contacts and the plane of the thrust fault. These correlate with radiometric highs from the LCRPL airborne radiometric survey, flown in 2005.

Follow up ground based scintillometer work and geological mapping of the prospect was undertaken in the early part of this year followed by drilling in the latter part of the year.

DIAMOND DRILLING

Five diamond core holes totalling 708m of drilling were completed to test the importance of northeast trending cross structures to mineralisation of the El Hussen thrust system (Table 4, Figure 10).

<table>
<thead>
<tr>
<th>Drill Hole</th>
<th>Easting AGD84</th>
<th>Northing AGD84</th>
<th>Azimuth</th>
<th>Dip</th>
<th>Total Depth (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EHS3</td>
<td>803078</td>
<td>8058765</td>
<td>65</td>
<td>-50</td>
<td>136.5</td>
</tr>
<tr>
<td>EHS4</td>
<td>803113</td>
<td>8058780</td>
<td>245</td>
<td>-58</td>
<td>150.5</td>
</tr>
<tr>
<td>EHS5</td>
<td>803163</td>
<td>8058586</td>
<td>235</td>
<td>-70</td>
<td>151.5</td>
</tr>
<tr>
<td>EHS6</td>
<td>802997</td>
<td>8058766</td>
<td>57</td>
<td>-52</td>
<td>118.6</td>
</tr>
<tr>
<td>EHS7</td>
<td>802948</td>
<td>8058751</td>
<td>68</td>
<td>-63</td>
<td>151</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>708.1</td>
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</tbody>
</table>

Table 4 - El Hussen 2007 Diamond Drill Hole Locations
Following geological logging, the core was scanned using a “GF Instruments Gamma Surveyor” scintillometer. Using a cut off of 50ppm U3O8 the core was divided into 0.5m intervals for assay. An extra 0.5m was included either side of the mineralised zones. These sections were split with a diamond core saw and half samples were sent to ALS Chemex in Townsville for analysis by method ME-MS61. This involves a four acid (HF, HNO3, HClO4 and HCl) “near total” digestion followed by a 48 element ICPMS scan, giving a detection range of 0.1-10,000ppm for uranium. The remaining half is stored at the LCRPL Caroline site.

Thirty samples were assayed on the basis of scintillometer readings and of these 19 samples returned assay results equalling or exceeding 100ppm (0.01%) U3O8. A further 9 samples returned values between 50 and 100 ppm U3O8. The highest uranium result was 0.5m @ 0.03% U3O8 from 18.65m.in EHS 7.

Encouraging results from 2007 diamond drilling program included:

- 5.5 metres at 0.02% U3O8 from 10.95 metres in EHS 7
- 3.5 metres at 0.02% U3O8 from 17.35 metres in EHS 7
Significant intervals of uranium mineralisation using a 0.01% U3O8 cut-off are given in Table 5.

<table>
<thead>
<tr>
<th>Hole</th>
<th>Sample Number</th>
<th>From (m)</th>
<th>To (m)</th>
<th>Assay U3O8 (ppm)</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>EHS 7</td>
<td>R028</td>
<td>10.95</td>
<td>11.45</td>
<td>155.1</td>
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</tr>
<tr>
<td></td>
<td>R174</td>
<td>11.45</td>
<td>12.05</td>
<td>145.6</td>
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<tr>
<td></td>
<td>R029</td>
<td>12.05</td>
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<tr>
<td></td>
<td>R175</td>
<td>12.55</td>
<td>13.05</td>
<td>150.9</td>
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</tr>
<tr>
<td></td>
<td>R176</td>
<td>13.05</td>
<td>13.55</td>
<td>159.8</td>
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</tr>
<tr>
<td></td>
<td>R030</td>
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<td>14.05</td>
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<td>14.75</td>
<td>139.2</td>
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<td>R031</td>
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<td>16.25</td>
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<td>173.9</td>
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<tr>
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Table 5 - El Hussen 2007 Diamond Drill Assay Summary
EXPLORATION COMPLETED 2008, YEAR 5

INTERPRETATION OF 2007 REGIONAL STREAM SEDIMENT SURVEY

The results of the 2007 stream sediment survey were discussed previously, (Lord, 2008).

Memo No. 1
Results of historical stream sediments surveys in the Seigal (6462) 1:100,000 sheet area were discussed first in Memo 1. From this it was concluded that uranium anomalies at El Hussen and El Hussen South may still be significant but are not as significant as those at Redtree across the NT/Qld border in Queensland. Gold anomalies in the middle section of El Hussen Creek and a stream to the south of it may be derived from the Mesozoic but there could also be a target in the underlying Proterozoic. It was proposed that these anomalies would be resampled in more detail during the 2007 program that would serve as a check on the past work and effect follow-up on the historical anomalies. This Memo also proposed a two staged program of ridge and spur soil sampling along the main ridges of the El Hussen, El Hussen South, Southern Comfort and Lagoon Creek stream sediment anomalies to outline drill targets.

Memos No. 2-4
Memos 2-4 incl. discussed thin section petrography of rock samples collected during the 2007 stream sediment survey. Only one sample pertained to EL23573 comprising oxidised sulphidic quartz-adularia vein material. Sulphide boxworks were interpreted as representing former pyrite and ?arsenopyrite and the sample probably contained up to 30% former sulphides. The quartz-adularia gangue is typical of low temperature hydrothermal fluids boiling under high fluid flows.

Memo No. 5
The Bulk Cyanide Leach (BCL) results of the 2007 stream sediment survey were discussed in Memo 5.
Gold
An impressive 5 sample BCL anomaly was located in the headwaters of Lagoon Creek spread over an E-W distance of 6km, possibly derived from the Cliffdale Volcanics. More sampling was recommended.
Silver
One low order anomaly was identified but not recommended for follow up.
Copper
Only one copper anomaly was identified from EL23573. Although minor volcanic hosted mineralisation was inferred the values may instead represent elevated background from the basalts present.
Palladium
Several Pd anomalies were identified for follow-up. The Westmorland Conglomerate appears to be the main source of anomalies with a cluster in the upper part of Breakneck Creek, a scatter of anomalies in eastern Breakneck Creek and two anomalous samples in the upper Lagoon Creek. Mine dumps SW of Northeast Westmoreland appear to have contributed one anomaly.

Memo No. 7
Results of the -80# stream sediments were discussed in Memo 7.
Silver
An isolated low order ?spurious silver anomaly was identified in Breakneck Creek.
Bismuth
The best Bi anomalies are in El Hussen Creek where there are 8 anomalous tributaries associated with the El Hussen Prospect. There are 3 anomalies in the SE corner of the license and an isolated value in the head of Doctors Creek in the west.
Barium
An isolated anomaly was identified in the head of one of the Cobar West creeks.

**Gallium**
Elevated gallium values are usually associated with the Seigal Volcanics. There are no clearly defined “anomalies” and the distribution of gallium seems to follow that of copper.

**Indium**
There were no significant In anomalies in EL23573.

**Molybdenum**
There were no significant Mo anomalies in EL23573.

**Memo No.8**
Memo 8 discussed the Upper Lagoon Creek BCL gold anomaly, described as the strongest gold anomaly draining from an area of Mesoproterozoic acid volcanics, sandstones and conglomerates overlain by Mesozoic quartz sandstone and conglomerate of the Mullaman Beds. The east-west alignment of the anomaly does not appear to be lithologically controlled but could be influenced by WNW trending structures passing through the anomalous drainages. A source from one of the units of the Westmoreland Conglomerate was also considered and it was noted that NTGS geologists had sampled basal units of the Conglomerate for Witwatersrand styles of gold mineralisation. However a source from the overlying Jurassic-Cretaceous conglomerates could not be ruled out. The acid volcanics of the Cliffdale Volcanics were also considered as a source of the anomalism. The anomaly is not supported by any other metals that are anomalous elsewhere. The tenor of the anomaly compares very favourably with stream sediment anomalies from other known major gold deposits. It was recommended that the back-up samples be assayed and that resampling be carried out. This was apparently not done.

**Memo No. 9**
This Memo documented a Pd anomaly from 5 adjacent creeks in the panhandle of the tenement covering an area of about 6 sqkm, underlain by Westmoreland Conglomerate. This is not supported by any other elements.

Follow up stream sediment sampling of the uranium and gold anomalies, proposed in the 2007 annual report for the beginning of the 2008 campaign and comprising re-sampling of the anomalous sites, infill sampling in the surrounding creek, geological mapping and rock chip sampling, has not been carried out.
REVIEW OF EXPLORATION POTENTIAL AND EXPLORATION MODELS

The report of a brief visit to the Lagoon Creek license area by NuPower to assess the geological potential of the area for economic uranium resources and the exploration carried out by Laramide was provided previously (Rutherford, 2008)

This was summarized as follows:

In understanding the origin of uranium mineralisation in the Lagoon Creek region, it is notable that the stratigraphy of the Westmoreland region differs from that of other basins in the NT with the accumulation of extensive eruptive intracratonic acid rocks of the Clifdale Volcanics over the Murphy Inlier basement and intrusion of the Nicholson Granite Complex. The earliest stages of formation of the McArthur Basin coincide with uplift of the Inlier and its weathering and rapid erosion to form the Westmoreland Conglomerate on its flanks. Palaeochannel current directions indicate input from the northeast parallel with main axis of the Inlier and an overall fining towards the southwest. The palaeocurrent trends are also parallel with later mafic dykes and it is suggested that this direction follows an erosional depression along a major structural break forming at the margin of the opening of the MacArthur Basin that was present before deposition of the Conglomerate. These structures may have then been reactivated allowing intrusion of the mafic dolerite dikes (e.g. at Redtree and Northeast Westmoreland).

