Dear Joint Review Panel,

RE: Frontier Oil Sands Mine Project (Teck Resources Ltd.), reference #65505

Guided by both indigenous Elders’ Traditional Knowledge and western science, the Keepers of the Athabasca (2006) are First Nations, Métis, Inuit, environmental groups, and citizens working together for the protection of water, land, air, and all living things today and tomorrow in the Athabasca River watershed. Our mission is to unite the peoples of the Athabasca River Watershed to secure and protect water and watershed lands for ecological, social, cultural and community health and well being.

Our membership drew Keepers’ attention to Teck Resources Inc’s proposal for another bitumen mine in Northern Alberta. When the Federal Minister of the Environment referred the project to a review panel and issued a Notice of Commencement of an Environmental Assessment under CEAA 1992 on January 19, 2012, we took note, but did not state our concerns at that time. We respect the rights of First Nations in the area, Métis organizations, and other Indigenous organizations who are directly affected to apply first, for we know funding is limited. We note that only one group was funded to engage at that time. When CEAA invited public comment on supplemental information until December 4, 2013, we didn’t respond as we were watching to see who else was included. Our membership insisted that we intervene as some of the leadership in First Nations and Métis organizations began to make deals and sign off on the project, and that is why we eventually applied to be intervenors. Keepers are glad that our application was successful, as our Board and membership are against this proposed project, and many of our membership who are also members of First Nations, Métis, and other Indigenous organizations were very disappointed when their elected leadership signed on to the project, against the wishes of many in these communities.

Trying to be concise, here are points relating to how Keepers of the Athabasca, our Board and membership would be affected by the approval of Teck’s application for the proposed Frontier Oilsands Project:
• The principle of sustainable development, as defined under EPEA is not upheld in this application, as cumulative environmental effects and human health effects in the area are already severe
• Financial considerations, including: potential overstating of Royalties, income, and taxes, the potential for huge costs to Canadian society in case of stranding or abandonment, and the overall economic viability of this project
• Consideration of climate change in relation to this project, including: Teck’s stated objectives are simply not safely achievable, extreme weather may provide risks not listed in the Environmental Impact Statement or Teck Resources Inc.’s answers to information requests, the possibility of increased forest flammability due to aerial emissions, and the environmental and upstream user water needs coupled with a steadily decreasing river flow in the Athabasca River
• Tailings: the proposed tailings management for this project is not acceptable, considering known impacts of current tailings management. Keepers also note the lack of any full containment options for tailings.
• Aerial emissions: particulate matter affects human health and Traditional Knowledge holders in our membership have raised the possibility of increased forest flammability.
• Environmental and human health monitoring: as current monitoring and self-reporting practices are shown not to have been successful in protecting the environment or human health, the approval of another project will exacerbate these issues.
• Health effects: this project would exacerbate current, known, while not properly documented human health effects, including rare cancers.
• The lack of Indigenous Knowledge utilized by Teck Resources Inc. in putting together their proposal.

As other intervenors are likely deeply involved on representing various aspects of these concerns, we will focus on financial considerations, tailings management and cumulative effects, human health, and the concerns of Traditional Knowledge holders:

Dr. Gerda Kits and Regan Boychuck will represent Keepers’ concerns regarding financial statements by Teck Resources Inc. in their Application and responses to requests for information, along with other financial implications stemming from this proposed project.

Dr. Gerda Kits presentation, entitled “Potential unmeasured costs associated with Teck’s Frontier Oil Sands Mine” will be verbal with copies distributed to the Panel, take approximately forty five minutes (not including time for questions), and provides the following points:

• Critique of Teck Resources Inc.’s lack of a cost benefit analysis
• Overview of potential unmeasured and/or underestimated external costs associated with Teck’s Frontier Mine Project
• Discussion of distribution of external costs associated with Teck’s Frontier Mine project
• Assessment of Teck’s projected oil price scenarios
• Studies utilized to make these points are:
doctrinal dissertation. Vancouver: Simon Fraser University. 
http://summit.sfu.ca/item/12630


- Zhang, Yifeng et al. 2016. Airborne Petcoke Dust is a Major Source of Polycyclic Aromatic Hydrocarbons in the Athabasca Oil Sands Region. *Environmental Science and Technology* 50: 1711-1720.


https://ehjournal.biomedcentral.com/articles/10.1186/1476-069X-12-3


Regan Boychuk’s expert presentation, entitled “Alberta Over A Barrel: Environmental liabilities and royalties in the oilsands” will detail financial liabilities and discount rates in consideration of Teck Resources Inc’s application, and potential royalty risks for the Joint Review Panel to consider. His presentation will take approximately one hour before questions. Studies and sources brought to bear by Mr. Boychuck are:

- **Bank of Canada (2018).** *Real Return Bonds Index Ratio* (September), 1p.
• Canadian Institute of Chartered Accountants (CICA) (1990a). “Section 3060: Capital assets”, Revision no. 67 (October), 10pp.
• Canadian Institute of Chartered Accountants (CICA), Canadian Association of Petroleum Producers (CAPP) and Explorers and Producers Association of Canada (EPAC) (2013). Oil and Gas Industry Task Force on IFRSS, “Survey of selected accounting policies of junior oil and gas entities”, 24pp.
• Clarkson, A. (2011). “In the red: Towards a complete regime for cleaning up environmental messes in the face of bankruptcy”, University of Toronto Faculty of Law Review, vol. 69, no. 2 (Spring 2011), pp. 31-67.


• Rogers, G. (2017). “Why the oil industry cannot afford to retire… yet!”, LinkedIn (11 September).


Keepers of the Athabasca submission to JRP Aug. 31, 2018


**Personal Communications / Interviews**

- Kavanagh, Mark. Liability management advisor (1999-2005), Alberta Energy Utilities Board. Interview (Calgary, Alberta) and email correspondence, August 2018.
- Rogers, Greg. Co-founder, Eratosthenes, financial research and advisory firm (Austin, Texas). Email correspondence, August 2018.
- Schneider, Thomas. Assistant Professor of Accounting, School of Accounting and Finance, Ted Rogers School of Management, Ryerson University (Toronto, Ontario). Email correspondence, August 2018.

Dr. John O’Connor will verbally present his written report entitled: HUMAN HEALTH IMPPLICATIONS - TECK’S FRONTIER TARSANDS MINE to elucidate Keepers’ concerns regarding the history of known health effects in communities in the region and north (downstream) of the proposed project, and the process he has been involved with that has still not accomplished following up on these health implications. His presentation will take about one half hour, not including questions. Studies utilized by Dr. O’Connor will be:

- Northern River Basins Study - Report to the Ministers 1996
- Northern River Basins Human Health Monitoring Program - March 1999
• Oilsands Development Contributes Elements at Low Concentrations to the Athabasca River and its Tributaries - Kelly, Schindler et al, PNAS Sept 2010 107(37) 16178-16183 http://doi.org/10.1073/pnas 1008754107
• Environmental and Human Health Implications of Athabasca Oilsands for Mikisew Cree First Nation and Athabasca Chipewyan First Nation in Northern Alberta - MacLachlan et al, Environment Conservation Lab July 2014, University of Manitoba
• Mel Knight-AB Environment Minister-2008-“Downstream” Babelgum (Iwerks)
• A Study of Water Sediment Quality as Related to Public Health Issues in Fort Chipewyan Alberta -Timoney Nov 11 2007 Nunee Health Board (Fort Chipewyan)
• Cancer Incidence in Fort Chipewyan 1995-2006 - Yiqun Chen, Alberta Cancer Board Div of Pop Health and Information Surveillance
• Cancer Risk Assessment and Exposure Sources of PAHs In the Athabasca Oilsands Region - Zhang, Shotyk, Zaccone, Martin et al, Env Science and Technology Jan 8 2016 es 2015-050926.RI
• The following is an article about the confirmed cancer clusters in Fort Chipewyan, and the charges against Dr. John O’Connor (background information for the JRP): http://rabble.ca/blogs/bloggers/djclimenhaga/2014/04/what-happens-now-we-know-there-really-cancer-cluster-fort-chip-n

Keepers’ Co-chair Paul Belanger will present a powerpoint and written report detailing Keepers concerns in regards to cumulative effects and the existing effects of current tailings management and the proposed management of tailings by Teck Resources Inc., including concerns about these issues:

• Migration of current tailings contaminants through the groundwater and into the Athabasca River
• Unacceptable and unrealistic tailings management proposal by the project proponent, which is similar to current, aging tailing management methods. Existing tailing ponds have numerous and serious problems. Modernization of waste management is required; details will be presented on current/previous green chemistry, full containment options, and complete recycling of water.
• Cumulative impacts: current industrial impacts on the Lower Athabasca ecosystem have reached unacceptable levels. Some effects have reached critical levels and the region cannot bear additional impacts. Serious impacts have been clearly reported in the areas of watershed, airshed and to the land (wildlife population and health impacts) Any additional development must be better designed and eco-friendly
• The studies called on by Paul will include:
  o Characterizing Sediment Sources and Natural Hydrocarbon Inputs in the Lower Athabasca River, Canada F.M. Conly, R.W. Crosley, and J.V. Headley J. Environmental Engineering and Science, 2002
- Geoscience of Climate and Energy 13. The Environmental Hydro-geology of the Oil Sands, Lower Athabasca Area, Alberta, Andrew D. Miall, Geoscience Canada, Volume 40, Number 3 (2013)
- Oil sands development contributes polycyclic aromatic compounds to the Athabasca River and its tributaries- Schindler, Short, Kelly, Fortin, Proceedings of the National Academy of Sciences 106(52), 22346-2235, 2009
- Oil sands mining and reclamation cause massive loss of peatland and stored carbon
- Rebecca C. Rooney, Suzanne E. Bayley, and David W. Schindler, Proceeding of the National Academy of Sciences, 2012
- Legacy of a half century of Athbasca oil sands development recorded by lake ecosystems
- Joshua Kureka, Jane L. Kirkb, Derek C. G. Muirb, Xiaowa Wangb, Marlene S. Evansc, and John P. Smola., Proceeding of the National Academy of Sciences, 2012
Differences between measured and reported volatile organic compound emissions from oil sands facilities in Alberta, Canada, Meng Lia, Leitheada, Moussaau, Liggioa, Morana, Wangb, Haydena, Darlingtona, Gordonc, Staeblera, Makara, Strouda, McLarent, Liiua, O’Briena, Mittermeiera, Zhang, Marsona, Cobera, Woldee, and Wentzella. Proceeding of the National Academy of Sciences, 2017

OIL SANDS TAILINGS TECHNOLOGY: UNDERSTANDING THE IMPACT TO RECLAMATION, Melinda Mamer, P.Eng, Suncor Energy Inc. 2016

Contaminant problems in the Athabasca River not overstated, David Schindler, et al, Published Simultaneously, March 23, 2017

Estimates of exceedances of critical loads for acidifying deposition in Alberta and Saskatchewan, Makar, Akingunola, Aherne, Cole, Akilu, Zhang, Wong, Hayden, Meng Li1, Kirk, Scott, Moran, Robichaud, Cathcart, Baratzedah, Pabla, Cheung, Zheng, and Jeffries, Atmos. Chem. Phys., 18, 9897–9927, 2018


Toxicity of naphthenic acids to invertebrates: Extracts from oil sands process-affected water versus commercial mixtures*, Bartlett, Frank, Gillis, Parrott, Marentette, Brown, Hooy, Vanderveen, McInnis, Brunswick, Shang, Headley, Peru, Hewitt, Environmental Pollution 227 (2017) 271-279

Predicted toxicity of naphthenic acids present in oil sands process-affected waters to a range of environmental and human endpoints, Alan G. Scarlett, Charles E. West, David Jones, Science of The Total Environment, 2012


Paul’s report will take approximately one hour (before questions). We hope that the current NAFTA challenge on Canada’s management of bitumen mine tailings¹ is kept in mind by the Panel while hearing the evidence reflected in Paul’s presentation.

Keepers of the Athabasca will represent the concerns shared with us by Traditional Knowledge holders in our membership by giving still unexamined excerpts from interviews shared with Keepers about this project. This verbal presentation will take roughly one half hour and address concerns in the following areas:

- Concerns about surface water quality and air quality
- Health concerns
- Concerns from an Environmental Consultant hired for Traditional Knowledge expertise about their work not being taken seriously
- Concerns about particulate emissions leading to increased forest flammability

¹ NAFTA body calls for investigation into oilsands tailings enforcement


Keepers of the Athabasca submission to JRP Aug. 31, 2018
Keepers of the Athabasca believes that it would be in the interest of the Joint Review Panel to call witnesses as according to the Terms of Reference, section 6. We are requesting that these individuals be provided notice to attend the hearings and provide evidence to assist the Panel:

- Alberta Environment and Parks: Mine Financial Security Program working group: a senior member of this working group, which met throughout 2017 with stakeholders to evaluate the MFSP, could provide information related to the evidence provided by Regan Boychuk, about financial security to cover liabilities for mining operations in Alberta
- Health Canada - Dr. Wadieh Yacoub (if possible). This individual was involved in Health Canada’s response to concerns about rare cancer clusters in Northern Alberta, and could provide additional information in reference to the evidence from Dr. John O’Connor

By calling on these specific witnesses to provide information during presentations by Keepers of the Athabasca, the Joint Review Panel will be able to better interpret the information provided by our team. We hope that our team could be allowed to also pose questions to these individuals in order for the Joint Review Panel to receive the full benefit of providing notice for these individuals to attend the Hearing. Our best estimate is that each of the witnesses called could provide between 15 minutes and one half hour of additional time to the process, but the information they would provide is crucial to add to the Joint Review Panels understanding.

Curriculum Vitae of Dr. John O’Connor, Regan Boychuck, and Dr. Gerda Kits are enclosed.

Thank you for this opportunity to present evidence, and please keep us informed on the possibility of Keepers witnesses participating in the hearing remotely.

Sincerely,

<Original signed by>

Jule Asterisk, Executive Director
Economic Impacts of Teck’s Frontier Oil Sands Mine

August 22, 2018

Report prepared for Keepers of the Athabasca

By Dr. Gerda Kits, PhD
Associate Professor of Economics
The King’s University
9125 50 St., Edmonton AB T6B 2H3

Scope of report

In its position as an intervenor in the Joint Panel Review of Teck’s Frontier Oil Sands Mine, Keepers of the Athabasca asked me to examine Teck’s arguments regarding the economic justification for the project. In its Project Update, Teck states that “the Project is in the public interest and will yield substantial net benefits to residents of the Athabasca Oil Sands Region, to Alberta and to Canada.” ¹ It justifies this statement with references to North American energy security, local employment and training opportunities, and estimated impacts on employment and government revenues. In a later information package,² Teck provides three oil price scenarios and estimates the project’s impacts on government revenues, GDP, and household income for each scenario, using a provincial input-output model.

While energy security, employment, and government revenues are indeed important benefits, a fair and full assessment of the project requires that they also be weighed against the potential costs resulting from the project. The appropriate method to determine whether a project will yield net benefits to society is Cost-Benefit Analysis (CBA), which sums both the total private and social benefits of the project and the private and social costs, and uses them to calculate the net social benefit. Teck does not provide a CBA in its submission to support its claim of net benefits. Furthermore, Teck’s submission provides only part of the information necessary to determine whether the project will, in fact, yield net benefits. It does not provide an estimate of total revenues over the life of the project, which is necessary to determine the benefits of the project. It provides estimates of private costs (construction, operation, and reclamation costs) but does not provide any monetized estimates of social costs, such as costs associated with climate change, other environmental damages, or impacts on human health.

My understanding is that another intervenor will be presenting a CBA of the Frontier project to the Joint Review Panel. My understanding is also that the Panel prefers intervenors to avoid presenting duplicate information. Therefore, I will not present a CBA in this report, and I encourage the Panel to consider the findings of the CBA presented by the other intervenor in their decision-making. As a supplement to that CBA, however, this report discusses some economic costs that have the potential to result from Teck’s

Frontier project, but are unlikely to be included in a CBA given the current state of knowledge. These are costs where there is significant uncertainty about impacts and/or difficulties in monetizing impacts. However, the difficulties faced in assessing and measuring these potential costs are not a reason to ignore them.  

In addition to assessing the potential costs arising from the project, Keepers of the Athabasca asked me to assess Teck’s projected oil price scenarios, since these shape expectations about the potential benefits from the project. While there is much uncertainty about oil price projections, especially after the events of the past few years, I would like to draw the Panel’s attention to several recent studies that suggest Teck’s price projections may be overly optimistic. In turn, this casts doubt on the prospects for private financial sustainability of the project, as well as the potential for the project to produce net benefits to society.

Given the potential for significant costs arising from Teck’s project, the current state of uncertainty about these costs, and uncertainties about projected revenues from the project, my opinion is that Teck has not credibly established that the proposed Frontier Oil Sands Mine will yield net benefits to society. I suggest that further research should be conducted to evaluate the potential costs and benefits before a decision is made on the project.

**Scope of potential costs for consideration by the Panel**

The Terms of Reference of the Joint Review Panel for the Teck Frontier mine project require the Panel to “conduct an assessment of the environmental effects of the project...in a manner consistent with the requirements of CEAA 2012, REDA, EPEA, the *Oil Sands Conservation Act* and these Terms of Reference.” CEAA 2012 requires the Panel, should it determine that the project is likely to cause significant adverse environmental effects, to refer the decision to the Governor in Council to determine whether these effects are “justified in the circumstances.” It further states that “The Government of Canada, the Minister, the Agency, federal authorities and responsible authorities, in the administration of this Act, must exercise their powers in a manner that protects the environment and human health and applies the precautionary principle.” The provincial Responsible Energy Development Act General Regulation requires the regulator to consider the social, economic, and environmental impacts of a project, and the Oil Sands Conservation Act states that projects may be approved if they are “in the

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3 I base my expectations of which factors are likely to be included in the CBA on the only other existent CBA of an oil sands project, a study of the Kearl mine: Joseph, Christopher Thomas Remus Biggs. 2013. *Megaproject Review in the Megaprogram Context: Examining Alberta Bitumen Development*. Unpublished doctoral dissertation. Vancouver: Simon Fraser University. [http://summit.sfu.ca/item/12630](http://summit.sfu.ca/item/12630)


6 Ibid, section 4(2).

public interest.” Finally, EPEA recognizes, in conjunction with “the need for Alberta’s economic growth and prosperity in an environmentally responsible manner and the need to integrate environmental protection and economic decisions in the earliest stages of planning,” that “the protection of the environment is essential to the integrity of ecosystems and human health and to the well-being of society,” and finally “the principle of sustainable development, which ensures that the use of resources and the environment today does not impair prospects for their use by future generations.”

