



**Cameco Australia Pty Ltd**

**EL 10176 and EL 24371**

**NABARLEK PROJECT**

**NORTHERN TERRITORY**

**ANNUAL REPORT**

**CONFIDENTIAL**

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## SUMMARY

Nabarlek Project is a uranium exploration project covering exploration licences (EL's) 10176 and 24371 for a total area of 383.8 km<sup>2</sup> and located approximately 250 km east of Darwin. Cameco Australia Pty Ltd (Cameco) was granted the tenements on 1<sup>st</sup> September 2004.

In early December 2006 a Joint Venture agreement was signed between Cameco (60 % and operator) and Uranium Equities Limited (40 %) to conduct exploration for uranium on the Nabarlek Project.

The exploration program for 2009 included drilling of 417 aircore (AC) holes for 7,617 m, airborne radiometric and magnetic surveys at N84 for 910 line kilometres and N23 for 498 line kilometres, and a Sub Audio Magnetic (SAM) survey within a one kilometer square area for 30.62 line kilometers at N147; and regional sampling and reconnaissance with 32 outcrop samples and 14 mapping locations.

AC drilling was focussed on follow up of geochemical and radiometric anomalies, and favourable structural settings to test for geochemical and alteration vectors within the transported cover, regolith and bottom of hole lithologies which may indicate potential for uranium mineralisation.

The drilling in the Coopers area intersected uranium mineralisation within Oenpelli Dolerite with NAA7130 returning a best intersect of 1 m at 0.198 % U<sub>3</sub>O<sub>8</sub> and with several other holes in the area returning highly anomalous uranium. Four AC holes define a northeast trend to the mineralisation which extends over approximately 200 m and is coincident with an interpreted northeast trending structure. The proximity of the Tip fault and other structures in the area together with the widespread uranium anomalies in the AC drilling indicates that the Coopers area is highly prospective for uranium mineralisation.

Drilling along the Gabo Fault identified an area of anomalous uranium (up to 21.8 ppm U<sub>3</sub>O<sub>8</sub> in NAA7035) within sandstone and dolerite proximal to an interpreted cross-cutting structure.

The results from AC drilling at N84 and U40 / U42 were largely disappointing and did not return any results above expected background uranium values.

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## **INTRODUCTION**

Nabarlek is a uranium exploration project covering exploration licences EL10176 and 24371. The project is managed and operated by Cameco Australia Pty Ltd (Cameco) in joint venture (JV) with Uranium Equities Limited (UEL). This report details exploration work completed by the JV during the sixth year of tenure.

The exploration objective of the project is to discover economic uranium mineralization within a geological setting similar to the known deposits of the Alligator Rivers region of the Northern Territory, and the concealed high-grade deposits of the Athabasca region of Saskatchewan in Canada.

### **Tenure**

The Nabarlek project originally comprised ELs 10176, 24371 and 24372, which were granted on 1<sup>st</sup> September 2004 for an initial period of six years. The original area of grant was 423 km<sup>2</sup>. Non-consent areas were excluded from the Exploration Licences at the time of grant.

EL 24372 was surrendered in September 2008, and the project now consists of the two remaining EL's 10176 and 24371 for a total area of 383.8 km<sup>2</sup>.

On 31<sup>st</sup> August 2008, 9 blocks for 25.2 km<sup>2</sup>, of the original 134 blocks, was relinquished from EL10176. No other relinquishments have been made on the licenses.

A waiver from relinquishment was approved by the Department of Resources – Mines and Energy, on 11<sup>th</sup> August 2009, to retain the full area of both EL10176 and 24371.

In early December 2006 a Joint Venture agreement was signed between Cameco and Uranium Equities Limited (UEL). Under the terms of the agreement, UEL would earn 40% interest in Nabarlek and the adjacent Namarrkon project (EL23700) if expenditure obligations are met. In June 2008, UEL attained equity and earned 40% stake in the Nabarlek project, and Cameco will continue to operate and manage the project.

The proposed exploration work for 2009 was presented to the Traditional Owners and Northern Land Council (NLC) at the Work Program Meeting held on 12<sup>th</sup> May 2009 at Oenpelli. Permission to conduct the program was given by the NLC on behalf of the Traditional Owners.

### **Location and Access**

The Nabarlek project is located in the western part of Arnhem Land, entirely within Aboriginal Land (refer Figure 1). The project is approximately 50 km east-northeast of Jabiru and is centred on the Nabarlek mine site. Darwin is located approximately 250 km to the west.

The tenements are located on the 1:250 000 map sheets of Alligator Rivers (SD-5301) and Milingimbi (SD-5302), and the Oenpelli (5573) and Goomadeer (5673) 1:100 000 map sheets.

## Figure 1: Project Location Map

The exploration work for 2009 was based out of Cameco's Myra camp. Access from Darwin is via the sealed Arnhem Highway to the Oenpelli road turnoff and then north-east along the Oenpelli-Maningrida road past Oenpelli to the Nabarlek road. Access to Myra Camp is via a track just west of the Nabarlek mine site.

Access within the project is variable and dependent upon topography. In general, most of the country is flat lying with low hills and can be traversed by four-wheel drive during the dry season. Heavily dissected sandstone escarpments of the Spencer Ranges are best traversed by foot and accessed by helicopter. Several pre-existing tracks in variable condition cut north-south and east-west across the tenement.

Work is undertaken in the area under the terms of the consent documentation agreed upon with the Northern Land Council on behalf of the Traditional Owners, pursuant to the Aboriginal Land Rights Act of the Northern Territory legislation.

### Physiography

The tenements contain several outliers of dissected sandstone plateau of the Spencer Range, which forms the eastern extension of the Oenpelli Massif. The remainder of the project consists of gently undulating sandy plains covered by open woodland with patches of open grassland and low shrub. Thin remnants of weathered and lateritised flat-lying Cretaceous sediments form tablelands in the northeastern portion.

The main drainage systems are Birraduk Creek and Cooper Creek, which flow to the northwest.

## REGIONAL GEOLOGY

The Nabarlek project area is located within the eastern margin of the Neoproterozoic Pine Creek Orogen, and is in the, in a region that has been subdivided into the Nimbuwah Domain of the Alligator Rivers region (Refer [Figure 2](#)).