The ultimate source of the uranium is considered to be the basement metasediments of the Murphy Inlier that was released during crustal melting and concentrated in veins, replacement and pegmatite or greisen hosted deposits in the apical regions of the Nicholson intrusives and the preceding Clifdale volcanic eruptives. Weathering and erosion during the 60-80My time gap between eruption of the Clifdale Volcanics (1850Ma), intrusion of the Granite suites (1863-1847Ma) and formation of the Conglomerate (1780Ma) then released the uranium for transport and precipitation in reduced fluvial sediments of the Westmoreland Conglomerate. Significant amounts of uranium are inferred to have accumulated in discrete fluvial palaeochannel facies within gravel and medium-coarse sands beds, and to a lesser extent in the siltstones of the upper parts of the Conglomerate, where the reducing environment required for uranium precipitation was due to sulphides instead of carbonaceous matter that was generally lacking at this stage of the earth’s evolution.

The better grades and more coherent deposits occur along the Redtree Dyke Zone that is also coincident with the main axis of deposition inferred for the Westmoreland Conglomerate. This is also then likely to have been the zone of highest uranium accumulation within discrete grit and sand channel deposits of the overall Westmoreland sedimentary package. The better grades are therefore expected to be in discrete palaeochannel zones corresponding to conditions suitable for uranium accumulation interspersed amongst periods of flooding and erosion during accumulation of the Conglomerate.

The coincidence of the uraniferous sands, grits and pebbly channels with the cross-cutting mafic Redtree Dyke has then resulted in the remobilisation of the uranium in proximity to the intrusive to be high graded in the adjacent sediments and upwards to be re-precipitated along the dike margins. This is at the expense of depleting the uranium immediately adjacent to the dyke. Local hydrothermal activity is also expected to have leached gold and base metals from the margins of the dykes and redeposited it elsewhere. The mafic dykes are considered a very unlikely source of uranium and the apparent relationship of the uranium ore lenses to them is instead primarily the result of sedimentary permeability control on secondary uranium deposition during sedimentation. This is supported by drill holes though dykes and adjacent sediments that have no uranium mineralisation, presumably because the dykes transacted barren sediments and further supported by the intersection of mineralised sediments in drill holes in the absence of any dykes at distance lateral to the Redtree Dyke Zone.
By comparison the style of mineralisation at Lagoon Creek differs from Redtree occurring in siltstones and mudstones near the top of the Westmoreland sequence and to secondary uranium in faults and shears cutting these units. These appear to be marginal as targets due to low-moderate grades, size potential and ore mineralogy.

The sediments of the upper Westmoreland unit are dominated by finer grained facies and therefore seem to be more distal from the source areas or main channels. It is therefore thought that exploration could be more successful by targeting discrete channels of coarser sands and grits proximal to the main axis of former sedimentary deposition and deeper in the stratigraphy. Mineralised channels might be detected by the use of stream sediment geochemistry and radiometrics to detect geochemical and radon/radium leakage up the major dyke and fracture zones. Clipping of the radiometric data might also reveal more subtle leakage signatures from channels at depth. These could be followed up with detailed ground radiometrics and soil sampling to define drill targets.

**EXPLORATION COMPLETED 2009, YEAR 6**

There was no on-ground exploration during 2009. A further more extensive review of the uranium potential of the Lagoon Creek License area was completed by Rutherford, (Appendix 1). His summary is as follows:

The distribution and grade of uranium mineralisation in the Lagoon Creek Licence is controlled by a number of different factors which includes:

- Proximity to source rocks of basement Clifffdale Volcanics and Nicholson Granite Suite.
- Concentrations within fluvial palaeochannels in various units of the Westmoreland Conglomerates derived from weathering of basement lithologies.
- Concentrations in finely bedded siltstones at the unconformity between the Seigal Volcanics and the Westmoreland Conglomerate possibly in lake or shallow soil filled ephemeral depressions. This style is widespread.
- Remobilisation within sedimentary hosts by hydrothermal reactions in zones marginal to intrusive mafic dykes aligned along the northern and north western margin of the Murphy Inlier. This style has given rise to the highest grade intersections in drilling and hybrid styles from the other settings given above.
- Superficial precipitation of secondary uranium minerals from groundwater within faults, shears, joints and bedding. Uranium is derived from leaching reduced uranium at depth from all types of uranium outlined above. This has given rise to widespread low grade superficial anomalism but is only locally economically significant about dykes.

The report discusses and illustrates various features related to each uranium setting and the implications that can be derived from them for exploration. This suggests a limited number of sites that could benefit from additional exploration to assess the potential for mineralisation.

There is a case for undertaking a reassessment of available drill core or cuttings to re-evaluate the geological and mineralogical controls on mineralisation as the models as these are not conclusively defined. This should be undertaken prior to new field work to assist in developing a satisfactory field model for exploration.

Further work has been recommended and this includes:
• A program of reassessment of drill core and cuttings from the licence be undertaken, including where possible examples of mineralisation from the Redtree and Junnagunna areas held by Laramide for comparative purposes. In this regard drilling from the Magerra area is important. The objective is to better understand the controls on uranium mineralisation and its redistribution.

• A program of field assessment of low order uranium radiometric anomalism and palaeochannel facies supported by soil sampling is undertaken in the south eastern portion of the licence.

• Work in the El Hussen area should be considered as low priority unless studies from drill core and cuttings reveal a new model for uranium in that area.
CONCLUSIONS AND RECOMMENDATIONS

Exploration at Lagoon Creek to date has focussed on the potential for economic uranium mineralisation associated with near flat lying fine grained sedimentary units in the upper part of the Westmoreland Conglomerate and in near vertical structural zones crosscutting the Conglomerate associated with intruded mafic dykes. While the historical drilling targeted flat lying mineralisation with vertical holes that mostly failed to test the crosscutting structural zones and located minor mineralisation the recent drilling of inclined holes to test both targets has failed to identify any significant zones of potentially economic mineralisation.

Radiometric anomalies identified by the airborne survey have not been followed up in detail and geochemical anomalies from the stream sediment survey remain to be followed up.

A preliminary review of exploration models suggests potential for sandstone hosted uranium mineralisation in fluvial sand and grit palaeochannels of the Westmoreland Conglomerate that may be independent of crosscutting structural zones and any mafic dykes. The dykes are thought to be an unlikely source of the uranium but may have acted locally to laterally remobilise and upgrade disseminated uranium in the sediments proximal to the dykes and vertically along the dyke margins. This new model enhances the prospectivity of the Westmoreland Conglomerate in the absence of structural control but requires substantiation with more detailed core relogging.

A more extensive review of the controls of uranium mineralization noted the importance of proximity to the ultimate source rocks in the basement Cliffdale Volcanics and Nicholson Granite Suite. Implications of the features of the uranium mineralization styles in fluvial palaeochannels of the Westmoreland Conglomerate, the Magerra Siltstone and along the marginal zones of the mafic dykes for exploration have been drawn and areas recommended for further work.

Relogging of selected drill core, including materials from the RedTree, Junnagunna and Magerra deposits for comparative purposes, was again recommended to better understand the controls on uranium mineralization and it redistribution.

The review also reiterated the importance of the remobilization of uranium along faults, shears, joints and bedding planes from deeper sources to the surficial environment to yield widespread low order radiometric anomalies as an important exploration tool for blind deposits, and integration of the airborne survey data with the historical and recent stream sediment data is required for the purpose of identifying such geochemical and radiogenic signatures of this leakage. Reprocessing of the airborne magnetic data could assist with identifying structures as leakage conduits and mafic dykes as potential hosts to mineralisation. Clipping and enhancing of the radiometric data may assist in recognising more subtle leakage anomalies in the dataset. Prospective areas should then be followed up with reconnaissance mapping, rock chip sampling, ground radiometrics and soil sampling to identify potential targets of deeper mineralization for drill testing.
EXPENDITURE STATEMENT, YEAR 6, 2009, PROPOSED PROGRAM YEAR 7, 2010

The expenditure statement for Year 6, and the covenant and proposed exploration activities are given in Appendix 2.

The Exploration Covenant for Year 6 was $100,000.00. Total expenditure was $78,730.72 and therefore the covenant was not satisfied.

A VOC letter was delivered along with this report.

It is proposed to substantiate the mineralization model discussed here with further detailed re-logging of drill core. Remodelling of the airborne geophysical data will be carried out to try to detect subtle leakage anomalies and the structures that they might be related to. Integration of this data with the historical and recent stream sediment geochemical surveys will be attempted to outline areas for detailed mapping, rock chip sampling and soil sampling in an attempt to define drill targets for a limited number of well sited drill holes.

