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Submission

21 February 2023

The Chief Executive
Department of Environment and Science
Attention: The EIS Coordinator
GPO Box 2454
BRISBANE QLD 4001

By Email: eis@des.qld.gov.au

Dear EIS Coordinator

Environmental Impact Statement - Surat Basin Carbon Capture and Storage Project

The following planning submission has been prepared for and on behalf of the Queensland Farmers' Federation (QFF) in respect of the Surat Basin Carbon Capture and Storage Project. The submission has been made to the Chief Executive of the Department of Environment and Science, Queensland.

In accordance with section 49 of the Environmental Protection Act 1994 (EP Act), the Department of Environment and Science (the department) has decided that the EIS can be publicly notified. Written submissions in relation to the EIS are invited from any person within the submission period. The submission period commences on 5 December 2022 and concludes on 23 February 2023.

1.0 BACKGROUND

1.1 The Queensland Farmers' Federation

The Queensland Farmers' Federation (QFF) is the united voice of intensive and irrigated agriculture in Queensland. It is a federation that represents the interests of 20 peak state and national agriculture industry organisations and engages in a broad range of economic, social, environmental, and regional issues of strategic importance to the productivity, sustainability, and growth of the agricultural sector. QFF's mission is to secure a strong and sustainable future for Queensland farmers by representing the common interests of our member organisations:

- CANEGROWERS
- Cotton Australia
- Growcom
- Nursery & Garden Industry Queensland (NGIQ)
- EastAUSmilk
- Australian Cane Farmers Association (ACFA)
- Turf Queensland
- Queensland United Egg Producers (QUEP)
- Queensland Chicken Meat Council (QCMC)
- Pork Queensland Inc
- Bundaberg Regional Irrigators Group (BRIG)

- Burdekin River Irrigation Area Irrigators Ltd (BRIA)
- Central Downs Irrigators Ltd (CDIL)
- Fairbairn Irrigation Network Ltd
- Mallawa Irrigation Ltd
- Pioneer Valley Water Cooperative Ltd (PV Water)
- Theodore Water Pty Ltd
- Eton Irrigation Co-operative Ltd
- Lockyer Water Users Forum (LWUF)
- Queensland Oyster Growers Association (QOGA)

QFF welcomes the opportunity to provide comment to the EIS Surat Basin Carbon Capture and Storage Project. This submission is provided without prejudice to any additional submission from our members or individual farmers.

1.2 The Importance of the Great Artesian Basin (GAB) and the Precipice Aquifer

The GAB is one of the largest underground freshwater resources in the world. It generates approximately $13 billion per year. It is a vital resource for 180,000 people, 7,600 businesses and 120 towns. This natural resource is relied upon by agriculture and is the lifeblood for the future of industry and rural communities into the future.

Groundwater from the Precipice aquifer provides an invaluable supply of water to numerous towns, agricultural enterprises and other regionally important facilities across southern QLD. This aquifer is currently being used for the production of livestock with a number of businesses having acquired licenses in this deeper but more secure aquifer for future expansion purposes.

2.0 SUMMARY OF CONCERNS

Whilst carbon injection into water aquifers is a tested and known technology for carbon storage, research suggests that the application of carbon capture and storage within a water resources aquifer is unprecedented. Carbon injection appears to normally be done into hyper saline groundwater or former gas reservoirs. The injection of CO2 into a water supply aquifer has never been done in the world and, in other projects, substantial efforts are made to protect and monitor overlying water supply aquifers.

CTSCo's proposal to inject highly corrosive liquified carbon dioxide (CO2) into a GAB aquifer represents a significant threat to one of Australia's greatest natural resources and subsequently the businesses and communities, which rely on it. It is imperative that valuable groundwater is not put at risk. This proposed trial is the first of its kind into the GAB and there is genuine concern regarding the lack of scientific evidence that underpins protection of the GAB, and quite frankly, whether a water supply aquifer as important as the GAB is even an appropriate location for these types of projects.

