**Submission to:**

**WA Scientific Inquiry into Hydraulic Fracture Stimulation in WA 2017**


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I am a married mother of six who was an RN before leaving the profession to look after my family full time. My husband works on a farm. I am writing this submission as a concerned community member who has become more aware about fracking in the past year or so and have joined the Frack Free Central Midlands group. My concerns for the health of my family, my community, our farmers and our land, food, water and air has prompted me to make this submission.

**Water**

Water is essential for life. The Mid-Western region is a food bowl and therefore relies on water consumption for food and animals. Twice in just over 10 years it has been officially claimed that the region is fully committed for available water, without taking into account that further irrigation is desirable.

According to the Doctors for the Environment Australia's Submission to the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory, dated April 2017:

(1) "*The process of fracking a gas well requires between 4-22 million litres of water for each frack. Each well may need to be fracked between 5 and 13 times, and most gasfields will require the sinking of hundreds of wells*."

As well as the sheer volume of water required, which is a huge concern for this community who will have to compete for their own use, contamination of chemicals used in the process is another major issue which should be studied in great depth. This brings me to my second major concern, health.

## Health

### Water and Chemical Contamination

I have a concern regarding the hundreds of different chemicals which can be used and potentially leak into the water supply or spilt during transportation via trucks throughout the region and Moora town itself.

In an article written by Bill Tinapple, Executive Director, Petroleum Division and featured in the September 2011 edition of 'Petroleum in Western Australia', he shares a diagram describing some of the

(2) '*Typical Chemical Additives Used in Frac Water*', stating that "*most chemical additives in use are chemicals used in everyday households*". This included *Ethylene Glycol*. It stated its '*Purpose' "Prevents scale deposits in the pipe*" and that it's '*Common Application' is "Automotive anti-freeze, de-icing agent, household cleaners*".

According to the Doctors for the Environment Australia's Submission to the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory, dated April 2017, page 5:

(3) "…*ethylene glycol is a clear liquid used in antifreeze and de-icing solutions. Exposure to large amounts of ethylene glycol can damage the kidneys, nervous system, lungs and heart*."

Other chemicals listed in the article include (but not limited to):

| Compound | Purpose | Common Application |
|---|---|---|
| Acids | Helps dissolve minerals And initiate fissure in rock (pre-fracture) | Swimming pool cleaner |
| Polyacrylamide | Minimizes the friction Between fluid and pipe | Water Treatment, soil conditioner |
| Glutaraldehyde | Eliminates bacteria in The water | Disinfectant, sterilization of medical and dental Equipment |

According to the website, 'Safecosmetics.org' - "Campaign for Safe Cosmetics. A project of breast cancer prevention partners", Polyacrylamide:

> *(4) Polyacrylamide is used as a stabilizer and binder in lotions and other products. Though it is not a concern in itself, it is made up of repeating molecules of acrylamide, which is a strongly suspected carcinogen and has been linked to mammary tumors. The European Union (EU) sets limits for the amount of acrylamide allowed in products containing polyacrylamide, but the United States does not currently regulate it.*

According to the Australian Government Department of Health website, nicnas.gov.au:

> *(5) "The National Industrial Chemical Notification and Assessments Scheme (NICNAS) assessed glutaraldehyde in July 1994. These are the main findings of that assessment.*
>
> *A product containing more than 0.1% glutaraldehyde is classed as a hazardous substance. Glutaraldehyde is not classified under the Australian Dangerous Goods Code. However, solutions of more than 25% glutaraldehyde are corrosive and would fit into Class 8 of the*

*Code. Lower concentrations meet the classification for 6.1 (b) substances.*

*Glutaraldehyde poisoning can occur through the skin, swallowing or by inhalation. The main problem with glutaraldehyde is that sensitivity can build up with repeated exposure.*

*Contact with solutions containing 1% or more glutaraldehyde and inhalation of glutaraldehyde vapours is the most common route for poisoning.*

*Signs of glutaraldehyde poisoning include skin irritation or allergic dermatitis. Eye irritation, occupational asthma and irritation to the nose and throat occur from breathing in the vapours*."

As the amount of water per frac is between 4 – 22 million litres of water and according to Bill Tinapple in his article, (7) "*fracturing fluids consist of 90% water, 9.5% sand (or other materials to prop open fractures) and 0.5% chemical additives*", if we look at the 'best case scenario' based on 4 million litres of water, each frac would use 422,222 litres of sand and 22,222 litres of chemicals per frac to give a total volume of 4,444,444 litres. Considering each well may be fracked between 5-11 times, this could amount to between 111,110 litres to 244,442 litres of chemicals.

Worst case scenario based on 22 million litres of water, 2,322,222 litres of sand and 122,222 litres of chemicals would be used for a total volume of 24,444,444 litres.