The CEAA and OSCA appear to leave some room for interpretation in the determination of whether a project is “in the public interest” and whether its effects are “justified in the circumstances.” The REDA General Regulation provides some guidance by stating that the regulator must consider social, economic and environmental impacts. This suggests that costs to be included in the net benefit calculation should include not only direct costs to the proponent (construction, operation and reclamation costs) and to the government (infrastructure and regulatory costs), but also potential damage to human health, to Aboriginal culture, land use, and rights, to other commercial operations, to wildlife, and to ecosystems and ecosystem goods and services. As per EPEA, this would also include costs imposed on future generations, such as the reduction in natural capital resulting from depletion of oil stocks and long-term changes in ecosystems.

It is difficult to measure and monetize many of these impacts, and any assessment of these costs will involve a number of assumptions that are subject to debate. However, these difficulties should not be used as an excuse to ignore these impacts, since they do represent real costs to society. For example, damage to human health imposes costs in the form of health care expenditures, lost productivity, and the subjective value associated with morbidity and mortality (usually estimated using techniques that determine how much people are willing to pay to avoid these risks). Damage to the environment imposes costs in the form of reductions in the direct use value of the environment (e.g. use for forestry, food production, or recreation), lost ecosystem goods and services (natural services that sustain human life, such as water filtration and carbon sequestration), and the subjective value associated with natural places and wildlife (again, often estimated using techniques that determine how much people are willing to pay to protect these amenities).

Despite the difficulties associated with measuring these costs, some of them have been well-studied and I anticipate that a number of them will be included in the CBA provided by the other intervenor. The Kearl CBA included private and government costs as well as costs resulting from the depletion of natural capital. It also included human health costs from a limited number of air pollutants (SO₂, NOₓ, PM₂.5, and VOCs), costs associated with greenhouse gas emissions, and costs resulting from the temporary loss of ecological goods and services during the mine’s lifetime. However, it excluded a number of costs due to lack of data. The following section discusses some potential costs that are likely to be omitted from a CBA due to a current lack of information, but which are nevertheless important for the Panel to

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consider, in accordance with the precautionary principle. This is not intended to provide an exhaustive list of costs, but to suggest that there is potential for significant costs that should be further studied.

Some potential unmeasured costs associated with Teck’s Frontier Mine project

Human health costs resulting from emissions of polycyclic aromatic hydrocarbons (PAHs)

Teck’s submission states that the human health risk from PAH exposure resulting from the project is low. However, a number of recent studies\(^\text{10}\) have raised concerns about PAH emissions exceeding expected levels in the region around the oil sands. Should the Panel decide that Teck’s project has the potential to contribute to PAH exposure at levels that could affect human health, it would be important to factor these health impacts into the determination of whether the project has net benefits to society.

To the best of my knowledge, no studies have yet attempted to value the potential human health damages caused by PAH emissions from the oil sands. Due to the current lack of certainty around emissions levels, human exposure to emissions, health impacts from exposure, and the damage costs associated with health impacts, it is not possible to include costs resulting from PAH emissions in a CBA at the present time. However, studies from other contexts suggest that these costs have the potential to be significant. For example, a 2001 study\(^\text{11}\) looked at costs resulting from increased lung cancer risk as a result of PAH emissions in Europe, and estimated a damage cost of €720,000 per case of lung cancer. Another study from Taiwan\(^\text{12}\) estimated a damage cost of $2.1 million US per death from lung cancer resulting from environmental contamination. These values cannot be directly applied to the current case because differences in context and the uncertainties discussed above. However, this does highlight the importance of further research to determine the potential costs from PAH emissions in the oil sands region, including from Teck’s project.

Human health costs resulting from deposition of mercury and other priority pollutants

Recent studies\(^\text{13}\) have also raised concerns about deposition of elements that are considered priority pollutants by the US Environmental Protection Agency in the oil sands region. Furthermore, some of

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\(^\text{10}\) Hsu, Yu-Mei, Tom Harner, Henrik Li, and Phil Fellin. 2015. PAH Measurements in Air in the Athabasca Oil Sands Region. *Environmental Science and Technology* 49: 5584-5592.


Zhang, Yifeng et al. 2016. Airborne Petcoke Dust is a Major Source of Polycyclic Aromatic Hydrocarbons in the Athabasca Oil Sands Region. *Environmental Science and Technology* 50: 1711-1720.


these elements have been found to occur in levels that raise concerns for human health. Should the Panel decide that Teck’s project has the potential to contribute to exposure to these elements at levels that could affect human health, it would be important to factor these health impacts into the determination of whether the project has net benefits to society.

To the best of my knowledge, no studies have yet attempted to value the potential human health damages caused by deposition of these elements from oil sands operations. As is the case for PAHs, current uncertainties around emissions levels, human exposure, health impacts, and damage costs make it impossible to include costs resulting from exposure to these contaminants in a CBA at this point. However, related studies suggest these costs have the potential to be significant. For example, mercury and lead exposure in mothers have been linked to IQ losses in their children; based on studies that suggest a 1 µg/g increase in maternal hair-mercury decreases IQ by 0.465 points, and estimated lifetime earnings losses resulting from lower IQ valued at an average of €13,579 per IQ point, a recent European study found an approximately €9 billion benefit from avoiding excess methyl mercury exposure in the EU. An older European study estimated the damage costs of cancers resulting from arsenic, cadmium and nickel exposure from a variety of industries. Again, the findings from these studies cannot be directly applied to the current situation, but highlight the potential costs associated with deposition of these contaminants, and call for further research to determine the extent of these costs.

Costs resulting from impacts on Aboriginal traditional land use, rights, and culture

Some intervenors, such as the Athabasca Chipewyan First Nation and Mikisew Cree First Nation, have raised concerns that Teck’s project will negatively affect their treaty and Aboriginal rights to pursue activities such as hunting, fishing, trapping and gathering on their traditional lands. Should the Panel determine that Teck’s project will have a negative impact on these rights, it would be important to include these impacts in the consideration of whether the project is a net benefit to society.

Although a number of studies have examined the impacts of oil sands projects on treaty and Aboriginal rights, to the best of my knowledge, none have attempted to place a monetary value on these impacts. Some related studies suggest ways in which impacts on treaty and Aboriginal rights could be monetized.


to enable their inclusion in a CBA. For example, a 2001 study\(^{17}\) of Aboriginal hunters in Northern Saskatchewan determined that a 25% decline in the moose population would be valued at $300 to $1425 per season, per hunter. A 1995 study\(^{18}\) found that urban Aboriginal families in Saskatchewan would be willing to pay $81 per household for wilderness protection, significantly more than non-Aboriginal families. A 2013 study\(^{19}\) found that the annual value of harvest from the Beverly and Qamanirjuaq caribou herds was $20 million, though this only included the market value of the meat, hides, and antlers, and excluded cultural and other passive use values. As for the health costs discussed above, these values cannot be directly applied to the current situation. However, they highlight the fact that these costs do exist and that further research is necessary to determine the extent of those costs in order to factor them into the analysis of Teck’s Frontier project.

**Costs resulting from impacts on wildlife and ecosystems**

Estimates of the damage to ecological goods and services resulting from direct landscape disturbances are available for inclusion in a CBA of the Frontier project. These estimates (at least partially) include the value of the landscape as habitat for wildlife species. However, concerns have also been raised that the project may have impacts on ecosystems and wildlife beyond the area directly disturbed, particularly in Wood Buffalo National Park. In August 2017, the Panel asked Teck to consider the Frontier project’s potential impacts on the park. In June 2018, a Strategic Environmental Assessment of the park\(^{20}\) was released, which raises concerns about migratory waterfowl, water quantity and quality in the Peace-Athabasca Delta, and bison habitat. Should the Panel conclude that Teck’s project has the potential to negatively impact the park, the costs associated with these impacts should be included in the consideration of whether the project is of net benefit to society. Some of these costs (e.g. impacts on water quantity and quality) may overlap with costs associated with impacts on Aboriginal traditional land use, rights and culture. However, there are also potential costs related to broader societal values for wilderness, recreation, and wildlife protection.

To the best of my knowledge, no studies have attempted to estimate the monetary values associated with ecosystems and wildlife in Wood Buffalo National Park. However, studies available from other

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contexts suggest these values may be significant. For example, a 2012 Canadian study\textsuperscript{21} found that households in New Brunswick were willing to pay $71.29 per household per year to increase protected natural areas to 14% of the provincial land base. Another study\textsuperscript{22} found that households in the Salmon River watershed in British Columbia were willing to pay amounts ranging from $48.56 to $86.17 per household per year for wildlife habitat protection in the watershed, and amounts ranging from $153.24 to $291.92 for water quality improvements. Another study\textsuperscript{23} found that households in Alberta were willing to pay amounts ranging from $184.02 to $330.36 per household per year for caribou protection. These studies suggest that Wood Buffalo National Park, as a unique wilderness site, has the potential to have significant economic value to society, and that damages to the park may result in significant economic costs. Further research is necessary to determine what these costs might be so that they can be included in analysis of Teck’s Frontier project.

Some potentially underestimated costs associated with Teck’s Frontier Mine project

In addition to the unmeasured costs described above, some costs that are likely to be included in the CBA of Teck’s project are potentially underestimated. For example, a recent study\textsuperscript{24} discovered “very large” rates of secondary organic aerosol (SOA) formation resulting from oilsands operations, comparable to rates from megacities. SOAs are a major component of PM\textsubscript{2.5} pollution. The SOA formation rate measured in the study was much higher than anticipated; this suggests that Teck’s projections of PM\textsubscript{2.5} emissions in its Project Update may have the potential to be underestimated. In turn, this implies that the costs associated with PM\textsubscript{2.5} emissions included in a CBA based on Teck’s submission may be underestimated. Another recent study\textsuperscript{25} found that measured volatile organic chemical (VOC) emissions from four large oil sands surface mines were significantly higher than those reported to the Canadian National Pollutant Release Inventory. This raises a question of whether the VOC emissions predicted in Teck’s Project Update might be underestimated. In turn, this would imply that the costs associated with VOC emissions included in a CBA based on Teck’s submission also have the potential to be underestimated.


\textsuperscript{25} Li, Shao-Meng, et al. 2017. Differences between measured and reported volatile organic compound emissions from oil sands facilities in Alberta, Canada. \textit{PNAS} 114(9): E3756-E3765.
Uncertain benefits associated with Teck’s Frontier Mine project

In responses to two Information Requests, Teck provides three scenarios for projected oil prices. In its response to IR #5, Teck projects low, reference and high long-run average West Texas Intermediate (WTI) prices at US$76.51, US$95, and US$115 respectively. Teck states that these projections are aligned with projections from the International Energy Agency. In its response to IR #10, Teck provides the associated Western Canadian Select (WCS) price projections: $65.01 ($11.50 differential between WTI and WCS), $79.50 ($15.50 differential), and $95 ($20 differential). It states that these projections are based on assumptions that “there will be overall long term and sustained global demand for oil and its associated petroleum products.”

A number of recent studies call this assumption into some doubt. Achieving the Paris Agreement goal of limiting global average temperature increases to under 2°C will require drastically reducing carbon dioxide emissions, which in turn requires limiting the use of global fossil fuel reserves. The policy and technology changes that will be necessary to achieve the Paris Agreement targets have been predicted to drastically reduce demand for oil over the lifespan of Teck’s Frontier project. In turn, a 2018 study predicted that this decrease in demand will result in significant decreases in oil prices from current levels, starting in 2020.

Furthermore, a recent study that assessed which specific fossil fuel reserves will be unused under the 2°C target found that “open-pit mining of natural bitumen in Canada soon drops to negligible levels after 2020 in all scenarios because it is considerably less economic than other methods.” As a result of this “stranding” of fossil fuel assets, Canada is predicted to experience drastic decreases in GDP and employment between 2020 and 2050. A study that looked specifically at the economic feasibility of further investments in Canadian oil sands, using a model that incorporates production costs, global oil

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28 Ibid, pg. 10-94.
prices, and carbon prices, found “a less than 5% probability that oil sands investments...would be economically viable over the next three decades under the 2 °C carbon budget.”

It is also worth noting that the National Energy Board’s own oil price projections do not align with Teck’s projections. The NEB projects prices for Brent crude, rather than WTI. The graph below shows that Brent has typically traded higher than WTI for the past several years.

Figure 1. Source: U.S. Energy Information Administration, Crude Oil Prices. Retrieved August 22, 2018 from Federal Reserve Bank of St. Louis. [https://fred.stlouisfed.org/graph/?g=kSjl](https://fred.stlouisfed.org/graph/?g=kSjl)

However, the graph below, showing the National Energy Board’s oil price projections for Brent through 2040, has three scenarios that are significantly lower than Teck’s projections for WTI prices. The NEB’s Reference case “is based on a current economic outlook, a moderate view of energy prices, and climate and energy policies announced at the time of analysis.” The HCP case includes the impact of global climate action, including higher carbon pricing, and the Technology case additionally includes the potential impact of new energy technologies, both of which are projected to reduce oil demand. Even the Reference case, however, takes into account “the potential for crude oil demand growth to flatten or begin declining.”

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36 Ibid, pg. 19.
Distribution of costs and benefits associated with Teck’s Frontier Mine project

Economics is typically concerned not only with issues of efficiency (here interpreted to mean that the benefits of the project should exceed the costs) but also with issues of equity or fairness. Arguably, a Panel tasked with deciding whether a project is in the public interest should also consider such issues. This suggests that in addition to the question of whether the Frontier project will yield net benefits to society, the Panel should also consider how the benefits and costs of the project will be distributed among different parties. Several of the costs discussed above are likely to fall primarily on households living in the oil sands region. This is certainly the case for impacts on Aboriginal traditional land use, rights, and culture. It also seems to be the case for at least some of the health impacts. For example, there appears to be a mercury “hotspot” concentrated around the oil sands region,\(^{37}\) concentrations of

other toxic elements have been shown to be higher near oil sands developments than in less disturbed areas,\textsuperscript{38} and PAH deposition has also been shown to be spatially concentrated around the oil sands region.\textsuperscript{39} This suggests that households in the region (many of whom are Indigenous) are at a higher risk to experience health impacts from these contaminants than households that are further away. While some of the local households will also receive benefits from the project in the form of employment and government revenue, the benefits of the project are probably spread over a wider population than the costs. For example, benefits from employment, corporate profits, and government revenues are widely dispersed among the population of Alberta, Canada and the rest of the world. In other words, households living in the region will probably experience a larger portion of the costs of the project than of the benefits. Since this is already the case for the many other oil sands projects in the region, this raises questions of fairness which the Panel should also consider in its deliberations.


\textsuperscript{39} Kelly, Erin N., Jeffrey W. Short, David W. Schindler, Peter V. Hodson, Mingsheng Ma, Alvin K. Kwan, and Barbra L. Fortin. 2009. Oil sands development contributes polycyclic aromatic compounds to the Athabasca River and its tributaries. \textit{PNAS} 106 (52): 22346-22351.
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Curriculum Vitae

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Education

2011
PhD in Agricultural and Resource Economics
Department of Resource Economics and Environmental Sociology
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Bachelor of Arts in Environmental Studies, With Distinction
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Professional appointments

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Publications

Refereed journal articles


**Book reviews**


**Manuscripts in preparation**


Kits, Gerda J. Why Educating for Shalom Requires Decolonization.

**Conference presentations**


Invited talks and workshops


Campus talks
2018 Kits, Gerda. 2018. Member of panel on “From Clickers to Climate Change: Classroom Technology at King’s.” The King’s University, Mar. 6.

2016 Kooistra, Remkes and Gerda Kits. 2016. “Flipping the classroom: Fabulous feat or flagrant folly?” Faculty Colloquium, The King’s University, Nov. 29.

2015 Kits, Gerda. 2015. “People and the land: Decolonization and ecological economics.” Faculty Colloquium, The King’s University, Oct. 27.


Grants received
2014 Co-applicant, Connection grant for “Are We There Yet? Economic Justice and the Common Good” conference. SSHRC.

2013 Co-applicant, “Science and Oilsands Development: Science and Decision-making on Major Projects.” King’s University College Internal Research Funding.

Awards and honours
2007 - 2010 Canada Graduate Scholarship (Doctoral)
Social Sciences and Humanities Research Council of Canada

2007 - 2009 Walter H. Johns Graduate Fellowship
University of Alberta

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University of Alberta

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Courses taught
Introductory courses
2010 - 2013 Introduction to Macroeconomics
2010 - 2014 Introduction to Microeconomics
2014 - present Principles of Economics I
2015 - present Principles of Economics II

Senior-level courses
2012, 2015, 2016 Intermediate Applied Microeconomic Theory
2013, 2016 Intermediate Applied Macroeconomic Theory
2015, 2017 International Political Economy
2011, 2013, 2015 Introduction to Canadian Political Economy
2012 History of Economic Thought
2012, 2013, 2016 The Economics of Development

Professional service
2014 Reviewer, Sustainable Development
2014 Reviewer, Environmental Conservation
2013 Reviewer, Journal of Forest Economics

University service
2013 - present Teaching Committee
2012 - present Research Committee
2012 - present Website maintenance and updating, Politics, History & Economics program
2017 Biology screening/interview committee
2015 Environmental studies screening/interview committee
2012 - 2015 Faculty representative, Campus Ministry Committee, Classis Alberta, Christian Reformed Church of North America
2012 - 2014 “Are We There Yet? Economic Justice and the Common Good” conference planning committee (conference held May 12 - 13, 2014)
2014 Computing science screening/interview committee
2014 Biology screening/interview committee

Professional memberships
2013 - present Canadian Society for Ecological Economics
2007 - present Progressive Economics Forum
2012 - present World Economics Association
Alberta Over A Barrel

Environmental liabilities and royalties in the oilsands

By Regan Boychuk

prepared for Keepers of the Athabasca Watershed Society

towards the Joint Review Panel hearing for Teck’s Frontier project

Any credible evaluation of whether an energy project is the public interest must soberly examine both sides of the balance sheet: The potential economic benefits must be carefully weighed against its likely fiscal, environmental, health, and climate costs. My submission will focus on two dimensions of this equation, (1) the environmental liabilities inherent in Teck Resource’s proposed bitumen mine and (2) the royalty risk inherent in approving a marginal project on the assumption current royalty rates will remain in place indefinitely.

