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Submission to:

WA Scientific Inquiry into Hydraulic Fracture Stimulation

Introduction

I welcome the WA Labor Governments inquiry into hydraulic fracturing and thank them for this opportunity to express my concerns with unconventional gas mining.

Western Australia is uniquely beautiful and of great intrinsic value. It is rich in wild natural places which tourists flock to visit, and our fragile environments are vital to our existing industries such as tourism, agriculture, horticulture, and fisheries. WA's sustainability must be protected for future generations.

A cohort of powerful people want to destroy our home by converting WA into an industrialised gas facility. This will irreparably change the landscape, contaminate our environment, and alter the fabric of our society, for little or no benefit to West Australians, just so they can line their pockets by exporting our gas overseas. This must not be allowed to happen.

The plethora of scientific evidence in peer-reviewed, published reports irrefutably demonstrates the extensive, negative consequences the unconventional shale gas industry (fracking) will have in WA.

Water contamination

The risk of water contamination from unconventional gas production is one of the most serious environmental concerns. A report conducted for the European Commission found the risk of contamination to surface waters and groundwater to be high (AEA Technology, 2012). Numerous reports from the US have documented the contamination of water systems surrounding gas developments (Wiseman, 2009; Michaels *et al.,* 2010). Water contamination can potentially occur to both groundwater and surface water systems from fracking fluids, drilling fluids, methane, waste water, and solid wastes. Water contamination could occur due to spills at the surface, leaking of fracking fluids or wastewater from wells and pipes, discharge of insufficiently treated waste water, or direct movement of methane, fracking fluids or wastewaters upwards through the rock body (IEA, 2012).

Well blowouts, where high pressures cause the eruption of wells during drilling, can result in the release of large amounts of drilling/fracking fluids and wastewater into surrounding water systems. In the US, blowouts and resulting water contamination have occurred on numerous occasions (Michaels *et al.,* 2010). For instance in Pennsylvania, a well blowout resulted in the release of nearly one million gallons

(3.79 million L) of wastewater which polluted nearby creeks (Michaels *et al.,* 2010). Blowouts have been found to be caused by failures to adhere to appropriate operating guidelines, including failures to maintain sufficient numbers of pressure barriers, failure to test blow-out preventers prior to use, and improper casing of wells (Michaels *et al.,* 2010).

Methane contamination

The over-pressurisation of natural gas in wells has been shown to cause the vertical migration of gas through fractures into overlying aquifers and surface water wells (Michaels *et al.,* 2010). River systems in the US and Australia have been found to be contaminated with methane (Pennsylvania DEP, 2010; DNRM, 2012; Santos, 2012). Such methane contamination can in some cases be linked to inadequately cemented well casings (Michaels *et al.,* 2010), although questions remain about the sources of such leaks in Australia (DNRM, 2012).
Understanding of the local geology and hydrology is needed to assess the potential for methane to travel through the rock body. However, such data are limited, and therefore more local and regional studies are required to assess the risks of methane contamination. The environmental and health impacts of methane contamination are unknown, and also warrant investigation (Jackson *etal.,* 2011).

Water consumption and extraction

Surrounding aquifers and springs could also be affected by the extraction of water from coal beds, but this risk depends on the local and regional connectivity of groundwater systems and remains unquantified (NRC, 2010). Studies in Australia predict that water extraction from coal beds will impact underlying and overlying aquifers, lowering pressure and water levels (Moran and Vink, 2010; WG, 2010). The river systems which depend on the discharge from springs could in turn be impacted by a reduction in water flow (WG, 2010). Threatened ecological communities reliant on spring complexes could also be significantly impacted by CSG operations (WG, 2010).

Soil contamination

Contamination of soils from fracking and drilling fluids and wastewater is also a potentially serious environmental hazard. Soil contamination has been caused by spills of wastewater and fracking fluids, which can contain toxic chemicals, high levels of salts and sodium, and other organic compounds (Santos, 2012; IEA, 2012). Contamination of soils has also occurred through the common practice of using evaporation ponds to store waste water in Australia and the associated seepage of chemicals into soils (Batley and Kookana, 2012).

Land clearing and habitat disturbance

Unconventional gas developments can impact habitats and biodiversity through the direct clearing of land, habitat fragmentation, the potential spread of invasive species, and an increased risk of fire (Williams *et al.,* 2012). Unconventional gas developments have a larger scale of industrial operation and land use compared to conventional gas (IEA, 2012). Access roads, pipelines, wells and other infrastructure

require the clearing of large tracts of land (Williams *et al.,* 2012). Unconventional gas requires a large number of drilling wells, with often more than one well per square kilometre, compared to less than one well per 10 square kilometres for conventional gas developments (IEA, 2012). In CSG operations wells may be as close as 200 m apart in a grid- like pattern, connected by roads and pipelines (Williams *etal.,* 2012). An analysis of gas developments in the Marcellus Shale in the US found nearly 3.6 ha per well pad of land were required, with an additional 8.5 ha of indirect edge effects (Johnson, 2010). A US study found that pipeline construction was the major contributor to forest loss and fragmentation, as well as a large increase in edge effects (Slonecker *etal.,* 2012).
Reports looking at the impacts of habitat loss from gas developments have stated that disturbance on local ecosystems is likely to have a long-term detrimental effect, as the installation of infrastructure means there is little chance of habitat recovery (Slonecker *etal.,* 2012).

