

Inquiry into the Implications for Western Australia of Hydraulic Fracturing for Unconventional Gas

The Western Australian Legislative Council Standing Committee on Environment and Public Affairs has commenced an inquiry into the implications for Western Australia of hydraulic fracturing for unconventional gas, otherwise known as 'fracking'.

On 7 August 2013, the Committee resolved to inquire into and report on the implications for Western Australia of hydraulic fracturing for unconventional gas, including:

- a) how hydraulic fracturing may impact on current and future uses of land;
- b) the regulation of chemicals used in the hydraulic fracturing process;
- c) the use of ground water in the hydraulic fracturing process and the potential for recycling of produced water; and
- d) the reclamation (rehabilitation) of land that has been hydraulically fractured.

Members of my family living in the Shire of Dandaragan number 6, and we are all aware of the publicity around the topic of unconventional gas fracking. There is a small group of activists present in and around the town of Jurien Bay, which exposes the public to large anti-fracking signage along the main street; submits extreme literature for publication in the Shire-printed local newsletter; has infiltrated tourism promotional bodies, and pressured local governments into holding local forums where their views are loudly heard.

Last year I responded to some of the newsletter extreme literature and attempted to put a more moderate light on the topic, suggesting readers examine the potential positives, as well as put the perceived negatives into perspective. Predictably, this letter was attacked in the following edition, referencing among other things grossly incorrect data from the Conservation Council. However, I was approached by many people in the district with encouragement, and thanks that someone had now spoken up for the apparent 'silent majority'. It is not my nature to be active in public, so I have let the issue continue with no further involvement, until now. Recently the local newsletter included a message from Shane Love our local MLA, suggesting people make submissions to the present inquiry. This has been the cue for me to write this letter.

I am a metallurgist, with almost 40 years' experience in the mining industry, including a total of about 18 years working in the mid-west. I have twice been the registered manager of the mineral sands mining operations at Eneabba, from the mid 1980s to the mid 1990s. For almost five years I was the Resident Manager of mineral sands mines in the USA. As a result of these years of experience I have direct knowledge of the regulatory regimes in WA, particularly the abilities and actions of the Department of Mines and Petroleum, and so believe I am appropriately qualified to opine on its ability to regulate the gas fracking industry. Having also directly dealt with various local, state and Federal authorities in pursuit of mining and mine rehabilitation activities in USA, I believe I can also relate the experience of the US fracking industry; its regulatory regime; and the emerging industry in WA.

In respect of the terms of reference for this enquiry, I will answer each question in order.

a) The impact of hydraulic fracking on current and future land uses

In the immediate area of the well head works, and initial installation of network gas pipelines, the land use is obviously disrupted. Apart from the well head works, access tracks and possible condensate separation equipment, the remaining land should be only temporarily diverted from its current long term use. It should be highlighted that the area of land diverted or permanently used for the gas recovery activity is a *miniscule fraction* of the disturbance caused by our traditional broad acre farming and grazing activity that encompasses much of the mid-western region's land use. In terms of economic value per area disturbed, recovery of gas is orders of magnitude more economically accretive to the state economy, compared to farming. There should be ample ability for losses of farmland to be compensated from the fruits of gas production.

In keeping with good practice in the mining and exploration for minerals in WA, proper consultation between landowners and gas developers is the best medium to agree on access and compensation. As a backstop, clear and equitable guidelines by the regulating authorities should be provided as minimum conditions for access and compensatory agreements, with regulators having powers to impose conditions where the parties fail to come to agreement. If found to be necessary, the regulators could command rehabilitation bonds to ensure that gas developers do not 'walk away' from commitments and responsibilities in respect of cleaning up the drilling area, and restoring the permanent land use where appropriate.

b) Regulation of chemicals used in fracking

There is a lot of hysterical discussion, particularly from the WA Conservation Council, and especially around the mid-west by extremist opponents of gas development, regarding contamination of drinking water. The inference being that the chemical reagents used during gas fracking and well development will somehow leak into the shallow water aquifers that supply domestic and stock drinking water, and make it unsuitable for use. Some of the negative opinions expressed are due to apparent secrecy by gas developers about their specific formulations of chemical additives, which developers maintain are proprietary intellectual property. The secrecy is taken by fracking opponents to be proof that something untoward is happening, and that absent complete transparency, there must be poisons being used.

