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ASX Announcement

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PARKWAY SECURES KEY APPROVALS FOR QBS BRINE MANAGEMENT COMPLEX (QBMC)

Highlights

- Key Environmental Authority (EA) and Development Application (DA) for QBMC approved.
- QBMC first regulated waste facility permitted to process both CSG waste brine and salts.
- Rapidly executing project development roadmap, aligned with industry developments.
- Release of CSG Regulatory Framework Report highlights major regulatory obligations.

MELBOURNE, Australia – Parkway Corporate Limited ("**Parkway**" or the "**Company**") (ASX: PWN, FSE: 4IP) is pleased to announce key approvals for the QBS Brine Management Complex (QBMC), including the Development Application (DA) have been approved.

Key Approvals

On 20 August 2026, Parkway was advised the relevant assessment authority, the Western Downs Regional Council (WDRC) has approved the DA for the QBMC. The approved DA encompasses additional approvals from the Queensland Government State Assessment and Referral Agency (SARA), including key Environmental Authority (EA), as well as State-Controlled Road Access Permit.

These key approvals support the accelerated development of QBMC, as the scope of these approvals covers both:

- **QBMC-CDP** (Stage 0, Commercial Demonstration Project)
  - In addition to processing a wide range of waste brines, the QBMC-CDP is intended to provide engineering data to underpin a final investment decision (FID) for full-scale commercial development of Stage 1. The nominal capacity of QBMC-CDP is anticipated to be 1/10th scale of the first commercial stage, Stage 1.
- **QBMC-Commercial** (Stage 1, strong financial metrics[1], NPV >$700 million, IRR >30%)
  - Stage 1 represents the first full-scale commercial development with a nominal processing capacity of ~75,000 tonnes of contained salts, in waste brine, annually.
  - Whilst Stage 1 represents a nationally significant scale of liquid waste management and chemical production infrastructure, the QBMC Master Plan involves the potential for staged development of up to 4 stages, a capacity that could notionally treat all the lifecycle waste brines produced by the coal seam gas (CSG) industry in Queensland[2].

[1] Indicative financial metrics, including basis outlined in the 2025 AGM Presentation: https://investorhub.pwnps.com/announcements/7280044

[2] Based on annual processing capacity of 75ktpa of contained salts in waste brine, across each of Stages 1 – 4, over nominal 20-year project life, for each stage. The cumulative processing capacity would result in the processing of approximately 6 million tonnes of contained salts.

Strategic Implications and Opportunity

As a result of securing key approvals, the QBMC will be the only regulated waste facility:

- permitted to process CSG derived waste brine and salts, and
- capable of converting the CSG derived waste brine and salts into valuable industrial chemicals, a beneficial use pathway that is required by the existing regulatory framework.

Important details about waste brine production, storage, processing and beneficial use related obligations of the CSG industry are outlined in a landmark technical report, *Regulatory Framework Review – The opportunity for beneficial use of CSG brine in Queensland*, released by Parkway. Additional details are summarised below in the *CSG Regulatory Framework Review* section, with the *Regulatory Framework Review* report attached in *Appendix 2*.

Since the large-scale development of the CSG industry in Queensland in 2010, the industry has produced significant waste brine volumes containing in excess of 3 million tonnes of salts, with the ultimate waste brine volumes forecast to increase significantly in future years.

Despite substantial investments in wastewater infrastructure, the vast quantities of waste brines generated by the CSG industry have not been beneficially processed and continue to be stored in regulated waste brine storage ponds, presenting significant environmental challenges and risks.

Notwithstanding these challenges, the CSG industry in Queensland continues to expand rapidly, with several recent announcements including on 20 March 2026[3], the significant expansion of the APLNG project securing approval for up to 1,695 additional wells with gas production potentially extending out to 2081. The projected life of CSG projects highlights the multigenerational rehabilitation challenges.

On 5 August 2026, Shell announced[4] that Arrow Energy an incorporated joint venture between Shell and PetroChina had approved plans to develop the next phase of its Surat Gas Project. The Surat Gas Project Central phase comprises 143 backfill wells and is expected to contribute substantial gas to the domestic market and to international LNG customers through the Shell QGC-operated LNG facility on Curtis Island, near Gladstone.

The expansion of the APLNG project in the Surat basin, and the new CSG wells associated with the Surat Gas Project Central[5] located in Hopeland south of Chinchilla in the Western Downs, are in proximity to the QBMC project (refer *Appendix 1*), highlighting the strategic importance of this location.

CSG Regulatory Framework Review

QBS engaged leading environmental consultancy Onward, to investigate the policy and regulatory frameworks that apply to the production, storage and disposal of CSG derived brines in Queensland.

Key Findings

- Saline brine presents long-term challenges because salt is difficult to remediate once released and capable of creating enduring rehabilitation, residual risk and stewardship obligations.
- Queensland's regulatory and policy framework prioritises prevention of environmental harm, resource recovery from waste through beneficial uses and the minimisation of waste disposal.
- Reliance on interim brine dams and potential disposal via salt encapsulation facilities does not resolve the underlying long-term liability associated with waste brine and salts.
- QBMC represents a credible and timely opportunity to shift Queensland's CSG brine management from indefinite storage and planned disposal towards beneficial use outcomes.
- Through QBMC, beneficial use can now be considered a practical and credible pathway.
- Regulatory settings require operators to consider beneficial use, before reliance on lower-order brine storage or disposal pathways likely to require stronger, evidence-based justification.

The *Regulatory Framework Review* report prepared by Onward is presented in *Appendix 2*.

[3] ABC News: https://www.abc.net.au/news/2026-03-20/federal-government-approves-1695-gas-wells-in-rural-queensland/106462828

[4] Shell Media Release: https://www.shell.com.au/about-us/media/2026-media-releases/shell-invests-in-next-phase-of-arrow-energys-surat-gas-project.html

[5] Arrow Energy - Surat Gas Project Central: https://www.arrowenergy.com.au/what-we-do/surat-gas-project/surat-gas-project-central/

Role of QBMC

The QBMC is a first-of-a-kind waste-brine-to-green-chemicals project being developed by Queensland Brine Solutions (QBS) a wholly owned subsidiary of Parkway. The core process technologies underpinning QBMC that enables processing and beneficial use of waste brines and salts is based on best available technology (BAT) being commercialised by Parkway.

Two Core Functions of QBMC

- Liquid Waste Management Services – processing of regulated waste brines produced by the:
  - Oil and gas industry, including Queensland CSG.
  - Mining industry, including coal, minerals, metals and refining.
  - Municipal water treatment, including inland desalination and wastewater treatment.
  - Data centres, mostly associated with cooling water blowdown.
- Industrial Chemical Production – converting waste brine into green chemicals including:
  - Industrial reagents used by industry, minerals processing and water treatment.
  - Fertiliser products, supporting productive and sustainable agriculture.

Alignment with Industry

In addition to representing a strategic investment opportunity, development of the QBMC is also strongly aligned with several local, state, federal government and industry priorities.

Queensland's Critical Minerals Future

On 29 July 2026, the Queensland Government announced[6] *Delivering Queensland's Critical Minerals Future 2026-30 Strategy*. Whilst the strategy includes significant funding to support the critical minerals sector, the strategy is intended to also accelerate the expansion of the critical minerals supply chain in Queensland, including local processing, refining and manufacturing.

A key input into downstream critical minerals processing are the chemical reagents, including caustic soda and hydrochloric acid, the chemical products planned to be produced by QBMC. The production of these important chemical reagents at QBMC is expected to play a key role in strengthening domestic supply chains. Parkway is also exploring opportunities to produce (recover) additional compounds including critical minerals not currently produced in Australia, from waste brine streams processed though QBMC, potentially further strengthening the Australia's domestic supply chains.

Aluminium Industry

In Queensland, bauxite the key raw material (ore) required for aluminium production is primarily mined in the Weipa region in Far North Queensland, before being processed in two large-scale smelter-grade alumina refineries, QAL and Yarwun, both located in Gladstone. The key reagent required for converting bauxite ore into alumina is caustic soda, leading to the importation of several million tonnes of caustic soda into Gladstone annually.

Whilst the major Queensland alumina refineries (globally significant importers of caustic soda, the major QBMC product) also export alumina, the future of the domestic downstream (smelting) industry has been bolstered by the recent $2.5 billion funding package secured by the Tomago aluminium smelter[7].

