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## **MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES**

### **BRIEFING NOTE FOR INFORMATION**

**I PREPARED FOR:** Honourable John Horgan, Premier of British Columbia

**II ISSUE:** Status of the Scientific Hydraulic Fracturing Review Panel

### **III BACKGROUND:**

In March 2018 Minister Mungall appointed a scientific panel (Panel) to review hydraulic fracturing. Panel members are:

- Dr. Diana Allen from Simon Fraser University - a groundwater specialist,
- Dr. Amanda Bustin from the University of British Columbia (UBC) - an induced seismicity specialist, and
- Dr. Erik Eberhardt, also from UBC - a rock engineering specialist.

Nalaine Morin was also contracted to provide advice to the panel on traditional Indigenous knowledge. She has led the environmental reviews of several large resource development projects on behalf of First Nations and her background enables her to connect First Nation traditional knowledge and western science.

The mandate of the Panel is to review the practice of hydraulic fracturing in the context of ensuring that natural gas is produced safely and the environment is protected and to report back to government their findings and advice by end of year. Specifically they were asked to consider what role hydraulic fracturing has in induced seismicity in Northeast British Columbia and what impacts hydraulic fracturing has on water quantity and quality. Their terms of reference also asked them to look at fugitive emissions during the process of hydraulic fracturing and to include traditional indigenous knowledge.

### **IV DISCUSSION:**

The Panel has been gathering information through scientific literature review and has met with over 60 experts in Panel sessions. Between May and mid-July of this year 50 Panel sessions have been held. One of these sessions was a full day meeting with Treaty 8 First Nations. The other sessions have consisted of meetings with scientific experts from: industry and industry associations; academia; government; the Oil and Gas Commission; First Nations; environmental organizations; and, the municipalities of Dawson Creek and Fort St. John.

Experts were asked to give a presentation to the Panel and include: scientific review of current data/state of practice; key challenges and mitigations; effectiveness of existing regulations; and, what research is on the horizon and knowledge gaps.

## V CONCLUSION:

The Panel is focusing now on assessing the information gathered and drafting the report for the end of the year. The Panel may also choose to hear from additional experts in the fall to fill in any outstanding information gaps.

### *December Update:*

Panel members have been working throughout the fall drafting sections of its report. The Panel held a meeting on December 7, 2018 to discuss progress and consolidation of the report. Panel members indicated that:

- there was still several sections that required drafting;
- they would endeavor to complete drafting those sections prior to the next meeting planned for December 19th;
- a rough first draft would be reviewed December 19th by the Panel and this draft could potentially be given to an editor to format (Ministry to contract) in advance of the final drafting and reviewing by the Panel;
- Panel members will be taking a break for Christmas beginning December 20;
- the Panel anticipates final review and editing of the Report will need to continue into January but this will be confirmed at the December 19th meeting.

### APPENDIX: Table of Presenters

**DRAFTED BY:**

Michelle Schwabe  
Director

**APPROVED BY:**

Richard Grieve, ED ✓  
Garth Thoroughgood, A/ADM ✓  
Dave Nikolejsin, DM ✓

**APPENDIX: Scientific Hydraulic Fracturing Review Panel - PANEL SESSIONS**

<b>May 14 and 18, 2018</b>			
<b>Presenter(s)</b>	<b>Presentation Title</b>	<b>Association</b>	<b>Area of Expertise</b>
Richard Slocomb, Kevin Parsonage, Ron Stefik	BC Oil and Gas Commission Regulation of Hydraulic Fracturing	BC Oil and Gas Commission	Regulatory
Ken Paulson, Stuart Venables, Jeff Johnson, Michelle Gaucher	BC Oil and Gas Commission Regulation of Induced Seismicity	BC Oil and Gas Commission	Regulatory
Jeff O’Hanley, Laurie Welch, Sean Curry, Suzan Lapp	BC Oil and Gas Commission Regulation of Water Associated with Hydraulic Fracturing	BC Oil and Gas Commission	Regulatory
Devon Aaroe	Water Resource Manager	City of Dawson Creek	Water Management
James O’Hanley, Sarah Dickinson	Permitting and Consultation	BC Oil and Gas Commission	Regulatory

