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IAEA SOUTH AUSTRALIA Government of South Australia

Alligator Rivers Uranium Province – Learnings, Theories & Discovery

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04 June 2019

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Competent Person's Statement

Information in this report is based on current and historic Exploration Results compiled by Mr Andrew Peter Moorhouse who is a Member of the Australasian Institute of Geoscientists. Mr Moorhouse is an employee of Alligator Energy Limited, and has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity he is undertaking to qualify as a Competent Person as defined in the 2012 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves. Mr Moorhouse consents to the inclusion in this release of the matters based on his information in the form and context in which it appears.

Alligator Energy In the Alligator Rivers 2011 - 2019

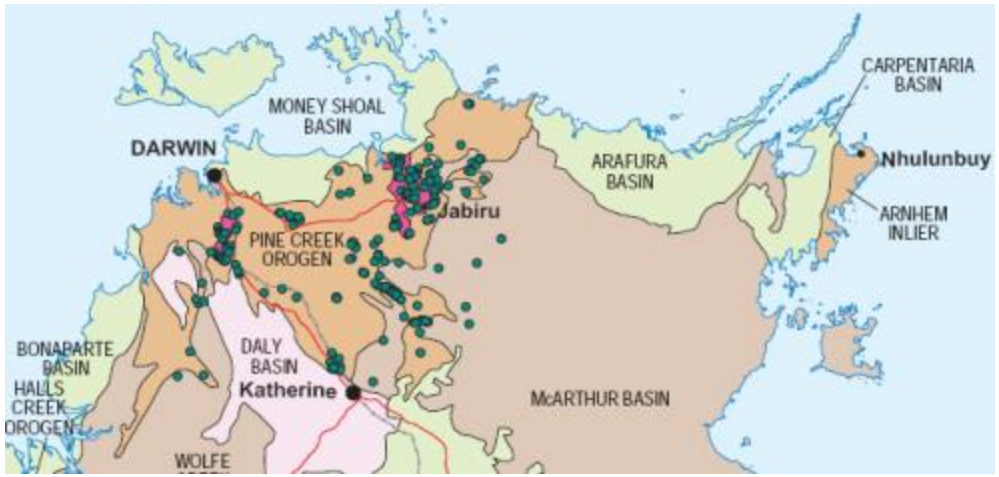
➢ Work completed since 2011 include:

- Over 30,000 metres of Drilling
- Over 10,500 whole rock geochemical samples
- Over 100 R&D test geochemical samples including vegetation and water
- Over 6000 line km of Airborne Geophysics
- Over 6000 Gravity geophysics stations
- Over 15,000 Ground radiometric station points
- Ongoing successful engagement and employment with traditional owners

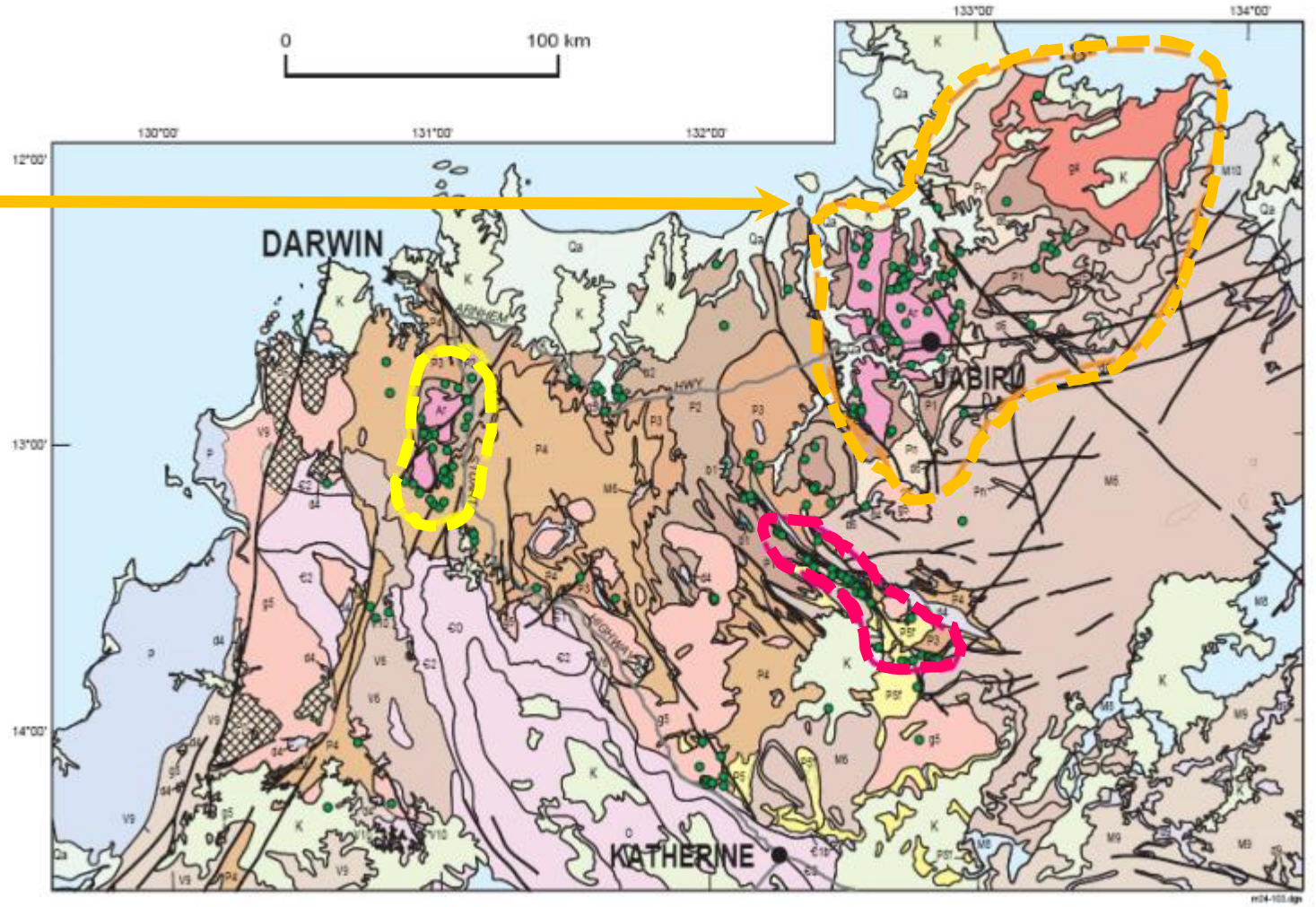
ARUP LOCATION

Many U occurrences in 3 distinct terrains:

- **Alligator Rivers Uranium Province (ARUP)**
- South Alligator Valley (SAV)
- Rum Jungle Mineral Field (RJMF)



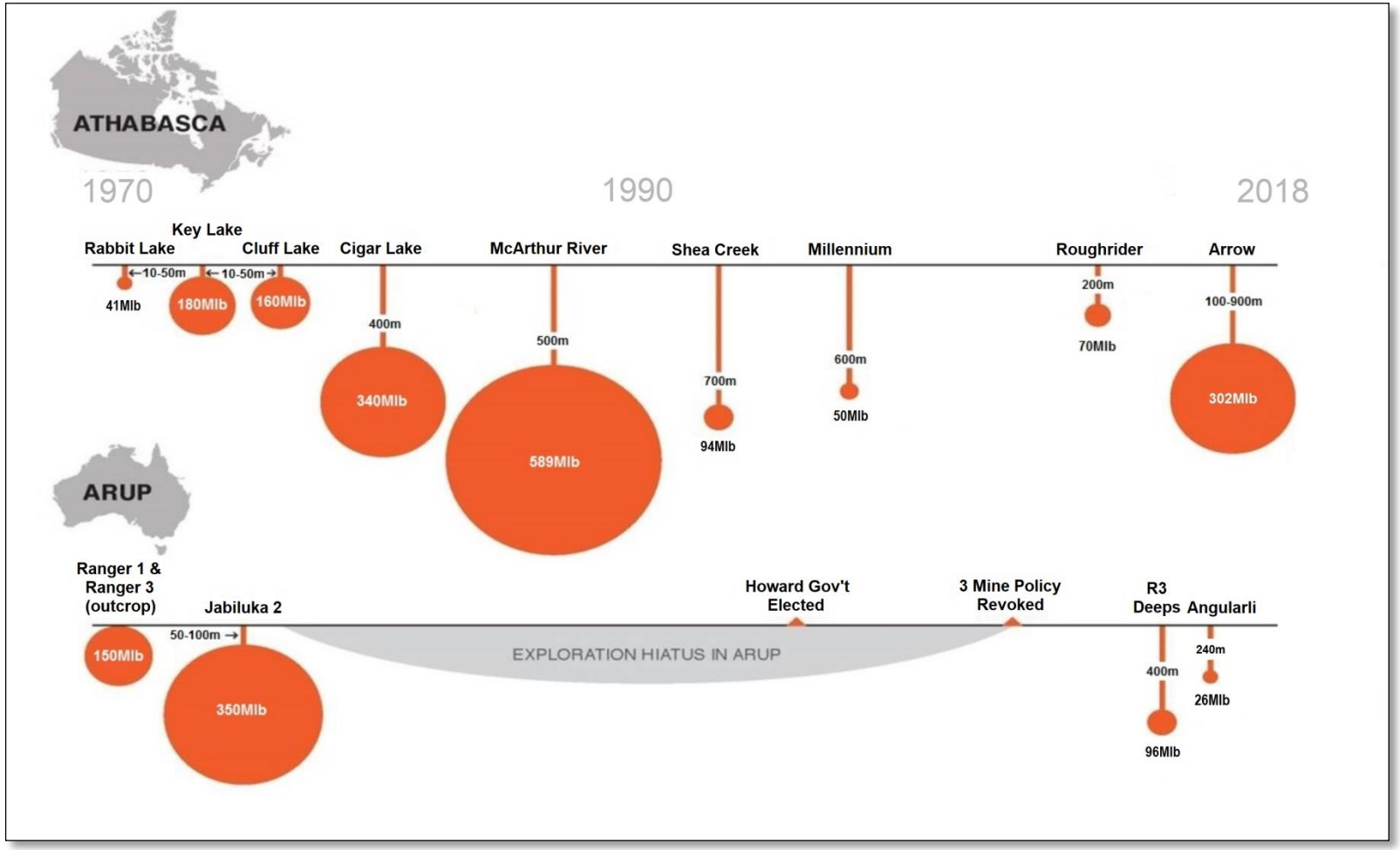
Source: Lally & Bajwah, 2006



Historical Exploration & Discovery ARUP vs Athabasca

ARUP

- 20-30 year hiatus in exploration (none in Kakadu area since 1977)
- Purely political
- Sporadic exploration in western Arnhem Land
- Knowledge base is limited
- Model-based exploration largely unsuccessful

