International Association of Hydrogeologists

VICTORIAN BRANCH

Keir Delaney
Secretary, Environment & Planning Committee Parliament House
Spring Street
Melbourne VIC 3002

Parliamentary Inquiry into Unconventional Gas – Victorian IAH Branch submission

Dear Mr. Delaney,

Thank you for the opportunity to submit comments to the Victorian Government Inquiry into Unconventional Gas in Victoria.

The International Association of Hydrogeologists (IAH) is a scientific and educational organisation for scientists, engineers, water managers and other professionals working in the fields of groundwater resource planning, management and protection.

Our mission is to further the understanding, wise use and protection of groundwater resources throughout the world. As a professional organisation, the IAH has a world-wide membership of more than 4000 individuals, 610 in Australia and 120 members in the Victorian Branch.

Terms of Reference

IAH have reviewed the Terms of Reference and focused our submission focuses on the following:

(2) the environmental, land productivity and public health risks, risk mitigations and residual risks of onshore unconventional gas activities;

(3) the coexistence of onshore unconventional gas activities with existing land and water uses;

(5) the resource knowledge requirements and policy and regulatory safeguards that would be necessary to enable exploration and development of onshore unconventional gas resources, including —

(a) further scientific work to inform the effective regulation of an onshore unconventional gas industry, including the role of industry and government, particularly in relation to rigorous monitoring and enforcement, and the effectiveness of impact mitigation responses; and

(b) performance standards for managing environmental and health risks, including water quality, air quality, chemical use, waste disposal, land contamination and geotechnical stability.

General Comments

The IAH's position is that any decision of whether to allow Unconventional Gas projects to proceed should be based on a scientific approach to understanding the risks associated with such projects.

The risks of 'Unconventional Gas' projects to groundwater vary significantly depending on the type and location of the project proposed. While a consistent decision making framework is required, each project should be considered on its merits. A blanket approach is overly simplistic.

It is critical that if Unconventional Gas projects are allowed to proceed then adequate regulatory controls are in place and enforced. This includes resourcing the appropriate government agencies to set and

enforce the requirements for impact assessments, well integrity, environmental objectives and ongoing monitoring. The implementation of best practise in impact assessments and well integrity depends on appropriate regulatory requirements.

Other states and federal agencies (and the United States for that matter) have significantly more experience in Unconventional Gas projects and have developed useful guidelines and associated policy documents. Victoria should look to build on what has already been learned and developed and not reinvent the wheel or repeat the same mistakes.

Victorian Groundwater Resources

Victorian's are currently licenced to extract approximately 1,000,000 ML of groundwater a year. For comparison, Melbourne consumes approximately 400,000 ML a year. Victoria's groundwater is a highly valuable resource to agriculture, industry and communities and provides a critical component of environmental water, such as baseflow to rivers. Previous studies (RMCG, 2008) have estimated the direct economic value of groundwater in Victorian at $350M annually.

Victoria has a good overall understanding of the extent of its large Tertiary Age sedimentary basins that are the largest store of fresh groundwater in the state. This is not 'new water' that has been claimed by one proponent during the public hearings in Sale. However, there still exist key data gaps that need to be addressed when assessing the potential impact of Unconventional Gas projects and the potential impact of any proposal must be in the context of the local groundwater conditions, which will require local assessment.

Victoria has an extensive (though not necessarily complete) network of observation bores that either have long term groundwater level and quality data available or can be sampled relatively easily to establish baseline conditions for impact assessments prior to a project occurring.

The Victorian Government in collaboration with the Federal Government is currently undertaking water science studies to examine the impacts of potential onshore gas projects on Victoria's water resources (http://onshoregas.vic.gov.au/science-studies/about-the-water-studies). These studies are understood to be close to completion and should be a key reference for the Committee to consider.

Existing impacts from hydrocarbon extraction in Victoria

Development of hydrocarbon fuels in the Gippsland Basin (brown coal onshore and oil and gas offshore) has had significant impacts on groundwater levels across the region. Groundwater level declines of greater than 40 m in the Yarram region have been attributed to the oil and gas extraction from Bass Strait (Hatton, et al, 2004). This resulted in the need for drilling replacement bores, lowering pumps or additional water pumping costs for which the Victorian Government provided financial assistance in approximately 2008 (Latrobe Aquifer Financial Assistance Package). Water levels continue to fall by around 1 m per year in the Yarram region due to offshore oil and gas extraction.