The geological formation of the Precipice Sandstone is a regionally significant and high-quality GAB aquifer. The Precipice Sandstone is also the source aquifer for springs and supports numerous Groundwater Dependant Ecosystems. The groundwater from the Precipice aquifer provides an invaluable supply of water to numerous towns, agricultural enterprises, power stations and other important facilities across the southern Queensland region.

This targeted injection of CO2 is proposed to occur into an aquifer that is important for supporting any future growth and intensification of agriculture in southern QLD.

QFF notes that the CTSCo's EIS states that the Precipice Sandstone aquifer is 'unsuitable for irrigation water, stock water, and drinking water', however this aquifer is currently being used for the production of livestock

with a number of businesses having acquired licenses in this deeper but more secure aquifer in the last few years for future expansion purposes. CTSCo's statement in this regard is incorrect.

QFF understands that CTSCo were awarded 2 tenements for greenhouse gas exploration. One was deemed unsuitable and was opposed by the local community largely due to concerns around protecting the GAB, and they are now reliant on this tenement near Moonie. This project is identified as a trial and QFF understands that likely expansion will be proposed following the trial with further GAB sites subsequently to be considered for similar projects. This longer-term upscale potential is of significant concern.

CTSCo's EIS states water quality is poor and unsuitable for stock water. This statement is incorrect as industry has been using water of similar quality for many years. Water with fluoride concentrations above guidelines levels, has been used by agriculture for many years, without adverse impacts to livestock. QFF is advised that the salinity is slightly elevated but well below stock limits and the fluoride is high but those 'limits' are loose at best and water with this level of fluoride has been used for stock for many years. Regardless, intensive livestock and townships have no problem using reverse osmosis to remove any impurities. QFF believes that the EIS uses incorrect statements about the suitability of the water for stock use.

QFF seeks that a full investigation is undertaken into the technical material provided by CTSCo in their EIS and fact sheets, that does not reflect accurate information, which would otherwise prove more challenging for this project to be fulfilled. As discussed with the Department of Environment, QFF will be providing further information by way of an independent peer review within 15 days of the close of submissions to provide a scientific assessment of the assumptions CTSCo has made it their EIS relating to the quality of water and other important considerations.

Based on the flawed modelling completed for the EIS, CTSCo believe the CO2 is not expected to leave from the injection point but does not factor in pumping as noted below. There are genuine concerns that it will acidify the surrounding water (pH from 7 to 4). There is concern that this acidification could result in the release of heavy metals and other contaminants from the surrounding rock. These contaminants will then move with the groundwater flow. There are concerns that the proposed monitoring program is too narrow to identify potential impacts to groundwater quality. Liquid CO2 is highly corrosive and wherever the GHG plume moves there is a risk to water infrastructure and stock use of the water.

QFF notes that there are potentially technical issues in keeping the liquid CO2 stable in this site.
QFF notes that CTSCO's groundwater modelling has not considered nearby extraction even though they were aware of the allocations. Other bore entitlements for these allocations have been approved by the Department clearly showing that industry has a future use intent for this water. The modelling has not considered extraction by nearby users. GAB groundwater within the Surat Basin is fully allocated and is the main constraint to further development of the region. Businesses looking for expansion opportunities through water supply will need to look to deeper more secure aquifers such as the Precipice Sandstone. Just it isn't being used now, doesn't mean community and industry won't seek to in the future and this should be considered in the EIS deliberations. Current and future users and entitlements need to be incorporated into the modelling.

The approval of this project is likely to set a precedent for future injection into water supply aquifers not only at this location, but other locations across the GAB in the future. The GAB is a highly valued natural resource that sustains both agriculture and regional communities and must be protected. It is currently. Injecting a regulated waste into a GAB aquifer is currently prohibited under existing regulation.

