GISERA
Gas Industry Social and Environmental Research Alliance

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WATER RESEARCH FACTSHEET

Potential impacts of coal seam gas development on water flows to the Great Artesian Basin

This report uses regional-scale groundwater modelling to analyse potential changes in groundwater flows in the Pilliga Sandstone, an aquifer of the Great Artesian Basin (GAB).

KEY POINTS

- The Pilliga Sandstone aquifer in the Narrabri region in NSW, is a fresh water source for irrigation, stock and domestic uses. The Pilliga forest is one recharge area for the Pilliga Sandstone, part of the GAB.
- This interim report demonstrates that CSG development will result in some changes to the groundwater flow and water balance of the Pilliga Sandstone in this recharge area of the GAB.
- Based on 500 simulations constrained with observations, preliminary results of the groundwater modelling showed an expected maximum water loss from this GAB aquifer due to CSG development of around 85 megalitres per year, equivalent to about 0.3% of the Long Term Annual Average Extraction Limit from this part of the aquifer.
- Water extracted for gas development is not taken from the GAB aquifer, but from the coal seams which are part of the Gunnedah Basin that underlie this GAB formation resulting in a reduction in pressure in the coal seams.
- The expected value of induced change in flow from the near-surface aquifer, called the Namoi Alluvium, into the Pilliga Sandstone was estimated at 0.89 megalitres a year or nearly 0.001 % of the average annual extractions from the alluvium. The groundwater of the Namoi Alluvium is a major agricultural resource for the region.
- This modelling study has provided an independent estimate of the range in potential maximum impacts on water volumes of the Pilliga Sandstone under a broad series of model parameters.

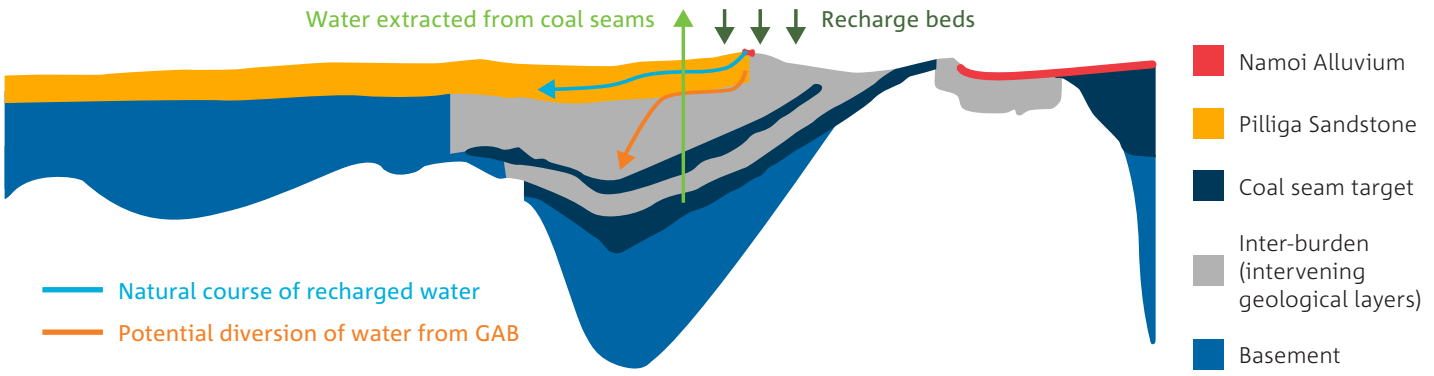
Research challenge

CSIRO is working to improve our understanding of the potential impacts of CSG depressurisation on the water volumes of the Great Artesian Basin.

This follows community concern that depressurisation of coal seams for producing gas may potentially impact groundwater pressure in the Pilliga Sandstone aquifer and affect the quantity of water recharge into the broader GAB.

Using groundwater models, researchers have quantified the range of changes in water flow and water balance to the Pilliga Sandstone, which could arise from depressurisation of the underlying coal seams. This approach uses a wide variation in the parameters of the groundwater model. It also takes into account the uncertainties associated with our knowledge of the groundwater systems in order to decide the range of possible flow changes into and from the Pilliga Sandstone. It integrates our current knowledge from existing models, as well as data and information on the geology and hydrogeology of deep sedimentary basins in the region.

The report provides results from a broad, generalised case of coal seam depressurisation for gas production, as an independent assessment of the possible range of potential impacts on the GAB water resource.



Conceptual cross section showing the geological layers and potential water movement due to CSG through the GAB aquifer. Figure for illustrative purposes only.

Research findings

This study found that the expected maximum change in flow of groundwater from the Pilliga Sandstone to deeper formations was 85 megalitres per year. This corresponded to about 0.3% of the Long Term Annual Average Extraction Limit of 29.68 gigalitres per year from the GAB groundwater source in this area, called the Southern Recharge Source.

Given wide variation in input parameters to the model, the corresponding 95% confidence of predicted maximum water loss from the Pilliga Sandstone ranged between 0.28 and 2299 megalitres per year. This indicates that the likely impacts are relatively small compared to estimated recharge to and groundwater use from the Pilliga Sandstone for other purposes.

The potential increase of groundwater flow from the Pilliga Sandstone to deeper formations was also accompanied by increased rate of water flow into the Pilliga Sandstone from the Namoi alluvial aquifer and surface streams overlying it. It is expected that the maximum change in flow from the alluvium to the Pilliga Sandstone will be 0.89 megalitres a year, equal to nearly 0.001 % of the average annual extractions from the alluvium.