1. Environmental Liabilities

According the provincial energy regulator, Alberta currently has ~$260 billion in oilfield- and mining-related environmental liabilities, virtually all of which are unfunded. Albertas regulatory assurance programs collect only a very small fraction of this total as security, and the bitumen programs are unlikely to collect significantly assurance more before climate constraints limit and eventually eliminate bitumen production. The oil & gas and mining industries do not have a savings plan for the eventual retirement of trillions of dollars in unfunded environmental liabilities globally. Cleanup is funded from cash flow generated by current operations, posing special financial risks that require proper planning for unanticipated acceleration of cleanup obligations due to regulatory, economic, and natural causes.

As Alexander Clarkson warned, “resource extraction industries are capital intensive and can be heavily reliant on debt financing. Therefore, when commodity prices fall, the solvency of the company falls dramatically and the company is quickly unable to comply with [environmental regulatory] orders.” Teck Resources has flirted with bankruptcy more than once in recent years. The 2008 collapse in commodity prices left a ‘debt-riddled’ Teck ‘teetering on the brink of financial meltdown due to the $9.8 billion in debt it took on to buy Fording Canadian Coal in the final days of the commodities boom’. Teck’s ‘unlikely saviour was a stunning turnaround’ in US corporate bond markets in the spring of 2009, giving Teck ‘desperately needed cash and time to manage its crushing financial obligations.’ Interest rates on Teck’s bonds almost doubled to more than 11 per cent from its 2005 bond sales at ~6 per cent. At the end of 2009, Teck CEO
Don Lindsay reflected: “The world was in freefall and nobody knew where the bottom was.” Lindsay conceded ‘the company never considered an economic meltdown of the magnitude that occurred in late 2008 and 2009.’ “It could happen again”, he said.8

With the slow down in economic growth in China in 2015, Teck’s bonds slipped back to speculative grade. Moody’s and Standard and Poor’s cut Teck’s outlook to “negative” in June and Teck’s implied credit rating slipped six levels below investment grade. By the end of 2015’s third quarter, Teck had lost $2.1 billion and written down assets by $2.2 billion. Teck again recovered as the result of a larger-than-expected bond sale in US markets, refinancing debt at higher interest rates to buy itself time to complete investments in its 20 per cent stake in Suncor’s Fort Hills bitumen project.9 If climate constraints or accelerated regulatory obligations lead to the early retirement of producing assets, however, Teck will not have the option of turning to capital markets for salvation.10

Trillions of dollars in unfunded environmental liabilities put the oil & gas and mining industries at constant risk of bankruptcy, leaving the public at constant risk of inheriting enormous cleanup costs. This manifests itself as powerful leverage for industry against government to extract regulatory, royalty, and even diplomatic concessions in order to avoid or delay costs that could lead to bankruptcy. It is regulators’ responsibility to prevent placing the public and their political representatives in this Catch-22. This dynamic has already manifested itself in relation to Teck Resources and another Canadian jurisdiction. It should serve as a cautionary tale.

1.1 Bending the Rules at Coal’s Twilight

Teck Resources had been aware of the issue of selenium runoff from their coal operations in the Elk Valley for many years. With Environment Canada investigating and a university study of the issue about to be released, Teck announced to shareholders in February 2013 it would spend up to $600 million over five years on water diversion and treatment facilities to address the problem. Teck also told shareholders to expect permitting delays for future projects until regulators accept their selenium management plan and assess cumulative impacts.11

The British Columbia government approved Teck’s planned expansion of coal operations in the Elk Valley later that same year, despite the fact the environmental assessment “was not able to conclude on the magnitude, reversibility and therefore significance” of an array of pollutants. ‘Nor could it determine “the effectiveness” of two planned water-treatment facilities that will use new methods in an attempt to filter out selenium.’ ‘Without approval,’ Mark Hume wrote in the Globe and Mail, ‘the mine would have shut down, 500 jobs would have been lost and the
pollutants already seeping from existing mountains of waste rock would have continued to leach into the river.’

As it turned out, Environment Canada’s 2012 investigations had found selenium levels in the Fording River so high the reproductive output of fish had been reduced by ~180,000 per year. Teck’s $100-million treatment plant, only the second such plant to ever utilize fluid bed reactor technology, was shut down in 2014 after a fish kill downstream. Teck received the largest ever single incident fine in relation to BC Fisheries Act pollution ($1.425 million), ended its relationship with the US engineering firm that built the plant, reconfigured the (still offline) treatment facility, and announced selenium-related spending would now increase 50 per cent to $900 million over the following five years. The BC auditor general later found the Ministry of Environment had denied a permit for Teck’s expansion of its Line Creek coalmine, but cabinet ignored the risks to the Elk Valley watershed and approved it anyway – the first time such powers had been used in BC. The federal government has since run diplomatic interference with our downstream neighbours, blocking the release of information on contaminants many times above guideline levels to the International Joint Commission.12

1.2 Discounting Environmental Liabilities

The discounting of environmental liabilities on company balance sheets is perhaps the most controversial aspect of financial accounting.13 Counter-intuitively, the less stable and resilient a company, the more accounting practice has tolerated the extent to which such a company can discount its environmental liabilities.14 This has the perverse effect of enabling the worst companies to take on the most dubious projects, placing both the public purse and the environment at maximal risk.

Reclamation costs are often the largest unfunded liabilities in the financial statements of firms operating in polluting industries. Those liability amounts are accounted for in present-value, making them very sensitive to the discount rate used. The discount rate difference can increase the asset retirement obligation* by 100 to 125 per cent – or even more for particularly for long-lived assets like coal or bitumen mines. “This is an area of major divergence between generally accepted accounting principles in the USA (US GAAP) and International Financial Reporting Standards (IFRS). Before moving to IFRS [in 2011], Canadian GAAP was converged with US GAAP on the reporting of environmental liabilities.”15

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* Asset retirement obligations under US GAAP are roughly equivalent to decommissioning and restoration provisions under IFRS and both are treated roughly equivalent to reclamation in this paper, though the specific obligations contained within either vary according to the jurisdiction the liabilities reside. Reclamation, for example, involves very little remediation in the US compared to Alberta.
“It is a well-known ‘dirty secret’ that environmental liability estimates developed in conformance with US accounting standards are unreliable and all too often materially understated”, Greg Rogers, the world’s leading authority on environmental liability reporting, wrote in 2010. “The vagaries of contingency accounting and environmental law and science, however, have made it practically impossible to empirically demonstrate this conclusion. As a result, the inherent incentives for manipulation have been unconstrained.”

In the following sub-sections, the evolution of environmental liability accounting practice and rules will be traced, Teck’s environmental liability reporting will be analyzed, and a practical solution to the discount rate controversy developed by leading environmental liability experts Greg Rogers and Charlie Atkins will be laid out.

1.2.1 The debate about discount rate diversity

Canadian accounting rules began requiring recognition of environmental liabilities in 1991. However, lax rules around management discretion over estimation, discount rates, and useful life meant these liabilities posed little challenge to industry balance sheets. But the 2011 transition from Canadian GAAP to IFRS could have resulted in billions in additional liabilities being recognized on Canadian balance sheets. IFRS did allow exemptions for first-time accounting of oil and gas liabilities in transition to its rules, but there was already significant diversity in how environmental liabilities were accounted for among Canadian companies, and the biggest difference between Canadian/US GAAP and IFRS had to do with discount rates and whether to include “own risk” within the “risk-free discount rate”.

Calculating the present-value of future environmental liabilities involves discounting future cash flows related to their retirement over the remaining useful life of the asset. “Under old Canadian GAAP and US GAAP, the ARO is estimated and then it is discounted based on the credit-adjusted risk-free rate. This is calculated as the current risk-free rate plus an adjustment to reflect the credit worthiness of the firm. Hence, the worse the firm’s credit rating, the higher the discount rate and the lower the present value of the ARO.” (Schneider 2011: 7)

The International Accounting Standards Board (IASB) is the group of experts responsible for developing IFRS Standards.

International Accounting Standard 37: Provisions, contingent liabilities and contingent assets (IAS 37) is most often interpreted as dictating the use of a risk-free discount rate, with no adjustments for own credit risk. …However, IAS 37 does not explicitly state that including own credit risk is not allowed and it was argued that firms could choose to include own credit risk in the
discounting of future environmental liabilities. ...As the Canadian IFRS transition date approached, the oil and gas industry in particular promoted the idea that including own credit risk was allowed under IAS 37. The debate over including own credit risk became the major issue for practitioners and standards setters during the transition to IFRS in Canada. Canadian Regulators requested guidance from the IFRIC [IFRS Interpretations Committee] over the discount rate, but the IFRIC refused and the issue was left unresolved at the time of transition. (Schneider, Michelon, and Maier 2017: 379)

At its November 2010 meetings, IFRIC recognized diversity of practice in including own risk, but was reluctant to clarify the issue itself.\textsuperscript{19} According the IFRIC staff’s assessment of whether the committee would be able to reach a consensus on a timely basis:

\begin{quote}
No. The problem with the IAS 37 measurements in general, and discount rates in particular, is that they are vague. There is not a clear measurement objective. Accordingly, any consensus the Committee reaches may be controversial, and could differ from the decisions made by the [International Accounting Standards] Board, as it continues its deliberations of the Liabilities project. The new liabilities standard is currently expected to be issued in 2011.\textsuperscript{20}
\end{quote}

In deciding not to take the issue onto its agenda in November 2010, the IFRS Interpretations Committee noted IAS 37 does not explicitly state whether or not own credit risk should be included, but also noted the predominant practice was to exclude own credit risk.\textsuperscript{21} This did not sit well with Canadian respondents, particularly the Accounting Standards Board (AcSB): ‘The inclusion of the comment regarding “predominant practice” in the tentative agenda decision could imply excluding credit risk from the discount rate for liabilities is consistent with the Framework and that no other accounting choice is permissible.’ The AcSB suggested IFRIC acknowledge diversity, but defer to the IASB’s larger liabilities project to clarify the issue\textsuperscript{22} – which is what IFRIC staff ultimately recommended:

\begin{quote}
The [IFRIC] staff think that paragraph 47 of IAS 37 is not clear on this issue, and the comment letters received provide evidence of diversity in practice outside of the jurisdiction in which this issue was initially raised. The staff do not think, however, that the Committee is in a position to state that own credit risk should or should not be included in the discount rate when measuring provisions. The staff still think the best place for this clarity to be provided is in the new Liabilities standard.\textsuperscript{23}
\end{quote}
The issue came to a head at contentious IFRIC meetings in March 2011. The chair of the Interpretations Committee ‘noted that the objections seemed to stem from an industry in one country adopting IFRS in 2011 and opined that the objections were not persuasive to overturn the assertion that predominant practice among those already using IFRSs was to exclude own credit risk from ‘risks specific to the liability’ in IAS 37 paragraph 47.’ Over the course of the meetings, the IFRIC chairman stated strong views:

…if I can make an observation at all about what I know of the extractive activity and also the Canadian situation. …the key issue I think is the more I see one industry and particularly in one country but certainly one industry complaining, I have to question why they are complaining and what the change is. Many in the extractive industry for environmental reasons have to post a bond or a Government guarantee or some other assurance that they will be able to meet their environmental obligation when it falls due several years into the future. They do that because not to put too fine a point on it, people in the extractive industry, especially the smaller ones, exploit, pillage, rape and then disappear with all the money and leave the mess behind for other people to clean up.

…I’m afraid the lesson for the Canadians is if you want a rules-based system you should have stayed with US GAAP. If you want to come to a principles-based system means making judgments, but considering the way that other people around the world also come to the determination of those judgments. And if you want a rule that says, or if you want a book of rules that says, I will do it this way unless you show me where it says I can’t, then I’m sorry, that’s the wrong philosophy for adopting IFRS.

Deloitte’s independent record of the March 10th meeting expected the predominant practice comment to remain in the committee’s decision, but it was ultimately dropped. As a result of IFRIC’s refusal to clarify the issue, two of the four major accounting firms that did not allow for inclusion of own credit risk had to change their position and allow it.

Part of IFRIC’s reasoning in not addressing the ambiguity of IAS 37 in 2010 and 2011 was that it would be dealt with shortly by the IASB liabilities project (the new liability standard was expected in 2011) – but more than seven years later that project remains years away from any conclusion. Reluctant to contradict major international oil and gas companies like ENI, Statoil, and those operating in Alberta’s oilsands that incorporate own risk into their environmental liability discount rates – and no longer being able to credibly defer to the IASB’s liabilities project to decide the issue – the IASB appears to have regressed to insisting there is no
substantial diversity in practice. While convenient for avoiding conflict with powerful clients, this position is not credible.

1.2.2 Management discretion, post-transition

Decommissioning and restoration provisions (DRPs) under IFRS or asset retirement obligations (AROs) under US GAAP “cover a number of very large future financial obligations which, by definition, are uncertain as to their timing and/or amount.” According to Thomas Schneider, “They are subject to a certain degree of management discretion with regards to both the amount and the timing, which leaves a great deal of flexibility in calculating the final number that shows up on the balance sheet.” Schneider, Michelon, and Maier add:

The extensive literature on earnings management has shown that when management discretion is available, it will be used (Healy and Wahlen, 1999; Roychowdhury, 2006; Dechow et al., 2010). Hilton and O’Brien (2009) provide evidence of opportunistic use of reporting regulations in the mining sector to avoid recognizing the impairment of mining assets. The opportunistic use of specific exemptions under IFRS 1 First time adoption of International Financial Reporting Standards (IFRS 1), and other options that present themselves upon transition have also been documented in the recent literature. Capkun et al. (2012), Ahmed et al. (2012) and Cormier et al. (2009) present evidence of opportunism and earnings management on transition to IFRS for European companies.

In their analysis of Canada’s transition to IFRS, Schneider, Michelon, and Maier (2017: 380, 387) find

the likelihood for firms to include own credit risk on transition to IFRS in Canada is increasing with the amount of environmental liabilities and when there is a greater exposure to US investors, after controlling for size, bankruptcy risk, leverage, media coverage, volatility and auditor. ...we note that most of the largest Canadian oil and gas companies, with significant operations in the controversial Alberta oil sands, choose to include own credit risk in discounting their environmental liabilities, while most of their smaller counterparts moved to the risk-free discount rate. In additional analyses, we find no evidence that investors place different value-relevance on environmental liabilities based on firms using a risk-free vs credit-adjusted [own risk] discount rate. This is an important additional element to understand why there is diversity in practice: if investors do not adjust for the discount rate
choice under IAS 37, managers are not restricted by stock market forces in making their discount-rate choice. ...We provide evidence that firms do not behave uniformly and their choice is dependent on their own reporting incentives. ...In total, 29 percent do not follow what the IFRIC declared as “predominant practice” (IFRS Interpretations Committee 2011: 3). 

...Qualitatively, with almost one in three of the firms including own credit risk, we conclude that there is significant diversity in practice.\(^3\)

Overall, their analysis of Canadian use of discount rate discretion led Schneider, Michelon, and Maier (2017: 391) to conclude “the size of a firm’s environmental provision and its exposure to the US capital market are key determinants in managers choosing to continue to include own credit risk in discounting their environmental liabilities.” But, while IFRIC had reluctantly acknowledged Canadian own risk discount rate diversity at transition, it nonetheless maintained that diversity did not exist internationally. Schneider, Michelon, and Maier examined that contention and found it unsupported by the evidence.

We conclude that there are enough oil and gas firms including own credit risk that a Canadian oil and gas firm would be justified in pointing to international practice as a reason for including own credit risk. This is what the Canadian oil and gas industry did when presenting its arguments to the IFRIC and we believe this is a major reason we find significant diversity in practice in the oil and gas industry upon transition to IAS 37. The story is somewhat different for the mining industry. Of the [international] 20 mining firms we sampled, we could identify none that included own credit risk. This puts the Canadian mining industry in a weaker position as compared to the oil and gas industry. However, if an audit firm allows an oil and gas firm to include own credit risk, the same audit firm would not be able to tell a mining company it could not do the same: in other words, once the practice is adopted by one industry, an auditor would not be able to deny its adoption by a firm in a similar industry. (2017: 396)

While no international mining companies were found to include own risk in their discount rates, Teck Resources does include own risk – at times using discount rates as high as 15 per cent to shrink environmental liabilities on its balance sheet, while also using useful lives extending more than a century into the future to apply those discounts to. The result is comparatively miniscule environmental liabilities showing up on their balance sheet.
1.3 Analysis of Teck Resources’ Environmental Liability Reporting, 2007-2017

In a November 2011 comment letter to the International Accounting Standards Board (IASB), Teck Resources noted “extractive activities are a global industry and there is disparity in the accounting for and presentation of various significant items, which makes comparison of similar entities difficult” and urged “the IASB to address the significant divergence issues in accounting for extractive activities.” The IASB’s refusal has allowed significant management discretion and Teck has utilized that discretion. For instance,

under IFRS (IAS 37), the discount rate used when the provision is originally recognised does not stay with the provision. All provisions are re-valued based on the discount rate as calculated at the current financial statement date, not the discount rate at the time of the original recognition. …This difference in addressing revisions to the discount rate with the move to IFRS has the potential to be the most significant change in the way environmental liabilities are valued on the balance sheet and ultimately pass through the income statement.

Schneider, Michelon, and Maier (2017: 397) found this inappropriate and recommended IAS 37 be changed to align with US GAAP on this point. “With own credit risk allowed under IAS 37, if a firm approaches bankruptcy environmental provisions can be wiped off the balance sheet. We struggle to believe this was the actual intention of the IASB and the IFRIC.”

As the economic crisis of 2008 pushed Teck to the brink of collapse, its inclusion of own risk gave it the opportunity to increase its nominal discount rate to 16.5 per cent – but Canadian GAAP rules meant it could only apply that discount rate to liabilities incurred in that same year, so the balance sheet impact was relatively minimal. However, the 2011 shift to IFRS granted far greater discretion, allowing new discount rates to be applied to all environmental liabilities, regardless of when they were incurred. When slowing growth in China pushed Teck’s corporate bonds back into junk status in 2015, part of the way Teck weathered the storm was doubling the discount rate it applied to its environmental liabilities. IFRS rules allowed Teck to temporarily shave more than half a billion dollars in environmental liabilities off its balance sheet by doubling its discount rates to ~14 per cent. (With its bonds back out of junk status the following year, Teck halved its discount rates and returned the liabilities to its balance sheet in 2016.)

Upon transition to IFRS in 2011, and more than a year after its bonds regained investment grade, Teck reduced its selenium-related discount rates, adding $230 million to their decommissioning and restoration provisions (DRPs). After the fish kill downstream from its Elk Valley treatment plant in October 2014, Teck changed its decommissioning and restoration cash
flow estimates related to selenium again and increased the related discount rate, shaving $331 million in liabilities from its balance sheet. After pleading guilty to the resulting environmental charges in 2017, Teck’s water quality DRPs ~tripled to almost $400 million.\(^{34}\) And yet, this was still only a fraction of the $900 million of expected selenium-related spending over the next five years, some of which would have to continue indefinitely in order to manage pollution levels.

