

## fracking inquiry

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**From:** Naomi Hogan [REDACTED]  
**Sent:** Sunday, 25 February 2018 9:21 PM  
**To:** fracking inquiry  
**Subject:** Submission to draft Final Report  
**Attachments:** 2018 Submission to the NT Scientific Inquiry Lock the Gate.docx (2).pdf; Attachment well data.pdf

Hello,

Please find attached a final written submission to the NT Fracking Inquiry.

Kind regards,

Naomi

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Naomi Hogan

Lock the Gate Alliance

[REDACTED]

**Submission to the NT Scientific Inquiry into Hydraulic Fracturing and  
Associated Activities**

**Response to the draft Final Report**

*February 2018*

**Executive Summary**

The key message throughout Lock the Gate's feedback is to bring forward the panel's mitigation recommendations to be required prior to further exploration fracking, in order to better match the risks.

The social licence to operate recommendations in the draft Final Report and the Social Impact Assessment would be strengthened if they reflected communities' requests for the research to be completed prior to the consideration of any further onshore gas exploration or production activity, for areas to be protected, health studies conducted, no go zones established and the right for landholders and Traditional Owners to say no.

It is critical that recommendations are implemented prior to any shale gas industry recommencement, because the risks of exploration fracking are similar to those from production in regards to land access, social impacts, water and chemical use.

Lock the Gate, after reading the report and thorough research, would like to put to the Panel the recommendations below:

1. A continuation of a moratorium on any unconventional shale gas mining or exploration should be continued across the Northern Territory until the identified research has been completed. This must include the completion of proper baseline assessments for water quality, quantity and flow rates, geological data, health impact assessments for target communities, ecological values and air quality data including methane concentrations.
2. These baseline assessments must be transparent, legally verifiable and publicly available. If unconventional gas developments are to proceed in any areas of the Territory in the future, these publicly held baseline assessments will be critical for ensuring any future pollution can be quantified and responsible companies can be held to account. The Lock the Gate Alliance does not support any continuation of shale gas extraction or exploration activities in the Territory before these baseline assessments have been completed.

3. Baseline assessments must be accompanied by systematic monitoring of each of the attributes listed above to assess change against baseline. All baseline assessments and monitoring should be conducted independently, be made publicly available, and be paid for by a levy imposed on the industry.
4. Due to the inherent and measured risks and impacts associated with shale gas extraction wherever it has been undertaken, exclusion zones are required to protect land, water and communities from the impacts of the industry. We recommend exclusion zones and buffer areas around agricultural land, all significant groundwater and surface water resources, identified cultural landscapes and tourism icons, national parks and other ecologically important areas, and residential dwellings from shale gas exploration and production impacts.
5. We acknowledge the growing body of evidence related to high methane emissions from unconventional gas extraction and processing activities. Adding 5% to Australia's emissions from a shale gasfield in the NT is of high consequence considering we have committed to making strong inroads to bringing down our emissions over the time period shale gas extraction in the NT could occur. To prevent methane emissions from unconventional gas in the Territory making a major contribution to global warming, laws must be amended to set strict and low allowable limits on methane emissions, and to mandate that operations that do not meet those limits will simply not be allowed to operate. No negotiation. The laws must also mandate strict independent measurement and accounting of greenhouse gas emissions from shale gas operations.
6. Requirement for full hazard assessments and compulsory disclosure of all chemicals used in unconventional gas mining, and prohibition of the use or production of chemicals or chemical mixtures (including geogenic) that are harmful to human health or the environment.
7. Amend the laws to prevent fracking companies using the threat of the Land Court to intimidate and coerce landholders and Native Title holders into signing access agreements, and implement powers to create legislation to give landholders, Traditional Owners and communities the right to say "NO" to unconventional gas operations at both an exploration and production proposal stage of development. The burden of proof must fall fully on the unconventional gas industry to prove that it will not cause harm, and this significant legal reform must be implemented prior to any further exploration fracking and only after baseline assessments have been made publicly available.
8. Include a requirement that all gas companies who seek to operate in the NT must hold comprehensive environmental insurance to cover all risks, and legislate to make gas companies responsible for any downstream impacts or impacts to neighbouring landholders.
9. Put in place world's best practice rehabilitation requirements that include:

- o Requirement for payment of upfront cash bonds to cover the full cost of rehabilitation;
  - o Rigorous estimation of bonds based on best practice calculations, the use of a mandatory government calculator, strong contingencies and no discounts;
  - o A mandated progressive annual rehabilitation ratio of 1:1 disturbance to rehabilitated area; and
  - o Prior to any approvals being given, gas companies must be required to provide a fully-costed gasfield closure plan which has been subject to stakeholder engagement and sign-off.
10. Amend laws to create a strict liability for gas companies for any spread of weeds or feral animals or any impacts on biosecurity or farm operations during gas exploration and production, and to create a strong fit and proper person test which precludes the granting or transfer of licences to financially inadequate companies or any companies with a record of non-compliance with environmental or company laws both nationally and internationally (this extends Recommendation 14.11).
11. A fully independent Ombudsman should be created to act as an umpire in disputes between landholders, Traditional Owners or communities and gas companies. The Ombudsman should have wide powers to compel gas companies to provide information and to act responsibly and prevent harm to people and businesses affected by their operations.
12. To address negative social impacts of FIFO workers, new QLD state legislation bans 100% FIFO workers for projects<sup>1</sup>. Despite having many shortcomings, the Queensland legislation is at least a start. This legislation should be improved upon and implemented in the NT.

### **Fundamental issues not mentioned in the draft Final Report**

There are two issues which have not been investigated by the Inquiry.

1. The use of sand for proppants - Origin reported that they used “2.5 million lbs of proppant<sup>2</sup>” in the Amungee NW-1H well. This could equate to over approx 1,000,000 kilograms of sand for one horizontal well. The inquiry’s final report would be strengthened by including the amount of sand required by a production gasfield. Where will it come from? Sand mining can be an invasive and ecologically

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<sup>1</sup> Minister for State Development and Minister for Natural Resources and Mines The Honourable Anthony Lynham, November 2016, <http://statements.qld.gov.au/Statement/2016/11/8/queensland-government-moves-to-deliver-choice-for-resource-communities-workers>

<sup>2</sup> Origin Energy Submission #283, p. 5 <https://frackinginquiry.nt.gov.au/submission-library?a=452658>

destructive practice which must be included when assessing the risks and impacts of hydraulic fracturing.

