Cameco Australia Pty Ltd

ERL 25896
CADELL PROJECT
NORTHERN TERRITORY
ANNUAL REPORT
CONFIDENTIAL

Date: September 2009
Period: 27 September 2008 to 26 September 2009
Report No.: CD09-02
Target commodity: Uranium
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Map Sheets: 1: 250, 000: Millingimbi (SD-5302)
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DRDPIFR - Minerals and Energy (1)
Northern Land Council (1)
SUMMARY

The Cadell Project is a uranium exploration project consisting of a single Exploration Retention Licence (ERL) 25896 consisting of 6 blocks with a total area of 20.13 km², located in West Arnhem Land approximately 250 km east of Darwin. Cadell project was part of EL3347 before being converted to ERL 25896 in January 2007. 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 an interest in the Cadell project, and adjacent EL22784, EL22785, and EL24992 if expenditure obligations were met. In June 2008, UEL declined to continue the Joint Venture arrangement and Cameco remains operator and manager of the project. The Stevens prospect was identified by an airborne radiometric survey in 1997 and followed up with outcrop sampling with the best result being 4.6% U₃O₈, 1.3% Pb and 2.2% P₂O₅ in clay-hematite talus rock with yellow secondary U stains. Six diamond cored holes (CDD0003 to CDD0008) for 1,019 m, and 25 reverse circulation holes for 1,388 m were drilled from 2003 to 2007 to test uranium mineralisation associated with the Steven’s fault and the weathered saprolitic dolerite beneath transported cover to the north of Steven’s fault. The best analytical results returned were CDD0003 of 0.6% U₃O₈ over 0.6 m in a vein within Nimbubah granite; CDD0005 of 6.8 m @ 2,620 ppb Au, 542 ppb Pt and 709 ppb Pd in saprolitic dolerite; CDR0015 and CDR0016 had the best results of 0.187% U₃O₈ and 0.094% U₃O₈ over 1 m in the Stevens fault breccia respectively; and CDR0013 with 6.06 g/t Au, 1.58 g/t Pt and 2.20 g/t Pd over 5 m in dolerite. Exploration conducted in the second year of tenure (this report) consisted of eight reverse-circulation drill holes (CDR0109 to CDR0116) for 1,386 m and 75 air-core drill holes (CDA0034 to CDA0108) for 878 m. The reverse circulation drilling activities were designed to test the uranium potential of the east-west trending Steven’s fault and investigate the low magnetic features for uranium mineralisation. The air-core drilling was designed to test for indications of uranium mineralisation beneath sand cover to the north of the Steven’s fault. An additional target is gold, platinum and palladium mineralisation in saprolitic weathered dolerite proximal to the Steven’s fault. The best analytical uranium results: 12 m @ 0.11% U₃O₈ from 85 m in brecciated dolerite in CDR0110; 6 m @ 115.3 ppm U₃O₈ from 49 m in brecciated dolerite in CDR0112 and 4 m @ 281.1 ppm U₃O₈ from 84 m at the faulted dolerite-sandstone contact in CDR0113. Anomalous Au and PGE results from geochemical sampling include: 10 m @ 661 ppb Au, 198 ppb Pt and 310 ppb Pd from 52 m in dolerite in CDR0112 and 1m @ 247 ppb Au from 51 m in dolerite in CDR0113. Planned exploration in 2009 will include a sub-audio magnetic survey to determine further structural controls on mineralisation and follow-up drilling of CDR0110 which returned 12 m @ 0.11% U₃O₈.

Eligible expenditure on the Cadell project for the reporting period was AUD$654,979.43. Exploration work for the third year of tenure may include a sub-audio magnetic survey and follow-up drilling of CDR0110. The exploration expenditure for this program is estimated at $300,000.
see insert map for detail

Insert Map
TABLE OF CONTENTS

SUMMARY .............................................................................................................................................. i

INTRODUCTION ................................................................................................................................. 1
  Location and Access ............................................................................................................................. 1
  Tenure ................................................................................................................................................ 1
  Regional Geological Setting ............................................................................................................... 2
  Local Geology .................................................................................................................................... 4
  Exploration Target ............................................................................................................................. 5
  Previous Exploration ........................................................................................................................... 6
    AFMEX 1997 to 2001 ....................................................................................................................... 6
    Cameco 2003 to 2007 ....................................................................................................................... 6

EXPLORATION WORK COMPLETED FOR THE PERIOD 2008 TO 2009................................. 7
  Air-Core Drilling ................................................................................................................................. 8
  Reverse-Circulation Drilling ............................................................................................................... 9
  RC Drilling and Sampling Methodology ......................................................................................... 9
    CRD0109 ......................................................................................................................................... 10
    CDR0110 ....................................................................................................................................... 10
    CDR0111 ....................................................................................................................................... 11
    CDR0112 ....................................................................................................................................... 11
    CDR0113 ....................................................................................................................................... 12
    CDR0114 ....................................................................................................................................... 13
    CDR0115 ....................................................................................................................................... 13
    CDR0116 ....................................................................................................................................... 14

EXPENDITURE ........................................................................................................................................ 14