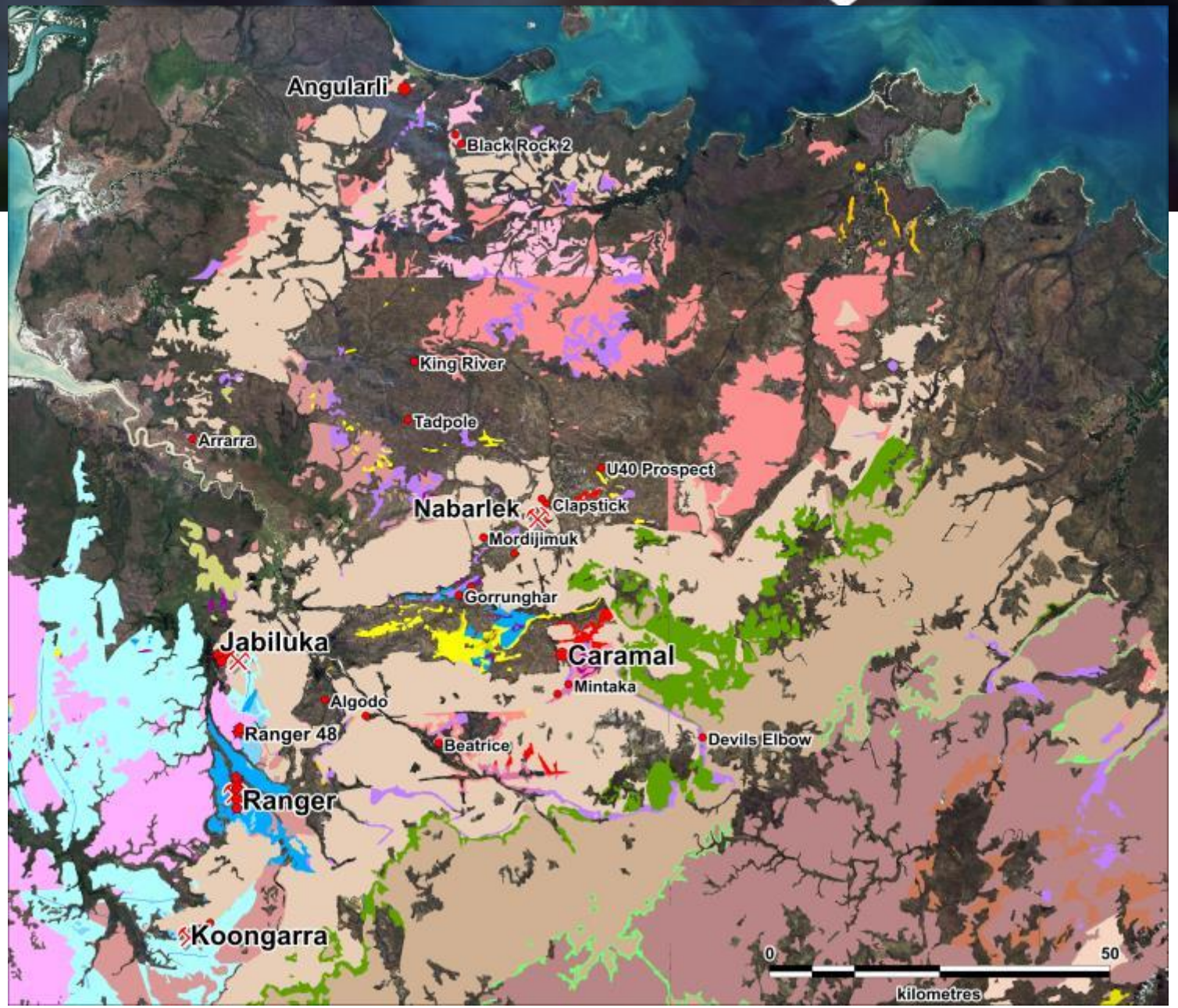


Regional Geology & Uranium

Existing Geology & Data

- NTGS Alligator Rivers 250k
  - Extensive sandstone and Cenozoic cover
- Majority of drilling is RAB
  - Typically not extending into basement
- Many diamond drill holes did not extend far into basement (<10m)

Geology overlay: NTGS Alligator Rivers 250k GIS data



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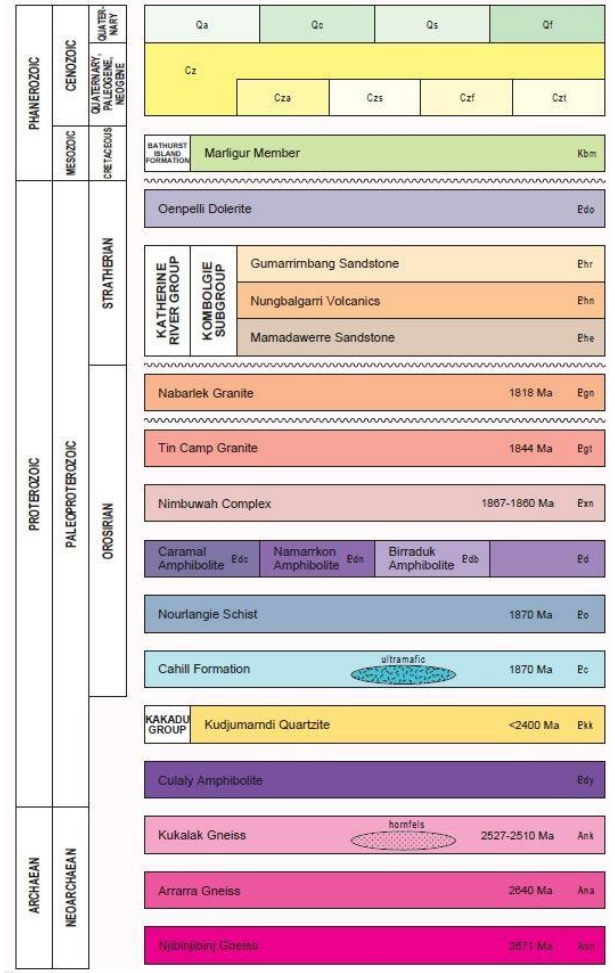
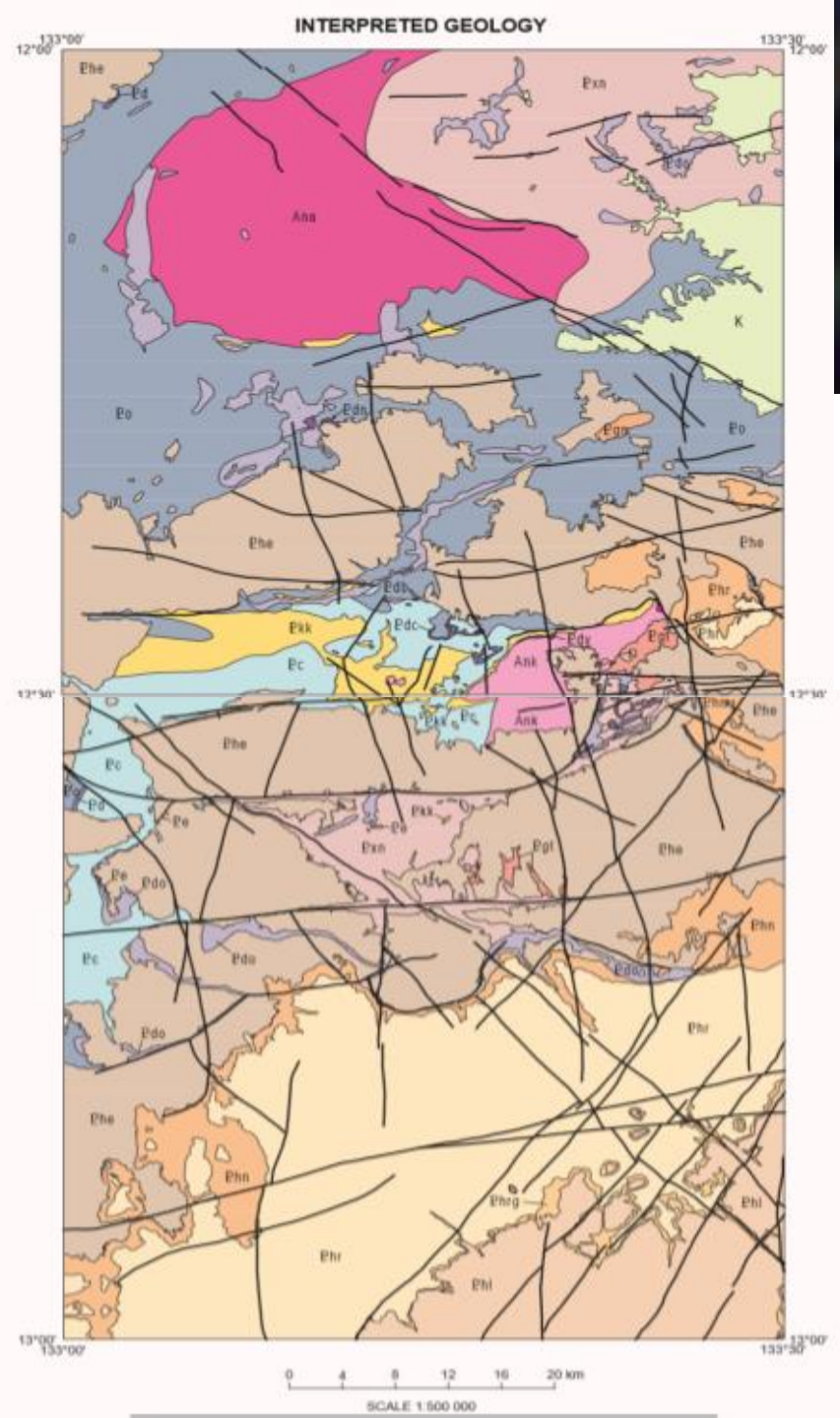
Existing Regional Geological Interpretation

Stratigraphy below Cretaceous-Tertiary-Quaternary cover:

- MidProterozoic
  - Oenpelli Dolerite
  - Mamadewere Sandstone
- Lower Proterozoic
  - Nourlangie Schist
  - Cahill Formation
  - Kudjumarndi Quartzite
- Archaean
  - Kukulak, Arrara and Njibinjibinj Gneisses



Images: Existing Geology interpretation within the ARUP NTGS govt 100k Howship and Oenpelli.