GROUND RELinquishMENT

EL23573 comprises 67 blocks. NuPower applied for a partial waiver of reduction on the area by relinquishing 2 blocks on 02/02/09 (Figure 3). This was accepted on 10/03/09 and the license area now comprises 65 blocks covering an area of 190sqkm.

WARRICK RAFFERTY
MSc(Hons) AusIMM, SEG
22 February 2010
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APPENDICES
APPENDIX 1 – URANIUM POTENTIAL OF THE LAGOON CREEK LICENSE AREA, NT
Review of Uranium Potential of the Lagoon Creek Licence Area, Westmoreland, Northern Territory

Neil F. Rutherford
December 2009
SUMMARY

The distribution and grade of uranium mineralisation in the Lagoon Creek Licence is controlled by a number of different factors which includes:

- Proximity to source rocks of basement Cliffside Volcanics and Nicholson Granite Suite.
- Concentrations within fluvial palaeochannels in various units of the Westmoreland Conglomerates derived from weathering of basement lithologies.
- Concentrations in finely bedded siltstones at the unconformity between the Seigal Volcanics and the Westmoreland Conglomerate possibly in lake or shallow soil filled ephemeral depressions. This style is widespread.
- Remobilisation within sedimentary hosts by hydrothermal reactions in zones marginal to intrusive mafic dykes aligned along the northern and north western margin of the Murphy Inlier. This style has given rise to the highest grade intersections in drilling and hybrid styles from the other settings given above.
- Superficial precipitation of secondary uranium minerals from groundwater within faults, shears, joints and bedding. Uranium is derived from leaching reduced uranium at depth from all types of uranium outlined above. This has given rise to widespread low grade superficial anomalism but is only locally economically significant about dykes.

The report discusses and illustrates various features related to each uranium setting and the implications that can be derived from them for exploration. This suggests a limited number of sites that could benefit from additional exploration to assess the potential for mineralisation.

There is a case for undertaking a reassessment of available drill core or cuttings to re-evaluate the geological and mineralogical controls on mineralisation as the models as these are not conclusively defined. This should be undertaken prior to new field work to assist in developing a satisfactory field model for exploration.

Further work has been recommenced and this includes:

- A program of reassessment of drill core and cuttings from the licence be undertaken, including where possible examples of mineralisation from the Redtree and Jannaguna areas held by Laramide for comparative purposes. In this regard drilling from the Magerra area is important. The objective is to better understand the controls on uranium mineralisation and its re-distribution.
- A program of field assessment of low order uranium radiometric anomalism and palaeochannel facies supported by soil sampling is undertaken in the south eastern portion of the licence.
- Work in the El Husse area should be considered as low priority unless studies from drill core and cuttings reveal a new model for uranium in that area.
# Contents

1. Introduction .................................................................................................................. 1

2. Source and Deposition of Uranium Mineralisation ...................................................... 1
   2.1 Stratigraphic and Age Considerations ...................................................................... 1
   2.2 Source and Host Lithologies ..................................................................................... 2

3. Mechanisms For Uranium Enrichment ....................................................................... 6
   3.1 Some General Considerations and Models ............................................................... 6
   3.2 Association of Mafic Dykes and Uranium in Extensional Environments .................. 11
      3.2.1 Abstract ........................................................................................................... 11
      3.2.2 Extracts from Paper ......................................................................................... 12
         3.2.2.1 Alteration: ................................................................................................. 12
         3.2.2.2 Mineralisation .......................................................................................... 12
         3.2.2.3 Genetic model for the formation of the uranium deposits .......................... 12
   3.3 Applicability of Mafic Dyke Model in Westmoreland Setting .................................. 13
   3.4 Uranium at an Unconformity or Exposed Surfaces .................................................. 19

4. Delineation of Uranium Mineralisation In Lagoon Creek Licence .............................. 20
   4.1 General Considerations ........................................................................................... 20
   4.2 Facies Models ......................................................................................................... 20
   4.3 Intrusive Mafic Dykes ............................................................................................... 23
   4.4 Geochemical Sampling ............................................................................................ 24
   4.5 Uranium Distribution In Drill Sections ..................................................................... 25

5. Considerations for Ongoing Exploration .................................................................... 29

6. Conclusions and Recommendations .......................................................................... 30

## Appendices

List of Figures in Text

Figure 1: Summary of the geology of the Westmoreland Uranium Field. The area straddles the Queensland and Northern Territory border. Yellow dashed line is Tin Hole Hinge Line ........................................ 2

Figure 2: Schematic section through Westmoreland region disposed about Murphy Uplift Zone. Mantle derived mafic dykes intrude up steep penetrating crustal fractures within and along the boundary of the Westmoreland Trough (Tin Hole Hinge Line). Erosion and deposition is indicated by the curved arrow ........................................................................................................................................... 2

Figure 3: Schematic view of fluvial depositional environment of Westmoreland Conglomerates along the northern margin of the Murphy Inlier. .................................................................................................................................. 3

Figure 4: Predominant palaeocurrent direction in the Westmoreland Conglomerate. ......................................................... 3

Figure 5: Schematic section summarising Westmoreland Conglomerate stratigraphy. Uranium is largely concentrated in the youngest units of the Westmoreland Conglomerate (Pt3w). ....................................................... 4

Figure 6: BHP stratigraphy showing multiple locations for uranium accumulation. ............................................................ 4

Figure 7: Example of Westmoreland Conglomerate gravels ............................................................................................... 5

Figure 8: Example of volcanic clastics in quartz-rich grit ................................................................................................. 5

Figure 9: Example of well-bedded siltstone overlying coarse sandstone of Westmoreland Conglomerate at unconformity with Seigal Volcanics. The sandstone-siltstone interface has anomalous radiometrics (red bar) ........................................................................................................................................ 6

Figure 10: Examples of settings for uranium concentration within proximal and distal fluvial delta and channel environments. Lower figure is of Honeymoon palaeochannel .......................................................... 7

Figure 11: Views of setting of the 4-Mile and Beverley deposits in South Australia. Four Mile is proximal to source and of higher grade (average grade 0.35% U3O8). Four-Mile represents a more classic roll front occurrence where as the more distant Beverley deposit (average grade 0.18% U3O8) is hosted in a raised sandy aquifer palaeochannel .......................................................... 8

Figure 12: Example of secondary shear hosted uranium mineralisation and host shear in Lagoon Creek Licence. These give rise to prominent radiometric anomalies. Although of no economic interest in themselves they could highlight zones of exploration interest which may point to buried targets. ........... 9

Figure 13: Example of secondary concentration of uranium at fault cutting Magerra Siltstone beneath Seigal Volcanics. The siltstone unit is calcareous in some locations. (From Kratos Exploration) .......... 10

Figure 14: Secondary Cu leached from and precipitated in cavities in basal Seigal Volcanics. The associated intrusive dyke rocks are also likely Cu and other metal sulphide-rich and precipitation of sulphides at depth in hydrothermal cells about dyke margins is likely to account for association of metal sulphide with reduced uranium .......................................................... 11

Figure 15: Location of major uranium occurrences in the Queensland section of the Westmoreland Uranium Field associated with intrusive mafic dykes (Redtree Dyke to west) and sills (Outcamp Long Pocket area to northeast) ........................................................................................................................................ 14

Figure 16: Schematic cross section showing relationship of mafic dykes and styles of uranium mineralisation. The uranium sitting at the unconformity position between the Seigal volcanics and Westmoreland Conglomerates is not related to mafic dyke intrusion .......................................................... 14
Figure 17: The Rectree-Huaraabagoo mineralisation appears to be either offset along the fault or a host palaeochannel bends or cuts obliquely across the fault. The zoned Garee and Jack Lens are hosted in Westmoreland sediments, the Namalaripi Lens is vertical and largely secondary .................................................... 15

Figure 18: Example of alteration at Rectree occurrence. The mineralogy is characteristic of that associated with the Chinese mafic dyke occurrences (quartz-chlorite-illite-pyrite). Pyrite is a very effective precipitant for uranium. Calcite is also reported as an associated mineral ........................................... 15

Figure 19: Distribution of uranium at the Junngunna occurrence .......................................................................................................................................................... 16

Figure 20: Location of deposits in the Westmoreland Uranium Field .......................................................... 17

Figure 21: Relationship of Newman drilling to the NE Westmoreland Dyke Zone in the Lagoon Creek Area. Green is Seigal Volcanics. (See Figures 34-37 for sections) .............................................. 17

Figure 22: Drilling at El Hussen South Prospect across the faulted contact between the Westmoreland Conglomerate [brown patterned] and Seigal Volcanics [green] (refer Figures 9 and 12 for examples). The intervening Magerra Siltstone at the unconformity is considered here as part of the basal Seigal Volcanic unit which is a plausible interpretation. (See Figure 33 for section) ......................................................... 18

Figure 23: Examples of dyke-sediment contacts in drill core. Upper left, no dyke (El Hussen); upper right two dykes but unreactive unaltered contact, no radiometric response, lower hematized sediment and vesicular dyke rock with some weak radiometric anomalism in split sandstone core (Junngunna); .................................................................................................................................................................................. 18