Given the energy intensity of aluminum production, a key motivation of investments into the Australian aluminium industry has been the drive to decarbonise the integrated supply chain. Whilst several billion dollars of decarbonisation related investments have been committed, one of the most effective strategies for decarbonisation of the aluminum industry, is the substitution of imported caustic soda produced by coal fired power, with domestically produced green caustic soda, as planned by QBMC.

[6] DNRMMRRD: https://www.nrmmrrd.qld.gov.au/mining-exploration/industry/critical-minerals/delivering-queenslands-critical-minerals-future

[7] AFR: https://www.afr.com/politics/federal/labor-announces-2-5b-bailout-for-tomago-aluminium-smelter-20260812-p60nrw

Data Centres

The development of data centres in Australia is increasingly constrained by the requirement to minimise water demands[8], which is leading developers to explore alternative sources of water, including wastewater treatment. The processing of certain feedwaters, particularly groundwater derived, as well as processing of cooling water used in data centres often generate significant volumes of waste brine.

Whilst there are various options for processing wastewater, including cooling water blowdown from data centres, there are limited options for the processing and/or disposal of the residual concentrated brine.

In addition to providing an opportunity for onsite installation of Parkway Hitachi Ultra-High Brine Concentration Systems (PH-UHBCS), the QBMC provides an ultimate beneficial use for the contained salts in the residual waste brine streams.

Strategic Infrastructure

The increasing regulatory compliance related requirements facing industry are driving the development of sophisticated next-generation waste processing facilities, particularly for hazardous and/or regulated waste streams where compliance obligations are most stringent.

As the requirements relating to the production, storage and processing of hazardous and/or regulated waste streams becomes more onerous, waste management facilities permitted to process such waste streams are becoming increasingly strategic and highly sought after by industry participants as well as institutional, particularly infrastructure investors.

As recently as last week Australia's largest waste management and resource recovery company Cleanaway (ASX:CWY) received a $9.4 billion bid from EQT Infrastructure[9]. This recent corporate activity follows a broader consolidation trend where infrastructure funds or larger industry players acquire strategic waste processing infrastructure, particularly where the facilities are permitted to process regulated wastes. Amongst a series of transactions from earlier this year, on 24 March 2026 Veolia widely recognised as the world's largest water and environmental services company acquired Enviropacific[10], to bolster its regulated waste processing capabilities in Australia.

Given the QBMC project is specifically being developed to process complex and concentrated brines considered regulated waste streams from major industries, the QBMC represents a highly strategic infrastructure development opportunity. In certain instances, the beneficial processing of regulated waste brine streams through QBMC has the potential to unlock very significant project development opportunities for industry, potentially representing billions of dollars of value creation.

Development Roadmap

Securing primary approvals has significantly derisked the development roadmap and timeline for QBMC and enables the project to rapidly proceed towards key development milestones including:

- Finalise engineering design for QBMC-CDP.
- Secure remaining subsidiary approvals (permits), enabling early siteworks to potentially commence later this year.
- Commit to first PH-UHBCS system and broader collaboration with Hitachi before year end.
- Finalise partnering arrangements, with view to support development of QBMC-Commercial.
- Finalise funding package, enabling decision to proceed with development of QBMC-CDP.

[8] AFR: https://www.afr.com/policy/energy-and-climate/labor-draws-up-plan-to-restrict-household-water-for-data-centres-20260813-p60o14

[9] AFR: https://www.afr.com/street-talk/eqt-infrastructure-bankers-up-to-lob-9-4b-bid-for-cleanaway-20260813-p60nwf

[10] Veolia: https://www.anz.veolia.com/en-au/newsroom/newsroom/veolia-strengthens-pfas-treatment-leadership-major-remediation-acquisition

COMMENTS FROM PARKWAY GROUP MANAGING DIRECTOR & CEO

Parkway's Group Managing Director & CEO, Mr. Bahay Ozcakmak makes the following comments:

"This is another major milestone for Parkway. After more than a decade of methodical R&D, process development, industry engagement and more recently project planning, we are excited to formally receive key approvals for the development of our flagship QBMC project.

At the heart of the QBMC project, is our core technology stack that will enable QBMC to accept hazardous and toxic waste brine and convert this into valuable industrial chemicals, sustainably.

The potential of this single project to transform the sustainability of some of Australia's largest industries is significant. Since we released our Master Plan in June 2023, our plans have grown to encompass strategic project development, whilst remaining focused on our core objective of leveraging our technology stack to create value. In recent years, we've systematically built a capability to enable us to successfully commercialise our technology portfolio, including through the initial stage of our first development project, QBMC-CDP.

The QBMC-CDP is intended to provide the necessary engineering data to underpin a final investment decision for QBMC-Commercial. Importantly, the DA we've secured today also covers Stage 1 of QBMC-Commercial, enabling us to maintain an accelerated development timeline and rapidly progress commercial scale development.

As highlighted in the Regulatory Framework Report we released today, there are significant existing obligations on the CSG industry, which will invariably increase over time. As the only regulated waste facility permitted to beneficially process CSG derived waste brine and salts, the QBMC represents a highly strategically important development opportunity that has attracted the interest of industry.

We are actively discussing opportunities to process significant volumes of brine from a range of sources, including from the CSG industry, as part of our development plans.

Finally, congratulations and warm thanks to all our stakeholders, including our partners, consultants, government representatives, shareholders and in particular our dedicated project team which has worked relentlessly, to ensure the QBMC reaches its full potential.

We look forward to making a positive impact on the Western Downs and broader Surat and Bowen basin regions, as the QBMC provides an important opportunity to address major regional sustainability challenges, whilst supporting significant economic development."

The release of this announcement has been approved by Parkway's Group Managing Director & CEO, Bahay Ozcakmak, on behalf of the board of directors of the Company.

ADDITIONAL INFORMATION

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PARKWAY INVESTOR HUB

To stay up to date with the latest news, access additional investor related resources including research reports and interact with Parkway by posting questions and feedback through a Q&A function, we encourage investors to sign-up to the Parkway Investor Hub.

How to sign-up to the Parkway Investor Hub

1. navigate to https://investorhub.pwnps.com/welcome
2. follow the prompts to sign up for an Investor Hub account.
3. complete your account profile.

or Scan QR Code to visit the Parkway Investor Hub.

ABOUT PARKWAY CORPORATE LIMITED

Parkway is a leading Australian water & wastewater treatment and process technology company. Parkway is focused on the commercialisation of a portfolio of innovative process technologies in key industrial markets, as Parkway believes this is an important and effective strategy for addressing various global water related sustainability challenges.

In recent years, Parkway has made significant investments in groundbreaking research and development (R&D) related activities, including in the acquisition, development, validation and optimisation of a comprehensive portfolio of cutting-edge industrial water treatment related process technologies.

In support of Parkway's accelerated technology commercialisation strategy, Parkway primarily operates through two strategically integrated capacities:

- **Industrial Operations** business division is focused on the provision of conventional water and wastewater treatment related products & services, including fabrication as well as project delivery related services including installation, for a broad range of predominantly commercial, municipal and industrial clients.
- **Process Technologies** business division is primarily focused on innovative process technology related R&D, including process screening, evaluation, optimisation and piloting, as well as a range of technology commercialisation related activities.

Integrated Capabilities

Parkway has assembled a fully integrated inhouse project delivery capability, including for the innovative process technologies being developed and commercialised by Parkway.

Additional information regarding Parkway, including an overview of the corporate structure of Parkway and the companies in its corporate group, can be found at: www.pwnps.com

FORWARD-LOOKING STATEMENTS

This announcement may contain certain "forward-looking statements". The words "continue", "expect", "forecast", "potential" and other similar expressions are intended to identify "forward-looking statements". Indications of (and any guidance on) future earnings, financial position, capex requirements and performance are also "forward-looking statements", as are statements regarding internal management estimates and assessments of market outlook.