CONCLUSIONS AND RECOMMENDATIONS ..................................................................................... 14

2009 WORK PROGRAM AND PROPOSED BUDGET ...................................................................... 15

REFERENCES ....................................................................................................................................... 16
TABLES

Table 1: Summary of exploration results for Cadell from 1997 to 2001 (AFMEX) .......................... 6
Table 2: 2006 Soil Geochemical Results ................................................................................. 7
Table 3: Exploration Summary for 2008 - 2009 for ERL25896 .................................................. 7
Table 4: Exploration Drilling Summaries ................................................................................. 7
Table 5: Air-Core Drill hole Collars ......................................................................................... 8
Table 6: Air-Core Drilling - Submitted Samples and Geochemistry Results............................ 8
Table 7: Air-Core Drilling - Lithologies ................................................................................. 8
Table 8: Air-Core drilling - TSA Data ................................................................................... 8
Table 9: RC Geochemical Assay Results .............................................................................. 10
Table 10: Grade thickness product for CDR0110 .................................................................. 11
Table 11: Grade thickness product for CDR0112 .................................................................. 12
Table 12: Grade thickness product for CDR0113 .................................................................. 13
Table 13: Eligible Expenditure Statement ............................................................................. 14

FIGURES

Figure 1: Location of Field Activities .................................................................................... ii
Figure 2: Cadell Project (ERL25896) Location Map ................................................................. 1
Figure 3: Simplified geology of the Pine Creek Orogen showing the location of selected mineral deposits (after Pirajno and Bagas, 2008). ................................................................. 2
Figure 4: NTGS 1:250,000 Regional Geology ........................................................................ 2
Figure 5: Local geology of Cadell Project ............................................................................. 4
Figure 6: 2003 - 2006 Drill Hole Locations .......................................................................... 7
Figure 7: Soil Sample Locations .......................................................................................... 7
Figure 8: 2008 Air-core and Reverse Circulation Drill Hole Locations ...................................... 7
Figure 9: Map showing uranium geochemical results for air-core samples ......................... 8
Figure 10: Map showing U/Th for air-core samples ............................................................... 8
Figure 11: Map showing Au results for air-core samples ...................................................... 8
Figure 12: Cadell Bedrock Geology Map ............................................................................. 8
Figure 13: 2008 RC Drill holes Location map ...................................................................... 9
Figure 14: CDR0109 drill hole section ................................................................................. 10
Figure 15: CDR0109 Downhole eU3O8% probe data ......................................................... 10
Figure 16: CDR0109 Drill Log Strip Plot ............................................................................ 10
Figure 17: CDR0110 drill log strip plot .............................................................................. 11
Figure 18: CDR0110 drill hole section ................................................................................. 11
Figure 19: CDR0110 Downhole eU3O8% probe data ......................................................... 11
Figure 20: CDR0111 drill log strip plot .............................................................................. 11
Figure 21: CDR0112 drill log strip plot .............................................................................. 12
Figure 22: CDR0112 drill hole section ................................................................................. 12
Figure 23: CDR0112 Downhole eU3O8% probe data ......................................................... 12
Figure 24: CDR0113 drill log strip plot .............................................................................. 13
Figure 25: CDR0113 drill hole section ................................................................................. 13
Figure 26: CDR0113 Downhole eU3O8% probe data ......................................................... 13
Figure 27: CDR0114 drill strip plot ................................................................................... 13
Figure 28: CDR0115 drill strip plot ................................................................................... 13
Figure 29: CDR0116 drill strip plot ................................................................................... 14
APPENDICES

Appendix 1: Cameco Australia Sampling Methodology and procedures........................................8
Appendix 2: CDA0034 - CDA0057 Detailed Drill Logs .................................................................8
Appendix 3: CDA0057 - CDA0081 Detailed Drill Logs .................................................................9
Appendix 4: CDA0058 - CDA0108 Detailed Drill Logs .................................................................9
Appendix 5: Drilling Report for CDR0109 - CDR0116.................................................................10
Appendix 6: Pontifex Petrography - RC Chips............................................................................10
INTRODUCTION

ERL 25896 (Cadell Project) is a uranium exploration project in Western Arnhem Land, Northern Territory, operated by Cameco Australia Pty Ltd (Cameco).

The prime objective is to discover economic ‘unconformity style’ uranium mineralisation by targeting geological settings similar to the known deposits of the Alligator Rivers Region, Northern Territory, and the concealed high-grade deposits of the Athabasca Region, Saskatchewan, Canada.

The objectives of the work completed by Cameco during the second year of the Exploration Licence were to:

- Conduct a truck mounted reverse-circulation (RC) drilling program, in the western and central parts of the tenement, in which eight holes were drilled totalling 1,386m;
- Conduct a truck mounted air-core drilling program in the northern portion of the tenement, in which 75 holes were drilled totalling 878 m;
- Further assessment of existing and newly acquired data sets (geochemistry, radiometrics, magnetics and TEMPEST) to define drill targets for 2009.

Location and Access

ERL 25896 is located in western Arnhem Land, Northern Territory on the Millingimbi (SD-5302) 1:250 000 scale topographic map sheet and the Goomadeer (5673) 1:100 000 scale topographic map sheet.

