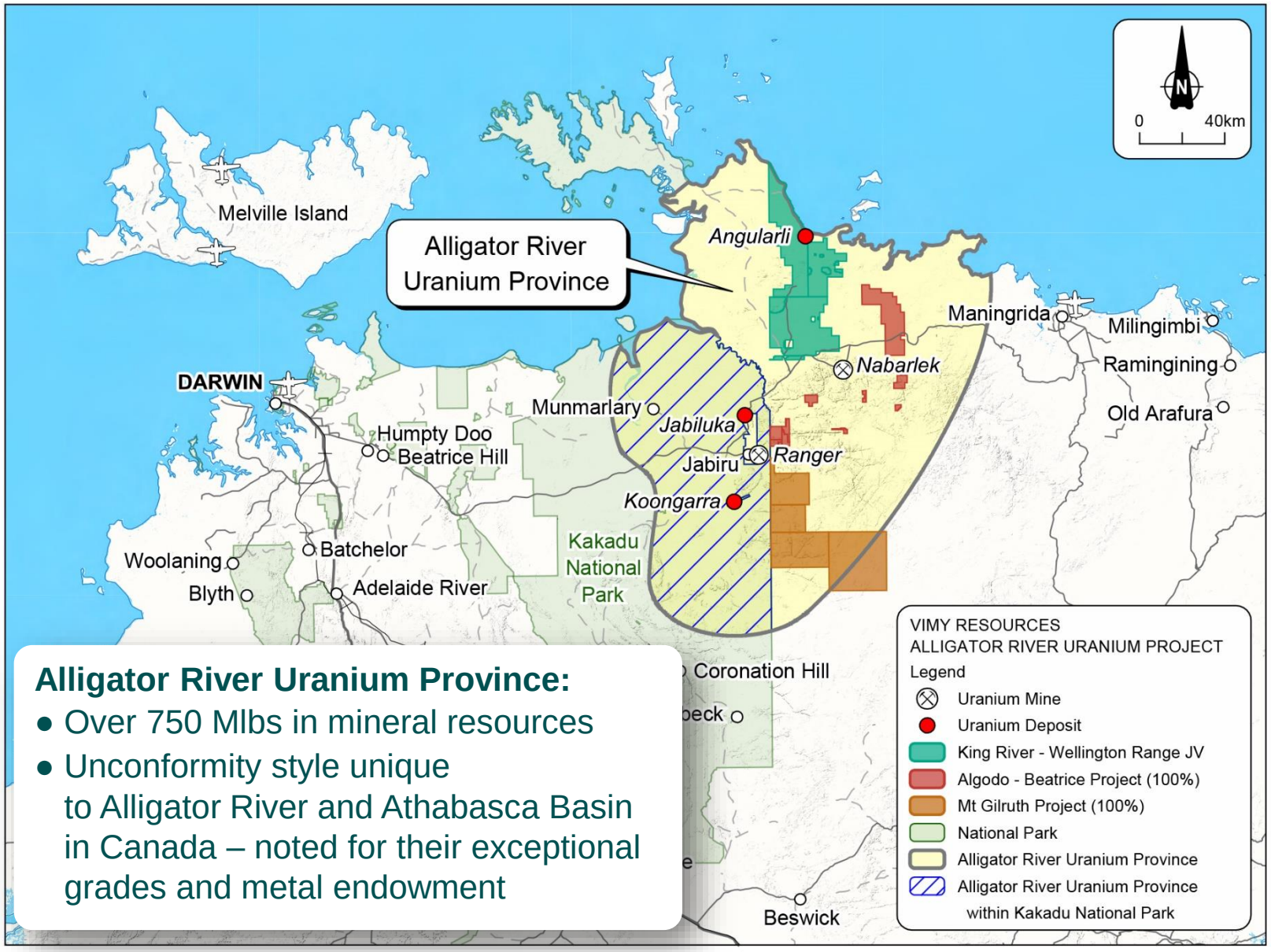
Mining a Cleaner Tomorrow

Refreshing the ARUP exploration toolkit – Angularli and Such Wow

Penny Sinclair | March 2019

VIMY RESOURCES

ALLIGATOR RIVER PROJECT LOCATION

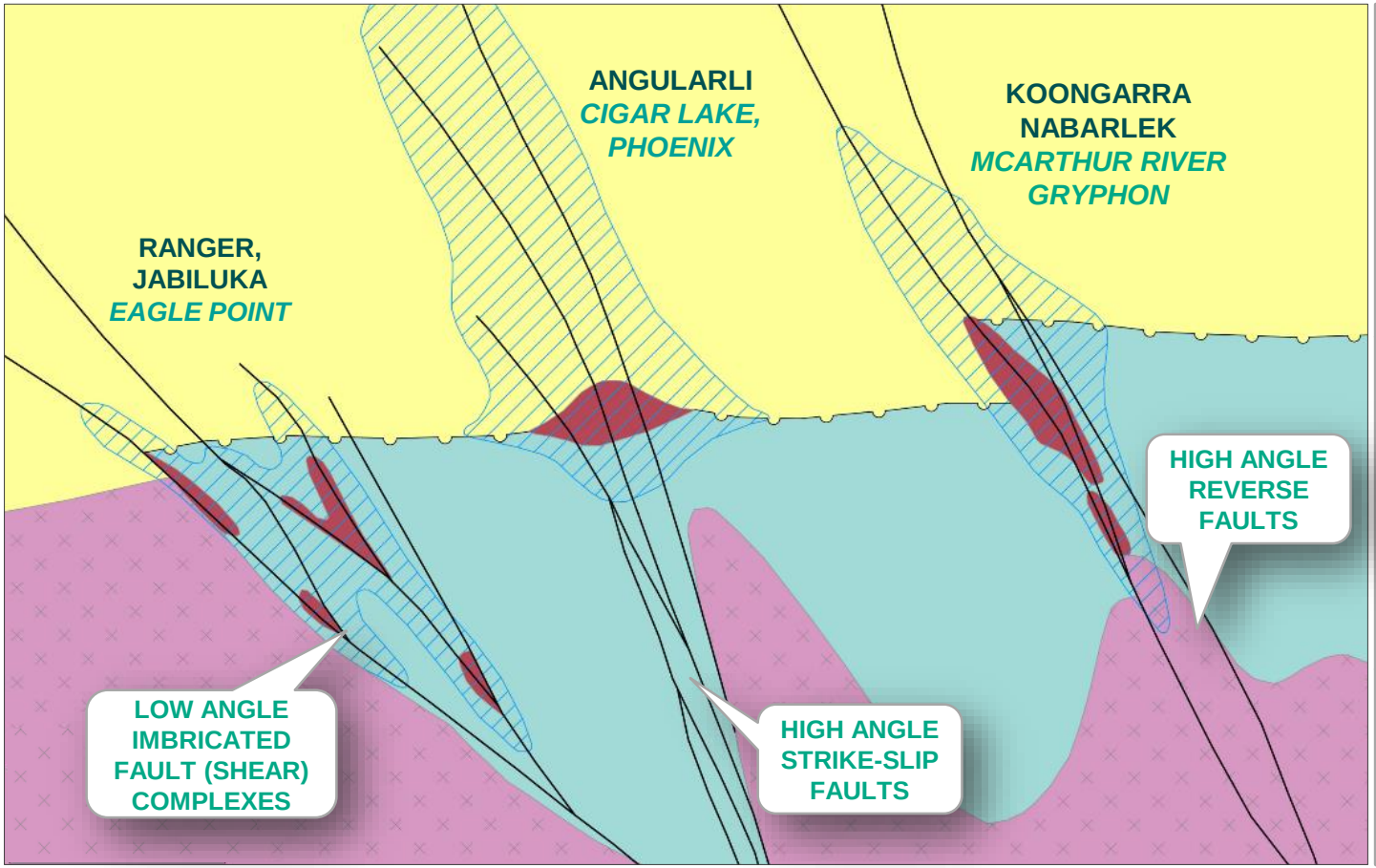


Alligator River Uranium Province:

- Over 750 Mlbs in mineral resources
- Unconformity style unique to Alligator River and Athabasca Basin in Canada – noted for their exceptional grades and metal endowment

ATHABASCA vs ARUP

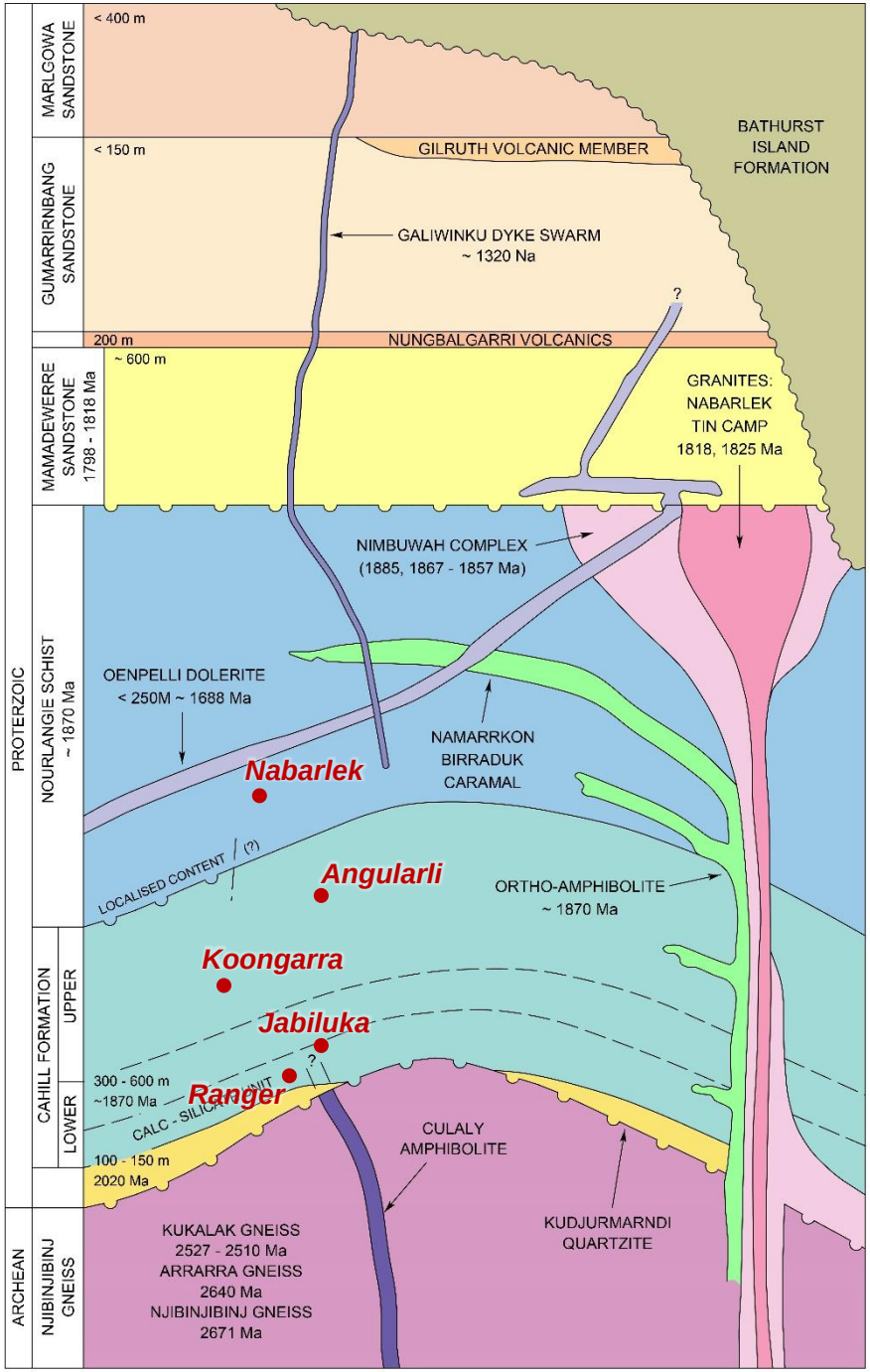
- Only two basins in the world known to host economic Proterozoic Unconformity Deposits
- Similar broad scale geological setting and history
- Three dominant styles of mineralisation
  - Varying structural and lithological settings



