

# Environmental Protection (Efficiency and Streamlining) and Other Legislation Amendment Bill 2025

**Submission No:** 028 and Supplementary  
**Submission By:** Glendon Farming Co  
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"Glendon"



17<sup>th</sup> December 2025

Health, Environment and Innovation Committee  
Parliament House  
George Street  
Brisbane Qld 4000  
Via email: [HEIC@parliament.qld.gov.au](mailto:HEIC@parliament.qld.gov.au)

**Submission: Environmental Protection (Efficiency and Streamlining) and Other Legislation Amendment Bill 2025**

Dear Health, Environment and Innovation Committee,

As a vested interest stakeholder impacted by resource activities occurring in our agriculturally rich region, namely the Condamine Alluvial Floodplain on the Darling Downs, I welcome the opportunity to provide feedback on the [Environmental Protection \(Efficiency and Streamlining\) and Other Legislation Amendment Bill 2025 \(The Bill\)](#), in particular those reforms pertaining to Chapter 3 and 3A of the *Water Act 2000*.

I have provided two submissions to the previous consultation undertaken by the Department of Environment, Tourism, Science and Innovation (DETSI), namely the release of the initial consultation paper '[Realising efficiencies and streamlining in the Environmental Protection Act 1994 and other portfolio amendments](#)' (consultation paper) from 10<sup>th</sup> June 2025 with submissions due by 14<sup>th</sup> July 2025. And then the second targeted tranche of consultation to the draft exposure of the Bill which occurred from Wednesday 24<sup>th</sup> September 2025, with feedback invited until 17<sup>th</sup> October 2025. During this second tranche I focused on the proposed reforms to the *Water Act 2000* which are most pertinent to our industry and ourselves personally as multi-generational farmers and irrigators which stand to have their water assets damaged by coal seam gas extraction represented by Arrow Energy's tenure over the Condamine Alluvial Floodplain and its Priority Agricultural Area.

Below, I touch on the points raised in my previous submissions, including reference to any further changes made to the Bill since the initial departmental consultation process.

**Environmental Protection Act 1994 Reform**

**Provide for the making of mandatory codes as an alternative to environmental authorities**

I have issues with this proposal based on the following points.

The replacement of EAs for low-risk ERAs with mandatory codes of practice (mandatory codes) under the *Environmental Protection Act 1994* (EP Act), begs the question: what would signify *low risk*?

Any activity that includes extractive resource mining, whether it be in the exploration or production phase, must always go through the full environmental authority assessment process, due to the long-term risks they pose to groundwater, surface water, flora and fauna, air quality, as well as greenhouse gas emissions and climate change. They can never, for this reason, be deemed 'low risk'.

The consultation paper stated that “while establishing a mandatory code for a specific ERA would remove the need to apply for and hold an EA to undertake the activity, a registration process for operators, a registration fee and annual fees may still be required for some ERAs.”

This should not be a ‘**may**’ situation, it has to be a ‘**will**’ still be required situation.

While the department may have a decreased workload from the reduction in EA assessments to work through, these ongoing **fees** could be used to fund more boots on the ground audit officers, to ensure better policing of the codes and general duties under the EP Act and Regulations – something which is sorely needed in Qld. This increased audit division would simultaneously decrease the likelihood of breaches of the EP Act duties if proponents were cognisant of the possibility of more frequent and random audits, acting as a significant deterrent while enabling stronger protection of our state’s sacrosanct environmental values.

It must also be a ‘**will still be required**’ situation for the **registration process**.

Without a registration process, or any sort of notification of the activities contemplated under the proposed mandatory code, how does the Department expect to be aware of what activities are occurring across the state and be able to hold them accountable?

To have the necessary accountability, there must be a registration/notification of activity process.

This lack of accountability, and with it **traceability**, has been a major issue with the extent of self-regulation permitted within the CSG industry in Qld, and in particular in conjunction with the introduction of the End of Waste Codes (EOWCs), under the *Waste Reduction and Recycling Act 2011* (WRR Act), which were introduced in order to reduce resourcing and streamline processes – coincidentally, similar aims as to what is being proposed under this reform.

According to the national report: ‘[Hazardous Waste in Australia 2021](#)’ by Blue Environment Pty Ltd, commissioned by the Commonwealth Government, the extent of self-regulation of the CSG industry has meant that waste such as drilling muds (C100) and residues of salt and brine (D300) have largely disappeared from tracking data:

#### **4.7.1 Coal seam gas industry wastes**

The coal seam gas (CSG) industry is concentrated in SW Qld due to deposits in the Surat Basin. The Qld CSG industry grew markedly during the mid to late 2000s and was known to produce large volumes of salty wastes, in the form of drilling muds (C100) produced during the establishment of wells and water raised to the surface as part of the gas extraction process. The latter is now desalinated in large scale reverse osmosis plants to produce large volumes of water suitable for a range of uses. This desalination process also leaves large residues (D300) in the form of salts or brines.

Qld’s approach to regulating the salty wastes from reverse osmosis treatment has evolved to require disposal in ‘regulated structures’ and, since the vast majority of this is managed onsite, **it has largely disappeared from tracking data.**

1

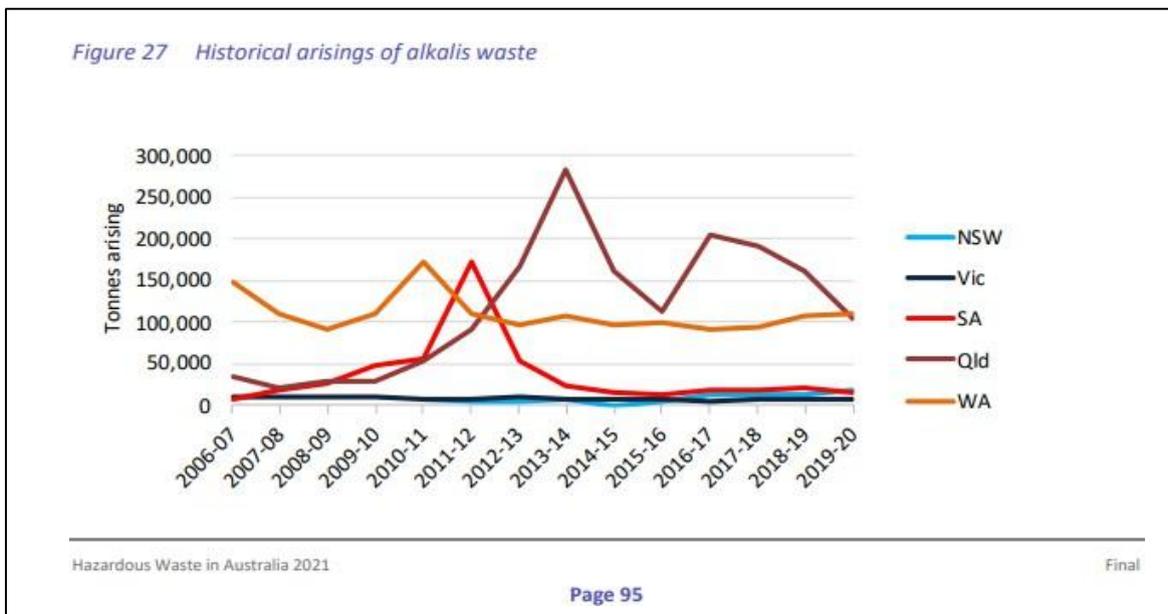
<sup>1</sup> Hazardous Waste in Australia 2021, Blue Environment Pty Ltd (**National Hazardous Waste Report**) <https://www.dceew.gov.au/sites/default/files/documents/hazardous-waste-in-australia-2021.pdf> p75/188

In fact, Qld CSG industry C100 waste, that is mostly drilling mud (in liquid form), has dropped as a proportion of total Qld C100 dramatically in recent years – 120,000 tonnes in 2014-15 down to just 1,500 tonnes in 2017-18.<sup>2</sup>

**The reason for the disappearance of Qld CSG drilling mud from tracking data is almost certainly the new ‘End of Waste Code’ for coal seam gas drilling mud**, which became effective in January 2019. This new industry requirement is designed to enable a waste to be reclassified as a resource, and therefore avoid administrative requirements such as waste tracking, as long as contaminant limits are demonstrated to be met and the material is managed according to one of the approved uses (essentially as input to composting to produce compost or conditioned soil product). These contaminant limits and the specifics of the approved uses are spelled out in the code. Although the End of Waste Code is silent on the issue, **this change in classification has largely seen drilling muds no longer tracked in Qld**. The small residual drilling muds tonnage still tracked probably represents those wastes not in compliance with the code, potentially due to exceedance of a contaminant threshold or simply because of impracticalities in sending the material to composting, with distance/cost potentially a factor.<sup>3</sup>

3

Prior to the introduction of the EOWC framework, there was a record of the waste disposal from coal seam gas mining. As soon as the EOWCs came into effect, the track and tracing fell off the cliff in the never never of self-regulation land, as demonstrated by the sharp drop-off in this chart for C100 waste from 2019:



4

<sup>2</sup> National Hazardous Waste Report p109/188

<sup>3</sup> National Hazardous Waste Report p109/188

<sup>4</sup> National Hazardous Waste Report p108/188

The same can be seen with the D300 Non-toxic salts waste category. This was historically dominated by highly saline solid, liquid and sludge by-products of CSG extraction, but these are not the main types of D300 appearing in tracking systems in 2019-20, as again they have fallen off the cliff into the never never land of self-regulation. They are still being produced in vast quantities, but unfortunately there is no longer any tracking of their quantities nor locations, thanks to the streamlined EOWC process.

The comment under **Qld** in this table, is a sad reflection of the situation we find ourselves in today:

**Sources**

Table 23 provides a summary of the main sources of D300 non-toxic salts in each jurisdiction.

*Table 23 Non-toxic salts summary source analysis 2019-20*

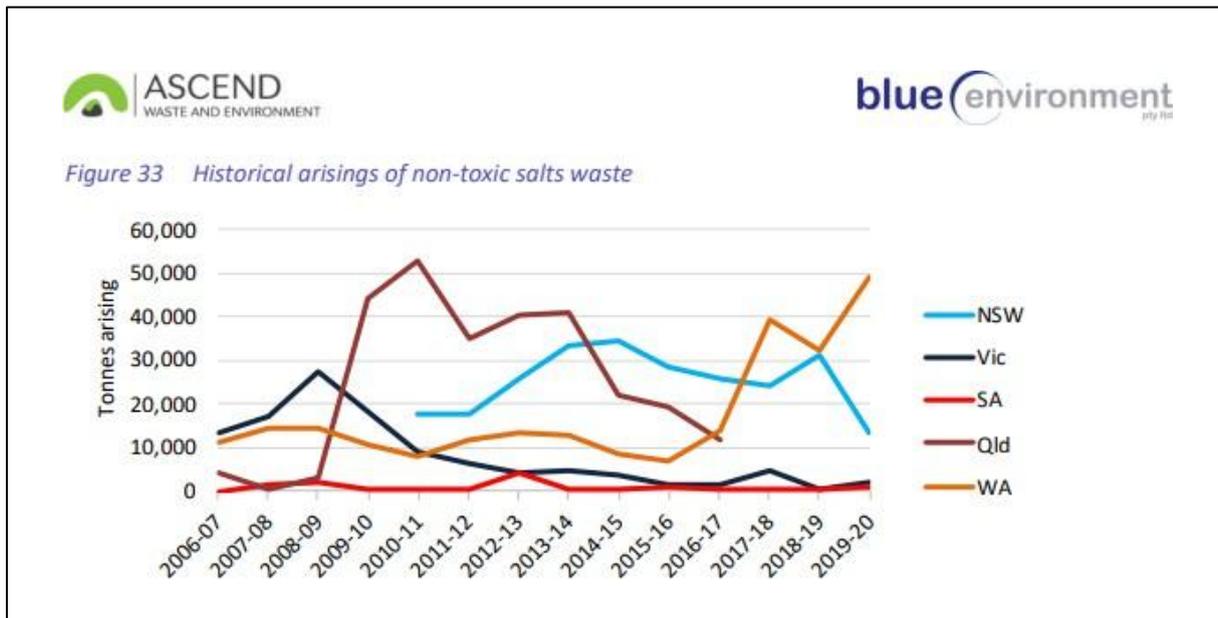
| NSW   | Vic <sup>85</sup>   | Qld  | SA                                    | National summary   |
|---|---|--|---------------------------------------|--|
| <ul style="list-style-type: none"> <li>• 55% Aluminium smelting</li> <li>• 38% Copper, silver, lead and zinc smelting and refining</li> </ul> | <ul style="list-style-type: none"> <li>• 72% Aluminium smelting</li> <li>• 13% Metal and mineral wholesaling</li> </ul> | Limited 2019-20 data available for useful analysis | <1% of national total for waste group | <ul style="list-style-type: none"> <li>• Other non-metallic mineral product manufacturing (WA only)</li> <li>• Aluminium smelting</li> <li>• Copper, silver, lead and zinc smelting and refining</li> <li>• Metal and mineral wholesaling</li> </ul> |

5

*“However, the quality of Qld data supplied in recent years is accompanied by a key caveat that infers incompleteness”*

6

This is demonstrated visually in this chart where tracking of CSG salt waste ceases entirely in Qld post 2017:



7

<sup>5</sup> National Hazardous Waste Report p119/188

<sup>6</sup> National Hazardous Waste Report p120/188

<sup>7</sup> National Hazardous Waste Report p120/188

Cutting corners and increasing the magnitude of industry self-regulation may indeed reduce the public purse in the short-term, but when impacts arise under this opaque and lack of direct oversight framework, they are often of an increased magnitude once discovered, one that ends up hurting the Qld taxpayer far greater in the long-run.

For example, now that CSG drilling muds are permitted to be added to compost (when within the standard quality parameters) - regulated on trust by the profit driven industry - we could find the situation that people are growing veggies in CSG waste that on a cumulative level over time, and where potential breaches to the Code may have been made, we would discover a link to the contamination source when it's all too late and people have started to experience health issues from the consumption of food grown in contaminated compost/soil. What is more, the ability to trace the link to the exact contamination source would be extremely difficult and involve exhaustive resources, due to the fact that tracking is ashamedly now more or less absent in Qld.

The department actually made reference in the Consultation Paper to the fact that impacts may not be apparent until years after the offence has taken place and **can be extremely complex**:

“The department encounters numerous cases where the environmental harm or impact is not always immediately apparent but becomes evident years later.

For example, land contamination, and the associated environmental and human impacts can be extremely complex and often not apparent until years after the commission of the offence that caused the contamination.”<sup>8</sup>

“Environmental offences are inherently complex and can have significant negative impacts on human health and the environment.”<sup>9</sup>

➔ Tracking and tracing is an essential component in the environmental investigation process. Its current diminishment should be reviewed, and especially considered if the Department is to go ahead with further streamlining of ‘low risk’ activities and processes.

Going back to the boots-on-ground audit team statement above, only by increasing a strong and well-resourced audit policing presence, can the government and public be assured that corners are not being cut by proponents in order to reduce time and costs, which ultimately risk human and ecological health.

➔ We desperately need more direct oversight, including better resourced auditing and compliance assessment provisions of ERAs in Qld, especially when increased self-governance and code assessable activities are being proposed. Only through such strengthened provisions can the public have confidence that safeguards to our environment won't be compromised by the streamlining changes being proposed.

➔ I have often heard it said, that proponents of ERAs consider it cheaper to pay the penalty if found non-compliant with environmental legislation and regulation, rather than put the correct measures in place. To complement the effectiveness of an increased auditing capacity as mentioned above, a substantial increase in penalties (fines) would also be a significant deterrent aid.

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<sup>8</sup> Consultation Paper – page 37

<sup>9</sup> Consultation Paper – page 38

That which also concerns me in regards to the proposal to move 'low-risk' ERAs to a mandatory code, as opposed to an EA, is the section on page 17 of the Consultation Paper, which indicates that this could also be applicable to exploration and mineral development projects - the first tranche being those operating under an ERA standard (ESR/2016/1985).

“Conversion of certain low-risk ERA standards to mandatory codes would allow exploration activities to go ahead **without EA paperwork** for activities that will comply with industry-accepted environmental management practices.”

During the EA process, the Department has a relatively robust indication of what is occurring where and within what timeframes. If you transition this to a Mandatory Code, you potentially lose this capacity to ascertain the nature of what is occurring, when and where. We risk a repeat of the bad old days, when coal exploration prospectors drilled thousands of test holes through the Condamine Alluvium (and other sensitive areas) with no record of their whereabouts, timelines or even conditions of the casings and exploration hole itself being recorded. This is now creating extreme risks to the integrity of the Alluvium with the advent of coal seam gas mining through the Condamine Alluvium on the Darling Downs, as these coal exploration holes act like a dormant conduit to cross-formation flows and contamination, waiting to be awoken with the onset of CSG depressurisation in the target coal measures below.<sup>10</sup>

➔ Learn from history and ensure that the same lax and irresponsible record keeping mistakes – with huge future ramifications – are not repeated.

Another issue is the possibility that by doing away with the EA process and moving to a mandatory code, communities and the public will have a reduction in their ability to participate in meaningful engagement and to have a say about projects being proposed in their region.

➔ Regional community participation and landholder rights should not be diminished through this process.

In general, the introduction of code managed ERA is not supported, as there are already sufficient fast pathways to EAs through existing provisions and streamlined processes. It also removes the community's ability to have a say on ERAs occurring in their region, which is a denial of due process and goes against the public interest. If this move is progressed, it risks severely reducing the regulator's ability to provide critical oversight, compliance and enforcement functions.

However, if these amendments proceed:

- (a) all proponents operating under ERA codes should be required to register with DETSI; and
- (b) that register should be made publicly available to ensure clarity for all in how the operation is regulated.

