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To: EPC
Subject: Submission to the Parliamentary Inquiry into Unconventional Gas Mining in Victoria

To the Parliamentary Inquiry into Unconventional Gas Mining in Victoria -

My name is Noah Beecher Kelk, and I live in Melbourne. I make coffee for a living and as such I use a large quantity of high quality milk from niche Victorian farmers. Gas mining directly threatens the quality of dairy products, and therefore also my job. This is one of many simple and important reasons that I am opposed to unconventional gas mining.

I am also strongly opposed to onshore gas mining, because I support community rights to self-determination. More than 50 communities around Victoria have conducted comprehensive surveys of landholders and residents and consistently found strong opposition to gas mining, with results as high as 99% of residents opposing the development of a gas industry. If these results are ignored, the entire edifice of Parliamentary democracy is at risk.

I oppose all forms of unconventional gas mining, both onshore and offshore, be it in from a coal seam, a layer of shale or sandstone, or any other geological structure. I recommend to the Parliament a complete and permanent ban against all onshore gas mining, and a complete ban against the use of any unconventional gas mining techniques, including but not limited to: hydraulic fracturing; horizontal drilling; and underground gasification or liquefaction processes. This ban should include all types of onshore gas resources, regardless of the geological structure in which they are found, and regardless of whether they are currently administered by the Petroleum Act or the Minerals Act.

In the interest of the Inquiry's process I shall address the terms of reference directly.

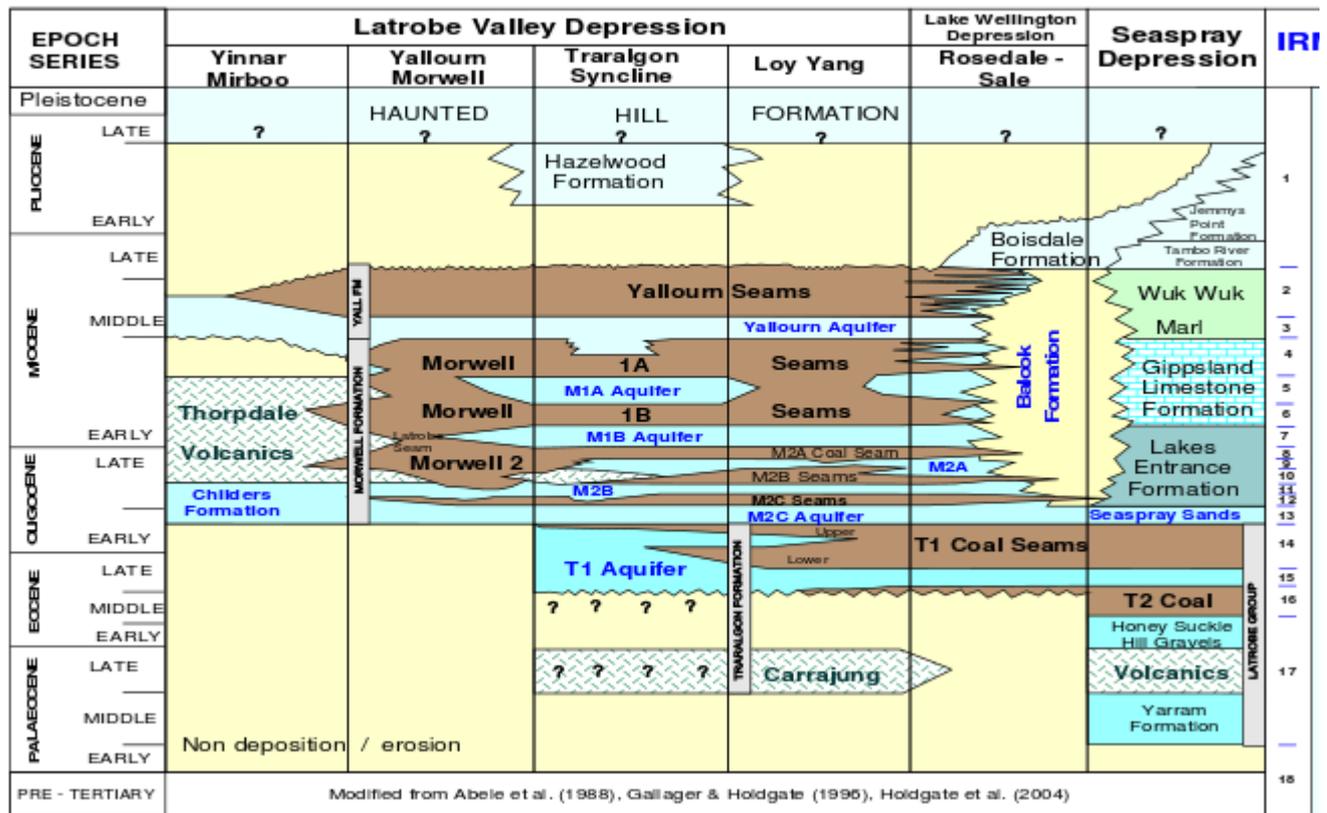
(1) the prospectivity of Victoria's geology for commercial sources of onshore unconventional gas;

