

Resourcing the Territory - future priorities supporting the Territory's economic revival

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Introduction

Following the Minister for Mining and Industry's announcement of the expansion and ongoing funding of the *Resourcing the Territory* program at AGES 2021, the Northern Territory Geological Survey (NTGS) has commenced a range of projects to enhance precompetitive data acquisition and delivery in several key areas across the Northern Territory. The expansion of the annual funding of the *Resourcing the Territory* program to \$9.5 million per year, with the funding to be ongoing, has allowed NTGS to focus on important themes to deliver on the Territory's economic revival.

Competitive grants program to stimulate exploration success

The successful Geophysics and Drilling Collaborations (GDC) competitive grants program will allocate up to \$3 million annually to co-fund selected eligible industry projects that address geoscientific knowledge gaps, advance exploration activity, and support the discovery and development of resources in the Territory.

The program provides co-funding assistance for 50% of the exploration program cost for:

- Drilling programs:
 - greenfields drilling: up to \$200 000 for selected greenfields drilling programs proposing a single, deep diamond drillhole; up to \$150 000 for programs of multiple diamond drillholes or \$100 000 for non-diamond drilling (RC, aircore, sonic, RAB)
 - brownfields diamond drilling: \$150 000 for diamond drilling programs testing new concepts below or adjacent to a known deposit
- Regional-scale geophysics:
 - \$100 000 for regional-scale geophysical acquisition resulting in a significant improvement in the resolution and quality of existing data (contiguous survey area greater than 350 km² or 25 km traverse length)
 - \$150 000 for reflection seismic surveys greater than 25 km length in underexplored areas.
- Innovative targeting:
 - \$100 000 for camp- or prospect-scale acquisition of geophysics or geochemistry where technique and/or approach is innovative in the area of interest; and/or re-analysis of existing sample sets and mine waste to include previously untested commodities (eg critical minerals) and/or improve targeting. This may include multi-element geochemical analysis, petrophysical data collection, or other techniques.

Additional funding is also available through the Territory Supplier Incentive, which offers an additional \$10 000 of co-funding per project to engage NT enterprises to complete works in the Territory.

All reports, drill core and data from the above projects are made public six months after the completion of project field work.

The GDC Round 16 funding is now available for projects to be undertaken during 2023; applications will close on 2 May 2023

Underpinning geoscience knowledge and resource potential through improved geophysical data

- Review and assessment of the quality of existing regional-scale government-acquired aeromagnetic and radiometric data. An audit was undertaken by Geointrepid Consulting Services on historical NTGS airborne data acquisition projects to assess the quality and accuracy of data structures and navigation information. The findings of this audit will identify a processes to recover, repair and upgrade NTGS's airborne geophysical datasets and will assist in designing future acquisition programs.
- Improve regional-scale coverage of potential field data such as ground gravity, through acquisition programs targeting areas where existing gravity data spacing exceeds 4 km.
- Broadening the opportunities for co-funded exploration geophysical acquisition projects through the expanded GDC program to encompass camp- to prospect-scale innovative geophysical acquisition projects in addition to the existing regional-scale opportunities.
- Continued acquisition and compilation of petrophysical data (Hallett 2023) either collected from drill core through the HyLogging™ program or reported through industry submitted company reports.

Accelerating resource development in known mineral provinces

- Expansion of the GDC program to include co-funding of: 1) brownfields diamond drilling of previously untested conceptual targets in areas of known resource potential, and 2) innovative targeting acquiring geophysical and/or geochemical data for camp- or prospect-scale target generation.
- Improve the understanding of the geological framework of the polymetallic Pine Creek Orogen, focusing on the Central Domain through a systematic review of stratigraphy and structural. Initial projects include: 1) 76 analyte reanalysis of legacy geochemical pulps of (meta) igneous units across the Pine Creek Orogeny to assist in redefining magmatic events; 2) construction of a 2D and 3D model of the Burnside area within the Central Domain (Micklethwaite *et al* 2023) to assist in the understanding of structural, stratigraphic and mineral system relationships.

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- Assessing mine waste at selected historical gold mines in the Pine Creek Orogen for secondary prospectivity in critical minerals including REEs (Bhowany *et al* 2023; cf **Applying geoscience to support a low emissions future**). Three mines sites have been sampled across the Pine Creek Orogen, two of which, Mount Bonnie/ Iron Blow and Brocks Creek, were funded through the *Resourcing the Territory* program; and one, Mount Todd, through Geoscience Australia's *Exploring for the Future* program. Analytical results and prospectivity assessments will be released for each individual mine site and ultimately contribute to the Atlas of Australian Mine Waste database being compiled under Geoscience Australia's *Exploring for the Future* program³.
- Improving regional-scale geophysical coverage of ground gravity data across the Pine Creek Orogen to increase resolution of current station spacing from ~11 km to at least 4 km (cf **Underpinning geoscience knowledge and resource potential through improved geophysical data**).
- Collaborative partnership with CODES, University of Tasmania (awaiting Australian Research Council funding approval) to extensively and systematically analyse mineral chemistry and event chronology across the Tennant Creek mineral field and East Tennant area to fingerprint productive mineralising events (Steadman *et al* 2023; cf **Applying geoscience to support a low emissions future**).

