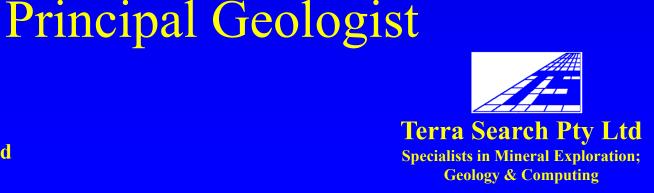
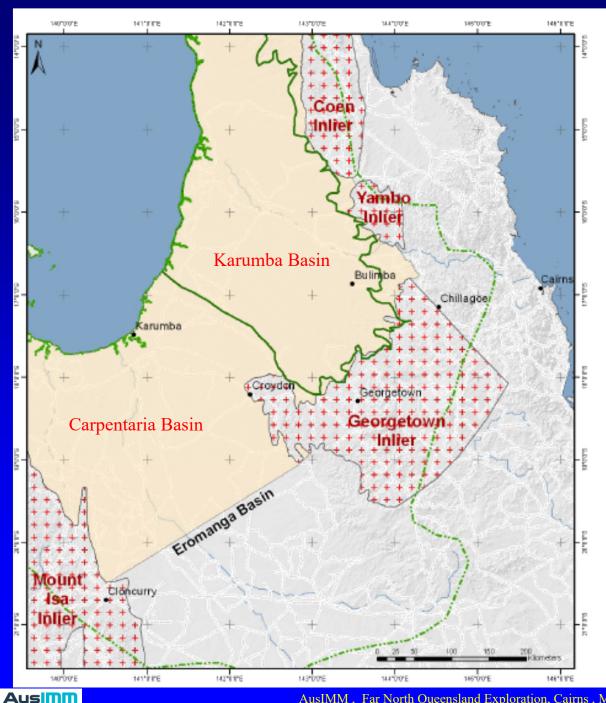
Under Cover Exploration SE Carpentaria Basin Far North Queensland AusIMM Roundup, Cairns, May 2019 Presenter: Dr Simon Beams.







Greenfields exploration within and under Carpentaria Basin cover

Advancing the understanding of previously unknown geology.



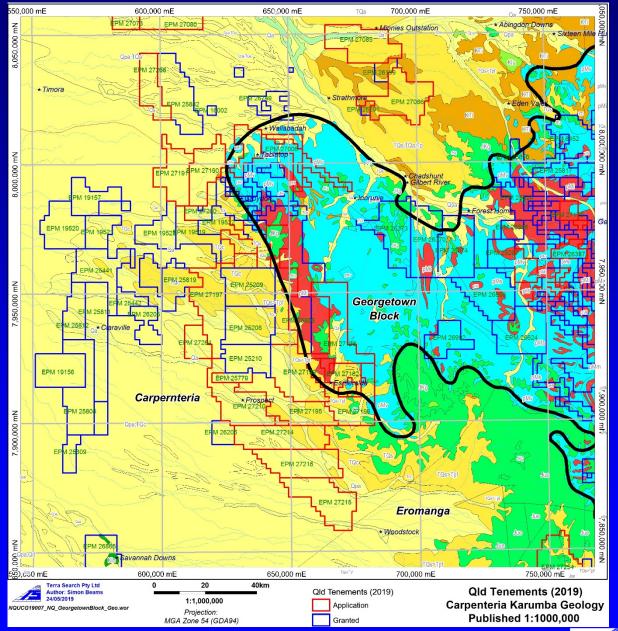
Date: 21stMay 2013





Current Qld Tenements - Carpenteria Karumba Geology

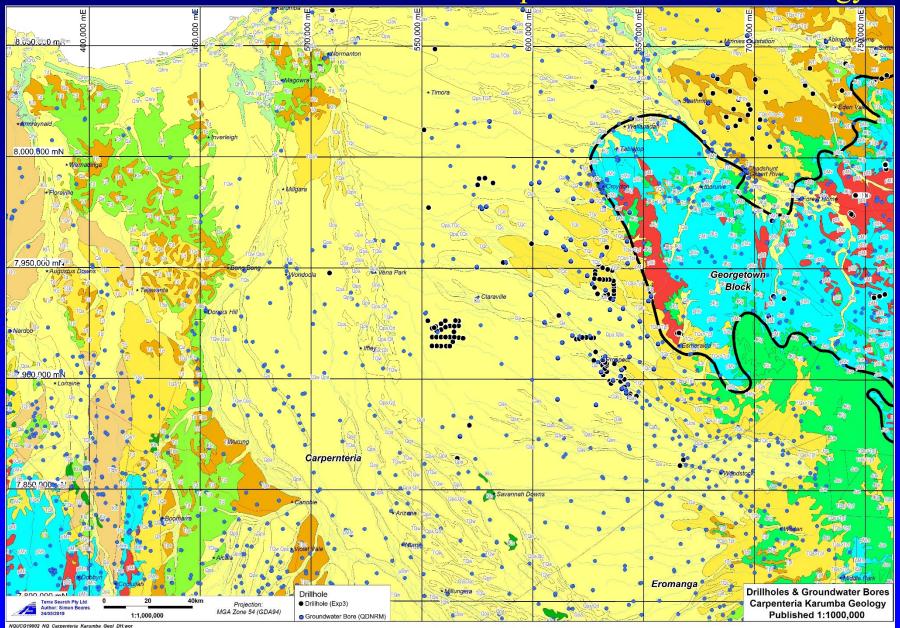
Analagous to the high risk -high reward exploration that was carried out under cover around the Mt Isa block in the 1980's that led to a spate of discoveries. Carpentarian Basin exploration is largely unheralded and should be recognized and supported particularly by Government.







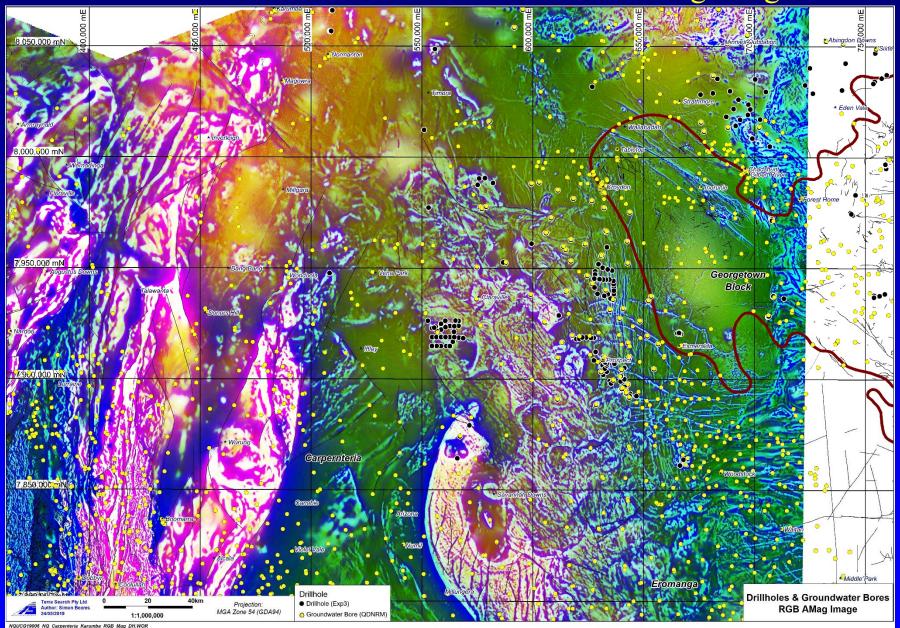
Drillholes & Groundwater Bores - Carpenteria Karumba Geology







Drillholes & Groundwater Bores – RGB AMag Image







Exploration of the Cover Sequence

- Company Drilling has enhanced the geological understanding of the cover sequence, providing information on basin sediments that can be several 100m's thick. New knowledge on:
 - Depth to Basement
 - Stratigraphic Relations
 - Lithologies
 - Redox Conditions