Figure 24: Examples of siltstone at and beneath Seigal Volcanic contact. Left photo shows fusion of sediment (porcellanite); right unbaked and partially baked ...................................................................... 19

Figure 25: Detailed geology map of Lagoon Creek licence. At least this level of detail is required to define potential host sedimentary channel environments proximal to source. Red dots U; blue dots Cu, Pb or Sn; green dashed lines dolomite. Arrowed are PtW zones of interest. (See Figure 10 top right) .. 21

Figure 26: U/Th ratio radiometric anomalies over geology. Note association of anomalism with PtW1 facies in south eastern section of licence and locally in PtW2. Some anomalism is also related to Cliffdale Volcanics. ................................................................................................................................. 21

Figure 27: Location of high U/Th ratios over grey scale TMI magnetics in Lagoon Creek Licence. .......... 22

Figure 28: Regional distribution of high U/Th ratios over greyscale TMI magnetics. Site 11 is Conglo anomaly; Site 7 is Magerra zone; Site 8 is Cobar II; Site 9 is El Hussen zone; Site 10 is Debbill Zone. .... 22

Figure 29: Possible sublith expression in uranium channel radiometrics of a link between Conglo site and Debbill area (see Figures 27 and 31). Note low zone immediately north of dotted trace. The character of the anomalism needs to be determined in the field .............................................................. 23

Figure 30: View to NE along Rectree dyke from Garee lens (See Figure 17). .............................................. 23

Figure 31: Summary of uranium stream sediment geochemistry over geology. The trace of a possible uranium channel from the Conglo anomaly to Debbill Zone (circled) inferred from U radiometrics data is shown as red dots. (See Figure 29). ........................................................................................................................................ 24

Figure 32: Location of Lagoon Creek licence over Landsat image. Also shown are mineral occurrences as dots, Red dots U; blue dots Cu, Pb or Sn; and dolerites as green dashed lines. .................................................. 25

Figure 33: El Hussen Section 1 showing relationship of uranium anomalism to stratigraphy. Note thinness of Magerra unit, lack of faulting or evidence of dyke rocks. ................................................................................................................................. 26

Figure 34: Magerra Zone Section 4175mE. Note dislocation of thicker Magerra unit and inferred dyke location .................................................................................................................................................. 27

Figure 35: Magerra Zone Section 4550mE. Note thicker Magerra unit, inferred dyke location in fault zone and possible palaeochannel hosted uranium at depth (or hybrid mineralisation). ............................................................... 27
Figure 36: Magerra Zone Section 5400mE. Note two zones of dislocation of Magerra unit, inference of two dykes and hybrid or palaeochannel uranium................................................................. 28

Figure 37: Magerra Zone Section 5725mE. Note dislocation of Magerra unit but little high grade uranium as might be expected with presence of a dyke. ................................................................. 28

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1. INTRODUCTION

This report incorporates views and interpretations made from an assessment of various company exploration reports, material published by government departments, papers published in journals and field assessment of outcrop and drill core. It is an attempt to synthesise various attributes that appear to influence the distribution of uranium, specifically in the Lagoon Creek licence (EL 23573) held by NuPower Resources, and also regionally in the Westmoreland Uranium Field. It also attempts to define targets areas that could merit further exploration, including drilling for uranium mineralisation.

Some of the issues which need to be considered include those relating to:
- The primary source of uranium in the district
- Redistribution mechanisms
- Hosts to uranium mineralisation
- Mechanisms of local enrichment to ore grades
- Methods by which ore grade bearing localities may be recognised.

A review of the geological setting of the Westmoreland area was submitted to NuPower Resources in August 2008. The views are extended here with better defined models for the mineralisation styles recognised.

2. SOURCE AND DEPOSITION OF URANIUM MINERALISATION

2.1 Stratigraphic and Age Considerations

Uranium is found in a number of settings in the Westmoreland Uranium Field. Following from this it needs to be recognised that there are a number of different mechanisms of concentration which have operated and that these have occurred at different points in time and in different circumstances. It also indicates that there is likely to be marked differences in degree of radiogenic equilibrium from type to type depending on age with the recent secondary concentrations being markedly out of equilibrium and the resetting of equilibrium in the past contributing to age date variation.

Uranium is localised within:
- Clifdale Volcanics rhyolitic and ignimbrite units overlying basement metamorphics of the Murphy Tectonic Inlier at low concentrations (3-15 ppm) but in a readily leachable (labile) state. The Clifdale Volcanics also includes anesitic intrusive and possibly extrusive units.
- Probably late pegmatite, granite and microgranite phases of the Nicholson Granite Complex (3-14 ppm) which intrude the Clifdale Volcanics as primary mineralisation and later secondary uranium in shears in these rocks, (Eva style occurrence).
- Discrete coarse sandstone, grit and conglomerate channels within the Westmoreland Conglomerate, the basal unit of the Tawallah Group.
- At or near the base of finely bedded siltstone units (e.g. Magerra Siltstone) overlying Westmoreland units at the unconformity with the overlying Seigal Volcanic lavas. These may be palaeo-soils or ash derived from the earliest eruptive phases of the Seigal Volcanics.
- Structures occupied by dolerites that may have been feeders for the Seigal Volcanics.
- Structures and shears cutting the Westmoreland Conglomerate and Magerra Siltstone.
- Structures cutting the Seigal volcanics (Cobar II type occurrence).
2.2 Source and Host Lithologies

In reviewing regional data, a conclusion that can be drawn is that there appears to be a pattern of uranium redistribution that relates to its initial erosion from primary source rocks to the east and northeast of its present locations coincident with the outcrop of the Murphy Inlier (Cliffdale Volcanics over basement metamorphics intruded by Nicholson Granite Complex 1845 My). Uranium (in solution given the age of the event, 1775-1770 My) along with heavy minerals, including Au, appear to have been leached or eroded, transported and ultimately deposited in a number of discrete coarse sand, grit and pebble fluvial fans and channels along a northeast-southwest trending depositional trough aligned parallel to the northern edge of the Murphy Inlier. These fluvial deposits constitute the Westmoreland Conglomerate (BHP essentially determined this).

Occurrences such as that at the Eva and Una May prospects appear to represent examples, albeit small in the regional context, of one of the early primary sources of uranium but the most likely major source is lable uranium leached from the rhyolites and ignimbrites of the Cliffdale Volcanics. Such intracratonic volcanic rift eruptions are recognised sources and primary hosts for uranium worldwide through to the present. Erosional materials from the volcanics and metamorphic basement derived quartz are important components of the Westmoreland Conglomerate units.

Figure 1: Summary of the geology of the Westmoreland Uranium Field. The area straddles the Queensland and Northern Territory border. Yellow dashed line is Tin Hole Hinge Line.

Figure 2: Schematic section through Westmoreland region disposed about Murphy Uplift Zone. Mantle derived mafic dykes intrude up deep penetrating crustal fractures within and along the boundary of the Westmoreland Trough (Tin Hole Hinge Line). Erosion and deposition is indicated by the curved arrow.
Later in the depositional history of the Westmoreland Trough, as coarse clastic sedimentation waned, uranium also accumulated locally in siltstone and mudstone units (reduced silt/soil) (e.g. Magerra Siltstone, Kratos work), possibly in over bank deposits or shallow silt filled depressions or lakes at the erosional interface between the Westmoreland Conglomerate and unconformably overlying Seigal Volcanics. Algal or bacterial reduction and evaporative and carbonate bearing sediments may have concentrated the uranium.
Figure 5: Schematic section summarising Westmoreland Conglomerate stratigraphy. Uranium is largely concentrated in the youngest units of the Westmoreland Conglomerate (Ptw). 

Figure 6: SHP stratigraphy showing multiple locations for uranium accumulation. From this it seems likely that uranium, apart from true primary sources, such as at Eva or Una May in pegmatites, greisens etc., will be confined to sedimentary settings hosted in fluvial channels or
overbank hosts near to sources or down catchment from the sources. The analogy is that of typical channel and delta fan hosted deposits.

Figure 7: Example of Westmoreland Conglomerate gravels.

Figure 8: Example of volcanic clastics in quartz-rich grit.
3. MECHANISMS FOR URANIUM ENRICHMENT

3.1 Some General Considerations and Models

At the time of deposition of the Westmoreland Conglomerate the concentration of uranium within the sediments would likely be sub-economic [although this has not been proven by drilling channel settings across the broader region]. It would require subsequent enrichment by some mechanism to produce ore grade concentrations. By analogy with more recent examples uranium would likely be primarily concentrated in porous reduced coarser grained sand and grit channels or fluvial fans,
although in some instances there is abundant kaolin in the matrix of some of the sedimentary units (from break down of feldspar?). This might be an expected case at Westmoreland given weathering of a rhyolite and ignimbrite terrain. Models of this analogy are shown in Figure 10 below.

Figure 10: Examples of settings for uranium concentration within proximal and distal fluvial delta and channel environments. Lower figure is of Honeymoon palaeochannel.
It would be anticipated that where reduced facies occur in the Westmoreland package near to source rocks these would contain sites with relatively high concentrations of uranium. One might consider the Beverley-4-Mile deposits in South Australia as an analogous example of such a fluvial fan, grit and sand palaeochannel setting with uranium derived from the adjacent ranges to the west.