Large volumes (approximately 25,000 ML per year) of groundwater are extracted for dewatering and production water purposes from the three Latrobe Valley brown coal mines. This has resulted in large groundwater level declines in the surrounding aquifers and extensive land subsidence with up to 2 m near the mines themselves (Gloe, 1977). Settlement to date has been relatively even such that structural damage has been minimal but stability issues near the mines remain ongoing issues (e.g. the Princes Freeway near Morwell was closed for approximately 8 months in 2011 due to ground instability).

Little is known about the impacts of groundwater quality from existing developments. Further research is required to understand groundwater geochemistry and water-rock interactions, sources of solutes that may be used as signatures of water sources, and effective monitoring technologies. New projects will similarly need to consider impacts on groundwater quality and not just quantity.

Regulatory Framework

Victoria has well developed groundwater management policies and well trained staff in the Department of Environment, Land, Water and Planning and the Rural Water Corporations that implement these policies for current groundwater projects. Additional resources, including qualified hydrogeologists, will be required to provide support to the Government to make sound decisions and oversight of Unconventional Gas projects, particularly if large scale development proceeds.

At least two sets of legislation are closely related to Unconventional Gas in Victoria, namely the Water Act (1989) and the Mineral Resources (Sustainable Development) Act 1990 (which covers Coal Seam Gas). Tight Gas may be covered under a third Act, the Petroleum Act 1998. It is unclear where Unconventional Gas projects fall within the Legislative framework. It is recommended that a review is conducted, if not already underway completed, of the interaction of the two Acts to ensure that they do not work at cross purposes to each other and there are no gaps in the legislation.

Risks to groundwater from Unconventional Gas projects

Unconventional Gas projects have the potential to negatively impact groundwater resources. Understanding these risk is critical when deciding on whether the risks are manageable and if the project should proceed. These risks include but are not limited to:

- Large declines in groundwater levels, if significant depressurisation is required, leading to reduced access for existing groundwater users, reduced water for the environment or subsidence at the ground surface.
- Contamination of shallow aquifers from activities conducted at the surface. For example, leaks from storage ponds or fuel storages.
- Cross contamination of aquifers by poorly constructed wells or preferential pathways developed by reservoir stimulation.

The potential risk of Unconventional Gas projects to impact groundwater varies significantly depending on the type of proposed project and local hydrogeological conditions. For example some projects will target very deep formations (>2,000 m), where productive aquifers may be separated by low permeability rock. The risk to groundwater in this instance is mostly due to well integrity and surface activities. Other projects, on the other hand, may target relatively shallow (<1,000 m), formations within closer proximity to regionally significant aquifers. The risks in this example are greater and would need thorough consideration. The number of production wells and the need for reservoir stimulation also depend on the properties of the target formation which vary from site to site. Therefore, a blanket approach for Unconventional Gas projects is overly simplistic.

Well integrity is considered a key risk factor for Unconventional Gas projects. Well “integrity failure can cause adverse changes in groundwater levels, flow rates and flow directions and can also lead to changes in groundwater quality” (Federal Department of Environment, 2014). There is emerging evidence that faulty wells and not hydraulic fracturing is the greatest risk to shallow groundwater

resources from Unconventional Gas projects (e.g. Darrah, et al, 2014). It is critical that Gas Wells are designed, constructed and decommissioned by proponents in accordance with relevant international best practise and verified by independent inspectors. Ongoing monitoring and maintenance is required to ensure well integrity is maintained during the life of the well. Environmental bonds (or similar) need to be adequate to cover potential legacy issues with abandoned wells or insolvent well owners.

The risk to groundwater resources form Unconventional Gas is much lower during the exploration phase than during the development phase. Given the uncertainty that exists about the economic viability of Unconventional Gas in Victoria, a staged approach may be appropriate commencing with relatively low risk exploration activities in the first instance to assess the resource potential and to identify sites with potential risks where concentrated scientific efforts are possibly warranted if further the projects are deemed viable.