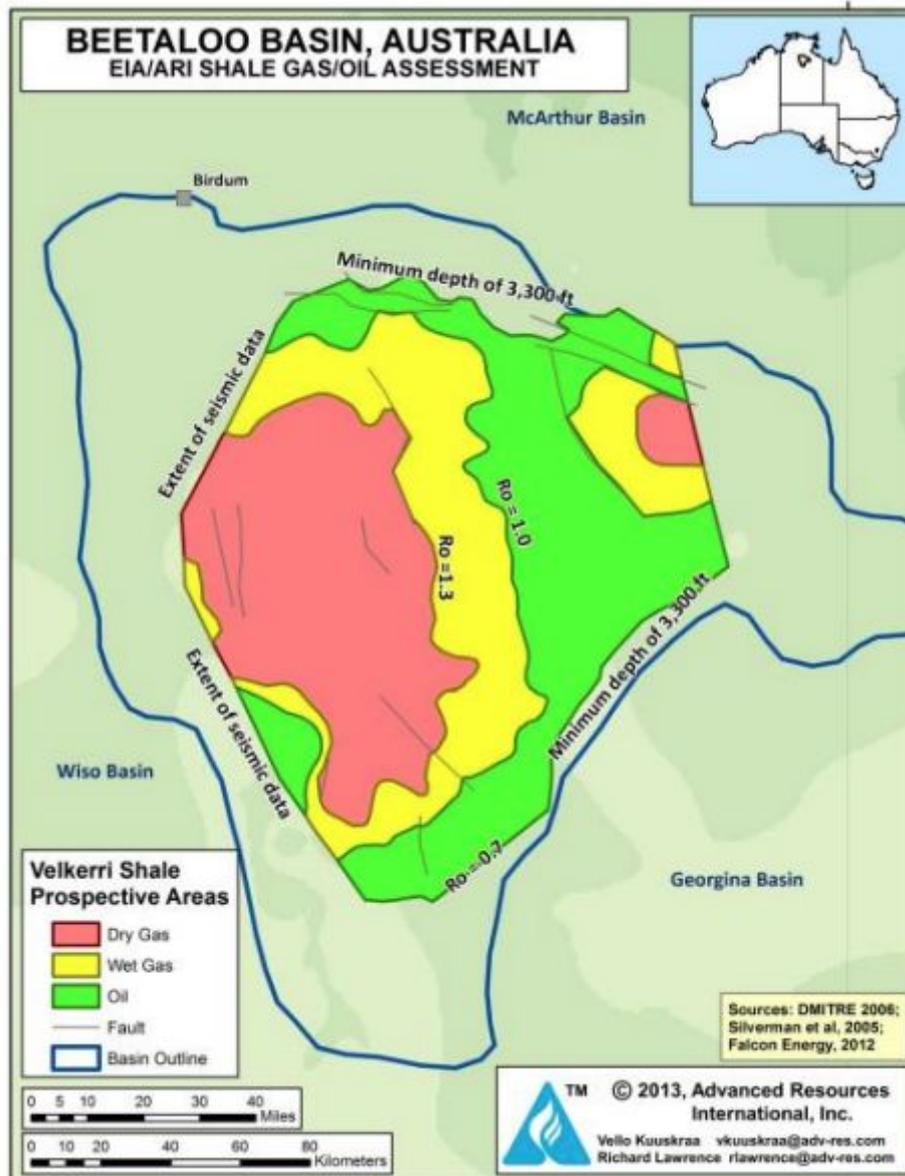
2. The production of oil - The Beetaloo Sub-basin contains areas of “gas and oil potential<sup>3</sup>”. Yet hydraulic fracturing for shale oil production, with its associated infrastructure requirements and risky pipelines, has not been discussed in the draft Final Report. This oversight is potentially due to the Terms of Reference of the Inquiry.

Lock the Gate discussed the Kyalla formation and the oil deposits found there in a hearing presentation to the Panel. Consistent oil plays have been found as part of the exploration activities to date and submitted by petroleum companies to this inquiry.

We would recommend that at the very least, the inquiry should at least recommend to the NT Government that no shale oil exploration fracking take place without thorough independent investigation of the risks, researched through scientific inquiry.

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<sup>3</sup> Page 79 of draft Final Report



Source: EIA

There are three further recommendations that should be added to the report:

1. That landholders have the right to veto and stop gas activities on their properties;
2. That all onshore gas activities continue to be prohibited until we fully understand all the implications of hydraulic fracturing activities, including exploration fracking, and fully understand the environmental context in which the oil and gas companies seek to operate (ie no fracking exploration or production until the completion of the SREBAs, the baseline health, groundwater/surface water interaction studies, methane, faultlines and informed no go zones are created); and
3. That the Petroleum Act be updated to ensure that risks of any shale oil exploration or production be fully and publicly investigated prior to any shale oil approvals or activities commencing.

## **General Comment**

It is our position that any consideration of a lifting of the moratorium should not be considered until such a time as all the research is completed and the no-go zones can be identified and put off limits to fracking. Exploration drilling (stages 2,3 & 4)<sup>4</sup> still requires drilling through aquifers and chemical use, and creates risks such as waste production which currently lacks any clear management plan.

## **Comments on the draft Final Report Chapters**

This submission is divided into sections to correlate with the various chapters of the report and appendices as relevant.

### **Chapter 1 Purpose of the Inquiry**

It is noted that the purpose of the Inquiry was for the Panel to assess and determine the nature and extent of the risks associated with hydraulic fracturing of onshore unconventional shale reservoirs and its associated activities on the environmental (aquatic, terrestrial and atmospheric), social, cultural, and economic conditions of the Northern Territory; and whether these risks can be mitigated to an acceptable level.

The draft Final Report states that assessments were conducted with crucial knowledge gaps which preclude any certainty. This uncertainty obstructs the achievement of any acceptable level of mitigation.

We suggest that the Terms of Reference will only be achieved when the studies necessary to identify the no go zones have been undertaken and completed. We request that true to the terms of reference, the inquiry recommends that no further exploratory hydraulic fracturing activity takes place before the required scientifically informed no go zones are legally set in place.

### **Chapter 2 Work of the Inquiry to date**

Lock the Gate Alliance acknowledges the work of the Inquiry to date.

We also acknowledge the dedication of the Northern Territory communities in their attempts to participate, despite often almost insurmountable obstacles such as distance, finances and time.

### **Chapter 3 Summary of discussions at community forums and the final list of issues**

The summary of discussions and issues raised by the community is appreciated. However, this chapter would be greatly improved by a frank and honest acknowledgement of the strong and clearly presented opposition to fracking that was expressed at the consultation meetings. Many communities expressed a strong desire for an outright ban on fracking.

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<sup>4</sup> Page 38 of the draft Final Report

People called for their areas to be put out of bounds to fracking. At some meetings there was almost unanimous votes for a ban on fracking. These sentiments are important and deserve to be recorded by the Inquiry in this chapter.

#### **Chapter 4 Evidence and risk assessment methodology**

The risk assessment matrix assumes that mitigation measures can reduce high risks, to low risks, despite insufficient data. For example, risks to surface and ground waters have been identified in the report, but the level of risk or how to fully mitigate them remains unknown. This data is necessary to conduct a valid risk assessment.

Lock the Gate Recommends:

1. Continue the hydraulic fracturing moratorium until the risks to our surface waters and groundwaters have been fully understood, and all SREBA and baseline testing has been conducted independent of industry and with all water information easily available to the public.
2. Independent baseline testing/monitoring must be conducted prior to any exploration activities.
3. Decommissioned wells need regular, ongoing monitoring indefinitely (at least 6 monthly), for early detection of any problems.

#### **Chapter 5 Shale gas extraction and development**

This chapter is of high significance and public interest. Therefore, we have undertaken a detailed assessment and offer the below suggestions to improve accuracy.

Pages 40-41: It would be more realistic to have written: "Cementing is essential for two reasons. Firstly, to provide strength to the well, and secondly, to provide a seal between the casing and the surrounding rock to inhibit gas and fluid flow from the shale formation (and other intersecting formations) to the surface."

Rather than: "Cementing is essential for two reasons. Firstly, to provide strength to the well, and secondly, to provide a seal between the casing and the surrounding rock so that gas and fluids cannot flow from the shale formation (and other intersecting formations) to the surface."

