



17th Legislative Assembly of the Northwest Territories

Standing Committee on Economic Development and Infrastructure

Report on Horizontal Hydraulic Fracturing

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**STANDING COMMITTEE ON
ECONOMIC DEVELOPMENT
AND INFRASTRUCTURE**

REPORT ON HORIZONTAL HYDRAULIC FRACTURING

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**STANDING COMMITTEE ON
ECONOMIC DEVELOPMENT
AND INFRASTRUCTURE**

REPORT ON HORIZONTAL HYDRAULIC FRACTURING

EXECUTIVE SUMMARY

Since the beginning of the 17th Assembly, the Standing Committee on Economic Development and Infrastructure has worked steadily on the complex matter of hydraulic fracturing in the Northwest Territories, looking at horizontal hydraulic fracturing in particular. We have gathered information, undertaken study tours, monitored government strategic planning, and kept abreast of developments in scientific knowledge and public policy. Most recently, we reviewed the proposed *Hydraulic Fracturing Filing Regulations*. Throughout, it has been clear that hydraulic fracturing is a matter of great significance to residents and to the future of the NWT.

As knowledge and best practices respecting hydraulic fracturing's operations, regulation, and impacts continue to evolve, so does the Committee's understanding. As such, we agree that work must continue into the 18th Assembly and we contribute to this process with this report.

This report identifies six themes that have recurred throughout our work:

1. Complex or "wicked" problems;
2. A precautionary approach;
3. Economic potential;
4. Water;
5. The pursuit of global, local, and regional knowledge; and
6. Roles for residents.

It also makes eight recommendations in the following priority areas:

1. The proposed regulations themselves; as well as
2. Human factors;
3. Monitoring;
4. Natural environment;
5. Reporting and disclosure;
6. Waste management;
7. Well construction; and
8. Well suspension and abandonment.

Notably, many filing—or application—requirements in place under the National Energy Board were eliminated in the proposed regulations, including requirements about water, environmental assessment, and northern operating conditions.

We do not expect the GNWT to manage its new responsibilities exactly as federal departments and agencies have done, but rather that it would strive for a truly northern approach, one that included fair and effective benefits for all residents, honoured enshrined Aboriginal rights, and assured protection of air, human health, land, water, and wildlife.

However, we would equally expect any territorial statutes and regulations—at minimum—to match, if not better, their federal predecessors.

As this work proceeds, decision-makers must be in continual pursuit of the best possible knowledge, recognizing that regional and local knowledge are in particular demand. We recognize, too, that members of the public are typically well-informed and provide the GNWT with insightful views on a range of matters of public concern. Across all regions, while some residents speak in favour of development and the jobs it can bring, others also raise concerns regarding hydraulic fracturing, including the accessibility of benefits and the exposure to risk, as well as the engagement process itself.

The GNWT has highlighted “four areas of interest to Northerners” within the proposed regulations. Yet Northerners have called on the GNWT for much more than these. We continue to insist upon meaningful public consultation and we recognize that to provide all communities in all regions with opportunities into the future, the NWT needs both a diversified economy and an environment that will sustain present and future generations. This will be challenging work, certainly, but with great rewards.

We look forward to the work of the next Assembly and our successor Committee, and we encourage all residents to review the Committee’s reports and recommendations, including the *Research Summary: Hydraulic Fracturing Filing Regulations*, tabled on June 4, 2015. All of these are available online at the website of the Legislative Assembly.

INTRODUCTION

Since the start of the 17th Assembly, the Standing Committee on Economic Development and Infrastructure (“the Committee”) has worked steadily on the complex matter of hydraulic fracturing in the Northwest Territories (NWT), looking at horizontal hydraulic fracturing in particular.¹ We have gathered information, undertaken study

¹ For an overview of different types of fracturing, see pp.6-8 of Tabled Document 277-17(5), *Research Summary: Hydraulic Fracturing Filing Regulations* (“the research summary”).

tours, monitored government strategic planning,² and stayed abreast of developments in scientific knowledge and public policy.³

Most recently, this work led the Committee to review the proposed *Hydraulic Fracturing Filing Regulations*, including observation of public engagement across the NWT in which hundreds of residents have shared passionate and insightful views.

Hydraulic fracturing is clearly a matter of great significance to residents and to the future of the NWT. The Committee continues to insist on meaningful public consultation and to recognize the vital need for a diversified economy—one that provides all communities in all regions with opportunities—and an environment that will sustain present and future generations.

As knowledge and best practices respecting hydraulic fracturing's operations, regulation, and impacts continue to evolve, so does the Committee's understanding. As such, the Committee agrees that engagement, consultation, and investigation must continue into the 18th Assembly. Here, we contribute to this process with a report on our work during this Assembly, highlighting areas that have not been adequately addressed and providing comments on the proposed regulations. We identify six themes emerging from our work and make eight recommendations.

As we have previously reported, it is beyond the Committee's mandate and capacity to comprehensively address all regulatory and policy issues associated with hydraulic fracturing.⁴ We look forward to the work of the next Assembly and our successor Committee, and we encourage all residents to review the Committee's reports and recommendations, including the *Research Summary: Hydraulic Fracturing Filing Regulations*, tabled on June 4, 2015.

GENERAL THEMES

The following themes emerge from the Committee's work on hydraulic fracturing.