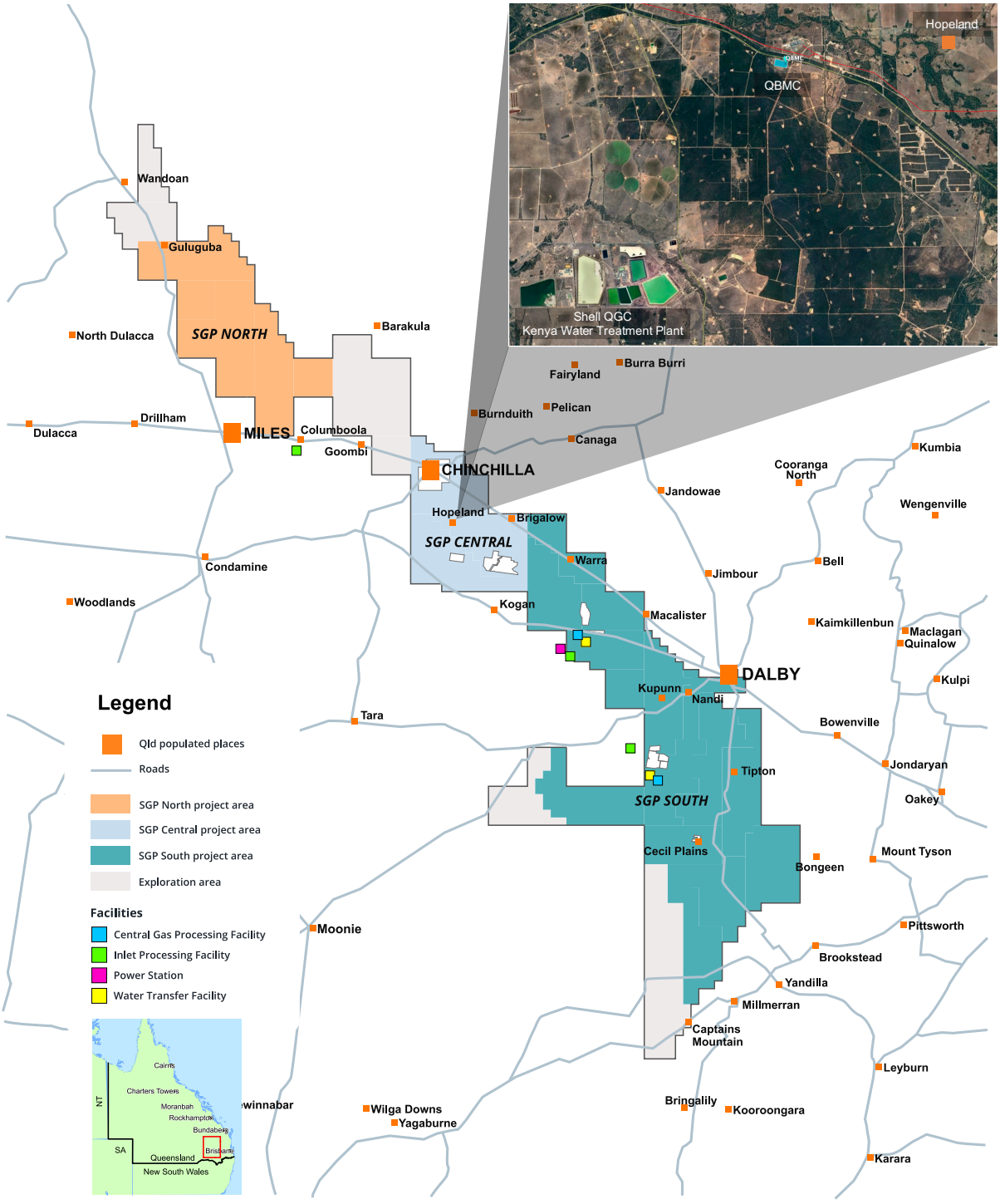
Where Parkway expresses or implies an expectation or belief as to future events or results, such expectation or belief is expressed in good faith and believed to have a reasonable basis. However, "forward-looking statements" are not guarantees of future performance and involve known and unknown risks, uncertainties and other factors, many of which are beyond the control of Parkway, its officers, employees, agents and advisors, that may cause actual results to differ materially from those expressed or implied in such statements. There can be no assurance that actual outcomes will not differ materially from these statements. There are usually differences between forecast and actual results, because events and actual circumstances frequently do not occur as forecast and their differences may be material.

Parkway does not undertake any obligation to publicly release any revisions to any "forward-looking statements" to reflect events or circumstances after the date of this announcement, or to reflect the occurrence of unanticipated events, except as may be required under the applicable securities laws.

APPENDIX 1

QBMC Project Location – Regional Context

The Surat Gas Project base map published by Arrow Energy[11] shown below, highlights the location of SGP Central where Arrow Energy plans to drill 143 backfill wells in the vicinity of Hopeland. The QBMC project (represented as blue polygon) is located approximately 6.2 km to the west of Hopeland, at the intersection of major regional power, road and pipeline infrastructure. The produced water from the planned SGP Central CSG wells is understood to be destined for concentration at the Kenya Water Treatment Plant operated by Shell QGC (brine ponds shown on map, located 8.5 km to the southwest of QBMC), where the produced brine will be stored until a permanent solution is ultimately adopted.



[11] Map modified by Parkway, based on base map of Arrow Energy, Surat Gas Project map: https://www.arrowenergy.com.au/what-we-do/surat-gas-project/

APPENDIX 2

Regulatory Framework Review – The opportunity for beneficial use of CSG brine in Queensland.

On 20 August 2026, on behalf of Queensland Brine Solutions (QBS), Parkway released the Regulatory Framework Review report prepared by independent environmental consulting firm, Onward.

Title:	Regulatory Framework Review – The opportunity for beneficial use of CSG brine in Queensland.
Date:	20 August 2026.
Size:	23 pages.
Version:	Rev 0.
Author/s:	Onward, refer to report.
Publisher:	Parkway Corporate Limited.
Terms of Use:	General information purposes only, not to be relied on for any specific purpose.

Regulatory framework review

The opportunity for beneficial use of CSG brine in Queensland

Queensland Brine Solutions

20 August 2026

Document version history

Version	Date	Revision description	Author	Authority to release
A	28 July 2026	Draft for client review	Liberty Pannowitz – Environmental Project Manager Callum Gawne – Principal	Mark Vile Managing Director
0	20 August 2026	Final for client delivery	Liberty Pannowitz – Environmental Project Manager Callum Gawne – Principal	Mark Vile Managing Director

Disclaimer

This Regulatory framework review has been prepared in accordance with the brief provided by Queensland Brine Solutions. The Report relies upon information provided by a range of sources and information collected at the time and under the conditions specified in the Report. All findings, conclusions or recommendations contained in the Report are based on that information. The report is for the use of Queensland Brine Solutions, and no responsibility will be taken for its use by any third party. Queensland Brine Solutions may, at its discretion, use the report to inform a range of third parties, including from industry, regulators, the public and other stakeholders.

Abbreviations and acronyms

Abbreviation/acronym	Definition
AEP	Australian Energy Producers
APPEA	Australian Petroleum Production and Exploration Association Limited
$CaCO_3$	calcium carbonate
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSG	coal seam gas
DETSI	Department of the Environment, Tourism, Science and Innovation
EA	environmental authority
EOW	end of waste
EP Act	*Environmental Protection Act 1994*
ERA	environmentally relevant activity
ERC	estimated rehabilitation cost
GISERA	Gas Industry Social and Environmental Research Alliance
HCl	hydrochloric acid
LNG	liquefied natural gas
MERFP Act	*Mineral and Energy Resources (Financial Provisioning) Act 2018*
mg/L	milligrams per litre
ML	megalitre
NaCl	sodium chloride
$NaHCO_3$	sodium bicarbonate
NaOH	sodium hydroxide / caustic soda
P&G Act	*Petroleum and Gas (Production and Safety) Act 2004*
QBS	Queensland Brine Solutions
QBMC	Queensland Brine Management Complex
RO	reverse osmosis
SEF	salt encapsulation facility
TDS	total dissolved solids
tpa	tonnes per annum
UQ	The University of Queensland
UQ-CNG	The University of Queensland Centre for Natural Gas
WRR Act	*Waste Reduction and Recycling Act 2011*

Terminology

The following terminology is used in this report for consistency. Unless otherwise stated, the meanings are working definitions for this report rather than formal statutory definitions.