### **Clearly identify the State's priorities for environmental protection in the EP Act**

This section should be expanded to include in the list of State Environmental Protection Priorities (SEPPs), any regionally significant water sources as recognised under the *Regional Planning Interests Act 2014* (RPI Act) and *Regulation 2014* – for example the Condamine Alluvium, the only prescribed

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<sup>10</sup> Focus on NRM Research: Evaluating the extent of hydraulic connectivity between the Condamine Alluvium, the Great Artesian Basin and the Walloon Coal Measures, Dr Bryce Kelly  
<https://cottoninfo.com.au/sites/default/files/documents/NRM%20researcher%20summaries%20-%20Evaluating%20hydraulic%20connectivity%20-%20June%202016.pdf>

regionally significant water source in Queensland.<sup>11</sup>

What is more, it would be highly desirable to bring back the inter-connectivity between the protection of environmental and agricultural values, as was afforded through the correlation between the *Strategic Cropping Land Act 2011* and the *Environmental Protection Act 1994*; in that an EA could not be approved for resource activities occurring on strategic cropping land (SCL) unless a SCL compliance certificate or SCL protection decision had been procured. This condition was sadly made void with the commencement of the RPI Act, and subsequent repeal of the SCL Act, to the dire detriment of the effective protection of agricultural values from CSG mining, namely on the Darling Downs, whereby Arrow Energy are successfully bypassing/avoiding the required impact assessment due to a lack of notification and evidentiary requirements placed upon resource companies under the RPI Act, under the exemptions present in the Act.

### **Allow for audits of PRCP schedules to be determined by the administering authority**

“Section 285 currently requires holders of a PRCP schedule to commission an audit of the PRCP schedule by a rehabilitation auditor every three years and submit an audit report to the administering authority.”

That proposed > provide the administering authority with the ability to require an audit of a PRCP schedule through a notice to the EA holder, rather than it being mandatory every three years.

I do not support this proposal. Industry should be held accountable to their rehabilitation commitments and obligations, and the Department must be able to monitor on a regular basis that the proponent is on track to fulfilling these requirements, which the 3-year cycle allows for.

Otherwise, you run the risk of proponents delaying the start of rehabilitation obligations, as they are no longer required to demonstrate regular updates, and having a situation where these obligations get kicked like a can down the road, further risking the Qld taxpayer footing the bill, especially if the situation arises that the proponent becomes insolvent. It's akin to students at school, you leave them unchecked and to their own devices, and only a very diligent small minority would do the necessary homework and revision for their exams, the rest will exploit the lack of oversight and not do the necessary preparation work, setting themselves up for potential failure. By removing the regular reporting obligations, the government risks having many projects with PRCPs not commenced, or barely commenced, and not on track, with a bigger headache for the Department to sort out towards the finish line. This is not in the public interest.

## **Water Act 2000 Reform**

### **Proposal to extend the Underground Water Impact Report (UWIR) cycle from the current 3 years to 5 years**

I am strongly opposed to this proposal.

During the prior consultation in which I heavily partook, there was no mention whatsoever of a move to change the UWIR cycle from 3 years to 5 years. This has completely come out of leftfield. It has denied affected stakeholders, especially those in the agricultural industry, to have a concerted and informed say on such a proposal that stands to have significant consequences on their farms, businesses and water assets.

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<sup>11</sup> The Regional Planning Interests Regulation 2014, Part 2, Section 3

Not only does it apply to the large and significant Surat CMA, but also to the UWIRs of individual tenure holders who fall outside of the Surat CMA.

Extending the window for reporting on resource industry-induced impacts to environmental values, including those on aquifers, water bores, Groundwater Dependent Ecosystems (GDEs), Springs and CSG-induced subsidence does not foster greater oversight nor public notification of impacts. It denies affected stakeholders and the general public a more regular timeframe in which to be informed of impacts and be able to have their say through the statutory UWIR consultation process. It denies landholders in particular the ability to be better informed so that they can be on the front foot and make business decisions according to the uninvited third-party impacts imposed upon them.

It also means that obligations through the UWIR process are not being assigned and actioned in an appropriate timeframe e.g. monitoring bores, baseline assessments, make good obligations/measures.

Critically, it severely reduces the effectiveness and functionality of the ongoing impact assessment process under the Queensland Government's adaptive management framework, which is provisioned through the complementary inter-linkage between the UWIR process and the *Environmental Protection Act 1994*.

This process is explained here in an extract from the [DETSI Guideline: Underground water impact reports and final reports \(ESR/2016/2000\)](#):

### **2.3 Adaptive management of impacts to groundwater: relationship with *Environmental Protection Act 1994***

Potential impacts on groundwater will be managed through an adaptive management regime through both the *Environmental Protection Act 1994* (EP Act) and the UWIR process in Chapter 3 of the Water Act.

The requirements of section 126A and 227AA of the EP Act are complimentary with the information requirements for an UWIR in section 376 of the Water Act. Section 126A outlines a list of information requirements which must accompany a site-specific environmental authority application where the resource activity or project involves the exercise of underground water rights. Section 227AA requires that this information also be included with an environmental authority amendment application where the proposed amendment involves a change in the exercise of underground water rights. These requirements ensure an upfront assessment of the impacts to environmental values from the exercise of these underground water rights has been undertaken, and that potential impacts are appropriately managed.

**It is anticipated that the information supplied with the environmental authority application will be utilised and built upon for the responsible entity's submission of the UWIR. Equally, any relevant information contained in an approved UWIR may be utilised as part of the environmental authority application.**

An environmental authority may be amended in response to the contents of an UWIR. This framework ensures that there is sufficient monitoring, collection and review of information for ongoing adaptive management of groundwater impacts due to the resource sector's statutory right to take underground water.

<sup>12</sup> DETSI Guideline: Underground water impact reports and final reports (ESR/2016/2000) [https://www.detsi.qld.gov.au/policies?a=272936:policy\\_registry/rs-gl-uwir-final-report.pdf](https://www.detsi.qld.gov.au/policies?a=272936:policy_registry/rs-gl-uwir-final-report.pdf) (DETSI UWIR Guideline) - p2/30

And further here:

Recommended methods and inclusions for Part D are described below:

An UWIR is required to include a description of past and predicted impacts on environmental values which result from the exercise of underground water rights. Relevant information submitted under the EP Act requirements can be utilised to address this requirement of an UWIR. In particular, this information builds upon information submitted as part of environmental authority application requirements under section 126A(2)(d) of the EP Act.

It is acknowledged that there will be uncertainties inherent in predictions of environmental impacts relating to the exercise of underground water rights which are submitted as part of an environmental authority application. This requirement therefore ensures the ongoing scrutiny of such impacts during the operational phase of resource projects. Any changes in impacts, or predicted impacts, identified in the UWIRs may trigger an amendment of the environmental authority to ensure the appropriate management of the impacts.

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Where resource proponents submit information in environmental authority applications, it is expected that there will be inherent uncertainties in predictions of environmental impacts relating to the exercise of underground water rights.

Therefore, under the Qld Government's preferred adaptive management approach, the UWIR is relied upon to provide ongoing and continuous information in regard to impacts derived from the modelling and monitoring provided by OGIA, both cumulative and sub-regional.

If the UWIR cycle is stretched out to 5 years this will cause this iterative (adaptive management) impact assessment process to be severely compromised due to the reduced frequency of pertinent information being made available to the administrative authorities. It will severely hamstring the regulator's ability to provide adequate compliance, enforcement and oversight in their remit to provide adequate protection to our state's environmental values.

There is already an existing ability for resource tenure holders and the Office of Groundwater Impact Assessment (OGIA) to request an extension beyond the 3 years if necessitated, under section 370 of the Water Act, subject to approval by the Chief Executive. This has indeed occurred with the latest iteration of the UWIR in 2025, following the last iteration in 2021, making it a 4 year cycle, due to new monitoring and research related to the Condamine Alluvium and the major Horrane Fault zone, which OGIA wanted extra time to work on so that some of the findings could be included in the UWIR 2025. This extra research demonstrates significant connectivity concerns between the Condamine Alluvium and the target Walloon Coal Measures, especially in regard to Arrow Energy's tenure over the Condamine Alluvial Floodplain and its Priority Agricultural Areas.

For the reasons stated above, this UWIR cycle extension should not be allowed to proceed.

**Align the obligations to prepare baseline assessment plans for landholder water bores with the UWIR obligations**

I fully support bringing the Baseline Assessment Plans under the Underground Water Impact Report (UWIR) obligations for the Surat CMA and aligning the requirements for baseline assessment of water bores which are both on-tenure and off-tenure.

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<sup>13</sup> DETSI UWIR Guideline – p14/30

At present, despite what was indicated below in a GasFields Commission Queensland (now Coexistence Queensland) guideline, BAPs are not publicly available, despite them being extremely pertinent to landholders/bore owners as directly implicated stakeholders. This means that landholders/bore owners are effectively being denied the right and ability to ensure that the responsible tenure holder is compliant with their baseline obligations pertaining to the bores in their region or sub-region, including their own.



### Checklist for Baseline Assessments: Private Water Bores

| STATUTORY OBLIGATION   | RESPONSIBILITIES  |   |
|--|---|---|
|  | RESPONSIBLE TENURE HOLDER (RTH)<br><i>The responsible resource company</i>  | BORE OWNER (OWNER)  |
| <b>Baseline Assessment Plan (BAP)</b>  |   |   |
| <ul style="list-style-type: none"> <li><input type="checkbox"/> BAP required prior to production of water on a resource tenure</li> <li><input type="checkbox"/> Submit to <a href="#">Department of Environment and Science (DES)</a> for approval</li> </ul>   | <ul style="list-style-type: none"> <li><input type="checkbox"/> Prepare a BAP (<a href="#">download the BAP guidelines here</a>):               <ul style="list-style-type: none"> <li>o identify the bores within the priority tenure area that will be assessed prior to the production of water</li> <li>o provide a schedule for completion of Baseline Assessments for each bore</li> </ul> </li> <li><input type="checkbox"/> Submit to DES for approval</li> <li><input type="checkbox"/> Implement BAP</li> <li><input type="checkbox"/> Publish BAP on website</li> </ul>  | <ul style="list-style-type: none"> <li><input type="checkbox"/> If asked, provide the following information to assist the RTH to prepare the BAP:               <ul style="list-style-type: none"> <li>o the location of any water bores on the land, and</li> <li>o any other details relating to the bore</li> </ul> </li> </ul>  |
| <b>Undertake the Baseline Assessment</b>   |   |   |
| <ul style="list-style-type: none"> <li><input type="checkbox"/> In accordance with the approved BAP</li> <li><input type="checkbox"/> If directed by DES (section 402 of the <a href="#">Water Act 2000</a>)</li> <li><input type="checkbox"/> On bores outside the resource tenure area that are published as Long-term Affected Area (LAA) bores in an underground water impact report (UWIR)</li> </ul> | <ul style="list-style-type: none"> <li><input type="checkbox"/> Follow the BAP to complete Baseline Assessments:               <ul style="list-style-type: none"> <li>o update the BAP if there are any changes to the schedule, and</li> <li>o report progress and any changes to DES</li> </ul> </li> <li><input type="checkbox"/> Undertake additional Baseline Assessments if:               <ul style="list-style-type: none"> <li>o directed by DES, or</li> <li>o required under a UWIR</li> </ul> </li> <li><input type="checkbox"/> Comply with the <a href="#">Baseline Assessment Guidelines</a> published by DES</li> </ul> | <ul style="list-style-type: none"> <li><input type="checkbox"/> Communicate with the RTH</li> <li><input type="checkbox"/> Enquire about potential for Baseline Assessments and timing</li> <li><input type="checkbox"/> Provide access to enable the RTH to undertake the Baseline Assessment.</li> </ul> <p style="font-size: small; margin-top: 5px;"><i>Note. This is an activity under the <a href="#">Water Act 2000</a> and a conduct and compensation agreement (CCA) and/or compensation are not required.</i></p> |

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BAPs are in fact only available through the *Right to Information* process which comes at a significant cost to the interested stakeholder, and with it a significant delay in having access to this information. This lack of public access to BAPs by landholders/bore owners creates an unlevel and non-transparent playing field in the coexistence nexus that farmers find themselves in.

Under this new measure to include BAPs within the UWIR process, the reporting must include:

- details of the bores to be baseline assessed and by when,
- reporting on the fulfilment of the BAP obligations in accordance with the stated timeframes,
- reporting on the fulfilment of the baseline assessments in accordance with the [guideline](#)<sup>14</sup> requirements including water quality parameters, and
- any compliance action taken where the obligations have not been met

➔ The public cannot be expected to wait for the next UWIR iteration for this to be made available. A transitional provision must be enacted to ensure this information is made available in the most prompt possible timeframes.

<sup>14</sup> Baseline assessment guideline ESR/2016/1999

- As per Make Good Water Bore Assessments, updates on BAPs and baseline assessment obligations should also be included in the OGIA UWIR Annual Reports.

## Baseline Assessment Strategy (Bill)

### Section 379A

- There is an urgent necessity to include looking at historical gaps in baseline assessments. For example, our neighbours fall in petroleum leases (PL) 238 and 258. They have not had baseline assessments performed and yet these were due in 2014 (zone 2) and 2017 (zone 3) respectively. I only know this thanks to accessing the BAP for Arrow Energy's tenure in our area through a Right to Information application. Many bores have fallen through the cracks and have not undergone a baseline assessment. Baseline assessments act as an insurance policy for landholders and it is critical that they are carried out and carried out effectively in accordance with the requirements as detailed in the [Baseline Assessment Guideline ESR/2016/1999](#).
- There is also a need to comprehensively look at the inadequacies in previous baseline assessments and have these addressed. I have seen historical baselines which are missing significant data including dissolved gas measurements and water quality testing results.

### Section 379B (1)(a)(i)

- 10km would be a more appropriate radius than 2km, as this is the impact zone from depressurisation as stated by OGIA in the UWIR 2021.

*“Depressurisation of coal seams from a single well creates a cone of groundwater pressure decline – also referred to as ‘cone of depression’ (refer to section 7.2 for definition) that extends radially away from the well over time – typically to about 10 km within 2–3 years of production in the Surat Basin if there is no interference from nearby wells.”<sup>15</sup>*

### Section 379B (1)(a)(ii)

- Change to “during production testing, water will be taken from the aquifer, or aquifer adjacent to that, supplying the water bore”
- The BAS details need to be made available on Queensland Globe (QG). For example, a coloured contour map layer (similar to the layers displaying the IAA and LAA contours) with each colour marking the required BAS priority area due date/deadline (*baseline assessment timetable*). When one looks up a bore in QG, one should be able to see against it the responsible tenure holder for the baseline assessment, the BAS deadline date, if a baseline assessment has been performed and if so when.
- It needs to be made clear in the legislation, that they cannot proceed with development until the baseline assessments, as per the BAS, have been appropriately completed. There needs to be a specific check and approval mechanism, rather than left to tenure holder self-

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<sup>15</sup> Office of Groundwater Impact Assessment (OGIA), Underground Water Impact Report (UWIR) 2021, p100 (UWIR 2021)

regulation.

- BAS updates should be included in OGIA's UWIR annual reports.
- It would be extremely useful, if when looking up bores in QG, that the formation details can be displayed on the left in the overview section. Presently it just states for example 'artesian' or 'sub-artesian facility', without the actual formation listed – as displayed below. This is too broad.

The screenshot shows the 'Attributes' page for a registered water bore with ID 107688. The page is part of the Queensland Government mobile application. The left sidebar contains navigation options: Topics, Search, Layers (16 items), Places (0 items), Maps (0 items), Print, and Help. The main content area displays the following attributes:

|  |                       |
|--|-----------------------|
| Registered number                      | 107688                |
| Status                                 | Existing              |
| Status code                            | EX                    |
| Type                                   | Sub-Artesian Facility |
| Type code                              | SF                    |
| Latitude                               | -27.50680017          |
| Longitude                              | 151.27299972          |
| Drilled date                           | 19 June 2001          |
| Bore report                            | <a href="#">Link</a>  |
| Bore aquifer attribution report (OGIA) | <a href="#">Link</a>  |

In order to decipher the formation a bore is in, you currently have to download the bore report and go through the data in a separate pdf file which is a real pain and very time consuming.

Additional to this, in the overview section, you could have fields that detail the baseline assessment, bore assessment and any Make Good Agreement (MGA) information, for example:

Baseline assessment due – DATE

Baseline assessment complete – Y/N - DATE

Bore assessment due – DATE or N/A

Bore assessment complete – Y/N - DATE

Make Good Agreement – Y/N - DATE

Make Good Outcome – MONITORING - RESTRUCTURE - NEW BORE/FORMATION DETAILS - FINANCIAL

This data should also be made available via the Queensland Government's open data portal (spreadsheet), or better still, on a dedicated bore status portal where individual bore details (high-level for privacy purposes) can be retrieved, as well as the ability to look at the bigger picture e.g. how many MGAs have resulted in a financial compensation outcome, how many new bores have been drilled in the Hutton SS due to MG process etc.

#### Insertion of new Section 396A

Instructions and obligations on undertaking a Baseline Assessment still need to apply, regardless of whether in a CMA tenure, as per the [Baseline Assessment Guideline ESR/2016/1999](#).

### **Provide an efficient and contemporary reporting framework for all statutory obligations related to water bore data through OGIA**

I fully support the enhanced reporting obligations from the responsible tenure holder to OGIA, which includes that related to baseline assessments, bore assessments and make-good agreements.

- ➔ This (high-level/non-sensitive) reporting information should also be made publicly available.

#### Section 437B(2)(b)(ii)(A) and (B)

- Reporting on MG measures/outcomes should include details on the formations in which new bores may have been drilled so that their ongoing aquifer sustainability can be monitored.
- There should be a mechanism/provision to allow for updated reporting to the Office if there is a material change in a Make Good Agreement.

#### Section 454A (4)

- Why has this disallowance been included? If an individual tenure holder is non-compliant with the UWIR obligations, then there should be full disclosure to the Office and Chief Executive regardless of their status as individual.

### **Create a process for a landholder to request a bore assessment by a tenure holder, including a decision, review and appeal process.**

#### Section 419B

- There should be compensation provisions for the collection of information/evidence by the bore

owner in order to lodge an effective bore assessment request with the chief executive, if such information/evidence is required.