Attracting and supporting resource development in frontier areas

- Undertake sedimentological characterisation to support stratigraphic correlations across the greater McArthur Basin (Close 2014) focusing on the Palaeoproterozoic Glyde package (Munson 2023).
- Establishing sedimentary facies associations and lithofacies within the Birrindudu Basin via detailed, systematic drill core logging of key drillholes to facilitate the creation of a consistent sedimentological and stratigraphic framework for the Basin (Crombez *et al* 2023). Collection of complementary datasets including gamma ray, sonic velocity and pXRF during the facies logging process, coupled with targeted isotopic analysis geochronology and geomechanical data, will provide extensive information to assist in correlating stratigraphy across the greater McArthur Basin, constructing 3D surfaces, and forming the basis for energy and mineral system analysis.
- Continuing a seamless approach to upgrading 1:250 000 geological outcrop mapping across the Amadeus Basin with the commencement of mapping on the 2nd edition Rodinga 1:250 000 geological series mapsheet. The project will continue to revise the understanding of stratigraphic and structural relationships of the Neoproterozoic to Palaeozoic basin, initiated through the characterisation of the well exposed Neoproterozoic stratigraphy in the northeastern section of the basin (Normington and Donnellan 2020); and applied through

the 2nd edition mapping of Henbury, Lake Amadeus and Bloods Range 1: 250 000 geological series mapsheets. Upon completion of field checking of key locations in the Rodinga area of the north eastern Amadeus Basin, the East Amadeus Basin 1:500 000 interpreted geology map will be published, complementing the West Amadeus Basin 1:500 000 interpreted geology publication (Weisheit 2021) and providing seamless interpretation at that scale.

- Collaborating with Geoscience Australia and the South Australia Department for Mines and Energy to provide improved data and interpretation of the stacked Neoproterozoic to Palaeozoic Warburton, Pedirka and Eromanga basins. The extension of these basins into the Northern Territory is poorly exposed at surface and is relatively underexplored. Through Geoscience Australia's *Australia's Future Energy Resources* (AFER) project (Fraser 2023) and integrating vital information from the more intensively explored South Australian extension of the basin systems, a greatly improved understanding of the geological framework (Verdel *et al* 2023), energy systems (Jarrett *et al* 2023), and potential for carbon and hydrogen storage, will be achieved. Through *Resourcing the Territory*, NTGS will be improving the resolution of ground gravity in this area from an ~11 km station spacing to a minimum 4 km spacing (Dhu 2023; cf **Underpinning geoscience knowledge and resource potential through improved geophysical data**).
- Continuing to update geological series map production from the Aileron and Irindina provinces with the publication of 1st edition Jinka 1:100 000 geological map (Weisheit *et al* 2022) and explanatory notes (Reno *et al* 2022), and the upcoming 2nd edition Huckitta 1:250 000 geological series map documenting the geology of these polymetallic terrains; and thereby providing a consistent stratigraphic and tectonothermal framework for mineral system studies such as epigenetic copper and tungsten mineralisation in the Jervois, Bonya Hills and Molyhil areas (McGloin and Weisheit 2022) and the VMS style mineralisation at the Home of Bullion copper deposit (Stuart 2022).

Applying geoscience to support a low emissions future

- Collaborative partnerships (awaiting Australian Research Council funding approval) with Australia Critical Minerals Centre, University of Adelaide; ARC Training Centre in Critical Resources, University of Western Australia; and CODES, University of Tasmania to undertake research projects across the Northern Territory to improve the understanding of LCT pegmatites (Pine Creek and Aileron/Irindina regions), cobalt and bismuth rich systems (Tennant region), and potentially REEs in phosphorites in the Georgina Basin.
- Commissioning CSIRO to undertake a desktop screening study of key Northern Territory onshore basins for CO₂, H₂ and compressed air storage capacity.
- Expanding GDC co-funding through the Innovative targeting criteria supporting the re-analysis of existing samples for untested commodities such as critical minerals (cf **Competitive grants program to stimulate exploration success**).

³ <https://www.ga.gov.au/news-events/news/latest-news/atlas-of-australian-mine-waste-puts-secondary-prospectivity-on-the-map>

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