The tenement is centred approximately 90 km northeast of Jabiru and 35 km southeast of the now rehabilitated mine site at Nabarlek (Figure 2). Access is either by air to the Nabarlek or Mamadawerre airstrips, or by road via the Arnhem Highway to Jabiru and then via Cahill’s Crossing and unsealed roads towards Mamadawerre outstation.

Figure 2: Cadell Project (ERL25896) Location Map

Field activities were based from an exploration camp located on Tin Camp Creek, named ‘Myra Camp’. Road access to Myra Camp is via the Arnhem Highway to Jabiru and bitumen road to Cahill’s crossing, then by dirt road via Oenpelli and Nabarlek.

In 2005, Cameco constructed a track to the Steven’s prospect via a back track to Mamadawerre from the Oenpelli-Maningrida Road for drilling access and most field activities. In 2006, an access track via Nabarlek (Stevens track), originally constructed by Afmex, was refurbished allowing access to the area from the west. The southern portion of the tenement is only accessible by helicopter due to the rugged nature of the sandstone terrain.

Tenure

ERL 25896 (Cadell Project) is located in Western Arnhem Land (Figure 2). Cadell was part of (EL) 3347 which was granted to the Kunbohwinjgu Joint Venture on 28 July 1997. Application to convert EL 3347 to an exploration retention licence was made on 19th January 2007. The ERL was granted to Cameco on 27th September 2007 and covers an area of 6 blocks for 20.13 km².
Cadell project is located within an Arnhem Land Aboriginal Reserve and is subject to an Exploration Consent Deed with the Northern Land Council (NLC) on behalf of Traditional Owners. Cadell contains areas that are sensitive or have cultural and/or social significance to the Traditional Owners, ‘No Go Areas’, and are excluded from exploration access.

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 in interest in the Cadell project, and adjacent EL22784, EL22785, and EL24992 if expenditure obligations were met. In June 2008, UEL declined to continue the Joint Venture arrangement and Cameco remains operator and manager of the project.

The proposed exploration work was presented to the Traditional Owners and Northern Lands Council (NLC) at the Work Program Meeting held on 1st April 2008 at Oenpelli. Clearance to conduct the program was given by the NLC on behalf of the Traditional Owners.

**Regional Geological Setting**

The Cadell project area is located within the eastern margin of the Neoarchaean and Palaeoproterozoic Pine Creek Orogen, and is in a region that has been subdivided into the Nimbuwah Domain of the Alligator Rivers region (Figure 3).

Figure 3: Simplified geology of the Pine Creek Orogen showing the location of selected mineral deposits (after Pirajno and Bagas, 2008).

This section is largely based on the work by Needham (1988, 1990), 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 4: NTGS 1:250,000 Regional Geology

The oldest exposed rocks in the Alligator Rivers region are included in the Neoarchaean (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. Palaeoproterozoic rocks in the Alligator Rivers region are amphibolite-facies psammites assigned in the Mount Howship Gneiss and the Kudjumardri 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 on-lap Neoarchaean basement highs, but gneissic variants are also thought pass transitional into paragneiss of the Nanambu Complex.
The Cahill Formation of the Namoona Group conformably overlie the Munmarlary 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 Cahill Formation is magnetic and significantly so at the base of psammitic unit in what is informally known as ‘hangingwall 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 intrude the Upper Cahill Formation.

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 migmatisation 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, b). The subgroup consists of sandstone units called the Mamadawerre Sandstone, Gumarrirnbang Sandstone, and Marlgora 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 units Neoarchaean and Palaeoproterozoic units, and the Kombolgie Subgroup, forming magnetic sills, dykes, lopoliths, and laccoliths. The Oenpelli Dolerite has a SHRIMP U-Pb baddeleyite date of 1723 ± 6 Ma (Ferenczi et al., 2005), however, geochemical and geophysical data suggest 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 transtensional movement along steep regional-scale strike-slip faults and possibly some shallow thrusting. These regional faults follow a pattern of predominantly north, northwest, north – northwest and northeast strikes, giving rise to the characteristic linearly dissected landform pattern of the Kombolgie Plateau. Another significant set trends east-west and 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, with a large lateral component in rocks of the PCS. 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.

**Local Geology**

The geology of the region can be divided into two geological domains, a northern domain of crystalline basement and dolerite bounded from the McArthur Basin sedimentary succession to the south by the east-trending Steven’s Fault (Figure 5). The project lies at the western extremity of the main surface expression of the Nimbuwah Complex, which occupies coastal plains and escarpment country north of the tenement, centred on King River. It is likely that the boundary between this complex and the high-grade metamorphics of the Pine Creek Succession (‘transitional zone’ of the Nimbuwah Complex; (Needham, 1988)) occurs within the tenement near Steven’s.

**Figure 5: Local geology of Cadell Project**

The transitional zone of the Nimbuwah Complex is represented by amphibolite to granulite facies pelitic to psammmopelitic gneiss and migmatite of the Myra Falls Metamorphics. The recently released NTGS 1:500, 000 scale GIS compilation for the Pine Creek Orogen specifies that these metamorphics belong to the Cahill Formation, based largely on geophysical character (Figure 4). However, this cannot be substantiated in outcrop by the presence of characteristic lithologies, suggesting the more general Myra Falls Metamorphics may be a more appropriate classification.