**Figure 11:** Views of setting of the 4-Mile and Beverley deposits in South Australia. Four Mile is proximal to source and of higher grade (average grade 0.35% U₃O₈). Four-Mile represents a more classic roll front occurrence whereas the more distant Beverley deposit (average grade 0.18% U₃O₈) is hosted in a reduced sandy aquifer palaeochannel.
As the fluvial channels and fans disperse and become more fine-grained down catchment the grade would tend to decline with uranium dispersed into finer facies and overbank silt and clay dominated settings and only likely to remain mobile in the deeper more persistent palaeochannels and porous sand bodies. In the Westmoreland case proximal sources are rocks of the Murphy Inlier so grade would be expected to decline and uranium become more dispersed into finer facies, from east and north-east to west and south-west.

In proximal settings normal reox roll front interface processes would give rise to high-grading of reduced uranium within porous sandy aquifers as at 4-Mile shown in Figure 11. In more distal settings reduced facies within the sandy channel aquifers would continue to precipitate uranium from groundwater flowing within the aquifer. The reduction mechanism at Westmoreland is less clear as abundant plant material would be lacking as occurs in the more modern (post mid-Palaeozoic) analogues. Alternatives would be algal or bacterial activity or presence of sulphide or abundant reduced iron in solution (Fe³⁺ oxidation to Fe²⁺ reduces uranium ion). Calcrete controlled precipitation of uranium in the drainage systems is unlikely as the area is one of high energy stream activity associated with high erosion rates.

Drilling to date in the Westmoreland region however does not appear to support the traditional roll front model at least as a stancalome mechanism at drilled sites with higher grade reduced uranium concentrations. No examples of simple reduced roll front concentrations appear to have been intersected, although it is clear that uranium does occur in palaeochannel settings within the Westmoreland Conglomerate package [e.g. Pt12, and Pt21]. This may in part be due to the general focus of drilling in the vicinity of secondary surface concentrations of uranium detected by ground and airborne radiometrics. There has been little or no focus on delineation to test potential for uraniumiferous palaeochannels independent of the secondary surface expressions detected by radiometrics (and by default, dykes).

The anomalous secondary surface uranium and radiometrics derive from possibly Palaeozoic or Mesozoic to Recent weathering of shallow reduced uranium resources frequently associated with faults, sites with strong jointing, for example, shallow uraniumiferous siltstone facies as in the El Hussen area or deep weathering about intrusive dykes where these intersect uraniumiferous palaeochannels nearer to the Murphy Inlier. Examples from the El Hussen and early Kratos exploration drilling are illustrated in Figures 12 and 13 below.

Figure 12: Example of secondary shear hosted uranium mineralisation and host shear in Lagoon Creek Licence. These give rise to prominent radiometric anomalies. Although of no economic interest in themselves they could highlight zones of exploration interest which may point to buried targets.
Figure 13: Example of secondary concentration of uranium at fault cutting Magara Siltstone beneath Seigal Volcanics. The siltstone unit is calcareous in some locations. (From Kratos Exploration).

It is clear that other factors have contributed to the local upgrading of reduced uranium grade within the Westmoreland sediments. There is also a need to account for local development of higher temperature or recrystallised assemblages in minerals associated with the uranium enriched zones and local introduction of sulphides into the host rocks in some instances.

There is a close spatial association of intrusive mafic dyke rocks within faults aligned along the trend of the Westmoreland Trough or Tin Hole Hinge Line. The coincidence of the dykes with the deposition axis of the Westmoreland Conglomerate suggests that the axis of the Westmoreland Trough also represents an extensional structural feature that reflects the location of the northern side of uplift along the Murphy Inlier. The dykes are likely primitive, mantle derived and considered the likely feeders for the Seigal Volcanics, but they are however not the source of the uranium. The
dykes and the Seigal Volcanics are copper rich, shown as significant secondary Cu associated with weathered basal volcanics as shown in Figure 14 and they may have locally introduced sulphides into the Westmoreland sediments along their contact margins.

Figure 14: Secondary Cu leached from and precipitated in cavities in basal Seigal Volcanics. The associated intrusive dyke rocks are also likely Cu and other metal sulphide-rich and precipitation of sulphides at depth in hydrothermal cells about dyke margins is likely to account for association of metal sulphide with reduced uranium.

3.2 Association of Mafic Dykes and Uranium in Extensional Environments

A potential mechanism for remobilisation and upgrading of uranium hosted within Westmoreland sediments is suggested by the close association of intrusive dykes within extensional faults and porous uraniferous sand, grit and pebble facies. Recognition of this association is not new but it has not been generally applied. Hochman and Ypma (1984) made thermoluminescence measurements on some 800 samples from the Westmoreland ore bodies and surrounding host rocks up to 8 km away. They concluded that the Westmoreland Conglomerate has suffered major radiation damage attributable to at least 10 ppm uranium over 107 years, and that it had a high inherent uranium content that was remobilized in a convective cell system, possibly triggered by intrusion of dolerite dykes or by heat flow along rejuvenated structures.

Schindlmayr and Beerbaum (1986) postulated that heat flow at about 820 Ma ago generated and maintained hydrothermal convection cells in the permeable host rocks. Eight samples from the Namalangi lens of the Redtree deposit (Figure 17) gave U-Pb ages for uranium mineralisation of 812 ± 55 Ma (Pidgeon, 1985) The Namalangi lense is a mix of reduced and secondary ore so the age could have been reset to some extent. The determined age significantly post dates the Westmoreland sediment deposition but does not exclude them as being a potential host unit within which remobilisation of uranium could have taken place. The age dates from U-Pb in remobilized material may have been significantly reset from its primary source or depositional age. The Redtree deposit age is not significantly different from that determined for Nabarlek (intruded by Oenpelli Dolerite) but much different to that of Ranger where such younger mafic dykes are not present.

A general model illustrating the association of mafic dykes and uranium enrichment is well summarised in a paper by Rui-Zhong Hu et al., Economic Geology, v. 103, pp. 583–598. (See Appendix 1). Their abstract and selected extracts are given below:

3.2.1 Abstract

South China is rich in vein-type hydrothermal uranium deposits hosted in granitic, volcanic, and carbonaceous and siliceous pelitic sedimentary rocks. The uranium deposits
are spatially associated with extensional structures and/or mantle-derived mafic dikes. Both the uranium deposits and mafic dikes are Cretaceous to Tertiary in age, temporally coincident with the crustal extension. Carbon isotope analyses of calcite deposited in the main-stage mineralization in the veins from 12 representative uranium deposits yield \( \delta^{13}C \) values of ore-forming fluids mainly from ~4 to ~8 per mil, which are permissive of a mantle origin for the \( \text{CO}_2 \) in the ore-forming fluids. A mantle origin is consistent with the association of the deposits with mafic dikes and the \( \text{He}/\text{He} \) ratios of ore-forming fluids (e.g., ~0.10–2.02 Ra for the volcanic-hosted Xangshan uranium deposit). Isotopic compositions of H and O demonstrate that water in the ore-forming fluids is predominately meteoric in origin. Ore-forming temperatures ranged approximately from 150°C to 250°C.

Uranium-rich crustal rocks in South China may have been the sources for the uranium. Crustal extension and associated mafic magmatism are considered to have heated the rocks and allowed \( \text{CO}_2 \) (possibly from mantle sources) to migrate upward and to mix with \( \text{CO}_2 \)-poor meteoric water. The \( \text{CO}_2 \)-rich hydrothermal fluids mobilized uranium from the source rocks and then the uranium was deposited in various host rocks to form the uranium deposits.

3.2.2 Extracts from Paper

3.2.2.1 Alteration:

Hydrothermal alteration of host rocks includes silification, hematitisation, sericitisation, carbonatisation, and argillisation (Table 1), although the alteration of sedimentary rocks is relatively weak and the intensity is highly variable from deposit to deposit. Alteration zones, tens of centimetres wide, occur along faults and fractures and extend outward into more reactive or brecciated [porous] rocks.

3.2.2.2 Mineralisation

Regardless of their host rocks, the uranium deposits have simple mineral assemblages, similar to the vein-type uranium deposits classified by Ruzicza (1993). The textures, crosscutting relationships, and mineral assemblages of the ores indicate that each episode of mineralization took place in three stages. Paragenetic relationships suggest that silification took place throughout the hydrothermal ore-forming events. In contrast, hematitisation, carbonatisation, and argillisation characterized by minerals, such as hematite, hydromica, illite and kaolinite are mainly present in the later stages. Quartz veins formed in the early stage are coarse to medium grained and contain rare disseminated pyrite and magnetite. The main stage of mineralization is marked by deposition of microcrystalline quartz in the veins. Mineral assemblages formed during this stage typically include pitchblende, pyrite, hematite, quartz, fluorite, and calcite. Other minor sulphides such as galena, sphalerite, and chalcopyrite are also present. Minerals of the late stage are comb quartz, calcite, fluorite, and pyrite. The main-stage calcite is pink or gray in colour and relatively fine grained whereas the late-stage calcite is usually white and relatively coarse grained. The six deposits considered in this study have combined resources of ~25,000 to 80,000 metric tons (t) U (~34,100–94,600 t U3O8) with average grades of ~0.1 to 0.3 wt percent U.

