# Under Cover Exploration Carpentaria Basin Between Georgetown & Mt Isa Blocks. North West Queensland

New Discovery Program Qld DNRME

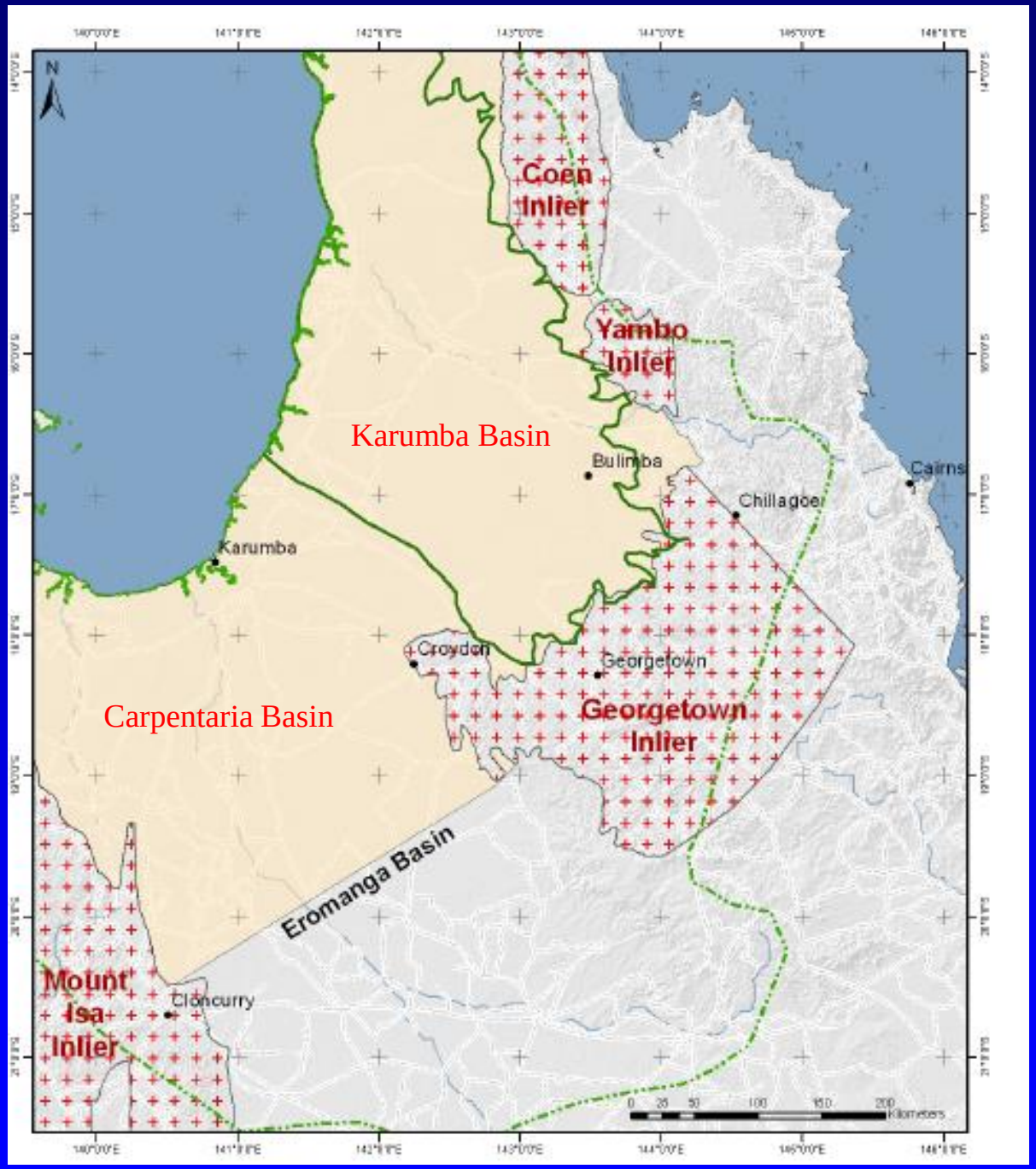
Mt Isa 18/9/2019

Presenter : Dr Simon Beams.

Principal Geologist

**Terra Search Pty Ltd**

**Specialists in Mineral Exploration; Geology & Computing**




Greenfields exploration within and under Carpentaria Basin cover

.

Advancing the understanding of previously unknown geology .

Locality Map
Carpentaria Basin

Date: 21st May 2013

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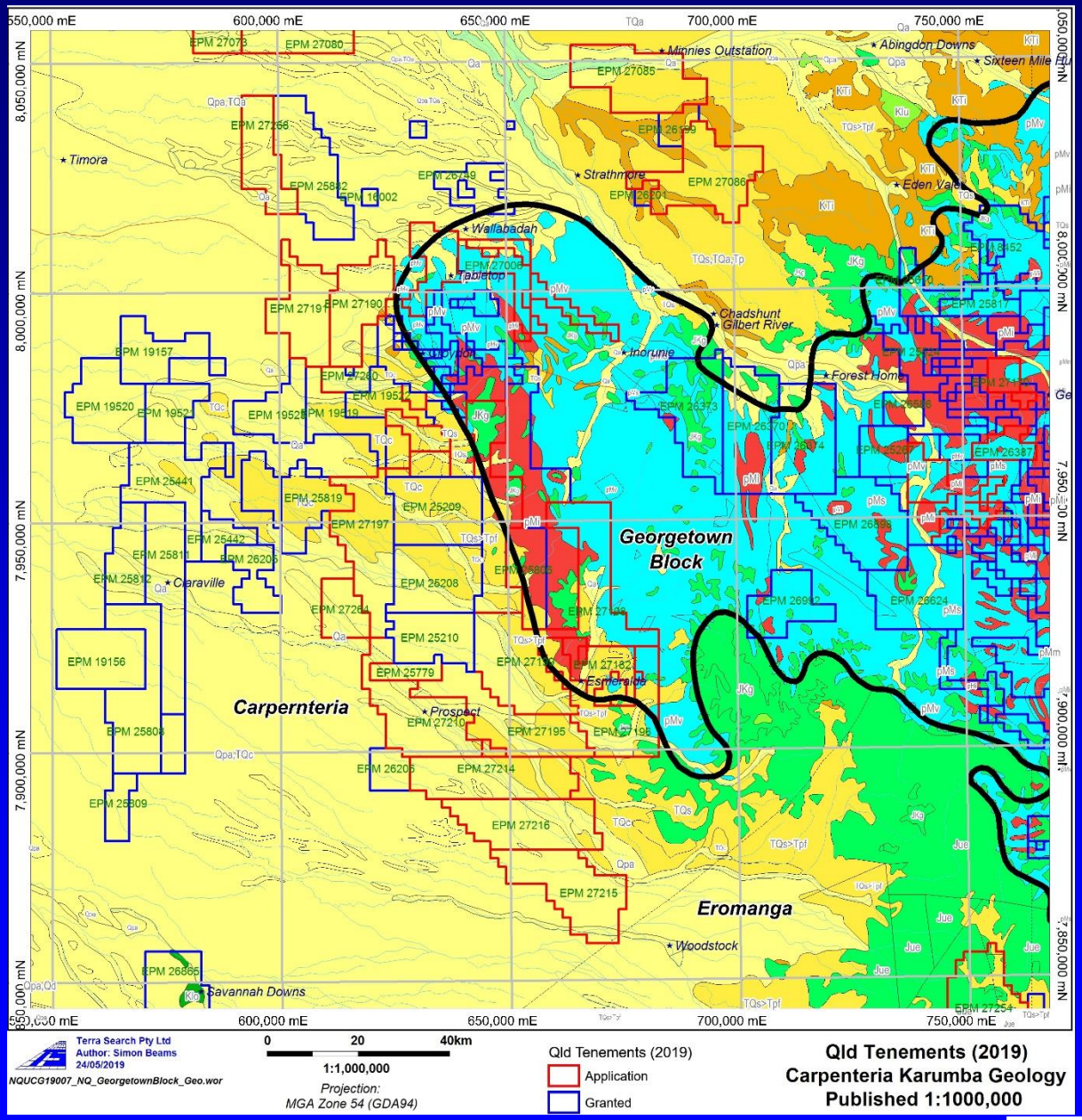
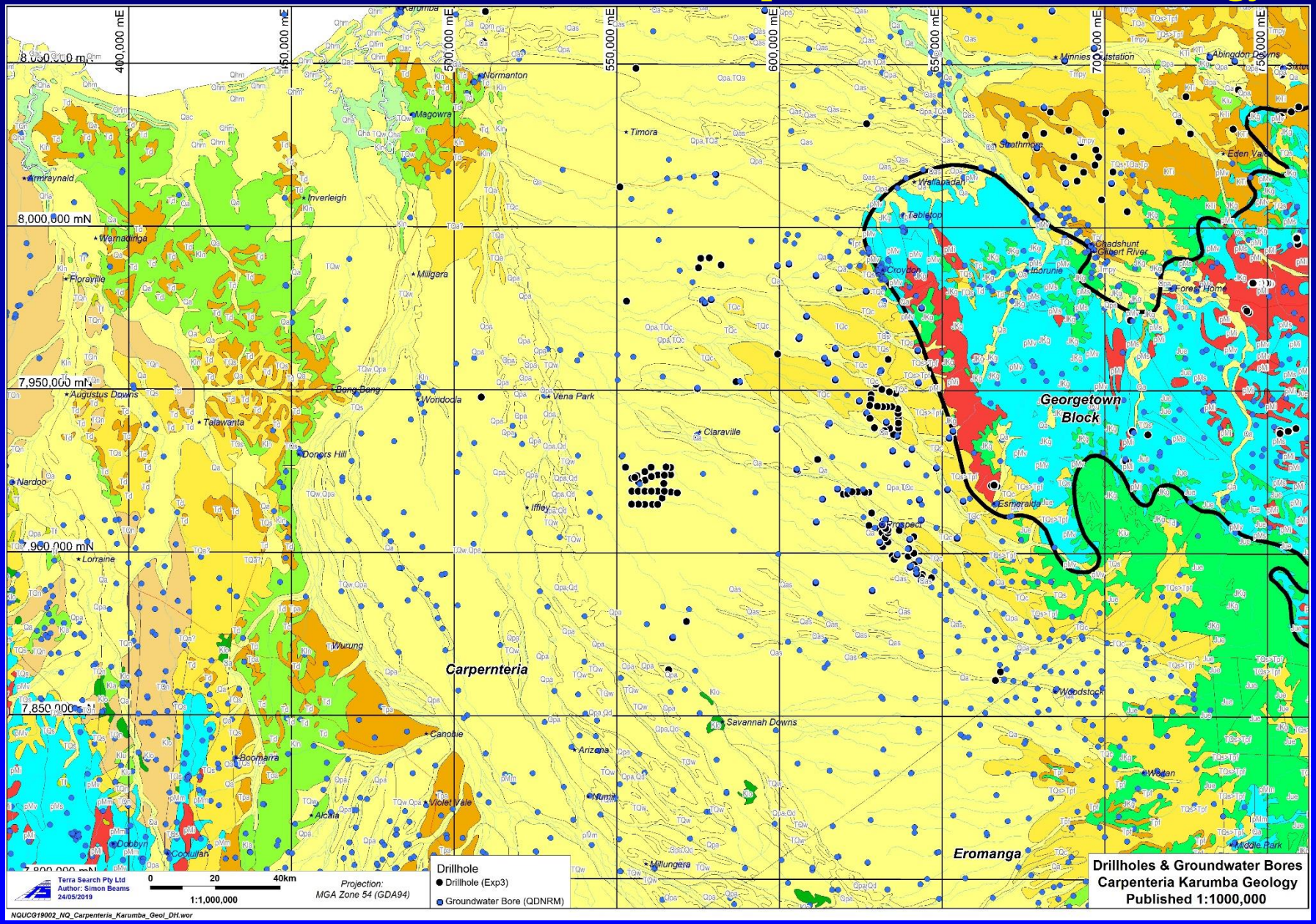
# Current Qld Tenements - Carpenteria Karumba Geology

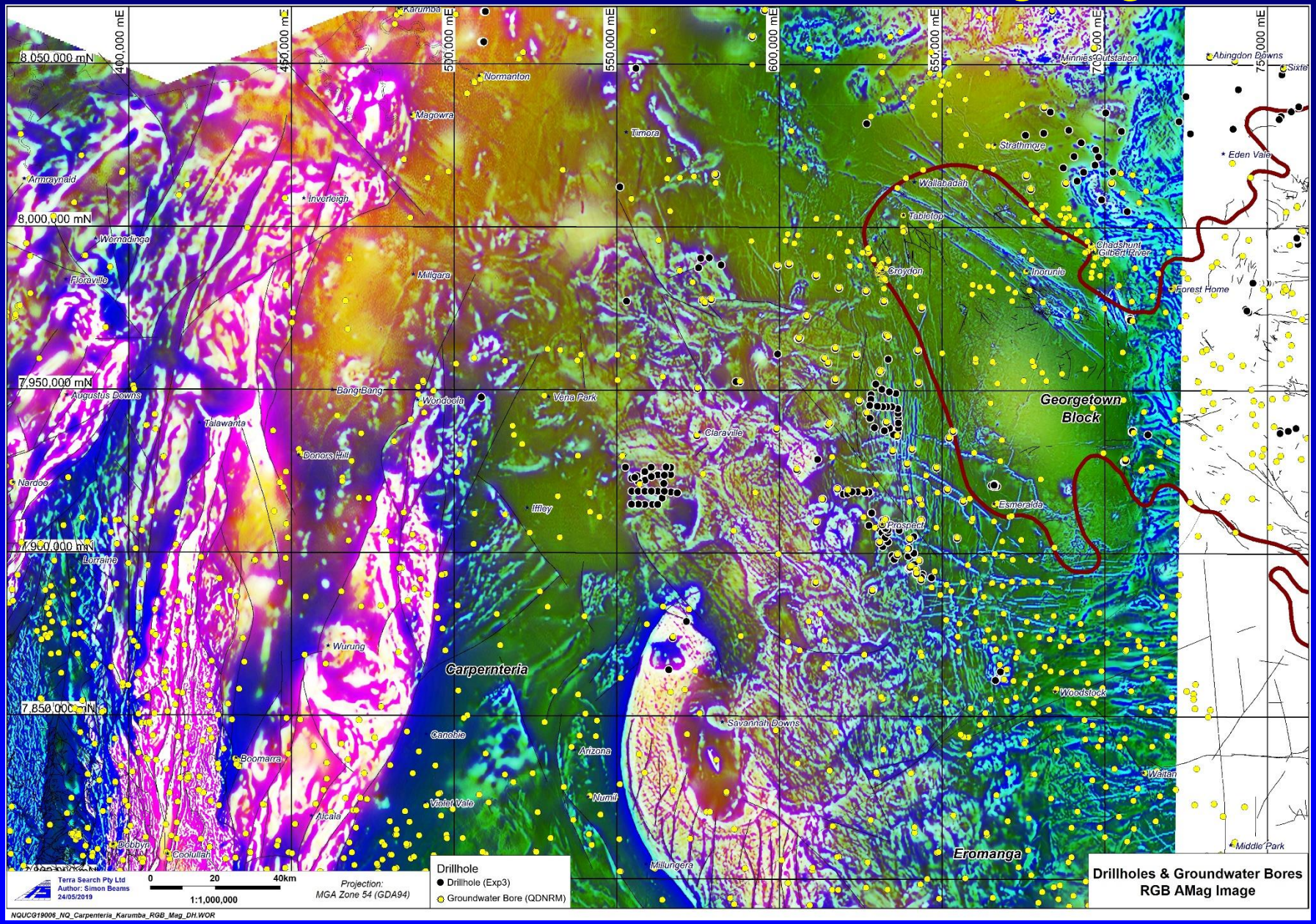
Analagous to the high risk –high reward exploration that was carried out under cover around the Mt Isa block in the 1980's that led to a spate of major discoveries. Carpentarian Basin exploration is largely unheralded and should be recognized and supported particularly by Government.