Sedimentary and volcanic rocks of the Lower Kombolgie Subgroup (Sweet et al., 1999a) unconformably overlie (and obscure) basement in the southern half of the tenement (Figure 5). The basal formation, the 100-250 m thick Mamadawerre Sandstone, forms a deeply dissected plateau surface. This area is composed largely of bare rock with sparse areas of shallow sandy soil supporting spinifex and scrub. Sandstone is quartzose to lithic and fine- to very coarse-grained with a variety of fluviatile to shallow high-energy marine bedforms, including trough and planar cross-beds (Ojakangas, 1979).
Mamadawerre Sandstone is unconformably overlain by the Nungbalgarri Volcanics, however, in Cadell this unit is only represented by lateritised surficial rubble. The contact is expressed locally as 100-500 m diameter sub circular depressions (‘dome and basins’), with the upper sandstone surface interpreted to represent the palaeotopographic surface of giant lunate current ripples or aeolian sand dunes with the volcanic draped over the top (Nott and Ryan, 1996). It may also represent large dewatering structures formed as a result of hot volcanic rocks draped over water-saturated sediments, which were deposited in estuarine conditions (Needham, 1978).

The Nungbalgarri Volcanics consist of multiple vesicular and amygdaloidal basaltic flows. The regional stratigraphic thickness of the volcanic unit is variable between 50m and 130 m, however, it may also be locally absent (Carson et al., 1999).

Sills and dykes of Oenpelli Dolerite occur within basement at Steven’s Anomoly, north of the Steven’s Fault (Figure 5). However, dolerite has not been intersected in any significant way in drill holes to the south of the fault under the cover of Kombolgie Subgroup. In drilling and outcrop, the dolerite ranges from fresh magnetic coarse-grained subophitic dolerite to pervasively altered chlorite-hematite rock. At Steven’s, the dolerite appears to form a sheet with a preserved thickness of less than 100 m that occupies the former unconformity between basement and Mamadawerre Sandstone immediately north of the Steven’s Fault. This structure is therefore interpreted to have had a fundamental control of distribution of the dolerite.

Undifferentiated Cretaceous rocks have been mapped as a small outlier in the central part of the tenement. The rocks are exposed as weathered outcrops of lateritised sandstone and siltstone forming a resistant mesa. A veneer of sand and black soil up to 20 m thick covers much of the area north of the Steven’s Fault.

**Exploration Target**

The focus of exploration in the Cadell 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 Platinum Group Element (PGE) 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**

**AFMEX 1997 to 2001**

Previous exploration in Cadell area has been carried out by AFMEX during the period 1997 to 2001 as part of the larger EL3347 tenement.

Table 1: Summary of exploration results for Cadell from 1997 to 2001 (AFMEX)

The Stevens prospect was identified by an airborne radiometric survey in 1997 and followed up with outcrop sampling in 1997 and 1998. Uranium was found associated with gold in altered Oenpelli Dolerite with the best result from the prospect being 4.6% \( \text{U}_3\text{O}_8 \), 1.3% Pb and 2.2% \( \text{P}_2\text{O}_5 \) in clay-hematite talus rock with yellow secondary U stains.

In 1998, the Steven’s Prospect was gridded to provide a base for a ground radiometric survey. Radiometric readings were taken every 25 to 50 m, along 100 m spaced north-south grid lines. The mapping and ground radiometrics completed over the area confirmed that the radioactive anomaly is confined to the dolerite close to its faulted contact with the Mamadawerre Sandstone.

No further work was conducted on the prospect until Cameco acquired EL3347 from Afmex in 2003.

**Cameco 2003 to 2007**

Cameco conducted helicopter-supported diamond drilling in the Stevens prospect in 2003 (CDD0001) and 2004 (CDD0002). Refer to Figure 6 for hole locations. The best analytical result obtained was 610 ppm \( \text{U}_3\text{O}_8 \) and 71 ppb Au over 20 cm at 31.8 m within dolerite in CDD0002. Saprolitic clays from 7.3 to 26 m returned assays of 16 ppm \( \text{U}_3\text{O}_8 \) and 31 ppb Au over 18.7 m (composite samples). Alteration associated with the Stevens fault in CDD0002 comprised massive hematite, sericite and chlorite alteration.

High resolution radiometric and magnetic airborne surveys and a hyperspectral HyMap survey were completed over the area in 2004. Additional rock sampling returned results of 0.15% \( \text{U}_3\text{O}_8 \) and 370 ppb Au with four other samples returning >350 ppm \( \text{U}_3\text{O}_8 \).

Six diamond holes (CDD0003 to CDD0008) for 1,019 m targeting the Stevens fault, were completed in 2005 (refer Figure 6). Intense chlorite-hematite alteration was recognised in the basal 10 to 15 m of the Mamadawerre Sandstone, with local zones up to 2 m thick returning up to 180 ppm \( \text{eU}_3\text{O}_8 \). The contact of the sandstone with Oenpelli Dolerite is brecciated and strongly altered. Narrow highly anomalous uraniferous veins were present in both the basement rocks and dolerite with preferred
northerly trend. CDD0003 returned best analytical result of 0.6% U₃O₈ over 0.6 m in a vein in Nimbuwah granite. CDD0005 returned 6.8 m@2,620 ppb Au, 542 ppb Pt and 709 ppb Pd in dolerite saprolite.

