Jackson, Vickie ENV:EX

From: Do, Nhi ENV:EX
Sent: Tuesday, May 15, 2012 4:39 PM
To: Zacharias, Mark ENV:EX
Cc: Gooderham, Coleen E ENV:EX; Jackson, Vickie ENV:EX
Subject: MATERIALS: HEALTH: Jt Ministers' Mtg - Human Health Risk Assessment - Oil and Gas BN - May 16
Attachments: 926952 - Human Health Risk Assessment Phase 2 for Joint Ministers Briefing.docx; 926952 - Appendix A.docx

Importance: High

Hi Mark,

Attached are updated materials from the Ministry of Health for tomorrow's joint Minister meeting from 3:30-4:30 in the s.15

**NOTE - Kellie O'Brien has been included as MLA Pimm will now be participating in the meeting*

Thanks so much,

Nhi Do | A/Administrative Coordinator | Deputy Minister's Office | Ministry of Environment | Phone 250.387.9886

MINISTRY OF HEALTH
INFORMATION BRIEFING NOTE

Cliff: 926952

PREPARED FOR: Honourable Michael de Jong, QC, Minister of Health
Honourable Terry Lake, Minister of Environment
Honourable Rich Coleman, Minister of Energy and Mines
Honourable Blair Lekstrom, Minister of Transportation
Honourable Mary Polak, Minister of Aboriginal Relations and Reconciliation
– **FOR INFORMATION**

TITLE: Human Health Risk Assessment of the Oil and Gas Industry in Northeastern British Columbia – Phase 2

PURPOSE: To determine the next steps of Phase 2.

BACKGROUND:
Phase 1 of the risk assessment canvassed the public, local governments, First Nations, and other groups and individuals about their health concerns related to oil and gas activity (Appendix A). The associated Information Note and draft Media Release regarding release of the Phase 1 report includes a summary of the issues raised and is being lead by Government Communications and Public Engagement.

Phase 2 of the risk assessment is intended to look at the concerns raised in Phase 1 and conduct an independent review of existing research related to human health effects of the oil and gas industry and apply this information to northeastern BC.

The following excerpts from the original Phase 1 Request For Proposal (RFP) indicate expectations:

> A follow-up to this stakeholder and targeted public engagement project will be a human health risk assessment of the oil and gas sector based on scientific review, incorporating the subject areas identified in the engagements from this project. The human health risk assessment will also involve a review of the risk management measures (such as monitoring, regulation, industry practice, and compliance) currently applied to deal with public health risks. Following the human health risk assessment, recommendations may be made for improving areas of the current regulatory, monitoring and industry (operational) practice systems.
>
> There will be a public engagement process on the results of the human health risk assessment and management review.
>
> Proponents are advised that the subsequent work (human health risk assessment) to this project will apply the general framework outlined in the Framework for Environmental Health Risk Management.

The Minister of Health's recent statement in the House with respect to Phase 2 is as follows:

> **Excerpt from Hansard May 10, 2012 Hon. M. de Jong:** Just to give the member a bit of a chronology. The phase 1 report is done. The member may recall one of the members in the House asked about it a couple of days ago. I anticipate it being released in the next couple of weeks. What will happen now is we'll need to engage, and want to engage, the services of a third party to begin the process of compiling and assessing the scientific data on the basis of a set of terms of reference that are the result of the consultation that took place in phase 1. There may be some primary data collection, some air quality monitoring. But I don't want to suggest that there are going to be field laboratories set up across the northeast of the province. This will be relying

largely on the body of scientific data that is out there to assess what and where the risk exists. That's probably going to be an 18-month exercise.

DISCUSSION:

It has been proposed that a RFP be drafted requesting the services of a subject matter expert (university expert in the field) from BC to work with the Assistant Deputy Minister's Steering Committee (ADMSC) to draft the terms of reference for Phase 2.

s.13

NEXT STEPS:

1. Issue a RFP to hire an expert to work with the ADMSC on refining the Phase 2 terms of reference (2-3 months);
2. Determine funding model and availability of resources (2 weeks) to assist in scoping the terms of reference;
3. Confirm governance model for delivering Phase 2 (concurrent); and
4. Issue an RFP based on the results of the above (3 months to conclude).

Program ADM/Division	Arlene Paton, ADM, Population and Public Health
Telephone:	250 952-1731
Program Contact (for content):	Tim Lambert, Executive Director, Health Protection
Drafter:	Lidia Surman/Clyde Macdonald
Date:	May 15, 2012

File Name with Path: W:\Health Protection\Protection\BRIEFING NOTES\2012\926952 Human Health Risk Assessment Phase 2 - Next Steps\926952 Health Risk Assessment - next steps - April 30.docx

APPENDIX A

SUMMARY OF THE FASER BASIN REPORT – IDENTIFYING HEALTH CONCERNS RELATING TO OIL & GAS DEVELOPMENT IN NORTHEASTERN BC.

The report provides a balanced summary of the issues identified by stakeholders of northeastern BC. It takes a holistic and integrated approach in identifying the key issues of concern with over 300 unique comments or submissions. It summarizes what the Fraser Basin Council heard and is laid out in a very easy to read format. The report does not validate or analyze any of the issues identified, as this will be part of the Phase 2 Human Health Risk Assessment process. The report lays out a significant amount of background information for the reader to set the stage and provide an overall understanding of oil and gas development and history in northeastern BC.

A range of potential health issues have been raised – physiological, psychological and social/cultural – that relate to a range of sources. Some health issues, such as direct exposure to toxic emissions or contaminated water or food may be immediate and easily observed and measured, whereas others are less noticeable or difficult to substantiate, such as those from exposure to smaller quantities of toxins over time.

Based on respondents' concerns, the following seven theme categories were identified:

- Personal health issues;
- Environmental pathways of exposure;
- Related environmental issues;
- Changes to the community;
- Community service issues;
- Oil and gas operational issues; and
- Institutional framework issues.

The report also captured the respondents' suggested response to the issues they raised.

Personal health issues and environmental pathways of exposure: Although respondents recognize the contribution of oil and gas activity as a significant economic generator for northeastern BC, they may attribute personal health problems, such as asthma and bronchitis, cancer, stress and sleep deprivation, directly to exposure to oil and gas operations. Other examples of exposure concerns included exposure to hydrogen sulphide, contaminated water, diesel dust, and ingestion of adversely affected livestock and/or wildlife.

Related environmental issues: Some respondents expressed concerns about the risk of harm from incidents such as well-site accidents, pipeline leaks and spills, increased traffic, and noise and light pollution. Others were concerned about the health of ecosystems and the effect a contaminated ecosystem would have on their health and the health of their families.

Changes to the community and community services: Many respondents stated that rapid social and cultural changes could have effects on the socio-economic and demographic structure of their communities, resulting in increasing pressure on existing health care services, social and community services, and municipal and regional infrastructure.

Oil and gas operational issues: One of the most common issues raised was hydraulic fracturing and the perception that this activity could lead to seismic activity, water quality and quantity issues, or the potential to trigger sour gas releases.

Institutional issues: These include monitoring and compliance, regulation and enforcement, communications emergency response, and tracking and reporting of adverse health effects. Some respondents were dissatisfied by what they saw as insufficient information available to them from both the government and the oil and gas sector, and a lack of transparency with respect to specific oil and gas development activity.

Overall, the respondents appreciated having ample opportunity and options for providing input in Phase 1, they made it clear they wanted the momentum from Phase 1 to continue.

The concern of many respondents was uncertainty and not being fully informed of the extent and nature of possible long-term health effects on individuals and communities within close proximity of oil and gas operations. Some are frustrated and want some of their concerns resolved by the regulator (e.g., Oil and Gas Commission), the provincial government, Northern Health Authority, and the oil and gas companies.

Jackson, Vickie ENV:EX

From: Zacharias, Mark ENV:EX
Sent: Monday, May 14, 2012 2:58 PM
To: MacDonald, Cairine ENV:EX; Jackson, Vickie ENV:EX
Cc: Do, Nhi ENV:EX; Giddens, Kiel ENV:EX
Subject: For discussion at tomorrow's Roundtable: s.13 s.13

Importance: High
Sensitivity: Confidential

Cairine / Vickie

As I'll be calling into tomorrow's Roundtable can you bring copies of this spreadsheet for discussion with MTL? This will inform the Human Health Risk Assessment meeting with the four Ministers on Wednesday afternoon s.13 s.13 This way there should be no surprises unless MoH (who owns the BN) proposes something new.

Regards, Mark

HHRA Phase 2
s.13

Pages 8 through 11 redacted for the following reasons:
- -
s.13, s.17

Jackson, Vickie ENV:EX

From: Blonde, Sarah ENV:EX
Sent: Thursday, April 26, 2012 11:39 AM
To: Do, Nhi ENV:EX
Cc: Jackson, Vickie ENV:EX
Subject: FW: Joint Minister's Briefing - Health Human Effects of the Oil and Gas Industry next steps

Updated info (location and such). I've confirmed Mark Z to attend.

From: Jukes, Shaina HLTH:EX
Sent: Thursday, April 26, 2012 11:36 AM
To: Blonde, Sarah ENV:EX; Unwin, Holly L TRAN:EX; Flesh, Cindy ABR:EX; Gajda, Gail MEM:EX
Subject: FW: Joint Minister's Briefing - Health Human Effects of the Oil and Gas Industry next steps

Hi everyone, Please see below details and provide confirmation of attendees for your office. Thank you ☺

MEETING:
Lead: MoH Richard

Participants:
Minister de Jong
Graham Whitmarsh, DM
Richard Maksymetz, MA
Arlene Paton, ADM Population and Public Health
Tim Lambert, ED Health Protection Branch

Minister Coleman TBC
DM TBC
Staff TBC

Minister Lake TBC
DM TBC
Staff TBC

Minister Polak TBC
DM TBC
Staff TBC

Minister Lekstrom TBC
DM TBC
Staff TBC
Date:
Wednesday, May 16th
Time:
3:30pm-4:30pm
Location:
s.15
Confirmation:

Materials:
Updated materials to be provided closer to date
Contact:
Shaina Jukes

Shaina Jukes
Administrative Coordinator to the Honourable Michael de Jong, QC
Minister of Health| PO Box 9050 Stn Prov Govt Victoria, BC V8W 9E2
Phone: 250-953-3547| Fax: 250-356-9587| Hlth.Health@gov.bc.ca

---

From: Jukes, Shaina HLTH:EX
Sent: Wednesday, April 25, 2012 5:18 PM
To: Unwin, Holly L TRAN:EX; Flesh, Cindy ABR:EX; Gajda, Gail MEM:EX; Blonde, Sarah ENV:EX
Subject: FW: Joint Minister's Briefing - Health Human Effects of the Oil and Gas Industry next steps

Hi Ladies,

We have confirmed this meeting for Wednesday, May 16th 3:30pm-4:30pm I realize this does not work for everyone but that was very unlikely anyway. If your minister cannot make it please try and have your DM and staff attend.

I will forward details and location shortly and updated material when we receive it.

Thank you,
Shaina

Shaina Jukes
Administrative Coordinator to the Honourable Michael de Jong, QC
Minister of Health| PO Box 9050 Stn Prov Govt Victoria, BC V8W 9E2
Phone: 250-953-3547| Fax: 250-356-9587| Hlth.Health@gov.bc.ca

---

From: Jukes, Shaina HLTH:EX
Sent: Wednesday, April 25, 2012 11:36 AM
To: Jukes, Shaina HLTH:EX; Blonde, Sarah ENV:EX; Gajda, Gail MEM:EX; Unwin, Holly L TRAN:EX; Flesh, Cindy ABR:EX
Subject: RE: Joint Minister's Briefing - Health Human Effects of the Oil and Gas Industry next steps (Cliff 925687)

Good morning Ladies,

It discussed and agreed upon at the end of today's meeting that another meeting needed to take place in approximately 2 weeks time for further discussions. Can you all let me know if your ministers are available on either Monday, May 14th or Wednesday, May 16th for an hour between the times of 3:00pm and 4:30pm.

Again this meeting would be Ministers, DM's and an EA, MA or other staff as required by your office.

Thank you,
Shaina

Shaina Jukes
Administrative Coordinator to the Honourable Michael de Jong, QC

Minister of Health| PO Box 9050 Stn Prov Govt Victoria, BC V8W 9E2
Phone: 250-953-3547| Fax: 250-356-9587| Hlth.Health@gov.bc.ca

---

From: Jukes, Shaina HLTH:EX
Sent: Tuesday, April 24, 2012 11:08 AM
To: Blonde, Sarah ENV:EX; Gajda, Gail MEM:EX; Unwin, Holly L TRAN:EX; Flesh, Cindy ABR:EX
Subject: FW: Joint Minister's Briefing - Health Human Effects of the Oil and Gas Industry next steps (Cliff 925687)

Good morning Ladies,

Please find attached materials for tomorrow mornings meeting.

Shaina Jukes
Administrative Coordinator to the Honourable Michael de Jong, QC
Minister of Health| PO Box 9050 Stn Prov Govt Victoria, BC V8W 9E2
Phone: 250-953-3547| Fax: 250-356-9587| Hlth.Health@gov.bc.ca

Jackson, Vickie ENV:EX

From: MacDonald, Cairine ENV:EX
Sent: Monday, April 23, 2012 9:49 PM
To: Jackson, Vickie ENV:EX
Subject: Fwd: Bullets for MTL on Human Health Effects of the Oil and Gas Industry - Phase 1 Report

Forwarded to mo

Sent remote mode.

Begin forwarded message:

> **From:** "MacDonald, Cairine ENV:EX" <Cairine.MacDonald@gov.bc.ca>
> **Date:** 23 April, 2012 8:56:19 PM PDT
> **To:** "Giddens, Kiel ENV:EX" <Kiel.Giddens@gov.bc.ca>, "Loiacono, Sabrina ENV:EX" <Sabrina.Loiacono@gov.bc.ca>
> **Subject: Fwd: Bullets for MTL on Human Health Effects of the Oil and Gas Industry - Phase 1 Report**
>
> Sent remote mode.
>
> Begin forwarded message:
>
> > **From:** "Zacharias, Mark ENV:EX" <Mark.Zacharias@gov.bc.ca>
> > **Date:** 23 April, 2012 8:23:31 PM PDT
> > **To:** "Jackson, Vickie ENV:EX" <Vickie.Jackson@gov.bc.ca>
> > **Cc:** "MacDonald, Cairine ENV:EX" <Cairine.MacDonald@gov.bc.ca>, "Schultz, Fern ENV:EX" <Fern.Schultz@gov.bc.ca>
> > **Subject: Bullets for MTL on Human Health Effects of the Oil and Gas Industry - Phase 1 Report**
> >
> > Vickie:
> >
> > Cairine requested some bullets for MTL in prep for Wednesday's meeting with the four Ministers on the Human Health Risk Assessment:
> >
> > 1. The study did not uncover anything that wasn't already known regarding public perceptions on and experiences with O&G exploration and development
> >
> > 2. The process was well received by participants and many participants appreciated the opportunity to input into the process and be heard.
> >
> > 3. Staff are costing out options to proceed with Phase II of this work should Ministers direct that Phase II move ahead.
>
> 4. Phase II cost estimates range from $1M - $2.6M and staff are working on ways to bring these costs down.

5. MoH has a BN to support this meeting that will be shared with the MOs.

Regards, Mark
250-415-6466

Begin forwarded message:

From: "Zacharias, Mark ENV:EX" <Mark.Zacharias@gov.bc.ca>
To: "Lake, Terry ENV:EX" <Terry.Lake@gov.bc.ca>
Cc: "MacDonald, Cairine ENV:EX" <Cairine.MacDonald@gov.bc.ca>, "Jackson, Vickie ENV:EX" <Vickie.Jackson@gov.bc.ca>, "Loiacono, Sabrina ENV:EX" <Sabrina.Loiacono@gov.bc.ca>, "Giddens, Kiel ENV:EX" <Kiel.Giddens@gov.bc.ca>, "Standen, Jim ENV:EX" <Jim.Standen@gov.bc.ca>
Subject: Human Health Effects of the Oil and Gas Industry - Phase 1 Report

Minister:

As requested, please find attached the oil and gas Human Health Risk Assessment Phase I reports. These have not been released publicly yet (will be released shortly by MoH) but some key points:

- The study did not uncover anything that wasn't already known regarding public perceptions on and experiences with O&G exploration and development

- The process was well received by participants and many participants appreciated the opportunity to input into the process and be heard

- A meeting is being set up with the four relevant Ministers (including yourself) on next steps

- Staff are costing out options to proceed with Phase II of this work should Ministers direct that Phase II move ahead.

Regards, Mark
250-415-6466

Jackson, Vickie ENV:EX

From: Do, Nhi ENV:EX
Sent: Tuesday, April 24, 2012 10:53 AM
To: Giddens, Kiel ENV:EX; Loiacono, Sabrina ENV:EX
Cc: Blonde, Sarah ENV:EX; Przada, Jennifer ENV:EX; Jackson, Vickie ENV:EX; Lee, Bonnie ENV:EX
Subject: MATERIALS: Joint Minister's Briefing - Health Human Effects of the Oil and Gas Industry next steps

Good Morning,

The following materials have been uploaded to Minister's SharePoint:

Human Health Risk Assessment -..

HEALTH Decision Note




Human Health Risk Assessment -..
Human Health Risk Assessment -..
Human Health Risk Assessment -..
Human Health Risk Assessment -..

HEALTH Attachments 1-4

Human Health Risk Assessment -..

Phase 1 FINAL REPORT

These documents can be found in the following folder:

04 Apr 25 / Jt Ministers Mtg - Human Health Effects

Thanks so much,

Nhi Do | A/Administrative Coordinator | Deputy Minister's Office | Ministry of Environment | Phone 250.387.9886

From: Jackson, Vickie ENV:EX
Sent: Tuesday, April 24, 2012 10:14 AM
To: Giddens, Kiel ENV:EX; Loiacono, Sabrina ENV:EX
Cc: Przada, Jennifer ENV:EX; Blonde, Sarah ENV:EX; Do, Nhi ENV:EX
Subject: FYI: Joint Minister's Briefing - Health Human Effects of the Oil and Gas Industry next steps - material

Good morning-

Just so you have this soonest. See highlighting below.

Nhi will post to the Minister's SharePoint.

Regards,

Vickie

From: Zacharias, Mark ENV:EX
Sent: Tuesday, April 24, 2012 10:09 AM
To: Jackson, Vickie ENV:EX
Cc: MacDonald, Cairine ENV:EX; Schultz, Fern ENV:EX; Lee, Bonnie ENV:EX
Subject: Fwd: Joint Minister's Briefing - Health Human Effects of the Oil and Gas Industry next steps - material

Vickie: Heads- up that we just received this and had no input into note and that the BN recommends assigning costs to MoE. Furthermore, staff have not yet finished their analysis on costing out Phase II.

Regards, Mark
250-415-6466

MINISTRY OF HEALTH
DECISION BRIEFING NOTE

Cliff: 925687

PREPARED FOR: Honourable Michael de Jong, QC, Minister of Health
– FOR DECISION

TITLE: Human Health Risk Assessment Relating to Oil and Gas Development in Northeastern British Columbia Project Update and Approval of Next Steps

PURPOSE: To provide the final Phase 1 report, along with proposed next steps and a governance structure for Phase 2, including a funding proposal for the Human Health Risk Assessment of the Oil and Gas Development in Northeastern BC Project.

BACKGROUND:
The three phase project is to identify, explore and assess concerns about human health risks relating to oil and gas development in northeastern BC.

Phase 1: public engagement to inform the scope and terms of reference and identify concerns relating to oil and gas development.
Phase 2: a human health risk assessment based on findings from Phase 1 and a comprehensive scientific review of evidence.
Phase 3: reporting of findings to the Province, stakeholders and the public.

Fraser Basin Council was contracted to conduct Phase 1 of the Human Health Risk Assessment and to prepare a report based on the findings (report attached). This report describes the targeted public engagement process followed during Phase 1 and sets out issues of concern associated with possible human health risks, including concerns that relate to changes to land, air, drinking water, and food quality. The Fraser Basin Council contract concluded March 31, 2012.

In Phase 2, the focus of the project is to use the findings from the Phase 1 report to investigate and research the range of potential human health risks, within the context of environmental health, stemming from oil and gas development in northeastern BC.

DISCUSSION:
A brief summary of the Phase 1 report prepared by Fraser Basin Council is contained in Appendix A.

A Request For Proposal (RFP) for Phase 2 is being drafted and will be shared with the Ministries of Environment, and Energy and Mines. The goal is to assess the public health risks identified in Phase 1 and from other evidence and recommend best management practices to address health risks as they relate to oil and gas development in northeastern BC.

[redacted]

s.13, s.17

Approved/Not Approved
Michael de Jong, QC
Minister

Date Signed

Program ADM/Division	Arlene Paton, ADM, Population and Public Health
Telephone:	250 952-1731
Program Contact (for content):	Tim Lambert, Executive Director, Health Protection
Drafter:	Lidia Surman/Clyde Macdonald
Date:	April 24, 2012

File Name with Path: W:\Health Protection\Protection\BRIEFING NOTES\2012\925687 Human Health Risk Assessment Relating to Oil and Gas Development in Northeastern BC Project Update and Approval of Next Steps.docx

APPENDIX A

SUMMARY OF THE FASER BASIN REPORT – IDENTIFYING HEALTH CONCERNS RELATING TO OIL & GAS DEVELOPMENT IN NORTHEASTERN BC.

The report provides a balanced summary of the issues identified by stakeholders of northeastern BC. It takes a holistic and integrated approach in identifying the key issues of concern with over 300 unique comments or submissions. It summarizes what Fraser Basin Council heard and is laid out in a very easy to read format. The report does not validate or analyze any of the issues identified, as this will be part of the Phase 2 Human Health Risk Assessment process. The report lays out a significant amount of background information for the reader to set the stage and provide an overall understanding of oil and gas development and history in northeastern BC.

A range of potential health issues have been raised – physiological, psychological and social/cultural – that relate to a range of sources. Some health issues, such as direct exposure to toxic emissions or contaminated water or food may be immediate and easily observed and measured, whereas others are less noticeable or difficult to substantiate, such as those from exposure to smaller quantities of toxins over time.

Based on respondents' concerns, the following seven theme categories were identified:

- personal health issues;
- environmental pathways of exposure;
- related environmental issues;
- changes to the community;
- community service issues;
- oil and gas operational issues; and
- institutional framework issues.

The report also captured the respondents' suggested response to the issues they raised.

Personal health issues and environmental pathways of exposure: Although respondents recognize the contribution of oil and gas activity as a significant economic generator for northeastern BC, they may attribute personal health problems, such as asthma and bronchitis, cancer, stress and sleep deprivation, directly to exposure to oil and gas operations. Other examples of exposure concerns included exposure to hydrogen sulphide, contaminated water, diesel dust, and ingestion of adversely affected livestock and/or wildlife.

Related environmental issues: Some respondents expressed concerns about the risk of harm from incidents such as well-site accidents, pipeline leaks and spills, increased traffic, and noise and light pollution. Others were concerned about the health of ecosystems and the effect a contaminated ecosystem would have on their health and the health of their families.

Changes to the community and community services: Many respondents stated that rapid social and cultural changes could have effects on the socio-economic and demographic structure of their communities, resulting in increasing pressure on existing health care services, social and community services, and municipal and regional infrastructure.

Oil and gas operational issues: One of the most common issues raised was hydraulic fracturing and the perception that this activity could lead to seismic activity, water quality and quantity issues, or the potential to trigger sour gas releases.

Institutional issues: These include monitoring and compliance, regulation and enforcement, communications emergency response, and tracking and reporting of adverse health effects. Some respondents were dissatisfied by what they saw as insufficient information available to them from both the government and the oil and gas sector, and a lack of transparency with respect to specific oil and gas development activity.

Overall, the respondents appreciated having ample opportunity and options for providing input in Phase 1, they made it clear they wanted the momentum from Phase 1 to continue.

The concern of many respondents was uncertainty and not being fully informed of the extent and nature of possible long-term health effects on individuals and communities within close proximity of oil and gas operations. Some are frustrated and want some of their concerns resolved by the regulator (e.g., Oil and Gas Commission), the provincial government, Northern Health Authority, and the oil and gas companies.

APPENDIX B

Governance of Phase 2.

The following governance structure is recommended:

The Ministry of Health continues to lead the project with a similar governance structure as with Phase 1. Assistant Deputy Ministers from Ministries of Energy and Mines, Environment and Health, a senior executive from the Oil and Gas Commission (OGC) and possibly the CEO of the Northern Health Authority form a committee to review and provide input into the process and key decisions. This approach allows nimble and effective decision making with minimal administrative and overhead costs.

If this structure is adopted, it is further recommended that working and advisory groups of other key stakeholders be formed to work with the successful contractor, as the project gets underway.

No budget has been assigned to support the governance structures as it is assumed that each participating entity will cover their own costs. The secretariat costs will be absorbed within the Population and Public Health Division budget.