Victoria's hydrogeology is complex and fragile. Here is a diagram from SRW's hydrogeological mapping report (can be found at:

http://www.srw.com.au/Files/groundwater_maps/Hydrogeological_Mapping_Report.pdf pg 18). As can

clearly be seen, the seams and aquifers have a complex and delicate hydrogeological relationship.

Figure 8 Gippsland basin Stratigraphy (from Schaeffer, 2008)



The report states: "The Latrobe Group comprises the most regionally extensive aquifer system in the Gippsland Basin". These aquifers provide Victorian farmers with water, Australia's single most precious and replaceable resource. There are energy alternatives; there are no water alternatives. Hydraulic fracturing causes aquifer contamination, mainly of methane, the unpredictable nature of the fracture.

There are countless videos and eyewitness reports of rivers near fracturing sites producing flammable gas. The general response from industry figures is: "there is no evidence that the river was not producing flammable gas prior to hydraulic stimulation of the resource, and as such, we cannot be held financially, legally, or morally responsible for this". I hope that the Parliamentary Inquiry will be able to discern the truth in these matters.

I wish to draw the Inquiry's attention to a further observation in the SRW report (pg 19):

"The coal seams in the Traralgon Formation are important in the hydrogeology as they represent regional aquitards while thick sand and gravel sequences, below, between and above them represent regional aquifer systems, from which groundwater is abstracted...the separation between aquifers of the Traralgon Formation and the lower sections of the Morwell Formation is not clear, and there appears to be significant hydraulic connection."

It is clear, therefore, that the Gippsland hydro-geological structures are inappropriate for onshore gas mining activities.

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

The environmental, land productivity and public health risks, and residual risks of onshore gas mining are numerous and well-attested. Meanwhile the risk mitigation strategies are ineffective and usually left undone.

In particular, my concerns include the following.

Environmental risks:

-Contamination of groundwater of methane

-Contamination of groundwater by other products - for example, I wish to draw the Inquiry's attention to the fine given by the NSW EPA to SANTOS, finding that they had polluted groundwater with uranium and other solids through their onshore gas mining activities.

(<http://www.epa.nsw.gov.au/epamedia/EPAMedia14021802.htm>) Origin Energy also admitted to have been using a product containing asbestos as part of onshore gas mining activities in Queensland

(<http://www.theaustralian.com.au/business/mining-energy/origin-energy-suspends-drilling-over-asbestos-find/story-e6frg9df-1226853907614>)

-Increase in soil and groundwater salinity

-Depletion of groundwater through overextraction for use in onshore gas mining activities

-Waste water (also called various things like 'produced fluid') is often sprayed on public roads and private property, or else kept in holding pools, which have been well documented to leak or break.

-Unconventional gas drilling produces the product of methane, generally to be burnt in order to provide energy. Methane is a potent greenhouse gas with a global warming potential around 20 times higher than that of carbon dioxide. In order to have any chance of keeping the earth in a habitable temperature range for human survival, we must cease the extraction and consumption of fossil fuels immediately, including but not limited to, all onshore and unconventional gas.

-Unconventional gas drilling often involves significant leakages of resource, known as fugitive emissions. This is due to the nature of the geological structures in which it is found, and the nature of unconventional techniques, such as hydraulic fracturing and horizontal drilling, which tend to produce long and unpredictable 'streams' of gas that be reliably captured.