Term	Meaning in this report
beneficial use	Use of CSG water, treated brine, recovered salts or brine-derived products for a productive purpose that avoids or reduces waste disposal and provides environmental, community or commercial value. In this report, beneficial use is preferred; beneficial reuse is used only where it appears in source material or quoted titles.
brine	A concentrated saline waste stream generated during treatment of CSG water, typically following reverse osmosis or other desalination processes.
category 2 regulated waste	A regulated waste category relevant to non-toxic salts, saline effluent, CSG brine and salt residues, triggering specific management, transport, treatment, storage and disposal obligations.
chain of responsibility	A liability framework under Queensland environmental law that may extend responsibility for environmental obligations beyond the immediate operator to related persons, including those with relevant control or financial benefit.
circular economy	An approach that seeks to retain materials in productive use for as long as they have value, including by recovering useful products from CSG brine rather than relying on disposal or indefinite storage.
coal seam gas water	Groundwater produced during CSG extraction to reduce pressure in coal seams and release gas. It is also referred to as produced water or associated water.
CSG saline waste hierarchy	The hierarchy established in Queensland's CSG water policy framework that prioritises treatment of brine or salt residues to create usable products wherever feasible, with disposal only considered after feasibility of usable and saleable product creation has been assessed.
disposal	A lower-order waste management pathway involving permanent or long-term placement of waste into or onto land or another authorised receiving environment. In this report, disposal is treated as an option to be considered only where higher-order recovery or beneficial use options are not practicable.
end of waste	A regulatory pathway under the WRR Act through which a waste-derived material may cease to be regulated as waste if it meets specified quality, use and management requirements.
environmental authority	An approval under the EP Act authorising a resource activity or prescribed environmentally relevant activity, subject to conditions regulating impacts, monitoring, reporting, rehabilitation and compliance obligations.
estimated rehabilitation cost	The estimated cost of rehabilitating land and preventing or minimising environmental risks if an environmental authority holder fails to meet its obligations.
feedstock	A material supplied to a treatment, manufacturing or industrial process for conversion into another product. In this report, CSG brine is described as a feedstock where it is treated to recover water, salts or produce chemical products.
financial assurance / financial provisioning	Financial security required to ensure funds are available for rehabilitation, closure, monitoring or remediation if an operator does not complete its environmental obligations.
general environmental duty	A duty under the EP Act requiring a person carrying out an activity to take reasonable and practicable measures to prevent or minimise environmental risk.
interim storage	Temporary storage of CSG brine in dedicated dams, ponds or tanks pending adoption of a long-term treatment, recovery or disposal pathway.
recovered product	A water stream, salt, chemical or other output generated from brine treatment that meets relevant specification, approval and market requirements for productive use.

Term	Meaning in this report
regulated waste	Waste prescribed under regulation for additional control because of its characteristics, risks or potential environmental impacts.
resource recovery	Recovery of useful materials, products or value from a waste stream, including conversion of CSG brine into recovered water, industrial chemicals, salts or other usable products.
residual risk	The risk of environmental harm, rehabilitation failure, monitoring need or management cost that remains after rehabilitation, closure or surrender of an environmental authority.
residual waste	Material remaining after brine treatment and product recovery that cannot be beneficially used and must be managed, treated, stored or disposed of in accordance with applicable waste classification and approval requirements.
salt encapsulation facility	An engineered facility designed to contain crystallised salts or saline residues for long-term disposal, generally relying on containment systems, monitoring and post-closure management to prevent release to the environment.
salt residue	Solid or concentrated saline material remaining after treatment, evaporation, crystallisation or processing of CSG brine.
social licence	The level of community, landholder and stakeholder acceptance that enables a project or industry practice to remain credible, trusted and practically operable over time.
waste	Material that is discarded, leftover, unwanted, surplus or otherwise requires management following an activity, whether or not it has potential value. In this report, untreated or unrecovered CSG brine and salt residues are treated as waste unless lawfully managed as a resource or product.
waste and resource management hierarchy	The preferred order for waste and resource management: avoid, reduce, re-use, recycle, recover, treat and dispose.

Executive summary

Queensland's coal seam gas (CSG) industry has made substantial progress in the beneficial use of produced water, but the management of concentrated saline brine remains a significant unresolved environmental, regulatory and commercial issue. Brine generated from reverse osmosis treatment is persistent, saline and regulated as waste. Unlike many contaminants, salt does not degrade over time, meaning that storage, treatment, and disposal decisions create long-term stewardship obligations that may extend for decades or longer.

Queensland's regulatory and policy framework clearly favours higher-order brine management outcomes. The *Environmental Protection Act 1994* (EP Act), *Waste Reduction and Recycling Act 2011* (WRR Act), Coal Seam Gas Water Management Policy 2012 (CSG Water Management Policy) and Coal Seam Gas Brine Management Action Plan 2023-2033 (Action Plan) collectively prioritise prevention of environmental harm, resource recovery, circular economy outcomes and minimisation of disposal. These settings require operators to consider treatment and beneficial use before relying on long-term storage, salt encapsulation or other disposal-oriented pathways. Recent independent research by CSIRO's Gas Industry Social and Environmental Research Alliance (GISERA) further reinforces this policy direction by identifying several beneficial use pathways that are now considered technically and economically feasible, strengthening the case for resource recovery as a practical alternative to long-term storage and disposal.

Current industry practice continues to rely heavily on interim brine dams, with approximately 13,000 ML of CSG brine stored across Queensland and significant additional volumes forecast. While these facilities may be authorised and managed under environmental authority (EA) conditions, prolonged storage increases risks associated with liner integrity, seepage, groundwater and soil impacts, monitoring, closure, financial provisioning, and community confidence. Salt encapsulation facilities (SEF) may provide a potential disposal pathway, but do not avoid the underlying long-term liability associated with permanent salt management and are expected to create approval, social licence and residual-risk challenges.

The Queensland Brine Solutions (QBS) Brine Management Complex (QBMC) presents a timely, policy-aligned and technically credible alternative to continued interim storage or disposal. The facility is intended to receive CSG brine as a process feedstock and treat it through staged, controlled processing infrastructure to recover water, produce industrial chemical products and manage residual streams under approved waste-classification and environmental controls. At full-scale development, QBMC is intended to have capacity to process all brine produced by Queensland's CSG industry, including legacy brines generated over the last decade.

QBMC aligns with the CSG saline waste hierarchy by seeking to treat brine and salt residues to create usable products wherever feasible. Its proposed recovery (production) of caustic soda, hydrochloric acid, and other outputs supports the transition of brine from a residual waste liability to a managed resource stream, moving brine management away from disposal and toward recovery, reuse and circular economy outcomes. For CSG operators and regulators, the emergence of an authorised and technically credible beneficial use pathway may become a material consideration when assessing brine management strategies. Where QBMC can demonstrate technical performance, environmental compliance, market acceptance, and commercial practicability, continued reliance on long-term storage, salt encapsulation or other disposal pathways may require stronger justification.

Overall, QBMC represents a timely and credible opportunity to improve the long-term management of CSG brine in Queensland. It provides a pathway more closely aligned with contemporary regulatory expectations, reduces reliance on indefinite storage and disposal, and may assist industry in addressing a long-standing environmental and social licence challenge.

Contents

1. Introduction

1.1. Purpose of report

This report reviews policy context, current industry approaches to brine storage and disposal, and emerging drivers for treatment and beneficial use. The report clarifies brine regulatory obligations and highlights the opportunity and timeliness for industry to consider emerging beneficial use treatments that have historically been dismissed on grounds of viability. The long-term liabilities, chain of responsibility, and risks associated with brine storage and salt encapsulation and the increasing financial liabilities to cover closure and monitoring are also discussed.

This report is based on the current regulatory framework and obligations for CSG brine treatment and management, and considers how those obligations align with the objectives of Queensland's CSG water management framework.

This report concludes that the opportunity to achieve brine management obligations and avoid uncertainties in financial liabilities through brine beneficial use is now possible with the development of the QBS Brine Management Complex (QBMC). The QBMC provides a permitted pathway for converting CSG waste brine into usable products and reducing the residual waste burden.

1.2. Background

Queensland has significant reserves of coal seam gas (CSG) in the Surat and Bowen Basins. The coal seams, from which CSG is obtained, contain both water and natural gas bonded to the coal. CSG is extracted by pumping groundwater to the surface to reduce pressure and release the trapped gas. The water that is pumped from the coal seams is referred to as CSG water, also known as produced or associated water.

Importantly, the Queensland Government requires operators to proactively manage this water to minimise environmental impact and maximise beneficial community use. More than 90% of CSG water generated in Queensland is made available for beneficial uses, including irrigation, livestock watering, commercial use, or discharge to watercourses (DETSI, 2025).

Where produced water does not meet quality criteria to enable beneficial use, treatment typically involves reverse osmosis (RO) processes that produce a pure water stream and a concentrated saline brine waste stream that requires management as a regulated waste product. Brine is defined by the Department of the Environment, Tourism, Science and Innovation (DETSI) as saline water with a total dissolved solid (TDS) concentration greater than 40,000 milligrams per litre (mg/L). In comparison, good quality drinking water has TDS of less than 500 mg/L. The TDS of sea water is typically between 35,000 and 38,000 mg/L.