² Tabled Document 147-17(4), *Economic Opportunities Strategy*; Tabled Document 65-16(6), *A Greenhouse Gas Strategy for the Northwest Territories 2011-2015*; Tabled Document 49-17(5), *Northern Lands, Northern Leadership: the GNWT Land Use Sustainability Framework*; and Tabled Document 62-16(5), *Northern Voices, Northern Waters: NWT Water Stewardship Strategy* ("the Water Stewardship Strategy"). See also the *Northwest Territories Energy Action Plan*, the *Northwest Territories Mineral Development Strategy*, and Tabled Document 154-17(4), *Responsible Extraction: An analysis of the Northwest Territories Mineral Development Strategy Panel Report*.

³ Committee Report 6-17(3), *Report on August 2012 Hydraulic Fracturing Study Tour* ("the study tour report"); Committee Report 1-17(5), *Report on Bakken Shale Formation Tour 2013* ("the Bakken report"); Committee Report 20-17(5), *Report on the Review of Hydraulic Fracturing Filing Regulations* ("the report on review"); and the research summary.

⁴ See p.3 of the study tour report.

THEME 1: “WICKED” PROBLEMS:

The matter of hydraulic fracturing in the Northwest Territories cannot be separated into independent discussions of economic, environmental, or human concerns. Regulation of this industry in our unique northern environment poses a “wicked” problem—a high-stakes issue impacted by complex and sometimes competing factors, including insufficient knowledge, infrastructural capacity, wide-ranging perspectives, and significant economic, environmental, and social considerations.⁵

THEME 2 – A PRECAUTIONARY APPROACH

Though associated activities continue, no hydraulic fracturing activity is taking place in the NWT, largely due to remoteness and a world-wide industry downturn. While resource extraction holds profitable potential, the NWT is not currently positioned to take advantage, while scientific knowledge and understanding of the cumulative and long-term impacts of hydraulic fracturing and its processes on human health, landscapes, water, and wildlife are poorly understood, particularly at local and regional levels, as is the capacity of hydraulic fracturing infrastructure—even the best available today—to maintain its integrity over time. Further knowledge is needed and the absence of evidence of harm today does not mean that protective measures should not be taken by government and by proponents.⁶

THEME 3: ECONOMIC POTENTIAL

Shale oil and gas development has significant socio-economic impacts associated with the creation of many permanent and temporary high-paying jobs,⁷ and offers

⁵ See p.250 of the *Report of the Nova Scotia Independent Review Panel on Hydraulic Fracturing* (“the Wheeler Report”): “Energy is seen as a wicked problem with complex interrelationships with social, economic, and environmental factors and ‘no easy answers’ for its intersection with sustainability (Coye and Simmons, 2014). Indeed, ‘super wicked problems’ have been used to characterize climate change because of the urgency of the issue, existence of irrational policies that discount the future, lack of effective and adequate decision-making, and irony that people causing the problem must also find the solution (Levin et al., 2012). Scientists and decision-makers are increasingly using the wicked problems framework to better assess the integrated and multi-dimensional nature of environmental risks, including the US Environmental Protection Agency regarding the challenges associated with air quality management (Stahl and Cimorelli, 2012).”

⁶ See p.11 of the Wheeler Report: “In the case of hydraulic fracturing and its associated activities and technologies, we can safely say that the proper application of a precautionary approach means that the burden of proof on avoiding public harm rests with developers and with those governments (i.e., federal, provincial, municipal, and Aboriginal governments) that may wish to pursue the possible applications of the technology in the future. Proportionality means that questions of risk, cost, and feasibility need to be weighed when considering a course of action or inaction.” See also pp.7 and 93 of *Environmental Impacts of Shale Gas Extraction in Canada*, prepared by the Council of Canadian Academies (“the COCA report”).

⁷ See p.5 of the Bakken report: “The Three Affiliated Tribes offered a lot of comment on the impact of development on their people. Benefits include 99% employment, unparalleled opportunities for Aboriginal entrepreneurs and businesses, improved community programming, and profits from royalties that, with proper planning, will secure the financial future of tribal beneficiaries for generations. Drawbacks include increased crime and substance abuse, disorganized road construction and heavy truck traffic throughout traditional territory, flaring, spills, impacts on wildlife and housing shortages. People who lack financial responsibility and life skills have suffered rather than benefited from increased activity and resource royalty collection.”

possibilities for economic growth to NWT communities and regions, including those where such needs are keenly felt.⁸ Young people and those seeking to enter or re-enter the workforce need training and employment opportunities that will enable them to continue to work in and contribute to their home communities.

The Committee's work and the work of our colleagues in the Legislative Assembly has highlighted training, employment, and revenue needs across the NWT, particularly in light of the current downturn in oil prices and exploration. The GNWT's approach to economic development, which includes hydraulic fracturing, will be of significant concern during the next Assembly.

THEME 4: WATER IS FUNDAMENTAL TO LIFE

Territorial and trans-boundary waters are essential to northern life and to Aboriginal traditions in the NWT.⁹ Waters ensures healthy, productive ecosystems, but they are currently subject to increasing pressures, including continuing low-water conditions and extra-jurisdictional impacts. Water remains a priority issue for the GNWT and for residents.