REE and trace element patterns and U-Pb isotope data of the ores are similar to those of the uranium-rich rocks in or near the mineralized areas. U-Pb isotope data also suggest significant uranium loss (up to ~70% of their original content) from the pre-existing rocks, indicating that they could have been the source of uranium for mineralization.

3.2.2.3 Genetic model for the formation of the uranium deposits

The formation of vein-type uranium deposits elsewhere in the world also has been linked to the emplacement of mafic dikes or crustal extension. Leroy (1978) suggested that the intrusion of mafic dikes in the Massif Central, France, heated aqueous solutions and triggered the circulation of hydrothermal fluids in fault systems within uranium-rich rocks and that the uranium leached from the rocks was deposited by interaction with reducing basinal fluids (Marignac and Cuney, 1999). However, it is unlikely that similar factors controlled uranium deposition in the South China [or Westmoreland] deposits because few reducing sediments exist in the extensional red basins of South China [or probably Westmoreland] and no obvious organic carbon was distinguished from carbon isotopes.
We propose the following model to explain uranium mineralization in South China. Cretaceous to Tertiary crustal extension was associated with intrusion of abundant mafic dikes and upward migration of mantle-derived CO₂. Incorporation of CO₂ into meteoric ground water in fault systems formed the CO₂-rich hydrothermal fluids. Heat introduced by intrusion of mafic magmas drove circulation of the CO₂-rich hydrothermal fluids within fault systems in the uranium-bearing source rocks and remobilized the uranium from the rocks as soluble UO₂(CO₃)₂⁻ and UO₂(CO₃)₇⁻. A number of factors may have played an important role in deposition of pitchblende from an original CO₂-rich fluid, including changes of T, P, pH, and Eh, but the dissociation of the uranyl carbonate complex as a result of pressure release and CO₂ effervescence from the fluid is considered to have been a key factor in many deposits. In the proposed model, episodic crustal extension, mantle magmatism, and release of CO₂ controlled episodic uranium mineralization.

Regions lacking uranium-rich source rocks, even those with well-developed extensional structures, do not host economically significant uranium deposits, as evident in Northeast China. The Proterozoic basement in South China is relatively uranium rich and appears to have been important in uranium enrichment of various rocks in the region, especially in the Cathaysia block. On the other hand, the Archean and Proterozoic basement in Northeast China is relatively uranium poor.

Hydrothermal uranium deposits in South China are Cretaceous to Tertiary in age and coincident with a period of regional crustal extension. CO₂-rich fluids scavenged the uranium from pre-existing uranium-rich granites, volcanic rocks, and sedimentary rocks and redeposited it in faults and fractures in a variety of host rocks to form vein-type uranium deposits. The CO₂ in the ore-forming fluids was likely derived dominantly from the mantle and/or from mantle-derived mafic magmas, although the water in the fluids was meteoric in origin. Mantle degassing CO₂ is believed to have been essential for the formation of uranium deposits in South China and is linked to the episodic crustal extension in the Cretaceous-Tertiary.

Rheinberger and others (1998) also considered that the primary conduits for the uranium-bearing fluids were the major north-east structures such as the Redtree dyke zone. They considered that the migration of the uranium-bearing fluids away from the structures was controlled mainly by the porosity of the sediments and uranium was precipitated adjacent to mafic rocks when oxidising ground waters were reduced by reaction with Fe³⁺ in solution [rather than dissolution and movement of uranium as carbonate complexes]. Hematite also formed during the reactions. What they did not adequately elaborate on was what the primary source of the uranium was and where it was at the time of dyke intrusion and why it was remobilized only locally at some sites.

### 3.3 Applicability of Mafic Dyke Model in Westmoreland Setting

Drilling and ground exploration in the Westmoreland Uranium Field show a close spatial relationship between mafic dykes or sills and highest grades of uranium within the upper units of the Westmoreland Conglomerate unit. Examples of this from the Queensland section of Westmoreland are shown in the Figures 15 and 16 below.

It should be remembered that sites or palaeochannels lacking uranium-bearing source rocks or those with uranium but some distance away from faults hosting a mafic dyke will not undergo significant enrichment of uranium by this model. Likewise palaeochannels that are uranium bearing but impermeable rather than being an open aquifer cannot interact with fluids and gasses derived from an intrusive mafic dyke so will not be upgraded or undergo alteration. (See Figure 23).

There are uranium occurrences that are not related to mafic dykes and these are considered later.

At Redtree, for example, mineralisation appears to be locally offset along a transecting fault on either side of a dyke indicating post mineralisation movement or a pebble to sandy palaeochannel containing uranium has changed direction in the vicinity of the fault prior to the intrusion of the mafic dyke. This is shown in Figure 17. There are often a series of dykes locally cutting the general Westmoreland sequence, some have chilled margins showing no reaction with the Westmoreland rocks, others show minor haematisation of the contact sediments, while a few have well developed reaction halos suggesting intersection of the dyke with a porous aquifer. These can be related to uranium enrichment.
Figure 15: Location of major uranium occurrences in the Queensland section of the Westmoreland Uranium Field associated with intrusive mafic dykes (Redtree Dyke to west) and sills (Outcamp-Long Pocket area to northeast).

Figure 16: Schematic cross section showing relationship of mafic dykes and styles of uranium mineralisation. The uranium sitting at the unconformity position between the Ségal volcanics and Westmoreland Conglomerates is not related to mafic dyke intrusion.

The thicker channels probably occupied the deepest sections of the fault-bound graben aligned along the northern boundary of the uplifting Murphy Inlier and likely coincided with the trace of the normal faults up which the dykes intruded during extension. Remobilisation of uranium related to dyke intrusion also explains the unusual depletion of uranium about the dyke boundaries often also coincident with the deeper sections of fluvial channels in which the uranium mineralisation might have concentrated during the “original” sedimentation event.
Figure 17: The Redtree-Huaraabago mineralisation appears to be either offset along the fault or a host palaeochannel bends or cuts obliquely across the fault. The zoned Garee and Jack Lens are hosted in Westmoreland sediments, the Namalangi Lens is vertical and largely secondary.

Figure 18: Example of alteration at Redtree occurrence. The mineralogy is characteristic of that associated with the Chinese mafic dyke occurrences (quartz-chlorite-lilitte-pyrite). Pyrite is a very effective precipitant for uranium. Calcite is also reported as an associated mineral.

The Junnagunna occurrence is similar in character to the Redtree-Huaraabago deposit illustrated above in that high uranium grades relate to the position of the dyke zone and could be confined to a palaeochannel trending NNE - S and SSW. (See Figure 19).
Figure 19: Distribution of uranium at the Junnagunna occurrence.

Of note is the description of the Moogooma occurrence south west of Rectree which is hosted within a conglomerate channel in the upper Westmoreland sequences (Ptw3).

MOOGOOMA

The Moogooma mineralisation is 5 km SW of Rectree along the Rectree dyke zone (Fig 2) and is present up to 500 m west of this zone. The mineralisation is associated with a 2-3 m thick conglomerate bed, stratigraphically close to the top of the Ptw3 unit of the Westmoreland Conglomerate.

Data from drill holes and trenches by QMI in the 1960s have been lost and only very limited data are available for this prospect.

The distribution of deposits in the south western, Northern Territory, section of the Westmoreland Uranium Field, is shown in the Figure 20. This can be divided into two main zones shown boxed in the figure. In the eastern Magerra Zone, occurrences are disposed along the strike of the NE Westmoreland Dyke Zone. In the western El Husseyn Zone mineralisation is disposed along the exposed anticlinally folded contact zone of the Westmoreland Conglomerate and unconformably overlying Seigal Volcanics generally coincident with exposure of a uraniumiferous (Magerra) siltstone unit or faults cutting that unit (See Figure 13). In this regard the setting in the El Husseyn zone differs from other occurrences, lacking dyke rocks, with the possible exception of the Cobar II occurrence.
Figure 20: Location of deposits in the Westmoreland Uranium Field.

Figure 21: Relationship of Newmont drilling to the NE Westmoreland Dyke Zone in the Lagoon Creek Area. Green is Seigal Volcanics. (See Figures 34-37 for sections).
Figure 22: Drilling at El Hussen South Prospect across the faulted contact between the Westmoreland Conglomerate (brown patterned) and Selgal Volcanics (green) (refer Figures 9 and 12 for examples). The intervening Magerra Sltstone at the unconformity is considered here as part of the basal Selgal Volcanic unit which is a plausible interpretation. (See Figure 33 for section).

