

To the Newfoundland and Labrador Hydraulic Fracturing Review Panel,

The Western Environment Centre (WEC) is a charitable, non-profit, non-governmental organization based in Corner Brook. We are an organization geared towards promoting environmental awareness and engaging communities in environmental issues. As such, we have compiled the following submission for the NLHFRP in a manner which we feel best represents the interests and concerns of West Coast communities and holds long-term community and environmental sustainability as a core concern.

This submission was completed by a number of WEC members and board members. It focusses on eight key elements, all of which pertain to subjects within the panel's terms of reference. These sections include: community engagement, socio-economic effects, air emissions, waste management, effects on ground and surface waters, wellbore integrity, chemical additives, and regulatory gaps. Some sections overlap somewhat in content as particular subjects are inevitably linked and cannot be avoided in their broad-reaching consequences (eg. fracking fluid disclosure regulations and deep well injection of wastewater). We have included our concerns, references to studies and cases of interest, as well as a number of recommendations which we sincerely hope you will consider.

1-Community Engagement:

As a grassroots, volunteer-based organization, WEC is greatly concerned about the impact hydraulic fracturing will have on communities. There have been a number of disturbing cases in North America where the public health and interests of affected communities were not adequately addressed. Pennsylvania in particular has been the site of a significant and non-anomalous number of problems, chiefly the town of Dimock. These problems are documented in the balanced study by Tom Wilber, *Under the Surface: Fracking, Fortunes, and the Fate of the Marcellus Shale* (included in references).

In these instances, when methane from the fracking operations began to compromise the water quality of residents' homes, it became very difficult for the residents to achieve redress. There is also the case being brought forward before the Supreme Court of Canada, by Jessica Ernst of Rosebud, Alberta, because of her difficult experiences with the environmental regulator and with Encana Corporation. That is not to say that any given energy company would be uncooperative in the event of an unforeseen problem or accident, but there are many documented risks associated with fracking and the ability and financial means of small communities to attain compensation or redress is severely limited.

Given this industry/community history, there are particular aspects of the regulatory and governance landscape in Newfoundland which we find troubling with respect to community engagement and wish to further outline. In particular, we are concerned about the lack of meaningful community participation during the review process, and this concern was part of our previous submission to Minister Derrick Dalley in regards to the panel composition and terms of reference. We have included this letter in our submission for reference.

Restrictions on public feedback

There are currently only two public consultations scheduled for all of Newfoundland and Labrador. In contrast, the Wheeler Panel conducted eleven public consultations in Nova Scotia, which has a much smaller total area and far fewer obstacles to travel in the region. It is not reasonable to expect that all citizens will have a chance to voice their input given this format. Many citizens will be unable to travel such great distances due to work, mobility issues, income, or a variety of other reasons. The lack of public consultations is indicative of the overall lack of meaningful public engagement.

We are concerned that requiring written submissions will decrease the amount of feedback that the panel receives. Many people are not comfortable with writing and will be discouraged from participating. Others simply do not have the time or the resources to make a written submission. Aboriginal tradition is one of verbal storytelling, and requiring a written submission in order for members of the Aboriginal community to be able to present is unacceptable. The lack of proper Aboriginal representation on the panel is glaringly obvious, and was raised in our earlier letter as well.

Legitimacy of public opinion

WEC sincerely hopes that the review panel does not dismiss feedback from citizens who are unable to submit written responses or to disregard this feedback as unimportant. Not everyone holds professional credentials and extensive academic experience relevant to hydraulic fracturing. This does not mean that the arguments presented by these people are not valid. Often, the general populace gets stigmatized as being emotionally driven, irrational, uninformed and unable to see the big picture. Scientists have known for a very long time that regular citizens are quite adept at assessing risk. It is well documented and proven that industry often exploits this misconception to their advantage in an attempt to discredit opposition. Wright, Bolger and Rowe (2002) is essential reading on this topic and included in the reference list. WEC asks that the review panel hold all responses it receives, regardless of the format or formality, in equally high regard.