25 reverse-circulation (RC) holes were completed in 2006, with eight deep RC holes designed to test uranium mineralisation associated with the Steven’s fault and 17 shallow RC holes to test saprolitic dolerite concealed beneath transported cover to the north of Steven’s fault. CDR0015 and CDR0016 had the best results of 0.187% U₃O₈ and 0.094% U₃O₈ over 1 m in fault zone respectively. CDR0013 returned 6.06 g/t Au, 1.58 g/t Pt and 2.20 g/t Pd over 5 m in dolerite.

A soil sampling program of 160 samples was trailed over the northern portion of the licence area where transported sand cover obscures the basement rocks (Figure 7). Sample CD070038 returned the best results of 96 ppb Au and 100 ppm U. Table 2 shows geochemical results from the soil sampling survey.

A Tempest electromagnetic survey was conducted over the Stevens area in 2006; the survey failed to identify any response related to mineralisation within the survey area.

No on ground activities were conducted during 2007. Application for the ERL covering the retained area of EL 3347 was submitted on 19th January 2007. Advice was provided to Cameco that on-ground access would not be possible after the ERL application was submitted, and no work was scheduled. ERL 25896 was granted to Cameco on 27th September 2007.

EXPLORATION WORK COMPLETED FOR THE PERIOD 2008 TO 2009

Exploration on ERL 25896 during the reporting period consisted of:

- Eight truck-mounted reverse-circulation drill holes totalling 1,386 m
- 75 truck-mounted air-core holes totalling 878 m at Steven’s prospect

During the reporting period, Cameco drilled eight RC holes along Steven’s fault for a total of 1,386 m and 75 air-core holes for 894 m in the northern sand covered area of the tenement.

The air-core drilling was conducted by Bullion Drilling Pty Ltd of Kalgoorlie, using a truck mounted air-core drilling rig. RC drilling was conducted by Gorey & Coley Pty Ltd of Alice Springs, using a truck-mounted UDR KL1500. The location of the drill holes and drill summary can be found in Table 4 and Figure 8.
Drill logging codes and sampling, geochemical analysis, and infra-red spectroscopy methodology is summarised in Appendix 1.

Appendix 1: Cameco Australia Sampling Methodology and procedures

All relevant tab delimited data is within the data directory of the report CD.

**Air-Core Drilling**

Air-core holes were drilled to refusal or where drilling conditions (eg, ground water) inhibited penetration. Drill spoils from each metre were inspected 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 by Cameco in Darwin. Short wave infrared (SWIR) reflectance spectrum is recorded from each sample represented in the soil chip trays using an Analytical Spectral Device (ASD). This data is used to characterise the clay minerals in the drill spoils.

Geochemical sampling was conducted as nominal five metre composite samples with smaller sample intervals over zones with increased gamma or alteration. A total of 267 samples (refer to Table 6 for sample listing) were collected from the drilling and submitted to Northern Territory Environmental Laboratories (NTEL) of Darwin, Northern Territory, for a suite of over 50 elements, and 4 lead isotopes by weak acid leach (WAL).

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

Table 5: Air-Core Drillhole Collars
Table 6: Air-Core Drilling - Submitted Samples and Geochemistry Results
Table 7: Air-Core Drilling - Lithologies
Table 8: Air-Core drilling - TSA Data

Distribution maps of various elements for air-core samples are presented in Figures 9 to 11. A bedrock geology map generated from both existing outcrop and drilling information is presented in Figure 12.

Figure 9: Map showing uranium geochemical results for air-core samples
Figure 10: Map showing U/Th for air-core samples
Figure 11: Map showing Au results for air-core samples
Figure 12: Cadell Bedrock Geology Map

A detailed report of drillhole information, including lithology, colour, alteration, and recorded gamma (cps) readings can in Appendix 2 to Appendix 4.
Appendix 2: CDA0034 - CDA0057 Detailed Drill Logs  
Appendix 3: CDA0057 - CDA0081 Detailed Drill Logs  
Appendix 4: CDA0058 - CDA0108 Detailed Drill Logs  

The uranium results returned in the aircore are below 10 ppm U₃O₈ which is considered background value for the Oenpelli Dolerite. However, slightly higher uranium values are found close to the Stevens fault, defining it as the main controlling structure for uranium mineralisation in the Cadell tenement.

CDA0094 (refer Figure 8) returned highly anomalous Pb206/204 ratios from isotopic analytical results of up to 294 from 9 to 17 m in doleritic saprolite. The rest of the aircore holes returned Pb isotope results below 1 which is considered the background value for the Oenpelli Dolerite. The Pb anomaly in CDA0094 is open to the north and was not tested at depth within the interpreted basement Nimbuwah Complex granitoids. The aircore holes surrounding CDA0094 were drilled to refusal in dolerite and also have not tested the basement rocks. This area remains a partially untested target that may require further drilling to test the prospectivity of the basement rocks for uranium mineralisation.