Exploration of the Cover Sequence

- Implications for Hydrogeology Often ignored but water is our most precious resource and limiting factor for development of northern Australia.
 - for the first time drill core of many of the aquifers holding water and aquitards stopping water flow
- Important Potential Resources of Oil shale
- Vanadium & other metals
- Target for Roll Front Uranium



Schematic Geological Cross Section Carpentaria & Karumba Basins (CSIRO 2012 report)

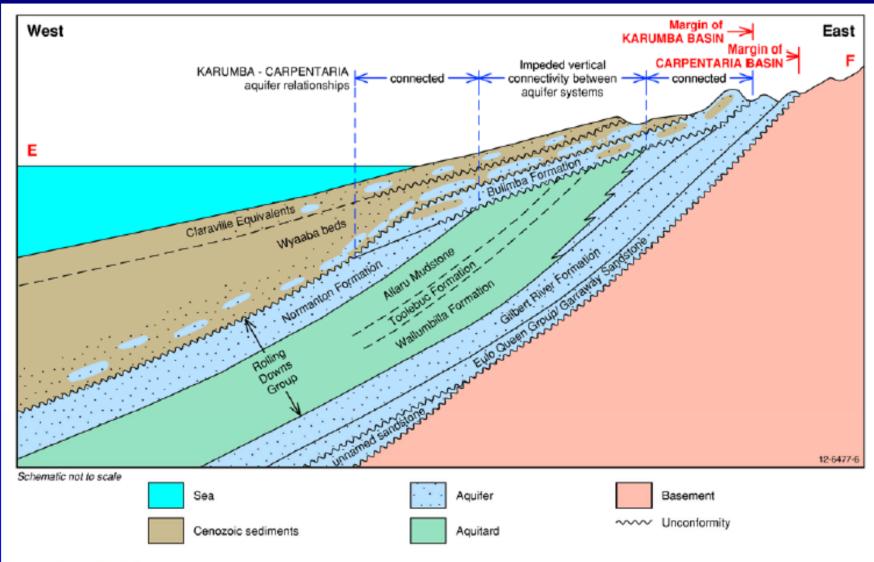
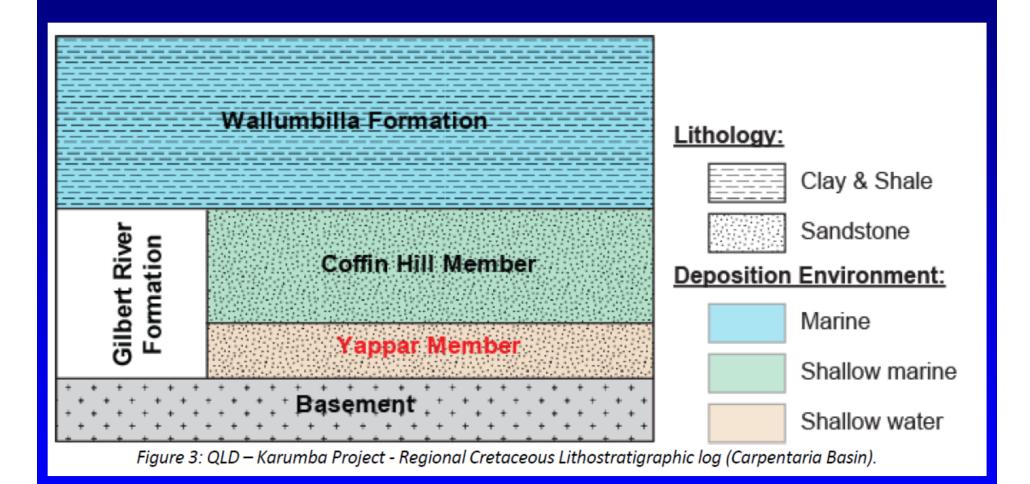


Figure 5.10 Schematic cross-section highlighting the connectivity between aquifers of the Carpentaria and Karumba basins

Note: see Figure 2.6 for approximate location

Mesozoic Stratigraphy Lower Carpentaria Basin



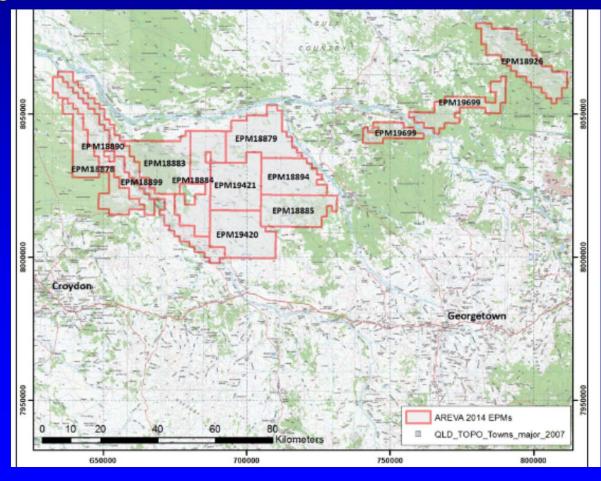
Areva Karumba Project (2014)

- Example of Research Quality Company Data.
- Uranium Exploration focus
- Wide applications in terms of understanding the cover sequence and hydrogeological implications.
- Partly funded by Qld Government through a CDI grant.
- Funding avenue no longer available because of QDNRM entire focus on NW Queensland



QUEENSLAND - KARUMBA PROJECT FINAL TECHNICAL REPORT 2014

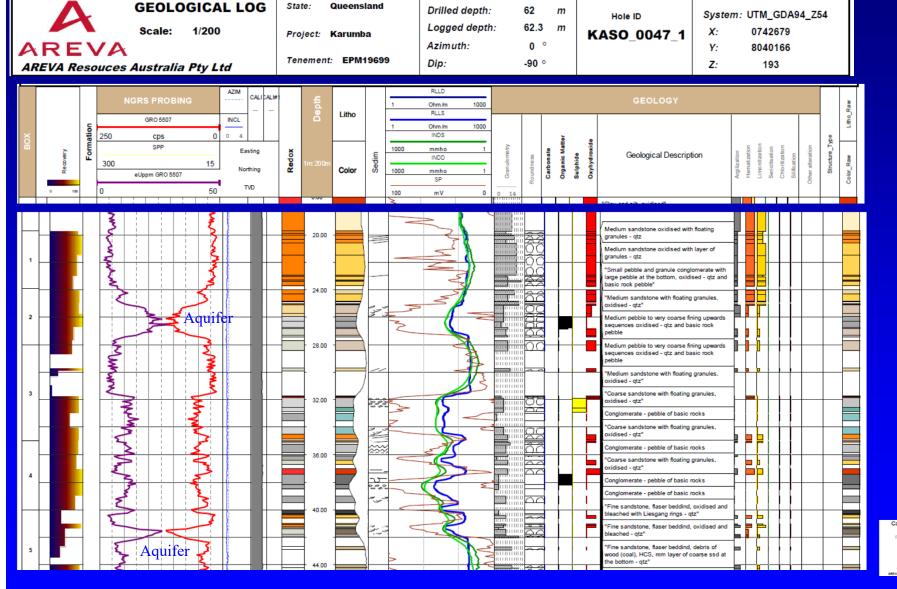
COLLABORATIVE DRILLING INITIATIVE ROUND 8