THEME 5: PURSUIT OF GLOBAL, REGIONAL, AND LOCAL KNOWLEDGE:

To keep abreast of a rapidly-developing field in which much remains unknown, all decision-makers must be in continual pursuit of the best available knowledge. Discussing the state of scientific knowledge about the impacts of hydraulic fracturing, the Council of Canadian Academies reported,

[T]here has been no comprehensive investment in research and monitoring of environmental and health impacts for either the implementation of best current practices or in the case of accidental releases that cannot be reduced to zero. Many of the pertinent questions are hard to answer objectively and scientifically, either for lack of data, for lack of publicly available data, or due to divergent interpretations of existing data.¹⁰

⁸ The Sahtu Dene and Métis have called for a joint review of the environmental and economic impacts of hydraulic fracturing, while the Fort Norman Métis Land Corporation previously supported exploratory work (two wells) in their region, noting the pressing need for economic stimulus. For further detail and the positions of other NWT First Nations, see pp.40-42 of the research summary, "Official First Nations Positions on Hydraulic Fracturing." See also **Tabled Document 71-17(5)**, *Petition for Vote on Fracking from Sahtu Residents*, **Tabled Document 140-17(5)**, *Gwich'in Tribal Council 31st Annual General Assembly August 19-21, 2014, Resolution #006:2014 AGA – Anti-Fracking*, **Tabled Document 257-17(5)**, *Dehcho First Nations Resolution on Total Ban on Hydraulic Fracturing*, **Tabled Document 256-17(5)**, *Li'idli Kúé First Nation Band Council Resolution on Hydraulic Fracturing*, and **Tabled Document 279-17(5)**, *Annual General Sahtu Secretariat Resolution No. 4 regarding Fracking*.

⁹ See p.3 of the *Water Stewardship Strategy*.

¹⁰ See p.216 of the COCA report.

All monitoring must include local and regional conditions, and the further pursuit of (and response to) knowledge of unique northern operating conditions—including permafrost, remote communities with limited municipal infrastructure, and winter roads—is essential.¹¹

THEME 6: ROLES FOR RESIDENTS

Social licence—public support of government legislation, regulations, policies, and programs—is an integral component of GNWT practice,¹² as is meaningful and timely public communication, consultation, disclosure, and engagement. Truly enhanced reporting and disclosure will include information disclosed to the Regulator and to the public.

Members of the public are typically well-educated in the matters in which they address the GNWT and the assumption of an “uneducated” public has been recognized “as a form of stakeholder silencing.”¹³ The pursuit of partnerships “with those willing to share the risks” demonstrates the GNWT’s willingness to engage with variant stakeholders and perspectives, and the GNWT has a responsibility to form and foster partnerships between industry, communities, and Aboriginal governments.¹⁴

THE DRAFT HYDRAULIC FRACTURING FILING REGULATIONS

As discussed in the Committee’s *Research Summary*, the *draft Hydraulic Fracturing Filing Regulations* (HFFR) put forward by the Department of Industry, Tourism, and Investment (ITI) draw extensively on the National Energy Board’s *Filing Requirements for Onshore Drilling Operations Involving Hydraulic Fracturing* (NEBFR).

It is both expected and desirable that the GNWT will not manage its new duties exactly as federal departments and agencies have done, but rather that the GNWT will strive for a truly northern approach, one that includes fair and effective benefits for all residents, honours enshrined Aboriginal rights, and assures protection of air, human health, land,

¹¹ Little scientific knowledge is available respecting the impacts of hydraulic fracturing on permafrost, nor the challenges that permafrost could pose to the undertaking of hydraulic fracturing. Further, the proposed regulations eliminate requirements addressing permafrost and response to northern operating conditions that had been in place under the NEB. For more detail, see p.38 of the research summary and pp.4, 16, and 20-21 of the Yukon’s *Final Report of the Select Committee Regarding the Risks and Benefits of Hydraulic Fracturing* (“the Select Committee report”).

¹² Addressing the Energy and Mines Ministers Conference in 2013, the Premier stated, “[We] are fortunate to have industry partners who recognize that to do business in the Northwest Territories requires a social licence which includes the blessing of whole communities and governments.” See “[Bob McLeod - Welcoming Remarks Energy Mines Ministers Conference August 26, 2013.](#)”

¹³ See p.224 of the Wheeler Report.

¹⁴ See p.6 of the Bakken report.

water, and wildlife. It is equally expected and desirable that territorial statutes and regulations will at minimum match, if not better, their predecessors.

Despite this, the proposed regulations eliminate many requirements in place under the NEB, including requirements respecting environmental assessment, proof of financial responsibility, management systems, safety culture and planning, human factors, lessons learned, northern working environments, environmental protection plans, well descriptions, groundwater protections, wellbore integrity, well control systems, well completion and hydraulic fracturing operations, hydraulic fracturing design, well suspension and abandonment, and waste management. Notably, the requirement that a proponent must demonstrate “how hydraulic fracturing will be conducted safely while protecting the environment” is among those eliminated.¹⁵ These are further detailed in the Committee’s *Research Summary: Hydraulic Fracturing Filing Regulations*, which also assesses how the proposed regulations address the GNWT’s identified “four areas of interest to northerners” (baseline surface and groundwater information, public disclosure of chemical additives, air quality, and enhanced reporting).¹⁶

Recommendation 1

Any regulatory framework must encompass clear minimum standards for evaluation of all applications; demonstrate full capacity and firm parameters for enforcement with meaningful consequences to non-compliance; and review and account for areas not carried over from federal requirements to ensure that all issues have been addressed.¹⁷

APPROACHING HYDRAULIC FRACTURING IN THE NORTHWEST TERRITORIES

Human Resource Elements

Human Error

The Committee previously highlighted the risks of human error and its potential for serious impacts. When Members toured the Bakken in 2013, they were not informed of a significant oil spill: Inadequate monitoring was a factor and the spill itself was not reported in the media until two weeks later.¹⁸

¹⁵ See Appendix 5 of the research summary.