### Reverse-Circulation Drilling

The reverse-circulation drilling program consisted of eight truck-mounted reverse-circulation (RC) drill holes (CDR0109 to CDR0116) for 1,386 m, designed to:
- test for extensions of mineralisation intersected in previous drilling programs.
- test the potential of Steven’s fault for uranium mineralisation at/near the unconformity-fault intersection.
- test zones of low magnetic response which are interpreted to relate to increased alteration and potential uranium mineralisation.
- investigate uranium mineralisation potential of NNW trending lineaments that cross-cut the Stevens fault.

Representative samples of every metre of RC cuttings are kept in plastic chip trays which are stored permanently by Cameco in Darwin.

A summary collar location table for the drill holes is shown in Table 4 and the drillhole locations are shown in Figure 13.

**Figure 13: 2008 RC Drill holes Location map**

### RC Drilling and Sampling Methodology

Short wave infrared (SWIR) reflectance spectrum is recorded from each sample of RC cuttings using an Analytical Spectral Device (ASD). Geochemical sampling was conducted as nominal four-metre composites depending on lithology. Samples were analysed at NTEL in Darwin for a suite of over 50 elements, and 4 lead isotopes by weak acid leach (WAL). Sampling, geochemical analysis, and infra-red spectroscopy methodology is summarised in Appendix 1.
A summary of drilling results is provided in Table 4. A detailed report on drilling information, including lithology, colour, alteration and magnetic susceptibility can be found in Appendix 5. Major and trace element geochemical data for RC chips is presented in Table 9.

Appendix 5: Drilling Report for CDR0109 - CDR0116

Table 9: RC Geochemical Assay Results

A total of 5 thin sections were prepared and described by Pontifex and Associates from selected RC chip samples. Petrological studies on dolerite samples identified ophitic clinopyroxene, olivine-green smectite derived from granular olivine and prehnite and pumpellyite on fracture surfaces. Minor sulphides, mainly pyrite and K-feldspar of secondary origin were identified in some of the dolerite samples.

Appendix 6: Pontifex Petrography - RC Chips

**CRD0109**

CDR0109 was drilled to 184 m to test the east-west trending Steven’s fault for uranium mineralisation at/or near the faulted contact of the Oenpelli Dolerite and Mamadawerre Sandstone.

CDR0109 was collared in Nimbuwah Complex Granite drilling through to Oenpelli Dolerite at 42 m. Oenpelli Dolerite continued from 42 m to 142 m where granites of the Nimbuwah Complex were intersected to the end of the hole at 184 m.

Geochemical sampling identified a best result of 108 ppm U$_3$O$_8$ over 1 m from 139 m in intensely hematite altered dolerite (Figure 14). The U$_3$O$_8$ anomaly is coincident with an increase in Au to 8 ppb.

The drill hole was gamma probed with eU$_3$O$_8$ intercepts calculated at 0.01% cut-off including 0.39 m @ 0.0177% U$_3$O$_8$ from 139.3 m. A section for CDR0109 and the downhole gamma log are shown below.

**Figure 14: CDR0109 drill hole section**

**Figure 15: CDR0109 Downhole eU3O8% probe data**

**Figure 16: CDR0109 Drill Log Strip Plot**

The intersected mineralisation in CDR0109 is proximally coincident with the basal intrusive contact of the Oenpelli Dolerite with the underlying Nimbuwah Complex granitoids. The mineralisation may be associated with localised brecciation on or near this contact with possible controls by secondary structures associated with the Stevens fault.

**CDR0110**

CDR0110 was drilled to test the uranium mineralisation potential of the Steven’s fault. CDR0110 is located 270 m to the south-east of CDR0109.
The drill hole intersected a thick sequence of Oenpelli Dolerite from 27 to 142 m then a sequence of medium grained inequigranular porphyritic basement granitoids of the Nimbuwah Complex to the end of hole at 256 m.

The hole intersected strong hematite and chlorite alteration from 27 to 105 m. Significant uranium mineralisation of 12 m @ 0.115% U₃O₈ from 85 m was intersected within dolerite. This coincides with intense hematite alteration. From 97 m, hematite alteration and radioactivity decreases to background levels. Coincident elevated levels of 22 ppb Au and 0.85 ppb Mo is associated with the uranium mineralisation. The mineralisation is interpreted to be controlled by subsidiary structures associated with the Steven’s fault.

The drill hole was gamma probed with eU₃O₈ intercepts calculated at 0.01% cut-off including 10.22 @ 0.13% U₃O₈ from 84.4 m, 1.95 m @ 0.041% U₃O₈ from 62.1 m, 1.21 m@ 0.031% U₃O₈ from 65.6 m and 1.73 m @ 0.034% U₃O₈ from 215.35 m. Grade, thickness and product calculations based on BQ gamma probe data for the main anomalous intervals are tabulated in Table 10. A downhole gamma log for CDR0110 is shown in Figure 19.