<b>May 28, 2018</b>			
<b>Presenter(s)</b>	<b>Presentation Title</b>	<b>Association</b>	<b>Area of Expertise</b>
Christine Rivard, PhD, Research Scientist	Investigation of potential upward fluid migration pathways in 2 study areas hosting unconventional hydrocarbon reservoirs in Eastern Canada	Natural Resources Canada/Geological Survey of Canada	Industry Challenges/Hydro- geology
Chelton van Geloven, R.P.F., Source Water Protection Hydrologist	Surface Water Quantity in NEBC	B.C. Ministry of Forests, Lands and Natural Resource Operations and Rural Development	Ground Water, water quantity
Suzan Lapp, PhD, PGeo, PAg Hydrologist	Surface Water Quantity	BC Oil and Gas Commission	Surface Water hydrology, NEWT
Laurie Welch, Ph.D., P.Geo. Hydrogeologist	Groundwater, Hydraulic Fracturing, Regulation, and Research	BC Oil and Gas Commission	Hydrogeology NEBC
Devin Scheck, P.Ag. Supervisor, Environmental Management	Wastewater Management	BC Oil and Gas Commission	water & waste water management
Alex Bevington, Research Earth Scientist	Detection of Constructed Water Bodies using Free Optical Satellite Imagery, Northeast BC	B.C. Ministry of Forests, Lands and Natural Resource Operations and Rural Development	Dugouts
Jun Yin, Ph.D., P.Geo, Regional	Aquifer Characterization Projects in Northeast BC	B.C. Ministry of Forests, Lands and	Hydrogeology NEBC

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Hydrogeologist		Natural Resource Operations and Rural Development	
<b>May 29, 2018</b>			
<b>Attendees</b>	<b>Presentation Title</b>	<b>Association</b>	<b>Area of Expertise</b>
Deanna Cottrell Water & Groundwater Risk Subject Matter Expert	Subsurface Water Quality Research	Shell Canada Ltd.	Hydrogeology, water initiatives
James Armstrong, PhD, Water Stewardship Advisor	Encana Water Management	Encana Corp	Ground water contaminates
Donald B. Davies, Ph.D., DABT Toxicology Consultant	Hydraulic Fracturing ... a Toxicologist's perspective	Intrinsic	Toxicology
Dr. Jon Fennell, M.Sc., Ph.D., P.Geo., Consultant	Hydraulic fracturing review: Water Quality	Integrated Sustainability	Ground Water contaminates
Stephanie Strachan, Environmental Studies Scientist and Ayisha Yeow, Senior Environmental Monitoring Scientist	Water quality and ecosystem health Monitoring in Petitot River and Surrounding watersheds: A review of the baseline study conducted from 2012 to 2014 and current activities to 2018	Environment and Climate Change Canada	Surface Water quality, CABIN model

<b>May 30, 2018</b>			
<b>Attendees</b>	<b>Presentation Title</b>	<b>Association</b>	<b>Area of Expertise</b>
Shawn Maxwell, PhD, Microseismicity	Hydraulic Fracture Induced Seismicity	Itasca Microseismic	Consultant/industry expert - Seismicity
John Nieto, Chief Technology Officer	Managing Induced seismicity in Canbriam's Altares Field	Canbriam Energy	Operator – Induced Seismicity
David Miller, P.Geoph. Team Lead, Geophysics	Induced Seismicity	Progress Energy	Operator – Induced Seismicity
Neil Orr, Chief Geophysicist and Andy Gamp, P.Geoph., District Geophysicist.	Presentation to Scientific Hydraulic Fracturing Review Panel	CNRL	Operator – Induced Seismicity

**APPENDIX: Scientific Hydraulic Fracturing Review Panel - PANEL SESSIONS**

Honn Kao, PhD., Research Scientist Geological Survey of Canada	Injection-Induced Seismicity in NE BC	Natural Resources Canada	Federal Government researcher-seismicity
David W. Eaton, PhD Professor, Department of Geoscience <i>NSERC/Chevron Industrial Research Chair in Microseismic System Dynamics</i>	Hydraulic Fracturing and Induced Seismicity	University of Calgary	Induced Seismicity
Stu Venables, P.Geol ; Dr. Alireza Mahani, P.Geol ; Jeff Johnson, P.Geol	Scientific Hydraulic Fracturing Review Panel: Induced Seismicity Technical Review	Geoscience BC, BC Oil and Gas Commission	Induced Seismicity

<b>May 31, 2018</b>			
<b>Attendees</b>	<b>Presentation Title</b>	<b>Association</b>	<b>Area of Expertise</b>
Maurice B Dusseault University of Waterloo	What are the Real Risks in Shale Gas Development in BC?	University of Waterloo	Industry Challenges
Jeff Willick	Scientific Hydraulic Fracturing Review Panel Wellbore Integrity	CNRL	Gas migration
Peter Pokorny VP, Operational Policy & Environment	Liability Management Presentation to the Scientific Hydraulic Fracturing Review Panel	BC Oil and Gas Commission	Well Remediation/Liability
David J Browne	Fugitive gas emissions from well drilling and completions (well construction and cement integrity)	Trican	Well construction and Cement
Ian Frigaard	Hydraulic Fracturing and Primary Cementing	University of British Columbia	Cement
Professor Roger Beckie and Dr. Aaron Cahill	BC Scientific Hydraulic Fracturing Review Panel Expert Statement on Fugitive Gas	University of British Columbia	Researchers Gas Migration
Kevin Parsonage, M.A.Sc., P.Eng.	Methane Emissions Presentation to the Hydraulic Fracturing Scientific Review Panel	BC Oil and Gas Commission	Gas Migration and fugitives

