

**GOVERNMENT OF YUKON
RESPONSE TO THE SELECT
COMMITTEE FINAL REPORT
REGARDING THE RISKS AND
BENEFITS OF HYDRAULIC
FRACTURING**

April 9, 2015

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Introduction

The final report of the Select Committee Regarding the Risks and Benefits of Hydraulic Fracturing was released on January 19, 2015 and included 21 recommendations. The recommendations focus on the need for continued public dialogue, continued respect for First Nations and First Nation engagement, detailed assessment of the economic, human health and social impacts, more baseline data and scientific research around water, greenhouse gases, air emissions, wildlife and induced seismicity, and assurance that regulatory processes will protect the safety of people and the environment. We believe gaining a better understanding is the central theme of the Select Committee's report, and the Yukon government fully adopts this approach.

The Yukon government agrees with the 21 recommendations which the Select Committee put forward. We also agree that being well informed and understanding the risks and benefits are key components of any responsible resource management decision. As a result, government is committed to learning more about the risks and benefits of hydraulic fracturing.

We intend to address the recommendations through existing activities as well as through new projects. Much of the baseline data collection and research will support projects in other natural resource sectors as well.

Yukon government will continue to work government-to-government with First Nations regarding their concerns around hydraulic fracturing. It will also continue to meet its legal obligations to consult affected First Nations. Yukon government will require the involvement and support of affected First Nations prior to any potential oil and gas development that would require hydraulic fracturing.

The Select Committee recommends that more knowledge and meaningful engagement are needed. We intend to participate in and expand the dialogue around hydraulic fracturing with First Nations, the public and industry.

Yukon government supports the development of a strong and robust oil and gas industry in Yukon and recognizes that the development of these resources could contribute to significant economic growth and diversification of the Yukon economy. Consumption of oil and gas continues to be a significant component of Yukon's energy use and the development of a local supply could help to meet Yukon's energy needs as outlined in the Energy Strategy for Yukon. We remain focused on how to best develop Yukon's resources in an environmentally responsible manner.

Yukon government notes that approximately 15% of Yukon is underlain by eight sedimentary basins which have potential to contain oil and gas. Roughly one third of these basins – corresponding to 5.4% of Yukon – is currently available for oil and gas disposition. The Liard and

Eagle Plain basins currently have active dispositions and are the most accessible. This government is focussing on the Liard basin for further research and possible shale development.

The Yukon government recognizes that there are many concerns about the environmental impacts of hydraulic fracturing, especially on water, greenhouse gas (GHG) and other air emissions, land, wildlife, seismicity, permafrost, and health and social impacts. We will seek a cross section of expert advice to ensure the quality and quantity of baseline data and scientific research on which we will depend to make decisions are adequate and sound.

We believe that Yukon's regulatory regime is robust, modern and designed to regulate all oil and gas activities especially when considered and combined with important processes such as YESAA assessments and water licencing procedures. These processes assist to minimize risk, mitigate impacts and build a stable sustained economy. As an added step, we will seek expert advice to review our regulatory regime to ensure that it will protect the safety of people and the environment.

This document includes a government response to each Select Committee recommendation and identifies some current and new actions that will assist in addressing the recommendations. Some of the new actions include:

- develop the public dialogue through an engagement strategy;
- conduct an economic study;
- augment baseline water monitoring work through collaborative research with the University of Calgary;
- expand seismic baseline data;
- explore partnerships with affected First Nations and other potential partners;
- seek expert advice to confirm our baseline information is adequate and our regulatory processes will protect the safety of people and the environment.

Work is already underway to implement these actions.

Government of Yukon Response to the 21 Recommendations

Public Dialogue

SC Recommendation # 1: THAT the Government of Yukon should have the support of the Yukon First Nations whose traditional territories are affected before allowing hydraulic fracturing.

YG Response: Agree. Yukon government (YG) will require the involvement and support of affected First Nations on any future oil and gas development within their traditional territories which requires hydraulic fracturing. We will continue to work government-to-government with First Nations regarding their concerns around hydraulic fracturing.

