

A/Professor Linda Selvey, MBBS(Hon), MAppEpi, PhD, FAFPHM
10th March 2018

Dr Tom Hatton
Chair, Scientific Inquiry into hydraulic fracture stimulation in Western Australia

Dear Dr Hatton

I am writing in submission to the scientific inquiry that you are chairing. I am a public health physician with extensive experience in senior public health roles in government and am currently an academic at The University of Queensland. In this submission I will address the first term of reference of the Inquiry: "Identify environmental, health, agriculture, heritage and community impacts associated with the process of hydraulic fracture stimulation in Western Australia, noting that impacts may vary in accordance with the location of the activity". I will focus on the health impacts that can occur remotely from fracking sites, given the likely location of any unconventional gas wells in Western Australia.

The peer-reviewed literature about the health impacts of hydraulic fracking has grown significantly in recent years. Professor Melissa Haswell summarised this literature in a critical review of the health impacts of unconventional gas mining in Western Australia, which she wrote in response to two reports about unconventional gas in Western Australia. This review is available at: <http://apo.org.au/system/files/74194/apo-nid74194-65491.pdf>. I commend this to you.

The health impacts reviewed by Professor Haswell include the impact of air pollution, water contamination, climate change, noise, traffic, mental health issues, and impacts on infants and children.

Many of the health impacts of hydraulic fracking increase with increasing proximity to gas wells, due to many of the impacts (air pollution, noise, traffic, landscape changes) being largely local (albeit that air pollution can be transported across vast distances). For example, a study from Pennsylvania found negative impacts of fracking on infant birth weight for infants born to mothers living within 3 km of a fracking site.¹ However, there are also a number of potential health impacts that would extend way beyond the fracking sites. These are, in particular, water contamination, water scarcity, the impact on landscape and biodiversity, and climate change.

Water contamination can occur through leakage/seepage into groundwater or through surface contamination from contaminated water storage into rivers and streams. As pointed out in your discussion paper, groundwater contamination is

¹ J Currie, M Greenstone, K Meckel, 2017. Hydraulic fracturing and infant health: new evidence from Pennsylvania. *Science Advances* 3(12), e1603021.

less likely to occur from shale gas extraction than coal seam gas extraction. However, there is some evidence that groundwater contamination has occurred in Pennsylvania, where shale gas extraction has occurred for a number of years.² Surface water contamination from leakage and/or overflow from storage of backflow water is potentially a major issue for the Kimberley and Pilbara regions, as they are areas with periodic extreme rainfall. There are a number of examples of leaking tailings dams where extreme rainfall overwhelmed dam capacity.^{3,4} The potential health impacts of contaminated surface water depend on the nature of the contamination, but there are now a number of studies describing surface water contamination due to fracking where the contamination resulted in harmful levels of a range of chemicals. Even in more remote sites, this contamination is potentially harmful to people relying on these water sources, for agriculture, and for the natural environment.^{5,6}

While the Pilbara and Kimberley regions have periods of extreme high rainfall, they also have periods of low rainfall, and in this case the extraction of water from surface or groundwater supplies required for fracking can also result in depletion of water for other uses, such as agriculture, drinking, domestic and commercial use. With growing food insecurity as a result of climate change, ensuring adequate water supply for agriculture is essential. Threats to food security due to water insecurity clearly have important implications for human health.

There is an increasing body of literature that demonstrates links between biodiversity and good health.⁷ Biodiversity is essential for human systems, such as agriculture, soil health, pest control etc. Having exposure to nature has also been shown to result in better health, even among people with lower socio-

² B Yan, M Stute, RA Panettieri, et al, 2017. Association of groundwater constituents with topography and distance to unconventional gas wells in NE Pennsylvania. *Science of the Total Environment*, 577:195-201.

³ Major tailings dam spill at Solomon Islands 'disaster' gold mine. SBS News, July 2016. https://www.sbs.com.au/news/major-tailings-dam-spill-at-solomon-islands-disaster-gold-mine_1

⁴ G Mudd, 2013. Ranger's toxic spill highlights the perils of self-regulation. *The Conversation*, <https://theconversation.com/rangers-toxic-spill-highlights-the-perils-of-self-regulation-21409>

⁵ United States Environmental Protection Agency. Hydraulic Fracturing for Oil and Gas: Impacts from the Hydraulic Fracturing Water Cycle on Drinking Water Resources; Final Report. US EPA: Washington DC; December 2016. Available at: <https://cfpub.epa.gov/ncea/hfstudy/recordisplay.cfm?deid=332990>, downloaded February 10, 2017.

