Prince Edward Islanders Implore the Government of PEI to Ban Hydraulic Fracturing (Fracking) for Fossil Fuel within the new Water Act Legislation

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Background

The 2016 Water Act Public Consultation Report resulted in a number of general recommendations from participants. I agree with the general recommendation from participants found in the Water Act Public Consultation Report (WAPCR, 2016) that:

> *"A new* ***Water Act should provide a set of uniform guiding principles for*** *all government* ***decisions involving water*** *resources,* ***including, but not limited to prohibiting the practice of hydraulic fracturing ('fracking')****."*

To a layperson, this recommendation clearly puts an emphasis upon a need for water protection, which is clearly compromised without including a prohibition on the practice of hydraulic fracturing ('fracking') in the new Water Act for Prince Edward Island (PEI).

I agree with the National Farmers' Union, regarding water protection, as summarized in the WAPCR, 2016, to *"****ensure a permanent ban on hydraulic fracturing (fracking).****"*

I agree with Don't Frack PEI, as summarized in the WAPCR, 2016 regarding water protection in its call for legislation to ***"outright ban on hydraulic fracturing (fracking) in PEI."***

I agree with the PEI Food Security Network regarding water protection as summarized in the WAPCR, 2016, to *"****ban 'fracking' [hydraulic fracturing].****"*

I agree with the Coalition for Protection of PEI Water regarding water protection as summarized in the WAPCR, 2016, to *"****ban hydraulic fracturing (fracking).****"*

It is important to note the number of individuals and organizations represented by such groups whom are clearly opposed to fossil fuel development, including hydraulic fracturing which has deleterious effects in terms the health of people in our communities, in terms of significant land degradation and water supply degradation, severe water chemical pollution, unresolved wastewater issues (ie. – fracking wastewater may not be processed effectively in treatment plants due to the radioactive wastewater contaminants within flowback fluid that are not removable in current treatment systems, for example), exacerbation of climate change and hindrance of PEI's strategic climate change mitigation efforts. These issues and others, such as protecting wildlife from the toxicity of fracking wastewater tailing ponds, dealing with spills, etc., all fall within the department responsible for developing our Water Act.

A List of Some Organizations Supporting a Ban on Hydraulic Fracturing in the Water Act

By extension of the Water Act Public Consultation Report of May 2016, prepared by the Environmental Advisory Committee of the Government of Prince Edward Island, the following list identifies the ~40 groups in support of an explicit ban on hydraulic fracturing (also known as hydrofracking or fracking) for fossil fuel in Prince Edward Island:

1. Bedeque Bay Environmental Management Association: www.bbema.ca
2. Blue Dot PEI: www.bluedotpei.com
3. Central Queens Wildlife Federation: www.facebook.com/Central-Queens-Wildlife-Federation-176233499121866
4. Citizens' Alliance of PEI: www.citizensalliancepei.org
5. Cooper Institute: www.cooperinstitute.ca
6. Cornwall Area Watershed Group: www.cawg.ca
7. Council of Canadians – PEI Chapter: www.canadians.org
8. Canadian Union of Public Employees (CUPE PEI): www.cupepei.ca
9. Don't Frack PEI: www.dontfrackpei.com/web
10. Ellen's Creek Watershed Group: www.ellenscreekwatershed.ca
11. Environmental Coalition of Prince Edward Island: www.ecopei.ca
12. Food Exchange PEI: www.foodexchangepei.com
13. Friends of Covehead and Brackley Bay: www.fcbbwatershed.ca
14. Hunter-Clyde Watershed Group: www.hcwg.editme.com
15. Green Party of PEI: www.greenparty.pe.ca
16. Kensington North Watersheds Association: www.knwsa.com
17. Latin American Mission Program
18. Lot 11 & Area Watershed Management Group: www.lot11andarea.org
19. Medical Society of PEI: www.mspei.org
20. Morell River Management Coop: www.morellriverpei.com
21. National Farmers Union – District 1, Region 1: www.nfu-pei.ca
22. New Democratic Party of PEI: www.ndppei.ca
23. PEI Advisory Council on the Status of Women
24. PEI Association for Newcomers to Canada: www.peianc.com
25. PEI Council of People with Disabilities: www.peicod.pe.ca
26. PEI Food Security Network: www.peifoodsecurity.wordpress.com
27. PEI People First: www.chimp.net/charities/p-e-i-people-first
28. PEI Watershed Alliance: www.peiwatershedalliance.org
29. Pesticide Free PEI: www.pesticidefreepei.com
30. Richmond Bay Watershed Association: www.rbwa.ca
31. Save Our Seas and Shores PEI: www.saveourseasandshores.ca/category/placespeoples/pei
32. Sierra Club of Canada – PEI Chapter: www.sierraclub.ca
33. Souris & Area Branch of the PEI Wildlife Federation: www.souriswl.ca
34. South Shore Watershed Association: www.sswa.ca
35. Southeast Environmental Association: www.seapei.org
36. Stratford and Area Watershed Improvement Group https://sawig.wordpress.com/
37. Trout River Environmental Committee www.troutriverec.org
38. Trout Unlimited Prince County Chapter: www.troutunlimitedprincecountychapter.com

