Submission No 3

INQUIRY INTO THE IMPLEMENTATION OF THE RECOMMENDATIONS CONTAINED IN THE NSW CHIEF SCIENTIST'S INDEPENDENT REVIEW OF COAL SEAM GAS ACTIVITIES IN NEW SOUTH WALES

Name: Mr Anthony John Pickard

Date Received: 24 October 2019

NSW GOVERNMENT | Chief Scientist & Engineer

Final Report of the Independent Review of Coal Seam Gas Activities in NSW

September 2014

Summary of Comments on 140930 CSG Final Report

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Number: 1 Author: Tony Subject: Sticky Note Date: 21/10/2019 9:44:37 PM

To The Chair of the portfolio Committee No.4 Industry.
Inquiring into the implementation of the recommendations contained in the NSW Chief Scientists Independent Review of Coal seam Gas Activities in NSW.

Sir
Firstly let me thank this Inquiry for allowing the Public to make comment.
My name is Anthony John Pickard and I have property in the Jacks Creek area of the Pilliga Forest.
I have gas wells to the South, North and West of me and this is my submission, which consists of some notations against sections and Recommendations contained in this Report.
I am sure to have missed many areas of concern, however I am sure that these will, in the main, be covered by others.
I have made my submission this way because I believe that it is best to point out at least some of the areas where either little to nothing has been done or where there can be improvements.
I have not attached documents to back my case because I feel that if they were needed by the Committee then a request for them can be made.
So much was pinned on the Chief Scientists Report yet the implementation has fallen short.
The Recommendations have in many ways not kept pace with the rapidly knowledge acquiring world and as such the Gas Companies are able to fall back and quote that they are fully compliant with the 2014 Recommendations. This is almost 2020.
I am also fearful that CSG in NSW especially the Narrabri Gas project will be placed before the IPC before all the Chief Scientists Recommendations are fully implemented, tested and approved.
Remember that should the Narrabri Gas project be approved prior to the complete implication of all the Chief Scientists Recommendations are fully implemented the company Santos can and most likely will argue that they only have to comply with many of the non regulatory Recommendations in place at the time of approval.
It is vitally important and only fair to both sides in this debate as well as those who are neutral, that ALL of the Recommendations be fully implemented prior to any approval of CSG Operations either Exploration or Production onshore in the state of NSW.

NSW GOVERNMENT | Chief Scientist & Engineer

The Hon Michael Baird MP
Premier
Minister for Infrastructure
Minister for Western Sydney
Parliament House
SYDNEY NSW 2000

Dear Premier,

Final Report – Independent Review of Coal Seam Gas Activities in NSW

In February 2013 your predecessor wrote requesting I undertake an independent review of coal seam gas activities in NSW. I now submit the final report of that Review.

This report presents the Review's findings and recommendations. Detailed support for the outcomes of the Review is provided in the accompanying reports and information papers released as part of the Review.

In presenting this final report I wish again to acknowledge the assistance of many people – the experts who advised the Review; those who took the time to write submissions or talk to my team; colleagues from government departments in NSW and other jurisdictions; colleagues in industry, research organisations, learned academies and professional associations; and the CSG review team itself which worked hard to make sense of a complex and contentious issue.

Yours sincerely,

Mary O'Kane
Chief Scientist & Engineer
30 September 2014

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EXECUTIVE SUMMARY

This report is the final and overarching report of the independent review of coal seam gas activities in NSW (the Review) undertaken by the Chief Scientist and Engineer. It presents the main findings and recommendations of the Review along with a summary of Government decisions regarding CSG over the time of the Review and a description of the Review process.

The Review was commissioned on 21 February 2013 by the former Premier, in a climate of community unease about CSG extraction.

The initial report of the Review was released in July 2013. In June 2014 the Review released reports on related matters referred to it by Government (cumulative impacts of activities in the Sydney Water Catchment, and placement of monitoring equipment for NSW water resources). At that time it also released a report on whether adequate financial mechanisms are in place to deal with possible environmental impacts from CSG and related operations.

With the release of this final report, the Review is also releasing reports on regulatory compliance and managing risk.

In preparing these reports, the Review drew on information from a large number of experts from around the world in a range of fields. It also consulted extensively with community groups, industry and government agencies.

Having considered all the information from these sources and noting the rapid evolution of technological developments applicable to CSG from a wide range of disciplines, the Review concluded that the technical challenges and risks posed by the CSG industry can in general be managed through:

- careful designation of areas appropriate in geological and land-use terms for CSG extraction
- high standards of engineering and professionalism in CSG companies
- creation of a State Whole-of-Environment Data Repository so that data from CSG industry operations can be interrogated as needed and in the context of the wider environment
- comprehensive monitoring of CSG operations with ongoing automatic scrutiny of the resulting data
- a well-trained and certified workforce, and
- application of new technological developments as they become available.

All of this needs to take place within a clear, revised, legislative framework which is supported by an effective and transparent reporting and compliance regime and by drawing on appropriate expert advice.

Of course, as the technologies involved are applied in new regions where the detailed hydrogeology is not yet fully characterised, there could be unexpected events, learnings, or even accidents. This is common for new applications in the extractive industries and underlines the need for Government and industry to approach these issues with eyes wide open, a full appreciation of the risks, complete transparency, rigorous compliance, and a commitment to addressing any problems promptly with rapid emergency response and effective remediation. It also highlights the need to record and capitalise on the data and knowledge gained from CSG extraction activities in new regions and to take advantage of new technology developments which, if harnessed appropriately, can make CSG production increasingly safer and more efficient over time.

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Transparent by and to whom? Certainly the Government Departments and the CSG Industry may be carrying out some of these requirements, but not all. However, the easy viewing of this Reporting and Compliance information by those who are wanting to do so is all but impossible at times to the average person due to changing website construction and the changing of supported search engines. Santos claims 'commercial-in-confidence' with much of its data this then prevents those who are questioning or interested in getting a better idea of how the CSG industry in Northern NSW may affect them and the environment from obtaining information necessary in order to understand the workings of the industry

Then there is the Governments GIPA system and its restrictive and high cost to individuals which has the effect of deterring many except those from organizations from using.

Number: 2 Author: Tony Subject: Sticky Note Date: 21/10/2019 10:04:12 PM

It has taken almost 5 years since the CS Report, an admission by a Coal Company and questions from those from the 'interested community', for a restrictive study of the hydrogeology of a small section of the Southern Recharge Area of the GAB to be commenced. Even in areas such as around the Narrabri Gas project area the hydrogeology has not been properly and throughly explored. In just the last 12 months GISERA has released 2 Reports, I will call them W8 and W9 and they are publicly available, on the drawdown of the groundwater due to Santos' CSG activity in the NGPA , with the first report showing a bigger that reported drawdown in one location while the second report agrees with many of the findings of the first report it finds that there will not be the larger groundwater drawdown as described in the first report.

Now, GISERA is doing a report on the possibility of there being Geological Faults in the area just to the West (Bohena Creek) of the area of high drawdown as described in the first Report.

I must point out that the GISERA Reports do not take into account the underground coal mine which has stated in the Water Reports presented with the application for SEARS for an expansion of its underground operation, that its operation would cause geological faults to occur in the GAB Basin floor and above.

It has been known by the Gas Companies and since 2011 by myself, when Eastern Star Gas gave a presentation to Narrabri Shire Council at a General meeting, on its operation and informed the Councilors, Council Staff and those members of the Community present, that there were already a number of geological faults in the GAB floor geological structure which would allow a faster leakage of groundwater from the GAB and GAB Southern Recharge into the coal seam below once there was a pressure drop within the coal seam due to the CSG operation of removing water from the coal seam in order to obtain the gas held within.

Contents

1 ABOUT THE REVIEW

1.1 THE REVIEW AND ITS REPORTS

The independent review of coal seam gas activities in NSW (the Review) undertaken by the Chief Scientist & Engineer began in late February 2013. The Terms of Reference for the Review are at Appendix 1. This report is the final and overarching report of the Review.

Over the past 19 months, the Review has examined the coal seam gas (CSG) industry, the potential environmental, human health and social impacts of CSG extraction, and the legislative and regulatory framework within which CSG operations occur in NSW.

The Initial Report of the Review (CSE Initial Report) was released in July 2013. It provided an overview of the issues and made five recommendations. Since then, the Review has released and is releasing reports on major topics identified through the Review, including:

- insurance and related financial coverage to manage environmental impacts (CSE Insurance)
- compliance systems and processes (CSE Compliance)
- risks to human and environmental health (CSE Risks).

The Review has also provided advice on other related matters requested by Ministers, specifically:

- the placement of monitoring equipment for water resources (CSE Monitoring)
- measuring cumulative impacts of activities which impact ground and surface water in the Sydney Water Catchment (CSE Catchment).

A full list of all the reports released by the Review is given at Appendix 2. All are available on the Chief Scientist & Engineer's website (http://www.chiefscientist.nsw.gov.au/coal-seam-gas-review).

In addition, the Review team is releasing information papers on fracture stimulation, abandoned wells and on managing the physical interface between the CSG industry and other activities. As well, more than 20 background information papers by experts were commissioned on a range of topics, with more than one paper for more controversial topics. These background papers are also available on the website.

1.2 PROCESS OF THE REVIEW

Overall the process of the Review was developed in the knowledge that the issues to be examined were contentious, complex, technical and wide ranging. For this reason it was clear that the Review needed to canvass many different opinions and experts covering a range of perspectives and fields, but it had to do this in a way that maintained a level of independence and avoidance (or awareness) of organisations' conflicts of interests.

The Chief Scientist & Engineer established a team within the Office of the Chief Scientist & Engineer (the Review team) to support and facilitate the Review work. The size of the task required the team to grow from the small team already in place in the Office. The fact that the Review team included individuals with a diverse range of academic and professional backgrounds, including computer engineering, chemical engineering, mechanical engineering, petroleum engineering, hydrogeology, medicine, agriculture, chemistry, environmental science, high-tech equipment compliance systems, public policy and communication, brought a range of perspectives to the issues involved. While the Review team members were not CSG experts, their range of experience meant the Review was able

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The Government monitoring bores in the NGP area total one and that was only equipped to monitor in the last 18 months.
Another bore nest is currently going down near Beehive road with another on Scratch Road, but they will not be equipped to monitor until sometime in 2020 at the earliest.
The existing nest (on Plumb Road) only remotely monitors Standing Water Levels with no pH or TDC by calc.. Water samples are taken occasionally with the results supposedly available to the public but these results are hard to find and DO NOT INCLUDE BACTERIA such as Sulphate Reducing Bacteria or any of the IRON Bacteria, both of which have a Microbiological Corrosive effect on the internal and external material that constitutes CSG Wells.
The monitoring well nest consists of 3 wells whose depths are 640.5m, 388m and 336m, there are no shallow (around 100m deep) bores in order to monitor the upper groundwater regions for BACTERIA which are known to cause Microbiological Corrosion of the the cement outer sealing and other gas related infrastructure.
Microbiological Corrosive Bacteria can be transferred from on location to another by the Well Drilling Infrastructure if not properly cleaned between uses even in the same area. (see Schlumberger https://www.glossary.oilfield.slb.com/en/Terms/h/h2s.aspx)
More on Bacteria later.

