

Consultation  
Regulatory Impact Statement for the  
**Queensland Lake Eyre Basin**



Prepared by the Department of Environment and Science

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Photo by Gary Cranitch © Queensland Museum

*The Department of Environment and Science acknowledges Aboriginal peoples and Torres Strait Islander peoples as the Traditional Owners and custodians of the land. We recognise their connection to land, sea and community, and pay our respects to Elders past, present and emerging.*

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### **Citation**

DES 2023 Consultation Regulatory Impact Statement for the Queensland Lake Eyre Basin. Brisbane: Department of Environment and Science, Queensland Government.

### **Acknowledgements**

The Department of Environment and Science (DES) acknowledges the First Nations peoples of the Queensland section of the Lake Eyre Basin, and pays respect to their Elders past and present. DES acknowledges the First Nations peoples' deep connections to their lands and waters, their customs, traditions, cultural heritage, knowledges, stories and systems, and notes that sovereignty was never ceded. DES is committed to shaping the future framework for the Qld Lake Eyre Basin in partnership with the First Nations peoples of the region.

DES greatly appreciates the respectful engagement, input, information, perspectives and advice provided by the Traditional Owners Alliance representatives and all the other members and proxies of the Lake Eyre Basin Stakeholder Advisory Group across a wide array of issues and interests. The guidance and support provided by the Chair is also very much appreciated.

June 2023

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# 1. Executive summary

The Kati Thanda-Lake Eyre Basin (LEB) system straddles four jurisdictions and is of both global ecological importance and regional First Nations cultural significance. It is a rare example of a remaining, intact set of dryland rivers, floodplains and connected alluvial hydrology left on the planet. This is a unique and special place, and it is worth properly protecting.

The challenges with maintaining the health and productivity of such a complex set of river and floodplain systems are substantial. The challenges include the need to maintain both the integrity of surface water processes on the various watercourses as well as the subsurface hydrology. What happens in the upper streams and rivers, the subsurface hydrology and ecological functionality, and the current and potential engineering activities on and below the surface, are all relevant and interconnected.

The Queensland component of the LEB (Queensland LEB) plays a critical role in the overall system, because while Kati Thanda-Lake Eyre sits over the South Australian border, three Queensland rivers which feed it and the adjoining freshwater Coongie Lakes wetlands. Overland water flows down the Georgina and Diamantina Rivers and Cooper Creek in Queensland, and their associated floodplains and connected rivers are the lifeblood of the adjacent landscapes and the end points of these systems. This includes the productive capacity of the region in terms of agriculture and tourism. Activities taking place in one part of this complex hydrological system can affect downstream water quality, potentially impacting on environmental health, agricultural success, other economic opportunities including tourism, and cultural matters. Throughout the region, First Nations historical and ongoing connection to Country is evident and remains strong.

The broad goal of the Queensland Government is to ensure that adequate long-term protection of the Queensland LEB rivers, watercourses and floodplains is achieved while supporting sustainable economic development in the region. The Queensland government also has important goals concerning Path to Treaty, and supporting First Nations' cultural, social, economic, and ecological priorities and aspirations, building from protection of Country and enabling greater involvement in decision-making. The intent is to develop a long-term framework for the Queensland LEB to deliver on these goals, collaboratively with stakeholders and through community consultation.

This consultation Regulatory Impact Statement (RIS) represents a critical phase in the process of developing a future framework for the Queensland LEB and is being released now to elicit community feedback on the options being considered by government for suitable protections for the rivers and floodplains of the region. A core focus of the issues discussed, and the options canvassed in this document are about the extent of the mapped areas of the rivers, watercourses and floodplains that could be afforded higher level protections (the 'Spatial' elements) if that is deemed necessary, and the future activities that should be permitted in those mapped areas (the 'Regulatory' elements). These options are put forward without preference or recommendation.

Proposed responses for delivering outcomes for the region's First Nations people are also considered.

A number of current land uses and on-ground activities exist in the Queensland LEB region, including conventional oil and gas exploration and extraction, mineral mining, grazing and some other farming, town-based economies, tourism, land and weed/pest management, and also cultural practices and caring for Country. Many of these activities have some interaction with the floodplains and rivers, and operate under existing restrictions relating to 'unacceptable uses and activities' such as open-cut mines, dams, and intensive irrigated cropping in such areas, although not comprehensively so.

These on-ground practices and current permitted land uses in the Queensland LEB are generally regarded as having minimal negative impacts on water quality and overland flows, although none are free of risks, and threats exist and remain. To date, current conventional oil and gas activities, which do not involve larger scale industrialisation on the floodplains, have not created higher level impacts, nor widespread or irreversible effects. No industry can claim to be risk-immune (and there have been incidents including a sizable oil spill close to a floodplain), but in the main the existing regulatory framework has successfully managed risks of existing conventional oil and gas activities.

However, the gradual emergence of plans and proposals for unconventional extraction of oil and gas in the rivers or on the floodplains of the Queensland LEB presents challenges to the future health and

integrity of these sensitive areas. This is because of the associated industrialised processes including intensive hydraulic fracturing techniques, and associated requirements for substantially greater volumes of water, use of chemicals, and generation of contaminants, wastewater, and other processes. Accidents leading to pollution of the waters of Kati-Thanda Lake Eyre, and its rivers and floodplain systems, could potentially be catastrophic for nature, for people, and the economic and social prosperity of the region. Similarly, major disruptions to the ecological processes and ecosystem functionality of the region which depend on overland flows and alluvial recharge processes, could have detrimental and potentially irrevocable outcomes for the region.

The clean and free-flowing rivers of the Queensland LEB are integral to the region's environmental and cultural values, and the region's critical tourism and agricultural sectors which rely on those values remaining intact. A legitimate question for the Queensland government is how best to anticipate and proactively manage future risks and threats, and address potentially fundamental shifts in risk before they become major problems, or create widespread or irreversible ecological or cultural impacts, which may have national and international ramifications.

The intent of government is to ensure the ongoing preservation of the sensitive ecological and cultural values in the rivers, watercourses and floodplains of the Queensland LEB, and to examine the case for expanding environmental protections spatially and/or through regulation as necessary to reduce or eliminate major future threats to them, while also supporting sustainable economic activities. Acting proactively will produce future economic, social and cultural dividends as well as protect a unique natural environment.

The North West Minerals Province overlaps with approximately one quarter of the Queensland LEB region, and it contains significant prospectivity for 'critical new economy minerals' that are an essential component of the transition to renewable energy and emissions reduction.

It is not intended or anticipated that the capacity to extract 'new economy' or other essential minerals away from sensitive river and floodplain areas in the Queensland LEB will be affected. Open cut mining is already an unacceptable use in existing Designated Precincts of the region. While any spatial extensions to Designated Precincts would include that provision, none of the Regulatory Options outlined below have been designed to impact on critical new economy minerals extraction in the North West Minerals Province. Even with the most expansive Spatial Option outlined below, 94% of the entire North West Minerals Province will remain unaffected.

Access to critical new economy minerals is important to support the Queensland Energy and Jobs Plan and to deliver the Queensland Climate Action Plan, including the need to decarbonise the economy. Critical new economy minerals projects will be subject to standard impact assessments and approval processes, including assessment against any expanded Designated Precincts. The Coordinator-General may also play a role in examining such projects that cannot be located outside Designated Precincts.

Accordingly, this consultation RIS lays out the following options (summarised here, and discussed in greater detail further in the document) and proposals for community consideration and feedback:

***Spatial options (extent of mapped protections)***

- Option 1. Retain the status quo – no change to current spatial extent of mapped areas for protection.
- Option 2. Expand current Strategic Environmental Area / Designated Precinct boundaries to add those river and floodplain areas, and special ecological features, considered to be of greatest ecological significance, to create a new regulatory map. These additions would largely be consistent with previously mapped areas of higher protection under pre-2014 river declarations, and would extend existing use provisions for such areas.
- Option 3. Build on the above option by including additional areas of ecological significance, adding to the breadth of spatial coverage of hydrological features.

**Regulatory options (permitted future activities)**

- Option 1. Retain the status quo – no change to current regulatory frameworks.
- Option 2. Augment the current regulatory regime to require a more detailed and comprehensive assessment approach to test for alignment, with pre-determined criteria for acceptable uses/activities within the Designated Precincts such as hydraulic fracturing, to provide certainty to industry regarding oil and gas extraction in the floodplains and rivers.
- Option 3. Not allow future unconventional oil or gas extraction as potential high impact activities in the regulatory mapped floodplains and rivers (i.e the finalised Strategic Environmental Area/ Designated Precinct areas) of the Queensland LEB.
- Option 4. Not allow any future oil and gas activities in the regulatory mapped floodplains and rivers.

**Options for environmental attributes of the Queensland LEB river systems**

- Option 1. Retain the status quo – no changes to current environmental attributes.
- Option 2. Broaden the environmental attributes, to capture the full range of key processes and functions that are considered fundamental to the preservation of the LEB's natural system, including geomorphic processes, riparian functions and wildlife corridors.

The Queensland government also has an important opportunity to address inequities and inadequacies in how Country is formally recognised and acknowledged, and how First Nations Traditional Custodians of the Queensland LEB are supported and enabled to care for their Country, consistent with the Queensland government's Path to Treaty process.

**In response to First Nations peoples' priorities, it is proposed that the Queensland government:**

- improve formal recognition of Country and Cultural Heritage, and address the need for appropriate engagement and consultation beyond Native Title processes on matters relating to Country.
- work constructively and collaboratively with LEB Traditional Owners Alliance members to consider how best to improve capacity to support engagement and participation in decision-making processes for the LEB region.
- examine how best to enable the realisation of First Nations people's aspirations for cultural, economic, social, and environmental opportunities and outcomes, including land and river management, First Nations-owned and managed tourism and business, and First Nations enterprises and entrepreneurialism such as in biodiscovery and traditional knowledge.

Finding the optimal mix of spatial, regulatory, and environmental attribute approaches as well as the proposed responses to First Nations priorities will enable government to best protect the Queensland LEB's river systems, and at the same time support economic prosperity across the region for the long term. In doing so, it is anticipated that industry and the community will benefit from greater spatial and regulatory clarity and certainty, which will help safeguard ecologically and culturally significant sites, and create economic, social and cultural opportunities for the region's First Nations peoples.

Greater details and specificity for each of the spatial, regulatory and environmental attribute options and the proposed First Nations responses, summarised above are provided within the body of this document.

Finally, it is acknowledged that discussions of the future for the Queensland LEB are taking place in the context of climate change, and that both considerations of contributions to climate change and impacts from it, may be additional matters the community wishes to comment on.



Lake Eyre Basin Stakeholder Advisory Group, Longreach and Brisbane © The State of Queensland

## Glossary

**Critical Minerals:** “Critical Minerals (also known as new economy minerals) are a range of essential metals and minerals used in emerging technologies such as electric vehicles, renewable energy products, low-emission power sources, consumer devices, and products for the medical, defence and scientific research sectors”. (Department of Resources 2022) <sup>1</sup>

### Gas type definitions (Lech et al, 2020)

**conventional gas:** conventional gas is obtained from reservoirs that largely consist of porous sandstone formations capped by impermeable rock, with the gas trapped by buoyancy. The gas can often move to the surface through the gas wells without the need to pump.

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<sup>1</sup> <https://www.resources.qld.gov.au/mining-exploration/initiatives/critical-minerals/about-critical-minerals>



**unconventional gas:** unconventional gas is generally produced from complex geological systems that prevent or significantly limit the migration of gas and require innovative technological solutions for extraction. There are numerous types of unconventional gas such as coal seam gas, deep coal gas, shale gas and tight gas.

**shale gas:** generally extracted from a clay-rich sedimentary rock, which has naturally low permeability. The gas it contains is either adsorbed or in a free state in the pores of the rock.

**tight gas:** tight gas is trapped in reservoirs characterised by very low porosity and permeability. The rock pores that contain the gas are minuscule, and the interconnections between them are so limited that the gas can only migrate through it with great difficulty.

**deep coal gas:** gas in coal beds at depths usually below 2000 m are often described as 'deep coal gas'. Due to the loss of cleat connectivity and fracture permeability with depth, hydraulic fracturing is used to release the free gas held within the organic porosity and fracture system of the coal seam. As dewatering is not needed, this makes deep coal gas exploration and development similar to shale gas reservoirs.

**coal seam gas:** coal seam gas (CSG) is a form of natural gas (generally 95% to 97% pure methane, CH<sub>4</sub>) extracted from coal seams, typically at depths of 300 to 1000 m. Also called coal seam methane (CSM) or coalbed methane (CBM). Coal seam gas" means natural gas when it is contained in oil shale or coal, whether or not it is in a gaseous state.

**natural gas:** the portion of petroleum that exists either in the gaseous phase or is in solution in crude oil in natural underground reservoirs, and which is gaseous at atmospheric conditions of pressure and temperature. Natural gas may include amounts of non-hydrocarbons.

**hydraulic fracturing:** means the injection of a substance or substances into a bore under pressure for the purposes of stimulating a geological formation<sup>2</sup>.

**oil:** a mixture of liquid hydrocarbons and other compounds of different molecular weights. Gas is often found in association with oil. Also see Petroleum.

**petroleum:** a naturally occurring mixture consisting predominantly of hydrocarbons in the gaseous, liquid or solid phase.

**Precautionary principle:** *"The precautionary principle... in environmental decision making, has four central components: taking preventive action in the face of uncertainty; shifting the burden of proof to the proponents of an activity; exploring a wide range of alternatives to possibly harmful actions; and increasing public participation in decision making"* (Kriebel et al, 2001).

**Palaeochannel:** an ancient stream or riverbed, cut into the rock or soil and overlaid by sediment after the stream has changed its course or dried up (Macquarie Dictionary Publishers, 2022).

**Sustainable agriculture:** refers to the use and development of agricultural resources that consider not only short-term benefits but longer-term economic, social, environmental and governance. (Department of Agriculture and Fisheries, 2022)

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<sup>2</sup> This is also known as 'fracking' in the vernacular. The Department of Environment and Science also uses 'frac or fraccing'  
[https://environment.des.qld.gov.au/\\_\\_data/assets/pdf\\_file/0034/88387/rs-is-fraccing-and-btex.pdf](https://environment.des.qld.gov.au/__data/assets/pdf_file/0034/88387/rs-is-fraccing-and-btex.pdf)

## 2. Introduction to the RIS process

The purpose of a consultation Regulatory Impact Statement (RIS) is to lay out options for proposed government action, and to seek community views on the merits, benefits, limitations and costs of them. Commonly, a consultation RIS will indicate government's preferred or recommended directions.

In the present case, the Queensland government publicly committed to releasing a consultation RIS as a means of seeking community preferences, feedback and responses to options for delivering the best framework for river/floodplain protections in the Queensland LEB, which also support sustainable economic activities. For this reason, the options provided in this consultation RIS are presented in a neutral way, with no preferred or recommended directions at this point.

The Queensland government also publicly committed to establishing a Lake Eyre Basin Stakeholder Advisory Group (LEB SAG) to inform the development of the consultation RIS through the input of a range of stakeholder interests, knowledge and perspectives.

The LEB SAG was formally convened on 24 November 2021 by the Department of Environment and Science (DES), and met five times, including in Longreach. The LEB SAG also conducted a trip to the Cooper gas fields as part of its investigation and consideration of the options available to government. Chaired by former Natural Resources Minister Stephen Robertson, the group included members representing First Nations communities through the Traditional Owners Alliance, agricultural bodies, conservation and environment groups, the mineral and oil/gas resources sectors, local governments, regional development, and scientific interests.

The LEB SAG discussed a range of ecological, cultural, economic, social, land use and other issues concerning the Queensland LEB region. Members received presentations from Traditional Owners, oil/gas operators, wetland ecologists and the Chief Geologist, and considered the scope of spatial and regulatory options for inclusion in the consultation RIS. Several formal position statements and policy reports were also tabled, alongside key scientific studies and analysis of relevant issues. All this content has been used to reflect the significance of the Queensland LEB region, the opportunities and threats it faces in the coming years, and in framing options for its protection.

At the last full LEB SAG meeting, members received a briefing on how the consultation RIS was expected to be formulated for government consideration, including the main spatial and regulatory options to be canvassed. Feedback was sought on the broad options as they stood, and the government further considered the views of all LEB SAG members along with input from government agencies and with reference to science prior to finalising this consultation RIS for community response.

This consultation RIS represents the culmination of a decade of public discussion and consultation processes regarding the long-term future of LEB rivers and floodplains. The future of Queensland LEB is important to all Queenslanders, and enabling the community to express further views and preferences prior to government making final decisions is a vital part of the process.

Following the community consultation period, the views of the community and stakeholders will be collated and considered before a decision RIS is prepared for government consideration. The Queensland government is committed to making a timely decision on the available spatial and regulatory options, and seeking to respond to the stated concerns, priorities and aspirations of First Nations peoples from the region. Making a timely decision will ensure that industry, the community, Traditional Owners, local government and others are all provided with greater certainty on the future regulatory framework governing the Queensland LEB.

**Map of the Lake Eyre Basin and drainage sub-basins area and inset of this location in Queensland.**



(Source: Department of Environment and Science, 2022)

## 3. Why the Queensland LEB is worth protecting

### 3.1 Ecological features and significance

The LEB is of high ecological and cultural significance nationally and globally. It is the largest internally draining system in Australia and one of the biggest in the world. The Queensland LEB region is a unique and spectacular environment. The Georgina, Diamantina and Cooper Basins contain some of the last remaining largely intact and free-flowing river systems in the world. These pristine rivers traverse the far western Queensland arid region, and support complex wetland ecosystems on densely channelised floodplains<sup>3</sup>. They are characterised by expansive floods that break prolonged droughts, and spectacular ecological resurgence.

The Lake Eyre Basin Intergovernmental Agreement 2001 (Balmaks et al, 2018) recognises the iconic Kati Thanda-Lake Eyre and its distributary systems as one of the last arid-zone water catchments around the globe to flow intermittently without interruption, with high conservation significance on a world scale. The LEB is known for its variable flow regimes, and variable rainfall patterns. Rivers in the LEB are among the most hydrologically variable in the world and are, on average, about twice as variable as other arid zones of other continents. The fact that there is a direct link to naturally occurring cycles of drought and flood is evidence that the hydrological, geomorphological and in-stream natural values remain largely intact (Hoy et al. 2002). This is re-affirmed by a more recent international analysis of free-flowing rivers (Grill, 2019).

The floods and zero flow periods of the unrestricted rivers of the LEB drive spectacular booms and busts in ecosystem responses (Kingsford et al. 1999; Puckridge et al. 2000). During flood, the region attracts millions of waterbirds which breed on the floodplains. Flooding is dependent on many factors. The same area may flood differently depending on the event. Factors such as event location, duration, previous events, soil moisture and vegetation presence and condition can all have an influence on flood patterns.

In the LEB's river systems, small changes in elevation in an otherwise flat landscape can have big influences on surface flow behaviour. Smaller and more frequent flooding can be just as important as larger floods. These flood cycles support internationally important biodiversity benefits, and the Queensland LEB floodplains in particular are of global importance ecologically and culturally. They also support abundant wildlife, and substantial and growing tourism.

In addition to flow regimes, water quality plays an important role in the spatial and temporal dynamics of ecological processes in dryland rivers (Sheldon and Fellows 2010). High turbidity in most of the aquatic features in the LEB limits potential for eutrophication, even in the presence of high nutrient loads (which may be natural) (McDougall et al, 2021). However, the risks of leakage of wastewater and drill spoil lead to greater concerns about impacts in a terminal system such as the LEB, where contaminants would concentrate in-situ. Contaminants can also exacerbate the effects of high nutrient loads in the river systems, where contaminants can floc the natural clay turbidity allowing greater eutrophication impacting ecological function, cultural values, and use for agriculture.

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<sup>3</sup> "Channel country" is a term to describe the interconnected (anastomosing) channels consisting of extensive floodplains and large areas of wetland habitats (~8.5 million ha; Bino et al. 2016) including artesian springs, waterholes, river channels, swamps, floodplains, and freshwater and saline lakes.



*Cooper Creek floodplains, © QLD Museum*

### **3.2 Physical and social geography**

The Queensland LEB covers an area over 510,000km<sup>2</sup>, approximately 30 per cent of the state's land area. The headwaters for the Georgina River, Diamantina River and Cooper Creek start in Queensland and flow into the Kati Thanda-Lake Eyre system. The sections of these rivers and floodplains that are currently within the 'Channel Country Strategic Environmental Area' represent some 15 per cent of this whole area.

The Queensland LEB region takes in all or part of 12 Queensland local government areas: Barcaldine, Barcoo, Blackall-Tambo, Boulia, Bulloo, Diamantina, Flinders, Longreach, McKinlay, Mount Isa, Quilpie and Winton. The region is home to more than 10,000 Queenslanders (per the 2021 Census, accounting for boundary differences between local governments and river basins). First Nations peoples represent around 16 per cent of this population (2016 Census). Communities are small and spread out across large areas, with greater population densities in towns like Blackall, Barcaldine, Longreach, Windorah, Bedourie, Winton, Birdsville, Boulia and Camooweal.

According to the 2016 census<sup>4</sup> on jobs by industry (Australian Bureau of Statistics, 2016), the key employers in these 12 local government areas are beef cattle farming (grazing) (19 per cent) copper ore

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<sup>4</sup> Employment figures from the 2021 ABS Census were not yet available at time of preparation. Updated ABS data will be reviewed as they become available.

mining (20 per cent) and minerals (such as silver-lead-zinc oxide ore) mining (10 per cent). It is worth noting that another 20 per cent of the labour force is employed by health, local government and primary education public sectors.

Mineral (ore) mining is mostly reported in the Mount Isa local government area (and existing elsewhere only in the McKinlay local government area), and oil and gas extraction in the Bulloo local government area. Mining and associated industries account for around 12 per cent of the \$2.8B regional economic output for the Outback region.

### 3.3 First Nations history, culture and aspirations

First Nations peoples have protected LEB Country and Culture for millennia, and today's Traditional Owners and Custodians of the LEB have continued to work to ensure the rivers, floodplains and groundwater of the country are protected for the future.

The LEB holds continuing significance for Traditional Owners who commonly speak of their obligations to look after rivers and water places according to ancestral lore and custom. The region's significance is demonstrated by the ongoing connections between Traditional Custodians and Country, and by the beliefs, traditions and oral histories associated with this unique landscape.

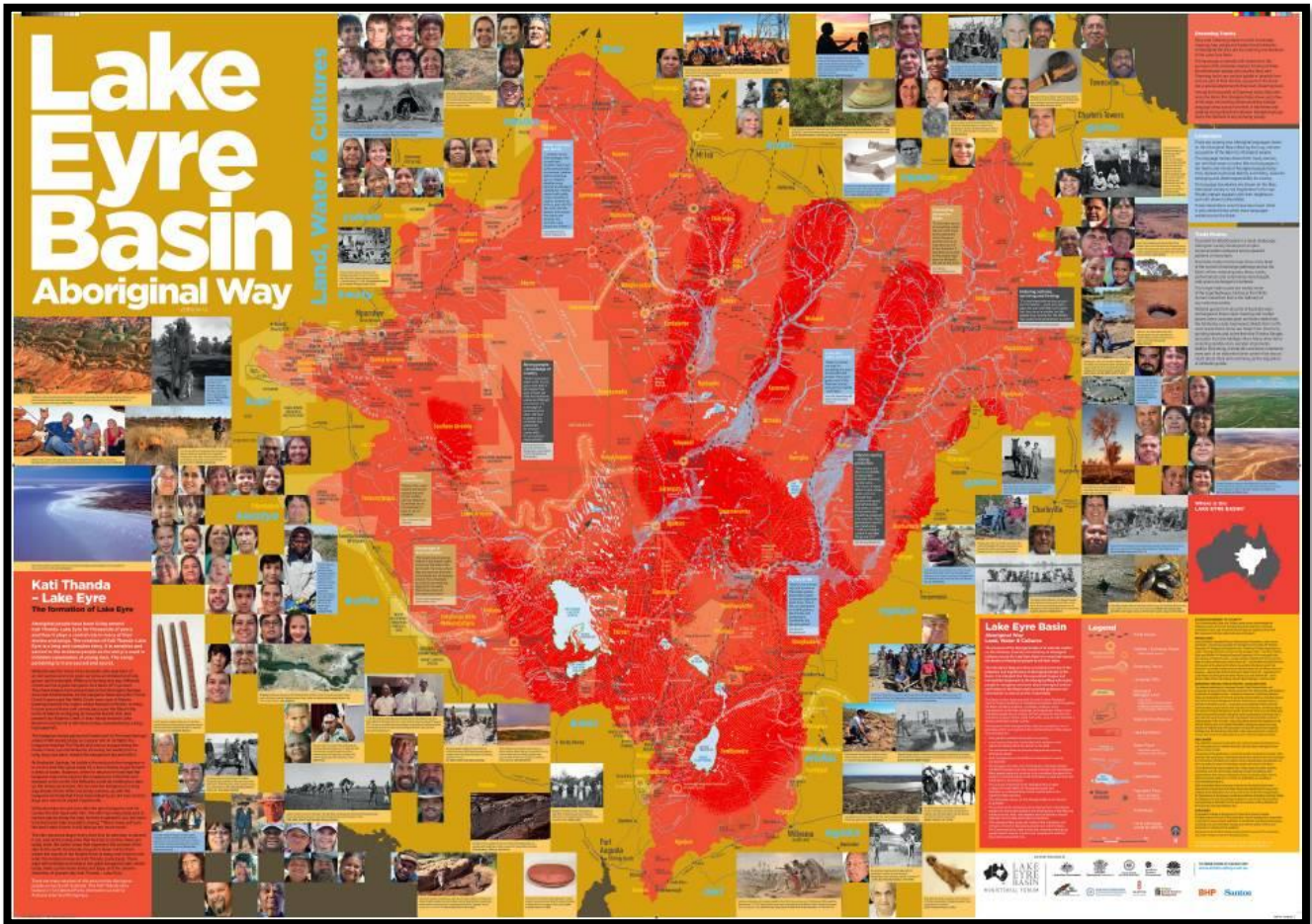
For the Traditional Owners, rivers are an intricate part of the landscape holding vast social, cultural and economic importance; the value of rivers is intangible. Rivers hold significance in a number of ways. Numerous 'story places' and totem species are associated with water, making it central to relationships between people and country. As noted in the latest national State of the Environment report (2022):

*"Country is one's connection to place. It connects people, plant and animal species to land, water and sky. Country is a place of belonging, stories of your Dreaming. It embraces the yarns, traditions, seasons, creation spirits and our ancestors. Country is the feeling of belonging and knowing deep within"* (Commonwealth of Australia, 2021).

