# Reimagining Northern Territory geology and prospectivity through investment in precompetitive geoscience

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A key feature of the *Resourcing the Territory* program is the acquisition and interpretation of precompetitive data in targeted areas of the Northern Territory to redefine the understanding of the geology and resource potential, with the intention of stimulating exploration investment. Strategies such as improving the resolution of regional-scale geophysical datasets; redefining the stratigraphy, structure and tectonic evolution of selected geological provinces such as the Pine Creek Origin, the greater McArthur Basin and the Amadeus Basin; plus collaborative partnerships with Geoscience Australia, CSIRO and universities, and strong relationships with active explorers in the NT have been key to delivering results.

## Geophysical data – the crucial starting point

Investment in modern, accurate and accessible regional-scale geophysical datasets has been a long-term strategy for the Northern Territory Geological Survey (NTGS) under the current *Resourcing the Territory* program and previous Northern Territory government-funded initiatives. Activities include regional-scale acquisition programs for potential field data that allow infill opportunities for tenure holders; co-investing with Geoscience Australia on seismic acquisition programs like the Northwest Northern Territory Seismic Survey (Henson *et al* 2024); uplifting historical government-acquired potential field surveys to improve accuracy and usability (Dhu 2024); collaborating with CSIRO to standardise and improve regional-scale industry acquired airborne electromagnetic (AEM) surveys plus the compilation and acquisition of rock property data.

In late 2025 and early 2026, NTGS released the Pine Creek Gravity Survey and West Arnhem Ground Gravity Survey, which delivered more than 16 000 new gravity stations in a total area of over 100 000 km$^2$ at spacings from 500 m to 4 km (Dhu 2026). This is a generational improvement in the resolution of regional-scale gravity data from the previous 11 km spaced data over that area.

In 2026, NTGS will undertake the Southern Georgina Ground Gravity Survey (Dhu 2026), which will complete ground gravity coverage of the entire Northern Territory at a minimum of 4 km spaced resolution. This year, NTGS will also undertake two regional-scale airborne magnetic and radiometric surveys over almost 50 000 km$^2$ in the highly prospective, polymetallic Pine Creek region (Dhu 2026).

Historical regional-scale geophysical data acquired by NTGS is being reviewed and 'uplifted' to improve the accuracy and reliability of these datasets. Surveys with poor navigation data, incorrectly located data, missing metadata, and erroneously or variably gridded data have been identified and are being systematically re-released as standardised located and gridded products with completed and standardised metadata.

Through a collaborative project with CSIRO, NTGS released *CSIRO–NTGS McArthur Basin Project: analysis and interpretation of historical AEM data sets* (Mule *et al* 2021), a collation of open-source AEM data sets within the southern McArthur Basin, with documented system characteristics, and modelled data to produce maps of subsurface conductivity. To further improve accessibility and usability of AEM data in key areas of the Northern Territory, NTGS is collaborating with CSIRO in 2026 to apply CGT (CSIRO Geophysics Toolkit), to enable efficient and effective processing and inversion of AEM datasets for the Tanami Region and produce data packages for each processable data set.

## The polymetallic Pine Creek Orogen

The Pine Creek Orogen is arguably the Northern Territory's most prospective geological province, containing polymetallic mineral systems that host commodities such as gold, uranium, lithium, iron ore, copper, lead, zinc, nickel, cobalt, REEs, graphite and magnesite. Under the *Resourcing the Territo*ry program, NTGS has focussed on modernising the understanding of the geological framework of the province through improving the resolution of geophysical coverage (see above), undertaking extensive multielement whole-rock geochemistry, targeted isotopic analysis, detailed lithological descriptions and structural interpretation. Early interpretation of the acquired data has led to a revised understanding of the stratigraphy, magmatic, metamorphic and structural evolution of the province (Reno *et al* 2025, Burton-Johnson *et al* 2025).

To further improve accessibility to open-source data, in 2026 NTGS will release a compilation of industry-submitted geophysical data that will include reprocessed magnetic, radiometric, plus spatially referenced and fully attributed induced polarisation data (Dhu 2026).

## The resource-rich greater McArthur Basin

NTGS has undertaken an extensive program under the *Resourcing the Territory* program and previous Northern Territory government-funded initiatives to improve the understanding of the highly prospective Palaeo–Mesoproterozoic McArthur, Birrindudu and South Nicholson basins, Lawn Hill Platform and Tomkinson Province. A vital component to the success of these ongoing investigations has been outstanding collaborations with Geoscience Australia, Adelaide University and CSIRO. Products will be continually released across the greater McArthur Basin and include: the 3rd edition MOUNT DRUMMOND 1:250 000 geological series map and explanatory notes (Munson *et al* 2025) that incorporates the findings from Geoscience Australia's Exploring for the

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Future South Nicholson Basin region project; an updated version of the interpretation-ready Kingdom seismic project – Beetaloo Sub-basin (Jason 2018) that will incorporate all seismic survey date across the greater McArthur Basin: and the release of the ELLIOT SPECIAL 1:100 000 geological series map and explanatory notes.

**The resource potential of the Amadeus Basin**

Products released this year from ongoing geological mapping by NTGS in the Neoproterozoic to Palaeozoic Amadeus Basin to produce seamless 1:250 000 scale coverage will include LAKE AMADEUS, BLOOD RANGE and RODINGA 1:250 000 geological maps and explanatory notes. HENBURY 1:100 000 geological map and explanatory notes will also be released.

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