39. United Food and Commercial Workers: www.ufcw.ca
40. Wheatley River Improvement Group: www.wheatleyriver.ca
41. Winter River-Tracadie Bay Watershed Association: www.wintertracadie.ca
42. Women's Network PEI: http://www.wnpei.org

Discussion

In the spring 2017 consultations I heard, through a friend who attended the Charlottetown Meeting, that it was stated (I have not dug up the audio-clip to verify this verbatim) a "true ban" on hydraulic fracturing for fossil fuels is not possible as there are other departments aside from the Government of PEI's Department of Communities, Land, and Environment that are involved.

I then spoke to an individual who was in touch with another government employee the other day, and that representative stated (paraphrasing) that the Water Act is not the place for a ban as it is not simply water related. One could take that to mean that the ill effects of fracking are so widespread that the government cannot figure out which department should ban it.

The Liberal Party of Prince Edward Island has a significant majority government afforded to them by a minority of voters that cast ballots in favor of their legislative agenda and party platform, by way of the First-Past-the-Post System. As we consider the large number of people and groups calling for a ban on fracking, there is no ban proposed in the draft Water Act. It is up to our Liberal Government whether or not they will choose to listen to the people this time. Recently over 37 thousand Islanders participated in a public consultation process, known as a Plebiscite. Despite this massive engagement process also a public consultation process, the vast number of ballots cast successfully on Electoral Reform, whereas a clear popular support emerged calling for a change of our current electoral system, the people were ignored for some bizarre and unclear reason. Let us be clear that eligible non-voters ought not to hold any sway in the matter, and it is impossible to discern the will of those eligible non-voters on the issue.

It is too presumptuous to conclude the majority of non-voters must have been happy with the current system, one argument oft given for ignoring the Plebiscite/public consultation results. So, over 37,000 people voted successfully, 52.42% of them favored Mixed Member Proportional Representation, yet their desire for change was absolutely discarded in favor of the mere 42.84% of those whom expressed interest for the current system. Did government nullify results on a dubious assertion that most non-voters would surely have wanted what the lesser of the 37 thousand plus voters did? It all seems to be such utter nonsense. Therefore results of extensive public consultations with Islanders can be, and have been more or less ignored, by times as of late, upon no just or reasonable grounds from my perspective. And I have voted Liberal, Conservative, etc. All people should simply have their vote for a party and platform hold equal weighting within the Legislative Assembly of Prince Edward Island. The people appear to realize this far more clearly than do the politicians in power. At the risk of doing damage to my cause, it simply must be pointed out, that for those citizens like I who are reasonably engaged in public processes, we do expect that the values and viewpoints expressed repeatedly on critical issues become reflected in Legislation. To ban fracking, fortunately, should be a far less contentious issue than electoral reform is from the perspective of our legislators.

At any rate, I sincerely hope this sort of thing, ignoring when reasonably-minded people are rightly requesting things for the betterment of our Island community; that we are not snubbed. It should not happen again with respect to these consultative processes in regards the Water Act.

We ought to be legislating a fracking ban. There is unquestionably a desire to explicitly ban hydraulic fracturing (fracking) for fossil fuels (whether inland or offshore) on PEI. With respect to legislation and those who say it is not possible, it is simply nonsensical. All federal, provincial, and municipal governments/departments, companies, everyone essentially; not just provincial government departments; would simply adhere to any of the island's legislation. We can do this! It is a positive thing. We can protect the environment, our water, and our peoples' health by banning fracking now while we have the chance to through the new Water Act. We surely know there is an expressed popular will to do so.