¹⁶ See pp.22-27 of the research summary.

¹⁷ See Appendix 5 of the research summary.

¹⁸ See p.7 of the Bakken report.

In its *Research Summary*, the Committee noted that human error is a repeated cause of hydraulic fracturing incidents. These include the mistaken injection of fracturing fluids into a shallow aquifer in Alberta¹⁹ and the “Innisfail blowout,” when an Alberta operator drilled too near a producing well,²⁰ and these and a lack of long-term knowledge complicate the claim that hundreds of thousands of wells in Canada have been hydraulically fractured “without incident.”²¹ Researchers at Pennsylvania State University advocate increased incident analysis and public disclosure of results to encourage better management practices and to avoid similar incidents.²²

Partnerships

Effective regulation of hydraulic fracturing requires “planning, people, partnerships” and the Committee has recommended that the GNWT develop strong partnerships between industry, communities, and Aboriginal governments.²³

The Committee also continues to recognize the role of industry partners in setting best practices. For example, when reviewing Saskatchewan’s self-disclosure-based regulatory system, the Committee noted its requirements for comprehensive baseline water and geological data²⁴ and flowback monitoring, explicit guidelines for contaminated water management and disposal, and provisions for environmental protection, remediation, and enforcement.²⁵ However, the proposed regulations refer to “industry best practices” as a standard nine times, while the role of the Regulator in approving “best practices” remains unclear.

¹⁹ See p.82 of the COCA report.

²⁰ Ibid.

²¹ See pp.6320 and 6351 the Hansard of the Legislative Assembly (May 27, 2015 and June 2, 2015)

²² See p.11 of the research summary.

²³ See p.8 of the Bakken report.

²⁴ In many ways, the NWT remains a “frontier,” being remote with little infrastructure to support development and because geological properties and specific drilling and production conditions remain largely unknown. The National Energy Board’s estimates of oil-in-place in the Canol and Bluefish shale formation are contingent on confirmation of the region’s geological properties. See p.4 of the study tour report and the NEB’s *An Assessment of the Unconventional Petroleum Resources of the Bluefish Shale and the Canol Shale in the Northwest Territories*.

²⁵ See p.3 of the Bakken report.

Communities, Infrastructure, and Workforce Readiness

The Committee has “highlighted the need to enhance and establish training facilities and opportunities for workers both in the oil industry and related service fields” and identified workforce readiness “as a key piece of Sahtu exploration readiness.”²⁶

If residents are to benefit from any development associated with hydraulic fracturing, they must be prepared to do so. Skills- and trades-based training is vital, but it does not stand alone. Financial management training could support residents in managing new and/or increased wages, while business training and mentorship could support local and Aboriginal businesses. Many of these are not currently available or specific to oil and gas development, and despite the current lull in activity, any training would need to begin promptly.²⁷

Communities would also need to be prepared for increased demands on already-strained local infrastructure,²⁸ including recreational facilities, roads, and water supplies, as well as potentially increased substance abuse and crime, including sexual crimes. The Committee has also heard of many negative social impacts associated with industry work camps,²⁹ while increased sex trafficking and abuses of prostituted women often accompany increased resource extraction activities.³⁰

The benefits of development, including increased employment and business opportunities, higher wages, and royalties—are best enjoyed in communities that are healthy, stable, and well-prepared for rapid and significant change.³¹ Such principles apply in all regions that could be impacted by hydraulic fracturing, including the Sahtu, Deh Cho, and Beaufort-Delta.

²⁶ See p.5-6 of the Bakken report.

²⁷ Ibid.

²⁸ See p.2 of the Bakken report.

²⁹ See p.5 of the Bakken report.

³⁰ See p. 152 of the Wheeler Report. See also Christopher Sun, reporting on the keynote address of State of Extraction Conference at Simon Fraser University for the *Vancouver Observer* on March 28, 2015.

³¹ See p. 5 of the Bakken report.

Recommendation 2

Any hydraulic fracturing regulatory framework must account for human factors, including error. Government oversight must ensure that reliance on self-monitoring in such a competitive industry does not hamper compliance. Budgeting for the Office of the Regulation of Oil and Gas Operations (OROGO) must not restrict access to expert advice from partners at the Alberta Energy Regulator or the NEB.

Any preparations must also include community support, including capital planning, work training, and strengthened social supports, as well as plans to integrate newcomers into NWT communities, accounting for varied needs in all affected regions. The Committee recommends a critical assessment of the economic costs and benefits associated with hydraulic fracturing in the NWT, including anticipated pre- and post-development impacts.

MonitoringBaseline Monitoring

The Committee previously recommended that any territorial hydraulic fracturing framework include "a strategy to gather environmental and geological baseline data, with federal support."³² The GNWT's response noted collaborative efforts through the Environmental Studies Research Fund (ESRF) and a Regional Study, proposed in 2013.³³ The Committee recognizes these and projects currently underway³⁴ as well as a provision in the proposed regulations requiring proponents to submit baseline surface and groundwater data.

Continued local and regional monitoring, including effective measurement of air and water quality and effective mitigation strategies to address all results, can better scientific understanding of hydraulic fracturing's immediate, long-term, and cumulative impacts. Without this, any initial framework is of little practical use. Notably, regulatory and scientific inattention and unpreparedness elsewhere have prevented regulators and

³² See p.4 of the study tour report.

