



GROUND AND SURFACE WATERS

GISERA | Gas Industry Social and Environmental Research Alliance

Groundwater connectivity the Eastern Beetaloo Sub-basin extension

CSIRO scientists will head out to central Northern Territory to collect new baseline environmental data to characterise groundwater flow processes governing connectivity in a recently identified extension of the Beetaloo Sub-basin.

Key points

- Recent geological investigations have identified an eastern extension of the Beetaloo Sub-basin in the Northern Territory.
- This area is geologically complex and has not been fully included in previous research programs focused on water resource planning and management.
- This project will gather new baseline environmental data on groundwater flow processes governing connectivity in the area.
- CSIRO scientists will head out to central Northern Territory to collect new baseline environmental data in the eastern extension of the Beetaloo Sub-basin.
- It builds on previous work suggesting there is potential for connectivity between the Cambrian Limestone Aquifer (CLA) and surface features.
- The project will provide new information to underpin future decision making on water and energy resource planning, investment and management.

This project, conducted through CSIRO's Gas Industry Social and Environmental Research Alliance (GISERA), will investigate potential connections between sub-surface formations which may host gas reserves within the eastern extension of the Beetaloo Sub-basin, the Cambrian Limestone Aquifer (CLA) and its sub-units, and the surface.

Through analysis of existing data and the collection of new data through fieldwork in the region, researchers will determine potential impacts that may occur if unconventional gas resources are developed in the eastern Beetaloo Sub-basin extension.

Project outcomes will help guide water infrastructure planning and investment, and inform water management and regulation to ensure water availability to ecologically and culturally important ecosystems.

This project has links to another similar CSIRO GISERA research project which is collecting baseline environmental and hydrogeological data in the nearby [Hot Springs Valley](#), located on the north-eastern margin of the Beetaloo Sub-basin.



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The Beetaloo Sub-basin

The Beetaloo Sub-basin lies southeast of Katherine in the Northern Territory and spans approximately 30,000 square kilometres.

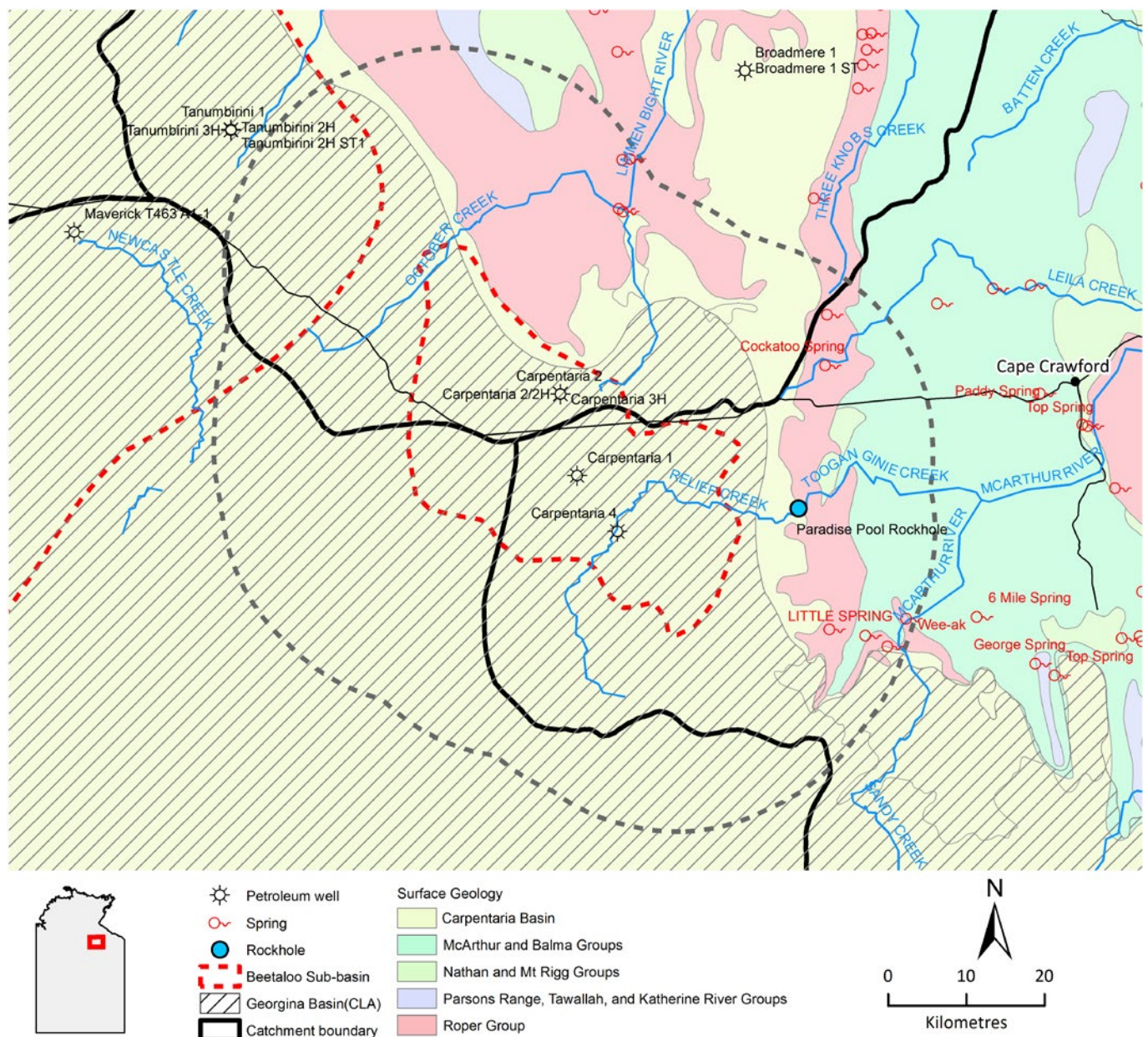
The estimated gas resources for the Beetaloo sub-basin are of similar size to other major gas producing basins in Australia, such as the Surat Basin in Queensland and the Bonaparte/Browse basins in Western Australia.