Social license to operate

The idea of social license and community permission is very important in sustainable development. The idea behind this concept is that the residents of communities who are most affected by the proposal should have the final say on whether it goes ahead. Social license exists in order to avoid environmental racism. Environmental racism occurs when environmentally degrading activities occur in areas of marginalized communities or low income areas. The benefits of the activity are reaped elsewhere, often in higher income urban areas. Negative externalities such as poor air quality, contaminated water and soil, industrial activity and cleanup are restricted to the community that can least afford to deal with it. The affected community often lacks the political or economic clout to take action. This is similar to the Core-Periphery theory of urban planning.

Both Canadian provinces which have fracking bans in place have stated that in order for the bans to be lifted, community permissions would have to be obtained and proven. In stark contrast to New Brunswick and Nova Scotia, Newfoundland and Labrador has not taken the concept of social license seriously. In fact, Newfoundland and Labrador has failed entirely to take measures which

include affected coastal communities in the public consultation phase. WEC recommends that before any activity is considered, a clear process needs to be developed which would determine if community permission exists.

Involving communities in the discussion

An excellent way to involve communities in a meaningful way to is use the integrated planning approach. Integrated planning is now relied on heavily in wildlife management and a variety of other sectors. The idea is to look at a proposal or problem and first determine all of the various stakeholders which could be affected by any change. Integrated planning strives to bring together numerous stakeholders with the goal of reaching an agreeable solution as opposed to simply drawing from experts in one field. An early example of successful integrated planning would be the reintroduction of wolves to Yellowstone National Park. Integrated approaches reach solutions which are agreeable to all parties. When integrated approaches are used, community buy-in to the resolution is much higher and, as a result, the success rate is higher as well. Hydraulic fracturing would be a good candidate for an integrated approach as a broad range of stakeholders including the tourism industry, Aboriginal peoples, fisheries, and environmentalists could have input in actual decision making as opposed to letter writing. An integrated approach should be considered by the panel.

2-Socio-Economic Effects

It is true that in some regions and communities, fracking has brought some economic benefits. For example, hotels tend to see lower vacancy rates because of the work teams that must come into the community to construct the well pads. However, these economic benefits have shown to be short-term at best. We draw your attention to a recent study of the limited job benefits associated with fracking. The report was conducted by the Multi-State Shale Research Collaborative and released in November 2013 (see Mauro et al., 2013). The report examines shale development in six states in the Marcellus and Utica Shales, states such as Pennsylvania and West Virginia. The report argues that the job prospects were overstated by the proponents. Moreover, the actual jobs generated fell far short of what had been projected, primarily because fracking is a capital-intensive industry, not a labour-intensive industry; most of the labour involved is associated with the construction of the well pads. It is true that shale gas development insulated some of these states from the worst effects of the economic downturn that began in 2008. However, in the longer term, the economic benefits from fracking have proven to be elusive.

It is our considered opinion that the many problems associated with fracking, as well as the risks, do not counterbalance the temporary and, in the end, insignificant economic benefit of fracking. Fracking will not provide the long-term, sustainable economic stimulus that the West Coast of Newfoundland needs.

3-Air Emissions:

Also of considerable concern with fracking operations is the air pollution that results from the operation. One can cite not only the off-gassing of fugitive methane gas from the wellbore as well as

the diesel emissions from the generators and the trucks, but also the more dangerous chemicals that have been found. There have been studies of volatile organic compounds (VOCs) in the emissions and many of these chemicals (e.g. benzene, toluene, ethylbenzene, and xylene) have been shown to have adverse effects on public health. For example, benzene is a known carcinogen and toluene is a neurotoxin. Also, as the fracking chemicals are stored in open-air ponds, the chemicals can vaporize and become airborne which results in a further negative impact on air quality.

One can consult the database prepared by the group Physicians, Scientists, and Engineers for Healthy Energy, who are mostly professors at Cornell University. This formed part of the background to the ban on fracking that was implemented in New York State. The report compiles recent peer-reviewed studies on the effects of fracking, mainly on public health. In its review of 22 studies on the effects of fracking on air quality, it was discovered that 21 out of 22 of these studies documented “elevated concentrations of air pollutants.”