# 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)

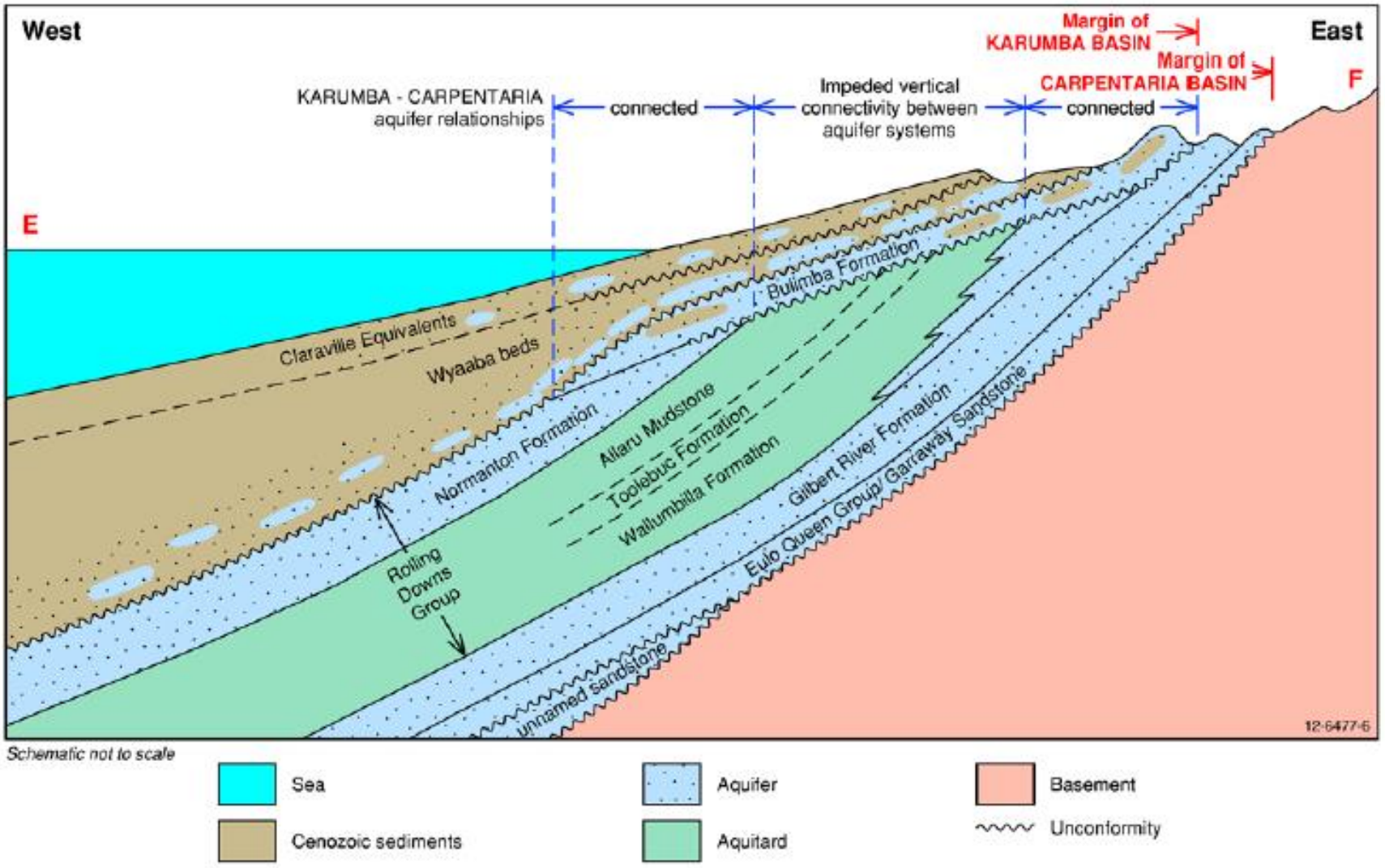
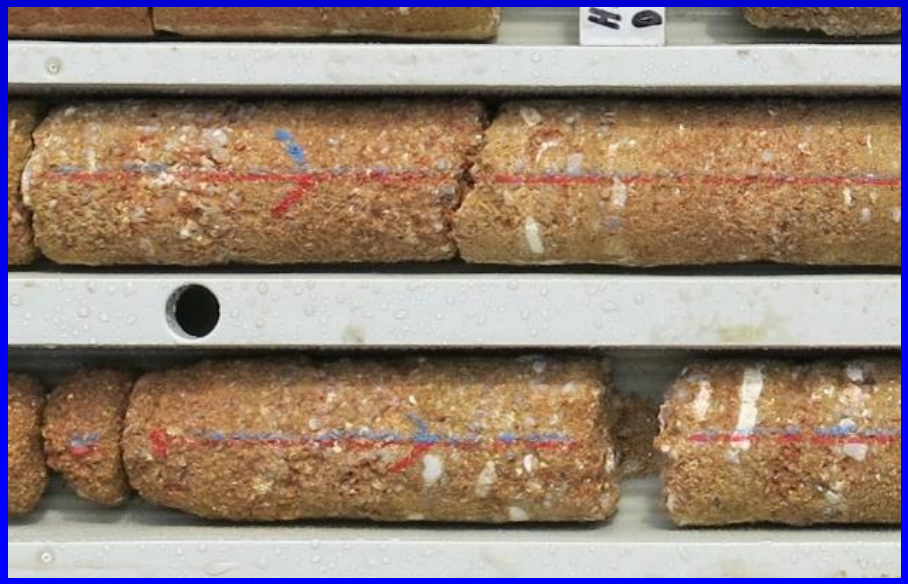



Figure 5.10 Schematic cross-section highlighting the connectivity between aquifers of the Carpentaria and Karumba basins

Note: see Figure 2.6 for approximate location

# Bulimba Fm clayey sand and grits (Palaeogene)

Carpentaria Basin

Date: 21st May 2013

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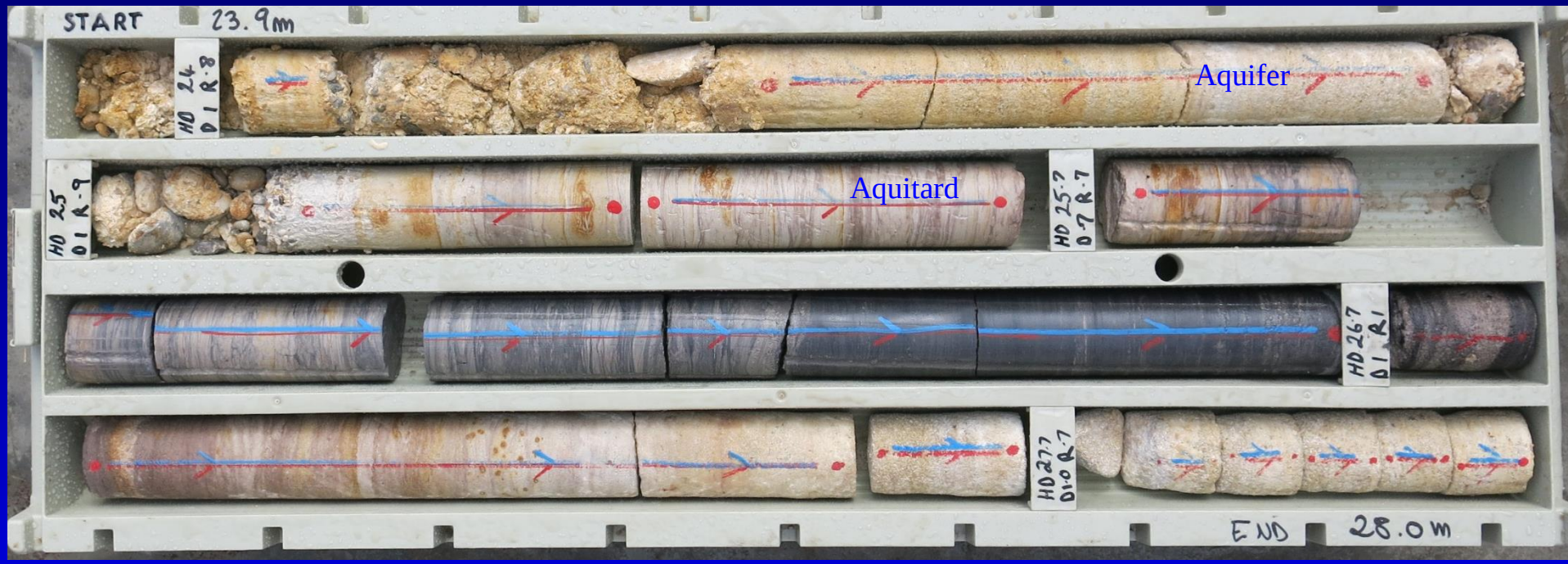
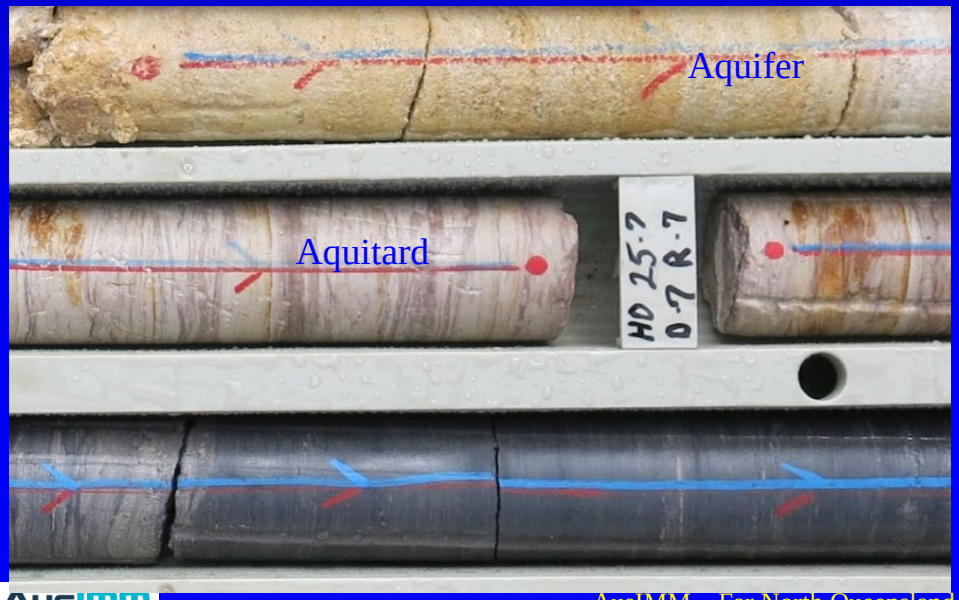
# Base of Bulimba Fm Overlying silcreted Cretaceous Wallumbilla Fm




Bulimba sandstone aquifer overlying Wallumbilla aquitard

Carpentaria Basin

Date: 21st May 2013

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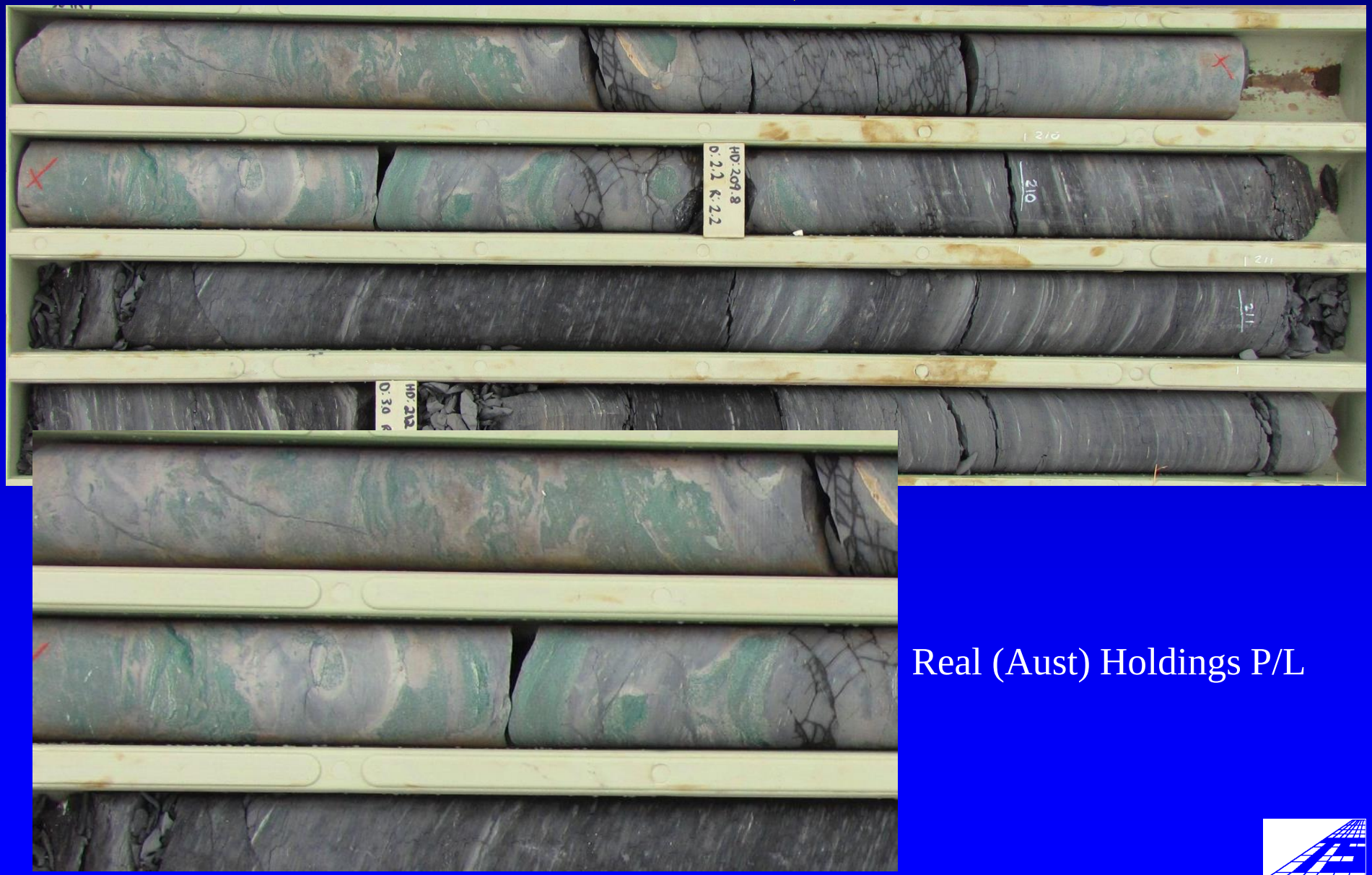
# Cretaceous Wallumbilla Fm