Air pollution

Air pollution from volatile chemicals and substances during unconventional gas production may pose environmental risks (Poole, 2012). A report conducted for the European Commission found the overall risk of air pollution across all phases of operation to be moderate (AEA Technology, 2012). Air pollution can occur from the flaring of wells to release excess gas (Poole, 2012), or from equipment such as drilling engines, pump engines, and compressors, and from very heavy vehicle use (IEA, 2012; Williams, 2012). Toxic chemicals can also be released from fracking fluids or wastewater (AEA Technology, 2012). For instance, aeration of wastewater impoundments can release toxic chemicals into the air (Bamberger and Oswald, 2012).
Potential air pollutants, aside from greenhouse gases, identified in the US include hazardous BTEX chemicals, butane, hydrogen sulphide, polycyclic aromatic hydrocarbons, propane, and particulate matter (Poole, 2012). In the US, several emissions inventories have shown that gas operations caused local air pollution, with increased levels of hazardous air pollutants (Clark *et al.,* 2012). A US study found concentrations of hydrocarbons around unconventional gas developments, including benzene, were higher than the majority of EPA air toxics monitoring sites, including urban sites (McKenzie *et al.,* 2012). Within areas of gas development operations, average concentrations of hydrocarbons, such as BTEX chemicals, were most elevated around wells (McKenzie *et al.,* 2012). The potential air pollutants in Australia would be similar to the US, but will depend on the chemicals used, chemicals present in wastewater, and the equipment used.

Recommendations

With the amount of scientific evidence now available on the serious impacts Hydraulic Fracturing has had on communities in the USA and Queensland I believe the only way to completely eliminate this in Western Australia is to legislate a complete ban.

References

AEA Technology. 2012. Support to the identification of potential risks for the environment and human health arising from hydrocarbons operations involving hydraulic fracturing in Europe. Commissioned by the European Commission DG Environment.

Bannberger, M. and Oswald, R.E. 2012. Impacts of gas drilling on human and animal health. New Solutions 22, 51-77.

Batley, G. E. and Kookana, R.S. 2012. Environmental issues associated with coal seam gas recovery: managing the fracking boom. Environmental Chemistry 9, 425-428.

Clark, C.E., Burnham, A.J., Harto, C.B. and Horner., R.M. 2012. The technology and policy of hydraulic fracturing and potential environmental impacts of shale gas development. Environmental Practice 14, 249-261.

Department of Natural Resources and Mines (DNRM). 2012. Summary Technical Report — Part 1: Condamine River Gas Seep Investigation. Queensland Government.

Howarth, R. W., Santoro, R., and Ingraffea, A. 2011. Methane and the greenhouse-gas footprint of natural gas from shale formations. Climatic Change, 106, 679-690.

International Energy Agency (IEA). 2012. Golden Rules for a Golden Age of Gas: World Energy Outlook Special Report on Unconventional Gas. Available at: www.worldenergvoutlook.org .

Jackson, R.B., Pearson, B.R., Osborn, S.G., Warner, N.R. and Vengosh, A. 2011. Research and Policy Recommendations for Hydraulic Fracturing and Shale-Gas Extraction. Center on Global Change, Duke

Johnson, N. 2010. Pennsylvania energy impacts assessment Report 1: Marcellus Shale Natural Gas and Wind. The Nature Conservancy, Pennsylvania Chapter, and Pennsylvania Audubon. Available at: http://www.nature.org/whereweworkhorthamerica/states/pennsvIvania/news/news3511.html.

University, Durham, NC, 11 pp. Available at: http://www.nicholas.duke.eduicgc/HydraulicFracturingWhitepaper2011.pdf

McKenzie, L.M., Witter, R.Z., Newman, L.S., Adgate, J.L. 2012. Human health risk assessment of air emissions from development of unconventional natural gas resources. Science of the Total Environment 424, 79-87.

Michaels, C., Simpson, J.L. and Wegner, W. 2010. Fractured communities: Case Studies of the environmental impacts of industrial gas drilling. Riverkeeper Inc.

Moran, C. and Vink, S. 2010. Assessment of impacts of the proposed coal seam gas operations on surface and groundwater systems kin the Murray-Darling Basin.

National Research Council (NRC). 2010. Management and Effects of Coal bed Methane Produced Water in the United States. National Academy of Sciences, Washington, DC.

Pennsylvania Department of Environmental Protection (PA DEP). 2010. DEP monitors stray gas remediation in Bradford County requires Chesapeake to eliminate gas migration, press release. PA DEP, Harrisburg, PA. Available at: http://www.portal.state.pa.ushortal/server.pt/communitvinewsroom/14287

Poole, D.T. 2012. Hydraulic fracturing of unconventional gas shales: Potential pollutants, treatments and remediation. The Ohio State University. Available at: http://senr.osu.edu/images/Poole final MENR prolect.pdf

Santos, I. 2012. Submission on National Greenhouse and Energy Reporting (Measurement) Determination 2012 - Fugitive Emissions from Coal Seam Gas. Submitted to the Department of Climate Change and Energy Efficiency.
Slonecker, E.T., Milheim, L.E., Roig-Silva, C.M., Malizia, A.R., Marr, D.A. and Fisher, G.B. 2012. Landscape Consequences of Natural Gas Extraction in Bradford and Washington Counties, Pennsylvania, 2004-2010. U.S. Geological Survey, Reston, Virginia.
Water Group (WG).2010. Water Group Advice On EPBC Act Referrals: Referral - 2008/4399, Santos-Petronas Referral - 2008/4059 and comments on Ap Lng Referral - 2009/4974. Water Group.
Williams J., Stubbs T. and Milligan A. 2012. An analysis of coal seam gas production and natural resource management in Australia. A report prepared for the Australian Council of Environmental Deans and Directors by John Williams Scientific Services Pty Ltd, Canberra, Australia.
Wiseman, H. 2009. Untested waters: The rise of hydraulic fracturing in oil and gas production and the need to revisit regulation. Available at: http://www.law.uh.edu/facultv/thester/courses/Emerging%20Tech%202011/Wiseman%20on%20Fracking.pdf