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22 January 2018

Ms Christine McDonald
Committee Secretary
Senate Environment and Communications References Committee
Department of the Senate
PO Box 6100
Parliament House
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Dear Ms McDonald

Inquiry into water use by the extractive industry

Thank you for the opportunity to provide a submission to the Senate Inquiry into water use by the extractive industry. 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 UQ 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 (www.ccsq.uq.edu.au). The Centre does not represent the views of its CSG industry members.

I note that the scope of the inquiry has a very broad focus on the current regulatory framework. The regulation of groundwater and surface water use for major extractive industry projects in Australia is subject to both Commonwealth and State/Territory legislation. Consequently it is impossible to consider the effectiveness of Commonwealth legislation in isolation, and due to the variation in State/Territory legislation a considered analysis of effectiveness is a complex task. In order to fully answer questions regarding existing safeguards, regulatory gaps and regulatory differences it would be necessary to conduct a detailed review of legislation across jurisdictions. This has previously been completed for the coal seam gas (CSG) industry (i.e., the *National harmonised regulatory framework for natural gas from coal seams*—last updated in December 2016), but would need significant resourcing to be completed to a similar level for other sectors e.g. other unconventional gas, conventional gas, uranium and mineral resources.

A high level overview of the various components of the regulation of groundwater and surface water as it relates to the extractive industry in Queensland, is **attached** for your information at Schedule 1. This overview was conducted by HopgoodGanim Lawyers¹ and provided to the Centre to assist with this response. It illustrates the volume of work

¹ Authors: Alison McKee, Senior Associate, Alyce Nielsen, Solicitor, Jonathan Fulcher, Partner, Resources and Energy, HopgoodGanim. Professor Fulcher is also Program Director, Energy & Resource, TC Beirne School of Law at UQ.

that would need to be undertaken in order to conduct the necessary review. It would also be worthwhile to undertake an international benchmarking review comparing Australian legislation with leading international practice.

One general comment on the current framework is that only the environmental impacts are assessed at both Commonwealth and State/Territory levels. The social and economic impacts of extractive industry development are only assessed under the relevant State/Territory legislation.

I encourage the Inquiry to contact the Queensland Government to gain a detailed understanding of the key aspects of relevant state legislation, as significant changes have been made since the commencement of the CSG industry. A number of regulatory changes introduced to manage the development and operation of the CSG industry have now been extended to other resource types. The features of the Queensland regulatory framework that seek to address the concerns identified by the inquiry include, but are not limited to:

- Requiring both gas and mining tenure holders to have the groundwater impacts of development assessed as part of the environmental authority application process under the *Environmental Protection Act 1994*.
- Requiring proponents to prepare Underground Water Impact Reports that estimate cumulative impacts of development. These are regularly reviewed throughout the life of the project and this may result in amendment of development conditions to address unexpected impacts.
- The option for the State Government to declare a Cumulative Management Area in an area where two or more resource industry tenures exist (any combination of petroleum and gas, and mining tenures). The Queensland Office of Groundwater Impact Assessment is then responsible for preparing a regional groundwater model and development of associated management responses.
- Introduction of the 'make good' framework requiring extractive industry proponents to negotiate with landholders regarding compensation for any impairment to water bores.
- Establishment of the GasFields Commission Queensland to facilitate coexistence between landholders, regional communities and the onshore gas industry
- Establishment of the Land Access Ombudsman to facilitate the resolution of disputes regarding Conduct and Compensation Agreements and Make Good Agreements.

The Centre for Coal Seam Gas has not conducted research into the *effectiveness* of the legislative framework. However we have **attached** at Schedule 2, a comprehensive analysis undertaken by Ms Sarah Asokendaran from the TC Beirne School of Law, University of Queensland of the adequacy of the regulatory frameworks. Alongside this I provide the following observations:

1. While the water impacts are assessed at both State/Territory and Commonwealth levels of government, the review conducted by the Independent Expert Scientific Committee (IESC) under the EPBC Act provides an expert level of scrutiny. This level of advice is not readily available through State/Territory assessment processes unless the regulator formally engages experts to contribute to the assessment.
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2. The publication of IESC advisory statements makes technical guidance available to other proponents and regulators who may be dealing with similar issues on applications that are not subject to IESC review.
3. The IESC has the ability to consider a wider range of water resource impacts under the water trigger than would be considered under the other matters of national environmental significance (MNES) provisions of the *Environmental Protection & Biodiversity Conservation Act 1999*.
4. At present the water trigger does not apply to other forms of unconventional gas development e.g., shale gas and tight gas. It should be noted that the extraction methods for these unconventional gas resources result in different water resource impacts to those of CSG operations.
5. Many of Australia's known shale gas resources occur in remote locations where the understanding and formal documentation of biodiversity assets may be insufficient to trigger other MNES assessments such as nationally threatened species and ecological communities or migratory species.
6. Other large-scale open cut mining activities may cause similar groundwater and surface water impacts to large coal mines, but are not referred to the IESC.
7. Other sectors which extract large volumes of water e.g., large-scale irrigation developments are also not referred to the IESC for review.
8. Commonwealth and State/Territory regulators impose a range of development conditions on major projects regarding environmental and social impacts. Standardised, plain English public reporting of performance against these conditions could assist to improve public confidence in industry performance and regulatory effectiveness.

Scientific understanding of Australian water resources is not static and nor should it be. The Centre has conducted a range of research regarding the groundwater resources of South West Queensland and the data generated by resource exploration and the operations of the CSG industry has been critical input in expanding scientific knowledge of water resource systems. In the case of CSG, it is important to note that the large resource developments themselves have generated huge amounts of new data and scientific insights simply not achievable without these developments. Ongoing, longitudinal, programmatic research is required to enable evidence-based adaptation. Key findings from the research program include:

1. There is considerable natural variability in the composition of groundwater resources i.e. water quality, and this variation can occur over surprisingly small distances. For example, generating pie charts of major ion chemistry from the 3D Water Atlas (<https://wateratlas.net>) provides an easy way to visualise these differences across the Surat Basin and identify specific chemical changes at the sub-regional level (and to make these differences public). Furthermore, research shows that it is also common to find traces of naturally occurring hydrocarbons throughout many parts of the stratigraphic column which pre-date any man-made development.
2. A number of different users extract groundwater from a geological basin, however the volumes taken by these different users are not monitored to the same extent. For example stock and domestic (S&D) bores are typically unmetered and the volume of groundwater extracted, which is collectively very significant, is not reported to government.² As a result groundwater flow models

² This is currently the case in the Great Artesian Basin. S&D water licenses "...do not have a volumetric limit". (Ref. Department of Natural Resources and Mines, *Queensland Great Artesian Basin Overview*)

that are used to estimate the *cumulative* impacts of all groundwater extraction are reliant on estimates of S&D use. Centre researchers have developed a new method of estimating S&D use using innovative multivariate statistical approaches, which provides a more nuanced understanding of the patterns of S&D water use.

3. The structure of the Great Artesian Basin (GAB) is complex and recent research is providing new insights regarding geological structure and hydrogeological flows. Field research at recharge sites in the Surat part of the GAB, combined with new understandings of fault seal behaviour in the basin indicates that, in the areas studied so far:
 - a. recharge effectiveness is generally less than previously assumed
 - b. much recharge that does occur, often has 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 new discharge sites being identified.
4. The actual volumes of associated water produced by the CSG industry as part of the gas extraction process 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 likely reason for high (conservative) pre-development estimates is 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 and continue to contribute to ongoing over-estimation when forecasts are updated. Production of salt has similarly been significantly over-estimated.

I would be happy to arrange for the Inquiry to receive a more detailed briefing on details of the Centre's research findings and ongoing work if this would be helpful.

Yours sincerely

Prof Andrew Garnett
Director
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(2017) <https://www.dnrm.qld.gov.au/data/assets/pdf_file/0008/1039409/gab-overview-factsheet.pdf>. However, 'most licenses to use GAB water are stock and domestic licenses' – and are linked to the land parcel of the bore drilled. See Department of Natural Resources and Mines, *Great Artesian Basin water management* (2017) <https://www.dnrm.qld.gov.au/data/assets/pdf_file/0011/1039439/gab-factsheet-water-management.pdf>; *Great Artesian Basin and Other Aquifers (GABORA) Water Plan 2017*, s 96. Also, it should be noted that "associated water" for gas projects and mine dewatering do not require a water license, *sensu stricto*, above in 1.

