GROUND AND SURFACE WATERS

GISERA | Gas Industry Social and Environmental Research Alliance

Groundwater modelling and predictive analysis to inform CSG impact assessment, monitoring and management

This project will undertake independent groundwater modelling and predictive analyses in the Narrabri region of New South Wales. These analyses will help improve the understanding of groundwater flow in alluvial and Great Artesian Basin aquifers and inform coal seam gas (CSG) groundwater impact assessment, regulatory monitoring and groundwater resource management.

Key points

- This project will conduct groundwater modelling and predictive analyses.
- These analyses will inform coal seam gas groundwater impact assessment and regulatory monitoring and management in the Narrabri region.
- Research addresses community concerns about groundwater impacts to aquifers, including groundwater losses induced by depressurisation of coal seams in the Gunnedah Basin.
- Better understanding of ground flow systems and water balance of the shallow alluvial aquifers is crucial for assessing and managing any impacts from coal seam gas depressurization in the deeper Gunnedah Basin formations.
- The project will improve modelling based on a previous GISERA study to estimate aquifer water balance under baseline and future conditions including considering cumulative impacts and climate change effects.

Community members are concerned about potential impacts to groundwater from gas development in the Narrabri region of NSW, where economically important aquifers are used for irrigation, stock and domestic uses.

Concerns centre on potential impacts to the Great Artesian Basin (GAB) aquifer, the Pilliga Sandstone and Namoi alluvial aquifers, and groundwater losses induced by depressurization of coal seams in the underlying Gunnedah Basin.

To avoid potential impacts to other groundwater users, minimal impacts to groundwater levels and pressures in the Namoi alluvial and GAB aquifers needs to be ensured.

CSIRO's Gas Industry Social and Environmental Research Alliance is conducting research to improve the understanding of groundwater resources and levels.

Results of this research help to quantify potential impacts and inform management strategies to manage groundwater resources.

Photo: The volcanic Nanderwar Ranges near Narrabri, NSW.

Need and scope

This project is addresses community concerns about water impacts. It will improve understanding of groundwater flow and water balances in economically important aquifers in the Namoi region that may be potentially impacted by CSG development within the Gunnedah Basin.

This improved knowledge is crucial for predicting, assessing and managing impacts from coal seam gas depressurization within the Basin's formations.

Addressing these needs will require improved modelling and simulation analyses to understand the baseline and future water balance of the Namoi alluvial and the Pilliga Sandstone aquifers.
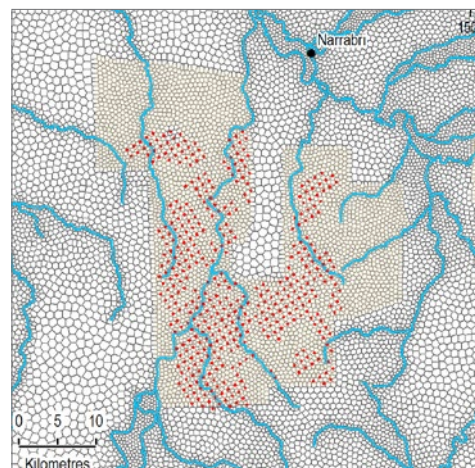
Updating groundwater modelling will help to quantify potential impacts to other water users in the context of the development baseline state of these aquifers.

(a)
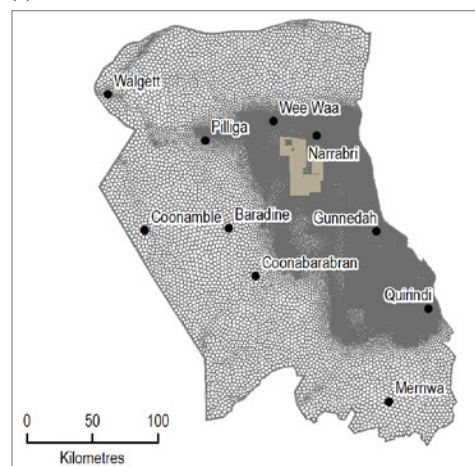
Model grid geometry
Namoi groundwater model domain

(b)

Watercourse lines
Narrabri CSG project extent
CSG wells

Numerical groundwater model grid showing the spatial refinement near proposed CSG wells for improved prediction accuracy.

Narrabri Shire

The Narrabri Shire covers approximately 13,000 square kilometres and is home to around 13,000 people with 6,000 living in the town of Narrabri, the main centre. The shire has been primarily a grazing and farming region since settlement. Irrigated cotton is now the main high-value crop in the region. The gas development project area is situated approximately 20 kilometres south of Narrabri.

Objectives

Project objectives include:

- Estimate baseline and future groundwater balance by assimilating new and improved hydrological and hydrogeological data for the Namoi alluvium and the Pilliga Sandstone aquifer.

- Predict groundwater impacts for the approved CSG water production rate of 37.5 gigalitres over 25 years, using various scenarios of groundwater use, CSG development, climate change and other factors.

- Develop a methodology to quantify 'uncertainties' in groundwater level trends and distinguishing impacts among different factors due to the transient nature of storage in these aquifers.

- Develop an interactive dashboard for the community and other stakeholders to visualise potential impacts and monitoring and management scenarios.

Methodology

The project will use of state-of-the-art numerical modelling, uncertainty analysis (analysing the uncertainty of variables) and data analytics including machine learning.

It will build on significant knowledge gained in previous GISERA projects to develop new, iterative modelling incorporating data from approved CSG production rates, improved understanding of the subsurface geology, and field and other data. A companion study is developing a new geological model.

CSIRO climate modelling studies will also be used to improve the aquifer water balance. Numerical models will be progressively developed using improved understanding of the geology represented in the conceptual model. The project will incorporate data from field and remote sensing observations, and to delineate potential CSG impacts.

More information

Find out more about this project and its companion project Geochemical modelling and geophysical surveys to refine understanding of connectivity between coal seams and aquifers.

Learn about other GISERA projects in NSW.

Read about previous GISERA groundwater modelling research in this region.