Project - Carbon Capture and Storage into the Great Artesian Basin

Carbon capture and storage has been utilised as a strategy to mitigate the impacts of climate change by limiting CO2 emissions from point sources such as coal-fired power stations, such as the one proposed in the

CTSCo CCS project. Carbon dioxide (CO2) is captured from burning fossil fuels and injecting the liquified CO2 product deep underground of approximately 2km, into a suitable geological formation such as a saline aquifer. CTSCo CCS project are proposing to direct CO2 waste from the Millmerran coal-fired power station, deep underground, in the Precipice Sandstone.

For CO2 injection it is important the aquifer is saline (Sodium Chloride) due to the reactive properties of the CO2 and NaCl which allow for a more alkaline water body, than adding CO2 into a more neutral environment, which will increase the acidity of the aquifer. It is also vital that no CO2 is injected into a water resource used for livestock or human consumption, which as stated, will contribute to acidification of the water body as the plume from the injection mobilises. In the CTSCo EIS Chapter 9: Groundwater, under section 9.7.4 residual impacts[1], CTSCo have highlighted that residual impacts are predicted to be limited and highly localised, however have not accounted for existing and future bore wells for agricultural use, noting:
"*The groundwater is not predicted to have a significant change in pressure. The injection testing of the GHG stream will have a negligible impact on the local groundwater quality of the Precipice Sandstone and will not compromise identified groundwater use. The groundwater EVs and WQOs of the vast majority of the Precipice Sandstone aquifer will remain unaffected by the Project, with the exception of changes to pressure and water quality within a highly localised extent, within the injected GHG stream plume*."[2]

For what we understand to be a world first in a water resource aquifer, this is unacceptable that 'the vast majority' of the Precipice Sandstone aquifer will remain unaffected. The design of the project is to target a low quality, and confined aquifer to avoid and minimise impacts to higher value and more frequently used aquifers in the area, however the information provided in the EIS doesn't reflect that statement, given there has been no allowances made for future agricultural expansion utilising water from the Precipice Sandstone aquifer of the GAB.

Under the *Environmental Protection Regulation 2019*, section 41, that for an activity involving direct release of waste into groundwater must refuse to grant an application if the authority considers under S41(2)part (b) the release of the waste is affecting adversely, or may affect adversely, a surface ecological system; or (c) the waste is likely to result in a deterioration in the environmental values of the receiving groundwater.

QFF notes that a clear avenue for GHG stream plume, which will mobilise within the aquifer via the extraction of bore water has not been evaluated in the EIS. The geochemical modelling undertaken in the CTSCo EIS Appendix 9A: Groundwater impact assessment, technical report, identifies that the main predicted changes (without bore extraction or utilising the aquifer as a potable water resource) will change the mineralogical composition of the aquifer from a pH of around 8 to a 4. The modelling undertaken assumes the injection of the CO2 will dissolve to form carbonic acid, thus degrading the current alkaline environment of the water, rendering it then unusable for livestock consumption.

The modelling work was focused on the plume migration; however, it is also worth noting that the foundation of this project is to reduce GHG's however, the geochemical modelling has also predicted the increase of sulphur dioxide (SO2) and nitrogen dioxide (NO2) as part of the associated impurities of the GHG injection stream. It is noted in the EIS that CTSCo that the impact of the impurities SO2 and NO2 would be negligible as their concentrations are relatively low, however this is inconclusive, as the ability for the stream flow integrated with bore extraction appears to not have been considered.

Status of CO2 storage in deep saline aquifers

Carbon capture and storage whilst continuing to allow continued large-scale use of fossil fuels is the only viable way to mitigate carbon emissions. Deep saline aquifers have been identified for quite some time as having the largest storage potential to store emissions. However injecting CO2 into deep saline aquifers leads

[1] 09+Groundwater+(final+221108).pdf (ctsco.com.au)
[2] 09+Groundwater+(final+221108).pdf (ctsco.com.au)p.86.

to a complex series of nonlinear issues that can significantly impact the water quality of the aquifer, and the underlying geomorphological formations.[3]