Actions:

Initiate discussions with affected First Nations regarding information needs related to understanding the risks and benefits associated with hydraulic fracturing.

Initiate discussions with affected First Nations regarding models of engagement including potential partnerships and agreements.

Continue to discuss a common regulatory regime for oil and gas on First Nations and public lands with the 1997 Memorandum of Agreement (MOA) Working Group.

Continue to seek First Nation involvement when negotiating Benefit Agreements as required by the Oil and Gas Act.

See also actions under Recommendation #4.

SC Recommendation # 2: THAT the Government of Yukon should consider options for continuing an informed public dialogue amongst Yukoners about the issue of hydraulic fracturing and the oil and gas industry more generally.

YG Response: Agree. The Yukon government agrees that it is beneficial to expand the dialogue around oil and gas activities, including hydraulic fracturing, with First Nations, stakeholders, the public and industry. The discussion will expand the science-based understanding of the technical, environmental, economic and regulatory aspects of hydraulic fracturing and the oil and gas industry generally.

Actions:

We will develop an engagement strategy that will provide opportunities for public dialogue and include information to enhance knowledge on the management and regulation of Yukon's oil and gas industry and improve the understanding of the risks and benefits of this industry. The strategy will include Yukon First Nations, stakeholders, industry and the public.

We will continue to participate in a Natural Resources Canada – Energy Mines and Ministers Markets and Trade Working Group which is creating a public portal with facts around shale oil and gas resources.

We will be open to formation of partnerships and use of mechanisms that can enhance communication and broaden knowledge of the oil and gas industry.

SC Recommendation # 3: THAT the Government of Yukon should make all relevant environmental data open, transparent and available to the public.

YG Response: Agree. The government shares the Select Committee's interest in improving public access to environmental data.

Actions:

YG currently collects water quality, water flow, and wildlife data across Yukon - including in areas with oil and gas development potential or activity - and makes information about the data publicly available online. The Yukon government is a partner in the federal National Air Pollution Surveillance (NAPS) Program and operates an ambient air pollution station in downtown Whitehorse to monitor air quality. Yukon air quality data is available online through Environment Canada's NAPS website. We will examine options for improving access to baseline data.

The Yukon Water Board and Department of Energy, Mines and Resources are participating in the Coordinated Online Information Network (COIN) initiative to make baseline water data and information regarding water use more easily available for oil and gas project assessments.

We will continue to maintain and improve YukonWater and Waterline, two online data catalogues regarding water use.

SC Recommendation # 4: THAT the Government of Yukon should respect First Nation final agreements and its ongoing obligations towards non-settled First Nations in addressing any issue related to hydraulic fracturing.

YG Response: Agree. YG will continue to work with First Nations regarding their concerns around hydraulic fracturing. The government will continue to meet its legal obligations to consult affected First Nations.

Actions:

YG will consult affected First Nations on any proposed hydraulic fracturing projects that might arise in their traditional territories.

YG will continue to incorporate local and traditional knowledge in relation to development of any oil and gas project.

See also response and actions under Recommendation #1.

Economic Impacts

SC Recommendation # 5: THAT the Government of Yukon conduct a thorough study of the potential economic impacts of developing a hydraulic fracturing industry. The study should include an assessment of potential infrastructure, health and social services and environmental costs related to the industry. The thorough economic analysis should include but not be limited to:

- an estimation of marketable oil and gas reserves in each basin,
- an estimation of the necessary capital investment for production in each basin,
- an estimation of operating and regulatory costs,
- an estimation of tax revenue and disbursement,
- the effects on Yukon's gross domestic product (GDP),
- wage and employment analysis including the economic impact of a fly-in, fly-out industry, and a comparison of the impacts of a hydraulic fracturing industry in contrast to a renewable energy industry.

YG Response: Agree. The government is interested in gaining a greater understanding of the potential economic impacts of shale oil and gas development in Yukon.

Proponents of large oil and gas activities are required to have a Benefits Agreement with YG and affected First Nations. The agreement provides opportunities for residents of communities affected by the oil and gas activity and other Yukon residents to benefit in the areas of employment, training and supply of goods and services related to the activity.

