

Submission to:

WA Scientific Inquiry into Hydraulic Fracture Stimulation in WA 2017

1. A Drying Climate:

I joined the Knitting Nannas Against Fracking because I have become aware over the last few years of the devastating consequences of fracking on the environment. I am concerned that we have reached a critical point in global warming and need to protect our water and land at all costs.

Over the 40+ years that I have lived in Perth, the climate has become drier, the bore at my home has had to be sunk to twice its original depth and I am planting more trees for shade to cool the house. Australia is the driest continent on earth (apart from Antarctica), and Perth's changing warming climate has happened faster and earlier than almost any other place on the planet. (1)

Sue Murphy, CEO, Water Corporation said that in 2001 when the aquifers were dropping and dams were empty it seemed like an aberration, but by 2002 the Water Corp acknowledged the problem and realized that long sustained change was required. This involved recycling and purifying waste water and building two sea water desalination plants with a third under consideration. (1)

I think that the introduction of unconventional gas with its requirement for large quantities of water, its degradation of that water through the addition of chemicals and its pollution of rivers and streams is a venture we cannot afford to take in W.A. We not only need clean fresh water for drinking, but also for agriculture, flora and fauna.

2. Conventional vs Unconventional gas:

I support the supply of conventional gas because it is extracted from relatively large permeable rock reservoirs and can be removed via vertical wells. It has successfully been extracted in Australia for many decades.

However, unconventional natural gas is found in less permeable deposits or spread more diffusely through the rock substrates. This gas is more difficult to access and therefore requires more specialized extraction techniques and processes, for example hydraulic fracturing (fracking), horizontal drilling, multiple drillings, and acidation. Fracking involves pumping large volumes of water, chemicals, radioactive tracers and sand into the ground at high pressure to release the trapped gas (2).

Modern fracking techniques used for unconventional gas extraction are vastly different to older fracking methods used in W.A.'s conventional oil and gas industries. These newer more damaging fracking processes have only been in use since the 1990s and require vast quantities of water and chemicals, much higher pressures, and riskier horizontal drilling techniques. Modern fracking technology has never been deployed on a commercial scale in Western Australia (1).

In Australia we have large conventional gas reserves and export the second largest amount of gas in the world. We have so much gas that we are set to become the biggest supplier over the next 2 years. An example related to this abundance was reported in

Queensland from April to October 2017 that some gas plants were not operating at capacity because there was "oversupply in the market." It is therefore questionable why corporations would frack the earth with unpredictable consequences to extract even more gas. Of course profit is the one and only motive, meanwhile the consequences for Australia's environment are high, and the low tax revenue raised is not worth the negative impact. 83% of the coal and gas mining industry is foreign-owned and mining is one of the smallest employers in Australia, employing only 2% of the population. (2)(3)

Climate change poses a material risk to the entire financial system. (Four Corners) The Australian Prudential Regulation Authority stated that Corporate Australian institutions that fail to adequately plan for climate change put their own futures in jeopardy with subsequent consequences for account holders, members or policy holders. With this duty to take climate change into account as a financial foreseeable risk issue, failure to do so opens them up to a breach of their liability of due care and diligence and misleading disclosure to markets. Should there be a financial risk issue (as can happen with fracking's operations and environmental impact) these Directors could be in breach of the Corporations Act. (2)

Water use: (1.4)

I was recently pleased to learn that my household used 6,000 litres less water for the last 2 month period compared with last year's, which seems to be the result of replacing appliances with more environmentally friendly items.

However if fracking is introduced to WA my water saving efforts are too miniscule to matter. ***One single shale gas frack uses between 11 and 34 million litres of water in the fracking fluids (5).*** (However Professor Anthony R. Ingraffea from Cornell University presented a photograph which showed that the laterals, wells and shale fractures are much larger than they used to be and stated that one well in the USA now requires 100 million litres of water and 9 tons of sand(5).) Wells are often fracked on multiple occasions, sometimes up to ten times, multiplying overall water use. Some of this fluid returns to the surface as flowback, but most stays underground and is never recovered - estimates suggest 70% or more remains underground and useless. Fracking usually occurs near water sources because of its high dependence on having accessible water (aquifers or rivers) for its operations. The W.A. government does **not** charge for the water used by fracking companies (7).