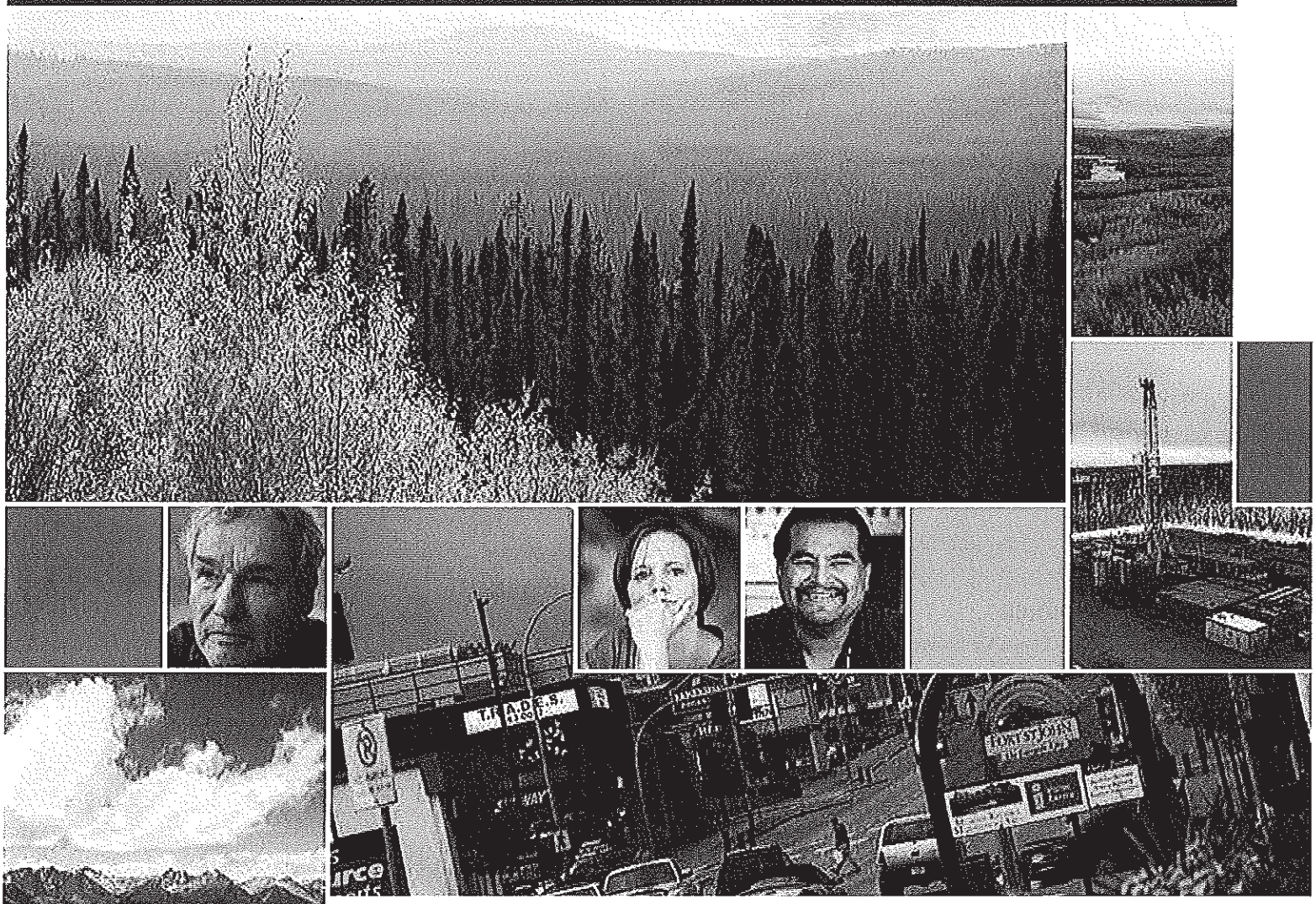
This model would work effectively and be small enough to facilitate decision making and keep costs to a minimum.

Pages 24 through 41 redacted for the following reasons:
- -
s.13, s.17

Identifying Health Concerns

relating to oil & gas development in northeastern BC

human health risk assessment – *phase 1 compendium of submissions*



A report of the Fraser Basin Council
to the BC Ministry of Health

SUBMITTED MARCH 30, 2012

Fraser Basin Council

FRASER BASIN COUNCIL

1st Floor, 470 Granville Street, Vancouver, BC V6C 1V5

T 604 488-5350
F 604 488-5351
E info@fraserbasin.bc.ca

To learn more about FBC and to reach our regional offices, visit us online: www.fraserbasin.bc.ca

Fraser Basin Council

This report is available in PDF.
Limited hard copies. Print copies printed on 100% recycled stock.
Photo credit: PictureBC www.picturebc.gov.bc.ca

Table of Contents

David Marshall,
Executive Director,
Fraser Basin Council,
1st Floor, 470 Granville Street,
Vancouver, British Columbia,
V6C 1V5.

March 7, 2012.

Dear Mr. Marshall,

I am writing to you today in response to the provincial government's decision to conduct a Human Health Risk Assessment of oil and gas industry activities in northeastern British Columbia. The Fraser Basin Council has been tasked with conducting Phase 1 of that work, which consists of inviting and assessing public comments on what human health and safety risks may be associated with oil and gas industry developments in the northeast of the province.

First, may I offer my sincere best wishes to you as you embark on this important task and seek opinion from a wide array of citizens' groups, government authorities, health organizations, environmental organizations, community groups, industry representatives, workers, academic institutions and others.

Second, may I say how important I believe it is to be doing this work now given the dynamic changes underway in the natural gas sector today – changes that I believe could dramatically increase human health and safety risks in the months and years ahead unless the industry is very carefully and more effectively regulated.

I will endeavor to keep my remarks brief and to focus them on a few key areas.

As a backdrop to my comments, I'll note that over the course of the past two years I have had an opportunity to research and write two peer-reviewed reports on the subject of shale gas developments, with a major focus of that work being northeast British Columbia. The first report was commissioned by the Program on Water Issues at the Munk School of Global Affairs and was published in October 2010 (*Fracture Lines: Will Canada's Water be Protected in the Rush to Develop Shale Gas?)*. The second was published by the BC Office of the Canadian Centre for Policy Alternatives and published in November 2011 (*Fracking Up Our Water, Hydro Power and Climate: BC's Reckless Pursuit of Shale Gas*).

As a result of work on those two projects, I have been called on to provide briefings to: the House of Commons Standing Committee on Natural Resources,

members of BC's Oil and Gas Commission and Ministry of Environment water officials, BC's Auditor General, a delegation of New Brunswick cabinet ministers and deputy ministers, and various First Nation and environmental organizations among others.

The focus of much of my work has been on the rapid increase in water usage by the natural gas sector as it moves to develop shale gas resources. As you know, developing such resources today commonly involves the use of hydraulic fracturing or fracking technologies. To stimulate gas production in shale zones, large volumes of water are pressure-pumped underground. This "stimulation" technique typically creates new cracks in the rock as well as further opening pre-existing cracks or faults in the rock. It is this fracturing process that allows the gas trapped in the rock to be released.

A few notable human health concerns that arise from this practice include:

- The potential for fracking activities to trigger potentially deadly sour gas releases (as occurred when a pipe in a producing gas well corroded and broke due to the presence of frack sand in the pipe and an uncontrolled sour gas leak occurred near the community of Pouce Coupe in November 2009).
- The potential for domestic water wells and homeowners' properties to be contaminated with either gas or liquid contaminants associated with the industry. This may result from the fracking activities themselves (as the US Environmental Protection Agency concluded late last year could be the case in Wyoming). Or it may be associated with poor well cement jobs (a poor cement seal in the annulus – the space between the well pipe and outer wellbore – provides an escape route for contaminants). Or it may be associated with highly toxic wastewater produced in the fracking process and that is subsequently mishandled and spills (there were 587 spills in northeast British Columbia in 2008-2009, the last year for which data was reported by the provincial Ministry of Environment). Or it may result from unforeseen "communications" that occur between gas wells spaced too close together (such events are confirmed by the provincial Oil and Gas Commission and have resulted in products from one fracked well migrating up to 750 metres to another well). Or it may be associated with "disposal" wells where toxic liquid wastes generated in gas industry operations are taken and pressure-pumped underground for disposal. On this last point, you may wish to ask the Oil and Gas Commission whether or not it has tested residential water wells in proximity to industry disposal wells. If it has, has it found any evidence of contaminants that might be associated with the disposal well? And if it has not conducted such tests, why has it not?
- Exposure to airborne contaminants associated with the flaring of gas and routine gas leaks from gas wells, pipelines and other gas gathering and distribution infrastructure.

- Chronic exposure to noise associated with compressors and other natural gas industry equipment and operations.
- Site-specific, intense increases in truck and vehicular traffic into and out of fracking operations.

A broader issue of concern for human health, safety and wellbeing may one day be access to sufficient quantities of fresh water. At this point, with the shale gas industry in its relative infancy, this may not present much of a risk. But it is noteworthy that in the late spring, summer and early fall of 2010, water scarcity was considered such a problem in the South Peace region of northeast British Columbia that the provincial government took the unusual step of declaring a drought advisory and placed restrictions on water takings. Conflicts over finite water resources can reasonably be expected to grow in the event that the shale gas industry expands dramatically and the region or portions of it undergo drought-like conditions once again.

Another broad issue of concern relates to the health and wellbeing of First Nations' communities in the region. All First Nations in the region report both declines in ungulate populations and changes in the health of those populations. A commonly expressed concern relates to industrial toxins that ungulates are exposed to. First Nations report abnormalities in the organs of ungulates that they have harvested. They believe such abnormalities trace to the ungulates having browsed or foraged on lands contaminated by the industry or drunk water at contaminated sites. Given the importance of moose and other ungulates as a food source for First Nation communities, this is a public health concern.

Before concluding this letter, I would like to mention one other issue that I think strikes at the heart of the challenges facing the provincial government as it considers the potential human health and safety risks associated with natural gas industry developments and their likely expansion in northeast British Columbia. That issue is cumulative impacts.

Rarely, if ever, do we see an indication that this is even on the radar screen of provincial regulators. Presently, an environmental assessment process is getting underway to assess the impacts of the proposed Site C dam in the South Peace region. The dam, if constructed, will have obvious environmental impacts. For that reason, it is being subject to a fairly rigorous assessment process that will include numerous public meetings.

Rarely are most *individual* gas industry developments in the region subject to anything approaching a similar assessment, even though just one multi-well natural gas pad where fracking operations occur may result in hundreds of thousands of cubic metres of water being rendered so toxic that it can never be returned to a river, lake or stream again. Or that the gas produced from such a site may, if it escapes in a leak, prove injurious fatal to local residents. And never are such wells and their impacts on local land, air and water resources

considered in context. Some of the shale gas company plans I have looked at show that over the next 20 to 30 years individual companies plan to drill and to frack thousands of gas wells. If the current regulatory approach is maintained each well will be considered and approved in complete isolation of what occurred before and what may be reasonably expected to occur in the near future.

Science and just good common sense tells us that as developments increase in number so do their impacts on the environment and on human health and safety. It is troubling to say the least that no cumulative impacts assessment process appears to be in place. Even more troubling, there appears to be no robust consultation framework in which the Oil and Gas Commission seeks to gather input form public health officials before approvals are granted for individual gas wells, let alone a broader planning and consultation process that seeks the input of public health officials on what constitutes an acceptable number of wells, the location of such wells, well densities and spacing, and the proximity of wells to individual residences and local communities.

In closing, I have proposed a coherent set of linked policy recommendations in the recent research reports I have written on shale gas industry developments in northeast British Columbia. I would be happy to further brief you on that research and its findings at your convenience.

Kind regards,

Ben Parfitt.

January - March 2011 s.22 regarding riser
Riser agreement signed on March 9,2011
June 28th, Day of Break
Traffic from day of break, all summer long
August 3rd, s.22 leave to go North
August 30th, s.22 leaves message regarding flagging for boaters
October 2nd, s.22 home from North
October 5th, s.22 shows up at s.22
October 25, s.22 and s.22
s.22 and neighbor agony
January 5th, s.22 meeting at s.22
January 11th, Meet s.22 in Fort St. John
Phone calls, emails

CNRL has a post with a wire box located on it that has bare wires hanging out of it. This was first noticed when we moved here some fifteen years ago. To this date, after several different CNRL employees have been informed and lately shown, nothing has been fixed.

s.22 in January-First Part of March 2011, we had several phone calls with s.22 regarding CNLR putting in a riser, on the pipeline, s.22 It seemed like a very rushed job, by the number of phone calls, that CNRL wanted this job done immediately. We were away, in New s.22 and returned several of s.22 messages by satellite phone. s.22 s.22 The day after we got home, s.22 and we discussed the riser, rental, damages, my time and compensation. I signed that day a contract and settlement regarding the riser. This took place on March 9, 2011. A surveyor staked the property out, and to date nothing has been done. The survey stakes are busted up and scattered all over the property and several CNRL employees have not only been informed but have drove by them, over them and no one has made any kind of effort to pick them up.

On June 28th @ approximately 4:45am we received a phone call from s.22 @ the CNRL plant stating that they had lost all pressure, there was a break but no one, at that time, knew where.
Around 5:15am, s.22 At this time s.22 went outside and informed me that there was a strong odor s.22 went and did a few barn chores, at this time s.22 drove into our yard, around 6:45am. At this time s.22 was in contact with a CNRL representitive via truck radio. s.22 was informing them that the wind was blowing from the south directly our way and stated that there was a strong odour in our yard. s.22 recommended that we should stay inside, and to keep all doors and windows closed. s.22 had a H2S monitor that didn't seem to be working. s.22
At noon, s.22
s.22

s.22

s.22 No CNRL representative phoned to check up on our conditions. Talked with s.22 s.22 and CNRL put s.22 up in a hotel for the night.

On June 30th, s.22 took the quad down to the property, where the break was, and noticed that there had been a lot of traffic. This was understandable, under the emergency conditions and we assumed that once things settled down someone from CNLR would contact us and go over with us what the procedures would be and the compensation for the traffic. Our spring had been late and wet, at this time the grass was just starting and with the moisture, traffic had caused a lot of damage.

36 days later, August 3rd, s.22 We had not heard from any CNRL representatives. Everybody, here, from operators to the area foreman, knew that we go north for the summer.

August 30th, we received a telephone message via our satellite phone from s.22 stating that they were going onto to property to put up flags for the boaters to warn them about the pipe in the river.

October 2nd, we arrived back home. We put our hunting horses down on the property, where the pipeline break was for fall pasture. When we took the horses down, it was obvious that there had been a lot of traffic all summer long. It appeared to be a well used road, and campers and fisherman took advantage of this situation, as well. A couple of neighbors, including a CNRL operator, said that they even took a drive down to look at the damages. A couple of my guides and myself picked up garbage after we trailed the horses down. CNRL should have put up a couple of signs or something to try and stop this, considering that they were the ones that showed the whole country you could access the river s.22

October 5th, s.22 showed up at our place. We were in the midst of pulling shoes off and trimming horses. I took time to have a talk with him and discussed some of my concerns, also mentioned the survey stakes that had been there since February that were now all busted up and scattered around. Also, mentioned the busted wire box with exposed wires hanging from the post. Afterwards s.22 took a drive down to the property. Survey stakes still there.

Later on, this same afternoon, s.22

October 25th, s.22 to discuss surveying. They said someone would be contacting me shortly to ask for access to do the surveying. s.22 drove down to the break site. Surveyors stakes still there.

First week in November, we've got some welding to be done on a tractor. s.22

s.22 has always done odd jobs like this so we gave him a call. It was an icy phone call and ended in "I won't be able to help you out." Not like s.22 Anyhow, this disturbed us a little so later on that evening we went down to s.22 to have a visit. The first twenty minutes was a relapse of the telephone conversation with s.22 I just come out and asked them what the problem was. We were then informed that s.22 s.22 CNRL's progress on repairing the pipeline.
The next day I was on the phone with s.22 we emailed back and forth and he informed us that he would clear things up with the neighbors and let them know that CNRL was dragging their feet not us. That evening s.22 showed up to apologize and s.22 called that same evening to let us know we could bring our tractor over the next day. Also, s.22
In a s.22 it was very disturbing knowing that rumors were "we put three families out of work, thanks to CNRL actions".

November contacted by s.22 regarding access for a surveyor. Surveying took place while we were down south weaning.
December 23rd contacted by s.22 and set up meeting.

January 5th s.22 for a meeting. This was the first any compensation was mentioned for property use, damages and rental. The meeting took three hours, we had lunch and discussed the plans and looked over the area use plans.

January 11th, s.22 We met with s.22 s.22 to sign some papers. After two different meetings (Barber shop, Tim Horton's) s.22 wanted us to sign some papers that stated CNLR could go ahead with their work, and the compensation could be figured out at a later date. I informed s.22 that I would like to be compensated before any work took place on my property. A couple emails were exchanged between s.22

s.22 on the 13th of February and the emails regarding this settlement and telephone calls started on the 14th.

February 23, conference call with Pioneer and Surface Rights Board

Compensation for:

1. All the above.
-numerous phone calls
-meetings
-unscheduled drop ins
-emails
-access with out permission
-access all summer
-riser access, meetings and phone calls. Now that it will be pass due and I'll have to go through this whole procedure for the second time

2. CNRL did not follow their own emergency plan, which is:

-A Level 2- an emergency situation that has the potential to escalate into a more serious situation which may jeopardize the safety of the public. There is potential danger to the public or personnel outside the boundaries of Company property. Evacuation of the EPZ is required.

-EPZ-Emergency Planning Zone: 2 KM from the point of break, we live within a mile.(1.6 KM)

-Contents: 1.5% H2S Moderate to strong odor. People may experience nausea, tearing of the eyes, headaches and loss of sleep following prolonged exposure, more susceptible individuals may respond more severely.

None of the above, was followed out on CNRLs part, regarding our household. Instead they had a helicopter flying around, UP WIND, from the break, checking gas levels and air lifting plant employee's families to the plant(household close to 2 miles from the point of break, up wind) We were closer and down wind and I don't care who was in charge of this, they had no right to put families ahead of others that were closer. s.22 s.22 should have been evacuated. We would have carried out this procedure ourselves had we been informed properly of the danger.

There were no check ups done, phone calls or visits to see how we were doing after this poorly handled emergency situation. Now that CNRL wants something, the communication level is bar none.

Apparently CNRL does not think that my time and property is worth anything, nor do they show any concern in the well being of my family. Let's add it up, everyone that has ever phoned me, emailed me, visited me or went and had a drive on my property is being paid, everyone but me.

CNRL showed extreme negligence in an emergency situation and with regards to repairing the break. I want to be certain that my family, myself and neighbors are not neglected again, if such an incidence was to take place again.
Put yourselves and your family in my situation and tell me that it isn't worth anything. s.22 breathing in H2S for seven hours and making a two hour drive to town, and not even getting a follow up phone call the following day or months after the fact to explain the situation. It is very disturbing and I believe that CNRL should be reprimanded for their wrong actions.

s.22

Feb 17, 2012

Re: Air Quality

Mr. Marshall,

There should be a permanent air monitoring station in Chetwynd and perhaps elsewhere. This should be independent of Northern Health as it and Oil & Gas are 2 government departments, and also independent of the Oil & Gas industry. The public does not trust any of these. Where was Northern Health 20 years ago on this issue? Rob MacIntosh of Pembina Institute, through a contractor, set-up 65 stations in Drayton Valley, funded by Suncor.

Monitors have to be sensitive to health hazards not those set by government and readings made public.

There is a particulate monitor in Chetwynd but the results are not public. I request that the readings be made public through the Echo. Are PM2.5 monitored as these are particularly harmful to the respiratory system. Coated with $S0_2$ from Pine River Gas Plant and with moisture sulphuric acid.

The Oil & Gas Commission when I phoned did not know whether PRGP was required to notify them or if they did. He said to phone 250-794-5200 and report this (Emergency #). He said:

- H_2S 2ppm at work site and evacuate
- No detectible odour off work site
- $S0_2$ 2.5ppm

You should pursue this and allowable lead at the worksite and off.

Setbacks for wells should be investigated (100 metres) from a house. How about a school? These (present) distances are crazy and irresponsible. Phone Gwen Johanssen, Hudson Hope. She is very knowledgeable or Lois Hill, Peace Environment Safety Trustee Farmington.

Flaring: Is this healthy for me and public? How can it be reduced? Production flaring next to homes? Note article Spectra: The full output of the plant was flared volume. Spectra said smell was sulphur. It was $S0_2$. (H_2S and gas when flared converts to $S0_2$). They are permitted to release 40 ton/day $S0_2$ and I believe that is what is being released daily.

It is dismaying that there were no detectable levels of SO_2 at the Hasler Flats with an air inversion. The air quality objectives as reported are very suspect. Where did these poisons go? An independent air monitor station is required near plant site.

People have, I am told experienced vomiting sickness etc. as a result of spectra upset. Respiratory illness in Chetwynd – bronchitis etc. – is very high. No tobacco science please.

Summary

- 2 Permanent Air Stations (Independent)
- Particulates to be made public
- Investigate setbacks
- OGC Competence

Spectra Upset: was it related to OGC? Did people get sick? Should be an independent air monitor on site. Spectra should by law remove more than 99.1 as there is methods where 99.8 or 9 removal is possible at an affordable price (CEO some years back stated in Council that the cost would be a 100 million).

Talk to the doctors

Mobile Air Monitor is mostly useless. Direction of air flow and inversions are not constant. Reports and my own experience indicate that Spectra releases at various times noxious gases.

Chetwynd Cancer Incidence – Feb 2012

This is a partial list of cancer deaths and survivors in Chetwynd and immediate area. A practicing doctor here said he has never seen such a high cancer rate in his career. Northern Health should determine the cancer rate and recommend precautionary measures. To scientific approach will lead to a "tobacco solution", where many years elapsed before scientific proof evolved:

s.22

Human Health Risk
Associated with the development of oil and gas

I have several concerns associated with the development of oil and gas in Northeastern BC. I am sure that this organisation is aware of many of these concerns, but my concerns are important enough to restate them here.

At many points in the process of obtaining oil and gas, compounds may be released into the environment. The pressure changes, as oil is brought up from lower levels in the earth, may cause natural gas in solution to come out of solution from the oil. If these gases are not captured and carefully processed, they and other products are released into the environment. One method of processing is to burn the gas. Unfortunately, flaring often releases many compounds if conditions are not perfect. Windy conditions, water or impurities in the gas or incomplete mixing with air will reduce the efficiency of the burn. These are conditions the industry cannot control. Incomplete burns may be identified by black smoke coming from the stacks, a common sight in this area. However, black smoke is not always present during an inefficient burn.

Incomplete burns can produce hundreds of toxins including benzopyrene, mercury, arsenic, chromium, hydrogen sulfide, nitrogen oxides, carbon monoxide, carbon dioxide, methane, unburned hydrocarbons, soot, ash, volatile organic compounds (eg, benzene, toluene, xylene) polycyclic aromatic hydrocarbons and sulphur compounds (eg. carbon disulphide, oxides of sulphur and carbonyl sulphide). These compounds cause humans various health conditions including interference with oxidation, cancers, aplastic anemia, neurologic conditions[1], delayed development, altered enzyme activities, irritation of skin, eyes and mucous membranes, depressed central nervous system, destroyed red blood cell membranes, headaches, nausea, confusion, cardio-pulmonary conditions, bronchitis and chronic cough. This list was not meant to be comprehensive; it is just a quick summary to illustrate the breadth of the concerns. Some of these conditions may be caused by concentrations of the poisons that are below the person's ability to

[1] "Exposure to Reduced Sulfur Gases Impairs Neurobehavioral Function", Kilburn, K.H.

detect the gas, and over time, the ability to detect the gas decreases with exposure.

Incomplete burns have been observed and reported in studies, and have been reported by observant and concerned citizens. The oil and gas industry produces 19% of organic compound emissions.[2] An inefficient sour gas flare produces various sulphur compounds in addition to the products of an inefficient sweet gas flare.

There is a stronger correlation between cancer and other pollution-caused diseases with populations living near gas flaring compared to the correlation between cancer and other pollution-caused diseases with populations living in urban areas with no flaring or other sources of pollution.[3] Populations of children living down wind of gas producing plants have more respiratory problems compared with children who do not live down wind of these plants.[4] I have observed young people who became physically ill when being driven past a gas well flare.

There have been many studies on the health effects of oil and gas development on other animals. Although these studies may not be directly applied to human populations, the results should be important considerations for future investigations.

There are definite health effects of living near oil and gas development. The relationship is observable, and indisputable proof is coming. In addition to the direct health effects, there are indirect effects due to an increase in traffic to support the industry. Increased traffic increases crashes, pollution and stress.

For these reasons I urge the Fraser Basin Council to carefully research all the data that correlates oil and gas development with health. This is an opportunity to clarify the health dangers of oil and gas development that may result in the creation of policies that will lead the industry in a relationship with the public that promotes health, prevents health problems and avoids lawsuits.

---

[2] "Flaring", Petroleum Communication Foundation, February 2000, p. 8.
[3] Elstein, P.R. and Selber, J. ed. "Oil, a Life Cycle Analyses of Its Health and Environmental Impacts", The Center for Health and the Global Environment, Harvard Medical School, March 2002, p. 28>
[4] Petroleum Communication Foundation.Centre for Energy. Quick Answers.

CAPP

CANADIAN ASSOCIATION
OF PETROLEUM PRODUCERS

March 6, 2012

David Marshall
HHRA – Phase 1, c/o Fraser Basin Council
1st Floor, 470 Granville Street
Vancouver, BC V6C 1V5

via e-mail: info@hhra.ca

Dear Mr. Marshall:

Re: Human Health Risk Assessment Phase I

The Canadian Association of Petroleum Producers (CAPP) appreciates the opportunity to provide input into Phase I of the Human Health Risk Assessment by the British Columbia Ministry of Health. CAPP acknowledges the desire to have a human health risk assessment is a reflection that people want a greater understanding about how the natural gas industry operates and which processes we use. We support steps that increase the understanding of our industry. CAPP would like to underscore that protecting the health of the public and our employees, as well as the environment, is of paramount importance to industry. CAPP recognizes industry's responsibility to address public concerns, because it is vital the public has confidence that industry develops resources safely and responsibly. The industry is responsible, well regulated and provides many direct and indirect benefits to the people of British Columbia. Nevertheless, we always look for possible improvements.