### Figure 2: Simplified geology of the Pine Creek Orogen showing the location of selected mineral deposits

This section is largely based on the work by Needham (Needham, 1988; Needham and De Ross, 1990; Needham et al., 1983), and Needham and Stuart-Smith (1980). Information that is not based on these references is indicated below.

The Bureau of Mineral Resources (now Geoscience Australia) completed 1:250 000-scale geological maps of the Pine Creek Orogen between the 1940s and 1960s following the discovery of uranium at Rum Jungle. The Alligator Rivers region was systematically mapped by the Bureau of Mineral Resources and the Northern Territory Geological Survey between 1972 and 1983. This later work produced 1:100 000-scale geological maps and reports for the region from Darwin to Katherine to the Alligator Rivers region.

### Figure 3: AGSO Pine Creek Orogen 1:500,000 Geology

The oldest exposed rocks in the Alligator Rivers region are within the Neo-Archaeon (ca. 2500 Ma) Nanambu Complex. The complex consists of paragneiss, orthogneiss, migmatite, and schist forming domical structures that are unconformably overlain by Palaeoproterozoic metasedimentary and metavolcanic rocks, which were formerly included in the Pine Creek Geosyncline. Recent collaborative research work by the Northern Territory Geological Survey (NTGS) and Geoscience Australia (GA) indicates that SHRIMP U-Pb age dating of an area of previously mapped Myra Falls Metamorphics outcropping within the Myra Inlier is Neo-Archaeon in age (Hollis et al., 2009a). This quartzofeldspathic gneiss is now referred to as the 'Kukulak Gneiss' (Hollis et al., 2009b).

Palaeoproterozoic rocks in the Alligator Rivers region are amphibolite facies psammites assigned in the Mount Howship Gneiss and the Kudjumarndi Quartzite. These formations are included in the Kakadu Group and are probably correlatives of the Mount Basedow Gneiss and Munmarlary Quartzite, respectively (Ferenczi et al., 2005). The group appears to onlap Neoproterozoic basement highs, with gneissic variants thought to pass transitionally into paragneiss of the Nanambu Complex.

The Cahill Formation of the Namoon Group conformably overlies the Kudjumarndi Quartzite. The lower part of the Cahill Formation (informally referred to as the Lower Cahill Formation) hosts the Nabarlek, Ranger and Jabiluka uranium deposits. The Lower Cahill Formation consists of a structurally lower calcareous marble and calc-silicate gneiss, which is overlain by pyritic, garnetiferous and carbonaceous schist, quartz-feldspar-mica gneiss, and minor proportions of amphibolite.

The informally named Upper Cahill Formation is psammitic and consists of feldspar-quartz schist, quartzite, lesser proportions of mica-feldspar-quartz-magnetite schist, and minor proportions of metaconglomerate and amphibolite. The Upper Cahill Formation is magnetic and significantly so at the base of psammitic unit in what is informally known as 'hanging wall sequence'. The magnetic characteristic of this unit is due to the presence of mafic sills or magnetite and it is a useful characteristic used to distinguishing the Cahill Formation from surrounding less magnetic rocks (Kendall, 1990). Mafic sills and dykes assigned to the Goodparla and Zamu Dolerites intruded the Cahill Formation prior to metamorphism.

The Nourlangie Schist overlies the Cahill Formation and consists of argillaceous to quartzose phyllite and quartz-mica schist that locally contain garnet and staurolite.

The supercrustal rocks of the region are structurally complex, having been affected by at least three deformation event before deposition of the late Palaeo- to Mesoproterozoic Kombolgie Subgroup (Thomas, 2002). The rocks have also been locally migmatized during the ca. 1847-30 Ma Nimbuwah Event. In addition, there is a broad trend of increasing grade from southwest to northeast in the Nimbuwah Domain. This gradient is thought to reflect the synchronous emplacement of ca. 1865 Ma granites in the Nimbuwah Complex.

The Kombolgie Subgroup is the basal unit of the late Palaeo- to Mesoproterozoic Katherine River Group of the McArthur Basin (Sweet et al., 1999a; Sweet et al., 1999b). The subgroup consists of sandstone units called the Mamadawerre Sandstone, Gumarrirrbang Sandstone, and Marlgowa Sandstone, which are divided by thin basaltic units called the Nungbalgarri Volcanics, and Gilruth Volcanics. The Mamadawerre Sandstone has a minimum age of ca. 1700 Ma, which is the minimum age of the intrusive Oenpelli Dolerite. Detrital zircon

SHRIMP data from the GA OZCRON database constrain the maximum age of the sandstone at ca. 1810 Ma.

The Oenpelli Dolerite is the most pervasive mafic intrusive suite to affect the Alligator Rivers region and is the youngest Proterozoic rock unit exposed. It intrudes various Neo-Archaeon , Palaeoproterozoic, and the Kombolgie Subgroup units, forming magnetic sills, dykes, lopoliths, and laccoliths. The Oenpelli Dolerite has a SHRIMP U-Pb baddeleyite date of  $1723 \pm 6$  Ma (Ferenczi et al., 2005). Geochemical and geophysical data suggests several phases of intrusion throughout the region. These intrusive events had a pronounced thermal effect within the Kombolgie Subgroup, with the promotion of fluid flow and aquifer or aquitard modification. Localised effects in the sandstone include silicification, desilicification, chloritisation, sericitisation, and pyrophyllite alteration. A characteristic mineral assemblage of prehnite-pumpellyite-epidote has formed in the quartzofeldspathic basement rocks adjacent to the intrusions.

Deformation since deposition of the Katherine River Group includes transpressional movement along steep regional-scale strike-slip faults and possibly some shallow thrusting. These regional faults follow a pattern of predominantly north, northwest, and northeast strikes, giving rise to the characteristic linearly dissected landform pattern of the Kombolgie Plateau. Another significant structural trend strikes east – west which includes both the Ranger and Beatrice Faults.

The Bulman Fault Zone is a principal regional feature and is considered to represent a long-lived deep crustal structure. However, it appears that post-Kombolgie displacements along this and other faults have not been great, because the Arnhem Land Plateau is essentially coherent and offsets along lineaments are generally minor. Field investigations of many interpreted ‘faults’, including those with a marked geomorphic expression, show no displacement, and are best described as joints or lineaments (Thomas, 2002).