Schedule 1

Legislative overview - water use by the extractive industry in Queensland



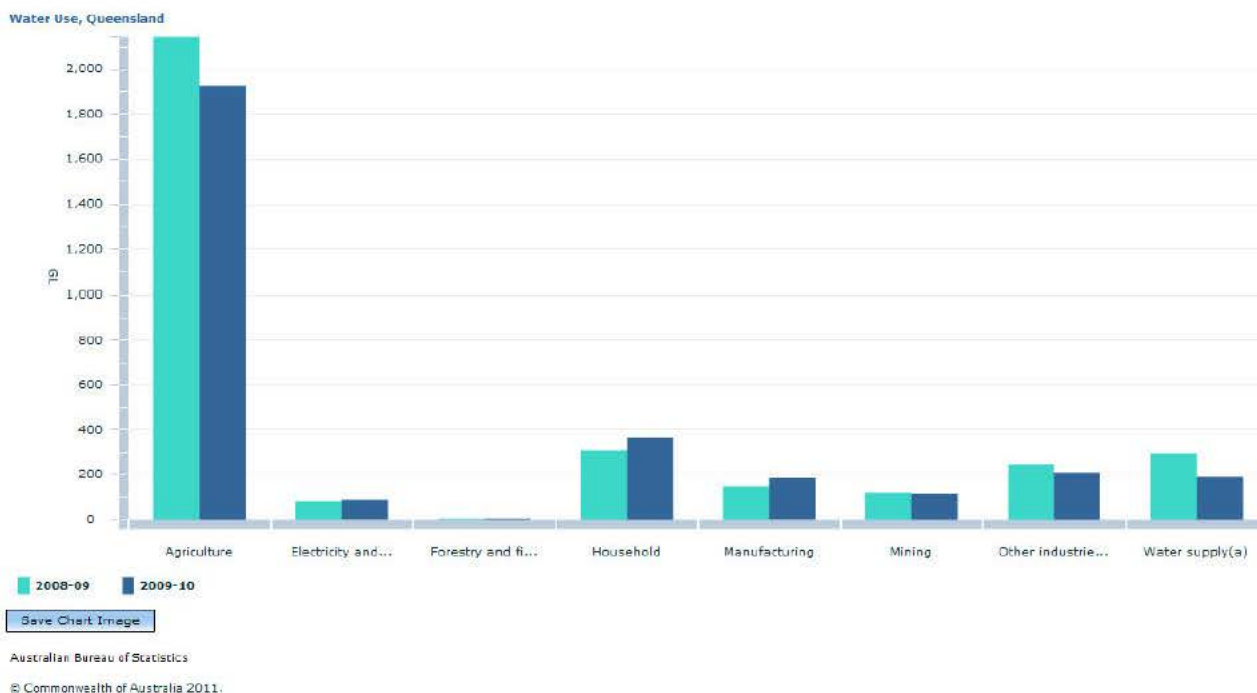
Ownership of Water

In Queensland, all rights to the use, flow and control of all water is vested in the State.¹

Water includes water in a watercourse, lake or spring, underground water, overland flow water, water collected in a dam and can include recycled and desalinated water from any source.²

Queensland can authorise the take or interference with water under legislation, water allocations, water licences or water permits.³

Both the coal and gas industries in Queensland are subject to heavy public scrutiny and regulation in respect of their use of water. The below table taken from the Australian Bureau of Statistics in 2011 demonstrates the use of the extractive industry of water in comparison to other industries.



Summary of legislation and approval components

Below is a table outlining the central pieces of legislation, approvals and components needed to be considered by the extractive industry in relation to water. This list is not intended to be exhaustive or comprehensive, but rather a high level summary of the level of regulatory burden connected with the extractive industries use of water in Queensland, as an example. Some of the key elements of these components are explored and summarised further below.

Legislation	Components	Approval
<i>Environment Protection and Biodiversity Conversation Act 1999 (EPBC Act)</i>	Matters of Environmental Significance Federal Referral	Federal Environmental Approval

¹ s 26 of the *Water Act 2000* (Qld) (**Water Act**)

² Schedule 4 of the *Water Act*

³ s 27 of the *Water Act*



Legislation	Components	Approval
	Controlled Action - Assessment and Approval Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) Bilateral agreements with States	
Petroleum and Gas Production and Safety Act 2004 (P&G Act) and the Petroleum Act 1923	Authority to Prospect Petroleum Lease Underground water management CSG Water Make Good Agreements Bore assessments Water monitoring activities authorities	State Gas Production Approval
Mineral Resources Act 1989 (MR Act)	Mining Lease Underground water rights Associated Water Licence (transitional provisions) Water monitoring activities authorities	State Mine Production Approval
Environmental Protection Act 1994 (EP Act)	Environmental Authority Terms of Reference Environmental Impact Statement Public notification/objections process Conditions	State Environmental Approval
Water Act 2000 (Water Act)	Water Plans Water Licence Associated Water Licence Underground Water Management Make Good Obligations Surface water and diversions (interference with the flow of water)	State Water Approval
Regional Planning Interests Act 2014 (RPI Act)	Regional Interests Development Approval Areas of regional interest Prohibits resource activity without approval or exemption	Regional Interests Development Approval (State)