Figure 23: Examples of dyke-sediment contacts in drill core. Upper left, no dyke (El Hussen); upper right two dykes but unreactive unaltered contact, no radioactive response; lower hematised sediment and vesicular dyke rock with some weak radiometric anomalis in split sandstone core (Junnguruma).
3.4 Uranium at an Unconformity or Exposed Surfaces

At the other end of the spectrum of possible mechanisms for uranium enrichment is simple near surface dissolution of ‘primary’ and re-precipitation of secondary uranium minerals due to surface weathering over time (since Proterozoic). This dissolution and precipitation would have occurred along bedding planes, shears, joints, faults and thrust surfaces. This type of occurrence is readily seen today in radiometrics or radon surveys and is widespread, for example, in the El Hussen Zone. It also includes local upgrading and mobilisation of uranium in occurrences associated with intrusive dykes (Ractree etc.) where weathering and erosion of the dyke rocks along the fault zones has exposed uranium to oxidation and leaching. This process requires circulation of oxidised groundwater through reduced uranium source rocks. (See Figure 12).

There is extensive uranium anomalism recognised in the Magerra and El Hussen areas that is associated with a generally thin sequence of locally carbonate bearing siltstones that are sandwiched between the Westmoreland Conglomerate and unconformably overlying Seigal Volcanics. This Unit, informally called the Magerra Siltstone (Kraton), likely represents material accumulated in depressions or broad shallow lakes or similar developed on the eroded upper surface of the Westmoreland Conglomerate. Modern analogues of this would be playa environments, calcareous soils or black soil plains or depressions where evaporative processes are significant. Some of the material may be derived from early Seigal Volcanics eruption.

Uranium is likely to have accumulated in these depressions from ground water from regional from regional source rocks by evaporative concentration. The silts have been subsequently preserved and at least locally “cooked” by the basal flows of the Seigal Volcanics. (See Figure 24). Where faulting has exposed these siltstones at the surface or oxidised ground water can access the unit uranium has been locally enriched (Figure 13).

In the case of the Cobar II occurrence a dyke or the basalts may have extensively reacted with this unit (perhaps a zone of wet uranium bearing sediments or shallow lake environment) to generate a fault or vein hosted zone with uranium within a basaltic flow close the surface. This case may be hard to follow up regionally.

![Image](image.png)

Figure 24: Examples of siltstone at and beneath Seigal Volcanic contact. Left photo shows fusion of sediment (porcellanite); right unbaked and partially baked.

The last stages of deposition in the Westmoreland Trough probably reflect a waning of tectonic uplift and rapid erosion of the Murphy Inlier and a quieter depositional environment more amenable to the accumulation of uranium across a more stable landscape. It may reflect a switch from extensional to compressive tectonism.
4. DELINEATION OF URANIUM MINERALISATION IN LAGOON CREEK LICENCE

4.1 General Considerations
In consideration of where economic resources of uranium might lie in the Lagoon Creek Licence thought should be given to the following:

- Are there and if so where are the critical Westmoreland host facies containing uranium.
- What uranium upgrading mechanisms might have operated such as roll fronts, playa or evaporative accumulation or dyke induced hydrothermal processes.
- Is there evidence of intrusive dykes, for example, in magnetic data or by topographic expression.
- Is there any evidence of a radiometric or geochemical expression in the licence that might relate to a facies hosted model.
- What evidence is there for structures cutting through the Westmoreland sequence that may give rise to secondary recent redox targets or radon leakage zones.

4.2 Facies Models
Facies models for the area are limited [Figure 4, 5 and 25] but available mapping and drilling suggest that the Lagoon Creek Licence can be broadly divided into two areas that potentially contain different styles of uranium host. To the west and incorporating the bulk of the licence are broad areas of fluvial deposits dominated largely by medium to coarse sand grading to silt, perhaps somewhat distal from source areas (Ptw1) that underlie directly or shallowly beneath Seigal Volcanics. To the east, immediately south of the Magerra area there is scope for channel hosted uranium resources with or without associated dykes (Ptw1). The Magerra area itself may be a hybrid setting between both types.

The requirement of a facies controlled model is you need evidence of discrete channels hosting porous coarse sand, grit and pebbles, low in clays and silt that connect with proximal source areas. (See Figure 11). Summary maps used as a source of geological information do not adequately represent facies distribution present. It is also not clear that if there were any such channel facies present whether they could have been persistent porous aquifers from the time of deposition until dyke intrusion or roll front action operated. The sediment type is not common in the wiser area at stratigraphic intervals near to the Seigal Volcanic unconformity where inter-fingerling with fine sand, silt or clay could downgrade the potential as uranium would likely have been dispersed or be incorporated into the clays etc., and less amenable to secondary reconsolentiation. Prospects more proximal to source, such as Redtree and Jannagunna, appear to be associated with coarser well channelled horizons some 300-500 metres across. (See Figures 17 and 19).

The possibility of roll front enrichment in coarse sediment channel deposits cannot be excluded however, so this is a possible mechanism that may operate and really only requires a suitable uranium bearing source facies to operate, either in the past [Proterozoic/Palaeozoic, or up to Recent times with appropriate uplift and retained porosity in the rocks. The most likely area for this to occur is in the fault bound slivers of Westmoreland Conglomerate with Cliffdale Volcanics to the south of the Magerra occurrence coincident with Ptw1/Westmoreland facies. Evidence for this or upgrade through weathering might be seen in the JV area in the south eastern section of the Lagoon Creek EL where the uranium radiometric channel anomaly is best developed. The discovery of a roll front occurrence is likely to be quite difficult. Examples of the environment and anomaly associated with Ptw1 facies are given in Figures 25-28 at sites labelled Conglo, L1, L3, L4 with L2 possibly associated with the Cliffdale Volcanics. These attractive channel environment target zones extend into the Aboriginal Land claim area to the immediate south and also include dolerite dykes.
Figure 25: Detailed geology map of Lagoon Creek licence. At least this level of detail is required to define potential host sedimentary channel environments proximal to source. Red dots U; blue dots Cu, Pb or Sn; green dashed lines dolerite. Arrowed are Ptsw zones of interest. (See Figure 10 top right).

Figure 26: U/Th ratio radiometric anomalies over geology. Note association of anomalous with Ptsw, facies in southwestern section of licence and locally in Ptsw. Some anomalous is also related to Clifdale Volcanics.
The central parts of the Licence area have not been tested by stratigraphic drilling due to a lack of geochemistry or radiometrics and access but this does not exclude the possibility of suitable host facies being present, although distance from source may be a consideration. Against this one might hope that there would be some “local” elevation of uranium radiometric signature at the surface to indicate an enriched source within a channel at depth within the Westmoreland group rocks. What is of note is that there is a slight general elevation in some sections of the central (more featureless) part of the licence relative to other sections but the data needs to be reimagined to remove higher peripheral values to exaggerate features in the central section that may be demonstrating channels within the Westmoreland rocks at depth. (See Figure 29). Alternatively the effect may be due to superficial features.

The reality is that it is only likely that speculative stratigraphic drilling is likely to intersect favourable uranium bearing channels but their locations might be based on inferences of where these might be by extrapolation of the axis to Westmoreland deposition and location of recognised deposits. The Lagoon Creek Licence is down drainage from the inferred source rocks into the depositional basin so more remote from the source areas than the established deposits. Outcropping sources such as Eva or similar might suggest that a new sediment deposit might occur to the west further down the Westmoreland palaeodrainage basin or in more recent sediment bodies but this is out of the joint venture area. Logging the stratigraphy in drill holes about known occurrences will assist in...
understanding the detail of the controls. What is clear is that not all dykes have a uranium association (depletion or enrichment) but those channels with uranium present do become enriched away from the dyke margin and depleted adjacent to the dyke. So assessing the form of the channels with uranium, their spatial distribution and position in the stratigraphy would be instructive.

Figure 29: Possible subtle expression in uranium channel radiometrics of a link between Conglo site and Debbill area (see Figures 27 and 31). Note low zone immediately north of dotted trace. The character of the anomaly needs to be determined in the field.

4.3 Intrusive Mafic Dykes

The dykes associated with uranium occurrences (e.g. Redtree Dyke, Figure 28) do not have a particularly prominent magnetic signature largely due to their relatively thin nature. They are more obvious from their pronounced negative topographic relief due to differential weathering of them relative to the more resistive sandstones and conglomerates of the Westmoreland units. This negative relief is also significant in effecting channelling of rain and surface water into the dyke zones where uranium may be remobilised and re-precipitated as secondary mineralisation. There is little evidence from magnetics and structurally controlled negative relief suggestive of intrusive dykes across most of the Lagoon Creek Licence except about the Magerra and Cobar II area. Some are mapped south of the Magerra area.

Figure 30: View to NE along Redtree dyke from Garee lens (See Figure 17).

The role of the dykes seems critical to the high grading of uranium and this is particularly so at sites such as at Magerra where stratiform mineralisation at or near the unconformity has been high graded about dyke margins. Where this event is lacking the grade remains anomalous but low. Similarly the
proximity of the unconformity siltstone to basalt flows may have locally upgraded the uranium in some locations. It could be that Cobar II deposit is a variant of this style.

Reprocessing of available detailed magnetic data using first and second derivative algorithms to accentuate rapid gradient change from shallow sources that might be anticipated from the dykes may help highlight their location. This may also help accentuate structural elements in the licence that might provide targets for more site specific soil sampling.