Rather than establishing an asset retirement savings plan to ensure the timely settlement of selenium-related decommissioning and restoration provisions, Teck management has used its discretion to manipulate accounting estimates to suit the financial needs of the moment.

\[1.3.1\] Meaningful analysis of Teck’s environmental liability reporting not possible

Teck’s previous decade of regulatory filings was analyzed for insight into the company’s management and reporting of environmental liabilities (Teck Resources 2008-2018a-c). Modeled on the advanced financial analytics utilized by Greg Rogers and Charlie Atkins (2015b), this exercise was fatally compromised by inconsistencies and insufficiencies in Teck’s reporting, as well as the 2011 transition to IFRS. Teck’s closing 2010 balance of environmental liabilities under Canadian GAAP is not reconciled with the opening 2011 balance under IFRS, leaving a difference of hundreds of millions unexplained.\(^{35}\) The post-2010 data is both insufficient as well as too inconsistent to draw informed conclusions. Teck’s failure to publicly report undiscounted and un-inflated figures prevents any alternative analysis of their liability data. Another major limitation is Teck’s failure to separately report “new liabilities incurred” from “revisions to prior cash flow estimates” – combining new liabilities with revisions to prior estimates eliminates accountability for poor estimation.

All this leaves in question whether even Teck itself properly understands its environmental liabilities, which it is presently applying to expand significantly with the Frontier bitumen mine. Teck Resources makes inappropriate use of large, own risk discount rates to minimize the balance sheet impacts of its vast environmental liabilities, it does not publicly report sufficient data to allow a detailed evaluation of its environmental liability management, and the company has not properly planned to fund the eventual retirement of its significant global liabilities. This leaves the public at extreme risk of inheriting very significant environmental liabilities, virtually guaranteed to exceed the economic benefit it derives from Teck’s proposed bitumen mine.

While Teck Resources will enjoy significant capital gains from share price appreciation resulting from expanded economic potential and the booking of bitumen reserves very early in the Frontier bitumen mine project, any change in projected operations over the coming decades leaves the company at real risk of bankruptcy and the public at real risk of ultimately enduring a net loss on the project. The economics of the Teck’s bitumen mine must be robust enough to
properly protect the public from adding to the already enormous unfunded environmental liabilities Alberta is currently at severe risk of inheriting from industry. The proper use of discount rates is essential to that calculus.
1.4 Resolving the Controversy Over Own Risk Discount Rates

There are glaring differences between environmental and financial liabilities, but accounting rules continue to be treated them as if they were the same. “In the case of default on financial liabilities,” write Schneider, Michelon, and Maier, “the creditors end up with the firm’s assets and the debt is effectively discharged. Environmental liabilities do not simply disappear if the polluting firm goes into insolvency.”

On the contrary, they often remain with the associated asset and serve to impair any future cash flows if the firm’s creditors takeover. Environmental liabilities may lead the creditor to have no desire to take over the residual assets of the firm, if they loom too large on the balance sheet. Ultimately, and in any case, all the costs associated with pollution are born by society at some level.

“The ultimate goal”, Schneider, Michelon, and Maier conclude, “is to get standards setters to make on balance sheet environmental liabilities directly reflect the true nature of these liabilities. No matter what one would wish, they do not simply go away if an entity is unwilling or unable to pay for them.”36

In the opinion of this writer, Greg Rogers and Charlie Atkins37 have convincingly resolved the debate over the inclusion of own risk in discount rates for under both US GAAP and IFRS. The key to reconciling the seemingly more permissive US rules with the supposedly less accommodating international accounting rules is to be found in Statement of Financial Accounting Standards No. 143, which governs accounting for AROs under US GAAP. Note 18 to paragraph A21 states: “In determining the adjustment for the effect of its credit standing, an entity should consider the effects of all terms, collateral, and existing guarantees that would affect the amount required to settle the liability.”38

In determining the adjustment for the effect of its credit standing, an E&P [oil/gas exploration and production] company should consider “the effects of all terms, collateral, and existing guarantees on the fair value of the liability.” Our research shows that E&P companies frequently estimate the fair value of AROs using a credit risk adjustment based on their incremental unsecured borrowing rate above a risk free rate (credit spread) on debt of similar maturity. For example, if the interest rate on a 30-year US Treasury is 2.5 percent and the interest rate on the reporting entity’s 30-year unsecured bond is 6.5 percent, the credit spread is 4.0 percent. Use of the entity’s credit spread in estimating the fair value of environmental liabilities implicitly assumes that the “terms, collateral, and existing guarantees” applicable to a company’s
unsecured corporate bonds are the same as those applicable to its environmental liabilities. However, this assumption is not valid.\(^{39}\)

### Comparison of Default Risks of Corporate Debenture and DRPs\(^{40}\)

<table>
<thead>
<tr>
<th>Terms</th>
<th>Corporate Debenture</th>
<th>Decommissioning and Restoration Provisions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Principal amount</strong></td>
<td>Fixed amount</td>
<td>Indeterminate amount</td>
</tr>
<tr>
<td><strong>Due date</strong></td>
<td>Fixed date</td>
<td>Indeterminate due date</td>
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<tr>
<td><strong>Interest rate</strong></td>
<td>Fixed or adjustable</td>
<td>No interest</td>
</tr>
<tr>
<td><strong>Collateral</strong></td>
<td>None</td>
<td>Secured by related asset</td>
</tr>
<tr>
<td><strong>Other security</strong></td>
<td>None</td>
<td>Regulatory financial assurance</td>
</tr>
<tr>
<td><strong>Tax effects</strong></td>
<td>Principle payments not tax deductible</td>
<td>Principle payments are tax deductible</td>
</tr>
<tr>
<td><strong>Priority in bankruptcy</strong></td>
<td>Lowest priority</td>
<td>Possibly highest priority</td>
</tr>
<tr>
<td><strong>Obligors</strong></td>
<td>Issuer only</td>
<td>Other jointly and severally liable parties</td>
</tr>
</tbody>
</table>

A number of terms and conditions relate to DRPs and protect the holder (the Alberta government) against default by the debtor. Examples are summarized in the table above and described in greater detail below, both adapted from Rogers and Atkins (2015a: 61-69):

- **Principal Amount**—The actual cost of decommissioning and restoration obligations cannot be fully known until the actual work is complete, but the legal and moral responsibility is to return the site to near its original state. The largest DRP expense and biggest unknown is the extent to which remediation is required for spills, leaks, and contamination that occurs at known rates but is not quantified at specific sites until investigation, typically only when reclamation is finally carried out.

- **Due Date**—DRPs have an indeterminate due date that is subject to acceleration by government action. With equivalent regard to AROs, Standard & Poor’s observes:

  Uncertainties inherent in their estimation include... The timing of asset retirement, which is subject to assumptions that can change materially. For example, in extractive projects, future price expectations for hydrocarbons or minerals affect the economic life of the assets. For power generators, asset-retirement timing depends notably on local regulatory decisions. Their impact might be favorable (i.e., in the case of an operating license extension) or unfavorable (i.e., in the case of an early mandated closure).\(^{41}\)

  The government’s ability to accelerate maturity through discretionary enforcement reduces its default risk.

- **Interest Rate**—Because DRPs do not carry interest, there is no risk of default on accrued but unpaid interest on the debt, and therefore the risk of default is lower.
• **Collateral**—DRPs are secured by the related asset. When DRPs are incurred, reclamation is fully secured because the value of an oil/gas/bitumen lease can reasonably assumed to exceeds the value the related decommissioning obligations. The lease can also be sold to a third party, who then assumes the liability – in which case the holder of the DRP (the Alberta government) may now have the security of the new owner, the prior owner, and the property and equipment. Additionally, the DRP may be effectively cross-collateralized by other assets of the debtor. And even at the end of the asset’s useful life, there may still be significant salvage value on site to offset reclamation costs.

• **Other Forms of Security**—Many regulatory regimes require the debtor to provide financial assurance in the form of trust funds, surety bonds, letters of credit, etc. The Alberta Energy Regulator’s Licensee Liability Rating Program and Mine Financial Security Program are two such regimes and their tests are at least intended to ensure the debtor poses an acceptably small default risk.

• **Tax Effects**—Decommissioning and restoration costs are tax deductible. Thus, tax savings, which are not considered in the estimated cash outflows used to estimate the DRP, should be deducted from the principal amount of the obligation when calculating the amount of the debt. Because the principal amount of the debt is smaller relative to the debtor’s assets, default risk is reduced.

• **Priority in Bankruptcy**—Though rarely (if ever) utilized by Albertan officials, until recently the powers of regulators to hold polluters jointly and severally liable was clearly established by the *Northern Badger* case (*Laycraft, Foisy, and Irving 1991*). The *RedWater Energy* case, currently before the Supreme Court of Canada, has recently cast doubt on these powers (*Wittmann 2016; Slatter, Schutz, and Martin 2017*). The *RedWater* case may well be decided by the time this hearing takes place, but at risk of contradicting the forthcoming decision, it is crucial to understand the background to the bankruptcy and environmental liabilities in Canada.

“Bankruptcy law is essentially a private system for the resolution of monetary disputes”, writes Dianne Saxe.

To a considerable extent, the risk has already materialized, and most of the money has been lost. Bankruptcy is therefore a defined procedure for allocating defined harms which have already occurred among a defined group. This structure does not accommodate, and was not designed to manage, risks of unlimited future harm to unlimited and
unidentified parties. Some environmental conditions present exactly this sort of risk.\textsuperscript{42}

“Canada’s current scheme of allocating the cost of environmental reclamation upon bankruptcy is environmentally harmful and fundamentally unjust”, according to Alexander Clarkson (2011: 33-34). “The problem with Canada’s environmental reclamation regime at bankruptcy is simple: At bankruptcy the cost of cleanup is often transferred from the bankrupt company to the public. Therefore, there is an incentive for companies to neglect their environmental obligations before bankruptcy.”

Up until about a decade ago, the legal consensus was that, even in bankruptcy, the public health and safety nature of environmental legislation rendered compliance mandatory. “The courts clearly voiced the opinion that the stay of proceedings does not and should not amount to permission to violate the law with impunity”, according to Nicholas Chaput. “Compliance with clean-up orders could not be assimilated to ordinary debts owed to the public authority charged with administering the statute.”\textsuperscript{43} In the Alberta lower court decision on Northern Badger, Justice MacPherson decided environmental cleanup took a back seat to secured creditors. “This was incorrect”, Dianne Saxe wrote at the time. “The logical conclusion of the Justice’s argument would be that a trustee in bankruptcy could ignore all provincial statutes if they would thereby save money, including dumping hazardous waste in a school yard if that were cheaper than using licensed disposal sites as required by provincial legislation. Fortunately, Justice MacPherson’s decision was reversed on appeal.”\textsuperscript{44}

However, the Northern Badger appeal court decision also introduced a complication, the ramifications of which are being felt today in the RedWater case. Because the oil company and its trustee misled the courts and disposed of all other assets except the seven inactive wells the regulator was asking be safely plugged before the appeal court ruled on the case, the Justices were not particularly sympathetic about the fact there were no funds remaining in Northern Badger’s estate to carry out their decision. The trustee was forced to abandon the wells in question at its own expense without any indication it could seek costs from the secured creditors that had benefited from the sale of the rest of Northern Badger’s assets.\textsuperscript{45} This resulted in insolvency receivers and bankruptcy trustees being reluctant to take on oil or gas companies out of fear they could be held liable for imposed environmental cleanup costs. Federal legislators addressed these legitimate concerns with amendments to the Bankruptcy and Insolvency Act (BIA) in 1992 and 1997. The 1997 amendments, meant to resolve uncertainties, have however resulted in more confusion. (Chaput 2012: 13, 16)
According to Alexander Clarkson and others, the Parliamentary debates and government materials from 1997 state these amendments had two purposes: “(1) to limit the liability of the trustee/receiver so they would be comfortable administering bankruptcies with environmental liabilities and (2) to nonetheless provide the public with an avenue to recover the cost of environmental reclamation.” The 1997 amendments were part of Bill C-5, tabled by Minister of Industry John Manley. When asked in Parliament “whether any action has been taken to prevent the dumping of contaminated buildings and worksites on local governments”, Manley replied:

We have given claims which stem from environmental damage priority over those of other creditors, both secured and unsecured, so that dealing with contaminated properties and properties that are adjacent to the property where the damage occurred and linked to the activity that caused the environmental damage will be able to be used as a priority claim in order to effect the cleanup. This will not only relieve some of the responsibility from local governments, but it will also ensure that trustees are willing to move in and take on some of these very difficult files. (Manley 1995)

In regards to virtually identical amendments to the rules around corporate restructuring, Liberal MP Ron MacDonald stated:

We were concerned because we did not want companies to be able to walk away because of environmental liabilities and leave effectively the crown or the trustee or the municipality with the burden. I am very pleased to see that basically there is a type of super-priority given to environmental clean up of these orphaned sites. (MacDonald 1996)

Industry Canada’s Sustainable Development Strategy reported the 1997 amendments helped “avoid ‘orphan site’ problems, alert environment ministries quickly to environmental problems and provide available funds from the estate to help finance the cleanup.” “Overall,” Clarkson concludes, “it appears from the Parliamentary debates and government publications that the purpose of the 1997 amendments was to protect the trustee and to relieve the public of some of the cost of cleaning-up abandoned sites.”

Indeed, that is exactly how Canadian courts interpreted the 1997 amendments in the decade that followed – despite efforts by industry to spin them to their advantage. “It might be argued that [Bankruptcy and Insolvency Act] s.14.06(8) provides... that an environmental costs claim is a provable claim”, Justice Burrows decided in 2005:
That, in my view, would be a misinterpretation of s. 14.06(8). I interpret the section as intending only to overcome what would otherwise be the effect of s. 121(1). That section provides that liabilities to which the bankrupt is subject on the day on which he becomes bankrupt, or to which he may become subject before discharge by reason of an obligation existing at the time of bankruptcy, are provable claims. If that section applied, an environmental claim arising after the date of bankruptcy but before discharge might not be a provable claim. Section 14.06(8) deals only with that timing issue. It does not convert a statutorily imposed obligation owed to the public at large into a liability owed to the public body charged with enforcing it. The [Northern Badger] principle continues to be part of the law.48

This understanding of the 1997 BIA amendments was undone by court decisions in Ontario and by the Supreme Court of Canada in its 2012 decision on AbitibiBowater. That case has provided the central justification for the recent Alberta court decisions on RedWater, despite the lower court in the AbitibiBowater case noting that one should be careful in the application of the case because it dealt with a unique set of facts. (Chaput 2012: 25) According to Clarkson (2011: 56), “although advocating against a “third-party pays” principle, the effect of the [Supreme] Court’s [AbitibiBowater] decision is to place the brunt of the costs of remediation on a third party: the public. In most cases the public would be left with the vast majority of costs of remediation”.

In the RedWater case, Alberta courts were unsympathetic to such concerns.49 In the appeal decision, the majority dismissed as “exaggerated” any fears the insolvency process as currently interpreted would be abused “for the purpose of avoiding environmental liabilities.”50 This dismissal, without argument or evidence, was far too flippant given the scale of unfunded environmental liabilities that already exist in Alberta: ~$260 billion according to Wadsworth (2018). In fact, eventual Nobel laureate and World Bank president respectively, George Akerlof and Paul Romer (1993), demonstrated 25 years ago the economic logic of looting a company doomed to fail – a strategy they coined Bankruptcy for Profit. Harvard Economics Professor Greg Mankiw commented at the time: “Indeed, given the incentives that regulators set up, it would be irrational for operators... not to loot.”51

To conclude this lengthy sub-section, the priority of regulators in bankruptcy was clearly established in Canada until courts began applying an alternative and widely permissive interpretation to the 1997 amendments to the federal Bankruptcy and Insolvency Act after 2007, culminating in the Supreme Court’s 2012 AbitibiBowater decision. The
*RedWater* case has furthered the controversy in these regards with specific relevance to oil and gas operations in Alberta, but (at least in the opinion of this writer), there is a reasonable chance the Supreme Court will limit or reverse the current permissive interpretation of bankruptcy law and reestablish some or all of regulators’ priority in the matter of environmental liabilities in bankruptcy. If the Supreme Court upholds the currently permissive interpretation of bankruptcy law, no regulator can in good conscience approve a project of the scale of Teck’s Frontier bitumen mine without full security for environmental liabilities up front.

And to conclude this section on the discount rate debate, environmental liabilities do not just go away if a firm becomes insolvent. There are significant and material differences between financial liabilities and environmental liabilities. “If shareholders manage to walk away from responsibilities associated with environmental liabilities they often fall to the creditors, and from there they fall to governments and society in general.”

Hence, environmental liabilities can be described as a liability that is not just attributable to the equity holders. Should accounting regulators believe that financial statements only reflect the liabilities directly attributable to equity holders, then including own credit risk is appropriate. However, then the full re-valuation of environmental provisions under IAS 37 at each reporting date is not appropriate and the standard should be changed to align with US GAAP on this point. With own credit risk allowed under IAS 37, if a firm approaches bankruptcy environmental provisions can be wiped off the balance sheet. We struggle to believe this was the actual intention of the IASB and the IFRIC. *(Schneider, Michelon, and Maier 2017: 397)*

In summary, as Rogers and Atkins have persuasively concluded: US bankruptcy courts, the US Securities and Exchange Commission, US generally accepted accounting principles, the International Accounting Standards Board, and environmental regulators “all reach the same conclusion: the debtor’s credit risk should not be included in the discount rate used to estimate environmental liabilities. Instead, environmental liabilities should be discounted at a rate no higher than the risk free rate.” *(2015a: 65-66)*

**1.5 Estimating Full Security for Teck’s Frontier Mine**

In its May 2017 responses to Joint Review Panel information requests, Teck reports the total reclamation cost of the proposed Frontier mine as $11.824 billion.52
Teck also suggests the maximum outstanding reclamation balance for the project would be $4.304 billion in 2037:\textsuperscript{53}

To give a sense of the importance of discount rates in estimating the balance sheet impact and cost-benefit import of environmental liabilities, consider the above two estimates discounted using Teck’s chosen discount rate vs. using a risk-free discount rate. In Teck’s application, its net-present-value calculations use an eight per cent discount rate. The proper benchmark for a risk free rate is the yield on the Bank of Canada’s Real Return Bonds. As of September 2018, the maturity date most relevant to Teck’s Frontier mine expecting to operate until 2066 are the 2050 Real Return Bonds, which yield 0.5 per cent.\textsuperscript{54}
Discounting the $11.8 billion cost of reclaiming the Frontier mine over its useful life using Teck’s eight per cent discount rate results in a net-present-value of just $216 million today. Using a proper risk-free discount rate results in a net-present-value of $9.3 billion – a difference of more than $9 billion or more than 4,200 per cent. The schedule of creating and retiring those environmental liabilities is more complicated than simply requesting the net-present-value of $11.8 billion today as full security of the project, but the example illustrates the impact of proper discounting.