Actions:

The Department of Economic Development will undertake an economic analysis that assesses the potential economic impact of developing shale oil and gas resources in Yukon. An assessment of shale resources will be conducted to determine the extent of the oil and gas resource in Yukon.

The Department of Energy, Mines and Resources will continue to participate on the Energy and Mines Ministers Conference Markets and Trade Working Group which is focusing on shale and tight resource developments.

Water

SC Recommendation # 6: THAT baseline ground and surface water data be collected for an appropriate period of time, in order to ensure that comprehensive data is available.

YG Response: Agree. The government shares the Select Committee's interest in seeing appropriate baseline water data collected, both for general monitoring purposes and for specific development projects.

Actions:

The government currently collects water quality and quantity data across Yukon - including areas with oil and gas development potential - and makes information about the data publicly available online.

In 2014 additional hydrometric stations were established to monitor surface water in Eagle Plain and Liard basins.

In light of the Select Committee's recommendations, the government will be assessing our baseline data inventory with a view to seeing where additional data collection may be needed and how it is verified. We will then seek expert advice to confirm our baseline information is adequate in comparison to other jurisdictions. We will undertake to fill any gaps in our data.

The Yukon government (Water Resources, Oil and Gas Resources, and Yukon Geological Survey) is collaborating with the University of Calgary on a Natural Sciences and Engineering Research Council of Canada (NSERC) project to develop baseline monitoring techniques to assess potential impacts on groundwater and surface water of oil and gas extraction.

In addition, the Department of Energy, Mines and Resources will consult with Land and Water Boards of the Mackenzie Valley in the Northwest Territories regarding the use and effectiveness of their *Guidelines for the Monitoring of Surface and Groundwater Response to Vertical and Horizontal Hydraulic Fracturing Operations in the Mackenzie Valley*. We continue to examine the Canadian Association of Petroleum Producers guidelines and to follow developments in other jurisdictions.

Department of Environment will continue to collect seasonal baseline groundwater data in the Eagle Plain basin and will also seek to expand the groundwater network in the Eagle Plain and Liard basins. As well, Department of Environment will continue with long term surface water and hydrometric monitoring, including hydrometric stations on the La Biche and Beaver Rivers in the Liard basin.

SC Recommendation # 7: THAT a better understanding of the impacts and interactions of hydraulic fracturing fluids on groundwater be developed.

YG Response: Agree. YG recognizes the need for a better understanding of the impacts and interactions of hydraulic fracturing fluids on groundwater.

Actions:

YG is collaborating with the University of Calgary on an NSERC project to develop monitoring techniques to assess potential impacts of oil and gas extraction, including hydraulic fracturing, on groundwater and surface water. A portion of this project will look at well integrity and the potential transport of hydraulic fracturing fluids and fugitive gas migration into groundwater. YG's association with this project will enhance government's ability to establish Yukon-based guidelines and standards on oil and gas activities, including hydraulic fracturing.

The *Yukon Water Strategy and Action Plan* was released in June, 2014. One of the six priority areas is to better understand and manage Yukon's groundwater, with emphasis on enhancing and formalizing the existing groundwater program in Yukon and developing a

regulatory framework to manage groundwater. A hydrogeologist has been hired to work on groundwater-related issues and lend expertise to existing water programs.

We will continue to participate in the advisory group on Canadian Water Network's Hydraulic Fracturing Consortium. The overall goal of this group is to develop a National Research Consortium for Hydraulic Fracturing and Water and to advance decisions for hydraulic fracturing and water.

SC Recommendation # 8: THAT requirements related to water intensive practices are adhered to even if non-water options for shale formation fracturing are to be considered.

YG Response: Agree. YG takes regulation seriously and will ensure practices are appropriate to protect the safety of people and the environment if non-water options for shale formation fracturing are to be considered.

Actions:

We will consult with an external advisory group or specialists who will review our regulatory system and identify any necessary improvements.