We have such a dry climate that wasting millions of litres of water is not an option; you can't drink gas. South Africans are currently facing serious water restrictions due to global warming, for which they were unprepared, and the subsequent 3 year drought. People are now queuing for water and the amount supplied is restricted and carefully monitored by government agents. The fact that this is happening in a developed country has sent shock waves around the world. South Africans cannot use the waste water from coal and copper mining because it is acidic. Consequently they are restricted to 50 litres per day of potable water (8). To put this in perspective, an adult in Perth uses an average of 244 litres of water per day. (9)

Wastewater: (1.11- 1.14)(1.6, 4.1)

Similar to the wastewater from coal and copper mining, wastewater from gas operations is not potable. This is because the flowback from fracking and water in the source rock which is brought to the surface during gas production may contain heavy metals, salts, radioactive materials and volatile organic compounds. The massive volumes of wastewater produced may be stored in large ponds, partially 'treated' and released into waterways or re-injected back underground – a process than can lead to earth tremors and earthquakes. (10)

Chemicals used in drilling and fracturing processes can be corrosion inhibitors, biocides, surfactants, friction reducers, gels, and scale inhibitors. These chemicals include methanol, ethylene glycol, naphthalene, xylene, toluene, ethylbenzene, formaldehyde and sulfuric acid, some of which are known to be toxic, carcinogenic, or associated with reproductive harm. Many of these compounds are considered hazardous water pollutants and are regulated in other industries, but not in the unconventional gas industry. (11)

Alarmingly, fracking for unconventional gas is already underway. The Department of Mines and Petroleum has issued exploration licences to gas companies that could end up fracking through our precious groundwater sources, including the Yarragadee north and south aquifers that supply Perth and the Southwest with drinking water. (12) This cannot be tolerated, particularly as our water resources are declining.

On the 12th February 2018, the CEO of the Water Corporation stated that, "Perth's recent rainfall is welcome but it has made little difference to our dam levels. While it may look like dam levels are increasing slightly at this time of year, this may not be the result of increased stream flow. The water in our dams is no longer just made up of inflows from rain. Groundwater and desalinated water are stored in these dams during periods of low demand so it is available when it is most needed in the hotter months." (13) Our metropolitan dam levels are currently at 41.1% of capacity. Mindful of the impact of climate change, one cannot afford to be reckless in supporting an unconventional gas industry which is so heavily reliant on water.

Incidents in Australia where unconventional gas methods have been used:

In 2004 mining company Amity Oil used diesel as a fracking fluid to access gas at the **Whicher Range** 5 well. The gasfield, 30km east of Margaret River, is known as "super tight" and has proved problematic since its discovery. Water based fracking fluids caused the clay surrounding the gas to constrict,[\[14\]](#) so diesel was used in the fracking fluid in an attempt to overcome this issue. More than 1.2million litres of diesel was injected into the drill hole,[\[15\]](#) but according to evidence provided to the WA Parliament by the Department of Mines and Petroleum (DMP), just 47 per cent was recovered.[\[16\]](#) Therefore the lasting legacy of this fracking operation is that more than 500,000 litres[\[17\]](#) of diesel oil is still sitting in the petroleum reservoir. This ageing steel and cement well also passes through the Yarragadee aquifer, providing a potential contamination pathway for the unrecovered diesel to migrate along. This aquifer is an important water resource for the south west and a resource that may be needed to help climate change proof the region. The site is in a Priority One water catchment area for Margaret River [\[18\]](#) and sits just a few kilometres from the actual Margaret River.