Key Geological Learnings

1. **STRUCTURE**
   - Initial basement-soled listric
   - Steepened normal & reverse faults (later reactivations essential)

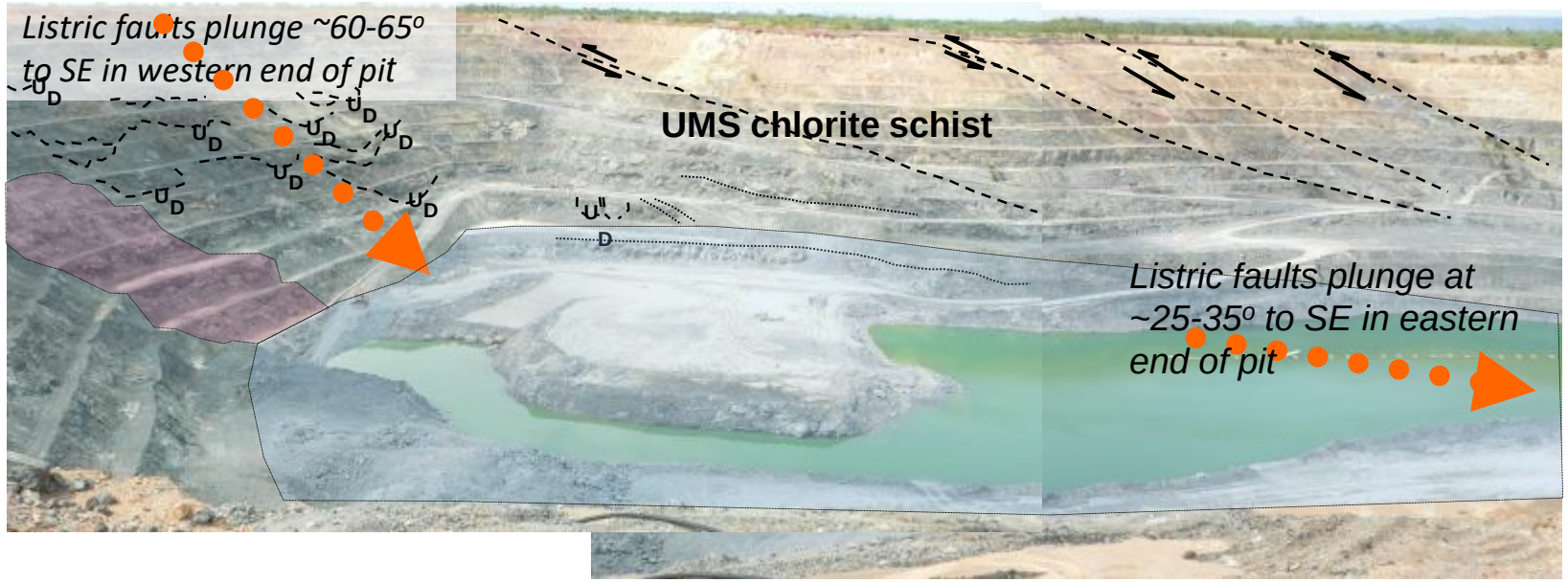
2. **STRATIGRAPHY**
   - Competency contrast
     - Carbonate vs schist
     - Fine-grained biotitic vs coarse-grained muscovitic schists
   - Permissive lithochemistry
     - Carbonate dissolution locally

3. **SOURCE FLUID CHEMISTRY**
   - Acidic mildly oxidised
   - Fluid movement UP from basement source
   - Deposition by
     - chemical reduction (Fe^{++} from chlorites)
     - pressure differential

4. **UNCONFORMITY** (with overlying MidProt)
   - Zero effect on distribution of U

Example – Ranger 1 No 3

- Inter-related Structures
  - Sub-Parallel listric faults
- Permissive Stratigraphy
  - Carbonates attacked by fluids to form chert (brecciated during reactivation)
  - Brittle/Ductile deformation



Intersecting listric fault systems (steep & shallow)

View to N & NW part of pit

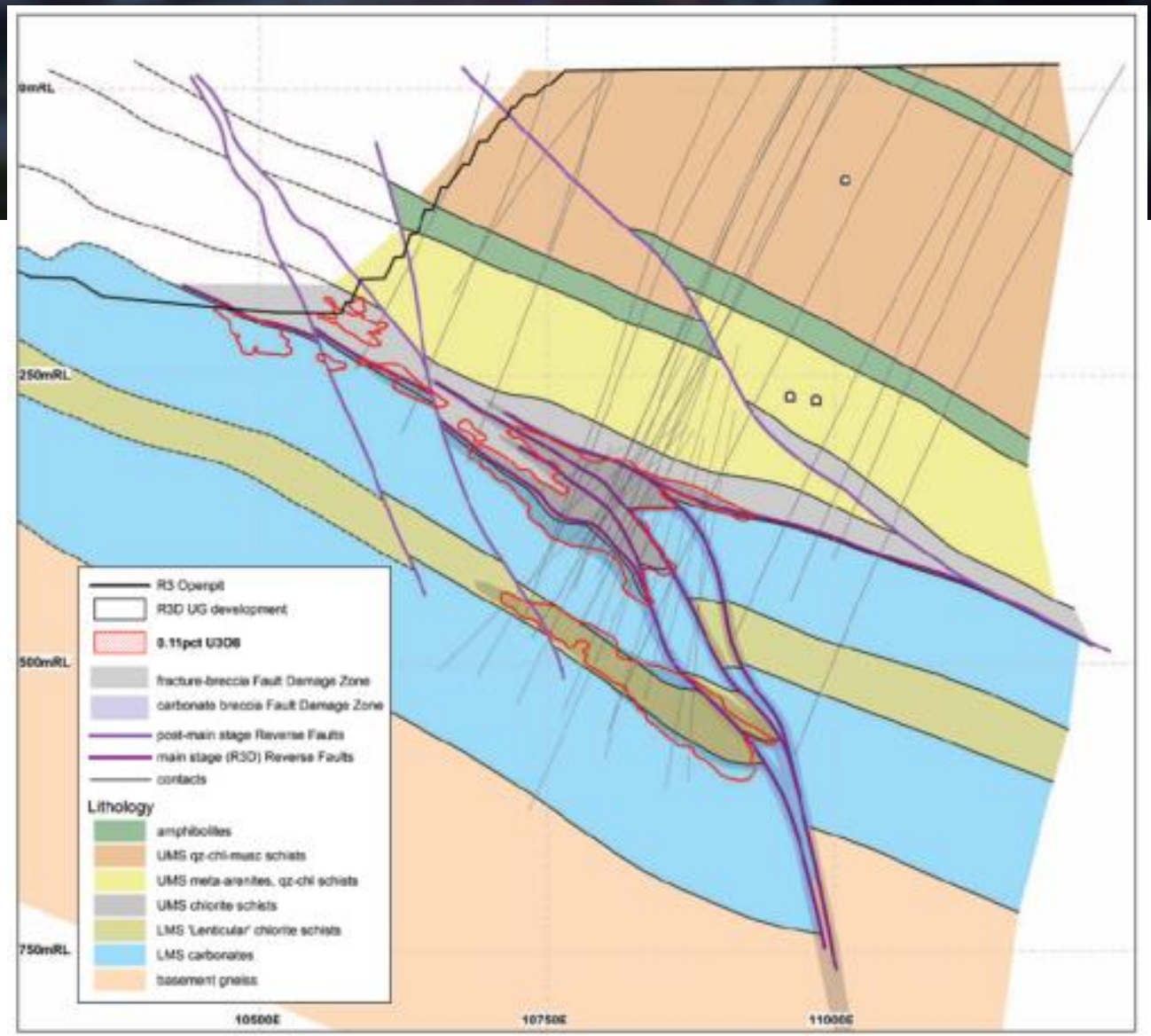
Listric faults
Foliation
SE plunge
LMS Chert
LMS Carbonate

R1 No 3, N wall
15 Nov 07

Example – Ranger 1 No 3 Deeps

- Ranger 3 Deeps – Down plunge of Ranger 1 No 3.
- Discontinuous from original No 3 orebody
- Basement tapping structures
- No unconformity.
  - >250m below unconformity level

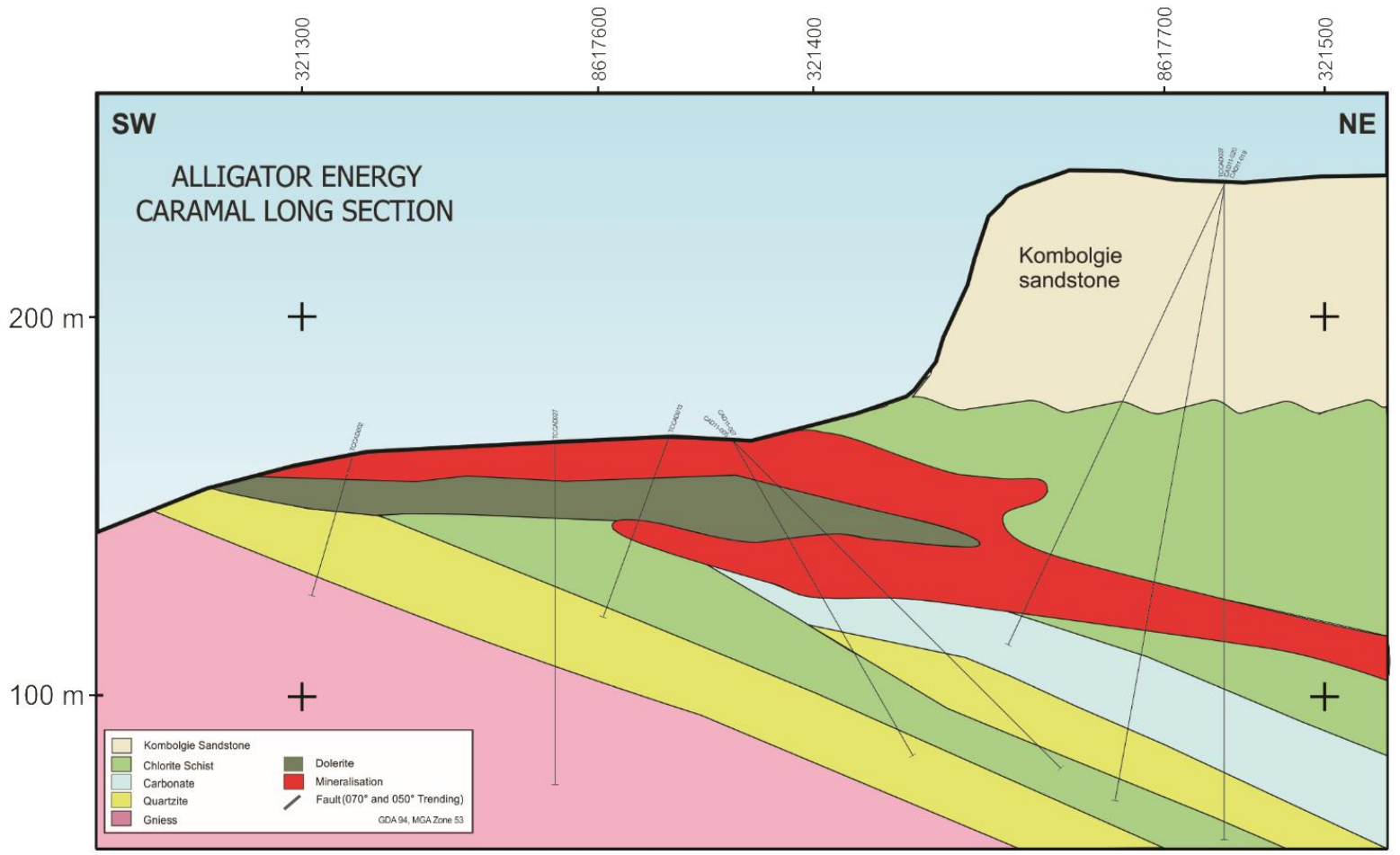
Understanding the stratigraphy structural relationships is key to knowing where large deposits are likely to occur