⁶ Adgate JL, Goldstein BD, McKenzie LM. Potential public health hazards, exposures and health effects from unconventional natural gas development. *Environmental Science and Technology* (2014); 48: 8307-8320.

⁷ World Health Organization, Climate change and health, Biodiversity, <http://www.who.int/globalchange/ecosystems/biodiversity/en/>. Accessed March 2018.

economic circumstances.⁸ Care for country is also inextricably linked to the health of Aboriginal peoples and communities.⁹ Given that a number of potential fracking sites encroach onto Aboriginal land, this is a critical issue. Fracking involves the construction of pipelines, roads, and other infrastructure. It also involves land clearing. Many of the potential fracking sites are farmland or relatively pristine areas. Therefore the potential damage to landscape poses a risk to the health of the local Aboriginal communities and beyond.

Finally, the extraction and burning of fossil fuels is resulting in what has been described by the World Health Organization as “The greatest threat to global health in the 21st Century”.¹⁰ Australia is already experiencing some of these health effects, particularly resulting from increased severity of extreme weather events, extreme heat, and drought. With increasing global average temperatures, the health impacts will increase and become less amenable to adaptation. Clearly limiting the risk of dangerous climate change is a global responsibility. Australia, with one of the world’s highest per-capita emissions, is failing to meet that responsibility, to our detriment. As yet, global emissions have not been limited sufficiently to reduce the risk of dangerous climate change. Global commitments to reduce emissions also are insufficient to contain global warming to 2C or less. Therefore the mining and combustion of any new fossil fuel reserves is irresponsible given the risks to human and natural systems from climate change.

Gas has been promoted as a ‘transitional fuel’ as when combusted, it results in fewer CO₂ emissions per unit energy than coal or oil. However, gas extraction and combustion still results in significant CO₂ emissions. In addition, because of the potential for methane leakage during and after extraction, unconventional gas has been demonstrated to emit at least the same level of carbon emissions per unit energy as oil or coal.^{11,12,13} Methane is a powerful greenhouse gas, being over 80 times more potent than CO₂ over a 20-year period. Simply on the grounds of risks to health and human systems from climate change alone, fracking should not go ahead in Western Australia or elsewhere.

In this brief submission, I have highlighted potential risks to human health from

⁸ R Mitchell, F Popham, 2008. Effect of exposure to natural environment on health inequalities: an observational population study. *The Lancet* 372(9650):pp. 1655-1660.

⁹ <https://www.creativespirits.info/>

¹⁰ World Health Organization, Climate Change and Health, WHO calls for urgent action to protect health from climate change – sign the call.

<http://www.who.int/globalchange/global-campaign/cop21/en/>, Accessed March 2018.

¹¹ Staddon PL, Depledge M. Fracking cannot be reconciled with climate change mitigation (2015). *Environmental Science and Technology* 49(14): 8269-8279.

¹² Howarth RW. A bridge to nowhere: methane emissions and the greenhouse gas footprint of natural gas (2014) *Energy Science and Engineering* 2(2): 47-60.

¹³ McJeon H, Edmonds J, Bauer N, Clarke L, Fisher B, Flannery BP, et al. Limited impact on decadal-scale climate change from increased use of natural gas (2014). *Nature* 514: 482-485.

fracking in Western Australia. I have focused on risks that are less reliant on proximity to fracking sites, given that many potential fracking sites in Western Australia are some distance from communities. These potential risks, including water contamination, water scarcity, impacts on nature and biodiversity and climate change, mean that fracking should not go ahead anywhere in Western Australia.

Thank you for consideration of my submission.

Yours Sincerely

A handwritten signature in blue ink, appearing to be 'Linda A Selvey', with a stylized, cursive script.

Linda A Selvey, MBBS(Hon), MAppEpi, PhD, FAFPHM