#### Section 419C

- In deciding the application for a bore assessment notice, the chief executive should be able to consult with outside agencies e.g. OGIA and DLGWV.
- It stated in the consultation paper that the decision about whether or not to issue a bore assessment notice to the tenure holder will be considered an original decision with associated internal and external review and appeal provisions, however this does not seem to be made clear in the Bill. Are the review and appeal rights being appropriately provided as previously intended?

#### **Clarify that land access for a make good arrangement does not allow access for other purposes**

Section 420 does not make reference to Land Access. Could the current subtle change in the Bill be made clearer?

#### **Clarify that OGIA's functions are covered by its annual levy**

#### Section 479

Support.

#### **Make other minor and administrative amendments – provide that only impacted bore owners be notified about the approved UWIR**

#### Section 386(1)(a)(ii)

As it is proposed that only affected bore owners may be notified about the approval of the UWIR, there should be provisions made that the notice also be published in locally circulating newspapers so that the wider community may also be made aware. Examples of local newspapers include the Toowoomba Chronicle, Western Downs Today, Queensland Country Life etc. I can understand the move to reduce mailouts, save time and cut costs, but not everyone is monitoring OGIA's website, and so for the purposes of transparency, a notification in local newspapers is required. This would be far cheaper and less time-consuming in comparison to the current approval notice mailout to all water bore owners in the Surat CMA.

#### **Clarify that land access for a make good arrangement does not allow access for other purposes unless expressly provided for in the agreement.**

#### Section 420

Support.

- ➔ Penalties should apply for any breaches of this condition.

## General Feedback

### **While making changes to chapter 3 of the Water Act, other amelioration measures should be considered.**

There is an undesirable and unsatisfactory lack of oversight of the water bore baselines and bore assessment process. The practice of carrying out the assessments is left to the responsible tenure holder under a guideline and based purely on trust. As we can see from the response to a [Question on Notice](#)<sup>16</sup> in parliament last year, the baseline assessments in the Condamine Alluvium are being carried out to an extremely insufficient standard which creates future problems for landholders in establishing liability if and when impacts to their water bores are to occur from CSG activity. The baselines are like an insurance policy for landholders, and yet what is occurring at present is not worth the paper it is written on due to their substandard nature and complete lack of information being provided to properly satisfy the guideline. This represents an injustice to farmers and regional bore owners.

- ➔ Departmental resources must be drastically increased so that more direct oversight can be effected and compliance better assured.

Ideally the baselines and bore assessments should be not be carried out and managed by the responsible tenure holder who has a conflict of interest as the potential future liable party. It is akin to letting the perpetrator of a motor vehicle accident carry out the insurance assessment on the damages incurred. This would never happen in the commercial world, and it is an injustice to farmers and regional bore owners that assessments (baseline and bore) are being allowed to be carried out by the culprit and committer of the damage in the onshore gas industry situation.

- ➔ Baselines and bore assessments should instead be carried out by a fully independent and at arms-reach qualified party, ideally a departmental body sitting under the Department of Environment, Tourism, Science and Innovation (DETSI) or the Department of Local Government, Water and Volunteers (DLGWV).

We used to have a *Groundwater Investigation and Assessment Team* (GIAT). This was made up of departmental experts including qualified hydrogeologists who were able to go out and do bore assessments and investigate any issues with water bores relating to CSG activity. They also acted as much needed mediators and arbiters between the well-resourced gas companies and under-resourced farmers, including providing essential community and industry engagement.

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<sup>16</sup> Question on Notice No.712, Asked on Tuesday, 11 June 2024  
<https://documents.parliament.qld.gov.au/tableoffice/questionsanswers/2024/712-2024.pdf>

# Groundwater Investigation & Assessment Team (GIAT)

- Groundwater investigations of potentially impaired bores.
- Implement and report on an independent monitoring program – Groundwater Net and Groundwater Online
- Audit water monitoring bore construction and monitoring procedures.
- Community and industry engagement



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Unfortunately, the GIAT was disbanded in about 2016 and nothing filled its void leaving farmers completely unsupported in make good battles with well-resourced multinationals whose focus is making profits and keeping compensation costs to a minimum. This came at a great cost to farmers while the gas companies gained further unjust advantage.

- ➔ The *Groundwater Investigation Assessment Team* (GIAT), or a similar departmental body, should be established to act as an independent assessor of water bore impacts from CSG activity, and have the ability to act like a mediator and arbiter of groundwater impact disputes that may arise between gas companies and bore owners. This would create a more level playing field and foster more confidence in landholder protections. I am happy to provide more information on this in any ongoing consultation opportunities that may arise.

The *CSG Net* program also appears to have been disbanded by government. The team that used to look after this are unreachable and there hasn't been a *CSG Net* annual community forum since 2021. Again, this is another sad reflection of the lack of resources being put into supporting farmers who are forced to navigate a very challenging and stressful scenario, where an uninvited third party has caused, or may cause, long-term damage to the most essential aspect of their properties and livelihoods – **water**.

- ➔ We need a return to the support and resourcing provided to farmers in the early days of CSG development in Qld. The industry is still expanding, and doing so in more closely settled areas with a higher density of water bores. The Qld Government has a responsibility and duty of care to provide this much needed support to regional landholders and communities. The gradual rescinding of resources over the last few years is a shocking affront on farmers, and plays purely into the pockets of the CSG

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<sup>17</sup> [https://www.waterysauces.org.au/presentations/David\\_Free\\_WRRRA\\_Presentation\\_22Feb2018.pdf](https://www.waterysauces.org.au/presentations/David_Free_WRRRA_Presentation_22Feb2018.pdf)

miners.

The Office of Groundwater Impact Assessment (OGIA) is an independent body that sits under DLGWV, but administered by and answerable to DETSI. However, it lacks a robust governance structure.

- ➔ To improve confidence in, and the integrity of the Office, it would be beneficial to introduce a board of directors or commissioners, similar to the structure of the GasFields Commission Queensland (GFCQ), now known as Coexistence Queensland, to which the operational staff of OGIA would be answerable to.
- ➔ To compliment these oversight measures, DETSI should also ensure there is adequate technical expertise within the Department in order to be able to review and adequately question OGIA's work and findings.

There needs to be a more constructive collaboration on groundwater impact matters and make good management matters between OGIA and the Water Department (DLGWV). At the moment there is a silo structure between government organisations which does not aid communication, collaboration and importantly the sustainable management of our groundwater resources.

For example, if it weren't for Central Downs Irrigators Ltd (CDIL) inviting both DLGWV representatives and OGIA to a members meeting, the DLGWV representatives wouldn't have heard the update and findings on OGIA's Airborne Electromagnetic (AEM) survey over the Condamine Alluvium.

There also needs to be co-collaboration with DLGWV in regard to ongoing sustainability assessment of an aquifer's capacity to incorporate make good measures that include the drilling of new water bores e.g. Hutton Sandstone.

- ➔ A cross-departmental mechanism/structure needs to be enacted to ensure better communication and collaboration outcomes on all groundwater impact and connectivity matters.

The Land Access Ombudsman should be made available to assist landholders with MGA negotiations as well as disputes pertaining to MG measures/commitments. I thought this was to be enacted under the MEROLA Act 2024 but no measures have yet been put in place. This delay to enhanced assistance to landholders is disappointing.

Landholders are poorly supported in this space. As mentioned above, the re-enactment of a Groundwater Investigation Assessment Team (GIAT), or similar body, is most needed to support landholders who have incurred unjust impacts to their water bores from an uninvited third party and to facilitate a more level playing field.

I thank the Parliamentary Committee for considering the feedback I have provided herewith.

Yours sincerely

*Liza Balmain*

Ph: [REDACTED]

Email: [REDACTED]

# Environmental Protection (Efficiency and Streamlining) and Other Legislation Amendment Bill 2025

**Submission No:** 028 - Supplementary  
**Submission By:** Glendon Farming Co  
**Publication:** Making the submission and your name public

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Liza Balmain  
"Glendon"



26<sup>th</sup> January 2026

Health, Environment and Innovation Committee  
Parliament House  
George Street  
Brisbane Qld 4000  
Via email: [HEIC@parliament.qld.gov.au](mailto:HEIC@parliament.qld.gov.au)

**Clarification post public hearing on 20<sup>th</sup> January 2026 for the Environmental Protection (Efficiency and Streamlining) and Other Legislation Amendment Bill 2025**

Dear Health, Environment and Innovation Committee,

Thank you for inviting me to present at the Public Hearing on Tuesday 20<sup>th</sup> January 2026 in Brisbane and allowing me the opportunity to expand on the points raised in my submission, as well as provide context to the practicalities of landholders having to navigate the legislation and frameworks in relation to coal seam gas activities and their impacts occurring on their farms or in the vicinity of their properties.

I would like to take this opportunity to clarify a couple of points raised throughout the public hearing session.

**1. UWIR Cycle**

Firstly, in relation to the last-minute proposal inserted into the Bill by the Department of Environment, Tourism, Science and Innovation (DETSI) for the Underground Water Impact Report (UWIR) cycle to be extended to 5 years as opposed to the current 3 years. This was not raised as a suggestion at all throughout the consultation process, and appears to have arisen from a suggestion by the resources industry. I would still appreciate clarification on where this proposal originated from. On discovering this new amendment to the Bill, I emailed Mr Kahil Lloyd, Acting Deputy Director-General, Environment and Heritage Policy and Programs (DETSI) on 22<sup>nd</sup> November 2025 seeking information on where this change had arisen from. Unfortunately, I have received no response to my enquiries. I also sought the same advice during an online briefing on 5<sup>th</sup> December 2025, but again received no clear answer.

**1.1 The Consultation Process**

The consultation process had included the proposal to change section 370 of the *Water Act 2000* to clarify that a new UWIR is required to be submitted for approval three years from its previous approval, to rectify the issues that have arisen from its current form of three years from the anniversary date of the report's first approval.

This was still the case late in the consultation period as demonstrated in the exposure draft of the Bill:

## Part 2

## Amendment of Water Act 2000

### 2 Act amended

This part amends the *Water Act 2000*.

*Note—*

See also the amendments in schedule 1.

### 3 Amendment of s 370 (Obligation to give underground water impact report)

Section 370(2)(c)—

*omit, insert—*

(c) be given on or before—

- (i) the third anniversary of the day the chief executive approved the most recent underground water impact report for the cumulative management area or resource tenure; or
- (ii) if the chief executive agrees to a later day—the later day; and

This change was well supported in order to remedy any complexities experienced by the Office of Groundwater Impact Assessment (OGIA) and responsible tenure holders (RTHs) in having the reports due “within 10 business days after each third anniversary of the day the first underground water impact report for the cumulative management area or resource tenure took effect” [current wording - section 370(2)(c)], as opposed to a much easier to manage three years from the approval date of the most recent report.

As stated by DETSI in the ‘supplementary information paper to support reading the exposure draft’, released to targeted stakeholders in late September, “this is a minor update with no substantive regulatory change.”

### 3.11.b Clarify the timeline for when a UWIR must be prepared to be three years after the approval of the last UWIR.

Clause(s): 3,4

Sections amended: ss370 (2)(c), s370B.

The proposal reflected in the exposure draft is to clarify that a new UWIR is required to be submitted for approval three years from its previous approval.

This will clarify, that a subsequent (new) UWIR must be prepared three years after the approval of the last UWIR. Currently, it is three years from the anniversary date of the report's first approval.

A proposed transitional provision will provide that this new submission date will apply from commencement.

This is a minor update with no substantive regulatory change.

I must admit, I felt somewhat betrayed by the consultation process - having engaged so heavily and having dedicated much precious personal unpaid time to the process - to have such a significant change made at the last minute with no prior consultation or feedback sought.

The issue with the timing is that now thousands of agricultural and community stakeholders, including affected landholders and bore owners, are wholly unaware of the proposed change to a 5 year UWIR cycle and have not had the opportunity to have a say. This is a breach of due process and a failure of public consultation on a matter which stands to have large ramifications for the thousands of potentially impacted bore owners.

The UWIR is a unique and critical process as it is the **only statutory instrument** regarding the impacts from resource companies exercising their underground water rights which provides for:

1. **Identification of existing impacts** on environmental values, including groundwater, from the exercising of underground water rights by the resource industry;
2. **Predictions of future cumulative impacts** on environmental values, including groundwater, based on all the existing and proposed coal seam gas (CSG), conventional oil and gas, and mining development, in the short term (3 year UWIR cycle) and long-term - over the life of the industry;
3. Identification of bores impacted beyond the trigger threshold\* in the short term – referred to as **Immediately Affected Area (IAA) bores**, where make good arrangements are required. As the UWIR is a three year cycle, this means that IAA bores are those that are predicted to be impaired within three years of the UWIR publication/approval;
4. Identification of bores impacted beyond the trigger threshold\* in the long term – referred to as **Long-term Affected Area (LAA) bores**. These are predicted to be impaired some time in the future, beyond the next three years and are provided for critical information purposes;

*\* the trigger threshold for consolidated aquifers, such as sandstone, is 5 metres of predicted groundwater level impact, and for unconsolidated aquifers, such as alluvium, it is 2 metres.*

5. **Maps** which demonstrate the area of the aquifer where the water level is predicted to decline by more than the bore trigger threshold in the short term (IAA) i.e. within 3 years, and at any time in the future (LAA); including maps which show the extent/distribution of predicted drawdown in each aquifer over the life of the industry.

6. The triggering of **Make Good obligations** on the responsible tenure holder (RTH) - commencing with bore assessments and then Make Good Agreements including the instigation of Make Good Measures (subject to the outcome of the bore assessment) - in line with the identification of IAA bores within the next three years;
7. Obligations assigned to RTHs under the **Water Monitoring Strategy** (WMS) for the construction and maintenance of groundwater monitoring points, including those for water pressure (groundwater level) and water chemistry\*\*, as well as groundwater chemistry\*\* reporting requirements from production wells. The WMS includes obligations on the RTH to report data to OGIA from the monitoring networks for the purposes of ongoing assessment. This includes obligatory reporting on associated water extraction volumes.

*\*\* please note groundwater chemistry monitoring is for the purpose of assessing groundwater connectivity (movement of water between formations) and not for the assessment of groundwater quality or gas migration which is currently not being carried out under the UWIR process, despite this being a high risk impact on environmental values from the exercising of underground water rights.*

8. Obligations assigned to RTHs for **baseline assessments** in off-tenure situations, as well as the statutory reporting to OGIA of the information from baseline and bore assessments for the purposes of updating the Qld Government's Groundwater Database (GWDB) which is publicly accessible via the Open Data Portal.
9. Obligations assigned to relevant RTHs (namely Arrow Energy) for the collection of LiDAR survey data at least once per year for the purposes of regional-scale monitoring of **CSG-induced subsidence** over the highly vulnerable Condamine Alluvial Floodplain.
10. The development of a **Spring Impact Management Strategy** (SIMS) for managing impacts on springs and watercourses that are supported by groundwater. It includes an assessment of risks to springs from current and planned resource development impacting the source aquifers and actions to be taken for preventing or mitigating those risks (where the predicted impacts on source aquifers are more than 0.2 metres = *springs of interest\*\*\**). The monitoring and mitigation strategies identified in the SIMS are assigned under the UWIR process to the relevant RTHs for implementation.

*\*\*\* There are a considerable number of **springs of interest** in the Surat CMA – being springs overlying aquifers with predicted impact of more than 0.2 metres drawdown at any time. For example, 89% of watercourse springs in the Surat CMA are identified as being impacted by resource development and classified as springs of interest.*

11. **Public consultation** on the draft form of the UWIR prior to the formation of a final report submitted to DETSI for approval.

## **1.2 Obligations**

It is essential that the UWIR cycle remains at prescribed 3 year intervals so that obligations can be statutorily assigned to responsible tenure holders within a stringent timeframe.

These obligations include:

- **Baseline Assessments** (currently off-tenure for the Surat CMA, but soon to be on-tenure as well, subject to the passing of the Baseline Assessment Strategy (BAS) in the Bill)
- **Bore Assessments** following the identification of IAA bores through the UWIR process
- **Make Good Agreements** and the implementation of **Make Good Measures** (subject to the

- outcome of the required bore assessment)
- The construction and maintenance of **monitoring points** under the WMS, including groundwater level monitoring and groundwater chemistry monitoring bores in locations and formations specified by OGIA in accordance with their modelling and ongoing assessment requirements
- Monitoring and mitigation measures identified in the **Spring Impact Management Strategy** assigned to the relevant RTH for implementation.