CAPP represents companies, large and small, that explore for, develop and produce natural gas and crude oil throughout Canada. CAPP's member companies produce more than 90 per cent of Canada's natural gas and crude oil. CAPP's associate members provide a wide range of services that support the upstream crude oil and natural gas industry. Together CAPP's members and associate members are an important part of a national industry with revenues of about $100 billion-a-year.

CAPP and the industry has been investigating and studying, in collaboration with academics, regulators and governments in Canada, many of the topics and matters of concern the public may raise during Phase 1 of this assessment. The industry has taken a science based approach and CAPP would like to emphasize the importance of taking such an approach through all phases of this assessment.

Forty-plus years of these findings are evidenced in the large number of studies (some published and others prepared for regulatory approval processes) on human and wildlife health risk assessments. Notable references investigating health concerns associated with oil and gas developments in Western Canadian jurisdictions include comprehensive work completed by the Western

2100, 350 – 7 Avenue S.W.
Calgary, Alberta
Canada T2P 3N9
Tel (403) 267-1100
Fax (403) 261-4622

1000, 275 Slater Street
Ottawa, Ontario
Canada K1P 5H9
Tel: 613-288-2126
Fax: 613- 236-4280

403, 235 Water Street
St. John's, Newfoundland and Labrador
Canada A1C 1B6
Tel 709-724-4200
Fax 709-724-4225

www.capp.ca • communication@capp.ca

Interprovincial Scientific Study Association (WISSA) and earlier investigations under the Acid Deposition Research Program (ADRP) and the Medical Diagnostic Research Program (MDRP). CAPP would be pleased to provide these and other references. This information is reflected in the many BC OGC and ERCB policies, initiatives, procedures, Directives and technical documents relating to the upstream oil and gas industry. The Ministry of Health should review this literature as it moves forward through Phase II of this assessment.

Within British Columbia, CAPP and its members have already taken additional investigations and actions to ensure the health and safety of its employees and public and the environment. For example the Science and Community Environmental Knowledge (SCEK) fund is an industry financed fund dedicated to improving the understanding and management of the impacts of oil and gas activities in British Columbia. In June 2010 the Debolt water treatment plant - a first of its kind in North America - treated non-potable water from deep in the earth for use in the industry, thus drastically reducing amount of fresh water needed for hydraulic fracturing operation. Additionally, CAPP has recently released five guiding principles and six associated practices for Hydraulic Fracturing to safeguard water quality for all. One practice, for example, requires every natural gas well to have an engineered steel casing system that is cemented to prevent any fluids from migrating to ground water aquifers. CAPP's practices also support the disclosure of fracturing fluid additives across Canada, which is now a regulatory requirement in British Columbia.

Additionally CAPP members have, through their community investment programs, contributed to many programs in British Columbia. A sample of these initiatives include anti-bullying, drug and alcohol awareness, Aboriginal Family Services, Women's' Health Initiatives and made significant contributions to health and recreation facilities in the communities of northeastern BC. One example of this is industry's contribution towards the re-construction of the Fort Nelson arena which collapsed under a heavy snow in 2008. Industry has also engaged with the public through participation in the local Stakeholder Advisory Committee, the Farmer Advocacy Office and other groups and forums.

The oil and gas industry has also provided many direct benefits to British Columbians in the form of royalties, which support government provided services, jobs and improvements to road and infrastructure. During the period of 2006 to 2010 industry paid $6 billion to the government of British Columbia for oil and gas rights. The Canadian Energy Research Institute forecast the natural gas industry will employ 40,000 directly by the year 2035, up from 12,000 employed in 2010. There is literature confirming the associations between personal wealth and healthier individuals and communities. CAPP believes the forecast development in the regions can continue to provide positive social supports and economic benefits which enhance the quality of life for which all Canadians strive.

The upstream oil and gas industry in British Columbia is well regulated by the Oil and Gas Commission as it applies the Oil and Gas Activities Act and associated regulations. Recognizing the need to ensure development is performed in a safe and responsible manner and the need for a contemporary regulatory framework that reflects technological advances, interest in unconventional gas, and increased social and environmental expectations, OGAA was implemented in 2010 after

extensive consultations with communities, local governments, First Nations, companies, landowners, environmental organizations and industry associations. All companies (operating and service companies) by law have safety programs that ensure safety and wellbeing of their employees. As well companies are mandated to have viable, tested site specific Emergency Response Plans to protect the wellbeing of the communities we operate in in the unlikely event of a safety issue.

CAPP understands the purpose of the study is to address human health concerning oil and gas development in BC's northeast. We recognize government must make the scope of Phase II appropriately broad and comprehensive in order to fully address the concerns of those living and working in BC's northeast. However, we suggest the study should have sensible boundaries on the investigation of social and social-economic impacts, as to ensure the crucial concerns of the public, as they correlate to the oil and gas industry, can be fully investigated in the time allowed.

CAPP would like to encourage and recommend that during the course of Phase II of the assessment that reviewers take an opportunity to conduct site tours of various oil and gas activities and facility in northeastern BC. CAPP recommends that the Ministry of Health should seek ongoing input from industry, academic and government experts during Phase II of the human health assessment as there is considerable experience and expertise with regulators, experts and ministries of health in other jurisdictions to draw upon. CAPP is pleased to provide useful information, expertise, contact and context where appropriate. We look forward to a continued dialogue throughout this important Human Health Risk Assessment.

In conclusion, sustainable and responsible development of natural resources has always been a hallmark of the oil and gas industry's commitment to our stakeholders. We aim for continuous improvement in the way we operate and how we relate to the public, and we recognize we can always improve as a result of our interactions with local communities and regulators. Canada's oil and gas industry is committed to delivering energy to Canada and the world in a responsible way.

Sincerely;

David Pryce
Vice President, Operations

Cc: Hon. Michael de Jong, Minister of Health
Hon. Rich Coleman, Minister of Energy and Mines & House Leader / Responsible for Housing

DAWSON CREEK WATER SHED SOCIETY

March 5, 2012

Human Health Risk Assessment,
BC Ministry of Health
c/o Fraser Basin Council

Dawson Creek Watershed Society

Concerns about water safety, quantity and quality relating to oil and gas development within the Kiskatinaw and Dawson Creek watersheds.

Dawson Creek Watershed Society is concerned that increased oil and gas drilling and fracking will adversely affect water safety in our watersheds. This is a serious concern in the Kiskatinaw watershed as it is the source of drinking water for the City of Dawson Creek, the Village of Pouce Coupe and many rural residents (approx 20,000 people). Historically, such activities in other jurisdictions across North America have caused serious water contamination.

A direct safety concern is the introduction of chemical pollutants into the water table. There are many potential sources of contaminants including the process of drilling and fracking wells, building and operating pipelines and surface drainage from heavy equipment and construction sites.

The quantity of water required for drilling and fracking also places a strain on the limited water available to the residents of the South Peace. In 2010, severe water restrictions were enacted to deal with a dire shortage of water due to a very dry year during an extended drought. While the plans in place did adequately deal with the situation, it did highlight the need to act conservatively when addressing issues about water in this area.

The quality of water that enters the pumping stations at Arras can be adversely affected by changes to the terrain in the upper Kiskatinaw watershed. The turbidity (suspended silt) in the Kiskatinaw River is a constant problem when drawing and treating water for human consumption. The geography of the area results in heavy loads of silt during spring runoff and after heavy rainfall. This problem is increased by road and pipeline construction and the resulting changes to drainage patterns. Proper care must be taken to minimize these changes as they affect downstream water quality.

The City of Dawson Creek has a long history meeting the challenge of providing safe drinking water to the City and surrounding area. A recent initiative is the establishment of a watershed steward position to mitigate activities in the watershed that lie outside the control of the municipality. An important aspect of this program is the testing and monitoring of water quality in the upper Kiskatinaw watershed.

1204–103rd Ave Dawson Creek BC V1G 2G9

DAWSON CREEK WATERSHED SOCIETY

Recommendations:

The Dawson Creek Watershed Society places great value in gathering verifiable data to gain a broader understanding of how our watersheds work and how we can ensure they remain viable. We recommend that the Province recognize the value of a well-funded, long-term academically rigorous study of the Kiskatinaw watershed.

This study should focus on the following key study areas: 1) water quality in aquifers, streams, rivers and precipitation. 2) air quality factors that would affect water quality including acid deposition from flaring. 3) land contamination that would affect water quality including storage of fracking fluids in open pits and the need for public disclosure on industry reports of well-site flooding incidents so City and rural area residents can appreciate how industry addressed and continues to monitor off-site impacts (e.g. from open-sumps, breached berms, and runoff from ground waste disposal sites. These key areas of study recognize the importance of how the land, air and precipitation act in combination to provide our water resource.

This baseline of data would be of enormous benefit to the citizens of the South Peace as the impacts of oil and gas development continue into the foreseeable future. This is the only reliable way to assess the health and well-being of our water and our people.

We feel that these recommendations should be coordinated with the City of Dawson Creek and their Watershed Steward. This would help in the implementation of the City's Source Water Protection Plan as required under the Drinking Water Protection Act including expanded water quality risk assessments, timely inter-agency information-sharing, and public reporting on state of the watershed

The Dawson Creek Watershed Society requests that the panel considers these concerns and recommendations and we look forward to enhancing our community's natural assets, the Kiskatinaw and Dawson Creek watersheds.

Yours truly,

Kit Fast, Chair, Dawson Creek Watershed Society

1204-103rd Ave Dawson Creek BC V1G 2G9

DAWSON CREEK WATERSHED SOCIETY

Backgrounder:

The Dawson Creek Watershed Society is a community-based volunteer non-profit organization. It is dedicated to the protection and conservation of the watersheds that sustain the City of Dawson Creek.

The purposes of the society are:

to restore and sustain the watershed of Dawson Creek as a healthy ecosystem;

to promote stewardship of the watershed of Dawson Creek through education and public programs;

to act as receivers and distributors of funds and in-kind donations; and,

to work cooperatively with other stakeholders of the Dawson Creek and Kiskatinaw watersheds.

1204–103rd Ave Dawson Creek BC V1G 2G9

Environmental Law Clinic
UNIVERSITY OF VICTORIA

Murray & Anne Fraser Building
PO Box 2400 STN CSC
Victoria, BC V8W 3H7
Phone: 250.721.8188
Email: elc@uvic.ca
Web: www.elc.uvic.ca

Recommendations for Human Health Risk Assessment of British Columbia Oil and Gas Development

By :
Katrina Andres
Bennett Arsenault
Julie de Wolf
Kate Feeney
Matthew Nefstead
Tim Quirk

Supervisors
Mark Haddock and Calvin Sandborn, Lawyers

Client: Peace Environment and Safety Trustees Society (PESTS)

Executive Summary

This report recommends that the Human Health Risk Assessment:

1. Adopt a holistic definition of health in its scoping of B.C.'s oil and gas development human health risk assessment.
2. Employ PFTIR (Partial Fourier Transform Infrared Spectorscopy) or other equally effective technology to measure the real time combustion efficiency of flares in northeast BC.
3. Investigate potential health effects from chronic exposure to H_2S.
4. Perform further studies to determine if Chemicals of Potential Concern identified in Garfield County, Colorado are or could be present in northeast BC at quantities that threaten public health.
5. Investigate the potential risk of H_2S exposure in "sweet gas".
6. Examine the impact of oil spills in water bodies.
7. Examine the potential human health impacts resulting from water contamination by hydraulic fracturing fluids and wastewater.
8. Consider the use of Cement Evaluation Tools to prevent the seepage of fracturing fluids into groundwater drinking sources.
9. Investigate the health risks associated with disposal pits leaching toxic oil and gas industry waste into nearby water sources.
10. Examine the human health risks posed by oil and gas industry air pollution contaminating water sources.
11. Examine the impact of sedimentation on water bodies resulting from oil and gas industry construction.
12. Examine the mental health impacts caused by stress and anxiety on residents living near oil and gas refineries.
13. Examine the extent to which sleep patterns of neighbouring residents may be affected by light form flares or noise.
14. Interview mental health workers to document mental health stress in the area.
15. Take steps to mitigate the potential mental health impacts to residents to the greatest extent possible (for example: creating setback requirements for flares, reducing noise, and responding to the concerns of residents.)
16. Mandate policies to ensure workers obtain adequate amounts of sleep.
17. Monitor the use of drugs and alcohol in workers on a continuous basis.
18. Examine the mental health impacts caused by stress and anxiety on residents living near oil and gas facilities.
19. Examine the extent to which sleep patterns of neighbouring residents may be affected by light from flares or noise.
20. Examine the potential mental health impacts on workers.
21. Examine impacts on mental health caused by continuous exposure to hazardous materials.
22. Examine the following community health impacts associated with oil and gas development:
    a. Drug and alcohol abuse
    b. Sexually transmitted infections
    c. Family strain

d. Prostitution
e. Crime and violence
f. Traffic and traffic accidents
g. Housing shortages and increased cost of living
h. Overburdened social and medical services
i. Poor educational performance
j. Threats to hunting and fishing culture

23. Examine the informational components to be required in emergency response plans (ERPs), set out the roles of various stakeholders and agencies, and examine optimal options for implementation of effective ERPs.
24. Conduct Phase 2 of the project with a broad conceptualization of risk, extensive stakeholder involvement, and a dynamic and responsive process, as described in the Framework for Environmental Health Risk Management.
25. Consult more recent risk assessment framework documents, including documents prepared by the US Environmental Protection Agency, Health Canada, Australia, and any other competent jurisdictions to ensure that the best possible method is implemented.
26. Take steps to ensure that the Ministry of Health establish thorough and transparent criteria for the selection of qualified risk assessors in Phase 2.
27. Be empowered to compel evidence as provided in the inquiry powers of the *Public Health Act.* This is necessary because of the industry practice of requiring confidentiality agreements from individuals who have settled claims arising from injury to person or property. These individuals may have the most important evidence for health risk assessors, yet may feel that cooperating with the assessment would contravene their confidentiality agreement with an oil or gas company.
28. Secure the agreement of industry to allow individuals to divulge information that is currently the subject of confidentiality agreements, or, in the alternative, request this same information directly from industry.

Contents

Introduction

In the 2010 Throne Speech, the BC government committed "to lead the world in sustainable environmental management, with the best air and water quality, and the best fisheries management, bar none."[1] To achieve that goal, the planned Human Health Risk Assessment (HHRA) of Oil and Gas Development must adopt a credible and holistic definition of human health. Furthermore, the HHRA must adopt best practices and procedures that ensure it is an effective, responsive, and transparent process.

Phase 1 of the HHRA is composed of "public engagement to inform the scope and terms of reference and identify concerns relating to oil and gas development."[2] The FBC will meet and engage with a broad range of interested parties, including:

- citizens' groups
- health professionals
- academics
- non-profits
- representatives from all orders of government, including First Nations
- oil and gas industry representatives, and
- other interested parties and individuals in northeast B.C.

in order to inform the scope of the upcoming human health risk assessment (Phase 2).[3]

This submission makes 28 recommendations to inform the FBC's Phase 1 scoping of the HHRA. Part I of this submission surveys the potential human health impacts of oil and gas development. Part II outlines our procedural recommendations for the risk assessment process.

---

[1] B.C. Ministry of Healthy Living and Sport, *Proposed Provincial Framework for the Development of Ambient Air Quality Objectives*, (2010) at 5-6, online: <http://www.bcairquality.ca/reports/pdfs/aqo-framework-consultation.pdf>, last accessed 27 January 2012.

[2] British Columbia, Ministry of Health, *Request for Proposals: Stakeholder and Targeted Public Engagement for Human Health Risk Assessment of British Columbia Oil and Gas Development*, (Victoria: Ministry of Health, 2011), Request for Proposals Number RFP HL163 at 5, online: last accessed 26 January 2012 at <http://thetyee.ca/Documents/2011/11/15/RFPHL163 Human Health Risk Assessmentv15.pdf.

[3] *Ibid* at 6.

Part 1: Health Impacts to be Considered

Definition of Health

Working within the parameters of the Request for Proposals, the FBC must scope a comprehensive HHRA for Phase 2. The Request for Proposals states that:

> *The scope of this project [Phase 1] will inform a human health risk assessment which could cover areas of human health risks from changes to the built environment, land, air, drinking water and food quality. Potential human health hazards subject to review could include gas development, extraction and production methods, emergency events such as well blowouts and pipeline breaks, chemicals used in drilling and well stimulation techniques, chemicals used in drilling waste, air quality issues related to well venting and processing facilities, onsite and offsite waste management, transportation and disposal activities, and land reclamation activities.*[4]

Scoping necessarily involves a clear understanding of potential human health risks. While the Request for Proposals does not specifically provide a definition of health, it does provide that within the Request for Proposal, "public health" means:

> *...the science and art of preventing disease, prolonging life and promoting health through the organized efforts and informed choices of society, organizations, public and private, communities and individuals.*[5]

The World Health Organization (WHO) defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."[6] The WHO definition is broad and holistic.[7] This definition should serve as a working model for the FBC and set the standard for the project's scoping.

Health Canada's Canadian Handbook on Health Impact Assessment cites with approval the merits of the holistic WHO definition of health, noting that it links "the complex interrelationships between social, economic, political and cultural health determinants with the natural environment."[8]

---

[4] *Ibid* at 9.
[5] *Ibid* at 5.
[6] Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19 June - 22 July 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948. The definition has not been amended since 1948. Online: <http://www.who.int/suggestions/faq/en/index.html>, last accessed 18 January 2012.
[7] Boddington, Paula, and Ulla Räisänen, "Theoretical and Practical Issues in the Definition of Health: Insights from Aboriginal Australia," Journal of Medicine and Philosophy: 34, 2009.
[8] Health Canada, "Canadian Handbook on Health Impact Assessment: Volume 1," November 2004, page 4, online: <http://publications.gc.ca/collections/Collection/H46-2-99-235E-1.pdf>, last accessed 23 January 2012.

The Public Health Agency of Canada lists eleven key determinants of health: income and social status, social support networks, education and literacy, employment/working conditions, social environments, physical environments, physical health practices and coping skills, healthy child development, biology and genetic endowment, health services, gender, and culture.[9]

Aboriginal definitions of health can also contribute to a more complete understanding and definition of health, building on the broad and holistic approach of the WHO definition.

> *Many indigenous peoples in Canada and elsewhere refer to health or wellness as a balance between the emotional, mental, spiritual, and physical dimensions of the person in connection to his or her family and community... and others suggest meanings that emphasize social relationships and spirituality, as well as the land.*[10]

A strong connection to the land figures prominently into Aboriginal definitions of health.

In order for the FBC to effectively scope the human health risk assessment, a comprehensive definition of health is necessary. At a minimum, the scope should include an inquiry into physical health, mental health, social and community health, incorporating aboriginal perspectives on health.

A narrow interpretation and definition of health that only incorporates an idea of an absence of disease or infirmity would overlook many important health factors that should inform the scope of the human health risk assessment. The scoping must include an inquiry into physical health, mental health, social and community health, and aboriginal health.

Recommendation

- We recommend that the FBC adopt a holistic definition of health in its scoping of B.C.'s oil and gas development human health risk assessment.

[9] Public Health Agency of Canada, "What Determines Health?" (2011) , online: <http://www.phac-aspc.gc.ca/ph-sp/determinants/index-eng.php#determinants>, last accessed 23 January 2012.
[10] Brenda Parlee, John O'Neil & Lutsel K'e First Nation, "'The Dene Way of Life': Perspectives on Health from Canada's North," Journal of Canadian Studies: Vol 41 No 3 (Fall 2007).

Physical Health Impacts

Air Pollution

In 2010 nearly 200 million cubic metres of natural gas was flared in BC. Natural gas flares are known sources of environmental pollutants that have been linked to cancer and other diseases. Studies in Alberta have found a connection between beef herd proximity to flare sites and increased incidences of reproductive complications.[11] Studies in Nigeria indicate that emissions from flares may corrode the roofs of nearby buildings;[12] impair plant growth;[13] and lead to reduced hemoglobin and red blood cell counts, and increased abnormality in blood cells.[14]

According to the BC Energy Plan, there is a provincial goal to eliminate all routine flaring in the province by 2016.[15] Despite this stated goal, the restriction on flaring under the Drilling and Production Regulation[16] of the BC Oil and Gas Activities Act (OGAA) consists simply of the vague requirement that flaring be "minimized". Between 1996 and 2010 the total volume of flared gas was reduced by 39%[17] -- but this reduction included virtually all of the easily implemented changes—in the form of large reduction in the flaring of solution gas.

Setting aside the question of whether – and how -- BC will achieve its goal of eliminating all flaring by 2016, we are faced today with the fact that substantial quantities of natural gas are flared daily. One of the factors that dictates the health impacts from flaring is combustion efficiency. The Oil and Gas Commission's 2010 report "Flaring, Venting and Incinerating" quotes an "assumed" figure of 95% combustion.[18] However, commonly available literature on the topic has concluded that 95% and greater combustion

---

[11] Cheryl Lynna Waldner, "Beef herd health and productivity and exposure to the petroleum industry in west-central Alberta," (1999), online: <http://library.usask.ca/theses/available/etd-10212004-001610/> Last accessed 26 January 2012.
[12] EE Nkwocha, EC Pat-Mbano, "Effect of Gas Flaring on Buildings in the Oil Producing Rural Communities of River State, Nigeria" (1994) African Research Review, online: <http://www.ajol.info/index.php/afrrev/article/view/58293>, last accessed 26 January 2012.
[13] PAO Odjugo, EJ Osemwenkhae, "Natural Gas Flaring Affects Microclimate and Reduces Maize (Zea mays) Yield" (2009) Int J Agri Biol, Vol 11, No 4, online: <http://www.fspublishers.org/ijab/past-issues/IJABVOL_11_NO_4/10.pdf>, last accessed 26 January 2012.
[14] OM Adienbo, A Nwafor, "Effect of Prolong Exposure to Gas Flaring on some Haematological Parameters of Humans in the Niger Delta Region of Nigeria" (2010) J App Sci and Env. Mng, Vol 14, No 1, online: <http://www.ajol.info/index.php/jasem/article/view/56470>, last accessed 26 January 2012.
[15] British Columbia Ministry of Energy and Mines, "The BC Energy Plan: Oil and Gas", (2007), online: <http://www.energyplan.gov.bc.ca/bcep/default.aspx?hash=9>, last accessed 24 January 2012.
[16] *Drilling and Production Regulation*, BC Reg 282/2010.
[17] BC Oil and Gas Commission, "Flaring, Incinerating and Venting Reduction Report for 2010", online: <http://www.bcogc.ca/document.aspx?documentID=1206&type=.pdf>, last accessed 22 January 2012.
[18] *Ibid.*

efficiency rates, while possible in the lab with no crosswind, are not realistic in the field.[19]

In order to determine with any reliability what the possible health effects from flaring on British Columbians are, it is imperative to know the combustion efficiency. This data does not appear to be currently available.

There are at least two distinct reasons why flare combustion efficiency is critical to ensuring healthy communities.

1. Un-burnt flare gas could contain significant quantities of H_2S
2. Low efficiency flares produce higher concentrations of particulate matter, which leads to poor air quality associated with respiratory distress.

According to the US EPA, "Emissions from flaring include carbon particles (soot), unburned hydrocarbons, CO, and other partially burned and altered hydrocarbons. Also emitted are NOx and, if sulfur-containing material such as hydrogen sulfide or mercaptans is flared, sulfur dioxide (SO_2). The quantities of hydrocarbon emissions generated relate to the degree of combustion."[20]

These pollutants can wreak havoc with human and animal health. A study out of the University of Saskatchewan found a correlation between sour gas flaring and still-births and calf mortality in Alberta beef herds.[21]

The US Centre for Disease Control (CDC) has established that 100 ppm of H_2S is "immediately dangerous to life and health."[22] At 600pm H_2S is lethal at exposures of 30 minutes. At 800 ppm it is lethal in 5 minutes.[23] The CDC further reports that concentrations as low as 50-100 ppm can cause respiratory irritation in 1 hour of exposure. Concentrations between 700 - 1000 ppm can result in rapid loss of consciousness, cessation of respiration and death.[24] Despite this well known human health hazard, the BC Oil and Gas Commission Emergency Response Plan Requirements only classifies a pipeline carrying gas with more than 10 moles / kilomole,

---

[19] Matthew Johnson (1999 & 2008), online: http://www.flaringreductionforum.org/downloads/20081205-830/Johnson.pdf & http://www.mece.ualberta.ca/groups/combustion/flare/papers/CombCan99-Efficiency.pdf) "Results showed that the combustion efficiencies of these flames are strongly dependent on the cross flow velocity" p. 8 1999 Document.
[20] US EPA, "Emission Factors" (2005), at para 13.5, online: <http://www.epa.gov/ttnchie1/ap42/ch13/final/c13s05.pdf>, last accessed 26 January 2012.
[21] Cheryl Lynna Waldner, "Beef herd health and productivity and exposure to the petroleum industry in west-central Alberta", (1999) , online: <http://library.usask.ca/theses/available/etd-10212004-001610/>, last accessed 26 January 2012.
[22] Center for Disease Control, "Documentation for Immediately Dangerous To Life or Health Concentrations (IDLHs)", (May 1994), online: <http://www.cdc.gov/niosh/idlh/7783064.html>, last accessed 26 January 2012.
[23] *Ibid.*
[24] *Ibid.*

or 10,000 ppm of H_2S as "sour".[25] Exposure to H_2S concentrations on this level would be fatal nearly instantaneously. According to this classification a pipeline carrying natural gas containing 9,000 ppm would be considered "Sweet gas" and subject to lower safety and setback requirements. This flies in the face of accepted CDC evidence of actual health risks, and additionally promotes a false sense of security about the safety of "sweet gas." The HHRA must investigate the potential human health risks associated with exposure to so-called sweet gas.