4-Waste:

It is widely recognized that disposal of hydraulic fracturing wastewater is perhaps the most troubling issue confronting the fracking practice with respect to water contamination risk and public health/environmental safety. Rozell and Reaven (2012) found that the worst-case scenario for contamination via fracking wastewater disposal was far greater than the other examined pathways including transportation, well casing failure, fracture migration and drilling site spills. There remain a number of unresolved issues surrounding how companies dispose of fracking wastes which are particularly troubling when examined from the Newfoundland perspective.

It is clear from the outset that possible options for adequate disposal of fracking wastewater are not only severely limited in Newfoundland, but riddled with potential risk and high uncertainty. It has been established that municipal wastewater treatment does not have the capacity to handle the complex and hazardous wastewater produced by fracking operations (CHPNY, 2014; Rozell & Reaven, 2012; Wheeler et al., 2014). Despite its widespread use, inadequate geology has deemed the practice of deep well injection unsuitable in many areas including much of the Marcellus Shale formation (Rozell & Reaven, 2012) and Nova Scotia (Wheeler et al., 2014). With the Green Point Shale formation being characteristically complex and rife with scientific uncertainty (Hinchey et al., n.d.), we fear that this method cannot be relied upon as a viable option in Newfoundland. Reuse of wastewater is an increasingly popular practice in the industry. While this may decrease source demand for water, it does not eliminate the need to treat highly toxic waste at the end of operation which, in the case of wastewater reuse, will be more concentrated (Wheeler et al., 2014).

Newfoundland’s dispersed and isolated geography within the province and its distant removal from the mainland may necessitate the trucking and/or shipping of waste materials over large distances. This is a very worrisome prospect as it would not only increase truck traffic and the associated negative impacts on communities and infrastructure, but it would add another pathway of possible contamination and increase the extent and probability of contamination risk.

In addition to the severe limits of adequate disposal methods on the island, it is important to also consider how Newfoundland’s regulatory framework might confront a history of industry negligence and misconduct. CHPNY (2014) noted many cases of company non-compliance with wastewater treatment regulations which resulted in environmental and public health violations. This

ranged from over 300 uses of illegal substances such as diesel in fracking fluids to the unreported and illegal disposal of wastewater in municipal sewer systems. Concerns raised in Nova Scotia regarding overflowing containment ponds and habitat contamination cannot be ignored so close to home (Wheeler et al., 2014). In addition, CHPNY (2014) also brought attention to numerous cases of misinformation and inadequate testing, monitoring and reporting not only by oil and gas companies but by US government agencies as well. We firmly believe that industry self-monitoring is a highly inappropriate means of ensuring public and environmental safety.

While fracking fluid constituents is covered in a later section, some reference to the possible contents of wastewater cannot be avoided. Issues around fracking fluid content disclosure already complicate the process of regulating and safely dealing with potentially highly toxic material. The possibly unique nature of flowback water from each well further compounds the uncertainty. This results from the site-specific characteristics of the parent rock and the substances which may be liberated. In addition to such worrisome materials as NORM's (naturally occurring radioactive materials), high salt content in flowback can be very difficult to treat and contributes to equipment corrosion and the degradation and permeability of containment ponds (Wheeler et al., 2014). This is a great worry considering many of the shale units of Western Newfoundland are marine deposits and will likely create briny wastewater (Hinchey et al., n.d.).

Newfoundland is a relatively underpopulated region with the West Coast hosting many small communities dealing with infrastructural problems and water issues as it is. On March 31st, 2014, 219 boil water advisories were in effect which impacted 162 communities in the province (NL Dept. Env. Cons., 2014). In the 2013/2014 year, 2556 water quality exceedances were recorded in the province including 270 for trihalomethanes and haloacetic acids (NL Dep't Env. Cons., 2014). Some private residences do not acquire water from protected public water supply areas and must orchestrate their own water quality monitoring and maintenance. This may be a vital issue in the more remote areas where fracking may occur.