The provincial government absolutely can legislate a ban on fracking in the Water Act. Banning fracking is going to be a political win, with significant benefits across the board for Islanders and very little downside; it offers a clear net-benefit. The societal will exists; we are virtually 100% behind our legislators on this issue as has been demonstrated time and time again.

Do not take my opinion that a legislated ban on fracking is doable within the Water Act. Our Premier Wade MacLauchlan earned an undergraduate Bachelor of Business Administration degree from the University of Prince Edward Island and went on to earn a Bachelor of Laws from the University of New Brunswick and a Master of Laws from Yale University. He worked as a law professor at Dalhousie University before becoming dean of the law school at the University of New Brunswick.

At the Environmental Forum organized by the Environmental Coalition of PEI in April of 2015, while running his election campaign, although Premier MacLauchlan did not definitively commit to a ban prior to public consultation, as other party leaders did, the Premier stated "a moratorium may come through the Water Act process." Now, if our Premier, a legal scholar in his own right, says we could implement a moratorium in the Water Act [despite "another department" obviously being responsible for mining/energy, and another for health/wellness, etc.] then I cannot see any legitimate reasons why we cannot instead implement permanently prohibit the practice. Other fracking bans are in place in other jurisdictions. The draft Water Act is an effective legislative means to a fracking ban, a process that will harm our water and more, most everyone on PEI prefers such a ban in order to protect our groundwater, among other reasons.

Through the consultation process we learned Islanders want a ban on fracking. We do not want a moratorium (temporary prohibition of the practice). The Premier was very clear articulating his desire to listen to the will of Islanders, and to develop meaningful legislation that reflects our views and values. I have a great deal of respect for our Premier, our Minister of Environment, and our MLAs, and implore our legislators to do the right thing. Please listen to Islanders on this issue by enacting a ban on fracking within the Water Act.

I respectfully, yet fundamentally disagree with the notion that an explicit prohibition on hydraulic fracturing for fossil fuels simply cannot be put in place within the new Water Act for PEI. If the argument there are other departments involved so it cannot be done is being put forth

as rationale for the exclusion of a fracking ban within the Water Act, this suggests to me we have a dysfunctional problem of so-called "silos" within our current government, and it seems quite nonsensical. Much of our existing legislation has implications across various departments. Legislation to ban fracking could be related to health of people in our communities, as the significant water contamination, evidence of groundwater contamination risks, air pollution problems; all legitimate health/safety/environmental concerns, as well there is much land degradation; significant water use, and each of these problems (and more) with high-volume hydraulic fracturing (or fracking) are related to the department that is primarily responsible for the development of our new Water Act.

Review of Scientific Literature Motivating the Need to Ban Hydraulic Fracking for Fossil Fuels on Air and Water Quality Protection, Leand Protection, Health, and Climate Grounds on PEI

The problems with unconventional natural gas development via high-volume slick-water hydraulic fracturing are well documented on Don't Frack PEI's website: www.dontfrackpei.com. Anyone can access over several hundred largely damning studies.

As examples of scientific literature found through Don't Frack PEI's website that may help to further motivate the Government of PEI to reconsider the implementation of a ban on hydrofracking within the Water Act, as a reasonable legislative means to a proper end that there is popular public support for, please see the following:

- Pennsylvania Department of Environmental Protection – at least 243 cases where private water supply was impacted by oil and gas activities: (http://files.dep.state.pa.us/OilGas/BOGM/BOGMPortalFiles/OilGasReports/Determination_Letters/Regional_Determination_Letters.pdf), and a related news article: (http://wivb.com/2014/08/28/243-cases-in-pa-where-fracking-contaminated-wells/).
- Physicians Scientists & Engineers for Healthy Energy – The *PSE Study Citation Database* organizes peer-reviewed journal articles on this subject shale gas and tight oil development, allowing users to access and cite bibliographic information from a growing library that has increased from 600 to over 1200 articles related on fossil fuel development involving hydraulic fracturing: (https://www.zotero.org/groups/pse_study_citation_database/items/).
- Concerned Health Professionals of New York – a compendium of 340 documents identifying problems with hydraulic fracturing: (http://dontfrackpei.com/web/wp-content/uploads/2014/07/CHPNY-Fracking-Compendium.pdf).