In addition to the devastating acute effects of H_2S exposure, numerous studies have found troubling effects from chronic low dose exposure. A Finnish study found an increase in spontaneous abortions among populations exposed to H_2S.[26] A recent study at Rush Medical University in Illinois found that exposure to even relatively low concentrations of H_2S are hazardous, and that "[a] rigorous epidemiologic investigation of persons who work with H_2S is warranted."[27] Multiple studies have found that chronic exposure is linked with depression, fatigue and reduced mental function.

Currently, the Air Quality Health Index, a federal government program that monitors air quality in real time across the country, does not cover northeast BC. In the oil and gas producing regions of Alberta, such monitoring is commonplace.[28]

A series of studies were conducted between 2005 and 2008 in Garfield County, Colorado on the possible health effects of oil and gas production. These studies found a theoretical significantly higher theoretical risk of cancer and non-cancer risks from benzene exposure near oil and gas development sites.[29] One of the primary findings of these studies was that insufficient data made it difficult to determine conclusively if observed health effects were caused by oil and gas development. What they did find, however, is a list of 15 "Chemicals of Potential Concern" (COPC) that are directly related to oil and gas development. These chemicals are:[30]

1. Acetone
2. Benzene

---

[25] BC Oil & Gas Commission, "B.C. Oil and Gas Commission Emergency Response Plan Requirements", (2004), online: <http://www.bcogc.ca/document.aspx?documentID=746&type=.pdf>, last accessed 26 January 2012.
[26] Kari Hemminki and Marja-Liisa Niemi, "Community study of spontaneous abortions: Relation to occupation and air pollution by sulfur dioxide, hydrogen sulfide and carbon disulfide", (1982), International Archives Of Occupational And Environmental Health, Volume 51, Number 1, 55-63
[27] Alan Hirsch, "Hydrogen sulfide exposure without loss of consciousness: chronic effects in four cases", (2010) International Journal of Toxicology 29: 569-581.
[28] Environment Canada, "Air Quality Health Index", online: <http://www.ec.gc.ca/cas-aqhi/default.asp?lang=En&n=E36ED558-1>, last accessed 26 January 2012.
[29] See generally, http://www.garfield-county.com/public-health/human-health-risk.aspx, last accessed 26 January 2012.
[30] Raj Goyal, "Air Toxic Inhalation: Overview of Screening-Level Health Risk Assessment for Garfield County" (2008) Colorado Department of Public Health, online: <http://www.garfield-county.com/public-health/documents/Air Toxics Screening Level Risk Assesment Presentation 6 17 08 - Dr_Raj Goyal.pdf>, last accessed 26 January 2012.

3. 2-Butanone
4. Chlormethane
5. Ehtylbenzene
6. 2-Hexanone
7. Methlene chloride
8. Styrene
9. Tricholofluoromethane
10. Tricholoethylene
11. Tetrachlorethylene
12. Toluene
13. Vinyl acetate
14. O-Xylene
15. m, p-Xylene

To learn what the real risks are to human health from oil and gas air pollution in Northeastern BC, the HHRA will need to collect a significant quantity of data on the quantum and content of flare and other emissions. The Texas Commission on Environmental Quality recently conducted studies examining flare combustion efficiency in varying conditions. Among their findings was a preliminary observation that a new passive, and relatively affordable measurement tool, Fourier transform infrared spectroscopy, provides relatively accurate measurement of flare combustion efficiency in common conditions.[31]

Recommendations

- We recommend that the HHRA employ FTIR (Fourier Transform Infrared Spectorscopy) or other equally effective technology to measure the real time combustion efficiency of flares in northeast BC.

- We recommend that the HHRA investigate potential health effects from chronic exposure to H_2S.

- We recommend that the HHRA investigate the potential risk of H_2S exposure in "sweet gas".

- We recommend that further studies be performed to determine if Chemicals of Potential Concern identified in Garfield County, Colorado are or could be present in northeast BC at quantities that threaten public health.

[31] Bruce Davis, "Summary of Flare Issues and Regulatory Plans", (October 4, 2011), presentation to Local Air & Water Management, at 25, online: <http://www.awma-gcc.org/docs/2011_10_Flare_Issues.pdf>, last accessed February 3, 2011.

Water Contamination

Oil Spills

Oil spills in water bodies pose a serious risk to human health. Spills resulting from pipeline leaks or ruptures are inevitable and a relatively common occurrence: an average of 803 pipeline failures occurred every year in Alberta between 1990 and 2005.[32] The oil spill in the Pine River in Northeast BC in 2000 as a result of a pipeline rupture is an example of the significant consequences to water resources, human health and fish populations that accompany an oil spill. Following the spill, the town of Chetwynd, which relied on the Pine River for drinking water, was placed on a water reserve for 4-6 weeks, and water had to be trucked in to the community.[33] Residents were told to conserve water, and restrict their water use to essential uses.[34] Chetwynd had to drill groundwater wells to replace the Pine River as the community's water source, as the Pine River was contaminated and could not be used as a source of drinking water for years after the spill.[35] One can foresee the human health impacts of extended water restrictions and shortage following an oil spill, especially in a community that could not easily access an alternative water source.

The Pine River incident demonstrates the devastating impact of oil spills occurring in water bodies on fish populations and other wildlife. Tens of thousands of fish were killed, and many birds and beaver died because of the spill.[36] In addition to being acutely toxic and lethal to fish, oil and other petroleum products can contaminate spawning beds, thereby compromising the success of future fish populations.[37] Declining fish populations and contamination of fish due to oil spills will have a negative impact on the health of humans who consume those fish as a food source.

The Pine River oil spill also proves that oil spills in rivers are difficult to contain and clean up, and thus pose a sustained risk to human health. The oil slick in the Pine River was 21 km long, and even though 30 million dollars was spent in clean up, 80,000 litres of the oil remain in the environment.[38] The Pine River was identified as the most endangered river in BC the year after the spill occurred.[39]

In light of the foregoing, the HHRA must consider the grave health impacts that could occur as a result of oil spills contaminating water bodies in Northeast BC. Pipelines that

---

[32] West Coast Env. Law, *supra*.
[33] Press release from the Attorney General, "Fish and Wildlife Assessment to be the focus of Provincial Response at Pine River Spill" (August 3 2000), online: <http://www2.news.gov.bc.ca/archive/pre2001/2000/3934.asp>, last accessed 23 January 2012.
[34] *Ibid.*
[35] West Coast Env. Law, *supra*.
[36] *Ibid.*
[37] Levy for Pembina, *supra*, at 22.
[38] West Coast Env. Law, *supra*.
[39] *Ibid.*

cross rivers and pipelines that are located close to water bodies or wetlands should be carefully inspected to ensure that they are in good condition and not at risk of rupturing.

Hydraulic Fracturing

The process of hydraulic fracturing to stimulate natural gas production wells is fraught with risks to water resources and human health. To begin with, the fluids used in the hydraulic fracturing process to force cracks in hydrocarbon formations contain several chemicals known to be harmful to human health. Some of these chemicals are: benzene, phenanthrenes, naphthalene, 1-methylnapthalene, 2-methylnapthalene, fluorenes, aromatics, ethylene glycol and methanol.[40] Health effects associated with these chemicals include cancer; liver, kidney, brain, respiratory and skin disorders; and birth defects.[41] The United States Environmental Protection Agency (EPA) has documented that the nine aforementioned chemicals are injected by hydraulic fracturing operations at concentrations that pose a threat to human health.[42] Several other chemicals used in the fracturing process are toxic in their pure form.[43] A list of 750 substances used by hydraulic fracturing operations recently published by Democratic members of three US House of Representatives committees contained 29 known possible human carcinogens and/or regulated toxic chemicals.[44]

A major concern is that the toxic fluids used in hydraulic fracturing operations will contaminate drinking water sources and thereby put human health at serious risk. More than 1,000 cases of water contamination have been attributed to hydraulic fracturing operations by courts and state and local governments in Colorado, New Mexico, Alabama, Ohio and Pennsylvania.[45] Water contamination can occur through: spills of fracturing fluids; during disposal of the toxic wastewater created by hydraulic fracturing; fracturing fluids escaping through cracks in well casings; and fluids migrating from the target hydrocarbon formation into aquifers or wells.

Spills of toxic fluids associated with hydraulic fracturing operations are inevitable. Spills may contaminate surface drinking water sources when they occur directly in water bodies or when they occur on soil and seep into groundwater sources. Spills of a lubricant gel used in the fracturing process in Pennsylvania polluted a wetland and

---

[40] Oil and Gas Accountability Project, "Our Drinking Water at Risk: What EPA and the Oil and Gas Industry Don't Want us to Know About Hydraulic Fracturing", Earthworks (2005) at vii, online: <http://www.earthworksaction.org/files/publications/DrinkingWaterAtRisk.pdf>, last accessed 24 January 2012 [Oil and Gas Accountability Project].
[41] *Ibid.*
[42] *Ibid*, at 8.
[43] *Ibid*, at 3.
[44] Karen Campbell & Matt Horne, "Shale Gas in British Columbia: Risks to B.C.'s water resources" (2011) The Pembina Institute, Drayton Valley, Alberta, at 13, online: <http://pubs.pembina.org/reports/shale-and-water.pdf>, last accessed 24 January 2012 [Pembina 2011].
[45] Abrahm Lustgarten. "Buried Secrets: Is Natural Gas Drilling Endangering U.S. Water Supplies?" *ProPublica* (November 13 2008), online: <http://www.propublica.org/article/buried-secrets-is-natural-gas-drilling-endangering-us-water-supplies-1113>, last accessed 24 January 2012 [Propublica].

resulted in a fish kill.[46] A rancher in Colorado was hospitalized after drinking tap water in his house, which was shown to contain benzene.[47] Spills associated with hydraulic fracturing operations were determined to be the cause of the benzene contamination.[48] Blow-outs of fracturing wells due to unexpected pressure changes (often a result of nearby fracturing operations) can cause spills of fracturing fluids and contaminate drinking water sources.[49]

Current disposal practices for the toxic wastewater produced by hydraulic fracturing in northeast BC can result in the pollution of drinking water resources and risks to human health. The majority of the fluids injected by hydraulic fracturing operations return to the surface and cannot be re-used.[50] Produced water, which is water that may be millions of years old that was contained in the hydrocarbon formations, also returns to the surface with the flowback fracturing fluids and is part of the wastewater that must be disposed of in fracturing operations. This water can contain high concentrations of salts, naturally occurring radioactive materials, arsenic, benzene and mercury.[51]

Tests of waste from the Marcellus shale in the USA have revealed the presence of uranium and radium at levels that could cause human health concerns.[52] Because no facilities exist in northeast BC to treat the toxic wastewater produced by hydraulic fracturing operations, it is typically injected into old gas wells.[53] Wastewater can leak from these disposal wells and contaminate groundwater. Ruptured and cracked casings of disposal wells in Texas and Kentucky have led to drinking water aquifers becoming contaminated.[54] Drinking water contamination due to escape of toxic wastewater and produced water from disposal wells is a problem connected with all oil and gas operations, not just hydraulic fracturing.

Hydraulic fracturing can also contaminate drinking water when toxic substances leak through cracks in the well casing and seep into groundwater. Cracks or gaps occur between the wellbore and the cement and casing of wells when a complete bond

---

[46] Riverkeeper, "Riverkeeper Appendix 1: Case Studies Impacts And Incidents Involving High-Volume Hydraulic Fracturing From Across The Country" 2010, online: <http://www.riverkeeper.org/wp-content/uploads/2010/01/Riverkeeper-DSGEIS-Comments-Appendix-1-Case-Studies.pdf>, last accessed 22 January 2012 [Riverkeeper].
[47] ProPublica, *supra*.
[48] *Ibid.*
[49] Pembina 2011, *supra* at 17.
[50] Pembina 2011, *supra* at 13, 16.
[51] Pembina 2011, *supra*, at 13.
[52] Marvin Restikoff et al, "Radioactivity in Marcellus Shale", Radioactivity Waste Management Associates, May 19, 2010, <http://energy.wilkes.edu/PDFFiles/Library/Marcellus%20Shale%20Radioactivity%20Report%205-18-2010.pdf>, last accessed January 20, 2012.
[53] Ben Parfitt, "Fracking Up Our Water, Hydro Power and Climate: BC's Reckless Pursuit of Shale Gas" (2011) Canadian Centre For Policy Alternatives, Vancouver, at 34, online: <http://www.policyalternatives.ca/sites/default/files/uploads/publications/BC%20Office/2011/11/CCPA-BC_Fracking_Up.pdf>, last accessed January 20, 2012 [Parfitt 2011].
[54] GAO, *supra,* at 25

between the wellbore and the cement and casing is not achieved.[55] Natural gas, fracturing fluids and produced water can escape from these cracks and contaminate groundwater.[56] In 2009 the Pennsylvania Department of Environmental Protection found a crack in a hydraulic fracturing well casing to be the cause of 14 private drinking wells becoming contaminated by natural gas.[57] The company at fault was required to install new water systems in the effected homes.[58] In 2007 inadequate cementing of a hydraulic fracturing well in Bainbridge, Ohio led to an explosion in a home and contamination of 22 private wells and one public water source.[59]

The risk to drinking water sources and human health posed by improper cementing of hydraulic fracturing wells is exacerbated by section 4(1)(e) of BC's Drilling and Production Regulation, which authorizes an Oil and Gas Commission official to exempt a proponent from all of the regulations governing well casing. Furthermore, section 18(7) of the Drilling and Production Regulation states "if there is any reason to doubt the effectiveness of casing cementation, a well permit holder must ensure that a survey is made to evaluate the cement integrity." The section does not specify what might cause a doubt to arise, and this vagueness puts human health at risk of water contamination. BC legislation should require the use of Cement Evaluation Tools, which are the most accurate tool for determining the integrity of the bond between the wellbore and the cement and casing.

Fracturing fluids can also contaminate drinking water sources by migrating from the targeted hydrocarbon formation into wells or drinking water aquifers. Cracks created in the targeted hydrocarbon formation by the injection of the fracturing fluids often link up with pre-existing cracks in the formation and fracture in unpredictable ways.[60] It is

---

[55] Pembina 2011, *supra* at 14.
[56] M. Zoback, S. Kiasei & B. Copithorne, "Addressing the environmental risks from shale gas development," at 8,
Worldwatch Institute, July 2010. And, "The greatest risk of contamination of ground water by fracture fluids comes from the potential for fluids to migrate upward within the casing/ formation annulus during the fracturing process. The most effective means of protecting ground water from upward migration in the annulus is the proper cementation of well casing across vertically impermeable zones and ground water zones" at 23, "State Oil and Gas Regulations Designed to Protect Water Resources", (2009); SEAB Shale Gas Production Subcommittee Ninety-Day Report – August 11, 2011, at 20-21, online: <http://www.shalegas.energy.gov/resources/081111_90_day_report.pdf>, last accessed 24 January 2012.
[57] Pembina 2011, *supra* at 14; and Riverkeeper, *supra,* at 3.
[58] Pembina 2011, supra at 14.
[59] Riverkeeper, *supra*, at 8; And, a recent Duke University study has shown that levels of methane in drinking water wells in close proximity to fracked wells contained higher and dangerous methane levels. See SG Osborn et. al., "Methane Contamination of Drinking Water Accompanying Gas-Well Drilling and Hydraulic Fracturing", Proceedings Of The National Academy Of Sciences Of The United States Of America (May 2011), online: <http://www.propublica.org/documents/item/methane-contamination-of-drinking-water-accompanying-gas-well-drilling>, last accessed 24 January 2012.
[60] Ben Parfitt, "Fracture Lines: Will Canada's Water be Protected in the Rush to Develop Shale Gas?," Munk School of Global Affairs, University of Toronto (2010) at 14, online: <http://www.powi.ca/pdfs/groundwater/Fracture%20Lines_English_Oct14Release.pdf>, last accessed 23 January 2012 [Parfitt 2010].

possible that vertical fractures could be created, causing fracturing fluids to migrate upwards from the targeted hydrocarbon formation into underground drinking water sources.[61] In Sublette County, Wyoming, several drinking water wells were found to be contaminated by benzene, a chemical used in fracturing fluids that can cause aplastic anemia and leukemia, at concentrations 1,500 times that safe for humans.[62] The U.S. Bureau of Land Management determined the cause of this contamination to be the nearly 6,000 oil and gas wells that were hydraulically fractured in Sublette County.[63]

The lack of any baseline water quality test of water bodies in northeast BC also poses a threat to human health. It is extremely important that baseline studies be done on water sources in the area of hydraulic fracturing operations in order to protect humans from contamination of water sources caused by fracturing. When the quality of a water source is known before fracturing operations take place, pollution of that water by fracturing operations will be easier to detect, and a clearer picture of the risks to human health presented by fracturing can be obtained. By enabling easier detection of pollution, baseline tests can also facilitate faster implementation of precautionary measures to protect people from water contamination.

A further threat to water sources and human health posed by hydraulic fracturing operations is the risk of disrupting hydrological cycles and watershed ecosystems by the massive water withdrawals exacted by hydraulic fracturing operations. Hydraulically fracked wells in BC's northeast consume between 5 million and 90 million litres of water, virtually none of which can be returned to the eco-system.[64] A critical question is what effects will these massive water withdrawals have on the region's hydrology and what will the ecological impacts be? Unfortunately, there are no clear answers to that question. For example, so little is known about many of the surface water sources used by industry that they are not even named.[65] Massive water withdrawals from northeast BC's surface and groundwater resources could result in diminishment of drinking water sources.[66] Watershed ecosystems could also be disrupted, thereby impacting fish and other wildlife habitat, and impacting humans who rely on these animals for food. Until we have a better understanding of what long term effects might result, it is foolhardy to allow large scale industrial water pollution to be sanctioned by the province. Industry and the Province must be tasked with undertaking comprehensive watershed level hydrological evaluations.

---

[61] *Ibid,* at 14.
[62] ProPublica, *supra.*
[63] *Ibid.*
[64] Pembina 2011, *supra*, at 10.
[65] Parfitt 2010, *supra* at 7.
[66] As the Oil and Gas Accountability Project states "The extraction of so much water for fracking has raised concerns about the ecological impacts to aquatic resources, as well as dewatering of drinking water aquifers." online: <http://www.earthworksaction.org/issues/detail/hydraulic_fracturing_101#GROUNDWATER>, last accessed 24 January 2012.

Several jurisdictions have either outlawed or put moratoriums on hydraulic fracturing in light of the risks it poses to human health. France and New Jersey have banned the practice.[67] A moratorium is in place in Quebec.[68] On November 18, 2011 the Delaware River Basin Commission cancelled a proposed vote to allow hydraulic fracturing, effectively putting a moratorium on the practice throughout the watershed.[69] In Maryland permit applications are currently in a limbo state with the regulator neither approving nor denying them.[70] A moratorium in BC would be the ideal solution in terms of environmental protection, health and safety. Without a moratorium the next best solution is to push for stringent and comprehensive regulations. Use of non-toxic fracturing fluids should be a requirement in BC.

In summary, the HHRA must consider the potential for the toxic fluids used and produced by hydraulic fracturing operations to contaminate water sources and thereby put human health at risk. Toxic fluids associated with hydraulic fracturing can enter water bodies via spills; during disposal of the toxic wastewater created by hydraulic fracturing; fracturing fluids escaping through cracks in well casings; and fluids migrating from the target hydrocarbon formation into aquifers or wells.

In regards to spills, the HHRA should consider the potential for fluids to spill out of open disposal pits. Protective mats should be used where fracturing fluids are used above ground to mitigate damage as a result of a spill. In regards to water contamination during disposal of fracturing fluids and wastewater, the HHRA should ensure all disposal wells in Northeast BC are properly capped. Any old well proposed to be used for waste disposal should be examined to ensure it will not leak.

To respond to the threat of fracturing fluids escaping from cracked well casings and then contaminating water sources, the HHRA should consider recommending the use of Cement Evaluation Tools, which are the most accurate tool for determining the integrity of the bond between the wellbore and the cement and casing. To address the danger of water contamination as a result of fracturing fluids migrating from the targeted

---

[67] Davide Castelvecchi, "France becomes first country to ban extraction of natural gas by fracking", Scientific American (June 30, 2011), online: <http://blogs.scientificamerican.com/observations/2011/06/30/france-becomes-first-country-to-ban-extraction-of-natural-gas-by-fracking/>, last accessed 25 January 2012; Maryann Spota, "N.J. Senate passes fracking ban", NorthJersey.com (June 29, 2011) <http://www.northjersey.com/news/NJ_Senate_passes_fracking_ban.html>, last accessed 25 January 2012.

[68] Rheal Seguin, "Quebec halts shale gas exploration", The Globe and Mail, online: <http://www.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/quebec-halts-shale-gas-exploration/article1934217/>, last accessed 25 January 2012.

[69] RiverKeeper, "DRBC Cancels Fracking Vote", (November 20, 2011), online: <http://www.riverkeeper.org/news-events/news/safeguard-drinking-water/drbc-cancels-fracking-vote/>, last accessed 25 January 2012.

[70] Greg Master, "Maryland Weighs Fracking's Potential Impact", (November 19, 2011), online: <http://westminster.patch.com/articles/maryland-weighs-fracking-s-potential-impact>, last accessed 25 January 2012.

hydrocarbon formation, the HHRA should ensure that hydraulic fracturing operations in Northeast BC are not conducted within or near to groundwater tables.

Given the above, and in light of the serious threat to human health posed by toxic fracturing fluids, the HHRA should examine the feasibility of using non toxic fracturing fluids. The HHRA should also recommend baseline water quality tests be done on all water sources near to fracturing operations in order to be able to detect whether fracturing operations are contaminating surrounding water bodies and posing threats to human health.

The HHRA must also consider the potentially grave effects on watershed hydrology posed by massive freshwater withdrawals by fracturing operations, and should recommend that industry and government undertake watershed level hydrological evaluations.

Disposal Pits

A serious threat to drinking water quality posed by all oil and gas industry activity is the use of disposal pits, or tailings ponds, for waste. As discussed in relation to hydraulic fracturing, waste from oil and gas operations contains several substances potentially hazardous to human health. These include: benzene, arsenic, barium, cadmium, chromium, lead and selenium.[71] These chemicals can contaminate drinking water sources via spills from the pits or from seepage through the pits and through soil into surface and groundwater. 6,700 cases of pits causing soil and water contamination were recorded by the New Mexico Environmental Bureau in that state between the mid-1980s and 2003.[72] Several reports have confirmed that chemicals found in tailings ponds are present in much higher concentrations under river ice in parts of the Athabasca River downstream of oil sands tailings ponds, indicating tailing pond leakage.[73] Section 51(3) of the Drilling and Production Regulation, which specifies the minimum set-back for liquid waste pits from water bodies (100m) and water supply wells (200m), is subject to the "Exemption Provision" at s 4(1)(e)(o) of the Drilling and Production Regulation. There is thus no firm regulation regarding setbacks of disposal pits from water sources, putting human health at far greater risk of water contamination from spills and seepage of toxins from disposal pits.

---

[71] Oil and Gas Accountability Project, online: <http://www.earthworksaction.org/issues/detail/pit_rule>, last accesed on 24 January 2012.

[72] *Ibid.*

[73] Liberal Report from the Study of the Standing Committee on Environment and Sustainable Development on the Impact of Oil Sands Development on Canada's Freshwater, "The Hidden Dimension: Water and the Oil Sands," at 16-19, online: <http://thetyee.ca/News/2010/08/18/The%20Hidden%20Dimension_Water%20and%20the%20Oil%20Sands.pdf>, last accessed 25 January 2012 [Liberal Report]; And see Andrew Nikiforuk, "Oil Sands Pollute with Fish-Killing Toxins, New Study Shows" (August 30, 2011), online: <http://thetyee.ca/News/2010/08/30/TarSandsStudy/>, last accessed 25 January 2012 [Nikiforuk, August 30, 2011].

The HHRA must consider the potential for disposal pits to contaminate drinking water sources and thereby threaten human health. All disposal pits should be required to be setback from water sources at least 200 metres, with no possibility of exemption from this requirement. The HHRA should test water bodies close to disposal pits for any chemicals associated with oil and gas industry waste to determine any potential threats to human health.

Air Pollution and Water Contamination

Air pollution produced by oil and gas industry activity can also contaminate water. Sections of the Athabasca River just downstream of tar sands production sites have higher concentrations of heavy metals and polycyclic aromatic hydrocarbons (PAHs), which are released into the air during oil and gas production.[74] PAHs are carcinogenic and would be very harmful to humans if they entered a drinking water source at high concentrations. Studies conducted in Nigeria's Niger Delta area compared a community with active oil and gas industry to one without – and revealed higher concentrations of PAHs, and concentrations above the WHO guidelines, in surface water sources near the community with oil and gas industry activity.[75] Gases released into the air through flaring by the oil and gas industry have also been found to cause acid rain.[76] Acidification of water bodies linked to acid rain in Nigeria has resulted in decreased fish catches; lower availability of food for fish; deformities in young fish; and improper hatching of fish eggs.[77] Consumption of acidic water can also cause stomach ulcers.[78]

The HHRA must consider the potential for oil and gas air pollution to contaminate water bodies and endanger human health. Water bodies in the vicinity of oil and gas operations should be tested for the presence of PAHs and other chemicals released into the air during oil and gas industry activity.