A summary of the responsible tenure holder obligations is outlined in [Schedule 9](#) of the draft UWIR 2025:

## Schedule 9 Summary of responsible tenure holder obligations

Table S9-1: Summary of responsible tenure holder obligations

| Responsible tenure holder | Water bore obligations (Chapter 11) |           | Water Monitoring Strategy (Chapter 12)  |            |            |                 |           |           |          | SIMS (Chapter 13) |             |                     |                                 |          |          |                   |
|---------------------------|-------------------------------------|-----------|---|------------|------------|-----------------|-----------|-----------|----------|-------------------|-------------|---------------------|---------------------------------|----------|----------|-------------------|
|                           |                                     |           | Installation and maintenance of monitoring infrastructure and six-monthly provision of data to OGIA |            |            |                 |           |           |          | GWX               | Reinjection | Subsidence<br>LIDAR | Monitoring and validation sites |          |          | Mitigation groups |
|                           |                                     |           | Installed   |            |            | To be installed |           |           |          |                   |             |                     | V1                              | W        | V2       |                   |
| BA                        | BB                                  | GL        | GC  | PR         | GL         | GC              | PR        |           |          |                   |             |                     |                                 |          |          |                   |
| Arrow                     | 35                                  | 20        | 139   | 14         | 12         | 20              | 15        | 4         | Yes      |                   | Yes         |                     |                                 |          |          |                   |
| Origin                    | 19                                  |           | 166   | 42         | 36         | 11              | 2         | 10        | Yes      | Yes               |             | 12                  |                                 |          |          |                   |
| QGC                       | 12                                  |           | 133   | 22         | 55         | 1               | 1         | 1         | Yes      |                   |             |                     |                                 |          |          |                   |
| Santos                    |                                     |           | 140   | 20         | 39         | 21              | 5         | 8         | Yes      |                   |             | 22                  | 7                               |          | 4        |                   |
| Senex                     | 3                                   | 2         | 25  | 1          | 6          |                 | 1         | 4         | Yes      |                   |             |                     |                                 |          |          |                   |
| Bridgeport                |                                     |           | 1   |            |            | 1               |           |           | Yes      |                   |             |                     |                                 |          |          |                   |
| Tri-Star                  |                                     |           | 6   | 3          |            |                 |           |           | Yes      |                   |             |                     |                                 |          |          |                   |
| AGL                       |                                     |           |   |            |            |                 |           |           | Yes      |                   |             |                     |                                 |          |          |                   |
| Armour                    |                                     |           |   |            |            |                 |           |           | Yes      |                   |             |                     |                                 |          |          |                   |
| ADZ                       |                                     |           |   |            |            |                 |           |           | Yes      |                   |             |                     |                                 |          |          |                   |
| OGT                       |                                     |           |   |            |            |                 |           |           | Yes      |                   |             |                     |                                 |          |          |                   |
| Denison Gas               |                                     |           |   |            |            |                 |           |           | Yes      |                   |             |                     |                                 |          |          |                   |
| CS Energy                 |                                     |           | 15  |            |            |                 |           |           |          |                   |             |                     |                                 |          |          |                   |
| Glencore                  |                                     |           | 8   |            |            | 3               |           |           |          |                   |             |                     |                                 |          |          |                   |
| Genuity                   | 1                                   | 1         | 14  |            |            |                 |           |           |          |                   |             |                     |                                 |          |          |                   |
| New Hope                  | 6                                   | 9         | 41  |            |            |                 |           |           |          |                   |             |                     |                                 |          |          |                   |
| New Wilkie Energy         |                                     |           | 3   |            |            |                 |           |           |          |                   |             |                     |                                 | 1        |          |                   |
| Yancoal                   |                                     |           | 13  |            |            |                 |           |           |          |                   |             |                     |                                 |          |          |                   |
| TBC                       |                                     |           | 1   |            |            |                 |           |           |          |                   |             |                     |                                 |          |          |                   |
| <b>Total</b>              | <b>76</b>                           | <b>32</b> | <b>705</b>  | <b>102</b> | <b>148</b> | <b>57</b>       | <b>24</b> | <b>27</b> | <b>-</b> | <b>-</b>          | <b>-</b>    | <b>34</b>           | <b>7</b>                        | <b>1</b> | <b>4</b> |                   |

**Notes:**

BA = bore assessment bores (section 11.4.2)

BB = bore baseline (off tenure) bores (section 11.6 & 12.9)

GC = groundwater chemistry monitoring point (section 12.6)

GL = groundwater level monitoring point (section 12.5)

GWX = production well monthly volume reporting (section 12.7)

LIDAR = LIDAR capture and annual data provision (section 12.12)

PR = production well groundwater chemistry point (section 12.7)

Reinjection = monthly reinjection volume reporting (section 12.9)

TBC = tenure holder to be confirmed – OGIA to work with tenure holder to maintain monitoring continuity whilst policy review is underway

V1 = spring vent monitoring site (section 13.7.1)

W = watercourse spring monitoring site (section 13.7.2)

V2 = watercourse validation site (section 13.7.3)

If instead these obligations are only assigned on a 5 yearly basis it will severely reduce assurances and protections put in place for farmers and landholders who are having their greatest asset – water – being damaged by an uninvited third party. Having it stretched out to 5 years will also severely diminish monitoring, assessment, mitigation and oversight capabilities. It is not in the public interest to have these obligations stretched out over a longer period, where emerging impacts may be missed or discovered too late, and the suite of potential mitigation measures to address the impacts rendered significantly less effective ... as the saying goes “the horse will have already bolted”. As impacts can often be irreversible, it is always better to be able to address impacts from a more proactive front-foot, rather than a reactive back-foot position, as is the intent of the underground water management framework (chapter 3 of the Water Act):

*“The underground water management framework is specifically designed to proactively identify impacts so that make good agreements can be entered into prior to predicted impacts.”<sup>1</sup>*

<sup>1</sup> DETSI Guideline, Water Act 2000, Quick Guide – Make Good Obligations ESR/2016/2681 (**Make Good Obligations Guideline**) [https://www.detsi.qld.gov.au/policies?a=272936:policy\\_registry/rs-gl-make-good-obligations-guide.pdf](https://www.detsi.qld.gov.au/policies?a=272936:policy_registry/rs-gl-make-good-obligations-guide.pdf) - p11

Take for example the propagation of CSG drawdown impacts, identified in the draft UWIR 2025, within the Precipice Sandstone – an important aquifer of the GAB. This is happening despite the ongoing re-injection program occurring in this aquifer as the overall CSG-induced drawdown impacts are now succeeding the re-injection rates due to significant zones of direct contact between the highly permeable Precipice SS and the Permian coal-bearing formations which have been activated by the CSG depressurisation occurring in the underlying Bandanna Formation.<sup>2</sup> This CSG-induced drawdown in the Precipice then has ramifications on the at high-risk springs whose source aquifer is the Precipice Sandstone, for example Springrock, Lucky Last and 311/Yebna 2. This has necessitated a review of the of the current mitigation measures for these springs to evaluate if they remain fit for purpose. Santos are now required to submit this review to OGIA for endorsement within 6 months of the UWIR 2025 taking effect.<sup>3</sup> If the UWIR cycle were expanded to 5 years, these springs could suffer consequences from CSG impacts before more appropriate mitigation measures are put in place under the statutory UWIR process.

OGIA has committed to develop a dedicated Precipice Sandstone groundwater model within the next UWIR cycle.<sup>4</sup>

*“OGIA is committing to undertake further work in this space in the next UWIR cycle, together with refinement of the modelling of impacts and hypothesis testing. This is particularly important and of high priority, given the significance of potential risks to GDEs that are supported by the Precipice Sandstone in the region.”<sup>5</sup>*

If the release of such, including the assessment of risks to associated environmental values is stretched out to 5 years as opposed to 3 years, then that is a delay in time for appropriate mitigation measures to be put in place for the necessary protection of an important GAB aquifer and its groundwater dependent ecosystems (GDEs) and springs.

The obligations underpin the monitoring, data collection, research and modelling which form the basis of the risk assessment of existing and future impacts. They must be assigned within a succinct timeframe to allow for proactive and effective mitigation of adverse impacts on environmental values before they become irreparable.

### **1.3 Information provision**

The CSG space is a rapidly evolving beast, due in part to the following aspects:

- Tenure holders’ proposed development plans are dynamic and often change;
- Scientific modelling (and predictions), including that for groundwater and subsidence, is constantly adapting as it is refined and calibrated against observed impacts/monitoring;
- Technological advances allow for a better understanding and monitoring of impacts;

This highlighted statement in the draft UWIR 2025, in reference to the propagation of impacts in the Precipice Sandstone, highlights the emerging identification of impacts as modelling is progressively refined in line with the collection of various data points and geological surveys:

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<sup>2</sup> Consultation draft of the Underground Water Impact Report 2025 for the Surat Cumulative Management Area, Office of Groundwater Impact Assessment (**Draft UWIR 2025**) – p79-80, 109-111

<sup>3</sup> Draft UWIR 2025 – p190

<sup>4</sup> Draft UWIR 2025 – p192

<sup>5</sup> Draft UWIR 2025 – p80

The main pathway for impacts is where major geological uplift and subsequent erosion have removed the protective Rewan Group, allowing the Precipice Sandstone to be in direct physical contact with the Bandanna Formation. This direct contact bypasses the regional aquitard and forms the primary pathway for hydraulic connection. The pathway is enhanced by the properties of the Precipice Sandstone in the northern region, where it is highly permeable making the aquifer capable of propagating pressure changes over large distances. Since the initial UWIR in 2012, OGIA has progressively refined its understanding of the extent of the contact zones, informed by drilling data and seismic surveys (2D and 3D) as data becomes available. There are two contact zones:

- an area immediately east of Injune, near the Fairview and Spring Gully gas fields and parallel to the Hutton-Wallumbilla Fault (the **western contact zone**)
- an area immediately east of Wandoan, south of the Peat and Scotia gas fields and adjacent to the Leichhardt-Burunga Fault (the **eastern contact zone**).

6

It is essential that the UWIR, as the most comprehensive mechanism for the dissemination of emerging information, trends and impact predictions, remains within a three year cycle so that that information provided to the public, affected stakeholders and government administrators is as contemporary as possible.

This also ties in with the subsequent section 1.4 which deals with the ongoing impact assessment facilitated by the complimentary adaptive management inter-linkage between the *Environmental Protection Act 1994* (Environmental Authorities (EAs) and EA amendment applications) and the Underground Water Impact Report process, as addressed in [my submission](#) and that of [Central Downs Irrigators Ltd.](#)

#### **1.4 Interlinkage between the Environmental Protection Act 1994 and the Underground Water Impact Report process which allows for ongoing scrutiny of impacts during the operational phase of resource projects**

The proposed change to an extended 5 year UWIR cycle goes against the intent of the *Environmental Protection (Underground Water Management) and Other Legislation Amendment Bill 2016*<sup>7</sup> whose policy objectives included:

- Strengthen the effectiveness of the environmental assessment of underground water extraction by resource projects
- Allow the ongoing scrutiny of the environmental impacts of underground water extraction during the operational phase of resource projects through clearer links between the *Environmental Protection Act 1994* and *Water Act 2000*
- Improve the make good framework in the *Water Act 2000*

These were achieved in part by requiring underground water impact reports to include an assessment of environmental impacts of the exercise of underground water rights and clarifying that an environmental authority may be amended in response to the content of an underground water impact report.

These policy objectives resulted in the insertion of new sections 126A and 227AA in the *Environmental Protection Act 1994*, as well as an amendment to section 215.

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<sup>6</sup> Draft UWIR 2025 – p79

<sup>7</sup> <https://www.legislation.qld.gov.au/view/html/bill.first/bill-2016-114/lh>

This was complimented by an amendment to section 376 of the *Water Act 2000*.

**Environmental Protection Act 1994:**

Insertion of new section 126A

*The new section 126A prescribes particular information which must be included in **site-specific environmental authority applications** relating to mining leases, mineral development licences and petroleum leases which will involve the exercise of underground water rights. The new information requirements ensure that the environmental impacts of the exercise of underground water rights by mining and petroleum tenure holders are appropriately assessed as part of an environmental authority application. This assessment will involve the consideration of the cumulative impacts of projects on groundwater resources in the region.*<sup>8</sup>

Insertion of new section 227AA

As per S126A above but in relation to environmental authority **amendment** applications which involve a change to the exercise of underground water rights.<sup>9</sup>

Amendment of section 215

*Clause 7 amends section 215 of the Environmental Protection Act 1994 to allow the conditions of an environmental authority for a resource activity to be amended if the administering authority considers the amendments to be necessary or desirable because of an impact or potential impact on an environmental value identified in an underground water impact report.*

*The amendment is related to the amendments contained in clause 33, which will require underground water impact reports under Chapter 3 of the Water Act 2000 to report on past and predicted future impacts on environmental values. The assessment contained in the underground water impact report may then be used to review the way in which the environmental authority regulates environmental impacts relating to groundwater take by resource activities. The amendment to section 215 will ensure that consequential changes can be made to the environmental authority.*<sup>10</sup>

**Water Act 2000:**

Amendment of section 376

*Clause 33 amends section 87 of the Water Reform and Other Legislation Amendment Act 2014 to ultimately amend section 376 of the Water Act 2000 to require underground water impact reports to include a description of past, and predicted future, impacts on environmental values which result from the exercise of underground water rights.*

*There will be uncertainties inherent in predictions of environmental impacts relating to the exercise of underground water rights which are submitted as part of the application for an environmental authority (see section 126A of the Environmental Protection Act 1994 inserted by this Bill). The amendment to section 376 of the Water Act 2000 ensures that there can be ongoing scrutiny of such impacts during the operational phase of resource projects. Any changes in impacts, or predicted impacts, identified in the underground water impact reports may trigger an amendment of the environmental authority to ensure the appropriate assessment and management of the impacts (see clause 7).*<sup>11</sup>

All of the above mentioned amendments sought to ensure all impacts to environmental values from the exercising of underground water rights by resource proponents were being identified, reported on and continuously assessed under an ongoing adaptive management framework, so that if emerging impacts were identified in the UWIR process, environmental authorities can be amended to address and manage

<sup>8</sup> <https://www.legislation.qld.gov.au/view/pdf/bill.first.exp/bill-2016-114> - p5

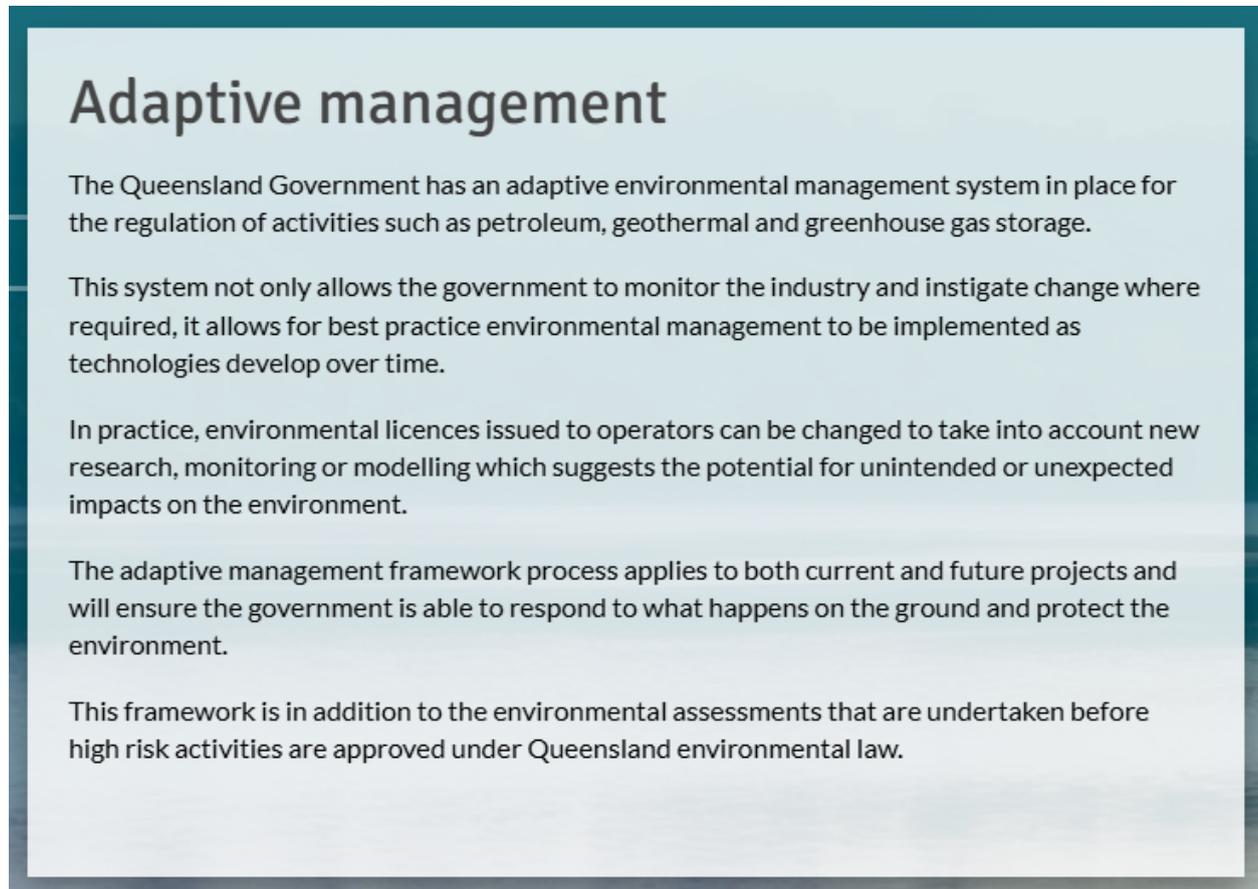
<sup>9</sup> <https://www.legislation.qld.gov.au/view/pdf/bill.first.exp/bill-2016-114> - p6

<sup>10</sup> <https://www.legislation.qld.gov.au/view/pdf/bill.first.exp/bill-2016-114> - p6

<sup>11</sup> <https://www.legislation.qld.gov.au/view/pdf/bill.first.exp/bill-2016-114> - p13

the impacts.

This aligns with the Government's description of Adaptive Management found on the DETSI website, whereby environmental licences/approvals granted to resource operators can be amended if new research, monitoring or modelling shows the likelihood of previously unknown or unquantified impacts on the environment occurring. The adaptive management system ensures the government is able to respond to emerging impacts in order to protect the environment:



## Adaptive management

The Queensland Government has an adaptive environmental management system in place for the regulation of activities such as petroleum, geothermal and greenhouse gas storage.

This system not only allows the government to monitor the industry and instigate change where required, it allows for best practice environmental management to be implemented as technologies develop over time.

In practice, environmental licences issued to operators can be changed to take into account new research, monitoring or modelling which suggests the potential for unintended or unexpected impacts on the environment.

The adaptive management framework process applies to both current and future projects and will ensure the government is able to respond to what happens on the ground and protect the environment.

This framework is in addition to the environmental assessments that are undertaken before high risk activities are approved under Queensland environmental law.

<sup>12</sup>

The change to a 5 year UWIR cycle would put this ongoing and continuous impact assessment out of kilter, whereby the delayed time frame to address emerging impacts would render it less effective and somewhat dysfunctional. The current 3 year interval is a good balance between allowing enough time for the required research, monitoring and modelling to take place, while there is a short enough time frame to implement any necessary modification to licences/approvals for the effective management and mitigation of emerging impacts if and when required.