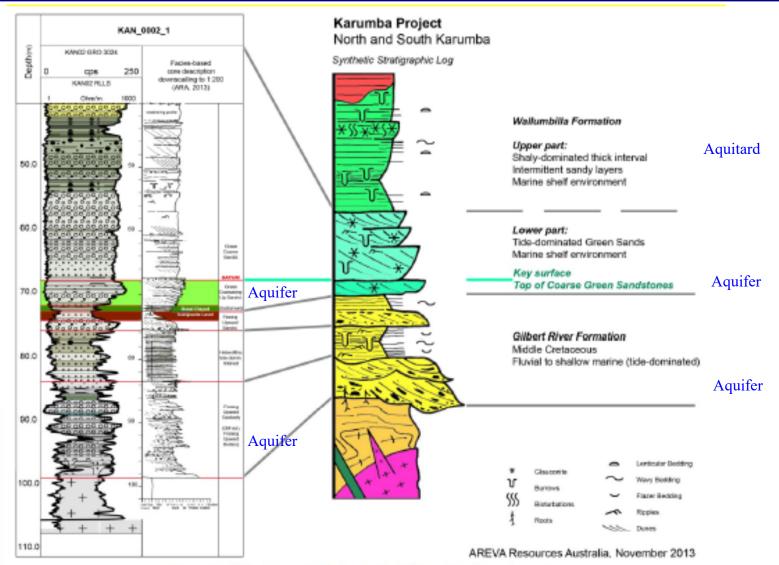


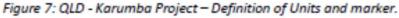
Areva Detaled logs with New Geological Understanding and clear Hydrogeological Implications. Maximum data gathering, sometimes light on interpretation





Project adds knowledge in greenfields area with research quality stratigraphic sections with hydrogeological implications.







Carpentaria Basin



Company data such as Areva's provides new knowledge with broad exploration and hydrogeology implications

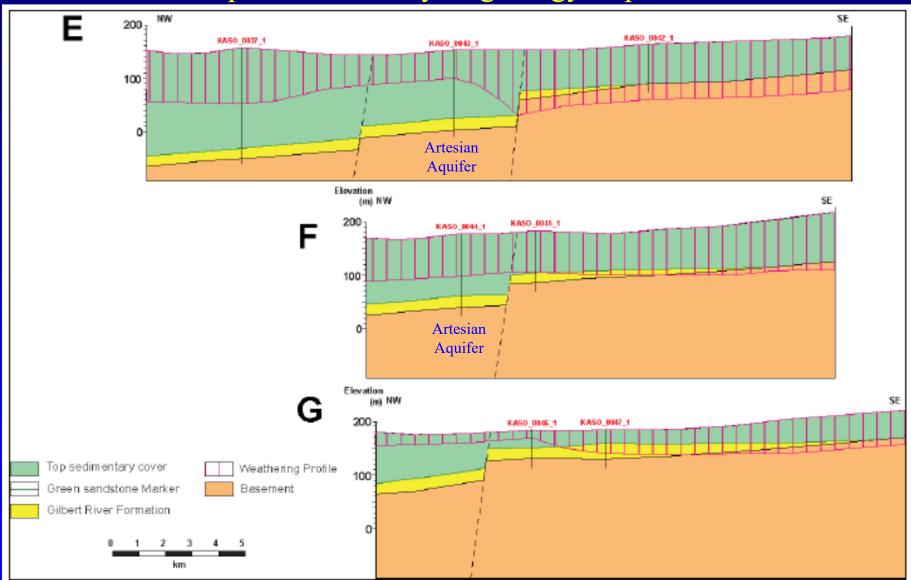


Figure 22: QLD - Karumba Project - Simplified cross-sections E to G (Vertical exaggeration X20).



Bulimba Fm clayey sand and grits (Palaeogene)







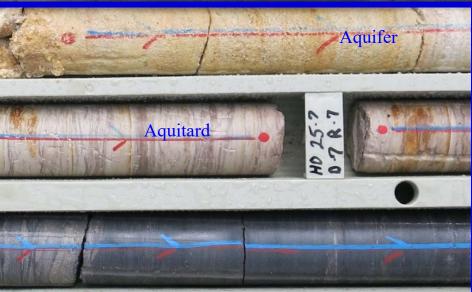
Date: 21stMay 2013





Base of Bulimba Fm Overlying silcreted Cretaceous Wallumbilla Fm





Ausimm

Bulimba sandstone aquifer overlying Wallumbilla aquitard





Cretaceous Wallumbilla Fm



Cretaceous Wallumbilla Fm (glauconite sandstone transitional environment) HBPD001 209m



Jurassic Gilbert River Fm Sandstone: Artesian Aquifer (fluviatile deposition) HBPD001 250m

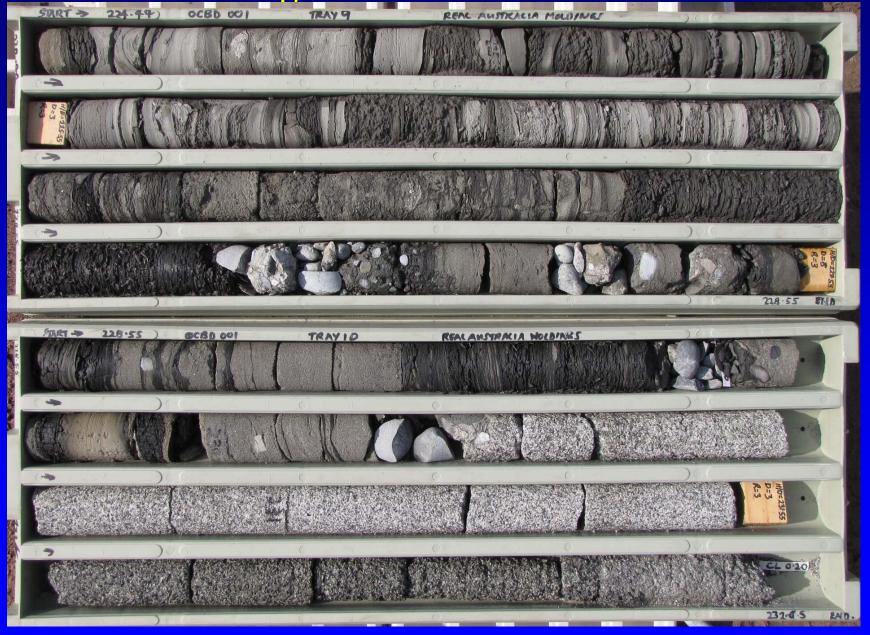


Gilbert River Fm Sandstone: Artesian Aquifer Base of Mesozoic HBPD002 260m



Conglomerate aquifer at Base of Mesozoic and basement granite Coralie OCBD001 229m





Conglomerate aquifer at Base of Mesozoic and basement granite Coralie OCBD001 229m



Very sharp basal contact Mesozoic and Proterozoic, no weathering profile. Permian Glaciation?

