

Exploring for the Future: Boosting exploration for resources in northern Australia

As part of a wider Australian Government initiative to boost exploration for resources in northern Australia, Geoscience Australia (GA) is leading the four-year *Exploring for the Future* program to help identify potential mineral, energy, and groundwater resources across the region.

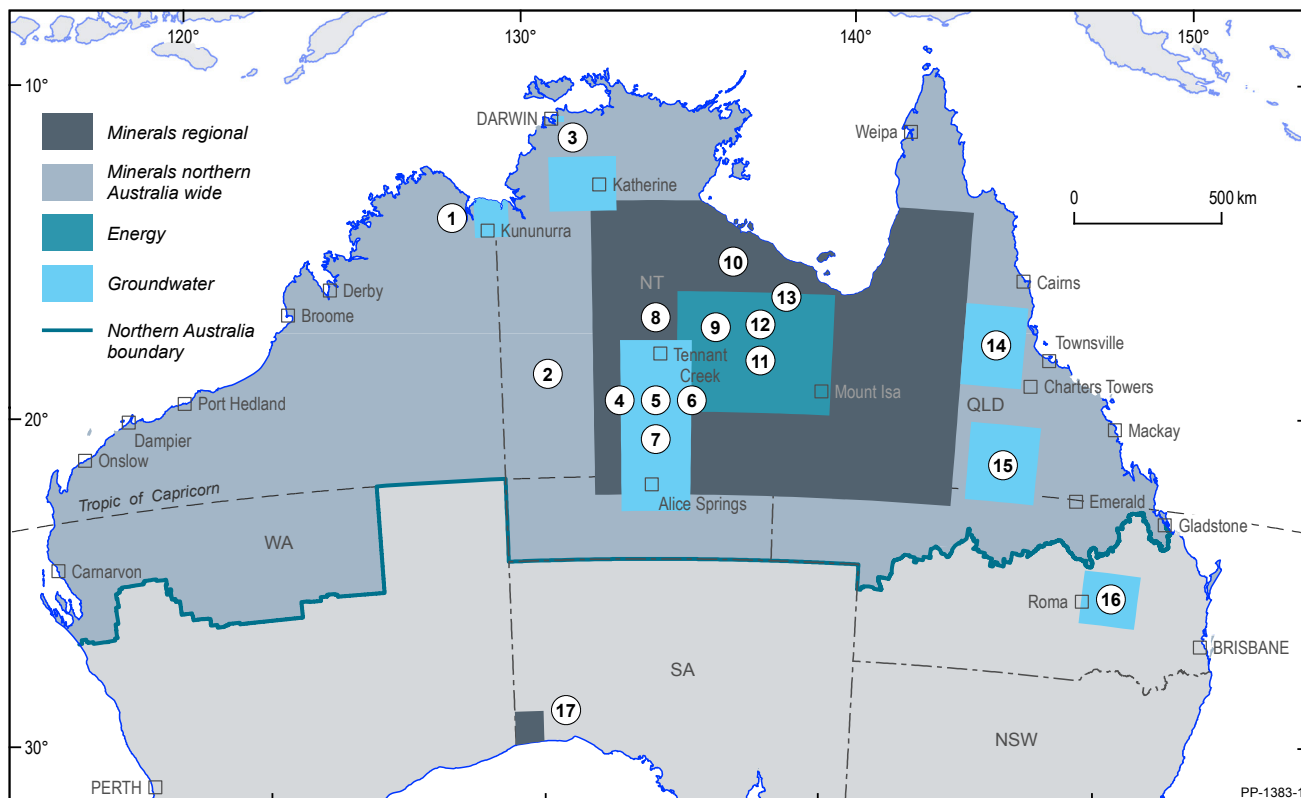
The program will deliver new pre-competitive data and information on minerals, energy and groundwater in collaboration with state and territory partners to guide and encourage investment in onshore resource exploration.

With the first year of field work now complete, our teams have collected a range of valuable research data and information across northern Australia and parts of South Australia.

Over the next three years, we will be collecting even more geoscientific data and then processing and compiling it to make it freely available for public use.

Our scientists and technicians are using innovative tools and techniques to gather new data using geophysical surveys, geochemical sampling, hydrological mapping and stratigraphic drilling.

An overview of current *Exploring for the Future* activities



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| ① AEM survey, East Kimberley | ⑦ Southern Stuart Corridor AEM survey | ⑬ North Australia geochemistry survey |
| ② Solid geology map | ⑧ Hydrogeochemistry sampling, Tennant Creek | ⑭ Bore hole monitoring, Upper Burdekin |
| ③ AEM survey, Northern Stuart Corridor | ⑨ AusLAMP survey | ⑮ AEM survey, Galilee Basin |
| ④ AusAEM survey, Mt Isa to Tennant Creek | ⑩ Hydrogeochemistry sampling, McArthur Basin | ⑯ AEM survey, Surat Basin |
| ⑤ Onshore drilling assessment, Mt Isa to Tennant Creek | ⑪ South Nicholson gravity survey | ⑰ Coompana drilling program |
| ⑥ AusARRAY survey, Mt Isa to Tennant Creek | ⑫ South Nicholson seismic survey | |

Minerals

The minerals component of the *Exploring for the Future* program focuses on identifying geological provinces that have the greatest potential for various mineral deposits.

Our main aim is to characterise the geology of the northern part of the Australian tectonic plate from the surface down to its base through a multidisciplinary approach of data collection and synthesis, to unravel the fingerprints of ore-forming systems, which transect these scales.