YG will prepare a policy for the regulation of hydraulic fracturing which would outline the goals of safe hydraulic fracturing and the regulatory approaches to meet the goals. We will continue to work with the National Energy Board and BC Oil and Gas Commission through our Services Agreements so that we enhance our regulatory approach.

SC Recommendation # 9: THAT adequate seasonal thresholds are established to ensure the usage of fresh water does not exceed watershed capacity.

YG Response: Agree. YG shares the concerns regarding the usage of fresh water not exceeding the watershed capacity.

Actions:

We are aware that other jurisdictions have developed regulatory tools and we will review tools used in other jurisdictions such as the North East Water Tool used by BC Oil and Gas Commission to provide guidance on water availability across north eastern British Columbia and support decision-making processes for water use approvals and licences.

The Yukon Water Board and Department of Energy, Mines and Resources are participating in the Coordinated Online Information Network (COIN) initiative to make baseline data regarding water use more easily available for oil and gas project assessments.

We will consult with an external advisory group or specialists who will review our regulatory system and identify any necessary improvements.

SC Recommendation # 10: THAT companies be required to make public the chemicals and chemical compounds that would be used, including case numbers, volumes, percentages and concentrations prior to any hydraulic fracturing activity.

YG Response: Agree. YG agrees that proponents should be required to publicly disclose information on the fluids used in hydraulic fracturing operations.

Actions:

Proponents will be required to publicly disclose information on the fluids used in the hydraulic fracturing operations prior to permitting. YG has made a public commitment to use FracFocus, a chemical disclosure registry setup by the BC Oil and Gas Commission.

We will continue to consult with an external advisory group or specialists who will review our regulatory system and identify any necessary improvements.

SC Recommendation # 11: THAT research be conducted to demonstrate whether well integrity can prevent migration of liquids or gases in the long term.

YG Response: Agree. YG is aware that multiple research studies on this topic are occurring in other Canadian jurisdictions which have mature oil and gas industries.

Actions:

We will monitor the research results and endeavour to collaborate in relevant research whenever possible.

YG is collaborating with the University of Calgary on an NSERC project to develop monitoring techniques to assess potential impacts of oil and gas extraction, including hydraulic fracturing, on groundwater and surface water. A portion of this project will be looking at well integrity and the potential transport of hydraulic fracturing fluids and fugitive gas migration into groundwater.

Greenhouse Gases (GHGs) and Other Air Emissions

SC Recommendation # 12: THAT air quality baseline data be collected for an appropriate period of time, in order to ensure that comprehensive data is available.

YG Response: Agree. The government shares the Select Committee's interest in seeing appropriate baseline data collected, both for general monitoring purposes and for specific development projects.

Actions:

The Yukon government is a partner in the federal National Air Pollution Surveillance (NAPS) Program and operates an ambient air pollution station in downtown Whitehorse to monitor air quality. Yukon air quality data is available online through Environment Canada's

NAPS website. YG will continue to collect long term air quality trend data for Yukon at the monitoring station located in Whitehorse.

The government will assess our baseline data inventory with a view to seeing where additional data collection may be needed and how it is verified. YG will seek expert advice (including Environment Canada) to confirm our baseline information is adequate in comparison to other jurisdictions and undertake to fill any gaps in our data.

We have access to over 25 years of Yukon baseline air monitoring data from Environment Canada. Council of Yukon First Nations (CYFN) is operating an air monitoring station north of Whitehorse at Little Fox Lake.

YG will review monitoring parameters in other natural gas producing areas such as northern BC and Alberta to inform what the appropriate monitoring stations and baseline parameters would be for oil and gas development in Yukon. YG will consider establishing two additional full monitoring stations in locations to be determined based on the review findings and input from expert advice.

SC Recommendation # 13: THAT research be done to develop a method to effectively measure and monitor GHG emissions over the full life cycle of natural gas.

YG Response: Agree. YG shares the Select Committee's interest in developing a method to effectively measure and monitor GHG emissions over the full life cycle of natural gas.