4.4 Geochemical Sampling

Stream sediment sampling at a density of 1 sample per 1-2 square kilometres has been used across the licence. Uranium values are shown in Figure 31 over a summary geology map. Elevated values correspond closely with geology and recognised zones with known uranium for the most part, for example, higher values over the Cliffside Volcanics and highest values over the Magerra zone. This demonstrates that geochemistry works satisfactorily in the environment. Of note is that a small number of moderately elevated values associate with the trace of a possible uranium channel between the Conglo anomaly and the Debbill Zone (circled and Figure 29). There is a single high value over Ptω2 outcrop in the SE corner of the licence that needs explanation by field follow up.

![Image of Figure 31: Summary of uranium stream sediment geochemistry over geology. The trace of a possible uranium channel from the Conglo anomaly to Debbill Zone (circled) inferred from U radiometrics data is shown as red dots. (See Figure 29).](image)

Stream sediment uranium values would be expected to be low in a tropical setting with wide redistribution by groundwater. Follow up soil sampling around catchment areas with anomalous streams and the trace of elevated radiometric anomalous is likely to be more productive than more detailed stream sampling and produce more definitive sites of anomaly source. Radiometrics will also assist in the resolution of anomaly source. It will be necessary to differentiate samples with high Th or rare earth elements that may relate to heavy mineral accumulation within the sedimentary
package derived from granites, (zircon, monazite, etc.) from those that are likely uranium only
anomalies derived by leaching of labile uranium.

The trace of the path from the Conglo site to the Debbill zone is controlled by topography and also
seemingly by lithotype as shown in the Landsat image in Figure 32.

Figure 32: Location of Lagoon Creek licence over Landsat Image. Also shown are mineral occurrences as
dots, Red dots U; blue dots Cu, Pb or Sn; and dolerites as green dashed lines.

4.5 Uranium Distribution in Drill Sections

Drill sections from the Magerra area and El Hussen show some notable differences in two key
features:

- Thickness of the Magerra Siltstone unit and its uranium content
- Inferred faulting and dyke intrusion and uranium hosted in palaeochannels

The thinness of the Magerra Siltstone unit in the El Hussen area and its relatively low uranium
content suggest that it is marginal to the main depositional basin into which the siltstone was
deposited. The thicker Magerra units appear to occur further to the east closer to the inferred axis
of the Westmoreland Trough and to sources of uranium. This supports the notion of the siltstone
accumulating within a lake or similar basinial depression along with uranium during the period the
unconformity position was exposed at the surface prior to the eruption of the Seigal Volcanics onto
the unconformity surface.

The Magerra Siltstone in the El Hussen section of the Lagoon Creek Licence does not appear to have
been significantly faulted other than by late large scale regional thrusts, anticlinal folding and
northwest-southeast cross faults (Calvert Fault, Namalangi Fault etc.) that have affected all the
sequence of units in the area and appears to lack evidence of dyke intrusion. Consequently there is
unlikely to be significant upgrading of uranium from the relatively thin siltstone units and limited
resource potential.
This contrasts with the sections drilled by Newman in the Magerra zone where the silstone units are thicker, seem to contain more uranium and are faulted in proximity to dykes intruded along the axis of the more Westmoreland Trough (Tir Hole Hinge Line) more proximal to source areas. The dyke intrusion and faulting event predates the more regional structural events that are prominent in the El Hussen area and are oriented northeast to south west parallel to the margins of the Murphy Inlier.

The Magerra drill sections show elevated uranium deeper into the Westmoreland sediment package suggesting that there may be uranium in palaeochannel units beneath the unconformity (Maggare Silstone level) and that these have locally been enriched in the vicinity of dykes. A mix of these two settings gives rise to the so called hybrid style of uranium in the drilling such as noted at Redtree.

Attention to the stratigraphic position and sediment characteristics in drill logging may help determine the key controls on primary uranium distribution and redistribution in the vicinity of dyke rocks.

Some of these features are illustrated in Figures 33 to 37.

Figure 33: El Hussen Section 1 showing relationship of uranium anomaliy to stratigraphy. Note thinness of Magerra unit, lack of faulting or evidence of dyke rocks.
Figure 34: Magerra Zone Section 4175mE. Note dislocation of thicker Magerra unit and inferred dyke location.

Figure 35: Magerra Zone Section 4550mE. Note thicker Magerra unit, inferred dyke location in fault zone and possible palaeochannel hosted uranium at depth (or hybrid mineralisation).
Figure 36: Magerra Zone Section 5400mE. Note two zones of dislocation of Magerra unit, inference of two dykes and hybrid or palaeochannel uranium.

Figure 37: Magerra Zone Section 5725mE. Note dislocation of Magerra unit but little high grade uranium as might be expected with presence of a dyke.
5. CONSIDERATIONS FOR ONGOING EXPLORATION

There are three aspects that need clarification in order to define the significance of the stratigraphic and sedimentary control on the primary reduced uranium distribution within the Westmoreland sequences, at the unconformity and understanding of the dyke host rock contact relationship. Primary in this case does not refer to the primary source rocks (Cliffdale Volcanics, Nicholson Suite etc.) but the reduced uranium specifically hosted within the Westmoreland sequences and at the unconformity position which has been subsequently remobilised by intrusive dykes and circulation of oxidised ground water in faults and shears producing secondary enrichments, at or close to, the present surface.

The features are:

- The characteristics of the sedimentary (palaeochannel) facies which are uraniferous and where these sit in the stratigraphy. This may applicable regionally.
- The nature of the (Magerra) unconformity hosted mineralisation and depositional character of the unit. Determination of its provenance and depositional character may be critical to localisation of all the potentially economic mineralisation in the Westmoreland area.
- The alteration and physical character of dyke-Westmoreland Conglomerate contacts. This would determine the significance of hydrothermal remobilisation of uranium as a process and development of economic grade uranium.

These can be best determined by relogging of available drill core with an emphasis of objective determining of the various attributes on section lines through the mineralisation.

Although access is difficult field mapping and sampling is suggested in the area about the Conglo and L1 to L4 anomalies and in the areas of Pt2 in the south eastern section of the Lagoon Creek Licence (Figure 27 and 32). An assessment of the drainage line and geology incorporating the low order uranium radiometric anomalism extending from Conglo to the Debbill area should be undertaken (Figures 29, 31 and 32). While some of this anomalism may be related to lateritic Fe-stone within the drainage system from the Conglo area the possibility that it is derived from palaeochannel host sources should not be excluded. Areas of anomalism in the SE corner of the licence may be sourced from Cliffdale Volcanics so the possibility of primary volcanic hosts (Eva style) should also be considered.

Soil sampling is recommended as the primary method of sampling at this time as it is more definitive and should highlight anomalism better than increasing stream sample density. Generally reconnaissance traversing is effective in this case. For this a traverse approximately one quarter to one third of the way up a slope out of the drainage line (break of slope top of lower talus) is sampled as a contour traverse. This effectively samples material shed down slope from with a specific section of a catchment and gives direct anomaly targeting. It can be considered to be a variant of ridge and spur sampling which is not really applicable to stratabound targets which may be down slope of ridges.

At this stage other than a reassessment of drill core or cuttings no additional work is suggested for the El Hussen Zone. Reassessment may produce new information that could suggest other work but emphasis should be on the Magerra Zone and to the south along the trend of the Tir Iole Hinge Line where dykes are localised.
6. CONCLUSIONS AND RECOMMENDATIONS

It is concluded that the distribution and grade of uranium mineralisation in the Lagoon Creek Licence is controlled by a number of different factors which include:

- Concentrations within fluvial palaeochannels in various units of the Westmoreland Conglomerates derived from weathering of basement lithologies.
- Concentrations in finely bedded siltstones at the unconformity between the Seigal Volcanics and the Westmoreland Conglomerate possibly in lake or shallow soil filled ephemeral depressions. This style is widespread.
- Remobilised within sedimentary hosts by hydrothermal reactions in zones marginal to intrusive mafic dykes aligned along the northern and north western margin of the Murphy Inlier. This style has produced the highest grade intersections in drilling and hybrid styles from the other settings given above.
- Superficial precipitation of secondary uranium minerals from groundwater within faults, shears, joints and breccia. Uranium is derived from leaching reduced uranium at depth from all types of uranium outlined above. This has given rise to widespread low grade superficial anomalous but is only locally economically significant about dykes.

There is a case for undertaking a reassessment of available drill core or cuttings to re-evaluate the geological and mineralogical controls on mineralisation as the models for these are not conclusively defined. This should be undertaken prior to new field work to assist in developing a satisfactory field model for exploration.

It is further concluded that there are areas within the Licence that have had inadequate follow up exploration that merit additional work to assess the potential for mineralisation.

It is recommended that:

- A program of reassessment of drill core and cuttings from the licence is undertaken, including where possible examples of mineralisation from the Redtree and Jumaguruna areas held by Laramie for comparative purposes. In this regard drilling from the Magerra area is important. The objective is to better understand the controls on uranium mineralisation and its re-distribution.
- A program of field assessment of low order uranium radiometric anomaly and palaeochannel facies supported by soil sampling is undertaken in the south eastern portion of the licence.
- Work in the El Hussen area should be considered as low priority unless studies from drill core and cuttings reveal a new model for uranium in that area.
APPENDIX 1

APPENDIX 2 – EXPENDITURE REPORT