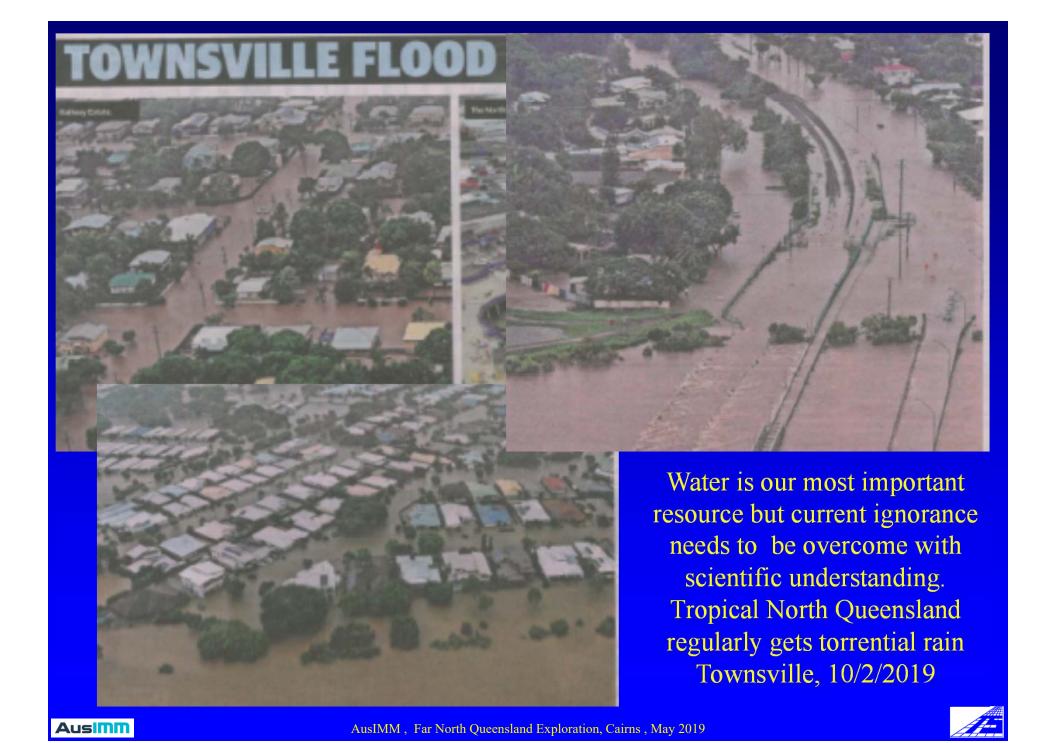
Real (Aust) Holdings P/L



Hit 2m thick artesian aquifer Gilbert River Formation at base of Mesozoic 240m Real (Aust) Holdings P/L







Torrential rain events regularly inundate northern Australia eg. inland sea 60km wide x 300-500km km long , Flinders & Norman Rivers, 8/2/2019. Much of this water goes into the ground. False colour Image, enhances muddy water.





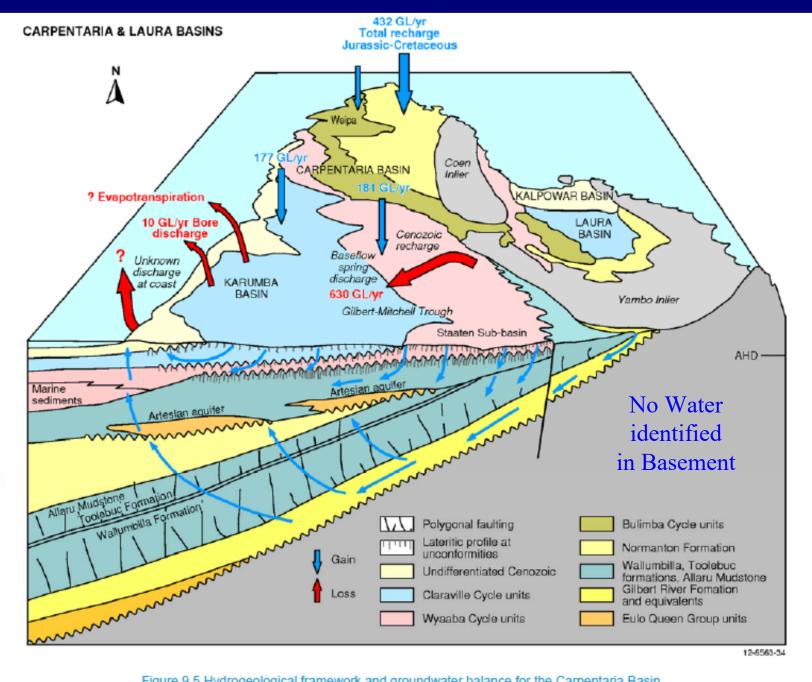


Figure 9.5 Hydrogeological framework and groundwater balance for the Carpentaria Basin



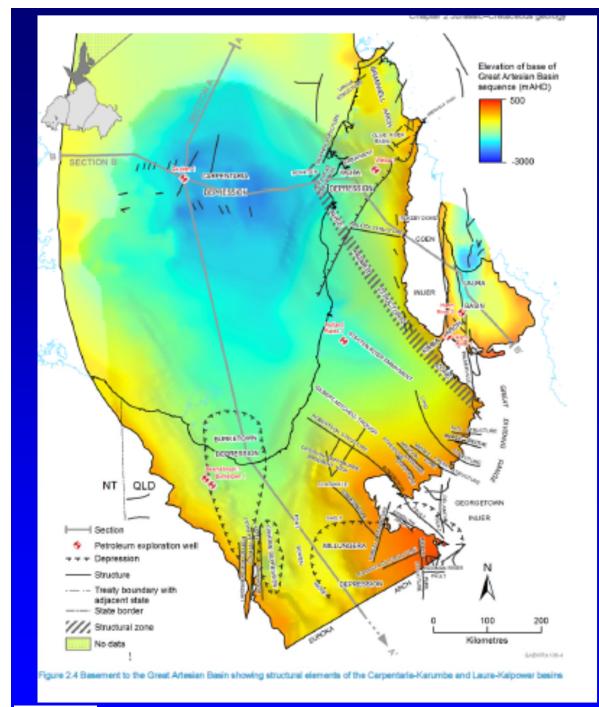
The recharge flux in the Karumba Basin is very high. We estimate the flux is 177,260 ML/year in the Claraville Beds, 181,480 ML/year for the Wyaaba Beds and 4,467,040 ML/year for the Bulimba Formation giving a total of 4,825,780 ML/year for the Karumba Basin Cycles. Thus the total recharge flux for the Carpentaria and Karumba basins combined is 5,257,880 ML/year. About 630,000 ML/year of this flux is discharged by baseflow springs, about 10,000 ML/year is extracted by bores and the remainder is lost through evapotranspiration and submarine outflow. These terms have never been quantified before.

Recharge 5,257,880 ML/year Karumba & Carpentaria Basins
Bore holes use 10,000 ML year = 0.2%
"Remainder is lost through evapotranspiration and submarine outflow"

The most significant feature shown in Figure 9.5 is the very low bore usage compared to the high recharge. There appears to be plenty of scope for further groundwater development in the Carpentaria Basin, and also particularly in the Karumba Basin.

CSIRO Report 2012





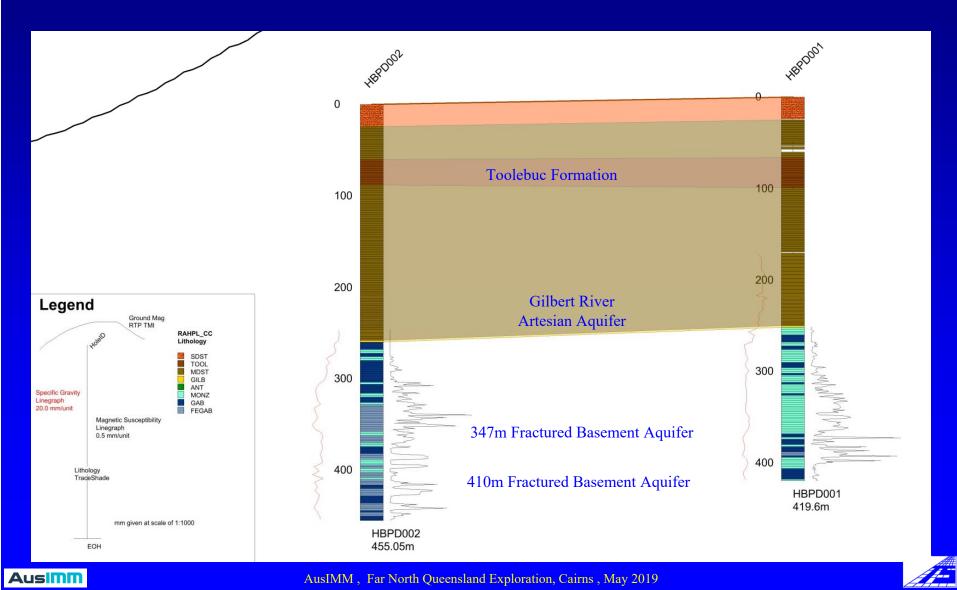
Tapping underground water is often portrayed as the equivalent of mining a finite resource. However, ground water does get recharged, is largely sustainable and valuable water is actually lost from the continent through submarine outflow.