According the Doctors for the Environment Australia's Submission to the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory, dated April 2017, (6) "*most gasfields will require the sinking of hundreds of wells*", these figures would have to be multiplied by the number of wells in the gasfield.

I do not choose to consume the chemicals in everyday household items mentioned above and certainly would not want myself, my family and my community drinking water, irrigating our crops or watering our livestock that potentially could be contaminated through either leakage or accident caused by fracking.

Alarmingly, according to the Doctors for the Environment Australia's Submission to the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory, dated April 2017,

(7) "*Most fracking chemicals have not been assessed for toxicity to humans or the environment.*"

**Air Quality**

A Peer reviewed article written by Geralyn McCarron (2018) Air Pollution and human health hazards: a compilation of air toxins acknowledged by the gas industry in Queensland's Darling Downs, International Journal of Environmental Studies, 75:1, 171-185, DOI: 10.1080/00207233.2017.1413221 included a table listing (8) *"emissions acknowledged by the CSG industry can be linked to both acute and chronic health effects".* These air toxins included:

*"Oxides of Nitrogen (NOx) including Nitrogen dioxide NO2)*

*Carbon monoxide (CO)*

*Volatile Organic Compounds (VOCs)*

*Ozone (formed when NO2 and VOCs react together in presence of sunlight.)*

*Sulphur Dioxide (SO2)*

*Formaldehyde"*

The health effects were listed for each toxin.

Dr McCarron states:

(9) "*There is international acknowledgement of the serious adverse impacts on human health of air pollution in general, and the toxicity of the specific air pollutants reported by the gas industry to the NPI (see Table 1, summary of air toxins/related health effects). Many families, including young children are, for up to 24 h a day, living, breathing and sleeping in the midst of point emission sources in Queensland's gasfields. They are exposed to acute peaks and chronic, lower concentrations of mixtures of harmful chemicals. Air dispersion throughout the regional airshed means the broader population is likely to be repeatedly exposed to lower doses of the same toxins*".

It would appear from the article that regulation and monitoring of emitted pollutants in Queensland's Darling Downs were not clearly defined, if indeed

there is even safe level for some chemicals and air monitoring was (10) "*infrequent, ad hoc, episodic and reactive*".

Dr McCarron found that:

(11) "*Emissions reported by the CSG industry to the NPI have escalated since expansion of CSG from 2006 onwards. Toxins include particulate matter with over 6,000% increase in reported emissions of $PM_{10}$ between the years of 2006/2007 and 2013/2014 (29.19–1926.9 tonnes). Reported emissions of $PM_{2.5}$ increased from zero to 301 tonnes. Emissions of oxides of nitrogen increased by 489%, (1704–10048 tonnes) VOCs by 337%, (153.4–670.6 tonnes) CO by 801%, (754–6,800 tonnes) $SO_2$ by more than 1000% (1.14–12.97 tonnes) and, remarkably emissions of the known carcinogen formaldehyde increased from 12 kg to 160.42 tonnes over the same time period. Further escalation in emissions is noted in the reporting periods 2014/2015, and 2015/2016 (Table 3).*

*Between the years of 2007 and 2014, hospitalisations of DDHHS patients for respiratory conditions increased by 142%, and hospitalisations for circulatory conditions increased by 133%. Hospitalisations from DDHHS areas fluctuated between 2007 and 2010 with significant rates of change apparent in 2010/2011 (circulatory conditions increased 32%, respiratory conditions 42%) and 2011/2012 (circulatory conditions increased 27%, respiratory conditions 18%). Increases were evident across all DDHHS areas including areas relatively distant from intense gas field industrialisation such as Goondiwindi and Inglewood. Interpretation of individual changes in these very low population centres is made more difficult by the number of drive in/drive out gasfield workers from across the Darling Downs.*

*Changes are not explicable by the modest population increase of 9.46% during the same time period, or the change in median age, which over the longer time frame of 2005–2015 increased by 2.4 years. They do however give weight to the community's perception that there has been an adverse change in their health status. It is noted that these changes were not commented on in the Queensland Government 2013 CSG investigation. This may relate to the limits of their terms of reference and/or lag time with data compilation"*.