Erosional remnants of flat-lying Palaeozoic Arafura Basin and Cretaceous Carpentaria Basin are present as a veneer throughout the coastal zone of the Top End. Various regolith components are ubiquitous as cover throughout much of the region.

### **Tenement Geology**

The Nabarlek project area is located to the north of the Myra Inlier and shares much of the same local geology. The project is half overlain by outcropping Mamadawerre Sandstone, forming the sandstone escarpments and dissected plateaux of the Spencer Ranges. In lowland areas, where the Mamadawerre Sandstone has been eroded off, the underlying metamorphic basement rocks or intrusive Oenpelli Dolerite are largely obscured by sandy colluvium or are heavily lateritised. Refer to Figure 4 for the local geology map, Figure 5 for an interpreted basement geology map, and refer to Figure 6 for the stratigraphy of the geological units of the Myra Inlier as determined from mapping and drilling.

Figure 4: Local 1:100,000 Geology, modified after NTGS Mapping

Figure 5: Interpreted Solid Geology Map

Figure 6: Stratigraphy of the Myra Inlier determined from diamond drilling



The Cahill Formation is the oldest unit within the Nabarlek project and generally forms scattered rubbly scree on low hills, or is below sand cover through much of the central portion on the project area.

The Cahill Formation is intruded by the Zamu Dolerite, the Nimbuwah Complex suite of granitoids, the Nabarlek Granite, the Tin Camp Granite, the Oenpelli Dolerite, and the Maningkorri Phonolite (listed in decreasing age). Amphibolite in the basement is commonly observed in drill holes in the project area, and is assigned to the Zamu Dolerite.

The unconformity between the Mamadawerre Sandstone and underlying rocks is sharp and generally flat-lying, although localised channels cut underlying rocks. Such channels tend to be filled with pebble to cobble conglomerate unit consisting of rounded to sub-rounded quartz pebbles, cobbles and rare boulders, quartzite, and rare clasts of schist and gneiss.

## **EXPLORATION TARGET**

The focus of exploration in the Nabarlek Project area is the discovery of unconformity-style uranium deposits. The prospective nature of the Alligator Rivers region is demonstrated by the presence of economic uranium occurrences at Ranger, Jabiluka, Koongarra and Nabarlek. In addition, significant gold, platinum and palladium resources are present at existing uranium occurrences in the Alligator Rivers Uranium Field (Ranger, Jabiluka, Koongarra and Coronation Hill/South Alligator Valley-style deposits) suggesting that economic Au and PGE (Platinum Group Element) mineralisation, associated with economic or sub-economic uranium may also be present in the project area.

Recent research into the Proterozoic Westmoreland District uranium deposits, from the Northern Territory – Queensland border suggests that the same broad physiochemical processes that govern unconformity-style uranium deposits also produce Westmoreland-style deposits, and indeed other basin/unconformity associated precious and base metal deposits (Wall, 2006). ‘Westmoreland-style’ uranium mineralisation may pose an exploration target in the dolerite and volcanic units of project area, although only sub-economic uranium occurrences have been discovered associated with these units in West Arnhem Land.

Despite local variations in structures, host rocks, element associations, all uranium deposits in the Alligators River region are located close to the unconformity between basement rocks and the Kombolgie Subgroup. In several examples, down-faulted blocks of the Kombolgie Subgroup, such as at the Ranger No 3 Orebody and the Hades Flat Prospect, are present adjacent to mineralisation. This common association of sandstone and uranium mineralisation is considered to be indicative of a favourable setting for the concentration of mineralising fluids, irrespective of the deposit-style model being invoked.

## **PREVIOUS EXPLORATION**

The following historical exploration information is extracted from various unpublished reports submitted by various companies to the Northern Territory Department of Resources – Mines and Energy as part of their statutory obligation. Open-file reports can be obtained from the Northern Territory Geological Survey.

## **Exploration by Queensland Mines Pty Ltd 1969 – 1998:**

The area covered by ELs 10176, 24371 and 24372 was held by Queensland Mines Proprietary Limited (QML) during the 1970's. Exploration work consisted of airborne radiometric and magnetic surveys, regional stream-sediment geochemistry, regional geochemical soil-sampling, regolith geochemistry, ground total count radiometric surveys, reconnaissance exploration and mapping with some facilitated by surveyed grids. The Nabarlek deposit was discovered by radiometric survey and ground follow-up in June 1970.

QML's exploration was curtailed in early 1973 by the Federal Government imposed moratorium on exploration pending a resolution of the issue of Aboriginal Land Rights. No further exploration work was completed until 1988. EL 2508 was granted to QML on 29 June 1988, and two separate two-year renewals of the tenement were applied for and granted in 1994 and in 1996. The tenement expired on 28 June 1998.

From 1988 and 1989, Surtec Geosurvey contracted by QML conducted tenement wide surveying and gridding, aerial photography, airborne spectrometer and magnetometer, photogrammetric, geological mapping, soil sampling, ground radiometrics, radon track etch surveying, trenches, rotary air blast (RAB) drilling, percussion and diamond drilling (DD), geochemical surveys, petrography and data processing.

QML conducted diamond drilling at twelve prospects (U65, U28, N84, S27, N147, SMLB, N7, N23, U40, U42, S13, and U19). Significant, but sub-economic uranium mineralization in strongly to moderately altered zones was intersected at the N84, S27, N147, U65, SMLB, U40 and U42 prospects. Many other anomalies were discovered but were discounted.

## **Exploration by AFMEX, Cameco, SAE Australia JV 1998 – 2003:**

In 1998, four months prior to expiry of EL2508, a joint venture partnership consisting of 25% Afmeco Mining and Exploration Pty Ltd (AFMEX) as the operating partner, 50% Cameco and 25% SAE Australia Pty Ltd acquired the tenement from QML. Exploration Retention Licences (ERL) were lodged over those portions of EL2508 that were considered the most prospective and the remainder was permitted to expire. On 20 May 1999, the joint venture partnership was granted ERL's 150, 151 and 152, and were relinquished in 2003.

