GROUP SUBMISSION TO THE WA INDEPENDENT SCIENTIFIC PANEL INQUIRY INTO HYDRAULIC FRACTURE STIMULATION IN WESTERN AUSTRALIA, 2017-2018

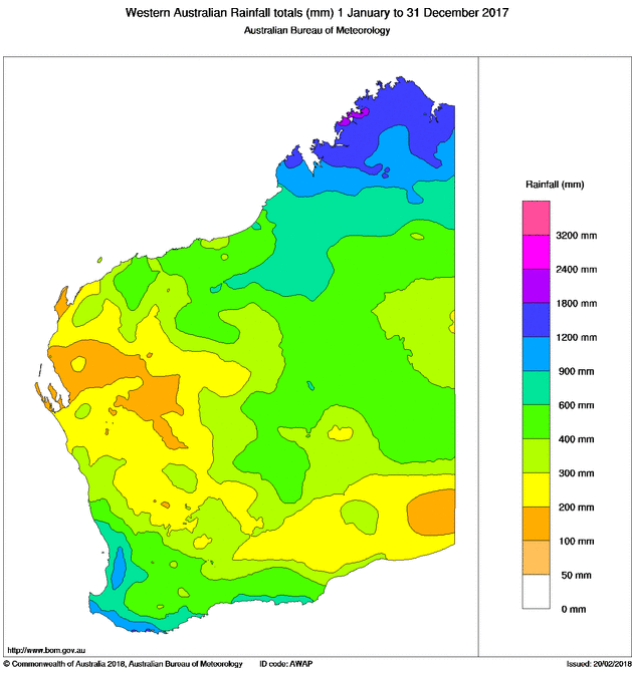
Our group, *Fracking Awareness Irwin Region - FAIR*, is comprised of a group of 20 concerned residents from the Irwin shire, which includes the old Irwin town site, nearby agricultural and horticultural enterprises, the locations of Springfield, Yardarino and Bonniefield, and the town of Dongara. The group originally formed around eight years ago, but has been in its present form since 2014. Its members are Rod and Annette Copeland, Julie Burr, Dianne Horne, Maria Brown, Jim March, Judi Lawrie, Gordon and Lyn Carruthers, John and Pat Lalor, Zandria Morgan, Llewellyn and Dot Morgan, Lynette Sutherland, Lyn Fontanini, Caroline Arnold, Shirley Knight and Catrina and Adrian Scatina. We also have other residents and friends who have contributed to our meetings and events, such as our Frack-free Declaration Day, held at Irwin on Sunday June 14th, 2015.

We wish to see a total ban on hydraulic fracture stimulation, not only in our region, but also throughout Western Australia.

Our major concern is the risk this practice poses to the ongoing availability and quality of the groundwater in our region and State, and the impact of this practice on the natural and manmade environments already existing here.

Water is an essential resource, more so in this country. Australia is the driest, permanently populated continent in the world, with the mid-west of Western Australia being amongst the driest regions of the country. Our groundwater resources are limited and are very slow to be replenished, due to low annual rainfall. The following map shows the rainfall totals for Western Australia for 2017, which, according to the Bureau of Meteorology, was:

"…very much above average for Western Australia and the ninth-wettest year on record."
[**http://www.bom.gov.au/climate/current/annual/wa/summary.shtml**]



As you can see, the annual rainfall in the Irwin region in a wetter-than-average year is between 300 and 400 mm. Records kept for the Irwin town site show that the average is closer to 300 mm, a level that impacts on residents' concerns regarding water usage and conservation.

Most of our group members who live outside the boundaries of the town of Dongara rely on groundwater and rainwater, with no access to scheme supplies. For this reason, they were very concerned to learn that 70-80% of all water used in the average fracking process is left at the depth of the fracking (i.e. several thousands of metres underground,) and is not recyclable due to its contamination by radioactive substances. That amounts to millions of litres of precious water that is, for all intents and purposes, permanently removed from the environment. This information was provided by Mr Jeff Haworth, an employee of DMIRS, at a Community Roundtable Meeting in Dongara on Wednesday, 8th November 2017.

Still relating to water resources, another concern for our members is the geological impact of hydraulic fracture stimulation. While the number of well-sites for conventional and unconventional shale gas production above ground are about the same, the group's concern lies with the number of underground fracking operations that can be drilled from each above ground well. The geological make-up of the Irwin area is extremely complex, with multiple fractures and fault lines. The group sees multiple fracking activities as possible triggers for geological rearrangements, resulting in the possible disruption or migration of the groundwater aquifers underlying the region. This could also result in contamination of our already fragile water supply.

Another major threat posed by both conventional and unconventional shale gas recovery, fugitive methane emissions, of concern for all group members, but particularly those who live in close proximity to active gas fields in the Irwin River valley. A scientific article published in 2011 evaluated the emissions from fracked wells as follows:

"We evaluate the greenhouse gas footprint of natural gas obtained by highvolume (sic) *hydraulic fracturing from shale formations, focusing on methane emissions. Natural gas is composed largely of methane, and 3.6% to 7.9% of the methane from shale-gas production escapes to the atmosphere in venting and leaks over the lifetime of a well. These methane emissions are at least 30% more than and perhaps more than twice as great as those from conventional gas. The higher emissions from shale gas occur at the time wells are hydraulically fractured—as methane escapes from flow-back return fluids—and during drill out following the fracturing. Methane is a powerful greenhouse gas, with a global warming potential that is far greater than that of carbon dioxide, particularly over the time horizon of the first few decades following emission. Methane contributes substantially to the greenhouse gas footprint of shale gas on shorter time scales, dominating it on a 20-year time horizon. The footprint for shale gas is greater than that for conventional gas or oil when viewed on any time horizon, but particularly so over 20 years. Compared to coal, the footprint of shale gas is at least 20% greater and perhaps more than twice as great on the 20-year horizon and is comparable when compared over 100 years.*