³³ See **Tabled Document 40-17(4)**, *Government of the Northwest Territories Response to Committee Report 6-17(3): Report on Hydraulic Fracturing Study Tour: Toward a Policy Framework for Hydraulic Fracturing in the Northwest Territories* ("the GNWT response").

³⁴ See the Department of Industry, Tourism, and Investment's document, "Monitoring and Research Related to Hydraulic Fracturing in the NWT Fact Sheet."

researchers from establishing useful baselines, leaving it “too late in many oil and gas areas to collect true baseline data.”³⁵

Enforcement

The Committee has repeatedly highlighted the need for a quality management program for all stages of any drilling process, yet the proposed regulations eliminated related provisions in place under the NEB.³⁶ Enforcement capacity—with meaningful consequences to non-compliance—is required to confirm operators’ statements and to perform checks to ensure that operators maintain their conditions of approval.³⁷ During a tour of Saskatchewan, the Committee heard that despite increasing permit applications and revenues, enforcement was hampered by program funding that did not grow accordingly.³⁸

Regulatory Authority

Under the proposed regulations, the Regulator may waive any requirements, a sweeping power the Committee has highlighted for further review.³⁹

The Committee also understands that Alberta is currently contemplating a formal review of the mandate of the AER, which—like OROGO—combines a mandate of industry growth with that of industry regulation. The next Assembly may wish to monitor any such review.

Recommendation 3

Any regulatory framework must include a strategy for establishing and maintaining such a framework, including regional and local monitoring, as well as baselines for all impacted regions. Further, baseline data is needed not only for surface and groundwater, but also air quality and greenhouse gas emissions, forest health, land, permafrost, and wildlife, as well as geology and seismicity, all areas highlighted by the Committee in the past. Data collected under disparate umbrellas must be marshalled to create an effective and accessible baseline framework.

³⁵ See p.207 of the Wheeler Report.

³⁶ See Committee correspondence of December 20, 2013 and Appendix 5 of the research summary.

³⁷ See Committee correspondence of December 20, 2013.

³⁸ See p.4 of the Bakken report.

³⁹ See p.28 of the research summary.

Effective enforcement demands clear parameters for proponents' submissions,⁴⁰ stringent requirements, careful and regular monitoring, and meaningful penalties for non-compliance. OROGO's inspection and enforcement capacity must reflect a commitment to regular inspections and to proportional growth as needed, and to ensure transparency and the fair application of any regulatory exceptions, strict parameters must apply to any exercise of the Regulator's authority to exempt operators from any requirements.

Natural Environment

As discussed, the cumulative and long-term impacts of hydraulic fracturing remain largely unknown, while local and regional impacts are unique to local and regional conditions.⁴¹ In its first report on hydraulic fracturing, the Committee wrote,

The Central Mackenzie Valley is home to many species of wildlife. Land consumption and disturbance, habitat fragmentation, and noise pollution are areas of serious concern for Members as well as for the people of the Northwest Territories. Strategies to monitor the impacts of industry on wildlife and habitat should include the development of independent and project-specific environmental monitoring.⁴²

The Committee also points to the Environmental Studies Research Fund (ESRF), funded by industry and previously managed by the NEB. Though the Fund existed before devolution, it has since become a GNWT responsibility. It is unclear whether funding was carried over, or if the NWT Fund has begun from scratch.

Air Quality and Emissions

Flaring, Incineration, and Green Completion Techniques (GCT):

Members have repeatedly highlighted GCT as an alternative to venting, flaring, and incineration. GCT reduce wastage of natural gas, offering economic benefits and reducing impacts on air quality and climate by reducing methane and other greenhouse gas emissions, volatile organic compounds (VOCs), and particulate emissions (e.g., soot and ash). As previously noted by the Committee, both

⁴⁰ An ongoing multi-year study of the Sahtu watershed, in which the GNWT is a partner, states that "[d]ata collected by proponents is not always on spatially or temporally relevant scales." See the annual project status report of the NWT Cumulative Impact Monitoring Program, *Establishing a watershed framework for assessing cumulative impacts of development*.

⁴¹ See the COCA report, particularly pp. 146 and 191.

⁴² See p.6 of the study tour report.

Alberta and British Columbia have set clear targets for flaring reduction,⁴³ while as of 1 January 2015 all newly fractured or re-fractured wells in the United States are required to use GCT. Additionally, there are no territorial regulations respecting incinerator stack testing, and industrial flaring at other sites within the NWT has resulted in significant emissions exceedances in the past, due in part to incinerators operating at inappropriately low temperatures (low efficiency).⁴⁴

Despite this, the NWT does not have flaring reduction targets in place, and while the regulations address GCT, operators may forego them where “impracticable” or “based on an economic evaluation.” The Committee is concerned this may result in the effective absence of GCT in any development and that enforcement would prove prohibitively difficult.

Measuring, Monitoring, and Reporting:

The proposed regulations require flaring reporting only where flaring takes place for more than 72 hours, within 500 metres of a residential area, or involves sour or acid gas, or if air quality exceedances are identified in a proponent’s initial emissions assessment. Since such assessment would take place before any approval, drilling, or on-site work, it appears unlikely that any such exceedances would be identified.