An area between Tennant Creek and Mount Isa has been selected to carry out focused integrated studies for mineral potential assessments. These assessments will focus on copper, gold, lead, zinc and uranium and will involve additional geoscientific data acquisition and knowledge generation.

Image: Vibroseis trucks acquiring seismic data



Activities

- **AusAEM surveys:** a series of airborne electromagnetic (AEM) surveys will take place across a large region of northern Australia, using a broad line spacing of 20 km. It is the largest AEM survey of its kind ever undertaken. In the 2017 field season, 20 000 line-km were acquired. Public release of this data is expected by March 2018. An additional 40 000 line-km will be acquired in the 2018 field season.
- **South Nicholson gravity survey:** 2724 gravity stations collected at 4km spacing. The data was released October 2017.
- **AusLAMP surveys:** The \$3.1 million Australian Lithospheric Architecture Magnetotelluric Project (AusLAMP) commenced late in 2016, with instruments installed around Tennant Creek, and is continuing throughout regions of the NT and Queensland. The project will measure the electrical conductivity structure of the crust and upper mantle to detect ancient pathways of mineral-bearing fluids, thereby providing vectors to mineral deposits. Data from 160 sites have been acquired in northern Australia.
- **AusARRAY surveys:** The Australian Passive Seismic Array Project (AusARRAY) is a collaborative, national survey that acquires seismic velocity data. Launched in July 2017, data from 120 sites are being acquired in northern Australia. This first array will be installed for a year, spaced approximately 55 km apart in an area spanning the NT–Queensland border.

- **Hydrogeochemistry sampling:** 20 unique groundwater samples collected from sites around Tennant Creek and McArthur Basin.
- **North Australia geochemistry survey:** 782 overbank surface sediment samples were collected during a helicopter assisted program between May and June 2017. The data is currently being processed and interpreted.
- **Solid geology map:** A solid geology interpretation of the area from Mt Isa to Tennant Creek and Darwin which progressively strips off Cenozoic, Mesozoic and Palaeozoic rocks has been generated and is out for review with state and territory geological surveys. This is a first step towards a national 3D geology map.
- **Isotopic atlas:** Samples have been collected from drill core libraries and submitted for analysis to measure neodymium and lead isotopes to map the main crustal boundaries of northern Australia. A compilation of argon data has commenced.
- 25 new uranium-lead geochronological age dates of key rock types of northern Australia has been completed and delivered in three reports.
- **Coompana Drilling Program:** More than 1800 metres of high-quality drill core samples have been collected from eight stratigraphic drill holes in partnership with the Geological Survey of South Australia.
- **Onshore drilling assessment:** Desktop based investigations are underway to assess the potential of the Tennant-Isa region for iron oxide-copper-gold and basin-hosted mineral systems. This desktop assessment, in addition to geological interpretations arising from new data acquisition, will inform stratigraphic drill targeting for the 2019 dry season.



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Energy

The energy component of the *Exploring for the Future* program will concentrate on the evaluation of the oil and gas prospectivity and resource potential of sedimentary basins.

Historically, the most valuable data to predict oil and gas resources has been seismic reflection data to understand the architecture of the basins and corresponding well data to analyse the potential of an active petroleum system. These techniques will also be the primary acquisition techniques for the new data due to their effectiveness; however, they will be supplemented by a variety of innovative techniques and interpretations to ensure the best outcomes.

Activities

- **South Nicholson Basin:** seismic surveys were conducted over the South Nicholson Basin in 2017. The processed data will be available in early 2018. Stratigraphic drilling will take place over the next two years to collect rock samples that will provide information on the resource prospectivity.
- **Kidson Sub-basin:** Planning for geophysical data acquisition is underway for the 2018 field season and the interpretation of the data will inform the location of stratigraphic drilling to acquire rock samples. This activity will enable improved understanding of the sub-surface geology and provide detailed information on mineral and hydrocarbon prospectivity.

Groundwater

The groundwater component of the *Exploring for the Future* program will assess the location, quantity and quality of potential groundwater resources in five regional areas to underpin future opportunities for irrigated agriculture, mineral and energy development, and community water supply.

The program will comprise both targeted regional investigations and analysis of groundwater prospectivity more broadly across northern Australia. Five regional areas have been selected for new targeted geoscience studies:

- East Kimberley
- Northern Stuart Corridor (Howard East and Daly River Basin)
- Southern Stuart Corridor (Tennant Creek to Alice Springs)
- Upper Burdekin
- Surat and Galilee Basins.

Activities

- **Southern Stuart Corridor:** 9613 line-km airborne electromagnetic survey completed; 21 bores logged for induction and gamma geophysics.
- **Northern Stuart Corridor:** 5423 line-km airborne electromagnetic survey completed; 50 bores logged for induction and gamma geophysics.
- **East Kimberley:** 13 379 line-km airborne electromagnetic survey completed with financial contribution from NT Department of Environment and Natural Resources from the Commonwealth National Water Infrastructure Development Fund for the Ord Stage 3: Keep River Project); 7920 km² LiDAR elevation data acquisition completed; 1071 station passive seismic and gravity survey completed; 161 station surface nuclear magnetic resonance survey completed; 25 water samples collected and analysed.
- **Surat and Galilee Basin AEM surveys:** 4477 line-km of airborne electromagnetics completed.
- **Upper Burdekin:** eight new water bores drilled; water level loggers installed at 14 water bores; 56 water samples collected and analysed.

For Further Information:

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