Construction

Construction accompanying the oil and gas industry can negatively impact water ecosystems and human health. Construction associated with the oil and gas industry introduces sediment into water bodies during road construction, road washouts and the construction of pipeline river crossings. Fish are sensitive to increased sedimentation, which can cause them stress, reduced feeding success, respiratory problems and habitat degradation.[79] Sedimentation may also result in reduced growth, delayed hatching and increased predation of fish fry.[80] Altering the landscape around water

---

[74] Nikiforuk, August 30, 2011, *supra*; And Liberal Report, *supra*.
[75] Ana, Sridhar and Emerole, "Contamination of Surface Waters by Polycyclic Aromatic Hydrocarbons in Two Nigerian Coastal Communities," 11 Journal of Environmental Health Research (2011).
[76] J.K.C. Nduka, O.E. Orisakwe, L.O. Ezenweke, T.E. Ezenwa, M.N. Chendo, and N.G. Ezeabasili, "Acid Rain Phenomenon in Niger Delta Region of Nigeria: Economic, Biodiversity, and Public Health Concern," The Scientific World Journal, August 28, 2008 [Nduka et al].
[77] Nduka et al, *supra* at 4.
[78] *Ibid.*
[79] David A. Levy, "Pipelines and Salmon in Northern British Columbia", The Pembina Institute (October 2009) at 17, online: <www.pembina.org/pub/1894>, last accessed 23 January 2012 [Levy for Pembina].
[80] *Ibid.*

bodies, for example by deforestation to facilitate a pipeline river crossing or road, will increase the amount of light reaching the water and increase water temperatures, as well as decrease habitat for insects that fish rely on for food.[81] By significantly impacting the health and survival of fish, sedimentation and habitat alteration caused by oil and gas industry construction can negatively impact the health of humans that rely on fish as a food source. Sedimentation can also alter wetland ecosystems and effect wildlife populations that inhabit them. The health of humans that rely on animals inhabiting wetlands, such as moose, as an important food source, could be negatively impacted. The HHRA should investigate the extent of the effects of such construction on fish populations and the subsequent effects on human populations.

Recommendations

- We recommend that the HHRA examine the impact of oil spills in water bodies.
- We recommend the HHRA examine the potential human health impacts resulting from water contamination by hydraulic fracturing fluids and wastewater.
- We recommend that the HHRA consider the use of Cement Evaluation Tools to prevent the seepage of fracturing fluids into groundwater drinking sources.
- We recommend that the HHRA investigate the health risks associated with disposal pits leaching toxic oil and gas industry waste into nearby water sources.
- We recommend that the HHRA examine the human health risks posed by oil and gas industry air pollution contaminating water sources.
- We recommend that the HHRA examine the impact of sedimentation on water bodies resulting from oil and gas industry construction.

[81] *Ibid,* at 19. And, West Coast Environmental Law, "Enbridge Northern Gateway Pipeline - risks for downstream communities and fisheries," online: <http://www.wetsuweten.com/files/WCEL_enbridgedownriver.pdf>, last accessed 23 January 2012 [West Coast Env. Law].

Mental Health Impacts:

Impacts on Residents Living Near Oil and Gas Refineries

In a US study conducted in a community after an island nuclear accident, researchers concluded that "chronic stress was and is a problem for many residents living near... power stations."[82] Researchers analogised the psychological impact of living near the nuclear site to living near oil wells, refineries, and other processes involved in providing energy.

Many residents living near oil and gas refineries suffer from chronic sleep deprivation. Excessive light from flares at fracking sites has been identified as a health hazard due to its "potential to cause sleep deprivation and irritation." [83]

A research team from Worchester Polytechnic Institute conducted a broad study on the health effects of oil contamination.[84] Data from six communities worldwide were included. The team found that, despite different problems in each community, "in all cases when oil contamination affects a community either directly or through other means there can be psychological symptoms such as stress, anxiety, and depression."[85] In several of the communities, the primary stressors were chronic noise, excessive light from flares, and the perpetual fear of living near a potentially environmentally unsound practice. In the Ken Khana Kingdom of Ogani, the greatest amount of social unrest came from "government reprisals in response to local protests against multinational oil companies."[86] In this case, the researchers attribute a prevalence of post-traumatic stress disorder in the community to the social unrest, disasters, and rioting that occurred in response to the government's refusal to take the note of concerns of the community members and attempt to control the practices of the oil company.[87]

Suicide rates have consistently been found to be higher in communities that are involved in resource extraction.[88]

---

[82] Andrew Baum, Raymond Fleming & Jerome E Singer, "Stress at Three Mile Island: Applying Psychological Impact Analysis", (1982) 3 Applied Social Psychology Annual 217-248.
[83] Benjamin Williams "Steps to Mitigate the Potential Health Impacts of Hydraulic Fracturing In New York State", online: <http://www.springerlink.com/content/h23528781uq67732/>, last accessed January 18, 2012.
[84] Jon Gay, Olivia Shepherd, Mike Thyden, Matt Whitman, "The Health Effects of Oil Contamination: A Compilation of Research", Worchester Polytechnic Institute, at page 69 [Gay].
[85] *Ibid* at page 69.
[86] *Ibid* at page 68.
[87] *Ibid* at page 69.
[88] Ruth Seydlitz, Shirley Laska, Daphne Spain, Elizabeth W. Triche, Karen L. Bishop: "Development and Social Problems: The Impact of the Offshore Oil Industry on Suicide and Homicide Rates", February 3, 2010, online at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1549-0831.1993.tb00484.x/abstract>, last accessed January 18, 2012.

An article entitled "The Psychological Impacts of Global Climate Change" included a discussion on the direct impacts of technological transitions associated with climate change, including the oil and gas industry.[89] "Indirect impacts" are described as threats to emotional well-being based on observations of impacts and concern or uncertainty about future risks. In more colloquial terms, these impacts have been said to cause "eco-anxiety". Eco-anxiety is a condition that has been described by sufferers as a "psychological affliction" that is "a chronic fear" of the potential environmentally unsound practices.[90] Individuals living within the vicinity of these practices, such as residents of oil and gas development communities, are more likely to suffer from chronic anxiety.[91]

Recommendations

- We recommend that the HHRA examine the mental health impacts caused by stress and anxiety on residents living near oil and gas refineries.

- We recommend that the HHRA examine the extent to which sleep patterns of neighbouring residents may be affected by light from flares or noise.

- We recommend that HHRA interview mental health workers to document mental health stress in the area.

- We recommend that HHRA take steps to mitigate the potential mental health impacts to residents to the greatest extent possible (for example: creating setback requirements for flares, reducing noise, and responding to the concerns of residents).

Impacts on Workers

A study concerning the mental health of workers at an offshore oil and gas site found that these workers are at risk of suffering from impaired mental health due to the nature of their employment.[92] A significant cause of their impaired state is due to the interruption of a regular sleep schedule. In almost all workers, it was found that "day/night shift rotation was associated with sleep disturbance."[93] Sleep disturbance has been linked to various psychiatric disorders, including depression.

The same study found a high rate of stress symptoms among workers. Workers were asked to complete a General Health Questionnaire, which asked respondents to what

---

[89] Thomas J Doherty & Susan Clayton, "The Psychological Impacts of Global Climate Change", American Psychologist, Vol 66(4), May-Jun 2-11, at pages 265-276.
[90] Stephanie Watson, "How Eco-anxiety Works" (2008), online: <http://science.howstuffworks.com/environmental/green-science/eco-anxiety.htm>, last accessed 23 January 2012.
[91] Watson, *supra.*
[92] Katharine R Parkes and Melanie J Clark: "Psychosocial Aspects of Work and Health in The North Sea Oil and Gas Industry", Department of Experimental Psychology at the University of Oxford [Parkes].
[93] *Ibid.*

extent they experienced "each of 12 symptoms of psychological distress"[94] over a 6 week period. The proportion of high scores on a standard measure of „stress' symptoms was 14.6%.[95] A high score indicates possible clinical or near clinical levels of distress.[96] The study concluded that environmental characteristics were found to be a determinant of mental health outcomes.[97]

Drug and alcohol abuse has been found to be relatively high among workers in the oil and gas industry in North America. Out of 16 industries in a survey that conducted the amount of alcohol consumed by industry per capita, personnel in the oil and gas industry ranked fourth. Oil and gas personnel were also among the most likely to report using drugs and alcohol while on the job.[98]

Recommendations:

- We recommend that the HHRA mandate policies to ensure workers obtain adequate amounts of sleep.

- We recommend that the HHRA monitor the use of drugs and alcohol in workers on a continuous basis.

Additional Mental Health Problems Caused by Exposure to Hazardous Materials

Exposure to hazardous materials can cause further mental health problems aside from those associated with the stress caused by living within the vicinity of a well or fracking site. A study conducted in 2003 that included a discussion on the social impacts of oil production and consumption noted that "wastes from oil refineries can create health risks to facility workers and surrounding communities... Health hazards include exposure to heat, polluted air, noise, and hazardous materials, including asphalt, asbestos, aromatic hydrocarbons, arsenic, hexavalent chromium, nickel, carbon monoxide, coke dust, **hydrogen sulfide,** lead alkyls, **natural gases**, petroleum, phenol, and silica... [Health] impacts from exposure to these materials... include... headaches and mental disturbances, psychosis and peripheral neurophathies."[99]

---

[94] *Ibid.*
[95] *Ibid* at 7.2.2.
[96] Parkes *supra.*
[97] *Ibid.*
[98] Jamie Wiebe, Garry Vinje, Edward Sawka: "Alcohol and Drug Use in the Workplace: A Survey of Alberta Workers", Applied Research Briefs, The Art of Health Promotion, January/February 1995, Vol. 9, No. 3, online: < http://ajhpcontents.org/doi/abs/10.4278/0890-1171-9.3.179>: last accessed 22 January 2012.
[99] Dara O'Rourke and Sarah Connolly: "Just Oil? The Distribution of Environmental And Social Impacts of Oil Production and Consumption", (2003) Annual Reviews, online: <http://escholarship.org/uc/item/32t2x692>, last accessed January 20, 2012.

Recommendations:

- We recommend that the HHRA examine the mental health impacts caused by stress and anxiety on residents living near oil and gas facilities.

- We recommend that the HHRA examine the extent to which sleep patterns of neighbouring residents may be affected by light from flares or noise.

- We recommend that the HHRA examine the potential mental health impacts on workers.

- We recommend that the HHRA examine impacts on mental health caused by continuous exposure to hazardous materials.

Social Health Impacts:

Community Impacts

The Canadian Public Health Agency recognizes that "health is determined by complex interactions between social and economic factors, the physical environment and individual behaviour."[100] Key health determinants are income and social status, social support networks, education and literacy, employment and working conditions, social environments, physical environments, personal health practices and coping skills, healthy child development, biology and genetic endowment, health services, and gender and culture.[101] The socio-economic impacts of the oil and gas industry are well-documented:

Demographic Changes

A sense of community is an important determinant of human health.[102] Oil and gas development is associated with an influx of workers, who are mostly young and male.[103] Rapid population growth and changing demographics cause disruption to communities. For instance, the actions of newcomers are less regulated by social disapproval and other types of informal social control.[104] The impact is greatest on rural and remote communities, which are less civilly robust and therefore have less capacity to manage the changes.[105] Between 2000 and 2005, the population in Northeast BC increased by nearly 9 percent, while the overall population in the province increased by 5.3 percent. In this same time period, the population of young people aged 15 to 29 increased by 5.7 percent in BC, while the same demographic increased by 15.1 percent in Northeast BC.[106]

Drug and alcohol abuse

Oil and gas communities experience increased incidence of drug and alcohol abuse. This is primarily due to the industry's high salaries, the composition of its workers, and the nature of its jobs. Oil and gas workers tend to have significant disposable income;

---

[100] Public Health Agency of Canada, "What Determines Health?," online: <http://www.phac-aspc.gc.ca/ph-sp/determinants/index-eng.php>, last accessed 20 January 2012.
[101] Ibid.
[102] Memorandum from Benjamin Williams, MPH to New York State Senator Greg Ball (7 September 2011) "Steps to Mitigate the Potential Health Impacts of Hydraulic Fracturing In New York State", online: <http://www.scribd.com/doc/64476300/Fracking-Health-Impact-Assessments>, last accessed on 18 January 2012.
[103] S.M. Goldenberg et al, "And they call this progress? Consequences for young people of living and working in resource-extraction communities," Critical Public Health (2010), at 157 [And they call this progress?]
[104] Rick Ruddell, "Boomtown Policing: Responding to the Dark Side of Resource Development," Policing (2011), at 3 [Boomtown Policing].
[105] *Ibid.*
[106] British Columbia Ministry of & Citizens' Services, "BC Stats Infoline," Issue 06-43, 27 October 2006. Last accessed online 9 February 2012 at http://www.bcstats.gov.bc.ca/releases/info2006/in0643.pdf.

the average salary in 2000 was $95,000.[107] Their jobs require them to work long periods of time in camp and do shift work.[108] During their time off, they often binge on alcohol and drugs.[109] Tired workers will use drugs as an upper after nights spent partying.[110] The problem is exacerbated by the social isolation that southern workers experience, removed from their social support networks in their home communities.[111] The use of drugs by workers has the additional effect of increasing the availability of drugs in the wider community. In the Northeast, per capita spending on alcohol doubled between 2006 and 2010 and per capita consumption of alcohol exceeds the provincial average by 50 percent.[112] Per capita drug-related offences (non-cannabis) are the highest in the province.[113] Social and medical services are overburdened and cannot meet the growing demand.[114]

There is a significant impact on the general community, as drug and alcohol use are associated with crime and violence. In Lapalme's study of the social impact of mining, another resource extraction industry, women observed that increased substance use causes "strained relationships, jealousy, violence, family breakdown, lost job and training opportunities and financial stress."[115] For the individual, in addition to the direct health impacts of substance abuse, drugs and alcohol encourage high risk behaviour such as unprotected sex. One approach to combating drug and alcohol use is mandating that oil and gas companies implement urine testing.

Sexually Transmitted Infections

The incidence of STIs is rapidly rising in the northeast, particularly among youth ages 15 to 24.[116] Chlamydia rates in this group increased 21 percent between 2000 and 2005 and exceed the provincial average by 22 percent.[117] There is a similar trend in northern Alberta, where rates of chlamydia and gonorrhoea are higher than in the southern half of the province.[118] The increase is strongly correlated with drug and alcohol abuse.[119]

---

[107] Board of Northern Health, "Population Health and Oil and Gas Activities: A Preliminary Assessment of the Situation in Northeastern BC," at 7.
[108] And they call this progress? *supra* at 158.
[109] *Ibid.*
[110] And They Call This Progress? *supra* at 162.
[111] And They Call This Progress? *supra* at 163.
[112] And They Call This Progress? *supra* at 162.
[113] *Ibid.*
[114] And They Call This Progress? *supra* at 157.
[115] Lise-Aurore Lapalme, "The Social Dimension of Sustainable Development and the Mining Industry: A Background Paper," Natural Resources Canada (2003), at 14 [Social Dimension of Sustainable Development].
[116] Shira Goldenberg et al, "Barriers to STI testing among youth in a Canadian oil and gas community," Department of Health Care and Epidemiology, University of British Columbia (2007), at 718 [Barriers to STI testing].
[117] *Ibid.*
[118] The Royal Society of Canada Expert Panel, "Environmental and Health Impacts of Canada's Oil Sands Industry," (2010) at 213, online: <http://www.rsc.ca/documents/expert/RSC report complete secured 9Mb.pdf>, last accessed 27 January 2012 [Royal Society].
[119] Barriers to STI testing, *supra* at 718.

Family impacts

The nature of employment in the oil and gas industry is disruptive to family life. Many jobs require workers to spend long periods of time in camp and/or do shift work. Impacts include domestic violence, strain on children caused by long absences, and marital breakdown.[120] As previously discussed, women have observed that substance abuse increases pressure on domestic relationships and has a negative effect on the family's overall social and economic wellbeing.[121] Another issue is the insufficient number of daycare spaces to meet increased demand. This shortage causes stress to working parents and has a negative impact on healthy child development and education.

Prostitution

There is an increase in prostitution catering to cash-rich oil and gas workers.[122] With their changing demographics, northern communities are increasingly young and male. The gender imbalance is most pronounced in oil and gas camps. This has resulted in an "ethic of exploitation" of women.[123] The impact is most acute on indigenous women, who have higher than average rates of unemployment and poverty.[124]

Crime and violence

A safe living environment is essential to human health. Resource towns are associated with elevated levels of disorder, crime and violence.[125] This is in part an outgrowth of the social disruption caused by resource development.[126] However, resource towns also attract persons with serious criminal histories.[127]

Traffic and traffic accidents

The rapidly growing population and the transport of workers and equipment to and from work sites increase traffic and places a significant strain on northern roads and highways. Infrastructure spending does not match the increased demand. One result is increased traffic accidents and fatalities.

---

[120] National Aboriginal Health Organization, "Resource Extraction and Aboriginal Communities in Northern Canada: Gender Considerations," (2008), online: <http://www.naho.ca/documents/naho/english/resourceExtraction/Gender_EN.pdf>, last accessed 27 January 2012 [Gender Considerations].
[121] Social Dimension of Sustainable Development, *supra*.
[122] National Aboriginal Health Organization, "Final Report Roundtable Discussion Exploring Community-Based Responses to Resource Extractive Development in Northern Canada", (2008) at 4, online: <http://www.naho.ca/documents/naho/english/resourceExtraction/finalReport.pdf> [Roundtable Discussion].
[123] Roundtable Discussion, *supra* at 4.
[124] *Ibid.*
[125] Lapalme, *supra*.
[126] Boomtown Policing, *supra* at 2
[127] Boomtown Policing, *supra* at 4

Housing/ Cost of Living

Housing or lack of housing contributes to increased stress, morbidity, mortality, social exclusion and physical and mental illness.[128] Resource communities are associated with housing shortages, inflated housing prices and rents, and lower vacancy rates.[129] Evictions of vulnerable tenants increase. The result is housing insecurity and homelessness. The impact is greatest on residents who are not employed in the oil and gas industry and do not enjoy the industry's high salaries. For women who want to leave abusive relationships, the shortage of affordable housing poses a significant barrier.[130]

Services

Access to medical and social services is directly related to health outcomes. Demand for services in Northeastern BC outstrips capacity.[131] According to health services utilization data, demand is highest during peak oil and gas activity periods. There is a similar trend in Alberta's northern communities, where there is an acute shortage of doctors.[132] Inadequate services only exacerbate the negative impacts of oil and gas on Northeastern communities. In particular, there is insufficient counselling available for drug and alcohol abuse and victims of violence and sexual assault.[133]

Education

One of the most important determinants of health is educational attainment. Northeastern BC has the highest percentage of 18 year-olds who do not complete secondary school in BC.[134] Youth are drawn into high-paid industry-related jobs at an early age.[135] This is in part due to the high cost of living.[136] Many youth also take jobs while in school, which has a negative impact on their studies.[137]

Hunting

Hunting is important to the culture in the Northeast and many residents' quality of life and general health. However, oil and gas development has a negative impact on

---

[128] Senate Subcommittee on Population Health, "A Healthy, Productive Canada: A Determinant of Health Approach," (2009), online: <http://www.parl.gc.ca/Content/SEN/Committee/402/popu/rep/rephealth1jun09-e.pdf>, last accessed 27 January 2012.
[129] National Aboriginal Health Organization, "Resource Extraction and Aboriginal Communities in Northern Canada: Social Considerations," (2008), online: <http://www.naho.ca/documents/naho/english/resourceExtraction/Social_EN.pdf>, last accessed 27 January 2012.
[130] Gender Considerations, *supra*.
[131] And they call this progress? *supra* at 158
[132] Royal Society, *supra.*
[133] Social Impact of Sustainable Development, *supra* at 17.
[134] And they call that progress? *supra* at 160.
[135] *Ibid.*
[136] *Ibid.*
[137] *Ibid.*

hunting activities by causing declines in animal populations.[138] First, oil and gas development is a major source of habitat destruction.[139] It is associated with destroyed wetlands, clear-cutting, and explosions.[140] Second, oil and gas undermines traditional land use patterns.[141] For example, roads may interfere with migration corridors.[142] Third, development activity disrupts wildlife behaviour and scares wildlife away.[143] Fourth, overhunting increases due to the rising population, improved road access, and increased wealth to purchase equipment such as snowmobiles.[144] Finally, pollution and toxic chemicals have a negative impact on wildlife health.[145]

There may also be a physical health impact from eating animals with elevated toxicity levels. Heavy metals and persistent organic pollutants concentrate in fatty tissues.

Recommendations:

- We recommend that the HHRA examine the following community health impacts associated with oil and gas development:
    - Drug and alcohol abuse
    - Sexually transmitted infections
    - Family strain
    - Prostitution
    - Crime and violence
    - Traffic and traffic accidents
    - Housing/ cost of living
    - Overburdened services
    - Education
    - Hunting/ culture

Emergency Response Plans

The lack of appropriately formulated emergency response plans constitutes a serious risk to human health.

The Oil and Gas Commission (OGC) is responsible for overseeing the approval of Emergency Response Plans (ERPs) for oil and gas activities in British Columbia. B.C. ERPs have been influenced by the Energy and Utilities Board (EUB) guidelines utilized

[138] "Resource Extraction and Aboriginal Communities in Northern Canada: Cultural Considerations," at 6, online at: <http://www.naho.ca/documents/naho/english/resourceExtraction/Cultural_EN.pdf>, last accessed 26 January 2012.
[139] *Ibid.*
[140] *Ibid.*
[141] *Ibid.*
[142] *Ibid.*
[143] *Ibid.*
[144] *Ibid.*
[145] *Ibid.*

in Alberta.[146] Specific requirements for B.C. ERPs are summarized in the British Columbia Oil and Gas Commission Emergency Response Plan Requirements.[147]

Rather than leaving emergency response planning to the OGC, there needs to be broader stakeholder involvement to achieve better transparency and accountability – and, ultimately, to achieve better ERPs. This could involve local public involvement (through public meetings) and consultation with government agencies, including Northern Health Officials. In Alberta, the regional health authorities have a role in designing site specific, municipal and provincial emergency response plans.[148]

Note that Peace Environment Safety Trustees Society (PESTS) has articulated the following additional concerns:

Emergency Response Plans are based on the assumption that affected persons will be evacuated in a worst-case scenario. Yet, it is recognized by the School District 59, "Gas Emergency Response Plan," that evacuation may not be possible:

> *"A school will only be evacuated if it is safe for drivers to approach the school, and staff/students are able to move safely from the school to the bus."*

It should be noted that bus drivers do not have H_2S or ERP training. In addition, sheltering is only a short-term solution. Well blowouts can last for weeks if sour gas is ignited. And dispersion of toxic gases can be unpredictable, due to weather inversions, topography, and combustion efficiency rates.

The word "evacuated" may be misleading in a worst-case scenario, since evacuation may not be possible. This raises the question of whether the emphasis should be on sheltering, training detection equipment, and protection equipment – and stop misleading the public with the idea that the solution to leaks is a nifty plan for evacuations.

Evacuation may simply not be possible in a toxic or gas leak. This potential hazard must be made public for all affected persons in the Emergency Planning Zone (EPZ). By

---

[146] Northern Health, "Population Health and Oil and Gas Activities: A Preliminary Assessment of the Situation in Northern BC - A Report," (2007) at 25, online: <http://www.northernhealth.ca/Portals/0/About/NH_Reports/documents/OilandGasreport.pdf>, last accessed 22 January 2012.

[147] Oil and Gas Commission, "B.C. Oil and Gas Commission Emergency Response Plan Requirements," (2004), online: <http://www.bcogc.ca/document.aspx?documentID=746&type=.pdf>, last accessed 22 January 2012.

[148] ERCB, "EnerFAQs 10: Public Health and Safety: Roles and Responsibilities of Agencies that Regulate Upstream Oil and Gas", Energy Resources Conservation Board, (2011), online: <http://www.ercb.ca/portal/server.pt/gateway/PTARGS_0_0_303_263_0_43/http%3B/ercbContent/publishedcontent/publish/ercb_home/public_zone/enerfaqs/enerfaqs10.aspx#16>, last accessed 24 January 2012.

definition, evacuation means "remove from danger" – and that may not be possible, contrary to the information currently provided to the public.

This misleading information about the panacea of "evacuation" needs to be addressed and changed to reflect the true reality of the risk to the people in the EPZ – as they are the ones that must make the judgment call as to the nature of a hazard, based only on instinct, not science. How people respond in an emergency may determine the hazard to themselves or others. A critical question is whether training should be required for people in an EPZ.

PESTS has articulated the following concerns about response time and procedures:

- Time required for confirmations of release, approximately 20 to 60 minutes (if detection has been indicated by sensors). If an odor or sound complaint is received, how long will it take to locate the source and which energy company will respond if more than one company is in the area?
- Gas leaks must be ignited within 15 minutes. Is an explosion not considered a hazard as well?
- If affected individuals are outside in their yard or in a nearby affected area, how will they be notified without any alarm system at the sites?
- ERP plans are based on fire-fighting protocols from the United States. How are ERP plans effective for toxic releases or possible explosions of natural gas releases, for the public and workers?
- Are EPZs and ERPs used as justification for inadequate setbacks?
- ERPs and the 100 metre setback are supposedly based on safety and health. However, how is this possible when a gas leak will travel 100 metres in 25 seconds, with only a 15 km/hr wind speed?