Nine diamond holes were drilled at ERL 150 (SMLB) during the period of tenure. Four diamond drill holes followed up untested minor mineralization along the Boundary Fault and parallel structures with limited success. Five holes were drilled into conductive targets identified with airborne EM (TEMPEST) surveys. The drilling was not successful in identifying any economic mineralization.

Exploration on ERL 151 (N147) focused on delineating blind repetitions of the Nabarlek shear zone south east of the two zones of known mineralization at N147. Geophysical targets in this area were also tested. Nineteen RC/DDH holes were drilled with only two holes intersecting radioactive intervals associated with shearing.

Although zones of significant alteration were intersected in both sandstone and basement, no mineralization was discovered that warranted follow-up work.

Two diamond holes were drilled at ERL 152 (U65) to test major structures and/or resistivity targets. Both holes intersected major faults or brecciation but neither hole intersected anomalous radioactivity. U65-5 intercepted strong alteration in the sandstone consisting of brecciated hematitic pebbly sandstone between 115.5 – 146.6 m and a zone of hematite rock between 151.8 and 160 m). Despite the encouraging nature of this alteration, AFMEX concluded the following year that mineralisation was restricted to minor occurrences within the Oenpelli Dolerite, and ERL 152 was relinquished in 2001.

ERL's 150 and 151 were relinquished in 2003.

### **Cameco Exploration**

#### **2004 – 2008:**

Cameco lodged application for EL10176, covering the former EL2508 and ERL's 150, 151 and 152, on June 1999. Grant of title was given on 1<sup>st</sup> September 2004, as three separate tenements EL10176 the largest central portion and two smaller titles (EL's 24371 and 24372) separated by large areas of non-consent land.

Various data compilations and reviews of historical data was completed with re-prioritisation of historical anomalies where completed extensive data review, compilation, digitised drill hole data, and also conducted field reconnaissance, sampling and mapping.

In 2005, an airborne hyperspectral survey (De Beers Hyperspectral Scanner) was flown over two-thirds of the project area covering the western portion. A TEMPEST survey was flown over the southern portion of EL 10176 and reprocessing of the 2001 TEMPEST survey in the northwest corner was completed. An airborne radiometric and magnetic survey of the S27 and N84 prospect areas was flown.

The TEMPEST survey identified a number of targets that were highlighted for further work. The results of the survey at S27 were enigmatic as the electromagnetic response identified in earlier surveys could not be imaged with TEMPEST.

A 14 hole RC/DDH drilling program was conducted in 2006. Drilling at S27 did not upgrade previous results obtained by Afmex, and the electromagnetic responses could not be adequately explained. Results from drilling of NARD6011 at the Gabo fault were encouraging with anomalous U concentration, encouraging structural configuration and alteration.

A TEMPEST survey over the western, central (main) and eastern portion of the project area was conducted to complete coverage by adding to previous survey datasets over the project. No conductive responses were observed directly related to the mineralisation at Nabarlek, SMLB or N147, although strong conductors were observed along the Nabarlek Shear between these prospects.

A trial SAM (sub-audio magnetic) survey by GAP Geophysics Australia Pty Ltd (GAP) was completed to the southeast of the N147 prospect. This survey was aimed at determining whether extensions of the Nabarlek Shear could be imaged below sandstone towards the south-east of the prospect. The results of the SAM survey were inconclusive, and it was determined that the SAM survey could not penetrate through the deep sand cover to image the basement structures.

In 2007, exploration drilling consisted of one helicopter supported diamond drill hole on the sandstone plateau to the south of Nabarlek, and reverse circulation with diamond drill tails at N147, N84 and Gabo fault; aircore drilling with 280 holes for 4,272m; regional outcrop sampling and soil sampling at N23, N147, Iris and SW Corner.

Drilling at N147 defined the best intersection for the dolerite-hosted uranium mineralisation of 21.1m at 0.32%  $U_3O_8$  from 115.1m in NARD6017. Diamond drilling was conducted to test for lateral strike extents of the mineralisation but only one hole NAD6023, 180 m to the SW, is interpreted to have intersected the mineralised zone. The mineralisation at N147 was interpreted to be of narrow width and of limited lateral continuity, associated with thin parallel steeply NW dipping structures, with a secondary set of shallow orientated mineralised veins.

The AC drilling intersected elevated U values along trend of various structures, eg Stevens fault, faulting in the U65 area, and a linear valley at S27.

In 2008, the exploration program included drilling of 85 reverse-circulation (RC) holes for 7,475 m, 532 AC holes for 8,101 m, an airborne radiometric and magnetic survey by UTS at U40/42 for 321 line kilometres, a test VTEM survey by Fugro of 35.8 line kilometres on four lines, and downhole geophysical logging of selected holes from N147 and SMLB by Borehole Wireline and Geoscience Associates Australia.

The RC drilling program at N147 was designed to test for extensions to the uranium mineralisation within Oenpelli Dolerite, first identified by QML in 1989. 19 RC holes for 2,737 m were drilled on the N147 prospect with the best uranium mineralisation intersection in 2008 being from NAR6318 with 28m at 0.145 %  $U_3O_8$  from 112 to 140 m with a maximum grade of 0.63 %  $U_3O_8$  from 120 to 121 m.

Six RC drill holes for 804 m at SMLB were designed to follow up historical drilling of weak uranium mineralisation associated with the Boundary fault. Best results were intersected in NAR6384 with 21 m at 510 ppm  $U_3O_8$  from 94 to 115 m within chloritised schists of the Cahill Formation. The drilling indicated weak mineralisation associated with the footwall schists in the basement fault wedge.

48 RC holes for 2,798 m were drilled on a grid (400 m x 200 m grid) southeast of N147 and at 6 RC holes for 414 m at Coopers to the east of N147, through the sandstone unconformity and into basement rocks, to test for geochemical and alteration vectors that may indicate potential for uranium mineralisation. The best result was intersected in NAR6345 of 134 ppm  $U_3O_8$  from 48 to 52 m in chlorite schist, proximal to an interpreted fault in the magnetics.

Regional RC drilling was conducted at Muddy Waters and Bus Stop testing Tempest conductive features. No results above expected background uranium values were returned. The nature of the conductive targets remains unexplained.