When one digs into the nitty gritty of the science on this issue, one quickly realizes that it is absurd not to ban fracking now on PEI. For one, because we are hoping to reduce our greenhouse gas emissions by at least the amounts laid out within our new energy and climate change mitigation strategies. Therefore we cannot allow fracking to ever happen here. All of these issues mentioned above, arguably fall well within the scope of our Department of Communities, Land, and Environment. Sure, there are other departments, health/wellness, and others, but it is like this with most any legislation. To implement a ban on hydro-fracking now in the new Water Act is a timely, effective legislative means to an end that Islanders definitely support.

Consider the practical synergies we could achieve by implementing an outright ban on hydraulic fracturing (fracking) for fossil fuels within the new Water Act. The Department of Communities, Land, and Environment is responsible for ensuring healthy communities, implementing sound land use policies, protecting our water, our air, and it is responsible for climate change mitigation. There is a whole team of staff dedicated to this issue of climate change mitigation alone. Given the vetted literature which highlights the problems of severe methane leakage into both the atmosphere and groundwater aquifers, and the unacceptably high greenhouse gas emissions over the lifecycle of unconventional natural gas development when utilizing the process of high-volume slick water hydraulic fracturing, it simply must be banned one way or another. Fracking must be banned to protect our health, our water, land, our air, our wildlife, and in order for the province to have any reasonable chance of meeting or hopefully exceeding our current GHG reduction targets as laid out in our current energy and climate change mitigation strategies.

Regarding climate change, the most recent National Inventory Report of Greenhouse Gas Emissions for PEI/Canada in 2016, for the year 2014, still used outdated global warming potentials (GWPs) for methane (CH_4), of 25 times more warming than CO2/unit of mass, integrated over a 100-year time frame. The US EPA, as of April, 2017, even under a Trump Administration and a Head of the Agency that has spent his career trying to dismantle the EPA, still the EPA shows that over 100 years, CH_4 has 28-36 times the GWP of CO2/unit mass, and at least 84-87 times the GWP as CO2/unit mass integrated over 20 years. The shorter timescale is most relevant to the protection of the Arctic sea ice which could disappear entirely by the late summers during the 2030s without aggressive emission controls of CO_2, and the far more potent short-lived warming agents such as CH_4 in particular, and black carbon (soot particles). Although the 100-year GWP is by far the most widely used, the IPCC itself drops this mini-bombshell in their 2013 report:

> ***"There is no scientific argument for selecting 100 years compared with other choices*** *(Fuglestvedt et al., 2003; Shine, 2009).* ***The choice of time horizon is a value judgement*** *since it depends on the relative weight assigned to effects at different times."*

We all know the 20 year timeline is most relevant to protecting Arctic sea ice to help mitigate a positive feedback loop that is occurring and enhancing global warming further, since the low-albedo ocean below will be uncovered faster with CH_4 leakage and black carbon flaring from natural gas development, and as this sea ice disappears, and the ocean then readily absorbs most wavelengths of light and radiates heat instead of reflecting almost all of the light back into space.

A below discussion was released by Don't Frack PEI: Wind Water Sun – Energy for the Long Run, March, 2013, with permissions from the journal Energy Policy by Jacobson et al. (2013).

Why Not Natural Gas?

Natural gas is excluded for several reasons. The mining, transport, and use of conventional natural gas for electric power results in at least 60-80 times more carbon-equivalent emissions and air pollution mortality per unit electric power generated than does wind energy over a 100-year time frame. Over the 10-30 year time frame, natural gas is a greater warming agent relative to all wind, water, and sunlight (WWS) technologies and a danger to the Arctic sea ice due to its leaked methane and black carbon-flaring emissions (discussed more below). Natural gas mining, transport, and use also produce carbon monoxide, ammonia, nitrogen oxides, and organic gases. Natural gas mining degrades land, roads, and highways and produces water pollution.