ARUP	*Athabasca*
Kombolgie Sandstone	*Manitou Falls*
Cahill Formation	*Wollaston Group*
Nanambu Complex	*Mudjatik domain*

REGIONAL STRATIGRAPHY

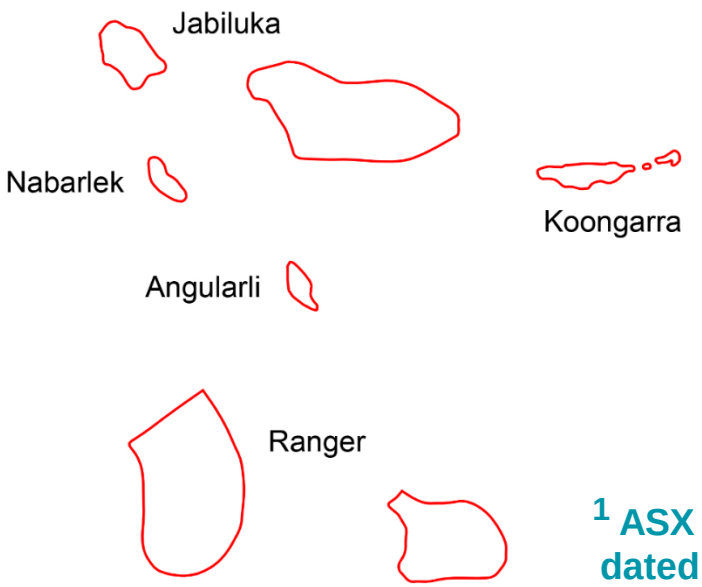
- Oenpelli Dolerite
  - > 1688 – 1735 Ma
  - > Voluminous dykes and sills
- Mesoproterozoic Mamadawerre Sandstone (1818 – 1798 Ma)
  - > Very coarse basal conglomerate
  - > Cross-bedded coarse to medium grained sandstone
  - > Un-metamorphosed
  - > ~ 600 m thick
- Palaeoproterozoic Cahill/Nourlangie Schist (Min. age 1870 Ma)
  - > Basal units can be calcareous and carbonaceous
  - > Upper units more siliciclastic
  - > Lower greenschist to lower granulite facies
  - > Unknown thickness

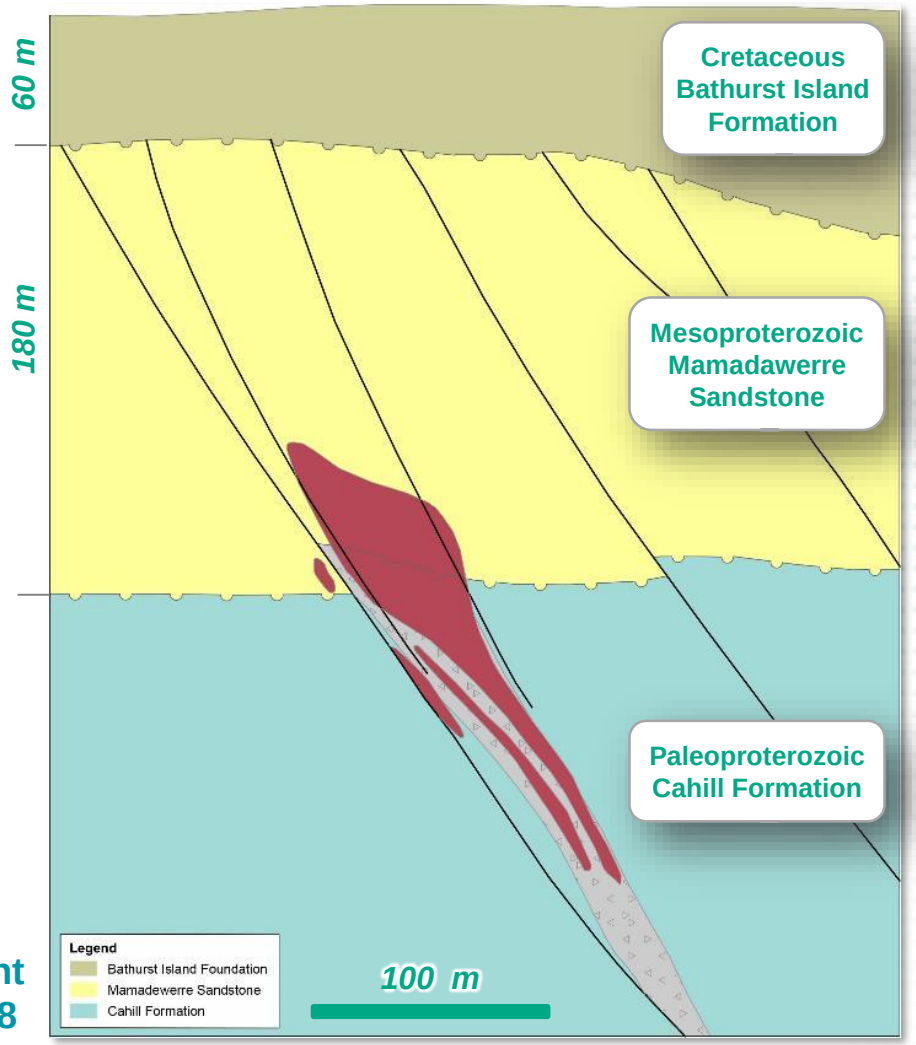


ANGULARLI DEPOSIT

- 2018 JV released Maiden Inferred Mineral Resource: **26 Mlbs U_3O_8 for 0.91 Mt at 1.3% U_3O_8 at a cut-off grade of 0.15% U_3O_8 [1]**
- Deposit is hosted within a multiply reactivated fault zone
- Mineralisation spans the unconformity and is hosted within **BOTH**:
  - > Palaeoproterozoic Cahill Formation
  - > Mesoproterozoic Mamadawerre Sandstone
- Pod plunges ~ 70˚ to the south-east
- Deposit Geometry: 300 m x 350 m x 40 m

ARUP Proterozoic Unconformity Deposit Footprints



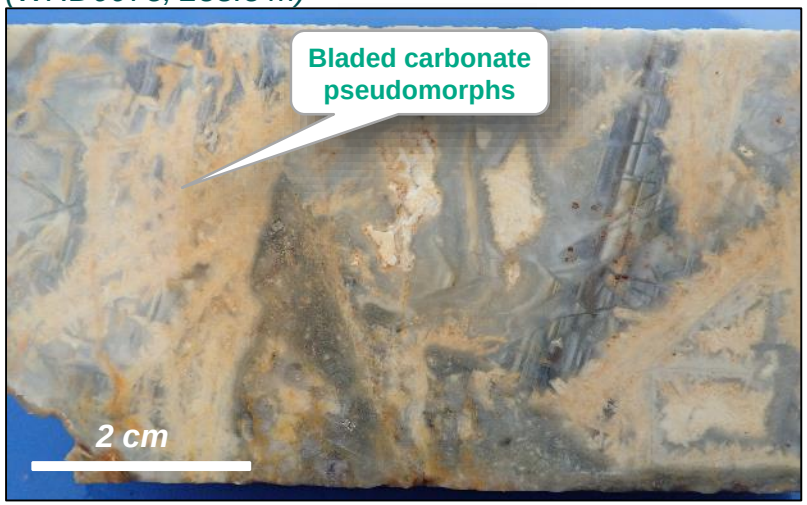


[1] ASX announcement dated 20 March 2018

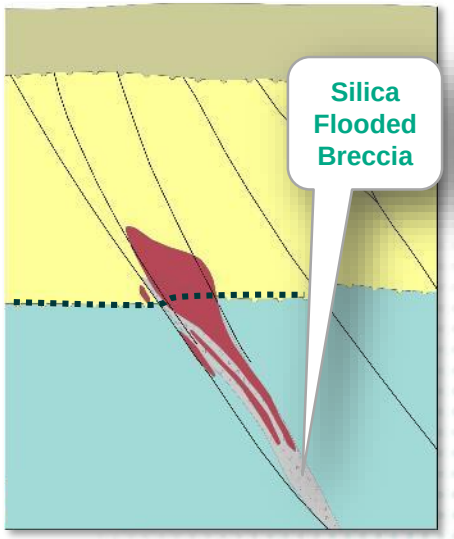
CAHILL FORMATION – SILICA FLOODED BRECCIA

- Pre-dates ore formation – ground preparation from ductile to brittle
- Zone of intense silica alteration along a pre-existing, reactivated fault zone
- Open space fill (epithermal-like) vein textures
- Truncated by Proterozoic unconformity
- **Pre-dates sandstone deposition**

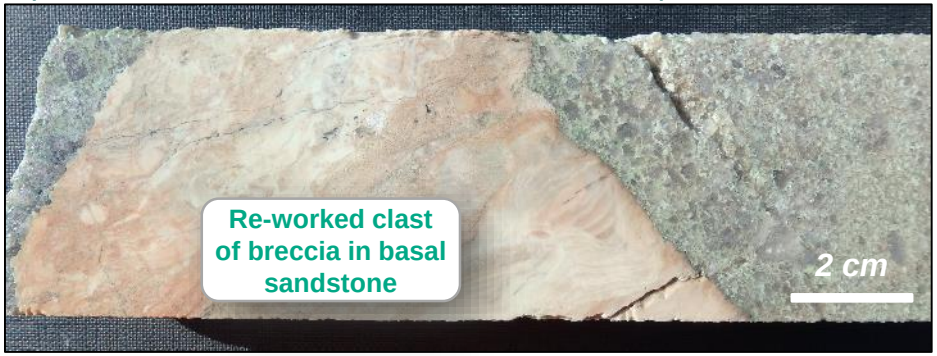
Bladed carbonate pseudomorphed by silica (WRD0073, 258.3 m)



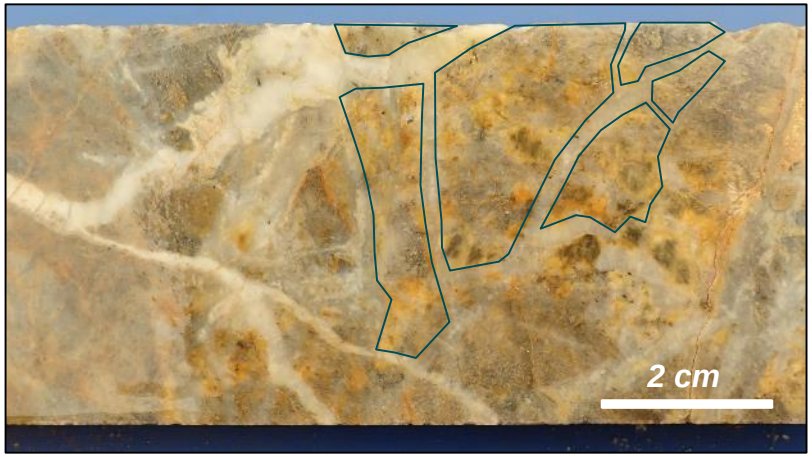
Cockade textures in quartz infill vein in breccia (WRD0084, 256.6 m)