AC drilling was concentrated in a corridor to the southeast and northwest of the Nabarlek Mine Lease, along key structures in areas not covered by sandstone; and in areas of anomalous Tempest conductive features to better target the RC drilling. The drilling was conducted to test for geochemical and alteration vectors within the regolith and transported cover that may indicate potential for uranium mineralisation.

AC drilling in the Coopers area intersected uranium mineralisation within Oenpelli Dolerite in one AC hole (NAA6406) returning 0.12 % U<sub>3</sub>O<sub>8</sub> over 1 m with other holes in the area returning anomalous uranium.

## EXPLORATION PROGRAM 2009

The exploration program for 2009 included drilling of 417 AC holes for 7,617 m; two airborne radiometric and magnetic surveys by UTS at N84 and N23 along the Quarry Fault for 1,408 line km; a one square kilometre ground Sub-Audio Magnetic geophysical survey at N147; and outcrop sampling, mapping and reconnaissance with 32 outcrop samples and 14 mapping locations.

**Table 1: Summary of 2009 Exploration Actives**

<i>Activity</i>	<i>Location</i>	<i>Number</i>	<i>Amount</i>
AC drilling	Coopers	48	1,072
	Delver	18	232
	Gabo fault	99	1,358
	N84	63	886
	U40 / U42	189	4,069
	Total	417 holes	7,617 metres
Magnetics and Radiometrics	N84	910 line km	
	N23	498 line km	
SAM Survey	N147	1 km x 1 km	

An archaeological clearance survey of the drilling areas was conducted by Earth Sea Heritage Surveys in June 2009.

Wildman River Stock Contractors were utilised for the construction of tracks into the drilling areas and drill site preparation.

A reverse circulation drilling program was planned for 2009 however the program was unable to be completed due to ongoing delays of the drilling contractor near the end of the field season.

### Aircore Drilling

The AC drilling was conducted by Bullion Drilling of Kalgoorlie, Western Australia. Drilling commenced on 27<sup>th</sup> July continuing through to 22<sup>nd</sup> August 2009.

AC drilling was conducted with the objective of generating prospective uranium trends from a number of targets and areas on EL10176, focusing on the follow-up of anomalous uranium results returned by previous wide spaced AC drilling programs, historical anomalous uranium results, and testing structural trends for concealed uranium mineralisation beneath sand and colluvium cover. Geochemical anomalies and alteration within the regolith and transported cover may provide vectors to uranium mineralisation.

### Figure 7: Location of AC Drilling

#### Table 2: AC Drilling Collar Location Summary

In total, the program consisted of 7,617 m from 417 holes. These areas drilled include:

- **N84, N84 South-** Anomalous results of over the entire length of NAA6911 with maximum of 65.8 ppm U<sub>3</sub>O<sub>8</sub> with elevated uranium intersected in areas to the north and south of N84.
- **Gabo fault-** The Gabo fault defines the intrusive contact of the Oenpelli Dolerite with Mamadawerre Sandstone on the southeastern side of the fault. The mineralisation to the northeast at N147 is interpreted to be related to structural reactivation along this contact, making this a prospective trend.
- **Delver-** On trend to southwest of Gabo fault and N147 mineralisation. NAA6744 returned a bottom of hole dolerite sample of 192 ppm U<sub>3</sub>O<sub>8</sub>.
- **Coopers-** On trend to northeast of Gabo fault and N147 mineralisation. A number of structures are interpreted within the area based on magnetics and gravity. Geochemistry returned 0.12 % U<sub>3</sub>O<sub>8</sub> in AC drilling (NAA6406) within hematite and chlorite altered Oenpelli Dolerite. Anomalous uranium in AC drilling up to 117 ppm U<sub>3</sub>O<sub>8</sub> is also located in the area. The east-southeast trending Tip fault passes through the area to the north.
- **U40-** historical anomalous uranium in sandstone, dolerite and basement rocks with best intersection of 1 m @ 328 ppm U<sub>3</sub>O<sub>8</sub>. The structural complexity of the prospects was highlighted in the airborne magnetic survey conducted in 2008.
- **U42-** historical anomalous uranium in dolerite with best intersection of 9 m at 640.6 ppm U<sub>3</sub>O<sub>8</sub>. The structural complexity of the prospects was highlighted in the airborne magnetic survey conducted in 2008.

All drilling was geologically logged and sampled on the drill site. Holes were drilled to refusal where competent rock inhibited penetration. Drilling depths varied from between 1 and 57 m with an average depth of 18 m for the program.

Drill spoils from each metre were interrogated using a handheld scintillometer (SPP2) for total gamma. Representative samples were collected from each metre of drilling, and placed in soil chip trays, which are stored in Darwin.

Geochemical sampling was conducted from the bottom of hole sample, along with more detailed sampling of zones with increased gamma, alteration and of lithologies of interest. A total of 533 samples (refer to Table 3 for analytical results) were analysed for standard suite analysis (suite of over 50 elements and 4 lead isotopes by weak acid

leach) and 275 samples (refer Table 4) were analysed using G957 analytical method (weak acid leach of 16 elements and 4 lead isotopes) from the drilling and submitted to Northern Territory Environmental Laboratories (NTEL) of Darwin, Northern Territory.

#### Table 3: AC Drilling – Analytical Sample Results

#### Table 4: AC Drilling – G957 Analytical Sample Results

Samples throughout the holes were analysed using a portable Niton XRF instrument with the results displayed in Table 5.

#### Table 5: AC Drilling – XRF Sample Results

An Analytical Spectral Device (ASD) was used to measure reflectance spectra from each representative sample in the soil chip trays. ASD spectral data is presented in Table 6.

#### Table 6: AC Drilling – TSG Clay Minerals

Sampling, geochemical analysis, and infra-red spectroscopy methodology is summarised in Appendix 1.

### Appendix 1: Cameco Australia Standard Sampling Methodology and Procedures

A detailed report of drill information, including lithology, colour, alteration, and recorded gamma (cps) readings can be found in Appendix 2.

