RESOURCING THE TERRITORY

Northern Territory: over the fence …

Dorothy Close
Director Regional Geoscience, Northern Territory Geological Survey

GSQ, Technical Workshop for Industry

Sep 2019

NORTHERN TERRITORY GOVERNMENT

THE TERRITORY BOUNDLESS POSSIBLE

Resourcing the Territory initiative (2018-2022)

RESOURCING THE TERRITORY

4 year (2018-2022), $26 million NT Government initiative to grow the exploration sector

- Supporting industry innovation through grants for greenfields exploration
- Upgrading the Territory's coverage of geophysical data
- Unlocking the resource potential of the Barkly and Gulf regions
- Stimulating greenfields exploration in central Australia
- Promoting the Territory's resource potential and investment opportunities
- Making exploration and geoscience data more accessible

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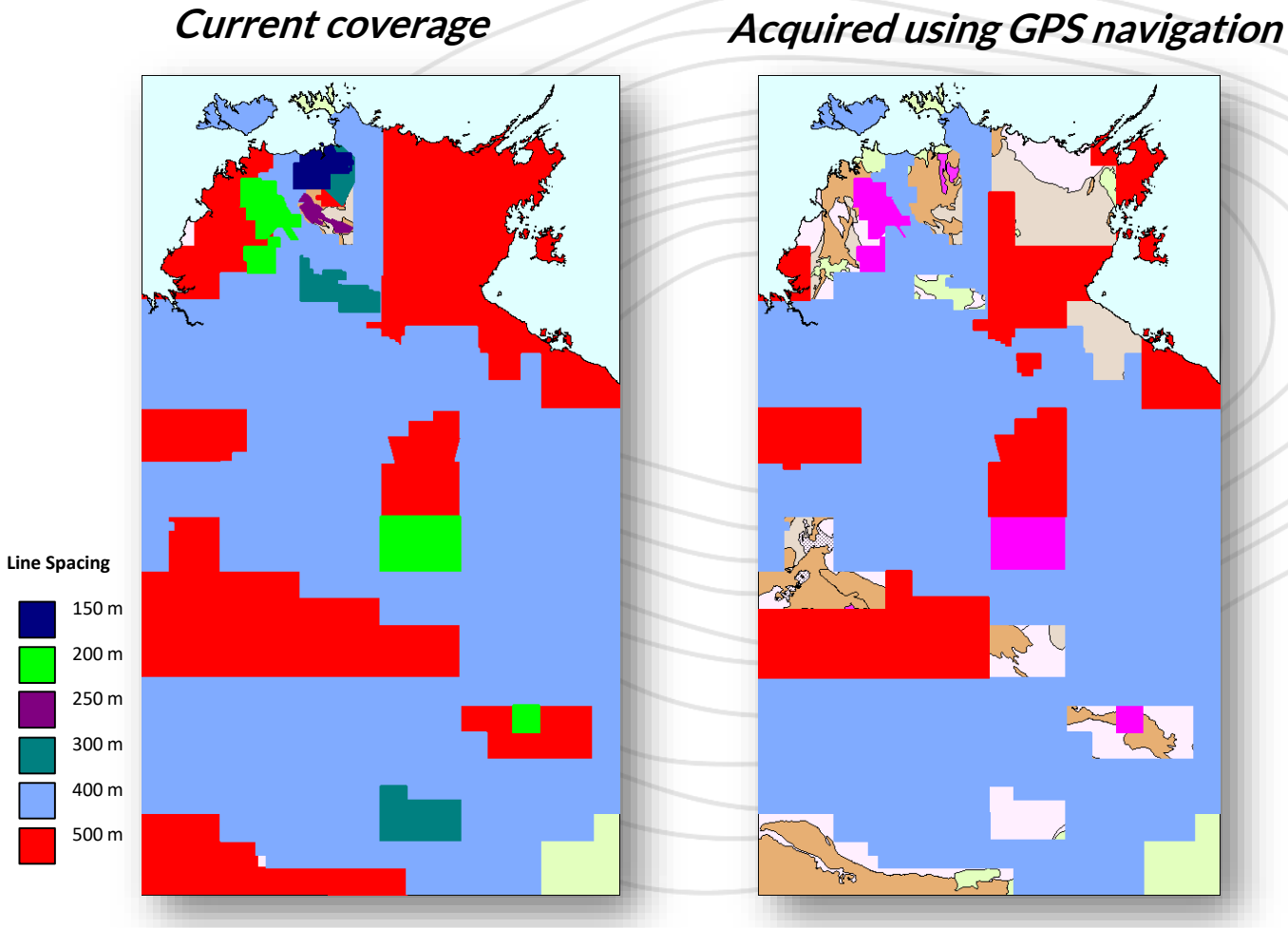
Upgrading the Territory's coverage of geophysical data

Aeromagnetic and radiometric

- NT has excellent regional aeromagnetic coverage however….
- ~36% of the NT not covered by mag-rad at minimum standard (400m line spacing & 80m flight height with differential GPS)
- 200m line-spaced magnetic coverage over basement provinces
- Industry infill encouraged

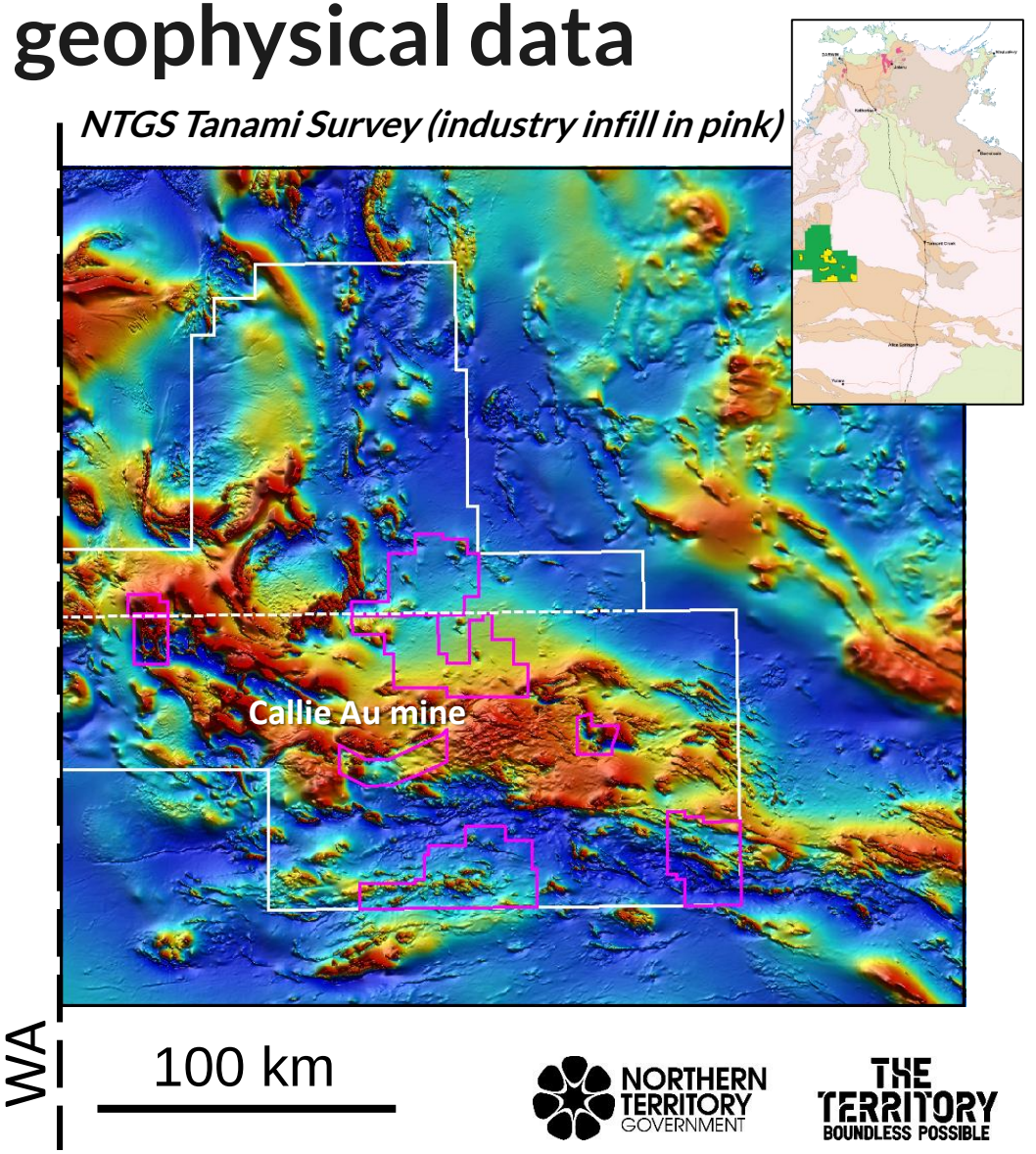


Upgrading the Territory's coverage of geophysical data

Aeromagnetic and radiometric

Tanami airborne magnetic and radiometric survey (2018)