Actions:

Yukon Energy Corporation (YEC) and the Yukon Conservation Society jointly commissioned two natural gas life-cycle studies in 2011 - 12 when investigating the use of Liquefied Natural Gas (LNG) for power generation. The studies can be found at:

[https://www.yukonenergy.ca/media/site_documents/LNG Life Cycle Assessment - Pembina Institute - Final Report](https://www.yukonenergy.ca/media/site_documents/LNG_Life_Cycle_Assessment_-_Pembina_Institute_-_Final_Report)

[http://www.yukonenergy.ca/media/site_documents/1260 ICF%20Marbek%20Final%20Report LNG lifecycle_july2013.pdf](http://www.yukonenergy.ca/media/site_documents/1260_ICF%20Marbek%20Final%20Report_LNG_lifecycle_july2013.pdf)

YEC commissioned a third study when their supply options changed. It can be found at:

[http://yukonenergy.ca/media/site_documents/LNG Life Cycle Assessment S and T Squared Consultants Inc. - Final Report.pdf](http://yukonenergy.ca/media/site_documents/LNG_Life_Cycle_Assessment_S_and_T_Squared_Consultants_Inc._-Final_Report.pdf)

Research continues to be undertaken by others. We will monitor the research results and endeavour to collaborate in relevant research whenever possible.

SC Recommendation # 14: THAT research be conducted regarding fluid and gas leakage specific to the unique permafrost conditions in Yukon.

YG Response: Agree. YG shares the Select Committee's interest in researching fluid and gas leakage specific to Yukon's permafrost conditions.

Actions:

Fluid and gas leakage research continues to be undertaken in areas with permafrost and government will monitor the research results and endeavour to collaborate in relevant research whenever possible.

YG continues to monitor well bore integrity in historic wells in the continuous permafrost of northern Yukon.

We will seek expert advice to review our regulatory system and identify any necessary improvements.

SC Recommendation # 15: THAT steps be taken to ensure that volatile organic compounds are not released during development and production.

YG Response: Agree. YG agrees that volatile organic compounds need to be carefully managed during development and production.

Actions:

Regulatory directions which will apply to all oil and gas activities are being developed for flaring, venting and fugitive emissions.

YG will continue to monitor mature regulatory regimes to evaluate their effectiveness in managing the release of volatile organic compounds.

YG will seek expert advice to review our regulatory system and identify any necessary improvements.

We will set acceptable levels based on the research and expert advice.

Land and Seismic

SC Recommendation # 16: THAT baseline data on wildlife and wildlife habitat be collected for an appropriate period of time, in order to ensure that comprehensive data is available, and that the impacts of hydraulic fracturing on wildlife be studied.

YG Response: Agree. The government shares the Select Committee's interest in seeing appropriate baseline data collected, both for general monitoring purposes and for specific

development projects in areas with higher oil and gas development potential, namely the Liard sedimentary basin.

Actions:

The government collects wildlife data across Yukon - including areas with oil and gas development potential - and makes information about the data publicly available online. The government will assess its baseline data inventory with a view to seeing where additional data collection may be needed and how it is verified. We will then consult with an external advisory group or specialists to confirm our baseline information is adequate in comparison to other jurisdictions. We will undertake to fill any gaps in our data.

YG will continue to survey and monitor the Porcupine caribou herd. We have deployed a number of cameras on old seismic lines in North Yukon to determine wildlife use along these cut lines.

We will continue to study baseline disturbance and recovery of linear features as required under the North Yukon Regional Land Use Plan to inform our general understanding of impacts.

SC Recommendation # 17: THAT baseline data on seismic activity be collected for an appropriate period of time, in order to ensure that comprehensive data is available.

YG Response: Agree. The government shares the Select Committee's interest in seeing appropriate baseline data collected.

Actions:

A seismic array comprising 13 seismometers is currently place in Yukon to measure seismic activity. This is part of a broader array that monitors earthquake activity across western Canada and Alaska. YG is working with a consortium of university researchers to significantly expand this seismic array over the next few years to over 40 instruments. This enhanced network will allow greater resolution on the locations of active faults in Yukon, and will provide more baseline information on the magnitude of naturally occurring "background" seismic activity.