Marine mudstone – aquitard

Real (Aust) Holdings P/L

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




Real (Aust) Holdings P/L

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

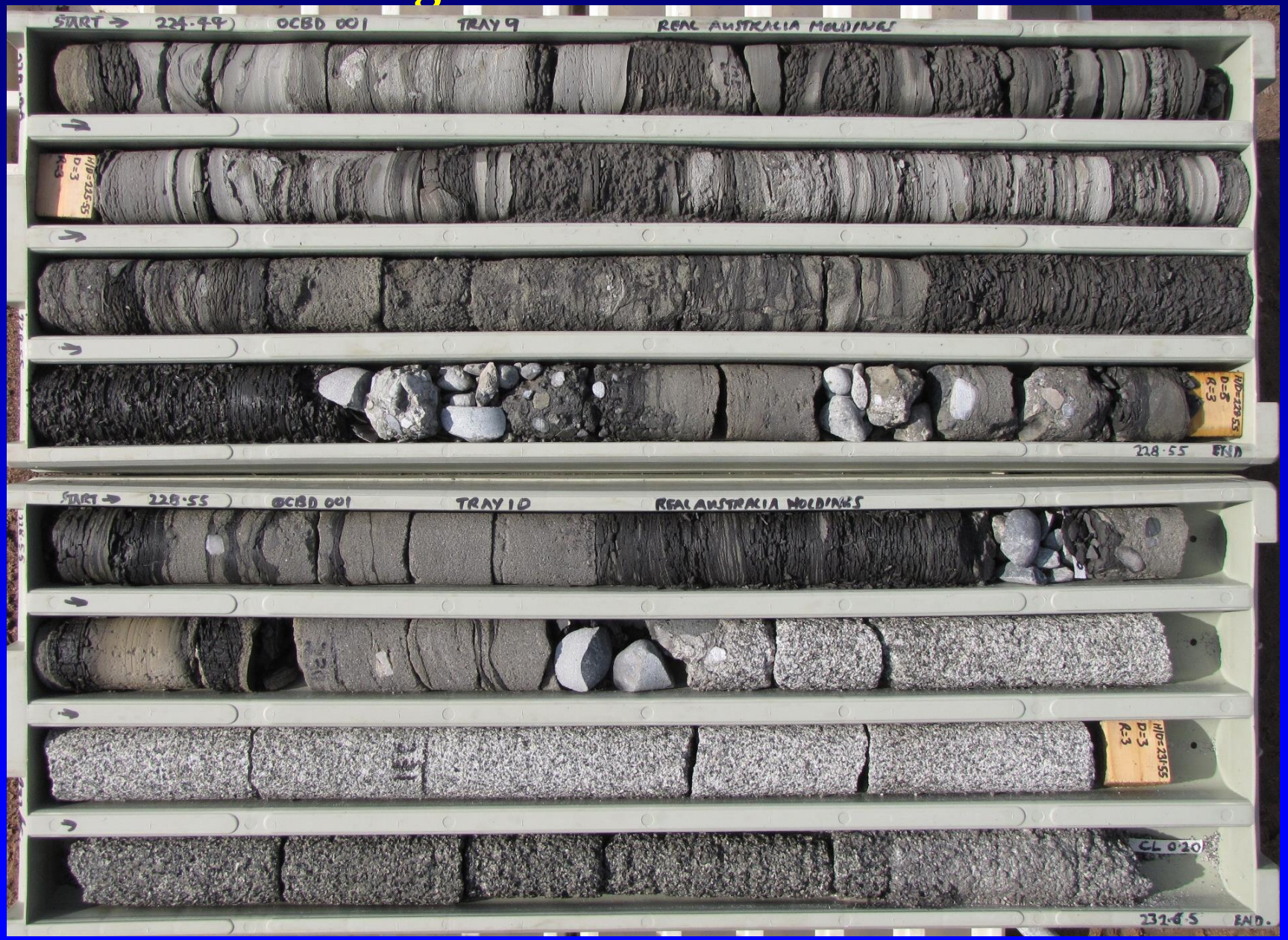

Real (Aust) Holdings P/L

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


**. Porous basement.**

Real (Aust) Holdings P/L

# 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. Permo-Triassic Glaciation? 290-250Ma

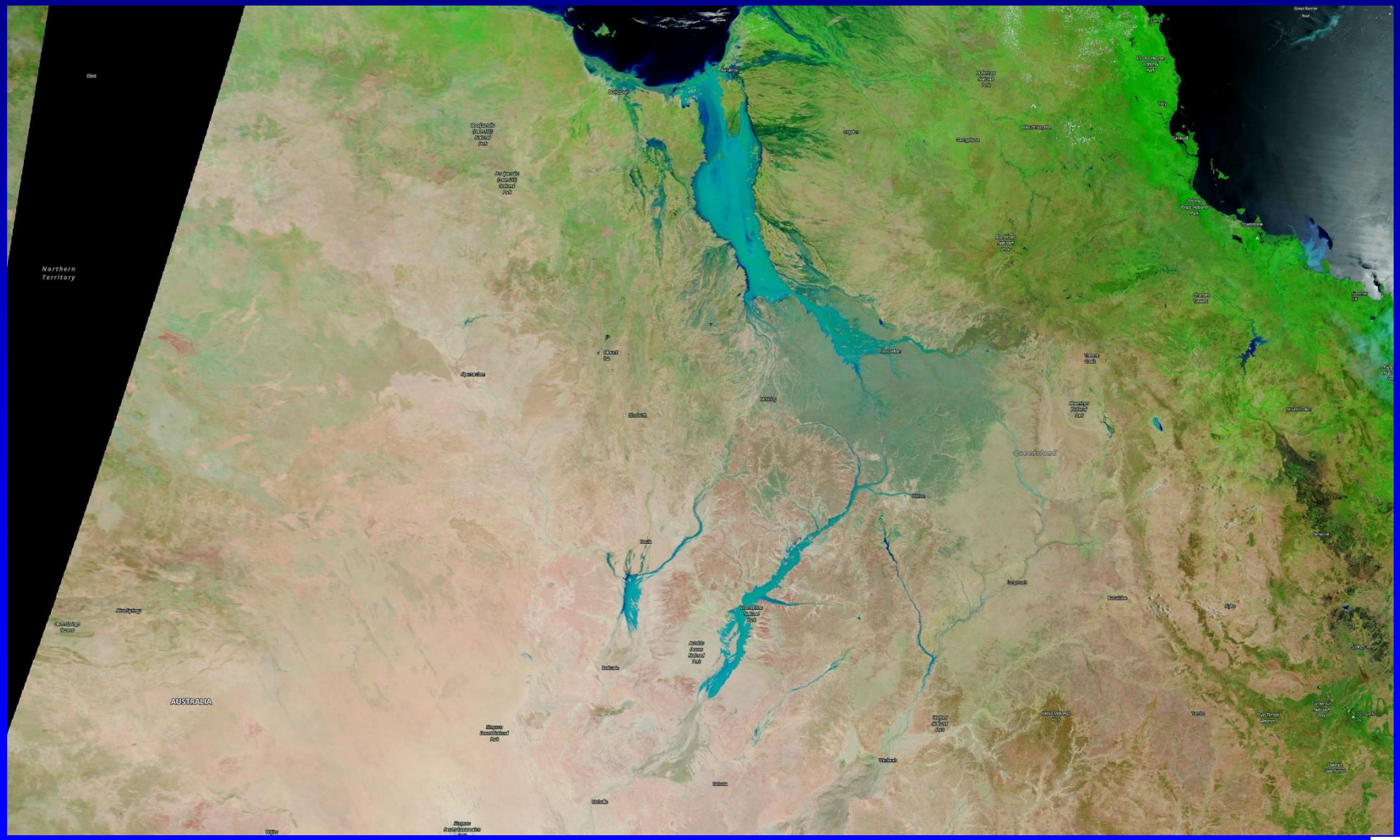
Real (Aust) Holdings P/L

**Hit 2m thick artesian aquifer Gilbert River Formation at base of Mesozoic 240m**

Real (Aust) Holdings P/L


Water is our most important resource but current ignorance needs to be overcome with scientific understanding.
Tropical North Queensland regularly gets torrential rain
Townsville, 10/2/2019

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.



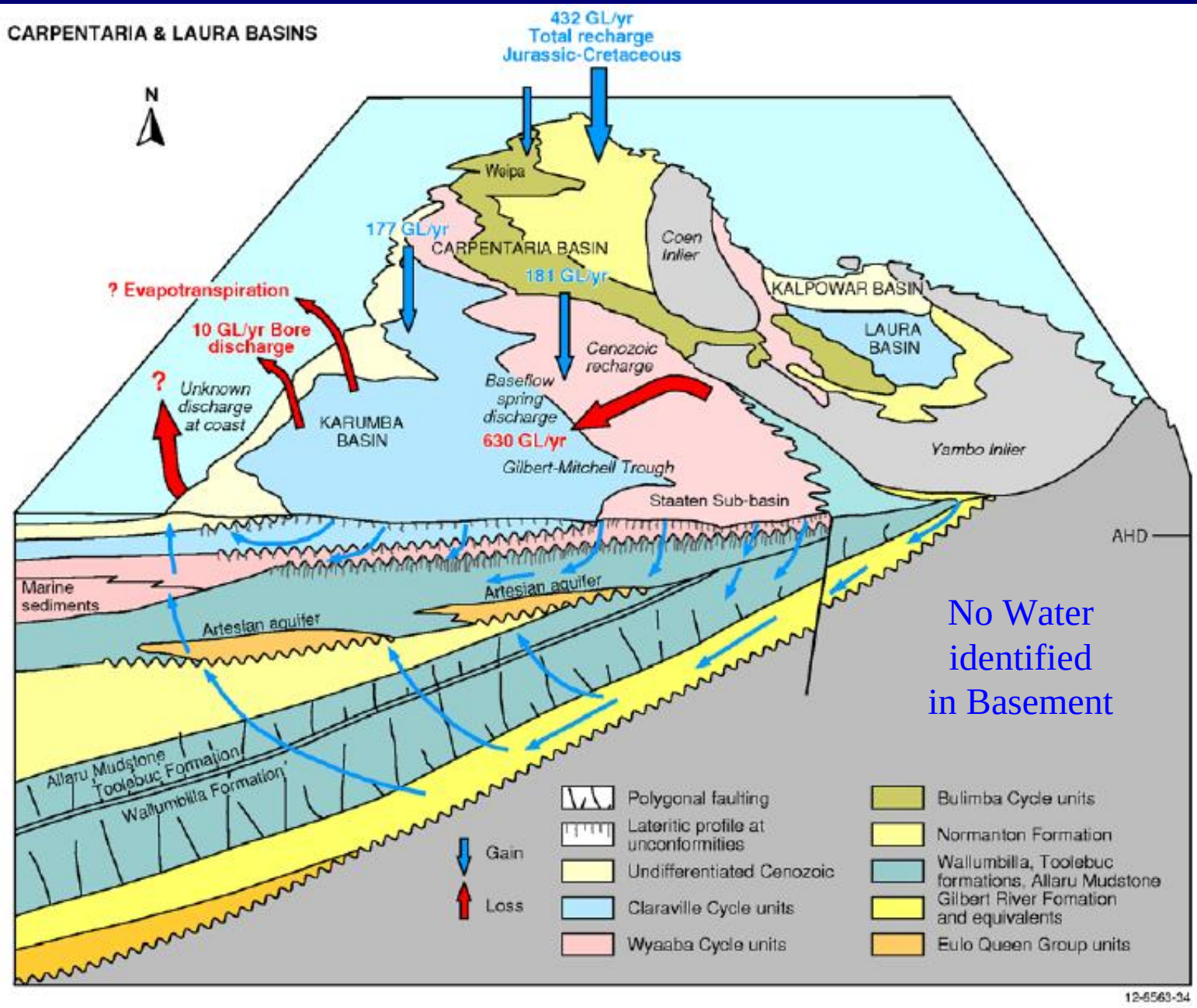



Figure 9.5 Hydrogeological framework and groundwater balance for the Carpentaria Basin

CSIRO Report 2012

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

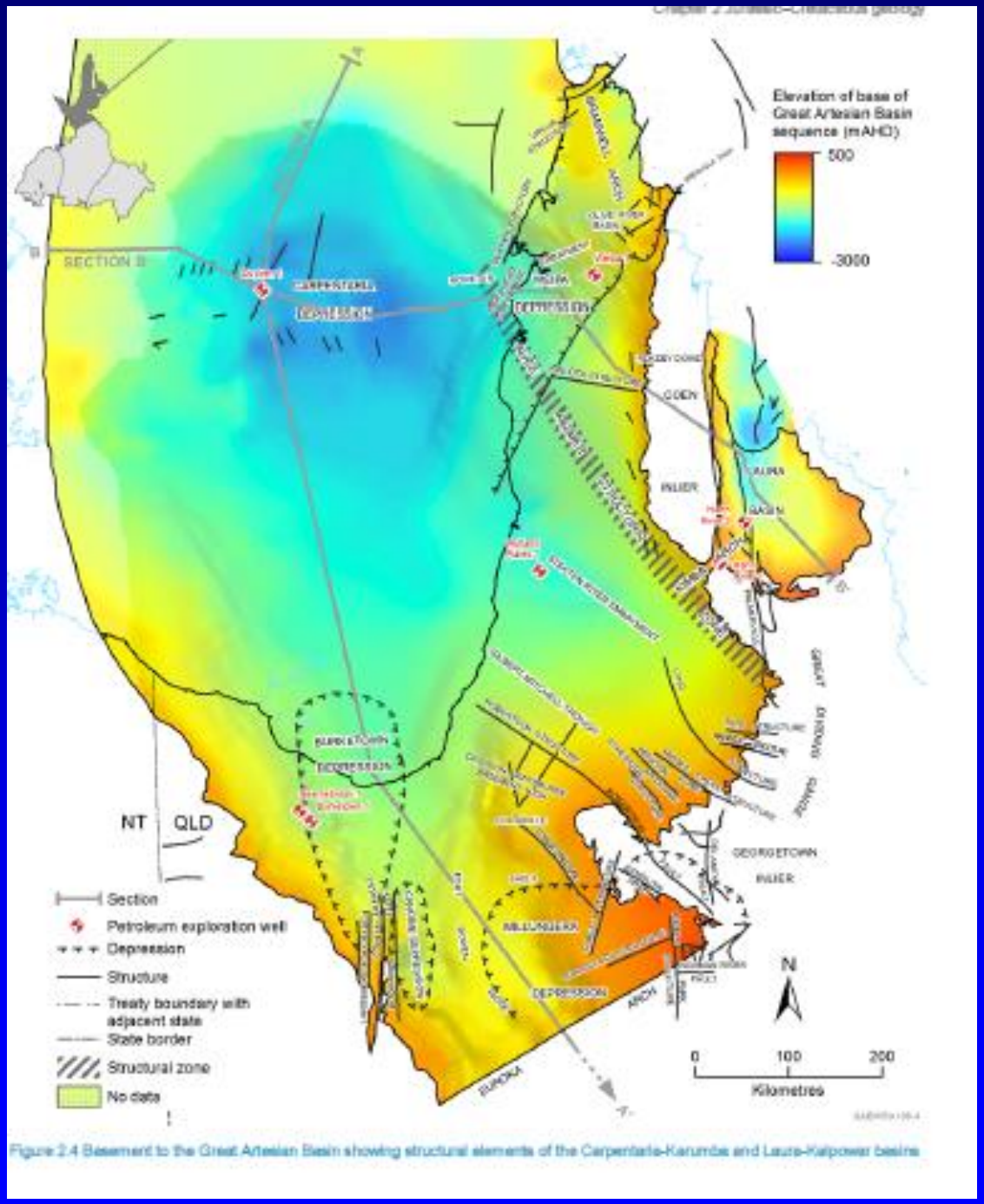


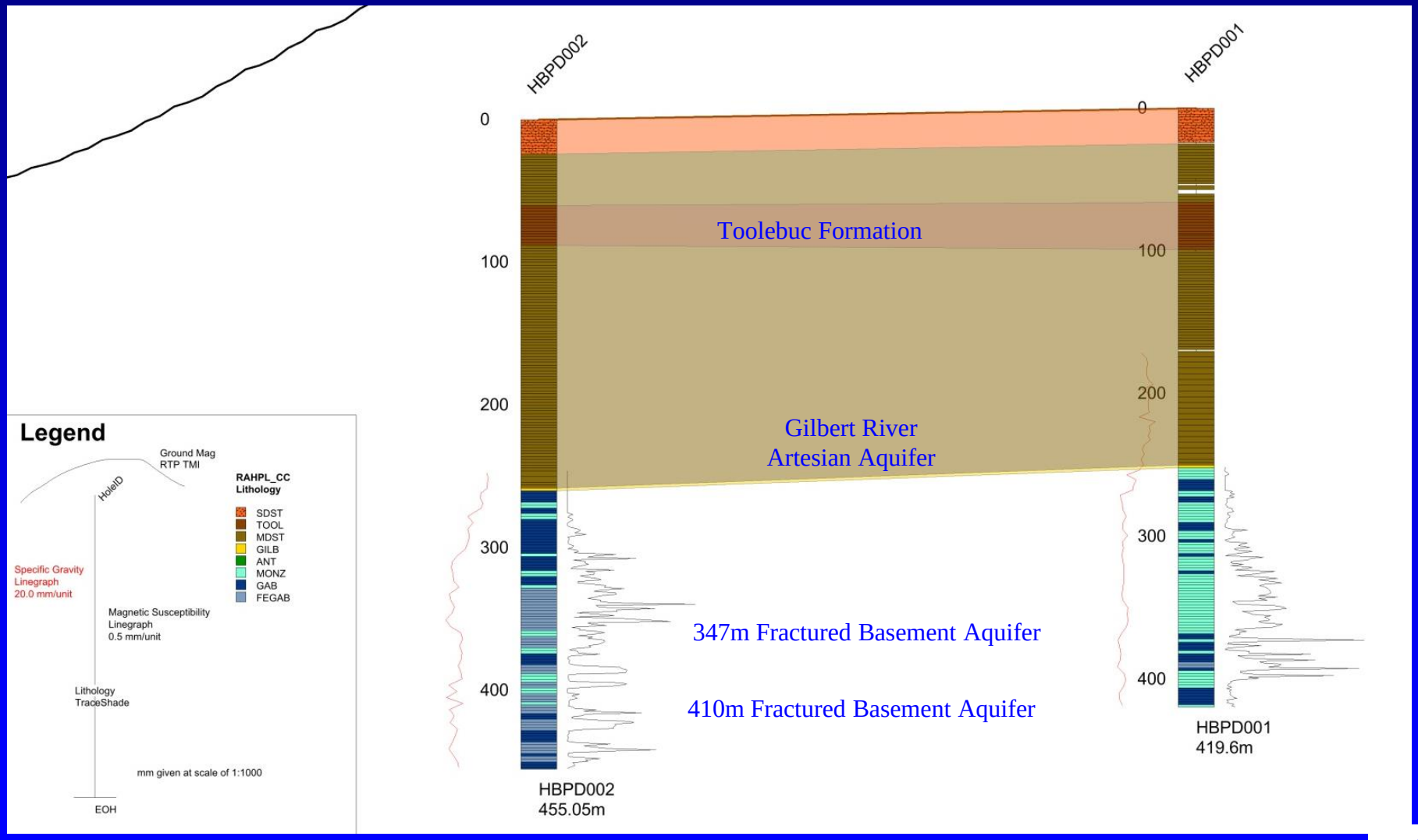

Figure 2.4 Basement to the Great Artesian Basin showing structural elements of the Carpentaria-Karumba and Laura-Kalpowar basins

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)