Ranger 3 Deeps cross section showing mineralisation and structural setting.
(Pevely, S. Hinman, M & McLellan, A. *Ranger 3 Deeps uranium deposit*. AusIMM Monograph-32 Australian Ore Deposits. P464. 2017)

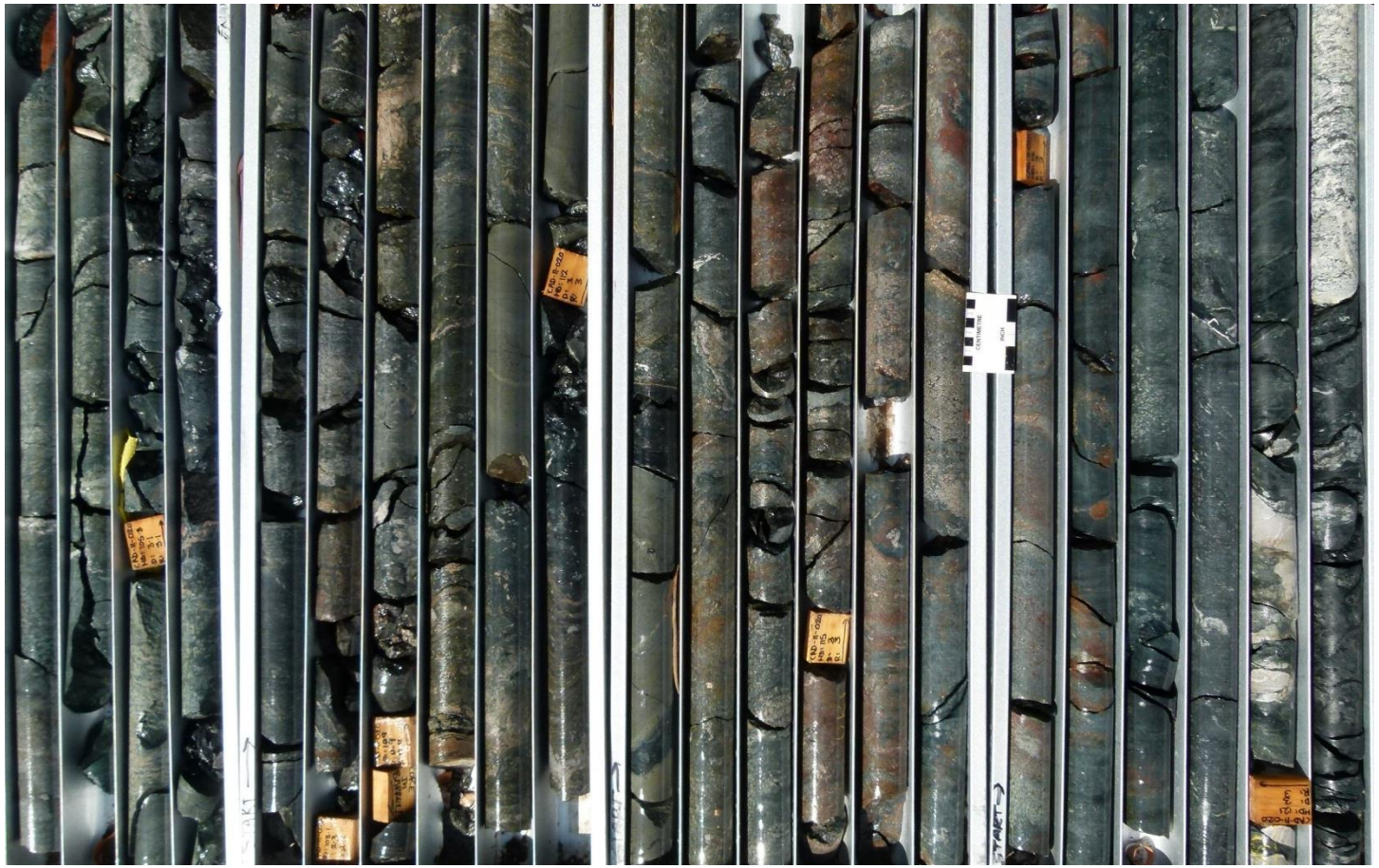
Example – Caramal

- Caramal comparable with Ranger3 and 3 deeps.
- Partially exposed which allowed easy discovery by QML in 1960s
- Sandstone 40-60m thick
- Mineralised zone typically 20-50m below unconformity
- Mineralisation occurs above carbonate sequence comparable to LMS at Ranger.



Example – Caramal

- Core from Caramal mineralised zone showing typical lithology and structure anticipated with large ARUP U deposits.
- Similar to that of Ranger mineralisation.
- CAD11-020: 14m at 7,072ppm U_3O_8 from 104m



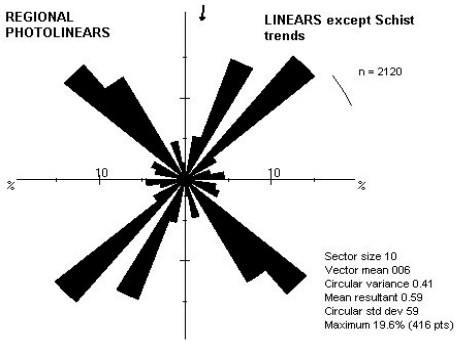
CAD11-020 104-122m Mineralised zone

Structures – Basement vs MidProt Sandstone

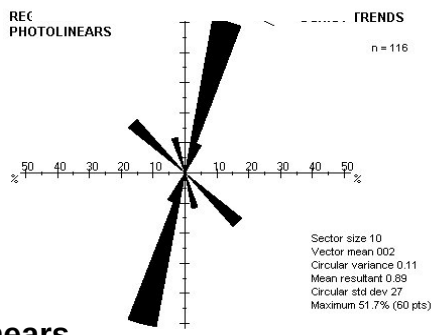
REGIONAL

Kombolgie & Lower Proterozoic lineaments
- from detailed air photo study & mapping

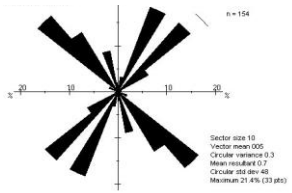
Linears in Kombolgie



Linears in Schist



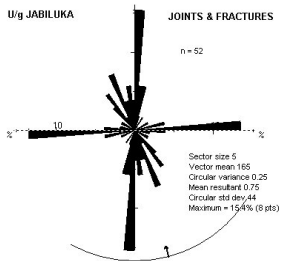
Drainage Linears



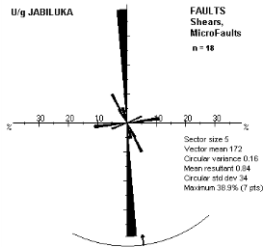
JABILUKA UNDERGROUND

Mapped in Lower Proterozoic basement

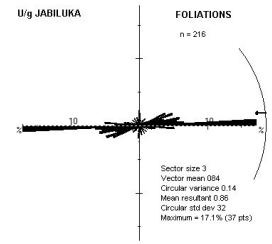
Joints & Fractures



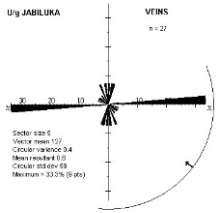
Faults & Shears



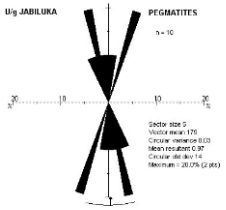
All Foliations



Veins

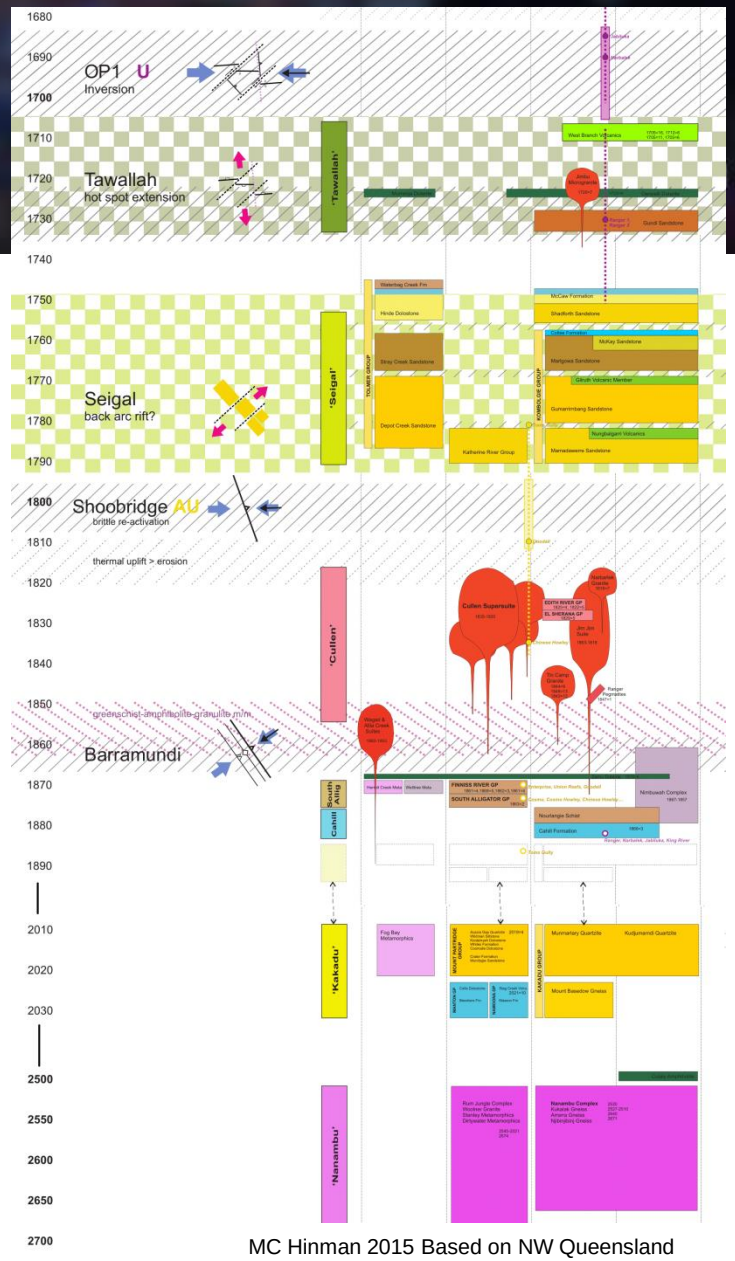


Pegmatites



Interpretation of Structural Deformations

- **Early setting structures are Key**
- Barramundi/Shoebridge/Seigal Pre Kombolgie
  - Initial basement deformation
  - Structural orientations have affinity with mineral occurences.
- Later Tawallah/ OP1 reactivate pre existing basement deformation
- Pre existing Seigal structures controlled Kombolgie deposition