Without the stability of sound infrastructure, baseline knowledge and adequate systems of monitoring/reporting/emergency response, it is impossible at this time to consider the West Coast of Newfoundland capable of dealing with hydraulic fracturing wastewater and the inherent risks associated with an accident or spill. In addition, further shortfalls currently face Newfoundland's ability to deal with fracking waste including a lack of viable and safe options for wastewater disposal on the island, inadequacies of the regulatory framework, an absence of suitable, third-party, standardized monitoring and enforcement capacity, and a worrying history of industry negligence and incompetency with respect to safe practice and transparency.

5-Surface and Ground Water:

In addition to the serious risks to public health and environmental safety discussed in the previous section on waste disposal and treatment, there remain other pathways for surface and ground water contamination as a result of the hydraulic fracturing process. We wish to urge the panel that the precautionary approach must prevail when contamination could impact drinking water sources or important wildlife habitat.

There are two main sources of contaminants that can degrade the quality of surface water and shallow groundwater. These include above ground sources as well as subsurface sources below the

groundwater resource. Risks to surface water resources and shallow groundwater as a result of fracking can occur due to accidental release of wastewater and fracking chemicals above ground (for example spills at the well pad). A further threat to ground water is natural gas leakage as a result of improperly sealed well casings or casings that have structurally deteriorated over time. Additionally, the infrastructure and processes used in fracking can cause changes to the natural hydrology resulting in vertical fractures along faults and fracture zones. This can allow upward movement of natural gas or saline water creating another potential avenue for groundwater contamination. Upward movement of contaminants can also happen along naturally existing pathways in the surrounding rock. Over time such migration can lead to cumulative detrimental effects on ground water resources.

Currently there is a lack of research on the possible consequences of hydraulic fracking on the specific environment of this province as well as a lack of baseline data upon which to make comparisons. The lack of transparency in many jurisdictions over what specific chemicals are used as additives in the fracking process warrants further concern. As a result, predictions about risks may be unreliable and in such a climate of uncertainty it would be unwise to disregard the known potential avenues for surface and ground water contamination that can result due to fracking.

6-Wellbore Integrity:

Failures of well bore integrity are one of the obvious concerns of hydraulic fracturing. The following section comments specifically on this topic because a faulty well casing can provide a major pathway for some of the previously discussed modes of water contamination. Despite industry's assurances to the contrary, grave concern is warranted. Some key examples are provided to illustrate this point.

Northrup (2010) points out that "well casing failures have already been documented in the Marcellus shale, in Pennsylvania, and in Garfield County, Colorado. The Pennsylvania Department of Environmental Protection recently fined Cabot Oil & Gas for violations on wells drilled in the Marcellus shale near Dimock, Pennsylvania. Of 62 wells drilled, Cabot was cited or fined on 32 of them, 8 of which polluted 10 local water wells."

Ingraffea et al. (2014) found that "operator-wide statistics in Pennsylvania show that about 6-7% of new wells drilled in each of the past three years have compromised structural integrity." The final report on the risks of hydraulic fracturing in the EU lists the following as one of the items under *main causes of impacts and risks*: "The challenge of ensuring the integrity of wells and other equipment throughout the development, operational and post-abandonment lifetime of the plant (well pad) so as to avoid the risk of surface and/or groundwater contamination," (Bloomfield, 2012).

Considine et al. (2012) reviewed all the notices issued by the Pennsylvania Department for Environmental Protection between 2008 and 2011 in relation to incidents at shale gas extraction sites. The 2,988 notices issued related to 845 environmental events, of which 25 were considered to be major events. Six events were not fully mitigated, of which two related to contamination of groundwater. The causes of these events were linked to inadequate well casing. It is clearly well-established that the integrity of well casings is not something we can take for granted. Human error is certainly something no industry has ever been able to fully rule out.

In addition to the immediate concern of casing failure during fracking operations there is also the long term integrity of decommissioned well bores to consider. CHPNY (2014) summarizes that

“few studies have considered the very-long-term fate (“>50 years”) of wellbore systems.” With re-injection of waste water into abandoned wells being one of the suggested waste management strategies, the long-term integrity of these well casings becomes an important question. This concern is echoed in the final report of the Quebec review of 2014 where the authors mention the “incapacity of the industry to guarantee the long-term integrity of gas wells” as one of their arguments to not allow hydraulic fracturing operations (Québec Bureau, 2014).