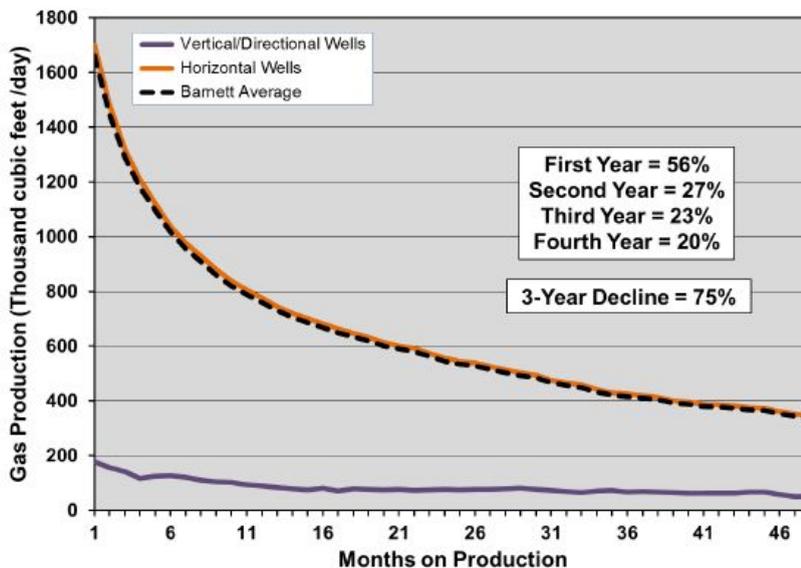
There are no guarantees of performance underground, only probabilities of success and failure. A well designed cement job with excellent materials and superb personnel doing the cementing can still fail.

In figure 5.4B all of the text descriptors on the right side of this figure are ideals, not certainties. Each has a probability, not a guarantee, of being achieved or avoided.

Page 42: "Hydraulic fracturing is a stimulation technique used to increase the production of oil and gas from unconventional reservoirs, such as shales, by the injection of a hydraulic fracturing fluid at high pressure into a cased wellbore (Figure 5.5)." Note that the casing must first be perforated. This is not mentioned, or shown in Figure 5.5.

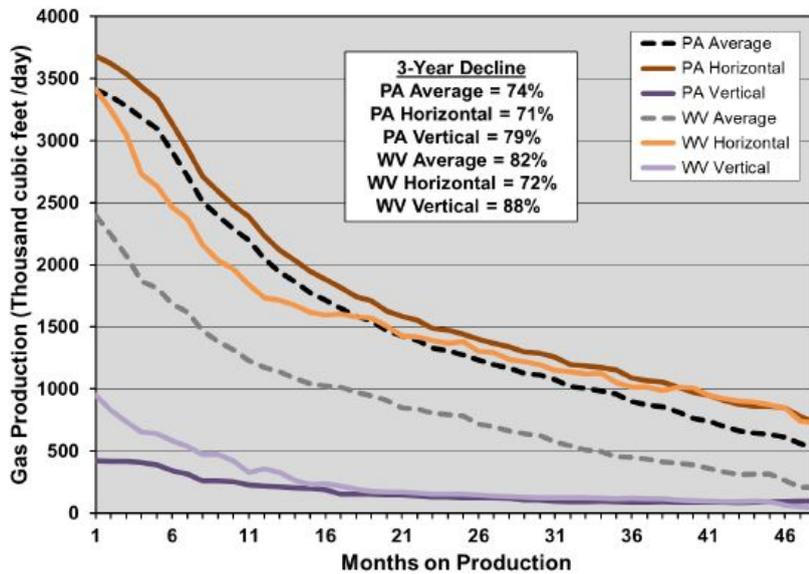
Also, Figure 5.5 shows injection of water, but should also demonstrate the addition of proppant and chemicals.

Page 44: "Most shale gas wells are designed to keep producing hydrocarbons for decades." This statement is contrary to the actual observations of well performance in the United States. It is much more accurate to say that most shale gas wells produce economically viable quantities of gas for less than a decade. See for example the report by Hughes<sup>5</sup>, where he extracts company data from Drillinginfo<sup>6</sup>. These decline charts are for the two largest shale gas plays in the U.S., the Barnett in Texas, and the Marcellus in Pennsylvania and West Virginia:



**Figure 3-11. Average decline profile for gas wells in the Barnett play.<sup>17</sup>**  
Decline profile is based on all shale gas wells drilled since 2009.

<sup>5</sup> Hughes 2014, <http://www.postcarbon.org/publications/drillingdeeper/>  
<sup>6</sup> <https://info.drillinginfo.com/>



**Figure 3-84. Average decline profile for horizontal and vertical/directional gas wells in the Marcellus play, by state.<sup>131</sup>**

Decline profile is based on all shale gas wells drilled since 2009.

These charts show clearly that modern shale gas wells experience 70-80% decline in production within the first 3 years of their lives. This decline phenomenon has serious implications for the economic viability of a shale gas play, and also on the impacts to landholders who would have to experience not one-time, but continuous disruptions due to the need to continuously develop a play over a long period of time to replace lost production.

Page 45: "In some cases, it is necessary to re-enter a well (called a 'workover') to perform maintenance, repairs or replacement of components, for surveillance, or to increase productivity. Such interventions can be critical to maintaining well integrity, and there are a range of technologies that can be applied to repair the casing and cement if integrity issues are detected." As the Lock the Gate Alliance presented to the Inquiry at the Public Hearings in 2017, an honest assessment of the probability of success of repair interventions is required in Final Report. See again the example by King<sup>7</sup> who notes that success at squeeze cementing for repair is "Usually about 50% - but conditions make success vary widely."

Page 46: " For shale gas wells abandoned using current practices it is highly unlikely that if any of these leakage pathways were to develop they would allow large fluid flow rates." Please cite source for this statement, given that the Panel goes on to write, " The Panel has found that there is a paucity of information available on the performance of abandoned onshore shale wells."

Page 47: " Halliburton, one of the largest service providers worldwide to the shale gas industry, responded that pressures are not monitored post abandonment and that there is no statistically based data available to indicate the percentage of wells that fail. Halliburton

<sup>7</sup> King, Squeeze cementing, [www.GEKEngineering.com](http://www.GEKEngineering.com)

continued, “based on reported MIT failure rates in active wells, the percentage should be very low and may be less than 1%.”

Halliburton could hardly be considered an objective judge of this phenomenon. MIT failure rates are informative but not definitive with respect to loss of wellbore integrity, and there are other non-industry studies specific to shale gas wells that show much higher rates of well impairment (Ingraffea et al. Proc. National Academy of Sci., 2014).

Further, the Alliance encourages the Panel to seek more specific information from Origin and Santos about their ongoing well monitoring post abandonment. We have obtained insights into Origin’s onshore gas wells in the Surat Basin of QLD that show valve leaks, outstanding rehab issues, stem seal leaks and other compliance issues, see attached.

We suggest that the gas companies may be able to contribute to information on abandoned wells. We recommend the panel seeks to obtain copies of inspection reports such as these to better understand the ongoing issues with gas wells in Australia, to inform the Final Report. The data exists and is held by the gas companies participating in this inquiry.

Page 51: "Blowout of onshore shale gas wells is unlikely during drilling because of the very low permeability of shale gas reservoirs."

Blowouts of onshore shale gas wells have certainly occurred, they are low probability events, but with high consequences. We cannot find evidence that blowouts are related to shale permeability, and instead they are a result of loss of well control while drilling through highly pressurized gas sands above the shale.

Page 51: "In the event a problem is detected by the CBL, there are various techniques that can be used to repair the compromised zone."

Please show evidence for this statement and note the above comments re the success rate of squeeze cementing.

A more accurate statement would be: "In the event a problem is detected by the CBL, there are various techniques that can be attempted to try to repair the compromised zone."