MC Hinman 2015 Based on NW Queensland Proterozoic event stratigraphy

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Structural Interpretations

- **Early setting structures are Key**
- Barramundi/Shoebridge/Seigal Pre Kombolgie
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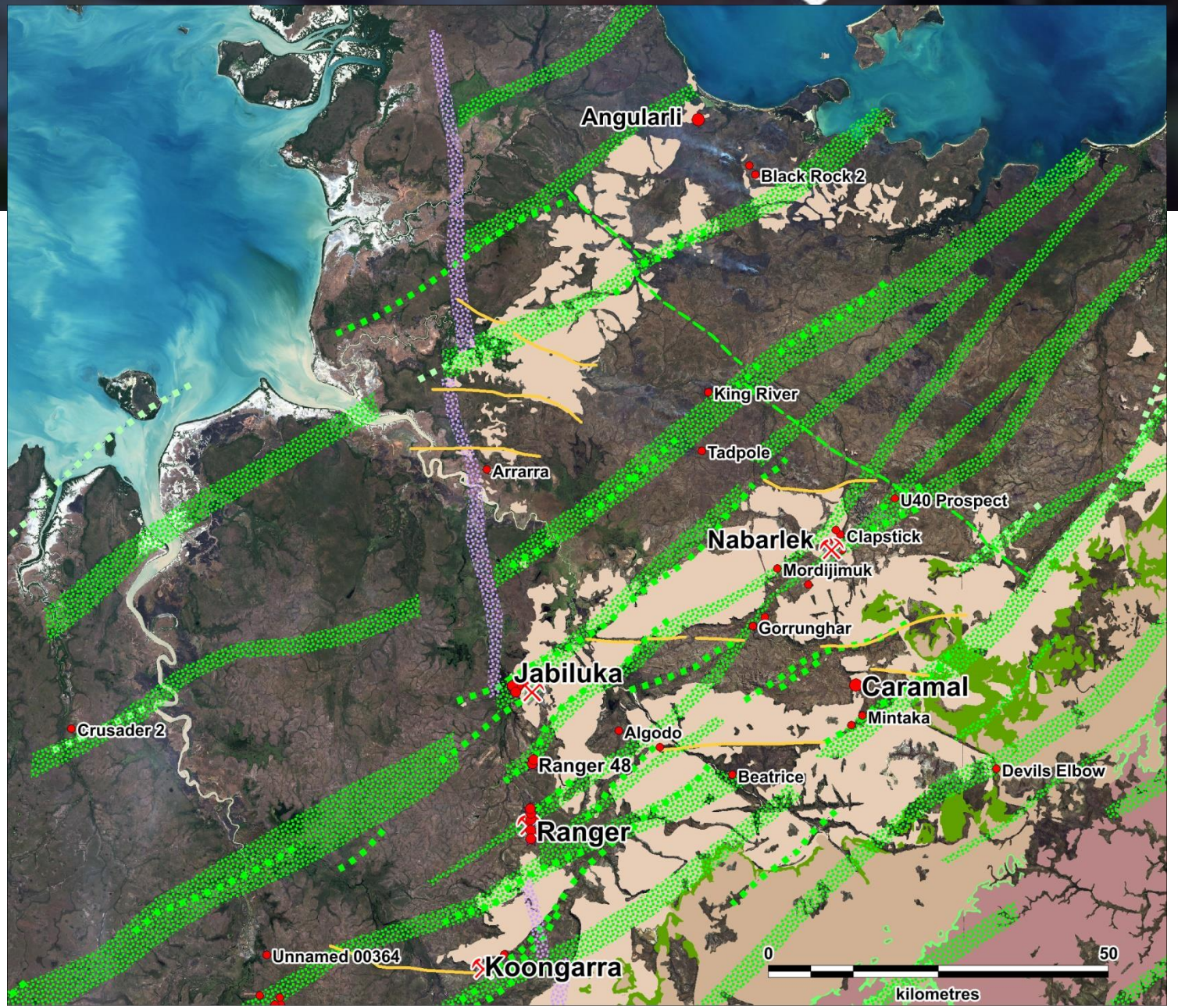
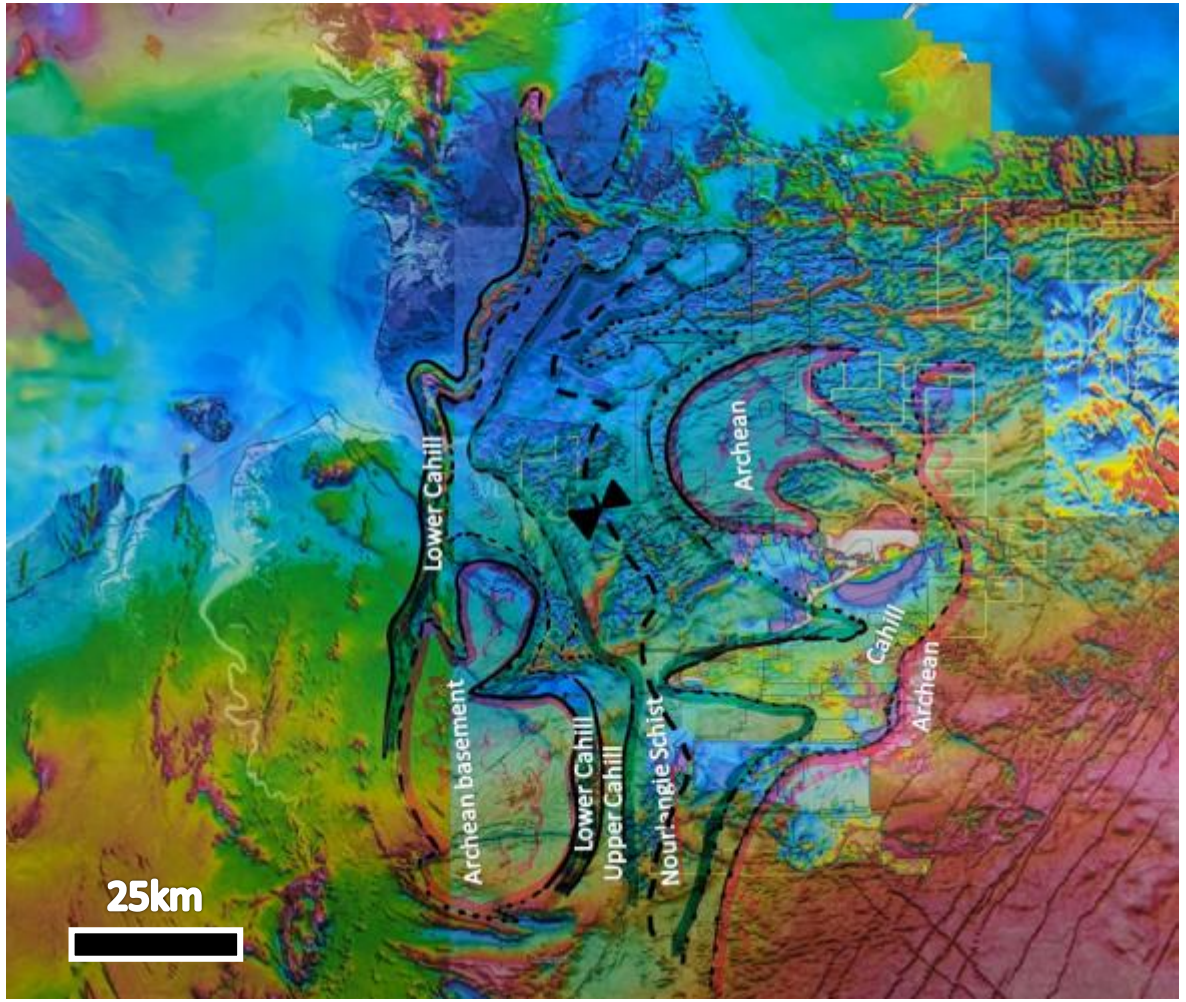


Reinterpreted Regional Geology of the ARUP

Stratigraphy below Cretaceous-Tertiary-Quaternary cover:

- MidProterozoic
  - Oenpelli Dolerite
  - Mamadewere Sandstone
- Lower Proterozoic
  - Nourlangie Schist including thick carbonate/schist sequence in Cannon Hill area
  - Cahill Formation
  - Kudjumarndi Quartzite
- Archaean
  - Kukulak, Arrara and Njibinjibinj Gneisses