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I have to wonder if the Gas companies fully co-operated with the Chief Scientist and those who assisted her in this Review, by providing all information that was requested of them in order to assist in making a proper and scientific based assessment of all the effects that CSG poses.
This concern is prompted by the tendency for the Gas Companies to claim "commercial-in-confidence" when asked to explain some matters related to their operation.
The latest publicly available written use of this was where Santos had used this 'commercial-in-confidence' excuse could be found on the Department of Planning and Environment Web Page for the Narrabri Gas Project and is contained in a request from the "Water Expert Panel - Follow-up questions for Santos" for more information to that supplied in the RTS by Santos.
If this excuse, by Santos, is being made today to a panel of experts set up by a NSW Government Department to provide expert and impartial advise to that Department, the question is "Was it used by the Gas Companies to avoid providing all the information requested so that the Chief Scientist could make her Recommendations"?
The other method used is to totally ignore the request for information, or to give a very vague reply or delay the reply for long periods until Santos feels that the question is no longer relevant to those who asked it.
As a member of the Narrabri Gas Project CCC (NGPCCC) I have experienced first hand all of the methods as described in the last paragraph over the last 6 months to 1 year.
It is not only Santos but the questions directed to NSW Government Departments through the designated Government representative to the NGPCCC also fall into this category.
Of late even the members of the NGPCCC do not seem to be interested in matters, other than those that could bring a financial gain, Narrabri Hub and the running of the Community Benefits Fund, have been the main topics, with questions from the Community that I represent concerning the CSG Operation taking a back seat.
I really have no idea why the above approach is being taken, all I know is that the questions given to me from the Community are getting more and more technical and more specific as I can think of no other reason except for a potential financial loss for this attitude. I can only speculate based on what is happening that Santos, the NSW Government Departments and others do not seem to appreciate this knowledge evolution.

to formulate detailed technical queries and undertake informed analysis and interpretation of relevant issues and information, drawing on experts advising the Review as necessary.

Throughout the Review the team has pursued the philosophy of operating as transparently as possible, publishing all submissions received apart from those marked 'confidential' on the website of the Chief Scientist & Engineer, talking to the media on request and publishing commissioned papers on the website. Those working on the Review, either in the team or as commissioned experts, were asked to declare all real and possible conflicts of interest with a register established and decisions about how to handle conflicts being determined on a case-by-case basis with decisions formally recorded.

The range and complexity of the issues meant that a great many individuals and organisations needed to be canvassed, ranging from independent impartial experts, to key players in the CSG landscape; from those deeply supportive, to others fighting to prevent the industry's further development.

To address the terms of reference and understand the complexities of the issues, the Review team conducted substantial literature searches (CSE Initial Report §1.4.1) and read widely in the peer-reviewed literature as well as the 'grey literature' reports from organisations, industry and associations. During the course of the Review, a range of material was developed and released by other Australian bodies including the Commonwealth (particularly through the IESC processes), the Queensland Government, CSIRO and other organisations. This was taken into account by the Review.

Consultation was undertaken widely with independent academic experts, government agencies, natural gas industry and service companies, industry bodies, wider industry, community activist groups and the broader community to understand the key issues from a range of perspectives. These consultations were done through public submissions, background technical information papers, formal meetings, visits, workshops, interviews and information requests.

Technical assistance and expertise was drawn particularly from universities, publicly funded research organisations, the learned academies and technical consulting firms. Such assistance included commissioned papers, occasional advice on formulating issues, assistance with identifying experts, peer review of the Review reports, and participation in meetings.

A series of background technical information papers was commissioned on a range of issues related to the CSG industry. Independent experts, who had minimal or no actual, potential or perceived conflicts of interest, were engaged to write the papers. The rationale, process and development for the papers is discussed in the Initial Report §1.4.2. More than 20 background papers have been developed and are available on the website (http://www.chiefscientist.nsw.gov.au/coal-seam-gas-review/csg-background-papers).

The Review inspected CSG exploration and related water-management activities at Narrabri and Gloucester and inspected CSG production and related activities at Camden. It also inspected the Apex Energy CSG exploration site in the Sydney Catchment.

A call for public submissions to the Review was made to enable the Review to understand the issues and concerns from various perspectives (CSE Initial Report §1.4.5). Submissions were welcomed throughout the entire Review and provided considerable insight into specific issues. A total of 266 submissions was received. The submissions are available on the website (http://www.chiefscientist.nsw.gov.au/coal-seam-gas-review/public-submissions).

Consultations involving community members and local councils were held across the State in Camden, Campbelltown, Gloucester, Sydney Catchment, Taree, Gunnedah, Narrabri (including the Pilliga) and the Liverpool Plains.

The team also consulted with government agencies in NSW, across Australia, and overseas.

Consultations with NSW Government agencies formed an important part of the Review, and were used to provide information on the current regulatory system, how the system has operated previously, and what reforms have been put in place more recently. The Review had many face-to-face meetings and teleconferences over the period with agencies, and also surveyed relevant agencies to identify data holdings and systems. The Review sought formal advice on specific issues as required. The Review team also worked closely with the Land and Water Commissioner, drawing on his ongoing consultations across the State on CSG.

The team met with relevant officers from Queensland, Western Australian and South Australian agencies to understand the processes and issues being dealt with in those states. Discussions were held with various Commonwealth Government agencies and agencies from overseas including from Canada, New Zealand, USA and UK. The government agencies associated with resource and environmental management in these other jurisdictions were consulted through meetings, phone discussions and email, with some of these agencies also assisting the Review by providing peer review of report sections, in particular as they related to their jurisdictions.

Various stakeholders from the CSG industry, including companies providing services to the CSG industry, community groups, industry bodies and associations, including from the wider business sector, were invited to meetings with the Review team to discuss key issues and concerns – including those raised in submissions. The Review team met many of these organisations multiple times, including meeting with peak bodies and key stakeholders in the final few weeks of the Review to ensure that the team kept abreast of any new issues that may have arisen.

The Review also ran several workshops aimed at resolving some of the more difficult issues. To understand the complexities associated with cumulative impacts in the Sydney Water Catchment, the Review held two workshops where it brought together top-level experts in relevant fields (see CSE Catchment §1.3.3). To inform the work on CSG risks, four workshops were held. These were a novel way of bringing together stakeholders (many expert) from industry, research organisations, government and the community so participants could hear, debate, consider and, in some cases, resolve opposing viewpoints. Attendees at these workshops were selected for their knowledge, expertise and interest in the issues related to CSG and related activities. Government officials, researchers, and representatives from extractive industries, peak bodies, learned academies and community groups took part, providing a diverse range of backgrounds, expertise and views. Further to this a series of targeted meetings was held with expert practitioners from individual government agencies, research organisations and industry to delve further into specific issues in particular the risks and technical controls available to manage CSG (see CSE Risks §1.2.1).

By far the most complex and time-consuming task the Review undertook was the Compliance Study and its investigation of the processes and systems for ensuring compliance with legislative instruments, regulations and conditions applying to CSG extraction in NSW. The approach to reviewing compliance activity was informed by consultation, public submissions, well inspections, site visits and extensive interaction with the various agencies responsible for compliance with the legislation and regulations pertaining to CSG extraction (see CSE Compliance §1.2), but was challenged by difficulties

in obtaining data to demonstrate compliance, and indeed it ended up being the rate-limiting step for the Review.

1.3 HOW THIS REPORT IS STRUCTURED

This final report provides the overall findings and recommendations of the Review. The individual reports, listed at Appendix 2, provide the detail, evidence and rationale behind various findings and recommendations.

The main findings of the Review are in Chapter 3 and its recommendations are in Chapter 4. As much has happened in Government regarding CSG over the course of the Review, these developments are summarised in Chapter 2 to provide contemporary context for the findings and recommendations.

2 DEVELOPMENTS IN GOVERNMENT AND RELATED ENTITIES SINCE THE REVIEW STARTED

During the course of the Review, a number of regulatory, administrative and process changes have been brought in by NSW Government as well as Commonwealth and local entities to address issues related to CSG.

Legislative reform has included a range of amendments to the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (SEPP), which brought about initiatives such as the Gateway Process, Strategic Agricultural Land mapping, residential CSG exclusion zones and their 2km buffers, as well as Critical Industry Clusters in the Upper Hunter, and clarified the State Significant Development criteria for CSG exploration wells. Further changes to the SEPP were also introduced to stipulate criteria to protect water resources, habitat and amenity; to ensure that decisions around approvals balance economic (resource) and environment issues; and to require the consent authority to consider biodiversity mitigation and offsets.

The *Protection of the Environment Operations Act 1997* and the *Protection of the Environment Operations (General) Regulation 2009* were amended, positioning the Environment Protection Authority (EPA) to be the lead regulator for environmental and human health impacts of CSG; and introducing a risks-based approach to environmental licensing.

Soon to be completed are a review of the *Petroleum (Onshore) Act 1991* and the introduction of a new title instrument that aims to ensure that activity approvals and conditions travel with the petroleum title. The Codes of Practice for Fracture Stimulation Activities and Well Integrity are also being reviewed, while Codes for Safety Management Systems and Emergency Response are being developed.

During the period of the Review, the Commonwealth Government has also introduced legislative changes that impact NSW CSG industry, in particular the introduction of the 'water trigger' under the *Environmental Protection and Biodiversity Conservation (EPBC) Act 1999*, requiring the CSG-related proposals that are likely to impact significant water resources to be referred to the Commonwealth. Later amendments devolved the Environmental Impact Assessment authority from the Commonwealth to NSW, with the Commonwealth accrediting the NSW processes.

Several changes have also been made to the administrative arrangements in NSW Government agencies for dealing with CSG. These have included the establishment of the Office of Coal Seam Gas in NSW Trade & Investment; the establishment of the position of Land and Water Commissioner; and a review followed by a restructure of the Division of Resources and Energy (DRE) in NSW Trade & Investment, following the appointment of a new Deputy Secretary. Furthermore, the responsibility for collecting minerals royalties (including for petroleum) has been transferred from DRE in NSW Trade & Investment to the Office of State Revenue in the Treasury and Finance cluster of NSW Government, effective from July 2014.

Efforts have also been made to streamline and coordinate processes across regulators, including through a Memorandum of Understanding (MOU) and the establishment of a cross-agency working group on CSG. In addition, several agencies have taken steps to improve regulatory capability and capacity through recruiting staff, purchasing additional

instrumentation and developing materials to improve officers' knowledge of the CSG industry.

On exploration licence issues, the NSW Government has:

- put a hold on CSG exploration and extraction in the Sydney Water Catchment Special Areas
- put a 6 month freeze on new petroleum exploration licence applications, which was extended by a further 12 months to September 2015
- undertaken to audit existing petroleum exploration licences
- designated the Santos Narrabri Gas Project and AGL's Gloucester Gas Project as Strategic Energy Projects
- signed an MOU with Santos to streamline the assessment process for the Narrabri Gas Project
- renewed AGL's Gloucester petroleum exploration licence and granted an activity approval to fracture stimulate four wells.

Initiatives that relate to land access have been introduced by Government and other entities, such as a review of the process for arbitrating land access arrangements for exploration commissioned by NSW Government followed by the announcement in August 2014 that all recommendations of that review were endorsed and will be implemented progressively. A voluntary Code of Practice for Land Access was developed by DRE. An MOU was executed by NSW Farmers, Cotton Australia, NSW Irrigators Council, AGL, and Santos agreeing common principles of access to private agricultural landholders' property.