"CalEnergy Resources assessed the Whicher Range reservoir. It stated in its information brochure, The Whicher Range Project' (August 2016) that the gas is found at a depth of at least 4km, and has seen the development of a clay mineral coating (rims) around the grains that encroaches on the original pore spaces. This clay mineral is affected by water from drilling or fracking fluids so that the size of the pathways for the gas to move from the pores to the well is further reduced and restricts gas flow. Previous operators of EP408 have attempted fracking without success. CalEnergy has assessed these programs and their results and has drawn the very clear conclusion that fracking is not suitable for this reservoir within the EP408 permit." (19)

Pilliga Forest

A 500-litre wastewater spill from a coal-seam gas operation in the beautiful **Pilliga Forest** in north-western NSW was investigated by the Environmental Protection Authority. The waste

water was spilt during a transfer from an assessment well to a holding pond at the Santos gas field near Narrabri on Tuesday, the EPA said. An EPA spokeswoman said the spill involved Bibblewindi Number 2 pond, and added that the No. 3 pond is already leaking wastewater into the aquifer layer beneath.

Fairfax Media revealed earlier this month that an investigation had found Santos had contaminated the aquifer with uranium at levels 20 times higher than safe drinking water guidelines.

The Greens described the water spilt on Tuesday as "toxic" and said it contained high levels of salt, as well as dangerous heavy metals such as arsenic, lead and uranium. Greens MP Jeremy Buckingham called for Santos' operations to be halted. He added, "This latest spill of toxic coal-seam gas water is proof that this industry is unsafe no matter who runs it," Mr Buckingham said. (20)

Livestock health risks (9.28, 9.6):

There is considerable evidence from the USA that gas mining is detrimental to livestock and domestic animals. Twenty-four case studies have been compiled of apparent harm to animals, mainly resulting from contamination of water wells, springs, ponds or creeks, some due to accidents or negligence, and others a consequence of normal operations. On seven cattle farms studied in the most detail, half the herd on average was affected by death or failure to breed.

In one case of 60 cattle with access to a creek allegedly contaminated with fracking wastewater, 21 died and 16 failed to reproduce, while 36 cattle without access to the tainted water remained healthy. (21)

When production ceases:

Once production ceases, wells are closed using cementing and capping. It is not possible to have a zero per cent well failure rate during production let alone post abandonment. Wells deteriorate with age, and they remain in the ground after they go out of production. The quality of aquifers and nearby rivers bubbling with methane gas cannot be restored once unconventional fracking has occurred. A recent USA study documents the failure of plant and soil systems disturbed by drilling and fracking activities to return to pre-drilling conditions following rehabilitation, even after 20 to 50 years (22).

Conclusion:

Large corporations such as Santos and Shell are interested in extracting unconventional gas for profit. Rehabilitation of the environment does not appear to be a high priority and when the groundwater is ruined then there is little they can do to fix the problem. Fines which have been imposed for past bungles are pitifully small (example \$52,000 for spillage and contamination in the Pilliga Forest.) In the 2015-16 financial year, Chevron and Santos paid no corporate tax (23) and paid nothing for the water they used.

We should not be fracking for gas and increasing our methane emissions which is contrary to the Paris Climate Agreement.

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13. Sue Murphy, CEO Water Corporation, The West Australian, 13/02/2018
14. Dept Mines & Petroleum Whicher Range Tight Gas Sands Study 2012 p 6
15. ASX Announcement Amity Oil Sept 8, 2004 http://www.antaresenergy.com/wp-content/uploads/2011/08/2004-09-08ASXSYD7526HMM_WR-5.pdf
16. **Question On Notice No. 1553** asked in the **Legislative Assembly on 31 October 2013** by **Mr C.J. Tallentire**: Q: Can the Minister confirm that in at least one of the wells that has been fracked, in the environmentally sensitive Whicher Range, diesel was used as a fracking fluid: (i) if yes, was all the diesel recovered after the fracking operation; A: Yes. (i) No. DMP's records indicate that 47% of the total diesel injected was recovered. This diesel was diverted to a separate vessel for sale to the local community.
17. The original figures for the amount of diesel used came from the ASX. The amount used was some 7000+ barrels. One barrel is 159 litres therefore the total amount used was around

1.1M Litres of diesel. Only 47 per cent of this was recovered i.e. approx.. 523,000L. This leaves around 590,000L still in the reservoir.

18. https://www.water.wa.gov.au/data/assets/pdf_file/0011/5114/12137.pdf

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