### Appendix 2: AC Detailed Drill Logs

#### Coopers

The Coopers prospect was defined by AC drilling in 2008 with a best uranium result of 0.12 %  $U_3O_8$  from 10 to 11 m at blade refusal within hematite altered Oenpelli Dolerite in hole NAA6406. Coopers lies to the south of the interpreted Tip fault, which juxtaposes Oenpelli Dolerite on the south and Mamadawerre Sandstone to the north. The Tip Fault is defined topographically by Coopers Creek.

The follow up AC drilling completed during 2009 was to better outline the area of mineralisation and to define drilling targets by deeper drilling methods.

48 AC holes for 1,072 m were drilled on the Coopers prospect. All drill holes on the southern side of the Tip Fault encountered Oenpelli Dolerite, and holes drilled on the northern side of the structure were terminated in Mamadawerre Sandstone.

#### Figure 8: Coopers AC Drilling Locations

The best uranium results from the drilling were returned within hematite altered Oenpelli Dolerite from three holes (NAA7119, NAA7121 and NAA7130) defining a northeast trend. NAA7130 returned a best result of 1 m at 0.198 %  $U_3O_8$  from 36 m, with anomalous zones of 9 m at 223.7 ppm  $U_3O_8$  from 22 to 31 m, and 1 m at 157.3 ppm  $U_3O_8$  from 41 m. NAA7121 returned two anomalous zones of 2 m at 395.1 ppm

U<sub>3</sub>O<sub>8</sub> from 23 m and 2 m at 484.9 ppm U<sub>3</sub>O<sub>8</sub> from 27 m. NAA7119 returned 4 m at 250 ppm U<sub>3</sub>O<sub>8</sub> from 21 m and a second anomalous zone of 4 m at 157.3 ppm U<sub>3</sub>O<sub>8</sub> from 27 m.

### Figure 9: Coopers AC Drilling – Maximum U<sub>3</sub>O<sub>8</sub> Values

The results from the drilling clearly show a northeast defined trend in the mineralised and anomalous uranium results which is coincident with an interpreted structure from the magnetics. This structure is interpreted to be an extension of the Gabo Fault which offsets and displaces the Tip Fault. A smaller northeast crosscutting structure is interpreted to displace the Tip Fault near NAA7146, based on the bottom of hole lithologies from the AC drilling. This cross structure lies near NAA6406 from the 2008 drilling which intersected 0.12 % U<sub>3</sub>O<sub>8</sub>.

A second area of weakly anomalous uranium is intersected near the southeastern margin of the Oenpelli Dolerite with NAA7165 intersecting an anomalous zone of 1 m at 68.8 ppm U<sub>3</sub>O<sub>8</sub> from 24 m. The position of the uranium anomaly in this area is analogous to the location of N147.

The magnetic interpretation indicates that the area is structurally complex, and this is further complicated by differing magnetic polarisations of the intruding dolerite, and quite possibly a different intrusive suite within the central area of the target area. The mineralisation intersected to date is interpreted to be structural controlled by the northeast trending Gabo Fault, and similar orientated cross structures. In section, however the mineralisation intersected in the AC drilling appears to be flat lying.

### Delver

The Delver prospect was defined by AC drilling in 2008 with hole NAA6744 returning a bottom of hole sample from 9 to 10 m of 192 ppm U<sub>3</sub>O<sub>8</sub> with anomalous results up to 66.5 ppm U<sub>3</sub>O<sub>8</sub> within the upper saprolitic weathered dolerite.

The AC drilling completed during 2009 was aimed at follow up of this anomalous uranium result. 18 holes for 232 m were completed in the area.

### Figure 10: Delver AC Drilling Locations

The best result of the 2009 drilling from the Delver AC drilling was hole NAA6942 which returned 64 ppm U<sub>3</sub>O<sub>8</sub> from bottom of hole sample of weakly chlorite and hematite altered dolerite at 16 m.

### Figure 11: Delver AC Drilling – Maximum U<sub>3</sub>O<sub>8</sub> Values

### Gabo Fault

The Gabo fault AC drilling program was designed to test for vectors to uranium mineralisation by drilling along the trend of the Gabo Fault structure. N147 provides the target model where uranium mineralisation occurs as en-echelon pods within the dolerite, with further potential for basement hosted mineralisation. Drilling and surface soil sample geochemistry at N147 has identified anomalous uranium within the



regolith. AC drilling was conducted along the trend of the Gabo fault structure with the aim of identifying anomalous geochemistry indicative of potential for uranium mineralisation warranting investigation using deeper drilling methods.

99 AC holes for 1,358 m were drilled along the Gabo Fault. Drilling intersected lithologies of Oenpelli Dolerite and Mamadawerre Sandstone, with the bottom of hole lithologies better defining the contact of the Gabo Fault.

#### Figure 12: Gabo Fault AC Drilling Locations

The best result from the AC drilling was returned from bottom of hole sampling of dolerite in NAA6995 with 1 m at 47.3 ppm  $U_3O_8$  from 14 m. Anomalous uranium results were returned from bottom of hole sandstone samples from holes NAA6980 with 1 m at 22.4 ppm  $U_3O_8$ , NAA7035 with 4 m at 21.8 ppm  $U_3O_8$ , and NAA7047 with 2 m at 20.1 ppm  $U_3O_8$ .

#### Figure 13: Gabo Fault AC Drilling – Maximum $U_3O_8$ Values

A grouping of anomalous uranium in AC holes NAA7035 (sandstone 21.8 ppm  $U_3O_8$ ), NAA7046 (dolerite 10.8 ppm  $U_3O_8$ ), NAA7047 (sandstone 20.1 ppm  $U_3O_8$ ) and NAA7049 (dolerite 10.0 ppm  $U_3O_8$ ) are located across the Gabo Fault and near an interpreted cross structure. Such a location is considered favourable for uranium mineralisation and the anomalous results derived from the sandstone samples may indicate the potential for uranium mineralisation in that area.

#### N84

The AC program was conducted to the west, north and south of the N84 prospect and previous drilling with the aims of determining the nature of weak radiometric anomalies in the area and following up elevated uranium values intersected in previous drilling. Previous AC drilling intersected anomalous uranium in hole NAA6911 with 16 m at an average grade of 48.1 ppm  $U_3O_8$  with a high of 65.8 ppm  $U_3O_8$  from 8 to 12 m in basement Cahill Formation quartz-mica schist.