Image from CSIRO Report 2012



Discovery of strong water flow from fractured basement rock, an example of an unknown unknown.

Geological Cross Section Humpback HPD002, Real (Aust)



Hit Deep Basement Artesian Aquifer 347m, HBPD002. Real (Aust)





HBPD002 Deep aquifer open space fracture 347m in gabbro Real (Aust)





Deep Basement Aquifer, Humpback Cudgee Ck



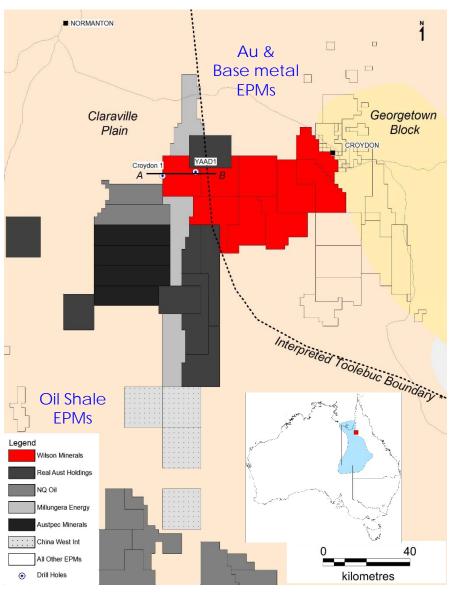
Having discovered a golden gusher: the end result is a concreted sealed hole. This was not the way the outback was opened up and a nation was built. Surely we can do better than this.







OIL SHALE EXPLORATION MODEL



The Toolebuc Formation is the focus of a number of current exploration projects across QLD following the raising of the oil shale moratorium by the QLD Government. The new QLD oil shale policy encourages private sector research and investment in high quality oil shale extraction technologies and exploration (DNRM, 2014).

- Toolebuc Formation underlies approximately 368km² of the Wilson Minerals package in the Croydon district of NW Queensland.
- Historic drilling intersected oil shale within Wilson Minerals tenement holding with significant oil yields
- Numerous current exploration activities underway across QLD and adjacent to Wilson Minerals tenements.







Struck Oil Shale!!



Real (Aust) Cudgee Ck



Struck Oil Shale!!

AusIMM, Far North Queensland Exploration, Cairns, May 2019

Real (Aust) Cudgee Ck



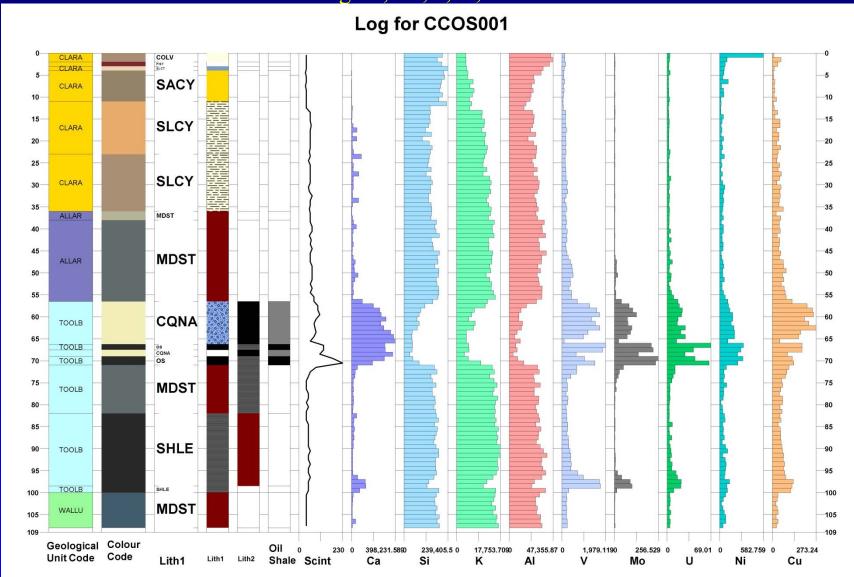
Oil Residue

Real (Aust) Cudgee Ck





Graphic Log Cudgee Ck Oil Shale hole Real (Aust) High V,Mo,U,Ni,Cu



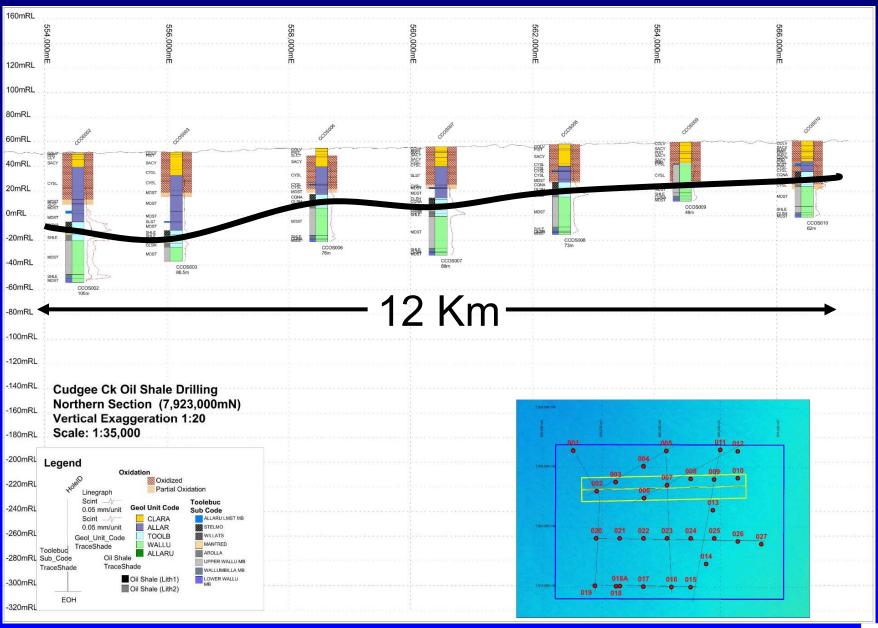
Ca

Mo U

Cu



Cudgee Ck, EPM 19156 Oil Shale: Real (Aust)

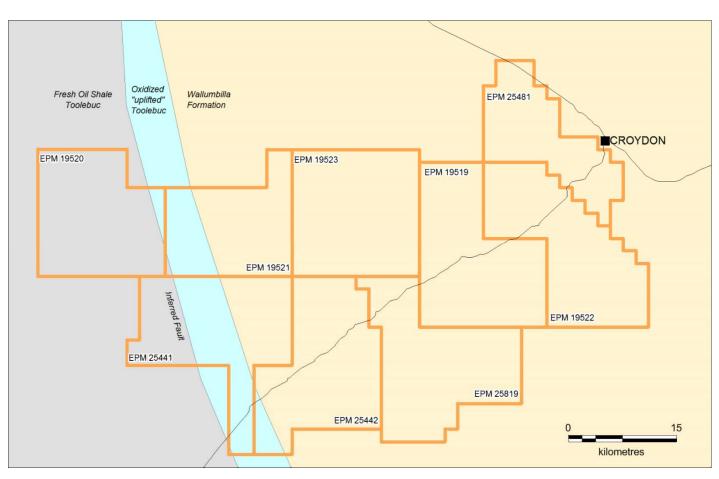






VANADIUM / MOLYBDENUM EXPLORATION MODEL

One technology that has the potential to transform our entire energy system is energy storage. Vanadium has high-tech applications for energy storage (low-cost redox flow mass energy storage system). Currently very little of the power we produce can be stored, meaning that power must be generated constantly to meet the demands of a modern society. (Clean Energy Australia Annual Report 2013).



- Toolebuc Formation is one of largest known resources of vanadium.
- Highly prospective oxidized shale in a 6.5 x 25 km corridor.
- Previous exploration of the Toolebuc Formation has delineated potential economic quantities of molybdenum, nickel and uranium.
- Exploration target average grade of 1800 ppm V and 300 ppm Mo.