### **1.5 Condamine Alluvial Floodplain – Darling Downs**

The Condamine Alluvial Floodplain is a rich agricultural region, dominated by intensive food and fibre cropping, due to its ideal flat topography, exceptionally fertile black clay (vertisol) soils, access to good quality water in the form of both the Condamine River and Condamine Alluvium, as well as reasonable average rainfall, and lastly its proximity to the port of Brisbane and end-user markets. The Toowoomba Region and Western Downs Regions are indeed the top two producing regions across the State in the form of Gross Value of Agricultural Production.

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<sup>12</sup> <https://environment.qld.gov.au/management/activities/non-mining/regulation/adaptive-management>

Unfortunately, this exceptional food bowl is facing impending CSG expansion from the west in the form of Arrow Energy's Surat Gas Project.

This region is highly susceptible to CSG impacts due to its flat topography and the consequences of CSG-induced subsidence, but also because of the invaluable Condamine Alluvium – a shallow, good-quality groundwater source – which is relied upon by irrigators and thousands of regional residents alike.

The Condamine Alluvium is highly vulnerable to CSG impacts as it sits directly on top of and is incised into the targeted Walloon Coal Measures (WCMs). Once CSG depressurisation (dewatering) commences in the underlying WCMs, in order to mobilise and extract the gas, the water in the now higher pressure Condamine Alluvium will use whatever connectivity pathways that are available to it to drawdown (leak) into the now lower pressure coal measures below.

These connectivity pathways are plentiful and include the following:

- ➔ Existing geological contact, especially where the intervening transition zone is thin or absent;
- ➔ Fractures, faults and fissures which allow for juxtaposition with other formations for horizontal cross formational flow, as well as vertical flow through these geological structures. The Horrane Fault, a major broad fault zone with displacements of up to 100m, stretches from south-west of Dalby to south-east of Cecil Plains throughout the heart of the intended CSG development area, which puts this area at high risk of significant subsidence and groundwater related impacts;
- ➔ Uncapped and unsealed legacy coal exploration holes from the 1960s/70s, of which there are an estimated 1000<sup>13</sup> across the Condamine Alluvium extent, whose location and conditions are unknown; waiting to act like conduits to cross formational flow once awoken by CSG depressurisation;
- ➔ Well integrity failure - corroded gas wells induced by microbial activity in the shallow subsurface<sup>1415</sup>

These connectivity pathways also represent the means for free gas to flow from the underlying WCMs to the overlying Condamine Alluvium and even to the surface in the form of fugitive greenhouse gas emissions. A similar situation was invoked with the river gas seeps in the Condamine River at Chinchilla.

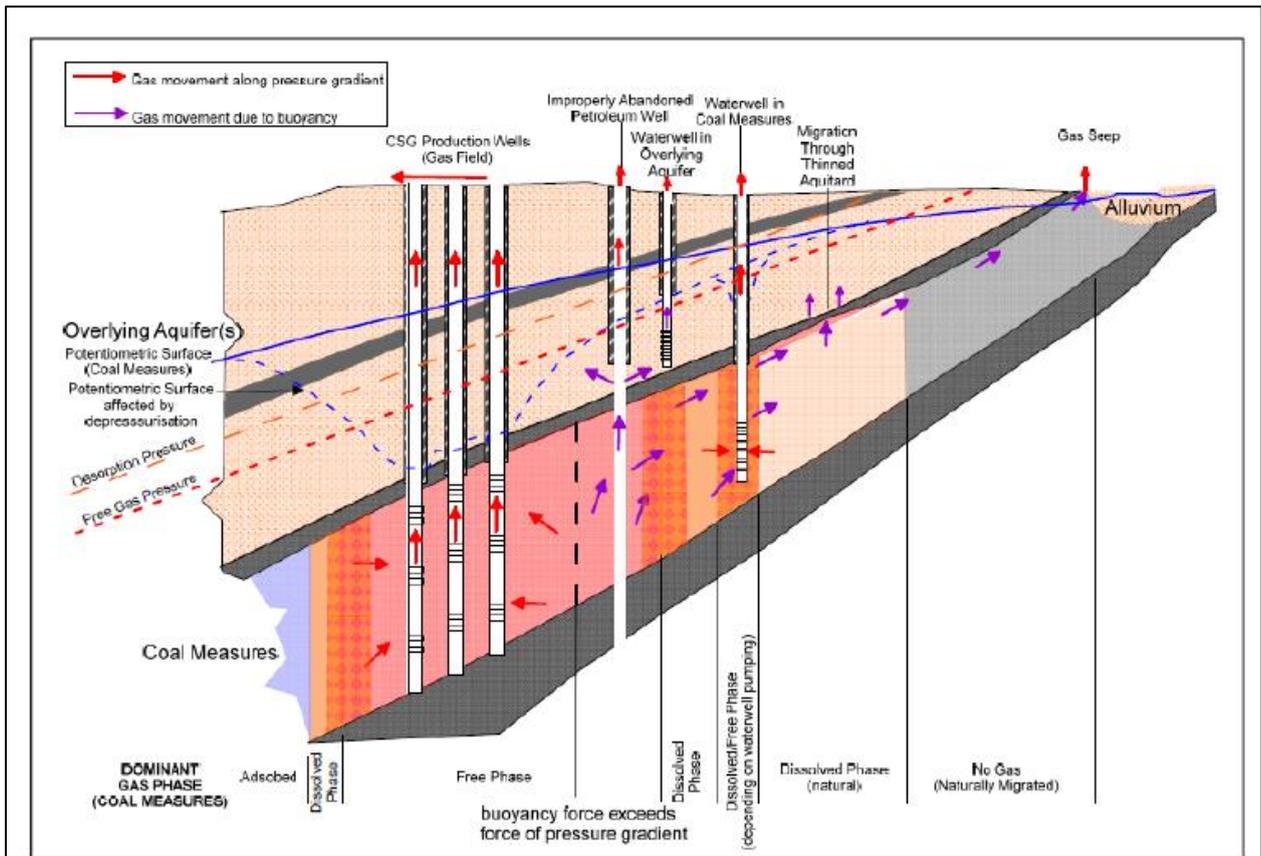
This schematic depicts how this gas migration can occur:

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<sup>13</sup> <https://documents.parliament.qld.gov.au/tableoffice/questionsanswers/2024/795-2024.pdf>

<sup>14</sup> [https://d3n8a8pro7vhm.cloudfront.net/lockthegate/pages/6799/attachments/original/1594111945/Xpandable\\_Patches\\_to\\_extend\\_the\\_life\\_of\\_corroded\\_CSG\\_Wells\\_in\\_Queensland\\_Australia.pdf?1594111945](https://d3n8a8pro7vhm.cloudfront.net/lockthegate/pages/6799/attachments/original/1594111945/Xpandable_Patches_to_extend_the_life_of_corroded_CSG_Wells_in_Queensland_Australia.pdf?1594111945)

<sup>15</sup> <https://gisera.csiro.au/research/surface-and-groundwater/understanding-controls-and-constraints-of-potentialmicrobially-influenced-corrosion-in-onshore-gas-wells/>



**Figure 1. Schematic of potential gas migration (reproduced from APLNG, 2010).**

16

Gas migration into the Condamine Alluvium would represent a devastating and far-reaching adverse impact for all affected bore owners, for the reasons explained below:

<sup>16</sup> Potential effects of free gas on bore water supply from CSG development, Klohn Crippen Berger (commissioned by CSG Compliance Unit Department of Natural Resources and Mines), March 2016 (**Gassy Bore Report**) <https://notatanycost.com.au/wp-content/uploads/2014/02/KCB-Gassy-Bore-Final-Report.pdf> – p13/29

### 5.3 Impacts on Water Bores

Presence of free gas in a water bore is more than just nuisance. It directly affects the bore's capacity to provide water supply for the intended purpose unless, where possible, remedial actions are taken. A bores' capacity to supply water can be affected in the following ways:

- Free gas hampers **pumping operations and damage pumps** and infrastructure potentially resulting in costly operations and replacements. Damages to electrical submersible pumps occur through gas locks, cavitation and overheating. Pumps may have to be replaced with different types, such as the positive cavity pumps (PCPs) or may require modifications to operate satisfactorily. Remedial options may not always be feasible.
- Free gas in the formation around a water bore provides a resistance to flow of water to the bore and reduces the formation's effective permeability to water. This in turn results in a **decline in a bore's designed capacity** or yield (i.e. the amount of water that the bore is capable of providing in a given period of time).
- **Quality of water** in a bore is also affected by the presence of gas. It causes sediments to accumulate at the bottom of water bores to move through the water column. In certain circumstances, it can lead to the production of some toxins.
- Free gas contains methane, carbon dioxide and nitrogen which are all odourless gases. Methane can burn, can be explosive and must be vented to the outside because it poses a **safety hazard**. Safety issues pose difficulties in running and maintenance of bore.

17

Research by OGIA already shows that gas migration is starting to occur in the Condamine Alluvium in locations where the intervening transition zone may be thin or absent and in the vicinity of the Horrane Fault Zone, brought on by existing CSG production in the area.<sup>18</sup> These are emerging red flags that must be treated with the utmost seriousness and due attention.

As the Condamine Alluvial Floodplain is such a critical agricultural region and asset to the State of Queensland, alongside its Alluvium which is the most productive in Queensland<sup>19</sup>, yet highly vulnerable to the impacts of CSG as they advance eastwards, it is absolutely critical that the UWIR remain at 3 yearly intervals so that any emerging impacts from the monitoring, research and modelling can be picked up without delay and provided to all stakeholders in a timely manner, as well as allowing the ability for ongoing impact assessment to occur through the adaptive management process afforded through the complimentary sections of both the EP Act and Water Act.

#### 1.6 New Water Bores

The proposed change of the UWIR cycle also has implications on establishing whether new bores are subject to the Make Good framework. This is because in order to establish whether a new bore has an impaired capacity and is therefore subject to make good provisions, section 412(2) of the *Water Act 2000* dictates that the decline must be more than the decline predicted at the location of the bore in the **relevant report** - being the approved UWIR in effect when the bore is constructed:

<sup>17</sup> Gassy Bore Report – p26/29

<sup>18</sup> Harris-Pascal, C et al, Hydrochemical indicators of connectivity between alluvial aquifers and underlying coal seam gas reservoirs: a case study from the Clarence-Moreton Basin, Queensland, Australia, October 2025  
[https://www.ogia.water.qld.gov.au/data/assets/pdf\\_file/0003/2105139/ca-preprint-20251030.pdf](https://www.ogia.water.qld.gov.au/data/assets/pdf_file/0003/2105139/ca-preprint-20251030.pdf)

<sup>19</sup> <https://www.bioregionalassessments.gov.au/assessments/11-context-statement-maranoa-balonne-condamine-subregion/1141-groundwater-systems>

**412 When does a water bore have an *impaired capacity***

- (1) An existing water bore has an *impaired capacity* if—
  - (a) there is a decline in the water level of the aquifer at the location of the bore and the exercise of underground water rights has, or has likely, caused or materially contributed to the decline; and
  - (b) because of the decline, the bore can no longer provide a reasonable quantity or quality of water for its authorised use or purpose.
- (2) A new water bore has an *impaired capacity* if—
  - (a) there is a decline in the water level of the aquifer at the location of the bore and the exercise of underground water rights has, or has likely, caused or materially contributed to the decline; and
  - (b) the decline is more than the decline predicted at the location of the bore in the relevant report; and
  - (c) because of the decline, the bore can no longer provide a reasonable quantity or quality of water for its authorised use or purpose.

(5) In this section—

*existing water bore* means any water bore in existence before the first underground water impact report relating to the area where the bore is located takes effect.

*new water bore* means a water bore other than an existing water bore.

*relevant report*, for a new water bore, means the approved underground water impact report—

- (a) in effect when the bore is constructed; and
- (b) relating to the area where the bore is located.

The UWIR is the only mechanism by which water decline impacts are predicted for each formation and subsequently delineated on a drawdown impact map, whereby satisfaction of the conditions of section 412(2) can be established. The following map is an example of such decline (drawdown) predictions in four aquifers of the Great Artesian Basin (GAB) due to resource activity, taken from the UWIR 2021. As detailed above, modelling and predictions of impacts can evolve fairly rapidly between iterations of the UWIR, and therefore it is beneficial to remain at three year intervals so the most accurate predicted decline can be applied in the situation of establishing whether a new bore may be subject to make good. It also allows landholders the ability to better evaluate the risks and feasibility of drilling a new bore in CSG affected areas, which comes at great expense, if it is only to fail in the future and subsequently not be subject to make good provisions. The provision of the most up-to-date information and impact predictions is critical for landholders attempting to coexist with the CSG industry, in the Surat Basin and elsewhere.

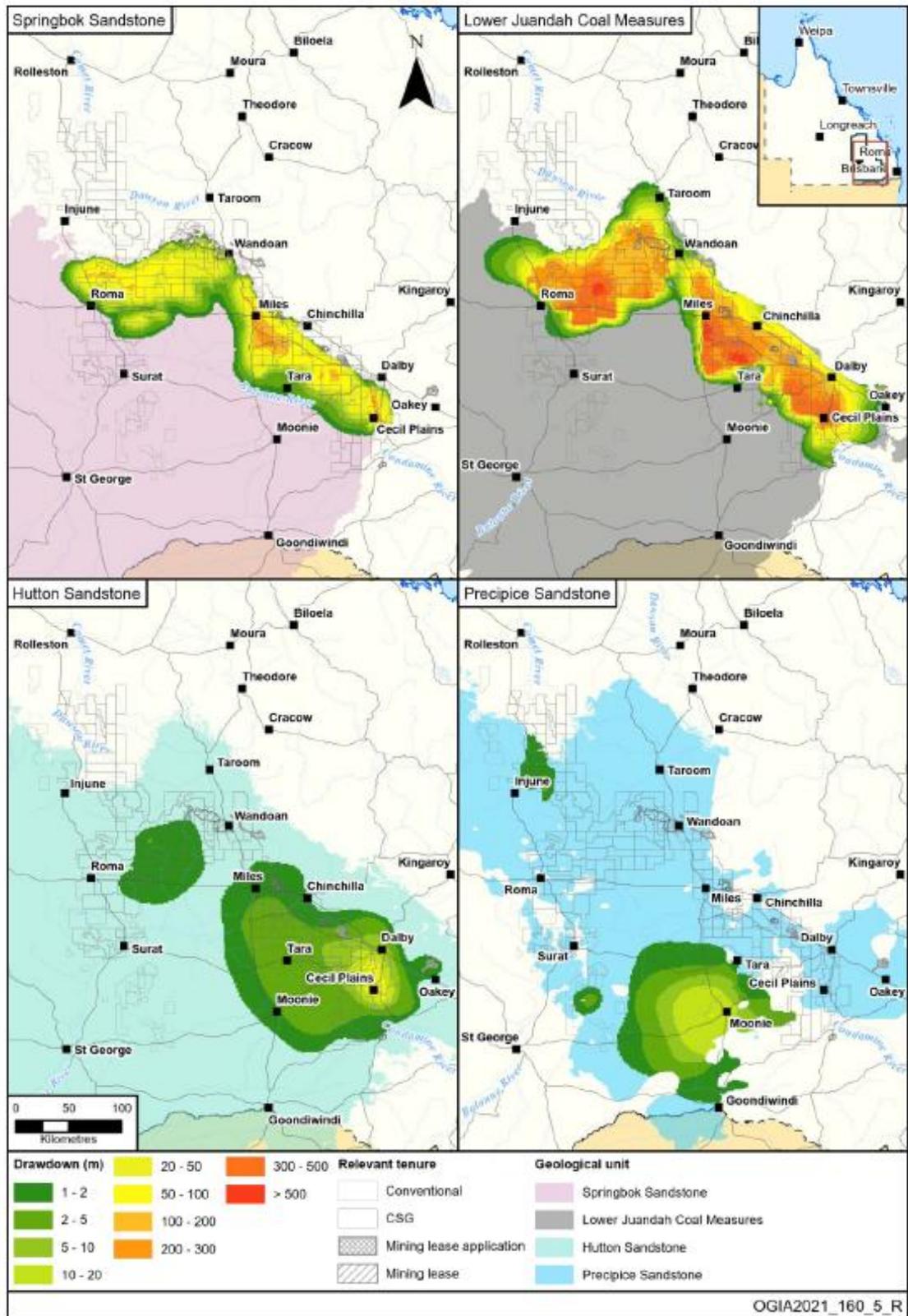


Figure 6-3: Long-term groundwater level impact patterns (P50) – overlying Springbok Sandstone, Lower Juandah Coal Measures (coal target formation) and underlying Hutton and Precipice sandstones (detailed maps are in Appendix E)

### 1.7 Response to DETSI representatives' statements in public briefing of 20<sup>th</sup> January 2026

In the Public Briefing by Department representatives on 20<sup>th</sup> January, when the subject of the proposed extension to the UWIR cycle was raised, Mr Kahil Lloyd said that the suggestion had come from an industry stakeholder. He also said that the (underground water management) framework had matured, which was proffered as a reason for extending the UWIR interval to 5 years. As discussed above, when it comes to the Condamine Alluvial Floodplain and its extreme vulnerabilities to CSG impacts posed by the expansion of Arrow Energy's Surat Gas Project, including its much higher density of water bores and volume of groundwater at risk, we find ourselves at a critical juncture where more intensified, continuous and comprehensive research and monitoring is required. It is most definitely not the time to put on the brakes and leave farmers and community members less informed and less reassured of the framework's capabilities to address impacts as they emerge.