The Cambrian Limestone Aquifer (CLA) system is the major aquifer in the Beetaloo Sub-basin with important cultural, environmental and economic values.

Recent geological investigations in the central McArthur Basin have identified an eastern extension of the Beetaloo Sub-basin.

The fault zones within the eastern extension host geological sequences are folded, faulted and displaced, and may include pathways that provide connections between gas bearing formations and the the overlying Cambrian Limestone Aquifer (CLA) hosted in the Georgina Basin.

The boundary of the McArthur and Georgina basins also coincides with numerous springs and waterholes that are known to be ecologically and culturally important.



Location of the eastern extension of the Beetaloo Sub-basin and its geological context



Abner Range near the Carpentaria Highway. This is a dramatic example of ancient sandstone formations that outcrop in central Northern Territory.

Project objectives

While recent research, including the Strategic Regional Environmental and Baseline Assessment (SREBA) and the Geological and Bioregional Assessment (GBA) have provided useful new information to assist with water resource planning, investment and management across the Beetaloo Sub-basin, those programs did not fully include the eastern extension of the Sub-basin.

The potential impacts on water resources from unconventional gas exploration and development in this area remains poorly understood. This GISERA project aims to address that knowledge gap.

Elsewhere in the Beetaloo Sub-basin, the aquifers of the Carpentaria Basin, the Cambrian Limestone Aquifer (CLA) and Roper Group are separated by aquitards.

In the eastern extension, these aquitards are absent and therefore new research is required to determine whether mixing of these water sources does occur and whether this needs to be considered further if the unconventional gas industry is developed in this region.

This research project will collect new baseline environmental data to better characterise groundwater flow processes governing inter aquifer-aquitard connectivity and groundwater–surface water connectivity in this area and provide new information to underpin future decision making on water and energy resource planning, investment and management.

This is necessary to build understanding of any potential impacts from an unconventional gas industry and put in place measures to mitigate those potential impacts.

Project methodology

The research team will undertake three key tasks. These are:

- Development of an initial conceptual hydrogeological model of the CLA over the Eastern Beetaloo Sub-basin extension. This will involve building a 3D model and/or cross sections of aquifer systems and potential pathways to the surface through integration of multiple lines of evidence (e.g. geological, hydrogeological, hydrochemical and geophysical data).
- A field campaign to demonstrate and refine this conceptual hydrogeological model, and to collect baseline hydrochemistry and isotope data from selected springs, groundwater bores and water holes prior to any potential development of gas resources. As part of preparation for the fieldwork a priority will be negotiating access to bores, springs and waterholes to take water samples, and early engagement with Traditional Owners (through the NLC) will be key.
- Identification and discussion of the potential impacts caused by the development of unconventional gas resources on the water resources of the region, based on the refined conceptual hydrogeological model. This will involve looking at hazards such as surface spills, well and aquitard integrity, and drawdown propagation.

Communicating the intent of this research project and its findings to community stakeholders has been identified as highly important for the success of this project. This will encourage discussion and support decision making within and across multiple stakeholder groups.

More information

Read more [about this project](#)

Learn about [other GISERA research in the Northern Territory](#)



Examples of the natural groundwater springs that occur at the surface of the the eastern extension of the Beetaloo Sub-basin: aerial view – Paradise Pool Rockhole; close up – Wee-ak Spring. Photo from Zaar (2009).

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GISERA is a collaboration between CSIRO, Commonwealth and state governments and industry established to undertake publicly-reported independent research. The purpose of GISERA is to provide quality assured scientific research and information to communities living in gas development regions focusing on social and environmental topics including: groundwater and surface water, greenhouse gas emissions, biodiversity, land management, the marine environment, and socio-economic impacts. The governance structure for GISERA is designed to provide for and protect research independence and transparency of research.