

20 November 2018

Centre for Coal Seam Gas

Great Artesian Basin Secretariat  
Water Division  
GPO Box 858  
CANBERRA ACT 2601

Dear Sir/Madam

**Submission: Draft Great Artesian Basin Strategic Management Plan 2018**

Thank you for the opportunity to provide a submission regarding the Draft Great Artesian Basin Strategic Management Plan 2018 (Draft Plan). I write from my position as Director at the University of Queensland (UQ), Centre for Coal Seam Gas. The Centre conducts and coordinates research on technical and social challenges associated with development of coal seam gas (CSG) onshore in Queensland. It was founded in December 2011 and is currently funded by both The University of Queensland and three of the main CSG industry proponents in Queensland. The Centre supports research across 18 different UQ schools and centres and all research is subject to the University's research integrity and ethics policies and procedures ([ccsg.centre.uq.edu.au](http://ccsg.centre.uq.edu.au)). The Centre does not represent the views of its CSG industry members.

This UQ Centre has managed a range of research projects regarding both the hydrogeology and socio-economic conditions of the Surat Basin, which forms part of the Great Artesian Basin complex. This research aligns with many of the strategic objectives and outcomes documented in the Draft Plan. I would be happy to arrange a research briefing for the Secretariat to provide greater detail on the findings from the Centre's research program if this would be of interest. The Centre would also welcome the opportunity to assist the Consultative Committee and the Department with any research and science communication aspects of the Management Plan. In particular, the Centre is currently coordinating the preparation of material that would be relevant to your information hub (see point 9 below) and would welcome discussions on collaboration in this space.

I would like to firstly congratulate the Great Artesian Basin Consultative Committee and the Australian, State and Territory governments on the development of this overarching planning document. It is important to acknowledge the inherent challenge of this task, which arises from the complexity of the nature of the Basin, the changing pattern of land use, important cultural heritage issues and the overlay of different regulatory jurisdictions. It is essential for the governments to have an agreed framework to facilitate a cooperative and consistent approach to water planning and management across this iconic Australian groundwater resource.

The key, relevant findings and outputs from the Centre's research programme are outlined below:

1. The Draft Plan states the importance of inclusive engagement to improve decision making and transparent public reporting. We would counsel the importance of managing expectations clearly i.e. whether community input into decision making (e.g. by a government executive or group) rather than collective decision making *sensu-stricto* e.g. by some formalised, representative process. The Centre strongly supports both the participatory design of impact measurement and reporting frameworks (e.g. tracking and reporting of socioeconomic indicators via the [UQ Town-Level Indicators portal](#)) and transparent public reporting of data (e.g. providing detailed groundwater data and geological information via the [3D Water Atlas](#)). We have also been successful in recruiting landholders to participate in a range of research activities, including negotiating for the placement of metering devices on 42 stock and domestic bores across the Surat Basin. This data has been provided on a confidential basis to enable validation of a new groundwater use estimation technique, with the outputs to be integrated into groundwater flow models.

2. Objectives relating to improving the **measurement** of all groundwater use are strongly supported. Management of our resources requires that we can model and forecast impacts. We cannot do this well if we do not measure what is used. The focus in many discussions around groundwater use is often on the 'non-traditional' resource industries, particularly when they are new to a region. However, if we are all interested in responsible resource stewardship, then it is in everybody's interest to monitor extraction by all *major* users. For clarity, this would include the agricultural sector including some take for stock and domestic purposes. This will help ensure achievement of policy and regulatory objectives and provide accurate and more complete data for input to key decision making tools i.e. groundwater flow and improved allocation models. In the interim, researchers at UQ have developed a new geostatistical methodology for improved estimation of non-metered use e.g., stock and domestic use, which can be adapted to the conditions in different areas of the GAB. I understand that some State Governments have also invested in developing improved estimation techniques. While these do offer a more robust methodology, they cannot match the reliability that bore monitoring data would deliver.
3. It is important that the volume of groundwater extracted by industries is accurately accounted for *and* that estimates reconciled against actuals – the reconciliation process is required to improve forward modelling. With reference to the unconventional gas sector, a recent review of the actual volumes of associated water produced by the CSG industry as part of the gas extraction process has shown that these volumes are significantly lower than pre-development estimates of water production. New estimates of associated water production, which are informed by actual production to date, now indicate that overall production by the industry may be ~30% of high-end pre-development forecasts (or ~70% of low-end pre-development forecasts). The reason pre-development estimates of produced water are higher than actuals is likely to be due to factors such as the need for industry to reduce project risk, government requirements for prudent forecasting, and a need to understand worst case scenarios. Software limitations (capacity to mathematically model complex physical relationships) were also a factor contributing to pre-development over-estimation. Production of salt has similarly been significantly over-estimated.
4. The Draft Plan notes that the declining and finite nature of the GAB resource has not been properly recognised. There is no indication in the plan of the expected duration of this resource e.g. are we planning for 10 years, 100 years or 1000 years. This is a critical issue for water resource planning and establishment of appropriate extraction limits. Field research at recharge sites in the Surat part of the GAB (which can be presented in detail on request), combined with new understandings of fault seal behaviour in the basin indicates that, in the areas studied so far:
  - a. Recharge effectiveness may generally be slightly less than previously assumed,
  - b. Much recharge that does occur, may often have a relatively short flow path to local discharge,
  - c. Groundwater flow paths in the Surat part of the GAB are different to those previously thought to exist, resulting in both new discharge sites being identified as well as some presumed very long range connectivity being likely absent.