Page 57: Further research into the well barrier failure vs well integrity failure is required before a 0.1% figure could be landed on.

For example, a 0.1% well integrity failure resulting in release of fluids through the well casing does not correlate with the Marcellus experience in Pennsylvania. A 0.1% integrity failure rate there would imply about 10 confirmed cases of release of fluids to the environment over a period of 14 years and about 11,000 wells there. The Pennsylvania Department of Environmental Protection<sup>8</sup> currently confirms 302 such cases, with hundreds more cases currently under evaluation. This would indicate a integrity failure rate of at least 3% in a play with what are considered in that jurisdiction to be tough regulations and ultra-modern development.

Page 57: The Panel is commended for recommending a minimum Category 9 or greater design for NT wells.

Pages 58-65: We strongly agree with the Panel’s recommendation and note that: "The current project application process for drilling activities in the NT contains requirements for

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<sup>8</sup> <http://www.dep.pa.gov/DataandTools/Reports/Oil%20and%20Gas%20reports/Pages/default.aspx>

the gas operator to describe components of well integrity management, but it currently does not explicitly require an overall well integrity management plan for the full life cycle of a well. It is the Panel's opinion that it should."

We also commend you for the recommendation:

"That the composition (inorganics, organics and NORMs) of flowback fluids, in addition to hydraulic fracturing fluids, be made publicly available." We note this should be expanded to also be publicly accessible, and not requiring complicated logins or difficult to access web pages etc.

Page 68: The interpretation of the final US EPA report in the draft final report could confuse readers, and in fact is already being used in the NT media to say that no contamination of drinking water has ever occurred from fracking, which is patently untrue.

This statement could be reworded or clarified: However, while there have been more than one million fracture stimulations (fracturing) treatments in North America, and more than 1,300 in the Cooper Basin in SA, there has been no reported evidence of fracturing fluid moving from the fractures to near surface aquifers.<sup>158</sup> Cooke 2012; US EPA Report.

- 1) Fracture fluid in near surface aquifers is reported in the US EPA report (from various parts of the fracking industry's processes)
- 2) There is no body measuring in SA, no data available, no baseline water results

With regard to the US EPA report, Tom Burke, EPA Deputy Administrator, said the study produced significant findings. Key among them was that fracking has caused contamination to drinking water resources.

"We found scientific evidence of impacts to drinking water resources at each stage of the hydraulic fracturing water cycle," he said.

Burke also said there are uncertainties and gaps in the data that prevented the study from making a national conclusion on fracking's impact on drinking water. But he said it has caused some problems in local communities. Those problems include poor well construction, spills of wastewater that contains fracking fluid and water withdrawals from areas that have low water resources<sup>9</sup>.

Lock the Gate further recommends:

1. The moratorium should remain until the Schedule of Onshore Petroleum Exploration and Production Requirements 2016 is amended to reflect the Inquiry's findings, and the regulations should be the same for exploration and production wells.
2. The Inquiry's recommendations for long term well monitoring (Recommendations 5.1, 5.2, 5.3) must be extended and include abandoned wells.

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<sup>9</sup> <https://www.apmreports.org/story/2016/12/13/epa-fracking-contamination-drinking-water>

## Chapter 6 Onshore shale gas in Australia and the Northern Territory

Chapter 6 of the draft Final Report highlighted the uncertainty caused by the lack of crucial data and the problems caused by the provision of contradictory information. Statements such as, “The scale of development is difficult to establish at the current time”<sup>10</sup> and “There is currently insufficient information available for any of the onshore shale gas basins in the Northern Territory to inform this long-term planning issue”<sup>11</sup>, coupled with contradictory information such as, industry estimates “the combined developments over the next 25 years could result in between 1,000 and 1,200 wells associated with around 150 well pads”<sup>12</sup>, while the “Energy Division of DPIR predicts that approximately 15,506 shale gas wells could be developed in the greater McArthur Basin, with possibly around 6,250 wells in the Beetaloo Sub-basin. This estimate is more than one order of magnitude (10 times) larger than the industry projection”<sup>13</sup>, demonstrate why any shale gas activity risks to the Northern Territory are currently impossible to accurately ascertain.

The potential and unknown scale of the industry in the Northern Territory further provides evidence that the scientific studies and no go areas should be undertaken prior to further exploration, as the impacts could otherwise be of an inappropriate scale to mitigate risks to sensitive areas.

Lock the Gate supports the Panel’s criticism of the current well abandonment regulations (the Schedule of Onshore Petroleum Exploration and Production Requirements 2016).

The report identified a lack of wastewater and solid waste management plans and facilities in the Northern Territory. The issue of waste disposal must also be addressed before the moratorium is lifted.

With regards to updating the diagram on page 81 to reflect the later Origin submission, this is welcomed. With regards to the Origin submission #283 and the description, there is one key area that was not dealt with in Origin’s response to the inquiry to date. Origin stated on page 5 of submission #283 that for the 12th stage, the well failed to reach formation breakdown<sup>14</sup>. In Origin’s verbal description to the panel in February 2018, they note that, *“For whatever reason the stress state at that specific stage would not break down. We couldn’t create a fracture.”*

Further investigation into why that was the case would be welcomed.

The CSIRO report to the inquiry states on page 82:

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<sup>10</sup> Page 86 of the draft Final Report

<sup>11</sup> Page 87 of the draft Final Report

<sup>12</sup> Page 86 of the draft Final Report

<sup>13</sup> Page 86 of the draft Final Report

<sup>14</sup> <https://frackinginquiry.nt.gov.au/submission-library?a=452658>

*“Because the hydraulic fracturing fluid is contained within the isolated wellbore zone, the pressure builds up until it exceeds a threshold known as the **breakdown pressure**. Once the hydraulic fracture fluid pressure exceeds the **breakdown pressure**, it fractures the rock, resulting in ‘hydraulic’ fractures.”*

And

*“At the start of the simulation, the hydraulic fracturing fluid is injected without any proppant, to initially open a fracture wide enough to allow the proppant to travel along the hydraulic fracture; this is known as the ‘well pad’.”<sup>15</sup>*

Origin has still not explained whether the breakdown pressure was not achieved due to the hydraulic fracture fluid not being contained within the isolated wellbore zone and why.

## **Chapter 7 Water**

Due to the lack of data for Northern Territory water sources and processes, Chapter 7 leaves us with many questions requiring answers.

This quote from the draft report sums the situation up perfectly, “it is apparent that available knowledge and data on the NT’s water resources (surface and groundwater), and their associated aquatic ecosystems, is presently insufficient to permit the risks associated with the development of any onshore shale gas industry in the NT to be assessed without considerable uncertainty”<sup>16</sup>. Aquatic ecosystems and biodiversity are of international significance and must be fully understood. This considerable uncertainty must be addressed through thorough research and baseline testing before the lifting of the moratorium can be considered.

There are unacceptable knowledge gaps and limitations in all aspects of water issues, eg. the amount used for fracking, surface water and groundwater capacities and processes, and water dependent ecosystems. “There is limited information about the groundwater systems in rocks underlying the Cambrian Limestone Aquifer and their connectivity with this groundwater system”<sup>17</sup>. These crucial knowledge gaps must be remedied and the risks identified and assessed, before we can consider proceeding with any fracking exploration or production wells.