Various studies have been undertaken, that have identified two major issues associated with CCS, which are (1) the high energy demand and high cost of the capture process - approximately 30% of the energy from a power plant would be needed to per-form the capture, with current technology; and (2) the logistics of injecting large volumes of CO2into deep underground formations and the potential for critical environmental consequences of such large-scale injection.[4]

The Precipice Sandstone is the basal unit of the Surat Basin, that contains a sequence of interlayered aquifers and aquitards, which overlay a regionally extensive GAB aquifer with typically low-salinity groundwater. Water abstraction in the Precipice Sandstone is currently used for town water, stock and domestic and industrial use, which is estimated to be between 4 and 13GL/year from approximately 800 water bores.[5] The exploration for groundwater and oil and gas resources have allowed for the combined use of hydrogeological and engineering data to evaluate the use of CCS in the GAB as a way of CCS for sequestration of superficial CO2.

The Precipice Sandstone however is believed to represent high-energy braided river deposits, due to the geomorphological make-up of the cross-stratified sandstone. The implications for this, in relation to the utilisation as a continued water source are the orientation, size and connectivity of the geobodies that comprise the flow units, which are believed to have a more limited lateral extent, greater clay content and more limited hydraulic connectivity.[6] From this, CTSCo cannot assure that no contamination of the water will occur in the flow units from the GHG stream plume.

Limited protection policies in place

An interesting aspect of CCS studies is the strong connection to water and water resources. Power plants such as the one at Millmerran are proposing an added capture facility to facilitate the CCS sequestration, require about twice the amount of cooling water as the original power plant. This will add to the already stretched water-demand to the capture design. For the subsurface storage part, possible migration or leakage of CO2 or brine, or both, into shallow drinking-water aquifers is a major concern. In the United States the federal Environmental Protection Agency (U.S. EPA) has developed regulations for CO2 injection, including creation of a new class of wells specifically for CO2 injection.

The new wells overseen by the EPA are referred to as Class VI wells and are part of the Underground Injection Control (UIC) Program. The UIC Program was created as part of the Safe Drinking Water Act, so the primary focus of U.S. EPA regulations under the UIC is on the protection of underground sources of drinking water (USDW's), and not on reducing anthropogenic carbon emissions. In addition, brine extraction for the purpose of pressure control leads to a problem involving management of CO2 and water.[7]

As shown in other parts of the world, water plays a significant role in both the technical aspects of CCS and in the associated regulations, and CCS in general has significant topical interest in the field of hydrology and the impacts to water used for livestock and regional communities. Protecting water as a resource and not as an avenue to reduce GHG's, needs to be implemented in Australia. Economic, policy and regulatory changes will not be without challenges, however creating and adhering to a regulatory system that cannot be amended or

[3] Celia, M. A., S. Bachu, J. M. Nordbotten,& K.W. Bandilla (2015), Status of CO2storage in deep saline aquifers withemphasis on modelling approaches and practical simulations, Water Resource. Res.,51, 6846–6892. https://doi.org/10.1002/2015WR017609

[4] Celia, M. A., S. Bachu, J. M. Nordbotten,& K..W. Bandilla (2015), Status of CO2storage in deep saline aquifers withemphasis on modelling approaches and practical simulations, Water Resource. Res.,51, 6846–6892. https://doi.org/10.1002/2015WR017609

[5] Hydrogeology Journal (2020) 28:175–192; https://doi.org/10.1007/s10040-019-02079-9

[6] Hydrogeology Journal (2020) 28:175–192; https://doi.org/10.1007/s10040-019-02079-9

[7] Celia, M. A., S. Bachu, J. M. Nordbotten,and K. W. Bandilla (2015), Status of CO2storage in deep saline aquifers withemphasis on modeling approachesand practical simulations,WaterResour. Res.,51, 6846–6892. https://doi.org/10.1002/2015WR017609

challenged as a result of storing waste in groundwater requires immediate intervention. Implementing mandatory regulation that restricts the degradation of our most valued resource, also requires strict policy instruments that restrict and deter this avenue of waste disposal as a mitigation practice for fossil-fuel generated power plants.