Other broader initiatives that affect CSG extraction include:

- an Energy Security Summit that examined emerging issues of gas supply for NSW
- the release of the Water Monitoring Framework developed by the NSW Office of Water, which includes a Groundwater Baseline Project commissioned by the Land and Water Commissioner
- an announcement by the Minister for Natural Resources, Lands and Water of a scheme to credit the return of groundwater to the water sources from which it was extracted
- development by the NSW Office of Water of Guidelines to assist proponents to develop Groundwater Monitoring and Modelling Plans
- release of a framework by the NSW Office of Water that describes the assessment criteria for the Aquifer Interference Policy to aid the development of a project proposal or Environmental Impact Statement.

Other developments, not directly related to CSG, that could impact the industry include:

- the release in October 2013 of the Independent Commission Against Corruption's report *Reducing the opportunities and incentives for corruption in the state's management of coal resources,* that makes a range of relevant recommendations on managing the coal mining industry in NSW
- a number of agency amalgamations and restructures including the formation of Bulk Water NSW from the Sydney Catchment Authority and State Water, and the creation of the new Department of Planning and Environment.

3 FINDINGS

This chapter presents the high-level findings of the Review. The evidence and reasoning supporting these findings is provided in the various detailed reports of the Review, listed at Appendix 2.

Stakeholders have significant concerns

- Land is a key issue and one that strikes an emotional chord due to the strong affinity Australians have with their land and its central role in the livelihood of rural communities. There is a perceived lack of support for rights of landowners in terms of access to their land. Lack of consultation, inadequate compensation, property value decreases, and potential legacy issues are also cited as major issues by landowners as are the negative impacts on amenity and a lack of adequate benefits for their neighbours and their communities.
- Water is another key issue. Primary producers and others fear that CSG developments will negatively impact prime agricultural land by depleting aquifers and contaminating groundwater reserves. They argue that it could result in reduced food production.
- Other major concerns, especially from community groups, are short- and long-term negative environmental impacts (and who will pay to remediate land); managing produced water and associated by-products such as salts; possible impacts on human and animal health; the distributed nature of the industry (giving rise to concerns including malfunctioning unattended wells and heavy traffic on minor roads); and the cost to the taxpayer of regulating the industry.
- Certain processes such as fracture stimulation ('fracking') and, to a lesser extent, horizontal drilling, are of particular concern in the context of CSG although the use of these techniques in other industries (underground water access in the case of fracture stimulation and infrastructure provision in the case of horizontal drilling) is more accepted.
- There is concern about lack of adequate and respectful consultation. Stakeholders cited the failure of industry proponents and government agencies at all levels to engage, provide information, communicate and address community concerns before proceeding with development. On the issue of consultation and adequate information provision, the Review notes that getting the balance right between overall benefit to society and impact on individuals is a recurrent challenge for governments especially for issues as divisive as CSG. While the Review found that consultation and information provision could be significantly improved, it is clear that there are many in the community whose level of concern is such that they are likely to remain opposed to CSG production in NSW under any conditions.
- A large number of those who expressed their opposition to CSG to the Review also made it clear that they were not opposed to CSG *per se* but were opposed to CSG production in heavily populated areas and in areas of intensive agricultural production.
- Local councils, especially rural councils, are concerned that they are not receiving adequate funds to cover rapid infrastructure upgrades (such as upgrades to local roads and other amenities) necessary to deal with the CSG industry coming to a rural locality.
- The CSG industry is concerned that it is being adversely affected financially by what it perceives to be an uncertain, often changing, and increasingly tough regulatory regime in NSW.
- There is a perception in some parts of the community that CSG extraction is potentially more damaging and dangerous than other extractive industries. This perception was heightened following the release of the American movie *Gasland* in 2010. The Review examined this issue in detail and concluded that while the CSG industry has several

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This dot point is as valid in 2019 as it was in 2014.
Yes there are people on both sides with a fixed view that will never be changed, however, there are many more that are willing to respectfully debate with Governments, Politicians and others within the community if only there was such an avenue to do so. Sadly there is not and the only real opportunity available is when there are Applications put to Government such as REF's, Modifications and EIS's, and even then it appears that the concerns raised in submissions by the members of the public these are ignored in favor of the gas companies.
There are of course Community Consultation Committees (CCC), Company organized tours and there were company organized public meetings, the latter has but gone with the Santos only holding meetings for prospective Contractors. The first two remain, with the CCC now becoming little more than a joke when it comes to addressing the concerns and questions directly relating to CSG.
Let me sight a few recent examples:
1 - In August 2018 GISERA put out 2 Reports. One on the expected effect that the NGP would have on the groundwater levels as a result of the NGP (W8) the other was on Plug and Abandoning of gas wells (S9), I proposed to the Chair that we invite GISERA to the NGPCCC to Present on the Reports, this was put to the members the majority voted No, Then at the next NGPCCC , after a presentation on Water Monitoring, the invite to GISERA was raised and this time it was a Yes and a date set for later in 2018, this was subsequently changed to early 2019, nothing happened, in the meantime GISERA out out another Report on the anticipated groundwater drawdown this one being Project area based (W9). After GISERA did not attend in early 2019 I raised the subject of inviting again. Again it was put to the vote this time the majority of members said NO. So it can be sen from this example that while one or two members want to know more and circulate that information to the people they represent, the majority of NGPCCC members do not want this to occur.
2 - At the July 2019 NGPCCC (#39) questions from the members of the community that I represent were again presented and accepted. Five (5) were to NSW Government Departments twenty seven (27) to Santos. To date only Two (2) out of Five (5) put to the NSW Government Departments were answered those not answered relate to an Groundwater Impact Study that the Qld. Government announced in May 2019 and whether the NSW Department responsible intending to do one also.
Of the Twenty Seven directed to Santos NONE have been answered, those questions that were answered were given out in hard copy only at the September 2019 meeting.
3 - At the September 2019 NGPCCC Secretariat (Santos) was handed 70 plus questions to be answered all these questions related to matters associated with the NGP. The Secretariat informed the Chair that they had these questions in writing and that Santos did not have the time to respond and as such did not want to. The Chair informed Santos that they must respond with what ever answer they feel was appropriate. To date answers to those question have not been returned.
I have to wonder why the NSW Government is looking into this 2014 Report. Is it because the Recommendations in the Report are too difficult and costly for both Government Departments and Gas Companies to police and adhere too?
Or:
Is it because the NSW Government is really concerned about the extent of knowledge and understanding about the CSG industry that people have re practices and events that have occurred in Australia and world wide that were bought up at the time but were ignored, for what ever reason and never covered by any of the Recommendations contained in the 2014 Chief Scientists Report?
As for a balance with regard to benefit to community/society verses impact on individuals, little to nothing has been done in regard to looking after the individual, especially those who live inside of the a gas field and do not hold the pro gas belief, I should know and I see this again in the attitudes towards myself by my fellow members on the NGPCCC and Santos. I represent a group within the so called Activists (those who have differing views and are willing to ask questions) and I get howled down for it, so much so that I have formed the opinion that maybe I and the other questioners are right in what we are doing and this has the Gas Companies and Government concerned.
At the September 2019 NGPCCC meeting, when the Department of Planning were discussing the Community Benefit Fund, I broached the subject about a requirement that a percentage of the monies in that fund be allocated for exclusive use in the area within the NGP for the benefit of those Narrabri Shire Rate payers, something along the lines of what the money was going towards in the main towns but on a smaller scale. It was suggested I keep quiet on the idea as it could be taken that I wanted a benefit.
Consultation is not respectful.

Number: 2 Author: Tony Subject: Sticky Note Date: 23/10/2019 8:47:32 AM

This note is a continuation of the previous.
Maybe if the gas companies were more open and honest and willing to provide answers to questions in a timely and respectful manner as well as having a less secretive nature when it comes to present and future plans (the Narrabri Gas Project EIS is a good example of this, for example, there is no information re the Power station or Compression plant in the EIS only a footprint outlined on a map of Leewood and a few lines in the EIS. The NGPEIS contains many such examples for those who are willing to read it).
I will sight another example;
In November of 2009 Eastern Star Gas put in an REF for the Tintsfield CSG Pilot, within this REF was a location for the produced Water Management Facility which was located near to the public roadway but on Company owned land, Wilga Park.
In February 2010 Eastern Star Gas put in the Tintsfield Water Management Plan which now has the produced Water Management Facility in the present location well away from the property boundary fence.
There is no explanation as to why the location was moved and requests to the NSW Department responsible for CSG for any Application and Approval documents for the location change, have gone unanswered, I suspect because there are none.
This is not important to many, however in 2019 Santos put in another Water management Plan for the Tinsfield ponds, this plan exposed a

Comments from page 12 continued on next page

3 FINDINGS

This chapter presents the high-level findings of the Review. The evidence and reasoning supporting these findings is provided in the various detailed reports of the Review, listed at Appendix 2.

Stakeholders have significant concerns

- Land is a key issue and one that strikes an emotional chord due to the strong affinity Australians have with their land and its central role in the livelihood of rural communities. There is a perceived lack of support for rights of landowners in terms of access to their land. Lack of consultation, inadequate compensation, property value decreases, and potential legacy issues are also cited as major issues by landowners as are the negative impacts on amenity and a lack of adequate benefits for their neighbours and their communities.
- Water is another key issue. Primary producers and others fear that CSG developments will negatively impact prime agricultural land by depleting aquifers and contaminating groundwater reserves. They argue that it could result in reduced food production.
- Other major concerns, especially from community groups, are short- and long-term negative environmental impacts (and who will pay to remediate land); managing produced water and associated by-products such as salts; possible impacts on human and animal health; the distributed nature of the industry (giving rise to concerns including malfunctioning unattended wells and heavy traffic on minor roads); and the cost to the taxpayer of regulating the industry.
- Certain processes such as fracture stimulation ('fracking') and, to a lesser extent, horizontal drilling, are of particular concern in the context of CSG although the use of these techniques in other industries (underground water access in the case of fracture stimulation and infrastructure provision in the case of horizontal drilling) is more accepted.
- There is concern about lack of adequate and respectful consultation. Stakeholders cited the failure of industry proponents and government agencies at all levels to engage, provide information, communicate and address community concerns before proceeding with development. On the issue of consultation and adequate information provision, the Review notes that getting the balance right between overall benefit to society and impact on individuals is a recurrent challenge for governments especially for issues as divisive as CSG. While the Review found that consultation and information provision could be significantly improved, it is clear that there are many in the community whose level of concern is such that they are likely to remain opposed to CSG production in NSW under any conditions.
- A large number of those who expressed their opposition to CSG to the Review also made it clear that they were not opposed to CSG *per se* but were opposed to CSG production in heavily populated areas and in areas of intensive agricultural production.
- Local councils, especially rural councils, are concerned that they are not receiving adequate funds to cover rapid infrastructure upgrades (such as upgrades to local roads and other amenities) necessary to deal with the CSG industry coming to a rural locality.
- The CSG industry is concerned that it is being adversely affected financially by what it perceives to be an uncertain, often changing, and increasingly tough regulatory regime in NSW.
- There is a perception in some parts of the community that CSG extraction is potentially more damaging and dangerous than other extractive industries. This perception was heightened following the release of the American movie *Gasland* in 2010. The Review examined this issue in detail and concluded that while the CSG industry has several

problem with the altered location, this being that when, in 2010, the ponds location was moved NO Indigenous Cultural Heritage Study was carried out at the new site. When in 2019 a Study done in it was found that there were artifacts of significance and a Scar Tree. Now do you see why people do not trust what a Gas Company or the Government says and pushers for more well defined and Policed Regulation.