- Seamless coverage of highly prospective, non-outcropping gold province
- ~ 240,000 line km @ 200 m line spacing
- >30,000 line km of industry infill to 100 m line spacing
- >42 000km^2 area
- Funded by NTGS with infill funded by industry; contract management and QA/QC by GA
- Final data released next week

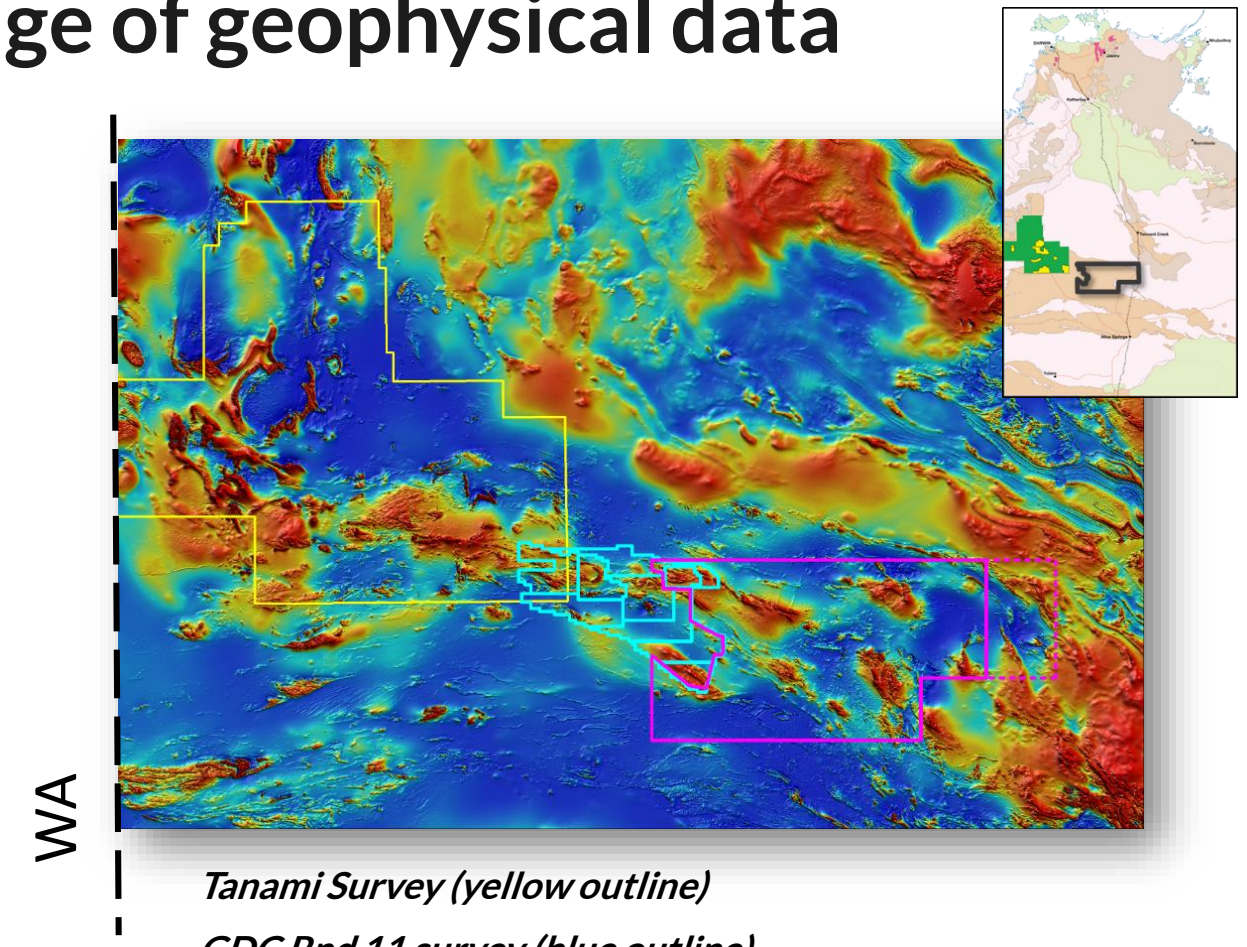


Upgrading the Territory's coverage of geophysical data

Aeromagnetic and radiometric

Mount Peake-Crawford airborne magnetic and radiometric survey (2019)

- Northern Aileron province (potential for Au, Cu, Ni, V, Li, Zn)
- 115,000 line km @ 200 m line spacing – industry infill to 100m
- 18 000 km^2
- Extending the Tanami Survey through linking 2019 IGO co-funded survey
- Currently being acquired, managed by GA



Tanami Survey (yellow outline)

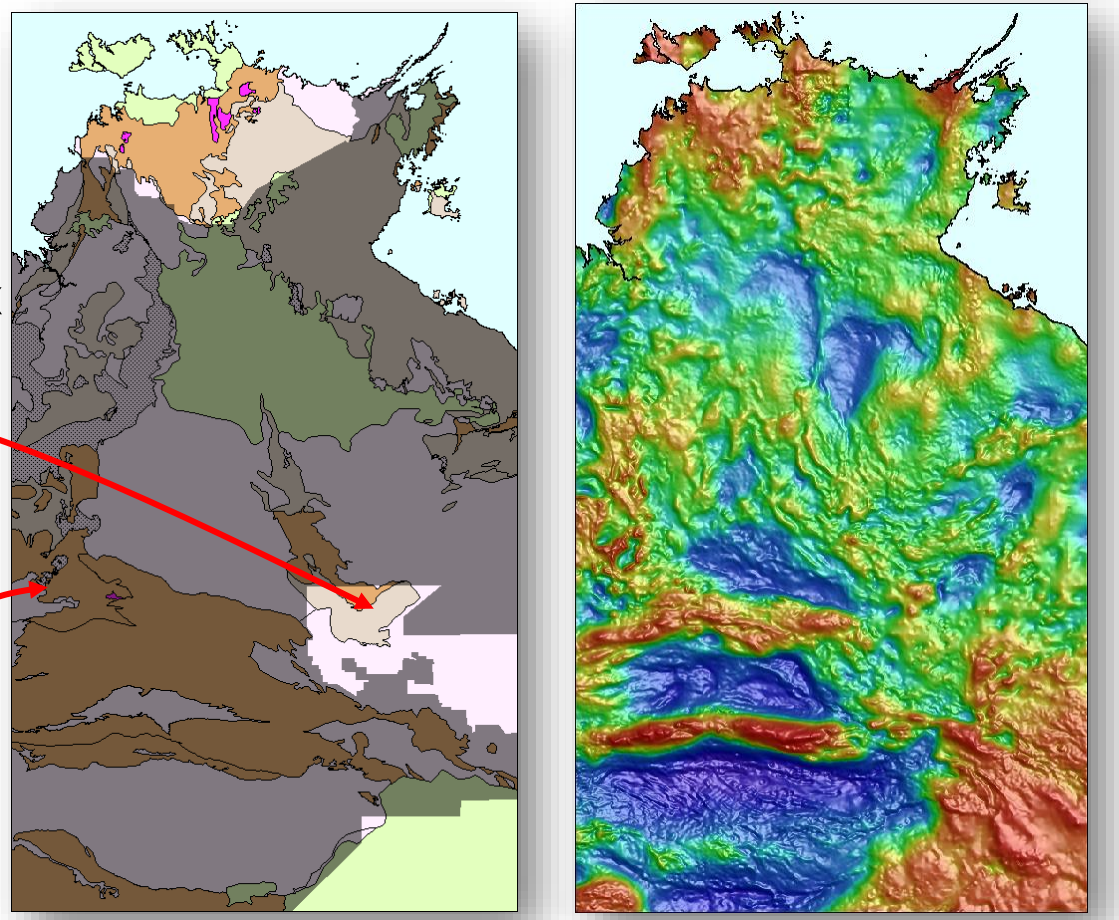
GDC Rnd 11 survey (blue outline)

Mount Peake-Crawford Survey (pink outline)

Upgrading the Territory's coverage of geophysical data

Gravity

- > 82% of the NT covered by ≤ 4 km spaced ground gravity
- ~ 234,000 square km remaining (~14,625 stations at 4 x 4 km spacing)
- Under consideration
  1. Georgina Basin Gravity Survey:
     - 58,670 square km
     - ~3650 stations @ 4 km spacing
  2. Tanami Gravity Survey:
     - Yet to be designed
     - Strong interest from industry for infill