EPBC Act - Coal and Gas

The EPBC Act is the Federal legislation which provides for Federal environmental approvals. The EPBC Act is intended to protect 'matters of national environmental significance' (**MNES**). In 2013 the 'water trigger' was added to the list of MNES. As a result, actions which involve CSG extraction or 'large coal mining development' which have or are likely to have a significant impact on water resources, will be captured by this water trigger. A project can be considered likely to have 'significant impact' on water resources, when considered in its own right or when considered with other developments, past, present or reasonably foreseeable.⁴ The definitions of both 'large coal mining development' and a 'CSG extraction' as well as the definition of 'significant impact' are very broad and essentially capture the majority of extractive projects in Queensland.

Extractive coal or gas projects will generally need an approval under the EPBC Act unless they fit within one of the statutory exemptions or there is a ministerial decision that the project is not a 'controlled action' for the purpose of the EPBC Act. Proponents generally refer a project to the Commonwealth for a decision on whether or not the project triggers the threshold of having or likely to have a significant impact on a MNES, including a water resource ("referral decision").

Where the Commonwealth decides that the project is a controlled action, the proponent will require assessment and approval under the EPBC Act. Some States have a bilateral agreement with the Commonwealth which allows the State to be able to undertake the assessment process. This is designed to mitigate any potential doubling up of the assessment process. There are multiple factors which may influence whether or not the project will be assessed by the Federal or State Government under a bilateral agreement, including the timing of the referral.

Once the assessment takes place, a report is then prepared for the Federal chief executive. The Federal chief executive must consider the advice of the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (**IESC**) before making a decision whether or not to approve (with or without conditions) the project in question. Matters the chief executive must take into account before making a decision whether or not to approve the project include:

- The ESD principles, which are defined to include the precautionary principle, the principle of intergenerational equity, conservation of biological diversity and the ecological integrity and improved valuation, pricing and incentive mechanisms⁵;
- the recommendation report, finalised public environmental report or environmental impact statement, any report of a commission of enquiry and any other assessment report;
- any other information the Minister has on the relevant impacts of the action;
- any other relevant comments given to the Minister;
- any relevant advice obtained from the IESC,

among other things.⁶

Any approval attaches to the proponent or the person granted the approval, and not the land or project. That is, proponents wishing to dispose of an asset must obtain consent from the Minister to the transfer of any approval.⁷

⁴ s 528 EPBC Act.

⁵ s 3A EPBC Act

⁶ s 136(2) EPBC Act

⁷ s 145B EPBC Act



The Minister may revoke, vary or add to conditions attached to an approval.⁸ In addition, any person may request a reconsideration of any referral decision (that is, whether or not an action is a controlled action).⁹ While the Minister can only make a new referral decision in specific circumstances, where the Minister does reconsider a decision, the public must be again invited to comment.¹⁰ Following reconsideration, the Minister must either confirm the decision, or revoke the decision and substitute a new decision.¹¹ This process undermines project certainty for proponents.

Petroleum and Gas (Production and Safety) Act

Water use in the CSG and LNG industry in Queensland is heavily regulated. The key pieces of legislation that govern the industry are the P&G Act and the *Petroleum Act 1923*. The impacts of extraction of water taken and used during these activities are also managed under the Water Act. The environmental management of petroleum activities, including the management of water is dealt with under the EP Act. These Acts work to manage the impacts on the environment from CSG and LNG production, to ensure that there are strict monitoring and compliance regimes in place so that resource companies are meeting their obligations.

In summary, these Acts ensure that:

- Groundwater is protected with a particular focus on the Great Artesian Basin. Landowners and rural communities rely on the supply of water from the Great Artesian Basin. The Office of Groundwater Impact Assessment (**OGIA**) is the body that provides the groundwater management functions previously carried out by the Queensland Water Commission.
- Landowner's water quality is protected. CSG operators are required to measure the water quantity in bores before CSG activities commence and during CSG extraction. This ensures that baseline information is obtained to record the impacts over time.
- Water quality is controlled. An example of this is where the Queensland Government banned the use of evaporation dams (in all but exceptional circumstances) and strengthened conditions around the treatment and use of CSG water.