Recommendation:

- We recommend that the HHRA examine the informational components to be required in emergency response plans (ERPs), set out the roles of various stakeholders and agencies, and examine optimal options for implementation of effective ERPs.[149]

[149] This recommendation was also made in the Environmental Law Centre's letter to the Honourable Colin Hansen, Minister of Health Services: "Re: Request for *Public Health Act* Inquiry to Investigate Whether Current Regulation of Oil and Gas Development Adequately Protects Human Health," 2 February 2011, page 12, online: <http://www.elc.uvic.ca/documents/11%2002%2002%20Ltr%20to%20Hansen%20re%20Inquiry%20%28final%20and%20SIGNED%29.pdf>, last accessed 22 January 2012.

Part 2: Procedural Recommendations

The Risk Assessment Framework

The Framework for Environmental Health Risk Management[150] that has been selected for implementation in this project appears to be an excellent model, applying an iterative, multi-stage process that allows for a broad and dynamic conceptualization of risk and direct stakeholder engagement. It is important that key aspects of the framework be adhered to as this process proceeds. Specifically:

1. It is crucial that the health risk assessment take a broad approach to determinations of risk. As we have outlined above, this requires the application of a holistic definition of "health", such as that adopted by WHO, and consequently a recognition of a broad range of potential health impacts.
2. The assessment must consider not only the effects of single chemicals independently, but the combined risk created by the entire industry.
3. It must also consider not only the direct risks to individual humans, but also the potential harms to the communities and ecosystems that support human health.
4. The framework calls for stakeholder involvement "during all stages of the risk management process."[151] While the current Phase 1 is an important first step in engaging stakeholders, it is crucial that local residents and other concerned citizens continue to have the opportunity to be involved as the process evolves through the subsequent stages. It is particularly important that stakeholders be consulted during the problem formulation stage of the risk assessment, and that engagement should continue all the way through the assessment process, terminating with the development and implementation of risk management measures and follow-up monitoring. The importance of stakeholder engagement will be discussed in more detail in the next section.
5. The risk assessment process must be dynamic and iterative. It must be responsive to stakeholder inputs and other developments, and it must allow for steps to be repeated as necessary to incorporate new information.

It is important to note that the framework is just that - a framework - and does not exhaustively detail the methods to be used to assess and manage risks. The substantive comments below may help guide the development of the specific methods to be used for this assessment. Once these methods have been established, an opportunity for further stakeholder input should be provided.

---

[150] The Presidential/Congressional Commission on Risk Assessment and Risk Management, *Framework for Environmental Health Risk Management: Final Report*, vol 1 (Washington, DC: RiskWorld, 1997), online: <http://www.riskworld.com/Nreports/1997/risk-rpt/pdf/EPAJAN.PDF>, last accessed 26 January 2012 [Framework].
[151] *Ibid* at 6.

The framework cited in the Request for Proposals[152] was a proposal authored by a joint presidential/congressional commission. This proposal later informed a comprehensive framework for cumulative risk management published by the US Environmental Protection Agency.[153] Based on the key principles referenced above, it appears that the basic elements of the commission's older framework are appropriate for application to this case. However, if the BC Ministry of Health wishes to proceed on the basis of this older framework, we recommend that the risk assessment model be developed with additional reference to more recent standards. Particularly, it would seem appropriate to consult the official US EPA framework, as well as similar documents published by Health Canada,[154] Australia,[155] and other competent jurisdictions. For specific methodology, we also recommend consulting similar risk assessments conducted in other jurisdictions, such as the Community Health Risk Analysis of Oil and Gas Industry Impacts in Garfield County, Colorado.[156]

Recommendations:

- We recommend that Phase 2 of the project be conducted with a broad conceptualization of risk, extensive stakeholder involvement, and a dynamic and responsive process, as described in the Framework for Environmental Health Risk Management.

- We recommend that the risk assessors consult more recent risk assessment framework documents, including documents prepared by the USA Environmental Protection Agency, Health Canada, Australia, and other competent jurisdictions to ensure that the best possible method is implemented.

- We recommend that the Ministry of Health establish thorough and transparent criteria for the selection of qualified risk assessors in Phase 2.

---

[152] British Columbia, Ministry of Health, *Request for Proposals: Stakeholder and Targeted Public Engagement for Human Health Risk Assessment of British Columbia Oil and Gas Development*, (Victoria: Ministry of Health, 2011), Request for Proposals Number RFP HL163 at 7, footnote 2.
[153] US EPA, *Framework for Cumulative Risk Assessment*, (2003) online: <http://www.epa.gov/raf/publications/framework-cra.htm>, last accessed 26 January 2012.
[154] Health Canada, *Health Canada Decision-Making Framework for Identifying, Assessing, and Managing Health Risks*, (2000) online: <http://www.hc-sc.gc.ca/ahc-asc/pubs/hpfb-dgpsa/risk-risques_tc-tm-eng.php>, last accessed 26 January 2012.
[155] Australia Department of Health and Ageing and enHealth Council, *Environmental Health Risk Assessment: Guidelines for Assessing Human Health Risks from Environmental Hazards*, (2002) online: <http://www.nphp.gov.au/enhealth/council/pubs/pdf/envhazards.pdf>, last accessed 26 January 2012.
[156] Teresa Coons & Russell Walker, "Community Health Risk Analysis of Oil and Gas Industry Impacts in Garfield County", (Rifle, CO: Garfield County Department of Public Health, 2008) online: <http://www.garfield-county.com/public-health/human-health-risk.aspx>, last accessed 26 January 2012.

Expanding the Audience

Need to balance confidentiality with accessing all pertinent information
Phase 1 of the HHRA process is forced to perform a delicate balancing act in obtaining all pertinent information for the accurate scoping of Phase 2. Serious privacy concerns are front and center in any discussion concerning personal health information, yet access to that very type of information is central to the HHRA.

Citizens have expressed reservations about discussing negative experiences surrounding the oil and gas industry because of the highly personal and sensitive nature of much of this information.

One of the primary concerns of citizens in Northeast BC is that virtually all individual aspects of the oil and gas industry escape substantial provincial and federal environmental assessment. Comprehensive assessment is avoided because individual oil and gas facilities typically fall below the threshold required by the BC Environmental Assessment Act and the *Canadian Environmental Assessment Act* (*CEAA*). Comprehensive reviews and joint review panels under *CEAA* stipulate extensive public consultation and public hearings are regularly required.

In comparison, the scope of this HHRA covers the entire oil and gas industry. Considered as a single project, the oil and gas development in northeast BC ranks among the largest in all of human history. An investigation into the human health effects of such a project cannot be properly completed without gathering all the relevant information. In this respect the health impacts of oil and gas development must be analyzed both on a micro level, examining the real and potential health effects of each facility, and on a macro level, examining the real and potential effects of oil and gas development as a whole.

In Phase 2, a targeted health survey should be administered to area residents by trained interviewers. The in-home surveys would obtain information about the general health and health risk factors of residents, as well as information about specific health conditions that are identified as priority concerns during Phase 1.

Need for Comments to be made public
We request that the Fraser Basic Council (FBC) post all non-sensitive public comments received as a part of Phase 1 of the project to the FBC's website. Until all members of the public have an opportunity to see and respond to the comments made to the FBC, the FBC's public consultation process will remain inadequate. Broad and inclusive public participation in Phase 1 of the Human Health Risk Assessment is essential to ensuring that Phase 2 is appropriately scoped. Should the FBC fail to make the comments public, they will be denying stakeholders the opportunity to:

- inform themselves about the issues by reading public comments; and
- use that information in making their own submissions.

Posting Public Comments is a Fundamental Issue to the Democratic Process

Public comments should be on the website because citizens have a right to view public comments first-hand and assess their contents. Otherwise citizens are deprived of vital information that could enrich their views and submissions -- and government loses the advantage of people learning from each other and thus presenting better information to government.

When public comments are not released, the public comment process is no longer a virtual town hall meeting where citizens know what each other is saying and conduct an open dialogue with each other and government. Instead, the consultation is reduced to a non-collaborative process of independent submission that invites redundancy instead of synergy. This leaves the concerned citizen isolated and uninformed, making submissions into an opaque Black Box of Government that is hidden from view.

This potential lack of transparency dramatically diminishes the public's opportunity to have its concerns inform the BC Government's decision about whether to continue its enthusiastic support of oil and gas projects within the province. The public interest demands that all parties who are interested in this HHRA and its potential impact be provided with a truly meaningful opportunity to comment on what issues should be canvassed in the HHRA in Phase 2.

Most important, citizens have a right to know what Government is hearing. The public interest demands that the consultation process be transparent, to ensure that people have a meaningful opportunity to voice their concerns and engage in a public dialogue about the true health effects associated with oil and gas developments.

The public interest demands that this right to participate be encouraged, respected and upheld.

Getting the Best Evidence for this Assessment

Some Northeast BC residents have expressed concerns over the use of non-disclosure agreements by industry actors to suppress information about oil and gas incidents and compensation for harm. Their concerns are supported by the investigative journalism of Andrew Nikiforuk, who observed widespread use of non-disclosure agreements in northern Alberta.[157] Without the ability to discuss health impacts with populations that are the most affected by oil and gas development, those subject to confidentiality agreements, the HHRA will be unable to gather the most pertinent information about health impacts. Conceptually we can conceive of this as two populations. As currently envisioned in the RFP, the FBC is able to speak with one of these populations, but not the other. The first population, those that have not directly experienced adverse health

[157] Global TV, "Untested Science" *16X9* (2011), online: <http://www.youtube.com/watch?v=eXChH1xw4Rk>, last accessed 27 January 2012.

impacts and have not been in contact with oil and gas industry agents, are free to give input. The second population, those who have personally experienced adverse health impacts, and who subsequently entered into agreements with industry, are unable to speak to the FBC. This could be a fatal flaw in the process.

In order to get an accurate picture of human health in the Northeast, it is essential that those carrying out the HHRA have the power to compel evidence available under s.86 of BC's Public Health Act.[158] If an individual does not comply with the order, section 87 renders that individual, on application to the Supreme Court, liable for contempt.[159] Since the human health risk assessment has a similar purpose to a public health inquiry, it would be absurd to not allow it the same truth-finding ability.

Recommendations

- We recommend that that the HHRA be empowered to compel evidence as provided in the inquiry powers of the *Public Health Act.*

- We recommend that the HHRA secure the agreement of industry to allow individuals to divulge information that is currently the subject of confidentiality agreements, or, in the alternative, request this same information directly from industry.

[158] *Public Health Act*, SBC 2008 c 28.
[159] *Ibid.*

Northeast Oil and Gas Health Advisory Committee

Dear David Marshall, Fraser Basin Council

Please find attached comments from the individual members from the Northeast Oil and Gas Health Advisory Committee (NEOGHAC).

The NEOGHAC is a non-government, non-profit, community-based multi-stakeholder organization with a mission of improving the overall health and well-being of communities in North Eastern British Columbia as they relate to up-stream oil and gas development in the region.

The NEOGHAC includes multiple stakeholders dedicated to safe and responsible oil and gas industry that protects and ensures the health and safety of local communities.

The NEOGHAC has evolved from the former Northeast Oil and Gas Working Group. The Working Group was established in March 2008 to form a vital link among various stakeholders, in order to address areas of health concerns and to facilitate the collection and dissemination of information to the community at large. Since its inception, the group established open and transparent communication and has made significant strides towards our mission, including but not limited to a resolution passed by the Health Officer's Council of BC, and participation in an air quality pilot study.

The following submissions are the opinions of our individual members and are forwarded to you from the NE O&G HAC on their behalf. As a reminder, we strongly recommend that representatives from the northeast should be included during the final phase of drafting recommendations to the Ministry of Health, as well as, Phase 2 and Phase 3; this is imperative in maintaining credibility and transparency.

Don Irwin / Charl Badenhorst
Chair / Vice Chair

Northeast Oil and Gas Health Advisory Committee Terms of Reference

PURPOSE:

Provide a collaborative forum with Northern Health, provincial government, academia, stake holder and industry for information exchange, education and research to facilitate the development of recommendations in response to prioritized health concerns relating to oil and gas activities in Northeastern British Columbia.

BACKGROUND:

Recognizing that

1. Oil and gas development is rapidly expanding, what are the direct and indirect impacts on human health?
2. What industry, government and other agencies can do to prevent and mitigate direct and indirect environ- mental and health impacts?

ACCOUNTABLITY:

Committee members are accountable to the people and organizations that they represent and to the committee as a whole.

PRINCIPAL OBJECTIVES:

- To raise awareness of the direct and indirect human health impacts of oil and gas activities as identified by the committee.

- To act as an advisory committee to Northern Health.
- To engage government ministries, regulators and the oil and gas industry in order to influence the practices, policies and regulations.
- To network with organizations and institutions with similar interests.
- To source independent expertise to help monitor, collect, review and advise on relevant and related information. To work towards collaborative solutions to minimize the direct and indirect human health impacts arising from oil and gas activities.
- To prioritize health concerns and assess those concerns to confirm impact.

MEMBERSHIP:

Membership will comprise a 2 year term with the option of consecutive terms.

Members may name an alternate when they are not available to attend.

Core membership should consist of at least one representative from the following groups:

Ministry of the Environment
Industry
Oil and Gas Commission (Advisory/nonvoting)
Northern Health
First Nations
Local Government (Member of the Peace River Regional District)
Academic/Researchers
Plus three representatives from Community Organizations/Members

Adhoc members:

Adhoc members are those who may be invited to contribute to the Committee regarding specific topics, practice issues, content expertise, etc.

OFFICERS:

Executive:

Chair: Elected or named every 2 years from the core membership

Vice Chair: Elected or named every 2 years from the core membership

Administrative support: Coordination and secretarial services to be provided by Northern Health

QUORUM:

A quorum shall be 50% plus one of core members. Each representative or their appointed alternate will be required to attend at least 6 meetings per year to maintain core membership.

VOTING:

Voting shall be by consensus. If consensus cannot be reached within 3 meetings, voting shall be decided by simple majority.
Voting will be roll call by name, unless a ballot vote is requested.

Authority:

Can form and oversee sub-committees/working groups/task forces to address specific issues relevant to the Committee's principle objectives

MEETINGS:

Meetings will be conducted monthly, with a minimum of 9 per year.

DISSOLUTION:

In the event of dissolution, all records shall be turned over to the office of the chair for safekeeping.

AMENDMENTS:

When the Committee identifies deficiencies to the Terms of Reference, a group will be struck from the Committee to draft changes. The Committee will approve the changes to the Terms of Reference.

OPERATIONS:

Committee members will report their activity on a regular basis to the people and organizations they represent.

COMMUNICATIONS:

Electronic copies of minutes will be forwarded to the office of the acting chair and the core membership, and may be posted on the Northeast Oil and Gas Health Advisory Committee Northern Health iPortal site. Communication to media and/or persons/organizations outside the membership and/or represented organization will be approved by the executive prior to release.

Conflict of Interest:

"Conflict of interest" means generally any situation in which a member or representative has or promotes an interest which results in or may be reasonably perceived to result in:

An interference with the objectivity with which the member or representative is expected to exercise responsibilities and duties to and on behalf of the North- east Oil and Gas Health Advisory Committee and/or

A detriment to others through Committee association, membership or information obtained through such membership or association causing injury to the reputation of fellow members by unauthorized use of information belonging to the Committee and/or

An advantage or material gain to the member or representative, and/or to other persons with whom the member or representative does not deal at arm's length, by virtue of the relationship of the member or representative to North- east Oil and Gas Health Advisory Committee.

Conflicts of interest must be identified, disclosed and effectively managed by the Committee.

Northeast Oil and Gas Health Advisory Committee

Human Health Risk Assessment of the Oil and Gas Sector for Northeast BC

1. Is it safe to live in the NE?

The Northeast Oil and Gas Health Advisory Committee needs legislation, regulation and policies as well as a forum to collect current and new data which can be used to develop and implement crude and specific indicators that reflect the following:

(a) That the regulatory process, as reflected by current legislation, regulation, and policies that guide the OGC are well enforced.

That incident reports are managed in an appropriate manner which includes appropriate referrals to Emergency Response Plans and partners, Environmental Health Officers, Public Health, Medical Health Officers, Acute Care Services, the public, land owners, industry and communities at high risk.

That water permits issued by the OGC be submitted to health, environmental and hydrologists reports which include effective and efficient enforcement of the terms and conditions of those water permits. This information should be published online as well as on a regular basis in local communities.

OGC develop and implement a process to publish ongoing summary reports after consultation with local community to determine the format and content. The OGC provide summary reports of the location and status of decommissioned wells which include:

Those wells that were decommissioned according to the original license.

The proportion of wells that were not decommissioned as depicted I the original license.

An assessment of the potential impact of inappropriately decommissioned wells.

(b) To publicly state any conflict of interest this includes those of employers.

(c) The proportion of funds, received from the industry by the OGC, that are used to generate sustainable support to local communities to provide ongoing health support, infrastructure support, and active and passive surveillance systems.

(d) That the OGC provide copies of summary reports of complaints received from the public.

How and when these reports will be published should be agreed by local authorities and communities.

2. That government, Ministry of Health, Ministry of Mines, Ministry of Environment, and local authorities develop an economic plan to be proactive in order to share new and current oil and gas development in the Northeast in order for health authorities, local government, schools, emergency services, RCMP, etc. to preplan for the influx of new employees, and industries that will be associated with the announcement of new land sales and/or new oil and gas development in regions.

(a) To incorporate First Nations and vulnerable communities in these plans
(b) To collectively develop a sustainable economic plan that will provide funds generate from land sales and the selling of oil and gas and its associated products to be invested into local communities. This plan must be agreed upon by stakeholders which includes taking in consideration all aspect of sensitive ethical issues.

3. That government revises its policy to wave environmental and health impact studies by the oil and gas industry. Also to publish the reasons why, in the past, this industry received this privilege. This is in conflict with BCs regulations and policies for most industries to develop targeted environ-mental and health impact studies.

4. Government and industry must develop legislation, regulations, policies and guidelines that will ensure all oil and gas wells drilled should be subject to an environmental impact study which includes reports from hydrologists, environ- mental conservationists, and/or health as indicated. This process should include a deposit that must be paid up front for each well to be drilled. These funds should be invested I a trust fund to ensure that the funds will be available for cleanup and decommissioning of wells in case the original contractor either sell or declare themselves financially bankrupt.

5. Government needs to collaborate with environment specialists, health professionals, the BC Medical Association, and the BC Health Officers Council to develop active and passive surveillance systems in order to monitor acute and

chronic health effects, changes in water, air, and soil quality, and native animal population and health.

These reports must be published in a format and timely fashion as agreed upon by key stakeholders.

6. Government, industry, and health professionals investigate and monitor the complex nature of the oil and gas industry particularly rapid development in and/or around small communities to assess and address associated socio-economical indicators that would reflect or

could be used to address poverty in communities and/or could be potentiated by this boom and bust nature of the industry. Therefore it's imperative that the above named economical plan be developed to address poverty associated with oil and gas (or any other industry).

The government recognize that poverty associated with the oil and gas industry include a significant increase in high rates of substance abuse, mental health illness, homelessness, single parenthood, communicable disease outbreaks, STIs, birthrates, violence against women, illiteracy rates and hopelessness. These observations are well documented in peer reviewed literature as well as in STATS Canada community surveys. It is clear that economic growth and job creations usually only benefits a small percentage of investors and skill worker, the majority of unemployed and unskilled workers end up in despair as was notice in so many situations in the past for instance prior gold rushes in the world and the question is, is there any difference between gold rushes and the rush on shale gas.

We trust that the Fraser Basin Council will take these concerns into serious consideration, as well as consider closely the intent and content of the Public Health Act. Bill 23 Section 3 of this act clearly instructs the Ministry of Health to make a Public Health Plan to promote and protect health and well-being. Please find attached Section 3 of the Public Health Act. The communities of the Northeast usually excluded as decisions are commonly dictated from the top down and require a forum as depicted in the Public Health Act to represent key role players.

Charl Badenhorst
NE Medical Health Officer
Northern Health

Part 2 — Public Health Planning and Reporting

Division 1 — Making Public Health Plans

Minister may require public health plans

3 (1) To promote and protect health and well-being, the minister may by order require a public body to make, in respect of a specific issue or geographic area, a public health plan.

(2) The minister may specify one or more of the following as the purposes of the public health plan:

(a) to identify and address the health needs of particular groups within the population, including aboriginal peoples;

(b) to monitor and assess the status of the health of the population, including through public health surveillance and monitoring indicators of, or factors influencing, the health of the population;

(c) to prevent and mitigate the adverse effects of diseases and disabilities, syndromes, psychosocial disorders, injuries and health hazards;

(d) to identify, prevent and mitigate the adverse effects of health impediments;

(e) to facilitate or plan for the delivery of core public health functions;

(f) to achieve a prescribed purpose.

(3) An order under this section may include a requirement to comply with any written agreement in respect of public health plans entered into between the minister and the public body.

(4) Each regional health board and local government having jurisdiction in the geographic area to which the public health plan applies must be consulted on the proposed public health plan.

(5) The minister may by order extend the time for completing the public health plan whether or not the time previously set has expired.

(6) A public body subject to an order under this section must comply with the order.

Approval of public health plans

4 (1) A public body required to make a public health plan must

(a) submit the public health plan to the minister,

(b) revise the public health plan according to the directions of the minister, and

(c) once the minister is satisfied with the public health plan, publish the public health plan.

(2) If in the opinion of the minister it would be in the public interest for section 5 *[effect of public health plans on statutory decisions]* or 6 *[relationship of public health plans to other planning processes]* to apply to a public health plan, the minister may place the public health plan before the Lieutenant Governor in Council for approval by order.

Division 2 — After Public Health Plan is Made

Effect of public health plans on statutory decisions

5 (1) In this section, "**authorization**" includes any licence, permit, approval or other authorization granted under this or any other enactment.

(2) This section applies if the Lieutenant Governor in Council approves a public health plan under section 4 *[approval of public health plans]* and, for the purposes of implementing a public health plan, makes a regulation to do any of the following:

(a) require persons making decisions under a specified enactment to consider the public health plan in making those decisions;

(b) restrict or put conditions on the issuance or amendment of authorizations under a specified enactment;

(c) restrict or put conditions on the exercise of a power or the performance of a duty under a specified enactment.

(3) A regulation described under subsection (2) applies to all of the geographic area under the public health plan, unless otherwise provided in the regulation.

(4) Despite an enactment specified in a regulation described under subsection (2), if the regulation establishes requirements that must be imposed in issuing or amending an authorization under an enactment, the requirements are deemed to be imposed

under the enactment under which the authorization is issued or amended.

(5) The issuance or amendment of an authorization, or the exercise of a power or the performance of a duty, contrary to a regulation described under subsection (2) has no effect.

Relationship of public health plans to other planning processes

6 (1) This section applies if the Lieutenant Governor in Council approves a public health plan under section 4 *[approval of public health plans]* and, for the purposes of implementing a public health plan, makes a regulation to do any of the following:

(a) require a specified part of the government, or a local government, to consider the public health plan during strategic or operational planning processes;

(b) require that the results of specified government or local government strategic or operational planning processes be consistent with the public health plan;

(c) despite any other enactment, provide that specified government or local government strategic or operational plans, bylaws or other planning documents, or classes of these, do not have legal effect to the extent of any inconsistency with the public health plan.

(2) If a regulation described under subsection (1) is made, the minister may, for the purposes of facilitating the implementation of the regulation, make an order

(a) modifying a provision of the regulation in respect of a local government, or

(b) exempting a local government from a provision of the regulation.

Reporting on public health plans

7 The minister may by order require a health authority to monitor the implementation of a public health plan in the geographic area for which the health authority has jurisdiction, and to report in the manner required by the minister on

(a) the measures that have been taken to give effect to the public health plan,

(b) compliance with the objectives of the public health plan, and

(c) any other matter relevant to the implementation of the public health plan.

Review and revision of public health plans

8 (1) The minister may by order require a review of a public health plan in accordance with terms set by the minister, and a person subject to the order must comply with it.

(2) The minister may by order vary the terms of a public health plan, and, if the terms are varied, the person responsible for the plan must revise the plan to the satisfaction of the minister.

(3) If a public health plan that has been approved by the Lieutenant Governor in Council under section 4 *[approval of public health plans]* is revised, the minister must either

(a) place the revised public health plan before the Lieutenant Governor in Council for approval by order, or

(b) request the Lieutenant Governor in Council to rescind the order approving the public health plan before it was revised.

Northeast Oil and Gas Health Advisory Committee

1. Human exposure to toxic emissions and substances

Human health outcomes are largely affected by environment. Industrial oil & gas activities have very specific and measurable impacts on the environment in NE BC.

a. airborne

- with rapid expansion of shale gas development, well clean-up flaring is increasing. Well-known products of incomplete combustion of these flared gases (toxins and carcinogens) are not accounted for nor measured. These well flares are regularly within 200 m of our homes and in the same fields where farmers are working and livestock grazes.

- fugitive emissions - piping, valves etc. are known (and expected) to leak, contributing raw gases and chemicals to airborne toxins.

- meteorological inversions. When "still air" inversions occur, emissions do not disperse. On occasion our farmers have had to stop harvest and leave the fields because of inversions holding down concentrated gas-well and facility emissions. These concentrated emissions likewise invade our homes.

- accidental releases - no warning system in place to monitor or to alert residents.

b. water

- contamination of water from airborne emissions, spills,

- fresh water used for fraccing becomes toxic waste. The safety (integrity) of downhole disposal of toxic waste has not been proven. It can migrate to aquifers. It causes small earthquakes and sub-surface instability.