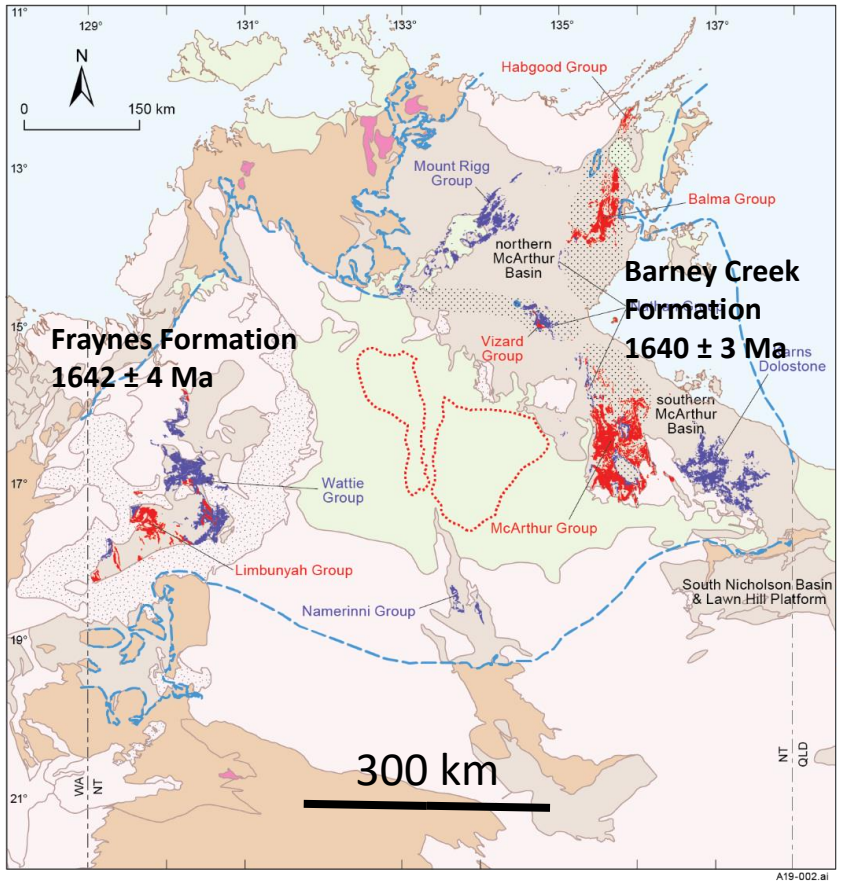


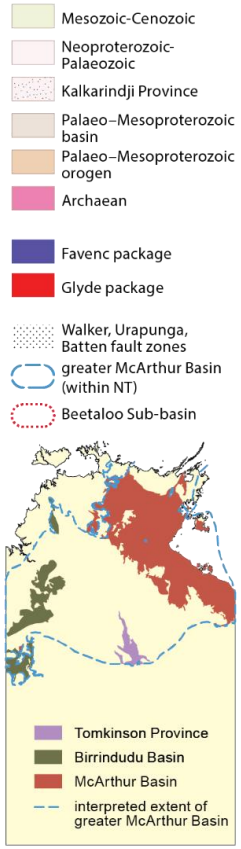
Unlocking the resource potential of the Barkly and Gulf regions

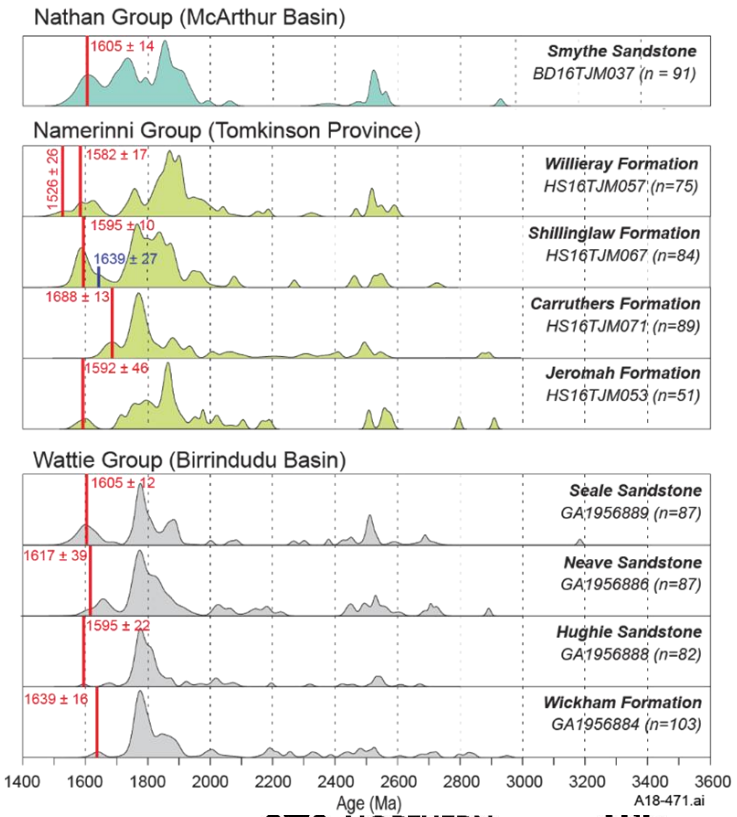
Building on previous CORE initiative in greater McArthur Basin

'greater McArthur Basin'

- Continuous distribution of prospective stratigraphy established over vast area of northern Australia)
- Known prospectivity for petroleum and minerals







Munson et al, AGES 2019

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Unlocking the resource potential of the Barkly and Gulf regions

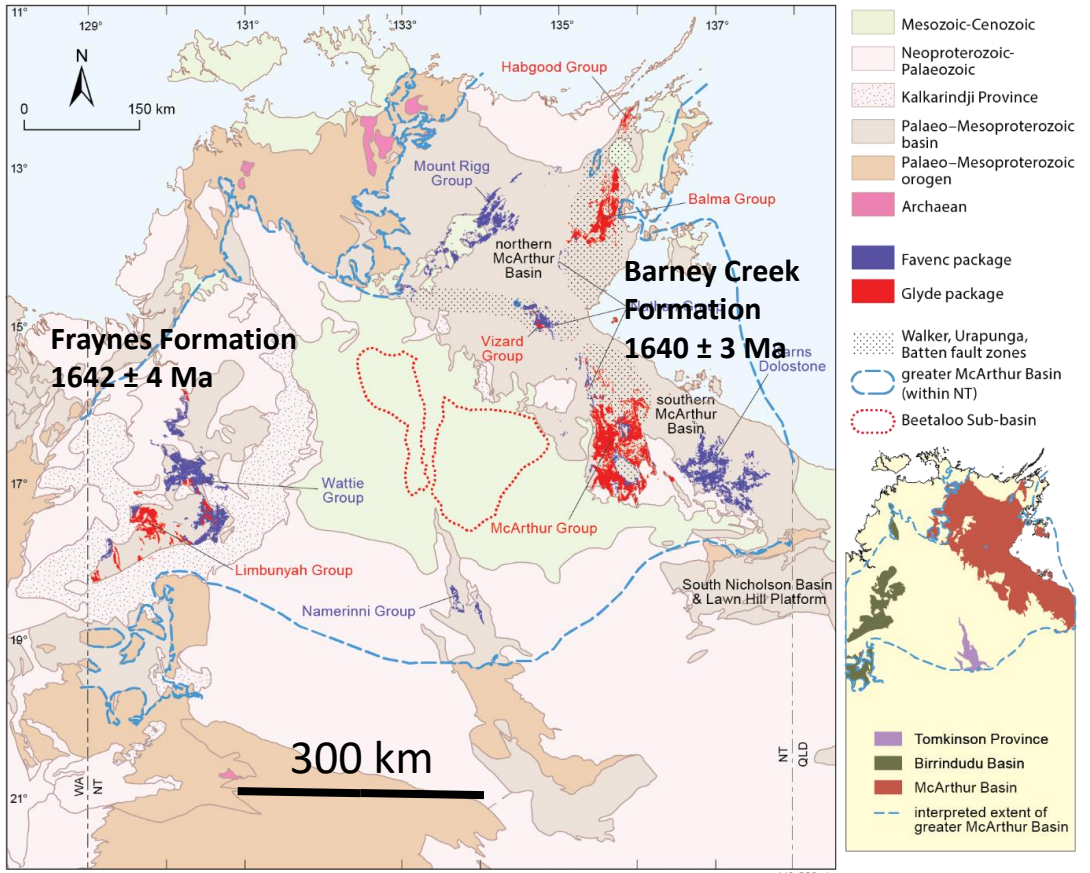
Building on previous CORE initiative in greater McArthur Basin

'greater McArthur Basin'

- Correlate stratigraphy between outcropping McArthur Basin, Birrindudu Basin and Tomkinson Province

- Understand regional scale stacked basin architecture and unconformities (gravity acquisition & modelling, seismic interpretation, SEEBASE®)

- Improve understanding of potential mineral and petroleum systems (fluid flow modelling; characterisation of source rocks)