Part 4 of the P&G Act contains the provisions relevant to water rights for petroleum tenures. The holder of petroleum tenure¹² may take or interfere with underground water in the area of the tenure if the taking or interference happens during the course of, or results from, the carrying out of another authorised activity for the tenure.¹³

These rights are known as the underground water rights for the petroleum tenure and are subject to the tenure holder complying with the holder's underground water obligations.¹⁴

The underground water obligations of a petroleum tenure holder are:

- the holder's underground water obligations under the Water Act, Chapter 3;

⁸ s 143 EPBC Act

⁹ s 78A

¹⁰ s 78B(6)

¹¹ s 78C(1)

¹² Authorities to prospect and petroleum leases are collectively referred to as a petroleum tenure.

¹³ s 185(1) P&G Act

¹⁴ s 185(2) P&G Act



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- any other obligation under the Water Act, Chapter 3 with which the holder is required to comply, if failure to comply with the obligation is an offence against that Act.¹⁵

The taking of water under the P&G Act is taken to be authorised under the Water Act¹⁶ and the resource tenure holder is not required to hold a water licence to take water that is produced or extracted during its activities.

The extraction of underground water by resource tenure holders has the ability to lower water levels in adjacent areas to where the activities are being undertaken. As a result, this may impact upon water bores or aquifers and springs in the surrounding area. Chapter 3 of the Water Act governs the management of impacts on underground water caused by the exercise of underground water rights by resource tenure holders.¹⁷

The purpose of Chapter 3 of the Water Act is achieved by requiring resource tenure holders to:

- monitor and assess the impact of the exercise of underground water rights on water bores and to enter into make good agreements with the owners of the bores; and
- prepare underground water impact reports that establish underground water obligations, including obligations to monitor and manage impacts on aquifers and springs; and
- manage the cumulative impacts of the exercise of 2 or more resource tenure holders' underground water rights on underground water.¹⁸

Extensive monitoring is required under these provisions to manage impacts on underground water. The Queensland Government also has in place certain policies to ensure that water quality is managed appropriately. The Coal Seam Gas Water Management Policy 2012 is an example of this. The role of the policy is to:

- clearly state the Government's position on the management and use of CSG water;
- guide CSG operators in managing CSG water under their EA; and
- ensure community understanding about the Government's preferred approach to management of CSG water.¹⁹

The Queensland Government is continually meeting with industry, landowners and other stakeholders to ensure that water use in the industry is thoroughly monitored. Recent amendments were introduced through the Water Reform Acts.²⁰

These amendments included an amendment to the EP Act to include additional application requirements for site-specific environmental authority applications. Amendments were also introduced to remove the general right for petroleum tenure holders to take or interfere with underground water in the area of the tenure for use in the carrying out of another authorised activity for the tenure (although transitional periods do apply)²¹.

¹⁵ Schedule 2 P&G Act

¹⁶ s 188 and 196 P&G Act and s 808 Water Act

¹⁷ s 361(1) Water Act

¹⁸ s 361(2) Water Act

¹⁹ https://www.ehp.qld.gov.au/management/non-mining/csg-water.html#csg_water_management_policy

²⁰ *Water Reform and Other Legislation Amendment Act 2014, Water Legislation Amendment Act 2016 and Environmental Protection (Underground Water Management) and Other Legislation Amendment Act 2016*

²¹ s 186 P&G Act



Mineral Resources Act - Associated Water Licence

There has been a raft of changes in relation to the use of underground water for coal mining projects in Queensland in recent years. Historically, coal mining proponents have found themselves in a situation whereby they have proceeded through the processes of obtaining a mining lease approval to mine as well as the associated environmental approval, only to discover that in order to physically remove the coal from the coal seam, they would be taking or interfering with the water surrounding the coal within the coal seam. This led to problems where a project could hypothetically have an approved mining lease and environmental authority but be unable to receive a water licence to remove water from a specific aquifer due to restrictions on the volume that could be allocated under the respective water plan. That is, an approved mine, that couldn't actually produce. In order to address this issue, among other things, a new statutory water right for coal projects was introduced under the *Mineral Resources Act 1989 (MR Act)* in 2014, which allowed proponents to take or interfere with underground water, resulting from the carrying out of an authorised activity under the mining lease ("associated water").²² This water right aligned the coal projects position with the rights of gas projects in Queensland. Before that Act could commence, further legislation was introduced²³ following public concern about coal projects having an unlimited right to take associated water. Further environmental authority requirements were imposed as well as transitional provisions in the MR Act.