Wilson Minerals AusIMM Presentation, FNQ Exploration Roundup, 2015

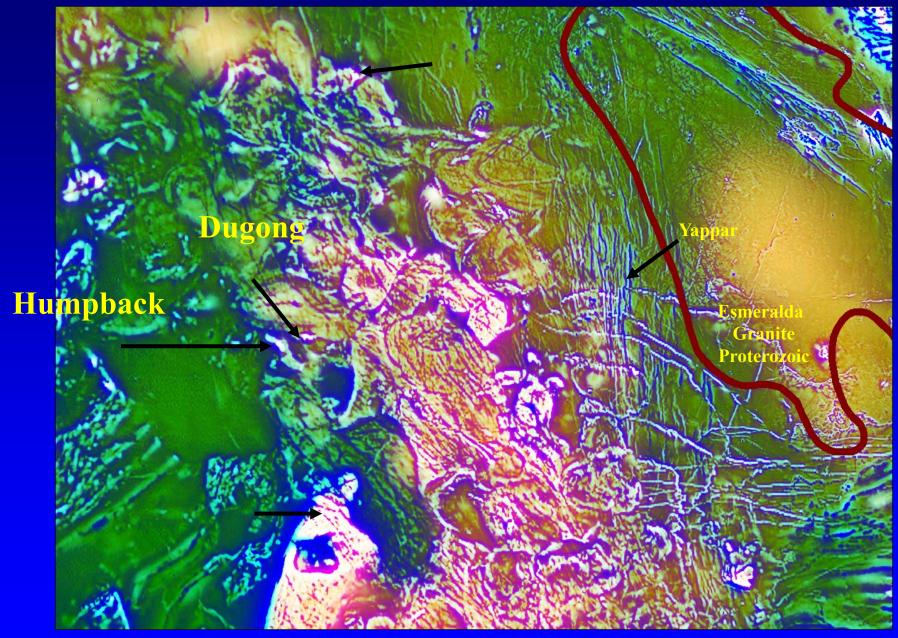


Exploration of the Basement

- Initial targeting of mineralization in basement utilizes deep seeking geophysical techniques
- Have to be able to see down to depths well in excess of 250m-300m.
- First pass targeting utilizes
 aeromagnetics and gravity surveys
- Later targeting with electrical geophysics eg.
 EM and IP