-Degradation and clearing of native forests, and other significant natural sites or habitats, to make space for drill pads and roadways. I wish the Inquiry to note specifically that although current proposed onshore gas mining activities in Victoria are for exploration and hence generally include less than twenty wells, if a commercially viable resource were to be found and developed, this would be likely to involve more than 100 individual gaswells, each with their own drill pad and access road. This adds up to a large amount of clearing and degradation.

Land productivity risks:

-As a barista, my particular concern is with the threat that onshore gas mining poses to the Gippsland dairy industry. Gippsland dairies produce extremely high quality milk which is incomparable to generic brands for texturing for a cappuccino or latte. My place of work consumes more than 40 L of full cream milk each day. On occasions when we have had to use other brands, the quality of coffee that we produce drops and we lose a competitive advantage we hold over other cafes.

-Methane contamination of groundwater threatens the quality of Victorian fruit and vegetables, fibre, beef, and dairy through contamination of stock or water used for irrigation. Australian produce is known worldwide to be clean, and of high quality. Onshore gas mining is a fantastic way to lose that reputation.

-Tourism is a major part of the Victorian economy. I wish to draw the Inquiry's attention to the Minerals Council of Australia's report on the Victorian Economic Outlook 2012

(http://www.minerals.org.au/divisions/victoria/victorian_economic_outlook/) where they note that education-related travel and personal travel excluding educational travel contribute \$4.5bn and \$2.5bn to the Victorian economy respectively, approximately the same amount contributed that the Minerals Council claims is contributed by mining (\$7.1bn, in the same report). However mining threatens the tourism industry by replacing wineries, beautiful natural sites, uncontaminated rivers and lakes, old growth native forests, and so on, with large, noisy, destructive, invasive gasfields. I hope the Inquiry does not take these words as an emotional comment on my part - these are impartial and accurate descriptions of gasfields such as those

in Queensland, as they pertain to the tourism industry of Victoria.

Public health risks:

- Onshore gas mining has many public health risks. I wish to draw the Inquiry's attention to the following peer reviewed study by Dr Marion Carey: http://dea.org.au/images/general/viewpoint_issue_8_CSG.pdf I strongly encourage each member of the Parliamentary Inquiry (and the Parliament more generally) to read the full study, however, I shall briefly list some of the risks here.
- Contamination of air, soil and water through onshore gas mining activities is a public health risk
- A range of hazardous chemicals have been reported to be used in onshore gas mining activities in Australia, including ethylene glycol, and ingredient in anti-freeze, which collects in the kidneys in a crystalline form and can affect kidney function, as well as the nervous system, lungs, and heart.
- Although the so-called BTEX chemicals are banned as additives in Victoria, however, there is some evidence that these chemicals are released through the process of hydraulic fracturing.
- Health risks presented by the lack of uncontaminated ground water, for example, if Australia experiences another drought (which is almost certain at some point).
- Contamination of drinking water has been associated with onshore gas mining activities in the USA. In particular I wish to draw the Inquiry's attention to the following quote: "Residents of the town have been advised to use alternative sources of water for drinking and cooking, and have adequate ventilation when showering." This illustrates an unacceptable public health outcome.
- Volatile Organic Compounds (VOCs) are released at various stages in drilling and by compressors and other equipment. VOCs contribute to various health risks including impaired lung function.
- There are numerous mental health concerns for people living amongst gasfields. I draw the Inquiry's attention to the following quote from a psychiatrist discussing the mental health risks presented by onshore gas mining:

"Exploration is when the psychological stresses are first noticed in the community.... uncertainty starts to generate community anxiety.... The community starts to divide between the few who see it as an opportunity for an additional income and the larger number who hear the risks and see little in the way of benefits. Seismic surveys come and go with some damage to paddocks, heavy vehicle traffic ruining country roads, and noise. Drilling occurs with the same complications. The town takes on a different look...Lifetime plans are put on hold or cancelled. Property development in the area declines as a result of the general uncertainty. Rental property is more expensive...The gas company employs very few locals.