Key steps in the process to understanding and managing the risk to groundwater posed by Unconventional Gas projects are comprehensive baseline groundwater monitoring and ongoing groundwater monitoring. That is, what is the current condition of groundwater in areas that may be developed and then what happens to groundwater condition as the project proceeds. Adequate baseline studies must be an integral part of impact assessments, and must be specific by state regulations. This is not withstanding the fact that changes in groundwater caused by a project may take many years to manifest.

Community

Lack of transparency and conflicting information may have eroded the confidence of stakeholders, particularly the communities. Proactive engagement with all relevant stakeholders is considered critical for developing a viable unconventional gas industry in Victoria. This would benefit from clear communication of the "science" of unconventional gas and its associated risks, which may have been distorted by the perceived biases of proponents and opponents of unconventional gas. Such initiatives at a state-level could add a layer of rigour and credibility to the development and approval process, supplementing the role of the Independent Scientific Expert Committee (ISEC, a panel of independent experts that provides scientific advice to decision makers on the potential impacts of coal seam gas and large coal mining development).

Research, baseline monitoring and impact assessment studies conducted by State agencies and Unconventional Gas developers should be made publically available to help build transparency and confidence in the process.

Existing resources and policies

Other Australian states and federal agencies (and the North America for that matter) have significantly more experience in Unconventional Gas projects and have developed useful guidelines and associated policy documents. There has also been significant technological advancement in the unconventional gas industry in recent years, both domestically and internationally. Victoria should look to build on what has already been learned and developed and not reinvent the wheel. It is assumed that Victoria has ready access to information and guidelines produced by other states. We have included a selection of resources from Europe and the United States that may be useful to the Committee contained at the end of the reference section of our submission.

Closure

We would be pleased to discuss or clarify any of the above points, when convenient.

We reiterate that IAH appreciates the opportunity to submit comments to this inquiry. If you have any further queries on the content of our submission, please contact Ben Hall, Vice-Chairperson Victorian Branch of the IAH.

Yours Sincerely

Ben Hall, Rikito Gresswell and Alexis Valenza

Executive Committee, Victorian Branch, International Association of Hydrogeologists

References

Darrah, T.H., Vengosh, A., Jackson, R.B., Warner, N.R. and Poreda, R.J. 2014. Noble Gases Identify the Mechanisms of Fugitive Gas Contamination in Drinking-Water Wells Overlying the Marcellus and Barnett Shales. Sept.15, 2014, Proceedings of the National Academy of Sciences

Department of Environment, 2014. Bore integrity, Background review, Commonwealth of Australia 2014.

GLOE, C. S. 1977. Land subsidence related to brown coal open cut operations, Latrobe Valley,Victoria, Australia. Second International Symposium on Land Subsidence. Proc. Anaheim Symp.1976, IASH-Unesco, pp. 399-407

Hatton, T., Otto, C. and Underschultz, J. (2004) Falling Water Levels in the Latrobe Aquifer, Gippsland Basin: Determination of Cause and Recommendations for Future Work, CSIRO unpublished report for Wealth and Oceans Flagship Program, Land and Water, and Petroleum Resource

RMCG, 2008. Economic Value of Groundwater in Victoria. Report for the Victorian Department of Sustainability and Environment.

Selected Existing Resources

European Commission

https://ec.europa.eu/energy/sites/ener/files/documents/Study%20to%20support%20the%20definition%20of%20a%20CBA%20methodology%20for%20gas.pdf

https://ec.europa.eu/jrc/sites/default/files/reqno_jrc70481_unconventional_gas_potential_energy_market_impacts_in_the_european_union.pdf

https://ec.europa.eu/energy/sites/ener/files/documents/2012_unconventional_gas_in_europe.pdf

United States

http://www.rff.org/rff/documents/RFF-Rpt-StateofStateRegs_Report.pdf

http://www.rff.org/centers/energy_and_climate_economics/Pages/Shale_Maps.aspx#maps