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<b>June 25, 2018</b>			
<b>Attendees</b>	<b>Presentation Title</b>	<b>Association</b>	<b>Area of Expertise</b>
Victor Shopland		City of Fort St John	City Water Manager, Regional Watersheds
Michael Freer, Treaty 8 Tribal Association and Dr. Gilles Wendling, GW Solutions	Scientific Hydraulic Fracturing Review Panel T8TA- Concerns	Treaty 8 Tribal Association/ GW Solutions	Lands and Resource Manager
Kara Green	Hydraulic Fracturing Review Panel	Halfway River First Nations	Senior Environmental Scientist / Project Manager Ecora Engineering & Resource Group
Ben Parfitt	Presentation to the Scientific Hydraulic Fracturing Review Panel	Canadian Centre for Policy Alternatives	Natural Resource Policy Analyst/ water dugouts

<b>June 26, 2018</b>			
<b>Attendees</b>	<b>Presentation Title</b>	<b>Association</b>	<b>Area of Expertise</b>
Julian Munoz C.E.T., Team Lead, Production Engineering	Water Management	Progress Energy	Water Management
Stuart Valentini, P.Eng., Manager, Drilling & Completions Engineering	Wellbore Integrity	Progress Energy	Drilling Engineer, Cementing

<b>July 10, 2018</b>			
<b>Attendees</b>	<b>Presentation Title</b>	<b>Association</b>	<b>Area of Expertise</b>
Ed Hoffman, Regional Director, Environmental Protection Division	Produced Water Management	Ministry of Environment	Water- waste permitting
Carlos J. Salas, MSc. P. Geo.	Enabling responsible Oil & Gas management through credible, unbiased earth science	Geoscience BC	BC Research updates and needs
Tim Lambert, PhD. Executive Director, Health Protection	Scientific Hydraulic Fracturing Review Panel Session NE Oil and Gas Human Health Risk Assessment	Ministry of Health	Human Health Risk Assessment
Ali Azizishairazi, Senior Water	Water quality management tools: potential application in managing	Ministry of Environment	Water Quality BC

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Quality Guidelines Specialist	Hydraulic Fracturing Fluids?	Watershed Science Branch	
Chris Pasztor, Director Resource Development	A Regional Strategic Environmental Assessment Update	Ministry of Energy, Mines and Petroleum Resources	Regional Strategic Environmental Assessment (RSEA)
Ian Bruce, Director of science & policy /John Werring,	Presentation to B.C.'s Hydraulic Fracturing Review Panel/ DSF Research into Hydraulic Fracturing in B.C.	David Suzuki Foundation	NE BC –SCVF/ gas emissions research

<b>July 11, 2018</b>			
<b>Attendees</b>	<b>Presentation Title</b>	<b>Association</b>	<b>Area of Expertise</b>
Deanna Cottrell	Water Management Overview Shell in NEBC	Shell Canada	Shell Water Projects
Max Kniewasser Brienne Riehl	Potential Risks of Hydraulic Fracturing in B.C. Presentation to the Scientific Review Panel	Pembina Institute	Water and Health Research
Rick Kessy, Chief Operating Officer Matthew Ng, Senior Geophysicist Jim Reimer, VP Geoscience & Technology (retired)	Presentation to the British Columbia Scientific Hydraulic Fracturing Review Panel	Painted Pony	Unconventional resource development – mid-size company
Dr. Mark D. Zoback Benjamin M. Page Professor of Geophysics Director, Stanford Natural Gas Initiative Co-Director, Stanford Center for Induced and Triggered Seismicity	Induced Seismicity Associated with Unconventional Oil and Gas Development	Stanford University	Induced Seismicity from injection
Dan Allan and Brad Hayes	State of hydraulic fracturing science BC Scientific Hydraulic Fracturing Review Panel	Canadian Society for Unconventional Resources	Research focus
Tara Payment, M.Sc Bill Westwood, P. Geoph.	1. Presentation to B.C. Hydraulic Fracturing Review Panel- Water 2. Presentation to B.C. Hydraulic Fracturing Review Panel- Induced Seismicity	Canadian Association of Petroleum Producers	Water Management Induced Seismicity