Similarly, while the proposed regulations permit incineration at 99-per-cent efficiency as an alternative to both flaring and GCT, neither industry nor regulators typically differentiate between flaring and incinerating, complicating monitoring and reporting. Efficiency also ranges between 66 and 99 per cent, dependent on a wide range of factors, including weather.⁴⁵

The Committee further notes that while in Alberta and British Columbia, the minimum public notification radius for flaring is 1.5 kilometers, while it here appears to be unspecified, and that proponents’ submissions regarding air quality do not appear to be included in the (voluntarily) publicly-disclosed pre-fracture report, despite being part of any proponent’s required Environmental Protection Plan.

⁴³ See p.7 of the study tour report. Alberta’s flaring rules are more clearly set out in its *Directive 060: Upstream Petroleum Industry Flaring, Incinerating, and Venting*.

⁴⁴ While the GNWT previously deferred to federal regulations, this approach pre-dated devolution. See p.4 of the GNWT response.

⁴⁵ See the Canadian Centre for Energy Information’s *Flaring: Questions and Answers*.

Greenhouse Gas Emissions:

The Committee has previously recommended that any hydraulic fracturing policy include requirements to quantify, report, and manage greenhouse gas emissions,⁴⁶ a requirement reflected in the proposed regulations, though evaluation parameters and/or enforcement mechanisms remain unclear. The Committee also seeks to determine how the proposed regulations engage the *Greenhouse Gas Strategy: 2011-2015*.

Additionally, the GNWT recently committed to taking action to support international efforts to limit the increase in global temperature to below two degrees Celsius, while it is estimated that up to 80 per cent of fossil fuels resource world-wide must remain in the ground to prevent catastrophic climate change.⁴⁷ The Committee asks how these factors may impact the GNWT's approach to flaring regulation, greenhouse gas emissions management and mitigation, and/or growth of the NWT's oil and gas industry.

Environmental Assessment

As detailed in the *Research Summary*, the proposed regulations' eliminate environmental assessment requirements, including consultation and socio-economic assessment in place under the NEB.⁴⁸ The post-devolution landscape provides an ideal framework for environmental assessment, as overseen by territorial regulators, specific to the potential impacts of hydraulic fracturing on unique territorial environments

Human Health

The Committee understands that human health concerns are among those raised by participants in public engagement on the proposed regulations.

The Yukon Select Committee completed its final report in January 2015, and included two recommendations related to human health, one respecting the collection of health-related baseline data and the other, a human health risk assessment to be undertaken by the territory's Chief Medical Officer.⁴⁹ In Alberta, where substantial hydraulic fracturing activity takes place, the AER is currently developing "a new process for

⁴⁶ See p.7 of the study tour report, p.2 of the Bakken report, and Committee correspondence of December 20, 2013.

⁴⁷ See the GNWT news release of July 8, 2015, "[GNWT to sign climate change statement at Climate Summit of the Americas](#)" and [Tabled Document 193-17\(5\)](#), *Publication (Nature, Vol. 517) regarding Distribution of Unused Fossil Fuels*.

⁴⁸ See p.31 of the research summary.

⁴⁹ See p.21 of the Select Committee report.

handling recurring multi-year and multi-stakeholder complaints involving human health concerns.”⁵⁰

Seismicity

Scientific knowledge has advanced since the Committee began its work on hydraulic fracturing at the start of the 17th Assembly. The disposal of wastewater by deep-well injection is increasingly linked to induced seismicity, or earthquake activity, as is horizontal hydraulic fracturing itself. Residents of Fox Creek, Alberta previously experienced roughly one measurable earthquake per year, yet regional monitors have detected 160 since December 2013, including two at 4.4 on the Richter scale.⁵¹ The British Columbia Oil and Gas Commission attributes 231 “seismic events” to both wastewater disposal and fracturing in the Montney Basin between August 2013 and October 2014,⁵² including a 3.8- and 4.4-magnitude earthquake, respectively.⁵³ These are reported to be the strongest associated with hydraulic fracturing recorded globally to date.⁵⁴

Local and regional geology are also factors in seismicity, again demonstrating the need for useful baselines not restricted by arbitrary boundaries (e.g., provincial borders or proponent land blocks), while the proposed regulations do not provide baseline parameters for notification of suspected seismic events or for related suspension or termination of operations.⁵⁵

Water

Conscientious management of all water resources remains a priority issue for residents, and many factors contribute to decisions on the regulation of water use as well as local and regional water studies. These include regulatory frameworks, regional geology and hydrology, stages of development, proximity to communities and to above- and below-ground water sources, water condition, technology and infrastructure capacity, and disposal options.

⁵⁰ See the AER’s *Recurring Human Health Complaints Technical Information Synthesis: Lochend Area* (July 2015).

⁵¹ See the Alberta Energy Regulator’s *Seismicity in Alberta*.

⁵² See the British Columbia Oil and Gas Commission’s *Investigation of Observed Seismicity in the Montney Trend* (December 2014).

⁵³ See *Earthquake Details* at Natural Resources Canada (August 4, 2014).

⁵⁴ See *The Globe and Mail* (17 July 2015).

⁵⁵ See p.37 of the research summary.

