

Production Induced Pressure Decline and Its Impact on CO₂ Containment: An Example from the Bowen Basin, Queensland

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Analysis of existing pressure data in terms of hydraulic head has several advantages when characterising a site for long term geological storage of anthropogenic CO₂. The Wunger Ridge in the Bowen Basin (Queensland) is a site of on-going gas production where several of the gas fields exhibit hydraulic communication via the underlying aquifer. CO₂ injection is proposed to occur downdip from the ridge with updip migration towards the gas fields. The location of injection was selected to ensure the gas fields will be depleted when CO₂ arrives. A hydrodynamic model of the aquifer was constructed to investigate existing flow patterns and the effect of production to help characterise CO₂ containment.

The hydrodynamic model at virgin conditions is also used to evaluate the likelihood of vertical hydraulic communication and potential leakage to overlying aquifers. This study demonstrated that the target reservoir is not in hydraulic communication with the overlying water resources of the Great Artesian Basin.

The hydrodynamic analysis showed that the virgin and present day flow systems are substantially different as a result of gas production. While the present day flow regime will impact CO₂ migration in the short term, it is anticipated that the flow regime will revert to virgin conditions once the gas fields are abandoned. For the short term, steep hydraulic gradients towards gas fields may accelerate CO₂ migration. Over the long term, the hydraulic gradients will flatten and have less impact on CO₂ movement.