The main argument for increasing the use of natural gas has been that it is a "bridge fuel" between coal and renewable energy because of the belief that natural gas causes less global warming per unit electric power generated than coal. Although natural gas emits less carbon dioxide per unit electric power than coal, two factors cause natural gas to increase global warming relative to coal: higher methane emissions and less sulfur dioxide emissions per unit energy than coal.

Although significant uncertainty still exists, several studies have shown that, without considering sulfur dioxide emissions from coal, natural gas results in either similar or greater global warming-relevant-emissions than coal, particularly on the 20- year time scale (Howarth et al. 2011, 2012a, 2012b; Howarth and Ingraffea 2011; Wigley 2011; Myhrvold and Caldeira 2012). The most efficient use of natural gas is for electricity, since the efficiency of electricity generation with natural gas is greater than with coal. Yet even with optimistic assumptions, Myhrvold and Caldeira (2012) demonstrated that the rapid conversion of coal to natural gas electricity plants would "do little to diminish the climate impacts" of fossil fuels over the first half of the 21st Century. Recent estimates of methane radiative forcing (Shindell et al. 2009) and leakage (Howarth et al. 2012b; Pétron et al., 2012) suggest a higher greenhouse-gas footprint of the natural gas systems than that estimated by Myrhvold and Caldeira (2012). Moreover, conventional natural gas resources are becoming increasingly depleted and replaced by unconventional gas such as from shale formations, which have larger methane emissions and therefore a larger greenhouse gas footprint than do conventional sources (Howarth et al. 2011, 2012b; Hughes 2011).

Currently, most natural gas in Canada and PEI is not used to generate electricity but rather for domestic and commercial heating and for industrial process energy. For these uses, natural gas offers no efficiency advantage over oil or coal, and has a larger greenhouse gas footprint than these other fossil fuels, particularly over the next several decades, even while neglecting the climate impact of sulfur dioxide emissions (Howarth et al. 2011, 2012a, 2012b). The reason is that natural gas systems emit far more methane per unit energy produced than do other fossil fuels (Howarth et al. 2011), and methane has a global warming potential that is 72-105 times greater than carbon dioxide over an integrated 20-year period after emission and 25-33 times greater over a century period (IPCC, 2007; Shindell et al. 2009). As discussed below, the 20-year time frame is critical.

When used as a transportation fuel, the methane plus carbon dioxide footprint of natural gas is greater than for oil, since the efficiency of natural gas is less than that of oil as a transportation fuel (Alvarez et al. 2012). When methane emissions due to venting of fuel tanks and losses during refueling are accounted for, the warming potential of natural gas over oil rises further.

When sulfur dioxide emissions from coal are considered, the greater air-pollution health effects of coal become apparent, but so do the lower global warming impacts of coal versus natural gas, indicating that both fuels are problematic. Coal combustion emits significant sulfur dioxide and nitrogen oxides, most of which convert to sulfate and nitrate aerosol particles, respectively. Natural gas also emits nitrogen oxides, but not much sulfur dioxide. Sulfate and nitrate aerosol particles cause direct air pollution health damage, but they are "cooling particles" with respect to climate because they reflect sunlight and increase cloud reflectivity. Thus, although the increase in sulfate aerosol from coal increases coal's air pollution mortality relative to natural gas, it also decreases coal's warming relative to natural gas because sulfate offsets a significant portion of coal's CO2 -based global warming over a 100-year time frame (Streets et al., 2001; Carmichael et al., 2002). Coal also emits "warming particles" called soot, but pulverized coal in the U.S. results in little soot. Using conservative assumptions about sulfate cooling, Wigley (2011) found that electricity production from natural gas causes more warming than coal over 50 to 150 years when coal sulfur dioxide is accounted for. The low estimate of 50 years was derived from an unrealistic assumption of zero leaked methane emissions.

Thus, natural gas is not a near-term "low" greenhouse-gas alternative, in absolute terms or relative to coal. Moreover, it does not provide a unique or special path to renewable energy, and as a result, it is not bridge fuel and is not a useful component of a sustainable energy plan.

Rather than use natural gas in the short term, we propose to move to a WWS-power system immediately, on a worldwide scale, because the Arctic sea ice may disappear in 20-30 years unless global warming is abated (e.g., Pappas, 2012). Reducing sea ice uncovers the low-albedo Arctic Ocean surface, accelerating global warming in a positive feedback. Above a certain temperature, a tipping point is expected to occur, accelerating the loss to complete elimination (Winton, 2006). Once the ice is gone, regenerating it may be difficult because the Arctic Ocean will reach a new stable equilibrium (Winton, 2006).