Because Teck prefers (and the Mining Financial Security Program allows) virtually all of those environmental liabilities to be secured by yet-to-be-produced bitumen, Teck suggests the maximum outstanding liability it might ever have to secure would be $4.3 billion if the mine unexpectedly closed in 2037. If regulators decided to impose full security for what Teck suggests as ‘maximum liability’, the net-present-value of $4.3 billion in 2037 would be $883 million today using Teck’s eight per cent discount rate. Using a proper risk-free discount rate that same $4.3 billion would be valued at $3.9 billion today – a difference of more than $3 billion or 343 per cent.

But even Teck’s $11.8 billion and $4.3 billion estimates are not complete totals of environmental risk. Contingent liabilities related to unintended leaks, spills, and contamination need to be added to that total on a probability-weighted, expected value basis. Considering Teck’s proposed water-capping remains an “unproven” strategy for managing bitumen tailings, contingent liabilities have the potential to be significant.

### 1.6 Recommendations for Evaluating Teck’s Environmental Liabilities

**Rogers and Atkins (2015b: 68-69)** make a variety of recommendations to aid analysts and regulators in assessing the economic effect of DRPs and the ability of oil and mining companies to fulfill their decommissioning and restoration obligations:

- Disclose separate values for liabilities incurred and revisions to estimated cash flows.
- Identify and correct any internal control system deficiencies underlying high year-over-year rates of revision to expected cash flows.
- Establish an asset retirement savings plan to assure timely settlement of DRPs. The savings plan should account for the possibility of significant unanticipated acceleration in settlement dates.
- Include DRP payments in the obligations table reported in the annual *Management Discussion and Analysis*. If the amounts are discounted, it is important to supplement the disclosures with undiscounted figures so that analysts can see the total amount of...
undiscounted expected cash flows. If amounts include an inflation adjustment, this fact should be disclosed along with the un-inflated amounts. If expected cash flows are truncated (e.g., disregarded beyond \( n \) years), disclose the truncation period, the justification for the truncation, and the total period over which settlement of existing DRPs is expected to occur. If some obligations require perpetual asset retirement activities (e.g., water containment or treatment – both highly relevant to Teck’s operations), disclose the annual undiscounted and un-inflated cost of these activities.

- Recognize that DRPs are “critical accounting estimates” and provide useful, non-boilerplate MD&A disclosures that will improve forecasting.
- Disclose the following additional information, if not included elsewhere:
  - The undiscounted value of new decommissioning and restoration provisions incurred during the year. Separately disclose data for provisions assumed in business combinations.
  - The expected number of years over which the entity’s existing DRPs will be settled, the expected cash flow compounded annual growth rates (CAGRs) over that period, and the factors contributing to the anticipated cash flow CAGRs.
  - The historical and anticipated future order and pace of DRP settlement.
    - Absent information to the contrary, it is expected that similar assets will be retired on a first-in-first-out basis. If asset retirement costs related to newer assets will be incurred prior to decommissioning and restoration provisions for older assets, and the change in that order will have a significant impact on the amount and timing of expected cash flows, companies should disclose this information.
    - Also, absent information to the contrary, it is expected that companies would on average retire one year of DRPs (incurred 30 to 60 years ago) every year. This could be called an “equilibrium pace.”
    - To assist analysts in making projections from historical DRP payments, companies should disclose whether recent DRP settlement costs reflect an accelerated, equilibrium, or deferred pace of retirement.
  - The undiscounted amount of market risk premium with an explanation of how this amount was determined.
  - The discount rate used to calculate the present value of expected cash flows and, if the rate includes a credit adjustment, an explanation of how the credit adjustment was determined taking into consideration “the effects of all terms, collateral, and existing guarantees” specifically related to the entity’s DRPs.
  - Reasons for historical trends in the rate of revisions to expected cash flows and expectations for future revision rates.
Historical DRP/CapEx ratios, forecasted changes in this ratio, and the underlying causes of such changes.

- The amount and types of financial assurance, including restricted assets, in place to secure settlement of DRPs.
- Details about any decommissioning and restoration savings programs designed to assure the availability of sufficient resources to satisfy DRPs in a timely manner as they come due.

The above information and analysis is required in order to sufficiently evaluate Teck's environmental liability management if regulators intend to make an informed decision in the public interest to add billions more to the ~$260 billion in oil/gas/mining liabilities the Alberta public is already at severe risk of inheriting from industry. Any evaluation of the viability of Teck Resources and any cost/benefit analysis of their proposed Frontier bitumen mine both need to properly account for their current and proposed environmental liabilities, including contingent liabilities and the potential for accelerated decommissioning and restoration obligations.

2. Royalty Risk

Alberta’s bitumen royalty regime was designed by six oilsands executives and adopted “in the main” by the Alberta government in 1997.\(^{58}\) Not surprisingly, it is exceedingly generous to industry. A decade later, the independent Royalty Review Panel deemed that royalty regime in need of significant reform in order to reflect the public interest. The Alberta government, however, failed to implement the majority of the Panel’s recommendations, leaving the industry-designed regime in place with adjustments that merely compensated for the corporate tax cuts enacted over the previous decade – and even then, only at sufficiently high oil prices.\(^{59}\)

Alberta’s bitumen royalty regime was formally excluded from examination during the province’s 2010 royalty review and was effectively excluded from examination during the 2015 royalty review. Bitumen land sales and royalties currently collect much less than a nickel for every dollar generated from oilsands development. Alberta has never produced more oil or collected fewer royalties than it does today. This is simply not sustainable over the long term.

A proper public interest evaluation of Teck’s proposed bitumen mine needs to appropriately account for royalty risk: the spectrum of potential royalty outcomes over the course of the Frontier mine’s life need to be weighted by probability and incorporated on an expected value basis into the cost-benefit analysis of whether the project is in the public interest.
In February 2018, Alberta Energy Regulator Vice President of Closure and Liability Management Robert Wadsworth told a crowd at the Calgary Petroleum Club that environmental liabilities for Alberta’s oil/gas/bitumen and mining industries totaled roughly $260 billion, including related contamination (Wadsworth 2018). The Society did not write up the event for their subsequent newsletter, as would have been typical, but the details were confirmed with Wadsworth via email (Personal communication, 3 May 2018).

According to the Alberta Energy Regulator (2017b: 1-2; 2018: 1), cash deposits and letter of credit guarantees currently held as security total $447,580,752 for coal mines, $939,252,679 for bitumen mines, and $178,973,469 for crude oil, natural gas, and in-situ bitumen. $1,565,806,900 represents approximately 0.6% of the regulators’ estimate of environmental liabilities.

Under the Mine Financial Security Program (MFSP), the Operating Life Deposit is only collected when proven and probable reserves (~300 billion barrels of high carbon oil) are depleted below 15 years remaining production (AER 2017a: 22-25). In-situ bitumen projects (i.e. SAGD) are managed under the Licensee Liability Rating (LLR) program; no deposits are currently held for bitumen projects through LLR.

In Carbon Tracker’s scenario offering a 50% chance of limiting global warming to 2°C, no new oilsands investment is required before 2025, including expansion/debottlenecking of existing projects. (2018: 12, 22) Oil Change International’s 2016 study concluded, “If we are to stay within the agreed climate limits and avoid the dangers that more severe warming would cause, the fossil fuels in fields that have already been developed exceed our global carbon budget.” (Muttitt 2016: 20)

Canada’s Ecofiscal Commission (2018: 38-39) recently highlighted the inadequacy of the MFSP in deterring or funding the accumulation of environmental liabilities in the oilsands: In six of seven categories, the MFSP was deemed “Negative” for both deterrence and compensation; “Positive” for investment).


‘In absolute terms, the authors estimate that the industry’s global environmental debt is several trillion dollars, an amount far greater than that officially reported in corporate financial statements. …The reality of course is that the vast and rapidly growing amount of oil and gas AROs [asset retirement obligations] are not funded and the states and the federal government do not have adequate security for future decommissioning expenditures.’

Greg Rogers, “Why the oil industry cannot afford to retire... yet!”, LinkedIn (11 September 2017):

‘The industry’s reported retirement obligations are highly material, but actual costs may be significantly larger. …Worse yet, industry analysts and the industry’s own financial reporting suggest that the underlying undiscounted cost estimates are too low. According to Boston Consulting Group, industry forecasts suggest that actual spending on decommissioning could be 1.5 to 2.5 times reported accounting estimates. …Unwary investors may be unpleasantly surprised to learn that the industry’s retirement obligations are much bigger than believed.

Accounting for liabilities is not the same as saving for them. People have trouble planning for retirement and so do companies. Decommissioning obligations are much like...
corporate pension liabilities. Complex accounting, measurement difficulty, excessive optimism, and frequent examples of gross underfunding characterize both. But unlike pension liabilities, decommissioning obligations are not subject to independent actuarial determinations of minimum funding obligations, and they cannot be discharged in bankruptcy. Because the industry has not saved for these obligations, it must keep producing income from some form of business activity to pay for its retirement. Failure to plan is planning to fail.

...With respect to asset retirement obligations, there is essentially no funding. There is no oil company 'lock box' of savings to fund these obligations. Stranded assets beget stranded liabilities. Carbon Tracker has reported that between 60-80% of fossil fuel reserves of publicly listed companies are ‘unburnable’ if the world is to avoid global warming of more than 2°C. The financial risk is that capital expended to find and develop these reserves could become wasted on stranded assets. In a 2°C scenario unburnable carbon equals stranded assets. Less understood is that unburnable carbon will necessarily also give rise to ‘stranded liabilities’ in the form of unpayable asset retirement debts. Unless oil companies, regulators, and investors begin collective efforts now to accurately measure and report the true scale of the problem, there is little chance of a timely solution.’


‘In the Canadian oil and gas industry, oil and gas producers are legally obliged to abandon and remediate every well and facility after production has ceased. In many cases this abandonment and remediation occurs decades after the wells are originally drilled. The use of dedicated remediation funds is rare.’


‘As S&P has stated, “AROs pose special financial risks due to a high degree of subjectivity, measurement imprecision, and uncertainty in the timing of settlement.” [Samson et al. 2007: 9] Producing estimates that accurately reflect the underlying economics and creditors' risks and rights is the first step. The next step is to assure the availability of sufficient resources to satisfy AROs as they come due. This requires asset retirement planning, as opposed to simply paying asset retirement costs out of operating cash flows. Such planning must also account for unanticipated acceleration due to regulatory, economic and natural causes. [James and Mock 2007]’

7 Alexander Clarkson, “In the red: Towards a complete regime for cleaning up environmental messes in the face of bankruptcy”, University of Toronto Faculty of Law Review, vol. 69, no. 2 (Spring 2011), p. 45.


‘Teck Resources Ltd. survived one near-death experience six years ago... Now investors are selling the miner’s bonds as if it’s headed back to junk. Teck’s investment-grade bonds are already trading like junk after its outlook was cut to “negative” in June. ...Moody’s Investor’s Service, which along with Standard Poor’s cut its outlook on Teck in late June to “negative” from “stable,” says the implied credit rating on the company’s Baa3-rated debt... is CaA1, six levels below investment grade. ...Teck is being further squeezed by spending on its 20 per cent share of construction costs at Suncor Energy Inc.’s C$13.5 billion Fort Hills oilsands project in Alberta.’

Danielle Bochove, Bloomberg, “No Groundhog Day for Canada’s Teck”, Vancouver Sun (26 November 2015), p. D2:

‘Like many natural-resource companies, Teck has been stung by collapsing demand from China, which has resulted in a plunge in the prices of everything it sells - copper, metallurgical coal and zinc. Teck lost $2.1 billion in the third quarter and wrote down assets by $2.2 billion, including $400 million on its Fort Hills oil sands project in Alberta. Teck’s commitment to the Fort Hills project, a joint venture with Suncor Energy Inc. and Total SA, has drawn parallels to its Fording Canadian purchase in 2008. Its downgrade back to junk by Moody’s, Standard Poor’s and Fitch Ratings Ltd. is also a reminder of those grim days.’

Peter Koven, “Bond sales gives Teck Mining financial breathing room”, Vancouver Sun (28 May 2016), p. C13:

‘a larger-than-planned $1.25-billion US bond offering that allows the company to refinance debt and provides some financial flexibility. But... this new bond offering carries higher interest rates than the older debt it is replacing. ... Despite the higher coupons on this new debt, experts said the deal is a sensible move. Teck has committed $2.9 billion to the Fort Hills oil sands project, and still has nearly $1 billion of spending remaining before first production, which is expected in late 2017. The timing of the Fort Hills investment is problematic, because the company’s cash flow is suffering due to weak copper and steelmaking coal prices. By pushing out debt maturities by several years, Teck has a buffer to get Fort Hills up and running without getting financially stretched.’

10 Greg Rogers, “Grading Exxon’s first climate risk assessment”, Eratosthenes (15 March 2018), p. 12:

‘The oil industry pays for decommissioning costs as they come due from current operations. There is no retirement savings account. If climate-related events trigger the early retirement of producing assets, and extra cash is needed for decommissioning costs, Exxon will not have the option of turning to the capital markets. Decommissioning costs produce a “return on environment” but offer no return on investment. Investors are right to be concerned that a combination of declining revenues and rising expenditures for decommissioning costs could trigger a liquidity crisis in a 2°C scenario.’

11 Peter Koven, “Good results have Teck sitting pretty”, Calgary Herald (8 February 2013), p. D5:

‘Teck also said it expects to spend up to $600 million over the next five years on water diversion and treatment facilities at its coal operations in Western Canada to combat increasing selenium concentrations in the water. Operating costs on those treatment facilities could reach $140-million per year [indefinitely], the company said. Those large expenses demonstrate that this is a major issue for Teck in the years ahead.’
Mark Hume, “‘Elk River is being poisoned,’ study finds”, Globe and Mail (21 March 2013), pp. S1ff:

‘a report co-authored by Richard Hauer of the University of Montana shows that selenium, nitrate and phosphate levels in the Elk River are higher than expected. ...Environment Canada had an investigative team in the Elk Valley last summer collecting water and fish egg samples’

Gordon Hamilton, “No new Elk Valley coal mines until selenium issue resolved”, Vancouver Sun (22 March 2013), pp. C1ff:

‘one of the largest water-quality projects in the world’; ‘In its fourth-quarter report, the company tells shareholders it expects permitting for future projects to be delayed until regulatory authorities accept the selenium management plan and can assess any cumulative impacts of new projects. ...The presence of selenium in the river is not a new issue. It has been identified downstream from Teck’s Elk River operations and from its coal mines upstream from Alberta’s McLeod River for years. Teck funded a 2010 report by experts and stakeholders that outlined the problem and came up with recommendations of how to mitigate its impact.’

Teck Resources Ltd., “Teck reports unaudited fourth quarter results for 2012”, Press release 13-4-TR (7 February 2013), p. 20:

‘Our draft plan contemplates total capital spending over the next five years of up to $600 million on the installation of water diversion and treatment facilities, and annual operating costs by the end of that period of approximately $40 million per year. Water treatment costs are expected to increase further in future periods, as additional treatment facilities are required to manage runoff from new mining areas. While the amount of those costs will depend on the technology applied to control selenium, our current estimate, assuming no substantive changes in technology, is that over the long term treatment costs could ultimately reach $140 million per year, or approximately $6 per tonne, of coal produced. We expect that water treatment will need to continue for an indefinite period after mining operations end in order to maintain water quality.

These cost estimates assume the application of biological treatment technology, which is currently being installed in the water treatment plant under construction at our Line Creek mine. We are actively investigating alternative treatment technologies with the potential to substantially reduce treatment costs. Our draft valley-wide selenium management plan also assumes that relevant regulators will agree to site-specific downstream selenium concentrations in certain aquatic environments already affected by selenium discharges from our coal mining operations in excess of those in provincial water quality guidelines. The modeling on which our valley-wide selenium management plan is based indicates that the selenium levels we are proposing for the upper Elk and Fording Rivers will result in selenium levels further downstream, including at Lake Koocanusa at the US border, which comply with provincial water quality guidelines and applicable limits on selenium concentrations prescribed by the US Environmental Protection Agency.

...We expect that permitting for current and future projects may be delayed until regulatory authorities have accepted the valley-wide selenium management plan and are able to assess the cumulative effects of new projects in the context of the selenium management plan for the valley as a whole. There can be no assurance that delays in obtaining approval of our valleywide selenium management plan will not result in consequential delays in permitting new mining areas, which would limit our ability to maintain or increase coal production in accordance with our long term plans. The potential shortfall in production may be material.’

‘A $100-million treatment plant that is a key piece of Teck Resources Ltd.’s plan to address a selenium pollution problem in British Columbia’s Elk Valley has been taken off-line because of a fish kill. ...A total of 45 fish were found dead near the plant, which was built as part of a $600-million, five-year plan to address the pollution threat to westslope cutthroat trout and other aquatic life in the Elk Valley. ...Chris Stannell, senior communications specialist with Teck... said despite the setback, Teck has not lost faith in the relatively new system. ...Environment Canada has been investigating the selenium problem and reports obtained recently by The Globe and Mail show levels in the Fording River are so high it’s toxic to fish eggs, causing a reduction in reproductive output of about 180,000 fish each year.’


‘Teck Coal Ltd. is being fined $1.425 million after pleading guilty to releasing toxic amounts of nitrate and hydrogen sulfite into the Elk River in October 2014. This is the second largest fine ever to be laid in B.C. related to Fisheries Act pollution. The largest occurred in February 2016 with Teck Metals in relation to pollution discharges from a smelter in Trail. This fine totaled over $3 million, encompassing 10 different incidents. In terms of a single incident charge, this recent fine to Teck Coal Ltd. is the largest ever in BC in relation to Fisheries Act pollution. ... The company responsible for the treatment facility was CH2M, an engineering company out of Colorado, that specializes in wastewater treatment and has carried out a number of projects for removing selenium from water at mines in the US. The Line Creek treatment facility was only the second plant in the world to be using Fluid Bed Reactor Technology to remove selenium from the effluent before entering the creek. On May 1, 2015, Teck Coal Ltd. discontinued their relationship with CH2M at the Line Creek site, constructed a new pond and reconfigured the treatment facility.’