- "cross communication" between wells during fraccing procedures happens. Fraccing is unpredictable, no guarantee that chemicals won't enter our aquifers

c. soil

- drilling waste is spread on fields - what contaminants are present?

- proven build-up of sulphur compounds in soil & plant life around O&G development can affect crops, livestock and enter the food chain.

2. <u>No tracking of adverse health effects</u>

- non-disclosure clauses in settlement agreements effectively erase record of injury

- our medical system does not track occurrences of toxic exposure, impossible to have a realistic assessment of health effects when they are not tracked or followed.

3. <u>Cumulative effect unknown</u>

- each of tens of thousands of multi-well pads, facilities and pipelines is permitted individually without regard to how many other wells and facilities are nearby.

- no environmental assessment, so it is impossible to assess health risks caused by environmental sources.

4. Regulations full of exemption opportunities

- for example, Drilling Regs include exemptions allowed for surface water contamination, and for setback distances

5. Ministry of Health **not** included in:

- setting standards (e.g., BC's standard for SO2 fully 8 times more lax than WHO)
- permitting - some facilities have been allowed in locations which subsequently threatened health of residents
- long-term planning ahead of land sales and development with consequent population increase
- Emergency Response Planning (evacuation protocols etc.)
- receiving immediate reports of incidents which have the potential to affect health (air, water, soil)
- not given financial capacity to take an active role in expanded responsibilities regarding gas development

6. Stress for residents

- traffic, noise, lights, sleep deprivation
- lack of transparency, information from industry and OGC vague, conflicting or simply "not available"
- unknown health risks
- forced without choice to live beside high pressure toxic gas facilities
- reality of individuals having been injured by exposure, but facts of this denied by government & industry alike.

Lois Hill
Peace Environment and Safety Trustees

Northeast Oil and Gas Health Advisory Committee

1. Groundwater Protection: what baseline water tests should be conducted pre and post fraccing?

2. Effects of increased traffic: what are the effects resulting from increased particulate dust, traffic volumes, traffic noise and road safety?

3. Air Quality: what are the airborn effects of industrial and agricultural activities (conduct baseline air quality impact assessment)?

4. What benefits would the public realize from easily accessible, user-friendly, factual, unbiased information about health and safety related to the oil and gas industry?

5. Socio-economic impacts of migrant workers: increased population and influx of money causes impacts to communities (e.g. drugs, vehicle accidents, street vagrancy).

Corey Jonsson
OGC

Northeast Oil and Gas Health Advisory Committee

1) OG activities need to be subject to the same environmental and health reviews PRIOR to spudding. In other words, make the process no different that the environmental assessment prior to hydro projects, wind or forestry projects.

2) Non disclosure issues- any health OR environmental issues or questions which were concerns of either by government or energy company should NOT be buried in a non disclosure clause of any kind. Otherwise, doing the science would not be possible, if information can be concealed or buried in a non disclosure arrangement.

3)Testing: From point #1 above, baseline testing is a requirement prior to spudding. It must include aspects of air, water and soil.
Monitoring (passive and active) must be part of the process and must be paid for by the company as part of the cost of doing business.

4) Lack of inspectors within the OGC> At present there are no more 14 enforcement/compliance officers available. This number would be available for a land mass larger than France and includes 30,000 to 40,000 oil/gas wells. As well as thousands of facilities, batteries, etc.

5) At present, no baselines are being done, on water in the

NE. Yet BC Geoscience was granted $12,000,000 in May of 2011 for the purposes of finding water for industrial purposes. We would like to see an equivalent matching of funds in order to do a proper assessment of our water resources BEFORE extraction and consumption for industrial purposes revs up.

Rick Koechl
Official Community Plan Advisory Committee

Northeast Oil and Gas Health Advisory Committee

Air Quality - SO2, NOX, O3, H2S, BTEX
Radioactivity
Hydrocarbons - water and soil
Crop and livestock losses
Noise

Judi Krzyzanowski
Researcher/Consultant

Northeast Oil and Gas Health Advisory Committee

Data collection
- Water monitoring
- Air monitoring
- soil monitoring

Key indicators and parameters, studies
- Prolonged testing

Brian Lieverse
Community Relations Advisor, EnCana

Northeast Oil and Gas Health Advisory Committee

Air quality
Water consumption and contamination
Cumulative Effects
Poor Land Planning which causes Stress and Mental Health Problems

How resource development has impacted theirs lives. Everything from change of diets because of impacts on hunting areas and medicinal plants areas to pollution of the food chain and water sources,

H2S is still a concern because of the proximity of wells to the communities.

Warren Reade
Aboriginal Health Improvement Committee

Jason Lee
Treaty 8 Tribal Association

NORTH PEACE ECONOMIC DEVELOPMENT COMMISSION

CITY OF FORT ST. JOHN · DISTRICT OF TAYLOR · DISTRICT OF HUDSON'S HOPE
PEACE RIVER REGIONAL DISTRICT ELECTORAL AREAS "B" AND "C":

BRIEFING NOTE TO FRASER BASIN COUNCIL

To: David Marshall, Executive Director
Date: March 4, 2012
Topic: Health Concerns about Oil and Gas Development in Northeastern BC

The North Peace Region is located at the epicenter of the Montney and Horn River unconventional Natural Gas plays. As well, BC Hydro's Site C project is now in the environmental and regulatory review stage (Stage 3), which includes a thorough and independent environmental assessment process, including a joint review panel. Three coal mining companies are also in the permitting stage within the North Peace region. In preparing for the impending growth from the Energy Sector, The North Peace Economic Development Commission completed the *Socio-Economic and Cultural Impact and Gap Analysis Study for the North Peace*. Through the Consultant Team's secondary research, the following four key topics emerged:

1) "Having a voice" in many arenas and particularly with new developments.
2) Labour, energy services and education.
3) Water management.
4) Regional agriculture, regional/urban divide and Aboriginal issues (e.g. business and culture).

Collectively, there is often a competition for limited resources. The cumulative impact from all sectors of the energy industry (fossil fuels, hydro and alternative energies) competing for finite resources is significant. This volatility creates **a "storm"** – a social storm within the community. Due to the differing time horizons of the three sectorial projects, it is difficult to forecast demographics and population.

Petroleum Human Resources Council of Canada reports Oil and Gas sector in Northeast BC is going to need an additional 11,300 by 2020. The sector is slowing down in the Horn River due to profitability and concentrating more on the Montney (Fort St. John and Dawson Creek which means my region, Fort St. John (North Peace) will be impacted by a pop growth of 38% if you place ½ the need into the community.

We recognize that the price for natural gas has softened in recent months but with the move to exporting thru LNG that in the mid to long term we will continue to see a big demand for employment in Northeast BC.

As mentioned, three mining companies are in the permitting stage.

a. 1st company: **300 workers required**
b. 2nd company: 7 mines with 350 workers/mine or **2450 workers;** and

c. 3rd company: **400 workers** required

Mining operations are typically 25 years in length so it makes sense to have workers reside in the community. So even if ¾ of the workers had a family of 4 the population in and around Hudson's Hope, Chetwynd and Fort St. John would be impacted by an additional 13,150 people.

It is estimated that the BC Hydro Site C dam will see 7,650 direct construction jobs through the 10-year construction period, and up to 35,000 direct and indirect jobs through all stages of the project. These jobs may see up to 5 to 6 employees doing one job over the ten year period so the cumulative impact to the region will be close to the 35,000 direct and indirect jobs as noted.

If all of these projects come to fruition, the possible population of the Peace River region will double for ten years and then contract after the BC Hydro Dam construction period to 83,000.

As mentioned, this volatility creates **a "storm"** – a social storm within the community. There is increased crime and addictions and education is lagging due to unpredictability in forecasting the future skills and capacity required by the energy industry. When there is a "boom" there are plenty of jobs and less urgency or need for people to educate themselves. Conversely when a "bust" occurs, people find themselves without the capacity to compete in a tighter, more competitive job market. A continuous cycle perpetuates – lots of money, "good life" and no planning for the future then when the good times are gone there is a lack of money, increased stress and an increase in people turning to vices such as alcohol, drugs and crime to try and cope. Even during the good times alcohol, drugs and crime are an issue.

The North Peace region's culture suffers as well with the cumulative impacts of the economic boom times. It pits Urban against Rural, Province against Region against Local Government; First Nations against Non-Aboriginals; one First Nations group against another First Nations group; industry sector vs. another industry sector; community against community; non-skilled labour force against skilled capacity; development vs. environment; and finally Province against neighbouring Province. All the required ingredients for the recipe of a **"Perfect Storm"**!

Right from the start of planning for the Study, I, as a the Regional Economic Development Officer felt it **needed to have "legs"** or it needed to demonstrate to the participants of the Study a model to move forward and not just collect dust on someone's shelf. I envisioned a **Circle of Influential Decision-makers**; or a gathering of Mayors, Chairs and Chiefs from the North Peace region drafting policy to effect change from the Study's findings.

Given the challenges of establishing a solid strategy for sustainability facing the North Peace region, it is important that this Leadership Circle embrace the concept of Sense-Making. Sense–Making is a collaborative process of creating shared awareness and understanding out of different individuals' perspectives and varied interests to provide insight into factors that surface as organizations address **uncertain or ambiguous situations.**

With regard to Health issues this group have and will continue to talk about include:

1. **Water issues**

    a. Current health of the regions aquifers
    b. Water requirements for regions population vs. Needs of oil and gas industry for Natural Gas extraction (fracking)

2. **Capacity of North Peace Community Infrastructure**

    a. Acute Care - new Regional Hospital and ability to handle impending growth
        i. Emergency response
            1. S.T.A.R.S and BC Ambulance
        ii. Staffing of new regional hospital (Physicians, Nurses, Specialists, and Technicians etc.)

    b. Extended Care – with impending growth families may choose to relocate senior extended family members into the region for support.

    c. Physician placement in Hudson Hope to answer current shadow population of 5,000. The true population of Hudson's Hope is currently 6,000 and if all the mining projects come to fruition, the population will grow to 12,000.

    d. Capacity of the region's current social infrastructure
        i. Substance abuse programs
        ii. Mental health
        iii. Physiotherapy
        iv. Dentistry
        v. Vision care
        vi. Health and Wellness programs

Respectfully submitted,

Sandra Lemmon

Sandra Lemmon
Regional Economic Development Officer

Old Hope Rd residents group

Proposals and Suggestions for Phase 1
of Health Risk assessment study

Jan.17/12

The following items should be included in our submission to the Fraser Basin Council:

1) Status of Immunity from Review for OG Activities within Province of B.C.

At the present time, OG Activities have had a free ride. Unlike other resource based industry developments, (such as Wind and Hydro electric production) OG has NOT been required to undergo any sort of Environmental/Health study impacts related to the exploration, extraction and transportation of hydrocarbons. This industry has escaped scrutiny by any appropriate government ministry or agency, by design. (In contrast, other resource industries, such as Forestry, "green energy" proposals are required to undergo major impact studies) It is now time that the same rules be applied to the OG industry as all other resource based industries are expected to follow. Each and every project, (new well site, facilities, pipelines) must be scrutinized to the same degree as all other resource based projects are expected to do. Cumulative impact studies must become mandatory and include each and every OG activity as it relates to human and environmental health.

2) Issue of Non Disclosure Agreements:

These so called "private" agreements between injured parties and OG companies MUST be prohibited. Non disclosure agreements have made it impossible to document the root causes of many OG disputes. Here lies the problem: When health problems or environmental health issues such as tainted water, are associated with OG activities, and shielded from any scrutiny or criticism by a non disclosure agreement, it impedes the necessary follow up of other related health impacts. Non disclosure agreements CONCEAL the evidence by "legally" withholding

key information for other parties needing the necessary facts. Without FULL disclosure on ALL incidents regarding OG activities scientific study cannot happen. Non disclosure must be prohibited by law.

3)TESTING:

Any assessment of OG Activities and the impact of on human health is not complete without complete testing of air, water and soil prior to drilling, during regular intervals of production. This must include:

a) chemicals used, frac fluids and waste water

b) Full disclosure is a MUST for the above chemicals injected and used on site

c) A complete RECORD must be kept for inspection on site and made available upon request by any citizen living in the vicinity of the spud.

d) ALL water wells within a 5 km radius of a spud should be sampled before, during and after the spudding and drilling commences

e) PASSIVE air monitors must be set up before, during and at regular intervals after production.

f) All TESTING expenses must be paid for by the OG companies as part of the cost of doing business.

g) At present, BRINE and other extracted solutions from drilling are NOT all labelled appropriately as TOXIC and are therefore being subject to lax ruling, in the event of a spill or surface contamination.

There is a woeful lack of OGC inspectors involved with Compliance and Enforcement with OG Activities. At present there is a program of "self inspection" being used by Industry (and sanctioned by the BC government) in order to "monitor" the industries actions. At last count, there were as few as 7 Compliance officers and about 3 Enforcement officers within the OGC jurisdiction. Bear in mind that there are about 30,000 well sites within the province, and thousands of facilities and batteries as well.

4)ACCESS to key Information pertaining to possible Health

about 2 years ago, when Minister Lekstrom included a "250 metre consultation zone". However, even this new addition has not been enacted into law.
Our request has been for a 500 m. minimum set back, allowing for a Royalty Crown Credit to be allotted to the energy company in lieu of loss of some revenue for inconvenience or time losses..

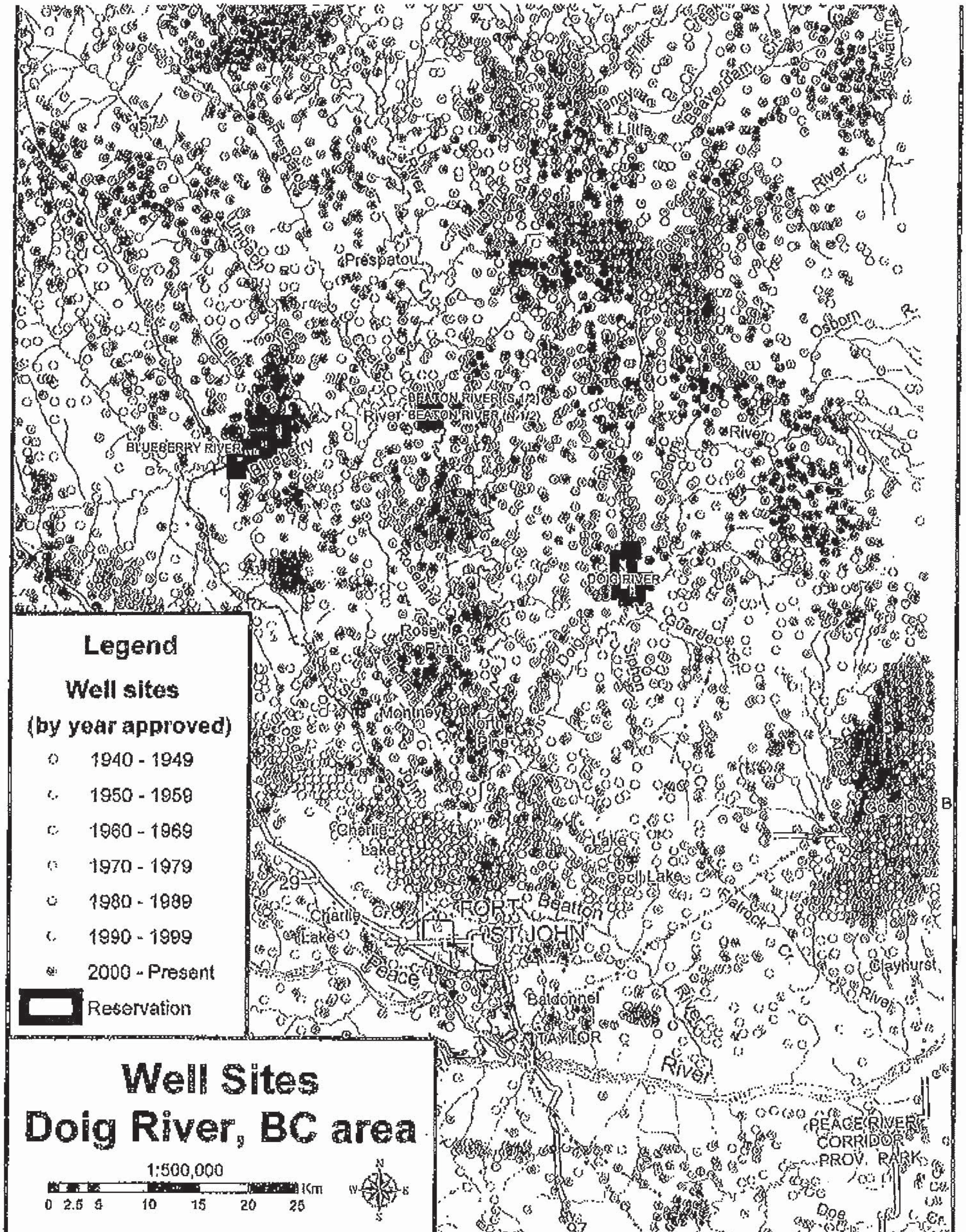
Other Issues

(1) Ensure lack of effective emergency response measures and coordination.

(2) Non-disclosure of health related issues - not financial or proprietary technology

(3) Quality of water with regard to fracking operations

(4) Proximity of oil and gas operations to populated areas.


Legend
Well sites
(by year approved)
1940 - 1949
1950 - 1959
1960 - 1969
1970 - 1979
1980 - 1989
1990 - 1999
2000 - Present
Reservation
Well Sites
Doig River, BC area
1:500,000
0 2.5 5 10 15 20 25 Km
N
S
W
E
Prespatou
BEATON RIVER (S 1/2)
BEATON RIVER (N 1/2)
BLUEBERRY RIVER
Blueberry
DOIG RIVER
Osborn R.
Charlie Lake
Cecil Lake
FORT ST. JOHN
Beatton
Baldonnel
TAYLOR
Clayhurst
Goodlow
PEACE RIVER CORRIDOR PROV. PARK
Peace
River
Doe Cr.
29
97

Peace Environment and Safety Trustees Society February 29, 2012

BC Oil and Gas Industry Human Health Risk Assessment CONCERNS

1. Compile and research medical statistics in the BC Peace Region and compare them statistically to the national averages, looking for higher than normal incidents of disease known to be caused by environmental contaminants. Patients known to be injured and compensated by industry should be interviewed as a follow-up to determine long time health consequences. This may be complicated if the compensation included a non-disclosure agreement with the company involved. When it comes to injury to health non-disclosure clauses should be forbidden.

2. Set up a system to track over time the health those whose health has been affected by the oil and gas industry. This would include workers in the industry. Many workers will not discuss their injuries in fear of losing a job or being blacklisted by the industry. It is important to ensure that employment and financial compensation to affected people past and future will not/does not preclude disclosure of injury or ongoing disability as this will interfere in the accuracy of information. Stress issues, such as excess traffic, frustration from noise, excess nighttime lighting, dust and concern for personal health and injury along with the loss of quality of life, need to be included in this tracking system.

3. There are many pertinent stories recent and years old that relate to health issues caused by the oil and gas industry. These stories need to be heard. Set up a method of recording these anecdotal events through individual interviews. The affected individuals can be located through public questionnaires requesting information from the general public.

4. Establish consistent ***baseline*** air, water and soil testing. Ensure comprehensive testing is done to determine what contaminants exist ***before*** industry starts drilling, testing to determine what changes have occurred over time and follow up to determine if there is an accumulation of effects over a larger area after drilling commences. Ensure industry complies with requirement to release information on specific substances used during drilling/fracking. Consistent testing and knowledge of substances used by industry will provide the information needed to determine if there is contamination in air, water and soil. It is important to determine ***all*** substances present, not only H2S and S02. *It is important to ensure that realistic tolerance levels for the noxious and poisonous gases and all related compounds used by the oil and gas industry are geared towards protecting human health.*

5. Allow for specific medical testing such as tissue sampling by independent labs of local human and animal population. What contaminants exist in our bodies that are not present in other populations, and what contaminants are in the food we eat that will contribute to ill health?

6. Oil and Gas caused emergencies have demonstrated that our current status of emergency response and site setbacks is not sufficient to protect residents in locations close to oil and gas sites. The Ministry of Health has not been notified in the past when incidents affecting residents' health occur, resulting in a lack of injury reporting. The exponential growth of drill and plant sites in the BC Peace Region will mean that in the future the entire region may have contamination issues, as these toxins will accumulate over time. Due to these issues we ask the following:
    a. The BC Ministry of Health should be included in regulating the industry in order to protect the health of humans and livestock. Ministry of Health should be involved in permitting individual drill and plant sites in order to foresee pertinent health and safety concerns in establishing a new site.
    b. The Ministry of Health should review the Air Quality Guidelines to bring them in accordance with the World Health Standards. At this time, the BC standard for SO2 is fully 8 times more lenient than the WHO standard.
    c. The Ministry of Health should be involved in any OGC reported Incidents or Complaints that affect air, water or soil in order to determine health consequences.

7. We request a sentinel air monitoring system be established for the entire region. The model for this can be seen in the Alberta Drayton Valley. This will enable residents to check air quality in real time by telephone or internet and enable them to take action in the event of an incident.

8. Full spectrum monitoring at all facilities including well site compressors and gas plants to determine all air contaminants. This assessment should include a detailed analysis of the flare/incineration gas rates, sources and composition. Well clean-up flaring can be a major source of toxic chemicals because of incomplete combustion, especially as it combines raw natural gas and fracking chemicals. The Alberta Research Council has found in a study that gas plant emissions were 4-8 times higher than emissions factor methods based on CAPP guidelines. If you add together the cumulative effect of compressor sites, gas plants and flaring at well sites by all companies, what is the combined effect of exposure on our health?

9. Children are more susceptible than adults to environmental threats that can affect their health and development early in life. Children's developing systems are much more vulnerable to irreversible damage from toxins and pollutants. This fact increases our need to discover what we are exposing our children to by living here.

10. With regard to the oil and gas development, increase funding to the Ministry of Health in order to:
    a. compensate strained local health authorities and hospitals
    b. provide specialised training for medical staff
    c. future studies and health issues

11. There is a lack of transparency and available information from both government and industry. Often this information is crucial to understanding the health effects in the industry. Residents want involvement and open access to information through ***all phases*** of this health study.

1200, 205 – 5th Avenue S.W. Calgary, Alberta, Canada T2P 2V7 Telephone 403-216-2510 Fax 403-216-2514

Progress

March 07, 2012

Fraser Basin Council
Via: Email info@hhra.ca

Attention: David Marshall, Executive Director, Fraser Basin Council

Re: BC Human Health Risk Assessment Phase 1

Dear Mr. Marshall:

Progress Energy is a Canadian exploration and production company focused on natural gas development in the Foothills of northeast British Columbia and the Deep Basin of northwest Alberta. Progress announced on February 7, 2012, an adjusted net capital program for 2012 of approximately $365 million to continue to develop its North Montney resource base, initiate the first phase of development on its joint venture lands with PETRONAS and to pursue its Dunvegan light oil play in the Alberta Deep Basin. In addition to this net capital program, Progress also benefits from approximately $130 million of capital carry on the British Columbia North Montney Joint Venture paid for by its joint venture partner.

Progress Energy appreciates the opportunity to comment on Phase 1 of the project, and offers the following comments on the scope of the assessment.

Previous Studies

We understand that there are a considerable number of relevant peer reviewed scientific studies on human and animal health in studies that have been done in oil and gas producing areas. We encourage the authors of this study to review these previous studies to ensure that the studies and monitoring being proposed is not replicating work that has already been done.

Scope

Progress Energy supports a well-defined science based study that reviews the following risks:

- Air quality in close proximity to oil and gas wells and facilities with emissions
- Water quality in close proximity to oil and gas wells and facilities.

1200, 205 – 5th Avenue S.W. Calgary, Alberta, Canada T2P 2V7 Telephone 403-216-2510 Fax 403-216-2514

Progress

We understand and respect that there are a large number of stakeholders that will have opinions on what should be in the scope of the study. We encourage the study to stay within a defined scope that is not covered elsewhere in the regulatory environment. As an example, drilling and completion requirements that ensure aquifer protection are covered by numerous regulations under the Oil and Gas Activities Act and should not be part of the scope of the Human Health Risk Assessment study.

We acknowledge that some stakeholders may want the scope to include social health based on increased oil and gas development as part of the Human Health Risk Assessment. We recommend that this important assessment should be done as part of a larger socioeconomic study by the appropriate BC government department, and should not be part of this study conducted by the BC Ministry of Health.

Continued Engagement

The oil and gas industry has considerable expertise in best practices, environmental monitoring, industry activity forecasts, and operations in NEBC. We encourage the study authors to continue to engage industry through appropriate means to ensure that all stakeholders understand the responsible development of British Columbia's natural gas and oil resources.

We are available for further discussion as appropriate through CAPP, industry committees, or for individual meetings. We look forward to continued engagement

Sincerely,

Steven Dunk

Manager, Regulatory Affairs and Policy
Progress Energy
sdunk@progressenergy.com

Managing for Safe Water in the City of Dawson Creek Domestic Watershed of the Upper Kiskatinaw River.