I feel that the above examples noted in these two (2) notes on the subject should be enough to warrant a full investigation into the whole Consultation process, particularly the so called Community Consultation Committees and how they are run. The NGPCCC has Santos as the Secretariat (so they can control the timing, flow and the extent of information requested by the members of the wider Community), has no official minutes and has problems understanding that the wider community still have a lot of questions around CSG.

The problem of getting the information out to the Community really needs to be addressed as the current method of reliance on Committee members and Companies to do the transmission is and has in many cases, FAILED or is FAILING.

aspects that need careful attention, as do almost all industries, it is not significantly more likely to be more damaging or dangerous than other extractive industries.

- Many perceive the CSG industry to be a new industry that is being fast-tracked without adequate attention to significant concerns. CSG production has been happening at significant levels in North America (where coal seam gas is generally referred to as coal bed methane) for two decades and in NSW for 13 years (at Camden by Sydney Gas, later AGL). CSG from NSW sources currently accounts for 5% of the NSW gas supply. In the 1990s the Government introduced measures such as a five-year royalty holiday (followed by a five-year incremental sliding scale of royalties from 6% up to 10%) to encourage the petroleum industry. This benefit was removed at the end of 2012. Some of the companies that began exploring during this time were responsible for incidents that led to increased concerns about the industry generally.
- Complex and opaque legislation and complex regulatory processes. This concern was raised repeatedly by community, the CSG industry and government agencies. It can lead to considerable administrative burden for those needing to comply, those assessing compliance and those trying to understand the legislative and regulatory regime from the community for the purpose of investigating concerns. This complexity can also lead to gaps, overlaps, contradictions and wasted time in inefficient oversight. The Review agrees that the legislation and regulatory processes need to be addressed.
- Inconsistent legislation. Many industry and community groups have alerted the Review to varying legislative and regulatory regimes for things similar to those relating to CSG extraction. Legislation and regulation covering the construction of wells and production of gas from coal seams as part of coal mining activities is less stringent than that for CSG production. Similarly a 2km buffer zone approach has been introduced for CSG extraction, but no such zone is in place for conventional gas or other types of unconventional gas extraction.

Lack of trust

- CSG companies are viewed as untrustworthy by some members of the community in both urban and rural areas. This lack of trust seems to stem particularly from some CSG exploration companies: being perceived to be in violation of land access regulations; being perceived by some to bully vulnerable landholders; not managing sub-contractors appropriately; engaging in questionable environmental practices; and not reporting accidents to the regulator quickly enough.
- Despite the limited extent of CSG development across NSW, Government is perceived by some as favouring the CSG industry for allowing it to proceed in areas where there has been considerable community opposition. Government is also perceived by some as not managing regulatory compliance effectively and not supporting compliance activities with sufficient penalties where CSG companies have infringed regulations.
- Government and industry information about CSG is perceived by some as lacking independence and, accordingly, is not trusted.
- Among groups trying to understand CSG impacts there is concern about lack of access to raw data, and especially baseline data associated with a locality, before CSG exploration and production commences. While the Government open data access provisions of recent years go some way to addressing this concern, the fact that most companies are not releasing this data in raw form (and are not required by Government to release it) leads to increased suspicion.
- There is considerable social tension and animosity between some neighbours in some local communities where CSG operations are proceeding or proposed. On the one hand there are those who are concerned about potential negative impacts of CSG extraction and see those who want its introduction as 'selling out' to CSG companies. On the other hand, landowners and community members who are in favour of CSG often feel that the debate has been 'hijacked' by environmental activists who are 'using' the community for their own ends.

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Number: 1 Author: Tony Subject: Sticky Note Date: 23/10/2019 9:27:29 AM

This comment is similar to the previous two.
The concerns mentioned in this section still persist today, with the comment being similar to the previous.
One of the reasons for this is that the Community Consultation is failing in its ability to be able to supply responses to questions and concerns raised by them.
I am a member of the Narrabri Gas Project Community Consultation Committee and have, over the years, asked questions of Santos and NSW Government Department with regard to CSG the Operation and Governance. Up until August of 2018 there was a very good response almost 95% of the questions asked were answered.
I must point out that early in the life of the current NGPCCC, after the NSW Department that was designated to be the Secretariat stopped attending, Santos stepped in as the Secretariat.
This arrangement worked reasonably well until August 2018.
After August 2018 there was a complete change of attitude by Santos that resulted in questions either being not answered, partially answered or the answer took over six (6) months to provide.
The situation has now reached a stage where at the September 2019 NGPCCC Santos, after receiving questions that I presented for answering on behalf of those I represent, told the Chair that they (Santos Secretariat) had received more questions from members of the wider community, and they (Santos) did not have the time available to respond. The Chair told the Secretariat that they must answer the questions and that if the answer was as the Secretariat had stated then that is the answer to the questions presented, but Santos must answer the questions.
One of the Secretariats duties is to supply both hard and electronic versions of Presentations, the answers to questions as well as other information discussed at the NGPCCC meetings so that the information can be sent out unaltered, to the wider Community via the email system.
This seems to have fallen down as to date (20191020) the Secretariat has failed to sent out anything from the September 2019 NGPCC meeting
What this indicates is that the the Community still have a lot of concerns about the CSG project and CSG as a whole and the solely remaining CSG company Santos seems really reluctant to reassure and belay those community concerns
I must also point out that while both the Secretariat and others on the NGPCCC take notes, there are no official Minutes only a Communique and meeting notes (basically the same as the Communique).
the Chair has stated on a number of occasions when the question of having proper minutes was raised, that he was not in favor of minutes that recorded identification of who said what and that he would resign if that practice was ever adopted.
Community Consultation in regards to the Narrabri Gas Project CCC and to the ability to disseminate answers to concerns as well as information on the NGP is all but gone as the NGPCCC has become a Santos controlled talk fest, now mainly centered on the Community Benefits Fund and the Inland Rail Hub at Narrabri, Community concerns are not important.

It is very difficult to have trust in a system or CSG company when they are in a position to control what information is disceminated to the Community and it appears that the NSW Government has turned a blind eye, surely the NSW Government Representatives on the NGPCCC have to write reports about the happenings of each meeting.

Lack of trust with regard to Contractors working for Santos stems from the spill at Bibblewindi that allegedly occurred in July 2011 and not reported at all by anyone until a member of the public did in late December 2011. One of the contractors that worked for Eastern Star Gas then is still working for Santos, even many the employees came across and worked for Santos, most if not all would have know about the spill yet none reported it. One Contractor whose contract required almost multiple daily visits to the Bibblewindi Water Treatment Facility, when asked why he did not report the spill responded with the answer, IT WAS NONE OF HIS CONCERN, and the Chief Scientist expresses that this is a perception on behalf of Community members.

Number: 2 Author: Tony Subject: Sticky Note Date: 23/10/2019 9:56:28 AM

I again point out that the NGPCCC is now failing to live up to its responsibilities mainly because the Secretariat (Santos) along with Government Departments, have for sometime been refusing to fully answer questions and concerns put to them.
It must be pointed out that the Internet and the ability to access information is a wonderful thing, but this access to information can also be made very difficult to many just by simply changing the websites or the supported search engines.
Some NSW Government websites have recently done this, while other sites such as SEED are just to difficult to use by many with only the basic computer skills.

There can be benefits to individuals, industry and communities

- Industry, particularly the manufacturing industry, believes having increased amounts of locally produced gas helps deal with concerns about rising gas prices and possible future shortages. This is a particular issue for several companies that have long-term gas purchase contracts expiring. As well as raising concerns about price, several industry and government figures have also expressed concern about potential gas shortages, in the light of the high-value contracts for the export of gas from the new LNG plants at Gladstone. The impending increase in export capacity is anticipated to lead to greater demand for CSG production and to cause Australian east coast gas prices to rise to meet the export price.
- With effective consultation addressing stakeholder concerns and appropriate levels of compensation, CSG development can provide new revenue streams for landholders and their communities. With appropriate support arrangements in place, landholders can make money from CSG production on their land. While local councils have to ensure their communities can cope with the industry influx, industry activity can bring benefits to communities, especially to rural communities, in terms of increased employment, rents and servicing opportunities.

CSG extraction and related technologies are mature and Australia is well equipped to manage their application

- Unconventional gas production is now a major industry especially in North America where, on balance, it is generally highly valued because of the energy security it provides. On the back of this, there is now considerable investment and experience in the development and refinement of technologies to maximise production while minimising adverse impacts. In Australia related technologies have now been extensively deployed successfully for some years (including at Camden in NSW). The independent petroleum engineering, geological and geophysical experts advising the Review consider that such technologies (including fracture stimulation and horizontal drilling technologies), with appropriate safeguards, are suitable for use in many parts of the sedimentary basins in NSW, noting that drilling in any new location is, to an extent, a learning-by-doing activity as there will always be local geological attributes specific to an individual resource development. These activities can and should be guided by companies investing in geophysics and other characterisation techniques to inform the best drilling and extraction approaches to take.
- There is a long history of working in the subsurface in Australia for the extraction of resources such as minerals, coal, gas, oil, water and, to a lesser extent, geothermal heat. This has led to a good understanding by Australian governments of what is needed to regulate subsurface activities for the purposes of safety, health, minimising environmental impact and protecting high-priority resources such as water. As a consequence Australia has built up high-quality expertise and knowledge of subsurface activities. In the public sector it has government agencies such as Geoscience Australia and State resources departments; research-intensive Earth Science and Mining Engineering departments in universities; publicly funded research agencies such as CSIRO and ANSTO; various collaborative research centres; and relevant national collaborative research infrastructure. In the private sector Australian resources companies have reputations as leading in the applications of world best practice. With Australia heavily invested in resources development, most of the global resources industry service companies have a major presence here. Australia also has a well-educated workforce.
- Australia has a strong track record in water technology innovation and management. Water is a key issue for Australia so we have developed significant capabilities in water management. This includes water treatment, operations and infrastructure for water and fluids management, management of byproducts such as salts, waste disposal,

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Number: 1 Author: Tony Subject: Sticky Note Date: 23/10/2019 9:57:11 AM
As pointed out throughout this submission, some will benefit many will not.

Number: 2 Author: Tony Subject: Sticky Note Date: 23/10/2019 9:51:03 AM
If Australia has such a long history of "working in the subsurface" and has "built up high-quality expertise and knowledge of subsurface activities" just the mention of the word Bacteria in groundwater external to the gas wells and Microbiological Corrosion of gas wells, the outer cement protective layers, and associated infrastructure, sends them into a state where these experts and the gas companies themselves, seem to not to acknowledge that the problem exists, but it does and does so in at least one gas field in Queensland.
More on this later.

remediation and rehabilitation. These activities are backed by considerable research and science expertise especially in government agencies, universities, CSIRO, the Bureau of Meteorology and various Cooperative Research Centres. This means that Australia is in a good position to rise to the challenge of managing the various water issues associated with CSG production.