Figure 17: CDR0110 drill log strip plot
Figure 18: CDR0110 drill hole section
Figure 19: CDR0110 Downhole eU3O8% probe data
Table 10: Grade thickness product for CDR0110

CDR0111

CDR0111 was drilled to test the Steven’s fault for uranium mineralisation at/or near the faulted intersection of the Mamadawerre Sandstone and Oenpelli Dolerite. The drillhole is located 325 m to the south-east of CDR0110.

CDR0111 was collared in Oenpelli Dolerite. The dolerite is medium grained K-feldspar-clay-sericite-leucoxene altered with sparsely plagioclase phenocrysts. Weakly chloritised medium grained granite of the Nimbuwah Complex was intersected from 31 m to 51 m. From 51 m to 67 m the hole intersected chloritised Oenpelli dolerite, followed by Mamadawerre Sandstone from 67 to 100 m. From 100 m to 152 m a thick sequence of variably altered Oenpelli Dolerite was intersected then, followed by Nimbuwah Complex Granite to the end of the hole at 202 m.

The gamma log did not provide any results above expected background values, confirming the irregularity nature of mineralisation in the Cadell tenement.

Figure 20: CDR0111 drill log strip plot

CDR0112

CDR0112 was drilled to 180 m to test the east-west trending Steven’s fault for uranium mineralisation at/or near the faulted contact of the Oenpelli Dolerite and Mamadawerre Sandstone. The drillhole is located 105 m to the east of CDR0111.
The drill hole intersected a narrow sequence of Oenpelli Dolerite from 24 m to 27 m, then a sequence of medium grained inequigranular porphyritic basement granitoids of the Nimbuwah Complex to 42 m. Oenpelli Dolerite was intersected from 42 m to 64 m before intersecting a thick sequence of Mamadawerre Sandstone from 64 to 111 m followed by dolerite from 111 to 134 m and then granite up to the end of the hole at 180 m.

Anomalous or elevated radioactivity is dispersed over three broad zones within the granite and dolerite: i) an upper interval in granite at depth 33 to 36 m with average grade of 126.16 ppm U_3O_8, and ii) an intermediate interval in dolerite at depth 49 to 59 m with average grade of 115.32 ppm U_3O_8 and the lowermost narrow low-grade interval close to the footwall contact with the underlying sandstone. Mineralisation on all three intervals is associated with intense hematite alteration (Figure 21).

The drill hole was gamma probed with eU_3O_8 intercepts calculated at 0.01% cut-off including 1.17 m @ 0.21% U_3O_8 from 34.61 m, 1.17 m @ 0.015% U_3O_8 from 49.36 m, 2.29 m @ 0.027% U_3O_8 from 50.76 m. Grade, thickness and product calculations based on BQ gamma probe data for the main anomalous intervals are tabulated in Table 12. A downhole gamma log, strip plot and drill hole section for CDR0112 are shown below.

Figure 21: CDR0112 drill log strip plot

Figure 22: CDR0112 drill hole section

Figure 23: CDR0112 Downhole eU3O8% probe data

Table 11: Grade thickness product for CDR0112

**CDR0113**

CDR0113 was drilled to 130 m to test the Steven’s fault for uranium mineralisation at/or near the faulted contact of the Oenpelli Dolerite and Mamadawerre Sandstone. CDR0113 is located 235 m to the east of CDR0112.

CDR0113 was collared in Oenpelli Dolerite. The dolerite is medium grained K-feldspar-clay-sericite-leucoxene altered with sparsely plagioclase phenocrysts. Mamadawerre Sandstone with pink diagenetic hematite and minor dark red brown hematite was intersected from 92 m to 117 m, and then followed by coarse grained granitoids of the Nimbuwah Complex to the end of the hole at 130 m.

Geochemical sampling identified three low intensity uranium anomalous zones. The upper mineralised zone is near surface in doleritic saprolite at depth 8 m to 28 m with 120.85 ppm U_3O_8. The intermediate uranium anomalous zone has 90.21 ppm U_3O_8 over 6 m from 51 m in chloritised dolerite. The lowermost mineralised zone is in dolerite close to the bottom contact with the sandstone with 281.10 ppm U_3O_8 over 4 m from 84 m (Figure 25).

The drill hole was gamma probed with eU_3O_8 intercepts calculated at 0.05% cut-off. Grade, thickness and product calculations based on BQ gamma probe data for the
main anomalous intervals in CDR0113 are tabulated in Table 12. A downhole gamma log for CDR0113 is shown in Figure 26.

Figure 24: CDR0113 drill log strip plot
Figure 25: CDR0113 drill hole section
Figure 26: CDR0113 Downhole eU3O8% probe data

Table 12: Grade thickness product for CDR0113

The weak mineralisation intersected in CDR0113 could be controlled by secondary structures that are related to the Steven’s fault.

CDR0114

CDR0114 was drilled to 124 m to test the Steven’s fault for uranium mineralisation at/or near the faulted intersection of the Oenpelli Dolerite and Mamadawerre Sandstone. CDR0114 is located 870 m to the south-east of CDR0113.

CDR0114 was collared in Oenpelli Dolerite drilling through a sequence of variably altered medium to coarse grained granitoids of the Nimbuwah Complex from 28 m to the end of the hole at 124 m.