Prepared by Reg. C.Whiten, P.Ag MCIP Watershed Steward, InterraPlan Inc. for City of Dawson Creek

Feb 16, 2012

Background: For over 20 years, the City of Dawson Creek has focused efforts on the need for a safe, and secure water supply to meet the needs of its residents, commerce, industry and rural bulk-water users. As a local government, and a major water licence holder and purveyor, it has taken the lead to undertake the following in partnership with provincial resource agencies, and participation of the general public and resource-use stakeholders in the 2800 km2 area of the Upper Kiskatinaw River watershed (UKRW):

1. Development of one of the first, Integrated Watershed Mgt Plan (1991) led jointly by the Ministry of Forests and Environment, and signed off by all key resource agencies;
2. Participated in the Dawson Creek LRMP (1998) which led to designation of its Domestic Water Supply Area, and attention provided to guide development with respect to water quality/supply protection;
3. Provided impetus to a series of Ministry of Environment baseline water quality research initiatives on watershed characterization, and study of surface water bacteria/parasties (2004, 2007, 2008)
4. Completion of an updated Watershed Mgt Plan (2003) as an independent initiative with support of Fisheries Renewal BC to further focus on issues arising from expanded development, in particular oil and gas development
5. Following passage of the Drinking Water Protection Act (2006), commissioned the completion of a Source Water Protection Plan (2007)
6. Provided support to the BC Forest Practices Board to undertake a Cumulative Effects Case Study on the Kiskatinaw River (2010), that put emphasis on Drinking Water as the key valued ecosystem component;
7. Has worked with the Regional Drinking Water Protection Team to obtain support for development of a Watershed Steward position, and program
8. Has partnered 2009-present with the Peace River Regional District funding support, to undertake surface hydrology characterization (8 hydrometric stations) to develop baseline understanding of flows, and basic chemistry; as well as hydrological modelling to consider future land-use change and effects on flows/quality.

Issues, Challenges and Opportunities for implementing the SWPP

1) **COMMUNITY WATERSHED DESIGNATION:** Because of its large size, the UKRW (>500 km2), has not been designated a Community Watershed which might provide further recognition in land-use plans and referral processes . Given this context, the City has only served as a 'stakeholder' interest to comment on land-use referrals but lacks authority to regulate development activities.

   Opportunity: *Ministerial discretion exists to formally provide this CW designation and such recognition provides a valuable tool for supporting efforts of the City to develop a practical model and program for Integrated Watershed Stewardship around provincial and local government objectives for both drinking water protection, and sustainable resource development.*

2) **LOCAL LEVEL LAND-USE PLANNING:** The LRMP provides some guidance on protection of the mainstem Kiskatinaw River corridor (East and West Branch) but has much discretion on the kinds of activities located in that sensitive corridor, and thus left to mitigation management approaches for all uses with inherent environmental contaminant risk (e.g. industrial waste disposal on surface, open sumps, gas processing facilities, industrial crossings, etc.).

   Recommendation: *There is a need to revisit the LRMP to have greater protection status for the main-stem river corridor, associated tributaries, groundwater, lakes and wetlands through a focused effort on sub-regional planning in the upper Kiskatinaw River as was done previously in the Muskwa-Kechika (detailed Pre-Tenure Plans) to more precisely define an appropriate local level management regime, with a focus on drinking water and flow protection (in line with objectives of the forthcoming Water Act)*

3) **WATERSHED GOVERNANCE:** An MOU to establish the Regional Drinking Water Protection Team based in Prince George and with full participation by all resource agencies, has ability to address local government issues on water quality protection, and has provision for direct representation by a local government...however, at present, the RDWP prefers that local governments resolve matters in the sub-regional context to the extent possible, and then only appeal to that Committee as needed to resolve matters;:

   Opportunity: *the City intends to make presentation, and see support from the RDWP for establishing a Kiskatinaw Watershed Advisory Committee (KWAC) as provided under the DWPA; of primary concern at present is the need for this KWAC (interagency body) to exist for information sharing, compliance auditing, research coordination, policy/process reviews, best-practices/mitigation promotion, and general implementation of the Kiskatinaw DWPP;*

   Recommendation: *undertake a review of the Regional MOU to determine effectiveness of its implementation, opportunities for enhancement and requirements in the case of UKRW Water Source Plan implementation.*
   Recommendation: that FLRNO establish a Watershed Specialist based in the Peace Region, to provide as a inter-agency technical liaison and support to a KWAC process.

4) **DELEGATED AUTHORITY FROM DWPA:** Notwithstanding the lack of formal regulatory authority, the recent DWPAct does afford considerable ability, and potential delegated authority by the Medical Health Officer /Drinking Water Officer, to undertake all necessary monitoring, threat assessment, and mitigation actions as required where there may be potential health risks from upstream sources (suggests this includes both point, and non-point) To date this implementation has been only in response to "complaints" rather than much of a proactive, investigative posture as the DWPA i.e. the NHA appears to provide for contaminant risk assessments and action with a focus on sewage waste, rather than potential pathways from industrial waste disposal practices direct to surface, or indirect from soil runoff, or groundwater; other issues may be related to staff resource capacity, skill specialization and/or agency directives with respect to DWPA implementation

Recommendation: *Undertake a review of DWPA using the UKRW as a case-study, would prove valuable to appreciate how related environmental protection legislation (Oil Gas Activities Act, Waste Mgt Act, and forthcoming Water Act etc. can best be harmonized to ensure provisions of the DWPA are effectively implemented by the NHA in partnership with the Water Purveyor;*

5) **DRINKING WATER PROTECTION:** For its part, the City of Dawson Creek has invested heavily with various provincial government infrastructure programs, to upgrade the Water Treatment Plant so that surface pathogens/bacteria issues can be effectively resolved to meet or exceed Drinking Water Guidelines; efforts are also undertaken through testing and monitoring of hydrocarbon and other potential contaminants at the raw-water source intake (spring freshet water column sampling, and Hydrocarbon metering including plans to upgrade the latter) and with only minor instances of elevated contaminants from various possible sources reported to provincial authorities.....with the recent initiative of government through the OGC, to provide disclosure of frac fluid composition, there is an ability for the City to enhance both surface- and ground-water monitoring within the upper watershed and plans are in place to do so this year, though it is not yet clear how the results will be used to ensure appropriate mitigation where non-point sources may be in consideration....the proposed interagency KWAC, in concert with the RDWPT will need to be in place to ensure all necessary further assessments, and response actions are in place should testing reveal any such contaminants in bottom –sediments or water column are found in the raw-water source;

Opportunity: *It would be valuable to determine just how such a KWAC mechanism would operate in the context of the UKRW where such follow-up to water quality threat assessments, and mitigation response are required, that is, clarifying the auditing, compliance roles and responsibilities between the OGC and NHA*

6) **GROUNDWATER ASSESSMENT AND PROTECTON:** Groundwater aquifer delineation remains a major source of concern with respect to drinking water protection in the upper Kiskatinaw; the City participated in the Montney Water Project – a jointly funded initiative BC government, industry and City – and there is a need to further extend the analysis of shallow-groundwater resources as this was not completed in Phase I of that work, including a review to understand potential risks from all gas development operations (drilling, hydraulic fracturing, waste disposal, transport) etc. where short, or long-term risks may exist where drilling is being done through shallow aquifers and lack of understanding of such issues (i.e. pathways to contamination through possible well-hole

depressurization, and shifting groundwater flows, or directly from loss of well-casing integrity over time through metal degradation, etc.....unfortunately, the FPB cumulative effects study (cited above) was focused primarily on and understanding of water supply issues, consideration of turbidity from surface disturbance but did not provide guidance on groundwater issues resulting from various intense gas development scenarios. As part of this effort, the City has commissioned a reputable hydrogeological consultant to provide further analysis of the MWP results, and provide recommendations for both groundwater monitoring, and terms of reference for an enhanced groundwater mapping effort

Recommendation: *That an extended Phase II MWP be undertaken (as is currently being pursued by the City with GeoScience BC) to ensure a thorough analysis of groundwater resources in the UKRW to improve decision-making and increased public confidence in water quality management as required under the DWPA;*

Opportunity: *Facilitate a linkages through the current federal arms-length investigation by the Council of Canadian Academies study on the impacts of shale gas development and use of hydraulic fracturing* to consider the UKRW as a case-study on this issue.

FORT ST JOHN
The Energetic City

City of Fort St. John
10631-100th Street
Fort St. John, BC
Canada V1J 3Z6

(250) 787-8150 City Hall
(250) 787-8181 Facsimile

www.fortstjohn.ca

March 5, 2012
File # 4900-01, 0400-20
Via email to info@fbbra.ca

Fraser Basin Council
1st Floor, 470 Granville St.
Vancouver, BC V6C 1V5

Dear Sir/Madam:

Re: Human Health Concerns Relating to Oil and Gas Development in Northeastern BC

Thank you to the Fraser Basin Council's David Marshall and the Ministry of Health's Tim Lambert and Lidia Surman for the presentation they provided to Fort St. John City Council at the February 13, 2012 Closed Council meeting.

Further to their request for input from the City with respect to the above noted matter, Mayor and Council respectfully request that the human health risk assessment relating to oil and gas development in Northeastern BC investigate the following:

- industry proximity to schools;
- storage of chemicals close to residential property and the need for detailed up-to-date records of what is stored in such places;
- the Oil and Gas Commission's approvals process;
- the Oil and Gas Commission's disconnect with local residents;
- industry's outreach program that regularly conveys information to those effected and the OGC's lack of one;
- Oil and Gas Commission's emergency response program and required updating;
- new technology and processes allow for a decreased footprint with multi-pad drilling. However, these now resemble an industrial site where the benefits and concerns are not concentrated. Regulators and producers should ensure that the local community understands the processes and emergency response plans;
- Provincial investment in industry and the need for research and development for the future – hydraulic fracturing does not have to be the only alternative;
- industry regulations and required updates to same;
- government bureaucracy lacking in industry knowledge and the requirement for updated information;

.../2

FORT ST JOHN
The Energetic City

- options for the Province to challenge industry to step up to the plate and to use innovations that are available;
- working conditions of industry including long hours;
- issues associated with four laned highways as opposed to twinned highways with respect to industrial vehicles;
- possible danger associated with increased industrial traffic on rural roads;
- issues associated with a shortage of ambulance service in the area;
- differing labour standards for the oilfield industry when compared with other sectors. The Province initiated the summer drilling program therefore the labour laws should be reviewed; and
- fly in fly out workers which cause parents to be away from their children thus leaving one parent families which is stressful on the at-home parent.

Thank you for the opportunity to provide input on this matter. Please note that a more comprehensive list of concerns could have been provided had the timeline been less stringent.

Yours truly,

Lori Ackerman
Mayor

cc: Council

DISTRICT OF
CHETWYND

RECEIVED

FEB 2 0 2012

FRASER BASIN COUNCIL

Office of the Mayor

District of Chetwynd

Box 357
Chetwynd, B.C.
Canada V0C 1J0

tel: (250) 401-4100
fax: (250) 401-4101
email: d-chet@gochetwynd.com

February 20, 2012

HRRA – Phase 1
c/o Fraser Basin Council
1st Floor, 470 Granville Street
Vancouver, BC
V6C 1V5

Attention: David Marshall, Executive Director

Dear Mr. Marshall:

Re: HRRA – Phase 1 / Chetwynd Interests

Thank you for the opportunity of meeting with you recently to discuss Chetwynd's Health concerns in relation to Northeast gas & oil developments.

Firstly I should note that our community supports the gas and oil industry generally. As a community we would like to see continued improvement in gas and oil activities and practices as they relate to health and social impacts affecting our communities.

We relayed most of our concerns to you during our recent meeting, however, I will provide a brief summary of the issues of most concern to our community:

- Direct and indirect impacts on local health services (medical staff and doctors shortages)
- Drug and alcohol related issues with increased population.
- Housing (lack of adequate housing stock, inflated rents due to demand-side issues)
- Traffic impacts (more traffic often travelling at greater speeds, vehicles often being driven by inexperienced youth drivers, impacts on local streets, parking, vehicle/wildlife impacts)

- Transient work force (use of services but lack of commitment and care of community, other related social issues)

- Increased risk of air borne and water borne contaminants from drilling, operations, transportation of goods, transmission lines and processing plants.

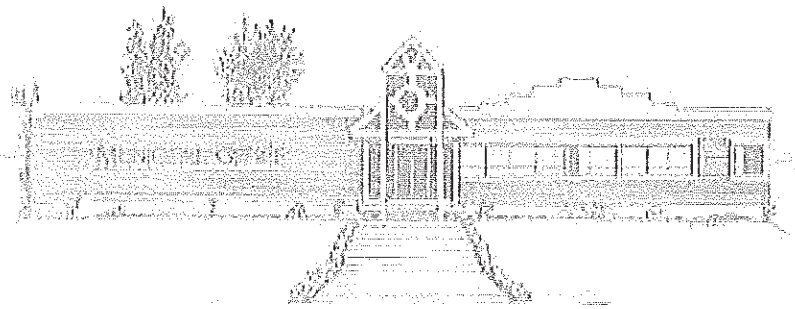
- Increased pressure on community infrastructure; water, sewer, roads, and recreation facilities.

- Need for continued provincial revenue sharing (i.e. Fair Share) to keep up with accelerated demands on local government services.

Thank you again for the opportunity to comment on gas and oil development in northern BC and its impacts on health, social and community infrastructure matters.

Yours Truly,

Merlin Nichols
Mayor



District of
Hudson's Hope

9904 – 105th Avenue
PO Box 330
Hudson's Hope, BC V0C 1V0
Phone: (250) 783-9901
Fax: (250) 783-5741

Office of the Mayor

February 27, 2012 File No. 6660-01

HRRA – Phase 1
c/o Fraser Basin Council
1st Floor, 470 Granville Street
Vancouver, BC V6C 1V5

Dear Fraser Basin Council:

RE: Human Health Risk Assessment – Phase 1 Comments

At the Council meeting held Monday, February 27th, 2012 Council discussed their concerns regarding human health and its relation to oil & gas development in Northeastern British Columbia.

Council would like to express their concerns in the following:

- H2S and other Neurotoxins
- Younger demographic and the effects of H2S exposure
- Air Quality Impacts
- SO2 and its respiratory impacts (BC threshold is 8 times WHO guidelines)
- Flaring – are we checking what is released
- We are checking point sources of discharge which may meet thresholds but collectively, do the cumulative impacts meet thresholds
- Fugitive emissions
- Transportation of hazardous materials and the potential for reaction between different chemicals being transported
- Are there accommodations for individuals more susceptible to effects of H2S, SO2, etc.
- Water (quantity & quality)

Board of Trustees and Boys

- Emergency Response Management, clarity around emergency procedures, Is Emergency Management Regulation by OGC in place
- Will a call to 911 generate a response to an oil and gas emergency
- Emergency Preparedness Zones – who checks the plans
- Training of Medical Staff – physician awareness of effects of H2S
- Registry or tracking effected individuals
- Health Services Funding is by census and not by the number of workers in the area
- Fracking & earthquakes.
- Increase in traffic/emissions/MVAs

The District of Hudson's Hope appreciates the efforts the Fraser Basin Council is making in conveying the concerns of individuals and organizations within the community.

With the increase in Oil and Gas activity in this region we need to be pro-active in our approach to human health and safety.

Yours truly,

Karen Anderson

Karen Anderson, Mayor
DISTRICT OF HUDSON'S HOPE

/lg

OFFICE OF THE MAYOR

P.O. Box 300, Taylor, BC V0C 2K0
Phone: (250) 789-3392 Fax: (250) 789-3543
www.DistrictofTaylor.com

March 7, 2012

Fraser Basin Council
1st Floor, 470 Granville Street,
Vancouver, BC
V6C 1V5

RE: Human Health Risk Assessment – Health Concerns related to Oil & Gas Development in BC

Dear Mr. David Marshall:

We would like to thank you, Dr. Lambert PhD. MSc and Mrs Lidia Surman for meeting with District of Taylor Council members and staff to discuss health concerns related to Oil & Gas Development in BC. This letter is intended to be a written submission of the concerns expressed at that meeting and we look forward to the next phase of the report. The concerns expressed are as follows:

1. There is concern that "fracking" is causing contamination of, and/or compromising local area water sources. How can people be guaranteed that this process does not impact their water supply since you cannot see the area of newly fractured rock? Local rural area residents are complaining of personal illness and the death of outdoor pond fish where the fish were healthy previously. It is cost prohibitive to test for contamination from chemicals used in fracking and, furthermore, due to the proprietary nature of the chemical formulations used, one is required to be a chemist to determine chemical origins.

2. If the wellbore is not correctly cemented, how can you guarantee that the water aquifers are not contaminated due to seepage?

3. The municipality provides treated drinking water to our residents through a "GUDIS" (Groundwater Under Direct Influence of Surface) well system from wells located in the Peace River. Without a watershed protection plan, how can we be sure that this water will not be compromised by fracking, poor cementing, contamination, or become nonexistent through depleted water sources. A large volume of surface water is also diverted to oil & gas operations.

4. Flaring of gas is regulated to ensure that there are no health risks, however, as we have seen, should a problem occur, poisonous gas has been flared in an effort to "fix" the problem before the regulators become aware.

5. Hazardous oilfield products are hauled through our community on a regular basis leaving an odour in their wake. The fumes are brought into the homes and offices through air intakes, leaving a lingering smell. It was noted that the smell in our office was not brought to your

attention at our meeting. It was simply because we encounter it on a regular basis and therefore become complacent.

6. Trucks having dangerous goods are often left parked for extended periods of time along our municipal roadways. Should a spill occur or vapour released, there could be negative impacts to the environment or worse - the loss of lives (H2S).

7. Area roadways are congested from the increase of large tanker trucks and increased general traffic associated with the oil & gas activity in the area. Unnecessary risks are being taker just to turn on/off the highways due to extended wait times. Roadways are not designed to handle this volume of traffic in their existing conditions

8. Labour shortages in the North have caused unrealistic salary demands. With increased disposable income, drug and alcohol addictions become prevalent.

Thank you for including our concerns in your report.

Sincerely,

Fred Jarvis
Mayor

PEACE RIVER REGIONAL DISTRICT

Office of the Chief Administrative Officer

February 28, 2012

Mr. David Marshall, Executive Director
Fraser Basin Council
1st Floor, 470 Granville Street
Vancouver, BC V6C 1V5

Via Email: info@hhra.ca

Dear Mr. Marshall:

Re: Submission - Phase 1 of the Human Health Risk Assessment

On February 15, 2012 the Peace River Regional District met with representatives of the Fraser Basin Council and the Ministry of Health as part of the Council's Phase 1 research and consultation to identify issues associated with human health. As a result of that discussion the attached position paper was prepared.

At its February 23, 2012 meeting the Regional Board authorized the Peace River Regional District's "Health Concerns About Oil & Gas Development in Northeast BC" position issues paper be forwarded to the Fraser Basin Council.

We look forward to the report that the Fraser Basin Council will deliver to the Minister of Health at the end of March 2012.

Yours truly,

Fred Banham,
Chief Administrative Officer

/dm

Attachment: Peace River Regional District Health Concerns About Oil & Gas Development in Northeastern BC

PLEASE REPLY TO:
☑ BOX 810, DAWSON CREEK, BC V1G 4H8, TELEPHONE: (250) 784-3200 or 1-800-670-7773 FAX: (250) 784-3201
EMAIL: prrd.dc@prrd.bc.ca

☐ 9505 - 100 STREET, FORT ST. JOHN, BC V1J 4N4, TELEPHONE: (250) 785-8084 FAX: (250) 785-1125
EMAIL: prrd.fsj@prrd.bc.ca

Peace River Regional District
Health Concerns
About Oil & Gas Development in Northeastern BC

Submission to the Fraser Basin Council - HHRA Phase-1 Consultation
February 28, 2012

IDENTIFICATION OF ISSUES:

- Air Quality
- Water Quality
- Social
- Emergency Notification/Response
- Industrial Transportation
- Peace and Quiet - Enjoyment of Residence
- Fear of theUnknown

AIR QUALITY ISSUE:

Oil & gas development affects air quality in a number of different ways, all of which brings to question, how does it affect human health:

- Increased traffic on rural, gravel roads; dust; traffic volume; oversized loads; overweight loads
- Flaring – what is being emitted into the atmosphere (particulates, gases fumes)
- Cumulative health effects of long term exposure

Recommendations:

- Air quality monitoring, community monitors, residential monitors and/or personal monitors
- Health records review of respiratory issues reported in the Peace region
- Scientific evaluation of emissions materials, identifying toxins and minimal exposure levels safe to human health

WATER QUALITY ISSUE:

Oil & gas development is trending toward hydraulic fracturing of subsurface rock formations to better access natural gas deposits. This fracking process requires extremely large amounts of water. This is surface water being pumped down a hole and then slowly recovered over time, which is a local frustration. Water in the Peace region is scarce because the region is the headwaters collection area for all water flowing north to the Arctic.

There is very little ground water and only a couple of rivers that have enough flow to provide year round regional water supply.

A second perceived health concern is the use and placement of recovered water from the industry's recovery process. What impurities are in that water and how is it being released back into the environment and what is the cumulative effect on human health?

A third issue is what effect is the fracking process having on ground water aquifers?

- Industrial water sources
- Volume of water used for industrial purposes
- Treatment of recovered industrial water
- Disposal of contaminated industrial water

Recommendations:

- Research industrial use of water associated with oil & gas development and operations
- Health records review of source water issues
- Scientific evaluation of region water and industry recovered water, identifying toxins and minimal exposure levels safe for human health

SOCIAL ISSUES

Oil & gas industry pays well, requires long work hours and attracts a relatively young and aggressive work force - these cumulative factors attract a number of social vices:

- Substance abuse (alcohol, drugs)
- Family stability
- Cumulative health effects of work schedules (hours of work, cumulative rest days, travel requirements, living out)

Recommendations:

- Health records review of oil & gas related social issues
- RCMP and Provincial court records review to determine complexity of social issues attributable back to the oil & gas work force

EMERGENCY NOTIFICATION & RESPONSE ISSUE:

There is a requirement of the oil & gas industry to have emergency notification and emergency response plans in place for every installation. The issue for the Regional District is the ability for the public to quickly and effectively initiate access to an oil & gas emergency situation (notification of an event).

- How is the oil & gas industry contacted in an emergency situation?

Recommendations:

- The Oil and Gas Commission set up a call answer centre to receive oil and gas emergency calls and coordinate those calls to be routed through the 911 call answer service provided by the Peace River Regional District

INDUSTRIAL TRANSPORTATION ISSUE:

Oil and gas development is not specific to any specific industrial site or work area and activity intensifies and diminishes depending on drilling programs and production results. As a result public roads are used extensively to transport men, supplies, equipment, machinery and by-product to and from each well site or gas plant location. A two stage drill rig can require up to 90 oversize transport truck loads to relocate. Fracking operations can add another 30 to 40 transport truck loads per frack and depending on location each well site can require a transport truck a day just to remove off site condensate collected from the process.

Recommendations:

Consideration needs to be made in understanding:

- How much additional traffic is put on the public roads identifying, oversized loads and hazardous material loads
- How any hazardous spills have occurred along public roads, associated to oil and gas activity

PEACE AND QUIET ENJOYMENT ISSUES

Oil & gas development brings intensive 24 hours per day - 7 days per week work activity during development of well sites and pipelines to a wide region consisting of both private and crown lands. For the most part this activity is in the rural areas and areas that historically have been very quiet and peaceful. A gas well development used to be a few weeks to a few months duration of intense activity but now many well sites are multi-well pads and require drilling, fracking and testing activity that lasts many months or even up to years of intense activity.

- Road traffic
- Flaring – noise and light disturbance
- Fracking noise (multiple compressors)
- Cumulative health effect of sleep disturbance associated with noise and light disturbance

Recommendations:

- Health records review of sleep disorders associated with oil and gas activity

- Consideration of siting and setback requirements from residences - are they adequate ?
- Research noise and light emissions emitted by well drilling, fracking, well servicing and flaring recommending reasonable disturbance levels safe for human health

FEAR OF THE UNKNOWN ISSUE:

One of the greatest health concerns generated by the general public associated with oil & gas development is the fear of the unknown: what's in the air; how will the noise affect individuals; what is industry dong to the water supply; who do I call if I think something has gone wrong?

Recommendations:

- Research needs to be conducted and factual scientific information needs to be shared with the general population to either inform the public of health risks and the potential mitigations or to dispel perceived public concern about perceived health risks
- Public education

Human Health Risk Assessment into Oil and Gas Development in North East BC:

As you are aware North East BC is inundated with a fast paced natural resource extraction. The land base is prevalent with oil & Gas, mining, alternative energy sources, forestry activity and exploration. Saulteau First Nations believe the pace of development is happening too fast and we find it difficult to keep up with.

SFN has many concerns in regards to our culture and continuity of our traditional mode of life promised to us in Treaty 8. Below is a list of growing concerns that directly impact our Treaty and Aboriginal rights:

- cumulative impacts from all industrial sectors on the land base reducing and fragmenting healthy and intact ecosystems;
- the volume of fresh water extracted for Oil and Gas purposes;
- the quality and health of water from industrial impacts occurring on the land base, more specifically storage locations of produced and toxic water resulting from fracking;
- appropriate baseline studies in place in regards to groundwater;
- the quality of air due to increased oil and gas, coal mining and road development for all industrial sectors;
- habitat fragmentation, ultimately impacting healthy wildlife populations;
- no knowing all the potential impacts that may result from hydraulic fracturing;
- "Ecological restoration" to occur on all impacted lands due to oil and gas activities.

In summary, SFN would like the preservation of healthy intact ecosystems, areas to remain untouched by industry. How can we continue practicing our way of life and passing on our oral history, traditions and lessons without a healthy land base, no water or trees? Who can speak on behalf of the wildlife and fish populations, ultimately we need each other to survive.

Kinana'skomitin,

"I thank you"

Naomi Owens (BSc, BIT)

Saulteau First Nations
Treaty, Lands and Sustainable Resource Management
SFN Acting Lands Director, Biologist
(250)788-3955 (Main)
(250)788-7259 (Direct)
(250)788-1276 (Fax)