In response to this part of the enquiry, I would like to reference a comprehensive study made by the Massachusetts Institute of Technology (MIT) into the recent enormous growth of fracking and gas development in USA, as I believe this to be a significant and independent reference for what the infant fracking industry in WA might rely on to guide our future industry. The study is entitled *The Future of Natural Gas. An interdisciplinary MIT study*. It was published in June 2011. While a significant focus of the report relates to the vast economic transformative benefits of the now so-called 'shale gale' in USA, it also addresses environmental concerns. In one of its headline conclusions, the report states "*The environmental impacts of shale development are challenging but manageable. Research and regulation are needed to minimise the environmental consequences.*"

The environmental impacts section of the 170 page report includes a summary statement repeated here. "*With over 20,000 shale wells drilled in the last 10 years, the environmental record of shale gas development has for the most part been a good one- but it is important to recognise the inherent risks and the damage that can be caused by just one poor operation.*" The level of activity covered by the report cites over 20 thousand wells, orders of magnitude greater than the supposed development in WA's mid-west. In spite of the huge activity, the report also states that of forty-three widely reported well drilling incidents, 47% (20 incidents) appeared related to the contamination of shallow water zones by natural gas. "*In the studies surveyed, no incidents are reported which conclusively demonstrate contamination of shallow water zones with fracture fluids.*"

In other words, the risk of polluting groundwater by fracking fluid chemicals is at the very worst, something that could be imagined but has not been conclusively demonstrated. Paying excessive attention to this remote possibility seems to me, to be a gross exaggeration, and the issue of what

chemicals are used, considered accordingly. In perspective, there is absolutely zero doubt about the chemicals, poisonous or otherwise, that migrate into shallow groundwater aquifers from agricultural, horticultural and recreational land in WA, and the affected areas are vast in comparison to any conceivable area used for gas well development. So why should we accept some grossly exaggerated, deliberately pointed scare campaign, as any reason to halt natural gas development that is clearly in the best economic interest of the state?

Even so, the Department of Mines and Petroleum (DMP) publically states on its website, that it *“requires the disclosure of all chemicals to be used in a Drilling Application and Environment Management Plan. Any chemicals solutions identified as being potentially harmful are not approved.”* In my direct experience, DMP does regulate and properly police such matters, and it should be adequate protection for the public and for environmental protection purposes that it is required to do so.

The list of chemicals that are used (albeit not the actual mixtures or formulations) in development of fracking wells is not especially secret, and in my observation of these lists, it seems quite clear that opposition to their use is both hysterical and deliberately exaggerated. Most of the listed reagents are also used in developing domestic water bores, or in public utility water treatment plants. Others are common household chemicals. It would serve the public interest in my opinion, to put this issue in its proper perspective by publicising the general list of reagents used; explaining where these reagents are otherwise properly used in food and water treatment; and that the chance of them leaking into drinking water sources is miniscule by reference to actual experience.

The other issue put forward by opponents of fracking is the possible contamination of drinking water by gas. Much has been made of a popular short movie of a household in USA where the gas from well water is ignited as it separates from the water in a kitchen sink. It should be pointed out that there are many private water wells in the USA which contain natural gas in the water, and that for many years (well before fracking started) it was possible to obtain simple de-gassing devices to remove gas from water. The inference that such gas contamination has been caused by the advent of fracking is an extremely spurious argument, and promoted completely out of any realistic proportion. Returning to the MIT report, the 20 widely reported incidents of gas contamination from the thousands of wells studied could all have been treated using the commercially available gas separator devices, and thereby reduce this adverse impact to nil. In the very unlikely event that gas well development in WA results in gas contamination of drinking water, this type of gas separator would be expected to be effective and nullify the problem. It might be a regulatory requirement that the gas developer is responsible for installing such a device where found to be necessary.

c) Use of ground water in the hydraulic fracturing process and the potential for its recycling

The use of substantial quantities of water in all well drilling activities seems to be overlooked in the opposition to gas fracking. However, it is true that water consumption, and in particular, the disposal of 'return water' are issues that should be properly dealt with. This issue has also been canvassed in the MIT report, and again put into some perspective by the report. While the situation in WA will have some differences (for example there is little intensive irrigation in the region) I find it instructive to again reference the MIT report. In all cases, the reported usage of groundwater in shale gas regions was less than 1% of the total water usage. The report goes on to say that in terms of 'water intensity' usage expressed as a ratio per unit of energy produced, is low compared to many other energy sources. For example, the usage of water for shale gas development was cited at less than four litres per gigajoule, compared to several thousands of litres producing a gigajoule of renewable energy from corn crop irrigation.