Rivers are also fundamental to the wellbeing of Country, and therefore to the wellbeing of people and culture. The healthy flows and water quality of rivers are particularly important in maintaining this culture.

Beyond Native Title, the First Nations peoples of the LEB region have previously worked together and with government representatives and others to develop a map of Aboriginal Cultural Heritage in the landscape, known as the Aboriginal Way map of LEB, crossing what are now parts of Queensland, Northern Territory, South Australia and New South Wales. Aboriginal Way Map signs have been installed throughout the area. Key elements of the cultural map include:

- Physical evidence of Aboriginal occupation exists throughout the Basin. This included artefacts, campsites, middens, stone arrangements, burial sites, paintings and engravings. Many First Nations people still live on country as their ancestors have done for thousands of years; others who may live further away still have strong connection to their country.
- Dreaming Tracks span multiple languages, connect stories and create strong ritual links between Aboriginal groups.
- Language names are drawn from many sources, not tribal areas or native title, but are in the hearts and minds of Aboriginal people today.
- Over 60,000 years, Aboriginal society developed complex and purposeful Trade Routes or patterns of human movement, where the exchange of material goods, ideas, words, performances were bought, sold, given, or bartered.



Aboriginal Way map used with permission from representatives of the Queensland Traditional Owners Alliance

The Queensland LEB Traditional Owners Alliance was formed in 2019 and is an initiative of 13 First Nations peoples from across the region with the aim of having a strong voice in decision-making about Country. Representatives from the current 16 Traditional Owner groups including Alywarra, Boonthamurra, Dieri, Indjalandji-Dhidhanu, Iningai, Koa, Kullilli, Maiawali, Mitakoodi, Mithaka, Pitta Pitta, Waluwarrar, Wangkamadla, Wangkangurru/ Yarluyandi, Wangkumarra and Yirrnendali have met and developed statements and positions on how best to protect and manage the waterways, floodplains and groundwaters of the Basin for future generations. Our Water Our Future (Lake Eyre Basin Traditional Owners Alliance, 2019) includes more information about the Alliance and position papers.

Cultures that survive, thrive and endure

*“Its most important we play our part but The Mother – earth and water – plays her part well after we’re gone. Yes, love me as a mother, but the greater love must be for The Mother that sustains the generations to come.”*

Leanne Wilson/Thompson, Inigai custodian (Aboriginal Way Map).  
<https://aiatsis.gov.au/explore/map-indigenous-australia>

The aspirations of the Traditional Owners Alliance include empowering Traditional Owner groups to have a strong voice on the management of the Lake Eyre Basin floodplains, river ways and water resources. The Alliance “advocates for local Traditional Owners to help develop an economic base for growth, that reflects the cultural, environmental, and heritage values of the Lake Eyre Basin” (Lake Eyre Basin Traditional Owners Alliance, 2019).

### 3.4 The problem

The clean and free-flowing rivers of the Queensland LEB are integral to the region's environmental and cultural values, and its agricultural productivity and economic potential. Sustainable economic activities, including organic beef production and tourism, need to be enabled and promoted to ensure there is future long-term economic growth and prosperity within the region.

To date, current practices, including resources-related activities have generally not had major negative impacts on the region's river systems, although this is not to suggest the absence of incidents or compliance issues. However, major concerns have been expressed by river ecologists and conservation scientists, land-management and conservation groups, and the wider community about whether the current planning and regulatory frameworks will be strong enough to protect the river systems of the LEB from the possible impacts of future unconventional<sup>5</sup> oil and gas extraction on the floodplains and rivers.

Particular activities and associated infrastructure (such as oil, unconventional gas extraction utilising hydraulic fracturing chemicals, mining, large scale infrastructure), within specific culturally- and ecologically-sensitive areas (such as rivers, streams, floodplains and other watercourses) represent additional risks and potential threats to water quality in the river systems and to cultural values in the landscape.

There are other concerns about water extraction, water usage and the storage and disposal of flowback (water and hydraulically fracturing fluids) associated with unconventional gas extraction, particularly in the context of overland flow. Linear infrastructure related to those activities can also impede, alter or reduce the flow and drainage of water.

Industry has indicated that since hydraulic fracturing activities were formally recorded from 2010, approximately 180 such wells have been drilled and hydraulically fractured in the LEB<sup>6</sup>. This is reported to include some 60 wells on the Cooper floodplain or elsewhere in the Designated Precincts of the Queensland LEB. However, the absence of regulatory reporting requirements in Queensland of 'unconventional' oil or gas extraction as distinct activities means the precise level or nature of current hydraulically fracturing activity, and associated intensity of industrialisation, in the Queensland LEB or on floodplains is not completely clear<sup>7</sup>.

To adequately protect the river systems and prevent the potential for widespread and irreversible impacts, a new and precautionary approach may be needed which can ensure risks are avoided in culturally- and ecologically-sensitive areas, while sustainable economic activities, including resources activities are supported elsewhere in the region.

## 4. Current challenges and responses

### 4.1 Historical and current regulatory framework

In 2011, the Queensland LEB, along with the Channel Country floodplains and recognised artesian spring features, were provided protection under the *Wild Rivers Act 2005* with declarations prohibiting large dams and large-scale irrigation, hard-rock mining, and additional regulations for petroleum and gas activities on or adjacent to watercourses.

In May 2013, the then Natural Resources and Mines Minister considered the outcomes of newly-targeted consultation undertaken with a Western Rivers Advisory Panel (WRAP<sup>8</sup>) he convened. In 2014, the *Wild*

<sup>5</sup> See Glossary for definitions of conventional and unconventional oil and gas.

<sup>6</sup> Source: Department of Resources, based on information provided by petroleum operators.

<sup>7</sup> However, the absence of evidence of larger industrialised footprints and large water use/management or any published data about activities suggests these hydraulically fracturing activities are lower scale ones associated with conventional/natural gas or oil extraction.

<sup>8</sup> <https://www.rapad.com.au/assets/Uploads/wrap-report-final.pdf>



*Rivers Act 2005* was repealed and the *Regional Planning Interests Act 2014* (RPIA) was introduced. Sections of the LEB rivers in Queensland along with most Channel Country floodplains were declared under the RPIA as a Strategic Environmental Area (SEA), including a Designated Precinct status (DP) where certain activities are identified as ‘unacceptable uses’ including broadacre cropping and open-cut mining. Petroleum activities (oil and gas extraction) are currently permitted under this framework.

When the mapping for the ‘Channel Country’ DPs was undertaken in 2014, the defined boundaries for the Queensland LEB river systems omitted some critical parts of what had been mapped previously, under the pre-2014 river protection Declarations for the Georgina and Diamantina Rivers, and for the Cooper Creek. It is not clear why this was, as it did not occur when similar processes were applied to all other DPs including those in the Gulf Country and Cape York Peninsula.

### Regulatory gap analysis and comparison

	Pre-2014 legislation (former)	<i>Regional Planning Interests Act 2014</i> (current)
<b>1. Assessment area</b>	There were previously two declared areas – Cooper Creek and Georgina/Diamantina, with a combined area of 50,994,020 hectares. In these areas, projects were subject to consideration of what types of development were assessable and prohibited, including mandatory conditions for resource projects, and a code which included additional assessment requirements for non-resource activities.	The current Channel Country strategic environmental area covers an estimated 6,643,032 hectares, approximately 87% less than the area under the previous framework.  In this area, all new or expanded resource <sup>9</sup> and regulated <sup>10</sup> activities are subject to assessment against the assessment criteria in the Regional Planning Interests Regulation 2014. Resource and regulated activities do not include all of the activities regulated under pre-2014 legislation.
<b>2. Areas of higher protection</b>	There were previously two main categories of ‘higher protection’: high preservation areas, and special floodplain management areas. On some water issues, floodplain management areas were also relevant. Higher protection areas represented a combined area of an estimated 7,543,488 hectares.  Prohibitions and assessment requirements varied depending on whether a project was located in these areas (refer rows 5 and 6 for further detail).	The ‘Channel Country’ Designated Precinct covers 6,643,032 hectares, the same extent as the strategic environmental area <sup>11</sup> . There are no other categories of protection in the framework.  Activities that are ‘unacceptable uses’ are not permitted in the designated precinct.
<b>3. Values</b>	There were previously five natural values, including: <ul style="list-style-type: none"> <li>• hydrologic processes</li> <li>• water quality</li> <li>• geomorphic processes</li> </ul>	There are currently three environmental attributes for the Channel Country: <ul style="list-style-type: none"> <li>• natural hydrologic processes</li> <li>• natural water quality</li> <li>• beneficial flooding of land.</li> </ul>

<sup>9</sup> An activity or authorised activity for a resource authority under the *Geothermal Energy Act 2010*, *Greenhouse Gas Storage Act 2009*, *Mineral Resources Act 1989*, *Petroleum Act 1923*, *Petroleum and Gas (Production and Safety) Act 2004*.

<sup>10</sup> Includes broadacre cropping (the cultivation of extensive parcels of land under dryland or irrigated management for cropping) and water storage dams (excluding those for domestic use and stock watering).

<sup>11</sup> This only occurs in the Channel Country, not other strategic environmental areas across Queensland.

	<ul style="list-style-type: none"> <li>• riparian function</li> <li>• wildlife corridor function.</li> </ul> <p>The framework sought to preserve these values by restricting where particular developments could be placed, and including specific conditions and codes to ensure appropriate management of impacts.</p>	<p>Project proposals must include an assessment of whether there would be a widespread or irreversible impact on these attributes.</p>
<p><b>4. Assessment process</b></p>	<p>Pre-2014 legislation was implemented through a regulatory framework that linked legislation, Code and river declarations to other regulating legislation. This incorporated a series of detailed assessment requirements to ensure natural values were preserved.</p> <p>Pre-2014 legislation requirements were assessed simultaneous to other processes, and conditions were attached to other approvals that granted permission to undertake works (for example an environmental authority under the <i>Environmental Protection Act 1994</i>).</p>	<p>A Regional Interests Development Approval (RIDA) is a standalone approval that is assessed against the Regional Planning Interests Regulation 2014 by the Department of State Development, Infrastructure, Local Government and Planning.</p> <p>The Department of Environment and Science, and Department of Resources provide assessment advice, dependent on the environmental attribute being assessed.</p> <p>A RIDA is required for all resource<sup>12</sup> and regulated activities<sup>13</sup>, where it is demonstrated there is no widespread or irreversible impact on environmental attributes. RIDAs are not necessarily obtained at the same time as other approvals and all statutory approvals are required prior to undertaking works.</p>
<p><b>5. Restrictions (resource activities)</b></p>	<p>The pre-2014 legislation declarations did not limit petroleum tenures, however there were restrictions on the type of infrastructure permitted within areas requiring a higher level of protection. Only 'authorised petroleum activities' were permitted in a high preservation area or special floodplain management area.</p> <p>Authorised petroleum activities<sup>14</sup> generally included small scale infrastructure such as some well sites, access tracks, power lines etc. Authorised petroleum activities excluded:</p>	<p>Open cut mining is an unacceptable use in the designated precinct and therefore not permitted.</p> <p>All petroleum activities are currently permitted in the designated precinct, subject to demonstrating the activity does not result in widespread or irreversible impact and obtaining a regional interest development approval.</p>

<sup>12</sup> An activity or authorised activity for a resource authority under the *Geothermal Energy Act 2010, Greenhouse Gas Storage Act 2009, Mineral Resources Act 1989, Petroleum Act 1923, Petroleum and Gas (Production and Safety) Act 2004*.

<sup>13</sup> Includes broadacre cropping (the cultivation of extensive parcels of land under dryland or irrigated management for cropping) and water storage dams (excluding those for domestic use and stock watering).

<sup>14</sup> Authorised activities included:

- Well sites where 1) the drilling rig mast is less than 20 metres in height – not exceeding 1 hectare disturbance and for multi-well sites not exceeding 1.5 hectares disturbance; or 2) the drilling rig mast is greater than 20 metres – not exceeding 1.5 hectares disturbance and for multi-well sites not exceeding 5 hectares disturbance. Well sites may include: well pads, water pumps, fuel storage and generators associated with well operations, sumps for storing drilling mud, flare pits, ponds used to contain and/or store stimulation fluid.
- Authorised activities also referred to other activities such as geophysical surveys, ecological geological surveys (including seismic petroleum activities), supporting access tracks and communication and power lines that are necessary for the undertaking of petroleum activities and that are located within well sites, well pads and pipeline right of ways without increasing the disturbance area of petroleum activities.

	<ul style="list-style-type: none"> <li>• processing and storage facilities, including dams<sup>15</sup></li> <li>• borrow pits</li> <li>• permanent campsites/workforce accommodation<sup>16</sup></li> <li>• waste disposal</li> <li>• other supporting infrastructure (e.g. sewage treatment plants<sup>17</sup>).</li> </ul> <p>Conditions were imposed to limit the size of authorised activities, and ensure impacts to natural values were minimised, for example:</p> <ul style="list-style-type: none"> <li>• accommodation facilities of more than 1 hectare, or for more than 60 people, were not permitted</li> <li>• accommodation facilities were not permitted within 200m of a watercourse, lake or spring</li> <li>• contaminants could not be directly or indirectly released to waters or land</li> <li>• barriers to flood flows were not permitted</li> <li>• progressive rehabilitation was required within beds and banks of a watercourse, wetland, lake or springs</li> <li>• waste must not be disposed of including but not limited to, operational by-products of any kind, including sewage, contaminant fluids, garbage.</li> </ul> <p>The pre-2014 legislation restricted where particular mineral mining tenements may be granted, namely the high preservation area, special floodplain management area and nominated waterways. For the mining tenements that were permitted in these areas<sup>18</sup>, activities were limited:</p> <ul style="list-style-type: none"> <li>• Only low impact activities were permitted to occur on land.</li> <li>• For watercourses, lakes and nominated waterways, activities were only</li> </ul>	
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<sup>15</sup> This included low hazard and regulated dams associated with environmentally relevant activities for which an environmental authority is required under the *Environmental Protection Act 1994*.

<sup>16</sup> Campsites/workforce accommodation facilities were defined as 'temporary' where in place for less than six months.

<sup>17</sup> The Environmental Protection Regulation 2019 states a sewage treatment plant is an environmentally relevant activity when (a) the site has a total daily design capacity of at least 21 equivalent persons; and (b) the pumping station has a total design capacity of more than 40KL in an hour if the operation of the pumping station is not an essential part of the operation of sewage treatment works to which paragraph (a) applies. The Regulation states this does not include carrying out works:

- other than operating a sewage pumping station mentioned above, involving only infrastructure for the collection of sewage, including, for example, pipes; or
- involving either of the following (a) operating or maintaining composting toilets, (b) treating or recycling greywater, or (c) operating no-release works.

<sup>18</sup> This included exploration permits, mineral development licences and mining leases.

	<p>permitted to be carried out using limited hand sampling techniques.</p> <ul style="list-style-type: none"> <li>• Activities were not permitted to occur within certain distances of watercourses, lakes, springs and nominated waterways (dependent on which area activities were located in).</li> <li>• Conditions were imposed for contaminated wastewater entering receiving waters of a watercourse, lake or spring, and impacts to natural values. There were also specific requirements for underground mining including assessment of hydrologic impacts.</li> </ul> <p>It should be noted that the pre-2014 legislation had not at the time of passing been designed to address oil/gas activities, and at the time of declarations being made in the LEB, unconventional oil and gas activities were largely hypothetical and horizon-framed activities.</p>	
<p><b>6. Restrictions (non-resource activities)</b></p>	<p>Prohibitions for non-resource activities varied based on the area affected by the proposal. Generally speaking, 13 activities were prohibited across one or more of the following areas:</p> <ul style="list-style-type: none"> <li>• high preservation area</li> <li>• special floodplain management area</li> <li>• floodplain management area</li> <li>• preservation area</li> <li>• nominated waterways.</li> </ul> <p>The prohibited activities in the declarations included:</p> <ul style="list-style-type: none"> <li>• agriculture</li> <li>• animal husbandry</li> <li>• aquaculture</li> <li>• environmentally relevant activities (other than mining or petroleum activities)</li> <li>• fossicking</li> <li>• in-stream works and activities (destroying native vegetation, excavating or placing fill in a watercourse, lake or spring)</li> <li>• native vegetation clearing</li> <li>• overland flow water (taking or interfering with water)</li> <li>• residential, commercial and industrial activities</li> <li>• riverine quarry material extraction</li> <li>• transport infrastructure works (diverting, constructing, or extracting quarry material from a watercourse)</li> <li>• watercourse, lake or spring (taking or interfering with water)</li> <li>• waterway barrier works.</li> </ul> <p>Permitted activities were subject to a Code.</p>	<p>Non-resource activities regulated by the <i>Regional Planning Interests Act 2014</i> are referred to as 'regulated activities'. The regulated activities that are unacceptable in the designated precinct include:</p> <ul style="list-style-type: none"> <li>• broadacre cropping (the cultivation of extensive parcels of land under dryland or irrigated management for cropping)</li> <li>• water storage dams (excluding those for domestic use and stock watering).</li> </ul>

	<p>This included detailed requirements to manage impacts to the natural values including for example:</p> <ul style="list-style-type: none"> <li>• management of pollutants (e.g. chemical spray, contaminated runoff, wastewater and tail water)</li> <li>• management of erosion and sedimentation in river beds and banks</li> <li>• management of impacts to riparian vegetation through minimised clearing</li> <li>• specific design measures to manage impacts to overland flow</li> <li>• management of impacts to fish passage, including minimum setbacks of watercourses.</li> </ul>	
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A driving principle of modern regional planning is the weighing up of land use constraints and opportunities, in conjunction with public consultation, to enable sustainable planning outcomes to be prioritised. Early identification of key issues assists in these being incorporated in state and local government planning processes which aim to provide certainty of outcomes rather than site by site basis. While there is no LEB-specific planning instrument, the region incorporates three such regional plans: the South West, Central West and North West Regional Plans.<sup>19</sup>

The Cooper-Eromanga basin comprises the most developed conventional oil and gas province in Australia, and conventional oil and gas operations have been operating in parts of the region for decades. Some 1,700 wells have been drilled to date in the Queensland LEB. While Queensland manages a comprehensive regulatory framework to guide assessment of such activities in the LEB, in recent years there has been increased industry interest and investment into the potential to develop unconventional (shale, tight and coal seam) gas and oil resources within the region. A consideration of the adequacy of the protections for the LEB must consider the effectiveness of the existing regulatory framework for both current and future activities.

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<sup>19</sup> On 27 July 2022 the Deputy Premier and Minister for State Development, Infrastructure, Local Government and Planning and Minister Assisting the Premier Olympics Infrastructure announced a commitment to undertake a review of these regional plans over the next three years.

Regulators and delegated approval decision makers are limited to determining assessment outcomes based on existing legislative boundaries and processes.

Notwithstanding the Federal government's Cooper Basin Geological and Bioregional Assessment Program which assessed possible development<sup>20</sup>, it has been argued (Redleaf 2018; Côte 2022) that the current regulatory framework may not sufficiently protect the ecological integrity of the LEB river systems, spatially, holistically (landscape), or cumulatively, especially as relates to the impacts of shale and tight gas extraction in the Cooper Basin.

Social impact assessment under the *Strong and Sustainable Resource Communities Act 2017* (SSRC Act) is mandatory for resource projects undergoing environmental impact statements under the *Environmental Protection Act 1994* (EP Act) or *State Development Public Works Organisation Act 1971* (SDPWO Act). Environmental management decisions made under the EP Act address performance outcomes relevant to the activities, types and amounts of authorised contaminants and identified environmental values by seeking to determine measures of impacts or mitigation strategies on environments.

The definitions of sensitive environments are limited (scheduled), and do not include many (critical) features of the Queensland LEB. For example, there is no reference to identifying cumulative consequence to the largest (terminal) internal drainage system in Australia. Nor is there reference to prior delegate decisions of relevance to the *Regional Planning Interest Act 2014* for Strategic Environmental Area designations.

The LEB hydrological environments (Schedule 8 of the EP Act defines existing flow regime) are highly variable, unpredictable, and not fully understood. These factors provide challenges to authorising Environmental Authorities (EA) that require acceptable thresholds and measurable conditions be identified. In the absence of certainty, conditions can be imposed that allow flexibility on outcomes or non-specific terms without clear and measurable thresholds.

The EP Act would require amendments to integrate the full risk of sensitive receiving environments that could be impacted by environmental harm within the LEB. Large scale impacts on floodplains are even more complex, have many environmental and physical variables (such as, site relief, flood type, vegetation, geology, soils, and subsurface hydrology), and indicate that such an approach may not be suitable. "Relative amounts of river flow through various channels in an anabranching system can readily be altered by small impoundments, raised roads or other interferences with the geomorphological structure of the channels. Such impacts should be carefully considered because hydrological modifications that result in increased frequency and extent of waterhole desiccation could have deleterious ecological impacts" (Hamilton, 2005). A remaining question may be whether seeking to apply mitigating conditions for the construction of infrastructure in complex floodplains and rivers is inconsistent with a precautionary principle.

### **LEB Perched Sand Aquifers**

The Queensland LEB floodplains are mostly hydrologically disconnected from the Great Artesian Basin. However, the extensive muddy floodplains of the LEB are characterised by buried sandy palaeochannels that are stratigraphically connected to source-bordering dunes that emerge as distinctive sandy islands through the floodplain surface (Maroulis et al, 2006). These create perched sand aquifers that are thought to be kept stable by regular 'low flow' events on the floodplain that refill these. While further research is required it is thought that these are critical in keeping LEB waterholes from drying up.

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<sup>20</sup> The studies, which included input from CSIRO and Geoscience Australia, considered a wide range of potential impacts, but fundamentally relied on assumptions about the suitability of current regulatory approaches to manage future risks.

Environmental authorities must “have regard to” any state government plans, standards, agreements, or requirements about environmental protection, but it is not mandated that the department make a decision that is consistent with those plans. Prior to an EA decision, the delegated decision-maker can consider matters such as the current state of technical knowledge for the activity. If an adverse impact is known, they can determine the feasibility of relocation of the activity. However, the EP Act is not a land use planning mechanism. The EP Act requires the decision-maker to *consider* the ‘environmental values’ under Environmental Protection Policies (EPP), but the outcomes and objectives must be identified as an ‘environmental attribute’ in the EPP.

In determining thresholds for amendment applications (Section 223 EP Act), relevant issues include level of environmental harm, increase of scale or intensity of the activity, new resource tenures, surface area increase or pipeline (no more than 10 per cent), or 150km of new pipeline. Public notifications may be required if deemed to be a major amendment. However, the legislative process to determine a cumulative increase in the scale of amendments is not clear (i.e. from original application), and applicants can modify amendment applications that result in no public scrutiny being required.