Unlike many contaminants that may attenuate or degrade over time, inorganic salt persists indefinitely in the environment. As a result, the management of brine and salt residues must be considered within a long-term stewardship framework, with risks and liabilities potentially extending for decades or centuries. Management of this hyper-saline brine remains one of the key environmental and regulatory challenges facing the CSG industry.

1.3. Regulatory framework

CSG and liquefied natural gas (LNG) operations in Queensland are subject to a complex regulatory framework including the following key legislation:

- *Environmental Protection Act 1994*
- *Waste Reduction and Recycling Act 2011*
- *Petroleum and Gas (Production and Safety) Act 2004* (P&G Act)
- *Water Act 2000* (Water Act)
- *Mineral and Energy Resources (Financial Provisioning) Act 2018* (MERFP Act)

The EP Act, WRR Act, and MERFP Act are key to the context of this report and the policy framework.

1.3.1. EP Act

The EP Act aims to protect Queensland's environment while supporting development that enhances community wellbeing both now and into the future, provided that essential ecological processes and environmental systems are maintained. It establishes the regulatory framework for the assessment, approval, and management of Environmentally Relevant Activities (ERA) which includes CSG activities as defined as resource activities.

The Environmental Protection Regulation 2019 (EP Regulation) identifies specific prescribed ERAs in Schedule 2. Waste processing and disposal ERAs are relevant to CSG brine management. The EP Regulation defines regulated waste and includes non-toxic salts within this category. Schedule 9 further classifies non-toxic salts, including saline effluent, as a category 2 regulated waste. Consequently, the brine and salt by-products generated during CSG production fall within the scope of regulated waste under the EP Regulation.

Operators require approval of an EA under the EP Act in order to undertake CSG extraction and ancillary activities. There are 74 approved EAs for Schedule 3[1] CSG activities in Queensland (Queensland Government, 2026). It is an offence to contravene a condition of an EA and operators are bound by the general environmental duty.

Section 6A of the EP Act establishes the key principles of environmental protection that must guide the administration of the Act. These principles require decision-makers to consider environmental risks and impacts through the lens of ecologically sustainable development. In summary, the Act is administered having regard to:

- The precautionary principle – where there is a risk of serious or irreversible environmental damage, a lack of full scientific certainty should not be used as a reason to delay protective measures.
- Intergenerational equity – the environment should be managed so that future generations can enjoy the same environmental benefits and resources as the present generation.
- Conservation of biological diversity and ecological integrity – biodiversity, ecosystems and ecological processes should be protected and maintained.
- Improved valuation, pricing and incentive mechanisms, including the polluter pays principle, whereby those responsible for environmental harm should bear the costs of preventing, mitigating or remediating that harm.
- The principle of proportionality – environmental management measures should be proportionate to the level of harm or risk being addressed.

[1] Schedule 3 of the Environmental Protection Regulation 2019 establishes particular resource activities that are high risk and attract an aggregate environmental score.

- The principle of primacy of prevention – preventing environmental harm is preferable to relying on remediation or mitigation after the harm has occurred.

These principles are foundational to not only the decisions to approve CSG and brine management activities but also informing the policies established by Queensland Government.

1.3.2. WRR Act

The WRR Act provides the overarching policy framework for how waste materials, such as CSG brine, should be managed. The WRR Act seeks to promote waste avoidance, resource recovery, recycling, and the efficient use of resources, while minimising the environmental impacts associated with waste generation and disposal.

End of Waste (EOW) Codes under the WRR Act provide a mechanism for certain waste-derived materials to cease being regulated as a waste and instead be managed as a resource. Primarily a framework that streamlines regulation while providing certainty, an EOW Code specifies the quality criteria, management requirements and permitted uses that must be met for a waste material to be considered a resource.

If a waste-derived material is managed in accordance with an applicable EOW Code or EOW Approval, it may no longer be subject to certain waste management requirements under the EP Act. This framework has enabled the beneficial use of large volumes of CSG produced water for construction activities and irrigation without the need for individual amendments to EAs.

Regarding waste disposal, the WRR Act establishes the waste levy to be imposed on waste disposed under various criteria. The disposal of CSG brine would in most instances attract the waste levy, making it an important financial lever to deter brine disposal.

The WRR Act embeds the waste and resource management hierarchy and circular economy principle in legislation, and these are adopted in the CSG Water Management Policy context.

1.3.3. MERFP Act

The MERFP Act establishes Queensland's financial provisioning framework for resource activities. It operates alongside the EP Act by managing the State's financial risk where the holder of a resource activity EA fails to meet environmental management, rehabilitation or compliance obligations. In practical terms, the MERFP Act provides the mechanism through which financial provisioning is collected, held and applied, while the EP Act remains the principal framework for imposing the environmental obligations that must be funded, including rehabilitation, prevention or minimisation of environmental harm, and restoration of disturbed land.

For CSG operators, the key financial provisioning concept is the estimated rehabilitation cost (ERC). The ERC is determined under the EP Act and is intended to represent the cost of rehabilitating land and preventing or minimising environmental harm for the relevant ERC period. Brine storage dams, salt residues, contaminated infrastructure, closure works and post-closure management are all captured by ERC.

Residual risk is particularly important in the context of CSG brine because salt does not degrade and may remain a source of risk after active operations cease. Even where land is rehabilitated, residual risks may remain if saline materials, seepage risks, containment systems or long-term monitoring requirements are not fully resolved. The MERFP Act establishes arrangements for managing financial provisioning and residual-risk payments, while the EP Act provides the statutory pathway for EA surrender, rehabilitation assessment and any post-surrender management requirements.

This has direct relevance to brine management strategy. Long-term brine dams and SEFs may increase rehabilitation, monitoring, maintenance and residual-risk exposure because they retain saline material in storage or disposal infrastructure over extended periods. Conversely, treatment and beneficial use pathways

may reduce the volume of material requiring long-term containment and therefore may reduce, or alter the nature of, future ERC and residual-risk liabilities.

In this way, the MERFP Act reinforces the EP Act principles of polluter pays, primacy of prevention and intergenerational equity. Operators are expected to internalise the costs of managing environmental harm, rehabilitation and residual risk rather than transferring those costs to the State, landholders or future generations. The financial consequences of brine storage, salt disposal and unresolved residual risk are central to assessing whether higher-order beneficial use pathways provide a more durable and policy-aligned approach to CSG brine management.

2. Policy context

The CSG industry experienced a significant phase of growth in Queensland in the 2010s with the approval and development of the Curtis Island CSG to LNG plants and supporting CSG fields in the Surat and Bowen Basins. Policy and legislative frameworks were strained, with the Queensland Government developing policy in real time to address issues as they emerged.

The introduction of the CSG Water Management Policy in 2012 signalled a change in approach to CSG water and brine management, effectively banning evaporation ponds and discouraging long-term reliance on brine storage dams. Approved EAs could no longer be relied upon as an approval of a brine dam, with operators forced through provisions in the EP Act to seek approval again through EA amendments.

The CSG Water Management Policy sets out the Queensland Government's preferred approach for managing water and saline wastes generated by CSG production. Its objective is to ensure that CSG water is managed in a way that protects the environment while maximising its beneficial use as a valuable resource.

The policy sought to move industry away from treating these materials as wastes requiring indefinite storage and toward recovery and beneficial use. It introduced a hierarchy for managing saline waste products, including brine and crystallised salts:

Priority 1	Brine or salt residues are treated to create usable products wherever feasible.
Priority 2	After assessing the feasibility of treating the brine or solid salt residues to create usable and saleable products, disposing of the brine and salt residues in accordance with strict standards that protect the environment.

Under this hierarchy, operators are expected to:

- maximise beneficial use where feasible
- investigate treatment and processing options that reduce the waste burden
- rely on disposal only where higher-order management options are not reasonably practicable

This hierarchy is also consistent with Queensland’s waste policy framework under the WRR Act that prioritises waste avoidance, recovery, and circular economy outcomes ahead of disposal.

The CSG Water Management Policy establishes a clear preference for beneficial use of saline waste. Although the policy recognises that disposal may be necessary where higher-order options are not feasible, the policy logic requires operators to demonstrate that beneficial use or recovery pathways have been properly assessed before lower-order disposal pathways are adopted.