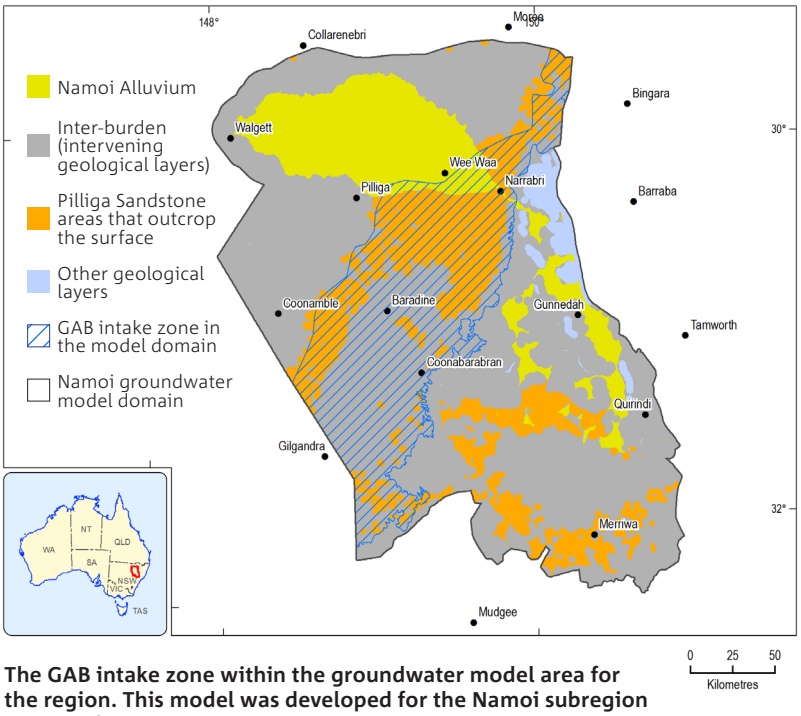
A final report from this research is due in mid-2018.

What is the Great Artesian Basin?

The Great Artesian Basin is Australia's largest groundwater basin. It contains about 65 million gigalitres of water and underlies more than 1.7 million square kilometres of eastern Australia. It consists of layers of aquifers and impermeable aquitards ranging from 65 to 250 million years old, deposited in the Triassic, Jurassic and Cretaceous periods.

Water from rain and some rivers enters the groundwater along the elevated eastern margins. From these areas of recharge, groundwater flow is driven by the slope of the formations and in some places it can discharge back to the ground surface.

The structure and nature of the sequence of aquifers govern how groundwater flows in the GAB.



The GAB intake zone within the groundwater model area for the region. This model was developed for the Namoi subregion as part of the Bioregional Assessments Programme.

FREQUENTLY ASKED QUESTIONS

Is the Pilliga area an important recharge zone?

Past studies identify the Pilliga area as part of the intake beds of the GAB in NSW. There is variability in the amount of recharge in different areas within the intake beds. CSIRO is currently undertaking further study to improve the understanding of recharge in this area.

How much water is recharged annually into the GAB aquifer in this region?

The amount of groundwater recharge into the Southern Recharge Zone is quantified as 42.4 GL/y by the Water Sharing Plan. The total water recharge through the NSW GAB intake beds was quantified as 295 GL/y.

Will CSG development from this area take water from the GAB resource?

No. The water is extracted from the coal seams which is part of the Gunnedah Basin that underlies the GAB formation. Due to the resulting pressure reduction in the coal seams over a period of many years, some water may flow from the GAB into deeper formations.

Will water be lost from the Namoi Alluvium due to CSG development?

As groundwater moves from the Pilliga Sandstone to the coal measures, some water from the Namoi Alluvium may move to the Pilliga Sandstone to replace it. This is estimated to be about 0.89 megalitres a year or nearly 0.001 % of the average annual extractions from the alluvium.

The GAB flux report only dealt with changes in flux (volume of water) , not changes to the water table. We don't deal with drop in water table in our report – this is the modelling output from the work undertaken in the Bioregional Assessments Programme. However, this information will be available through the Bioregional Assessment Programme, which assesses cumulative water impacts from CSG and coal mines.

Are the GAB aquifer and coal seams connected?

No. There are thick layers of rock formations between the GAB aquifer and coal seams that generally have low permeability. However, lowered pressures in the coal seams resulting from CSG development has the potential to lead to some flow of water from the GAB, and this is being investigated in a probabilistic way through this research.

Where do I find more information?

A complete report of this project is at: gisera.org.au

More about the GAB and coal seam gas is at: gisera.org.au/more-information/frequently-askedquestions/the-great-artesian-basin-and-coal-seam-gas/

ABOUT CSIRO's GISERA

CSIRO formed the Gas Industry Social and Environmental Research Alliance (GISERA) as a collaboration between CSIRO, Commonwealth and state governments and industry to undertake publicly-reported independent research. The purpose of GISERA is to provide quality assured, independent scientific research and information to communities living in gas development regions focusing on social and environmental topics including: groundwater and surface water, biodiversity, land management, the marine environment, human health impacts and socio-economic impacts. The governance structure for GISERA is designed to provide for and protect CSIRO's research independence and transparency. Visit www.gisera.org.au for more information about GISERA's structure, projects and research findings.

FURTHER INFORMATION: 1300 363 400 | gisera@gisera.org.au

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