Where a coal project falls within the transitional provisions, a proponent will be required to obtain an associated water licence to have the benefit of the statutory right to associated water.²⁴

A project will be caught by the transitional provisions if prior to December 2016:

- The environmental authority for the mining lease was granted; or
- The environmental authority application (or amendment application) had been made, but it was not decided; or
- If the environmental authority wasn't applied for or granted, but there is a notified coordinated project under the *State Development and Public Works Organisation Act 1971* in relation to the mining lease; **and**
- The proponent did not hold but would have been required to hold a water licence or permit to take or interfere with underground water as a result of the authorised activities for the mining lease.²⁵

Applying for a separate associated water licence under the transitional provisions involves preparation of an environmental impact information and public notification and submission process.

The chief executive must consider the environmental impact information, any proper submissions made as well as the public interests before granted an associated water licence. Only after the grant of an associated water licence can the underground water rights in the MR Act be exercised.

For those projects that do not fall within the transitional provisions, additional environmental authority requirements ensure that there is assessment of any projects which take or interference with underground water under that approval process.

²² *Water Reform and Other Legislation Amendment Act 2014*

²³ *Environmental Protection (Underground Water Management) and Other Legislation Amendment Act 2016*

²⁴ s 839(2) MR Act

²⁵ s 839(1) MR Act



Water Act

The water planning framework in Queensland uses the catchment and underground water area based approach to planning. Water plans apply to catchment rivers, lakes, dams, overflow land and springs and where necessary, underground water. Water plans outline the water covered by the plan, including whether or not it is surface and/or underground water. It also covers the economic and social and ecological outcomes as well as measures and criteria for deciding water entitlements such as water licences. These plans generally provide for the approval mechanism to take or interfere with water within specific aquifers and allocate volumes available from various reserves.

Underground Water Management

As discussed above, proponents are subject to underground water management obligations under the Chapter 3 of Water Act.

Before a coal or gas project can exercise its underground water rights (discussed above), it must provide an underground water impact report (**UWIR**) to the chief executive. An UWIR predicts ground water impacts and sets out monitoring and impact management strategies for the project. A proponent must then undertake bore assessments for each bore that is within an immediately affected area of an UWIR (or other bores as directed by the Department) generally within 60 days of the UWIR taking effect.

A proponent will be required to enter into a make good agreement with each bore owner, for all bores that have had a bore assessment. A proponent must use its best endeavours to enter into a make good agreement, generally within 40 business days after the bore assessment is undertaken. If the bore assessment shows that the bore has, or is likely to have, impaired capacity, caused, or materially contributed to by the resource activities, the make good agreement must include make good measures, which essentially seek to rectify the shortfall in water available to the bore owner.

Surface Water and Diversions

Taking or interfering with surface water will generally need to be authorised under the Water Act and the relevant water plan. However, both coal and gas projects can interfere with the flow of water by diversion if:

- it is a diversion of a water course and is associated with a resource activity;
- the impacts of the diversion were assessed under an environmental authority; and
- a condition of the environmental authority relates to the diversion.²⁶

RPI Act

The *Strategic Cropping Land Act 2011* (Qld) (**SCL Act**) was repealed upon the commencement of the *Regional Planning Interests Act 2014* (Qld) (**RPI Act**) on 13 June 2014.

The RPI Act regulates activities within an area of regional interest. Areas of regional interest often relate to water and include:

- (a) strategic cropping areas (**SCA**);
- (b) priority agricultural areas;

²⁶ s 98 Water Act



(c) priority living areas; and

(d) strategic environmental areas.²⁷

The RPI Act prohibits proponents from carrying out resources activities within an area of regional interest unless one the relevant exemptions applies or the holder has a regional interests development approval (**RIDA**) for the activities.²⁸

The RPI Act regulates activities and therefore is not a pre-requisite for project grant, but any approval must be obtained before activities commence.

The exemptions or otherwise RIDA application process are quite complex to navigate.

²⁷s 7 RPI Act

²⁸ s 19 RPI Act