This draft final report also discovered, “Many high yielding aquifers within the NT are close to full allocation against the prescribed contingent allocations. Groundwater and surface water resources in a number of specific areas such as Alice Springs, Darwin Rural, Douglas Daly, Katherine and Mataranka are recognised as being under pressure from resource development”<sup>18</sup>. This makes the risks of water depletion due to the onshore gas industry an extreme concern, potentially impacting residential, environmental and other industries’ water availability. That would be unacceptable.

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<sup>15</sup> <https://frackinginquiry.nt.gov.au/inquiry-reports?a=465932>

<sup>16</sup> Page 112 draft Final Report

<sup>17</sup> Page 112 draft Final Report

<sup>18</sup> Page 105 draft Final Report

Aquifer contamination with methane is another serious risk which has been understated by the inquiry as methane is not considered toxic. High levels of methane in an enclosed space can have explosive and potentially fatal consequences though. This could happen in the gap between the water and a bore head, or in an enclosed bathroom of a house where the water has been contaminated<sup>19</sup>.

Further, methane can be harmful to aquatic organisms, and is of particular concern in subsurface groundwater dependent ecosystems. Disturbance to groundwater chemistry can significantly alter aquifer biodiversity and ecosystems and the microfauna that inhabit them, and also have flow on effects to connected ecosystems including rivers and their riparian zones<sup>20</sup>.

The Northern Territory's current regulations are inadequate to effectively protect our surface and groundwaters. Panel's recommendation (7.1) to amend the Water Act needs to be extended to include exploration licences as well as production licences. Regulations to protect water from over-extraction and contamination, and to bring the use of water by the gas industry under the Water Act must be finalised prior to any potential recommencement of water use by the onshore gas industry.

## **Chapter 8 Land**

The Northern Territory is renowned as a tourist destination due to its abundant wildlife, untamed natural beauty and wide open spaces. Our beef and horticultural produce are highly sought after nationally and internationally due to our clean green image. And our Territory culture, both traditional and non-indigenous, is deeply embedded in our landscape.

Chapter 8 recognises the known deleterious impacts of shale gas operations. These include land use intensification, fragmentation, disruption to agricultural operations and alienation of agricultural land, large water demand, vegetation clearing and the production of polluting waste.

All landholders deserve a right to have a say over what happens on their land and to protect their primary production or tourism industries. It is for these reasons we insist landholders need a right to veto gas activities on their land.

With the exception of National Parks, Chapter 6 failed to identify any sensitive or significant areas as no go zones. In order to protect the NT's sensitive landscapes and areas of conservational, historical, aesthetic, cultural or agricultural significance, all research must be completed, no go zones identified and declared, and regulations must be updated, prior to any consideration of the lifting of the moratorium. This will prevent any exploration activities from occurring in and risking sensitive or significant areas.

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<sup>19</sup> <https://www.theguardian.com/environment/2011/apr/12/families-gas-drilling>

<sup>20</sup> **National Water Commission, 2008.** *Subsurface groundwater-dependent ecosystems*, Australian Govt 2008.

## Chapter 9 Greenhouse gas emissions

We do not agree that the risks to the climate from shale gasfields in the Northern Territory are low. According to the Federal Environment Department<sup>21</sup> Australian emissions rose for the third consecutive year in Australia in 2017, with gas production and exports being blamed.

According to scientists, we need our emissions to be falling. The emissions from large scale shale gasfields across the Northern Territory may be what pushes us past the climate change tipping point with catastrophic consequences for the NT<sup>22</sup>.

We recommend the Panel seeks clear review of this chapter by climate scientists to ensure the risk matrix and the recommendations are in line with the latest climate science.

We also wish to point out the aerial surveys have had high success rates for pinpointing exact emission sources and super emitters of methane and other greenhouse gases. This point should be updated in the Final Report, while noting that independent baseline measurements prior to any further onshore gas exploration or extraction activities are critical for being able to monitor changes into the future.

## Chapter 10 Public health

The Terms of Reference do not allow for the Inquiry to comment on the potential health impacts of on-site workers, so all risk assessments in the draft report are in relation to the general public. Where there are risk factors for the general public, the risks could be increased for on-site workers due to their proximity and level of exposure.

“There is very limited data on the composition of flowback and produced water occasioned by onshore shale gas extraction in Australia ... overseas studies suggest that flowback and produced water can contain a much greater number of potentially environmentally sensitive chemicals than are present in the original hydraulic fracturing fluid composition”<sup>23</sup>. It is then assumed that these chemicals might not be “harmful to human health or to the environment”<sup>24</sup>. It is unacceptable to assume that by the time any contaminated water (or air) reaches the point of consumption, the chemicals will be considerably diluted and suitable for human consumption. Nor is it acceptable to assume that some contamination is acceptable, and it is only when contamination surpasses certain levels that it becomes an issue.

A study of the Material Safety Data Sheets (MSDS) for the chemicals used in hydraulic fracturing, found many are listed as “Dangerous Goods”<sup>25</sup> and carried warnings such as: “Harmful if swallowed”, “Harmful if contact with skin”, “Very toxic to aquatic life”<sup>26</sup>, and “Do

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<sup>21</sup> <http://www.abc.net.au/news/2017-12-19/greenhouse-gas-emissions-increase-third-consecutive-year/9271176>

<sup>22</sup> <https://www.environment.gov.au/system/files/resources/b2915be6-16e4-4cb3-8533-471ed879bfc1/files/kadu-coast.pdf>

<sup>23</sup> Page 64 of draft Final Report

<sup>24</sup> Page 65 of draft Final Report

<sup>25</sup> [https://dpir.nt.gov.au/\\_data/assets/pdf\\_file/0008/369809/stimulation-additives.PDF](https://dpir.nt.gov.au/_data/assets/pdf_file/0008/369809/stimulation-additives.PDF)

<sup>26</sup> <https://www.caymanchem.com/msdss/10597m.pdf>

not breathe dust/fume/gas/mist/spray”<sup>27</sup>. The assumption that chemicals would not make their way to water/humans/communities in offsite locations due to operational controls is an extremely dangerous one, considering the quantities of these dangerous chemicals used and the likelihood of risk control failures.

The human health risk assessments and reports examined as part of this inquiry only provided limited information. While it is true that many health reports conclude that further research is required for a definitive assessment of onshore shale gas activities’ impacts on health, the sheer weight of the number of reports<sup>28</sup> indicates that there are serious health issues associated with fracking. Territorians can not be used as guinea pigs and sacrificed in a fracking health experiment.

We suggest you read: *‘Air Pollution and human health hazards: a compilation of air toxins acknowledged by the gas industry in Queensland’s Darling Downs’*,<sup>29</sup> published by Dr Geralyn McCarron on 8th January 2018. She concludes: "Increased cardiopulmonary hospitalisations are coincident with the rise in pollutants known to cause such symptoms. Apparently, controls to limit exposure are ineffectual. The burden of air pollution from the gas industry on the wellbeing of the Darling Downs population is a significant public health concern."

## **Chapter 11 Aboriginal people and their culture**

The ties between Aboriginal people and their environment has been well documented in numerous studies. These ties greatly influence physical, mental and spiritual health, are site specific and are impossible to quantify. It is also impossible for anyone not from a particular language group to fully understand their Aboriginal ontology.

“Recommendation 11.6: That Land Councils, AAPA, and the Government cooperate to ensure that reliable, accessible (including with the use of interpreters), trusted, and accurate information about any onshore shale gas industry is effectively communicated to all Aboriginal people that will be affected by any onshore shale gas industry”<sup>30</sup>, while welcomed, also raises serious concerns. Who will decide what is “trusted, and accurate information about any onshore shale gas industry”? Will the Indigenous people be informed of all the risks and the need for highly skilled workers, which will see them disadvantaged?

