



A RESEARCH PROSPECTUS FOR THE GREAT ARTESIAN BASIN

(as revised June 2009)

Purpose of the *Research Prospectus* [see www.gabcc.org.au for full text]

The Great Artesian Basin (GAB) is the world's largest fresh water artesian aquifer system and one of Australia's most important water resources. Landholders and governments have invested many millions of dollars in the GAB to rehabilitate bores, renew water delivery infrastructure and improve knowledge about the Basin and the benefits that it provides. With this investment comes the opportunity to improve GAB management and support the values attached to the GAB. However, our knowledge of the Basin is incomplete. Additional research is required on the structure, functions and values of the GAB, the infrastructure used to access GAB resources, higher value uses for GAB resources and GAB management and investment. The Great Artesian Basin Coordinating Committee, a national advisory group to government on management of the GAB, with representatives from all stakeholder groups, is well placed to work with research and funding organisations to encourage and facilitate priority research.

The aim of the *Research Prospectus* is to identify priority GAB research. It is hoped that the *Prospectus* will guide the preparation of new research proposals that provide an opportunity for researchers, industry and resource managers to collaborate in meeting the needs of the management of the Basin into the future.

In principle:

- research should focus on identified areas of strategic priority, and inform/influence practice and policy.
- research findings should be accessible to a wide audience, and
- cooperation should be maximised and duplication minimised.

In this context, research is defined as any form of inquiry seeking evidence to increase knowledge and includes activities that expand, clarify, reorganise and/or create knowledge. It includes not only traditional scientific research but also approaches like surveys, literature reviews, case studies, statistical analysis and focus groups.

Addressing the research questions

The GABCC has identified important knowledge gaps in a range of research areas. The GABCC invites potential researchers/contractors to provide proposals to address the priority research questions outlined below. These questions have been grouped under five themes: 1. Understanding the resource; 2. GAB access infrastructure; 3. Monitoring and measurement; 4. Higher values uses; and 5. Valuing investment and allocation.

This document outlines the questions in **theme 2: GAB access infrastructure**.

2. GAB access infrastructure

Governments and landholders have worked cooperatively to invest in the best science and technology available to rehabilitate bores, improve water delivery infrastructure and change practices to ensure that water is used judiciously. Substantial gains have and are being made in eliminating waste and restoring pressure. Over \$350M will have been invested into the Great Artesian Basin Sustainability Initiative (GABSI) alone, by its completion at the end of 2014. These investments need to be protected.

2.1 Water bore failure

Water bores constructed both privately (non-GABSI), and as part of the GABSI program, have an anticipated lifetime largely determined by the method of construction, construction standards and landholder water bore maintenance.

The failure of older water bores, and more recently some water bores constructed under GABSI, is an emerging issue that jurisdictions and landholders will need to resolve. These failures are likely to continue to occur as infrastructure deteriorates over time. Any response requires an understanding of the likelihood of water bore failure (both GABSI and privately constructed works) and the risks to the groundwater resource associated with any failures. In planning and determining a response to this issue, a projection of the number of water bores that are anticipated to fail is needed to determine the extent of any future investment required.

Priority research questions

- a. What methods and data do we need to assess the risk of bore failure?
- b. Can we project the future failure of water bores in the GAB?
- c. What are the current knowledge gaps in why water bores fail?
- d. How does a risk profile shape projection of landholder and government costs for infrastructure?
- e. What technical advances in construction and materials are required to prolong the life of water bore infrastructure?
- f. What do we need to know about increased costs of construction and materials?
- g. What data do we need to collect on construction materials?
- h. What are implications for databases and storage of materials information?
- i. What do we need to do about standards for construction and materials?
- j. What methods can be used for down-hole assessment of bores?

2.2 Failure of distribution systems

Since the 1980s Australian and state governments have assisted landholders in undertaking rehabilitation of uncontrolled water bores and the replacement of open bore drains with closed distribution systems. In many cases, state governments have established minimum construction guidelines for piping systems (e.g. tanks, troughs, cooling ponds, scour valves, air release valves) with the best available technical knowledge. In addition, state government engineers undertake the role of system design.

During the period of investment under GABSI and its predecessors, there have been failures in distribution systems including cooling pond design and polytank failures. While the best available knowledge and materials are used during the design and construction of these assets, it is anticipated that some failures will continue to occur. This has implications for the future maintenance of these distribution systems and associated costs, landholder confidence in the program and jurisdictional response to any failures into the

future. Investigation into ways to predict, monitor and respond to distribution system failure is needed.

Priority research questions

- a. What methods can be used to assess the risk of system failure?
- b. Can we project the future failure of distribution systems?
- c. What information would we collect to assess system condition?
- d. What are the current knowledge gaps in why distribution systems fail?
- e. What are the future management costs of piped systems?
- f. How does a risk profile shape projection of landholder and government costs for infrastructure?
- g. What data do we need to collect on construction materials?
- h. What are implications for databases?
- i. What do we need to know about increased costs of materials?
- j. What are issues around distribution design?
- k. Are standards in materials and design adequate?

2.3 Down-hole leakage

Jurisdictional investment in capping and piping has historically focused on the loss of water from artesian water bores at the surface; however, in some circumstances, water (and pressure) is also being lost below ground.

The current extent of 'down-hole' leakage in the GAB is unknown, but there is a growing perception within the community that it is a significant issue for pressure recovery in the GAB. This is an issue which may be occurring in both subartesian and artesian water bores. If down-hole leakage is confirmed as an issue, adequate technical information is needed to support any policy resolutions and any future decision making within the jurisdictions (e.g. regulatory compliance, potential future work under GABSI or similar subsidy program, water bore construction standards).

Priority research questions

- a. What is an appropriate methodology to identify and characterise the extent and occurrence of this issue in the GAB?
- b. Should partnerships be developed within the Petroleum and Gas industry and with academic researchers to develop methodologies to characterise this issue?
- c. What effect will down-hole leakage have on pressure recovery and the maintenance of environmental flows?
- d. What rehabilitation options are available for these water bores?
- e. How can we assess the costs to rehabilitate down-hole leakage?

2.4 Sub-artesian water bores returning to artesian conditions

As result of investment in capping and piping, measurable pressure recovery is occurring in the GAB. In marginal areas this is resulting in some subartesian water bores returning to artesian conditions. Bores currently in this condition are unlikely to be operating open bore drain distribution systems. This has implications for eligibility for inclusion in GABSI phase 3, and for the protection of pressure recovery that has resulted from GABSI and its predecessors. Investigation into the potential for a return to artesian conditions and ways to monitor pressure recovery is required.

Priority research questions

- a. Where and how many water bores are likely to return to artesian conditions?
- b. What tools do we need to better assess, manage and map recovery in these areas?

Further information

Partnerships

The Committee is not well placed to directly undertake research. However, the Committee is well placed to

- provide leadership and focus strategic research
- broker relationships within the research community and between industry, policy and research groups
- build a knowledge base, and
- communicate research to a wide audience.

Scholarships

The GABCC has established two PhD top-up scholarships, each valued at \$5,000 per annum over three years. These top-up scholarships are intended to supplement the funding of primary scholarship holders who intend to conduct innovative research that will address priority research questions and themes identified in the *Research Prospectus*.

How to get involved

For further information on the *Research Prospectus*, potential for partnering or the PhD top-up scholarships, or to indicate your interest, please contact the GABCC Secretariat or complete a registration of interest form – see www.gabcc.org.au for further information.