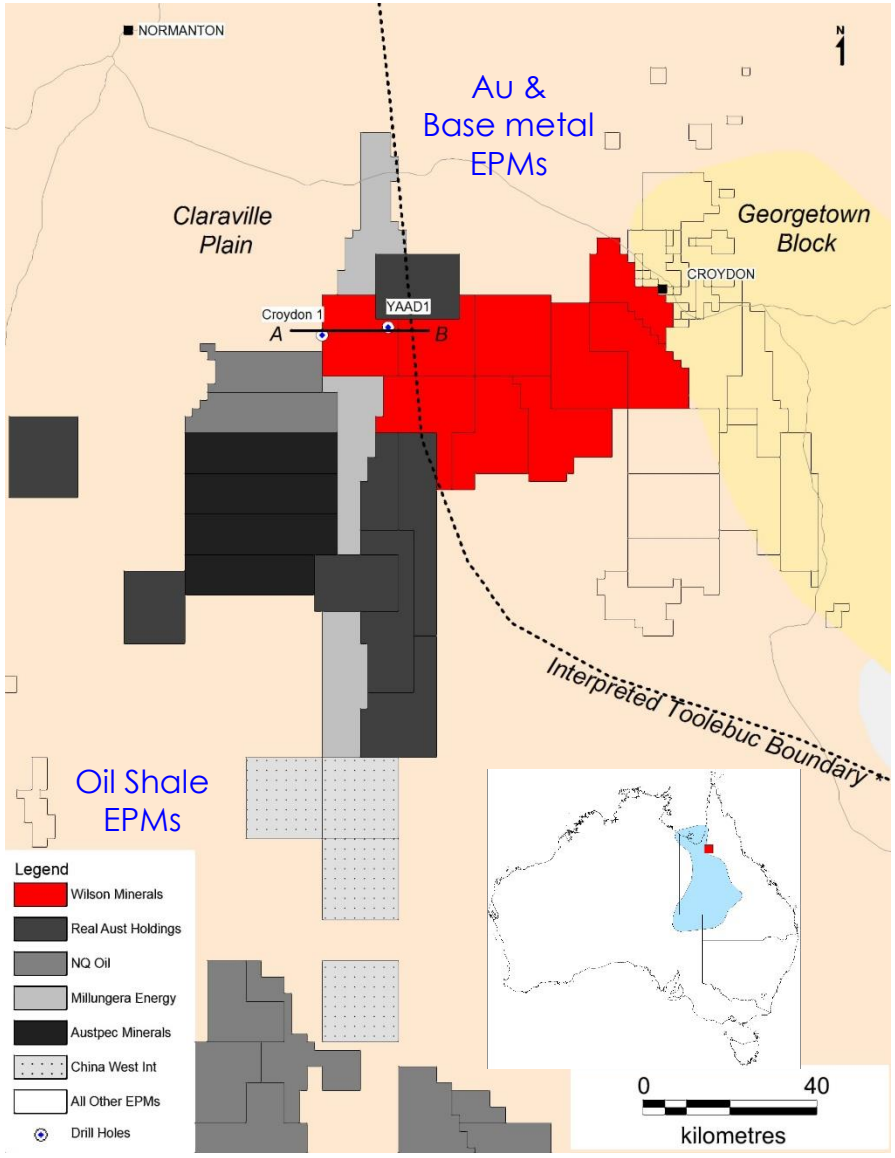
# Deep Basement Aquifer , Humpback Cudgee Ck


**HBPD002, 410m iron stained fracture coatings**

Real (Aust)

# 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 368km$^2$ 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 !!

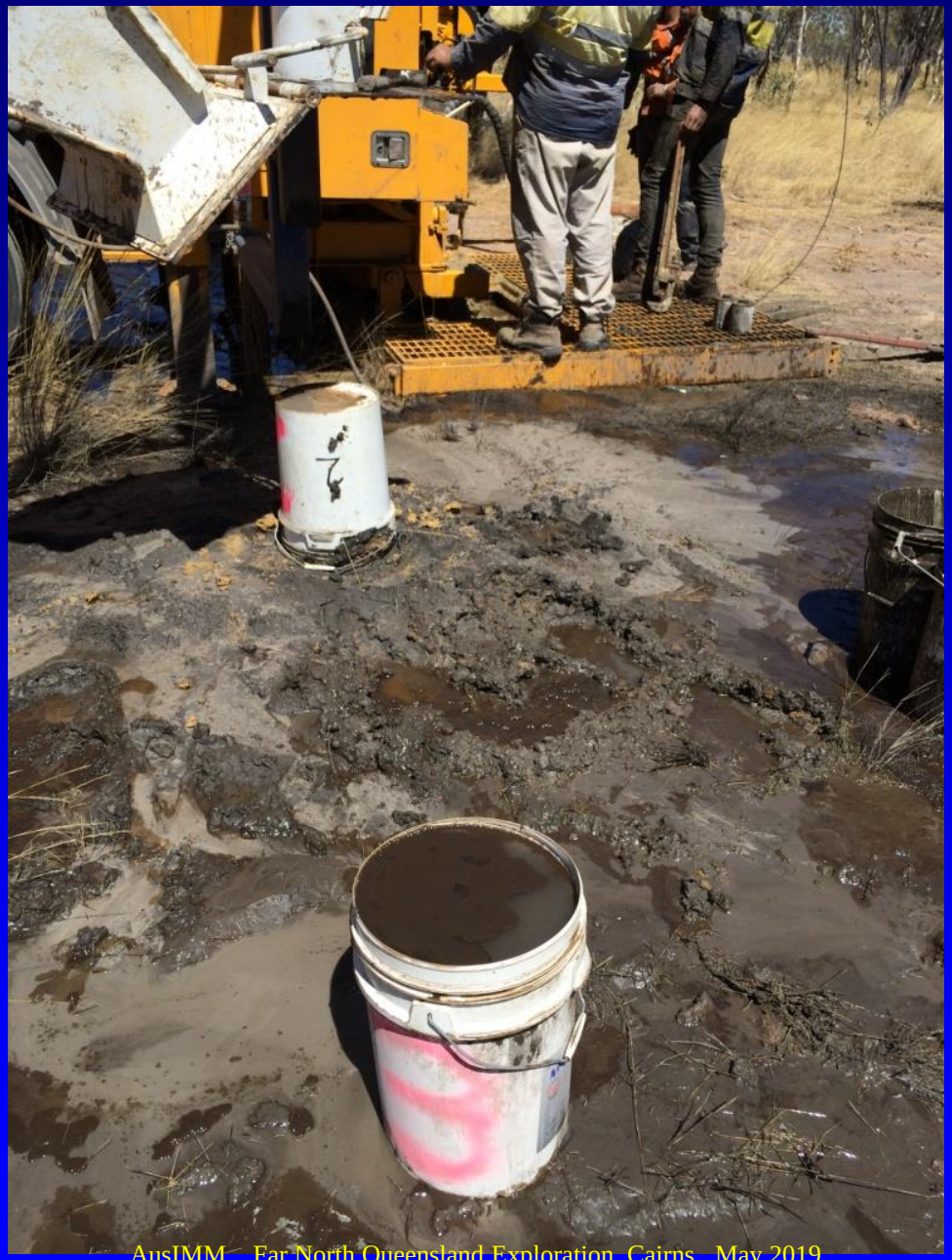
Real (Aust)
Cudgee Ck

# Struck Oil Shale !!

Real (Aust)
Cudgee Ck

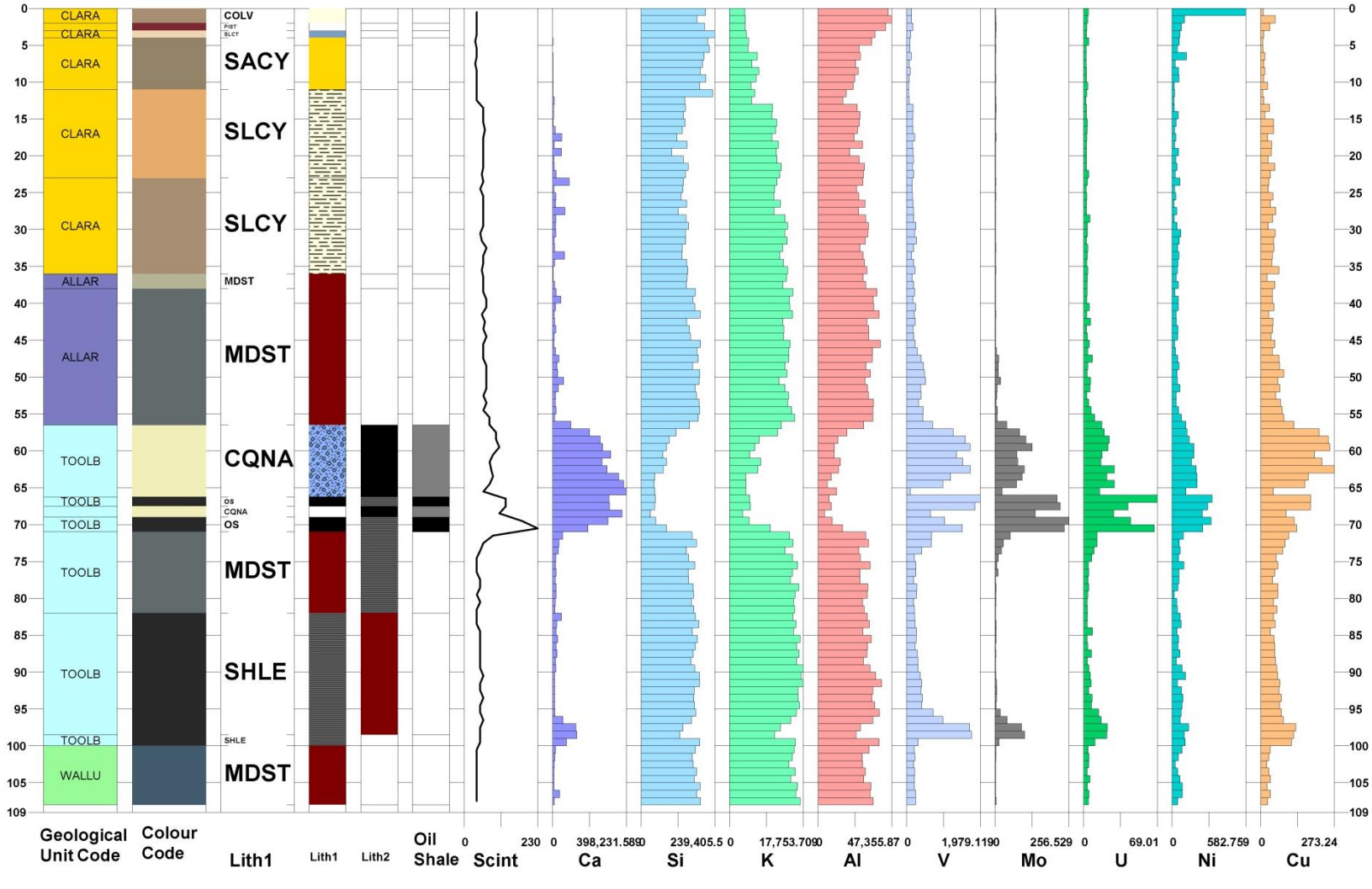
# Oil Residue

Real (Aust)
Cudgee Ck



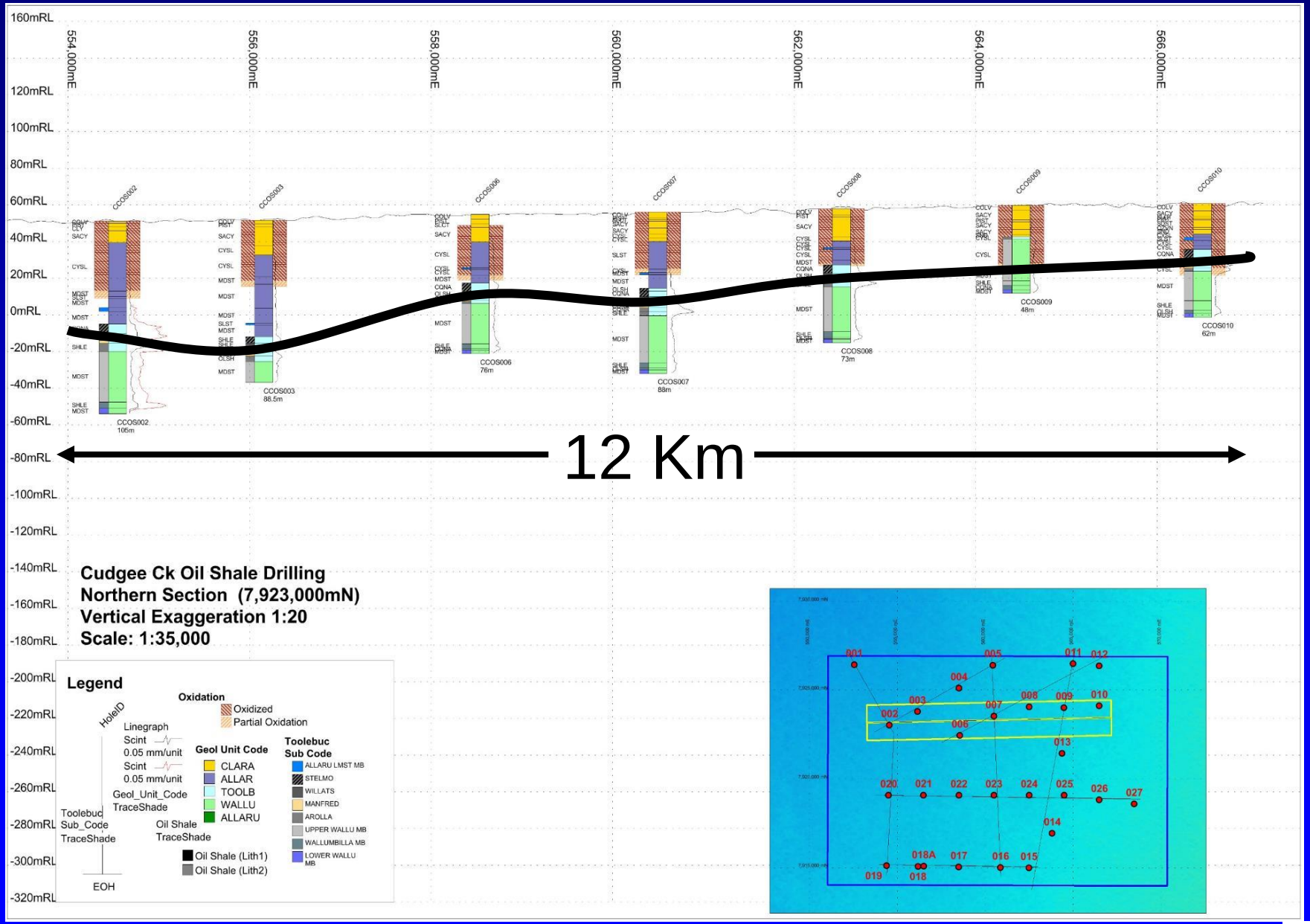
# Graphic Log Cudgee Ck Oil Shale hole Real (Aust)

## High V,Mo,U,Ni,Cu




Ca V Mo U Cu

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



Terra Search Pty Ltd
Specialists in Mineral Exploration, Geology and Computing

KLONDIKE
EXPLORATION SERVICES

Queensland Government

# Exploration of the Outcropping Basement

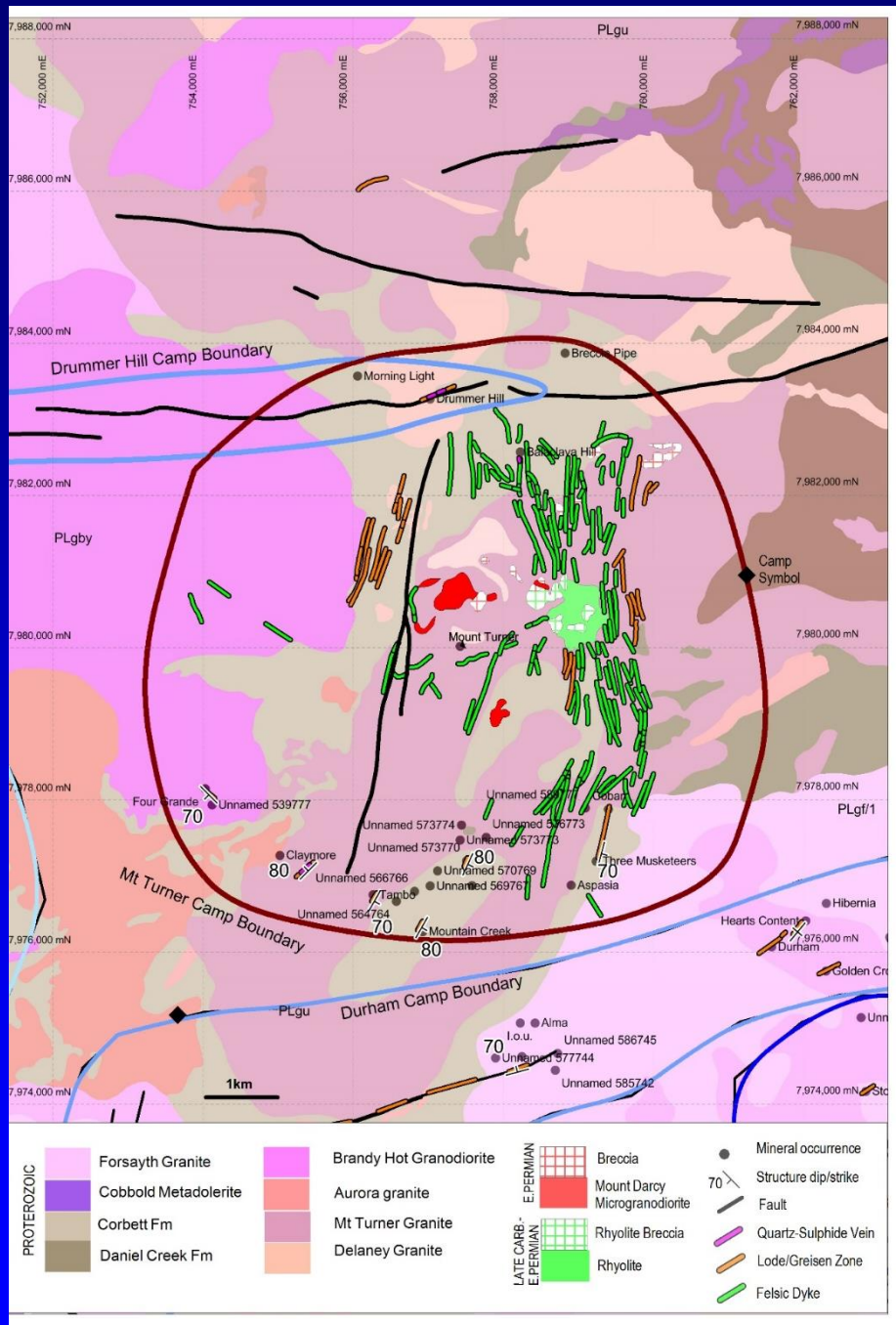
## METALLOGENIC STUDY OF THE GEORGETOWN, FORSAYTH AND GILBERTON REGIONS NORTH QUEENSLAND.