Accordingly, assessments of feasibility and practicability are not necessarily static. A pathway that may have been commercially or technically unavailable when earlier brine strategies were developed may need to be reconsidered where new infrastructure, technologies, or commercial arrangements become available. The

emergence of a viable beneficial use pathway therefore affects contemporary interpretations of best practice environmental management and the application of the hierarchy.

As the hierarchy suggests, at the time of the policy release there was no viable treatment pathway for beneficial use. Nonetheless, EA decision-makers had to consider the CSG Water Management Policy when assessing proposed CSG projects.

Industry undertook a number of studies over the subsequent years into beneficial use and disposal options. In 2018 the Queensland Government commissioned a report from the Australian Petroleum Production and Exploration Association Limited (APPEA, now Australian Energy Producers [AEP]) on CSG water and brine management. The report reviewed a range of potential management pathways that had been investigated by industry, either individually or collaboratively. The options assessed included:

- selective salt recovery (recovering commercial salt products)
- deep injection of brine into suitable geological formations
- ocean outfall disposal following treatment and transport
- encapsulation or engineered disposal of salt residues

The report concluded that no single solution had emerged as a commercially and technically viable industry-wide answer at the time and highlighted that brine management remained one of the most significant unresolved environmental and operational issues for the Queensland CSG industry. While water treatment technologies were well established, the residual salts and brines required a durable management pathway capable of handling very large quantities over the life of the industry.

A review of the APPEA report by The University of Queensland Centre for Natural Gas (UQ-CNG) in 2020 identified SEFs as the industry's preferred medium-term (10 to 15 years) pathway for long-term salt management, while also recognising that this option requires further environmental assessment, residual risk management and stakeholder engagement. The results of this review indicated that the industry had not made any meaningful progress towards moving brine management up the hierarchy.

Seeking to establish certainty, the Queensland Government released the Action Plan in consultation with industry. It establishes high-level actions for both government and industry. While indicative of continuing progress towards improved certainty for brine management, the Action Plan does not introduce any new, significant policy signals.

In 2026, CSIRO's GISERA has undertaken a Queensland-focused review of beneficial use, management and disposal options for CSG brine generated from the Surat and Bowen basins (GISERA, 2026). A key outcome from the GISERA study is that it identifies several potential beneficial use pathways that show technical promise and are economically feasible including the recovery of caustic soda, calcium carbonate, and a sodium chloride-rich stream via causticisation. While the GISERA study did not identify any proponents of beneficial-use related projects, the causticisation reaction identified as a promising chemical route is a patented process owned by Parkway Process Technologies, a corporate affiliate of QBS.

Despite the policy direction prioritising beneficial use and the lack of any SEF operating history in Australia, the GISERA study ultimately concludes that disposal in SEFs '*as the most feasible and defensible current option for industry-wide implementation'.* It should be noted that GISERA itself is not a regulatory body, is partly industry funded and performs research and provides advice to industry.

The *Regional Planning Interests (Condamine Alluvium) and Other Legislation Amendment Act 2026* further reinforces a tightening regulatory approach to CSG activity in sensitive groundwater and agricultural areas. It strengthens the protection of one of the State's most significant groundwater resources, the Condamine Alluvium, through introduction of a deemed EA condition that prohibits contaminant releases '*by the operation of a well'* into waters of the Condamine Alluvium where those releases would result in water quality inconsistent with applicable water quality objectives.

3. Current industry practice

Queensland's CSG industry generates associated water during gas extraction, which varies in volume and quality over a project's life. Associated water extraction has stabilised at around 54,000 megalitres per year (ML/y), with approximately 82% generated from the Surat Basin (Office of Groundwater Impact Assessment, 2025). It is estimated that between 5 and 15 million tonnes of salt (through RO of associated water and generation of waste brine) will be produced over the lifespan of the industry (UQ Australia, 2020). Approximately 13,000 ML of brine is currently stored in 36 dams across Queensland, with additional volumes expected (Business Queensland, 2026).

As part of an EA application under the EP Act, CSG operators must demonstrate how the CSG water and waste brine will be managed in accordance with the CSG Water Management Policy. EA application supporting information typically consists of commitments to achieve the policy but has for the most part not resulted in any strict end-of-life brine management obligations through EA conditioning.

Industry continues to rely heavily on the storage of CSG brine waste in dedicated dams typically intended as an interim or temporary arrangement until a long-term disposal strategy is adopted. Brine dams are typically shallow, lined earthen basins (Figure 3.1). As evaporation occurs over time, salts and other dissolved constituents concentrate in the dam. Given evaporation ponds for storing CSG water are effectively banned in Queensland, the operation of “temporary” dams for extended periods, where the water invariably evaporates, represents a significant regulatory risk.

These dams present ongoing environmental and operational risks, including seepage to soil and groundwater, liner integrity and maintenance requirements, increasing salinity and contaminant concentrations, and accumulation of trace elements such as arsenic, boron, and selenium. Operators are obliged to manage brine dams in accordance with their EA conditions that require regular water and structural monitoring.

Risks of brine storage are compounded by the duration of storage where, in some cases, brine has remained stagnant in dams for periods exceeding 15 years. This materially weakens the characterisation of these assets as temporary containment as they reach their operational end-of-life and require liner maintenance works in the absence of alternative management options.

From a stakeholder and social licence perspective, interim dams attract increasing scrutiny where communities perceive that temporary storage arrangements have become a de facto permanent disposal strategy, particularly without a defined long-term management outcome.

With limited progress on alternatives, industry is still developing brine dams as an interim solution. As recently as June 2026, an EA amendment application seeking approval for an expansion of a CSG operation, including construction of new brine dams, seeks to manage brine through storage acknowledging no long-term solution is understood.

Figure 3.1 CSG brine dam (GISERA, 2026)

3.1. Challenges with disposal via salt encapsulation

Despite the policy setting of the last 14 years, disposal via SEF is still considered by industry the most viable option for brine management despite identified opportunities in beneficial use (GISERA, 2026). There are no approved SEFs in the state (or in Australia) and disposal via SEF presents risks to operators, community, and the environment.

Risks to operators

- Regulator expectations and guidance for achieving SEF approval under the EP Act are not clear, creating approval uncertainty.
- Community perceptions and expectations.
- Financial assurance and residual-risk frameworks for SEFs are under development, providing no certainty in long-term costs and liability.
- Ongoing monitoring and maintenance requirements may be perpetual, with operators subject to future unknown policy and decision-making on EA surrender and tenure relinquishment.
- Environmental liability through chain of responsibility that extends beyond the immediate EA holder to related persons, including entities such as a holding company or individuals with relevant land ownership, control, financial benefit or capacity to influence conduct.

The CSG industry depends on maintaining social licence with community and stakeholders, particularly landowners on whose land CSG infrastructure operates. Perpetual environmental, cost, and liability risks of SEFs have the potential to threaten the balance of co-existence that the industry has spent decades building. A recent CSIRO publication highlighted the significant concerns about brine storage and the prospect of the large-scale disposal of waste salts from the CSG industry (Witt K, 2025).

Risks to the environment and community

- Contamination of groundwater via leaching.
- Failure of containment systems resulting in contamination to receiving waters.
- Soil salinisation.
- Land use impacts and sterilisation.
- Stewardship, liability and costs in perpetuity.

Disposal via SEF does not align with the policy priority established by the Queensland Government in the CSG Water Management Policy, nor the WRR Act. Operators are obliged to investigate, assess, and exhaust all other options thoroughly before disposal can be considered. In some instances, these policy settings are set in EA conditions.

The Queensland Government through its Action Plan is seeking further research and development from industry, suggesting that future policy changes are subject to the findings of yet to be completed studies. Actions assigned to industry, including research and development, do not set a clear timeframe for delivery.

4. The beneficial use opportunity

The policy setting, current industry practice, and brine management challenge provide an opportunity for beneficial-use treatments to become the preferred solution for CSG operators. Brine waste management within the CSG industry requires innovation to meet environmental and regulatory expectations. Advanced technology development for brine waste management delivers measurable benefits, including reducing the volume of saline waste, minimising risks to groundwater and ecosystems, and ensuring compliance with Queensland's stringent environmental standards.

The identification of the viability of recovering caustic soda, calcium carbonate, and a sodium chloride-rich stream via causticisation (GISERA, 2026) is timely, with recent approval of the QBMC.

4.1. QBMC overview

Located 20 km south of Chinchilla, QBMC is the flagship facility being developed by QBS, a subsidiary of Parkway Corporation Limited. It is understood to be the first approved dedicated CSG brine treatment and resource recovery facility of its kind in Australia.