Years after operations would have ceased in our communities and with the companies long gone, the burden of monitoring and cleanup would fall towards the taxpayer. Long-term effects of wellbore failure would only be noticeable upon contamination of the surrounding environment which is simply too late.

7-Chemical Additives:

The chemical composition of the fracking fluid and the enriched flowback water causes grave concerns in the health community (as indicated in CHPNY, 2014). Some people argue that the chemicals are insignificant because they only comprise 0.5% of the overall fracking fluid. Put into context, this can mean 0.5% = 50.000 – 220.000 liters (2-6 full tanker trucks) of chemicals (not fracking fluid) per well (Off. of the Aud. Gen. of Canada, 2012)

The regulatory framework thus far has been entirely insufficient to force full disclosure of the chemical composition of many of the fracking fluids and the US House of Representatives Committee on Energy and Commerce has identified 2,500 hydraulic fracturing products containing 750 chemicals in use between 2005 and 2009 in the US. These included 29 chemicals that were known human carcinogens, regulated under safe drinking water legislation or listed as hazardous air pollutants under clean air legislation (Bloomfield, 2012). The final report to the EU also lists one of the main risks to be “the potential toxicity of chemical additives and the challenge to develop greener alternatives,” (Bloomfield, 2012).

“In a peer-reviewed study, NIOSH partnered with oil and gas operators and service companies to evaluate worker exposures to, and internal uptake of, volatile organic chemicals at six sites in Colorado and Wyoming where wells were being prepared for production. The study found benzene in the urine of wellpad workers.” (CHPNY, 2014).

Underscoring the dangerous nature of chemicals used in fracking operations, the National Institute for Occupational Safety and Health reported that at least four gasfield workers have died since 2010 from acute chemical exposures during flowback operations and warned that flowback operations can “result in elevated concentrations of volatile hydrocarbons in the work environment that could be acute exposure hazards,” (CHPNY, 2014). The agency further noted that such volatile hydrocarbons “can affect the eyes, breathing, and the nervous system and at high concentrations may also affect the heart causing abnormal rhythms.”

But these are not only worries of the US. In a closer context, the Quebec Center for Environmental Law obtained, in March 2013, a complete list and data on products used by 5 companies in Quebec. Among this list were:

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| 1. Ferrotrot 880 (iron sequestrant): | possible carcinogen to humans |
| 2. CI-27 (corrosion inhibitor): | optic nerve damage, kidney damage |
| 3. D-3 (non-emulsifier): | central nervous system depressant |
| 4. AI-275 (corrosion inhibitor): | with formaldehyde, carcinogen to humans |
| 5. FE-1 (flow back enhancer): | irritant to respiratory tract |

(full list included in attached documents—“Documents accès à l’information gaz de schist”)

Chemical composition is not only worrisome from a pure health perspective. In case of emergencies like spills or fires, our emergency personnel need full disclosure of the chemical composition of the liquids they are dealing with. This is necessary in order to perform their job in the best possible manner, but also to protect our emergency personnel from potentially hazardous materials.

This industry is not merely proposing to use these chemicals in a closed industrial process with proper disposal. This industry proposes to inject several tanker trucks of these chemicals into our environment per well, fully knowing that not all of it is recoverable. In addition to this, they are even suggesting to use abandoned wells as a possible waste management solution to this toxic mix of chemicals. As stewards of the environment we categorically reject both of these ideas. They are neither environmentally responsible, nor sustainable, particularly not in the geological context of the West Coast of Newfoundland.

8-Regulatory Gaps:

Lack of a clear chief regulatory body

The C-NLOPB is the main regulatory body for the bulk of Newfoundland and Labrador’s oil and gas projects. However, the mandate and role of the C-NLOPB is not clear if shore-based drilling would be included. Furthermore, C-NLOPB has a dual mandate not only of ensuring operators meet Atlantic Accord Statutes, but is also tasked with promoting exploration and “maximum hydrocarbon recovery.” It is a conflict of interest to both regulate an industry and attract interest, as the fewer the regulations the more appealing an industry.