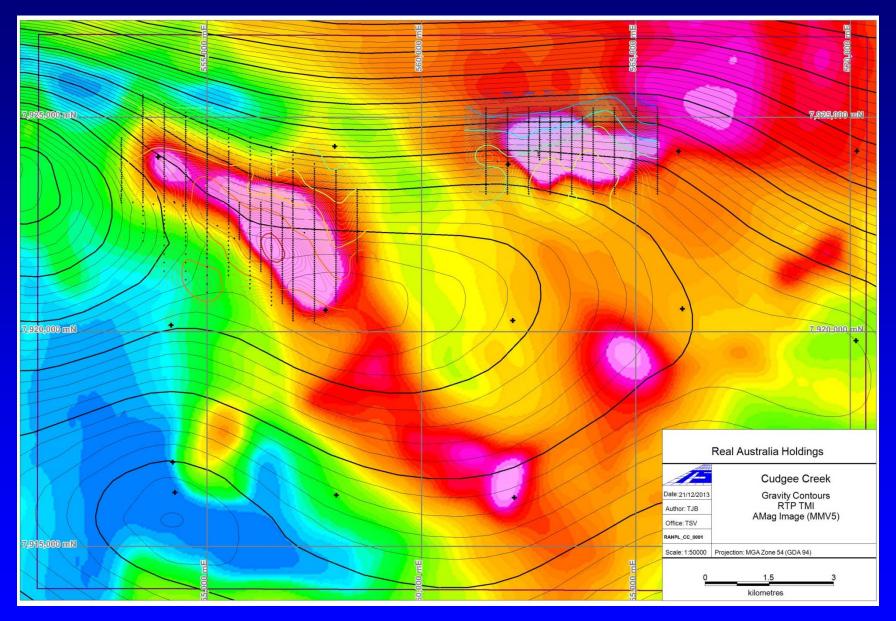


RTP-1VD-AS RGB Magnetics

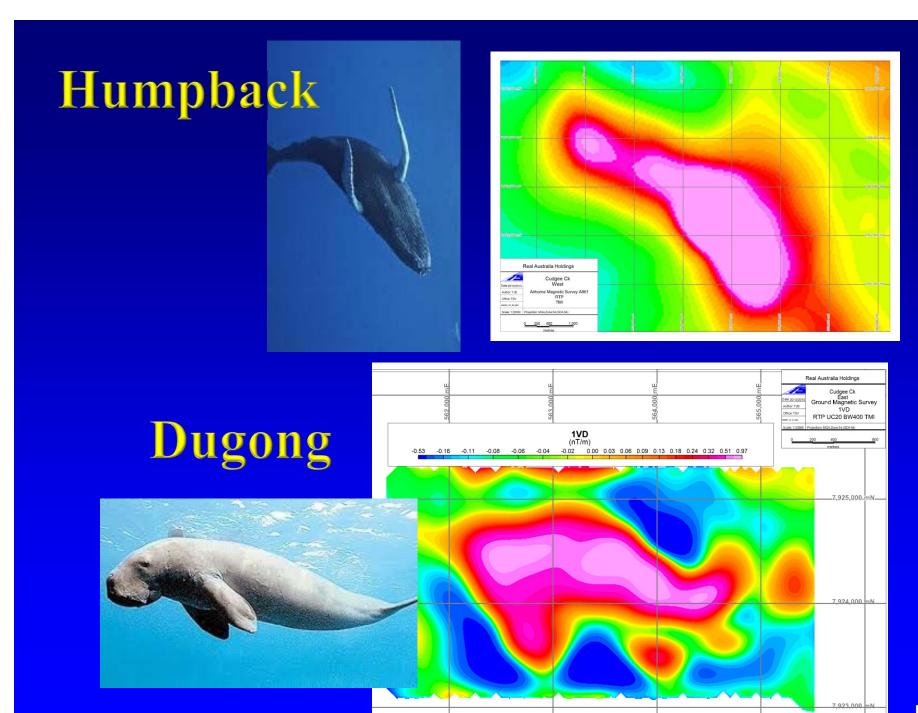




Cudgee Ck, Real (Aust) Coincident Mag & gravity

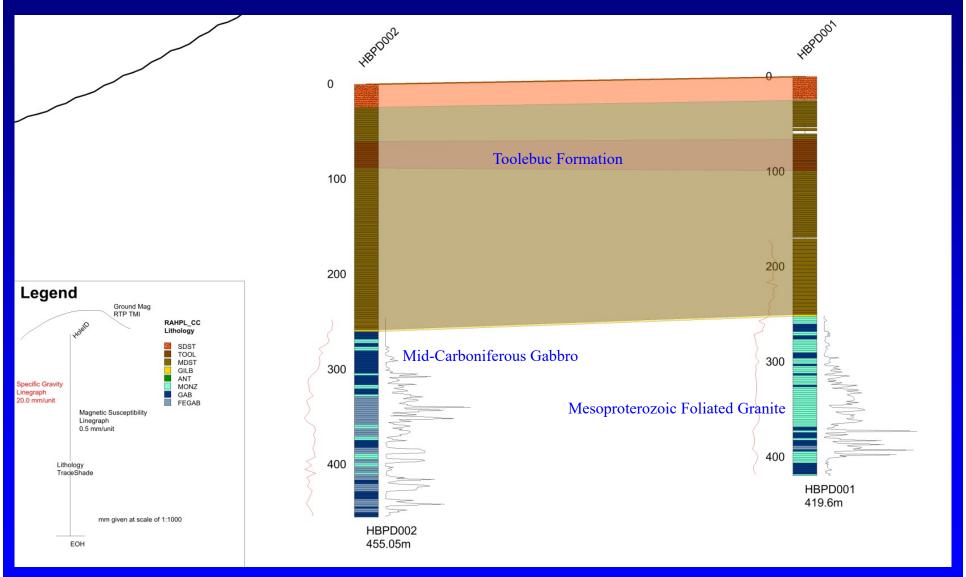








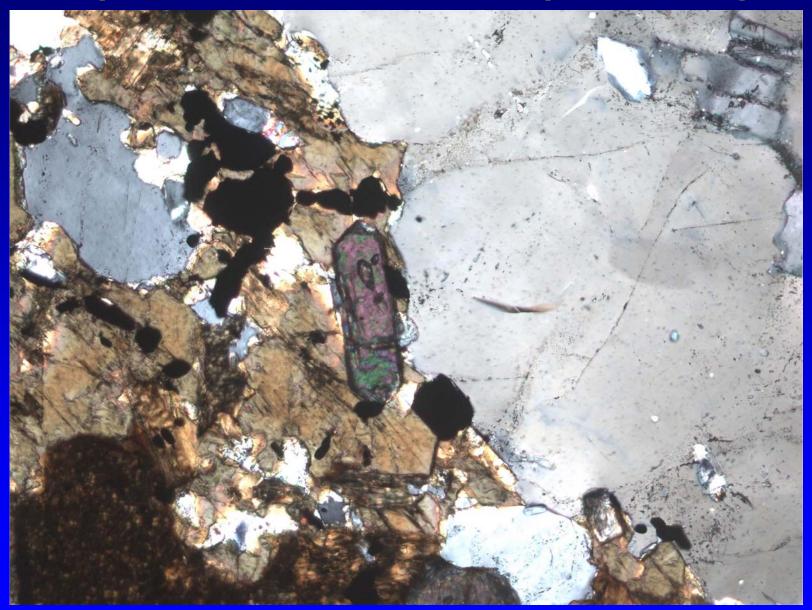
Real (Aust) Cudgee Ck & Coralie : new Knowledge Partly funded by Qld Govt CDI. Geological Cross Section Humpback,







Humpback zircon and biotite quartz feldspar





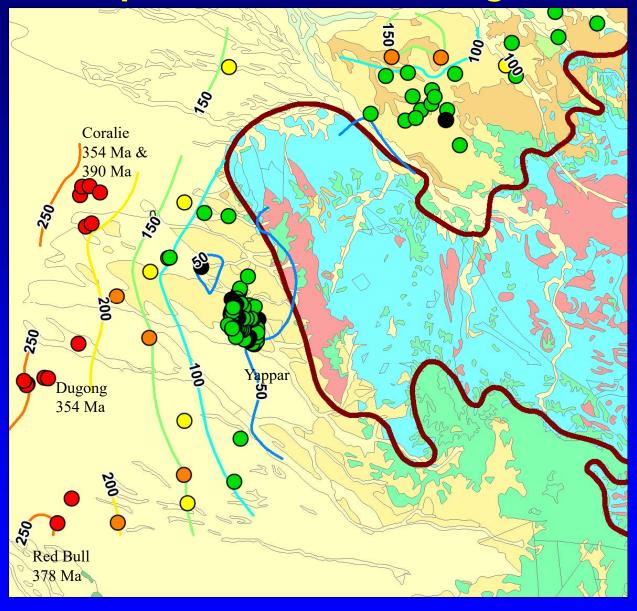
Zircon U/Pb Age Dating (Adam Nordsvan : Curtin University 2017

CUDGEE CREEK	DGPD002	5134053	354±20 Ma	274.5m Andesite
CUDGEE CREEK	HBPD001	5134042	1530±20 Ma	350.27m Coarse grained titanite granite
CUDGEE CREEK	HBPD002	5134045	1540±40 Ma	316.85m Very coarse grained monzogranite
CUDGEE CREEK	HBPD002	5134046	351±10 Ma	349.1m Hornblende biotite quartz diorite
CUDGEE CREEK	HBPD002	5134047	347±10 Ma	441.6m Diorite
OLD CORALIE	OCBD002	5134055	354±10 Ma	276.04m Quartz diorite
OLD CORALIE	OCBD003	5134056	390±20 Ma	286.62m Porphyrytic biotite granite
OLD CORALIE	OCBD004	5134057	352±20 Ma	261.88m Biotite quartz monzonite

Cf: Kidston 334 Ma; Pajingo 342 Ma, Charters Towers 415Ma, Woolgar 373 Ma, Forsayth Suite 1540 Ma,



Depth to Basement & Ages

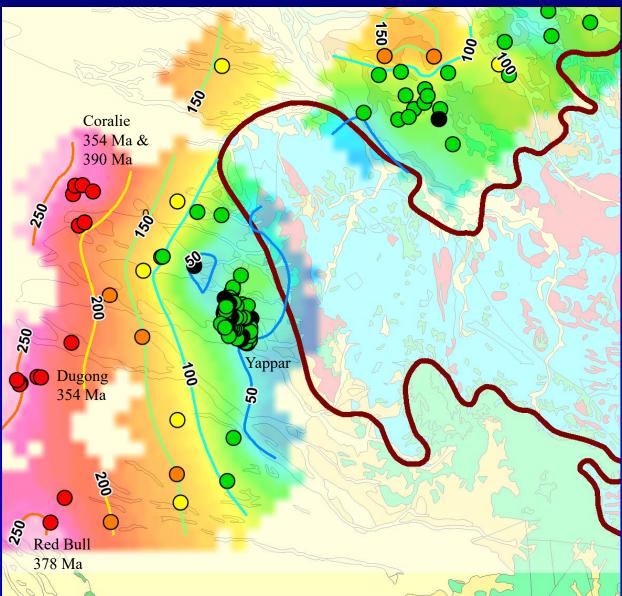


Yappar Moho Resources Dec,2018 Scout drilling 10m @ 1g/t Au

Humpback 1540Ma & 350 Ma



Depth to Basement & Ages



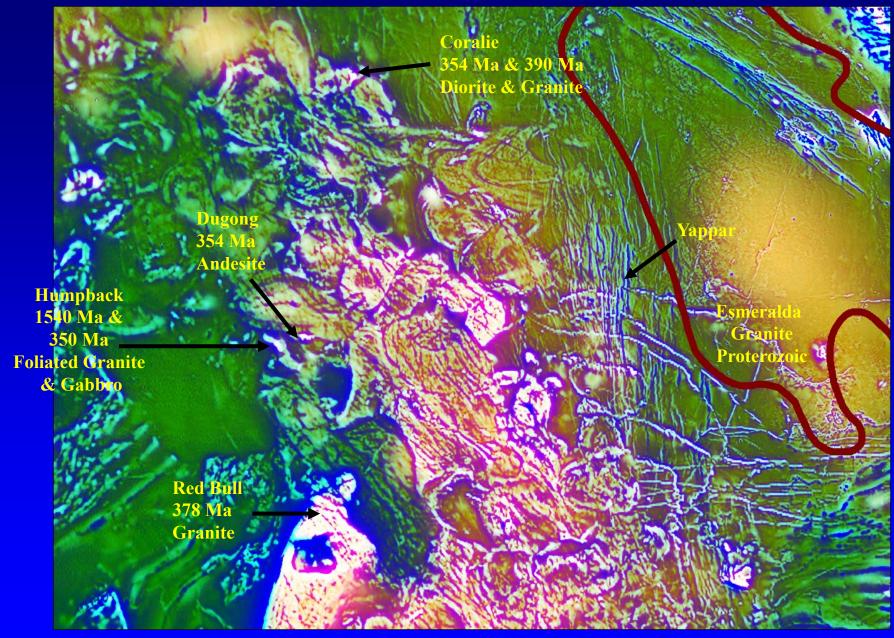
Yappar Moho Resources Dec,2018 Scout drilling 10m @ 1g/t Au



Humpback

1540Ma & 350 Ma

Magnetic Terranes with Ages





Real (Aust) HBPD002 252.3m Base of Mesozoic overlying Foliated Proterozoic Granite ~1540 Ma. Humpback, Cudgee Ck.