Exploration wells are fracked to optimize the flow and the wells are flared for months. There is no explanation of the risks and precautions taken in these fracking and flaring operations. There is no publicity given to any air or water testing. There have been at least two separate unpredicted explosions locally due to gas migration known to the community from just a dozen exploration wells...This results in understandable anxiety about safety risks. In Gloucester this first phase has taken 5 years so far and production has yet to commence."

Regarding risk mitigation, I particularly wish to draw the Inquiry's attention to the inappropriate management of waste water. The practices are often highlighted by industry figures as a way in which they demonstrate their responsible management of public health and environmental risks relating to water contamination. Below is a photograph from the Northern Star which shows that native wildlife can easily access these pools. This kangaroo later died as a result of poisoning from the pond.

(<http://www.northernstar.com.au/news/slippery-slope-to-death/1693669/>)



The practice of using holding ponds is extraordinarily dangerous. In times of rain, the ponds often overflow and run off into the surrounding area.

Moreover, failure rates of gas wells start at 6% in the first year and increase dramatically with each successive year. Abandonment and capping practices are poorly monitored. As with remediation of coal mines, the industry has no interest in spending additional funds on ensuring legacy safety of these sites. Once the profitable resource has been extracted, risk mitigation is of no consequence to the extractors.

- (3) the coexistence of onshore unconventional gas activities with existing land and water uses, including —
- (a) agricultural production and domestic and export market requirements;
 - (b) the legal rights of property owners and the impact on property values; and
 - (c) any implications for local and regional development, investment and jobs;

It is my view that coexistence is impossible between onshore gas mining activities and existing land and water uses, and as such I recommend to the Inquiry that all onshore gas mining activities are subject to a permanent ban. My reasoning for this is as follows.

Agricultural production is at risk mainly due to the depletion through overuse and likely contamination of water resources, most particularly of aquifers. Onshore gas mining requires an enormous amount of water which is then unavailable for agricultural production. Onshore gas mining has also consistently been linked to water pollution, particularly with methane and industrial chemicals.

Domestic and export market requirements will be much harder to fulfil as a result of an onshore gas mining industry. Stock will become contaminated through consumption of contaminated water and fodder. Beef and milk is produced around the world - Victoria's competitive advantage is entirely due to the quality and cleanliness of our product. This reputation, and our enormous food export business, cannot coexist with onshore gas mining activity.

The legal rights of property owners are already being infringed upon by the onshore gas mining industry. In particular, I note that there are potential legal issues regarding the impact of one landholder's decision to allow gas mining on their property, and how this will affect the livelihood of people around them. Reports from people living in gasfields in the United States of America indicate that landholders are generally treated very poorly by gas companies. I draw the Inquiry's attention to the following quote from a Wyoming farmer who has gas wells drilled on his property. (The full article can be read here and I strongly encourage the Inquiry, and indeed the full Parliament, to read this op ed: <http://www.smh.com.au/comment/coal-seam-gas-industrys-solution-to-underground-pollution-is-to-bury-the-proof-20140227-33m4t.html>)

"The pattern in the US is that when water contamination surfaces, the gas company pays an undisclosed sum of money in return for a non-disclosure agreement that prevents people talking about their water contamination. It is the gas industry itself, with its teams of lawyers and deep pockets, that actively prevents investigations into water contamination."

Another socio-legal implication of the industry is that strong community opposition should not be overruled for the sake of profiteering. More than 50 communities around Victoria have conducted comprehensive surveys of landholders and residents and consistently found strong opposition to gas mining, with results as high as 99% of residents opposing the development of a gas industry. This cannot be ignored.

Gas mining is an industrial and infrastructure-intensive industry, but one which hires very few workers. By contrast, agriculture and tourism provide a vast majority of jobs for rural and regional Victoria. These industries cannot coexist, so developing gasfields will produce a net loss in jobs, investment, and income, mainly from agriculture and tourism.

(4) the ability of potential onshore unconventional gas resources contributing to the State's overall energy sources including —

(a) an ability to provide a competitive source of energy and non energy inputs for Victorian industries;

(b) an affordable energy source for domestic consumers; and

(c) carbon dioxide emissions from these sources;

Onshore gas reserves are NOT needed for Victoria's energy future. There are a number of reasons for this that I shall outline.