Mr Lloyd also cited the Department's ability to issue a bore assessment direction notice as a safeguard mechanism whereby IAA bores may not be identified, and subsequent make good obligations not triggered, due to the drawn out 5 year time frame. However, this would be a reactive situation, whereby the bore assessment direction notice would be triggered by a bore owner seeking as such from the chief executive once they experience an impaired capacity. This contradicts the intent of the framework being proactive in nature to impacts before they manifest themselves:

*"A key role of an UWIR is to predict groundwater impacts that are likely to occur in both the immediate and long-term. One of the purposes of making these predictions is to ensure that resource tenure holders enter into make good agreements with bore owners **prior to their bores experiencing an adverse impact.**"<sup>20</sup>*

### 1.8 Extension provision beyond formal UWIR cycle

The ability to extend a UWIR beyond the prescribed interval, if required, is already possible thanks to section 370 of the Water Act.

This poses further issues, in that if the prescribed interval is amended to 5 years as proposed, it could well result in publication timeframes beyond this if further extensions are requested of the DETSI chief executive by either the responsible tenure holder or OGIA for the Surat CMA.

This is an unacceptable situation with unintended consequences that appear not to have been duly assessed or considered by the administering authority.

### 1.9 Conclusion

The underground water management framework, established under Chapter 3 of the Water Act, **ensures that a bore owner is not disadvantaged by resource operations.**<sup>21</sup> If the relevant monitoring, assessment and make good obligations are not being informed, provided and assigned within a suitable 3 year timeframe, how can this fundamental objective of the framework be ensured?

It goes without saying that those most affected should have the biggest say, and that is by far farmers, landholders, bore owners and impacted community members. This proposed change and the way in which it has been enacted, without appropriate engagement and consultation with affected stakeholders, is not fair and reasonable, and represents a contravention of due process. For this reason and those outlined above, it should be categorically removed from the Bill.

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<sup>20</sup> Make Good Obligations Guideline - p3

<sup>21</sup> Make Good Obligations Guideline - p3

## 2. CSG-induced Subsidence

There were some questions raised during the Public Hearing regarding CSG-induced subsidence, how it occurs and the consequences of its impacts.

I have attached a document I wrote to compliment my submission to the *Mineral and Energy Resources and Other Legislation Amendment (MEROLA) Bill 2024* in relation to the then proposed Subsidence Management Framework. This document aims to explain the causes, consequences and the inherent scientific uncertainty of CSG-induced subsidence, with a particular focus on our region. I have included it as a means to provide some background context to the situation farmers face in the highly vulnerable Condamine Alluvial Floodplain on the Darling Downs, as subsidence, previously dismissed by Arrow Energy in the EIS consultation and assessment stage<sup>22</sup>, has eventuated to be a highly detrimental, costly and generally irreversible impact for both dryland and irrigated farmers who consistently produce an extensive amount of Queensland's high quality food and fibre production, which now finds itself at risk of diminishment.

I hope the above information and points of clarification may be considered by the Parliamentary Committee in their review of the *Environmental Protection (Efficiency and Streamlining) and Other Legislation Amendment Bill 2025*, especially the misguided and ill-informed proposal to change the UWIR cycle from the current three years to five years.

Yours sincerely,

*Liza Balmain*

Ph: [REDACTED]

Email: [REDACTED]

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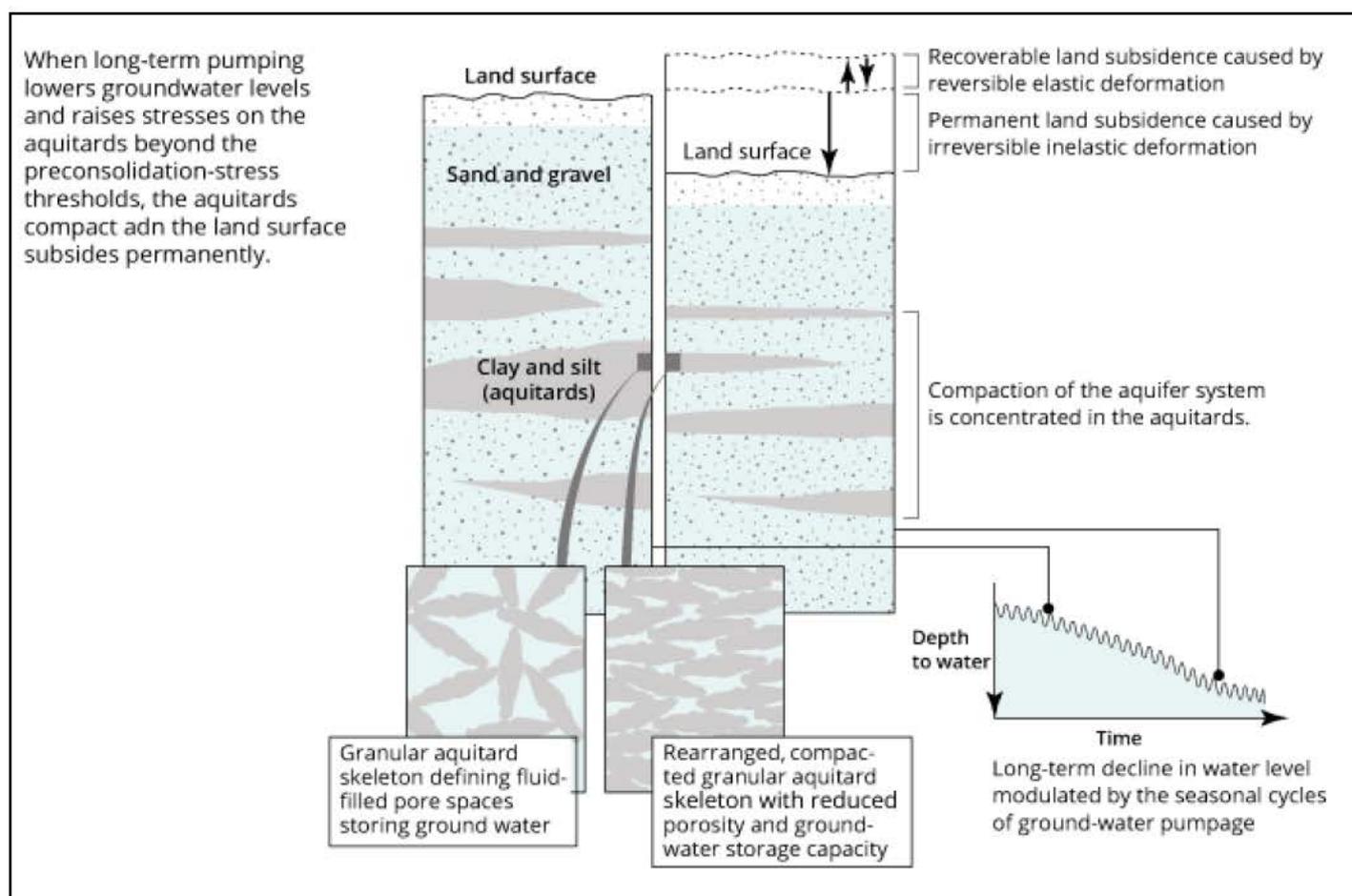
<sup>22</sup> <https://www.parliament.qld.gov.au/Work-of-the-Assembly/Tabled-Papers/docs/5724T1052/5724t1052-fd87.pdf>

## Appendix: CSG-Induced Subsidence

### Subsidence - Cause

In basic terms, subsidence is caused by the fluid (water and gas) extraction from the subsurface and the subsequent change in effective stress which causes compaction of the rock formation, translating to subsidence at the ground surface:

*“At any point below the ground surface, the weight of overlying strata is supported partly by water pressure and partly by the fabric of the rock mass. Any reduction in water pressure therefore results in an increased proportion of the load being carried by the rock mass, leading to compression of the rock. This is known as an increase in effective stress. The combined compression over the thickness of rock strata affected by reduced water pressure results in subsidence at the ground surface.”<sup>55</sup>*



Extract from Arrow Energy presentation slides to the Arrow Surat Community Reference Group – March 2020<sup>56</sup>

<sup>55</sup> Arrow Energy Pty Ltd, Surat Gas Project - Subsidence monitoring and prediction, 754-MELENP268280-AA 10 December 2021

<sup>56</sup> [https://www.arrowenergy.com.au/\\_\\_data/assets/pdf\\_file/0005/32909/ASCRG-Presentation-March-2020.pdf](https://www.arrowenergy.com.au/__data/assets/pdf_file/0005/32909/ASCRG-Presentation-March-2020.pdf)

Prior to CSG development occurring, water pressure in the coal seams is holding the gas adsorbed to the coal matrix. In order to release the gas, water is extracted so that adequate depressurisation is achieved for the gas to mobilise.

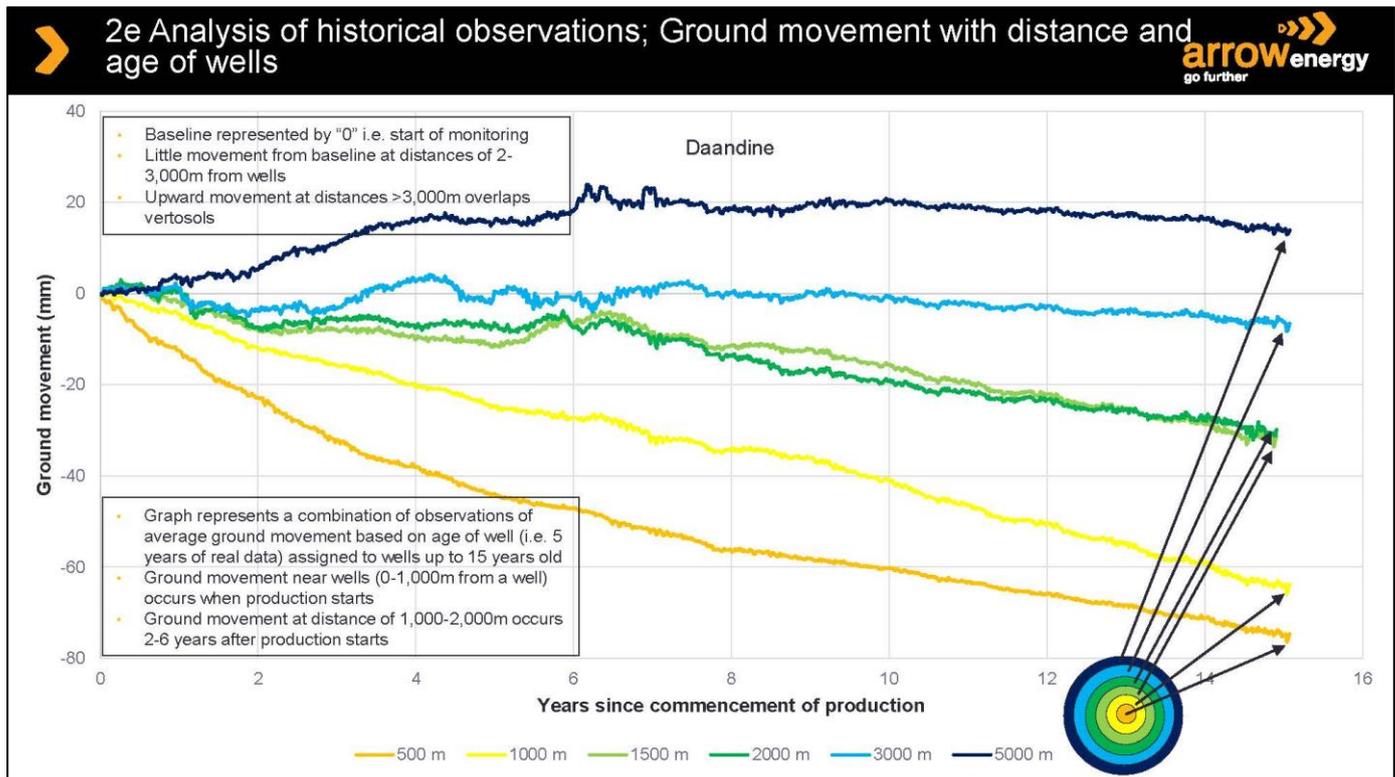
Subsidence is caused consequent upon the right of proponents to take an unlimited amount of water from the Walloon Coal Measures (part of the Great Artesian Basin), under section 185 of the *Petroleum and Gas (Production and Safety) Act 2004* under an authorised activity.

|  |
|--|
| <p><b>Part 4</b></p> <p><b>Water rights for petroleum tenures</b></p> <p><b>185 Underground water rights—general</b></p> <p>(1) The holder of a petroleum tenure 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.</p> <p><i>Examples—</i></p> <ul style="list-style-type: none"><li>• underground water necessarily or unavoidably taken during the drilling of a petroleum well or water observation bore</li><li>• underground water necessarily or unavoidably taken during testing for petroleum production or petroleum production authorised under section 32 or 109</li></ul> <p>(2) The rights under subsection (1)—</p> <p>(a) are the <i>underground water rights</i> for the petroleum tenure; and</p> <p>(b) are subject to the tenure holder complying with the holder’s underground water obligations.</p> <hr/> <p>Page 194 <span style="float: right;">Current as at 26 April 2024</span></p> <p style="text-align: center;">Authorised by the Parliamentary Counsel</p> <hr/> <p style="text-align: right;">Petroleum and Gas (Production and Safety) Act 2004<br/>Chapter 2 Petroleum tenures and related matters<br/>[s 186]</p> <p>(3) There is no limit to the volume of water that may be taken under the underground water rights.</p> <p>(4) Underground water taken or interfered with, under subsection (1), from a petroleum well is <i>associated water</i>.</p> <p>(5) The tenure holder may use associated water for any purpose and within or outside the area of the tenure.</p> <p>(6) In this section—</p> <p><i>another authorised activity</i>, for the petroleum tenure, means an authorised activity for the tenure under part 1, division 1 or part 2, division 1.</p> |
|--|

CSG-induced subsidence has far-reaching effects and cannot be isolated to one farm field or property, it adheres to no anthropogenic surface boundaries. The effects of CSG depressurisation may be felt up to 10km from the extraction point:

*“Depressurisation of coal seams from a single well creates a cone of groundwater pressure decline – also referred to as ‘cone of depression’ (refer to section 7.2 for definition) that extends radially away from the well over time – typically to about 10 km within 2–3 years of production in the Surat Basin if there is no interference from nearby wells.”<sup>57</sup>*

As can be seen from the below analysis of historical ground movement observations, CSG-induced subsidence is most apparent up to 2km from the well head. But is noticeable at even 3km from the well head.



Extract from Arrow Energy Duleen-Kupunn AWP presentation slides<sup>58</sup>

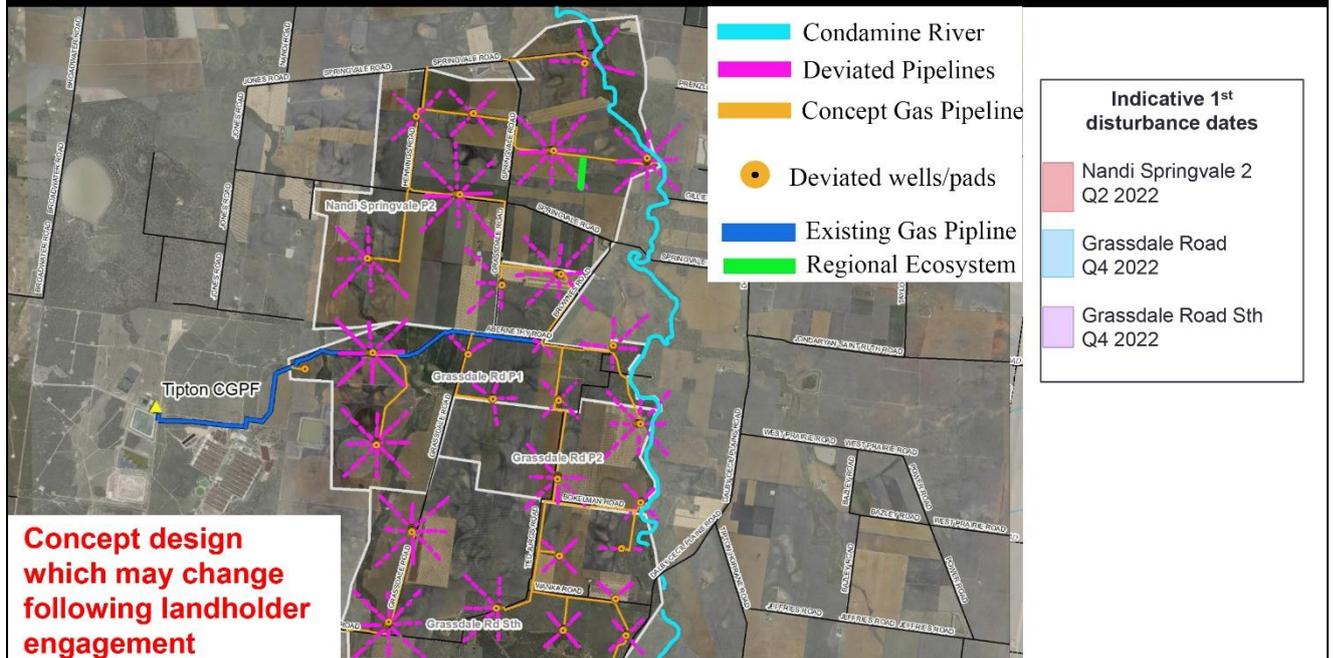
However, it must be noted that the above analysis is based on the Daandine gasfield which is predominantly single vertical wells. Whereas, deviated or directional multi wells are more predominant on the Condamine Floodplain, and are the planned and preferred well type where depths allow. Up to 8 deviated wells, also known as horizontal wells, can be located on a single well pad, where each well is drilled vertically and then deviates out horizontally, up to a distance of 1500m underground from the well pad, in a spider like effect.

The following diagram of planned development in the Springvale and Grassdale areas shows the extent of deviated well pads planned across one area.