‘The BC auditor general says the province overruled the Ministry of Environment and ignored risks to the Elk Valley watershed when it approved the Line Creek coalmine expansion. ... The Ministry of Environment denied a permit for the expansion of Line Creek but it was later approved anyway by Cabinet. It was the first time Cabinet used its authority to approve such an expansion, said Bellringer. “The rationale for the decision was not publicly disclosed,” says the auditor general’s report. ...If Teck was not allowed to expand into new pits, each of its Elk Valley mines would close and the problem of legacy selenium would be turned over to the taxpayer, [BC Energy and Mines Minister Bill Bennett] said. “The mining industry would have to close down, thousands of people would have been out of work,” said Bennett.’


‘United States officials are accusing their Canadian counterparts of sitting on damning new data about toxic chemicals from southern British Columbia coal mines in water shared by both countries. In a letter to the U.S. State Department, Americans on the International Joint Commission say Canadian members are blocking the release of information on contaminants that are many times above guideline levels. “Canadian commissioners have not been willing to submit a report that addresses selenium pollution in transboundary waters of the Kootenai River drainage,” says the letter to the State Department’s director of Canadian affairs. The commission was created in 1909 as
a way to discuss water that crosses the U.S.-Canada border. The BC dispute, brewing for decades, burst open in June when the commission’s two Canadian members refused to endorse a report on selenium in the Elk River watershed just north of the border. ...Until all agree, the report won’t go to either government, [Commission spokeswoman Sarah] Lobrichon said. The Americans say the delay is deliberate. “Our Canadian colleagues prefer an earlier version of the report that is weak on addressing the recently defined impacts of selenium,” the letter says. Teck built a water treatment plant in 2014, but its operation has been intermittent and it is currently closed. …The company said it’s following a water quality plan and will spend up to $900 million over the next five years on new treatment plants.'


‘Some argue that incorporating credit standing produces counterintuitive reporting. They observe that a decrease in an entity’s credit standing would, if incorporated in measurement, produce a decrease in the recorded liability. The offsetting credit to this debit would be a gain. The entity would appear to be profiting from its deteriorating financial condition. On the other hand, an increase in an entity’s credit standing would produce an increase in the recorded liability. The entity would appear to be worse off as a result of the improvement. Those results are certainly unfamiliar, but are they really counterintuitive? A balance sheet is composed of three classes of elements—the entity’s economic resources (assets), claims against those resources held by non-owners (liabilities) and the residual claims of owners (equity). In a corporation, the value of owners’ residual claims cannot decline below zero; a shareholder cannot be compelled to contribute additional assets. When an entity’s credit standing changes, the relative values of claims against the asset change. The residual interest—the stockholders’ equity—can approach, but probably never reach, default risk free. Traditional financial statements have ignored those economic and legal truisms, so any measurement more consistent with real world relationships will necessarily be unfamiliar.’

International Accounting Standards Board (IASB), “Credit risk in liability measurement”, Staff paper (June 2009), p. 4, para. 1:

‘Arguably, questions about the role of credit risk in liability measurement have generated more comment and controversy than any other aspect of fair value measurement.’

Thomas Schneider, Giovanna Michelon, and Michael Maier, “Environmental liabilities and diversity in practice under international financial reporting standards”, Accounting, Auditing & Accountability Journal, vol. 30, no. 2 (May 2017), p. 378:

‘arguably the most material environmental item in relation to financial accounting: how de-commissioning costs, clean-up costs and other related environmental liabilities are recognized in the financial statements’

Greg Rogers and Charlie Atkins, “Accounting for environmental liabilities in bankruptcy”, Eratosthenes (September 2016), pp. 54-55:

‘Few issues in accounting generate the kind of gut-level reaction that this issue provokes. Some have termed the idea of including an entity’s credit standing in the measurement of its liabilities a perfidious doctrine. Others argue that reporting the effect of changes in an entity’s credit standing is counterintuitive or even dangerous.'
The principal argument against incorporating credit risk in accounting estimates of liabilities is that doing so can mask impending bankruptcy for an extended period by depressing the value of recorded liabilities and when actual bankruptcy intervenes the liability may be marked down even to zero on an accounting basis if it, in fact, becomes worthless in the marketplace.

14 Greg Rogers and Charlie Atkins, “Accounting for environmental liabilities in bankruptcy”, Eratosthenes (September 2016), p. 54:

‘As counter-intuitive as it may seem, all other things being equal, higher liability default risk equates to lower recorded liability estimates.’


‘the worse the firm’s credit rating, the higher the discount rate and the lower the present value of the ARO [asset retirement rating obligation].’

15 Thomas Schneider, Giovanna Michelon, and Michael Maier, “Environmental liabilities and diversity in practice under international financial reporting standards”, Accounting, Auditing & Accountability Journal, vol. 30, no. 2 (May 2017), p. 378:

‘For firms in polluting industries, future de-commissioning and clean-up costs are often the largest unfunded liabilities recognized in the financial statements. The amount that enters the financial statements is the present-value of these liabilities and the liability duration is typically long, making them very sensitive to the discount rates used. This is an area of major divergence between generally accepted accounting principles in the USA (US GAAP) and International Financial Reporting Standards (IFRS). Before moving to IFRS, Canadian GAAP was converged with US GAAP on the reporting of environmental liabilities.’


‘The discount rate difference can increase the asset retirement obligation by 100% to 125%.’


17 Revision no. 67 (October 1990), effective for years beginning on or after December 1990, revised “Section 3060: Capital assets” in the Canadian Institute of Chartered Accountants (CICA) Handbook, including paragraphs dealing with “Future removal and site restoration costs” (CICA 1990a: 1141(5), para. 3060.40):

“Provisions are needed to accrue the liability for future removal and site restoration costs, when the likelihood of their incurrence is established as a result of environmental law, contract, or because the enterprise has established a policy to restore a site, and when such costs can be reasonably determined.”

Revision no. 67 also revised the CICA Accounting Guideline: “Full cost accounting in the oil and gas industry” (CICA 1990b: 111):
“References to “estimated dismantlement and abandonment costs” have been deleted from paragraphs 28 (c) and 34 and references to “future removal and site restoration costs” have been included in paragraphs 45, 52, 57 and 59.”


‘With the move to IFRS, one of the key areas affecting firms in extractive industries pertains to the accounting rules by which environmental liabilities are accounted for. For firms in these industries, environmental matters play a major role in operations. The change in accounting rules will have a material effect on the total amount of environmental liabilities reported and the way in which they are expensed over time. I expect that under IFRS, more environmental liabilities will be recognised in the financial statements of firms operating in extractive industries, such as oil and gas and mining. However, there are certain mitigating factors that may be strong enough such that we see no significant increase in the reported environmental liabilities of these firms. ... The new IFRS rules are very sensitive to the discount rate used and there is some debate as to exactly how the new discount rate should be calculated.’

Thomas Schneider, Giovanna Michelon, and Michael Maier, “Environmental liabilities and diversity in practice under international financial reporting standards”, Accounting, Auditing & Accountability Journal, vol. 30, no. 2 (May 2017), p. 381:

‘With the move to IFRS in Canada, the larger Canadian oil and gas firms were expecting increases of hundreds of millions of dollars to their on-balance-sheet liabilities if they were to move to a risk-free discount rate for environmental provisions. The Canadian Association of Petroleum Producers (CAPP) identified this issue as “potentially the most material adjustment to the statement of financial position for the vast majority of CAPP’s members” (CAPP comment letter to IFRIC, March 2011). Most of the largest firms in the sector, particularly those with large operations in the Alberta oil sands developments, took the position that they could include own credit risk in discounting these liabilities.’

International Financial Reporting Standards (IFRS) Foundation, IFRS 1 First-time Adoption of International Financial Accounting Standards (December 2010), paras D8A and D21A:

‘[D8A] Under some national accounting requirements exploration and development costs for oil and gas properties in the development or production phases are accounted for in cost centres that include all properties in a large geographical area. A first-time adopter using such accounting under previous GAAP may elect to measure oil and gas assets at the date of transition to IFRSs on the following basis:

(a) exploration and evaluation assets at the amount determined under the entity’s previous GAAP; and

(b) assets in the development or production phases at the amount determined for the cost centre under the entity’s previous GAAP. The entity shall allocate this amount to the cost centre’s underlying assets pro rata using reserve volumes or reserve values as of that date.

The entity shall test exploration and evaluation assets and assets in the development and production phases for impairment at the date of transition to IFRSs in accordance with IFRS 6 Exploration for and Evaluation of Mineral Resources or IAS 36 respectively and, if necessary, reduce the amount determined in accordance with (a) or (b) above. For the
purposes of this paragraph, oil and gas assets comprise only those assets used in the exploration, evaluation, development or production of oil and gas.

...[D21A] An entity that uses the exemption in paragraph D8A(b) (for oil and gas assets in the development or production phases accounted for in cost centres that include all properties in a large geographical area under previous GAAP) shall, instead of applying paragraph D21 or IFRIC 1:

(a) measure decommissioning, restoration and similar liabilities as at the date of transition to IFRSs in accordance with IAS 37; and

(b) recognise directly in retained earnings any difference between that amount and the carrying amount of those liabilities at the date of transition to IFRSs determined under the entity’s previous GAAP.’


‘In accordance with Section 3110 – Asset Retirement Obligations of the [Canadian Institute of Chartered Accountants] Handbook, issuers are required to include certain disclosure about asset retirement obligations (AROs) in their financial statements, if applicable.

...Thirteen issuers, including two venture issuers, included AROs in their financial statements. Seven of these issuers also included AROs in the summary contractual obligations table in their MD&A.

Five issuers discussed the AROs in both their MD&A and their AIF, seven issuers discussed the AROs only in their MD&A and one issuer did not discuss the AROs in their MD&A or AIF.

Disclosure of AROs varied among issuers. For example, some issuers recognized, measured and disclosed liabilities for AROs associated with the retirement of long-lived assets in accordance with GAAP, but did not include a discussion of these liabilities in their MD&A and/or AIF.

Other issuers provided more useful information regarding AROs to investors. For example, one issuer accrued environmental remediation costs relating to certain mines in its annual financial statements in accordance with GAAP. The issuer also included a comprehensive discussion of these costs in its MD&A and AIF, separating the costs into categories such as the costs of compliance with environmental legislation and the costs associated with the disposal of hazardous materials, and also divided the costs among open mines, closed mines and development projects. The issuer then identified the current and future impact of the costs on financial results and noted that it would record a loss accrual if a contingent loss arose due to the improper use of an asset and the loss was probable and could be reasonably estimated.’


‘The Liabilities project staff are aware of the diversity in practice. The issue was raised in a number of the comment letters received on Exposure Draft/2010/1… At the September Board meeting (at which the above paper was discussed), the Board decided to continue its deliberations on the project to replace IAS 37, on the grounds that applying the standard has given rise to diversity in practice and needs amendment. As part of these deliberations, the Board plans to consider adding more guidance on whether discount rates should include nonperformance (own credit) risk.

It appears to the staff that clarity is needed on the following points:
(a) Is credit risk a ‘risk specific to the liability’?
(b) If yes, then:
   (i) **Must** the entity include an adjustment for credit risk in the discount rate? or
   (ii) **May** the entity include an adjustment for credit risk in the discount rate? or
   (iii) **Should** credit risk be **specifically excluded** from any adjustment made to the discount rate?

...In the light of the above, the staff recommends that the Committee does not take this issue onto the agenda, but that the Committee recommends that the Board should make clear whether, and how, own credit risk should be reflected in the calculation of provisions, as part of the ongoing Liabilities project. However, the staff notes that the submission specifically requests ‘interpretation of whether the phrase “risks specific to the liability” prohibits the inclusion of a provision for credit risk in the discount rate.’ [emphasis added]. In the staff’s opinion, the principles in IAS 37 and ED/2010/1 are not clear and therefore it is not possible or appropriate to state that credit risk is prohibited from any risk adjustment to the discount rate.


21 **International Financial Reporting Standards (IFRS) Interpretations Committee, IFRIC Update (January 2011), p. 3:**

‘The Committee observed that paragraph 47 of IAS 37 states that ‘risks specific to the liability’ should be taken into account in measuring the liability. The Committee noted that IAS 37 does not explicitly state whether or not own credit risk should be included. The Committee also noted that the predominant practice today is to exclude own credit risk which is generally viewed in practice as a risk of the entity rather than a risk specific to the liability. Accordingly, the Committee does not expect significant diversity in practice, and therefore [decided] not to add this issue to its agenda.’


‘The views expressed in this letter take into account comments from AcSB members and staff but do not necessarily represent a common view of the AcSB. Views of the AcSB are developed only through due process.

...we agree with the Committee’s decision not to add this item to its agenda. However we disagree with certain changes to the rationale provided.

The revised tentative agenda decision states: “...the Committee does not expect significant diversity in practice, and therefore [decided] not to add this issue to its agenda.” This reasoning contradicts responses to the Liabilities Exposure Draft as reported by IASB staff to the Board in September 2010, including responses by two of the large auditing firms (and referenced in paragraphs 15 and 16 of the initial staff paper submitted to IFRIC members in November 2010). In Canada we are particularly aware that there is diversity in practice in the calculation of provisions for asset retirement obligations and a divergence of views amongst the major accounting firms.

The inclusion of the comment regarding “predominant practice” in the tentative agenda decision could imply excluding credit risk from the discount rate for liabilities is
consistent with the Framework and that no other accounting choice is permissible. Whether credit risk should be included in the discount rate for liabilities is a complex area that the IASB Staff Discussion Paper “Credit Risk in Liability Measurement” examined in significant depth. After deliberation of this paper and responses received to it, the IASB did not conclude on the inclusion or exclusion of credit risk. Instead they decided to pursue the topic within the Conceptual Framework Measurement project and agreed to consider the input received from the responses to that paper when considering the measurement of liabilities in other topics. Given this decision by the IASB we think it is inappropriate for the IFRS Interpretations Committee to provide guidance beyond the statement that IFRSs are unclear.

Therefore, in our opinion the agenda decision should note that IFRSs are unclear, followed by the previous concluding comments: “The Committee noted that this request for guidance would be best addressed as part of the Board’s project to replace IAS 37 with a new liabilities standard, and that the Board is already considering the request for additional guidance to be incorporated into this new standard.”

See the appendix to this letter for our proposed revised wording.


‘The staff think that paragraph 47 of IAS 37 is not clear on this issue, and the comment letters received provide evidence of diversity in practice outside of the jurisdiction in which this issue was initially raised. The staff do not think, however, that the Committee is in a position to state that own credit risk should or should not be included in the discount rate when measuring provisions. The staff still think the best place for this clarity to be provided is in the new Liabilities standard.’


‘The Committee reviewed the comments received on the revised tentative agenda decision on this issue issued in January 2011. Ten comment letters had been received, three from international audit networks and seven from entities and individuals in Canada.

The Committee had a short but heated debate on the issue. The Committee agreed to confirm its decision not to add the topic to its Agenda. The Agenda Decision is likely to include the comment that ‘predominant practice today is to exclude own credit risk which is generally viewed as a risk of the entity rather than a risk specific to the liability’. The Chairman noted that the objections seemed to stem from an industry in one country adopting IFRS in 2011 and opined that the objections were not persuasive to overturn the assertion that predominant practice among those already using IFRSs was to exclude own credit risk from ‘risks specific to the liability’ in IAS 37 paragraph 47.’


27 Personal communication with Thomas Schneider, 20 August 2018.


‘This paper is unchanged from paper 15B presented during September 2015 IASB meeting.

...During this research project, we have consulted accounting guides issued by major audit firms, spoken to some auditors and reviewed annual reports of entities. On the basis of this limited evidence, it appears that most entities outside of Canada exclude own credit risk.

...It is our understanding that entities outside of Canada have continued to exclude own credit risk from the IAS 37 discount rate, so divergence in practice is limited.

...Some maintain that own credit should be a part of any liability measurements, including entity-specific ones. Consideration of this is outside the scope of this research project.

International Accounting Standards Board (IASB), IASB Update (March 2017), p. 3:

‘Concluding the research project (Agenda Paper 17B)

The Board noted that the project has two outputs:

a. the project findings; and
b. a list of matters for future staff consideration in standard-setting work relating to discount rates and other aspects of present value measurements.

The Board decided that:

a. it will not seek feedback from the public on the research outputs; and
b. no further work on the research project is needed to meet its objectives.

All 12 Board members agreed with these decisions.’


30 The Oil and Gas Industry Task Force on IFRS’ 2013 survey of Canadian junior oil and gas accounting practices found very similar results (27 per cent used own risk) and advised, “IFRIC chose not to issue any authoritative guidance to clarify the requirements of IAS 37, necessitating the use of judgment in applying this standard.” (CICA, CAPP and EPAC 2013: 6-7)

Regan Boychuk

Alberta Over a Barrel


In 2009 and 2010, Teck only reported its weighted average nominal discount rate (2008 = 5.86%; 2009 = 6.33%; 2010 = 6.85%), obscuring the range of discount rates it had typically reported (2008 = 5.75 - 16.5%). This leaves it unclear whether they continued applying dramatically higher discount rates (or at least exactly what larger rates they did apply) to liabilities incurred in 2009 and 2010, but the increasing weighted averages suggest they did apply rates similar to 2008 despite regaining investment grade in 2010.

Teck Resources Ltd., 2014 Consolidated Financial Statements (17 February 2015), p. 34.

Teck Resources Ltd., 2014 Consolidated Financial Statements (17 February 2015), p. 34.


As of 31 December 2010, Teck reported its asset retirement obligations (AROs) at $806 million. As of 1 January 2011, it reported its decommissioning and restoration provisions (DRPs) at $1.014 billion. In transition to IFRS, Teck “recorded an adjustment to increase the decommissioning and restoration provision asset by $65 million and an adjustment to reduce the decommissioning and restoration provision liability by $110 million for a total adjustment that increased equity by $175 million on transition to IFRS.”

$806 million minus $110 million = $696 million ≠ $1.014 billion

36 Thomas Schneider, Giovanna Michelon, and Michael Maier, “Environmental liabilities and diversity in practice under international financial reporting
standards”, *Accounting, Auditing & Accountability Journal*, vol. 30, no. 2 (May 2017), pp. 378, 398:

‘Based on the evidence, our main conclusion is that, until the discount rate issue is addressed, IAS 37 is not a quality standard; not because it leaves discretion to the management per se but because it does not take into account the nature of environmental liabilities and their recognition as a matter of public interest. The way in which environmental liabilities are accounted for is extremely material to extractive industries, and in a more general sense, to the investing community and to the public in general. It is difficult to determine what the principles are behind IAS 37 when it comes to “risks specific to the liability.” Ambiguity in a standard that allows a large liability to differ by upwards of 100 percent based on firm choice should be dealt with.’