The only potential method of saving the Arctic sea ice is to eliminate emissions of shortlived global warming agents, including methane (from natural gas leakage and anaerobic respiration) and particulate black carbon (from natural gas flaring and diesel, jet fuel, kerosene burning, and biofuel burning). The 21-country Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants recognized the importance of reducing methane and black carbon emissions for this purpose (UNEP, 2012). Black carbon controls for this reason have also been recognized by the European Parliament (Resolution B7-0474/2011, September 14, 2011). Jacobson (2010) and Shindell et al. (2012) quantified the potential benefit of reducing black carbon and methane, respectively, on Arctic ice.

Instead of reducing these problems, natural gas mining, flaring, transport, and production increase methane and black carbon, posing a danger to the Arctic sea ice on the time scale of 10-30 years. Methane emissions from the natural-gas system and nitrogen-oxide emissions from natural-gas combustion also contribute to the global buildup of tropospheric ozone resulting in additional respiratory illness and mortality.

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The following article comes just yesterday, courtesy of The Tyee, a Canadian news publication. (Source: https://thetyee.ca/News/2017/04/11/Methane-Leaks-from-Energy-Wells-Affects-Groundwater/). Yet more reasons to ban fracking and protect our water within the Water Act.

Methane Leaks from Energy Wells Affects Groundwater, Travels Great Distances, Study Confirms

By Andrew Nikiforuk April 11, 2017

A new University of Guelph study proves what many western Canadian landowners have long documented — that methane gas leaking from energy industry wells can travel great distances in groundwater and pose safety risks, contaminate water and contribute to climate change. The study, published in Nature Geoscience this month, also concluded that current monitoring for gas leakage, usually at ground level and adjacent to wells, is inadequate to detect contamination [1].

“Current surface and subsurface monitoring efforts of shale gas development are thus insufficient to meaningfully detect or assess methane impacts to atmosphere and groundwater,” the study found.

British Columbia’s floundering shale gas industry has drilled and fracked nearly 10,000 wells in northeastern B.C. over the last decade, causing more than 1,000 earthquakes in the region [2]. Impacts on groundwater are not being systematically monitored [3].

The study took a novel approach, said Aaron Cahill, lead author and groundwater researcher at the University of British Columbia.

“We asked if leaks occur from an energy well, what happens to the groundwater and where does the methane go, and nobody had looked at that before.”

Cahill and other scientists at Guelph’s Institute for Groundwater Research injected methane over a 72-day period into a shallow sand aquifer at Canadian Forces Base Borden in Ontario at a rate of about a cubic metre a day — a volume much less than actually recorded at many leaking oil and gas wells in Alberta and B.C.

Guelph researchers tracked the injected methane for more than eight months via monitoring wells as the explosive gas travelled through the ground, entered the atmosphere or dissolved into groundwater, causing subtle but important changes to water chemistry.

In an aquifer, bacteria can metabolize methane and generate undesirable byproducts such as hydrogen sulfide. Bacterial reactions can also bring about the release of trace elements, changing water quality and potentially rendering it undrinkable.

“We didn’t see a lot of methane reacting. It degraded at low rates. In other words, if a leak were to occur the methane wouldn’t go away too rapidly from the aquifer,” Cahill said.

Cahill also noted that the study covered only a short time period and used only small amounts of methane.

“For larger leaks over longer times and greater areas, these findings would indicate that the groundwater would likely become unusable,” he said.

Cahill said the distance travelled by the methane in a relatively shallow sand-based aquifer and complex interactions showed the importance of monitoring groundwater around energy developments. He also called for more research in different settings and adjustment in regulations.

Alberta, for example, only classifies a leaking well as “serious” when it leaks 300 cubic metres of methane a day [4], but the research showed extensive impacts on groundwater with a leak of just one cubic metre per day.

Methane leakage from tens of thousands of shale gas, coalbed methane, inactive and abandoned wells pose a major and costly environmental problem throughout North America where the energy industry has drilled more than 4 million holes since the 1850s [5, 6].

