Australian Government

BIOREGIONAL ASSESSMENTS

PROVIDING SCIENTIFIC WATER RESOURCE INFORMATION ASSOCIATED WITH COAL SEAM GAS AND LARGE COAL MINES

Coal resource development and water resources in the Galilee subregion

The Bioregional Assessment Program has improved our understanding of the potential impacts of coal seam gas and coal mining developments on water resources and water-dependent assets such as wetlands and groundwater bores.

At a glance

The assessment examined how seven potential new coal mines could affect groundwater and surface water resources, and the assets that depend on them, in the Galilee subregion. Regional-scale hydrological modelling suggests that cumulative hydrological changes from multiple mines are *very likely* (more than 95 percent chance) and extend further than predicted from impact assessments of individual mines. There is some risk of ecological and hydrological changes to a small fraction of the groundwater-dependent streams and vegetation in the subregion. Some springs, including most of the springs in the Doongmabulla Springs complex, could experience drawdown of more than 0.2 metres but more detailed local information is required to determine the level of risk. Bores associated with the Jericho town water supply are *very unlikely* (less than five percent chance) to experience drawdown of more than two metres. It was not possible to draw any conclusions about the potential impact on bores associated with the Alpha town water supply.

Where is the Galilee subregion?

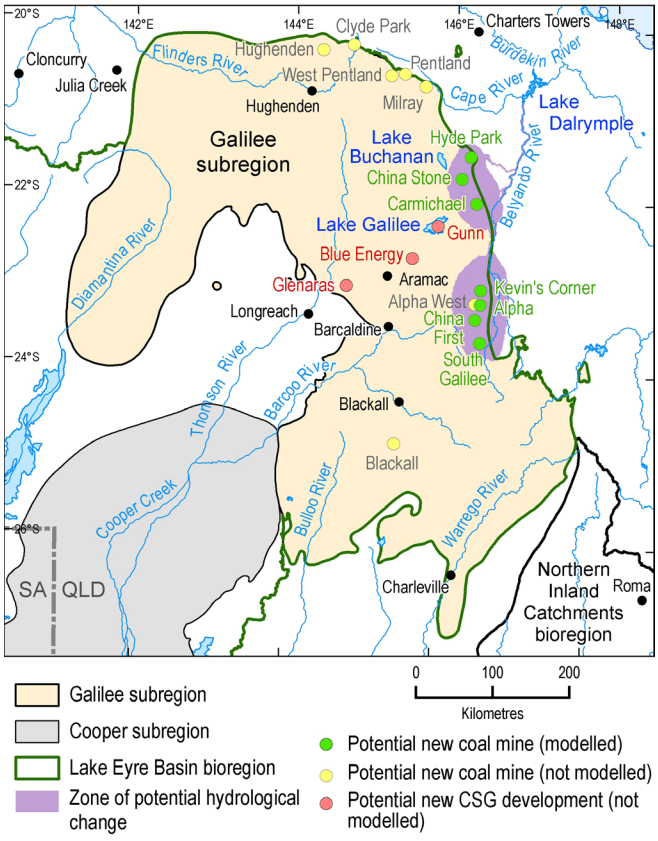
The Galilee subregion covers about 248,000 square kilometres of central Queensland. It is part of the Lake Eyre Basin bioregion. The main towns are Blackall, Charleville, Barcaldine and Hughenden.

What are the coal resource developments?

At the time of the resource assessment in December 2014, there were no commercially producing coal mines or coal seam gas developments in the Galilee subregion. Fourteen potential new coal mines and three coal seam gas projects were identified. Seven coal mines had enough publicly available information to be assessed in the numerical surface water and groundwater models: the open-cut Alpha and Hyde Park coal mines; and the combined open-cut and underground coal mines Carmichael, China First, China Stone, Kevin's Corner and South Galilee.

What are the potential changes in water?

The total area where developing the seven potential new coal mines may cause changes in groundwater or surface water is 14,030 square kilometres. This area is the zone of potential hydrological change.



The zone of potential hydrological change includes 13,364 square kilometres of land where there is at least five percent chance of at least 0.2 metres of groundwater drawdown in the near-surface aquifer. Cumulative groundwater-drawdown impacts are *very likely* between the proposed South Galilee, China First, Alpha and Kevin's Corner coal mines in the southern part of the region and between the proposed Carmichael and China Stone coal mines in the north. Maximum modelled drawdowns exceeding 5 metres in the near-surface aquifer only occur very close to the mines (within several kilometres), and will usually occur sometime after 2050.

The zone of potential hydrological change includes 6,285 kilometres of streams with potential changes in flow. In the Burdekin river basin, changes in the surface water flow regime are *very unlikely* to propagate further downstream than Lake Dalrymple.