<sup>57</sup> Underground Water Impact Report for the Surat Cumulative Management Area 2021, OGIA – p100  
[https://www.rdmw.qld.gov.au/\\_data/assets/pdf\\_file/0008/1584728/uwir-2021-report.pdf](https://www.rdmw.qld.gov.au/_data/assets/pdf_file/0008/1584728/uwir-2021-report.pdf)

<sup>58</sup> [https://www.arrowenergy.com.au/\\_data/assets/pdf\\_file/0004/33079/Surat-Gas-Project-Area-wide-planning-update-14-May-2021.pdf](https://www.arrowenergy.com.au/_data/assets/pdf_file/0004/33079/Surat-Gas-Project-Area-wide-planning-update-14-May-2021.pdf)

## Springvale and Grassdale development areas



Deviated (horizontal) drilling is likely to cause a higher degree of CSG-induced subsidence as opposed to vertical drilling due to the larger surface area in contact with the coal seam, with varying and enlarged subsidence patterns compared with vertical wells:

*“a horizontal well allows higher rates of production due to its large surface area in contact with the coal seam (assuming the same volume of coal in both cases). Therefore, a horizontal well will tend to reach the maximum settlement early. However, different shapes of the subsidence bowl could be expected. An enlarged subsidence bowl, symmetric about the horizontal well axis, similar to the one observed in tunnels, could be expected in horizontal wells (see Figure 6) compared to the axisymmetric type of bowl that is commonly observed in conventional vertical wells.”<sup>59</sup>*

<sup>59</sup> Subsidence: An overview of causes, risks and future developments for coal seam gas production, Jubert A. Pineda and Daichao Sheng, July 2013 – p40

Therefore, the onset of subsidence will likely be more rapid and severe in the case of horizontal multi-directional wells:

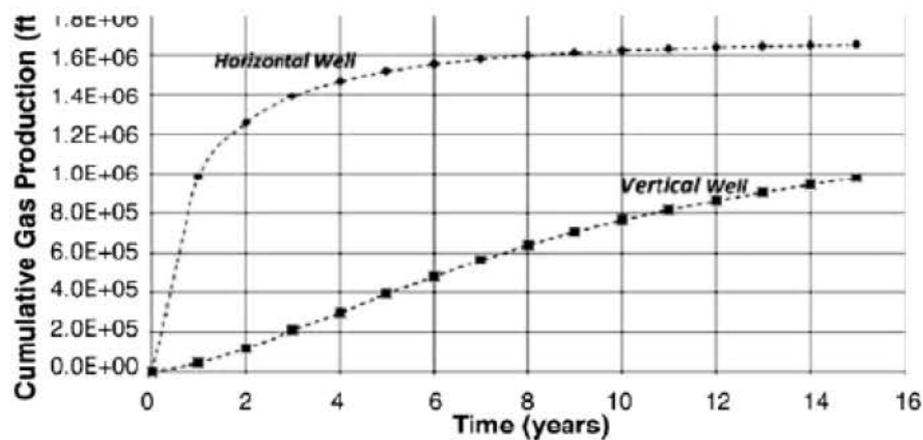


Figure 22. Cumulative gas production in vertical and horizontal wells (from Maricic et al, 2008)

Extract from 'Subsidence: An overview of causes, risks and future developments for coal seam gas production, Jubert A. Pineda and Daichao Sheng, July 2013'

*"The adoption of multiple wells, in both vertical and horizontal configurations, will enlarge the volume of soil prone to settlement. Thus, the impacts on natural resources, such as aquifers and rivers, as well as infrastructure will increase. A complex and possibly non-symmetrical subsidence bowl could be expected if multiple wells are involved."*<sup>60</sup>

*"It is expected that multiple wells will enhance and complicate the subsidence bowl in both cases."*<sup>61</sup>

All in all, the Condamine Alluvial Floodplain faces some of the most extensive, far-reaching and varied subsidence due to shallow coal depths, geological characteristics and the preference for horizontal multi-directional wells, all while occurring on farmland which is undeniably the most vulnerable to CSG-induced subsidence within the Surat Basin.

## Subsidence - Consequences

Subsidence poses a considerable threat to farming operations and crop productivity on the slope-dependent Condamine Floodplain, where effective drainage is critical.

The Gasfields Commission Queensland (GFCQ) in their report '[Potential consequences of CSG-induced subsidence for farming operations on the Condamine alluvial floodplain](#)' acknowledged that, unlike

<sup>60</sup> Subsidence: An overview of causes, risks and future developments for coal seam gas production, Jubert A. Pineda and Daichao Sheng, July 2013 – p41

<sup>61</sup> Subsidence: An overview of causes, risks and future developments for coal seam gas production, Jubert A. Pineda and Daichao Sheng, July 2013 – p50

the swell-shrinkage properties of soil which are temporary and manageable, **CSG-induced subsidence is permanent**.<sup>62</sup> They also confirmed that if effective drainage is impaired through landform change resulting from CSG-induced subsidence **there will be some (potentially high) reduction of productivity**.<sup>63</sup>

Many of our farms have been intensively developed over time with laser levelling to improve effective drainage, to ensure the optimal application of flood irrigation water and to enhance water use efficiencies, including the return of irrigation tail water to water storages via return drains where a consistent gradient is critical, and designing our farms to ensure the first flush of any contaminated agricultural run-off remains on farm and does not enter water ways.

While laser-levelling is utilised to achieve the above-mentioned goals, it is usually only required once, at the initial development stages. Apart from the occasional touch-up work that may be required in order to fix patches of occasional floodwater erosion. Laser-levelling is kept to a minimum due to the considerable financial cost and the compaction issues it causes to farm fields, as explained below.

Some of the consequences of CSG-induced subsidence on very flat, intensively farmed prime agricultural land include the following:

**Drainage:**

As depressions form, water is unable to effectively drain from an area and will sit in the depression. If a crop is present in the subsided area, it will suffer from waterlogging as explained in the following section.

While this photo is not from a CSG development area, it demonstrates the severe effects of damaged crops due to waterlogging – a likely consequence of CSG-induced subsidence:



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<sup>62</sup> GFCQ Potential consequences of CSG-induced subsidence for farming operations on the Condamine alluvial floodplain – Final Report, July 2023 – p7

<sup>63</sup> GFCQ Potential consequences of CSG-induced subsidence for farming operations on the Condamine alluvial floodplain – Final Report, July 2023 – p20

### **Ineffective application of irrigation water:**

Flood furrows are developed to ensure a consistent grade across the paddock so that applied irrigation water will travel consistently down the furrow and uniformly wet the crop line.



If subsidence depressions form within the paddock, the irrigation water will not flow uniformly across the paddock and will sit in the depression resulting in areas which do not get watered. In the dry, unwatered areas, the crop will suffer and result in considerably reduced crop yields. Where the water sits for a prolonged duration in the depressions, this will cause waterlogging effects on the crop health, as detailed below, and again will lead to a reduced crop yield.

### **Waterlogging results in crop losses or yield decline:**

Our soil is a heavy black clay vertosol<sup>64</sup> which has an immense water holding capacity. This is great for retaining moisture for the growth of crops. However, when it comes to CSG-induced subsidence and the forming of depressions in paddocks, it means that water will sit for prolonged periods in the depressions compared with sandier loamy soils, where deep drainage occurs much quicker. Water sitting in the depressions on black clay soil will be subject to slow drainage and slow evaporation.

### **Impacts of waterlogging include:**

- Missed planting crop opportunities due to inaccessibility of the waterlogged subsided areas/paddocks
- Inability to harvest crops in waterlogged areas

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<sup>64</sup> <https://www.qld.gov.au/environment/land/management/soil/soil-testing/types>

- Weed/pest/fungicide disease pressures and not being able to address these issues due to inaccessibility of the subsided waterlogged areas/paddocks by machinery, spray coupe etc
- General inability to fulfil weed/pest/fungicide management program
- Waterlogging lowers oxygen levels in the root zone, which reduces plant growth.
- Waterlogging or inundation of the seedbed affects germinating seeds and young seedlings more than mature plants. Earlier-sown crops that have emerged and are well established can tolerate waterlogging more than plants that are emerging during waterlogged conditions.
- Waterlogging causes root-tip death within days. Loss of root tips limits the uptake of nutrients (particularly nitrogen) and water after waterlogging. As a result, plants that have been waterlogged ripen early and grain is often pinched.
- Nitrogen is lost from waterlogged soils by leaching and denitrification – the process where nitrogen is converted to gaseous oxides of nitrogen.<sup>65</sup> This loss of nitrogen is damaging to crop growth, strength, vigour & yield. What’s more, the subsequent emissions of nitrous oxide (N<sub>2</sub>O) – a major greenhouse gas - is detrimental to the atmosphere, hence bad for our planet and worsens a farming business’s carbon footprint.
- Denitrification leads to a loss of soil fertility<sup>66</sup>
- Shallow rooting systems formed in waterlogged areas, which then in drier times are unable to obtain sufficient moisture to maintain full growth.

Pondage causes an increase to soil compaction which harms soil structure. Good soil structure is important for the movement of water, gases and roots, which are critical for healthy soil. Compacted soils lack good soil structure as the air spaces that are essential in the movement of water, gases and plant roots are compressed.

*“Waterlogging - When the soil is at or near field capacity, micropores in the soil are full of water and the macropores allow for the movement of oxygen.*

*When a soil is above field capacity, the macropores fill with water and the soil is depleted of oxygen. When this happens, plant roots cannot get oxygen from the soil and microbial activity slows. Over a prolonged period, plants eventually die.*

*Also, without oxygen in the soil, nitrogen breaks down and is lost as gas in a process called denitrification. This can cause a decline in soil fertility.”<sup>67</sup>*

This more detailed explanation from [N-Drip](#) explains some of the severe impacts on cotton crop production in waterlogging situations:

“Vertosol is one of the most common soil types in the Queensland region. The soil ranges from brown to black and tends to crack open when dry and swell when wet.

Vertosol has a high water holding capacity, is very fertile, and can supply crops with nutrients over time.

<sup>65</sup> <https://www.qld.gov.au/environment/land/management/soil/soil-testing/soil-terms>

<sup>66</sup> <https://www.qld.gov.au/environment/land/management/soil/soil-properties/fertility>

<sup>67</sup> <https://www.qld.gov.au/environment/land/management/soil/soil-properties/water>

Initial water infiltration into Vertosol is rapid and fast due to shrinkage and cracks of the soil when dry. However, when the cracks disappear due to wetting, water infiltration becomes extremely slow, and waterlogging can occur.

Waterlogging is the saturation of soil with water. *i.e.*, soil pores, which are the spaces between soil particles, are filled with water. Gases diffuse slowly in solution, and so waterlogging reduces oxygen (O<sub>2</sub>) concentration while increases Carbon-dioxide (CO<sub>2</sub>) concentrations in the soil.

Since plant roots need oxygen for respiration, waterlogging consequences for plants may include reduced or ceased growth, death of root apices, and changes in nutrient accumulation (Dodd et al., 2013). In addition, waterlogging increases soil salinity and can cause transient toxicity of soil nutrients that are typically safe when the soil is drained, such as iron, manganese, and even nitrogen.

In cotton crops, the immediate effects of various waterlogging periods on the plant are extreme. Exposure of cotton plants to 3 hour waterlogging results in complete death of terminal apices of roots (Huck, 1970) and impedes energy generation due to the lack of oxygen.

Since the uptake of mineral nutrients depends on energy production in the roots, waterlogging inhibits the uptake of macro-nutrients (N-P-K), especially during peak flowering (McLeod, 2001; Milroy et al., 2009).

Waterlogging affects the vegetative growth and yield of cotton depending on the cumulative time it is subjected to it. Wu *et al.* (2012) observed a 27–30 % yield reduction after 4–9 days of waterlogging, while ten-day waterlogging caused a 42% yield reduction (Jiang et al., 2013). These yield losses are more significant when waterlogging happens during the early stages (Bange et al., 2004)."

These photo from [OptiSurface](#), a leading farm earthworks solutions specialist, visually demonstrate the benefits of having consistent grades for optimal drainage as opposed to water-logged depressions:





Just a 50mm difference in ground height can mean the difference between a bumper crop and no crop:



### **Remediation through laser levelling comes with a multitude of issues:**

- Laser levelling comes at a huge financial cost
- There are only a limited number of earth-moving contractors on the Downs with the required skill set to work on these issues. They are already in short supply and this will only increase exponentially as subsidence occurs across the Floodplain.
- Where is the dirt to be obtained to fill in the depressions?
  - a. You cannot bring dirt into an area without causing an impact in the retrieved area
  - b. If based on cut and fill process from within one paddock, the whole paddock will reduce in elevation compared with the surrounding land, potentially creating a low area on one's farm where water will naturally flow towards
  - c. You cannot effectively introduce soil from an outside area due to the incompatibility of soils and potential lower grade of external soils
- Extreme management difficulties as the subsidence doesn't happen all at once in the first couple of years, it is ongoing and the length of time is unquantified. Therefore, do you attempt to rectify it on a regular basis as the subsidence progresses (every 1-2 years), or wait for years until it's plateaued and suffer the consequences in the meantime?
- It could lead to having to redesign whole farm/paddock layouts if a change in slope occurs or the overall elevation within rectified subsided paddocks change (see (b) above).
- The practice of laser levelling and its aftermath comes with many issues/impacts:
  - a. Crop losses/yield decline due to compacted soils. Compaction results in reduced porosity, preventing water from accessing the root zone. The effects of compacted soils can be witnessed in reduced crop yields for a number of seasons following the laser levelling event
  - b. The uneven distribution of Nitrogen and other nutrients following laser levelling
  - c. The potential for sodic or saline subsoils to be exposed in the laser levelling process which could lead to long lasting low production effects
  - d. Loss of moisture retaining stubble cover
  - e. Loss of biomass (carbon sequestration) from lost stubble cover
  - f. Missed crop opportunities while laser levelling remediation work is carried out

*"Good soil structure is important for the movement of water, gases and roots, which are all critical for a healthy soil. Compacted soils lack good soil structure as the air spaces that are essential in the movement of water, gases and plant roots are compressed."<sup>68</sup>*

### **Subsidence risks impacts on surface water flows including:**

- Changing the natural flow of the water across the floodplain, around which our farms have been designed
- Changing the natural flow of the water and potentially reducing flows to ecological systems (GDEs) which rely upon existing flows and quantities of water available

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<sup>68</sup> <https://www.qld.gov.au/environment/land/management/soil/soil-health/compaction>

- Resulting in potential overland flow (OLF) losses (for irrigators) from the change in natural water flow direction and subsequent missed crop opportunities from the loss in OLF water available
- A change in slope may change the velocity of surface water flows leading to erosion
- A change in slope may change the velocity of surface water flows leading to sediment deposition

**Subsidence could have far-reaching impacts to farm infrastructure including:**

- Costs to repair potentially impacted farm infrastructure e.g. leaking/seeping storage dams or worst-case scenario dam failure
- Loss of water from seeping/failed dams
- Subsequent lost crop opportunities due to lack of water from subsidence induced seeping/failed dams
- Making the slope in channels and return drains ineffective
- Causing stress/strain on underground polypipe water supply networks which could lead to pipe joint failure

**Consumption of valuable time:**

- Landholders' time working on issues and compensation claims, time taken away from their families and running their businesses

**Mental Health Impacts:**

- Significant Mental Health concerns in dealing with the consequences and having to negotiate with resource companies in what will likely be an extremely stressful period

Not only does subsidence risk permanent and irreversible impacts to prime agricultural farms and their infrastructure, resulting in potentially high yield and economic losses as outlined above, it can also have less apparent but devastating effects on our shared environmental assets.

Subsidence has the potential to change overland flow pathways, around which our farms have been designed and developed. A loss or increase in overland flow could be extremely impactful to the profitability and productivity of farming businesses. Any changes to overland flow pathways will affect river catchments alike with a risk of increased erosion and gully formations.

*“However, consequences of subsidence and small changes to land surface topography in the study region could be important in terms of changing overland flow patterns, which may increase erosion and gully formation.”<sup>69</sup>*

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<sup>69</sup> Assessment of impacts of the proposed coal seam gas operations on surface and groundwater systems in the Murray-Darling Basin, Moran & Vinks, UQ (2010) – p46

Subsurface compaction may result in the deformation of overlying or underlying aquifers. This deformation could result in the opening of new or existing fractures which would change the hydraulic relationships and risks changing groundwater flows between aquifers.

*“In addition, proponents did not consider whether compaction of coal seams in the Walloon Coal Measures after dewatering might result in deformation of overlying or underlying aquifers or confining units. This deformation may result in opening of new or existing fractures in these units which would change the hydraulic relationships and may change groundwater flows between aquifers.”<sup>70</sup>*

There is a very concerning risk, particular to our region, that the propagation of dewatering effects in the immediately underlying target coal seams may lead to direct settlement in the unconsolidated sediments of overlying alluvial systems like the Condamine Alluvium.

*“Primary subsidence issues remain associated with shallow groundwater extraction in largely unconsolidated and clay-rich sediments. There may be a concern in Australia in areas where shallow coal seam targets immediately underlie alluvial systems, such as the Condamine Alluvium in Queensland. In this situation, propagation of dewatering effects may lead to direct settlement in the unconsolidated sediments.”<sup>71</sup>*

The Independent Expert Scientific Committee (IESC) has highlighted that there is a greater risk of settlement or compaction of overlying aquifers or alluviums which directly overlie the target coal seams, such as in the case of the Condamine Alluvium, and especially where the intervening material is thin or absent.