## GSQ Release August,2019


Dr Gregg Morrison - Klondike
Harry Mustard - Terra Search Consultant
Ashley Cody - Terra Search
Dr Vladimir Lisitsin – Qld DNRME
Jose Veracruz - Activex
Dr Simon Beams - Terra Search

# Georgetown Metallogenic Study

Exhaustive review of published company reports and communications, field inspection of 160 historical mines and mineral occurrences, collection of numerous observations and samples for radiometric dating, rock identification and studies of hydrothermal alteration, quartz textures and multi-element geochemistry.

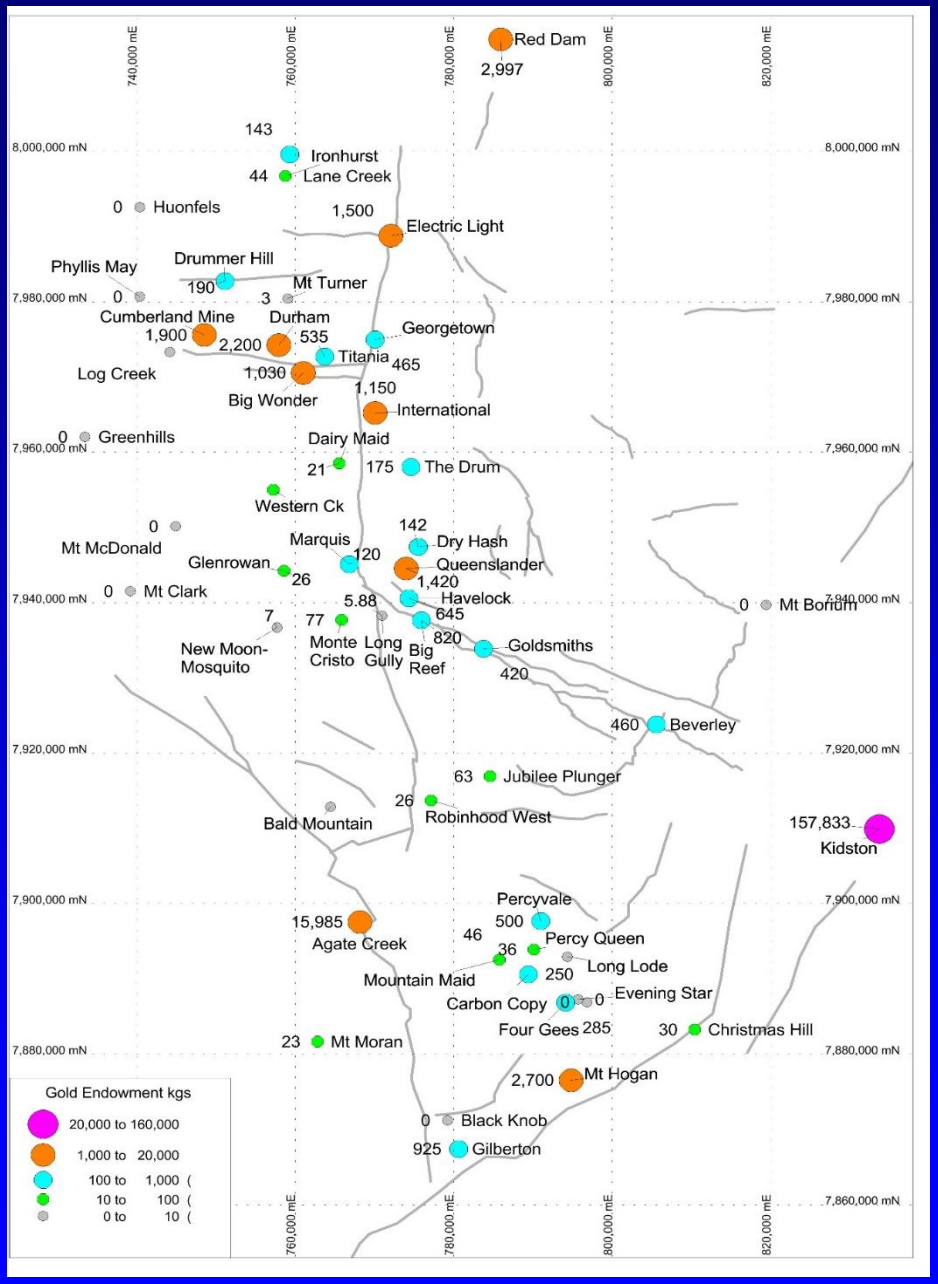



Example of GIS data available for the Georgetown Metallogenic Study area i.e. geology, structure, dyke – lode – vein orientations, mineral occurrence locations, etc.

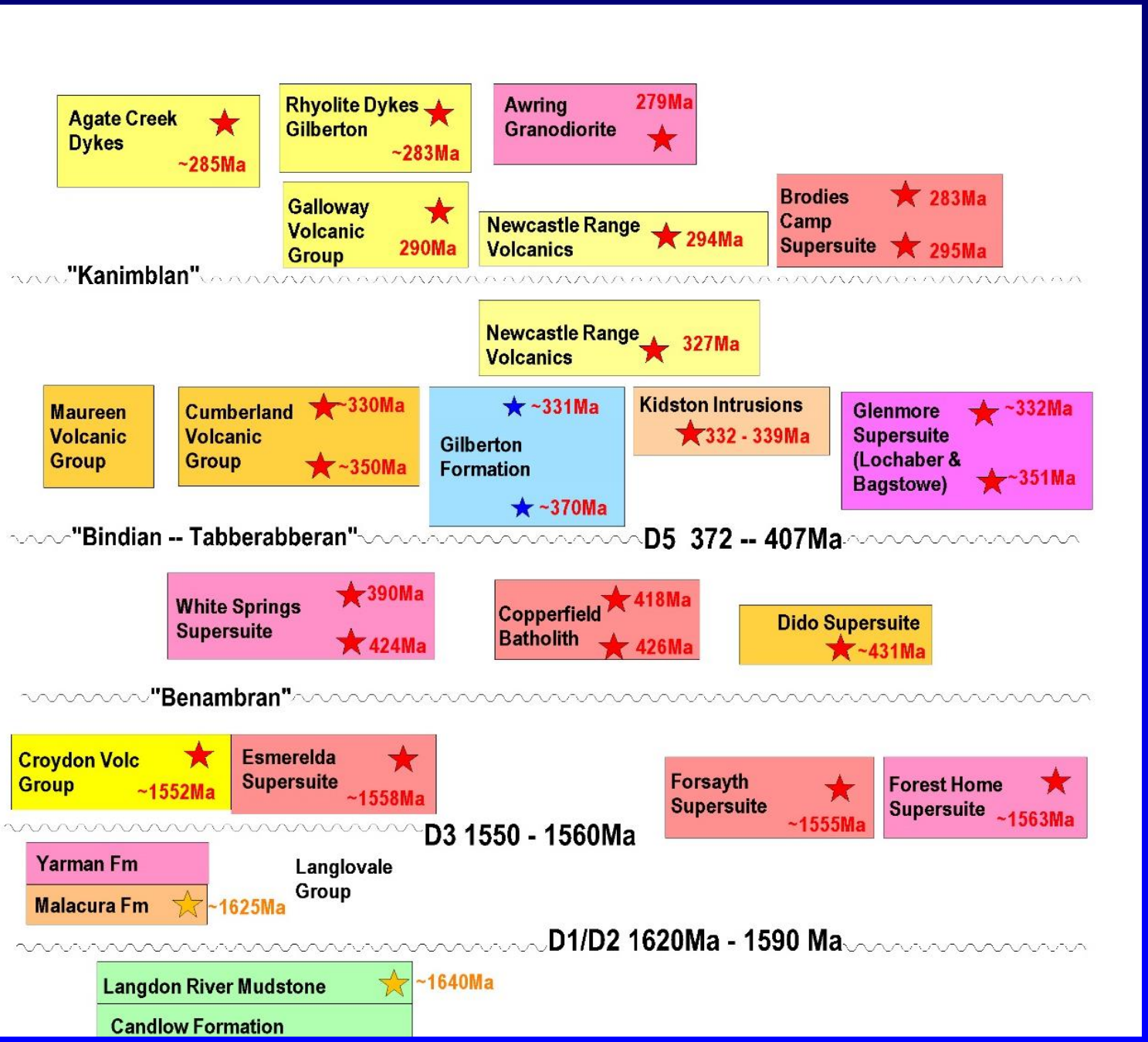
# Mount Turner Camp

# Example Mineralization description


Polymictic breccia composed mostly of rhyolite angular clasts cemented by cryptocrystalline quartz. Cut by later fine veinlets of clear quartz. Hydrothermal breccia from Sherwood, Agate Creek, Forsayth (Sample #231516; +100 g/t Au, 42 g/t Ag).