*Conventional oil & gas exploration site, near Bellara, Andrew Picone, © The Pew Charitable Trusts*

From a review of recent RIDA assessments, it appears there is limited guidance provided in the assessment of Regional Planning Interest Act ‘Channel Country Strategic Environmental Areas’ or the significance of the associated environmental attributes, referenced for two assessment processes. The following table identifies limitations to this existing regulatory framework that could be improved to better manage current and emerging industries:

## Regulatory framework analysis of potential threats and impacts from existing and future development activities

Relevant Act	Overview of limitations of management tools
Water Act	<p><b>W1: Monitoring of groundwater</b>                      Water licencing processes provide for assessment of hydrological impacts for individual projects.                      Although CSG wells in the Cooper/Eromanga basins are currently limited in number and extent, increased monitoring of groundwater quality and quantity may be beneficial to provide for better informed decision making and management of cumulative impacts into the future.                      Cumulative Management Plans incorporate allocated water uses with authorised activities and monitor thresholds to Great Artesian Basin water supply. Options to incorporate improvements at environmental authority (conditions) or post approval stage.</p>
Environmental Protection Act	<p><b>EP1: Water quality objectives/environmental values</b>                      There are no established environmental values (EVs) or water quality objectives (WQOs) for LEB under the Environmental Protection (Water and Wetland Biodiversity) Policy 2019 to inform EA conditions. Currently, only state-wide values/objectives are referred to.                      There is a risk that the existing objectives/values considered in the EA process are unsuitable for the unique water-related values of the LEB.                      Improvements on clarity of Environmental attributes provide the scope for values.                      Environmental Protection Act would require amendments to refer to such values.</p> <p><b>EP2: Water management</b>                      CSG water management policy provides guidance to assist CSG operations in determining management solution(s) for produced water, but there is no equivalent policy for Shale/Tight gas.                      Current regulation powers allow for this policy development</p>
Regional Planning Interests Act	<p><b>RPI1: Regulation of storage structures</b>                      Water storage dams are currently an unacceptable use, but other liquid storage facilities associated with resource activities (e.g. above ground holding tanks) are permitted, subject to obtaining a RIDA.                      There is a risk that if a flood occurred contaminants could be released from these liquid storage facilities to sensitive environmental areas. Given there are watercourses and floodplains located outside of the SEA/DP, this impact is not always considered under the current RPI framework.                      Improvements to protect sensitive environmental areas by expanding the SEA area.</p> <p><b>RPI2: Extent of SEA/DP</b>                      The mapped extent of the SEA/DP doesn't include all the important watercourses and floodplains particularly at the top of the catchment which means open cut mining, broadacre cropping and water storage dams could occur.                      Improvements to capture additional SEA areas spatially would address this threat.</p> <p><b>RPI3: Land use suitability – P&amp;G</b>                      Although P&amp;G activities are assessed under the EP Act, no planning mechanism exists for precluding high risk activities from occurring in highly sensitive areas.                      Restrictions on authorised activities located in sensitive areas would address this risk.</p> <p><b>RPI4: Environmental attributes</b>                      RIDA assessment doesn't consider the full range of key processes and functions that are considered fundamental to the preservation of the natural system.                      There is a risk that activities impact on environmental attributes that cannot be considered in the RIDA, including geomorphic processes, riparian functions and wildlife corridors. Improvements on Environmental attributes definitions provide the scope for values relevant to the Lake Eyre Basin.</p> <p><b>RPI5: Land use suitability - infrastructure</b>                      All environmental attributes are vulnerable to the impacts of linear and non-linear infrastructure, particularly beneficial flooding.                      Infrastructure (other than water storage dams) are permitted in the DP, subject to obtaining a RIDA. An infrastructure code for the LEB floodplains could be prepared and considered under the RIDA process.                      Current regulation powers allow for codes to be developed.</p>



	<p><b>RPI6: Extent of SEA/DP</b></p> <p>The mapped extent of the designated precinct (where unacceptable uses apply) does not include all areas with significant hydrological connections (above and below ground) or important spring complexes.</p> <p>Improvements to protect sensitive environmental areas can be achieved by expanding the SEA area.</p>
Waste Reduction and Recycling Act	<p><b>WRR1: End of waste code</b></p> <p>There is an end of waste code for CSG drilling muds, which states when a waste becomes a resource and any relevant requirements and/or conditions for its use. There is no equivalent code available for tight/shale.</p> <p>Current regulation powers allow for codes to be developed.</p>
Fisheries Act 1994	<p><b>FA1: Accepted Development requirements for operational work that is constructing or raising waterway barrier works</b></p> <p><i>Fisheries Act 2014</i> defines waterways to regulate the sustainable connectivity to maintain fish passages and are identified as Matters of State Environmental Significance (MSES). The <i>Planning Act 2016</i> regulates development triggers to construct barrier works with self-assessable option if complying with the Accepted Development Requirements or development assessment approvals under the State Development Assessment Codes 18 – Constructing or raising water barrier works in fish habitat. Environmental offsets may be required if determined that significant residual impacts are authorised.</p> <p>At present, Oil, Gas and petroleum activities are not triggered (outside of minister call in provisions).</p> <p>(Source: <a href="https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/1564508/QWWBW-Guide-to-determining-waterways.pdf">https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/1564508/QWWBW-Guide-to-determining-waterways.pdf</a>)</p> <p><a href="#">adr-operational-waterway-barrier-works.pdf (daf.qld.gov.au)</a></p> <p><a href="#">sdap-v3.0-state-code-18-constructing-or-raising-waterway-barrier-works-in-fish-habitats.pdf (statedevelopment.qld.gov.au)</a></p>

Emergent industrial practices in the resources sector, and more effective and intensive resource extraction technologies, paint a picture of a rapidly evolving industry. This presents and highlights new complexities and challenges in a regulatory environment, compounded by the unpredictability of climate change on fragile ecological systems such as floodplains and rivers. Effective assessment-based regulation capable of adequately protecting First Nations cultural values and environmental assets in complex systems such as these becomes increasingly challenging. Balancing sustainable economic activity and job creation with protecting precious cultural and environmental values and resources, many of which are already under stress as a result of climate change, is imperative.

It should be noted that EAs do not currently deliberately distinguish approved environmental harm between exploration/extraction of conventional or unconventional oil or gas. However, impacts from unconventional oil or gas extraction will generally be more significant in terms of use of chemicals, significant additional water use<sup>21</sup>, storage of waste materials, and the overall industrial footprint of the operating site.

For example, the CSIRO has previously investigated the scientific knowledge of shale gas and shale oil (Huddleston-Holmes, 2018b), compiling national and international findings, particularly from North America, where shale gas and oil developments are well-established industries. The cumulative impacts associated with the scale of shale gas and oil resources were identified as a greater risk than conventional oil or gas resources. Whilst target resources are similar, numerous wells are typically required to effectively exhaust shale resources for example, increasing the overall scale and intensity of

<sup>21</sup> It has been estimated that low intensity hydraulic fracturing for conventional (natural) gas may use approximately 1ML of water, whereas high intensity hydraulic fracturing for unconventional gas can typically require around 20ML of water per wellhead, with multiple wellheads on each site.

development required for a project to be economically viable. Extraction methods per well can be uneconomic, regardless of quantities of gas presence and the best way to improve its productivity per well is to increase the contact area (between the well and resource). Extraction is also reliant on underground pressure once a well is opened, and as permeability is typically so low, pressure equilibrium can take years (based on single wells), and thus requires high volumes of water to maintain this pressure (Saeid-Mokhatab, 2019).

In 2018, DES commissioned an independent scientific expert panel, convened by Redleaf Environmental, to provide advice on current risks to the internally significant values of the LEB river system in Queensland. The panel undertook a risk assessment process and determined that there were 'medium' to 'high' risks associated with conventional and unconventional petroleum and gas under the current regulatory framework and 'medium' to 'very high' risks associated with open-cut mining in permitted areas (Fielder et al., 2019). The expert panel recommended that petroleum and gas activities be excluded from river and floodplain areas and that open-cut mining be prohibited within the Queensland LEB.

A separate report was commissioned by the former Department of Natural Resources Mines and Energy, and produced by the CSIRO which conducted an 'Assessment of scientific knowledge of shale case and shale oil potential impacts'. It was not Queensland LEB-specific but considered the potential environmental impacts of shale gas and oil extraction activities, and summarised aspects of Queensland's regulatory framework which related to potential impacts.<sup>22</sup>

Several prominent river scientists have highlighted the potential for devastating impacts caused by mining and petroleum infrastructure, including all-weather roads and levee banks, cutting off or diverting flows across Channel Country floodplains and compromising aquatic ecosystems, drought refugia (waterholes) and grazing pasture (Arthington & Balcombe, 2011; Sheldon et al., 2010; Dickman et al., 2017; Kingsford, 2017). The Australian Council of Learned Academies has warned that a fully developed shale gas industry in an arid area has the potential to become a major user of groundwater (Crothers, 2016).

**Risks of environmental harm**

- A leak at a Zeus oil well in far southwestern Queensland released 250,000 litres of crude oil into the environment, understood to be one of Queensland's largest mainland oil spills.
- Zeus infrastructure, including wellhead, was located very close to the Cooper Creek floodplain, and within a kilometre of nearby wetlands, but the incident occurred during a dry period.
- Crude oil leaked without control for almost a week, only stopped by a specialist team flown in from the United States to shut the wellhead off (the operator had no local expertise).
- Had this spill occurred on the floodplain or during a wet period, it could have had devastating impacts on downstream water quality, internationally recognised wetland ecologies and waterbird populations.

A range of key stakeholders consulted prior to this RIS have agreed that a key consideration in the context of regulatory action relates to oil and gas extraction on the floodplains, and in particular what is proposed or potentially planned for the future in terms of unconventional gas and oil in these areas.

The LEB SAG agreed unanimously that "the rivers and floodplains of the LEB are of

special significance, and that they deserve proper protection". Proper protection in this case needs to consider current activities but also anticipate future ones and how they may be quite distinct, with higher inherent risks.

Management of existing oil and gas considerations is therefore an important starting point. The current, risk-based regulatory framework consists of several resources-focused pieces of legislation which deal with the land tenure side and the common/general provisions of the processes, plus environmental protection and regional planning legislation which deal with assessments, approvals and regulatory

<sup>22</sup> Both the Scientific Expert Panel Report and the DNRME-commissioned reports are available online: <https://environment.des.qld.gov.au/management/policy-regulation/changes/protection-lake-eyre-basin-streams-watercourses>

conditions for the activities. As with any risk-based regulatory framework, risks and threats are identified and conditioned for but nevertheless activities are not ultimately 'risk free' and accidents do occur.

**LEB water quality conditions and risks from changes in the flow regime**

Water quality of LEB river systems are considered at near-natural state, with limited releases of pollutants, near natural turbidity and the continued presence of natural sediment and nutrient filters (floodplains and wetlands). LEB water quality is unique, characterised by turbid (milky streams) and variable levels of salinity (influenced by flow and groundwater interactions). Ground and surface water exchange is not well understood, for example it is suspected that the Cooper Floodplain is characterised by underground sandy paleochannels, manifesting as distinct waterholes. These conditions make baseline threshold conditions challenging (State of Basin reports - Lake Eyre Basin Ministerial Forum 2017, Lake Eyre Basin: State of the Basin Condition Assessment Report 2016 Summary, Department of Agriculture and Water Resources, Canberra. CC BY 3.0. Link: [https://web.archive.org/awa/20190509001215mp\\_/http://www.lakeeyrebasin.gov.au/Documents/state-basin-condition-assessment-2016-summary.docx](https://web.archive.org/awa/20190509001215mp_/http://www.lakeeyrebasin.gov.au/Documents/state-basin-condition-assessment-2016-summary.docx) ).

The LEB's unique ecosystems and waterhole refugia is characterised by a boom-bust regime (variable water flow, rainfall and quality - fresh or saline) that sustains ephemeral river systems and water dependent ecosystems. These ecosystems and waterholes are susceptible to changes in regimes, waterhole hydrology, hydrological persistence, depths when flows cease, and groundwater connectivity. Highly productive waterhole littoral zones, critical as food sources for aquatic fish, crustaceans and waterbirds are susceptible to modified flow releases.

Shale/tight unconventional gas production requires large amounts of water to be used as part of the production processes (Huddleston-Holmes, 2018a, CSIRO Summary Report of the assessment of scientific knowledge of shale gas and shale oil potential impacts)

Greater use of water for petroleum and gas production in the LEB would create risks for the LEB's sensitive flow regime. Maintaining low levels of water extraction is a priority identified in the 2016 Condition Assessment and compared to the current unmodified flow regime, waterhole use/pumping will reduce Cooper Creek waterholes persistence (Bunn et al, 2006. Flow variability in dryland river).

However, the current planning and regulatory frameworks may not be strong enough to protect the river systems of the Queensland LEB from possible future unconventional resource activities and their potential impacts. Departments with administrative responsibility for key statutory instruments associated with the region contributed to an internal review conducted by government in 2019 and validated in 2021. The threats and potential impacts posed by particular development activities were evaluated, and it was found that there was a need for additional protections for environmental attributes in the LEB.

Particular activities and associated infrastructure (such as unconventional oil and gas extraction utilising intensive hydraulic fracturing with chemicals, significantly increased water usage and management, larger scale infrastructure) within ecologically sensitive areas (such as rivers, streams, floodplains and other watercourses) are likely to represent a new order of risks and potential threats to water quality in the river systems and to cultural values in the landscape. Technology improvements over the last decade within the industry, combined with significant albeit potentially temporary price spikes for conventional oil/gas can promote interest in unconventional resources, making the future risks of such activities on the floodplains more tangible.

While it is recognised that some low-level, less intensive hydraulic fracturing (often referred to as "stimulation") sometimes occurs already in the Queensland LEB to access natural gas resources that are more readily accessible, this is not the same methodology or intensity required to extract shale, tight, or deep coal-based resources that has been used in other places. The intensive hydraulic fracturing that is involved in getting these resources out requires a greater amount of water extraction and usage and the storage and disposal of flowback (water and hydraulic fracturing fluids). Linear infrastructure related to those activities can also impede, alter or reduce the flow and drainage of water.

In summary, many stakeholders are of the view that the current regulatory framework is not sufficient to manage risks associated with future unconventional oil and gas industrial practices, particularly in the context of these taking place on highly ecologically-sensitive floodplains. The increased usage of water and the impacts on water quality by unconventional activities could have a catastrophic impact on

existing agricultural production, noting this is a significant economic contributor to the region. Similarly, the impact on First Nations Cultural Heritage from the materialisation of anticipated risks would cause irreparable harm and immense hurt to First Nations peoples interests in the region.

There are several possible responses and solutions (see options canvassed later) available to government to address the concerns raised, as well as other fundamental considerations regarding the possible economic, environmental, social and cultural aspirations of First Nations peoples.

#### **Lady Annie Mine and cumulative impacts**

- After heavy rainfall in 2009, the Lady Annie copper mine dam was breached, releasing 447 megalitres of uncontrolled, highly toxic tailings into the upper reaches of the Georgina River catchment.
- The 2009 spill affected 47 kms of Saga and Inca Creeks, killing fish and other freshwater species, and impacting livestock. A further three contamination events have occurred since at the site.
- Open cut mining activities themselves are prohibited within the Designated Precincts of the Queensland LEB.
- The increased focus on new economy resources including industrial metals and rare earth minerals in the North-western parts of the Queensland LEB could bring mining activities closer to ecologically sensitive river systems, with increased pollution risks.
- Climate change modelling predicts higher frequencies of intense rainfall events, making incidents like the Lady Annie dam breach more likely without greater protections and better monitoring.



*Lady Annie Copper Mine tailings breach, ©The State of Queensland*

## 5. Economic activity in the Queensland LEB region

This section provides a summary of the main industries and economic activities that already operate in the Queensland LEB, as background to consideration of existing and future opportunities and challenges, and as context to consideration of the problem statements, risks identified, and options for reform canvassed through this document. In some cases, reliable financial data are limited, and the Queensland government would welcome any additional information that might be available within industries or the community.

### 5.1 Grazing

Beef cattle farming is the most widespread industry with a relatively even distribution of jobs across all local government areas. It generated in excess of \$640 million in the 2018-2019 financial year, accounting for five per cent of Queensland's total agricultural output and comprising just over 10 per cent of Queensland's livestock. According to ABS data from 2016, 1,643 people were employed by the beef and sheep cattle farming industry in the twelve local government areas of the Queensland LEB region (Australian Bureau of Statistics, 2016).

Grazing of both sheep and cattle was established in the Queensland LEB in the mid-1870s. Most of the towns present today were founded as trading centres to provide services to support the agricultural families and grazing operations of the area. Intergenerational farming is common, however the current average age of landholders has increased, with reports that young people are finding it increasingly difficult to establish themselves on the land.

The rivers and floodplains of the Queensland LEB have proven successful resources for livestock production, with about 88 per cent of Queensland's basin area used for grazing. The region supports 659 agriculture businesses, running over 1.1 million cattle and more than 485,000 sheep. The Queensland government supports regional communities to target sheep and goat production, with recent Regional Agriculture Development Grants. Since 2015, budget allocations of \$26.14 million have been provided towards sheep cluster fencing, and initiatives to address invasive plants and animal control (Queensland Feral Pest Initiative), complementing \$14 million from the Federal Government. The Queensland LEB is the centre of Queensland's (and Australia's) organic beef production. The market price for organic beef is generally higher than other beef. With a lack of reliable rainfall, high evaporation rates and cautious regulation and management of water resources in the region, there is no largescale cropping in the Queensland LEB, largely due to the nature of the soils and ecology of the region, but there are some restrictions under RPI Act about such activities within the DPs.



*Cattle, upper Georgina, R. Jaensch, © Wetlands International*

There are several economic considerations for the grazing industry, with the key issues being:

- impacts on beneficial flooding and increased erosion
- water quality and dewatering
- organic certification
- reduction in climate resilience.

It should be noted that all land managers have a responsibility to ensure biosecurity risks (as described under the *Biosecurity Act 2014*) from animal or plant pests, diseases and contaminants are minimised, and that new activities do not accelerate these risks.

### 5.1.1 Beneficial flooding and erosion

The LEB floodplains are considered some of the most productive grazing lands in the basin. Floodplain pastures are reliant on flood events, rather than rainfall, to initiate pasture growth. This is due to the very high clay content of the cracking soils of the floodplains (Qld Government & MLA, 2007). Loss of fodder due to impacts from the obstruction or afflux from petroleum infrastructure (roads, pipelines pads and wastewater dams) on floodplains presents a high risk of high impact to the industry.

Disruptions to flow from infrastructure on the floodplains impacts fodder presence and growth, particularly for the frequent 'gutter' flows (5–15 per cent coverage of floodplain) to 'handy' flows (15–60 per cent of the floodplain). Impediments to flow or concentration of flow can lead to a change of equilibrium, altering or removing stock fodder abundance and priority grazing species on and off floodplains.

On floodplains, the results are often artificially drying, waterlogging, or scouring (removing vegetation and soil). Off the floodplain, infrastructure can concentrate the flow, leading to erosion gullies beyond the floodplain, reducing water retention and depleting available soil moisture. The extent of grasslands can be reduced and woody thickening can occur. In both cases this alters the fodder assemblage (available species) and abundance (amount of fodder), reducing the carrying capacity of the properties located along the floodplains and rivers for grazing animals (Government of SA DEWNR, 2015).

### 5.1.2 Water quality and dewatering

Grazing relies largely on natural flow regimes and waterholes for stock watering. Mining activities can mostly rely on the runoff they collect. If a mine intersects the groundwater table, impacts will be assessed as part of the approval process. Water requirements for coal seam gas, shale gas and oil production are described in the SEP Review report (Côte, 2022).

There have been consistent concerns raised from the agricultural industry about the availability and quality of this water especially from the shallow perched sub-surface alluvial systems often relied upon for stock and domestic use<sup>23</sup>. Industrial chemicals are required in gas operations for activities such as drilling, cementing, well construction and completion, well clean-up, hydraulic fracturing and waste treatment. The composition and concentration of chemicals will depend on site-specific conditions such as the geology and mineralogy of formations, environmental conditions such as temperature and pressure, and requirements to maintain well integrity and production. The managed use or accidental release of chemicals can have negative impacts on local and regional water quality if not adequately controlled or managed (Côte, 2022).

Licences for pastoral water use is subject to the associated water plans under the *Water Act 2000*. These include Georgina, Cooper and Diamantina Water Plans. Within thresholds, the petroleum industry is licenced (with mitigating measures to decrease risk) to release some waste products onto the floodplains as part of the standard operations (e.g. drill mud, accidental stimulation/ hydraulic fracturing fluids leakage, waste oil etc). These shallow aquifers are an important source of water and the cumulative impacts of oil and gas production may have a significant impact on water quality of stock and grazier domestic water.

As part of the Cooper Water Plan, surface water can be extracted under licence from river channels, the floodplain and permanent waterholes. Under realistic hydrological modelling, the water requirements for oil and gas production represent about two per cent of annual flows and the model showed extraction of that magnitude would not impact flows or alter flooding regimes in Cooper Creek. However,

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<sup>23</sup> AgForce, 2022, Stakeholder Advisory Group meetings

investigations on potential impacts on agricultural productivity have not occurred. Further, current state regulation under the *Water Act 2000* is unlikely to be a sufficient control as Water Plans do not necessarily capture all localised impacts on complex networks of environmental values (Côte, 2022).

### 5.1.3 Organic sector

There is significant concern regarding the cumulative impacts of petroleum industry licensed release of wastewater onto the floodplains from drilling and stimulation activities<sup>24</sup>. Drill mud, and accidental stimulation fluid and petroleum chemical leakages are licensed (subject to mitigating conditions, within EAs) to be released onto the floodplains. Downstream organic certified graziers could have their certification revoked if certain chemicals are present in water used for stock. According to the Australian Certified Organic Standards “environmental contamination may be such as to preclude operators and operations from certification, where it cannot be demonstrably shown that contamination threats are able to be managed in a way as to avoid

contamination of certified products and the farming system. Rigorous and ongoing monitoring and residue testing may be required where such concerns exist” (Australian Certified Organic, 2019).

#### Chemicals in wastewater during oil and gas production:

Natural rock formations contain elements and compounds (geogenic chemicals) that could be mobilised into flowback and produced waters during drilling and hydraulic fracturing activities. Tests identified potential elements that could be mobilised into solutions by hydraulic fracturing fluids - aluminium, arsenic, barium, cadmium, cobalt, chromium, copper, iron, lead, lithium, nickel and zinc. Priority organic chemicals were also detected in extracts of powdered rock samples, including phenols, polycyclic aromatic hydrocarbons (PAHs) and total recoverable hydrocarbons (TRHs). EA conditions consider chemical limits of oversaturated solids prior to mixing (Part A), drilling fluids or post soil/by products (Part B), or Part C if hydrocarbon sheen is visible. (Arsenic, Selenium, Boron, Cadmium, Chromium, Copper, Lead, TPH (including Benzene)). EA conditions do not address some chemicals.

(Kirby JK, et al 2020).

### 5.1.4 Climate resilience of the grazing industry

The LEB system is highly influenced by the El Niño Southern Oscillation phenomena, with summer monsoons in the headwaters triggering flooding during intense events. Maximum and minimum temperatures are projected to continue to rise increasing evaporation and evapotranspiration. High climate variability is likely to remain the major factor influencing rainfall. Winter and spring rainfall is expected to decline, with the intensity of heavy rainfall events likely to increase (Queensland Government, 2019).

The reduction in frequency of the low to medium flow events in the LEB resulting from this climate scenario could reduce the recharge amount and frequency of the alluvial subsurface water which both top up water holes for stock water and naturally irrigate the floodplain fodder species.

Increased diversions for mining infrastructure on floodplains will likely compound these issues, impeding the natural low flow events and further reducing the frequency and amount of water available for recharge (Hamilton et al, 2005). Equally, an increase in intensity in heavy rainfall events will likely result in large, high-energy flows resulting in more on and off floodplain erosion and greater risk of accidental discharges of contaminants into the terminal LEB system.

## 5.2 Oil and gas

The latest Australian Energy Statistics (2022) data show that in 2020–21, around 83 per cent of total domestic gas production was for export and LNG plant own use. Domestic manufacturing accounted for

<sup>24</sup> AgForce and Qld Farmers Federation, 2022. LEB Stakeholder Advisory Group

7.1 per cent of use, with a further 2.9 per cent domestic use being ‘residential’.

The Cooper-Eromanga geological basins (in concert) are the most developed mainland oil and gas provinces in Australia. Oil and gas have been produced in the Queensland LEB region since the mid-1980s from the underlying Cooper and Eromanga geological basins. As of the end of 2019, the Cooper-Eromanga basin produced an estimated 8,522 PJ of gas, 396 million barrels of oil (MMbbl) and 121 MMbbl of condensate (refer to Tables 2 to 5 for sense of relative scale with other regions) ([GeoScience Aust., 2021](#)).

According to Business Queensland, the petroleum industry in Queensland is worth more than \$1 billion in terms of production value, and exceeded \$750 million in terms of exploration in 2014–2015 alone. The Queensland coal seam gas (CSG) industry is a rapidly growing one, and has supported more than \$70 billion worth of investment across the State since 2015 (largely in Central Queensland, rather than in the Queensland LEB region) ([Business Qld, 2022a](#)). In the 2021–22 financial year, Queensland’s oil and gas sector generated \$1.185 billion in petroleum royalties<sup>25</sup>.

Conventional gas extracted from the Cooper Eromanga region is relatively small scale (internationally, nationally and even when compared to that of other regions in Queensland): 9 out of every 10 petajoules (PJ) of all gas produced in Queensland comes from the Surat and Bowen basins ([Business Qld, 2022b](#)). Gas production from the Cooper-Eromanga basin supplies the Eastern Australian Gas Market<sup>26</sup>, for export and domestic use. Much of the Queensland portion of the Cooper basin is subject to exploration and production leases, many of which overlap the Cooper Creek DP.