There are things we need to know more about

- While Australia has a long history of working in the subsurface, there is still considerable uncertainty associated with the development of any new resource province. Currently CSG activities tend to be considered mainly at a site-specific level. A better understanding of the industry impacts at scale and over time is needed. To enable better planning decisions and better management of cumulative impacts, it will be necessary that industry collects and provides to Government significantly more data than at present including data from a wider range of sources. With a diverse range of resources, including coal, CSG and underground water, hosted in our sedimentary basins, there is a need to understand better how the different resources and their development regimes interact. More detailed knowledge of the structure and composition (especially regarding hydrogeology) of the sedimentary basins is needed to enhance productivity for the CSG industry through more precise resource characterisation and better subsurface and surface environmental management.
- There is a need to understand better the nature of risk of pollution or other potential short- or long-term environmental damage from CSG and related operations, and the capacity and cost of mitigation and/or remediation and whether there are adequate financial mechanisms in place to deal with these issues. This requires an investigation of insurance and environmental risk coverage, security deposits, and the possibility of establishing an environmental rehabilitation fund. Doing this is essential to ensure that the costs and impacts from this industry are not a burden for the community.
- Legacy issues, including better understanding of inappropriately abandoned wells, need attention.

Risks can be managed

- Management of potential risks associated with CSG, as with other industries, requires effective controls; high levels of industry professionalism; systems to predict, assess, monitor and act on risks at appropriate threshold conditions; legislation; regulation; research; and commitment to rapid remediation, continuous improvement and specialist training. The Review studied the risks associated with the CSG industry in depth and concludes that – provided drilling is allowed only in areas where the geology and hydrogeology can be characterised adequately, and provided that appropriate engineering and scientific solutions are in place to manage the storage, transport, reuse or disposal of produced water and salts – the risks associated with CSG exploration and production can be managed. That said, current risk management needs improvement to reach best practice.
- In particularly sensitive areas, such as in and near drinking water catchments, risk management needs to be of a high order with particularly stringent requirements on companies operating there in terms of management, data provision, insurance cover, and incident-response times.

New knowledge and technologies are becoming available but need to be harnessed to make CSG extraction safer and more productive

- Rapid advances in knowledge and technologies in a wide range of fields (especially in information and communication technologies; numerical modelling; geology, geophysics and petroleum engineering; and new materials) are occurring and can be harnessed to improve CSG production efficiency and to minimise adverse impacts. Some of the most notable recent developments include:

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Number: 1 Author: Tony Subject: Sticky Note Date: 23/10/2019 2:44:46 PM

What should be added to this list is recording BACTERIA numbers in both private and Company groundwater bores in and around any gas project or the Exploration well site,
It is now public knowledge that in 2016 a Queensland gas company found that the outer cement casing (the one much touted to prevent aquifer interchange) had been damaged by Microbiologically influenced corrosion (Bacteria such as Sulphate Reducing Bacteria produce by-products such as Hydrogen Sulphide gas which when mixed with water form a Sulphuric acid).
The unnamed Queensland Gas company approached a company called Saltel, one of the of Schlumberger Group, to assist with an internal support patch to reinforce the well casing after the external cement was repaired.
The article goes on to say that Microbiological influenced corrosion seems to be "systemic in the region".
Yet nobody including the NSW arm of the gas company Santos, the NSW Departments even the new so called Government and Gas company co-funded body GISERA, want to acknowledge the problem BACTERIA will play in well life and long term protection from Aquifer Interchange after plug and abandoning.
This of list neighs also includes many of the NGPCCC members.

External Microbiological attack to the outside cement and steel surfaces of a gas well can never be ignored, but for some reason it is.

Number: 2 Author: Tony Subject: Sticky Note Date: 23/10/2019 3:03:16 PM

A good indication that what the Gas Companies and others have been telling us about the flow velocities of the ground water in the area of the Narrabri Gas Project is incorrect and has been an attempt to make the geology/hydrogeology of the whole geological region known as the Pilliga Sandstone into one aquifer with a very tight grain structure thus providing a flow rate of meters per year. This has been completely blown out of the water by the NSW Government Monitoring Bore nest on Plumb Road Hydrogeology Report for the first 150 meters from ground level. Not only are many layers of material not 'cemented' (not quite formed rock) but these non cemented layers have varying as well as mixed particle sizes in them. This results in different obstructions to groundwater flow as such the groundwater flow rates through these areas is different and ranges from meters per hour to meters per year provided the groundwater has somewhere to flow to.
There are also layers of material that act as retarders to downward groundwater flow so the groundwater flows sideways between these confining layers Groundwater flow rates to at least 150 meters, and possibly deeper, are not as stated by many, there are variable.
As if further proof of this all you have to do is have a look at the flow rates of groundwater from the stock and domestic bores as well as Santos' own bores located at Bibblewindi and Leewood. If the flow rate was as indicated in many publications in terms of meters per year then how come my bore for example can pump just about continuously at a rate of 500mils per second and not run dry, on inital start-up the water level above bore initially drops by 2 meters but then stays static at about 2 meters above the pump at around 65 meters from the surface.
Now if the groundwater flow rate was as quoted as being meters per year, my bore would not pump groundwater after initial start-up.
All the statements about flow rates are based on there being no medium for encouraging groundwater flow such as water bores, springs and now the established fact that groundwater from the GAB and Southern Recharge regions of the GAB will flow downward into the coal seams due to the pressure differential caused by the extraction of water to win the CSG and now a combination of Gas and underground Coal mining.

Wake up a lot of the information gathered in 2014 (and I am being restrained), is so far out of date and based on very poor science as such needs to be revisited with a more open 2019 practical mind.
Requires revisiting.

Number: 3 Author: Tony Subject: Sticky Note Date: 20/10/2019 6:02:58 PM

In 2019 we are still waiting for this one.

Number: 4 Author: Tony Subject: Sticky Note Date: 23/10/2019 3:20:21 PM

Without spending to much time on this issue which I believe needs to be revisited again by the Chief Scientist, I will relate an attempt by Santos in conjunction with a mine with acidic based waste to treat that waste soil with one of the by-products of the Coal Seam produced water.
When the community found out about the "trial" from 2 lines in a Santos Water Management Plan and asked Santos at the July 2019 NGPCCC to explain a bit about the "trial", the Santos representative did not want to comment, however at the September 2019 NGPCCC when the subject of the "trial' came up the only comment the Santos representative made was that the "trial" was not going ahead.
What concerns me is that Santos tried to be part of a trial to use a bye-product salt called Soda Ash (the salt Sodium Carbonate) is not noted in any publicly available analysis of produced water from the Narrabri Gas Project coal seams, so it is not known what process is to be used to extract or produce a Soda Ash only Brine.
There are also problems with the products of reaction between acid soils, in this case from a copper mine. One product is CO2 the other could be Sodium Chloride.
Santos has given no answer to questions on the subject despite the reference to the trial in one of their Water Management Plans and the

Comments from page 15 continued on next page

remediation and rehabilitation. These activities are backed by considerable research and science expertise especially in government agencies, universities, CSIRO, the Bureau of Meteorology and various Cooperative Research Centres. This means that Australia is in a good position to rise to the challenge of managing the various water issues associated with CSG production.

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- While Australia has a long history of working in the subsurface, there is still considerable uncertainty associated with the development of any new resource province. Currently CSG activities tend to be considered mainly at a site-specific level. A better understanding of the industry impacts at scale and over time is needed. To enable better planning decisions and better management of cumulative impacts, it will be necessary that industry collects and provides to Government significantly more data than at present including data from a wider range of sources. With a diverse range of resources, including coal, CSG and underground water, hosted in our sedimentary basins, there is a need to understand better how the different resources and their development regimes interact. More detailed knowledge of the structure and composition (especially regarding hydrogeology) of the sedimentary basins is needed to enhance productivity for the CSG industry through more precise resource characterisation and better subsurface and surface environmental management.
- There is a need to understand better the nature of risk of pollution or other potential short- or long-term environmental damage from CSG and related operations, and the capacity and cost of mitigation and/or remediation and whether there are adequate financial mechanisms in place to deal with these issues. This requires an investigation of insurance and environmental risk coverage, security deposits, and the possibility of establishing an environmental rehabilitation fund. Doing this is essential to ensure that the costs and impacts from this industry are not a burden for the community.
- Legacy issues, including better understanding of inappropriately abandoned wells, need attention.

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- In particularly sensitive areas, such as in and near drinking water catchments, risk management needs to be of a high order with particularly stringent requirements on companies operating there in terms of management, data provision, insurance cover, and incident-response times.

New knowledge and technologies are becoming available but need to be harnessed to make CSG extraction safer and more productive

- Rapid advances in knowledge and technologies in a wide range of fields (especially in information and communication technologies; numerical modelling; geology, geophysics and petroleum engineering; and new materials) are occurring and can be harnessed to improve CSG production efficiency and to minimise adverse impacts. Some of the most notable recent developments include:

NSW EPA released some information some of which was unreadable, in response to a GIPA.
From information received the EPA withdrew its support for the trial in second quarter 2019 after initially giving it
So much for the so called "manageable risks", they are, only if the public do not find out and start to ask questions.

Number: 5 Author: Tony Subject: Sticky Note Date: 23/10/2019 3:24:43 PM

All of this so called "new technology" especially modelling relies heavily on the information put to it, but theory should not replace the in-field gathering of information to put to a model and the results of a model, should if possible be field tried to prove the result.
I will say no more on the subject of information quality and how it is applied.
This is another area that needs revisiting.
Theory is good Practical is much better.

Number: 6 Author: Tony Subject: Sticky Note Date: 23/10/2019 3:37:35 PM

Desktop Modeling without "in field" work seems to have become the new norm, and as sometimes happens the model comes up with results that do not please either Santos and the NSW Government Departments or both, and when the public query the result, all that has to done is change a few numbers and rerun to get your desired result and that it appears GISERA did with the W9 groundwater study (see below for a very brief explanation). If the written Reports are anything to go by, both were MODEL Based.
I quote the 2018 GISERA Studies W8 which had an area of groundwater drawdown which, if the colour indications on figure 6 of that Report can be believed, of anywhere from 0.2 meters to 10 meters, this drawdown amount was revised in the reworked 2019 W9 study to agree with the Santos result of a project wide groundwater drawdown due to the NGP of around 0.2 meter project wide.

    - data technologies especially in the area of big data, data analytics and data fusion. These technologies use very large amounts of data from diverse sources to enable better understanding of complex earth systems with an improved grasp of the uncertainties in modelling for purposes such as characterising CSG resources and predicting groundwater impacts. For these powerful technologies to be effective, significantly more data from a wider range of sources need to be collected
    - visualisation technologies that allow for detailed inspection of data. These include using 3D and movie techniques which are often particularly useful in allowing experts from a wide range of disciplines to inspect and analyse large amounts of complex data easily and quickly. They are also used for training and testing responses to hazardous situations
    - sensor and monitoring technologies – both in-line and remote monitoring technologies – are becoming very cheap and are increasingly integrated with onboard signal processing and communications technologies. This means that the very large amounts of surveillance data they produce can be preprocessed locally then rapidly sent to a central data repository
    - artificial intelligence techniques that allow for intelligent, real-time interrogation of monitoring data with alerts when anomalies are detected
    - developments in petroleum engineering that allow for better matching of combinations of appropriate technologies for particular geological situations
    - developments in new materials.
- In order to speed the beneficial uptake of new technology developments for an industry as contentious as CSG, the Review concludes that Government needs access to such expertise on a permanent basis, such as by creation of a standing committee comprising top experts from relevant disciplines, to advise it when to act on new technology developments as they become available.