37 *C. Gregory Rogers, J.D., CPA, is author of Financial Reporting of Environmental Liabilities and Risks after Sarbanes-Oxley* (Wiley, 2005) and a nationally recognized expert on environmental accounting and disclosure. He is a past chairman of the American Bar Association’s Committee on Environmental Disclosure and a contributing expert to the US Government Accountability Office investigation and report to Congress on environmental disclosures.

Charles A. Atkins has been actively involved in investment management, venture capital, software, and property development businesses over the course of the past thirty-nine years. Mr. Atkins is an economist by training with a specialization in international monetary economics, finance and operations research. He was a Morehead Scholar at UNC Chapel Hill, a Marshall Scholar at the London School of Economics and Political Science, and a visiting fellow at the Brookings Institution.


39 *Greg Rogers and Charlie Atkins*, “*Accounting for oil and gas environmental liabilities in bankruptcy*”, *Petroleum Accounting and Financial Management Journal*, vol. 35, no. 2 (Summer), p. 60:

“The following example illustrates how default risks specific to environmental liabilities are quite different from the standard reference point of a long-term unsecured corporate bond. Assume that the US government holds 30-year corporate unsecured zero coupon debenture [“A debenture is a type of debt instrument that is not secured by physical assets or collateral. Debentures are backed only by the general creditworthiness and reputation of the issuer.”] issued by an E&P company and the same company has an ARO arising under federal law that is expected to be settled in 30 years. What are the comparative risks of default from the perspective of the holder specific to each of these two different obligations and how do these risks affect the appropriate credit risk adjustment to the discount rate used to value them?’

40 Adapted from Table 2 in *Rogers and Atkins* (2015a: 61).


Nicholas Chaput, “Environmental clean-up in bankruptcy and insolvency: What priority for the environment?”, University of Toronto Faculty of Law Masters of Laws thesis (2012), pp. 13-14:

‘the consensus in this trilogy of cases [Bulora (Ontario High Court of Justice, 1980), Panamericana (Alberta Court of Appeal, 1991), and Lamford Forest (British Columbia Supreme Court, 1991)] was that, despite a debtor being in a liquidation or restructuring process, the public health and safety nature of environmental legislation rendered compliance a mandatory priority. The courts clearly voiced the opinion that the stay of proceedings does not and should not amount to permission to violate the law with impunity. ...Compliance with clean-up orders could not be assimilated to ordinary debts owed to the public authority charged with administering the statute. It is important to note that, in all three cases, the court does not hesitate to address directly the “balancing of values” implied by conflicting environmental and bankruptcy laws and to discuss the importance and the social value of the environmental legislation.’


A board member of the Alberta energy regulator from 1989-2001, Dr. Brian Bietz, confirmed regulators understood in 1991 the implications of the Northern Badger case: polluters could be held jointly and severally liable (Interview, June 2016).

Dianne Saxe, “Throwing the net wider: Can parent companies and lenders be held liable for contaminated land?”, Windsor Review of Legal and Social Issues, vol. 3 (May 1991), p. 43:

‘the receiver had deliberately negotiated sales of the debtor’s assets designed to ensure that all of the valuable assets were realized for the benefit of the secured creditor, leaving for the trustee in bankruptcy only the burdensome “assets” such as the disused wells. This arrangement was made without notice to the Energy Resources Conservation Board, despite its express interest, and without drawing the fact to the attention of the court which approved the sale. For this reason, the receiver was ordered to perform the abandonment, (at an estimated cost of more than $250,000) notwithstanding the fact that there were no longer sufficient assets in the debtor’s estate. There was no indication in the decision as to whether the deficiency would have to be made up by the receiver personally, or whether he could look to the secured creditor for indemnity.’

Alexander Clarkson, “In the red: Towards a complete regime for cleaning up environmental messes in the face of bankruptcy”, University of Toronto Faculty of Law Review, vol. 69, no. 2 (Spring 2011), pp. 46-47.


According to a former liability management advisor to the Energy Utilities Board, Alberta regulators shared industry’s preferred interpretation of the 1997 BIA amendments as early as 1999 – eight years before Ontario courts began accepting any such interpretation and 16 years before Alberta courts ruled in the RedWater case. (Kavanagh, personal communication)


‘the appellants argue, there is no unfairness in subordinating the Alberta Treasury Branches’ position to Redwater’s environmental obligations. Alberta Treasury Branches knew of these risks, assessed them in its creditworthiness analysis, and should not now be able to complain that they have come to fruition. Fairness is perhaps in the eye of the beholder, but this argument cannot succeed. ...Whether this is fair or not is not the issue, because the BIA and the general law of priority of claims expressly recognize the priority of secured claims.’

*It is perhaps worth noting here, that as a result of Northern Badger, lenders had in 1991 accepted their responsibility for enabling polluters:*

‘In the event the polluter cannot pay, then the liability should be treated as a social cost. ...[But] relief from direct liability risk would not relieve a lender from the credit risk caused by environmental liability. The lender must still contend with the possibility that a borrower may be a polluter and that cleanup obligations imposed on the borrower could cause the value of its security to be eroded or eliminated. The borrower’s cash flow may be insufficient to pay for cleanup and still service the debt. For this reason, lenders will undertake due diligence procedures whenever they have a concern that a borrower’s business may pose an environmental risk.’ (Canadian Bankers’ Association 1991: 9, 13)


See Teck Resources Ltd., Frontier Oil Sands Mine Project Update (June 2015), vol. 1, sec. 13 “Closure, conservation, and reclamation plan”, Table 13.5-5, “Annual and cumulative reclamation upper lift material salvage schedule” and Table 13.5-9, “Annual and cumulative reclamation schedule for mine and plant”, pp. 50, 58.


‘During the 2007 royalty review’s public consultations, industry reassured Albertans that the tar sands royalty regime was “thoughtfully developed with all stakeholders” through “collaboration among industry, government and other[s]” and “adopted after extensive consultation.” In reality, the tar sands royalty regime in place between 1997 and 2008 was “the result of a concerted effort on the part of representatives with expertise in business economic decision-making from six companies active in the Oil Sands.” The six companies whose executives drafted the regime were Syncrude, Gulf (now part of ConocoPhillips), Suncor, Amoco (now part of BP), Imperial Oil (controlled by ExxonMobil) and Canadian Natural Resources. Tar sands producers wrote their own royalty rules and they were implemented, “in the main,” by Klein’s government in 1997. Those rules, along with [the development of Steam-Assisted Gravity Drainage] SAGD, sparked what the world’s leading business newspaper called “North America’s biggest resources boom since the Klondike gold rush more than a century ago.”

Gillian Steward, “Betting on bitumen: Alberta’s energy policies from Lougheed to Klein”, Parkland Institute, Canadian Centre for Policy Alternatives, and the Corporate Mapping Project (June 2017), sec. 3: “Ralph Klein and the National Task Force on Oil Sands Strategies”, pp. 16-33.

Ian Urquhart, Costly Fix: Power, politics, and nature in the tar sands (North York: University of Toronto, 2018), pp. 52-57, 74-87.

Regan Boychuk

<contact information removed>

**Relevant Experience**

**Recognized as a leading expert on the Alberta oilpatch’s environmental liabilities**
- Retained by the University of Calgary’s Public Interest Law Clinic to advise on their intervention on behalf of landowners at the Supreme Court in the *RedWater* case, December 2017-January 2018.
- Have briefed Alberta Energy, Alberta Environment, the Alberta Energy Regulator, the finance minister, and the Auditor General’s office on environmental liabilities in Alberta’s oilpatch.
- Founded Reclaim Alberta, researching/developing/advocating practical solutions to the accumulation of unfunded oil and gas liabilities.

**Recognized as an expert on the Alberta oilpatch’s profits**
- Authored peer-reviewed study, *Misplaced Generosity*, in 2010 for the University of Alberta’s Parkland Institute.
- Served on the Oil Sands Expert Group advising the 2015 Royalty Review Panel.

**Relevant Employment**

**Research Associate / Public Policy Research Manager**
Parkland Institute
January 2010 – June 2011

**Research Analyst**
Lexington Energy Services
October 2006 – November 2007

**Research Assistant**
University of Calgary, Department of Political Science

**Education**

**York University**
Master of Arts, Political Science
Graduated September 2005

**University of Calgary**
Bachelor of Arts, International Relations
Graduated April 2004

**Southern Alberta Institute of Technology**
Print Journalism Diploma
Graduated May 2001
HUMAN HEALTH IMPLICATIONS - TECK’S FRONTIER TARSANDS MINE

Prepared for Keepers of the Athabasca

By Dr. John O’Connor

For thousands of years, Indigenous peoples living in and around Northern Alberta, have subsisted independently off the land and water. Generations of families have managed successfully to fully use economically what nature has provided, in a sustainable way. However, over the past approximately half-century, many of those close to the land have asked questions and voiced concerns regarding changes—changes which have increasingly seriously impacted their traditional way of life. No-one had any answers, it seemed:

--water, once drinkable directly from the Athabasca (River and Lake), increasingly tasting “bad” and undrinkable, and with a constant sheen of oil on the surface

--fish with deformities, extra/missing pieces, and whose flesh tasted “bad”

--ducks and moose increasingly inedible

--muskrat, similarly inedible, and with a shrinking population

--cat-tails, and other flora, long sources of traditional medicines, increasingly harder to find along the river and lake shores

--air odours similar to gasoline

The largest community downstream, Fort Chipewyan, has a population of approx 1200. It was established in 1788, and is made up of Cree, Chipewyan, Metis and non-Indigenous residents. Roughly 70% of the population has lived traditionally. The above described changes were, and are, most noted by this exact population.

Since the early 90s Northern River Basin Study1 and its companion study-Northern River Basins Human Health Monitoring Program2 there have been myriad studies3, focused on the

1 Northern River Basins Study - Report to the Ministers 1996
2 Northern River Basins Human Health Monitoring Program - March 1999
environment downstream of the 140,000 + km² undergoing mining for Tarsands oil. Peer-reviewed, respected and published in, for instance, the Proceedings of the National Academy of Sciences, one after another has demonstrated different aspects of the impacts of mining of Tarsands, and of the accumulation of waste, including water, along the way. And Science has mirrored Traditional Environmental Knowledge (TEK)—which has vividly described changes and quality deterioration in air, water, land, and the food chain, downstream of the area disrupted by Tarsands mining.

All this is in sharp contrast to the claims, by the Albertan and Canadian governments, that “there is no evidence of contribution of degradation”⁴ coming from decades of mining activity. This claim, despite growing evidence from TEK and scientific studies, has been adhered to by successive governments and industry.

Fort Chipewyan, since the late 90s, had begun to experience health issues unlike any time in its 200+ years. Malignancies, auto-immune diseases, diabetes—to mention just a few—in a community so traditional in its lifestyle, and far removed from the stresses and processed life of Fort McMurray, was foreign to residents. A spike in certain cancers especially was quite noticeable by the early 2000s. Cancers that included cancer of the biliary tract—notably cholangiocarcinoma, a particular cancer that was rare, and not expected to occur at more than 1 in 200,000 of the general population.

The community needed answers.

Health Canada, the body responsible for on-reserve health in Fort Chipewyan, sent 3 physicians to Fort Chip, in Mar 2006. The senior physician in the group took a swig of water in the Nursing Station and stated that “there is nothing wrong with the water in Fort Chip”! Later in 2006, Health Canada gave the community a confident reassurance its cancer rate was no higher than expected, after an examination of deceased files, gathered from storage. Independent analysis questioned the statistical interpretation of data obtained from these files, and the sources from which data was extracted. This left Fort Chipewyan with little faith in Health Canada’s words.

In 2006-7, a model by Golder and Associates, a company long employed by Industry to study Environmental Impacts of proposed plants and expansions, predicted that certain metals, including mercury, would rise exponentially in concentration in traditional foods downstream of a proposed Suncor expansion. This was DOWNPLAYED by none other than Health Canada! In response, the NUNEE Health Authority in Fort Chipewyan contracted Dr Kevin Timoney to study traditional foods and water proximate to Fort Chipewyan⁵. His findings tended to support the findings of Golder and Assoc. He advised the community that Mercury and Arsenic levels

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⁴ Mel Knight-AB Environment Minister-2008—“Downstream” Babelgum (Iwerks)
⁵ A Study of Water Sediment Quality as Related to Public Health Issues in Fort Chipewyan Alberta -Timoney Nov 11 2007 Nunee Health Board (Fort Chipewyan)
were at levels too high for human exposure, and that residents should strictly limit their consumption of fish—especially Wall-Eye (bottom feeders). Children were advised to avoid bathing/swimming in Lake Athabasca, and pregnant women to avoid consuming fish entirely. Other age groups were generally to limit consumption to no more than weekly. Both Dr Griffin, a Family Physician then providing services to Fort Chip, and myself, supported this advice. Health Canada responded by stating that they had advised the community of this prior to this study. No one in Fort Chipewyan was aware of this previous advisory.

Because of my advocacy for Fort Chipewyan, I was subject to vexatious complaints at the College of Physicians and Surgeons from Health Canada (2007), including one of “raising undue alarm” in the community of Fort Chipewyan. In fact, the community was relieved to have me speak out for and with them. They had tried in vain to have their concerns heard, prior to my becoming involved. The only alarm that Fort Chip experienced was that Health Canada—accountable and responsible for on-reserve health—was not concerned with the community’s health situation. This has added Fort Chip’s general level of mistrust in Health Canada.

In 2008, with confidence in now both Alberta Health and Health Canada at an all-time low, the Alberta Cancer Board was asked to do a formal study of cancers in Fort Chip. After a year, the Cancer Board revealed to Fort Chip that cancer was 30% more prevalent, singling out specific types of cancer, including hepatobiliary cancer. This contradicted Health Canada’s prior findings.

The Board recommended ongoing monitoring, in addition to a comprehensive health study of the community.

I participated, as a member of a Scientific Team, in a year-long effort to put together Terms of Reference for such a study.

Just prior to the TOR being presented to the community of Fort Chip, the Chair of the Scientific Team inserted a clause that Industry should be part of a Management Oversight Committee on any such study. While many of us on the Team opposed such an inclusion, it went ahead. Fort Chip rejected this out of hand, as we predicted. Alberta-Health Minister Gene Zwozdesky—present at the meeting with Fort Chip leaders and Elders—led the departure from the community centre, cancelling the health study.

The study never happened.

The Chair, unknown to the rest of the Team, was also the Health and Environmental Advisor to the Oilsands Developers Group, simultaneously.

This was the closest downstream communities have EVER come to a comprehensive health study.

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I stress—NO HUMAN HEALTH STUDIES HAVE EVER BEEN COMPLETED BY EITHER PROVINCIAL OR FEDERAL HEALTH AUTHORITIES downstream of the Tarsands.

In Jan 2016, Prof Jonathan Martin and a team from the University of Alberta presented their findings\(^7\) after a 2 year study of the impact of coke dust-so-called “petcoke”—emanating from the mounds of this waste product of Tarsands production. This fine particulate matter is a major source of Polycyclic Aromatic Hydrocarbons, a class 1 human carcinogen. Petcoke becomes airborne, and spreads/is distributed for a radius of at least 30km from its origin—at the larger, more established Tarsands mining operations. This has serious implications for the community of Fort McKay, well within the 30km zone, where community members have for years noticed an increasing chronic layer of dust, in addition to industrial odours, both outside and inside their residences. Despite the publication of this paper, there’s been no response from local, provincial or federal governments.

There is a pressing need to urgently assess human health downstream of the tarsands mining area in Northern Alberta. This must be undertaken before any more development is allowed to occur. Enough evidence has amassed, in study after study, to indicate that significant exposure has already occurred. Promises were made regarding comprehensive health studies, but were unfortunately never kept. At this point, there is little or no trust in provincial and federal health authorities when it comes to health surveillance.

\(^7\) Cancer Risk Assessment and Exposure Sources of PAHs In the Athabasca Oilsands Region - Zhang, Shotyk, Zaccone, Martin et al, Env Science and Technology Jan 8 2016 es 2015-050926.RI
Studies mentioned in my report:

Northern River Basins Study - Report to the Ministers 1996

Northern River Basins Human Health Monitoring Program - March 1999

Oilsands Development Contributes Elements at Low Concentrations to the Athabasca River and its Tributaries - Kelly, Schindler et al, PNAS Sept 2010 107(37) 16178-16183
http://doi.org/10.1073/pnas 1008754107

1073/pnas 1217675110

Environmental and Human Health Implications of Athabasca Oilsands for Mikisew Cree First Nation and Athabasca Chipewyan First Nation in Northern Alberta - MacLachlan et al, Environment Conservation Lab July 2014, University of Manitoba

Mel Knight-AB Environment Minister-2008-“Downstream” Babelgum (Iwerks)

A Study of Water Sediment Quality as Related to Public Health Issues in Fort Chipewyan Alberta -Timoney Nov 11 2007 Nunee Health Board (Fort Chipewyan)

Cancer Incidence in Fort Chipewyan 1995-2006 - Yiqun Chen, Alberta Cancer Board Div of Pop Health and Information Surveillance

Cancer Risk Assessment and Exposure Sources of PAHs In the Athabasca Oilsands Region - Zhang, Shotyk, Zaccone, Martin et al, Env Science and Technology Jan 8 2016 es 2015-050926.RI

Article about the confirmed cancer cluster in Fort Chipewyan, and charges against me:
http://rabble.ca/blogs/bloggers/djclimenhaga/2014/04/what-happens-now-we-know-there-really-cancer-cluster-fort-chip-n
Keepers of the Athbasca, Intervenor Submission
FRONTIER OIL SANDS MINE PROJECT
Environmental impacts Segment
August 30th, 2018

Paul Belanger (co-chair, Keepers of the Athbasca Watershed Society)

Keepers of the Athbasca is very concerned about the environmental impacts of an additional oil sands mine north of existing operations. We contend that the impacts of a large new mining project will be too risky to approve without major changes to the proponents proposal and the regulatory environment. As a group consisting of mainly indigenous, Métis and concerned citizens living in the Athabasca watershed, we are the people most impacted.(along with animals)

Firstly, several studies show, risks to the watershed are too great. Perhaps the greatest risks are provided by tailings ponds. A conventional tailing pond, as proposed by Teck Resources, is far too risky a threat to groundwater. There is risk of a number of toxic compounds, which add to the current impact load of the existing oil sands and industrial operations.