Queensland’s conventional gas chiefly comes from the Ballera and Roma oil fields (in the Cooper and Surat basins, respectively)<sup>27</sup>. In terms of how this compares to Eastern Australian gas production, the Australian Energy Regulator indicates that gas coming from the *entire* Cooper basin (which includes supplies from South Australia as well as Queensland) forms around five per cent of the total east coast supply (Australian Energy Regulator, 2021(a)) and fulfils a role as a ‘swing’ producer in dealing with ‘seasonal or short term supply imbalances’ in the domestic gas market. In 2020, the Queensland Surat-Bowen basin supplied more than three quarters (76 per cent) of all gas produced in Eastern Australia for that year (Australian Energy Regulator, 2021(a)).

On average, around 5,290 people were employed in oil and gas extraction across the whole of Queensland over the year (Australian Bureau of Statistics, 2022). No formal published data were available for the exact number of people employed in the oil and gas activities of the Queensland LEB region specifically (where data has been available, it has been collected on a per-local-government area basis, which does not neatly conform to the hydrological boundaries of the LEB itself).

As mentioned, the Queensland LEB region includes or straddles twelve local government areas (Barcaldine, Barcoo, Blackall-Tambo, Boulia, Bulloo, Diamantina, Flinders, Longreach, McKinlay, Mount Isa, Quilpie and Winton). Across these twelve areas, 2016 ABS data on key industries of employment suggests estimates of between ten and twenty five people (less than 1 per cent of the local working population), who lived in the Queensland LEB region, were employed in the Oil and Gas Extraction industries ([ABS, 2016](#)).

It is understood that there are a number of ‘fly-in-fly-out workers’ who are employed by the oil and gas industry and work in the Queensland LEB region, but reside elsewhere. Verified data are not readily available to indicate the scale of such employment, but one estimate based on ABS data suggests it may

<sup>25</sup> Table 4.6, pg. 103, Budget Paper No. 2 – [Budget Strategy and Outlook, 2022-23 Queensland Budget](#), available at (accessed 02/09/2022)

<sup>26</sup> The Eastern Australian Gas Market consists of an interconnected gas pipeline network that supplies gas to Queensland, New South Wales, the Australian Capital Territory, Victoria, Tasmania and South Australia. It is also linked to the Northern Territory via the Northern Gas Pipeline and to overseas customers via three LNG export plants on Curtis Island near Gladstone.

<sup>27</sup> [Petroleum and gas production statistics](#) (December 2020), and [Queensland's gas reserves](#) Through a process known as ‘perturbation’, ABS incorporates random adjustments to protect the identities of respondents. This has little impact on statistical patterns or contexts, but can create apparent inconsistencies in data when presenting very low values such as those mentioned above.



be in the order of 89 individuals.

Overall, it is impossible to accurately and credibly quantify the *direct* economic contributions of the oil and gas industry specifically to the Queensland LEB region and the local communities in it.

In some cases, the operations of the oil and gas industry in the Queensland LEB also provide some ancillary economic benefit to local landholders through income derived from sub-lease compensation, sub-contracting opportunities, maintenance of dual-purpose roads, fencing and water infrastructure, and in some circumstances provision of water storage dams (ex-wastewater storage ponds). Ancillary income also comes to local governments via additional rates from oil/gas leases.

Petroleum resources are defined and reported using the international Society of Petroleum Engineers' Petroleum Resources Management System<sup>28</sup>, which recognises that “*all reserve estimates involve some degree of uncertainty ... [and are generally derived] by highly-skilled individuals who use their experience and professional judgement in the calculation of those volumes.*”<sup>29</sup> Most recent ‘best estimate’ assessments by Geoscience Australia of the prospective lifetime productivity (estimated at 42 years) of the Cooper-Eromanga Basin are as per Tables 1 to 6 below<sup>30</sup>.

As a dollar value, Cooper-Eromanga has potential to be worth around \$8.4B of conventional, and a theoretical \$15.8B of unconventional, gas (assuming a long-term average reference price of \$7/ gigajoule (GJ), as proposed by Queensland Treasury Corporation). These figures are based on volumetric calculations of potential commodity availability, and have not been tested commercially in the market.

**Table 1 – Australia's remaining commercially (currently) recoverable conventional gas reserves and potentially recoverable resources<sup>31</sup>.**

Where	Petajoules (PJ) – Best Estimate		Trillion Cubic Feet (Tcf) – Best Estimate	
	Currently commercially recoverable Reserves (2P)	Potentially recoverable Resources (2C)	Currently commercially recoverable Reserves (2P)	Potentially recoverable Resources (2C)
Cooper / Eromanga Basin Conventional	1,058	1,598	0.94	1.42
TOTAL Conventional for Australia	72,082	120,170	64.09	106.85
Proportion of Cooper-Eromanga compared to TOTAL for Australia	1%	1%	1%	1%

**Source: Australia's Energy Commodity Resources: 2018 and 2019 Data Tables, Gas | Australia's Energy Commodity Resources 2021**

<sup>28</sup> SPE Petroleum Resources Management System Guide for Non-Technical Users, (accessed 02/09/2022)

<sup>29</sup> SPE Petroleum Resources Management System Guide for Non-Technical Users, (accessed 02/09/2022)

<sup>30</sup> 2P reserves and 2C resources are differentiated based on certainty of amounts and recoverability. 2P reserves are commercially recoverable amounts, which are known. 2C resources are potentially recoverable, in amounts which are known, but recoverability is contingent on commercial, technical or other factors. Further information at: <https://www.ga.gov.au/digital-publication/aecr2021/gas#summary-section>

<sup>31</sup> Australia's Energy Commodity Resources: 2018 and 2019 Data Tables, Gas | Australia's Energy Commodity Resources 2021, (accessed 02/09/2022). The Department of Environment and Science is relying on formally published and publicly available data for such analyses. As new published data become available, they will be included in further analysis and advice to government.

### Conventional vs unconventional gas and oil

The terms 'conventional' and 'unconventional' refer to the ways in which the gas or oil commodity is held below ground, and how it is extracted (for production/export/use).

According to Lech (2019): “Conventional petroleum accumulations ... were the first to be exploited historically as they are relatively easy to find, and have produced the majority of oil and gas worldwide to date ... [They are]... typically bounded by ... water and ... impermeable rock. The petroleum was not formed in situ; but migrated [there] from [another] source.”

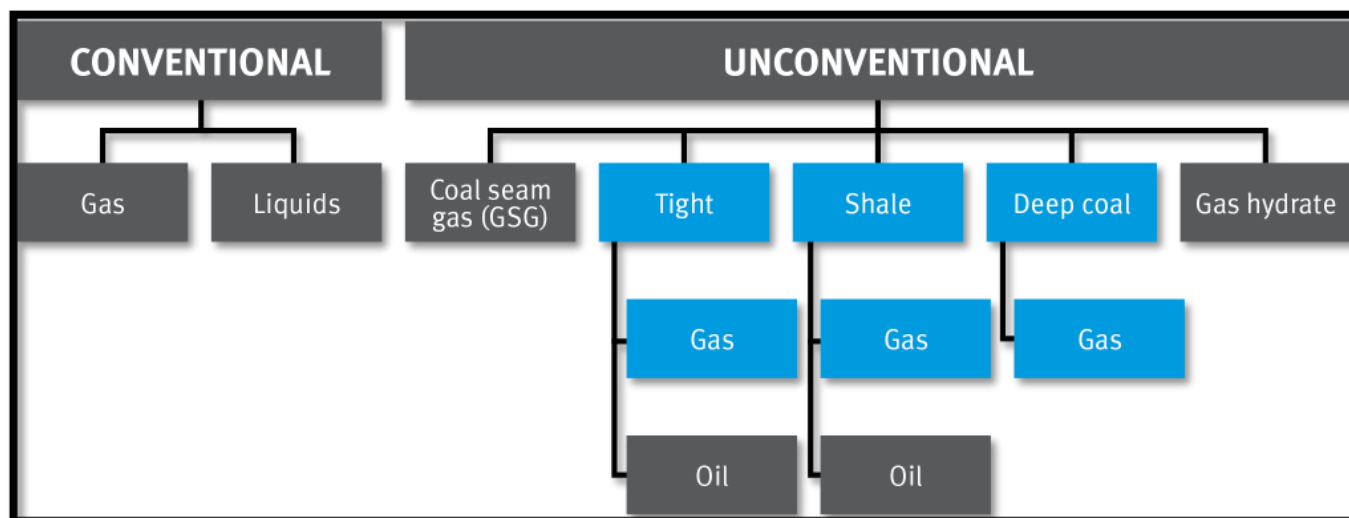
Conventional gas can be extracted using naturally occurring pressure or pumping to 'suck' the gas out of the ground. It is a relatively 'easy' form of extraction. Australian conventional gas basins exist offshore and on the mainland. The Cooper and Eromanga basins are two, amongst a collection of nine, conventional gas basins in Australia. (Source: <https://energyinformationaustralia.com.au/conventional-vs-unconventional/>).

Source: [https://www.bioregionalassessments.gov.au/sites/default/files/gba-coo-stage2-appendix\\_petroleumprospectivity\\_final.pdf](https://www.bioregionalassessments.gov.au/sites/default/files/gba-coo-stage2-appendix_petroleumprospectivity_final.pdf)

Conventional natural gas, CSG and shale gas are chemically similar with the former being a mix of methane with ethane, propane, butane and other hydrocarbons; and the latter being mostly pure methane. Natural gas (i.e. mostly methane) can be trapped within tiny pores (spaces) of shale, sandstone, and other types of sedimentary rock. If it is 'trapped', it needs more effort to extract – something that is not the 'conventional' way of accessing.

Shale Gas is held within shale rock, which needs hydraulic fracturing ('cracking open' using water) to be released. Tight Gas is trapped in sandstone and limestone, and needs hydraulic fracturing to access.

Sources: <https://energyinformationaustralia.com.au/conventional-vs-unconventional/> and <https://www.csiro.au/en/research/technology-space/energy/what-is-unconventional-gas> and [https://www.bioregionalassessments.gov.au/sites/default/files/factsheet\\_-\\_unconventional\\_gas.pdf](https://www.bioregionalassessments.gov.au/sites/default/files/factsheet_-_unconventional_gas.pdf)



Note: Blue indicates unconventional play for the Cooper Basin only ([https://www.bioregionalassessments.gov.au/sites/default/files/gba-coo-stage2-appendix\\_petroleumprospectivity\\_final.pdf](https://www.bioregionalassessments.gov.au/sites/default/files/gba-coo-stage2-appendix_petroleumprospectivity_final.pdf))



Shale gas exploration, Beetaloo, Northern Territory. Imaged used with permission.

See link for additional mages of [Unconventional infrastructure at Beetaloo](#) Northern Territory (ABC News)

**Table 2 – Australia's commercially (currently) recoverable unconventional gas reserves and potentially recoverable resources (i.e. CSG, ‘other than CSG’ and syngas combined)**

Where	Petajoules (PJ) – Best Estimate		Trillion Cubic Feet (Tcf) – Best Estimate	
	Currently commercially recoverable Reserves (2P)	Potentially recoverable Resources (2C)	Currently commercially recoverable Reserves (2P)	Potentially recoverable Resources (2C)
Cooper / Eromanga Basin Unconventional	0	2,265	0	2.01
CSG TOTAL for Australia	28,934	26,197	25.73	23.29
Unconventional (other than CSG) TOTAL for Australia	0	12,252	0	10.89
Syngas <sup>32</sup> TOTAL for Australia	1,153	1,469	1.03	1.31
TOTAL for Australia	30,087	42,183	27	38
Proportion of Cooper-Eromanga compared to TOTAL for Australia	0%	5%	0%	5%

Source: [Australia’s Energy Commodity Resources: 2018 and 2019 Data Tables, Oil | Australia’s Energy Commodity Resources 2021 \(ga.gov.au\)](#),

<sup>32</sup> The department recognises that Syngas is an industrially derived product. Geosciences Australia cites this commodity as being part of the ‘unconventional’ gas group. Thus, the department is including it in total figures to fully represent unconventional resources and reserves within Australia.

**Table 3 – Australia's commercially (currently) recoverable crude oil reserves and potentially recoverable resources**

Where	Petajoules (PJ) – Best Estimate		Million Barrels (MMbbl) – Best Estimate	
	Currently commercially recoverable Reserves (2P)	Potentially recoverable Resources (2C)	Currently commercially recoverable Reserves (2P)	Potentially recoverable Resources (2C)
Cooper / Eromanga Basin CRUDE	363	354	61.7	60.2
TOTAL CRUDE for Australia	1,761	3,444	299.5	578.4
Proportion of Cooper Eromanga CRUDE compared to TOTAL for Australia	21%	10%	21%	10%

Source: [Australia's Energy Commodity Resources: 2018 and 2019 Data Tables](#), [Oil | Australia's Energy Commodity Resources 2021 \(ga.gov.au\)](#),

**Table 4 – Australia's commercially (currently) recoverable condensate reserves, and potentially recoverable resources (MMbbl)**

Where	Petajoules (PJ) – Best Estimate		Million Barrels (MMbbl) – Best Estimate	
	Currently commercially recoverable Reserves (2P)	Potentially recoverable Resources (2C)	Currently commercially recoverable Reserves (2P)	Potentially recoverable Resources (2C)
Cooper / Eromanga Basin CONDENSATE	94	123	16.0	21.0
TOTAL CONDENSATE for Australia	6,788	8,660	1,154.4	1,472.8
Proportion of Cooper Eromanga CONDENSATE compared to TOTAL for Australia	1%	1%	1%	1%

Source: [Australia's Energy Commodity Resources: 2018 and 2019 Data Tables](#), [Oil | Australia's Energy Commodity Resources 2021 \(ga.gov.au\)](#),

**Table 5 – Australia's commercially (currently) recoverable LPG reserves, and potentially recoverable resources**

Where	Petajoules (PJ) – Best Estimate		Million Barrels (MMbbl) – Best Estimate	
	Currently commercially recoverable Reserves (2P)	Potentially recoverable Resources (2C)	Currently commercially recoverable Reserves (2P)	Potentially recoverable Resources (2C)
Cooper / Eromanga Basin LPG	92	104	21.9	24.6
TOTAL LPG for Australia	751	456	178.5	108.2
Proportion of Cooper Eromanga LPG compared to TOTAL for Australia	12%	23%	12%	23%

Source: [Australia's Energy Commodity Resources: 2018 and 2019 Data Tables](#), [Oil | Australia's Energy Commodity Resources 2021 \(ga.gov.au\)](#),

**Table 6 – Australia's potentially recoverable unconventional oil resources**

Where	Petajoules (PJ) – Best Estimate			Million Barrels (MMbbl) – Best Estimate		
	Oil	Condensate	LPG	Oil	Condensate	LPG
	Potentially recoverable Resources (2C)					
Cooper/Eromanga	0	53	30	0	9.0	7.2
TOTAL UNCONVENTIONAL for Australia	0	373	30	0	63.5	7.2
Proportion of Cooper Eromanga UNCONVENTIONAL OIL compared to TOTAL for Australia		14%	100%		14%	100%

Source: [Australia's Energy Commodity Resources: 2018 and 2019 Data Tables, Oil | Australia's Energy Commodity Resources 2021 \(ga.gov.au\)](#),

### 5.2.1 Prospectivity of future oil and gas

Given the existing conventional oil and gas productivity of the Cooper Eromanga basin, there is theoretical scope for increased yields from new, unconventional oil and gas sources via new extraction methods.

However, assessments<sup>33</sup> of what yields *might be* are based on modelling and not proven data, that would be gained through an on-site discovery process. Accordingly, the results vary widely indicating estimates are more uncertain than strictly empirical.

Commodity	Basin	Assessor	Recovery Factor %	Year	Best estimate of potentially recoverable reserves* (2C)		
					PJ	Tcf	MMbbl
Shale gas	Cooper	US Energy Information Agency (EIA)	Not available	2013	104,485	92.9	
		AWT International	15	2013	55,110	49	
		Geoscience Australia	5	2018	7,777	6.92	
	Eromanga	AWT International	15	2013	92,225	82	
	Georgina	AWT International	15	2013	56,235	50	
		EIA	Not available	2013	14,396	12.8	
Tight gas	Cooper	Geoscience Australia	5	2018	57,303	50.95	
		US Geological Survey	Not available	2016	28,946	25.74	
Shale oil	Cooper	EIA	6	2013	6,468		1,100
		Geoscience Australia	5	2018	2,617		445
	Georgina	EIA	4	2013	4175		710

<sup>33</sup> Assessments of prospectivity are completed using the international Society of Petroleum Engineers' Petroleum Resources Management System

		Northern Territory Geological Survey	10	2014	155,350		26,420
Tight oil	Cooper	Geoscience Australia	5	2018	144,119		24,510
Coal oil	Cooper	US Geological Survey	Not available	2016	2,234		380
*that could be produced with current extraction technology and industry practice, from existing reserves							

Source: Table 4 – Undiscovered prospective unconventional gas resource assessments, [GA 2021](#) and Table 4. Undiscovered prospective unconventional oil resource assessments, [GA 2021](#)

There is also variability in terms of how *recoverable* the commodity is (i.e. the recovery factor) – which assessing bodies derive using a range of methods such as probability (e.g. stochastic) or statistical modelling, or through comparing recoverability to analogues in other parts of the world ([GA, 2021](#)).

All estimates of future unconventional resources are based on modelling assumptions and have not been proven, meaning there is significant uncertainty in the assessments – especially in terms of size of recoverable reserves, and how *recoverable* the reserves are. This is for several reasons.

Unconventional gas exploration in Australia is in its early stage of development and has proved relatively contentious in term of community anxiety and social licence. This is none more the case than environmentally sensitive areas such as floodplains, given additional risks of surface water quality and cultural and ecological values. Knowledge of the precise geological characteristics of potentially promising regions (such as that of Cooper-Eromanga and Diamantina) as they relate to unconventional gas extraction is incomplete, due to lack of on-ground investigation and direct measurement. Investigations to date suggest the existence of contingent resources, but further exploration and development activities would be required. There has been limited unconventional gas exploration to date Geosciences Australia suggested in 2018 that relevant timeframes would take between five and eight years (Hall et al, 2018).

However, as at 2022, Geosciences Australia indicates that – in Australia – there are currently no published reserve data for ‘other than CSG’ (namely shale, tight or basin centred gas). In part, this is because the requirements for companies to report resources do not require companies to distinguish between conventional and unconventional resources with regulators. As a result, there continues to be a high degree of uncertainty in published resource estimates ([Geoscience Australia, 2021](#)). Modelling methodologies, data sources, and geographic locations, vary widely across natural resource management researchers and related bodies, and have produced results which have not yet had the benefit of refinement through exploration.

In a letter to ASX in May 2022 ([Santos, 2022](#)) Santos indicates an intention to drill 100 wells in the Cooper-Eromanga basin, and to invest more than \$430 million in development to assist the domestic gas supply market. This includes the joint venture with Beach Energy and new drilling plus optimising well connections, which is claimed will result in an additional 2.7 petajoules (through to 2023).

## 5.2.2 Potential oil and gas yield from the Queensland LEB

Estimates of prospective resources, by their very nature cannot be assumed as translating directly into developable resources. For the reserve to be developed, a series of commerciality tests need to be applied to gauge economic value. These can include assessment of market factors, assumptions around cost of exploration and production, and forecasts of inflation (Australian Competition and Consumer Commission, 2019). They also include an assessment of the geological characteristics which inform ability to drill, hydraulically fracture, or produce from each particular site information gathered from exploration is used to inform assessment. Exploration and appraisal activities do not guarantee that *commercially viable* resources will be identified or developed.

This was confirmed during a presentation to the LEB SAG, where an industry representative indicated that due to existing pipeline capacity and market opportunities, their intention in the Cooper gas fields is to focus on conventional oil and gas production, with production forecasts to establish no more than 20 drill

sites per annum in the region going forward<sup>34</sup>.

Similarly, there is uncertainty around the recoverability of reserves, even after they have been assessed as being commercially viable. For example, while Santos reported an expected 3 PJ of commercially recoverable shale gas reserves from the Moomba gas field in 2012/2013, the subsequent experience in accessing them resulted in those reserves being reclassified as ‘potentially recoverable’ (contingent resources). It is worth noting that contingent resources are not considered to be commercially recoverable due to one or more technical, commercial or other factors needing resolution to make the commodity recoverable (Geoscience Australia, 2021).

On the domestic supply front, while the Australian Competition and Consumer Commission has released an interim report (1 August 2022) indicating that there may be a looming local gas shortage, this appears driven by the exporting (as LNG) of most of the gas produced rather than by production or supply problems per se. The latest Resources and Energy Quarterly bulletin from the Federal Department of Industry, Science and Resources indicates that “After reaching 83 Million tonnes (Mt) in 2021–22, Australia’s LNG export volumes are forecast to stabilise at 80 Mt, as output from Pluto LNG train two offsets falling production from the Northwest Shelf.” In this context, it should also be noted that while there are no major hurdles to accelerated production of already operational or approved conventional gas projects in the Queensland LEB, there may be some practical constraints on additional supply rates due to infrastructure capacity constraints (such as pipe size limits or use contract-related congestion).

As at 2018, pipelines to export extracted gas from the Cooper Eromanga and Surat basins to eastern, northern and southern markets – the South West Queensland Pipeline, the Moomba to Adelaide Pipeline System and the Moomba to Sydney Pipeline respectively – were already close to capacity as discussed above, potentially limiting opportunities for transfer of additional commodity from the source (Australian Energy Regulator, 2021(a)). It is understood that this remains the case as at August 2022. Some gas producers may overcome this congestion issue by ‘swapping’ rights to like-for-like commodities (e.g. swap rights to gas in one region for rights to the same amount in another region), though this approach is not recognised to be a long term answer to transportation challenges (Australian Energy Regulator, 2021(a)).

All current and future oil and gas projects are required to address environmental management, risk and mitigation processes for oil and gas activities under the state’s regulatory regime. The time, effort and monetary costs associated with environmental management under the regulatory framework are factored into the cost of production and therefore has bearing on the commercial viability of the resources.

The long lead-in for any potential unconventional gas projects is also relevant in this context. It is understood that the average timeline through exploration, appraisal, development and into full production for gas fields, typically exceeds 12-15 years. It therefore appears clear that the domestic gas supply/distribution issues of today will not be solved by potential or possible unconventional gas projects which are many years away from production.

Notwithstanding the regulatory options discussed later, oil and gas companies will also need to assess the LEB’s oil and gas opportunities considering the uncertainty around modelling, compounding issues of pipeline capacity, the distances to market, timeframes for EAs and tighter future climate responsibilities.

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<sup>34</sup> Stakeholder Advisory Group meeting input from APPEA, May 2022

It should be noted that there are challenges with estimates of production values, resource volumes, and future activities which lead to difficulties in assessing financial costs and benefits of status quo or alternative options. Current proven resources are mapped at the geological basin level, which straddles Queensland and South Australia. Similarly, prospectivity is mapped at geological basin level and presents additional complexity due to being unproven, resulting in broad assumptions being made, but these have not been demonstrated in the areas of policy interest.