Carbon Storage and water security

Not all CCS projects require an aquifer to store the CO_2 stream. In 2009 a report was issued that assessed Australia's future potential for CCS. In this report the National Carbon Storage taskforce noted that the simplest form of CCS involves depleted oil or gas fields.[8] But for the CTSCo project, injection of the CO_2 stream will use a very deep part of the Precipice Sandstone aquifer. Once the CO_2 is injected, the actual injection zone will become unusable as a water source. The object for CO_2, is to be injected where it will remain underground. This means that the area of injection effectively becomes unusable as an aquifer.

As has been previously noted, the EIS identified that high alkalinity, salinity, chloride and fluoride levels, make the Precipice Sandstone aquifer unsuitable for irrigation, stock and domestic use. This is however unsubstantiated, given that the many landholders in this vicinity currently extract groundwater for stock and domestic use, which requires treatment such as reverse osmosis.

Combining CCS, and climate change, it is understood that CCS is a large mitigation factor that will help contribute to Australia's net zero emissions, and help reduce the impacts of climate change, but one factor that was failed to be considered in the EIS is the impacts to the aquifer with increased extraction under climate change. There is no data that can assure landholders that the injecting of a CO2 stream will not cause environmental pollution within the aquifer, and more importantly the increased reliability of the aquifer to contain enough groundwater for extraction in periods of drought. Regardless of what the current water quality is brought forward in this assessment, protecting our groundwater for the future is critical for the future of water security in Australia. The IPCC has already indicated that the predicted impacts of climate change for Australia will see higher evaporation of surface water, longer periods of drought and increased flood events. A reliable groundwater source to maintain the water security of the GAB, needs to be held in higher regard than a place to dispose of unwanted industrial waste.

3.0 Submission Recommendations

QFF recommends the following:

- QFF strongly encourages the government not to allow injecting waste into the GAB and does not amend legislation that would allow such an activity at any location in the GAB in the future.
- QFF encourages legislative parameters are put in place to strongly guide and underpin where it is appropriate to explore carbon capture and storage projects and where it is not, ensuring the future protection of the GAB.
- QFF strongly encourages that alternate sites are explored that sit outside the GAB, provide distinctly saline formations, cost effective injection sites that do not provide usable water that could otherwise support the future growth of agriculture and rural communities.
- Treat trials of this nature extremely cautiously due to the potential risks they pose to the GAB and the possible precedent approvals may then set for future projects.
- Ensure agriculture and rural communities are engaged in an authentic, effective manner moving forward in any future advancements of carbon capture and storage projects to ensure all impacts are understood and considered.
- As discussed with the Department of Environment, QFF will be submitting a peer review in relation to the quality of water and other assumptions for consideration within 15 days of close of submissions.

[8] National Carbon Mapping and Infrastructure Plan—Australia: Full Report

4.0 Conclusion

There is increasing pressure on the global need to abate CO2 which in turn is driving the development of innovative and new methods of doing so. QFF submits that innovation, technology, and best practice that is underpinned by sound, scientific data has an important role to play in CO2 abatement targets being achieved in the future.

QFF is concerned, however, that this project has the potential to be a poor "flagship" "first of its kind in QLD" trial for the Carbon Capture and Storage (CCS) Industry and the many industries that the technology aims to support. There is not enough scientific evidence to give comfort that the GAB will be safeguarded. The proposed aquifer is significant both from an environmental and economic perspective. This trial poses risks to the current and future operations for agriculture in the region. This aquifer is too close to affected users and contains good quality water which has the ability to support the future growth plans of the agricultural industry in that region.

QFF submits that consequently, the Surat Basin Carbon and Storage Project should not proceed and at the very least, further consultation with concerned business and industry should take place before further consideration for the project be given.

QFF welcomes the opportunity to provide comment to the EIS Surat Basin Carbon Capture and Storage Project and would welcome the opportunity to discuss the specific contents of this submission with you at your convenience.

Yours sincerely

Ms Jo Sheppard
Chief Executive Officer