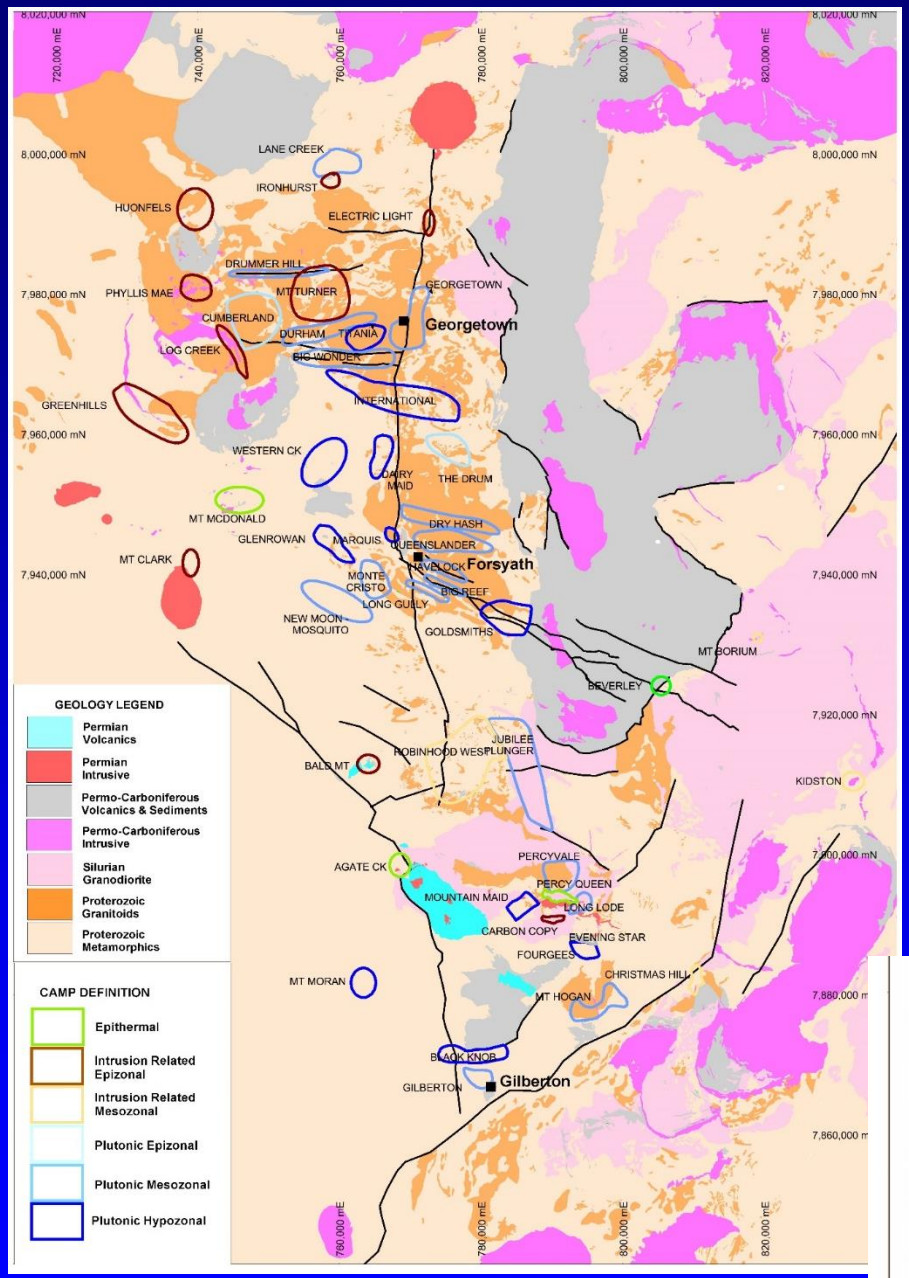


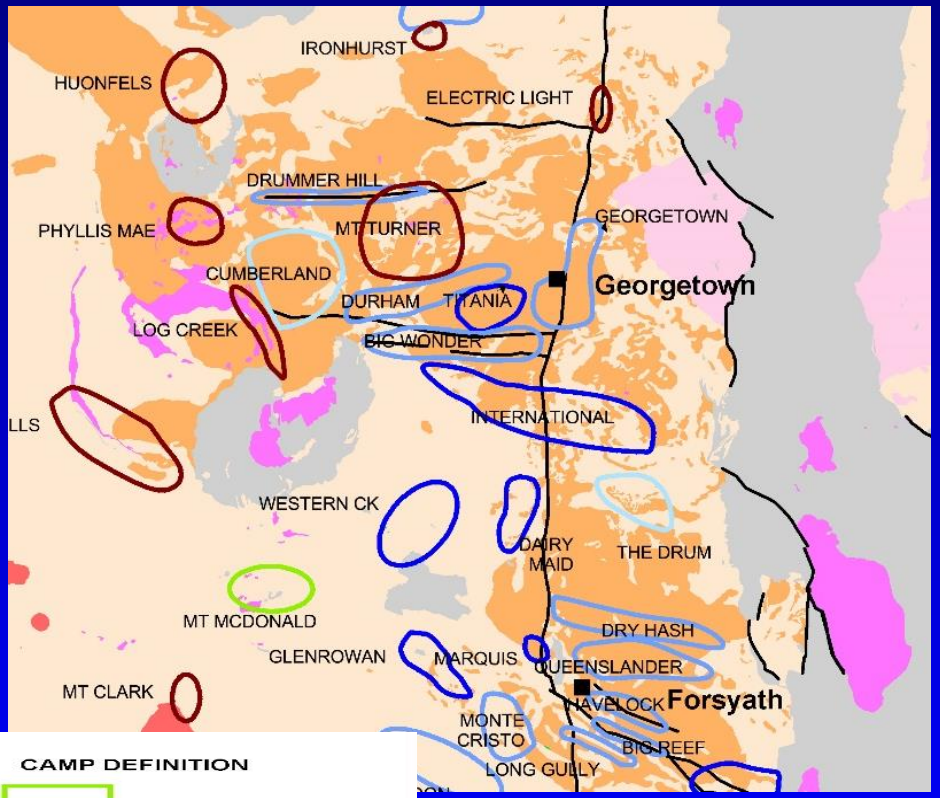

# Map of Georgetown, Forsayth and Gilberton region showing location of historical gold mines and gold endowments.

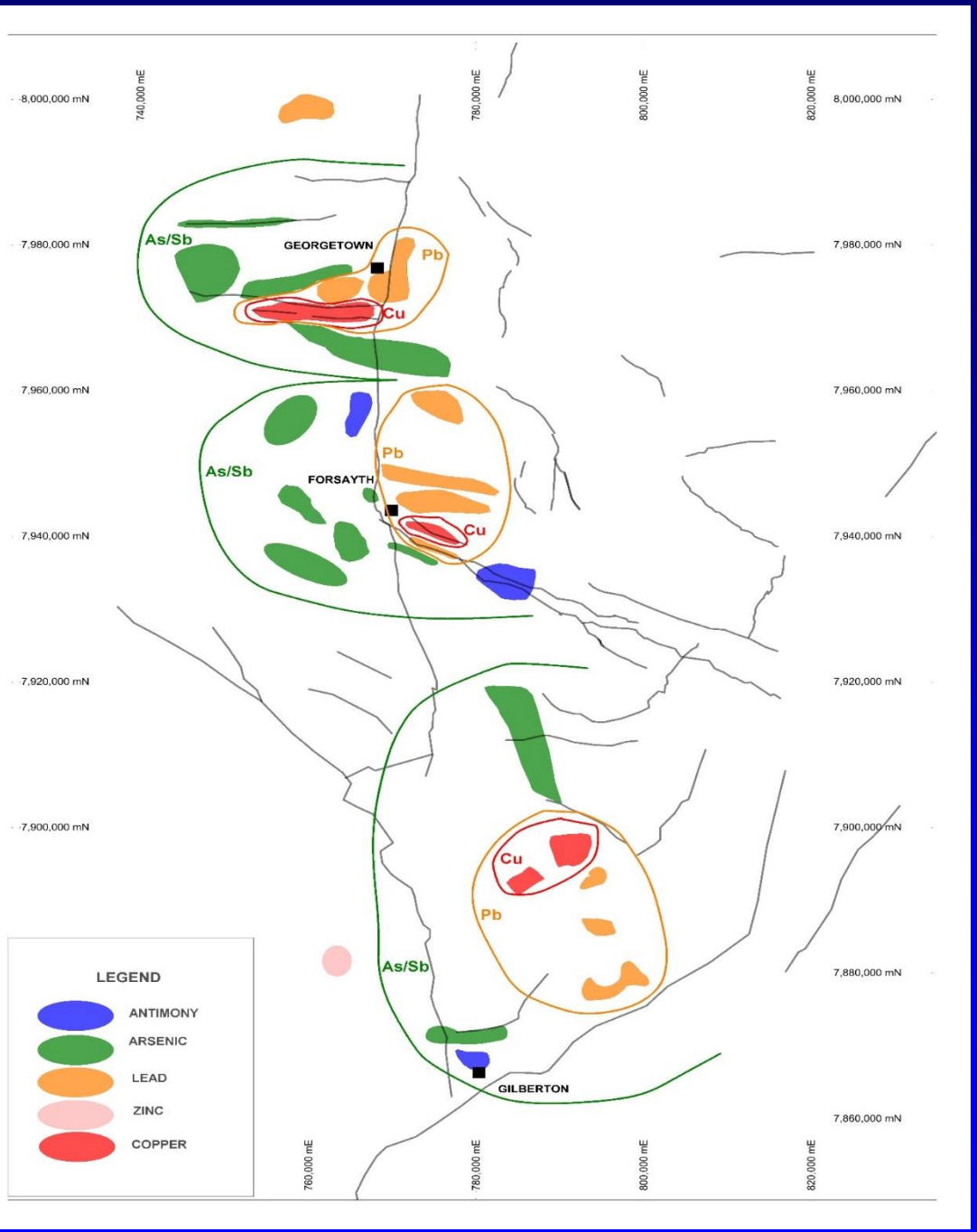



# Georgetown Region Stratigraphic Column, modified from Jell, 2013

# Metallogenic camps plotted on the broad scale geology and structure






Map showing Georgetown metallogenic camps coloured by most enriched base metal including arsenic and antimony. Note copper rich cores enveloped by lead and a peripheral arsenic and antimony zone. Gold occurs throughout all camps but is more often found associated with lead

# Exploration of the Under Cover Basement

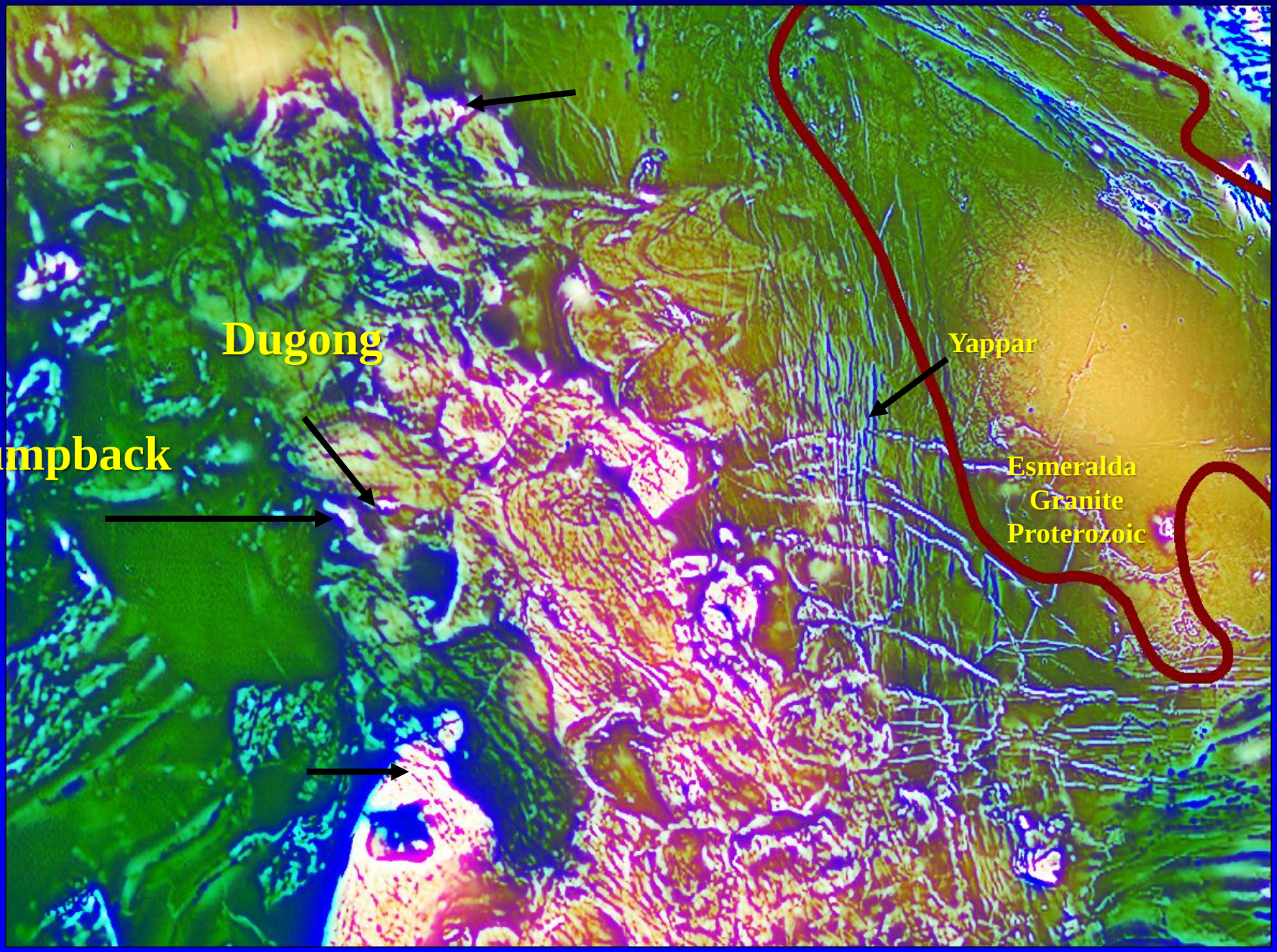
- Initial targeting of mineralization in basement utilizes deep seeking geophysical techniques

- **Have to be able to see down to depths well in excess of 250m-300m**.

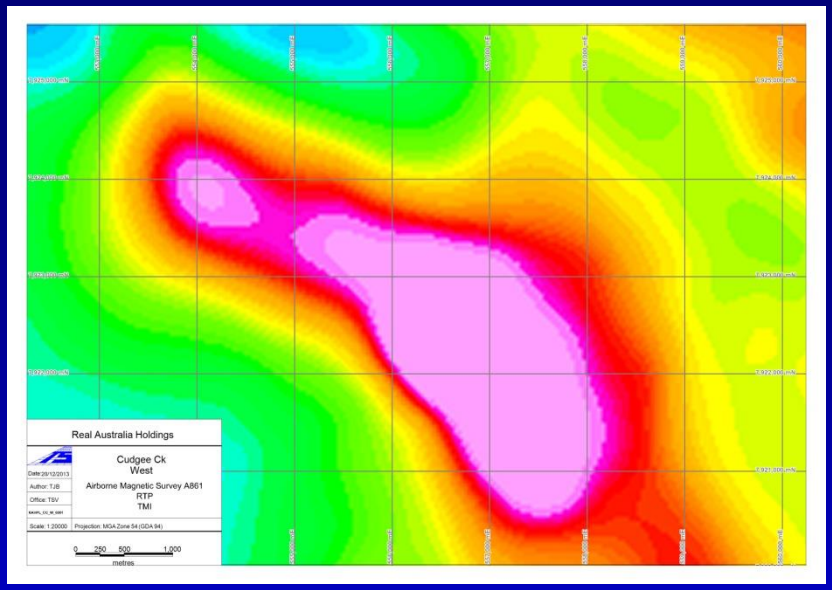
- **First pass targeting utilizes aeromagnetics and gravity surveys**