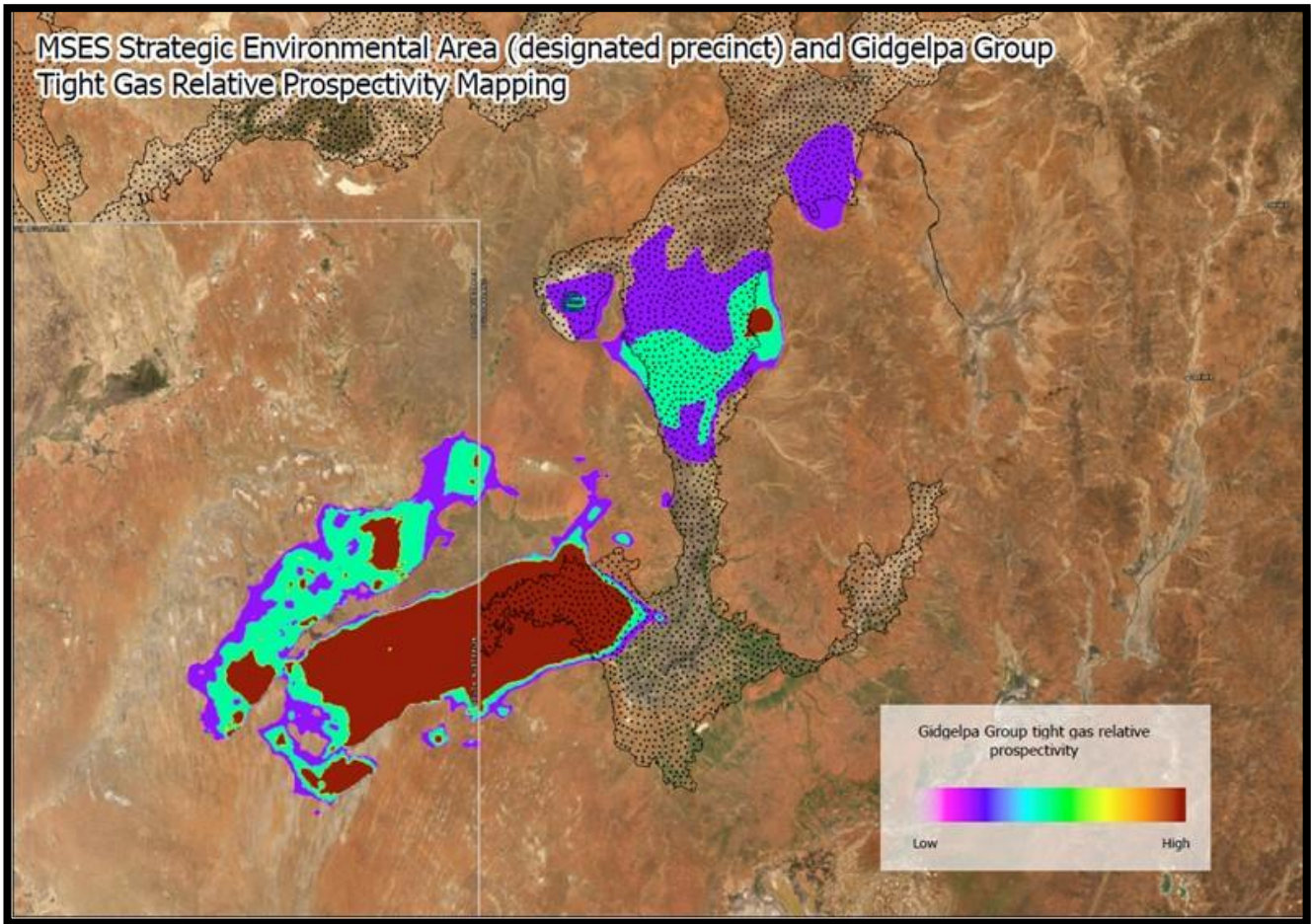
*Cooper Creek, Jundah, © The State of Queensland*

### **5.2.3 Future commerciality of reserves**

The Geological and Bioregional Assessment (GBA) analyses of the Cooper Basin by Geoscience Australia, CSIRO and the Federal Environment Department have included 'confidence-level' prospectivity mapping of potential unconventional resources. These provide an indicative impression of where the resources are, varying by levels of confidence of availability, which also enable both accessibility and some broad imputation of their possible viability as real-world extractable materials. In turn, this can be compared spatially with the existing DP for the Cooper Creek system.



**Constructed ‘prospectivity confidence’ heat mapping for unconventional tight gas with SEA/DP overlay (sources Geosciences Australia data + RPI Act statutory map layer)**



The analysis illustrated in the maps above indicates relatively limited availability at a high confidence level of the three main unconventional resources (shale, tight and deep coal gas/oil), and that their availability is not spatially linked or limited to the floodplains of the Cooper system. Unfortunately, it appears that similar analysis is not available for unconventional oil resources in the Cooper<sup>35</sup>, nor for either unconventional oil or gas resources in the Toolebuc Formation near the Windorah floodplains and wetlands.

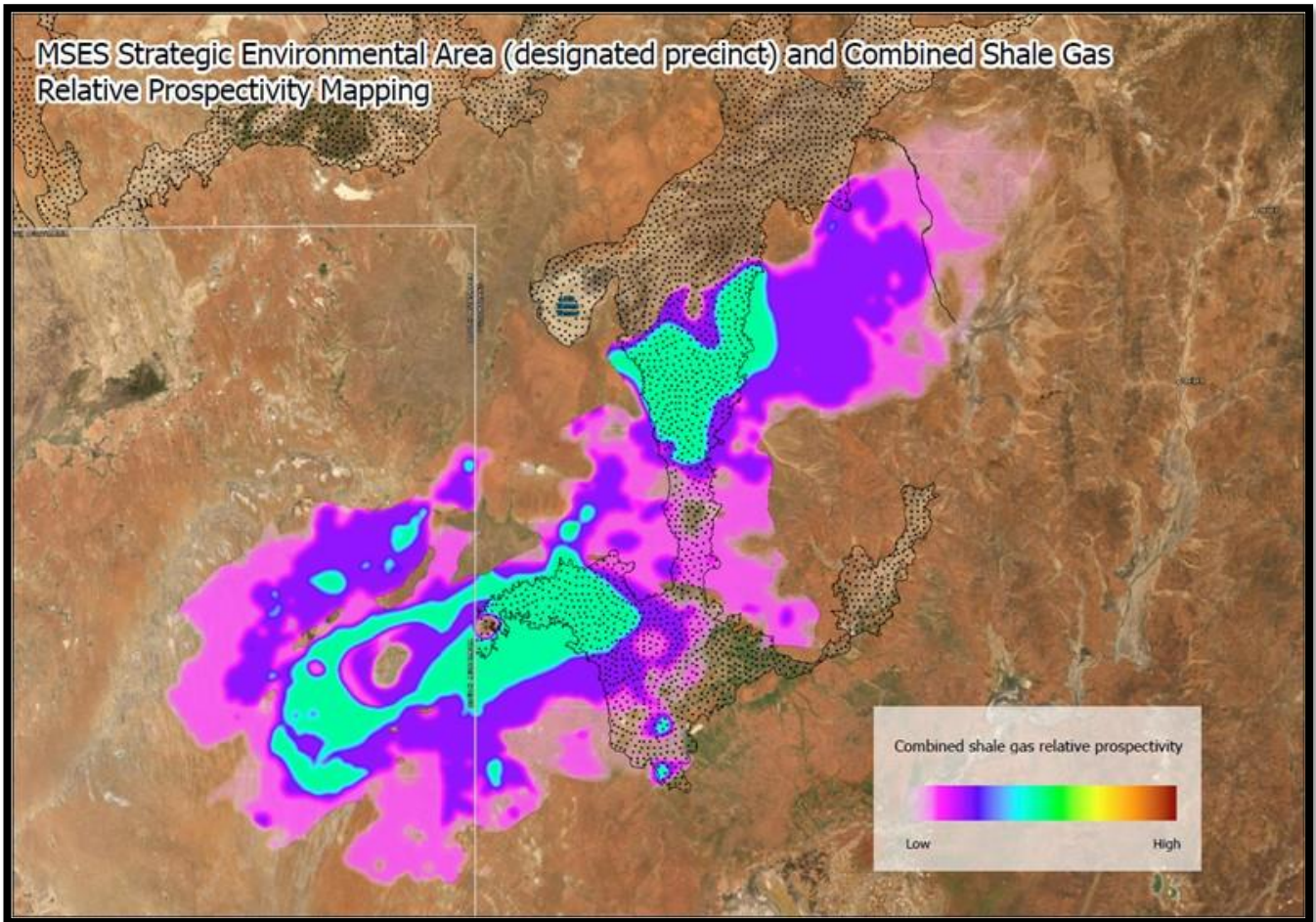
Overall, and given the relative insignificance of gas production in the Cooper Basin when considered at the national and Queensland levels, there may also be availability constraints, as well as potential limitations associated with the actual extraction of them. This leads to important questions about the future commercial viability of those resources.

There is also uncertainty around the management of environmental threats and risks of unconventional gas industrialisation in ecologically sensitive flood plains (especially in flood, spill/contamination or polluting events). Excessive take of surface/subsurface water that might be reasonably anticipated with unconventional oil and gas extraction has significant potential to interfere with the functioning of the LEB’s sensitive ecological areas. It is not clear that existing industry risk management and mitigating processes for oil and gas activities properly reflect and manage the range of potential impacts from such future activities on Queensland LEB floodplains.

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<sup>35</sup> It was concluded by the analysis that unconventional resources in the Cooper Basin are likely to be entirely gas.

**Constructed ‘prospectivity confidence’ heat mapping for unconventional shale gas with SEA/DP overlay (sources Geosciences Australia data + RPI Act statutory map layer)**



It should also be acknowledged that with global commitments to climate action, all future economic activity, including fossil fuel extraction, will need to factor in greenhouse gas emission considerations. There are also growing demands of capital investment/shareholders and superannuation policy holders to see greenhouse gas emissions drive industry investment decisions<sup>36</sup>.

Any future development of unconventional resources in the Queensland LEB is unlikely to occur before the end of this decade, the commerciality of prospective sites will also be subject to this context. Prospective oil and gas productivity will therefore have to undergo an additional viability test arising from the strengthening global policy and commercial context of addressing atmospheric carbon and methane. Government and industry emission reduction targets will therefore need to be factored into feasibility assessments for future resource developments (Clean Energy Regulator, 2022).

Many resource companies have already committed to climate targets such as net zero operational emissions by 2050. The broader carbon-economic context implies, however, *additional* costs to industry, that are likely to be generated to enable companies to comply with both their own and also government emissions targets. Likely reduced demand for hydrocarbon commodities as the international community diversifies its energy supplies to renewable sources may also weigh on the longer-term economic viability of prospective gas and oil reserves.

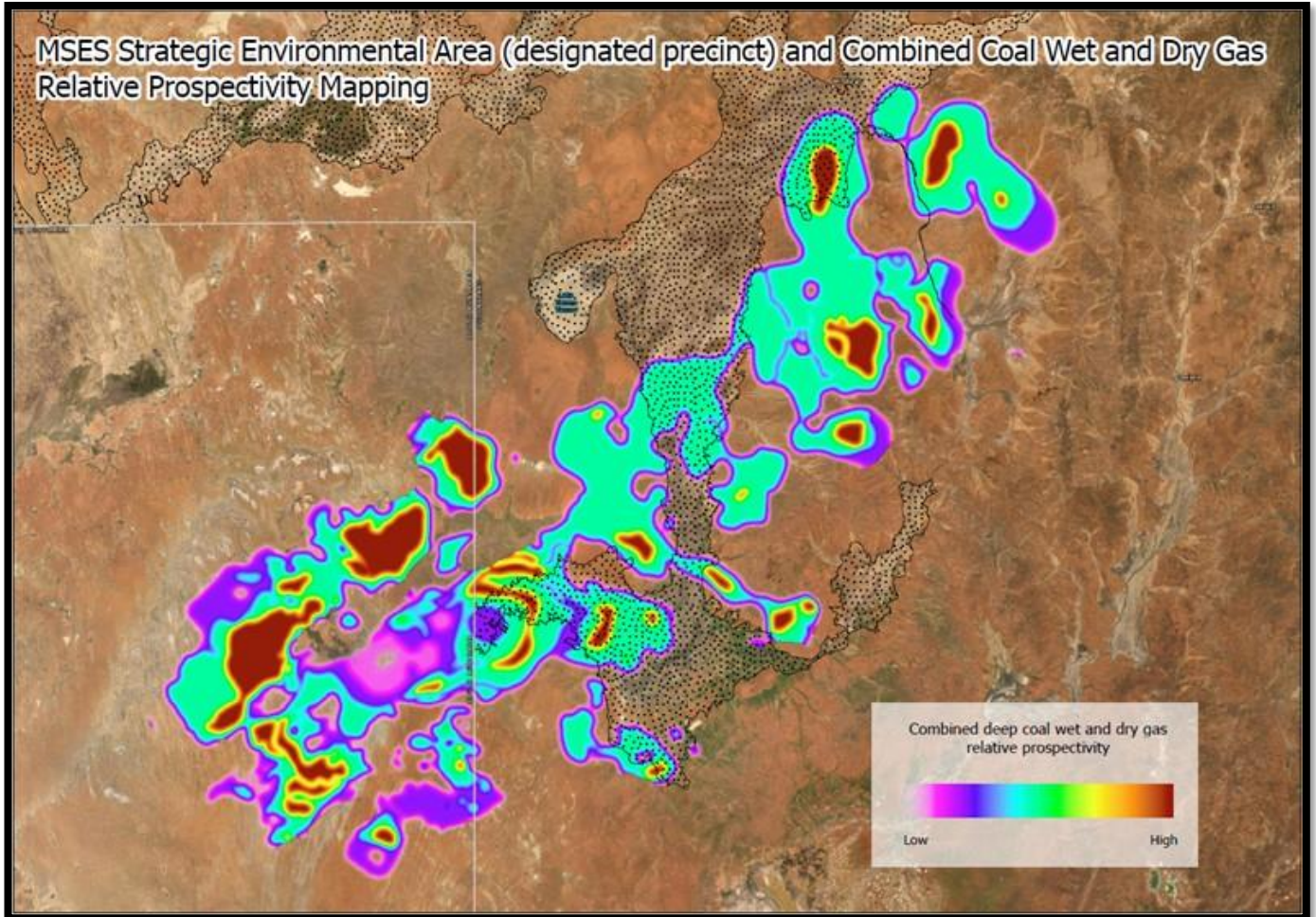
The private sector will have to assess the viability of oil and gas opportunities in light of the uncertainties

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<sup>36</sup> see for example: <https://www.hesta.com.au/about-us/media-centre/hesta-sets-stronger-2030-emissions-reduction-target-and-signals-heightened-monitoring-and-engagement-with-key-emissions-intensive-companies>

around reserve modelling, as well as consideration of pipeline and infrastructure capacity, distances to market, timeframes for Environmental Authorities and other approvals, together with emission reduction targets. Ultimately, decision to undertake exploration of prospective resources includes consideration of regulatory and market factors, assumptions around costs of exploration, development and production, and forecasts of inflation ([Australian Competition and Consumer Commission, 2019](#)):

**Constructed ‘prospectivity confidence’ heat mapping for unconventional deep coal gas with SEA/DP overlay (sources Geosciences Australia data + RPI Act statutory map layer)**



### 5.2.4 Management of environmental threats

Unconventional gas exploration and extraction is a relatively new pursuit in Australia. Necessarily, there is a clear level of uncertainty surrounding the effective management of new environmental threats and risks arising from possible future unconventional gas industrialisation in ecologically sensitive flood plains, especially in the context of flood, spill/contamination or polluting events.

Industry argues that, based on existing practices and risk management strategies, the probability of contamination from polluting events is relatively low, and likely to be relatively spatially isolated or contained. Nevertheless, environmental accidents in the fossil fuels industry are not rare: on average, one accident happens each year (based on 43 accidents on Australian mainland and surrounding waters between 1970 and 2013), causing unauthorised environmental contamination.

Where processes do exist, such as requirements to report environmental harm under Environmental Authorities, they have typically taken operators several days to several months to report, stop and fully implement remedial actions. In the last ten years of notable industrial incidents, this has included the Zeus Oil Spill, 2013 (Queensland LEB), the Montara Oil Spill 2009<sup>37</sup>, the Pilliga State Forest CSG Water spill 2011<sup>38</sup>, and the Port Bonython hydrocarbon groundwater contamination<sup>39</sup>.

The consequences of a future major event in the Queensland LEB, in terms of adverse impacts on natural and cultural values, and ecological function, are potentially substantial and include (based on previous incidents) contamination of groundwater, affecting local communities which are often dependent on this water for 'stock and domestic' supply, as well as overall ecological function, and deaths of native and migratory bird species. Destruction of First Nations Cultural Heritage may also occur.

Consequences would be at their greatest in flood situations, where the anastomosing nature of the Queensland LEB's channels creates unpredictable flows, and could spread contaminants and other environmentally harmful materials across the landscape. Given this history, the unique morphology of the LEB's river systems, and the novel nature of unconventional gas activities in floodplain areas, it is not clear that industry risk management and mitigating processes for oil and gas activities properly reflect and manage the range of potential impacts to LEB floodplains.

### 5.3 Tourism

The near-natural state of the rivers in the Queensland LEB helps support a tourism industry, mostly made up of 'grey nomads' who are attracted to the vast, mostly natural, landscapes of the region. Key attractions with the Queensland LEB include the Dinosaur Trail and Stockman's Hall of Fame in Longreach.

Tourism is a significant economic generator in Outback Queensland. It is believed to have potential for significant growth in the next ten years, both in terms of turnover and visitation (Tourism & Events Qld, 2018), and has remained relatively productive despite significant setbacks associated with the Covid-19 pandemic. Tourism in the Outback Queensland region supported the employment of a total of 4,600

#### Compliance and enforcement activities for the unconventional gas industry

- 90 compliance activities in relation to coal seam gas were undertaken in Queensland in the 2020-21 period, through site inspections and desktop assessments. 23 reports and 100 notifications were received from the community (including about significant pollution incidents).
- Where breaches have occurred within the unconventional oil and gas industry, they have caused unauthorised environmental harm. For example:
  - Unauthorised release of 1.1 megalitres of pumped CSG water to surrounding land (2021).
  - Two defective pipelines causing release of around 90,000 litres of crude oil to the environment (2018).
  - Wilful serious environmental harm in a pilot underground coal gasification project (2018).
  - Constructing and operating CSG wells and dam in an endangered regional ecosystem (2015).
- Environmental harm from resource activities can be serious and difficult to prosecute even in situations where compliance visits occur and where communities can engage in monitoring and reporting.
- DES' capacity for compliance visits in the Queensland LEB are limited, with none occurring since 2019. Remote locations with no routine Regulator oversight could be at a greater risk of environmental harm going unchecked and un-remediated with unconventional oil and gas extraction.

<sup>37</sup> [Link to information on Montara Oil Spill 2009](#)

<sup>38</sup> [Link to information on the Pilliga State Forest CSG Water spill 2011](#)

<sup>39</sup> [Link to information on the Port Bonython hydrocarbon groundwater contamination](#)

people<sup>1</sup>.

The Qld LEB is only a part of the broader area known as Outback Queensland. Based on the local government areas of Boulia, Winton, Longreach, Diamantina and Barcoo as well as Barcaldine and Blackall which are partly within 'Outback Queensland', there were 199,000 overnight visitor stays in the year ending March 2021 with a total expenditure of \$112.8 million (Tourism Research Australia, 2021).

It should be noted this was at a time of Covid-19 related border restrictions, which prevented many travellers from southern states coming to Queensland.

In the year ending March 2022, the tourism sector was estimated to bring in approximately \$570 million to the Outback region, and around 4.4 million nights of visitation<sup>40</sup>. While this amounts to a six per cent drop in spending, and a nine per cent drop in visitation, compared to the last three years, it does indicate a 10 per cent recovery compared to the previous year, and the tourism sector's capacity to be a continuing revenue stream for the Outback region. It also highlights the importance of protecting the natural values of the region, which attracts visitors.

Tourists come from Queensland, interstate, and international places to experience and wonder at the broad open spaces of Queensland's Outback. They bear witness to the pristine natural wonders of the region and connect with the richness of cultural heritage and hospitality of the people of this land. The Outback's tourism industry's competitive strengths relate to an intact and unspoiled environment. It is dependent on clean, healthy, and functioning environments, with unimpeded flows



*Tourism Thomson, © The State of Queensland*

through watercourses, and recharge to waterholes. These include a relaxed and peaceful atmosphere; accessible and quintessential desert experiences that include Australian wildlife and geography; and a diverse landscape and natural environment that supports bird watching in the Channel Country. These floodplains form breeding grounds for one per cent of the total global population of waterbirds.

There is a concern that the current regulatory arrangements may not sufficiently protect these features. To support the region's tourism sector in the long-term and to continue to attract tourists to the region, properly safeguarding the natural state of the Queensland LEB from new and emerging threats is necessary.

The total Outback Queensland area figures provided earlier suggest some of the broader potential for tourism for the Queensland LEB region specifically. While it may be difficult to provide robust estimates of the value of future tourism in the Queensland LEB, we can be more certain of the dependency of this industry on clean and healthy and functioning environments. This includes the overland flows and water

<sup>40</sup> <https://teq.queensland.com/au/en/industry/research-and-insights/tourism-data-explorer>

quality in the rivers and floodplains, and the watercourses and waterholes recharged via alluvial hydrological processes exposed to impacts from pollution and excessive surface/subsurface water takes.

<p style="text-align: center;"><b>LAKE EYRE BASIN (QLD) KEY NATURAL VALUES</b></p> <p style="text-align: center;"><b>OBJECTIVE: Maintain the hydrological and ecological processes of the Cooper Creek, Georgina and Diamantina river catchments</b></p>					
HYDROLOGICAL PROCESS	GEOMORPHIC PROCESSES*	WATER QUALITY	RIPARIAN FUNCTION*	WILDLIFE CORRIDORS	BENEFICIAL FLOODING
<p>Maintain the natural hydrological processes of the area</p>	<p>Maintain the geomorphic processes of the area</p>	<p>Maintain the water quality of the area</p>	<p>Maintain the functioning riparian processes of the area</p>	<p>Maintain the wildlife corridors of the area</p>	<p>Maintain the beneficial flooding processes of the area</p>
<ol style="list-style-type: none"> <li>1. Natural, unrestricted flow in and along stream channels and the channel network in the area</li> <li>2. Overflow from stream channels and the channel network in the area</li> <li>3. Natural flow paths of water across floodplains connecting waterholes, lakes and wetlands in the area</li> <li>4. Groundwater sources, including the Great Artesian Basin and springs that support waterhole persistence and ecosystems in the area</li> </ol>	<ol style="list-style-type: none"> <li>1. Natural erosion</li> <li>2. The transport and deposit of sediment by water throughout the catchments and along the watercourse systems and estuaries</li> </ol>	<ol style="list-style-type: none"> <li>1. The natural water quality in the watercourse channels and aquifers and on floodplains in the area characterised by physical, chemical and biological attributes that support and maintain natural aquatic and terrestrial ecosystems</li> </ol>	<ol style="list-style-type: none"> <li>1. Native riparian vegetation associated with watercourses, estuaries, lakes, floodplains and wetlands</li> </ol>	<ol style="list-style-type: none"> <li>1. Natural habitat in the watercourse systems</li> <li>2. Permanent waterholes and springs</li> </ol>	<ol style="list-style-type: none"> <li>1. The beneficial flooding of land that supports floodplain grazing and ecological processes in the area</li> </ol>
<p>* Not currently considered an environmental attribute for the Channel Country strategic environmental area, but considered for other SEAs</p>					

## 6. A risk-based approach to Queensland LEB river protections

The previous materials have highlighted the unique values of the Queensland LEB, its environmental and cultural sensitivity, the interests of First Nations Custodians, and an array of existing activities including in the agriculture, tourism and resources industries. This is a very special, but also very sensitive region, where getting the delicate balance right across the environmental, cultural, economic and social spheres is challenging.

In light of the risks of future environmental and cultural harm, and impacts on non-resources based economies, there is a clear case for considering options to both improve the extent of regulatory reach (spatial) and the regulatory toolkit itself. In this context, legislation and regulation have been deemed necessary for overseeing the resources industry development over several decades. Similarly, the practice of protecting intact, free-flowing river systems in Queensland over the past twenty-odd years has been based on legislative/regulatory approaches being the only effective mechanism to achieve outcomes. While the need for such mechanisms has not been challenged, the adequacy of current protection has been publicly questioned by a range of stakeholders and communities.

### 6.1 First Nations aspirations and Cultural Heritage protections

It is acknowledged that protecting the rivers and floodplains of the Queensland LEB supports both ecological and cultural values, and First Nations economic and social aspirations. It is also recognised that First Nations Peoples' Cultural Heritage, their concerns for Country and their expressed need for engagement and consultation all go beyond Native Title processes.

It is also recognised that section 28 of the *Human Rights Act 2019* creates obligations on government to protect, respect and promote First Nations' rights to Cultural Heritage.

There is a formal review of the *Aboriginal Cultural Heritage Act 2004* underway, led by the Department of Seniors, Disability Services, and Aboriginal and Torres Strait Islander Partnerships.

#### Vibrant country – strong protection

*“The country out there is incredible; all those little channels reaching out like veins – ‘The Veins of Hope’. When it rains, brown water veins run through that country with green everywhere else. This place is unique in the world and should be preserved and cared for. Future generations need to see it and enjoy it without trying to control it and take things out of it”*

Scott Gorringer, Mithaka Custodian (Aboriginal Way Map).

<https://aiatsis.gov.au/explore/map-indigenous-australia>

### 6.2 The position of Government

Protecting the rivers, watercourses and floodplains of the Queensland LEB, while also supporting sustainable economic activities, has been a policy priority of government for several years, reflected in election commitments, government statements, and policy work.

In 2017, the Queensland government committed to “Work with Traditional Owners, stakeholders and communities to ensure the State’s pristine rivers are protected. This will include a review of the extent to which the *Regional Planning Interests Act 2014* provides adequate protection for these rivers.”

In 2019, the government indicated “the proposed framework will increase protections in streams and floodplains in the Queensland section of the Lake Eyre Basin...” committing to “returning the protections that existed in (a pre-2014 legislative) framework.” There was also a commitment to “ensuring First Nations peoples have input”, and it was further acknowledged that, “Achieving the balance between economic prosperity and ecological sustainability is absolutely vital.”

In 2020, the Queensland government committed to “Establish a Lake Eyre Basin (Qld) Stakeholder Advisory Group including Traditional Owners, industry bodies, environment groups, local government, scientific experts and government departments to inform the development of a consultation Regulatory Impact Statement for the proposed Lake Eyre Basin Framework.”

The government indicated its objective is “To ensure adequate protection of Lake Eyre Basin streams

and watercourses is balanced with economic development”. This has been articulated in practice as ‘protecting the rivers, floodplains and water courses of the Qld Lake Eyre Basin while supporting sustainable economic development’. Doing so in a way that ensures First Nations involvement, recognising that protection of the ecology and cultural heritage of the region from key threats, has been key to the process. As discussed above, responding to the challenges presented with future unconventional oil/gas on floodplains is the main focus and outcome sought, given risks from hydraulic fracturing and increased industrialisation.