There are 1,500 inactive and leaking wells in Alberta's cities (some are in malls and playgrounds) and more than 150,000 abandoned or inactive wells in rural Alberta [7].

Reports of groundwater contamination are common throughout oil and gas regions in North America. In Pennsylvania alone there have been hundreds of cases of groundwater contamination from energy wells [8].

Although industry argues that shale gas wells are too deep to affect groundwater, most methane leaks come not from the production source or bottom of the well but from shallower geological formations closer to the surface of the well. Gas flows up then enters groundwater or the atmosphere via corroded, old or faulty seals.

Because all energy wells puncture the earth and caprocks, they often serve as effective pathways for the migration of methane, and other gases such as cancer-causing radon over time.

Phil Rygg, director of communications for the BC Oil and Gas Commission, said there were "some important learnings from the study" but that it only looked at how methane moves through beach sand in Ontario.

He added that "it did not examine how gas could move along a shale gas well and enter groundwater."

However, the researchers noted in their paper that methane will migrate much farther and faster in fractured sedimentary rock, like that found in northern B.C. and Alberta, compared to a sand aquifer.

Rygg said that a similar groundwater study is now being done by UBC and supported by Geoscience BC with technical input from the B.C. Oil and Gas Commission. Its goal is "to understand methane behaviour in the subsurface in northeast B.C., and includes drone and remote sensing research."

"The commission will continue to support research in this area, and supports the general recommendation for enhanced monitoring," he said.

Despite evidence of serious methane leakage into groundwater from energy wells, many regulators and energy companies have denied the scale of the problem, claimed the methane naturally migrated into the groundwater or was caused by bacteria [9].

But the study challenges those assumptions by showing how a methane leak actually behaves in an aquifer.

Moreover, the study found that methane leakage into groundwater can affect water over a large area and "is an equivalent, if not, more significant process relative to atmospheric emissions."

Once methane migrates into a pump house or basement it can be explosive in confined spaces.

"There has been no science-based groundwater monitoring using modern methods at fracking sites," said Beth Parker, director of the G360 Institute for Groundwater Research and a co-author of the paper [10].

"Our findings are evidence that prospects for insightful information obtained from such groundwater monitoring are good, which goes against the 'conventional wisdom' mostly based on speculation or intuition."

In recent years the chronic problem of methane leakage has been aggravated by hydraulic fracking, which causes more wear and tear on well plumbing and seals with intense pressures, shaking and well-banging seismic activity [11].

John Cherry, one of Canada's top hydrogeologists and one of the paper's authors, said the new study should put to rest any arguments that there is no point monitoring groundwater for methane contamination from energy wells "because it will move like little snakes in channels and you'll never find it."

"The study found that very small amounts of injected methane ended up having a large impact on the aquifer — the magnitude was huge, and the methane hung around for a long time."

No Canadian regulator has set up proper groundwater monitoring near shale gas facilities as recommended by a 2014 Council of Canadian Academies report on fracking.

"No regulator has yet done what we recommended," confirmed Cherry. Alberta doesn't have a protocol for investigating methane contamination of groundwater.

The Council of Canadian Academies report found that the fracking industry, the foundation of B.C.'s failing liquefied natural gas strategy, had marched ahead without credible baseline data, scientific knowledge and necessary monitoring and had put groundwater at risk [12].

Jessica Ernst, a landowner who is suing the Alberta government and Encana alleging negligence in the fracking of shallow coal seams more than a decade ago, welcomed the Guelph study as long overdue [13].

Ernst said she would include the study in filings to support her lawsuit alleging the government's "negligent investigation and cover-up of Encana's fracking practices when the company illegally fractured my community's drinking water aquifers and put us in explosive risk in our homes."

Ernst said that the water reservoir in her hamlet of Rosebud blew up in 2005 — an incident the local paper attributed to an "accumulation of gases" that seriously injured a county worker [14].

In a separate incident a year later, “Alberta rancher Bruce Jack and two industry gas-in-water testers were also seriously injured and hospitalized after industry’s leaking methane and ethane caused his water to explode,” said Ernst [15]. A 2011 Alberta Innovates report on the leak that identified industry contamination was never released to the Alberta public.

The Guelph study adds some cold and hard science to the growing debate about methane migration from oil and gas wells.