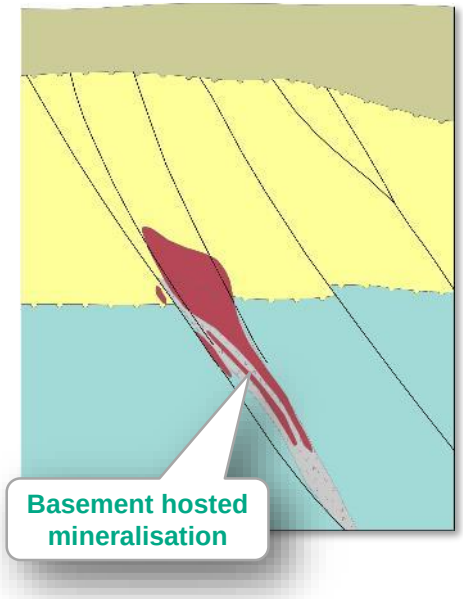
Epithermal clast in chlorite altered sandstone (WRDD0135, 237 m)



Mosaic breccia composed of intensely silica-sericite altered Cahill formation, cross-cut and annealed by a network of druzy quartz-pyrite-white mica veinlets

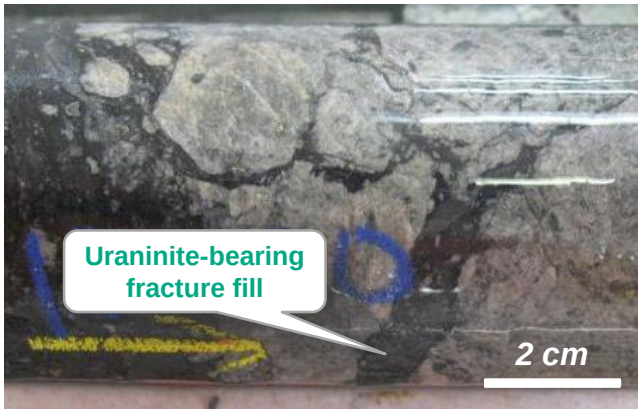


BASEMENT HOSTED MINERALISATION

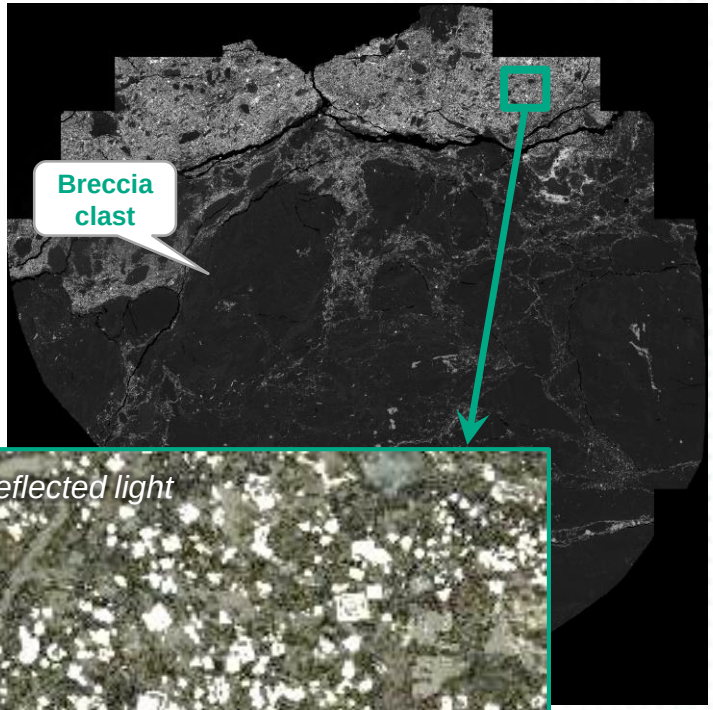


- Breccia matrix infill, minor replacement
- Mineralogy - uraninite-silica-white mica-chlorite
- Very fine (~ 10μm), zoned uraninite grains

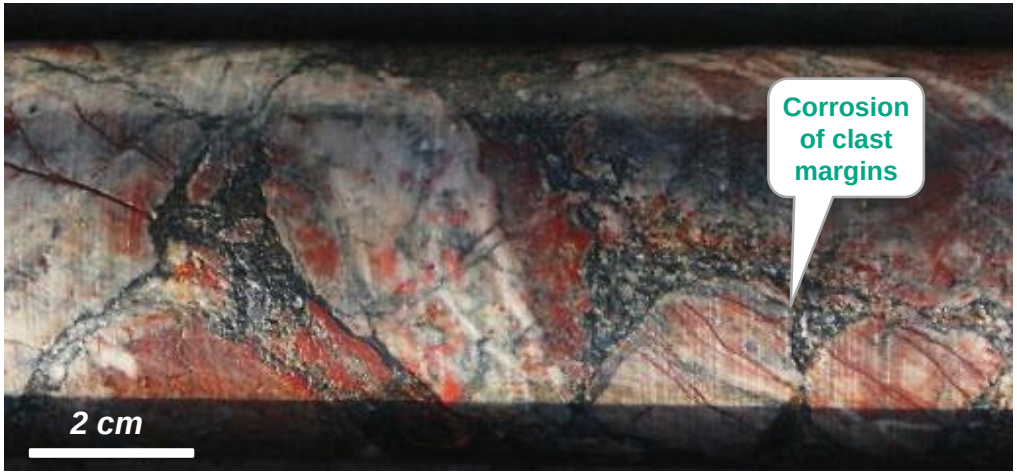
Uraninite veins in SFB matrix (WRD0073, 273 m)



BSE Image of uraninite bearing matrix in brecciated SFB (WRD0073, 272.9 m)

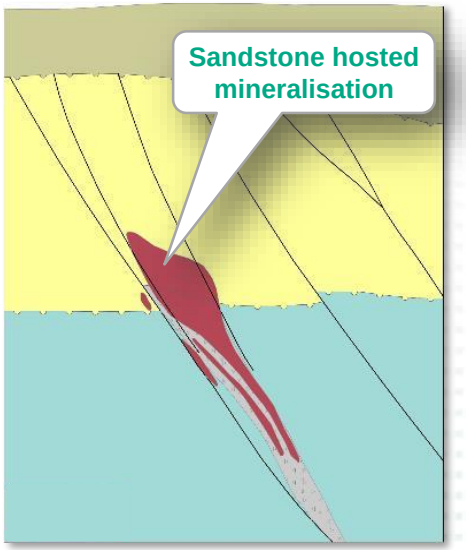


Uraninite bearing veins in the SFB matrix (WRD0084, 249.8 m)



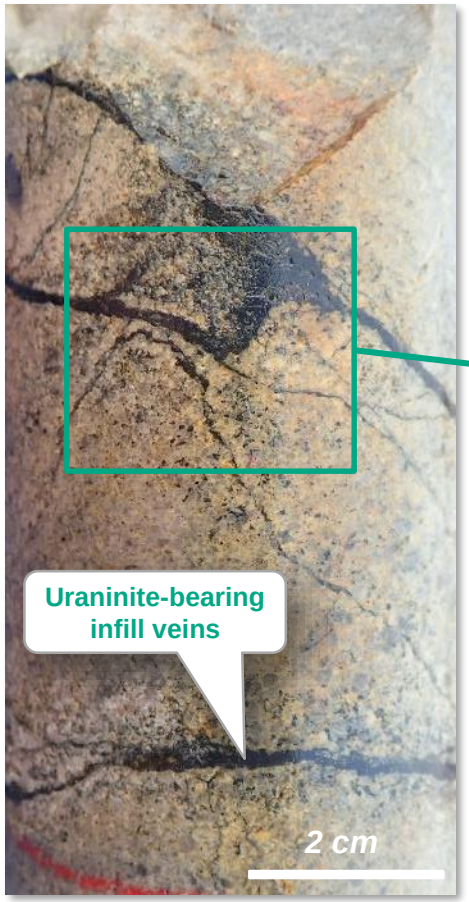
SANDSTONE HOSTED MINERALISATION

- Brecciated sandstone with uraninite-bearing matrix fill (cement)
- Selvedge alteration limited to sericite - chlorite +/- hematite
- Some matrix replacement in discrete zone

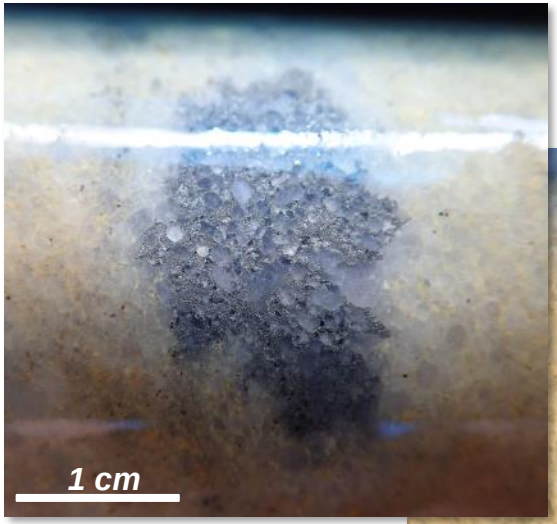


Uraninite – chl – sericite – sil veins with minor hematite selvedge alteration (WRD0081, 228.6 m)

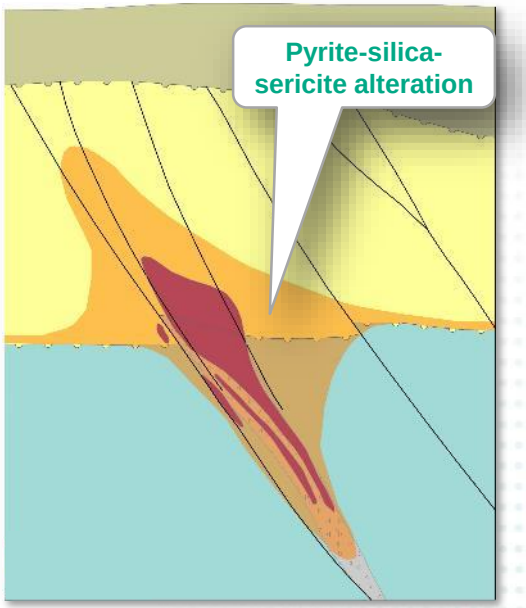
Uraninite – chl – sericite – sil veins in brecciated and altered sandstone (WRD0081, 229.1 m)



PROXIMAL ALTERATION - SANDSTONE & CAHILL FORMATION



Pyrite-silica-sericite altered Mamadawerre Sandstone (WRD0091, 245 m)