The Queensland Government has also now announced the formal stages of its First Nations Path to Treaty process, which forms an important backdrop to the Queensland LEB focus.

To break the broad objective down to its key components, a set of more specific ecological, economic, cultural and social objectives have been used by the Department of Environment and Science to guide the development of options, and these have also formed the basis of some of the discussions within the LEB SAG. A related set of outcomes sought under these components was also applied to help identify areas to focus on for policy framing and opportunities to achieve the overall government commitment.

<p><b>Ecological objective:</b> Protect and conserve the key natural processes, functions and values essential to sustain the free-flowing river systems of the LEB.</p>	<p><b>Economic development objective:</b> Enable sustainable economic activities and future prosperity which avoids ecological impacts</p>	<p><b>Social objective 1:</b> First Nations Cultural Heritage and other heritage places are recognised and protected, and First Nations priorities and aspirations are acknowledged and addressed.</p>	<p><b>Social objective 2:</b> Personal, social wellbeing needs and sustainable communities are supported. Benefits from local economic growth and sustainable development are realised across the region equitably</p>
<p><b>Outcomes being sought:</b></p> <ul style="list-style-type: none"> <li>• Appropriate legislative protections are put in place to achieve protection of the rivers, watercourses and floodplains.</li> <li>• First Nations Country is protected</li> <li>• Industrial activities or other ecological threats are kept out of and away from sensitive areas (particularly the SEA) in the region.</li> <li>• No major obstructions or alterations of water flow for the Cooper Creek, Diamantina and Georgina river catchments.</li> <li>• Key hydrological, geomorphic and ecological processes (including the biodiversity that depends on them) and functions are maintained.</li> <li>• Areas identified as having significant hydrological connection to the river system are adequately protected.</li> <li>• Groundwater dependent landforms and ecosystems are protected and sustainably managed.</li> <li>• The quality of surface water is sustainably managed and interactions between water sources are maintained (including springs).</li> </ul>	<p><b>Outcomes being sought:</b></p> <ul style="list-style-type: none"> <li>• Agriculture, tourism and land management are all supported.</li> <li>• First Nations’ economic opportunities and aspirations are supported.</li> <li>• The quality and quantity of surface water and groundwater continues to allow sustainable use for domestic, stock and agriculture purposes.</li> <li>• The mineral resources sector is supported by providing regulatory certainty for outcomes for the region.</li> <li>• The petroleum (oil and gas) resources sector is adequately regulated to enable the ecological objective while providing certainty for outcomes in other areas in the region.</li> <li>• Development that contributes to realising goals of the Resource Industry Development Plan, the Outback Qld Regional Recovery Plan and other relevant industry and sector goals.</li> <li>• Economic growth, growth in regional employment, and improvements in</li> </ul>	<p><b>Outcomes being sought:</b></p> <ul style="list-style-type: none"> <li>• First Nations Cultural Heritage places, areas and connections are recognised, respected and protected in the landscape</li> <li>• Other heritage places are preserved for the benefit of the community and future generations.</li> <li>• First Nations priorities and aspirations across the social, economic, cultural and environmental spheres are acknowledged and addressed.</li> </ul>	<p><b>Outcomes being sought:</b></p> <ul style="list-style-type: none"> <li>• Social development and community sustainability across the region is maintained and strengthened.</li> <li>• Ecologically sustainable development supports viable, diffuse, inclusive and intergenerational benefits and livelihoods.</li> <li>• First Nations people benefit socially, economically and culturally from local sustainable economic activities.</li> </ul>



	infrastructure and services, as a result of activities within the LEB, is realised regionally.		
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## 7 Challenges to be addressed

### 7.1 Spatial

In hydro-ecological terms, the current statutory map for the Queensland LEB rivers has been critiqued for being incomplete and omitting critical components of the intact river systems. Of concern has been the exclusion of upper streams and watercourses of each of the three main rivers, as well as aspects of their floodplains and some special hydrological features associated with them.

When the SEA/DP boundaries for the river systems were set up under the RPI Act and Regulation, some critical parts of what had been mapped previously under the pre-2014 river protection Declarations for the Georgina and Diamantina Rivers, and for the Cooper Creek were omitted or excised. This did not occur when similar processes were applied to previously mapped protected rivers in the Gulf Country, on Cape York Peninsula and elsewhere.

It could be argued that the effect of these critical components of the intact river systems being left outside of the current statutory map boundaries, is that the statutory mapping regime may be inadequate and could compromise river system integrity. Activities upstream or in adjacent areas, not captured by the mapping and hence not formally recognised as areas of special interest, might undermine uninterrupted overland flow, water quality, and other hydrological processes essential for the region’s healthy landscapes and sustainable practices.

### 7.2 Regulatory

As discussed, the LEB is of high ecological and cultural significance nationally and globally; it is the largest internal drainage system in Australia and one of the biggest in the world.

The LEB also has one of the most variable flow regimes in the world, and contains one of the last remaining unpolluted, largely free-flowing arid river systems on the planet. These clean and free-flowing rivers of the Queensland LEB are integral to the region’s environmental, agricultural, and cultural values. They enable and support a range of economic activities, including organic beef production and tourism, and are a critical ingredient to future sustainable economic growth and prosperity within the region.

These operate under a raft of existing state legislative, regulatory and planning regimes that apply in the Queensland LEB, as well as a small but important set of Federal legislation. However, only one of the Queensland Acts – the RPI Act and its Regulation – includes any LEB spatially-specific considerations.

#### Overview of the current regulatory framework<sup>41</sup>

	Relevant Act	Description	Management tools
<b>Resource tenure</b>	<i>Petroleum Act 1923</i>	<ul style="list-style-type: none"> <li>Regulates certain petroleum and natural gas activities. The <i>Petroleum and Gas (Production and Safety) Act 2004</i> supersedes this act, but an amended version of the</li> </ul>	<ul style="list-style-type: none"> <li>Petroleum tenure – conditions and obligations for existing tenure holders</li> <li>Since 31 October 2021, no new production leases can be granted under the 1923 framework</li> </ul>

<sup>41</sup> Note: this is not an exhaustive list of applicable Queensland legislation

	Relevant Act	Description	Management tools
		<i>Petroleum Act 1923</i> was retained to preserve rights of existing tenure holders.	
	<i>Petroleum and Gas (Production and Safety) Act 2004</i> (P&G Act)	<ul style="list-style-type: none"> <li>Regulates petroleum and gas exploration development and production, safety, and pipelines.</li> <li>Tenure cannot be granted without Native Title being resolved or an Environmental Authority</li> </ul>	<ul style="list-style-type: none"> <li>Petroleum tenure conditions and obligations</li> <li>Annual monitoring/reporting requirements</li> <li>Code of practice prescribed in the Regulation, including for leak management, detection and reporting</li> </ul>
	<i>Mineral Resources Act 1989</i> (MR Act)	<ul style="list-style-type: none"> <li>Regulates mining exploration development and production.</li> <li>Tenure cannot be granted without Native Title being resolved or an Environmental Authority</li> </ul>	<ul style="list-style-type: none"> <li>Minerals and mining tenure conditions and obligations</li> <li>Annual monitoring/reporting requirements</li> </ul>
<b>Water management</b>	The <i>Water Act 2000</i> (Water Act)	<ul style="list-style-type: none"> <li>Provides for the sustainable management of Queensland's water resources by establishing a system for the planning, allocation and use of water; the management of impacts on underground water caused by the exercise of underground water rights by the resource sector. Water use in the LEB is guided by three water plans under the Water Act:                             <ul style="list-style-type: none"> <li>Water Plan (Cooper Creek) 2011</li> <li>Water Plan (Georgina and Diamantina) 2004*</li> <li>Water Plan (Great Artesian Basin and Other Regional Aquifers) 2017.</li> </ul> </li> <li>* Note Georgina and Diamantina Water Plans will expire in 2024; and will be subject to a stakeholder consultation stage.</li> </ul>	<ul style="list-style-type: none"> <li>Water licence for taking water (or water permit for taking non-associated water for shorter term projects)</li> <li>Water entitlement for extracting non-associated water in a regulated water area for mineral and coal authorities and unconventional gas extraction other than CSG – Chapter 2.</li> <li>Underground water impact report requirements every three years under Chapter 3 for unlimited underground water rights where the taking of water happens as a result of authorised activities (associated water) under Petroleum and Gas (Production and Safety) Act 2004 (P&amp;G Act)</li> <li>Make-good requirements under Chapter 3 outlines arrangements for tenure holders to 'make good' the impact bores as a result of exercising underground water rights under the P&amp;G Act</li> <li>Water Plans</li> </ul>
<b>Land use Planning</b>	<i>Regional Planning Interests Act 2014</i> (RPI Act)	<ul style="list-style-type: none"> <li>Identifies and protects areas of regional interest, including strategic environmental areas (SEAs). Applications in an SEA undergo assessment against the criteria which include whether the proposal will have a widespread or irreversible impact on the environmental attributes.</li> </ul>	<ul style="list-style-type: none"> <li>RIDA under RPI Act for resource or regulated activities in SEA – this includes assessment of land use suitability and may include conditions regarding environmental attributes</li> <li>RPI Regulation defines Designated Precincts (DPs) in which the assessment criteria identify unacceptable uses for that area.</li> </ul>
<b>Environmental</b>	<i>Environmental</i>	<ul style="list-style-type: none"> <li>Regulates activities to avoid, minimise or mitigate impacts</li> </ul>	<ul style="list-style-type: none"> <li>Environmental authority (EA) conditions commensurate to risk of activity <sup>42</sup></li> </ul>

<sup>42</sup> Note: many of the EAs do not reflect contemporary standards as some sites have been in operation since the 1970s and were approved as existing activities under the EP Act in the 1990s. DES has a limited ability under the EP Act to update EA conditions to contemporary standards without a company's agreement.

	Relevant Act	Description	Management tools
<b>harm reduction</b>	<i>Protection Act 1994 (EP Act).</i>	on the environment. Most resource activities will be required to obtain an environmental authority either via a standard, variation or a site-specific application relevant to the proposed activity.	<ul style="list-style-type: none"> <li>• Statutory restrictions on chemical additives for hydraulic fracturing fluids (EP Act and Regulation)</li> <li>• Large scale projects can go through an Environmental Impact Statement process and an application for an environmental authority may or may not be made at the same time.</li> </ul>
	<i>Waste Reduction and Recycling Act 2011</i>	<ul style="list-style-type: none"> <li>• Establishes a framework for waste management and resource recovery practices in Queensland. The key provisions related to the resource industry, include prescribed activities and requirements for resource recovery areas and planning for waste reduction and recycling and reporting about waste management.</li> </ul>	<ul style="list-style-type: none"> <li>• Optional registration for resource producer and compliance with end of waste code, including for associated water</li> </ul>

To properly protect the river systems and prevent the potential for widespread and irreversible impacts from these activities, it could be argued that a new and precautionary approach may be required; one which can ensure risks are avoided in ecologically sensitive areas, while sustainable economic activities are supported elsewhere in the region.

In terms of responses to flooding events, it should be recognised that hydrological processes in the Queensland LEB are far more complex and less predictable than singular, predictable events. While it may be possible to move drilling rigs, it is not possible to move well heads, borrow pits and other onsite infrastructure.

According to Traditional Custodians from the region, major flooding happens every 40–50 years, and what has been seen since the mid-1970s are only moderate floods. This means the oil and gas industry has only ever had to deal with one truly major flood event (in the mid-1970s) since conventional oil and gas first appeared in the region. On the basis that full production in the Queensland LEB has only been from the mid-1980s, this means industry has never had to respond to a truly major flooding event on the floodplains. The risks with what might happen with unconventional activities and all the associated increased industrialised footprint on floodplains in these contexts is a totally unknown and unclear scenario.

### Environmental protection legislation

- The *Environmental Protection Act 1994* aims to ensure ecologically sustainable development for people and communities, while aiming to protect sensitive ecosystems and quality of life, by allowing / regulating for environmental harm to occur in specific locations.
- It focuses on conditioning development activities – for example, types and amounts of authorised contaminants – and manages environmental values in terms of how impacted they are by those activities.
- The *Nature Conservation Act 1992* aims to protect natural and cultural values in specific locations through formalised protection or conservation mechanisms.
- The *Environmental Protection Regulation 2019* (EP Regulation) defines environmentally sensitive areas in two categories (A and B), including features or areas identified under NC Act, other relevant legislation, conventions signed by Australia, and endangered regional ecosystems.
- While some of these are relevant for the Queensland LEB, individual river system objectives (in terms of health, ecological processes and services, cultural values or services) are not included in decision-making under the EP Act about development activities in and around those systems.

An oil or gas proposal would only require an Environmental Impact Statement under the EP Act or SDPWO Act in certain circumstances. For example, where complex off tenure infrastructure or other project requirements are proposed.

## 8 Options and impact analysis

There are two related but distinct items that must be considered. The first is the *where* issue of what is regarded as important to map and regard as of special significance, while the other concerns *what* is permitted or regulated within relevant areas. These are obviously connected, but for the purposes of this RIS, the spatial issues are dealt with independently of the regulatory considerations.

Accordingly, this section lays out a set of options for the spatial considerations, and the next section provides a separate set of regulatory options. When considered together, there is capacity to envisage different blends of effects across the options, and a matrix indicating these is provided at the end of both sets of options being highlighted.

### 8.1 Spatial (extent of mapped protections) options

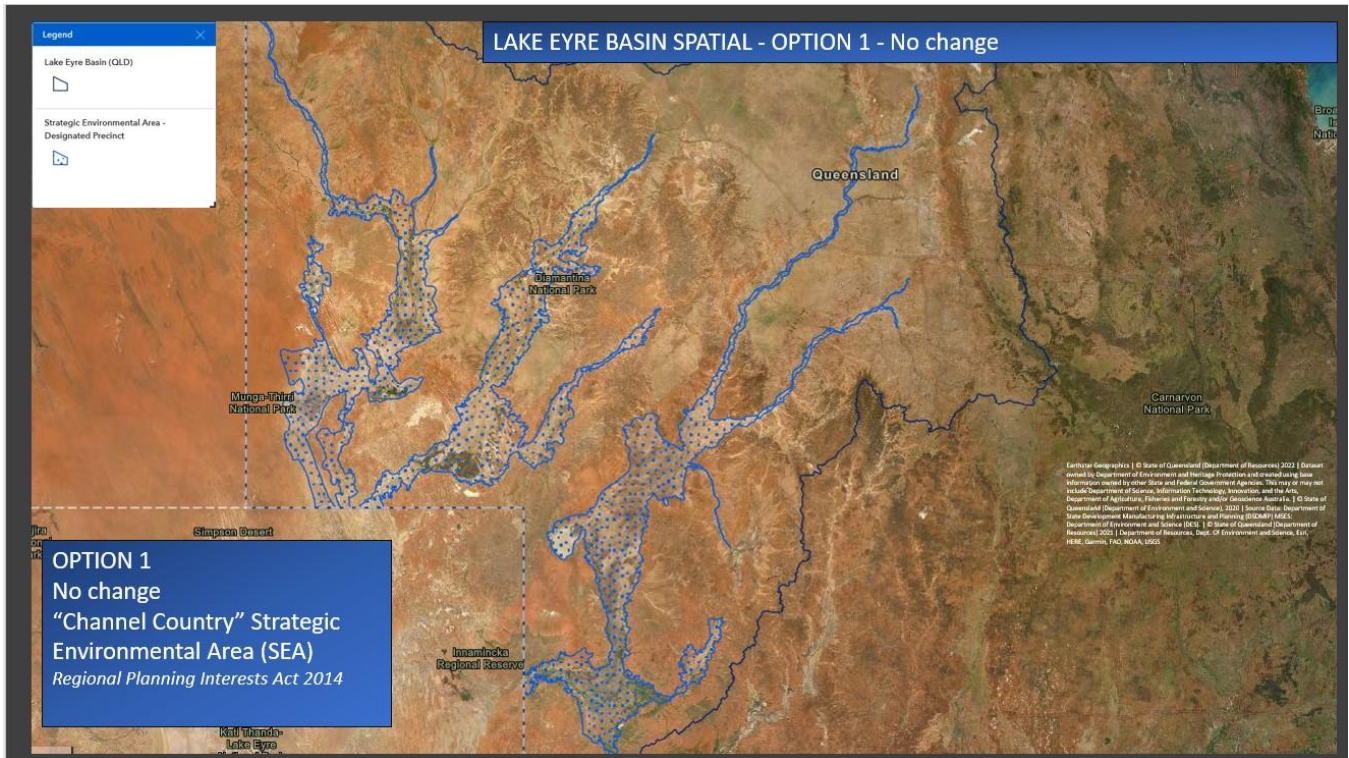
Across each spatial option, there is no intention to change the absence of distinction between SEA and DP for the Queensland LEB area.

All the mapping used in the analysis, draws on data based on decades of research, aerial photograph interpretation and field validation which has been subject to peer-review, validation and updating processes and community consultation. Mechanisms exist for finer scale mapping of vegetation and hydrological features, if required. All the spatial layers identified, and underpinning data, are publicly available and can be accessed via a specially developed [Queensland Lake Eyre Basin Map Viewer tool](https://experience.arcgis.com/experience/088582835c5447fd9330b521e0d743ec).<sup>43</sup>

#### 8.1.1 Spatial Option 1 (status quo)

The status quo approach involves the simplicity of retaining what is already in place, based on existing Strategic Environmental Area and Designated Precincts boundaries.

<sup>43</sup> <https://experience.arcgis.com/experience/088582835c5447fd9330b521e0d743ec>



The advantage of this ‘no change’ option is the current mapped boundaries are not changed, and existing familiarity with them and planning based on them is not affected.

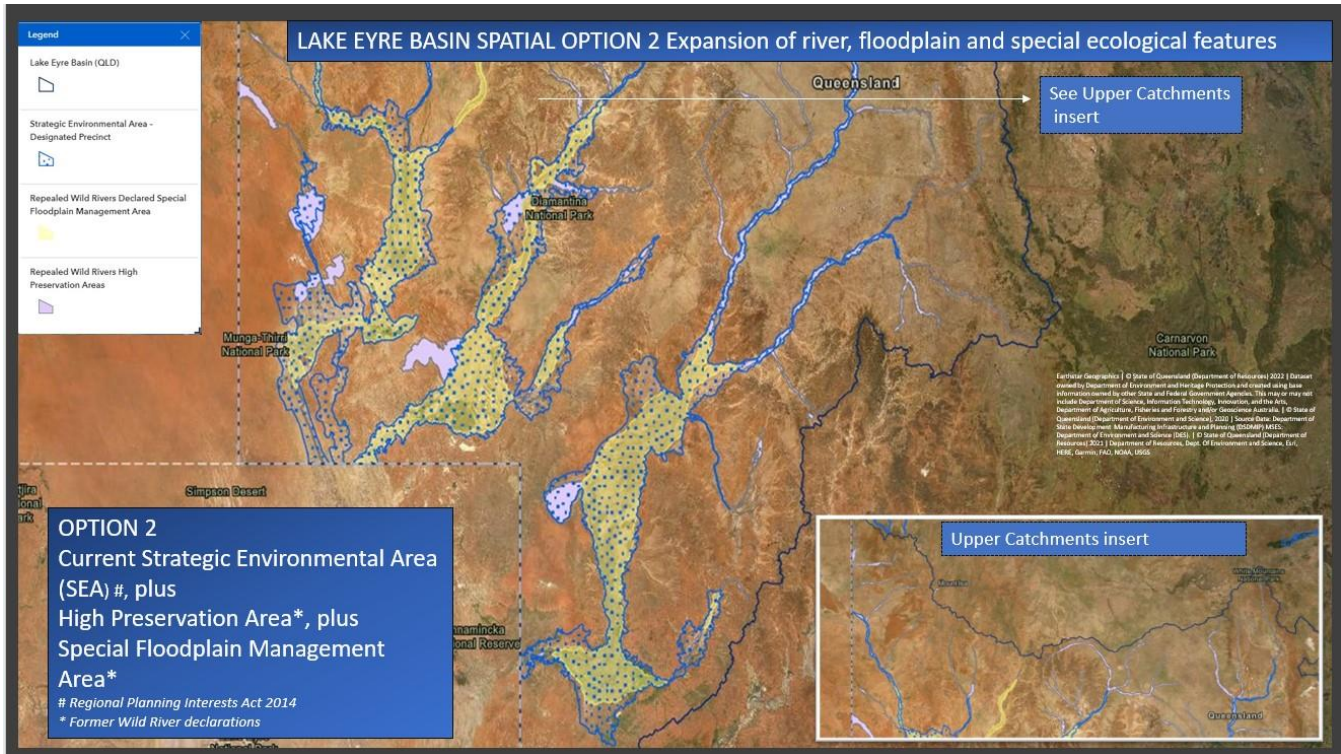
The disadvantage of this ‘no change’ option is that the ecological deficiencies with the mapped boundaries are not addressed. This results in critical parts of the river systems, including upper streams and watercourses, floodplains and special hydrological features, all recognised by past ecological scientific analysis, continue to be excluded from the mapped areas of higher regulation.

In addition to representing flaws and shortcomings in the comprehensiveness of the river system mapping, these deficiencies leave those systems exposed to activities upstream or in adjacent areas which undermine overland flow, water quality, and other hydrological integrity concerns.

### 8.1.2 Spatial Option 2

One alternative approach to the status quo option is to expand current SEA/DP boundaries to add in river and floodplain areas and special ecological features that were previously identified as areas of higher protection under past river declarations. The key areas that could be captured in this approach would be the previous High Preservation Areas, Special Floodplain Management Areas and Special Features that were components of the pre-2014 (Wild Rivers) protections.<sup>44</sup>

<sup>44</sup> It is not proposed that Nominated Waterways be included in Spatial Options 2 or 3.



The advantage of Spatial Option 2 is that it provides and restores greater integrity to identifying and recognising the rivers and floodplains areas of greatest ecological significance, and policy interest. In particular, this means areas in the upper parts of the river systems presently omitted from the SEA/DP would be included. Similarly, some refinements to the floodplains and adding in of special ecological features makes the recognised SEA/DP areas more comprehensive. These were all previously identified through extensive scientific analysis and also community consultation under the previous (pre-2014) rivers protection framework. As these are areas that have previously been mapped and protected, it is a simple process of applying former but retained statutory mapping layers to the current SEA/DP statutory mapped areas.

The disadvantage of this option lies in the process of changing boundaries. At the administrative level, this is not difficult and involves no real cost or workload. For entities or individuals operating near to or in the areas, the changes would require a small investment of time in reviewing and updating any materials or planning based on the current boundaries.

It should be highlighted that any spatial extensions to DP will also involve an extension of the current regulatory provisions associated with unacceptable uses within the DP areas. This includes open cut mining and dams. However, it should also be stressed that such extensions of current regulations would not be retrospective in terms of affecting existing operational activities, nor would it restrict activities adjacent to the DPs or those underground including potentially underneath rivers and floodplains providing there is no direct interaction with the surface and shallow subsurface hydrological processes.

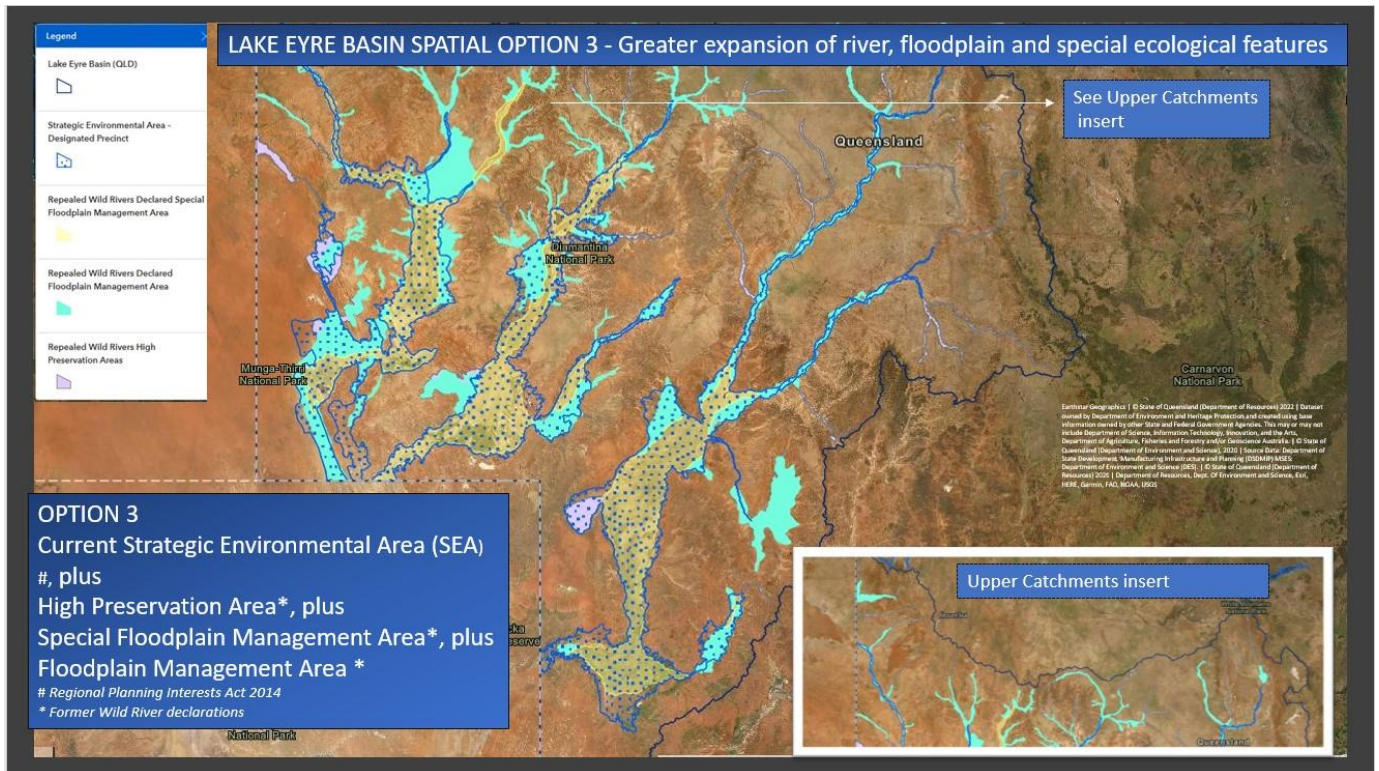
This spatial option is not expected to impact on critical new economy mineral mining. However, to support its Queensland Energy and Jobs Plan and its Climate Action Plan, the Queensland government may in the future seek to vary provisions for extended Designated Precinct areas, subject to standard impact assessment and approval processes, where critical new economy minerals are identified and cannot be extracted from outside of those areas.