There is a five percent chance that the maximum number of zero-flow days will increase by at least 200 days per year in the Belyando River downstream of Sandy Creek junction and the Suttor River downstream of its confluence with the Belyando. These increases are greater than interannual variability and would likely occur in very wet years, when the rivers can flow for more than 200 days.

Further details can be found in *Assessing impacts of coal resource development on water resources in the Galilee subregion: key findings* (product 5), *Surface water numerical modelling for the Galilee subregion* (product 2.6.1) and *Groundwater numerical modelling for the Galilee subregion* (product 2.6.2).

What might that mean for ecosystems and water-dependent assets?

Potential impacts are limited to the zone of potential hydrological change for ecosystems and assets that depend on streams or the near-surface aquifer. Regional modelling suggests that it is *very unlikely* that the source aquifers of any of the Great Artesian Basin springs in the Eromanga Basin will be impacted.

There is a five percent chance that drawdown in the Clematis Group source aquifer will exceed 0.2 metres for 181 of 187 springs that comprise the Doongmabulla Springs complex near the Carmichael River. Ecological impacts cannot be ruled out, although local-scale information is needed to improve the understanding of potential impacts to these springs.

It is *very likely* that at least five of the seven springs sourced from the upper Permian coal measures will be affected by more than five metres of drawdown.

Joshua Spring, Galilee subregion. Credit: E. Turner (Department of the Environment and Energy)

Multiple lines of evidence were used to identify areas that may merit closer attention when considering potential impacts for some ecosystems within the zone of potential hydrological change. The assessment found that closer attention may be required when considering impacts for: 8% of the 2801 kilometres of groundwater-dependent streams, 3% of the 2433 square kilometres of groundwater-dependent vegetation on floodplains, and 5% of the 1189 square kilometres of groundwater-dependent vegetation outside of floodplains.

Of the 241 water-dependent ecological assets in the zone of potential hydrological change, 148 intersect areas that are more at risk of hydrological changes compared to other areas in the zone. These 148 assets may merit closer attention when considering potential impacts. Most of these assets are groundwater-dependent ecosystems or potential habitat of threatened species.

The only surface water economic asset in the zone of potential hydrological change is a basic water right on the Belyando and Suttor rivers. There is a five percent chance of annual flows reducing by around one percent and of zero-flow days increasing by between 152 and 260 days a year at the three extraction points associated with this basic water right.

Groundwater drawdown as a result of the seven modelled coal mines may affect 138 bores that belong to five groundwater economic assets. Most (about 85 percent) of

these—including bores associated with the Jericho town water supply—tap the Clematis Group aquifer and are not expected to experience drawdown of more than two metres. Potential drawdown for the remaining bores—including those associated with the water supply for the town of Alpha—is uncertain, either because the model used in this assessment was not suitable for predicting impacts on them or due to uncertainty about which layer they source water from.

Further details on the results can be found in *Assessing impacts of coal resource development on water resources in the Galilee subregion: key findings* (product 5). More specific information on the impacts, including the sensitivity of different ecosystems to hydrological changes, can be found in the impact and risk analysis (product 3-4).

How was the assessment done?

Scientists used the best available data to describe coal and coal seam gas resources, and to assess potential changes to surface water and groundwater due to proposed coal resource developments.

They developed regional groundwater and surface water models for this assessment. The natural and human-modified ecosystems in the subregion were classified into 31 landscape classes to enable a systematic analysis of potential impacts on, and risks to the water-dependent assets nominated by the community. The landscape classification was based on the subregion's geology, geomorphology, hydrogeology, land use and ecology. These landscape classes were aggregated into 11 landscape groups based on their likely response to hydrological changes. Potential impacts were identified by overlaying landscape classes and assets on the modelled changes in hydrology and, in some cases, by ecological modelling.

Local councils, natural resource management groups and community groups provided information on water-dependent assets that they value, such as threatened and endangered species, wetlands and water sources.

A register of these assets is available for use in future assessments.

How will information from the assessment be used?

The data and tools from this assessment are available to support natural resource management in the Galilee subregion. They can be used in future assessments and environmental studies.

Results from this assessment are provided in 12 technical reports, a water-dependent asset register and a data register at www.bioregionalassessments.gov.au/assessments/galilee-subregion. The website provides open access to the methods and datasets used to develop the assessment. Explore the subregion in more detail on BA Explorer, at www.bioregionalassessments.gov.au/explorer/GAL.

Data from a range of disciplines are provided under a Creative Commons Attribution license where possible, on the Australian Government's public data information service www.data.gov.au.

Visit www.bioregionalassessments.gov.au to find out more about the Bioregional Assessment Program.