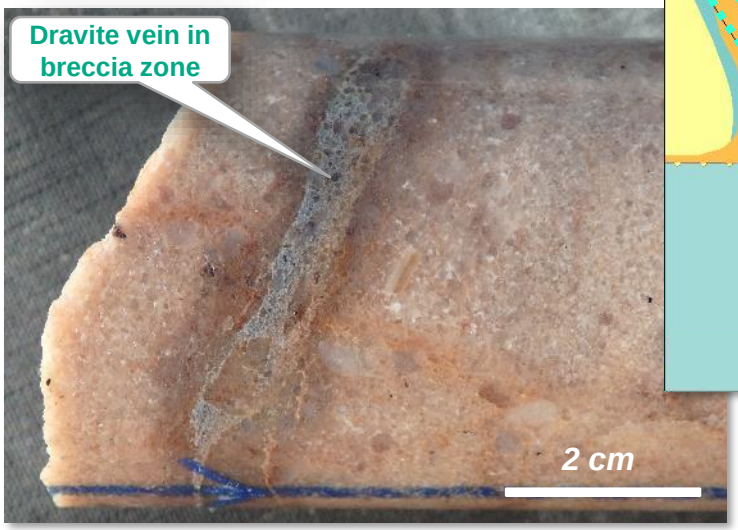
Silica and sericite altered Cahill Formation overprinted by a network of druzy quartz-pyrite veins (WRD0091, 245 m)

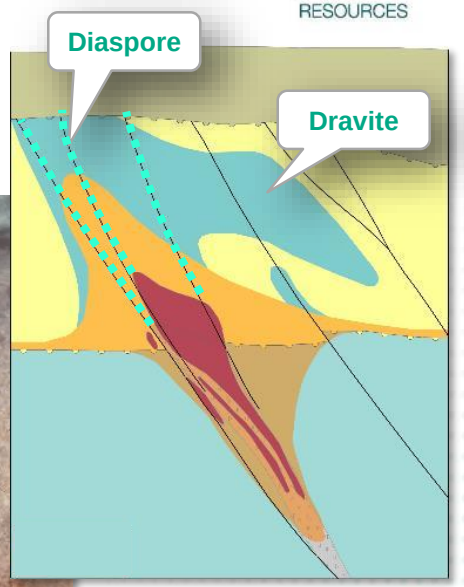
- Sericite and pyrite replacement of the sandstone matrix
- Sericite – pyrite wall-rock replacement and pyrite-quartz stockwork veining
- Patchy de-silification of both sandstone and basement
- Co-incident Au, Cu, Co, Pb and Ni anomalism

DISTAL ALTERATION – MAMADAWERRE SST.

- Fracture controlled cryptocrystalline dravite (Mg-rich tourmaline), diaspore (αAlO(OH))
- Extensive ‘mappable’ alteration halo within sandstone

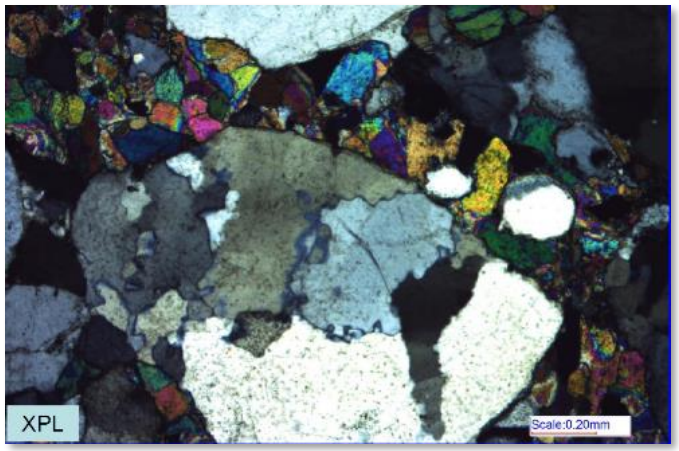
Diaspore veins in outcrop (Such Wow Prospect)



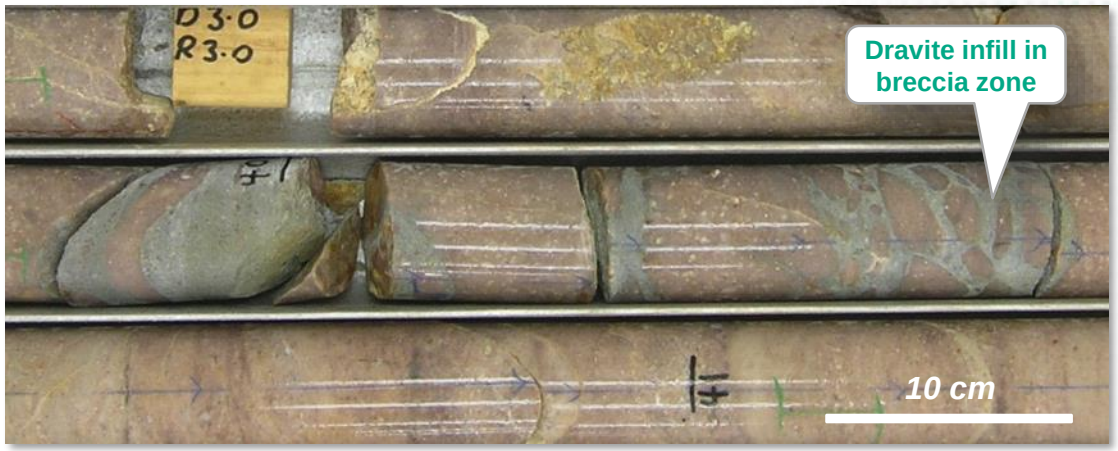


Dravite vein in bleached sandstone (WRDD0133; 144.4 m)

Diaspore in sandstone matrix; Such Wow Prospect (Crawford, 2017)

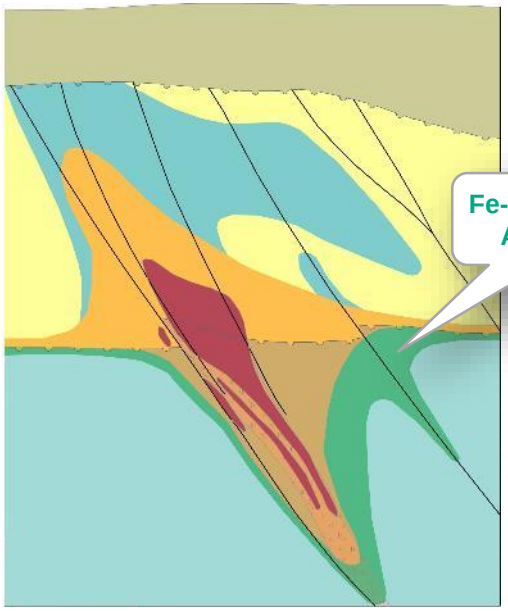


Dravite matrix in silicified Mamadawerre Sandstone breccia (WRD0089; 40 m)



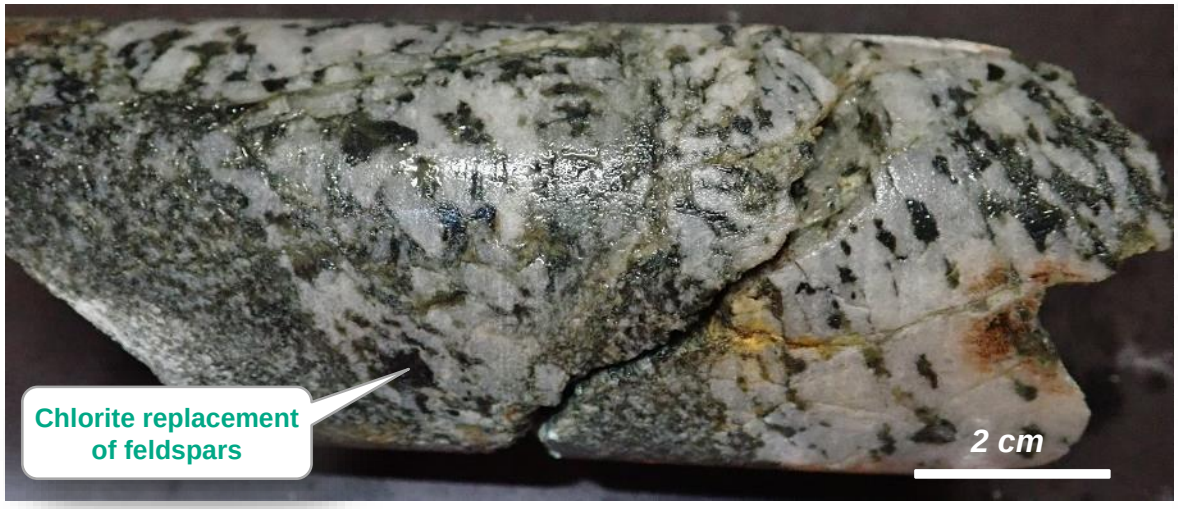
DISTAL ALTERATION – CAHILL FORMATION

- Weak to moderate chlorite alteration
- Selective mineral replacement of biotite, muscovite, feldspar and/or garnet
- Intermediate (Fe-Mg) composition
- Distribution and intensity highly dependant on protolith



Selective replacement of garnets by intermediate (Fe-Mg) chlorite hanging wall to mineralisation

Intermediate (Fe-Mg) chlorite replacing feldspars and phyllosilicate minerals in a Leucosome and in the leucosome (WRD089, 255.4 m)



TIMING OF PRIMARY URANIUM MINERALISATION

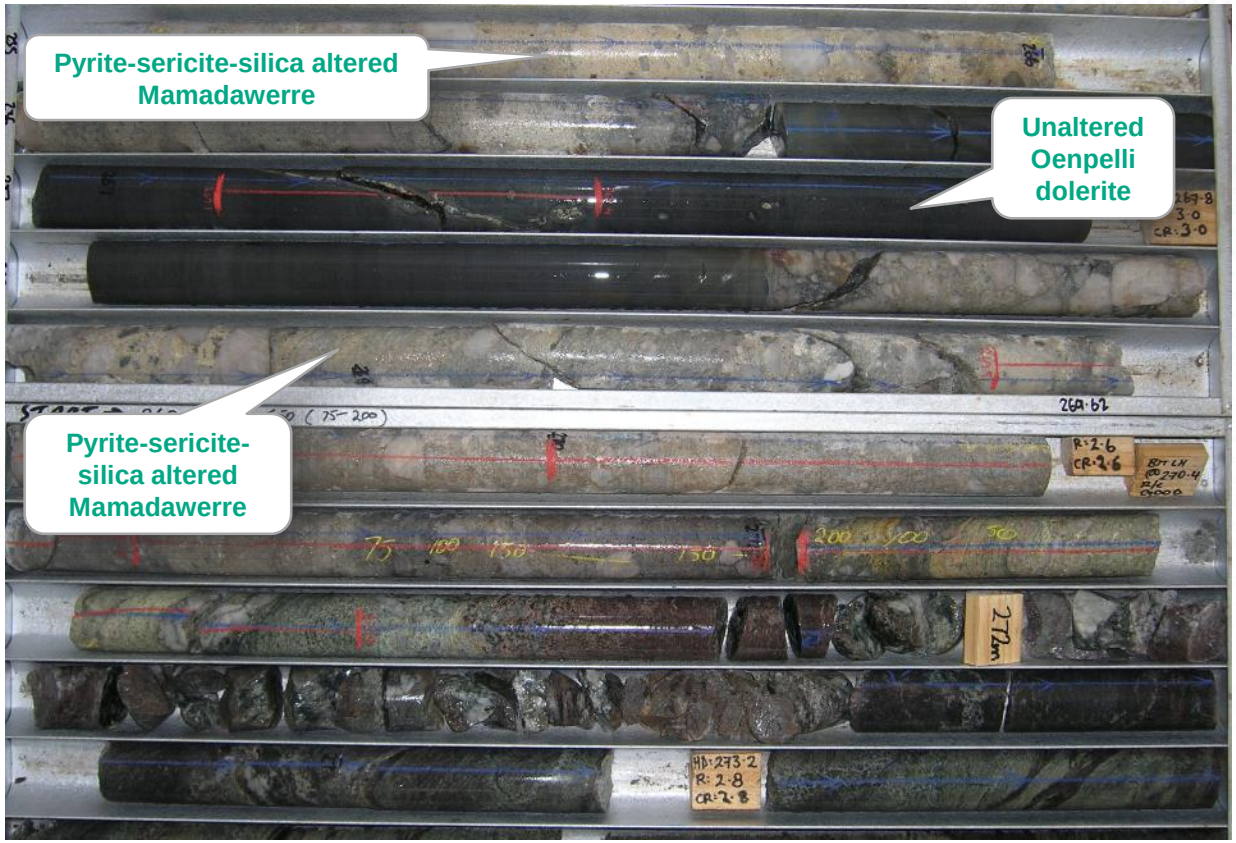
Relative timing relationships:

- Primary uranium veins in sandstone
  - Hence mineralisation event post-dates early sandstone deposition
- Unaltered Oenpelli Dolerite (1,735 - 1,688 ± 3 Ma*) cross-cuts proximal alteration zone
  - Minimum age constraint of 1,735 ± 3 Ma for mineralisation

**NTGS U-Pb baddeleyite age for Oenpelli Dyke from Angularli*

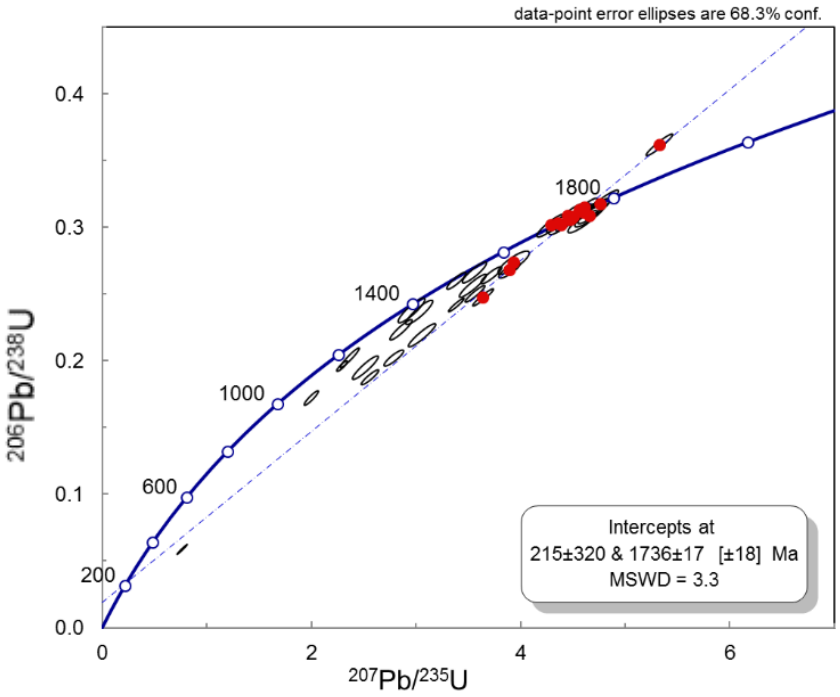
Uraninite – chl – sericite – sil veins with minor hematite selvedge alteration (WRD0081, 228.6 m)

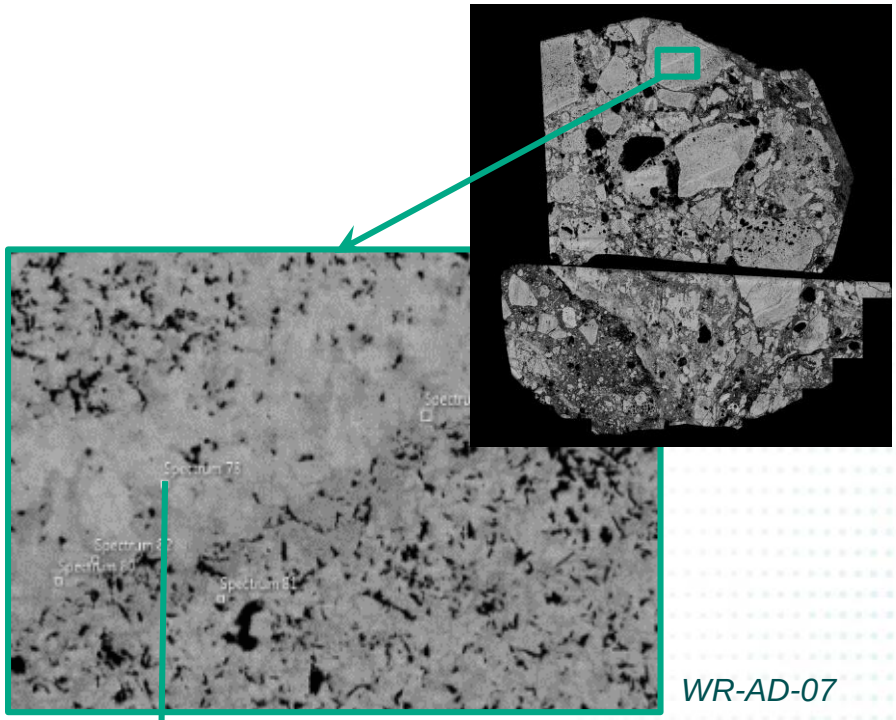
WRD0067;265 – 273.5 m



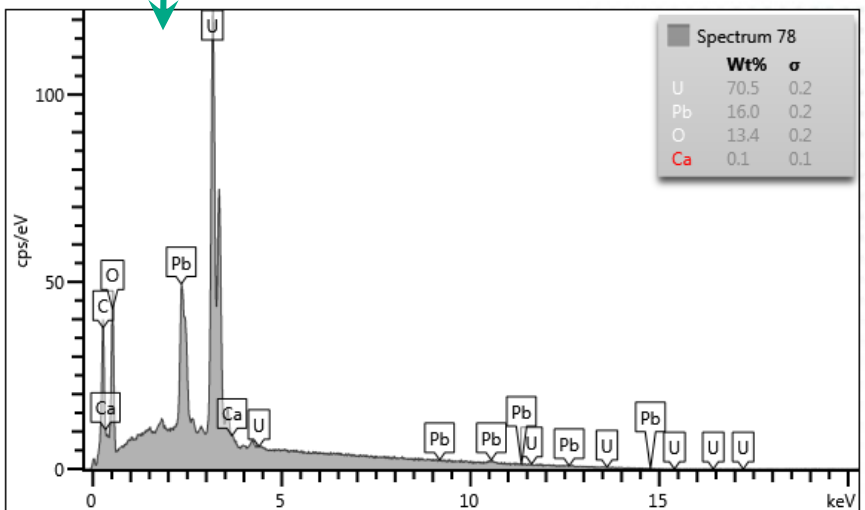
TIMING OF PRIMARY URANIUM MINERALISATION

- Application of SEM to identify least altered uraninite grains for dating
- LA-ICP MS U-Pb dating
- Oldest sample dates returned of:
  - **1736 ± 17** Ma and **1738 ± 34** Ma returned from SFB hosted mineralisation
  - 1695 ± 94 Ma from altered (significant Pb loss) sandstone hosted vein

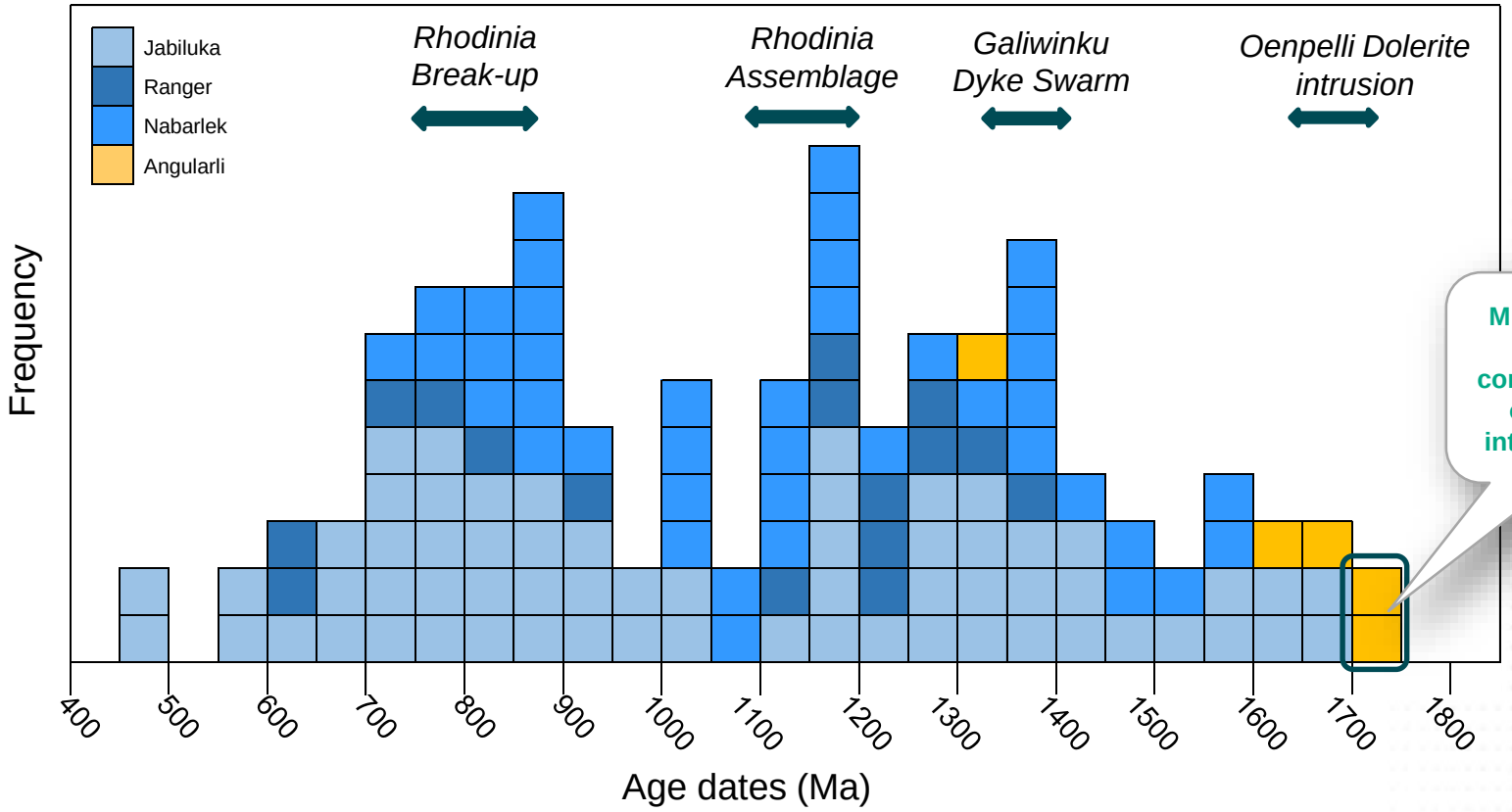




WR-AD-07



REGIONAL MINERALISATION AGE

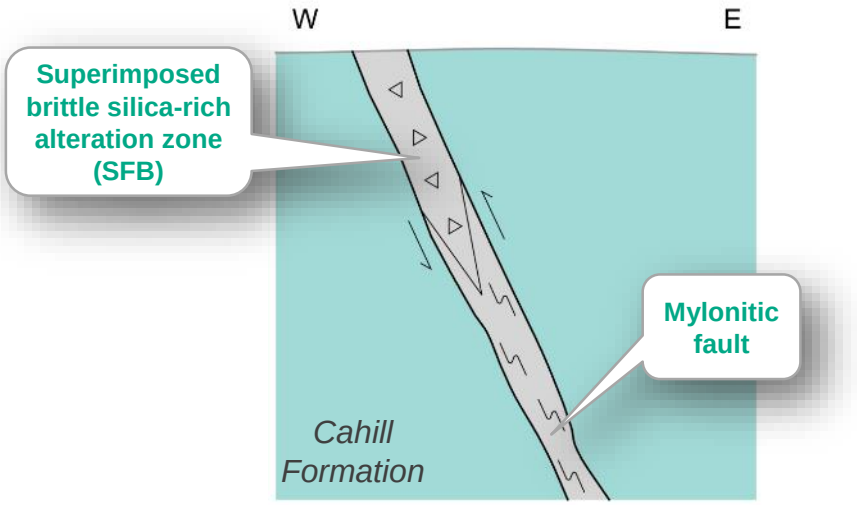


ARUP dating information:

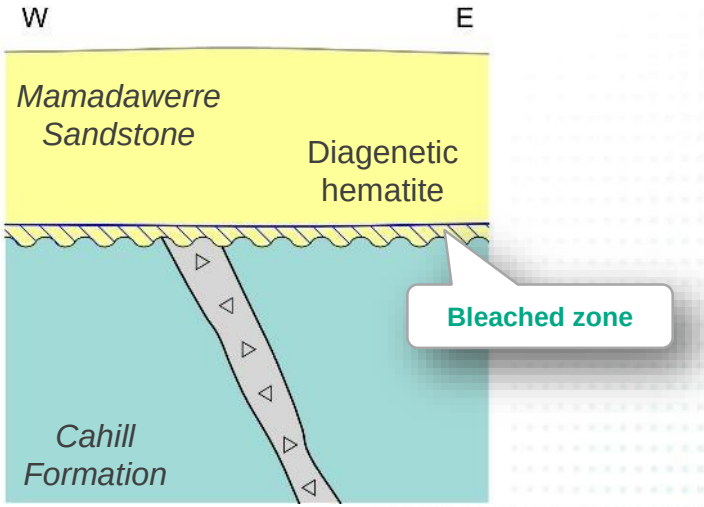
- Accepted age of mineralisation event ~ 1650 Ma
- Recognised reset dates around ~ 1350 Ma, 1150 Ma and ~ 800 Ma
- Angularli age dates indicate that some mineralisation pre-dates Oenpelli Dolerite intrusion
- Additional reset date related to Oenpelli Dolerite intrusion ~ 1650 Ma?

GEOLOGICAL RECONSTRUCTION

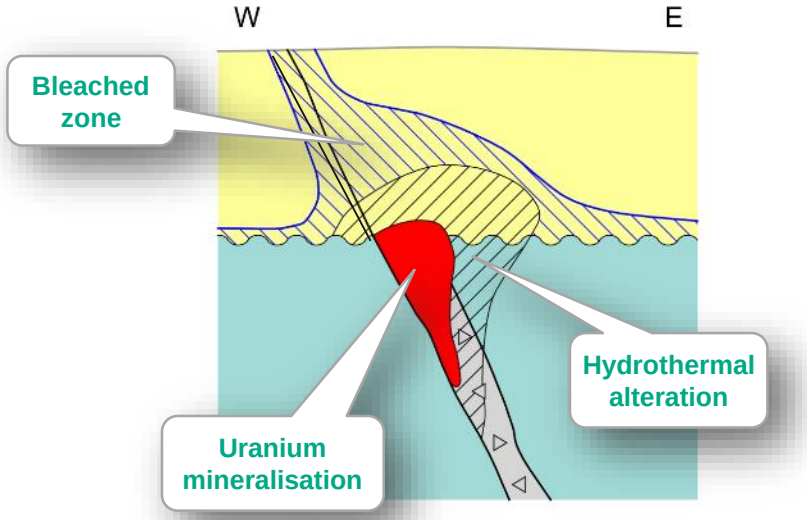
A. Formation of SFB by brittle reactivation of ductile fault zone. Epithermal alteration overprint



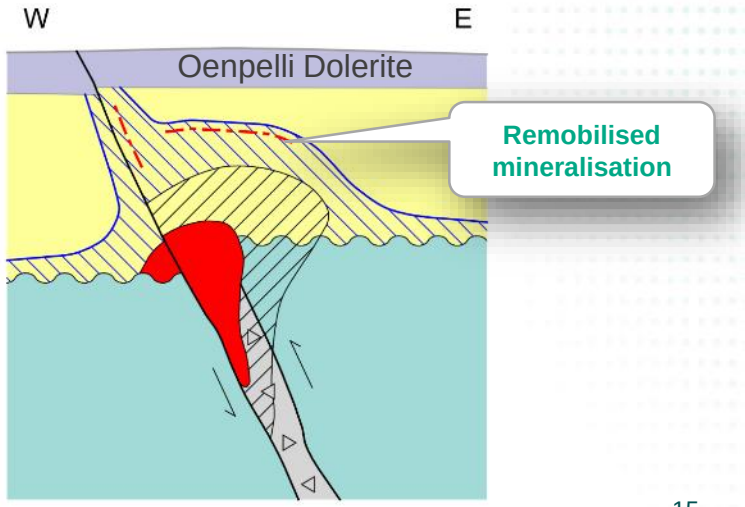
B. Uplift, erosion and deposition of sandstone burial and diagenesis



C. Brittle, sinistral, strike-slip faulting of SFB. Fluid mixing and the precipitation of mineralisation



D. Post-min brittle reverse off-set with meteoric water invasion and uranium re-mobilisation



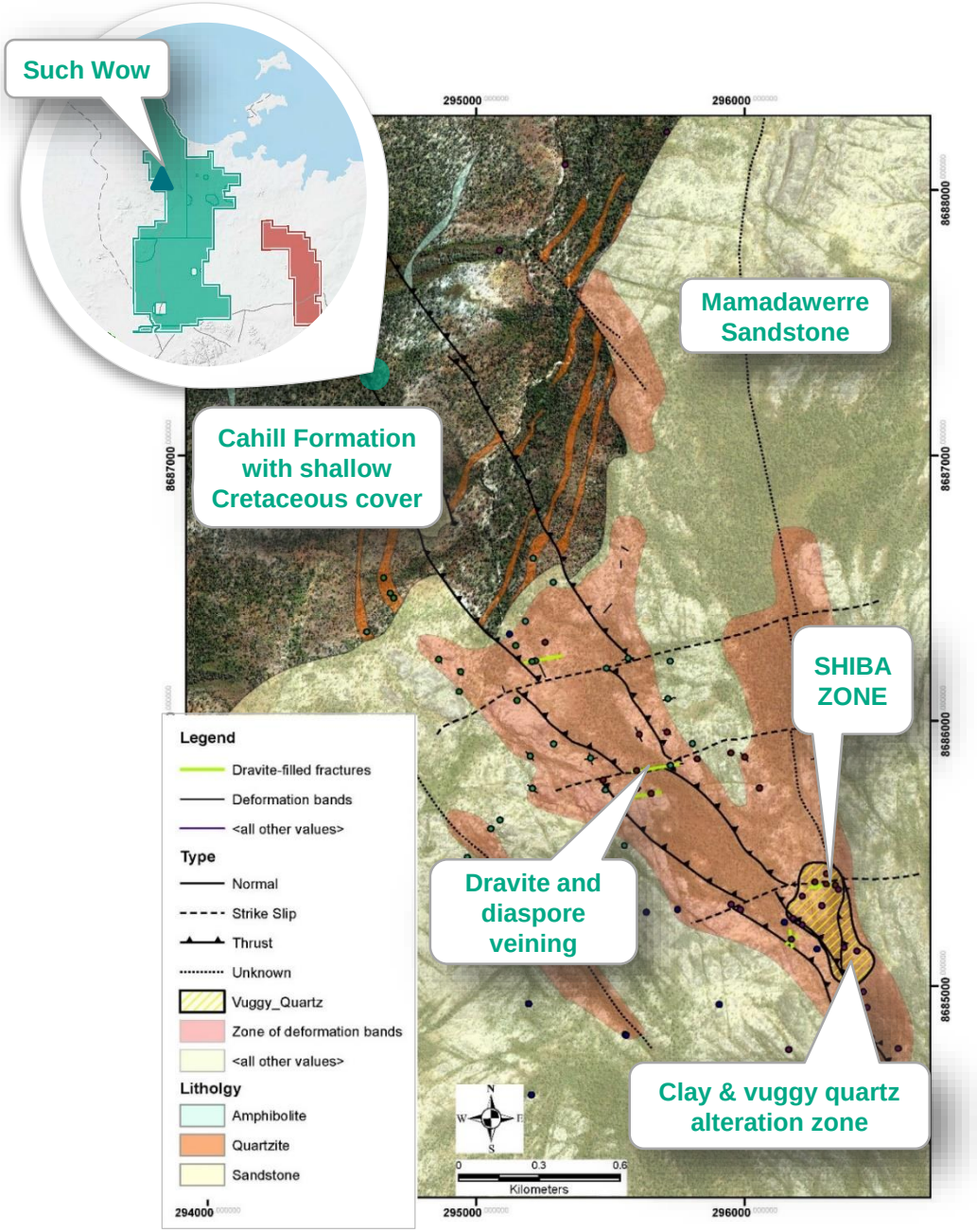
LEARNINGS

- ARUP uranium mineralisation is ***not*** limited to basement
  > More like the Athabasca Basin than previously understood
- ARUP hydrothermal alteration systems ***can be*** spatially extensive in the sandstone
  > Mapped visually and geochemically (uranium, Pb isotopes, boron etc)
  > Several hundreds of metres of vertical extent and at least 1,000 metres along strike
- Not all uranium mineralisation in the ARUP is associated with intense Mg-rich chlorite alteration
- Recent discoveries in the Athabasca have shown that discoveries are still possible in areas with no-sandstone cover and deep within basement

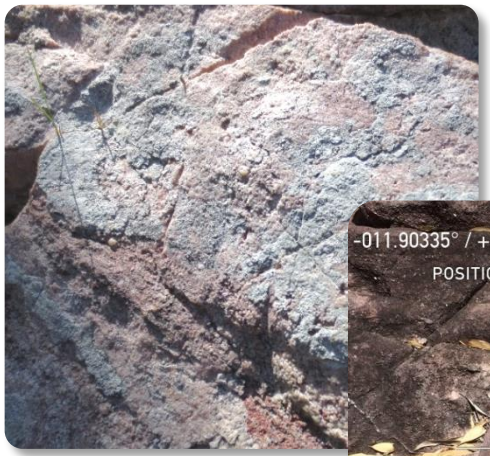
Dravite veining in sandstone outcrop overlying southern extension of Angularli