### 8.1.3 Spatial Option 3

A further approach to the status quo option is to build on Spatial Option 2 by adding in other floodplain protection areas that include additional areas of ecological significance, adding to the breadth of spatial coverage of hydrological features.

The advantage of Spatial Option 3 is that it augments Spatial Option 2 by including additional river, floodplain, and special ecological features, thus providing even greater protections for those features against the risks posed by resource sector activities. These areas were previously mapped under past river declarations.

The disadvantages of Spatial Option 3 are a compounding of the need for entities or individuals operating near to or in the areas to review and potentially revise plans, where this extends into areas not previously mapped at the higher level of significance. Administratively, this is not difficult and involves no real cost or workload as the previous mapping layers still exist and can easily be added to the statutory map. Extension of unacceptable uses (such as open cut mining) and potential exceptional variations under Option 2 would apply.



## 8.2 Regulatory (permitted future activities) options

Current oil/gas activities may pose risks to the river systems, and require close management, but in the main they are not heavily industrialised *in-situ*, and do not require high impact activities such as deep and intensive hydraulic fracturing and all the ancillary issues this process entails.

However, particular potential future high impact activities and associated infrastructure on the floodplains/ivers within ecologically sensitive areas (such as rivers, streams, floodplains and other watercourses) may be much more likely to represent risks and potential threats to water quality in the river systems and to cultural values in those landscapes.

These future high impact activities include unconventional resources extraction of shale gas, shale oil, deep coal gas, and tight gas, each of which requires deep and intensive hydraulic fracturing, utilisation of fracking chemicals and larger scale infrastructure. There are other concerns about water extraction, water usage and the storage and disposal of flowback (water and fracking fluids) associated with unconventional resources extraction in watercourses or on floodplains, particularly in the context of overland flow. Linear infrastructure related to those activities can also impede alter or reduce the flow and drainage of water. Future 'instream' mining (mineral resources extraction in watercourses or on floodplains) poses similar risks.

Properly safeguarding the natural state of the Queensland LEB will allow existing agriculture, including organic production, to continue, and will support greater capacity to attract tourists to the region, supporting local businesses, and contribute significantly to the region's economy.

Mineral mining in the Queensland LEB is already subject to regulation under the EP Act and the RPI Act. Open cut mining is an unacceptable use activity within the DPs, but there are no similar restrictions to underground mining or to mining away from the DPs. Changes to the boundaries of the DP would extend these provisions spatially, but would only apply to projects not already in operation.

### 8.2.1 Regulatory Option 1 (status quo)

The baseline option is to retain the existing legislative and regulatory regimes, and work on the assumption that the current assessment and approval processes will adequately manage future activities and heightened risks.

Existing legislative and regulatory regimes would need to be effective in the face of increased industrialisation, significantly more intensive hydraulic fracturing, chemical and water usage, greater risk of pollution, and increased likelihood of interruptions to overland flow and impacts on water quality.

The advantage of this lies in it requiring no change to the current approach. While there are periodic minor adjustments to assessment and approval processes which allow for minor adjustments to the existing regulatory regimes, this option would essentially maintain the status quo for both expansions of existing operations, and the development of new ones, both conventional and unconventional, with possible adaptation in an effort to keep up with increased industrialisation and new extraction methods.

The disadvantage of this option is that it assumes the current approach is the optimal one, and that it will continue to be fit for purpose despite the potential roll out of activities that it was not designed to manage from an operations, risks and compliance perspective. The ongoing health of the river systems and the maintenance of water quality, which is a critical factor for agricultural productivity, tourism, cultural integrity, and town supply will be reliant on such an assumption.

It should be noted that this regulatory option will have no bearing on future critical new economy minerals mining extraction in the Queensland LEB.

### 8.2.2 Regulatory Option 2 (potential augmentation to the status quo)

Beyond the periodic minor adjustments to assessment and approval processes which allow for incremental enhancements to the existing regulatory regimes, there could be an option to augment the existing arrangements to be more explicit about what is acceptable and unacceptable under the broad rubric of the current regulatory regime.

The approach in this context would be to accept that there *may be* some circumstances in which the current assessment and approval processes will not adequately manage future activities and heightened risks. However, projects or proposals (conventional or unconventional) could be assessed on a case-by-case basis, with considerations including how to best manage possible increased risks from greater industrialisation and new extraction methods.

The focus would be on strengthening existing provisions under the EP Act, as well as under the RPI Act, but with a heightened focus on risk management principles to adopt a greater precautionary approach, and potentially with increased compliance and regulatory oversight of activities.

Additional measures under this broad option could include, for example, better defining certain 'unacceptable uses' in the DPs, such as permanent gas processing facilities, regulated dams, landfill, large sewage treatment facilities, and major overground pipelines. Certainty of 'acceptable' developments authorised in the DP could also be provided, including exploration, appraisal and development activities, wells, pumps and flowlines, access tracks, laydown areas, temporary camps, fuel storage for well operations, and hydraulic fracture stimulation.

Operators could also be required to anticipate moderate and major flooding events, and implement conditions to cease drilling or related activities when water was present or anticipated on well sites.

Industry representatives have suggested that consideration could also be given to declaring a Cumulative Management Area for the Cooper Basin under the *Water Act 2000*, overseen and coordinated by the independent Office of Groundwater Impact Assessment (OGIA) – though the case for, and merit of, such a declaration requires testing given that the focus of a CMA is on groundwater, and the key risks to the LEB region relate to surface water and alluvial systems.



The advantage of Regulatory Option 2 lies in its reliance on the existing broad regulatory approach to deliver case specific enhancements which requires moderate amendments to the current approach. While there are periodic minor adjustments to assessment and approval processes which allow for enhancements to the existing regulatory regimes, this option would essentially maintain the status quo while providing a greater adherence to risk management and more regulatory oversight and compliance.

The disadvantage of this approach is that it is quite intensive in terms of demands on the regulator in assessing the particulars of any proposals, and potentially in future compliance activities. It could also introduce a degree of uncertainty for industry proponents, where the application of requirements may not be entirely consistent from one case to another or over time.

In the context of the threats to the ecology and cultural values of the rivers and floodplains mentioned elsewhere, and in light of capacity to adequately condition the risks, this approach may fall short of adequately managing all of the risks that could materialise over time. It does not apply a blanket approach to regulating new high impact activities, which may create longer assessment and approvals periods for individual proposals.

It may therefore require significant investment in resources to support the Regulator in its work, including in more rigorous onsite inspections, and compliance monitoring. It also creates the potential for considerable uncertainty for proponents and the impressions of inequity in outcomes, while also not delivering clarity and certainty from an ecological and cultural protection perspective.

In terms of responses to flooding events, it does not recognise that hydrological processes in the Queensland LEB are far more complex and less predictable than singular, predictable events. While it may be possible to move drilling rigs, it is not possible to move well heads, borrow pits and other onsite infrastructure. According to Traditional Custodians from the region, major flooding happens every 40–50 years, and what has been seen since the mid-1970s are only moderate floods. This means the oil and gas industry has only encountered one truly major flood event (in the mid-1970s) since conventional oil and gas first appeared in the region. On the basis that full production in the Queensland LEB has only been from the mid-1980s, this means industry has never had to properly respond to a major flooding event on the floodplains. The risks with what might happen with unconventional activities and all the associated increased industrialised footprint on floodplains in these contexts is a totally unknown and unclear scenario.

It should be noted that this regulatory option is not anticipated to have any bearing on future critical new economy minerals mining extraction in the Queensland LEB.

### 8.2.3 Regulatory Option 3 (unconventional oil and gas extraction on rivers and floodplains deemed unacceptable activity)

Another alternative approach to the status quo option is to seek to proscribe future **unconventional**<sup>45</sup> oil/gas extraction in the floodplains and rivers as ‘unacceptable uses’ in the Designated Precinct on the basis they represent **new high impact activities**<sup>46</sup> which will create unacceptable risks. The exact footprint of the floodplain and rivers areas within which such activities would be prohibited from will be derived from the spatial option that is eventually selected as the future Designated Precinct areas included in the statutory map for Queensland LEB.

While existing oil/gas activities may pose risks to the river systems, and require close management, in the main they are not heavily industrialised *in-situ*, and do not involve ‘high impact activities’ such as deep and intensive hydraulic fracturing and all the ancillary issues this process entails.

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<sup>45</sup> Defined, with reference to the CSIRO and GeoSciences Australia definitions (see GBA reports) which focus on the extraction processes, including full-scale fracking and related activities for shale oil and shale, tight and (deep) coal gas. See Glossary for definitions.

<sup>46</sup> This will need to be defined via with reference to additional Regulation or via policy guidelines.

However, as described above potential future activities and associated infrastructure on the floodplains/ivers within ecologically sensitive areas (such as rivers, streams, floodplains and other watercourses likely to represent greater risks and potential threats to water quality in the river systems and to cultural values in those landscapes. These include unconventional resources extraction of shale gas, shale oil, deep coal gas, and tight gas, each of which requires deep and intensive fracturing, utilisation of hydraulic fracturing chemicals and larger scale infrastructure.

There are other concerns about water extraction, water usage and the storage and disposal of flowback (water and hydraulic fracturing fluids) associated with unconventional resources extraction in watercourses or on floodplains, particularly in the context of overland flow. Linear infrastructure related to those activities can also impede, alter or reduce the flow and drainage of water.

The definition of ‘high impact activities’ could include the following:

- intensive hydraulic fracturing, using chemicals and including diagonal/horizontal drilling
- groundwater extraction for fracturing and other exercise of underground water rights
- contaminant storage and contaminant disposal
- high impact well sites, borrow pits and petroleum (oil and gas) facilities
- Other supporting infrastructure which could impact on overland flow or water quality.

### Draft definitions of ‘high impact petroleum and gas activities’

High impact petroleum and gas activity to be included in amendment regulation	Rationale
<p><b>Groundwater extraction for hydraulic fracturing</b> means—</p> <p>Taking of groundwater for hydraulic fracturing of shale, tight or coal seam gas wells, where:</p> <ul style="list-style-type: none"> <li>• it does not happen during the course of, or results from the carrying out of another authorised activity for a petroleum tenure; and</li> <li>• a water permit or water licence, as defined under the <i>Water Act 2000</i> is required.</li> </ul> <p>This applies to water take under both a water plan and/or underground water area.</p>	<ul style="list-style-type: none"> <li>• Technology has increased significantly, and more recent studies indicate regulation is required.</li> <li>• Independent CSIRO report identified water take in the shale and tight industries as requiring a high degree of regulatory focus due to higher fracturing rates. According to Department of Resources, both shale and tight gas activities require hydraulic fracturing of all wells.</li> <li>• Scientific expert panel identified this as a high-risk activity, as the Lake Eyre Basin is recognised for its global significance of groundwater and springs.</li> <li>• Connectivity between the aquifers may result in a direct drawdown of groundwater from overlying aquifers or depressurisation of overlying aquifers.</li> <li>• Drawdown of aquifers must be considered as a cumulative impact across the entire basin; however, there is a general lack of information as to what constitutes a baseline for groundwater across the state, making it difficult to assess cumulative impact.</li> </ul>
<p><b>Exercise of underground water rights</b> means—</p> <ul style="list-style-type: none"> <li>• Where related to a tenure under the <i>Petroleum and Gas (Production and Safety) Act 2004</i>—taking or interfering 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.</li> <li>• Where related to a tenure under the <i>Petroleum Act 1923</i>—taking of water necessarily taken as part of production testing or petroleum production under one or more tenures.</li> </ul>	<ul style="list-style-type: none"> <li>• Technology has increased significantly, and more recent studies indicate regulation is required.</li> <li>• Independent CSIRO report identified significant water take associated with the CSG industry.</li> <li>• Scientific expert panel identified this as a high-risk activity, as the Lake Eyre Basin is recognised for its global significance of groundwater and springs.</li> <li>• Connectivity between the aquifers may result in a direct drawdown of groundwater from overlying aquifers or depressurisation of overlying aquifers.</li> <li>• Drawdown of aquifers must be considered as a cumulative impact across the entire basin; however, there is a general lack of knowledge as to what constitutes a baseline for groundwater across the state, making it difficult to assess cumulative impact.</li> </ul>
<p><b>Hydraulic fracturing</b> means—</p>	<ul style="list-style-type: none"> <li>• Technology and occurrences have increased significantly.</li> </ul>

High impact petroleum and gas activity to be included in amendment regulation	Rationale
<ul style="list-style-type: none"> <li>• A technique used to increase the permeability of natural underground reservoir that is undertaken above the formation pressure and involves the addition of chemicals.</li> <li>• This includes:                             <ul style="list-style-type: none"> <li>○ hydraulic fracturing</li> <li>○ hydrofracking</li> <li>○ fracture acidizing</li> <li>○ use of proppant treatment.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Risks associated with fracking may include:                             <ul style="list-style-type: none"> <li>○ introduction of contaminants to aquifers</li> <li>○ increased connectivity between aquifers</li> <li>○ seismic activity</li> <li>○ impacts of chemical breakdown</li> <li>○ sediment accumulated between vertical faults could be forced out, connecting the various strata, and resulting in greater aquifer connectivity and drawdown.</li> </ul> </li> </ul>
<p><b>Contaminant storage</b> means—</p> <ul style="list-style-type: none"> <li>• Land-based containment structures, levees, bunds, voids and dams constructed as part of environmentally relevant activities on the petroleum tenure.</li> <li>• Includes structures rated as low, high or significant under the <i>Manual for assessing consequence categories and hydraulic performance of structures</i>.</li> <li>• Flare pits and storages for drilling/stimulation fluids.</li> <li>• This excludes:                             <ul style="list-style-type: none"> <li>○ storage structures and waste disposal not associated with a petroleum tenure</li> <li>○ water storage dams</li> <li>○ an end of waste resource.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Contaminant facilities identified by the Scientific Expert Panel as a high risk activity on floodplains due to potential for overtopping or leaching.</li> </ul>
<p><b>Contaminant disposal</b> (general and regulated) means—</p> <p>All waste disposal (including, but not limited to, operational by-products of any kind, including sewage, contaminant fluids, and garbage) in or on land or waterways.</p>	<ul style="list-style-type: none"> <li>• Contaminant facilities identified as a high risk activity on floodplains due to potential for overtopping or leaching.</li> </ul>
<p><b>High impact well sites</b> means—</p> <ul style="list-style-type: none"> <li>• single well sites greater than 1 hectare disturbance</li> <li>• multi-well sites greater than 1.5 hectare disturbance</li> </ul>	<ul style="list-style-type: none"> <li>• Thresholds are based on authorised petroleum activities under pre-2014 river protection declarations for Cooper and Georgina/Diamantina.</li> <li>• Consistent with thresholds in the definition of essential petroleum activities.</li> <li>• Scientific expert panel recognise the importance of floodplain ecosystems and recommend all gas wells be excluded from frequently flooded areas (designated precinct).</li> </ul>
<p><b>Supporting infrastructure</b> means—</p> <ul style="list-style-type: none"> <li>• Campsites/workforce accommodation that:                             <ul style="list-style-type: none"> <li>○ is fixed at any location for a period of more than 6 months; or</li> <li>○ is more than 1 hectare; or</li> <li>○ accommodates 60 people or more; or</li> <li>○ is within 200 lateral metres of a watercourse, lake or spring</li> <li>○ located within pre-existing areas of clearing or significant disturbance</li> </ul> </li> <li>• Sewage treatment plants that are determined to:                             <ul style="list-style-type: none"> <li>○ be an environmentally relevant activity under the Environmental Protection Regulation 2019; and</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Consistent with wild rivers which effectively prohibited:                             <ul style="list-style-type: none"> <li>○ permanent campsites/workforce accommodation</li> <li>○ sewage treatment plants</li> <li>○ borrow pits</li> <li>○ the construction of infrastructure for processing or storing petroleum or by-products.</li> </ul> </li> <li>• The scientific expert panel identified the high risk of infrastructure on overland flow, fish passage and major impacts to floodplain ecosystems, including diverting watercourses. The panel noted this is particularly evident in the arid environment of the Lake Eyre Basin where flow paths are easily disrupted. The panel was not prescriptive in defining particular types of infrastructure that were higher risk however it was recommended that construction of raised infrastructure be limited. There was extensive</li> </ul>

High impact petroleum and gas activity to be included in amendment regulation	Rationale
<ul style="list-style-type: none"> <li>○ include release of sewage, treated sewage effluent or solid waste (biosolids) to land or water</li> <li>● A petroleum facility under the <i>Petroleum and Gas (Production and Safety) Act 2004</i>, excluding transportation infrastructure. Examples include:               <ul style="list-style-type: none"> <li>○ storage depot</li> <li>○ processing plant</li> <li>○ refinery</li> <li>○ compression hubs<sup>47</sup></li> <li>○ water treatment.</li> </ul> </li> <li>● Borrow pits greater than:               <ul style="list-style-type: none"> <li>○ 0.2 hectares in area; and</li> <li>○ more 2m in depth; or</li> <li>○ located within 200m of a watercourse, wetland or spring; or</li> <li>○ 50m of a drainage feature; or</li> <li>○ 500m from another site.</li> </ul> </li> </ul>	<p>discussion from the SEP on the impacts of above ground linear infrastructure (broadly defined as roads, rail, pipelines, viaducts, channels etc.) and the need for appropriate assessment/conditioning requirements.</p>

Any changes would not be retrospective so they would not impact on current activities which are already approved in the region. Future ‘instream’ mining (mineral resources extraction in watercourses or on floodplains) poses similar risks, given open cut mining is already an unacceptable use in the mapped DP, and this would be automatically extended under Spatial Options 2 and 3<sup>48</sup>. However, this would not apply to existing operational activities.

To protect the river systems and floodplains into the future and avoid the potential for widespread and irreversible impacts arising from significantly industrialised activities, a precautionary approach<sup>49</sup> is needed. It is not clear that the current planning and regulatory frameworks are strong enough to protect the river systems of the Queensland LEB from these possible impacts they are untested in such scenarios, and there are benefits for industry, community and the ecology from delivering clarity and certainty. This can help ensure risks are proactively prevented in the most ecologically sensitive areas of the region, while supporting sustainable economic activities across the region.

Analysis has been conducted of particular areas close to the Georgina and Diamantina Rivers which are or may be prioritised for so-called ‘new economy minerals’ in terms of impacts on mineral mining activities in the North West Minerals Province, noting that any extensions to the DPs would only impact proposed future operations and not existing ones.

There are inherent risks from instream mining to local and downstream ecological and cultural values, and the potential to damage water quality throughout the systems. There are also considerable engineering and logistical challenges with such practices. Given that this regulatory option would be spatially limited to the DP areas (existing or expanded), there are alternative approaches available to proponents – such as employing underground mining methods and technology, and avoiding watercourses in any surface activities. Accordingly, in practice such impacts can be simply minimised

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<sup>47</sup> A centralised facility that compresses gas and if required, treats gas to supply specifications. May include (but is not limited to) compression units, turbine alternators, dehydrator packages, water separator and treatment, flares, diesel generators and storage, air compressors, control room, office, workshops, access roads/tracks etc.

<sup>48</sup> for example quarry resource activities required to support infrastructure needs, regulated by the *Forestry Act 1959* by means of quarry materials is not intended to be restricted

<sup>49</sup> See precautionary principle definition in the glossary

through proponents' avoidance of river and floodplain areas when it comes to surface disturbances or direct operations.

On that basis, it is not intended that this regulatory option limits the capacity to extract 'new economy' or other essential minerals away from sensitive river areas, in the same way that it is not intended to limit future oil and gas resources away from rivers and floodplains. As open cut mining is already an unacceptable use in existing DPs, such activities are only a consideration insofar as any spatial extensions to DPs affect future plans. Outside of the DPs, existing or extended, it is not intended there be any additional regulatory restrictions on mineral mining in the North West Minerals Province.

The advantage of Regulatory Option 3 is that it takes a clear precautionary approach to future risks and threats, which are conceivable and foreseeable in the context of LEB floodplains. It obviates the need for proponents to seek approvals under the existing or modified regulatory regimes in essentially novel, untested scenarios where:

- impacts of water requirements, pollution risks and potential significant interruptions to overland flow are present;
- the capacity of the existing regulatory and planning framework is unknown and untested; but
- the consequences of things going wrong could be catastrophic.

It also avoids potentially complex regulatory assessment work for both proponents and the Regulator. Meanwhile, the benefits to the environment, cultural heritage protection, agricultural production, tourism and river system intactness would be prioritised as known and proven activities or outcomes.

The resources sector would also be provided with clarity and certainty over where it can operate under existing regulatory approaches, and where certain activities would be restricted. While potential future unconventional oil and gas extraction remains a prospect in the Queensland LEB, with only theoretical, unproven benefits, Regulatory Option 3 would reduce the investment risks and uncertainties from exploration in more challenging locations, and encourage a focus on less risk areas. The ongoing availability of areas away from the rivers and floodplains will enable companies to make more informed commercial decisions about investments, financial risks and anticipated returns.

A disadvantage of this option from a legislative perspective, and potentially from an industry one, is the administrative complexity in delineating between conventional and unconventional resources activity, and high impact activities, in statute or other regulatory instruments.

While the resources themselves are not easily distinguished as conventional or unconventional, the methodologies for extraction are distinct, owing to the levels of industrialisation and intensity of fracing, water use/storage, and footprint impacts. This would need to be comprehensively described and captured under legislation or regulation, and might create unintended definitional issues.

The limits on some potential unconventional oil/gas extraction may impact on the theoretical value tenements for some resource sector operators, but this must be seen against the unproven prospectivity of the basin. Existing infrastructure is limited and the viability of the reserves are questionable given that they are extremely deep and likely to be complex and prohibitively expensive to extract. In addition, the long lead time in exploring, developing and extracting potential gas deposits makes it difficult to forecast the value of gas production in the Cooper Basin. Longer-term future demand for gas is uncertain, as investor sentiment shifts on the place of fossil fuels in a carbon constrained future energy and climate policy context.

The greatest impact of this option is clearly on the oil/gas sector, given it would limit some production in some areas of the Cooper Basin and the other Queensland LEB river systems. However, only a small proportion of the estimated value of \$8.4 billion (conventional) and a theoretical \$15.8 billion (unproven unconventional) of resources for the entire basin would be located in DPs. For example, analysis of the area of the DP in the Cooper Creek which would overlap with the most productive reserves in the Cooper Basin are estimated to only be a small percentage of the total in the case of shale and deep coal gas, and less than half of the limited tight gas theoretically available. As any changes to regulation would not be retrospective there will be no impact on current industry viability.

The ecological and cultural benefits, and the associated potential benefits to the agricultural sector, tourism and townships from the cleanest possible environment and free-flowing rivers and overland flow

are close to impossible to quantify, but are obvious and undeniable.

It should be noted that this regulatory option will have no bearing on future critical new economy minerals mining extraction in the Queensland LEB.

### **8.2.4 Regulatory Option 4 (all future oil and gas extraction on rivers and floodplains deemed unacceptable activity)**

Regulatory Option 4 builds on all the identified precautionary and practical rationales for proscribing certain oil and gas activities on the floodplains and rivers mapped as DPs described in Regulatory Option 3, but seeks to disregard the distinction between conventional and unconventional, and instead proposes to prohibit **all future oil and gas activities** in these areas. This would result in all new oil and gas extraction in the floodplains and rivers being regarded as high impact activities and thus unacceptable in the DPs. This would not affect or impact on existing activities, nor apply retrospectively.