In its *Research Summary*, the Committee considered a number of water contamination incidents associated with hydraulic fracturing,⁵⁶ including those mentioned previously, 38 fracture communications incidents in Alberta and British Columbia prior to 2010, and the inappropriate injection of wastewater into 452 California aquifers.⁵⁷

Fracturing Fluids

The Committee agrees that the pre-fracture disclosure of fracturing fluid ingredients and drilling chemicals is vital.⁵⁸ However, such disclosure remains imperfect, often excluding proprietary information and impeded by a general lack of scientific understanding of the wide variety of chemicals used and their interactions with each other, with formation geology, and with surface water and groundwater (e.g., in flowback).⁵⁹

Wildlife

Landscape change due to increased oil and gas development is the primary management concern for boreal caribou,⁶⁰ yet the proposed regulations eliminate requirements expressly addressing boreal caribou, as well as requirements addressing other wildlife and heritage resources with particular attention to species at risk. During its Bakken tour, the Committee observed that,

When questioned about wildlife concerns, a State legislator noted his view that wildlife could move and take care of itself! This situation demonstrates to the Committee that if adequate planning to address wildlife and other environmental concerns does not take place in advance of, and alongside development, it will likely be neglected. Wildlife is highly valued in the Northwest Territories and the

⁵⁶ In May 2015, the EPA reported, in draft, that it had not found evidence that hydraulic fracturing had "led to widespread, systemic impacts on drinking water resources in the United States." In its review of this report, the Committee noted that a wide range of factors significantly limit the Agency's findings. A lack of long-term monitoring data challenges any conclusions, and while the study is detailed and stringent, it comprises a "snapshot-in-time" of limited data, including inaccessible information, unavailable data on fracturing chemicals and their properties, spills, water use, and wastewater volumes, and a comparatively small number of studied wells (approximately 38,000 wells fractured between 2011 and 2013, when horizontal hydraulic fracturing has taken place in the United States since the late 1990s). See *EPA's Study of Hydraulic Fracturing for Oil and Gas and Its Potential Impact on Drinking Water Resources* ("the EPA report").

⁵⁷ See p.9 of the research summary.

⁵⁸ See Committee correspondence of December 20, 2013.

⁵⁹ For example, the EPA identified 1076 unique chemicals used in fracturing fluids, yet could measure or estimate physiochemical properties for only 453, and was further hampered by limited data on wastewater composition. See the EPA report.

⁶⁰ See p.14 of **Tabled Document 255-17(5)**, *Hydraulic Fracturing Public Information* (the Department of Industry, Tourism, and Investment's package).

Department of Environment and Natural Resources and Sahtu leadership have significant roles in ensuring continued wildlife and habitat protection.⁶¹

In the NWT, the Bathurst and Bluenose East caribou populations also urgently need conservation and management action, while the habitat provided by boreal forests is under extreme environmental pressures.

Recommendation 4

Any regulatory framework must include an overall environmental mitigation strategy recognizing the unique demands and impacts of hydraulic fracturing and addressing the matters noted above, including clear plans to monitor and manage emissions and flaring, to mitigate and manage material effects on air quality, and to evaluate air quality through specific and measurable requirements,⁶² as well as micro-seismic monitoring.⁶³ The Committee recommends that the GNWT monitor the work of other jurisdictions, including Alberta and Yukon, in their studies and best practices, including work on hydraulic fracturing and human health.

Additionally, the Committee again urges water withdrawal limits that would account for developmental stages and periods of low-water, as well as the development of tracer chemical standards and development plans indicating both sources and limits. Industry must demonstrably minimize water use.⁶⁴

Respecting spills and other incidents, any regulatory framework must be prepared to respond to such events, which are often unpredictable, even with stringent precaution. Fracturing chemicals and fluids, including wastewater, released into trans-boundary waters, either intentionally or accidentally, would also require address.⁶⁵

Much of this work would be required prior to any hydraulic fracturing.⁶⁶

⁶¹ See p.5 of the Bakken report.

⁶² A 2012 report commissioned by the GNWT examined environmental impacts directly or indirectly attributable to hydraulic fracturing, and highlighted the following eight themes: Groundwater contamination from below-ground activities; wastewater management and disposal from above-ground activities; chemical additives and fuel handling, transportation, and storage; well blowouts; water usage and supply; land consumption and disturbance; air quality; and induced seismic activities (earthquakes). See p.1 of the GNWT response.

⁶³ See p.5 of the study tour report.

⁶⁴ See p.5 of the study tour report, p.3 of the Bakken report, and Committee correspondence of December 20, 2013.

⁶⁵ See pp.6344-6345 of the Hansard of the Legislative Assembly of the Northwest Territories ([June 2, 2015](#)).

⁶⁶ See Committee correspondence of December 20, 2013.

Reporting and Disclosure

Reporting and disclosure are essential, and encompass monitoring, testing, and data storage protocols. While under the proposed regulations, all public disclosure remains voluntary, there are no minimum standards to guide or otherwise encourage disclosure.

Databases

The Committee observes that separation between GNWT participation in FracFocus.ca and any GNWT online database storing other publicly-disclosed information (e.g., the pre-fracture report) may cause confusion amongst stakeholders and the general public.

Voluntary and Mandatory Disclosure

The matter of voluntary versus mandatory disclosure, as well as public disclosure has been one of great public discussion. The Committee recognizes that the pre-fracture report outlined in the proposed regulations would contain a wide range of information. However, public disclosure remains voluntary, including the manner and time of disclosure. Excepting the voluntary disclosure of annual environmental and safety reports, it also remains unclear which provisions of the proposed regulations enhance post-fracture reporting. Arguably, the number of NEB provisions eliminated in the proposed regulations would result in reduced reporting.