#### Figure 14: N84 AC Drilling Locations

63 AC holes for 886 m were drilled in the N84 area. The drilling intersected Oenpelli Dolerite, quartz-mica schists, amphibolite and quartzite of the Cahill Formation and Mamadawerre Sandstone lithologies.

The best uranium result from the drilling was 1 m at 12.4 ppm  $U_3O_8$  in hole NAA7089 sampled within Oenpelli Dolerite. In general, the drilling returned elevated uranium values similar to previous drilling, with an average of 3.4 ppm  $U_3O_8$  for all basement samples analysed.

#### Figure 15: N84 AC Drilling – Maximum $U_3O_8$ Values

No other significant results were returned from the drilling.

## U40 and U42

At the U40 and U42 prospect areas, weak uranium mineralisation was previously discovered by QML in 1992, however the structural controls on mineralisation and geological framework for the area is poorly understood. The AC drilling was aimed at determining the geological basement map of the area, and determination of geological vectors to mineralisation to better define drill targets to follow up on the weak uranium mineralisation previously intersected. The airborne magnetics flown in 2008 demonstrates that the area is structurally complex, and AC drilling was used to substantiate and shallow test some of these structural intersections and associated weak radiometric anomalies.

189 AC holes were drilled in the U40 and U42 area for 4,069 m. The drilling intersected Oenpelli Dolerite, Cahill Formation metasedimentary sequences of arkose, schist, semi-pelite, amphibolite, psammite and quartzite, and Mamadawerre Sandstone.

Figure 16: U40 AC Drilling Locations

Figure 17: U42 AC Drilling Locations

The geochemical results from the program were largely disappointing with a maximum result of 12.9 ppm  $U_3O_8$  in NAA7274 from 9 to 14 m in logged quartzite. This same interval contained 13.5 ppm Th.

Figure 18: U40 AC Drilling – Maximum U3O8 Values

Figure 19: U42 AC Drilling – Maximum U3O8 Values

An interpreted basement geology map has been constructed from the AC drilling. The AC drilling bottom of hole sampling clearly distinguishes the basement metamorphic rocks of the Cahill Formation from the Oenpelli Dolerite with the Cahill Formation rocks returning an average of 3.85 ppm  $U_3O_8$  compared to 0.65 ppm  $U_3O_8$  for the dolerite.

The AC drilling has not provided any further geochemical vectors to uranium mineralisation beyond which was already established.

## Outcrop Sampling

32 outcrop samples and 14 mapping locations were collected from the Nabarlek project area during the course of the field program. Locations of the samples and mapping stations are shown in Figure 20.

Figure 20: Location of Outcrop Samples

Table 7: Location of Samples Sites

The outcrop sampling and processing was performed using Cameco standard methodology, as outlined in Appendix 3. This appendix details methodology used for reflectance spectroscopy, laboratory techniques and methods, and analysed elements. All samples were submitted to Northern Territory Environmental Laboratories (NTEL) in Darwin for geochemical analysis. The laboratory sample preparation, analytical methods and techniques and analysed elements can also be found within Appendix 3.

### Appendix 3: Cameco Standard Outcrop Sampling and Processing Procedures

The following tables details the data and results from samples collected during the program.

Table 8: Sample Descriptions and Properties

Table 9: Outcrop Sample Structure Measurements

Table 10: Outcrop Sample Alteration

Table 11: Outcrop Sample TSA Clay Minerals

Table 12: Outcrop Sample Geochemistry Results

Three samples were collected from the N23 area, with two samples of Mamadawerre Sandstone (C010547 and C010548) and the third sample (C010549) of a hydrothermally brecciated basement rock.

Sample C01548 in the N23 area, returned the best uranium result with 18.79 ppm  $U_3O_8$  within moderately hematite altered sandstone.

Sample C010549 is a hydrothermal breccia with up to 80 % of the rock taken up by quartz crustiform and quartz cockscombe breccia veining of a parent rock that is strongly hematized and altered. This sample is located near the interpreted Quarry fault from magnetic imagery.

One outcrop sample (C010554) and four mapping points were taken from the Muddy Waters area. All stations consisted of homogeneous quartzite which outcrops on the ridges. These quartzite ridges have been historically mapped as Kudjumarndi Quartzite, but are now interpreted to be part of the Lower Arkosic Unit of the Lower Cahill Formation.

Five historical trenches were identified on the side of a ridge to the west-southwest of the Muddy Waters area, and were mapped and sampled with stations C010530 – C010533. The trench to the east and near the bottom of the hill exposes Lower Cahill Formation basement rocks of laminated quartzite that are variably strongly hematized and moderately chloritized with C010530 returning 3.38 ppm  $U_3O_8$  and 24.3 ppm Th. To the west and uphill, the basement rocks grades from a quartzite into a quartz-rich semipelite defined by quartz-rich bands with alternating bands of chlorite and hematite. The rock remains strongly altered but is composed of significantly more quartz veining and recumbent folding (defined by quartz veins). Assay results of C010531 returned 4.94 ppm  $U_3O_8$  and 23.6 ppm Th. In the trench at the top of the hill, the rocks are composed of quartz-rich semipelites tending more to schistose texture, and are moderately hematite altered. Assay results from C010532 returned 6.13 ppm  $U_3O_8$  and 20.2 ppm Th. In the trench to the west, the rocks are less altered with less quartz veining and folding is more open.

In the southeast of the project 17 outcrop samples were collected following up interpreted faults and lineaments within the Mamadawerre Sandstone in combination with strong illite hyperspectral anomalies. Two samples (NA080001 and NA080002) of weathered Cahill Formation schist were collected and returned 3.07 ppm  $U_3O_8$  and 4.04 ppm  $U_3O_8$  respectively, with up to 22.2 ppm Th. Samples collected from the

Mamadawerre Sandstone did not return any results above expected background values of 1 ppm U<sub>3</sub>O<sub>8</sub>, however the values returned for thorium appear to be high and average 4.9 ppm Th for the sandstone sampled in the area.