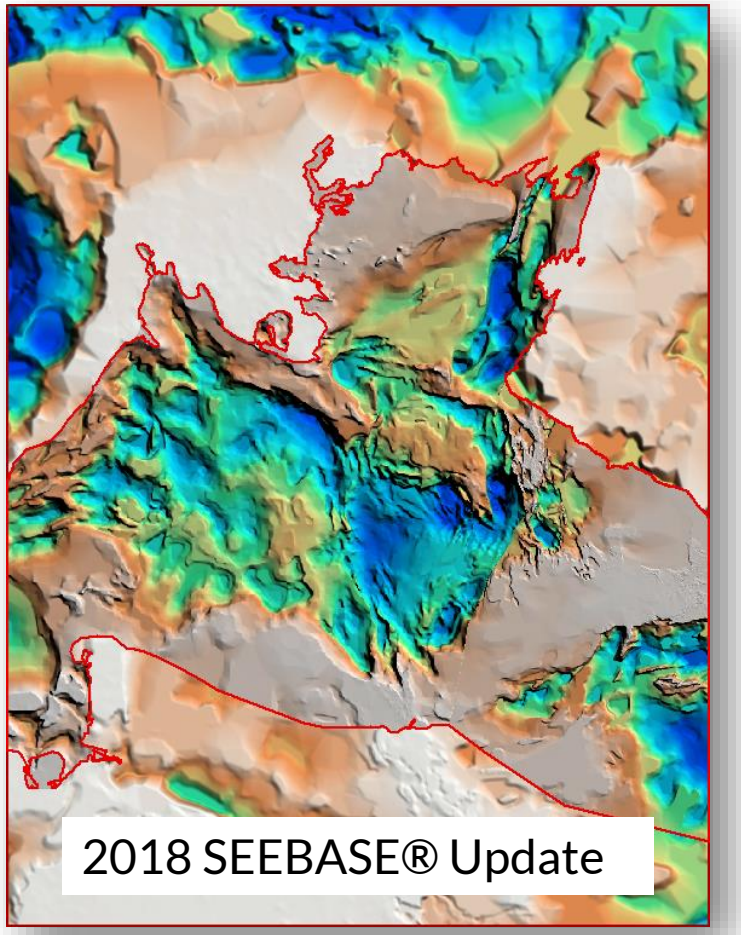
Munson et al, AGES 2019

Unlocking the resource potential of the Barkly and Gulf regions

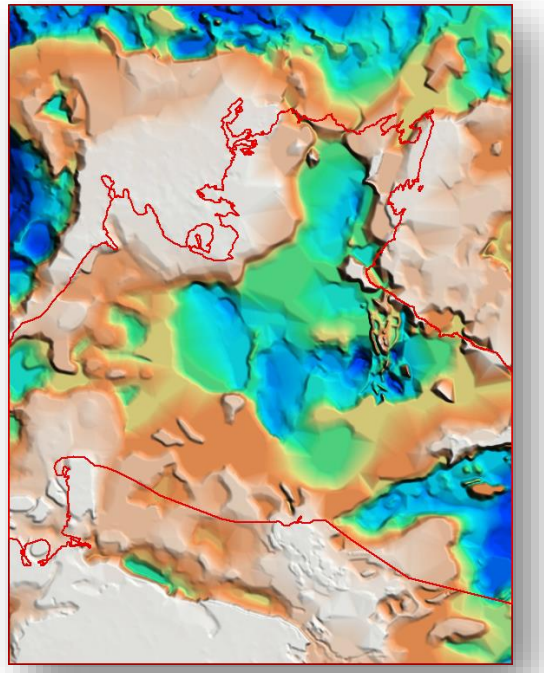
Building on previous CORE initiative in greater McArthur Basin

'greater McArthur Basin' - SEEBASE

- Depth to base Mesoproterozoic and magnetic basement
- Frogtech Geoscience
- (2018)
- Extending east into Queensland



2018 SEEBASE® Update



2006 OZ SEEBASE

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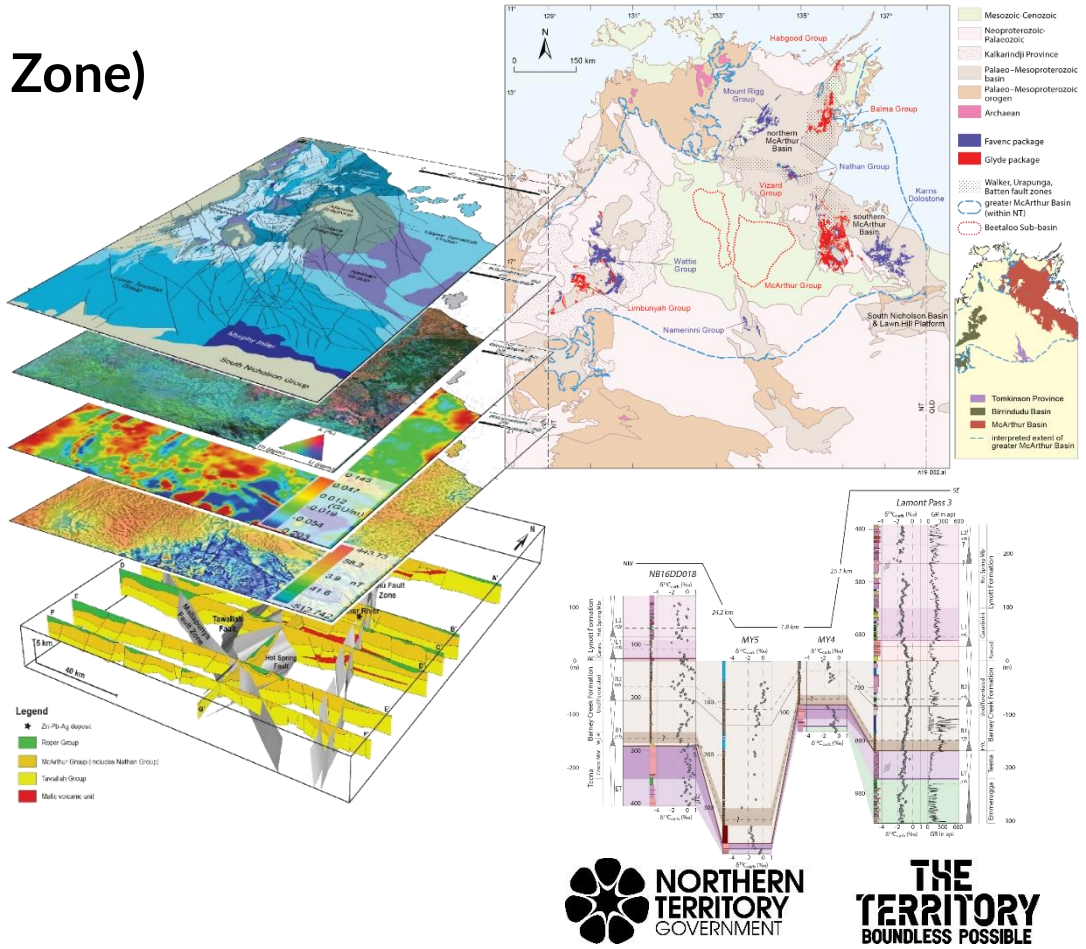
McArthur Basin: CSIRO-NTGS collaboration (Batten Fault Zone)

- Gravity acquisition by NTGS, reprocessing and stitching of multiple industry AEM surveys
- Solid geology and structural interpretation of geophysical data
- 2D forward modelling of high-resolution gravity profiles
- Carbon isotope and sequence stratigraphic assessment of McArthur Group
- Deformation-fluid-flow modelling



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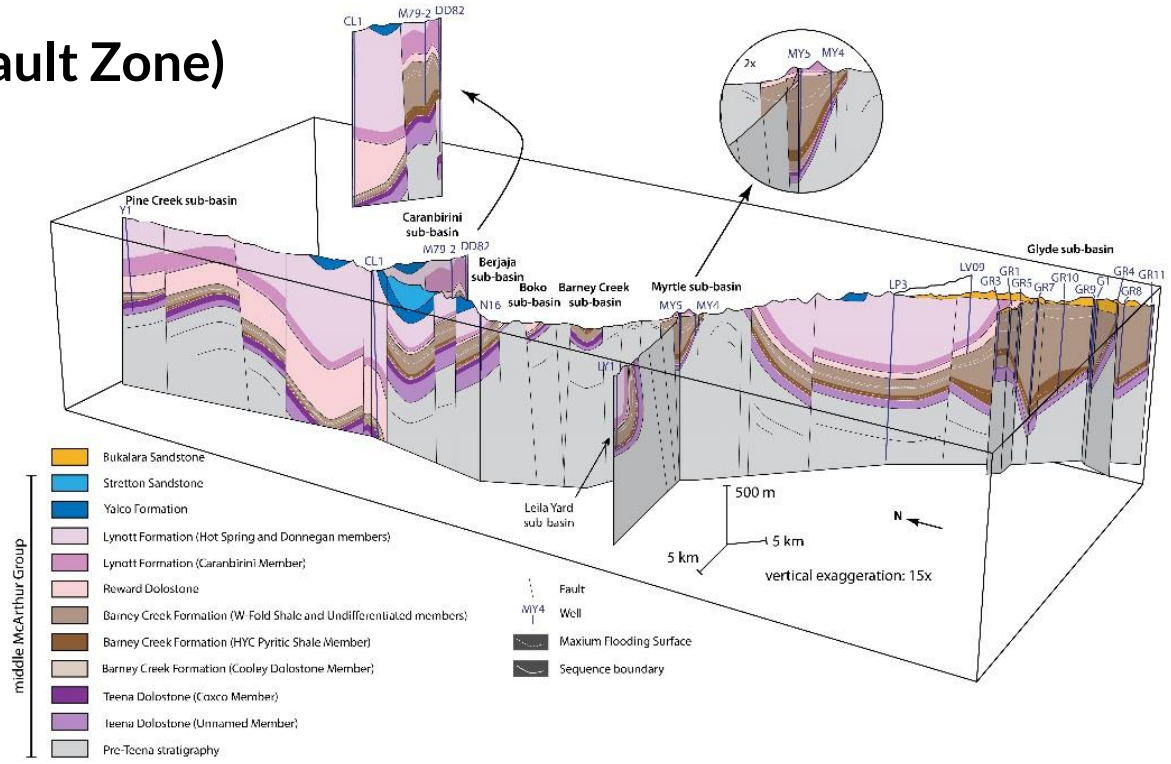
Building on previous CORE initiative in greater McArthur Basin