There are no guarantees

- All industries have risks and, like any other, it is inevitable that the CSG industry will have some unintended consequences, including as the result of accidents, human error, and natural disasters. Industry, Government and the community need to work together to plan adequately to mitigate such risks, and be prepared to respond to problems if they occur.

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Number: 1 Author: Tony Subject: Sticky Note Date: 23/10/2019 3:32:29 PM
Still waiting for this to happen and be available for the public to read and comment on.

4 RECOMMENDATIONS

The final recommendations of the Review are presented below, grouped according to themes. Some of the recommendations have been modified, simplified or combined, compared with the form in which they were first presented in previously released reports of the Review; however their intent has not changed.

Intent, communication, transparency and fairness

Recommendation 1

That Government make clear its intent to establish a world-class regime for extraction of CSG. This could be articulated in a clear public statement that covers:

- the rationale/need for CSG extraction
- a clear signal to industry that high performance is mandatory, compliance will be rigorously enforced and transgressions punished
- a fair system for managing land access and compensation
- a mechanism for developing a clear, easy-to-navigate legislative and regulatory framework that evolves over time to incorporate new technology developments
- mechanisms for working closely and continuously with the community, industry, and research organisations on this issue.

Recommendation 2

That Government ensure clear and open communication on CSG matters is maintained at all times. This includes:

- simplicity and clarity in legislative and regulatory requirements
- ensuring openness about CSG processes in line with an open access approach; publishing all relevant approval requirements, decisions and responses, and compliance and enforcement outcomes on appropriate government websites and making CSG data from companies, Government and research organisations available through a centralised Government data repository
- measurable outcomes to track performance against commitments to reform.

Recommendation 3

That Government investigate as a priority a range of practical measures for implementation (or extension of current measures) to allow affected communities to have strengthened protections and benefits including fair and appropriate:

- land access arrangements, including land valuation and compensation for landholders
- compensation for other local residents impacted (above threshold levels) by extraction activities
- funding (derived from the fees and levies paid by CSG companies) for local councils to enable them to fund, in a transparent manner, infrastructure and repairs required as a consequence of the CSG industry.

Recommendation 4

That the full cost to Government of the regulation and support of the CSG industry be covered by the fees, levies, royalties and taxes paid by industry, and an annual statement be made by Government on this matter as part of the Budget process.

Legislative and regulatory reform and appropriate financial arrangements

Recommendation 5

That Government use its planning powers and capability to designate those areas of the State in which CSG activity is permitted to occur, drawing on appropriate external expertise as necessary.

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Number: 1 Author: Tony Subject: Sticky Note Date: 23/10/2019 9:18:44 PM

Recommendation 2

I feel that concerns on this Recommendation have been raised in earlier comments posted to this Report and at the NGPCCC.
The only point to add is that the closer the time-line for the decision on the Narrabri Gas Project gets the easy access to information about and the answering of questions about becomes less and harder to obtain.

Number: 2 Author: Tony Subject: Sticky Note Date: 23/10/2019 9:19:10 PM

Recommendation 2

This point needs more defining as it is to vague especially with regards to "other local residents".
A full definition and level of "Impacted" is required as well as exactly who are "other local residents" is it neighbors to those who host gas wells, is it just landowners who do not live in the area where there is a csg operation, could it be landowners who do not live on their holdings but whose land value may have been devalued.
Who sets the 'threshold levels' especially when it comes to groundwater?
What does minimum, maximum and all the other degrees of affection really mean once a landholder has problems, do not forget that the Chief Scientists Report also says there are no guarantees with the industry. Even Mr Banks of Santos stated at approximately 36.10 minutes in on the SBS Program Insight aired in May 2018 that Santos could not give a 100% Guarantee that the NGP would not impact on the groundwater of the Region where the NGP is.
Who has to 'prove' impact, surely the landowner who does not have the resources and contacts that the csg companies have cannot ever hope to be able to prove impact if the csg companies deny that their operation impacted on that person in any way.

This Recommendation needs cleaning up so that it better protects those who may experience problems as a result of a csg operation and better defines many possible events that the Recommendation is designed to cover.

Number: 3 Author: Tony Subject: Sticky Note Date: 24/10/2019 2:37:54 PM

Still on Recommendation 3.
This last point is still to be worked out with the CSG Industry and the local Council with the whole process being Transparent to public scrutiny and input from all sides including the ratepayers and especially those who live in the area where there is a csg operation.
In many cases Councilors claim that they alone are the voice of the residences of Shire, this being based on them being elected as current Councilors, if this statement is accepted and Councilors only decide upon the type, amount and where the monies are to spent and it is not spent wisely and for projects as mentioned then what redress does the Community have, and do not respond by saying 'you can always vote them out at the next election'.
There is an old saying "never get between a politician and a bucket of money", read of that saying as you will.

This dot point needs redressing.

Number: 4 Author: Tony Subject: Sticky Note Date: 24/10/2019 2:38:13 PM

Recommendation 4

Royalties should not be considered for part of any cost recovery.
They are public monies for a publicly owned asset and as such should not be gobbled up in cost recovery. They are to be used only for the public good.
This point needs to be reworded to reflect the proper use of all Royalties monies.
The gas operator needs to carry all the costs of regulation and compliance.
Just leave Royalties out of it.
Remember, under the current system of Royalties payable, that costs to the industry are recoverable when assessing taxation and when calculating the amount of Royalties payable, in many ways the gas companies already are paying the costs out of Royalty payments.

Reducing the Royalties payable will have a effect upon the monies paid into any Community Benefit Fund.

How Royalties are determined needs to be addressed to ensure that the State of NSW and its Residences get maximum return on this ever diminishing resource.

"User pays", this applies to so many things these days, so why not apply this philosophy to the CSG Industry.

Recommendation 6
That Government move to a single Act for all onshore subsurface resources (excluding water) in the State, constructed to allow for updating as technology advances. This will require a review of all major Acts applying to the resources sector.

Recommendation 7
That Government separate the process for allocation of rights to exploit subsurface resources (excluding water) from the regulation of the activities required to give effect to that exploitation (i.e. exploration and production activities); and that it establish a single independent regulator. The regulator will require high levels of scientific and engineering expertise, including geological and geotechnical ability, environmental and water knowledge and information, and ICT capability including data, monitoring and modelling expertise; and will be required to consult – and publish details of its consultations – with other arms of Government and external agencies, as necessary. The regulator will also require appropriate compliance monitoring and enforcement capability.

Recommendation 8
That Government move towards a target and outcome-focused regulatory system, with three key elements:

- regularly reviewed environmental impact and safety targets optimised to encourage uptake of new technologies and innovation
- appropriate and proportionate penalties for non-compliance
- automatic monitoring processes that can provide data (sent to and held in the openly accessible Whole-of-Environment Data Repository) which will help detect cumulative impacts at project, regional and sedimentary basin scales which can be used to inform the targets and the planning process.

Recommendation 9
That Government consider a robust and comprehensive policy of appropriate insurance and environmental risk coverage of the CSG industry to ensure financial protection short and long term. Government should examine the potential adoption of a three-layered policy of security deposits, enhanced insurance coverage, and an environmental rehabilitation fund.

Managing risk by harnessing data and expertise

Recommendation 10
That Government commission the design and establishment of a Whole-of-Environment Data Repository for all State environment data including all data collected according to legislative and regulatory requirements associated with water management, gas extraction, mining, manufacturing, and chemical processing activities. This repository, as a minimum, would have the characteristics that it:

- is accessible by all under open data provisions
- has excellent curatorial and search systems
- houses long-term data sets collected as part of compliance activities
- can accept citizen data input
- can be searched in real time
- is spatially enabled
- is able to hold data in many diverse formats including text, graphics, sound, photographs, video, satellite, mapping, electronic monitoring data, etc., with appropriate metadata
- is the repository of all research results pertaining to environmental matters in NSW along with full details of the related experimental design and any resulting scientific publications and comments
- is the repository of historical resources data with appropriate metadata

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Number: 1 Author: Tony Subject: Sticky Note Date: 24/10/2019 8:21:02 AM

Recommendation 8

This dot point will only work if there was a proper and comprehensive baseline study with which to compare the ongoing monitoring to and them ongoing automatic monitoring, especially groundwater external to the gas wells and infrastructure which at present is only SWL, pH and TDS by calculation and water analysis as found on the inside of the monitoring bores, this should be backed up by at least a 3 monthly water sampling and not at the present time frame, with a very comprehensive analysis including Bacteria types and numbers such as, but not limited to, SRB, Iron Bacteria, Methanogenic Bacteria, Heterotrophic Plate counts, Hydrocarbon Utilizing Bacteria, Naphthalene Utilizing Bacteria.

Bacteria play an important part in the life span of a gas well especially when it comes to the outside cement seal which is supposed to both protect the steel casing as well as to prevent aquifer cross contamination. Any increase in natural bacteria numbers in groundwater external to a gas well, pipeline, water treatment facility should be viewed with concern and reasons why should be properly and thoroughly investigated.

Bacteria, by monitoring number growth or die out, can also be used as an early warning of any leaks of hydrocarbons, and can be used to detect any surface spills.

This Recommendation needs to be amended to better reflect the methods, frequency and locations for both automatic and manual methods of the monitoring process especially when it comes to groundwater.

Number: 2 Author: Tony Subject: Sticky Note Date: 24/10/2019 8:22:38 AM

Recommendation 9

This still has to see the full light day.

Number: 3 Author: Tony Subject: Sticky Note Date: 24/10/2019 8:31:29 AM

Recommendation 10

If SEED is the site that this Recommendation applies to then it is not user friendly to those with limited computer skills.

This Recommendation needs to be looked at and maybe the site re engineered to make it more user friendly.

Also like so much that has been neglected with regard to getting the message out there about CSG, there is very little bold pushing of this site on either the NSW Government sites of the Gas Company sites, it may be there but it is overshadowed by other headings.

This Recommendation needs to be really pushed as it forms a major center piece of Public Consultation.

Various legislative amendments or other incentives will be needed to direct all environment data to the Repository.

Recommendation 11

That Government develop a centralised Risk Management and Prediction Tool for extractive industries in NSW. This would include a risk register, a database of event histories, and an archive of Trigger Action Response Plans. The tool would be updated annually based on Government and company reporting and would include information on risk management and control approaches and draw on data from the Whole-of-Environment Data Repository for the State. The risk tool would be reviewed and commented on by relevant expert and regulatory bodies. The risk tool would be used to assist with:

- assessing new proposals
- assessing compliance
- improving prediction capability for consequences of incidents in risk assessments
- improving prediction capability of risk likelihoods
- informing project design amendments to decrease risk levels (such as undertaken in the Dam Safety Committee)
- informing the calculation of cumulative impacts
- flagging issues or risks that require a higher level of regulatory protection such as inclusion in legislation.