While we agree that the gas industry should fund the design and delivery of any information programs, a clear separation between funding and information delivery must be enforced, to ensure the information delivered is impartial and not influenced by the gas industry.

## **Chapter 12 Social impacts**

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<sup>27</sup> [https://www.chemsupply.com.au/documents/BE0155\\_AU.pdf](https://www.chemsupply.com.au/documents/BE0155_AU.pdf)

<sup>28</sup> COMPENDIUM OF SCIENTIFIC, MEDICAL, AND MEDIA FINDINGS DEMONSTRATING RISKS AND HARMS OF FRACKING (UNCONVENTIONAL GAS AND OIL EXTRACTION)  
<http://www.psr.org/assets/pdfs/fracking-compedium-4.pdf>

<sup>29</sup> <http://www.tandfonline.com/doi/full/10.1080/00207233.2017.1413221>

<sup>30</sup> Page 266 draft Final Report

This chapter makes no mention of all the opposition to fracking shown at consultations or in polls conducted by NT media. It does show “ Number of submissions emphasising risks and benefits relating to social impacts” in Figure 12.1<sup>31</sup>, but little emphasis is placed on the fact the majority of submissions emphasised the risks not benefits.

We feel it is inappropriate to use a CSIRO study<sup>32</sup> showing trust and acceptance of the extractive industries to imply acceptance of an onshore gas industry. The scale of unconventional onshore gasfields across the landscape, and the impacts on local aquifers and air quality over a vast area where people are forced to ‘coexist’ means that trust and acceptance of onshore gas is often far lower than the acceptance granted to other extractive industries. We know from our many stalls and meetings across the NT and Australia, that it is common for people working in other extractive industries to oppose onshore gas fracking.

Recommendation 12.2: “That gas companies ensure the provision of adequate and sustainable funding to ensure the identified infrastructure requirements are met and maintained appropriately”. How will this be assessed and regulated?

Recommendation 12.3: “That consideration be given to the development of road use agreements between gas companies and local councils that include safety considerations and ensure monitoring for compliance, including reporting requirements”.

This recommendation should be more than just “consideration”, road use agreements are absolutely necessary to avoid vehicular accidents and road deaths, and to mitigate the financial burdens of road maintenance.

While well intentioned, the recommendations from this chapter fail to recognise the heart of the social issues. The recommendations in this chapter do not meet the community concerns expressed to the panel. These concerns centre around a loss of lifestyle and loss of identity as Territorians.

In regards to Recommendation 12.12<sup>33</sup>: “That gas companies be required to develop a social impact management plan that outlines how they intend to develop and continue their SLO within each of the communities they will operate in. This should be developed in conjunction with any SIA, and introduced as early as possible, preferably in the exploration phase, to ensure that any potential changes can be flagged in advance to allow communities time to adapt and prepare for the changes”.

Social Licence to operate cannot be brought by a ‘management plan’ to help people ‘prepare for changes’ that are outside our control. This is exacerbated due to local people having no power to object, or right to say ‘no thanks’.

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<sup>31</sup> Page 270 draft Final Report

<sup>32</sup> Page 287 draft Final Report

<sup>33</sup> Page 283 draft Final Report

Baseline studies, independent research on health impacts, groundwater flows, an understanding of landscape and wildlife impacts and clearly laid out no go areas, all must be completed before exploration. All laws, through the necessary processes and NT Parliament, with full cost recovery from the fracking companies must be put in place. All that critical work must be undertaken before the community is forced to endure a fracking company's attempts to 'optimise the relationship'.

## Chapter 13 Economic impacts

ACIL Allen conducted a thorough analysis of a range of scenarios regarding future shale gas production in the Northern Territory, and within this modelling provided estimates on the tax effects on both GST and royalties<sup>34</sup>. The Final Report chapter 13 could be strengthened by an assessment of the data in line with the below economic overview.

Notably, the ACIL analysis place the highest probability of occurring on their low development 'Calm' scenario, even with the removal of the current moratorium. Therefore, the scenarios involving much more extensive shale gas development — called Breeze, Wind and Gale — should be considered low probability events. Indeed, many of the results of the ACIL analysis have been widely misrepresented as to show large economic effects, when in fact they will be very marginal, and in many cases, too small to model<sup>35</sup>.

### ACIL Allen tax effects in context

The four scenarios are called Calm, Breeze, Wind, and Gale, and represent progressively higher gas output scenarios. With a partial lift of the moratorium on shale gas, Calm scenario has been assessed as the most probably outcome, as their scenario probability matrix shows (reproduced below).

FIGURE ES 7 ACIL ALLEN DEVELOPMENT SCENARIO PROBABILITY MATRIX

INDUSTRY DEVELOPMENT SCENARIO	Production Profile	Production Cost Regime	POLICY SCENARIO PROBABILITY MATRIX		
			PERMANENT MORATORIUM	PARTIAL LIFT	FULL LIFT
BASELINE	Nil Shale Production	N/A	CERTAIN	MODERATE	LOW
SHALE CALM	Exploration occurs Failure to commercialise	N/A	ZERO	VERY HIGH	VERY HIGH
SHALE BREEZE	Scenario 1 Target production: 36PJ per annum	High cost	ZERO	MODERATE	HIGH
SHALE WIND	Scenario 2 Target production: 150PJ per annum	Moderate cost	ZERO	LOW	MODERATE
SHALE GALE	Scenario 3 Target production: 365PJ per annum	Low cost	ZERO	VERY LOW	LOW

SOURCE: ACIL ALLEN CONSULTING

<sup>34</sup> ACIL Allen Consulting. (2017). The economic impacts of a potential shale gas development in the Northern Territory. October 2017. Accessed at

[http://www.acilallen.com.au/cms\\_files/ACILAllen\\_ShaleGasNT\\_October2017.pdf](http://www.acilallen.com.au/cms_files/ACILAllen_ShaleGasNT_October2017.pdf)

<sup>35</sup> Campbell, R. (2018). Economies of Shale: Submission on the Draft Report of the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory. *The Australia Institute*. Accessed at

<http://www.tai.org.au/sites/default/files/P437%20Submission%20on%20NT%20fracking%20inquiry%20FINAL.pdf>

Despite setting out these scenarios it is important to note that ACIL stresses how little information there is on the size and scope of commercial share gas reserves in the NT. As ACIL write ‘even the most information regarding the quantity and quality of gas *in situ* is unknown’. As such, it sidesteps the critical issue of whether the reserves are economic to produce in the first place. As ACIL state clearly in their guide to interpreting their report, there is simply not enough information to make this assessment as such they state their report is ‘not an assessment of the commercial viability of a shale gas industry in the NT’.

It is also important to note that total fracking royalties assumes that production continues out to 2042. At any stage, drops in the gas prices or increases in other costs could render the project uneconomic and cause production to stop, with impacts on the economic output and also the ability of the Government to collect revenue to pay for ongoing costs of the industry for monitoring and compliance.

### Royalties

The ACIL Allen report models the effects on NT royalties in each scenario. These effects are summarised below, where the expected royalties are compared to existing royalty revenues. The revenue effects in the most likely scenarios are very small.