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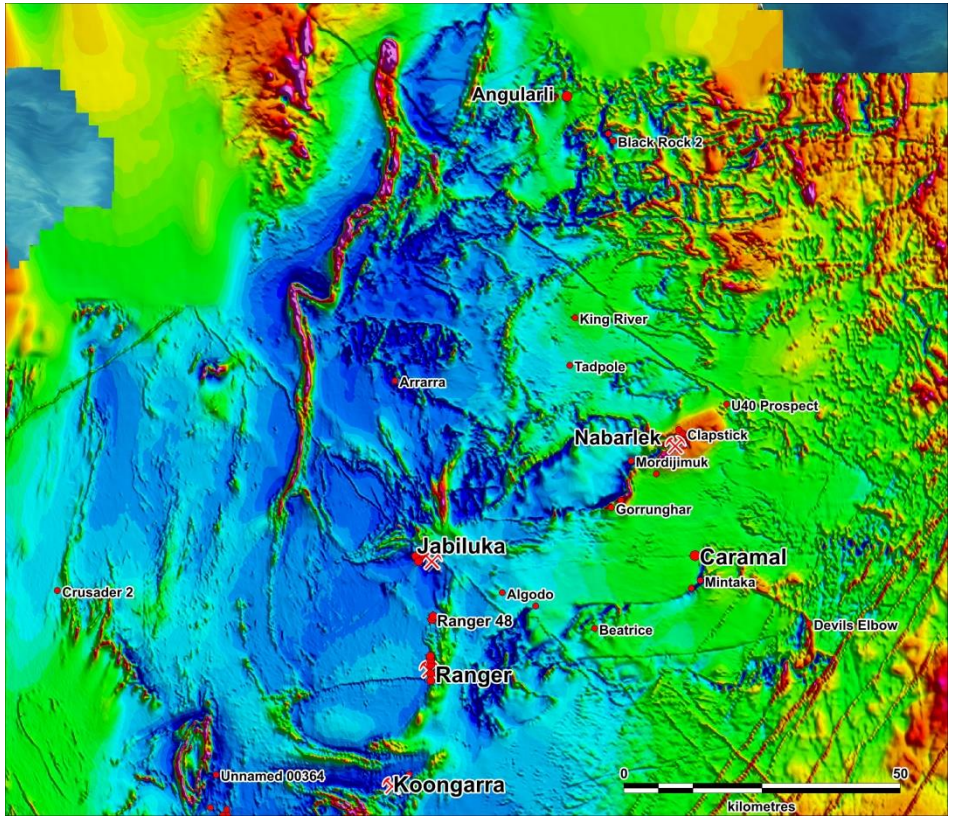
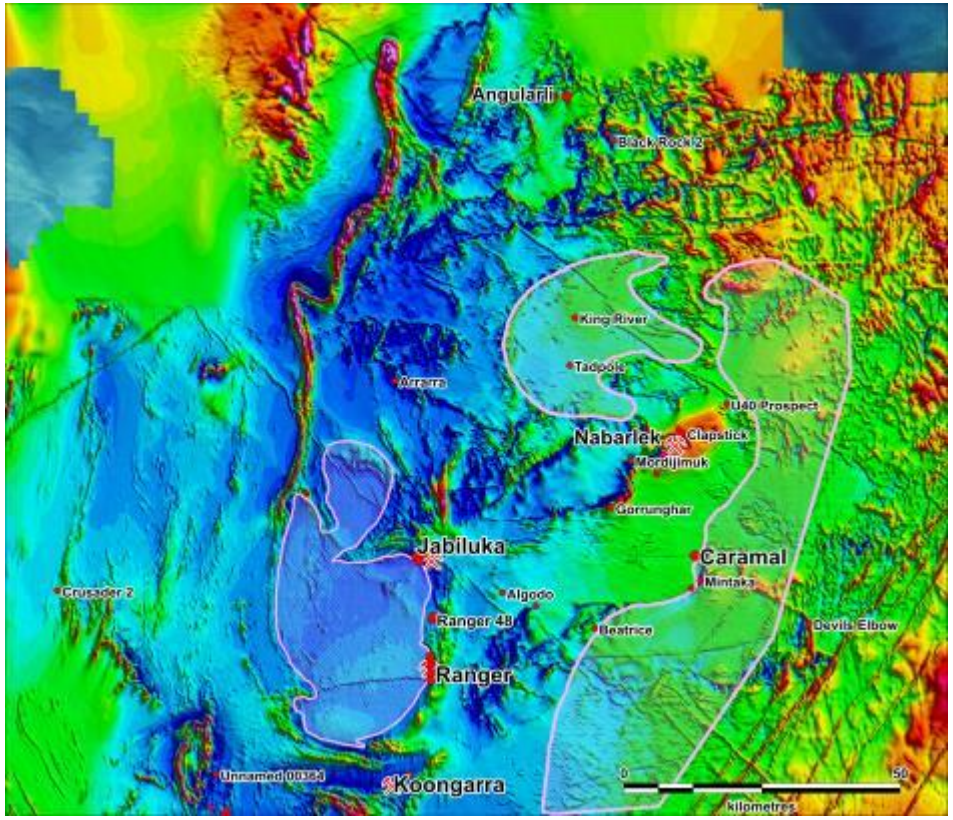
Reinterpreted Geology

- Clean slate – working up stratigraphy incorporating known geology



Reinterpreted Geology

1. Basement Archean domes



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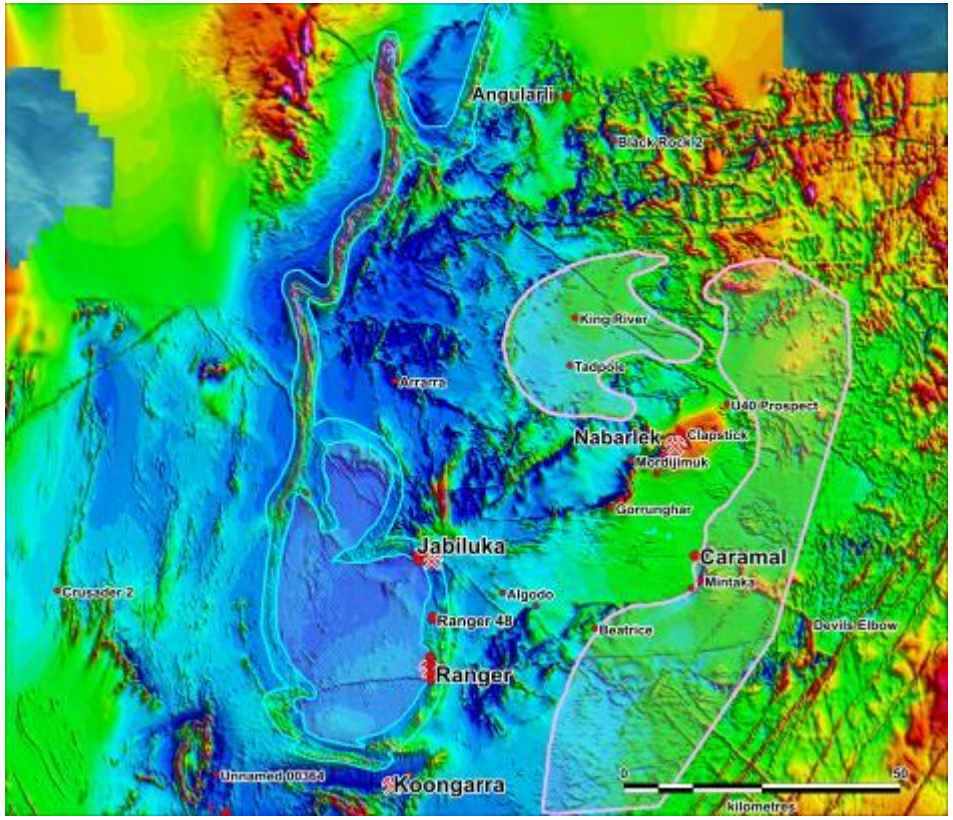
Reinterpreted Geology

1. Basement Archean domes
2. Lower Cahill (Ranger LMS)



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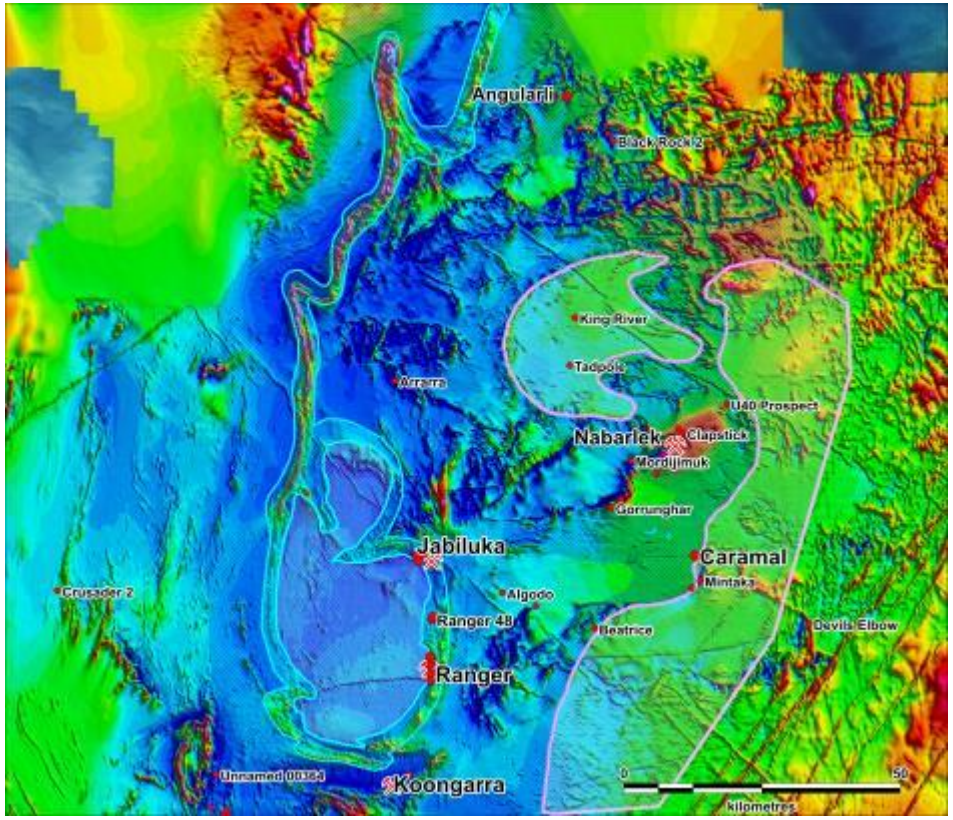
Reinterpreted Geology

1. Basement Archean domes
2. Lower Cahill (Ranger LMS)
3. Upper/Undifferentiated Cahill



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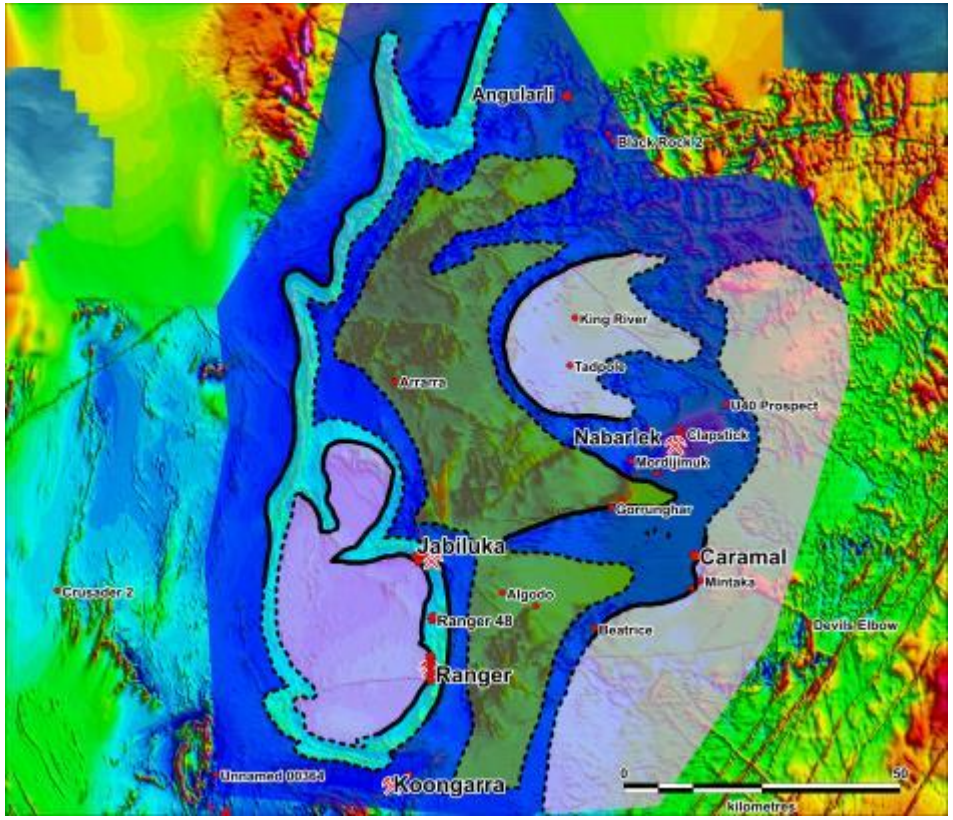
Reinterpreted Geology