Where possible, the re-use of development water that is returned by the flow of gas through the well should be encouraged. Present practice seems to limit reuse when either saline water mixes with the development water in the gas producing strata, or the distance to the next well makes it unfeasible to store and transport the volume. Reverse osmosis technology is a potential solution for

onward use of the returned water, but is expensive and would also need a suitable local use for the purified water to derive any benefit from the expense. In the geographic context of WA's mid-west it seems unlikely that many prospective fracking well locations would allow feasible reuse of the return water.

d) Land rehabilitation

Because the actual fracturing processes would take place several thousand metres below the surface, there would be no impact on the surface above the horizontal parts of the well zone, and therefore no necessity for any surface treatment. The well drilling site, water storage, and gas pipeline routes are all subject to surface disturbance and therefore candidates for land rehabilitation. Examples of land rehabilitation in the area include the pipeline easement for the buried Dampier to Bunbury Natural Gas pipeline (DBNGP) which was installed two decades ago. Nowadays it is virtually indistinguishable from adjacent grazing or broad acre cropping land, save for the periodic warning signs depicting the vicinity of the pipeline. Where the pipeline easement runs through native vegetation, the typical mineral sands post-mining rehabilitation techniques have been used to good effect. The pipeline easement constitutes the preponderance of disturbance for the DBNGP, and there seems no reason why this experience should not form the basis for new infrastructure development.

Rehabilitation of well head development and water storage sites should also be considered, where this infrastructure is not going to be required for future use, for similar land restoration. If the well is producing, and the future requirements for fracture redevelopment and extension are intended, then the area should be fenced off until the ultimate redevelopment has been completed. Rehabilitation bonds for this long term temporary land use would protect the state from costly remediation in the event the gas operating company failed to undertake the required land remediation.

Conclusions

Since the standing committee's interest is from an environmental perspective, it would also be interested that the advent of an ample natural gas supply close to the metropolitan area would have a significant environmental benefit. As WA increasingly uses natural gas in proportion to coal for electricity generation, the carbon emission ratio continues to improve. The Australian Greenhouse Office website shows that WA's South West Integrated System (SWIS) is attributed 0.78 tonnes of CO₂ equivalent per megawatt hour (MWh) of electrical power consumption compared to for example, Victoria, where the CO₂ emissions are 1.17 tonnes per MWh. For the most part this difference is due to the more significant proportion of gas fired power generators used by the SWIS.

Gas fired power generators typically emit about 40% of the CO₂ per MWh compared to coal fired generators. Reducing the proportion of coal fired generation can realistically only be achieved if there is a significant local gas supply.

Gas developments in WA's north west are unlikely to increase the proportion of gas used by SWIS, due to the distance from the source to the consumer. Indeed, the cost to users in WA's populated south west are currently significantly impacted by the transport cost to get the gas to the market. A regionally adjacent gas supply would not only make more affordable gas available for power generation in SWIS, it will also stimulate more environmentally friendly industry in the region. For the mid-west, this advantage would be even more pronounced. Wind-generation coupled to gas generation is seen as a most feasible technology to further reduce WA's relative dependence on the carbon based economy, and we have a growing number of main stream wind generators in the mid-west. It follows that wind and gas generator combinations would be increasingly feasible and useful in the mid-west, given significantly available local gas supplies.

The environmental issues concerning the public about fracking are real, and do need to be dealt with effectively. Proper regulation will deal with the real issues, and effective public communication should allow people in the mid-west to become more comfortable with the industry. Extreme views

and biased presentation of reported problems probably won't go away; but for the most part I am confident that people faced with a balanced presentation of factual industry data, will accept the advent of gas fracking in the mid-west.

Respectfully submitted,

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Jurien Bay, September 12, 2013