Recommendation 12

That Government establish a standing expert advisory body on CSG (possibly extended to all the extractive industries). This body should comprise experts from relevant disciplines, particularly ICT and the earth and environmental sciences and engineering, but drawing as needed on expertise from the biological sciences, medicine and the social sciences. The prime functions of this expert body would be to advise Government:

- on the overall impact of CSG in NSW through a published Annual Statement which would draw on a detailed analysis of the data held in the Whole-of-Environment Data Repository to assess impacts, particularly cumulative impacts, at project, regional and sedimentary basin scales
- on processes for characterising and modelling the sedimentary basins of NSW
- on updating and refining the Risk Management and Prediction Tool
- on the implications of CSG impacts in NSW for planning where CSG activity is permitted to occur in the State
- on new science and technology developments relevant to managing CSG and when and whether these developments are sufficiently mature to be incorporated into its legislative and regulatory system
- on specific research that needs to be commissioned regarding CSG matters
- on how best to work with research and public sector bodies across Australia and internationally and with the private sector on joint research and harmonised approaches to data collection, modelling and scale issues such as subsidence
- on whether or not other unconventional gas extraction (shale gas, tight gas) industries should be allowed to proceed in NSW and, if so, under what conditions.

Recommendation 13

That Government establish a formal mechanism consisting of five parallel but interacting steps. The five steps are given below.

- Companies or organisations seeking to mine, extract CSG or irrigate as part of their initial and ongoing approvals processes should, in concert with the regulator, identify impacts to water resources, their pathways, their consequence and their likelihood, as well as the baseline conditions and their risk trigger thresholds before activities start. These analyses and systems should be incorporated in project management plans to meet regulator-agreed targets. Appropriate monitoring and characterisation

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Number: 1 Author: Tony Subject: Sticky Note Date: 24/10/2019 8:39:25 AM
Recommendation 11
If the sudden withdrawal from the Department of Planning EIS page on the Narrabri Gas Project in July 2019 and no response from Santos to the Arriscar Risk Assessment of the NGP is anything to go by, then this Recommendation really needs work from a team that is passionate about Risk Management and the application of.

Number: 2 Author: Tony Subject: Sticky Note Date: 24/10/2019 8:55:44 AM
Recommendation 12
If GISERA is meant to play a major role in this Recommendation, the idea is failing badly in the eyes of many within the questioning community.
GSERA is co-funded by the gas companies so there will always be suspicion of impartially there.
The majority of Studies and Reports are Queensland based, modified to include NSW. It is only now that GISERA is starting to look at the Narrabri Area.
GISERA was formed to late to carry out baseline studies in NSW along the same lines as is quoted in the August 2019 Update, that GISREA is doing in the Northern Territory.
Many of the positions on the advisory Panels attached to GISERA to advise project selection are long term or permanent, this should be changed to ensure an injection of new thinking. Terms should be fixed at 12 months.

Number: 3 Author: Tony Subject: Sticky Note Date: 24/10/2019 8:58:49 AM
Recommendation 12
In short so much of this Recommendation has not been implemented.
It needs to be fully implemented and running as in the Recommendation for at least 2 years so that full and accurate field data can be obtained.
Currently the NSW Government is relying solely on data from the gas companies and a few of the States own monitoring systems many of whom are nowhere near the actual site of the CSG operation (you only have to look at the data quoted in the EIS especially the NSW Departmental water monitoring data that was used to see this).

Number: 4 Author: Tony Subject: Sticky Note Date: 24/10/2019 9:02:24 AM
Recommendation13, dot point 1.
This is important and should be done with the infrastructure built and maintained by the Gas Companies but the monitoring done by outside Interdependent bodies.
I say this because the monitoring Santos is currently doing is of little real value especially now that Santos has altered the way it represents SWL on its Water Portal site. The recording has gone from a slightly jagged line to now a completely straight one with a very slight curvature.
This was done after I as a member of the NGPCCC wanted to know about 2 large spikes in the SWL at 2 sites that had occurred in 2015 and early 2016 and why the Santos Water Portal had no new results recorded on it since 2016.
I am surprised that nobody in the Regulation Department picked this up, so it can be assumed that the Regulator does not check that Santos is fully complying and providing correct up-to-date and accurate data to the community via any of its public sites including SEED.
Another case where transparent information is a myth.

systems would be developed as part of these project management plans and then installed. The monitors would measure baseline conditions and detect changes to these, as well as providing data on impacts and triggered risk thresholds.

- Data from the monitors should be deposited (either automatically or in as close to real time as possible) in the State Whole-of-Environment Data Repository by all the extractive industries. Increasingly automated tools to interrogate data in the Repository should be developed, and these used to search data for discontinuities and compliance alerts.
- As a separate process, the expert advisory body would examine on a frequent basis all data relevant to a region or a sedimentary basin. This data would come from a range of sources (the companies' monitoring data along with triangulation/cross-validation data such as that from satellites, reports from local councils, seismic data, subsidence maps, information from cores, etc.). The expert body would use this data review to check for any factors signalling problems in that region and, if any are found, recommend to Government the appropriate action to be taken with regard to the relevant parties.
- In a parallel process, the Government should commission, construct and maintain a variety of models of each region and in particular one that seeks to address cumulative impacts. These models should feed into the land use planning process and the activity approvals processes, and should assist in target setting for new projects.
- Government, working with other appropriate Australian governments, should commission formal scientific characterisation of sedimentary basins starting with the East Coast basins, and concentrating initially on integration of groundwater with the geological, geophysical and hydrological context. Viewing these integrated systems in models and in interpretation could be described as a 'Glass Earth' approach to understanding the dynamics of activities and impacts in the basins.

Training and certification

Recommendation 14

That Government ensure that all CSG industry personnel, including subcontractors working in operational roles, be subject to ongoing mandatory training and certification requirements. Similarly, public sector staff working in compliance, inspections and audits should be given suitable training and, where appropriate, accreditation.

Legacy and consistency matters

Recommendation 15

That Government develop a plan to manage legacy matters associated with CSG. This would need to cover abandoned wells, past incomplete compliance checking, and the collection of data that was not yet supplied as required under licences and regulations. There will also need to be a formal mechanism to transition existing projects to any new regulatory system.

Recommendation 16

That Government consider whether there needs to be alignment of legislation and regulation governing extraction of methane as part of coal mining and the application of buffer zones for gas production other than CSG with the relevant legislation and regulation provisions governing CSG production.

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Number: 1 Author: Tony Subject: Sticky Note Date: 24/10/2019 2:41:09 PM

Recommendation 13 dot point 2
See above comment re how automatic monitoring data is not checked to see if it current and accurate.
Santos' Water portal should be, and is assumed to be, part of the Open Transparent reporting requirement by that company.
Again the non user friendly site SEED comes into play as it plays a major role in providing and transmitting information to the public.

This failing needs to be addressed.

Number: 2 Author: Tony Subject: Sticky Note Date: 24/10/2019 9:16:39 AM

Recommendation 14
The question of access to sites without notice should be looked at.
Regulators should be able to turn up at the local headquaters of a CSG Operation and advise the person in charge of the site or area that they wish to inspect.
There has been incidents of late, not CSG as far as I know, where the Regulator was required to give 7 days notice of a visit and the company involved immediately commenced clean up of the issue. It was fortunate that the local community was watching and recorded the matter.
Not saying that a CSG Company would do the same thing. but the notification time of intended visits should be no more that 12 hours, if that.
Regulator Staff should have been given suitable training on the Industry and overall terrain to be able to do their job efficiently.

This Recommendation needs to be revisited.

Number: 3 Author: Tony Subject: Sticky Note Date: 24/10/2019 9:54:56 AM

Recommendation 15
What about monitoring for Bacteria in the groundwater external to and near abandoned and operational wells.
Bacteria such as Sulphate Reducing Bacteria (SRB) and Iron Bacteria are, in most cases, naturally occurring in groundwater.
In 2012/2013 Santos recorded SRB in a number of the water analysis on private bores during a one-off project wide groundwater testing that Santos claims constituted a Baseline of ground water conditions. So it is known that Microbiological Corrosive Bacteria are present in the groundwater external to the gas wells and other infrastructure.
Microbiological Corrosion is a big problem and I refer you back to remarks made earlier in this submission on the 2016 Queensland well incident, these wells were operational.
How can effective monitoring of abandoned well outer cement condition be done if the well is plugged? It cannot, so maybe an abandoned well should not be plugged, this would allow both checking of the outer cement condition using conventional methods such as gamma ray and ultra sound and also allows for the repairs to be carried out to both the outer cement and to the casing should they be needed via the inside of the unplugged well. Again I refer you to the Queensland incident and the Saltel site.
Testing for Bacteria levels and possible number growth in the external to the gas well groundwater should be carried out at depths of approximately 80 to 100 meters where groundwater is located and in 4 cardinal point locations within 50 meters of a gas well.
The Pilliga Sandstone region has good groundwater in nearly all locations and depths and has a number of 'unconsolidated streams' running through it, (visit the Well Completion Report for the NSW Water Monitoring Bore nest on Plumb Road in the Pilliga Forest to see the Geology/Hydrogeology Report).
If the NSW Government really cares about protecting groundwater and wants to fully implement the Aquifer Interference Policy then this Inquiry should take a long look at this matter because if the cement that is sealing one aquifer from another, and that is the main stated purpose of the external cement layer is weakened due to Microbiological influenced Corrosion, then there is a possibility of cross aquifer contamination, as well as other forms of aquifer contamination/pollution which could render the groundwater permanently unsuitable for use either domestically, for stock or irrigation.

This Recommendation on although well down the list of Recommendations should be treated with utmost priority and be revisited and revised almost constantly to ensure the very best long term outcomes.

Number: 4 Author: Tony Subject: Sticky Note Date: 24/10/2019 2:42:27 PM

Summary
Summary of some of the points raised to this submission that seem to have common threads.

1 Bacteria and microbiological influenced corrosion.

I have to ask the why effects of Microbiological attack on the outer gas well cement was never taken into account in the Recommendations especially when the problem of Microbial influenced Corrosion?
Microbial destruction of cement and steel was known at the time of this 2014 Report, I even pointed the problem out in my submission dated 1st May 2013 where the concern was clearly mentioned, and subsequently ignored. WHY?

Example of how the subject of Bacteria is handled.
At the July 2019 Narrabri Gas Project Community Consultation Committee (NGPCCC) meeting both Santos and the DPE representative stated

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systems would be developed as part of these project management plans and then installed. The monitors would measure baseline conditions and detect changes to these, as well as providing data on impacts and triggered risk thresholds.

- Data from the monitors should be deposited (either automatically or in as close to real time as possible) in the State Whole-of-Environment Data Repository by all the extractive industries. Increasingly automated tools to interrogate data in the Repository should be developed, and these used to search data for discontinuities and compliance alerts.
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- In a parallel process, the Government should commission, construct and maintain a variety of models of each region and in particular one that seeks to address cumulative impacts. These models should feed into the land use planning process and the activity approvals processes, and should assist in target setting for new projects.
- Government, working with other appropriate Australian governments, should commission formal scientific characterisation of sedimentary basins starting with the East Coast basins, and concentrating initially on integration of groundwater with the geological, geophysical and hydrological context. Viewing these integrated systems in models and in interpretation could be described as a 'Glass Earth' approach to understanding the dynamics of activities and impacts in the basins.

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That Government ensure that all CSG industry personnel, including subcontractors working in operational roles, be subject to ongoing mandatory training and certification requirements. Similarly, public sector staff working in compliance, inspections and audits should be given suitable training and, where appropriate, accreditation.

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That Government develop a plan to manage legacy matters associated with CSG. This would need to cover abandoned wells, past incomplete compliance checking, and the collection of data that was not yet supplied as required under licences and regulations. There will also need to be a formal mechanism to transition existing projects to any new regulatory system.