Nearly a half a dozen studies done by scientists at Duke and Stanford universities have consistently found elevated levels of methane in water wells near shale fracking operations but couldn’t always identify the source or the mechanism for contamination [16, 17].

Other studies have found chemistry changes in groundwater near energy wells.

A 2014 University of Texas study, for example, looked at 100 water wells in the heavily fracked Barnett Shale and found that approximately 30 per cent of the wells within 2.9 kilometres of gas drilling sites showed an increased amount of arsenic and other heavy metals.

An earlier 2013 University of Texas study suggested that elevated levels of strontium, barium, selenium and methanol in water wells near gas wells could be due to a variety of factors, including hydro-geochemical changes from lowering of the water table, or industrial accidents such as faulty gas well casings [18].

For decades, fracking technology patents filed by industry noted that “it is not uncommon during hydraulic fracturing for the fracture to grow out of the zone of productive interest and proceed into a zone of non-productive interest, including zones containing water [19].”

But industry has repeatedly dealt with abuses of groundwater by offering landowners money and demanding that they sign non-disclosure agreements [20].

In the absence of any credible groundwater monitoring, governments such as that of British Columbia can also claim, “There has never been a confirmed case of groundwater contamination in B.C. as a result of hydraulic fracturing [21].”

The Canadian Association of Petroleum Producers still maintains that “more than 215,000 wells have been hydraulically fractured in B.C., Alberta and Saskatchewan without a demonstrated impact on drinking water, according to regulators [22].”

B.C. Natural Gas Development Minister Rich Coleman denied that energy wells leak methane in 2014 [23]. In contrast, the BC Oil and Gas Commission does not deny this reality.

According to a report by three University of Waterloo engineers, more than 10 per cent of B.C.’s existing 20,000 active and abandoned wells leak [24]. In addition, some of the province’s shale gas wells have become “super emitters” of methane.

In recent years one energy company spent $8 million in northern B.C. to repair a badly leaking shale gas well.

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Concluding Remarks

Again, these issues of protecting people in our communities from health concerns due to air pollution, to provide water quality protection, to have sensible water use, to avoid needless land degradation, to avoid dealing with unnecessary water chemical pollution/toxic tailing ponds/toxic spills/unresolved toxic wastewater disposal problems from fracking, to improve/or not further hamper climate change mitigation efforts, and the responsibility to protect wildlife from contaminated wastewater tailing ponds, these are issues which fall squarely within the realm of our Government of Prince Edward Island's Department of Communities, Land, and Environment. There is no better time or department to address this issue legislatively, and as our Premier has stated, a fracking moratorium (or a ban) could be dealt with in our new Water Act.

During the spring of 2017 consultation process, 21 of 28 written submissions received as of April 11, 2017, have explicitly requested to ban hydraulic fracturing for fossil fuels (fracking). No doubt many presenters at the public consultations have also echoed their desire to ban this toxic, extreme, and unnecessary form of fossil fuel extraction as it poses unacceptable risks to our groundwater we depend on, among other problematic issues related to fracking and our watersheds, let alone our land, air, health, and our climate, etc.

At the Leaders Environmental Forum of April 21, 2015, our Premier spoke eloquently about the public consultation processes which would be in place throughout the development of our Water Act. He spoke of these as a chance to listen, gain useful insights, and to work collaboratively as Islanders to collectively develop proper legislation. I sincerely hope the Liberal Government of Prince Edward Island is able to see how much Islanders want a ban on hydrofacking, and that our government immediately takes action to ensure that hydrofracking never happens here, via our new Water Act Legislation.

At least about 40 well respected community organizations are in support of a ban on fracking, by extension of the WACPR, 2016 alone. Almost all of the written submissions in the spring 2017 have requested a ban on fracking. Many presenters have come out a second time around, and are wondering why a ban on fracking was not incorporated into the draft Water Act. The notion it cannot be done is simply untrue. A true ban on fracking can be incorporated as part of our Water Act.

I implore you, please listen to and respect the popular will of the people of Prince Edward Island whom have collectively and undoubtedly stated we are in support of a ban on hydrofracking within this Water Act.

Thank you for taking the initiative to develop a draft Water Act, for engaging in a public consultation process, and thank you in advance for your careful consideration of this submission and the input of other islanders and groups.

With best regards.