[Robert W. Howarth·Renee Santoro· Anthony Ingraffea: *Methane and the greenhouse-gas footprint of natural gas from shale formations, A letter,* Department of Ecology and Evolutionary Biology, Cornell University, Ithaca, NY 14853, USA e-mail: rwh2@cornell.edu]

The authors included the following table in their findings:

Table 2 Fugitive methane emissions associated with development of natural gas from conventional wells and from shale formations (expressed as the percentage of methane produced over the lifecycle of a well)

	Conventional gas	Shale gas
Emissions during well completion	0.01%	1.9%
Routine venting and equipment leaks at well site	0.3 to 1.9%	0.3 to 1.9%
Emissions during liquid unloading	0 to 0.26%	0 to 0.26%
Emissions during gas processing	0 to 0.19%	0 to 0.19%
Emissions during transport, storage, and distribution	1.4 to 3.6%	1.4 to 3.6%
Total emissions	1.7 to 6.0%	3.6 to 7.9%

See text for derivation of estimates and supporting information

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They also added the following:

After completion, some fugitive emissions continue at the well site over its lifetime. A typical well has 55 to 150 connections to equipment such as heaters, meters, dehydrators, compressors, and vapor-recovery apparatus. Many of these potentially leak, and many pressure relief valves are designed to purposefully vent gas. Emissions from pneumatic pumps and dehydrators are a major part of the leakage (GAO 2010). Once a well is completed and connected to a pipeline, the same technologies are used for both conventional and shale gas; we assume that these post-completion fugitive emissions are the same for shale and conventional gas. GAO (2010) concluded that 0.3% to 1.9% of the life-time production of a well is lost due to routine venting and equipment leaks (Table 2). Previous studies have

estimated routine well-site fugitive emissions as approximately 0.5% or less (Hayhoe et al. 2002; Armendariz 2009) and 0.95% (Shires et al. 2009). Note that none of these estimates include accidents or emergency vents. Data on emissions during emergencies are not available and have never, as far as we can determine, been used in any estimate of emissions from natural gas production. Thus, our estimate of 0.3% to 1.9% leakage is conservative. As we discuss below, the 0.3% reflects use of best available technology.

These findings only reinforce the threat posed by the emission of fugitive methane from fracked gas wells; we are already aware of this threat from conventional gas wells following the much publicised leakage from the Corybas well at Yardarino in 2012. With no baseline health or emissions testing done in this area that any of the group are aware of, such emissions pose an enormous threat to the residents and their pets and livestock in the vicinity of gas wells, as well as the natural flora and fauna.

Further to this, claims made by the gas industry regarding the safety of the components of the fluids used in the fracking process, totally ignore the potential for chemical reactions that could occur once the fracking fluids mix with naturally occurring substances in fracked wells. A scientific report published by the CSIRO in2012 states the following:

"Although the industry is adapting where possible to more benign fracking chemicals, there is still a lack of information on exposure to natural and added chemicals, and their fate and ecotoxicity in both the discharged produced and flow-back waters." **[Graeme E. Batley and Rai S. Kookana: *Environmental issues associated with coal seam gas recovery: managing the fracking boom*]**

This lack of information adds to the lack of confidence that we have in the supposed safety of fracking fluids. A report written by Narelle Towie regarding this finding states:

"Review author and CSIRO chief research scientist Dr Graeme Batley says there is very little understanding of the chemical concentrations or what happens to them over time. CSIRO scientists have highlighted concerns that chemicals produced by hydraulic fracturing could be affecting ground and surface waters.

In a review published in the national science agency's online ***Environmental Chemistry*** *journal researchers say fracking may be unlocking pollutants currently trapped safely in the ground and mixing them with substances injected by mining operations.*

Review author and CSIRO chief research scientist Dr Graeme Batley says there is very little understanding of the chemical concentrations or what happens to them over time." [**Narelle Towie: *Environmental effects of fracking unclear: CSIRO study***]

Admittedly this research mainly addressed the coal seam gas industry in Queensland, the author refers to the chemicals used in both coal seam **and** shale gas fracking.

Finally, for those people who claim that natural gas, particularly that obtained from unconventional or fracked sources, is a cleaner source of energy than other fossil fuels, and a solution to slow climate change, they need to consider the following:

"The large GHG footprint of shale gas undercuts the logic of its use as a bridging fuel over coming decades, if the goal is to reduce global warming. We do not intend that our study be used to justify the continued use of either oil or coal, but rather to demonstrate that substituting shale gas for these other fossil fuels may not have the desired effect of mitigating climate warming."

[Robert W. Howarth·Renee Santoro· Anthony Ingraffea: *Methane and the greenhouse-gas footprint of natural gas from shale formations, A letter,* Department of Ecology and Evolutionary Biology, Cornell University, Ithaca, NY 14853, USA e-mail: rwh2@cornell.edu]

The members of FAIR wish to emphasise that while the threats to water, air and the overall health of the environment outlined in this submission apply directly to them, they also apply to any other region in Western

Australia, Australia and, in fact, the whole world. For this reason, high volume hydraulic slick water fracturing should be banned.

REFERENCES

Australian Bureau of Meteorology: Map of annual rainfall in Western Australia, 2017;

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http://www.australasianscience.com.au/article/issue-januaryfebruary-2013/environmental-effects-fracking-unclear.html