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That Government consider whether there needs to be alignment of legislation and regulation governing extraction of methane as part of coal mining and the application of buffer zones for gas production other than CSG with the relevant legislation and regulation provisions governing CSG production.

that they would not answer any questions on Microbiological damage to gas wells in Queensland even when documentation from Saltel (part of the Schlumberger Company) as well as an article were produced and made available to them as well as other members of the NGPCCC including the EPA. Only Santos took a copy of the material.
Santos at the September NGPCCC did provide a response of sorts, referring back to past presentations of a number of years ago, as Santos (who are the Secretariat to the NGPCCC has not, as of 20191017, provided an electronic version of their written answer to the NGPCCC members to enable transmission to the wider community, I cannot attach, however if asked I am sure Santos will provide a copy of the one page answers to the inquiry.
Bacteria is such a touchy subject even GISERA have not mentioned Microbiological Damage in any of their Reports up-to-date, especially any that relate to Plug and Abandoning or water monitoring.
To date there are NO requirement in NSW to test groundwater in and around gas wells or projects for the presence of SRB and the Iron Bacteria or indeed any bacteria (full list provided in comments to Recommendation 8) that may reveil problems with leakage of hydrocarbons into the external, to that infrastructure, groundwater
Santos did do a few tests for SRB in a few of the so called one-off groundwater Baseline testing of private bores in and adjacent to the Narrabri Gas Project area and in those tested for SRB, at least 80% had SRB present especially those bores near the Leewood Operation.
SRB are known to be present yet no more testing was done, WHY?
I must also inform you that the Queensland Gas Company involved approached Saltel in 2016, so who else outside of Saltel and the Gas Company involved knew about this?
Queensland is Queensland but the BACTERIA is the same in NSW and is in the groundwater which is on the outside and surrounds the gas well outer cement casing.
The damage to the gas wells in Queensland was from the outside and into the cement.

2 Advisory bodies co-funded by Governments and Gas Companies.

In the light of knowledge gained in the years since this Review this whole section on process is not correct and well out of date, as an example the body GISERA, set up after the CS Report is funded in part by the Gas Companies and by Governments that have been heavily lobbied to support the CSG Industry, as such the impartiality and Independence of both GISERA and the CSIRO have, in many peoples eyes, been compromised.

Consultation and Publicly available information on CSG.

As stated in my Submission the Government site SEED is not use friendly to those with all but good computer skills.
The Narrabri Gas Project CCC a body charged with being a link between the Community, NSW Government and, in this case, Santos has, since August 2018 not lived up to it terms in that Santos and the NSW Government Department have either ignored or very briefly answered the questions put to them since that date.
How can the community have their genuine concerns answered if those charged with providing the answers are very tardy towards responding?
We as have a responsibility to pass on information that can assist others, this is something I feel strongly about and do when information is provided, yet there seems to be a culture creeping in that has the opposite view about spreading provided material.
Allowing Santos to become the Secretariat once the Government Secretariat pulled out, was and still is, a big error and should be addressed as a matter of urgency as the method of reporting the happenings of the NGPCCC should be reassessed and redressed.

As a recent example of the Secretariat not passing on information of importance to the NGPCCC membership.
In the Santos Activity Update for October 2019 sent out @1.56pm 20191010 there is no mention of this Inquiry and no link.
This Inquiry is important to all as the Chief Scientists Recommendations have an affect on the community as a whole. It is all very well to say that Santos does the right thing, the community need to know what that right thing is, hence the case for inclusion.

Due to space concerns I have had to continue this in the following note.

Number: 5 Author: Tony Subject: Sticky Note Date: 24/10/2019 1:05:57 PM

4 Royalties and their use.

Royalties are monies paid for public assets, they should never be used by the extracting Company to pay fees, charges, levies and the costs of Regulation and Industry support.
The should be used solely to benefit all the residences.
Note that the Narrabri Gas Project Community Benefit Fund if it ever comes to fruition, relies solely on Santos paying monies into it based on a percentage of the Royalties paid for the gas, similarly the monies paid into the Santos Hosting Landowner Fund, only established to give those hosting CSG, more money than the Agreed Access monies and a big cause for division in the local community, is based on a percentage of Royalties payable.

Thankyou
Mr A J Pickard
Narrabri NSW

Comments from page 20 continued on next page

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APPENDICES

APPENDIX 1 TERMS OF REFERENCE

Review of coal seam gas activities in NSW

At the request of the NSW Government, the NSW Chief Scientist & Engineer will conduct a review of coal seam gas (CSG) related activities in NSW, with a focus on the impacts of these activities on human health and the environment.

The Chief Scientist & Engineer is to:

1. undertake a comprehensive study of industry compliance involving site visits and well inspections. The Chief Scientist's work will be informed by compliance audits undertaken by regulatory officers, such as the Environment Protection Authority and other government agencies
2. identify and assess any gaps in the identification and management of risk arising from coal seam gas exploration, assessment and production, particularly as they relate to human health, the environment and water catchments
3. identify best practice in relation to the management of CSG or similar unconventional gas projects in close proximity to residential properties and urban areas and consider appropriate ways to manage the interface between residences and CSG activity
4. explain how the characteristics of the NSW coal seam gas industry compare with the industry nationally and internationally
5. inspect and monitor current drilling activities including water extraction, hydraulic fracturing and aquifer protection techniques
6. produce a series of information papers on specific elements of CSG operation and impact, to inform policy development and to assist with public understanding. Topics should include:
   - operational processes
   - NSW geology
   - water management
   - horizontal drilling
   - hydraulic fracturing (fraccing)
   - fugitive emissions
   - health impacts
   - wells and bores
   - subsidence.

The NSW Chief Scientist & Engineer will provide an initial report to the Premier and the Minister for Resources and Energy on her findings and observations by July 2013.

APPENDIX 2 REPORTS AND BACKGROUND PAPERS WRITTEN AND/OR COMMISSIONED BY THE NSW CHIEF SCIENTIST & ENGINEER DURING THE INDEPENDENT REVIEW OF COAL SEAM GAS ACTIVITIES IN NSW

Reports written by the NSW Chief Scientist & Engineer for the Independent Review of Coal Seam Gas Activities in NSW

Available at http://www.chiefscientist.nsw.gov.au/reports

- Initial Report on the Independent Review of Coal Seam Gas Activities in NSW
- Environmental risk & responsibility and insurance arrangements for the NSW CSG industry
- On measuring the cumulative impacts of activities which impact ground and surface water in the Sydney Water Catchment
- Placement of monitoring equipment for water resources in NSW
- Study of regulatory compliance systems and processes for coal seam gas
- Managing environmental and human health risks from coal seam gas activities
- Final Report of the Independent Review of Coal Seam Gas Activities in NSW

Information papers written by the NSW Chief Scientist & Engineer for the Independent Review of Coal Seam Gas Activities in NSW

- Information paper: On managing the interface between coal seam gas activities and other land uses (Setbacks)
- Information paper: Fracture stimulation activities
- Information paper: Abandoned wells

Reports commissioned by the NSW Chief Scientist & Engineer for the Independent Review of Coal Seam Gas Activities in NSW

Available at http://www.chiefscientist.nsw.gov.au/coal-seam-gas-review/csg-background-papers

	Topic	Expert name and organisation	Title of paper
1	Baseline human health	Dr Pavla Vaneckova & Assoc Professor Hilary Bambrick: University of Western Sydney – Centre for Health Research	Approaches to baseline studies of human health in relation to industries with potential environmental impact
2	CSG processes	Professor Peter Cook: PJC International, National Centre for Groundwater Research and Training, Flinders University	Life Cycle of Coal Seam Gas Projects: Technologies and Potential Impacts
3	Community concerns	Dr Melanie Taylor, Ms Natalie Sandy & Professor Beverley Raphael: University of Western Sydney - School of Medicine, Disaster Response and Resilience Research Group	Background paper on community concerns in relation to coal seam gas
4	Data management	Dr Ian Gibson, Intersect Australia	NSW Coal Seam Gas: Data Background Paper
5	Gas dispersion modelling	Professor Peter Rayner & Dr Steven Utembe: University of Melbourne - School of Earth Sciences	Modelling the Airborne Dispersion of Pollutants from Coal Seam Gas Extraction
6	Geology	Dr Craig O'Neill and Dr Cara Danis: Macquarie University - Department of Earth and Planetary Science	The Geology of NSW: The geological characteristics and history of NSW with a focus on coal seam gas (CSG) resources
7	Geology	Professor Colin Ward and Assoc. Professor Bryce Kelly: University of New South Wales - School of Biological, Earth and Environmental Sciences	Background Paper on New South Wales Geology: With a focus on basins containing coal seam gas resources
8	Groundwater	Mr Doug Anderson, Ms Priom Rahman, Ms Erica Davey, Mr Brett Miller, Dr William Glamore: University of New South Wales - Water Research Library	Background Paper on Groundwater Resources in Relation to Coal Seam Gas Production
9	Horizontal drilling	Professor John Carter: Advanced Geomechanics	Background Paper on Horizontal Drilling
10	Legislation and regulation	Ms Sue Graebner, Independent consultant	Legislative framework for CSG exploration and production. Released as appendix to CSE report, "Study of

			regulatory compliance systems and processes for coal seam gas"
11	Methane	Dr Linda Stalker: CSIRO	Methane origins and behaviour
12	Produced water	Assoc Professor Damian Gore and Dr Peter Davies: Macquarie University - Department of Environment & Geography	Macquarie University Background paper on produced water and solids in relation to coal seam gas production
13	Produced water	Dr Stuart Khan and Ms Geena Kordek	Coal Seam Gas: Produced Water and Solids,
14	Risk, insurance & management	Mr Bernard Evans: Hicksons Lawyers	Paper 1 - Insurance and Environmental Securities; Attachment: Environmental risks arising from CSG operations
15	Risk, insurance & management	Mr Tony Abbott: Piper Alderman	Insurance and Environmental Securities; Attachment: Risk Model Evaluation
16	Sedimentary basins	Assoc Professor Tim Rawling & Professor Mike Sandiford: University of Melbourne - Melbourne Energy Institute	Multi basin usage/cumulative impact,
17	Seismicity	Professor Mike Sandiford and Mr Gary Gibson: The University of Melbourne - Melbourne Energy Institute	Seismicity and Induced Earthquakes
18	Seismicity	Dr Barry Drummond: Independent consultant, formerly with Geoscience Australia	Background Paper on Seismicity
19	Subsidence causes	Dr Jubert A Pineda and Professor Daichao Sheng: The University of Newcastle - ARC Centre of Excellence for Geotechnical Science and Engineering	Subsidence: An overview of causes, risks and future developments for Coal Seam Gas production
20	Subsidence monitoring	Dr Simon McClusky and Dr Paul Tregoning: The Australian National University - School of Earth Sciences	Background paper on subsidence monitoring and measurement with a focus on coal seam gas (CSG) activities
21	Subsidence monitoring	Cooperative Research Centre for Spatial Information	Subsidence monitoring in relation to coal seam gas production
22	Water treatment	Emeritus Professor Chris Fell: Fell Consulting Pty Ltd	Water treatment and coal seam gas

Other reports written by or commissioned by the NSW Chief Scientist & Engineer prior to the Independent Review of Coal Seam Gas Activities in NSW

- Hydraulic fracturing for coal seam gas (CSG) stimulation in NSW, by Dr Rob Jeffrey: CSIRO
- CSE draft letter on the likelihood of hydraulic fracturing