McArthur Basin: CSIRO-NTGS collaboration (Batten Fault Zone)
Key findings

- Key growth faults controlling mineralisation are often almost blind at surface
- Anomalously thick sequences of mafic volcanics in the Tawallah Group have spatial association to known mineralisation
- Short-lived compressional event at end of deposition of Barney Creek Formation may be tectonic driver for fluid flow and diagenetic mineralisation
- C isotope stratigraphy is a powerful tool for regional correlation, combined with sequence stratigraphy to recognise maximum flooding surfaces



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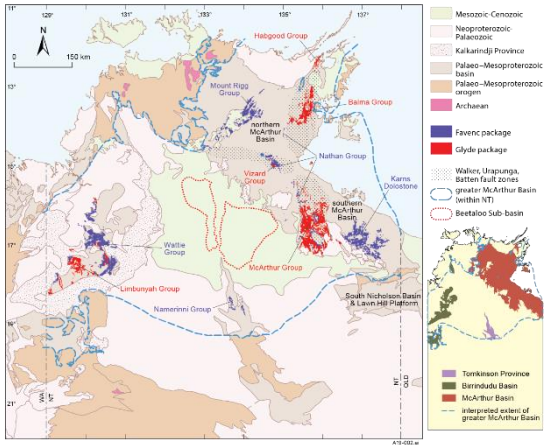
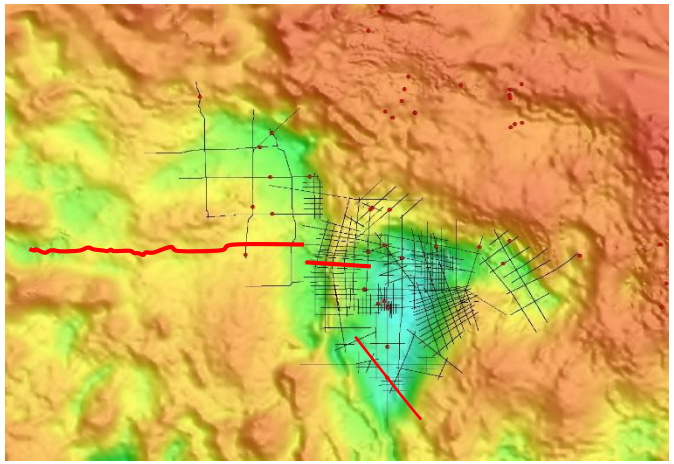
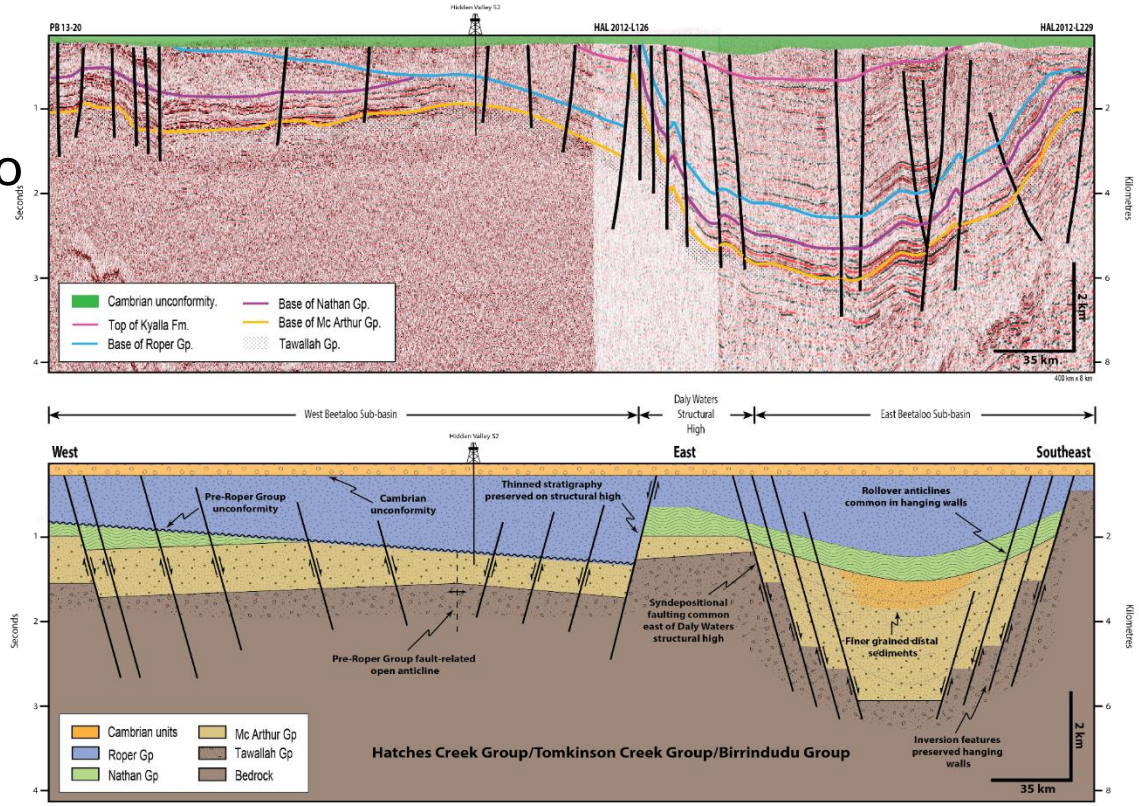
McArthur Basin: Beetaloo Sub-basin – seismic interp

- Defining the boundary of the Mesoproterozoic Beetaloo Sub-basin
- Determining fault architecture controlling basin formation from Paleoproterozoic to Mesoproterozoic







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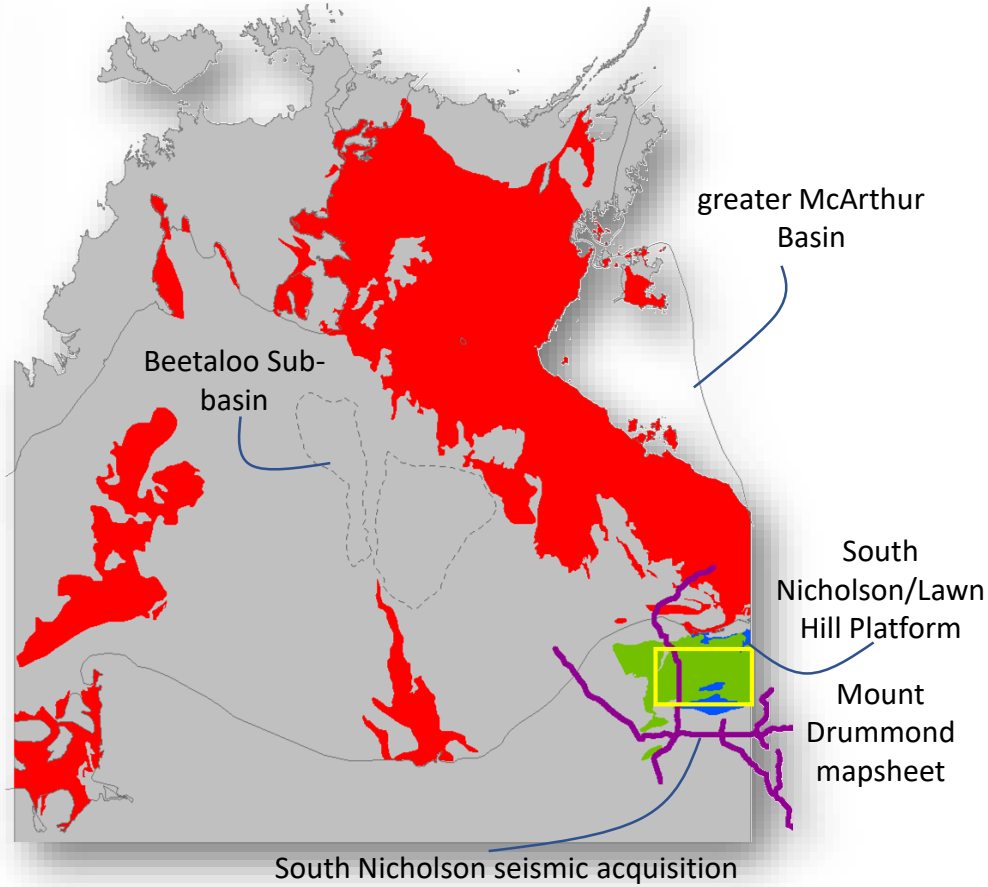
THE TERRITORY BOUNDLESS POSSIBLE