Sharp contact with overlying Mesozoic ~100 Ma.

~ 1400 Million year time break, no weathering profile, possible glaciated terrain in Permian?



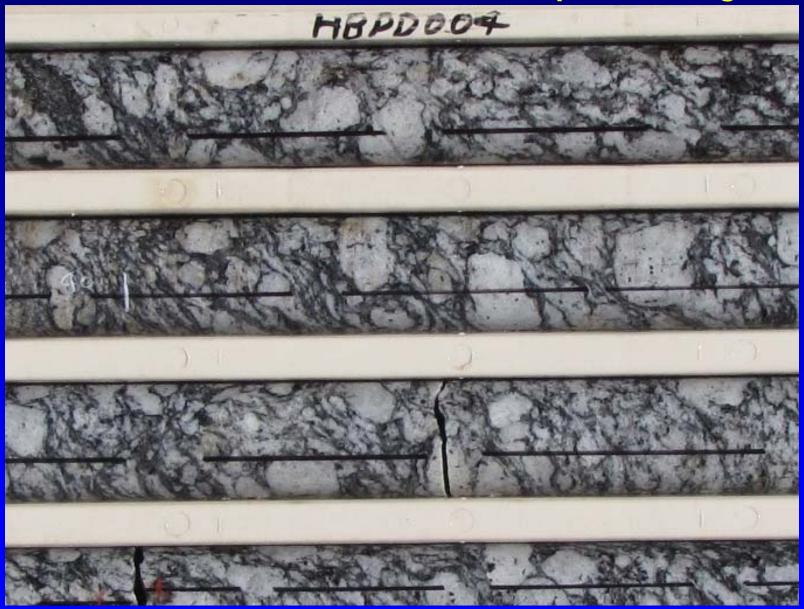


HBPD001 350m cg titanite monzogranite 1540 Ma Humpback, Cudgee Ck





HBPD004 301m cg foliated monzogranite Probable MesoProterozoic 1500 Ma Humpback, Cudgee Ck



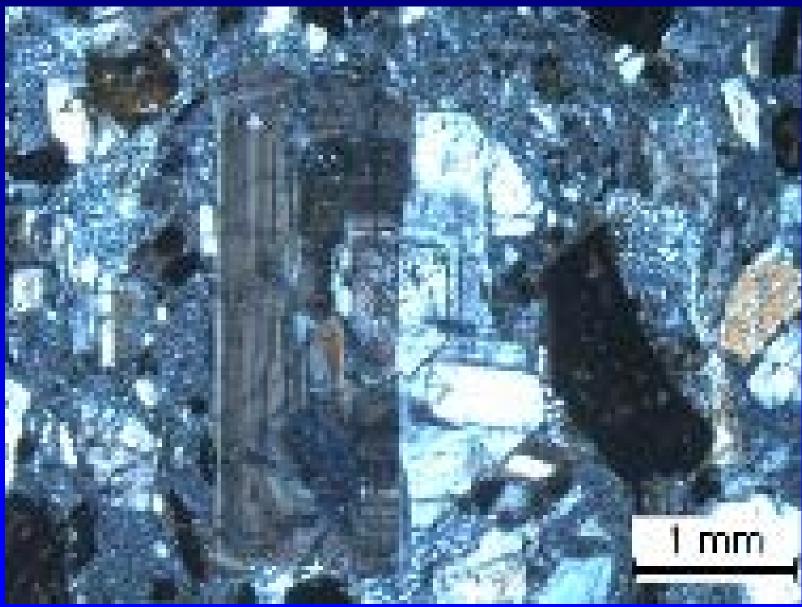


HBPD002 Gabbro. New Discovery Mid Carboniferous Mafic & Intermediate intrusives and extrusives 347 Ma





Dugong photomicrograph andesite porphyritic fragmental volcanic. New discovery. Mid Carboniferous intermediate volcanics 354 Ma



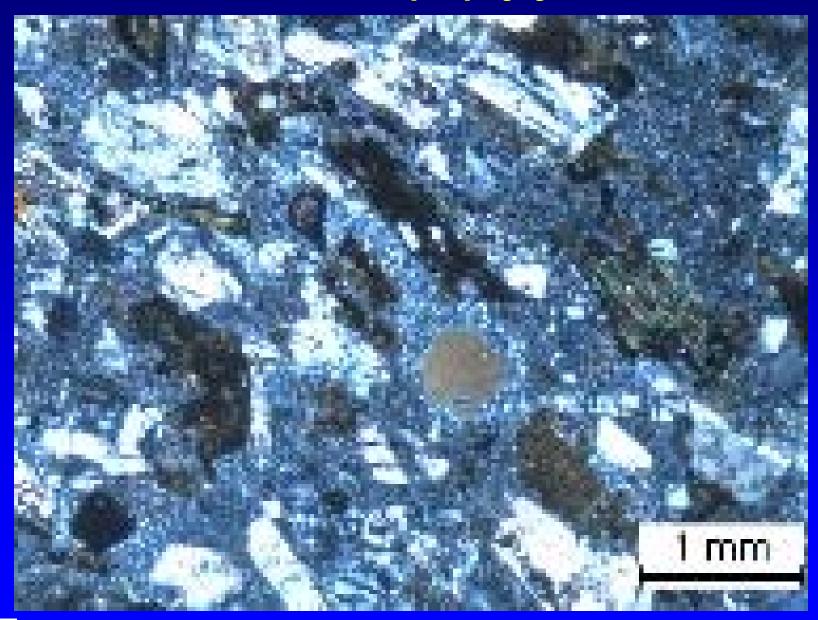


Dugong DGPD002 magnetite and secondary biotite altered andesitic volcanics. Mid Carboniferous intermediate volcanics 354 Ma





Dugong photomicrograph chlorite magnetite altered andesite porphyry





OCBD004 262m Porphyrytic biotite monzogranite 352 Ma Coralie





Old Coralie OCBD004 256m Sericite alteration . Mid Carboniferous 352 Ma Host







Figure 52b. Strongly green Sericite Altered Granite basement



Old Coralie OCBD004 259m K feldspar veinlets sericite alteration 352 Ma host





igure 53a. K-Feldspar veinlets cutting sericite Iltered granite basement

Figure 53b K-Feldspar Veinlet and sericite altered granite basement



Conclusions

- We are learning a lot more about what lies within and under the Carpentaria Basin
- Resources and mineralization are being discovered.
- The extent of the water resource could be under-estimated because discoveries of unknown water repositories are still to be made.
- This high risk exploration is deserving of more support from Government than it is currently getting.
- Deep under cover exploration involves extensive use of innovative technology and high powered science.
- The goal of the Carpentaria Basin exploration programs is to create wealth ,where there is currently none.
- In this regard, mineral exploration is part of the creative economy and we should resist any attempt to portray it as a dinosaur industry.



Prospects are good for Cairns

JACK LAWRIE

A WATER basin 50-100km west of Croydon could potentially yield long-term economic benefits for the region, with promising signs of gold, oil shale and the transition metal variadium used in making batteries.

Dr Simon Beams; principal geologist of Terra Search, presented some of the findings at the Australasian Institute of Mining and Metallurgy Far North branch annual mining roundup in Cairns yesterday.

"There's a lot of search activity out in that area, which hasn't received a lot of exposure while the government is focusing on Mt Isa," he said.

"It's early days, but an indication there's a lot of activity in that part of the world

Post Conference Discussion

CAIRNSPOST.COM.AU FRIDAY MAY 31 2019

"If we get mining developments in that area, Cairns will be an obvious beneficiary in jobs."