	Calm	Breeze	Wind	Gale
Average real royalties per annum (\$m)	0	11.9	34.4	69
Share of NT 2017-18 total resource royalties <sup>36</sup>	0.0%	5.3%	15.3%	30.7%
Share of NT 2017-18 own-source revenue	0.0%	1.3%	3.6%	7.3%
Share of NT 2017-18 total revenue	0.0%	0.2%	0.6%	1.1%

For context, the coal seam gas (CSG) revenues in Queensland in 2015-16 were \$22 million. Forecasts for future royalties from oil and gas have been revised down repeatedly, from a forecast back in 2012-13 of \$636 million by 2017-18, down to a forecast of \$147 million in the actual 2017-18 budget.

### GST

The effect on NT GST allocations is also modelled. Like for royalties, the size of these estimated effect for each scenario are put in the context of total GST allocations. These average values from the modelling exercise are in 2017-18 real dollar values and can thus be compared on a dollar-for-dollar basis with the 2017-18 revenues in the NT budget.

<sup>36</sup> This and other NT government revenue figures come from the 2017-18 NT Treasury Budget.

	Calm	Breeze	Wind	Gale
Average real GST effect per annum (\$m)	0.3	14.3	37.4	63.1
Share of NT 2017-18 GST revenue	0.0%	0.5%	1.3%	2.2%
Share of NT 2017-18 own-source revenue	0.0%	1.5%	3.9%	6.7%
Share of NT 2017-18 total revenue	0.0%	0.2%	0.6%	1.0%

### Jobs

The modelling also has an output the number of additional jobs created in each gas development scenario, both within NT and the rest of Australia.

Most interesting is that in all scenarios there is no net national job creation, as any additional jobs in NT are filled at the expense of potential resource industry jobs elsewhere in the country. This may be an artefact of a full-employment assumption in the modelling exercise, however the economic reality that there is competition for workers in resource industries is nevertheless an important consideration.

	Calm	Breeze	Wind	Gale
Average jobs	5.0	82.0	252.0	524.0
Share of average NT workforce to 2042 (at 1.5% annual growth <sup>37</sup> )	0.0%	0.0%	0.1%	0.3%

### Boom and bust cycle amplified

One final consideration is that the expansion of additional resource extraction in NT would further hitch its economy on the global resource cycle, rather than contributing to stabilising its economy.

As ACIL notes, how far advanced any gas development gets depends on global conditions, and the domestic industry will respond to those fluctuations in terms of:

<sup>37</sup> This is the average annual growth in the NT labour force since 2012. ABS (2018). 6202.0 - Labour Force, Australia, Jan 2018. Table 10. Accessed at <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6202.0Jan%202018?OpenDocument>

- The construction of pipelines and other facilities certainly will employ people, but this will be temporary and pro-cyclical.
- Both construction and ongoing output will respond to global resource prices, further enhancing the Territory's boom-bust nature of its economy.

Regarding the recommendation of full cost recovery:

Lock the Gate agrees fully that the costs should be born by the industry. APPEA is already publicly arguing that the royalties would be more than enough to pay for any costs associated with an onshore gas industry, and therefore it's the Government's responsibility to pay for regulatory changes, baseline assessments, and the like. This argument is flawed, as the royalties do not kick in until the production phase and the amount of royalties paid could be very little, as evidenced by the ACIL Allen report to the inquiry.

There is a huge amount of upfront work to do before any gas activities could possibly go ahead. The industry are willing to invest billions in taking risks in exploration activities, therefore they should be willing to invest in funding all regulatory changes, preparatory research, and infrastructure construction.

These funds need to be held independently with outcomes independent of the industry's goals and instead led by scientific needs and the needs of the other Territory industries and communities.

## **Chapter 14 Regulatory reform**

We have a particular concern that exploration fracking can begin right away if the moratorium is lifted, without all the recommended studies being completed and without no-go zones identified and protected. As there is little difference between exploration and production, all regulatory changes must apply to both exploration and production wells and activities. All regulatory improvements need to capture any exploration licences already issued and be applied retrospectively, binding all shale gas related activities to all the recommendations.

Lock the Gate commends Recommendation 14.1: "That the Government design and implement a full cost recovery system for the regulation of any onshore shale gas industry"<sup>38</sup>, and suggests a steering group with representatives of the key stakeholders including conservationists, Indigenous representatives, pastoralists, etc be formed to oversee the government's adoption of all the inquiry's recommendations. A clear separation between industry funding and the regulation of any onshore shale gas industry in the NT is vital to ensure undue industry influence on regulation implementation.

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<sup>38</sup> Page 339 draft Final Report

The Government needs to put in place a safety net for pastoral industry to be able to have legal and financial support to check implications of any new laws drafted. Landholders need independent expertise to help review the regulations and any agreements, with the costs to be fully funded by the onshore gas industry through an independent body.

The inquiry's suggestion for the NT to follow South Australia's two tier approach to monitoring and regulation fees, where a demonstrated compliant experience results in lower surveillance and regulation fees, has some merit. A reduction in fees would provide incentive for companies to comply more rigidly to regulatory standards, but a reduction in monitoring may lead to complacency.

We have concerns with the current process of Ministerial approval for Production Licences under the Petroleum Act, as outlined in figure 14.11 and over pages 371 and 372 of the draft Final Report. The list of mandatory considerations by the Minister, that may result in a production licence not being granted, must be expanded to include all the regulatory improvements as outlined by the Panel, and the ability to examine new information with regard to the environmental conditions, water availability etc.

The Petroleum Act could also be strengthened by ensuring that EMPs for exploration activities are put out for public comment over sufficient time for feedback with mandatory consideration of issues raised. Therefore increasing public scrutiny of exploration fracking activities.

Legislation must also be developed to prohibit the exploration for and development of any shale oil.

Improve Recommendation 14.29 to read: That the Government enacts provisions that reverse the onus of proof or create rebuttable presumptions for pollution and environmental harm offences for all regulated onshore shale gas activities.

We support the introduction of Option 1. Option 1 must be implemented and all gas applicants and existing licences be approved under the new regulatory regime, prior to any recommencement of onshore shale gas activities.

## **Chapter 15 Strategic regional environmental and baseline assessment**

The intent of this section of the draft Final Report is strongly supported.

We note however that the impact of exploration, appraisal and delineation fracking wells will also interfere with the collection of adequate pre-development assessment and environmental baseline data.

We strongly recommend the panel replace the words 'production licence' with 'further exploration or production licences or approvals' in the below recommendation:

Recommendation 15.1 That a strategic regional environmental and baseline assessment (SREBA) be undertaken prior to the grant of any production licence for onshore shale gas.

We also request that monitoring data and independent SREBA results must be live and readily accessible to third parties online.

Water can be slow moving and slow changing, so requires baseline data to be established for years prior to commencement of any onshore shale gas development. The establishment of independently collected baseline data, and a full understanding of all the aquifers, surface water and water processes and ecological services is crucial to water management and protection. Water contamination and depletion is of utmost concern to Territorians, all the 'knowledge gaps' and uncertainty must be addressed prior to any consideration of the lifting of the moratorium.