Unlocking the resource potential of the Barkly and Gulf regions

Building on previous CORE initiative in greater McArthur Basin

Extending into South Nicholson, Lawn Hill Platform; collaboration with Geoscience Australia (*Exploring for the Future*)

- Continued stratigraphic characterisation & correlation across Meso-Palaeoproterozoic stacked 'super' basins
- Updated mapping of Mount Drummond 1:250 000 outcrop geology (NTGS)
- Regional geophysical acquisition (GA + NTGS)
- Interpretation of basin structural architecture & geodynamics
- Source rock geochemistry and characterisation
- Petroleum and mineral systems analysis



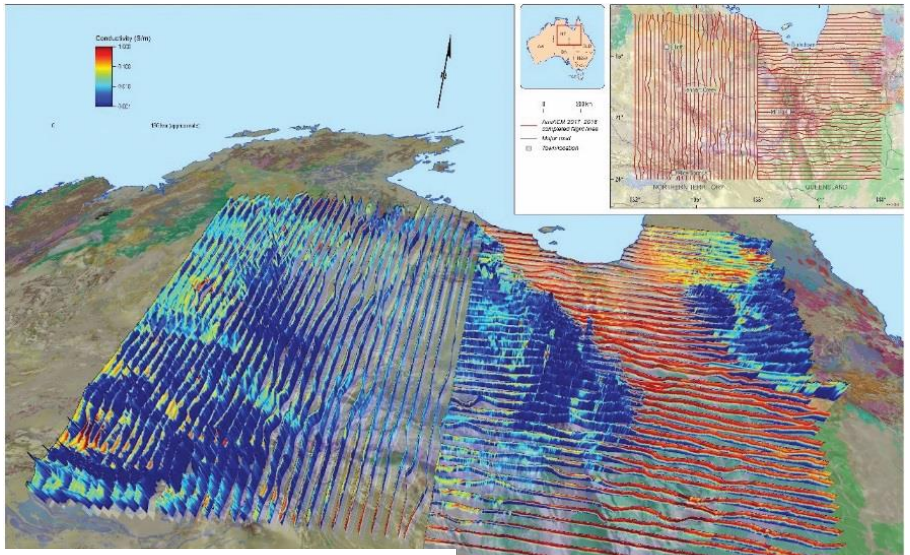
Resourcing the Territory initiative (2018-2022)

RESOURCING THE TERRITORY

Unlocking the resource potential of the Barkly and Gulf regions

Geoscience Australia *Exploring for the Future* in the Barkly region (NTGS co-investing and collaborating)

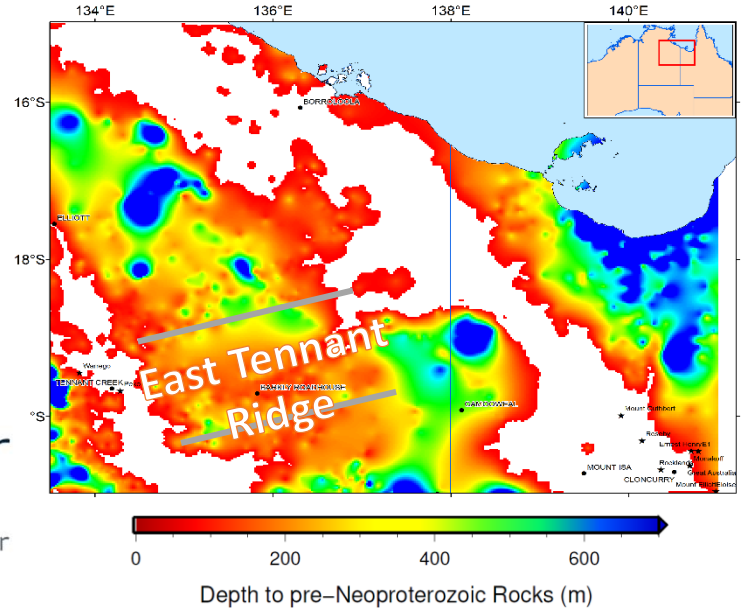
- Unprecedented level of new geoscience data at outcrop to lithospheric scale
- Potential for undercover mineral province east of Tennant Ck



Ley Cooper et al AGES 2019

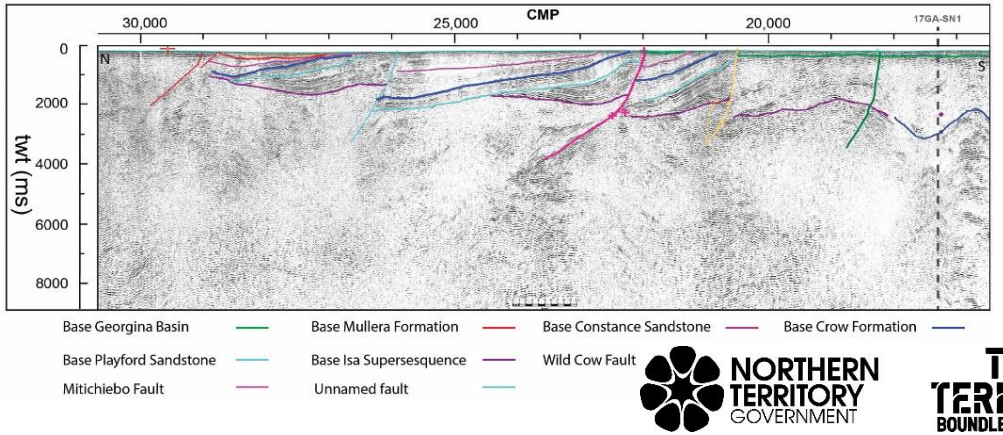
Australian Government
Geoscience Australia

Exploring for the Future
minerals | energy | groundwater



South Nicholson seismic

Carr et al AGES 2019



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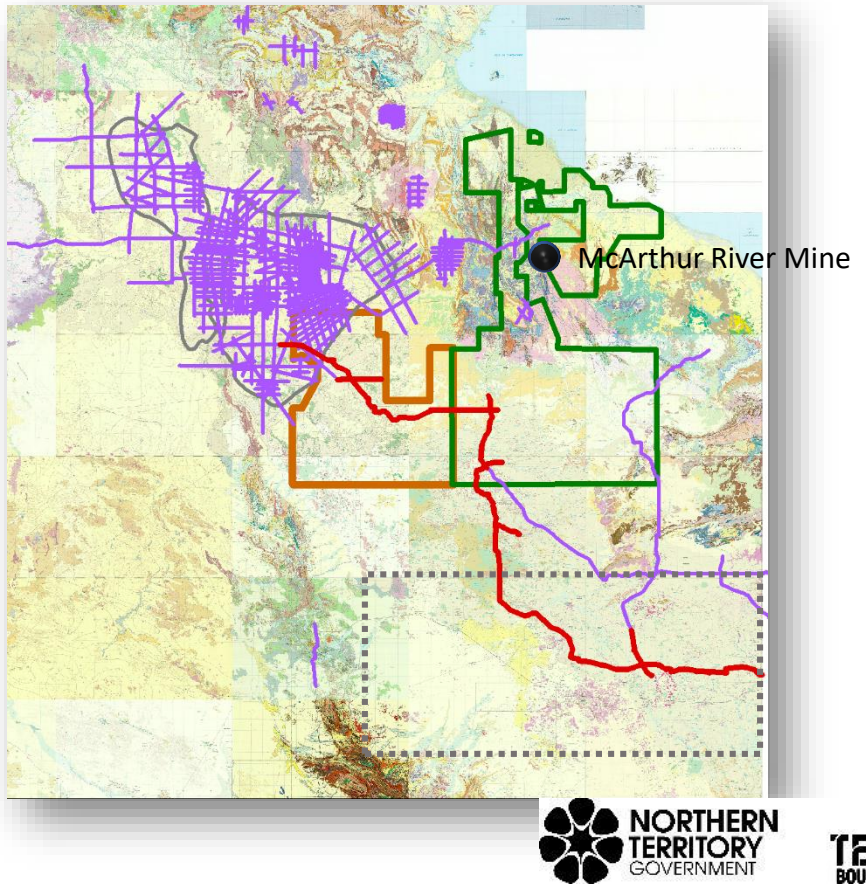
Australian Government
Geoscience Australia

Exploring for the Future
minerals | energy | groundwater

Major new geophysical datasets being collected

- SW McArthur 2 km spaced ground gravity acquisition completed - (adjacent to Batten Fault Zone
- 2km gravity (CORE initiative)
- Barkly seismic acquisition (>800 km from Qld border to Beetaloo Sub-basin ~~acquisition~~ commenced this week