1. Basement Archean domes
2. Lower Cahill (Ranger LMS)
3. Upper/Undifferentiated Cahill
4. Nourlangie Schist



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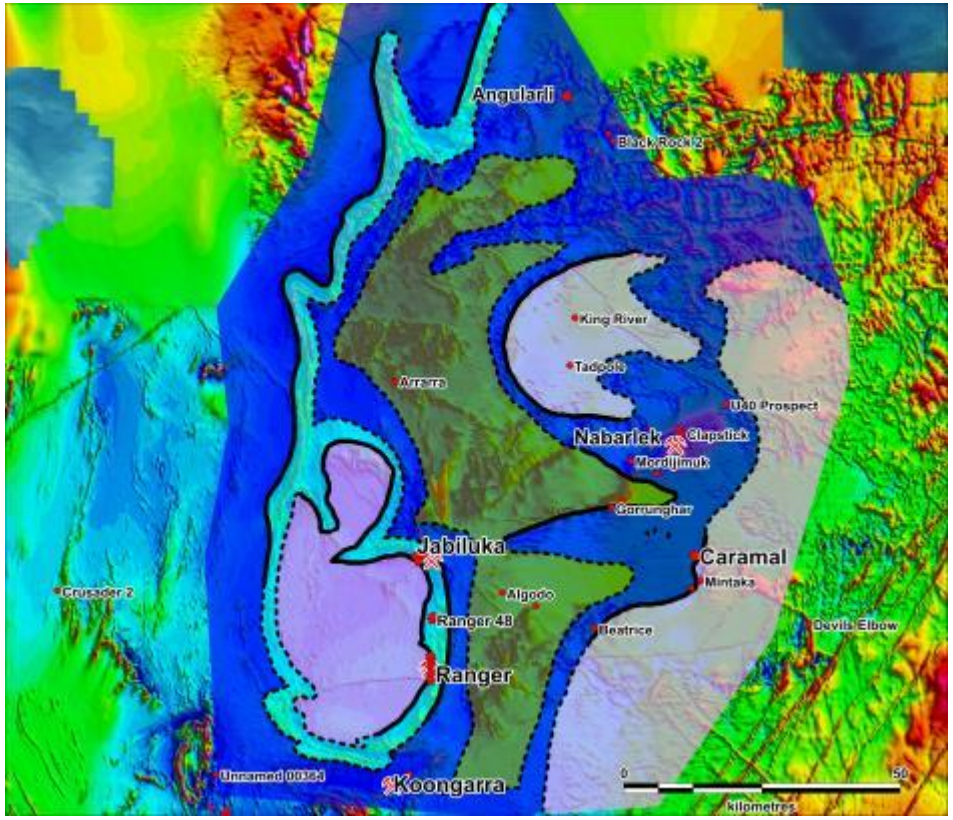
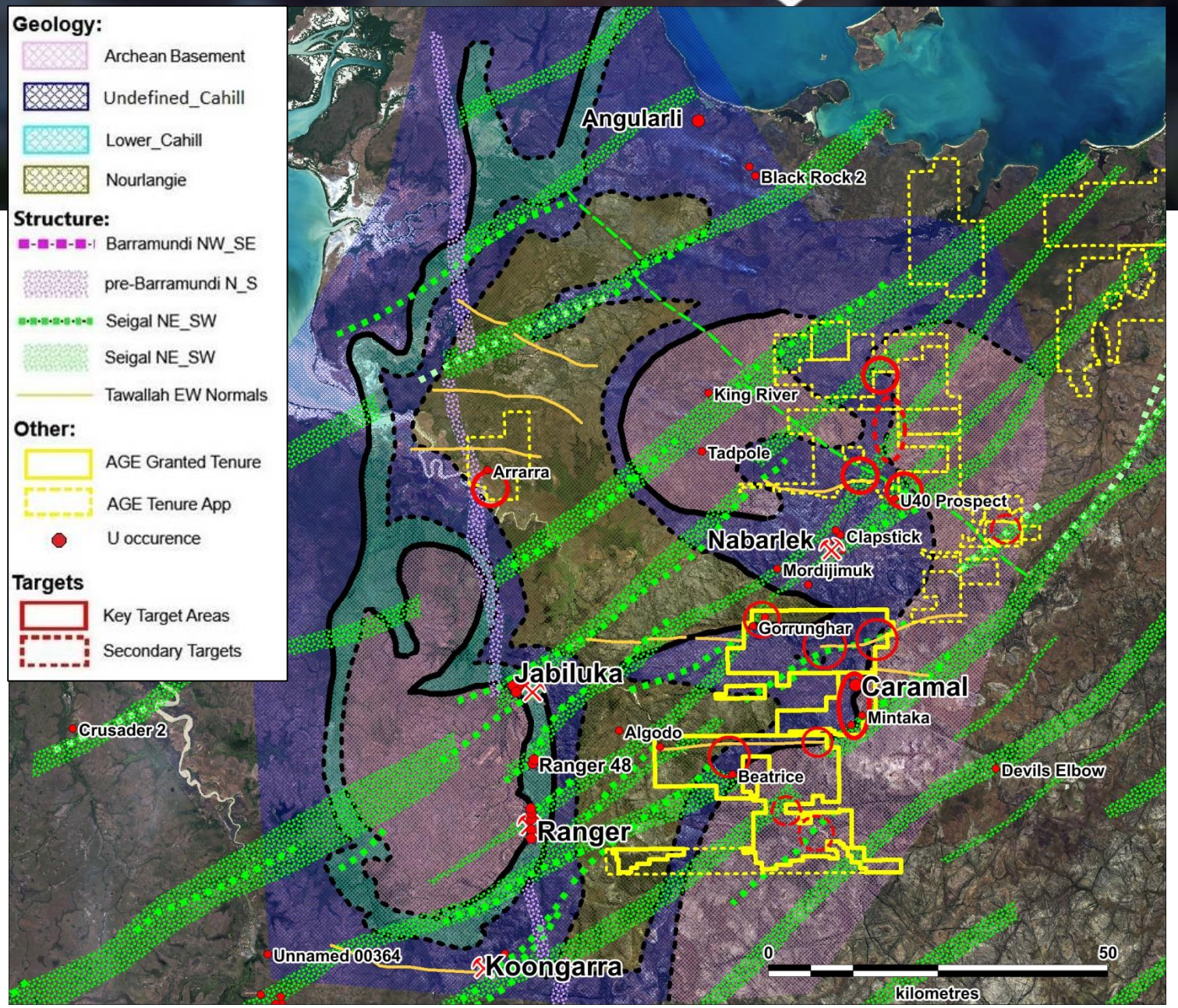
Structure & Geological Targets

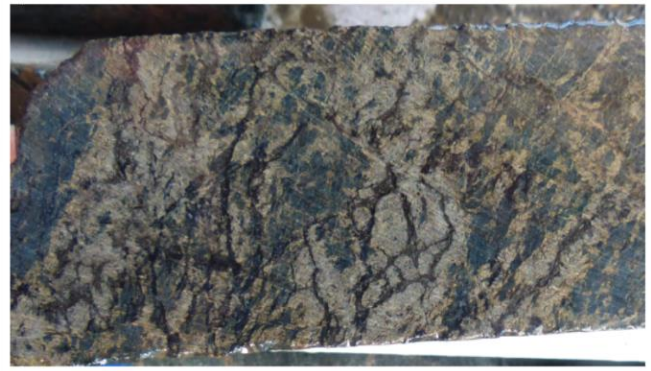
- Investigate coincident structural zones with interpreted Archean contacts.





Conclusions for Discovery

- Identify location of the Archean/Lower Cahill contacts across tenure (Refer targets image)
- How to identify these under cover?
- Combination of techniques must be used as targeting vectors. Varying Geophysics, Geochemistry including isotope analysis and geological targeting (conjugation of structure and stratigraphy..
- Most importantly further understanding how to identify old basement structures – pre-setting of mineral systems

