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The Panel
Independent Scientific Inquiry into Hydraulic Fracturing in the NT
By email: fracking.inquiry@nt.gov.au

Dear Panel

I must thank you for providing the opportunity to provide comment on the excellent report which details the Inquiry's draft recommendations that would mitigate risks the Inquiry has identified in regards to the potential of hydraulic fracturing in the Northern Territory. I support the majority of the Inquiry's recommendations and look forward to the Northern Territory Government implementing them.

The recommendations that I would like to provide some comment on are those recommendations relating to well integrity and the potential costly liabilities stemming from the failure of some gas wells.

Note that I have had over 43 years of experience in the assessment, development and management of water resources in the Northern Territory since moving to the Northern Territory in 1974. I led the groundwater assessment group in the Northern Territory Government for more than 20 years.

One of the projects that I have had a significant input into since finishing my employment with the Northern Territory Government was the Northern Australia Sustainable Yields (NASY) project managed by CSIRO. The project produced *critical information on historical, recent and likely future water availability aimed at helping governments, industry and communities consider the environmental, social and economic aspects of the sustainable use and management of the water assets of northern Australia.*

Please note that while I am well known to at least four members of the panel, at no stage during the inquiry did any members of the panel seek any input from me.

During the earlier Hawke Inquiry, while on the committee of the Northern Territory Branch of the International Association of Hydrogeologists, I assisted with the compilation of the Branch's submission to that Inquiry. In that submission the members of IAH(NT) recognised the unconventional gas industry has the potential to greatly benefit the economy of the Northern Territory and the Australian nation, and is a component of the developmental program of Government.

A significant issue raised in IAH(NT)'s submission to the Hawke Inquiry was that of the management of the risk of adverse environmental impacts should well integrity be compromised. IAH(NT) were concerned that the deterioration and failure of improperly decommissioned (also known as 'abandoned') wells could, over time, result in long-term release of oil and/or gas into the environment. A view was presented in IAH(NT)'s submission that a funding requirement on the owner of a gas well at a level that matches reclamation costs would provide the best mechanism to ensure maintenance of well infrastructure, reduce environmental impacts, and protect the Northern Territory from costly liabilities stemming from the failure of some gas wells.

On the 28 November 2014 Dr Hawkes presented his report on the Independent Inquiry into Hydraulic Fracturing in the Northern Territory. In that report he concurred with the IAH(NT) that well integrity and the ongoing funding of remedial work was a significant issue

Dr Hawkes stated that:

- Application of leading practice for construction and closure can minimise environmental risks associated with decommissioned wells, but the longevity of long-term integrity of decommissioned wells remains poorly understood.

- The possibility that wells may leak and require significant remedial action decades after they are decommissioned presents a significant challenge for government policy and regulation. Even with open-ended liability of operators for abandoned wells, it may be difficult to enforce remediation decades after a well is decommissioned.

I note that in the draft Final Report of the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory you completed in December 2017 you also agree with the IAH(NT) that well integrity and the funding of remedial work is a significant issue

The only aspect of the Inquiry's report that I have issues with is CSIRO's *Report into the shale gas well life cycle and well integrity* (included in your report as Appendix 14) and recommendations 5.3 and 7.10 based on that report.

CSIRO's Section 5.3 titled *Well Failure Rates* reviews barrier and well failure rates reported in open-source international literature for oil and gas wells, with data primarily from North America. Note that the literature presented primarily covered conventional oil and gas resources. CSIRO found that *overall, largely using data sets from the US that the rate of well integrity failure that has the potential to cause environmental contamination is approximately 0.1%, with several studies finding no well integrity failure. The rate for a single well barrier failure was much higher, however, in the order of 1-10%.Furthermore, there were very few single barrier failures observed for wells constructed to Category 9.*

The data sets used from the US referred to 36682 wells of which only 2162 had been plugged and abandoned. Only 107 wells were category 9. Thus meaningful data on the durability of category 9 single barrier wells is sparse.

In addition to the lack of data for category 9 wells there were also some glaring omissions of relevant studies in the CSIRO review; Namely:

1) CSIRO's report did not refer to the November 2010 article *Analysis of High-Collapse Grade P110 Coupling Failures* by Michael G. Burns.(https://www.azom.com/article.aspx?ArticleID=5554)In that article Michael G. Burns states that *The oil and gas industry has recently been plagued with a large number of coupling failures in high-collapse Grade P110 casing strings, most frequently during fracturing operations in shale gas wells.* He states that *One factor that may be significant is that the failures often occur as or shortly after the casing is cooled by the introduction of surface water and chemicals.* This point should have been addressed by CSIRO.

2) It is remiss of CSIRO not to refer to the extensive work undertaken by Norway's Statoil – a company that was once an active participant in the shale oil industry in the NT. *In 2012 Statoil acquired an interest in the four exploration permits 103, 104, 127 and 128 in the South Georgina Basin in the Northern Territory (NT) through a joint*

venture project with PetroFrontier Corp. In 2013 Statoil became the operator of the project and carried out an exploration programme which involved a 2D seismic survey, drilling five wells and rehabilitating eight well sites. Based on their analysis of the seismic and well data collected, they decided to withdraw from further exploration activities in the licence area. (https://www.statoil.com/en/where-we-are/australia.html)

Statoil have investigated and published a significant amount of literature on well failures and their causes. *At the 20th Drilling Conference in Kristiansand, Norway, in 2007, Statoil presented an internal company survey of offshore well integrity (Vignes, 2011).* The paper upon which this presentation was based can be found in the Journal of Marine and Petroleum Geology, Volume 56, September 2014, Pages 239-254. *This analysis showed that 20% of 711 wells had integrity failures, issues, or uncertainties (Vignes, 2011). When subdivided into production and injection wells, the survey concluded that 17% of 526 production wells and 29% of 185 injection wells had well barrier failures.* In the paper data is presented on the number of hydrocarbon boreholes drilled onshore in Australia. The source is given as Geoscience Australia. In the paper it states that well failure statistics were not available for Australia. It would have been enlightening if Australian data on well failure rates and the percentage of wells that have been plugged and abandoned in Australia was presented in CSIRO's report.

I believe that CSIRO needs to present a more balanced report on well integrity issues associated with fracking in the shale gas industry that utilises data from around the world, including Australia. . At present most of the data that CSIRO presents from the USA is for the conventional oil and gas industry. To achieve a balance, CSIRO also needs to focus more on data from the shale gas industry. Once such a more comprehensive study is undertaken then, and only then, will the NT fracking panel and the NT public be in a position to properly assess the likely risks associated with the integrity or otherwise of shale gas/oil wells constructed in the NT.

Thanks once again for providing the opportunity to provide comment on your excellent report.

Kind regards

Peter Jolly