The planned facility will be a dedicated CSG brine treatment and resource recovery complex that treats brine from existing CSG operations or legacy brine dams and converts it into recovered water, industrial chemicals and managed residual streams utilising a proprietary flowsheet. The project design is presented in Figure 4.1.

QBMC is proposed to receive CSG brine as a process feedstock and treat it through staged, controlled processing infrastructure. Brine would initially be transferred to the facility by road transport, with outputs to include recovered water suitable for beneficial use, chemical products (caustic soda, hydrochloric acid, lime and more) and residual solid waste managed in accordance with approved waste classifications and approval conditions.

The project is to be developed progressively, commencing with Stage 0, a commercial demonstration project (CDP), with pilot-scale infrastructure to confirm process performance and commercial viability. A staged delivery model also allows technical performance, product specifications, waste classifications and environmental controls to be progressively verified before larger-scale treatment capacity is developed, in Stages 1-4.

The facility will be located within the Crossroads Renewable Energy precinct and supported by associated renewable energy infrastructure, including solar generation and battery energy storage. This co-location is relevant to the project's low-emissions positioning and provides a practical basis for integrating brine treatment with renewable energy supply, subject to the timing and delivery of the associated energy infrastructure.

By transforming brine into a manageable resource through improved treatment and recovery processes, these innovations support sustainable industry practices, protect sensitive environments, and align with government objectives for responsible resource development for beneficial use. At full-scale development, the QBMC will have sufficient design capacity to process volumes equivalent to Queensland's annual CSG brine generation, inclusive of the vast inventory of legacy brines produced over the last decade.

QBS Brine Management Complex (QBMC)

Parkway Corporate Limited

Flagship Parkway-Tech Development Project

- Parkway has developed the **only viable pathway in Australia**, to process CSG derived waste brine into valuable industrial chemicals.

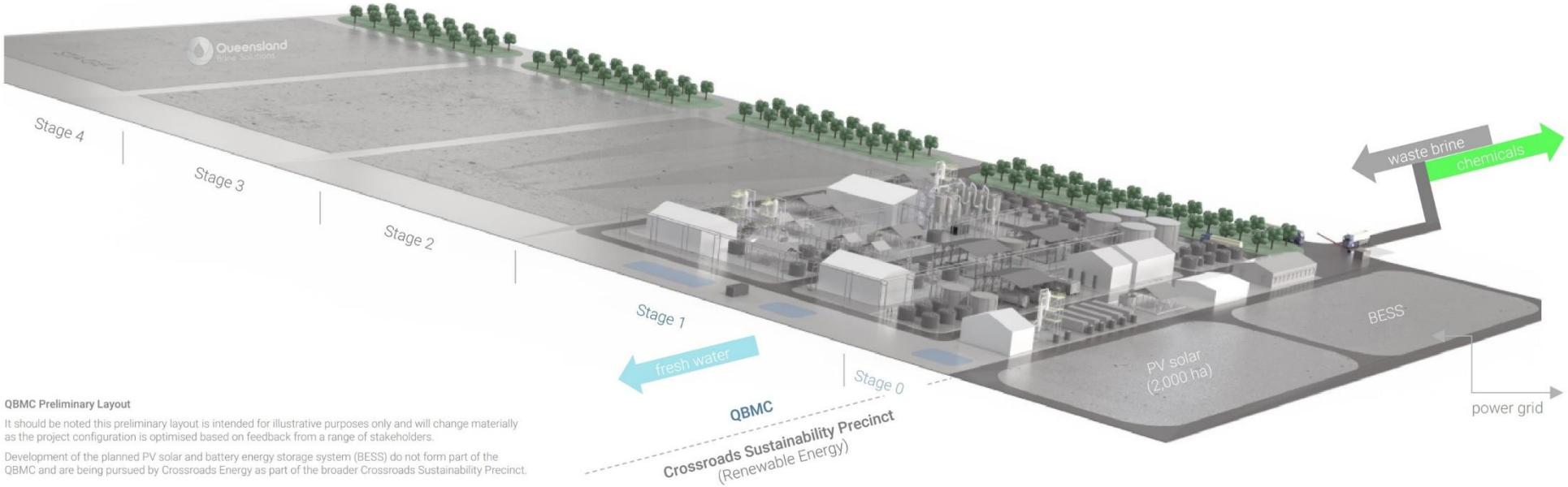


Figure 4.1 QBMC indicative concept design (PWN, 2025) (adapted by author)

4.2. Regulatory and policy alignment

QBMC is consistent with the principal regulatory and policy objectives identified in this review where it supports beneficial use, resource recovery, circular economy outcomes, and waste minimisation as alternatives to indefinite storage or disposal of concentrated brine. QBMC aligns with Priority 1 of the CSG Water Management Policy and Action Plan through direct creation of usable products from brine. It provides a credible pathway beyond interim storage and supports transition of brine from residual waste liability to a potential managed resource. It is aligned with the WRR Act hierarchy because it seeks to move brine management from lower-order treatment or disposal management, toward higher-order recovery and beneficial use preferences.

The availability of an approved commercial resource recovery facility is a relevant consideration when operators assess the practicability of higher-order management options under Queensland's waste hierarchy and associated policy framework. Where such pathways are demonstrated to be technically, environmentally, and commercially practicable, proponents must consider them as part of the assessment of brine management strategies before adopting lower-order disposal or long-term containment options. Whether a particular management approach satisfies applicable statutory and policy requirements would remain a matter for assessment by the relevant regulatory authority based on the circumstances of each proposal.

4.3. Technological alignment

The QBMC utilises a proprietary flowsheet incorporating patented technologies and electrochemical processes to achieve concentration and facilitate synthesis of chemical products that can be beneficially used in industrial processes. Incoming brine is subject to pretreatment to remove impurities before primary processing to separate primary inorganic components and concentrate acid and base products. Chemical products will be pumped into tanker trucks for delivery to end customers, while adopting best practices in material handling. Some products may also be used internally in the QBMC processes.

The process being adopted at QBMC enables up to 98% of the resource to be recovered from the brine waste, subject to feed chemistry and operating conditions. The remaining 2% represents residual waste that would be managed in accordance with standard waste management requirements of the EP Regulation.

GISERA identifies the recovery pathway as technically viable and identifies potential markets for the recovered products (GISERA, 2026).

4.4. Feasibility and practicability of beneficial use

The assessment of beneficial use is not static. A brine management option that was previously considered technically unavailable or commercially immature may need to be reconsidered where new infrastructure, approvals, technology, or market pathways become available. In this context, the emergence of QBMC is relevant because it provides a potential beneficial use pathway that can be assessed against the CSG saline waste hierarchy, the WRR Act hierarchy, and the EP Act principles of prevention, proportionality, and polluter pays.

For CSG operators, feasibility and practicability should be assessed on an evidence-based and project-specific basis. Relevant considerations include technical performance, ability to accept relevant brine quality and volumes, regulatory approvals, transport and logistics, recovered product specifications, market demand, residual waste classification, environmental risk, whole-of-life cost, financial provisioning implications and the extent to which the option reduces long-term storage, rehabilitation, and residual-risk obligations.

Where QBMC can demonstrate that it is technically, environmentally and commercially practicable, continued reliance on interim storage, planned SEFs, deep-well injection or off-site disposal may require

stronger justification. This does not mean that beneficial use will be mandatory in every circumstance, but it does mean that lower-order options should be reasonably assessed against an available higher-order pathway rather than against a historical assumption that no practicable treatment or recovery option exists.

4.5. Options comparison matrix

Table 4.1 provides a high-level comparison of the main brine management pathways relevant to this report. The comparison is indicative and is intended to support strategic assessment rather than replace project-specific technical, commercial, or regulatory evaluation.