Geochemical sampling identified two low intensity uranium anomalous zones in dolerite. The upper mineralised zone is near surface in doleritic saprolite at depth 5 to 18 m with 21.37 ppm U3O8. The lower mineralised zone is in oxidised dolerite close to the bottom contact with the granite with 60.83 ppm U3O8 over 1m from depth of 89 m. The intersected mineralisation could be related to remobilisation of uranium along the post dolerite structures.

Figure 27: CDR0114 drill strip plot

CDR0115

CDR0115 was drilled to 170 m to test zones of low magnetic response which appear to correspond with an increase in uranium indicated by radiometrics. CDR0115 is located 215 m to the north of CDR0114.

CDR0115 intersected strongly chlorite altered and moderately hematite altered plagioclase-porphyritic dolerite from start to the end of the hole at 180 m (Figure 28). Magnetic susceptibility measurements average 0.8 through out the dolerite.

The gamma log did not provide any results above expected background values, confirming the irregularity nature of mineralisation in the Cadell tenement.

Figure 28: CDR0115 drill strip plot
CDR0116

CDR0116 was drilled to 140 m to test the Steven’s fault for uranium mineralisation at/or near the faulted intersection of the Oenpelli Dolerite and Mamadawerre Sandstone. CDR0116 is located 612 m to the south-east of CDR0114.

CDR0116 was collared in Oenpelli Dolerite. The intersected dolerite is medium grained quartz bearing, K-feldspar-clay-sericite-leucoxene altered with sparsely plagioclase phenocrysts. Variably altered medium to coarse grained granitoids of the Nimbuwah Complex were intersected from 93 m to the end of the hole at 140 m.

Geochemical sampling identified elevated uranium in doleritic saprolite, possibly related to supergene enrichment from weathering of the dolerite.

Figure 29: CDR0116 drill strip plot

EXPENDITURE

Eligible expenditure for the Cadell Project in 2008-2009 was AUD$654,979.43 as shown in Table 13.

Table 13: Eligible Expenditure Statement

CONCLUSIONS AND RECOMMENDATIONS

The eastern and central parts of the tenement to the north of Steven’s fault are dominated by widespread occurrence of Oenpelli Dolerite. Oenpelli Dolerite is more widespread than first envisaged and probably encompasses 40% of the near-surface Proterozoic geology of the tenement.

The uranium results returned from the aircore drilling are below 10 ppm U₃O₈ which is considered background value for the Oenpelli Dolerite. CDA0094 returned an anomalous Pb isotope result of up to 294 (Pb206/204 ratio) from saprolite weathered dolerite, with the hole drilled to refusal in dolerite. The Pb isotope ratios indicate that substantial Pb206 (the result of decay of uranium) has been introduced into the area tested by drilling. This anomaly is open to the north. Surrounding aircore drill holes were drilled to refusal in the dolerite and none of the drilling has tested below the dolerite into the basement rocks for uranium mineralisation. Further work is required to understand the nature of the Pb anomaly and how it may relate to the know mineralisation along the Stevens fault.

Intense hematite and chlorite alteration is observed within the mineralised portions of Oenpelli dolerite in CDR0110 and CDR0112. The degree of alteration of the dolerite in mineralised areas indicates significant hydrothermal fluids were circulating through the area. In CDR0110 uranium mineralisation is coincident with elevated levels of Au to 22 ppb and Mo to 0.85 ppb. Mineralisation intersected in CDR0110 may be controlled by post dolerite structures associated with the Steven’s fault. 2009 diamond drilling around CDR0110 will test the secondary structures for uranium mineralisation.

CDR0115 was drilled to test a zone of low magnetic response which was interpreted to relate to increased alteration and potential uranium mineralisation. Strongly chlorite altered and moderately hematite altered Oenpelli Dolerite was intersected from start to the bottom of the
hole; however anomalous uranium was not intersected. Mineralisation in the Cadell tenement may in part be controlled by secondary structures related to the Stevens’ fault; these secondary structures may be associated with zones of low magnetic signature which is interpreted to represent clay alteration associated with the structures.

A small ground sub-audio magnetic geophysical survey is recommended for the area as this may highlight structural zones that are not apparent in either the magnetic or electromagnetic data sets. The survey may provide further targeting information required for follow-up drilling of the significant uranium mineralisation identified in CDR0110.

2009 WORK PROGRAM AND PROPOSED BUDGET

The work proposed for 2009 include:

- Comprehensive review and evaluation of all previous exploration data (geophysics, geology derived from mapping, drilling and geochemistry) in order to reassess the exploration potential of the tenement.
- Ground geophysical Sub-Audio Magnetic (SAM) survey in to order image conductors associated with structures, since these could relate to clays, porosity or graphite; indicative of alteration and/or fluid-rock interaction with potential to precipitate uranium.
- Follow-up diamond drilling on the significant uranium mineralisation intersected in CDR0110 to identify controls on mineralisation; the main objective being to increase targeting measures by collection of structural data.

Expenditure for the exploration program in the third year of tenure covering the 2009 to 2010 reporting period is anticipated to be $300,000 to complete the program as planned.
REFERENCES


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