Recommendation 5

In keeping with the GNWT's post-devolution authority, the Committee recommends amendments to the *Petroleum Resources Act* to address mandatory disclosure and legislated privilege periods. Until that time, it is expected OROGO would continue the NEB's practice of explicitly requesting that operators waive such privileges.

Waste Management

Storage, treatment, transportation, and disposal of waste materials—including emergency planning and protection of vulnerable communities and habitats—remain key areas in Committee discussion.⁶⁷ Members point to Kennetcook, Nova Scotia, where hydraulic fracturing wastewater has sat in open storage pits for more than two years, subject to flooding and overflow, due to regulatory ill-preparedness and mismanagement.

⁶⁷ See p.7 of the Bakken report and Committee correspondence of December 20, 2013.

The Committee previously emphasized the importance of monitoring flowback,⁶⁸ because heat, pressure, and time can alter fracturing fluids' composition, both information and when stored as wastewater.⁶⁹ Monitoring of naturally occurring radioactive material (NORM) may also be relevant. The GNWT has stated that it is a "long-term goal to manage [wastewater] very effectively, treat it, if possible, and reclaim it, if possible, in the NWT,"⁷⁰ while the Committee has previously stated,

Transporting waste out of the Northwest Territories on the winter road system appears to be an adequate temporary solution; however, industry emphasized that in order to advance to production, a made-in-the-north water treatment or disposal system must be found.⁷¹

However, even with current technology and best practices wastewater cannot be re-integrated into the water table or re-used except, typically, for later stages of hydraulic fracturing. Even then, the general robustness and applicability of wastewater recycling remains poorly understood and large quantities of freshwater remain a core requirement as brackish or saline water damages both formations and equipment.⁷²

Recommendation 6

Any regulatory framework must implement and enforce stringent waste management requirements, including transportation and emergency management expectations.

On-surface storage of waste materials (e.g., lined pits) remains unacceptable to the Committee, which again emphasizes its support of tank storage only.⁷³ Additionally, emerging scientific knowledge must be taken into account in any future pursuit of deep-well injection in our region. Risk assessment must account for the possibility of restricted access in other jurisdictions.

⁶⁸ "The process of allowing fluids to flow from the well following a treatment, either in preparation for a subsequent phase of treatment or in preparation for cleanup and returning the well to production." See p.223 of the COCA report.

⁶⁹ See Committee correspondence of December 20, 2013.

⁷⁰ See p.6344 of the 17th Legislative Assembly of the Northwest Territories Hansard ([June 2, 2015](#)).

⁷¹ See p.5 of the study tour report.

⁷² See p.66 of the Wheeler Report and pp.94-95 of the COCA report.

⁷³ The Committee also highlights the opportunity to apply lessons learned from British Columbia's experience with industry borrow pits to regulatory requirements on water sources, wastewater, monitoring, and enforcement; see Committee Correspondence of December 20, 2013.

Well Construction: Casing, Cementing, Logging, and Drilling

As the Committee has repeatedly emphasized, stringent casing and construction regulation, including compliance monitoring and enforcement, as well as regular monitoring and maintenance of suspended and abandoned oil and gas wells, are essential to reducing methane leakage and the risk of inter-well communications.⁷⁴ The Committee has recognized the existence of best practices.⁷⁵

Nevertheless, insufficient scientific and practical understanding of the long-term impacts of active, suspended, and abandoned wells leave considerable uncertainty respecting the ability of even the most stringent rules to prevent leakage and communications over extended periods. Further, the regulations appear to eliminate requirements respecting blow-out prevention specific to hydraulic fracturing and previously in place under the NEB.⁷⁶

Recommendation 7

Any regulatory framework must impose clear and stringent well construction standards and require thorough, consistent, and long-term well monitoring, including procedures to effectively and efficiently identify and address any loss of integrity.

Well Suspension and Abandonment

Abandonment and Decommissioning

As the Committee has previously recommended, any regulatory framework must address the full lifespan of a well, including abandonment and decommissioning.⁷⁷

Securities and Proof of Financial Responsibility

Sufficient securities are a vital component of development, as demonstrated in other jurisdictions. Saskatchewan has implemented a liability management program,⁷⁸ while Alberta is currently facing an increasing number of newly orphaned wells, presenting

⁷⁴ See Committee correspondence of December 20, 2013 and p.11 of the research summary.

⁷⁵ See Committee correspondence of December 20, 2013.

⁷⁶ See Appendix 5 of the research summary.

⁷⁷ See Committee correspondence of November 26, 2013 and December 20, 2013.

⁷⁸ See p.4 of the Bakken report.

public environmental, financial, and logistical liability. Further, the Auditor General of Alberta, reviewing securities policies for mines and the oilsands, recently reported,

“improvements are needed to both how security is calculated and how security amounts are monitored. Without these improvements, if a mine operator cannot fulfill its reclamation obligations and no other private operator assumes the liability, the province is at risk of having to pay substantial amounts of public money.”⁷⁹

Recommendation 8

A review of territorial securities policies and the implementation of clear securities criteria are required to aid the GNWT in preventing the negative impacts experienced elsewhere. The GNWT must continue the NEB’s practice of refusing surety bonds as proof of financial responsibility.⁸⁰

CONCLUSION

This concludes the Committee’s *Report on Hydraulic Fracturing and the Northwest Territories*. All Committee reports and tabled documents are available online at the Legislative Assembly website (www.assembly.gov.nt.ca).

⁷⁹ See the *Report of the Auditor General of Alberta* (July 2015).

⁸⁰ See p.22 of the research summary.