- Later targeting with electrical geophysics eg. EM and IP

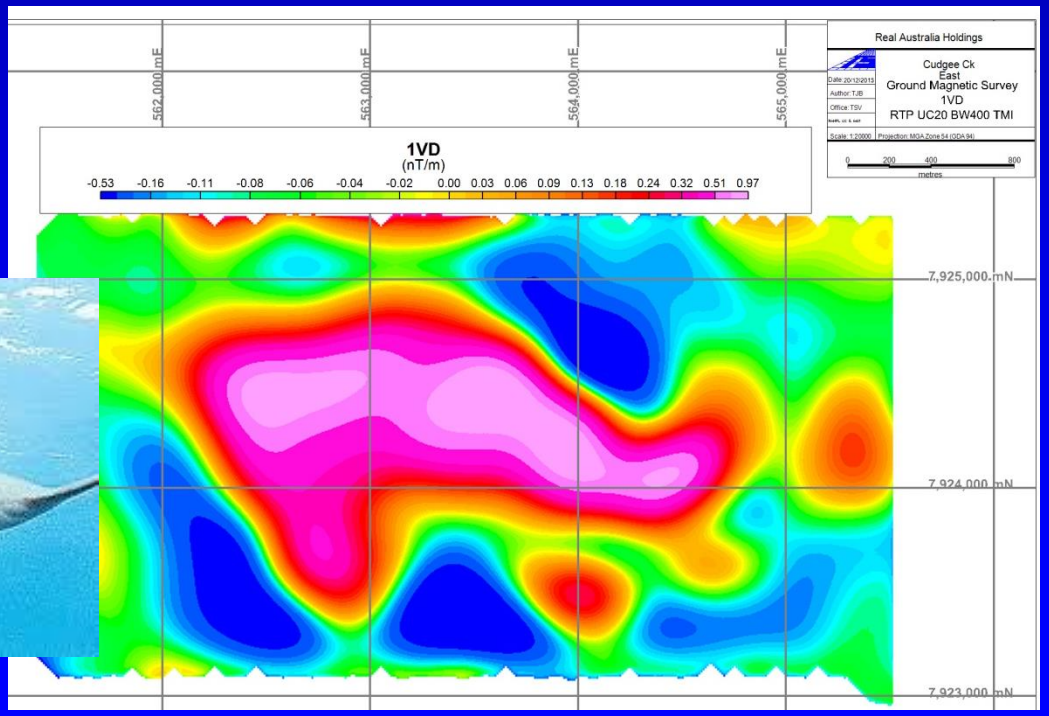
# RTP-1VD-AS RGB Magnetics



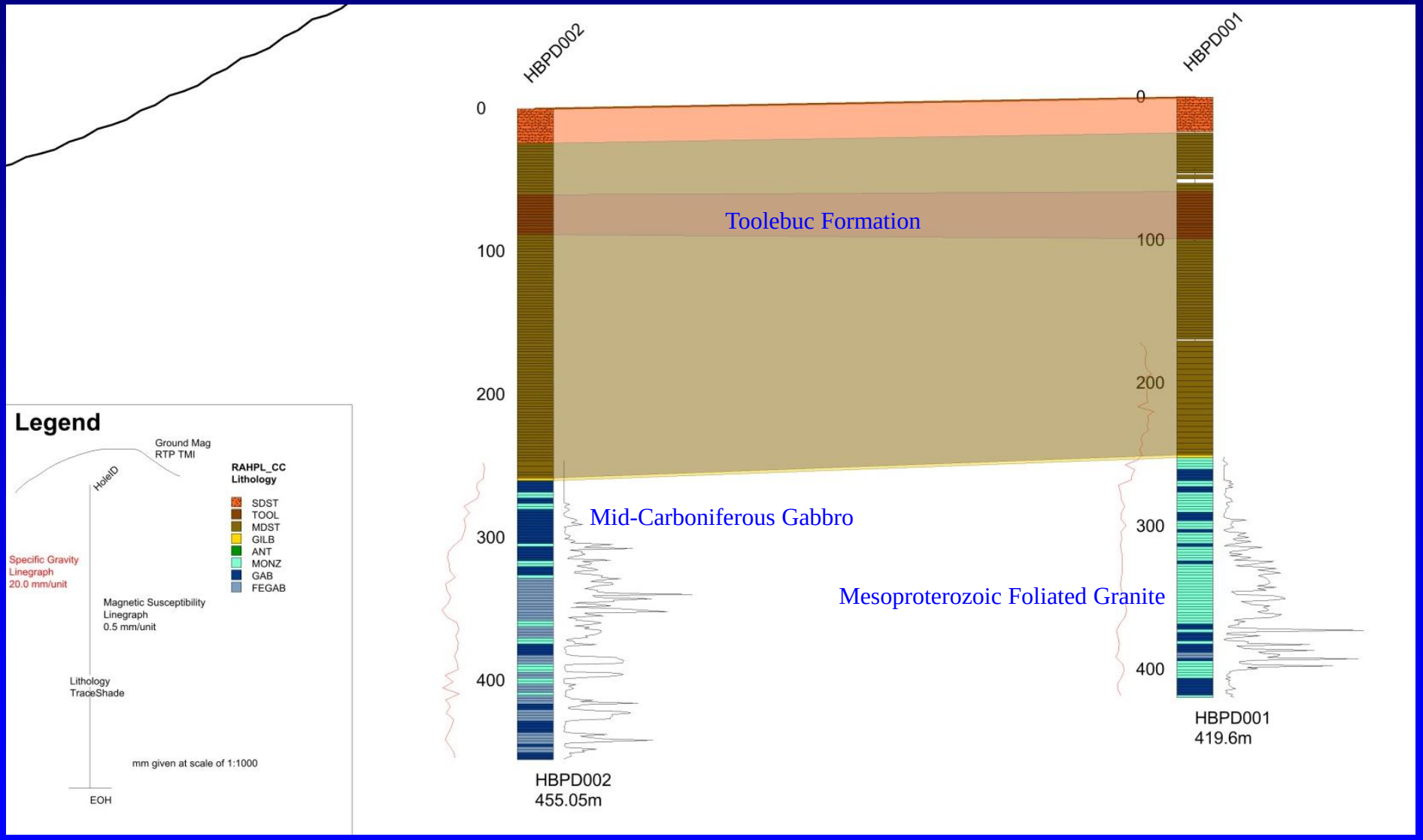
# Humpback



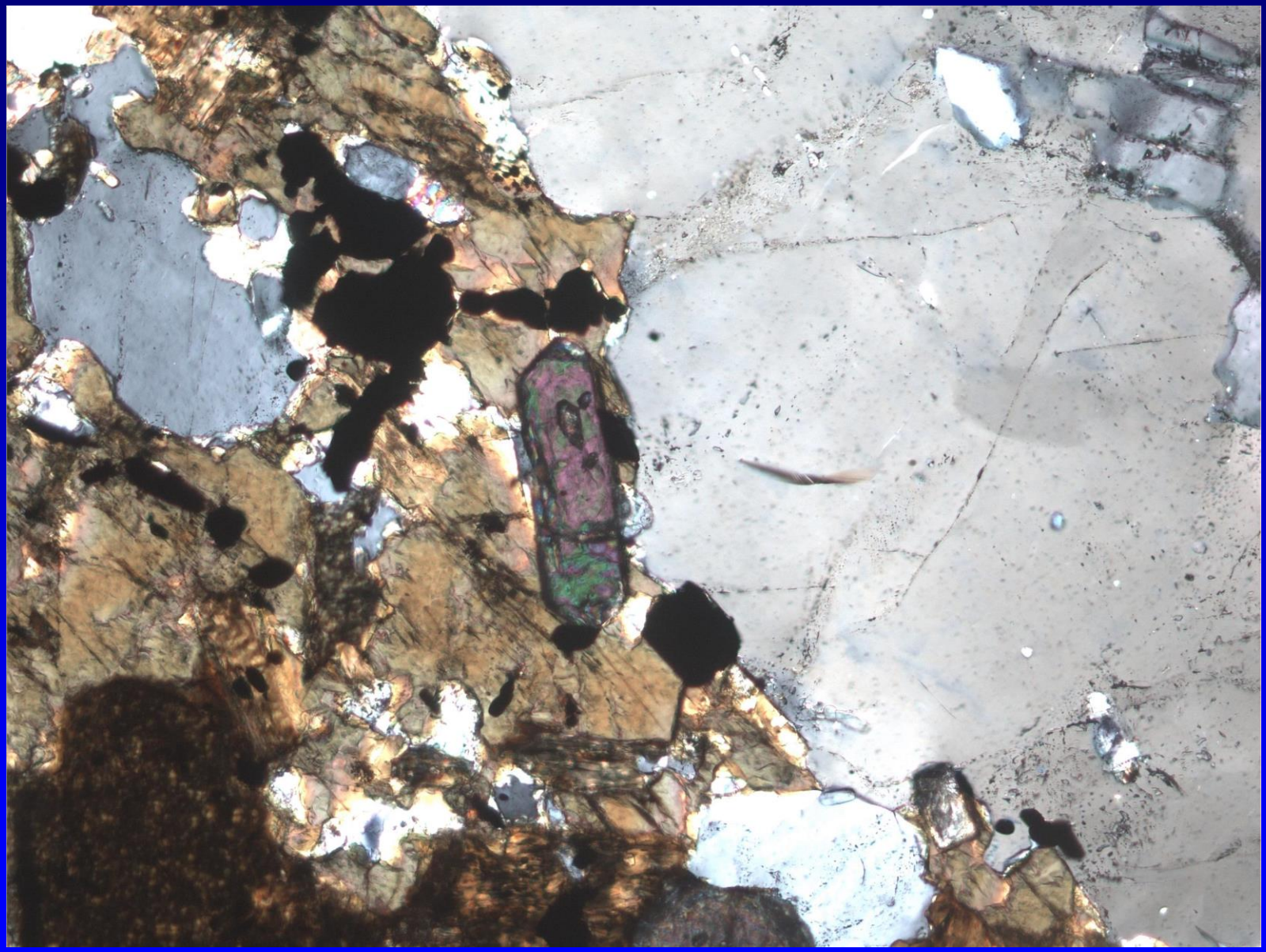

# Dugong



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



# Humpback zircon and biotite quartz feldspar

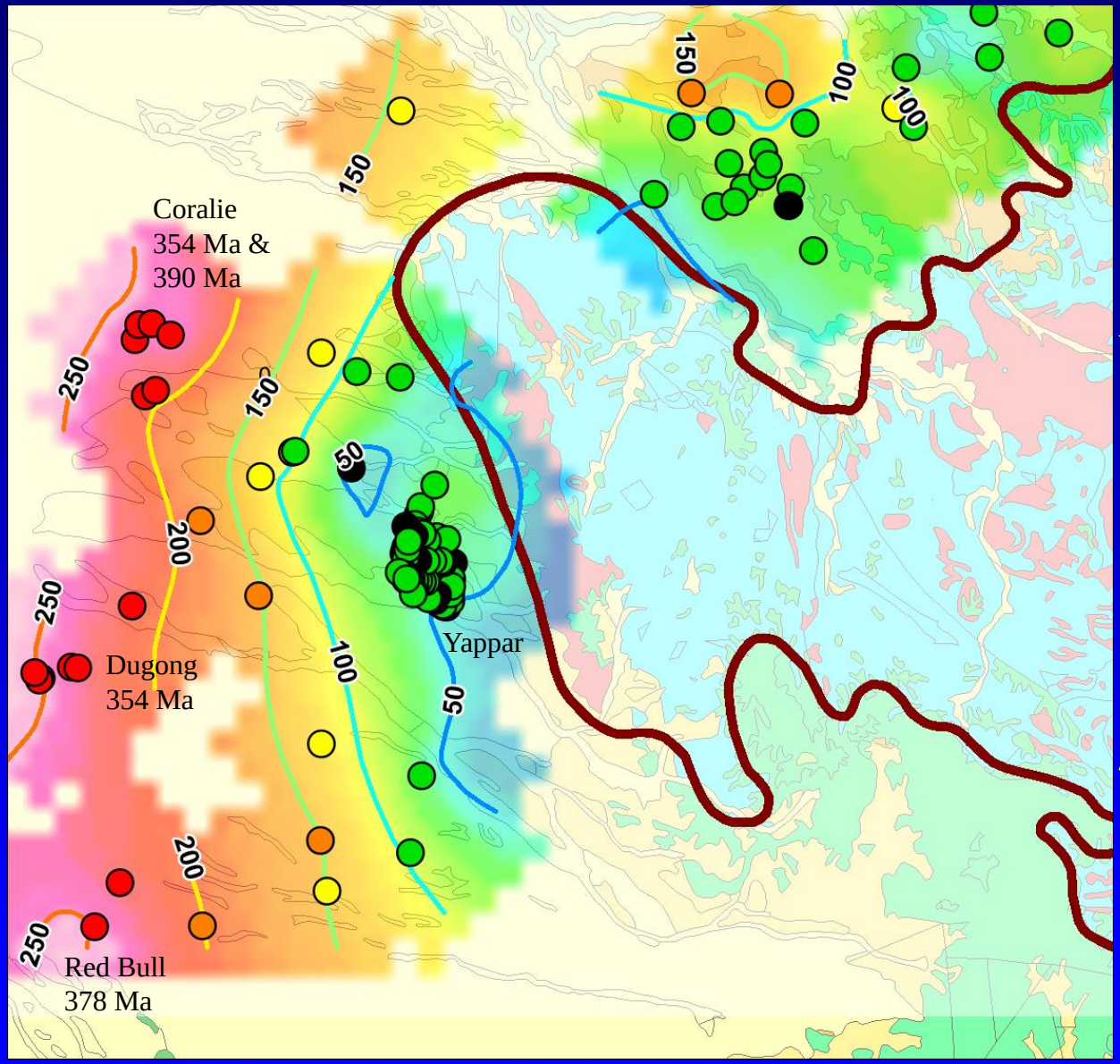


# Zircon U/Pb Age Dating (Adam Nordsvan : Curtin University 2017

| | | | | |
|---|---|---|---|---|
| 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, Lolworth 390 Ma,Woolgar 373 Ma, Forsayth Suite 1540 Ma,

# Depth to Basement & Ages



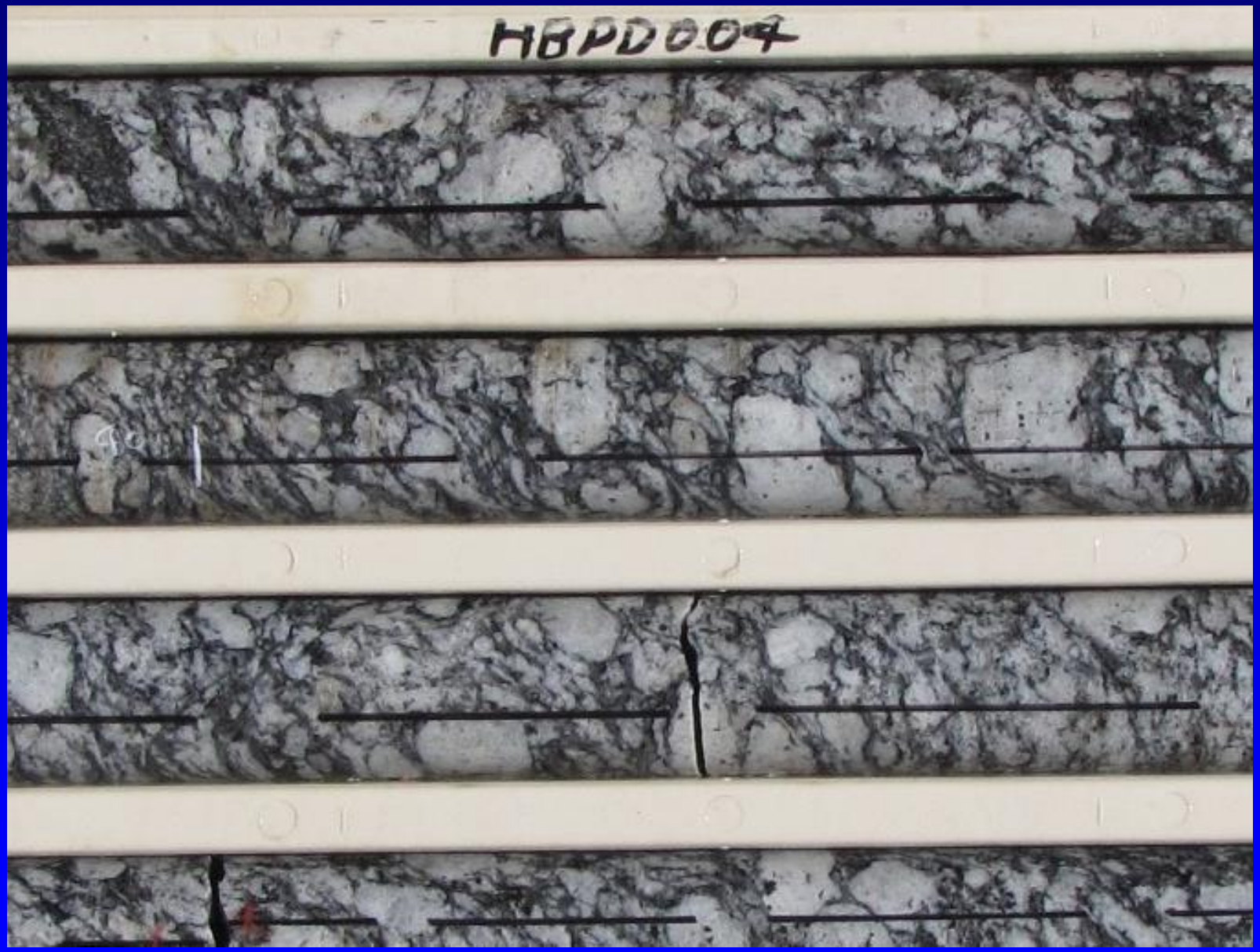

**Yappar Moho Resources Dec,2018 Scout drilling 10m @ 1g/t Au**

# 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?

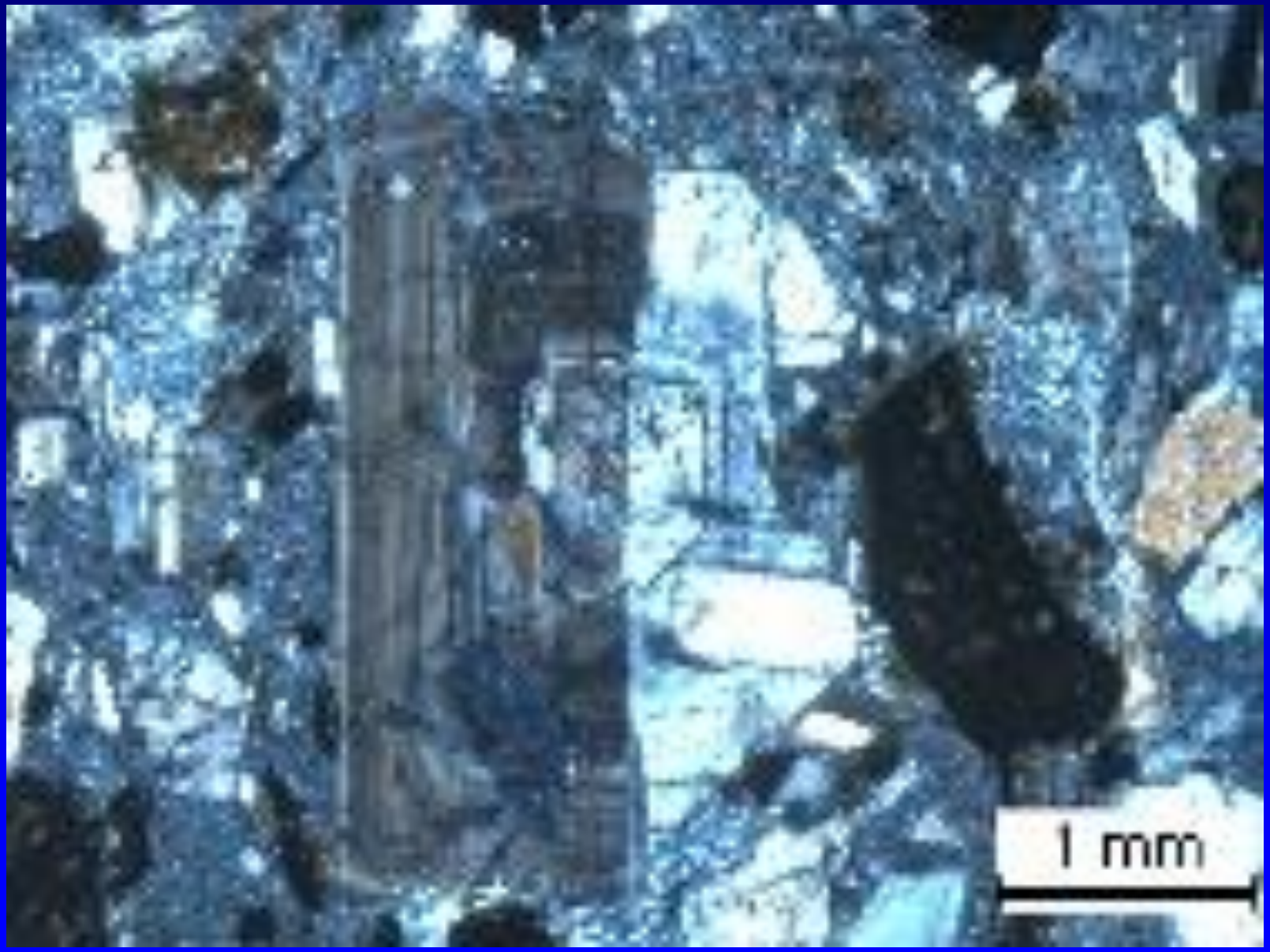
# HBPD001 350m cg titanite monzogranite 1540 Ma Humpback, Cudgee Ck