In terms of potential impacts under this option on mining activities in the North West Minerals Province, these would apply consistently with the discussion in Regulatory Option 3.

The advantage of this approach is that it would deliver a more inclusive regime of allowable and non-allowable activities based on a strong precautionary approach, which is also administratively easier to craft. It avoids the risks of unintended definitional gaps and unforeseen regulatory outcomes between conventional and unconventional gas, and is comprehensively preventative when it comes to future risks from resources extraction.

The disadvantage of Regulatory Option 4 is that it applies a blanket approach to any new resources activities in the floodplains and rivers mapped as DPs, capturing some future conventional operations that would involve the same methods and risks as those associated with existing conventional operations. This would restrain the capacity to extract some known and proven conventional resources in DP areas, and could arguably result in unfair commercial advantages to operators already extracting conventional resources over those planning conventional oil or gas operations .

While there is reasonable uncertainty about unconventional resource extraction, the Queensland Resources Industry Development Plan indicates that the resource sector is seen as a core part of the state's economic health, principally through royalties income. While new economy minerals have been a key focus in this regard, the Queensland government will likely require ongoing supply of conventional gas as a domestic energy source for the foreseeable future, until renewables and storage is able to fully displace other energy sources.

It should be noted that this regulatory option will have no bearing on future critical new economy minerals mining extraction in the Queensland LEB.

## **8.3 Options for capturing environmental attributes of river systems**

Some potential amendments to the 'environmental attributes' applied to the Queensland LEB river systems have been identified for consideration. These concern the environmental attributes that are already captured in legislation, but which currently exclude important ecological functionality and hydrological processes which have been incorporated in previous river protection. Issues include:

- specifically citing systems/locations and connectivity such as braided channel networks, terminal wetlands and lakes, aquifers, off-stream water bodies and adjacent floodplains.
- identifying hydrological variability, and ensuring explanations of water quality include physical, chemical and biological attributes, which provides a context for water quality analysis.
- referencing geomorphic characteristics, riparian function (including vegetation) and wildlife corridor functionality.

One option in response is to do nothing, and retain the status quo based on existing definitions of environmental attributes. This constrains the attributes to the following current matters: natural hydrological processes; the natural water quality in the stream channels and aquifers and on flood plains; and the beneficial flooding of land that supports flood plain grazing and ecological processes in the area.

However, this risks leaving an incomplete and ecologically-deficient approach to environmental attributes in place. The alternative approach is to address this deficiency, and make the environmental attributes descriptions more comprehensive. This would be administratively simple, and make little difference in practice to existing operations and practices. The additional proposed attributes in this case would include the natural geomorphic processes, functioning riparian processes, and functioning wildlife corridors identified issues above.

These additional environmental attributes were included under the previous rivers protection framework. The inclusion of the additional attributes will ensure that any regulated or resource activity will not result in widespread or irreversible impacts on the attributes and in turn, support the ongoing ecological sustainability of the area. Ongoing protection of the region is of particular importance to First Nations Peoples who wish to maintain the cultural and all the environmental values of the region.

The inclusion of the additional attributes may increase the cost of project design and the time taken to provide further information as part of the RIDA assessment. As with the impacts of the SEA, given that much of the information will be collected as either part of an application for an environmental approval or as part of an environmental impact statement the extra costs are not expected to be significant. However, there may be some limits on activities or their location. The costs for the agriculture sector, if any, are expected to be minor. It is not expected to result in any costs for the tourism sector.

## 8.4 First Nations aspirations and Cultural Heritage protections

It is acknowledged that protecting the rivers and floodplains of the Queensland LEB can support protection of both ecological and First Nations cultural values, and can facilitate the economic and social aspirations of First Nations people in the region.

The LEB Traditional Owners Alliance has stated:

“For the Traditional Owners, caring for country is more than a matter of economic prosperity, it is a sacred and ancient traditional responsibility carried forward from mother to daughter, father to son and includes social, environmental, and cultural considerations. Traditional people live by the seasons and think of country as their mother and of water as the sacred lifeblood, keeping them connected through hunting, fishing, and ceremonial practices. We are kept strong and understand our culture by connecting to the stories and songs that live in our country, and through them continue to observe our own traditional lore, customs, cultural boundaries and obligations.”

A key objective is ‘the conservation of the LEB for future generations’, which for the Traditional Owners Alliance involves “expanding the ‘designated precinct’ and expanding ‘unacceptable uses’ to high impact petroleum and gas activities... which should include roads, pipelines and gas wells and pads”.

However, the Traditional Owners Alliance is also looking beyond immediate regulatory changes, and is concerned about capacity building for First Nations peoples in the region. It is seeking ongoing support for the Traditional Owner Alliance “as a functional governance and advisory structure, so it can play a central role in decision-making about land and resource management in the Lake Eyre Basin.”

Traditional Owners also want the Alliance to play a greater role in monitoring and compliance of resource and other activities.

It is also recognised that concerns about First Nations Cultural Heritage and responsibility for Country can and do exist outside of determined Native Title areas. This highlights there is a need for engagement and consultation with First Nations peoples that goes beyond Native Title processes<sup>50</sup>.

There is a formal review of the *Aboriginal Cultural Heritage Act 2003 and the Torres Strait Islander*

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<sup>50</sup> It is noted that Queensland’s social impact assessment process must also be considered for large resource/coordinated projects requiring environmental impact assessment under the EP Act, and SDPWO Act. This includes requirements for particular projects to address First Nations peoples matters that build cultural capability and participation, including tailored consultation during project planning and assessment, ongoing stakeholder engagement framework and prioritising workforce and procurement opportunities.

*Cultural Heritage Act 2003* underway, led by the Department of Seniors, Disabilities Services, and Aboriginal and Torres Strait Islander Partnerships. The LEB Traditional Owners Alliance has previously submitted that “the Aboriginal Cultural Heritage Act does not currently protect our cultural heritage – it cannot be relied upon to defend gas operations on our land”, and that:

- “It pits Aboriginal peoples against the gas company directly, which is a power imbalance, and which often causes division in mobs to the benefit of the gas company
- It doesn’t require Free Prior and Informed Consent or self-determination
- Insufficient information is provided of proposed activities and possible impacts to heritage
- Fast time frames pressure TOs without respect of culturally appropriate decision-making processes
- It doesn’t protect our intangible heritage in the cultural value of the floodplains for our dreaming stories and cultural practices”.

It is also recognised that section 28 of the *Human Rights Act 2019* creates obligations on government to protect, respect and promote First Nations’ rights to Cultural Heritage. This is especially significant given the Queensland government’s announcement of a formal Path to Treaty. This included a statement of commitment signed between the Queensland government and Queensland First Nations peoples foreshadowing legislation that will enshrine the treaty process, with independent bodies made up of First Nations and non- First Nations peoples to set the framework for truth telling and healing.

## **Proposed responses**

In responding to these issues and concerns, it is anticipated that the Queensland government will examine how best to address inequities and inadequacies in how Country is formally recognised and acknowledged, and how First Nations Traditional Custodians are supported and enabled to care for their Country. Without addressing such inequities and inadequacies, there are risks of loss of Cultural Heritage and denial of Cultural Rights, and a missed opportunity to support and facilitate the realisation of a range of priorities and aspirations highlighted by First Nations people from the Queensland LEB region, expressed through the LEB Traditional Owners Alliance.

### **8.4.1 Improved formal recognition of Country and Cultural Heritage**

It is proposed that the Queensland government recognises the extensive presence of First Nations People’s Cultural Heritage across the Queensland LEB region, and accept First Nations people’s concerns for their Country and the expressed need for appropriate engagement and consultation beyond Native Title processes on matters relating to their Country.

This involves formally supporting a broader understanding of First Nations Traditional Custodianship that goes beyond Native Title processes, to ensure enhanced engagement and consultation in approvals processes. This would be consistent with other processes that are afoot concerning national processes on Constitutional Voice, Recognition and Truth-telling, as well as Queensland’s Path to Treaty. This approach could be advanced through the recently announced Treaty process, or through a stand-alone commitment from the Queensland government regarding the First Nations peoples of the Queensland LEB.

### **8.4.2 Improved capacity to support engagement and participation in decision-making**

It is noted that LEB Traditional Owners Alliance representatives have voiced concerns about the capacity and resource constraints of First Nations’ peoples relative to multi-national resource operators and the consequent imbalance in power that this causes. In response, it is recognised that, investment in training and funded professional positions for First Nations peoples in administration and governance, and in the areas of legal and technical expertise may be necessary to address the identified constraints and to ensure a more level playing field for effective engagement.

Improved capacity to engage with government, and to participate in decision-making processes for the LEB region continues to be raised by the LEB Traditional Owners Alliance on behalf of First Nations



peoples from the region. In response, the Queensland government will work constructively and collaboratively with LEB Traditional Owners Alliance members to consider how best to move forwards in achieving this outcome.

### 8.4.3 Realisation of First Nations peoples’ broader aspirations

Beyond addressing capacity constraints, the Queensland government will examine how best to enable the realisation of First Nations people’s aspirations for cultural, economic, social, and environmental opportunities and outcomes. This could include resourcing land and river management roles, promoting First Nations-owned and managed business, and enabling First Nations enterprises and entrepreneurialism such as those based on biodiscovery and traditional knowledge.

In the Queensland LEB, there are currently 17 paid Indigenous ranger positions in an area that is one third of Queensland. This compares to many hundreds of rangers funded by the Queensland government and Commonwealth across the state. There is a clear opportunity to build on the current ranger capacity, and broaden their scope and remit to support a range of river and land management activities.

Investment in Indigenous rangers has been shown to have a multiplying effect in building the capacity and governance within communities in which they operate. Skills in land management, fire, erosion, Cultural Heritage protection are valuable in their own right, but the benefits to health, wellbeing and capacity for employment and business in other areas increases the viability of remote towns and communities.

Biodiscovery is an emerging industry in the Queensland LEB. Existing nanofibre and bio-oil enterprises in Camooweal, led by Myuma Group, point towards numerous commercial opportunities with large, global companies. Continued support for this First Nations-led industry could lead to expansion in this high-value, high-tech opportunity, and also support similar enterprises elsewhere.

First Nations-led tourism experiences are increasingly a drawcard for remote Australia. Tourism with First Nations’ operators focused on internationally significant wetlands and floodplains in the Queensland LEB region could be key to the high-value, low-impact sustainable tourism of the future. These opportunities can flourish with the right support for investment and capacity in First Nations entities and joint-ventures.

Additionally, working with investors like the Indigenous Land and Sea Corporation, First Nations-owned horticulture and grazing properties could be a focus for future land acquisitions for conservation and economic opportunities. The key objective overall is to ensure that outcomes which protect ecological and cultural values in the Queensland LEB region are also of direct and tangible benefit to the Traditional Custodians, whose ancestors have protected and relied on the region sustainably over millennia – a legacy which continues to the present day.

### Summary matrix of spatial and regulatory options and their potential outcomes

<i>Option / consideration</i>	<i>Adequacy of river system protections</i>	<i>Supports sustainable economic activities</i>	<i>Potential impacts on industry</i>	<i>Supports First Nations aspirations</i>	<i>Resilience to climate change impacts</i>
<b>Spatial Option 1 (Status quo)</b>					
<b>Reg Option 1 (status quo)</b>	Existing integrity inadequacies and risks remain.	Current activities sustained; future tourism limited.	No change	Current concerns remain; possible future limitations	No change to current risks
<b>Reg Option 2 augmented status quo – pre-determined acceptable activities</b>	Existing integrity inadequacies and risks remain.	Current activities sustained; future tourism limited.	No change	Current concerns remain, possible future limitations	No change to current risks
<b>Reg Option 3 Unconventional not</b>	Risks reduced, integrity	Current activities sustained, future	Some limitations to	Increase to capacity to	Opportunity to build better

<i>on floodplains</i>	inadequacies remain	tourism improved	possible future unconventional	address aspirations	climate resilience
<b>Reg Option 4 Future oil/gas not on floodplains</b>	Risks minimised integrity inadequacies remain	Current activities sustained, future tourism improved	Greater limitations to possible future resources	Increase to capacity to address aspirations	Enhanced opportunity to build climate resilience
<b>Option / consideration</b>	<b>Adequacy of river system protections</b>	<b>Supports sustainable economic activities</b>	<b>Potential impacts on industry</b>	<b>Supports First Nations aspirations</b>	<b>Resilience to climate change impacts</b>
<b>Spatial Option 2 (extent to include pre-2014 HPAs and SFMZs)</b>					
<b>Reg Option 1 (status quo)</b>	Integrity inadequacies improved, risks remain.	Current activities sustained, future tourism limited.	No change to oil/gas. Very limited change to mineral mines, none to critical NEM mining	Current concerns remain, possible future limitations	Small change to current risks
<b>Reg Option 2 augmented status quo – acceptable activities</b>	Integrity inadequacies improved; risks remain.	Current activities sustained; future tourism limited.	No change to oil/gas Very limited change to mineral mines, none to critical NEM mining	Current concerns remain, possible future limitations	Small change to current risks
<b>Reg Option 3 Unconventional not on floodplains</b>	Integrity inadequacies improved, risks reduced.	Current activities sustained, future tourism improved	Above + some limitations to possible future unconventional, none to critical NEM mining	Greater increase to capacity to address aspirations	Opportunity to build better climate resilience
<b>Reg Option 4 Future oil/gas not on floodplains</b>	Integrity inadequacies improved, risks minimised.	Current activities sustained, future tourism improved considerably	Above + greater limitations to possible future resources, none to critical NEM mining	Greater increase to capacity to address aspirations	Enhanced opportunity to build climate resilience
<b>Option / consideration</b>	<b>Adequacy of river system protections</b>	<b>Supports sustainable economic activities</b>	<b>Potential impacts on industry</b>	<b>Supports First Nations aspirations</b>	<b>Resilience to climate change impacts</b>
<b>Spatial Option 3 (extent to include pre-2014 HPAs and SFMZs plus additional FMZs)</b>					
<b>Reg Option 1 (status quo)</b>	Integrity inadequacies addressed, risks remain.	Current activities sustained, future tourism limited.	Same as Spatial Option 2	Current concerns remain, possible future limitations	Moderate change to current risks
<b>Reg Option 2 Augmented status quo – pre-determined acceptable activities</b>	Integrity inadequacies addressed, risks remain.	Current activities sustained; future tourism limited.	Same as Spatial Option 2	Current concerns remain, possible future limitations	Moderate change to current risks
<b>Reg Option 3 Unconventional not on floodplains</b>	Integrity inadequacies addressed, risks reduced.	Current activities sustained, future tourism improved	Same as Spatial Option 2,	Greater increase to capacity to address aspirations	Opportunity to build better climate resilience
<b>Reg Option 4 Future oil/gas not on floodplains</b>	Integrity inadequacies addressed, risks almost removed.	Current activities sustained, future tourism significantly improved	Same as Spatial Option 2	Greatest increase to capacity to address aspirations	Enhanced opportunity to build climate resilience

## 8.5 - Impact on the North West Minerals Province and new economy minerals mining

A key focus of the Queensland Resource Industry Development Plan is the 'North West Minerals Province', located in the north west of Queensland. This area is one of the world's richest mineral producing regions for lead, zinc, silver and copper, and deposits of 'critical' or 'new economy' minerals. These include copper, vanadium, bauxite, cobalt, graphite, tungsten, zinc and nickel, which are required for the development of a Queensland Battery Industry and other future economic developments.

The majority of the North West Minerals Province is outside the Queensland LEB region. Mining and associated industries account for around 12 per cent of the \$2.8 billion regional economic output for the Outback region, which is also not the same geography as the Queensland LEB.

The Queensland government's New Economy Minerals program includes currently operating mines, new exploration activities, and re-examining existing mines for secondary prospectivity. The latter uses new technology to consider re-opening old (abandoned) mines, and re-exploring potential new economy mineral deposits in tailings dams, and mineralisation of drill core samples with a focus on copper cobalt and vanadium. This is presently focused on sites north of Mount Isa, south and east of Cloncurry and around Julia Creek (none are in the Queensland LEB region). Similarly, the recent opening of the Saint Elmo vanadium mine, the development of a mineral demonstration processing plant in Townsville, and investment in the Flinders Highway and Mount Isa Rail line, are all located outside the Queensland LEB.

Mineral exploration and producing mines located in the Queensland LEB region include Cannington, the world's largest producer of silver and lead, Phosphate Hill, mining phosphate rock and manufacturing ammonium phosphate fertilisers, and Osborne Copper-Gold, recovering cobalt from the tailings of the Starra and Mount Dore deposits (refer to Map).

Spatial Options 2 and 3 canvassed earlier would involve some extensions to river, watercourse and floodplain areas as enhanced DPs, and would thus also widen the 'open cut mining as unacceptable uses' provisions that already apply within the DPs. However, the impacts of this are expected to be negligible in practice, given it is understood that the new economy minerals in the Queensland LEB occur deep underground (>500 metres), deeper than the minerals in the Mount Isa and Cloncurry regions, and will likely involve underground mines.

Access to critical new economy minerals is important to support the Queensland Energy and Jobs Plan and delivery of the Climate Action Plan, including the need to decarbonise the economy. Critical new economy minerals projects will be subject to standard impact assessments and approval processes, including assessment against any expanded Designated Precincts. The Coordinator-General may also play a role in examining such projects that cannot be wholly located outside Designated Precincts.

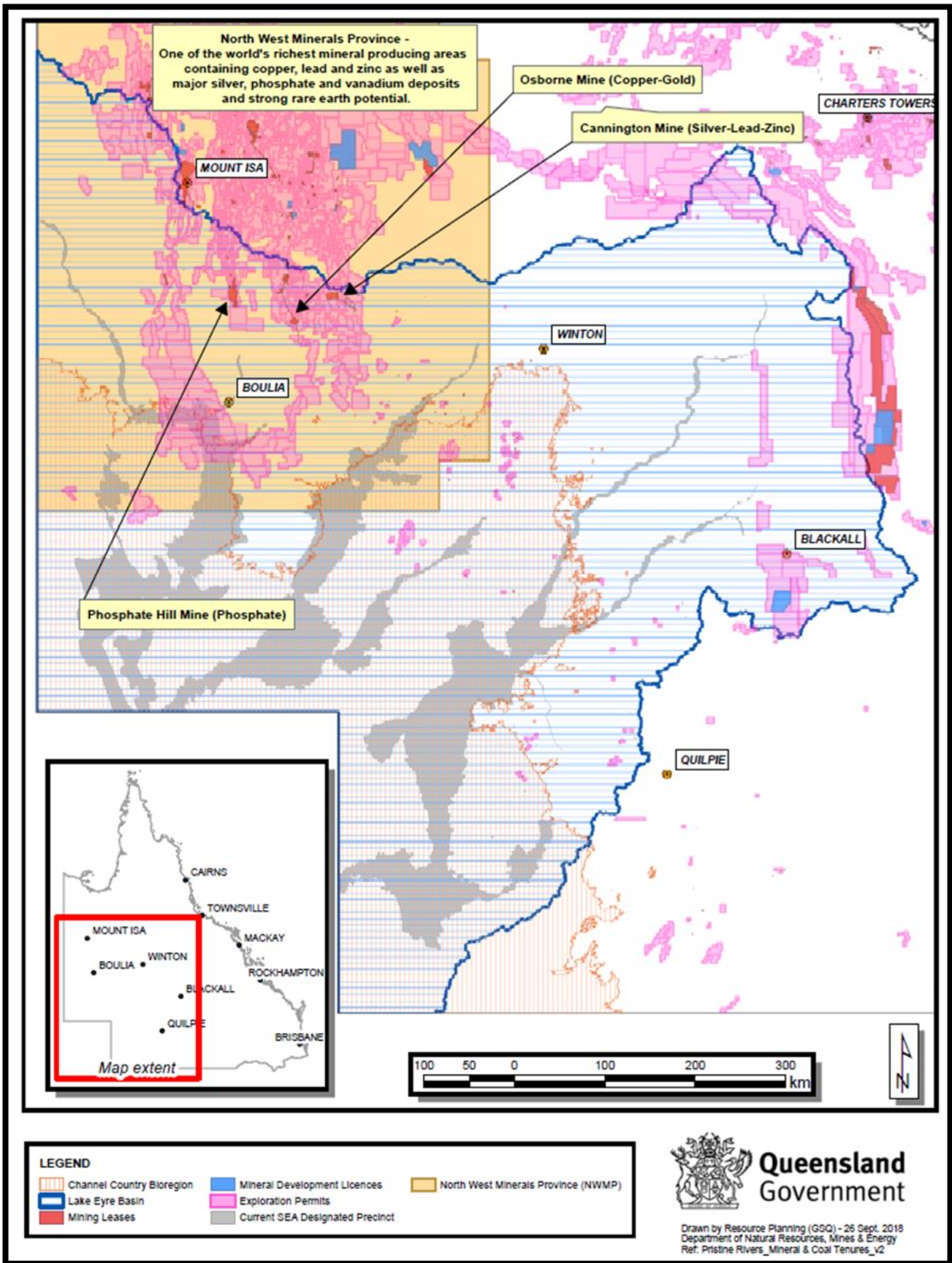
Even with open cut mining for minerals such as Phosphorus, suitable avoidance of such extraction in water courses ('in-stream mining') would ensure resources remain accessible for extraction. Open cut mining outside of the DPs is not excluded under the RPI Act and would be allowed, subject to appropriate assessment under the EP Act. Underground portals, tailings and water storage would need to be kept away from the watercourses.

Figure 1: Geographical scope

The Province spans 10 local government areas:  
 Burke Shire Council, Carpentaria Shire Council,  
 Cloncurry Shire Council, Croydon Shire Council,  
 Doomadgee Shire Council, Etheridge Shire Council,  
 Flinders Shire Council, McKinlay Shire Council,  
 Mount Isa City Council and Richmond Shire Council.



North West Minerals Province (State of Queensland, 2017)



## 9 Climate change issues

It is acknowledged that discussions of the future for the Queensland LEB are taking place in the context of climate change, and that both considerations of contributions to climate change and impacts from it may be matters the community wishes to comment on.

Oil and gas industries necessarily deal in fossil fuels (methane) extraction and other hydrocarbon production, the consumption of which make a contribution to global anthropogenic atmospheric warming and other climate change-related processes and effects. In turn, these effects can impact on values and functionality in the Queensland LEB, and are an additional significant threat to water resources, riverine ecosystems, biodiversity and endemic species. The current regulatory framework is concerned only with assessing the direct and immediate impacts of activities and is not designed to address the broader issues with climate change.

These comments are offered as non-controversial but indisputable statements of fact, and no further discussion of them is provided. The issues discussed throughout this RIS are concerned with managing and addressing risks to the local biophysical, environmental and cultural heritage assets from direct impacts of activities understood to represent the greatest threats and most challenging issues with maintaining ecological processes. Consequently, the intersecting issues of emissions intensive oil and gas exploration and extraction in Queensland LEB and imperatives to protect the floodplains and rivers of the region are noted but are not the subject of this RIS.

## 10 Conclusion and how to comment/respond.

This consultation RIS has laid out the key issues and options for government's consideration in the development and finalisation of a future framework for the Queensland LEB, centred primarily on the stated aspirations of First Nations peoples and the protection of the LEB's rivers and floodplains which are the lifeblood of the region's ecology, economy, cultures and communities.

DES looks forward to hearing your views about the future framework for the Queensland LEB. In particular, we are interested in your preferred options for best mapping the most sensitive areas of the rivers and floodplains of the region, for regulating future oil/gas risks and potential threats to those areas, and for properly recognising and protecting First Nations Cultural Heritage and environmental attributes of the river systems.

To provide your views and preferred options, you can:

- Complete the online survey on <https://intheloop.des.qld.gov.au/> to and choose your preferred options, and/or
- Email your written submission to [policyinitiatives@des.qld.gov.au](mailto:policyinitiatives@des.qld.gov.au)

Comments on the consultation Regulatory Impact Statement will close 5.00pm Friday 25 August 2023.

To contact the Strategic Policy Team in the Department of Environment and Science please email [policyinitiatives@des.qld.gov.au](mailto:policyinitiatives@des.qld.gov.au)

Following receipt of community feedback and responses to the options canvassed in this consultation RIS, the Queensland government will consider its preferred approaches. It is anticipated that a Decision RIS will be prepared by DES to provide a summary of the responses received, and recommendations for future spatial, regulatory and other approaches. This will include clear planning and processes to manage the required implementation of the adopted options and other related decisions including how they may be phased or sequenced. In any event, it is envisaged that there would be a communications strategy to support industry and community awareness.

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## Appendix 1

Lake Eyre Basin Stakeholder Advisory Group representatives were drawn from:

- Lake Eyre Basin Traditional Owners Alliance
- Desert Channels Queensland
- Australian Rivers Institute, Griffith University
- Agforce
- Pew Charitable Trusts
- Queensland Farmers' Federation
- Queensland Resources Council
- Australian Petroleum Production and Exploration Association
- RAPAD / Longreach Regional Council
- Lock the Gate Alliance

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<sup>i</sup> Tourism Research Australia