Given the complexity of the GAB structure, it is likely that the current understanding of recharge processes and flow patterns needs to be re-evaluated with the benefit of new scientific methods, and in some areas increased data availability.
5. While climate change was identified as a challenge in the early sections of the report there are no specific objectives to address this key issue. Climate change issues will by default be addressed in many of the actions identified in the plan, however the risks associated with climate change e.g., changes to recharge rates, evaporation rates and water demand, may warrant the inclusion of specific monitoring strategies to ensure that forecasts are as good as can be, or perhaps that systems provide early warning of issues arising.
6. Actions to support the allocation of water to sustain Aboriginal and Torres Strait Islander values, cultural heritage and other identified community values are also supported. It is important that any

transparent data reporting systems provide an appropriate security structure that allows protection of any confidential or culturally sensitive records.

7. The GAB Sustainability Initiative has delivered excellent results in minimising water wastage. It is essential that reliable long-term funding is provided to continue this essential capping and piping program. It is recommended that incentives are also developed to encourage bore owners to undertake timely and effective infrastructure maintenance and replacement activities.
8. Actions to encourage research collaboration are strongly supported. Some suggestions to enhance collaborative capability and research quality include:
  - a. Improve data quality through the development of clear, well-structured data dictionaries for any data collection activities; and development and sharing of best practice sampling and testing methodologies.
  - b. Development of automated software processes to QA/QC data, but retaining the flexibility for expert users to apply different parameters. This has been developed for the 3D Water Atlas, allowing the public version of the Atlas to display the highest quality data, while providing expert users with the option of investigating data anomalies for research purposes.
  - c. We need to improve our understanding of what data provides the most value for different functions i.e. more data is not necessarily going to contribute to increased knowledge. It must also be understood that the data that provides most value in decision making processes may change with time as conditions in the Basin change.
9. The Draft Plan emphasises the need for the latest scientific information regarding the Basin to be readily accessible to scientists, planners and managers; and communicated well to the community. Again, the Centre is strongly supportive of this concept and has pushed forward with the 3D Water Atlas. Furthermore, the Centre and National Energy Resources Australia (NERA) are co-funding a project to publish a special edition of the International Journal of Hydrogeology to collate and present key research regarding the changing understanding of the GAB over the last ~10 years. This edition is scheduled for publication in December 2019 and will feature articles from leading scientists in government, industry and academia. In addition this project will incorporate a multi-channel communication strategy to transfer these new scientific understandings to the broader community. I see strong alignment with the proposed centralised information hub and would welcome the opportunity to discuss collaborations in regard to this recommendation.
10. It is evident that all parties agree that scientific knowledge of basin must continue to develop in order to support key resource planning and management activities. The University of Queensland would be very willing to participate in coordinated discussions with government, industry, community and other research bodies regarding future research needs.
11. In summary, based on the Centre's research to date, we would suggest the following priority actions:
  - a. Develop a strategy to better monitor and disclose groundwater usage by all major water users, across all use types (including stock and domestic) to improve understanding of current consumption levels, estimates of future demand and planning processes. This may need to include the construction and communication of a "case for change" and a stakeholder engagement strategy to develop "buy in" amongst users who have not historically metered and may have concerns on the impact of measuring on licences and allocations.
  - b. Facilitate a coordinated approach to identification of knowledge gaps and design a strategic multi-party research program that recognises (i) State and Territorial differences regarding the extent of the resource and different development and usage patterns; and

- (ii) the geological inhomogeneity of what is termed 'the' GAB but is in fact a many component system, with different dynamics in different "sub" basins.
- c. Develop a specific climate change research and management strategy for the Basin that is based on a credible risk assessment.
- d. Facilitate collaboration with research providers regarding the structure and content of the proposed information hub.

If there were to be just one recommendation allowed, we would recommend that efforts should go into building a coalition of major users to implement more comprehensive measurement and disclosure. This alone would not only improve our ability to manage, but would be evidence that all players are serious about long term resource stewardship.

I would reiterate that the Centre is very interested in collaborating with the Secretariat and the Consultative Committee regarding the information hub concept and would welcome future discussions regarding this initiative.

Yours sincerely



Professor Andrew Garnett  
**Director – UQ Centre for Coal Seam Gas**