



## **A RESEARCH PROSPECTUS FOR THE GREAT ARTESIAN BASIN**

(as revised June 2009)

### **Purpose of the *Research Prospectus*** [see [www.gabcc.org.au](http://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 1: Understanding the resource**.

## **1. Understanding the resource**

The structure and function of the GAB has been a topic of on-going research since its discovery more than a century ago. Natural discharge from the GAB, and the biological communities that depend on the springs and soaks, have also been investigated. Monitoring of bores in the Basin has contributed to knowledge about the GAB and its management. Much of the work on the GAB has been published and bibliographies are available for review. However, the GAB is a very extensive and complex aquifer system and significant knowledge gaps still limit the reliability of management and investment decisions. Additional research on understanding the Basin is required in the areas listed below.

### **1.1 Water balance**

Many of the components of the water balance in the GAB have been estimated through very broad scale simplified modelling or extrapolated from point source or site measurements. An understanding of the characteristics of the principal aquifers - and the volumes, rates and processes of water movement into and through them - is necessary to predict the consequences of various management options.

#### *Priority research questions*

- a. How can the assumptions and errors in the water balance be improved on?
- b. What are the vital gaps in our knowledge of the water balance that restrict management?
- c. What do we know about rates of up and down leakage between aquifers?
- d. What are the volumes of recharge?
- e. What are the aquifer recharge processes?

### **1.2 Surface/groundwater interaction**

While much of the GAB is confined, in the intake areas rivers and streams run across the exposed sandstone aquifers. The National Water Initiative (NWI) and other initiatives demonstrate the increasing recognition of the connectivity between surface water and groundwater systems, and the need to plan and manage accordingly.

#### *Priority research questions*

- a. How do we set priorities for investment for research into springs and surface water groundwater interaction?
- b. How does management of GAB impact on surface water management?
- c. How does management of surface water impact on GAB management?
- d. How is this accounted for in plans?
- e. What can we do to bring together a database/map of natural discharge/stream baseflow sections?
- f. What is the importance of diffuse discharge?

### **1.3 Springs and other groundwater dependant ecosystems**

The springs in the discharge areas of the GAB are listed as threatened ecological communities under the federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and many springs are also protected under state legislation, in conservation areas and through water management plans. There has been research into the ecology of the springs identifying many endemic species, and many of the threats to their continued existence and unique qualities have also been identified. However, more

information is needed on their ecological significance, the processes that threaten them and how best to manage these processes.

*Priority research questions*

- a. What is the local hydrology around springs?
- b. How important are shallow aquifers?
- c. What are the values associated with springs?
- d. How will recovered flows affect springs and stream baseflow?
- e. How does on-ground management affect springs?
- f. What is the history of spring formation, discharge and extinction?
- g. What factors influence spring geomorphology?
- h. How does a changing flow regime affect spring biodiversity?
- i. What are processes that threaten biodiversity?
- j. What techniques can be used to restore springs?

#### **1.4 Indigenous values**

The GAB springs have great traditional and contemporary cultural significance, as they are often the only permanent water in arid areas. The springs have provided water, food and other material resources for many thousands of years. Springs have significant spiritual value as ceremonial sites and feature in many dreamtime stories. However, most GAB springs have not been systematically surveyed or assessed for indigenous heritage values and significance, and much remains to be documented.

*Priority research questions*

- a. What needs to be done to better document and recognise the indigenous values associated with the GAB, particularly with springs?
- b. What methods used by Aboriginal peoples is effective in managing springs?
- c. What are the creation/dreamtime stories that are attached to particular springs, associated species or activities?

#### **1.5 Modelling and assessment tools**

Appropriate assessment tools are required to improve understanding of the hydrology of the Basin, assist in the development and implementation of plans and assess the impact of management decisions. The current Model has many limitations and is a tool only suitable for undertaking Basin-wide assessments.

*Priority research questions*

- a. What are the current deficiencies in data and models that require investment?
- b. Where and at what scale do we need models to address this issue?
- c. How can modelling be improved?
- d. What other assessment tools are appropriate?

#### **1.6 Sustainability under climate change**

Changes in climatic patterns have the potential to affect the water balance of the GAB e.g. changing recharge-discharge volumes and balance, and affecting springs through evaporation. There is also the potential, if surface water and shallow groundwater systems become unreliable, for increasing pressure to be placed on access to the resource of the Basin. Investigation into the likely impacts of climate change on the GAB is required

### *Priority research questions*

- a. What is the potential for climate change to place more pressure on the GAB resources?
- b. How will climate change affect baseflow to/from streams?
- c. How will rainfall patterns affect recharge?
- d. Are springs likely to be affected by increased evaporation?
- e. What effects do management actions have on greenhouse gas emissions?

## **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](http://www.gabcc.org.au) for further information.