	A	B	C	D	E	F	G	H	I	
1	<b>Surat Master Well List for Field Verification</b>									
43	Berwick 2	PL70	19-Feb-93	-27.2501	148.8928	Gas		On both HC and WB list (owned by OE). Also on 2003 list. Well inspected 15/10/2014. Production wing valve leaks well head press <1min. Line pressure 3.7 psi. Flow line riser is open. Water off take from casing, natural flow to stock trough 20m with tank.	22	A: 1202 B: unobtain
44	Berwick 3	PL27	26-Jun-98	-27.2407	148.8891	Gas		Status changed Oct 2014 from "Shut-in" to Shut-in/water/no licence". Well inspection 15/10/14 notes: 1)"minor oil staining from tubing";2) "no bull plug in "A" annulus ball valve"; and water off take from surface casing to unknown supply point. Flow line riser is open.	1280	A: 5 B: unobtain
45	Borah Creek 1	PL14	29-Apr-82	-27.1142	148.8643	Gas	P&A rehab incomplete/uncertain	WCR only on file. Facilities agreement to take water.		
46	Borah Creek 2	PL14	30-Jul-82	-27.0999	148.8408	Oil	P&C/licence	P&A reports on file. No diagrams		
47	Borah Creek 3	PL14	25-Sep-82	-27.1167	148.8744	Gas	Shut-in	Well inspection 15/9/14. No valve leaks. No integrity issues identified. Flow line is open. Kincora-Newstead reinjection 4" line runs through lease area.	630	A: 52 B: N/A
48	Borah Creek 4	PL14	15-Nov-82	-27.1091	148.8638	Gas	P&C/transferred/licence	On WB list - Owned by LO. PB4WB per WCR. No records post WCR		
49	Borah Creek 5	PL14	29-Apr-82	-27.1064	148.8529	Oil	P&C no licence	Agreement to take water.		
50	Borah Trust	PL14		-27.0317	148.7677	Water	Out of scope	In PL21 list, but no other records. Have lats/longs available. Spudded 1927. Listed as a water supply bore.		
51	Bottletree 1	PL22	9-Jul-90	-27.0901	149.0204	Gas		On both HC and WB list (owned by OE)		
52	Braeburn 1	PL227	26-May-06	-27.0151	149.2134	No flow	P&A unverified	P&A on drill. Details in WCR.		
53	Brekkie Creek 1	PL22	11-Oct-01	-27.1107	148.8864	Gas	P&A rehab incomplete/uncertain	P&A'd. Reports on file.		
54	Broadway 01	PL56	28-Aug-83	-27.2726	148.8213	Gas	P&C/transferred/no licence	On WB list - Owned by LO, P		
55	Broadway North 01	PL56	24-Aug-91	-27.2596	148.8141	No flow	P&A complete verified	P&A on drill		

	A	B	C	D	E	F	G	H	I	
1	<b>Surat Master Well List for Field Verification</b>									
94	Fitzroy 01	PL21	29-Sep-84	-27.1213	148.6615	No flow	P&C/licence	Plugged back for conversion to WB as per WCR. No records post WCR		
95	Gambier Park 01	PL174	8-Mar-83	-27.0375	149.2158	No flow	P&C/licence	Plugged back for conversion to WB as per WCR. No records post WCR		
96	Glennarn North 1	ATP 754P	14-Dec-87	-27.4598	149.0022	Unknow	P&C no licence	No records located		
97	Glengarlin 01	PL14	5-Feb-81	-27.0522	148.7325	No flow	P&C/licence	Plugged back for conversion to WB as per WCR. No records post WCR. Origin is in negotiation with LO and lawyer over outstanding rehab issues. Access must be confirmed through Origin's Land Specialist (Stephen Keating) not less than 24 hours in advance of planned entry to the property.		
98	Glenloth 1	PL22	17-Jan-93	-27.0899	149.0291	Gas	P&A rehab incomplete/uncertain	P&A'd. Reports on file.		
99	Hartwood 01	PL14	28-Sep-81	-27.1837	148.7453	No flow	P&C/licence	Plugged back for conversion to WB as per WCR. No records post WCR		
100	Hollymount	ATP 754P	15-Nov-90	-27.9872	149.2587	Unknow	P&A unverified			
101	Hoolan Creek 01	ATP 470P	3-Sep-81	-27.3622	149.0942	No flow	Out of scope	P&A'd on drill as per WCR. DHD on file shows abandonment plugs		
102	Horseshoe 1	PL227	21-Dec-85	-27.0030	149.2037	Gas	P&C/transferred/licence	On WB list - Owned by LO. PB for conv to WB per WCR. DHD on file shows only PB4WB plugs		
103	Horseshoe 2	PL227	28-Oct-02	-27.0099	149.1920	Gas	Shut-in			
104	Horseshoe 3	PL227	16-Apr-04	-27.0103	149.1925	Gas		On both HC and WB list (owned by OE)		
105	Ironbark 01	PL14	2-Jul-82	-27.1460	148.8846	No flow	P&C/transferred/licence	On WB list - Owned by LO. Compl as WB f/Blythesdale per WCR. DHD reflects PB4WB		
106	Kanaloo 1	PL27	23-Jul-87	-27.2229	148.8919	Gas	Shut-in	Well inspection 15/10/14. Swab valve seized and can't be operated. Valve leaks - lower master and production wing valves have stem seal leaks when operated and under pressure. LP 10 PSI - dead leg. 2x3" flow lines.	642	
	Kanaloo North 1	PL27	7-Jul-98	-27.2168	148.8872	Gas		WB list 3 shows this as WB also. 2006 photos seem to show water offtake. Well inspection 15/10/14. Swab valve seized and can't be operated. LP 10 PSI - dead leg. 2x3" flow lines.	645	

	A	B	C	D	E	F	G	H	I
1	<b>Surat Master Well List for Field Verification</b>								
57	Bundara 01	PL27	4-Sep-78	-27.2219	149.0450	Gas	P&C/licence	Plugged back for conversion to WB as per WCR. No records post WCR	
58	Bundara 02	PL27	23-Sep-83	-27.2164	149.0397	No flow	P&C/licence	Plugged back for conversion to WB as per WCR. No records post WCR	
59	Byanbunoo 1	PL74	6-Aug-81	-27.6093	148.9305	No flow	P&C/transferred/no licence	On WB list - Owned by LO. PB4WB per WCR. No records post WCR	
60	Carbean 1	PL14	30-Oct-84	-27.2130	148.9072	Gas	Shut-in	Well inspection 15/10/14. Minor valve leak (Swab). 6psi on meter run. Line Pressure (LP) 5 psi. 3" & 6" lines through lease under pressure - dead legs.	187
61	Carbean 2	PL14	18-Sep-88	-27.2039	148.9083	Gas	Shut-in	Well inspection 15/10/14. No valve leaks. 2 psi on meter run. HSE risk identified due to well being in flood area. Flow line riser is open. Poor access to lease area.	3
62	Carbean 3	PL14	2-Feb-85	-27.2116	148.9142	Gas	P&A rehab incomplete/uncertain	P&A'd. Reports on file.	
63	Carbean 4	PL14	16 frb 85	-27.2038	148.9162	Gas	Shut-in	Well inspection 15/10/14. Major valve leaks - stem seals have significant leaks when operated and under pressure. Flow line riser is open. Poor access to lease area.	567
64	Carbean 5	PL14	25-Sep-85	-27.1921	148.9110	Gas	Shut-in	Well inspection 15/10/14. Major valve leaks - lower master and Swab valves have stem seal leaks when operated and under pressure. LP 3 PSI - dead leg. Poor access to lease area.	835
65	Cardigan 1	PL22	28-Sep-93	-27.0119	148.8518	No flow	P&A unverified	P&A on drill. Details in WCR.	
66	Caxton 1	PL22	28-Jan-95	-27.0973	148.8587	Gas	Shut-in	Agreement to take water.	
67	Caxton 2	PL22	20-Aug-97	-27.0930	148.8761	Gas & c	Shut-in	Well inspection 08/10/14. No valve leaks. line pressure 18PSI, second string 184PSI (SG formation). Oil and gas flow lines capped & under pressure (dead legs).	184