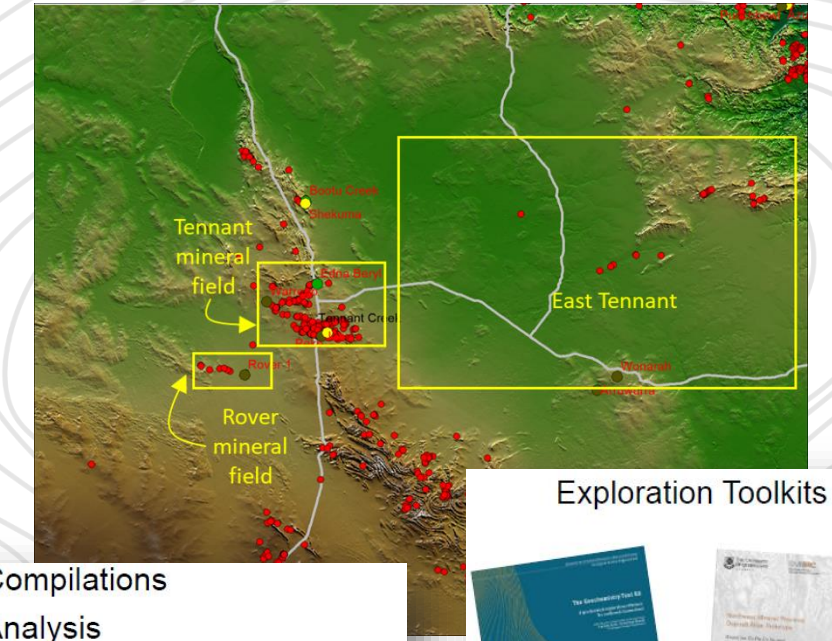
MinEx CRC National Drilling Initiative

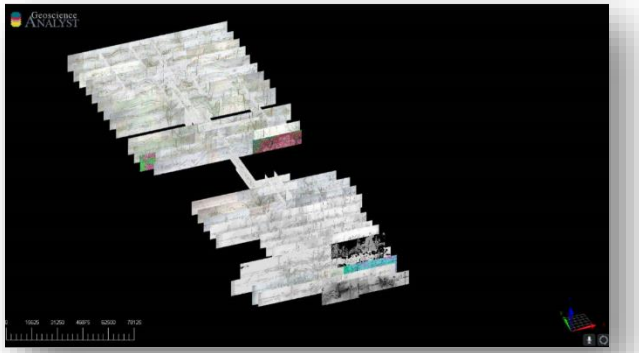
- Stratigraphic drilling in the Barkly region due to commence field season 2020

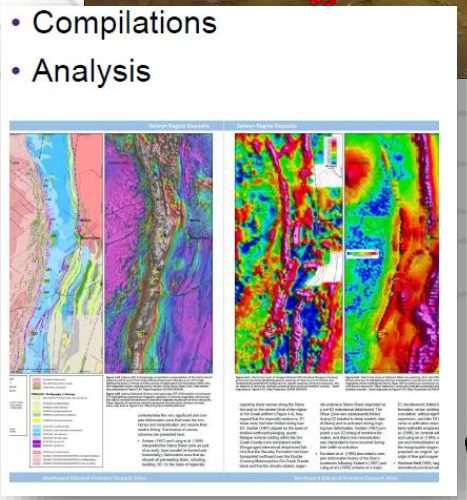
Unlocking the resource potential of the Barkly and Gulf regions

Planned activity in Tennant and Rover mineral fields

- Complete capture of all historic drilling and geochemistry data over region (in progress)
- Commission WH Bryan Mining & Geology Research Centre (Uni Q) to produce mineral atlas for all major deposits, 3D visualisation products, exploration toolkit
- New data to improve the understanding of the below surface geology and base metal mineral systems in Rover field - collaboration with Geoscience Australia







Resourcing the Territory initiative (2018-2022)

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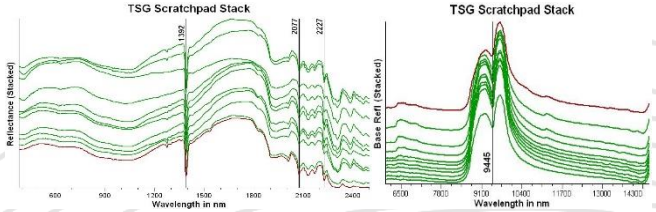
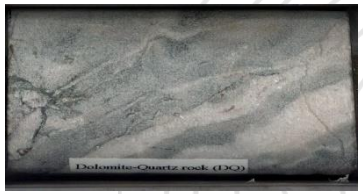
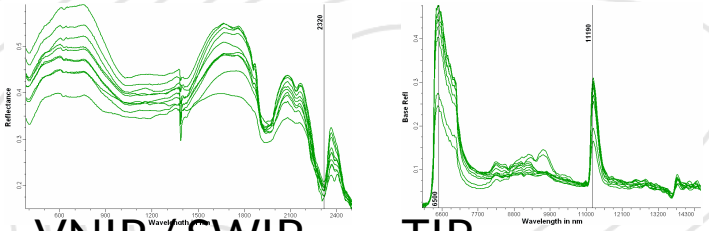
Tennant mineral field

- Build a physical and virtual representative drill core collection for the Tennant mineral field (liaise with industry to identify key drill core)
- HyLog all Tennant mineral field drillcore in NTGS core repositories
- Systematic collection and collation of rock property data
- Collating and gridding all open file industry geophysics



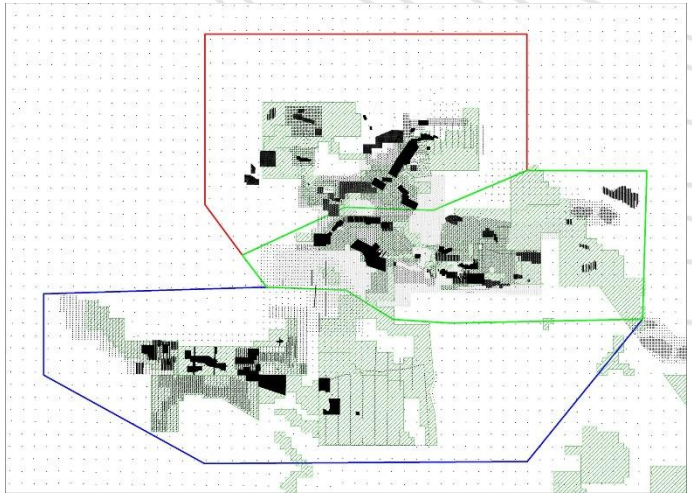
Talc dolomite rock VNIR / SWIR TIR





Dolomite Rock VNIR / SWIR TIR

Tennant Creek Hyperspectral Atlas



Open file industry geophysics

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Resourcing the Territory initiative (2018-2022)

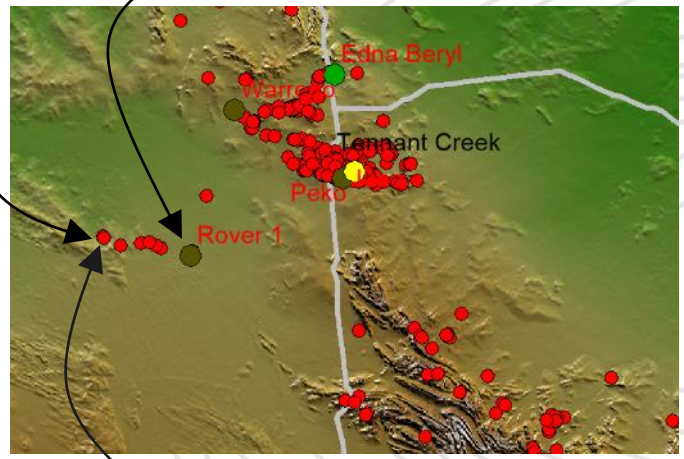
RESOURCING THE TERRITORY

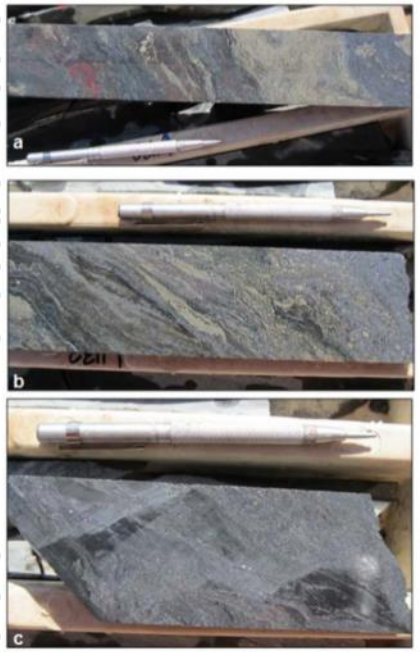
Rover mineral field

- Explorer 108 Pb-Zn and Curiosity prospect – does this represent an different mineralisation style to classic Tennant Creek ironstone hosted Au-Cu?
- Characterise host sequence and mineral system - Explorer 108 mineralisation assoc with dolomite-rich units; Castile conceptual interpretation: Explorer 108 rep Pb-Zn rich end member with Curiosity located along feeder structure proximal to Cu rich zone of the same system