## **Geophysics**

In July 2009, GAP Geophysics based out of Brisbane, Queensland, conducted approximately 30.6 line kilometres of a ground based Sub Audio Magnetic (SAM) survey within a one square kilometre area covering the N147 prospect within EL10176 (refer Figure 21). The SAM survey attempted to identify structures that may associated with the mineralisation at N147.

In May 2009, Universal Tracking Systems (UTS) Geophysics of Belmont Western Australia flew an airborne fixed wing magnetic/radiometric survey over two survey areas, N84 (910.25 line km) and N23 (498 line km). The location of these surveys is displayed in Figure 21.

### **Figure 21: Geophysical Survey Locations**

#### **SAM Survey Description and Deliverables**

SAM surveys are performed by passing an alternating current into the ground between two electrodes placed outside the survey area, perpendicular to the direction of survey. The passage of current through the ground is biased by the presence of conductive material, as the electrical current moves it creates a magnetic field directly proportional to the current density. The magnetic field is measured using a cesium vapor magnetometer, which is capable of distinguishing the cyclical magnetic field generated during the survey from that which is natural to the survey area. The magnetic field generated during the survey is composed of that which is produced by the wires feeding the transmitter electrodes (Primary Field) and that resulting from current flowing within the ground (Normal Field). The survey generated magnetic field is identified by post processing, and the theoretical effects of the primary field is removed by knowing the location of the transmitter wires and current used. The residual of this process undergoes an Equivalent Magneto Metric Resistivity (EQMMR) transform which defines the measurement with respect to the direction of current flow (Boggs, 1999). The results are reported in pico-Teslas per Amp (pT/A) of current used during the survey. A further description of the survey is provided Appendix 4 of the contractor logistics report.

#### **Appendix 4: GAP Geophysics Logistics Report**

The interpretation provided in this report is limited to qualitative observations, as quantifying the SAM survey results is difficult. The reported current density (pT/A), combined with the frequency content or roundness of the anomaly, give an idea of relative depth and conductance.

Products delivered by the contractor included the easting, northing, elevation, EQMMR, and total magnetic intensity (TMI). Data was originally delivered in AGD66 Zone 53 coordinate projection. The data has since been converted to GDA94 Zone53 coordinate projection using the software package Oasis Montaj 7, and is provided in

ASEG format and .ers grids. Images of collected data may be found in the contractor's logistic report. All data can be found in the Data Folder accompanying this report.

Results of the survey show a distinct conductive linear striking to the north east, which is interpreted to be related to the dolerite-basement contact.

### **Airborne Magnetic and Radiometric Survey Description and Deliverables**

The UTS airborne radiometric and magnetic survey used a CRESCO-08-600 fixed wing aircraft flown at a minimal ground clearance of 40 m (or as safety permits). A line spacing of 50 meters and tie lines 500 meters were used for both survey areas. The survey aircraft was equipped with a tail mounted Scintrex Cesium Vapor CS-2 Magnetometer, capable of measuring a scalar magnetic field to an accuracy of 0.001 nT. A three component magnetometer was also used to compensate for the magnetic distortions caused by the aircraft. Processing of the magnetic data included corrections for diurnal variations, spikes and an IGRF 2009 correction, which removes the regional magnetic gradient.

The resulting Total Magnetic Intensity (TMI) and Radiometric grids for the two survey areas and images of collected data may be found in the contractor's logistic report Appendix 5.

### **Appendix 5: UTS Logistics Report**

All data can be found in the Data Folder accompanying this report. The data contains dxf files of the survey areas and lines. The radiometric and magnetic data is stored in two separate ASEG data files.

## **CONCLUSIONS AND RECOMMENDATIONS**

AC drilling at Coopers as follow up of anomalous uranium results from previous drilling has delineated a northeast trend of uranium mineralisation which is coincident with the interpreted trend of the Gabo Fault. The anomalous and mineralised zone extends for approximately 200 m based on four AC holes. Uranium mineralisation is associated with strong hematite and chlorite alteration within Oenpelli Dolerite. Mineralisation as intersected in the AC drilling appears to be flat lying within the dolerite, and no controls on the mineralisation, with the exception of the coincident interpreted structure, is evident. A focussed drilling program using deeper drilling methods is necessary to determine the nature and extent of the uranium mineralisation.

AC drilling of the Gabo Fault was conducted southwest from N147 towards N84 prospects to determine the potential for uranium mineralisation along this sandstone - dolerite intrusive contact. Mineralisation at N147 is interpreted to be the result of ingress of oxidised uranium bearing fluids from the sandstone and into the dolerite where the reducing capacity of the dolerite was able to precipitate uranium within cooling related breccias and fractures. The drilling returned anomalous uranium results up 21.8 ppm  $U_3O_8$  within Mamadawerre Sandstone near the interpreted Oenpelli Dolerite contact and proximal to interpreted cross cutting structures. The location of these anomalous uranium results are consistent with the N147 exploration model and follow up by deeper drilling methods is warranted.

AC drilling to the southwest of N84 did not intersect any anomalous uranium above expected background values and no further work is considered within the immediate area of focus.

AC drilling at the U40 and U42 area was largely unsuccessful in delineating further drilling targets. A basement geological map has been constructed for the area, however the intrusive Oenpelli Dolerite has continued to provide an added complexity in the area. The magnetics suggests there may be multiple dolerite intrusions of differing polarity, which has hampered the structural interpretation. Further exploration is still recommended for the area, with particular focus on U40, to test the interpreted position of the Quarry fault and other structures in the vicinity of the anomalous uranium intercepts in drilling by QML.

Interpretation of the SAM survey over N147 has identified a weakly defined structure which appears to cross cut the Oenpelli Dolerite – Mamadawerre Sandstone contact (Gabo Fault). This structure has not been tested by drilling to determine whether it has any controls on the mineralisation at N147.

## **2010 WORK PROGRAM**

Cameco in joint venture with UEL intends to conduct further drilling during the 2010 field season. The focus of the exploration efforts will be to better test and follow up on the positive results defined by previous AC drilling.

The exploration methods employed during the 2010 program will consist of:

- Reverse-circulation drilling (approximately 5,000 m)
  - Drilling at U40, Coopers, and Gabo fault
- Ground geophysical surveys
  - Coopers, Gabo Fault, N23
- Outcrop sampling and reconnaissance

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