The government will assess our baseline data inventory with a view to seeing where additional data collection may be needed and how it is verified. YG will then consult with an external advisory group or specialists to confirm our baseline information is adequate in comparison to other jurisdictions. We will undertake to fill any gaps in our data.

YG will explore opportunities to link into British Columbia seismicity studies related to oil and gas activities in northeast British Columbia near the Liard basin in southeast Yukon.

SC Recommendation # 18: THAT the impacts of seismic activity in Yukon be studied to evaluate the seismic risks caused by hydraulic fracturing and to avoid the development of flow paths to fresh water.

YG Response: Agree. YG shares the Select Committee’s concerns regarding the potential seismic risks caused by hydraulic fracturing and avoiding the development of flow paths to fresh water.

Actions:

The government will work on expanding seismic baseline data and obtaining more knowledge on earthquakes in the territory through collaborations with universities and other governments.

Research on seismic risks is underway in other jurisdictions with extensive oil and gas activity. We will continue to monitor the research and include important learnings into our regulations, guidelines and practices.

SC Recommendation # 19: THAT the impacts of hydraulic fracturing on Yukon’s permafrost be thoroughly researched. This would include research on the interaction between groundwater and surface water, regional and local scale pathway assessments and evaluation of permafrost degradation at wellheads.

YG Response: Agree. YG shares the Select Committee’s interest in researching the impacts of hydraulic fracturing on Yukon’s permafrost.

Actions:

A number of research organizations, including Yukon government, currently monitor permafrost in Yukon. This data is accessible on-line via the Yukon Permafrost Network. Yukon government will identify opportunities to expand and enhance its monitoring network through collaborations with other researchers, particularly those working in the Liard basin area.

We will monitor the results of permafrost research underway in other jurisdictions such as Northwest Territories and Alaska and will endeavor to collaborate in relevant research whenever possible.

Human Health and Social Impacts

SC Recommendation # 20: THAT health-related baseline data be collected for an appropriate period of time, in order to ensure that data is available.

YG Response: Agree. The government shares the Select Committee’s interest in seeing appropriate baseline data collected, both for general monitoring purposes and for specific development projects.

Actions:

In light of the Select Committee's recommendations, the government will assess its baseline data inventory with a view to seeing where additional data collection may be needed and how it is verified.

We will review the results of a recently released three-year health impact study conducted in northeast British Columbia.

SC Recommendation # 21: THAT Yukon's Chief Medical Officer of Health be mandated to conduct a thorough human health risk assessment where hydraulic fracturing development is proposed in Yukon.

YG Response: Agree. YG can assure the public that we will proceed with caution and transparency to learn more about the risks and benefits of hydraulic fracturing in Yukon.

Actions: We will work with the Yukon's Chief Medical Officer of Health and expert advisors to determine an appropriate approach to assessing potential human health implications.

Conclusion

The Select Committee report has given us guide posts to proceed with caution and transparency to learn more about the risks and benefits of hydraulic fracturing and to ensure the safety of people and the environment in Yukon. We recognize that oil and gas development is a rapidly evolving field. As we learn more and technology advances, we are likely to adapt and enhance our actions. We will continue to communicate our projects and activities to the public.

The Yukon government supports the development of an oil and gas industry in Yukon. We recognize that oil and gas consumption will continue to be a significant component of Yukon's energy use for the foreseeable future. The responsible development of Yukon oil and gas resources is an opportunity to secure a local supply of energy, which is part of our vision under the Energy Strategy. We have confidence in the strength of the assessment and regulatory processes to ensure that oil and gas activities can be done in an environmentally responsible way.

We will continue to involve and seek the support of affected First Nations in oil and gas projects involving hydraulic fracturing and continue to meet our legal obligations to consult First Nations.

We are looking forward to continuing the engagement initiated by the Select Committee with First Nations, the public, and industry; conducting more research regarding the impacts of hydraulic fracturing; and working with experts to ensure our regulatory regime is appropriate and effective.

It is through this approach that we will achieve an understanding of the risks and benefits of hydraulic fracturing and develop a regulatory regime that will foster responsible resource development for the benefit of all Yukoners.