With this in mind, I have a huge concern regarding the air quality should fracking be allowed in Moora and the surrounding area, particularly for Moora's most vulnerable. I have six children, there are two primary schools and one senior school with many young families living here. We have a hospital with the Moora Frail and Aged Lodge attached to it and a lifestyle villiage. Dr McCarron states:

(12) "*DDHHS* (Darling Downs Hospital and Health Services) *hospitalisation data for acute respiratory and circulatory conditions appear consistent with short-term health impacts of air pollution. Of concern is the future health of a population subject to chronic exposure. Long-term, real-time 24-h exposure monitoring to capture the temporal and spatial variability of a wide range of key environmental toxins is necessary to assess exposure. Average ambient levels do not give an adequate assessment of the health risks to vulnerable subgroups of the population*
*[50Brown, D.R., Lewis, C. and Weinberger, B.I., 2015, Human exposure to unconventional natural gas development: a public health demonstration of periodic high exposure to chemical mixtures in ambient air. Journal of Environmental Science and Health, Part A: Toxic/Hazardous Substances and Environmental Engineering,* ***50****(5), 460–472. doi:10.1080/10934529.2015.992663.[Taylor & Francis Online], [Web of Science ®], [Google Scholar]]. This applies particularly to children, pregnant women, the ill, including those with pre-existing cardiac and respiratory disease, and the elderly. It applies to those living in close proximity to infrastructure, who are exposed to spikes of multiple air toxins, with increased risks on still nights during temperature inversions. These are the populations also at most risk to high volume pollutants. Children, with their high ventilation rates per body weight and increased activity and play outdoors, are particularly susceptible to the adverse effects of air pollution*
*[51Allen, J. 2002, The ozone we breathe. NASA Earth Observatory, featured articles. Available online at:https://earthobservatory.nasa.gov/Features/OzoneWeBreathe/(accessed 4 August 2017). [Google Scholar]]. When exposed to mixtures of toxic chemicals they have heightened risk because of the immaturity of their immune and metabolic responses and their potential to live long enough for latent illnesses to develop [52Australian Government Environmental Health Risk Assessment Guidelines for assessing human health from environmental hazards, 2012. Available online at:http://www.eh.org.au/documents/item/916(accessed 4 August 2017). [Google Scholar]]. It is increasingly recognised that even current air standards properly applied provide suboptimal protection for the most vulnerable in our society*."

In Dr McCarron's conclusion, she states:

(13) "*Whilst the full range of factors underlying the escalating hospitalisation of Darling Downs' residents for acute respiratory and circulatory conditions is unknown, the DDHHS statistics are significant and warrant full investigation as to causal factors. Communities in the Darling Downs have been exposed to significant pollution associated with the rapid and extreme industrialisation by the gas industry and with toxins directly attributable to that industry. The*

*considerable growth in hospitalisations for acute respiratory and circulatory conditions concurrent with the increase in toxic pollutants in the local airspace suggests that controls to limit exposure are ineffectual*".

And that:

"*A growing body of published research on the industry's emissions and resultant adverse health impacts supports the decisions by other jurisdictions (France, Ireland, Bulgaria, New York State), to impose bans on unconventional gas development. Acute hospitalisation data from the Darling Downs raise a red flag. It is urgent that there should be a comprehensive investigation of the health impacts from the unconventional gas industry in Australia*".

The Doctors for the Environment Australia's Submission to the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory, dated April 2017 conclude their report by stating:

(14) "*As with many complex human activities, absolute certainty regarding impacts of unconventional gas development on public health may never be attained. However, there is already sufficient indication of the potential for harm to human health and the environmental determinants of health from an ever growing scientific evidence base. Any economic benefits from this industry must be weighed against the long-term impacts on human health and the environment, and the impact of further global emissions on our ability to mitigate climate change. Decisions made today will affect the health, wellbeing and quality of life for future generations. As doctors concerned about the health of Australians we urge the inquiry to reject further expansion of this industry until much more work can be done at a local level to more fully understand and prevent the serious risks that it poses*".

**Conclusion and Recommendation**

I have only scraped the surface in my submission but based on scientific evidence of the Doctors for the Environment Australia and Dr Geralyn McCarron alone, I do not think it safe, wise or in the best interests of the people of Moora and surrounding land and farms (who supply a vast amount of food for WA and beyond), for Perth or Western Australia as a whole. Dr McCarron's "red flag" with regard to her findings in Queensland should be taken seriously so the same mistakes are not made here in Western Australia and our residents suffering.

Clean air to breath, food to grow on uncontaminated land and water is our basic human right and should remain so. As this clearly cannot be guaranteed by either companies or the government then I recommend that all further exploration and new drilling should be banned immediately and permanently over the whole State of Western Australia.

## References


(1) (3) (6) (7) (14)

https://www.dea.org.au/wp-content/uploads/2017/04/Scientific-Inquiry-into-Hydraulic-Fracturing-in-the-NT-Submission-04-17.pdf

(2) (6)

http://dmp.wa.gov.au/Documents/Petroleum/PD-RES-PUB-121D.pdf

(4)

http://www.safecosmetics.org/get-the-facts/chemicals-of-concern/polyacrylamide-2/

(5)

https://www.nicnas.gov.au/chemical-information/factsheets/chemical-name/glutaraldehyde

(8) (9) (10) (11) (12) (13)

https://www.tandfonline.com/doi/full/10.1080/00207233.2017.1413221