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

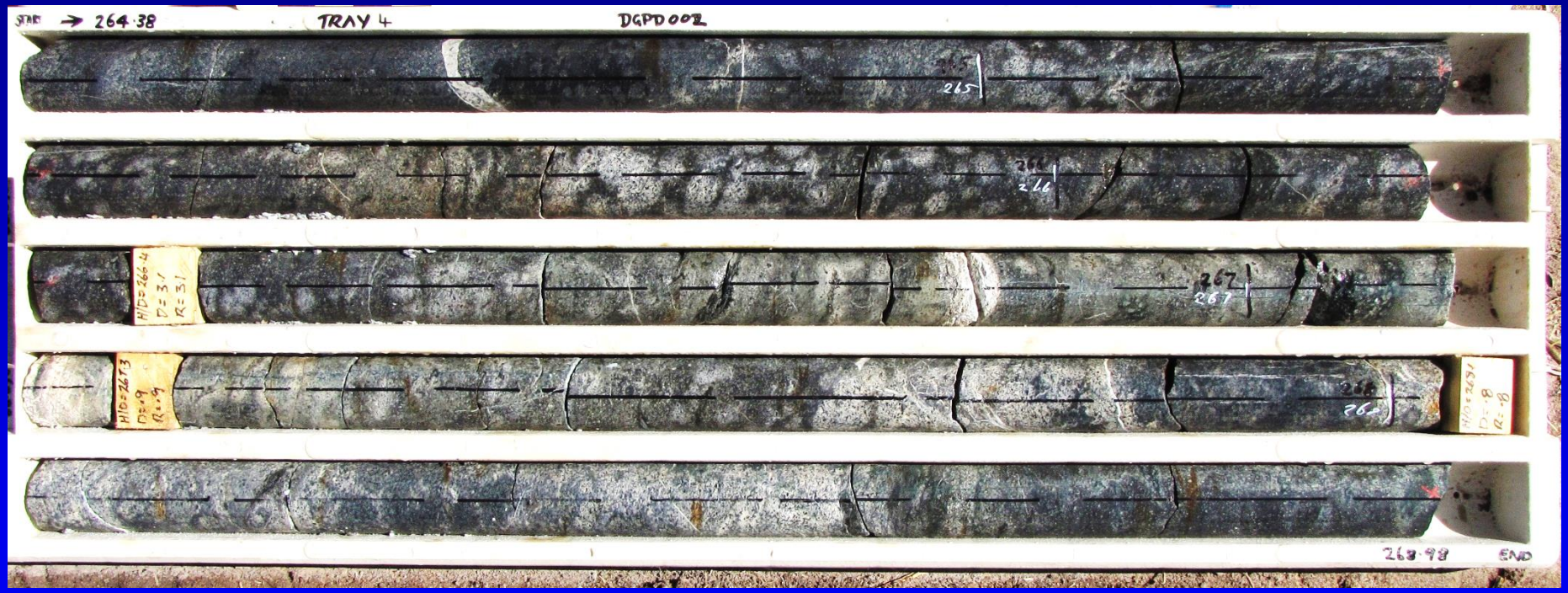


# HBPD002 Gabbro. New Discovery Early Carboniferous Mafic & Intermediate intrusives and extrusives 347 Ma

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



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



# OCBD004 262m Porphyrytic biotite monzogranite 352 Ma Coralie

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


Figure 52a. Strongly green Sericite Altered Granite basement

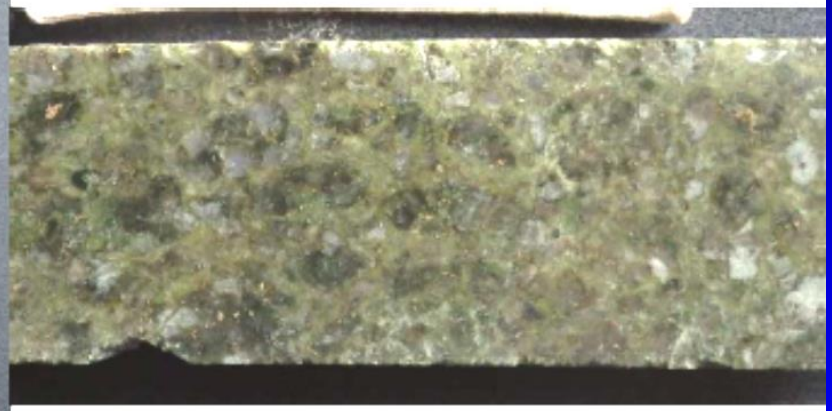


Figure 52b. Strongly green Sericite Altered Granite basement

RESTRICTED LAND ACCESS TO EXPLORATION

MAJOR IMPEDIMENT TO DISCOVERY

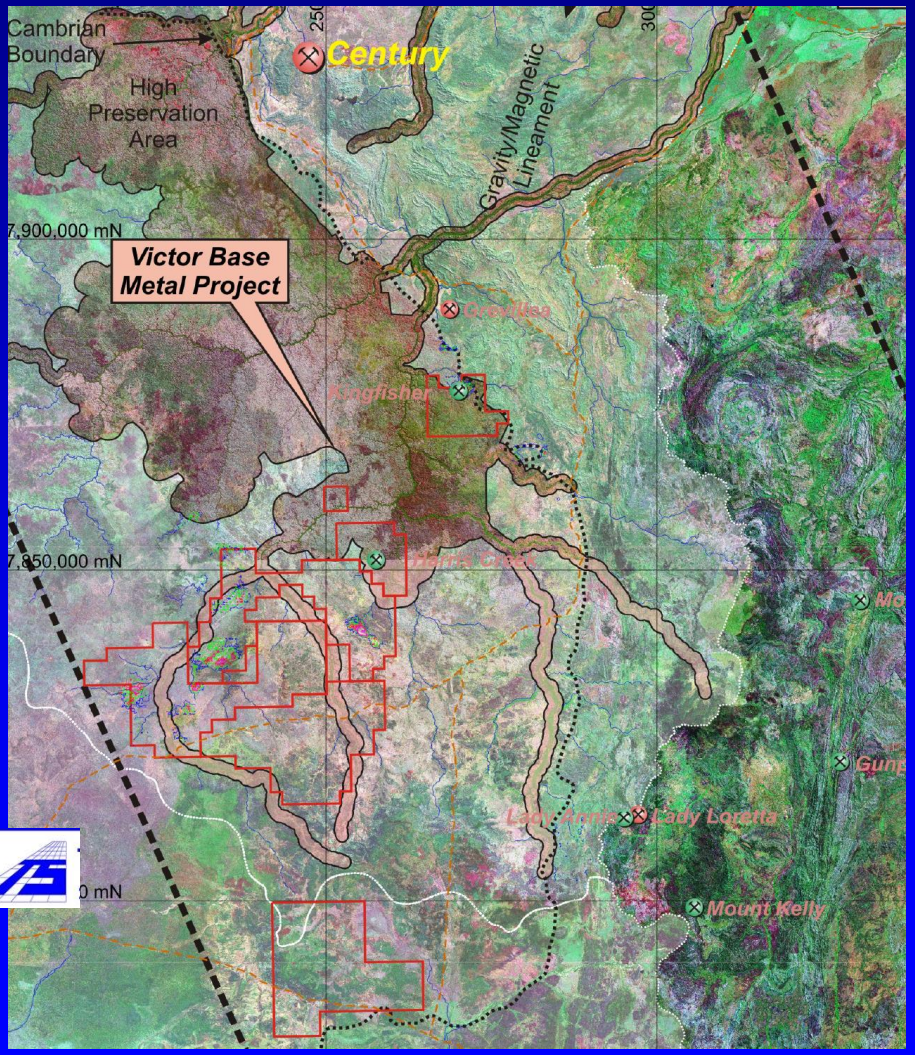
GIVEN THE URGENCY OF REPLACING RESOURCES FROM MINES RUNNING OUT OF ORE

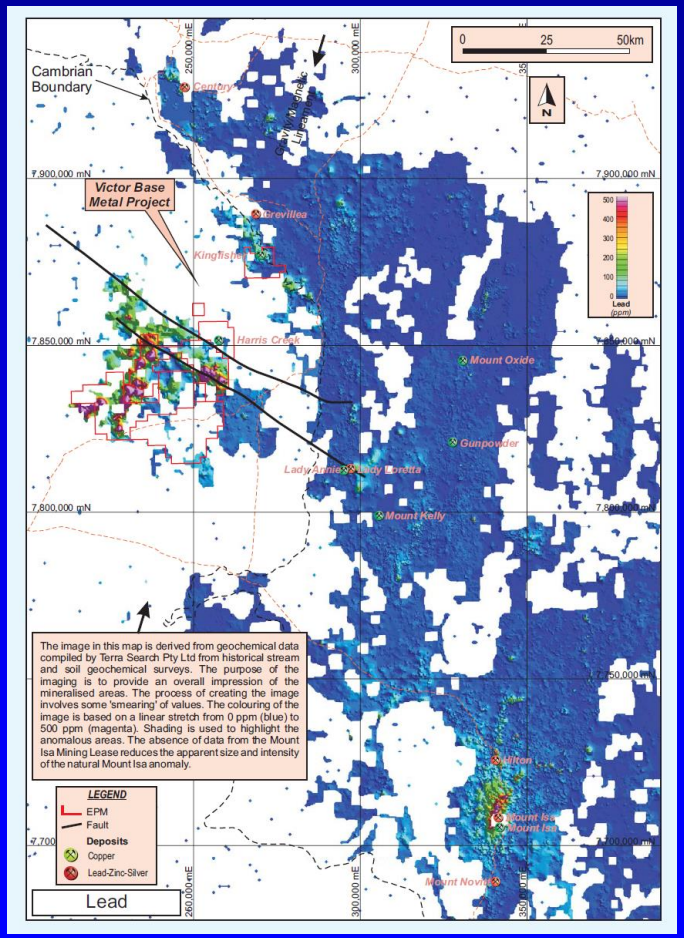
. IN NW QUEENSLAND.

MINERAL EXPLORATION SHOULD BE THE NUMBER ONE LAND USE INSTEAD OF 10th ORDER PRIORITY.

EARLY EXPLORATION HAS MINIMUM TO NO ENVIRONMENTAL IMPACT

# NW of Mt Isa The most likely place to find the next Mt Isa . Locked up by the equivalent of “Wild Rivers”

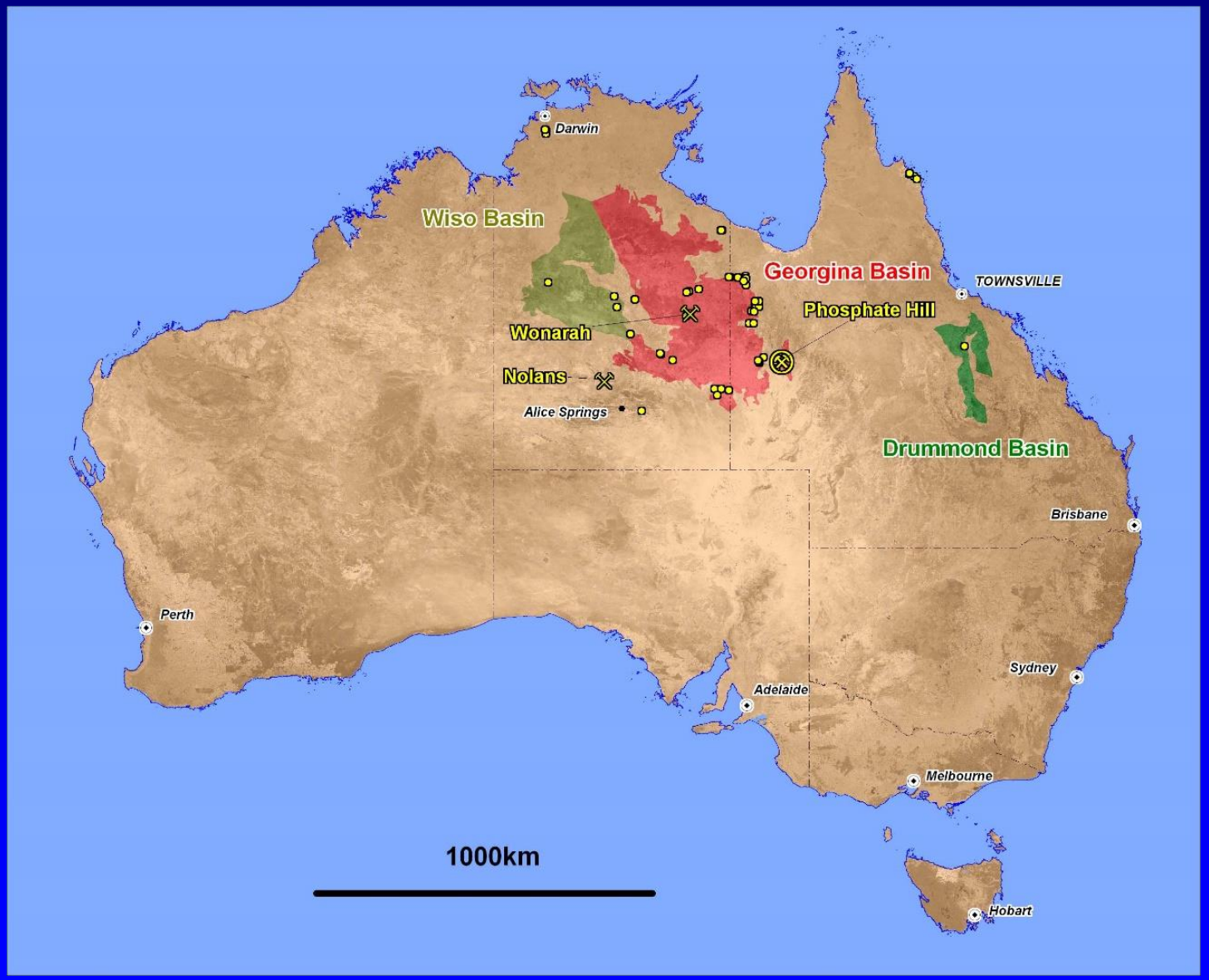


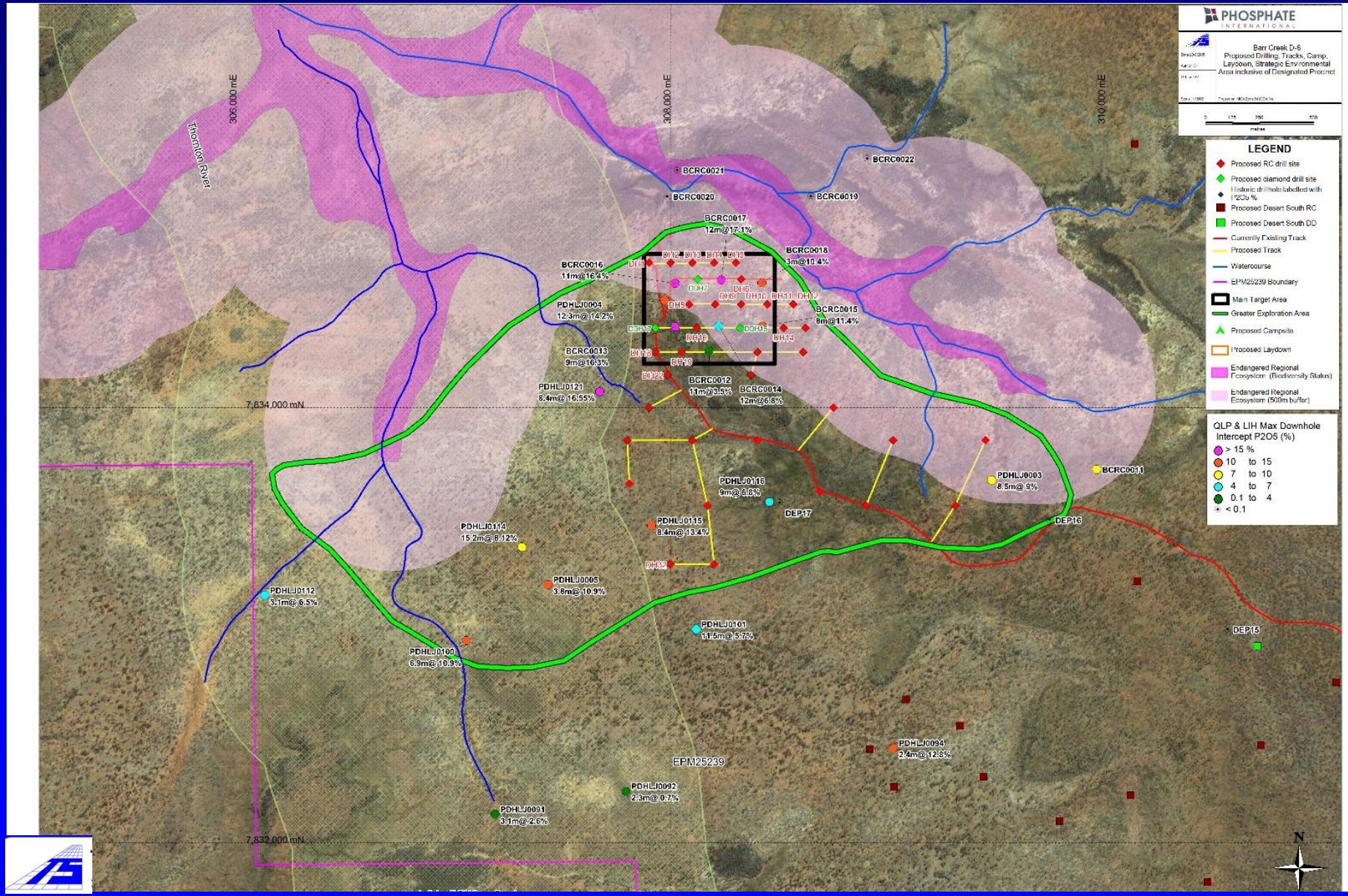
This rock from an old (1890's) prospecting pit in very prospective ground NW of Mt Isa, with very encouraging indications of copper (green).Ideal spot to try and discover the next Mt Isa ore-body. This rock inside high preservation zone . We are prevented from exploring there because of Gregory Wild Rivers equivalent.

# Typical Savanah woodland in “High Presevation zone” Endangered wetland” NW of Mt Isa

# NORTHERN AUSTRALIA – Phosphate Mineralisation. An enormous resource that could help feed the 7 billion plus world population. Only partially developed.



# The southern tentacles of the Gregory Wild Rivers extend to strangle a potentially viable phosphate resource.



The drillhole in this supposed high preservation wet-land drilled to 60m without encountering any water!!!

Area of poor quality turpentine scrub with very low environmental values but identified as 500m buffer around Strategic Environmental Area (SRA), thus severely restricting exploration activity. Thousand of square kilometres of similar ecosystem throughout northern Australia.

All Exploration activity , immediately rehabilitated .
Example 2. Drill hole rehabilitation. Status of drillhole immediately after drilling. Cutting off drill collar.

All Exploration activity , immediately rehabilitated . Example 2. Drill hole rehabilitation. Bags & sample removed collar removed, topsoil replaced. Site ready for growth after next rain.

# Score Card (1)

- Fantastic data sets being added to all the time by State and Federal Initiatives
- Uranium – Mining Banned, no exploration
- Oil Shale – Previous Ban , State Government sympathetic to Green opposition to fossil fuels and Green opposition to fracking. However Government support for R&D
- Water Our most critical Resource – shrouded in ignorance, new discoveries immediately plugged and forgotten. Link to geoscience unravelling.

# Score Card (2)

- Prospective base metal terrane NW of Mt Isa, one of the most likely areas for new discovery – exploration totally hindered by poorly ground truthed “Wild Rivers”
- Similar story with Phosphate NW of Mt Isa.
- The most serious impediment to mineral exploration and discovery is land access.
- Government Support such as CDI’s are being scaled back.
- State Government Fees are very high and creating barriers to entry, consuming ever higher proportion of exploration budget

# 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.

# Nothing wrong with a dinosaur pedigree, after all their ancestors were walking in the Cretaceous