Increasing degree of alteration

SUCH WOW – APPLICATION OF LEARNINGS 2016



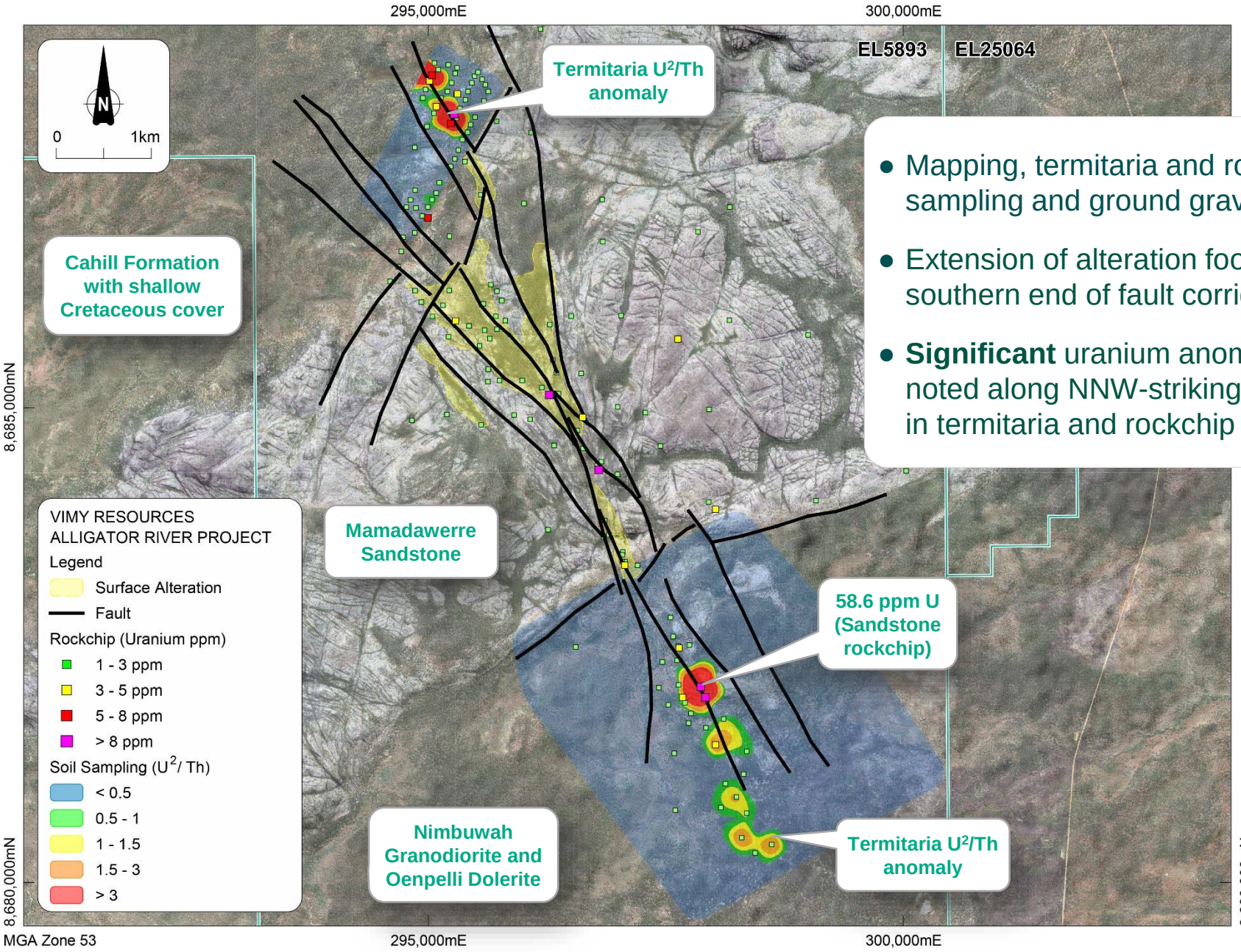
- Reconnaissance mapping and rock-chip sampling completed in late 2016
  - Broad zone of clay alteration and structural disruption
  - Dravite and diaspore veining
  - Vuggy quartz & clay alteration
  - Anomalous uranium, boron (dravite) and gold in rockchip samples



Diaspore vein on fracture surface

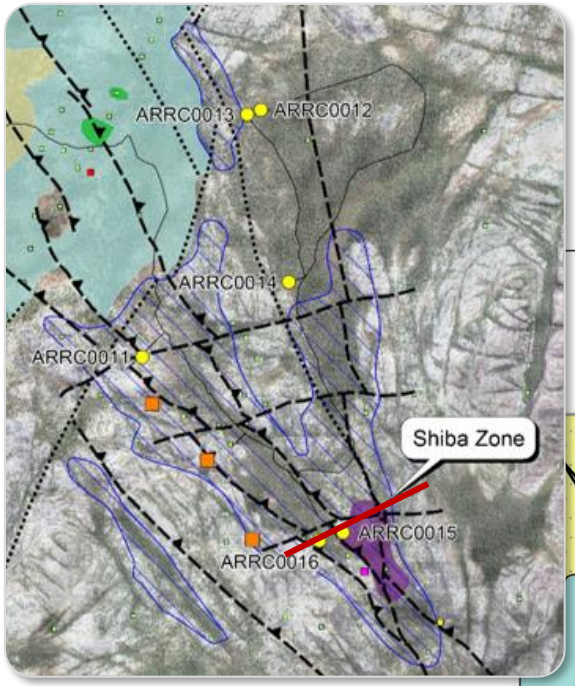
Shear band with associated clay alteration

SUCH WOW – APPLICATION OF LEARNINGS 2017



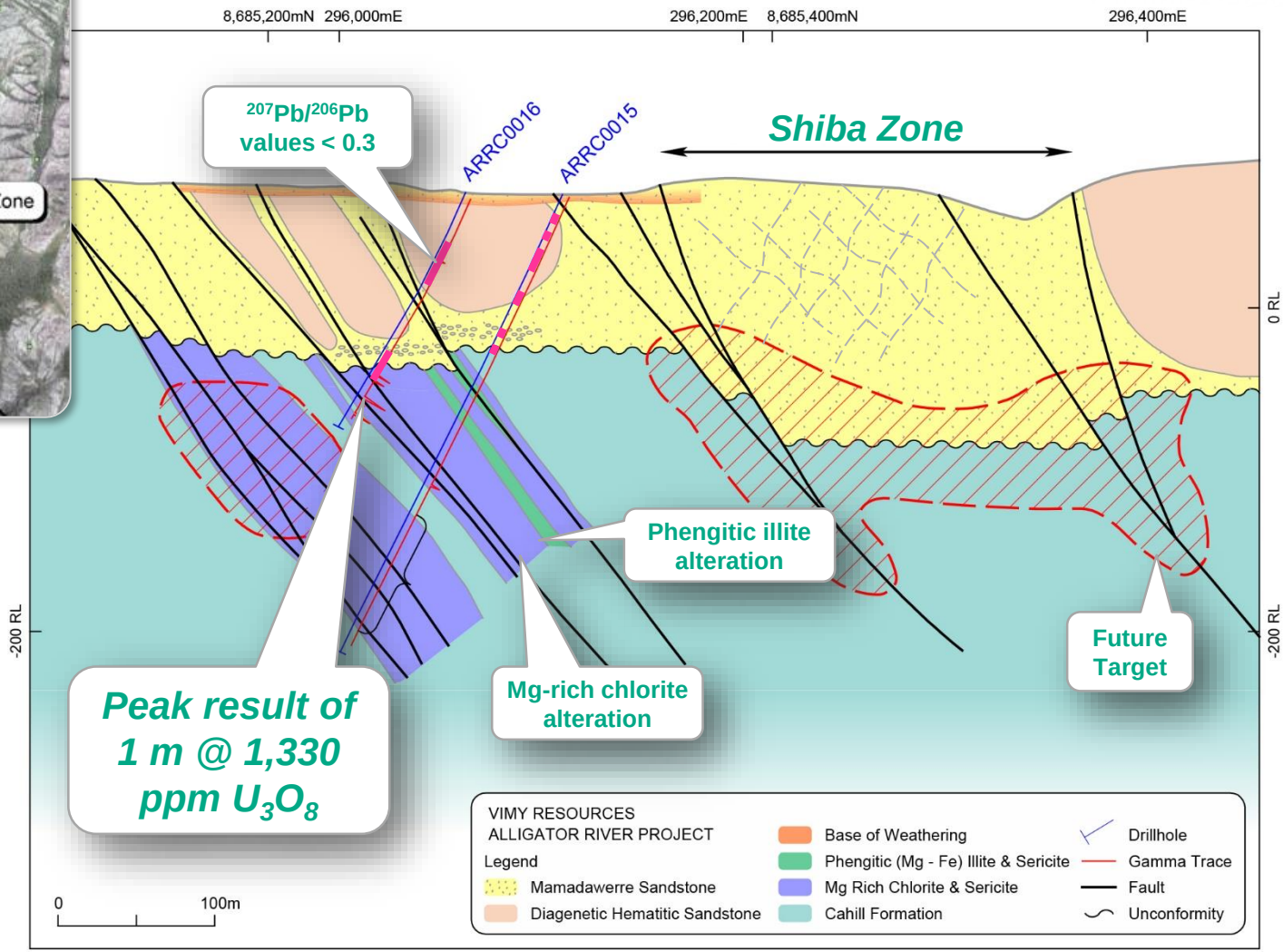
- Mapping, termitaria and rockchip sampling and ground gravity survey
- Extension of alteration footprint to southern end of fault corridor
- **Significant** uranium anomalism noted along NNW-striking fault both in termitaria and rockchip sampling

SUCH WOW – APPLICATION OF LEARNINGS 2018

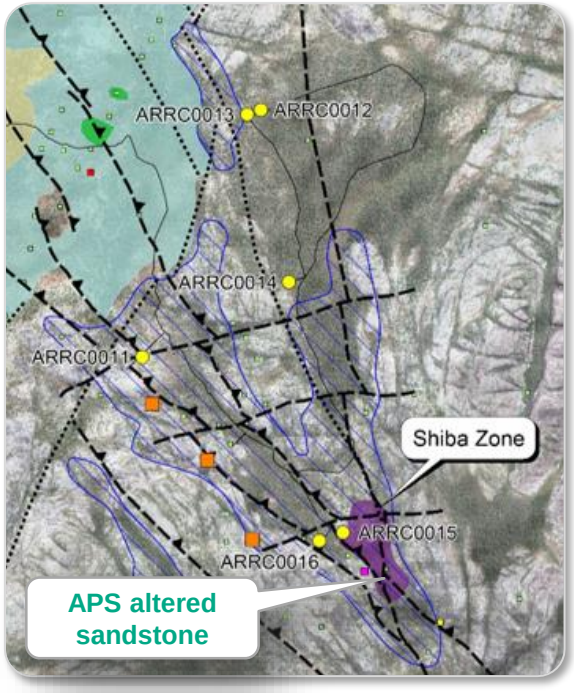


- First pass widespread RC drilling (6 holes)
- Intersected uranium mineralisation within broad zones of Mg-chlorite & phengitic-illite alteration in faulted/sheared basement