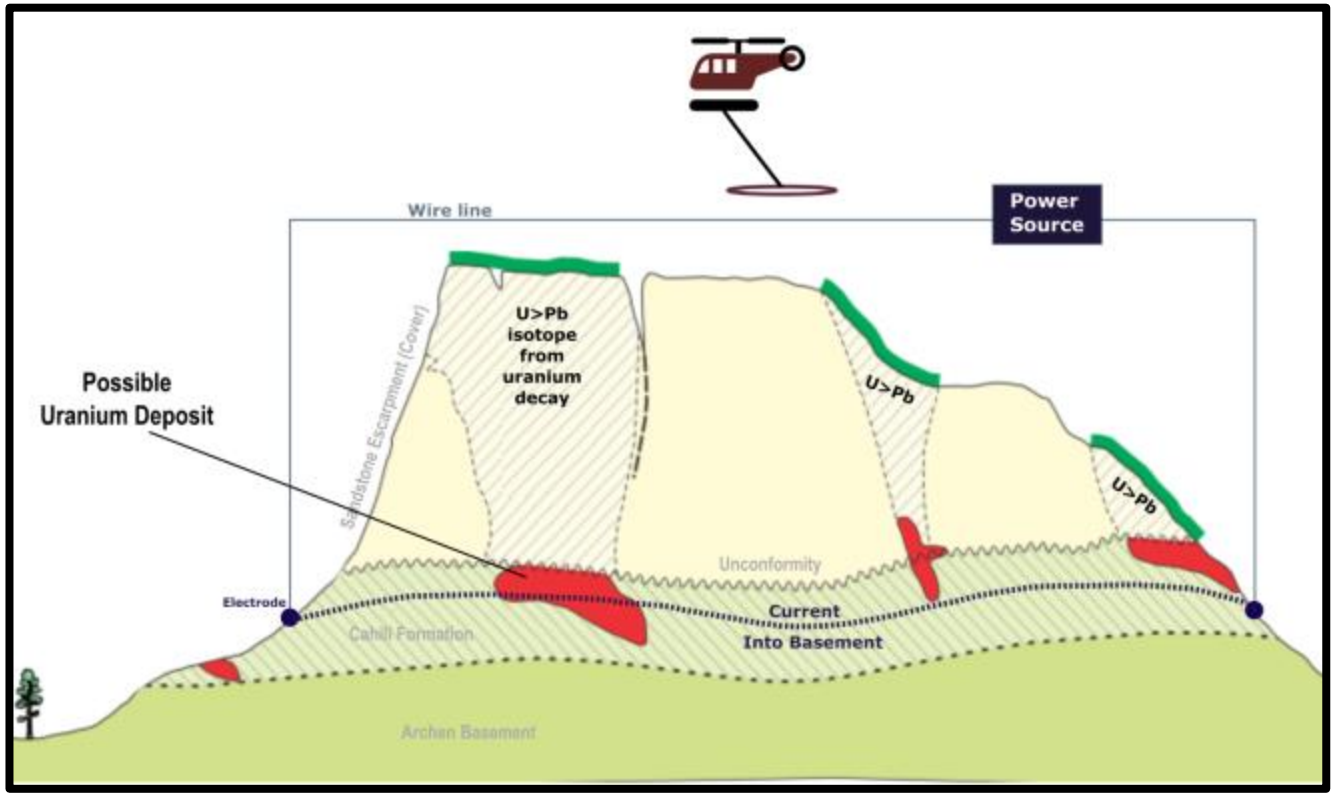


Research & New Exploration Techniques

- GEOPHYSICAL
  - Sub-Audio Magnetics (SAM)
  - Modern reprocessing
    - Magnetics, Gravity & EM
    - Condor (Success in Athabasca)
  - Airborne gravity

- GEOCHEMICAL
  - Best vector remains U
  - HyLogger
  - Regional litho geochemistry
  - Boron????

- ISOTOPIC
  - Proprietary R&D Pb isotope sampling to continue for vectoring
  - Radium in waters sampling



SAM set up aimed at higlighting sub-Kombolgie basement features

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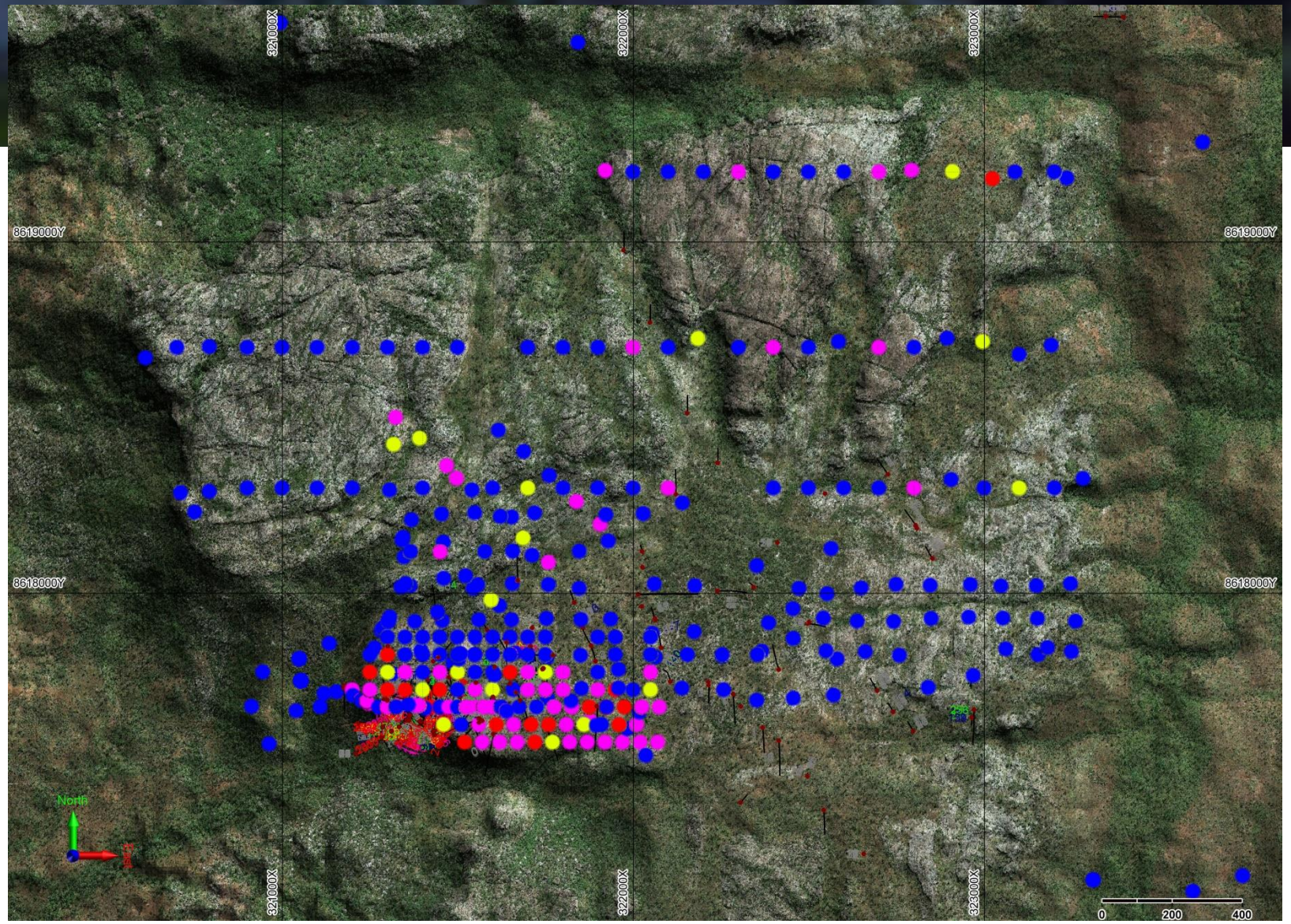
Isotope R&D

- Analysis, interpretations and application developed in conjunction with CSIRO
- Primary use as a targeting vector
- Caramal a good example of a decay isotope response.

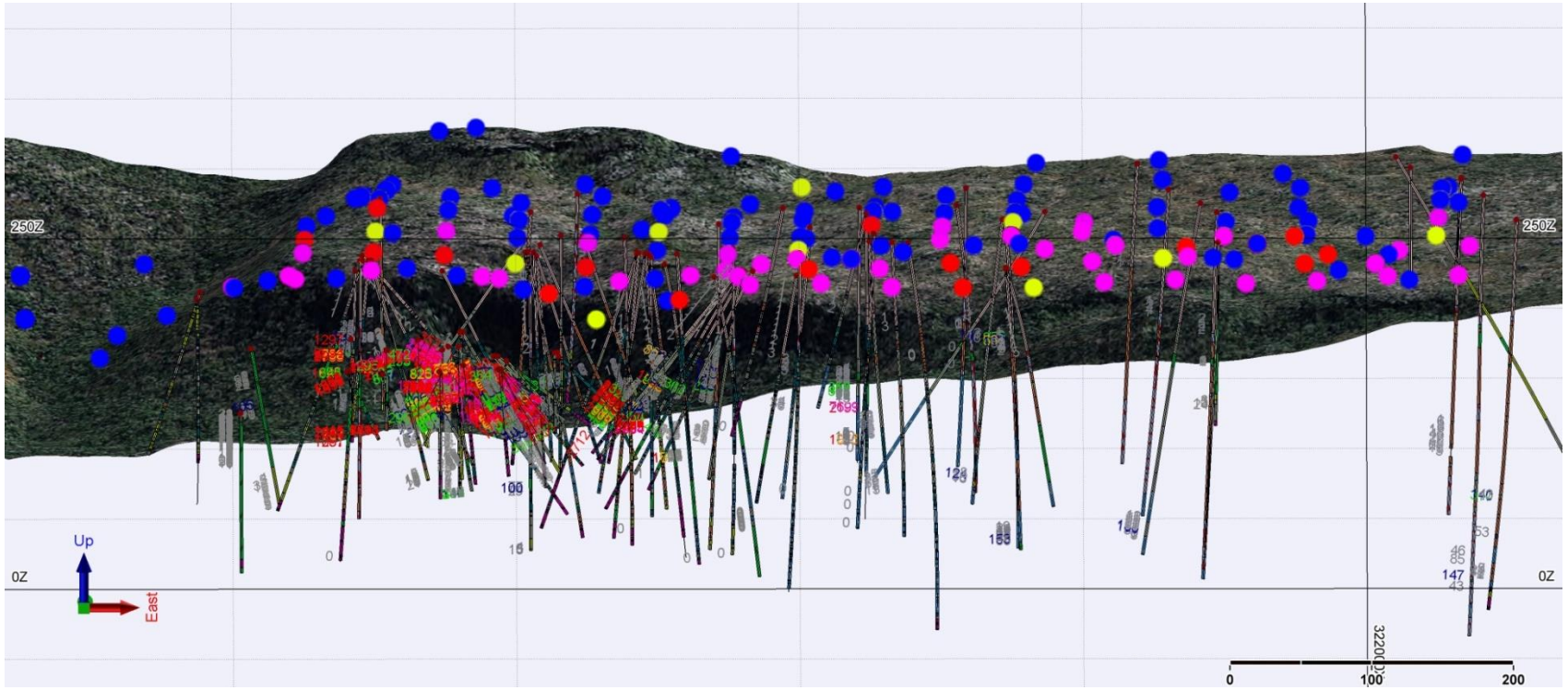
Yellow = Remobilised, recent or younger activity.
Purple/Red = Primary mineralisation event timings & Excess radiogenic Pb.
Blue = Older, perhaps monazites or thorium rich basement sequences.



Isotope R&D

Continued R&D development

- Sandstone depth effects
- Structural controls on diffusion pathways for radiogenic products
- Sandstone permeability



Next Steps

- Ground truth interpreted geology
  - Contacts & Structure
  - Ranger/Jabiluka stratigraphy = Where??
  - Stratigraphic drilling
- Methods for identifying Lower Cahill
- Most effective geophysics for identifying structures below Kombolgie
- Kudjumarndi Quartzite
  - Age dating
  - Way up criteria
- We will use observed ARUP uranium deposit characteristics to discover future ARUP uranium deposits!