Explorer 108: 11.87 Mt @2% Pb, 3.23% Zn, 11.12 g/t Ag

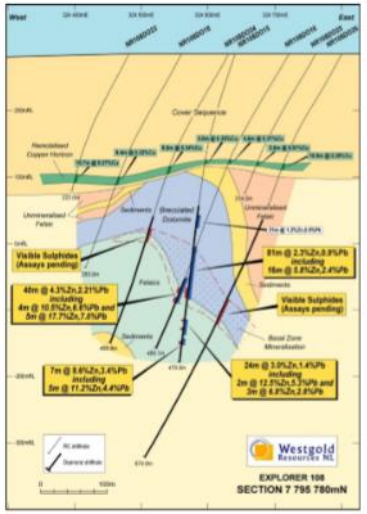
Rover 1: 6.8 Mt @1.7 g/t Au, 1.2% Cu, 2 g/t Ag



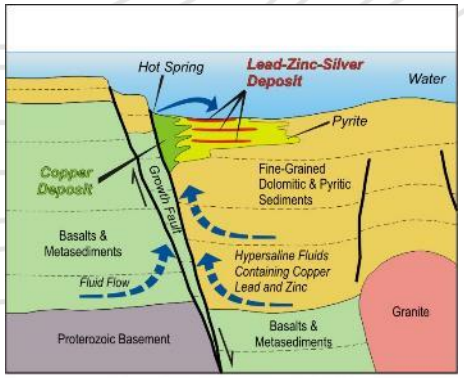


Pyrite, galena, chalcopyrite, sphalerite mineralisation @ Curiosity

Curiosity (MXCURD002): 11.7M @3.73% Pb, 4.86% Zn, 33 g/t Ag, 1.02 g/t Au, 0.24% Cu



Explorer 108 cross section



Proterozoic Base Metal Exploration Model

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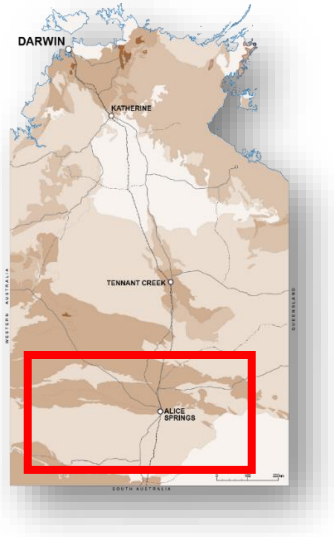
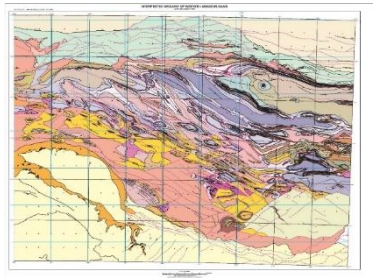
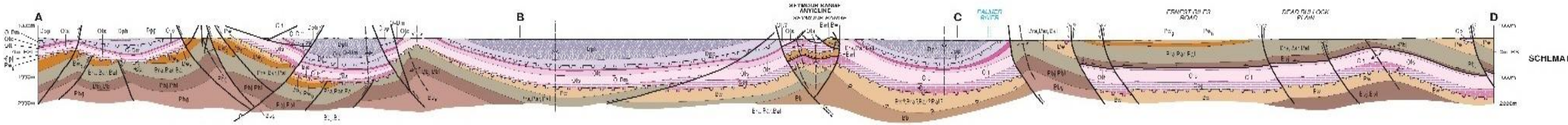
Stimulating greenfields exploration in central Australia



Focus on **Amadeus Basin** and **Aileron Province**

- Fundamental mapping, stratigraphic characterisation and geological framework
- Mineral systems of Aileron Province
  - ❖ Syngenetic deposits (1825-1780 Ma) – typically assoc mafic/bimodal magmatism and exhalites in clastic sediments
  - ❖ Recent discoveries (Grapple; Hendrix) - transgressive massive sulphide breccias that appear epigenetic (or remobilised syngenetic)
- Amadeus Basin: focus on Neoproterozoic stratigraphy and 3D basin architecture





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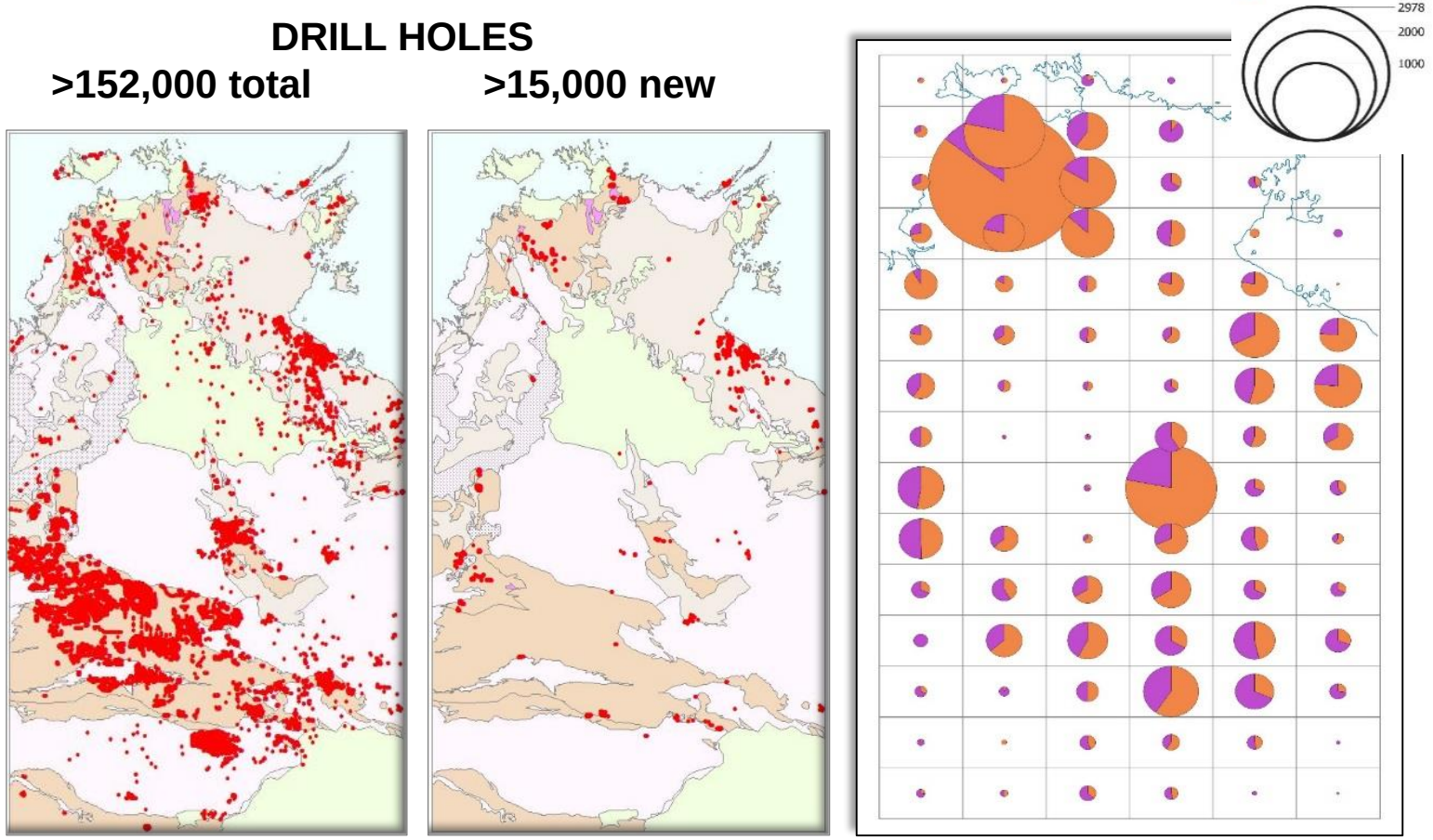
Making exploration and geoscience data more accessible

- Major campaign to upgrade NT-wide drilling and geochemistry datasets
- Ongoing input of incoming data, plus major legacy data capture
- Commenced in Batten Fault Zone, moving to Tennant Creek, then remainder of Barkly



Resourcing the Territory initiative (2018-2022)

RESOURCING THE TERRITORY

Summary

- NTGS is has a diverse range of geoscience programs in progress to stimulate exploration in the NT through the *Resourcing the Territory* initiative.

- In combination with *Exploring for the Future* program this is the biggest campaign of collaborative pre-competitive geoscience in the Territory's history

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Australian Government
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Exploring for the Future
minerals | energy | groundwater

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RESOURCING THE TERRITORY

Geophysics and drilling collaboration program

- Under the 2018-2022 *Resourcing the Territory* initiative grant funding is available to exploration companies for drilling or geophysical acquisition in areas of data paucity or to test innovative techniques
- Up to 50% of costs to a max of $125 000 for diamond drilling and $100 000 for reverse circulation drilling or geophysical acquisition
- All data open file 6 months after completion of program
- An **additional $10 000** funding will be offered to engage NT enterprises to complete works in the NT which must be spent exclusively on local service and supply.