Table 4.1 Comparison of CSG brine management options

Option	Policy alignment	Environmental and residual risk	Cost and liability considerations	Overall assessment
Interim brine storage	Lowest alignment where storage becomes long-term. May be acceptable only as a managed interim measure.	Ongoing seepage, liner, structural integrity, overflow, groundwater and closure risks increase with time.	Continuing monitoring, maintenance, liner renewal, closure, ERC and residual-risk exposure.	Useful as short-term containment but weak as a durable long-term strategy unless linked to a defined treatment, recovery or disposal pathway.
Salt encapsulation facility	Lowest-order option where material is disposed.	Long-term containment, leaching, land use, rehabilitation, monitoring and perpetual stewardship risks remain.	Potentially high upfront capital, approval, operating expenses, financial provisioning, post-closure monitoring and residual-risk costs.	May provide a disposal pathway, but requires strong justification where a higher-order recovery option is feasible.
Deep-well injection	Lowest-order option where material is disposed.	Dependent on geological suitability, injectivity, containment certainty and groundwater protection.	Requires investigation, approval, monitoring and contingency costs; liability depends on long-term containment performance.	May be technically possible in limited circumstances, but does not recover value and may attract heightened scrutiny in sensitive groundwater contexts.
Off-site disposal	Lowest-order option where material is disposed.	Transfers material to a disposal facility but does not remove broader waste-generation and product-stewardship issues.	Transport, gate fees, levy exposure, acceptance limits and ongoing documentation requirements may be material.	May remain necessary for residual waste but is unlikely to be persuasive as the primary industry-wide brine strategy where recovery options exist.
QBMC/Beneficial use	Highest-order option where reuse, recycle and recovery of waste resources.	Reduces reliance on long-term containment, but residual waste, transport, storage, and process controls must be managed.	Treatment and transport costs must be assessed against avoided storage, SEF, monitoring, rehabilitation, levy and residual-risk costs.	Most policy-aligned option because it prioritises beneficial use provided it can demonstrate feasibility through technical performance, product markets, and residual-waste controls.

4.6. Benefits of beneficial use

The beneficial use of brine waste addresses risks posed by disposal options, creating meaningful benefits for operators, community and the environment. Table 4.2 summarises how QBMC addresses those risks by shifting brine management from long-term disposal and containment toward authorised treatment, resource recovery and managed residual waste pathways.

Table 4.2 Risks identified for salt encapsulation and how QBMC addresses them

Risks	Risk pathway	How QBMC addresses the risk
Approval uncertainty for SEFs	Regulatory expectations for SEF approval remain unclear, creating uncertainty for operators seeking a disposal pathway.	QBMC provides an approved treatment and resource-recovery pathway rather than a disposal pathway. Where operated under appropriate approvals, it gives operators a clearer basis to demonstrate that higher-order management options have been considered before relying on SEFs.
Community perceptions and expectations	Large-scale permanent salt disposal may be viewed by communities and landholders as a long-term transfer of industry risk to local landscapes.	QBMC reframes brine as a feedstock for recovered water and industrial products, reducing reliance on permanent local salt disposal. This supports a more positive social licence environment centred on resource recovery, circular economy outcomes and reduced legacy risk.
Uncertain financial assurance, residual risk and long-term liability	Long-term storage or SEF disposal may create uncertain closure, post-closure monitoring, residual risk and financial provisioning requirements.	By transferring brine to an authorised processing facility and converting most of the stream into recovered products, QBMC may reduce the volume and duration of residual liabilities that operators would otherwise need to provision for through storage or disposal infrastructure.
Perpetual monitoring and maintenance	SEFs and long-term dams may require ongoing monitoring, maintenance, reporting and future decisions about EA surrender or tenure relinquishment.	QBMC reduces reliance on passive long-term containment by processing brine through active treatment infrastructure. Residual wastes remain subject to approved management requirements, but the overall pathway is intended to reduce the scale of material requiring perpetual containment.
Chain of responsibility exposure	Environmental liability may extend beyond the immediate EA holder to related persons where long-term waste and contamination obligations remain unresolved.	A properly documented transfer to an authorised brine processing facility can support clearer allocation of responsibilities for acceptance, treatment, product recovery and residual management. This may reduce unresolved operator exposure compared with retaining brine in long-term storage or disposal assets.
Groundwater contamination via leaching	Stored salts or brine may leach if containment systems degrade or if disposal facilities do not perform as intended over the long term.	QBMC reduces the volume of brine and salt requiring long-term containment by recovering products and water from the stream. Residual materials would be managed under approved waste classifications and environmental controls, reducing reliance on indefinite in-ground containment.
Containment failure and receiving-water impacts	Dam, liner or SEF failure could result in saline releases to surface waters, drainage lines or other receiving environments.	QBMC is proposed as purpose-built industrial treatment infrastructure with controlled receipt, storage, processing and residual management systems. This reduces dependence on extensive long-term storage and supports more active containment and process controls.
Soil salinisation	Leaks, seepage, spills or poorly controlled salt disposal can increase soil salinity and reduce land capability.	QBMC reduces the mass of salt requiring disposal by converting brine into usable products and recovered water where feasible. This reduces the quantity of saline material that could otherwise contribute to soil salinisation through long-term storage or disposal failure.

Risks	Risk pathway	How QBMC addresses the risk
Land use impacts and sterilisation	SEFs and long-term storage dams can occupy land for extended periods and limit future land use or rehabilitation options.	QBMC consolidates brine processing within dedicated industrial infrastructure rather than requiring multiple long-term disposal or containment sites across CSG tenures. This may reduce land take, support rehabilitation of legacy dams and minimise sterilisation of productive land.
Stewardship, liability and costs in perpetuity	Because salt is persistent, permanent disposal can create long-duration stewardship obligations with uncertain future costs.	QBMC seeks to avoid or reduce perpetual stewardship by recovering value from the brine stream and minimising the residual waste requiring final management. This aligns with the policy preference for product creation wherever feasible before disposal is considered.

4.7. Limitations and dependencies

QBMC provides a credible and policy-aligned beneficial use pathway, but its significance depends on successful staged implementation and demonstration of performance.

Key dependencies include:

- confirmation of process performance at each stage
- ability to manage variable brine chemistry
- product quality and specification
- market acceptance and offtake for recovered products
- transport and logistics capacity
- compliance with EA and waste-management conditions
- the commercial terms under which operators can transfer brine to the facility

These dependencies are not necessarily unique to QBMC and do not undermine the policy relevance of QBMC. Rather, they define the evidence required for QBMC to become a durable long-term pathway for CSG brine management. The central regulatory implication is that, as QBMC progresses from demonstration to commercial operation, operators and regulators will likely increasingly need to assess whether continued reliance on lower-order storage or disposal remains reasonable, practicable and consistent with contemporary expectations for beneficial use and resource recovery.

5. Conclusions

CSG brine management remains one of the most significant unresolved environmental, regulatory, and commercial issues facing Queensland's CSG industry. While the industry has achieved substantial beneficial use of produced water, the concentrated saline brine generated through treatment continues to present long-term challenges because salt is persistent, difficult to remediate once released, and capable of creating enduring rehabilitation, residual-risk and stewardship obligations.

Queensland's regulatory framework clearly favours higher-order brine management outcomes. Current reliance on interim brine dams and potential disposal via SEFs does not resolve the underlying long-term liability associated with saline waste. These approaches may remain necessary in limited or transitional circumstances, but they carry material risks. As storage durations increase, these risks become increasingly difficult to characterise as temporary or minor.

The emergence of QBMC has the potential to materially change the context in which future brine management options may be assessed, particularly where the facility demonstrates technical, environmental and commercial practicability. By treating CSG brine as a feedstock for recovered water and industrial products, QBMC provides a pathway that is more closely aligned with the saline waste hierarchy, the waste and resource management hierarchy and contemporary expectations for circular economy outcomes. It has the potential to reduce reliance on long-term storage and disposal, reduce the volume of residual material requiring containment, and alter the scale and nature of future rehabilitation and residual-risk liabilities.

The publication of the GISERA report is an important development in the Queensland brine management landscape. By identifying several beneficial use pathways for CSG brine as technically promising and economically feasible, the report weakens the historical basis for assuming that long-term storage or disposal are the only practicable options. Although GISERA does not determine regulatory outcomes, its findings support a more contemporary assessment of brine management strategies. Where higher-order recovery options are available, future reliance on lower-order storage or disposal pathways is likely to require a clearer, evidence-based explanation of why those options are not reasonable or practicable in the circumstances.

On balance, QBMC represents a credible and timely opportunity to shift Queensland's CSG brine management from indefinite storage and disposal toward resource recovery and beneficial use. The emergence of QBMC, together with Queensland's policy hierarchy and recent GISERA findings, materially changes the strategic context for CSG brine management. Beneficial use can now be considered a practical and credible pathway rather than a purely aspirational objective, and future assessments of brine management strategies should consider this evolving context. As QBMC progresses toward commercial operation, continued reliance on lower-order storage or disposal pathways is likely to require stronger, evidence-based justification.

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