1. Victoria should transition immediately to an entirely renewable energy supply future. This is possible and can be seen elsewhere, for example in many regions of Germany, and closer to home in South Australia. A renewable economy is a big ask but it is achievable, as long as the Parliament has the will to achieve it. Onshore gas resources are not renewable and as such should not form a part of Victoria's energy future. Therefore, development of this resource is wasteful and stupid.

2. It is clear that duplicating services unnecessarily is wasteful and inefficient. I put it to the Inquiry, that duplicating our energy network by having both an electricity supply grid and a gas supply grid is a poor decision, which duplicates regulation and maintenance fees. We should discourage people from relying on gas-based appliances, and encourage new structures to be built without gas connections.

3. Gas prices have increased dramatically in the last few years. This is set to increase as gas reserves run low. Unconventional gas mining is resource intensive and costly, due to its massive and invasive infrastructure requirements. It will never be as cost-effective as renewable forms of energy generation.

4. The majority of onshore gas reserves are earmarked for export. This will link Australian gas markets with an international market, which will force domestic consumers to pay international prices for our resource.

5. If the Inquiry is primarily interested in ensuring an affordable domestic gas supply, I would recommend to them legislating against export of gas products. There is adequate gas supplies for domestic consumption for several decades, over which period a transition to renewable energy sources will be easily possible.

6. Carbon emissions and other greenhouse gas emissions as a result of onshore gas mining will be extreme. Methane (CH₄) has a global warming potential (GWP) of approximately 20, i.e., it is 20 times more powerful than carbon dioxide (CO₂). Methane is the primary resource being collected in onshore gas mining activities, and as outlined above, it is prone to leak extensively both at the point of collection and at other points where fractures have allowed it to escape, for example through groundwater, to the surface. There is strong evidence of methane clouds gathering over gasfields. For example, I draw the Inquiry's attention to the following quote from a media release from NASA (http://science.nasa.gov/science-news/science-at-nasa/2014/09oct_methanehotspot/):

"One small "hot spot" in the U.S. Southwest is responsible for producing the largest concentration of the greenhouse gas methane seen over the United States – more than triple the standard ground-based estimate....In each of the seven years studied from 2003-2009, the area released about 0.59 million metric tons of methane into the atmosphere."

The study also specifically notes that although this cannot be attributed to hydraulic fracturing, it should be attributed to "leaks in natural gas production and processing equipment". On this basis it is vital that the Inquiry understand that hydraulic fracturing is NOT the only objectionable element in onshore gas mining, but that all onshore gas mining activities cause massive leaks of greenhouse gases.

7. When methane is burnt to produce energy, for example in steel mills or in domestic heating appliances, a chemical process called oxidation occurs in which methane (CH₄) is converted into carbon dioxide (CO₂) and water (H₂O). So even when methane is not leaked during the mining process, and is properly collected, distributed, and consumed, it contributes a large amount of greenhouse gas emissions.

8. Industry figures recommend methane as a "transition fuel" between coal and a renewable economy. However this is unnecessary and serves only the interests of those who profit from these extractive industries. It is entirely possible to "leapfrog" this option and move from coal to renewables without first developing another highly polluting and destructive industry (i.e. gas).

(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;

It is my view that no amount of regulatory safeguards or resource knowledge requirements could possibly alleviate the dangers which have been consistently linked with onshore gas mining, both in Australia and overseas.

(6) relevant domestic and international reviews and inquiries covering the management of risks for similar industries including, but not limited to, the Victorian Auditor-General Office's report Unconventional Gas: Managing Risks and Impacts (contingent upon this report being presented to Parliament) and other reports generated by the Victorian community and stakeholder engagement programs.

I would draw the Inquiry's attention once again to the variety of sources that I have recommended to them throughout my submission.

In conclusion, I recommend once again to the Inquiry that the Victorian Parliament place a complete ban on all onshore gas mining activities, including all unconventional gas mining techniques. This is for a wide variety of reasons, ranging from economic, to environmental, to social and legal. In particular, my employment as a speciality barista is threatened by the onshore gas mining industry and the impact it is certain to have on the quality of Victorian dairy products.

I would like to thank the Inquiry for taking the time to read my submission.

Yours,
Nathan Noah Beecher Kelk
Melbourne, Victoria