The C-NLOPB states on its website that it has operators which are responsible for the protection and safety of the environment – that this is not something the C-NLOPB does. WEC would like to know what regulatory body will be directly responsible for environmental protection and monitoring. The public deserves to know—with a high degree of confidence—that someone is keeping a watchful eye on human and ecosystem health.

Need to tighten federal and provincial regulations

Under the list of pollutants monitored by Environment Canada, Fracking fluids have not been included due to the low individual concentrations. There are no measures in place to monitor the cumulative effects of these toxins, determine any levels of bioaccumulation, or their long term effects on environmental and human health.

In theory, Environment Canada could prohibit some chemicals from being used in fracking fluid. This has not been done. Health Canada is compiling a list of high priority substances, but they estimate that it will not be completed until 2021 at the earliest. It would be very premature to allow fracking before our top scientists and doctors have finished determining what toxins we should be cautious of.

Provincially, there is no single agency responsible for overseeing fracking operations. Possible effects would fall under a multitude of acts and regulations administered by a slew of different departments. Since hydraulic fracturing has not been done in this province there was never a need to develop a specific set of regulations such as has been done in New Brunswick.

It is clear that our federal and provincial agencies are not doing enough to ensure that hydraulic fracturing will be conducted safely. We need to strengthen existing regulations as well as develop entirely new ones before we even consider having enough regulatory oversight to continue.

Overlapping legal jurisdictions

The governance structure of Canada can complicate issues when local governments are not in agreement with federal or provincial policies. In Canada, natural resources are the responsibility of the province except in special cases. Nova Scotia and New Brunswick are examples where a province wide ban or moratorium exists. Provincial laws generally override regional or municipal laws. This means municipalities might be powerless to resist development even when the residents do not want it. Zoning regulations are another option but in many cases zoning changes are subject to provincial approval. A similar problem exists in the United States, where some states have fracking bans, and some cities have bans in states where fracking is allowed.

These legal uncertainties can create conflict and animosity between different levels of government. There needs to be more clarification on these issues, as well as the issues in the next subsection.

Cleanup responsibility and limited liability

Operators are typically held responsible for any damage caused during exploration or extraction. However, a limited liability usually exists. The total cost of damages can quickly exceed the limited liability. Some companies take it upon themselves to foot more of the bill, but there is no legal obligation to do so. In the unfortunate event of a disaster, who is responsible for cleanup? Will the province or the municipality be stuck with the bill? Once the operator is no longer working a site but some damage occurs such as seepage, will the operator still be responsible?

The taxpayers of the province, especially affected communities, cannot afford to be put at such high levels of risk.

Other regulatory gaps

Other areas where legislation is either inadequate or non-existent include: wastewater treatment/disposal/monitoring, monitoring drinking water, charging and tracking of water use, emissions tracking, long term health studies, cumulative effects monitoring, and effects which occur from events under the threshold for mandatory reporting. These are examples only and are in no way meant to be an exhaustive list of all regulatory gaps.

Conclusion:

The above information outlines our current major concerns and some recommendations with regard to the potential development of hydraulic fracturing in Western Newfoundland. The available evidence of technical failure and unpredictability, regulatory inadequacies and incompetence, industry negligence, cases of environmental and public health damage, and the absence of long-term socio-economic benefits paint a bleak picture for potential fracking developments. While these cases may not proportionally represent hydraulic fracturing activity around the world, they provide information about the negative possibilities which *may* happen. Given the severely lacking information about long-term effects of fracking and related activity, and the absence of baseline data from Western Newfoundland, what *may* happen should be regarded with extreme diligence and a precautionary approach should be taken. It is therefore the position of the Western Environment Centre that a ban be put in place in the province of Newfoundland and Labrador on hydraulic fracturing development until adequate scientific evidence can ensure its relative safety for environmental and human health and sustainability.

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