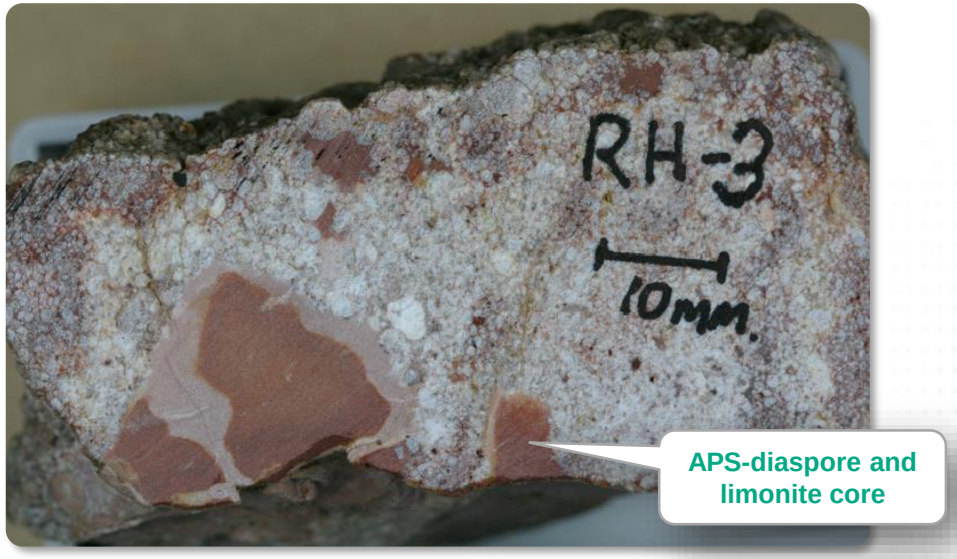
- Anomalous $^{207}Pb/^{206}Pb$ results in sandstone
- Highly anomalous uranium and pathfinder elements in groundwater drilling samples



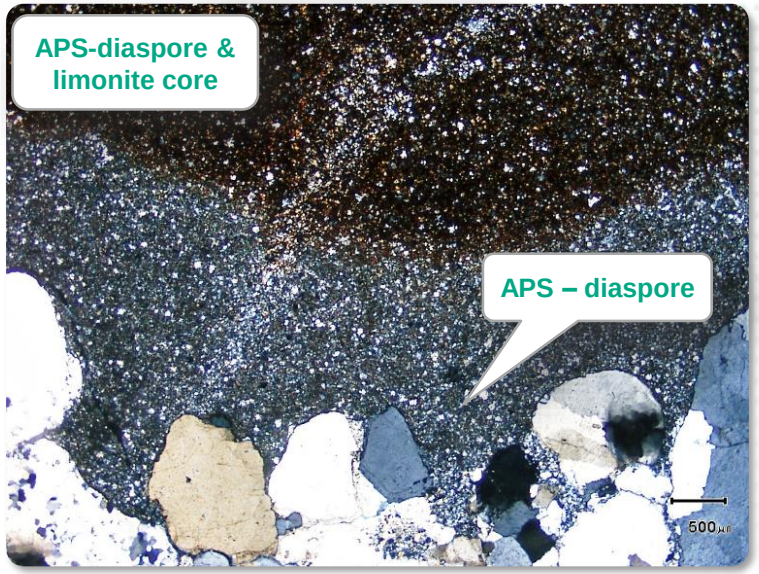
SUCH WOW – APPLICATION OF LEARNINGS 2018



- REE bearing alumina-sulphate-phosphate (APS) minerals identified in faulted sandstone at Shiba



- Zoned replacement-style alteration domains composed of ultra fine-grained mixture of APS-diaspore +/- limonite
- Sandstone matrix also replaced by APS-diaspore mix
- APS minerals present in the proximal alteration halos of many Proterozoic unconformity deposits
- Indicator of the presence of highly acidic, oxidizing hydrothermal fluid

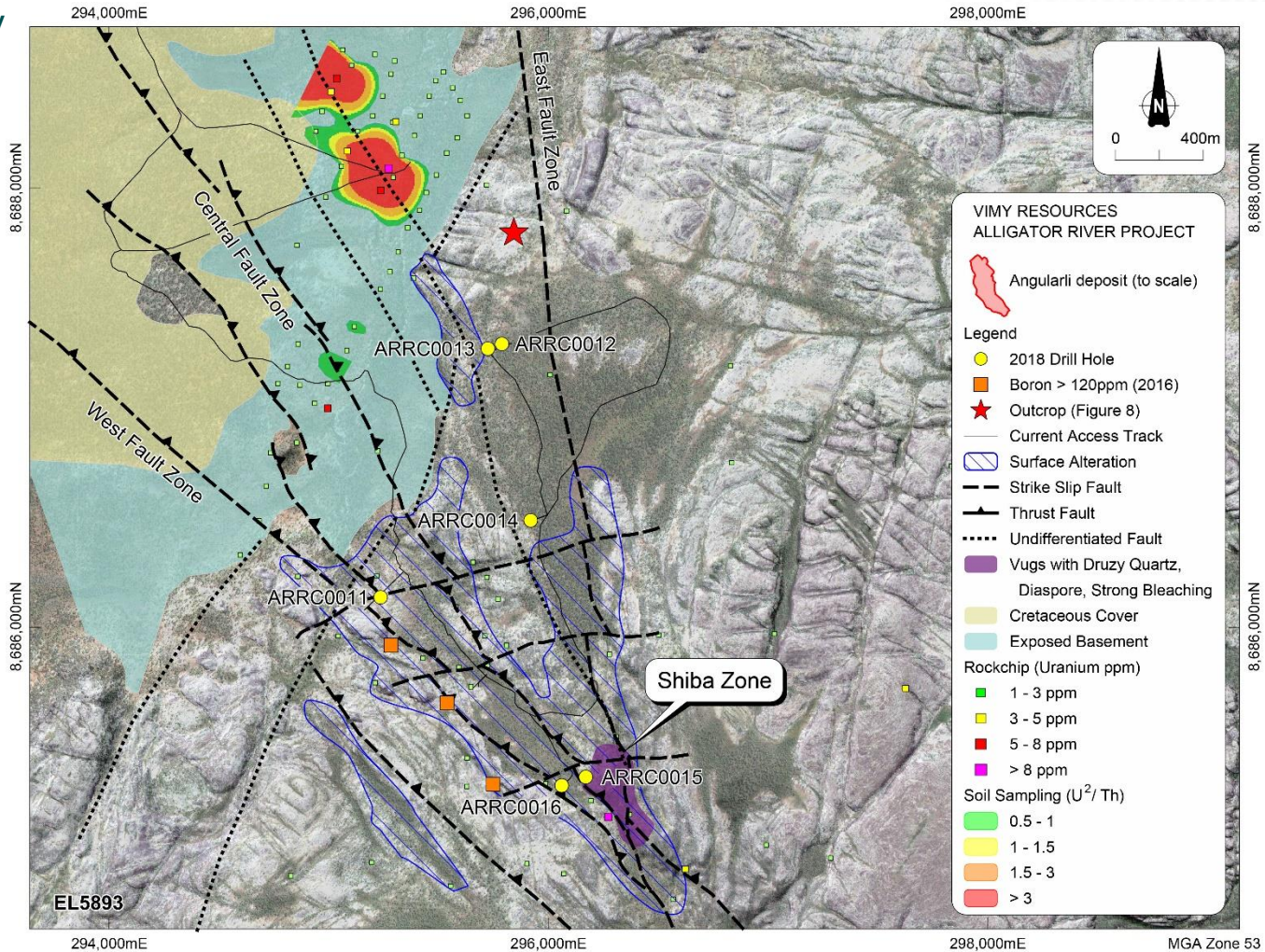


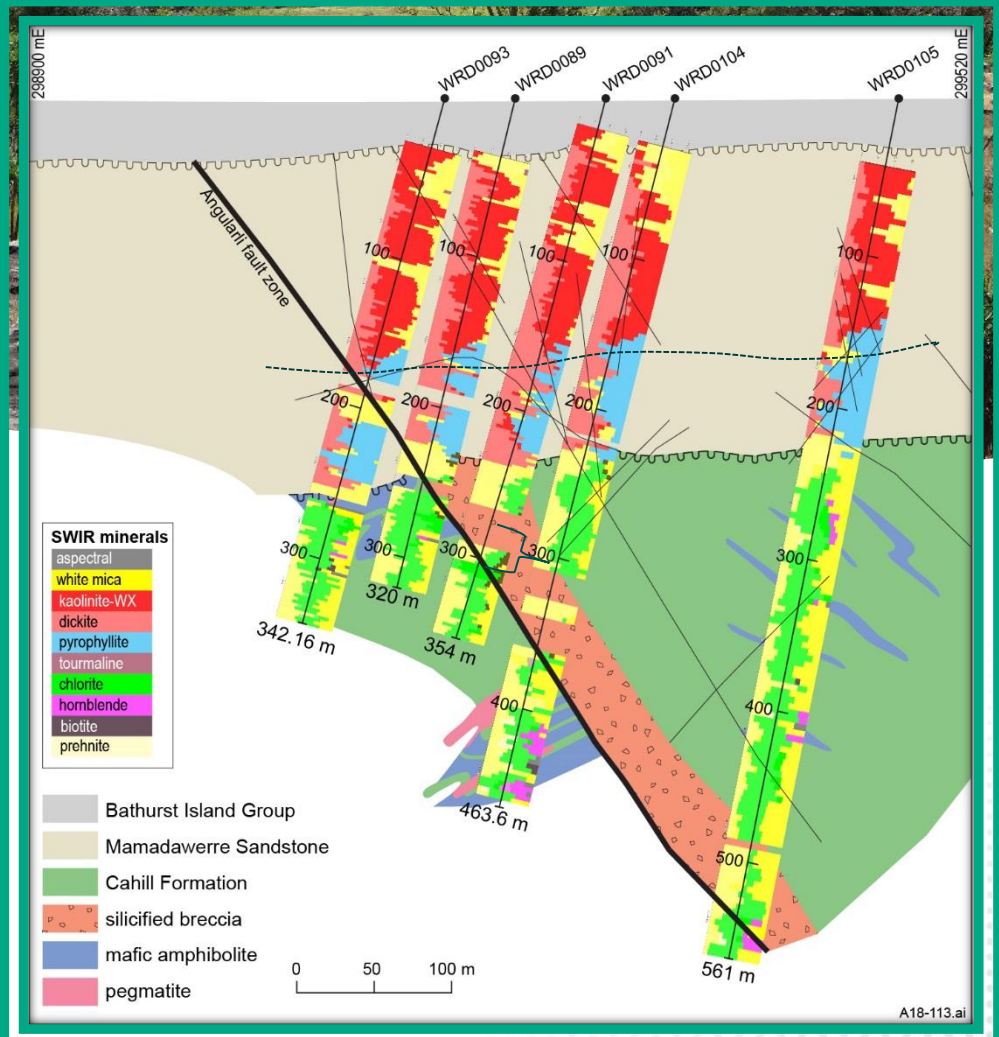
SUCH WOW (SHIBA) – 2019 DRILL TARGET!

Successful application of learnings gained from Angularli led to the ***rapid*** identification of a new mineralised corridor – Such Wow (Shiba):

- Outcropping, structurally controlled, hydrothermal alteration system that is ***4 km long x 1 k wide***
- Demonstrated ***uranium fertility***
- Mg-rich alteration chemistry (Ranger/Jabiluka)

Diamond drill target for 2019!





VIMY RESOURCES

"Hyperspectral analysis at Angularli uranium deposit, Northern Territory" NTGS Record (Manuscript under review)

Authors: Smith BR & Sinclair P

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