*“A greater hydraulic risk exists where intervening material is absent due to a geological unconformity or where aquifers directly overlie or underlie the coal seam, such as in the Condamine alluvium in central Queensland (Hillier 2010; Moran & Vink 2010). A higher risk of connectivity results in a greater potential for settlement as a greater thickness of materials will be impacted and potentially compressed. Less connected systems are likely to be more competent and hence exhibit less total settlement.”<sup>72</sup>*

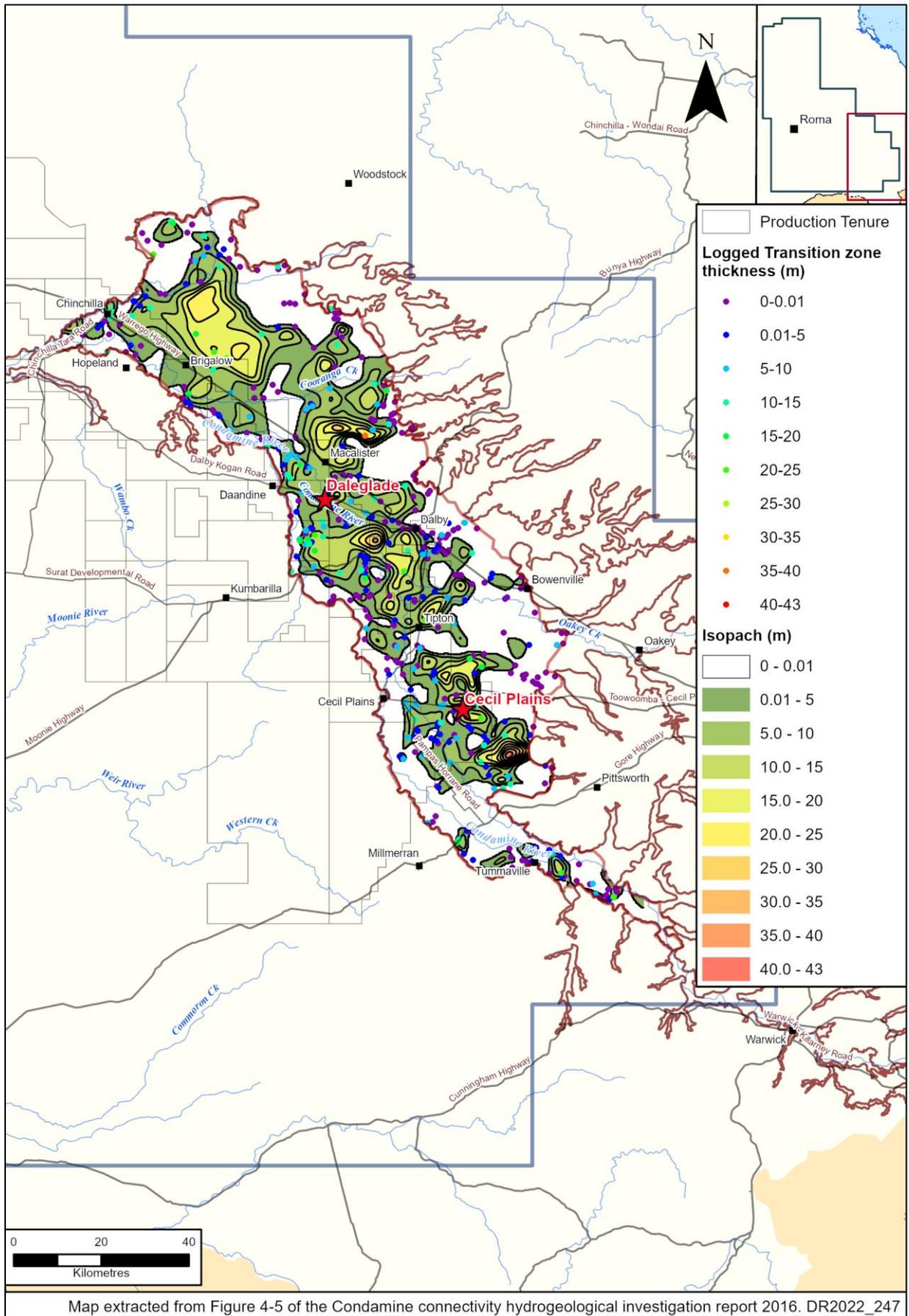
From the following Isopach map, which shows the thickness of the intervening layer (known as the *transition zone*) between the Condamine Alluvium and the Walloon Coal Measures, it is clear to see that the transition zone separating the two formations is thin or absent across large swaths of the Condamine Alluvium extent and therefore subject to a greater risk of hydraulic connectivity and a subsequent greater potential for settlement within the overlying Alluvium.

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<sup>70</sup> Assessment of impacts of the proposed coal seam gas operations on surface and groundwater systems in the Murray-Darling Basin, Moran & Vinks, UQ (2010) – p46

<sup>71</sup> Background Review: Subsidence from coal seam gas extraction in Australia, IESC, 2014 – p49

<sup>72</sup> Background Review: Subsidence from coal seam gas extraction in Australia, IESC, 2014 – p30



In fact, 40% of the Alluvium has a transition zone thickness of less than 5 metres:

**Table 4-1 Modelled transition zone thickness**

| Thickness of transition zone (metres) | Modelled coverage of area (%) |
|---------------------------------------|-------------------------------|
| <5                                    | 40                            |
| 5–10                                  | 31                            |
| 10–15                                 | 15                            |
| 15–20                                 | 9                             |
| >20                                   | 4                             |

Extract from 'Groundwater Connectivity between the Condamine Alluvium and the Walloon Coal Measures: A hydrogeological investigation report, OGIA, August 2016'

We are understandably highly concerned about the future integrity of the Condamine Alluvium. If compaction (settlement) resultant from CSG mining were to occur in the Alluvium, it would be irreversible, permanently reducing its storage capacity.

“compaction of the aquifer system, may permanently decrease its capacity to store water. Even if water levels rose, compacted sediments would remain as-is; most compaction that occurs as a result of historically low groundwater levels is irreversible”<sup>73</sup>

Once the Alluvium’s storage capacity is lost, it is lost forever.

CSG-induced subsidence not only risks significant impacts and consequences to farm land, farm production, farm profitability, farm viability and the mental health of farmers and their families, but it also represents significant risks to regional environmental values such as groundwater and surface water resources.

### Subsidence – Scientific Uncertainty

Subsidence, or reservoir compaction, is a relatively novel field of research, with much still to be learnt.

As explained above, it is caused primarily by the removal of gas and water (fluid extraction) from the coal seams. However, it is a highly complicated process due to the numerous varying geological factors that contribute to its occurrence, characterisation and magnitude, rendering predictions to be the subject of a large degree of uncertainty:

*“Subsidence is the manifestation of subsurface compaction driven by fluid extraction and the resultant interaction of the remaining fluid and porous solid. Consequently, predictions of*

<sup>73</sup> [https://www.arrowenergy.com.au/\\_\\_data/assets/pdf\\_file/0005/32909/ASCRG-Presentation-March-2020.pdf](https://www.arrowenergy.com.au/__data/assets/pdf_file/0005/32909/ASCRG-Presentation-March-2020.pdf)

*subsidence (or uplift) require an approach that considers both of these coupled processes (i.e. fluid dynamics and solid mechanics). By extension, the quality of subsidence predictions is heavily dependent on the quality of predictions of water (and in the context of CSG production, gas) flow in the subsurface. The geomechanical response of a compressible formation depends on the geological characteristics of the in-situ rock and the tectonic stress environment, which in combination with the pressure and temperature variation profile, defines the stress path controlling elastic and inelastic behaviour. **However, real geometries are large and complex, and the properties required for making predictions are commonly subject to a large degree of uncertainty.***<sup>74</sup>

Despite the Office of Groundwater Impact Assessment's (OGIA) earlier statements that subsidence will be relatively uniform<sup>75</sup>, the IESC has since demonstrated that non-uniform compaction and subsidence is possible:

*“Formation heterogeneity, both in terms of geometry and permeability (i.e. propensity for depressurisation), **can result in non-uniform compaction of a geological unit. At the surface, this can manifest as variation in subsidence as well as net horizontal movement.** Extreme cases of differential surface movement, vertically or horizontally, could induce ground failures such as surface faults and earth fissures (Holzer, 1984).*<sup>76</sup>

In fact, the heterogeneity or variation is particularly evident in the Walloon Coal Measures of the Surat Basin, upon which our farms sit:

*“In reality, **the subsurface is often extremely heterogeneous, but this heterogeneity can be difficult to capture in the models used to predict the pressure changes used in calculations of subsidence.** As an example of this, one can consider the **Walloon Coal Measures** (i.e. the target of CSG production in the Surat Basin). It has been noted (e.g. by Cardwell (2018)) that **the coal measures vary significantly between wells at relatively short (e.g. 50 m) spacing, with entire coal packages appearing or disappearing over this distance.** This clearly presents a challenge when trying to create models based on data gathered at a more typical CSG well spacing of 750 m.”<sup>77</sup>*

Compaction and resultant subsidence are of significance in the younger Surat Basin compared with the older sedimentary Bowen Basin due to its higher permeability geological units, where produced water is subsequently greater in the Walloon coal seams compared with those of the Bowen.<sup>78</sup>

As seen from this table taken from Vinks et al: *Scoping Study: Groundwater Impacts of Coal Seam Gas Development – Assessment and Monitoring*, the water content is considerably higher in the Walloon Coal Measures:

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<sup>74</sup> Consultation on IESC Information Guidelines Explanatory Note: Subsidence Associated with Coal Seam Gas Mining, Commonwealth of Australia, 2023 (**IESC CSG Subsidence Explanatory Note**) – p60/105  
<https://www.iesc.gov.au/sites/default/files/2023-04/consultation-subsidence-associated-with-csg-mining.pdf>

<sup>75</sup> Underground Water Impact Report for the Surat Cumulative Management Area 2021, OGIA

<sup>76</sup> IESC CSG Subsidence Explanatory Note – p28/105

<sup>77</sup> IESC CSG Subsidence Explanatory Note – p66/105

<sup>78</sup> IESC CSG Subsidence Explanatory Note – p60/105

| Measure  | Gas production (Mm <sup>3</sup> /well/year) | Water production (ML/well/year) | Water: Gas production | 2P Reserve/area (Mm <sup>3</sup> /km <sup>2</sup> ) |
|----------|---|---------------------------------|-----------------------|---|
| Bandanna | 20.0  | 64.6                            | 3.2                   | 40  |
| Baralaba | 4.3   | 0.5                             | 0.1                   | 14  |
| Walloons | 1.6   | 36.4                            | 22.7                  | 45  |
| Moranbah | 2.8   | 10.0                            | 3.6                   | 21  |

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It is understood that higher initial coal permeability (like that in the Walloons) permits higher gas production and more gas desorption. This in turn results in a greater depleted region around the vicinity of the well-bore and subsequently leads to larger ground subsidence.<sup>80 81</sup>

In the Surat it can take much longer to reach the target seam pressure (up to months), which could be a proxy for greater compaction associated with production.<sup>82</sup>

Compaction has a greater probability in sandstones and claystones, therefore despite compaction being expected to be greatest within the dewatered coal seams, the compaction of other formations, and their contribution to subsidence, cannot be discounted.<sup>83</sup>

Subsidence modelling and predictions is an ongoing area of research and there is still much to learn in regards to the contribution of gas desorption induced coal shrinkage:

*“Nevertheless, the total displacement at the ground surface is the sum of all compaction mechanisms occurring within multiple geological units. It is dependent on the magnitude and direction of compression (which are dictated by pressure changes from extraction of associated water and desorption of gas from coal seams), the depth and depth-interval over which compression occurs, and the geomechanical properties of the geological units throughout the entire depth profile. Whilst the desorption-induced shrinkage of coal is well understood at the laboratory scale, including the stress-dependence of the processes at work (Liu et al., 2017), the degree to which this behaviour translates to the reservoir scale in CSG production is an ongoing area of research.”<sup>84</sup>*

The evolving nature of this area of research and the level of scientific uncertainty is highlighted by the fact that up until recently, the OGIA were only factoring in the removal of water (depressurisation) in

<sup>79</sup> Scoping Study: Groundwater Impacts of Coal Seam Gas Development – Assessment and Monitoring; Sue Vink, Nadja Kunz, Damian Barrett, Chris Moran; January 2011; Document reference: P08-010-002.doc – p20

<sup>80</sup> Numerical simulation of ground surface subsidence due to coal-bed methane extraction, Ayodeji Jayeoba, Durham University, UK, 2020 – p131

<sup>81</sup> A discussion on analytical and numerical modelling of the land subsidence induced by coal seam gas extraction; Guojun Wu, Shanpo Jia, Bailin Wu, Diansen Yang – p9-10

<sup>82</sup> IESC CSG Subsidence Explanatory Note – p60/105

<sup>83</sup> IESC CSG Subsidence Explanatory Note – p60/105

<sup>84</sup> IESC CSG Subsidence Explanatory Note – p28-29/105

their subsidence modelling<sup>85</sup>. However, it is understood that gas desorption-induced coal shrinkage is likely to contribute up to 70% of the total subsidence extent.<sup>86</sup>

The properties of the localised coal (depth, thickness, porosity, permeability, gas content etc) need to be known in order to be able to determine the potential shrinkage capacity. There is very limited stratigraphic core hole data from the east of the Horraine Fault. What is more, this area contains the Horraine Trough, which is a half-graben depression, reaching a maximum thickness of approximately 1300m in a subdued depocentre<sup>87</sup>, with **unique** geological characteristics that has been described as containing Permian sub-basin like properties.<sup>88</sup>

The lack of available data across the proposed CSG development area, and therefore the inability to comprehensively and effectively predict CSG-induced subsidence, is highlighted by *Coffey Environments Australia* on a number of occasions in their Subsidence Technical Report for Arrow Energy's Surat Gas Project:

*"It should be noted that these assessments do not necessarily represent the encompassing range of settlement, as the linkage between settlement and drawdown **is based upon very limited information**. Other data might provide a different range. The assessments of modulus **are based on limited field records** and the assessment of volume loss due to coal seam gas loss for the coal components of the profile **is based on a single published result which may not reflect the conditions in the Surat. As a result, the settlement predictions carry uncertainty.**"<sup>89</sup>*

*"While the predicted subsidence would not breach the adopted investigation levels **it must be recognised that the assessment is based on limited data and contains significant uncertainty**. The assessment is sensitive to the adopted values of:*

- *Modulus of the coal measure rocks.*
- *Volume loss of coal associated with removal of coal seam gas.*
- *Predicted groundwater drawdown."<sup>90</sup>*

Currently, the true extent of CSG-induced subsidence cannot be established across our region due to the extensive heterogeneity within the Walloon Coal Measures and the lack of available data across the entire prospective CSG development area.

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<sup>85</sup> Exploring the contribution of coal shrinkage to coal seam gas-induced subsidence: A research update paper, OGIA, April 2023

<sup>86</sup> Hummel N., Rai U.B., Dudley J.W., Schutjens P.M.T.M., Gear I., Sutton H., McKelvey P. – *Unlocking methane desorption effects in reservoir compaction and subsidence computations for coal seam gas development* – featured in 82<sup>nd</sup> EAGE Annual Conference & Exhibition 2021

<sup>87</sup> Geology and 3D geological models for Queensland's Surat and southern Bowen basins, OGIA, December 2021

<sup>88</sup> <https://www.energynewsbulletin.net/archive/news/1050727/investor-profile-arrow-energy-shoot-for-new-surat-basin-play>

<sup>89</sup> [https://www.arrowenergy.com.au/\\_data/assets/pdf\\_file/0006/30003/Appendix-K-Subsidence-technical-memorandum.pdf](https://www.arrowenergy.com.au/_data/assets/pdf_file/0006/30003/Appendix-K-Subsidence-technical-memorandum.pdf) - p29

<sup>90</sup> [https://www.arrowenergy.com.au/\\_data/assets/pdf\\_file/0006/30003/Appendix-K-Subsidence-technical-memorandum.pdf](https://www.arrowenergy.com.au/_data/assets/pdf_file/0006/30003/Appendix-K-Subsidence-technical-memorandum.pdf) - p43

It is also a possibility, yet to be established, that there could be an uptick in the level of subsidence towards the end of gas production in an area:

*“In the context of subsidence, this suggests that the desorption-induced shrinkage component of coal seam compaction may increase as the reservoir pressure approaches its end state. This has been reported internally by the industry (Rai & Hummel, 2019)”<sup>91</sup>*

As aforementioned, to add to the magnitude of risk of subsidence, deviated drilling, which is proposed across the majority of the floodplain where depths allow, also increases the magnitude of subsidence due to the larger surface area in contact with the coal seam and results in a larger degree of non-uniformity in the subsidence seen at the surface (different shapes of the subsidence bowl).<sup>92</sup>

As noted by *Coffey Environments Australia*, Arrow Energy’s commissioned technical experts:

*“the subsidence process is considered to be largely irreversible.”<sup>93</sup>*

Likewise, the potential consequences of reservoir compaction and surface subsidence are often irreversible and will be far-reaching. The damage to priority agricultural land uses (PALU) will not be a one-off event, but rather a stream of continual impact over the extensive time during which subsidence occurs, creating a high risk of continual interruption to farming practices and requiring continual adaptation across multiple land holdings.

All in all, CSG-induced subsidence and its scientific uncertainty is a significant issue in the Surat Basin, and exponentially so across the Condamine Floodplain which is highly vulnerable to any change in landform. Just slight changes in surface topography risk negative effects on drainage, the effective application of irrigation water and overland flow pathways which are all pivotal to optimal crop production. In our region, subsidence impacts will have far-reaching and long-term consequences on productivity, leading to significant economic losses, not only due to the decrease in crop yields but also the costs of trying to rectify the change in land form, if at all feasible. Furthermore, there is the potential risk to the integrity of farm infrastructure like water storage dams and the ensuing production and economic losses that could result.

It is unacceptable that landholders are expected to assume such an unquantified and substantial risk to their properties and livelihoods, economic viability and ongoing productive capacity.

The science and legislation are playing catch-up while the risks to high-value assets are permitted to occur. Further comprehensive and evidence-based research under a precautionary principle approach must be carried out before further development is contemplated.

<sup>91</sup> IESC CSG Subsidence Explanatory Note – p29/105

<sup>92</sup> Subsidence: An overview of causes, risks and future developments for coal seam gas production, Jubert A. Pineda & Daichao Sheng, July 2013

<sup>93</sup> [https://www.arrowenergy.com.au/data/assets/pdf\\_file/0006/30003/Appendix-K-Subsidence-technical-memorandum.pdf](https://www.arrowenergy.com.au/data/assets/pdf_file/0006/30003/Appendix-K-Subsidence-technical-memorandum.pdf) - p29