Secondly, I will summarize how cumulative environmental impacts have reached a critical threshold based on recent studies. They show critical impacts have been reached in the NE Alberta region and the Athabasca watershed. These studies describe how there is no ecological buffer remaining for an additional large development as described by Tech Resources. The environmental impacts affect water quality and the terrestrial animal and plant ecosystems. Additionally current and past industry air emissions are and have produced acid rain which show a clear cumulative impact to lakes and the boreal forest in a very large area.

Finally, the mining technology choices by Tech Resources Inc are not the best available oil-sands mining and extraction methods. There are now available (and in use) demonstrating tailings-free extraction technologies which require less CO2 emissions as compared to very old tar sands extraction methods which were developed from the 1930’s to the 1970’s.

**Watershed and Groundwater Risks Related to Tailing Ponds**

**Groundwater Issues, GW-1**

The first item of concern is a summary analysis by Hydrogeologist, Gilles Wendling of GW Solutions:

GW solutions has reviewed the groundwater baseline dataset and hydrogeology studies completed by Teck for the proposed Frontier Project and presented in its application and submitted documents. GW Solutions has also created a 3D conceptual hydrogeological model to assess the level of confidence of Teck’s recognized potential adverse effect of the project on the water resources.
GW Solutions has identified the following key weaknesses and omissions:

1. The geometry (ie. top and bottom and lateral extent of formations) is poorly defined for the Cretaceous and Devonian formations due to the spacing between locations where information is available (which can regularity exceed 1 km), particularly within the proposed ETAs and in the area between the PDA and the Athabasca River. Consequently, the top and bottom of the formations, that play an important role in the groundwater movement, are poorly defined in areas that are sensitive because they correspond to areas where groundwater discharges to the Athabasca River. In addition, these areas with data gaps are critical because they correspond to areas where conduits and cavities could be present in the subsurface, as inferred by mapped sinkholes. A few boreholes and coreholes showing sound bedrock would misrepresent a bedrock that could be 100 to 1,000 times more conductive due to karst related conduits.

2. The geological and groundwater data available for the east side of the PDA (eg at the location of the ETAs) are limited to the Quaternary layers; therefore, they omit the definition and understanding of important layers such as the Devonian formation.

3. Teck has predominantly relied on values of hydrogeological parameters (hydraulic conductivity and storability) obtained at other oil sands project sites. These parameters are used estimate the dynamic of the groundwater regime in all the aquifer units identified on site, each unit having it own characteristics; therefore, Teck has not sufficiently considered that:

   a. The hydrogeological inits at the Teck site and its LSA may have different hydrological behaviours than similar units at other oil sands project sites, located tens of kilometres away. Only one formation, the Quaternary (uppermost aquifer), was adequately assessed locally, at the scale of the PDA.

   b. The hydrogeological units at the Teck site and its LSA may have different hydrogeological behaviour across the LSA and the modelled area due to the size of the study area. The Teck Frontier LSA covers an area of approx 1600 km², being approximately 45 km long and 35 km wide. For such a large area encompassing several aquifers, only one pumping test was completed in one aquifer, when dozens of pumping test should have been completed to properly define the hydrogeological conditions.. As a result, local field measurements and the definition of the local hydrogeological parameters are missing to validate inputs used in the hydrological numerical model developed by Teck.

4. The groundwater flow between the PDA and the Athabasca River has not been adequately defined. This is a major gap in the required information because groundwater very likely flows through the Devonian and Quaternary formations to discharges into the Athabasca River. New to the PDA, the Athabasca River local cuts down into the Devonian Formation. There is possibly direct interaction between the Athabasca River and groundwater in the Devonian formation, particularly near the sinkholes. The groundwater flow is critical in supplying the river base flow in winter conditions and needs to be properly assessed. Teck has used assumptions in their conceptual and numerical models (eg. presence of impermeable layers that create a barrier
to groundwater flow near and under the Athabasca River) that have not been confirmed by field investigations.

5. The data set defining the piezometric conditions in the various aquifers is poor due to the lack of monitoring wells (i.e., poor definition of all the aquifers), and the limited coverage of time (i.e., very few monitoring wells equipped with data loggers providing information on the seasonal fluctuations of the piezometric conditions). This poor definition of the piezometric conditions also affect the reliability and validity of both the conceptual and the numerical models. (provided by Teck)

6. The baseline information describing groundwater recharge, discharge and groundwater-surface water interaction provided in Teck’s application is very general and limited, and not supported with field measurements. In addition, Teck refers to outdated studies published as far back as 1979 (38 years old) in a scientific field (surface water and groundwater interactions) that has evolved drastically in the last 10 to 20 years. Presently available tools and protocols should be used to adequately assess the surface water and groundwater integration in the affected region. Due to the size of the footprint of the proposed project and potential of the project to modify the local water cycle, it is critical that a proper assessment of the modification of the water cycle be completed, considering its potential effect on the Athabasca River and its cumulative effect with the other oil sands operations in the region.

7. The complete baseline dataset, combined with some inadequate assumptions, render the available hydrogeological model unreliable to simulate prediction scenarios with confidence. This is particularly important when numerical models are the only tools for reviewers and regulators to build an educated opinion on the potential negative impacts such a project would have on the groundwater regime, an it potential cumulative effects on the regions, the Athabasca River, and the MacKenzie Basin.

**Groundwater Issues, GW-2 Monitoring**

*There is a need for comprehensive data through monitoring groundwater and the Athabasca River and tributaries if we are to understand the real and complete impacts to the water shed.*

Quotes from: A Local Test Study Distinguishes Natural from Anthropogenic Groundwater Contaminants near an Athabasca Oil Sands Mining Operation, Savard, et al, 2012

As the extraction rates and regional extent of oil sands development will increase in the near future, collaborative efforts aiming at understanding the groundwater flow systems and fingerprinting the natural and mining-related sources of organic and metallic contaminants may be determinant in maintaining good water quality and healthy aquatic ecosystems in the Canadian oil sands district.

1.2. Potential natural and anthropogenic sources of “naphthenic acids” and metals in the Lower Athabasca oil sands region
Naphthenic acids (NAs) are a complex suite of carboxylic acids which are water-soluble, polar organic compounds, potentially toxic to aquatic organisms including phytoplankton, daphnia, fish and mammals, and are also endocrine disrupting (Lister et al., 2008; Richardson, 2010). These organic acids are naturally present in petroleum. While ambient levels of NAs in the groundwater of the Pleistocene glacio-fluvial sand in the study area are always below 1 mg/L (mining reports), NAs become concentrated and may exceed 100 mg/L in oil sands process waters (PW), i.e., water that is used for oil sands bitumen mining operations. For that reason, nearby groundwater-surface water systems are prone to potential contamination (McMartin et al., 2004; Oiffer et al., 2009). Consequently, new methods that can accurately assess the relative contributions of these compounds from both natural background and potential oil sands production-related inputs could be helpful to delineate the environmental impact related to mining.

Below quote is from this study showing ongoing problems with access to data from Government and industry. How can we assess risk properly?

The Environmental Hydro-geology of the Oil Sands, Lower Athabasca Area, Alberta

Andrew D. Miall, 2013

Oil sands mining and in situ project licensing and operation regulations include Environmental Impact Assessments that mandate considerable hydrogeo-logical measurement and monitoring work. However, little of this is independently evaluated for accuracy or synthesized and interpreted for the public. Recent changes in Alberta environmental regulation, including the establishment of the Alberta Environmental Monitoring Management Board (in October 2012) are expected to bring new transparency to environmental management of Oil Sands operations.

Groundwater Issues, GW-3 Groundwater Contamination from tailing ponds

The below references of this section clearly show that current tailing management methods are not adequate to the protection of the Athabasca watershed. A tailing pond lining which cannot allow leachate is the only safe holding pond. But industry knows this is too expensive and is not financially feasible. Currently it is known that leachate is reaching the Athabasca River, but poor data collection cannot inform us as to the extent of this groundwater problem.

This information (below) points to the conclusion that any new mine must use an extraction method which is tailings waste free, since the region watershed cannot tolerate additional large tailing waste and an added source of contamination. Current active mining operations and their tailing ponds are increasing in size every year without any regulatory controls.

The below statement is from a study indicating that current tailing pond design is not preventing the release of AEO (Acid-extractable organics), such as naphthenic acid to groundwater.
Profiling Oil Sands Mixtures from Industrial Developments and Natural Groundwaters for Source Identification, Frank, et al, 2014- Environmental Science and Review

The objective of this study was to identify chemical components that could distinguish chemical mixtures in oil sands process-affected water (OSPW) that had potentially migrated to groundwater in the oil sands development area of northern Alberta, Canada. Differentiation of natural from OSPW sources was apparent through measurements of O₂ :O₄ ion class ratios (ESI-HRMS) and diagnostic ions for two families of suspected monoaromatic acids (GC Å~GC-TOF/MS).

The resemblance between the AEO profiles from OSPW and from 6 groundwater samples adjacent to two tailings ponds implies a common source, [supporting the use of these complimentary analyses for source identification]. These samples included two of upward flowing groundwater collected <1 m beneath the Athabasca River, suggesting OSPW-affected groundwater is reaching the river system.

Below is a Globe and Mail summary of the important points of this study (above):

Federal study says oil sands toxins are leaching into groundwater, Athabasca River
BOB WEBER  EDMONTON — The Globe and Mail  Feb. 20, 2014

New federal research has strongly backed suspicions that toxic chemicals from Alberta’s vast oil sands tailings ponds are leaching into groundwater and seeping into the Athabasca River.

Leakage from oil sands tailings ponds, which now cover 176 square kilometres, has long been an issue. Industry has acknowledged that seepage can occur, and previous studies using models have estimated it at 6.5-million litres a day from a single pond.

The soil around the developments contains many chemicals from naturally occurring bitumen deposits, and scientists have never able to separate them from contaminants released by industry.

The current Environment Canada study, accepted for publication in the journal Environmental Science and Technology, used new technology to discover that the mix of chemicals is slightly different between the two sources. That discovery, made using a $1.6-million piece of equipment purchased in 2010 to help answer such questions, allows scientists to actually fingerprint chemicals and trace them back to where they came from.

“Differentiation of natural from [tailings water] sources was apparent,” says the study.

The scientists took 20 groundwater samples from areas at least one kilometre upstream and downstream from development. They took another seven samples from within 200 metres of two of the tailings ponds. Samples were also taken from two different tailings ponds.

The analysis was focused on so-called acid-extractable organics, which include a family of chemicals called naphthenic acids. “Their enhanced water solubility makes them prime candidates for possible migration beyond containment structures via groundwater,” the report says.
Those toxins were found in groundwater both near and far from development. But their chemical composition was slightly different nearer the mines – closer to that found in the water from the ponds.

“The resemblance between the [acid-extracted organics] profiles from [tailings water] and from six groundwater samples adjacent to two tailings ponds implies a common source. These samples included two of upward-flowing groundwater collected [less than] one metre beneath the Athabasca River, suggesting [tailings water] is reaching the river system.”

The study doesn’t quantify the amount of tailings ponds water that is escaping.

It noted that even at the sample sites near development, pond water was diluted by natural groundwater.

Industry is working to address the tailings issue, budgeting more than $1-billion in tailings-reduction technology.

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**Naphthenic acid appears to be a high risk toxic release from tailings ponds into river water,**

*Quote from study below which indicates that soil does not absorb NA and it is water soluble especially when mixed with salt water in tailing ponds.*

**Adsorption of single-ring model naphthenic acids on soils, Canadian Geotechnical Journal, Headley, Barbour, 2011**

**Conclusion**

The adsorption of single-ring model naphthenic acids on soil was measured under various conditions using a partitioning batch method. The effect of molecular structure, pH, and CaCl2 salt on the adsorption of the single-ring model naphthenic acids investigated was statistically significant, while other conditions, including temperature and organic carbon content had negligible effect.

(data shows) there would be little adsorption of the model naphthenic acids by soils, regardless of the various conditions investigated. This will result in high partitioning to the water column in aquatic environments.

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**Naphthenic acids are shown to be very toxic and require close monitoring as well as remediation**

*There are more 1 billion cubic meters of tailing ponds content to date. This volume is increasing rapidly. Tailing ponds each have varying concentrations of Naphthenic acid, but 100 ppm is common.*

*Quote from study below:*
Predicted toxicity of naphthenic acids present in oil sands process-affected waters to a range of environmental and human endpoints, Scarlett, et al, Science of the Total Environment, 2011

Naphthenic acids (NAs) are considered to be a major toxic component of oil sands process-affected waters (OSPW) and are also widely used for industrial processes. The effects of previously identified NAs (54 in total), together with six alkylphenols, were modeled for a range of environmental and human toxicity related endpoints using ADMET predictor™ software. …Polycyclic acids containing a single aromatic ring were predicted to be the most toxic to fathead minnows… Some of these compounds were also predicted to be the most carcinogenic (based on rat and mouse models), possess human estrogenic and androgenic activity and potentially disrupt reproductive processes. Some aliphatic pentacyclic acids also were predicted to exhibit androgenic activity…

Cumulative Impacts to the Lower Athabasca River Region Related to Oil Sands Operations

There are significant and well reported various environmental impacts of current and previous oil sands industry activities in NE Alberta. Over the past 10 years, new studies and understanding have examined the growing cumulative impacts. Some ecological areas of concern have reached critical levels of impact load as outlined below.

Another large mining operation with business-as-usual technology cannot be approved without causing regional ecological disaster.

Below quotes are from this study:


Abstract: The extent to which pollution from tar sands industrial activities in northeastern Alberta, Canada affects ecosystem and human health is a matter of growing concern that is exacerbated by uncertainty. In this paper we determine whether physical and ecological changes that result from tar sands industrial activities are detectable. We analyze a diverse set of environmental data on water and sediment chemistry, contaminants in wildlife, air emissions, pollution incidents, traditional ecological observations, human health, and landscape changes from the Athabasca Tar Sands region, Canada. Increases in contaminants in water, sediment, and fishes downstream of industrial sources; significant air emissions and major pollution incidents; and the loss of 65,040 ha of boreal ecosystems are documented. Present levels of some contaminants pose an ecosystem or human health risk. The effects of these pollutants on ecosystem and public health deserve immediate and systematic study. Projected tripling of tar
sands activities over the next decade may result in unacceptably large and unforeseen impacts to biodiversity, ecosystem function, and public health. The attention of the world’s scientific community is urgently needed.

Pollution from tar sands activities derives from 11 sources: (1) permitted (licensed) discharges to air and land; (2) seepage from tailings ponds; (3) evaporation from tailings ponds; (4) leaks from pipelines; (5) major spills of bitumen, oil, and wastewater; (6) stack emissions; windblown coke dust, (7) dry tailings, and (9) tar sands dust; (10) outgassing from mine faces; and (11) ancillary activities such as transportation, construction of mines, ponds, roads, pipelines, and facilities, and landscape dewatering.

There is an urgent need for information about the impacts of tar sands activities. Much is at stake for the long-term health of humans and ecosystems, the boreal forest, and the world’s climate.

Given the 40-year history of licensed and unlicensed discharges into air, soil, and water, the ‘baseline’ predevelopment condition of the Athabasca River may have been lost long ago. Presently, we cannot quantitatively apportion contaminant levels into natural and industrial sources. The attention of the world’s scientific community is urgently needed. The extent to which tar sands pollutants are affecting ecosystem and public health deserves immediate and systematic study. Short of this, the projected tripling of tar sands activities over the next decade may result in unacceptably large and unforeseen impacts.

The below study shows how massive the snow melt impact is to the waterways of the lower Athabasca. How will regulators manage this. How can a new large mine not contribute to a pollution load which was not recognized until recently?

Oil sands development contributes polycyclic aromatic compounds to the Athabasca River and its tributaries, Schindler, Kelly et al, from PNAS, 2009

For over a decade, the contribution of oil sands mining and processing to the pollution of the Athabasca River has been controversial. We show that the oil sands development is a greater source of contamination than previously realized. In 2008, within 50 km of oil sands upgrading facilities, the loading to the snowpack of airborne particulates was 11,400 T over 4 months and included 391 kg of polycyclic aromatic compounds (PAC), equivalent to 600 T of bitumen, while 168 kg of dissolved PAC was also deposited.

Dissolved PAC concentrations in tributaries to the Athabasca increased from 0.009g/L upstream of oil sands development to 0.023 g/L in winter and to 0.202 g/L in summer downstream. In the Athabasca, dissolved PAC concentrations were mostly<0.025g/L in winter and 0.030g/L in summer, except near oil sands upgrading facilities and tailings ponds in winter (0.031–0.083g/L) and downstream of new development in summer (0.063–0.135g/L).

In the Athabasca and its tributaries, development within the past 2 years was related to elevated dissolved PAC concentrations that were likely toxic to fish embryos. In melted snow, dissolved
PAC concentrations were up to 4.8 g/L, thus, spring snowmelt and washout during rain events are important unknowns.

These results indicate that major changes are needed to the way that environmental impacts of oil sands development are monitored and managed.

Below is the conclusion of a report showing the cumulative impact of landscape disturbance as related to loss of natural CO2 storage

Oil sands mining and reclamation cause massive loss of peatland and stored carbon, Rooney, Bayley, Schindler, PNAS, 2011

We quantified the wholesale transformation of the boreal landscape by open-pit oil sands mining in Alberta, Canada to evaluate its effect on carbon storage and sequestration. Contrary to claims made in the media, peatland destroyed by open-pit mining will not be restored.

Current plans dictate its replacement with upland forest and tailings storage lakes, amounting to the destruction of over 29,500 ha of peatland habitat. Landscape changes caused by currently approved mines will release between 11.4 and 47.3 million metric tons of stored carbon and will reduce carbon sequestration potential by 5,734–7,241 metric tons C/ y. These losses have not previously been quantified, and should be included with the already high estimates of carbon emissions from oil sands mining and bitumen upgrading.

A fair evaluation of the costs and benefits of oil sands mining requires a rigorous assessment of impacts on natural capital and ecosystem services.

Water Quality Issues in the Oil Sands Region of the Lower Athabasca River, Alberta, David Schindler, Geoscience of Climate and Energy 12, 2013

I summarize the controversies about industrial pollutants in freshwaters near the oil sands industrial area of Alberta, the inadequacies in environmental monitoring that have led to widespread misconceptions, and recent attempts to correct the problems.

Adequate data are available to show that mercury, other trace metals, and polycyclic aromatic compounds are being added by industry to the Athabasca river system and its watershed, although the relative contributions of industrial development and natural sources remain in question. [this question was resolved in 2014, in study a year later, pj b]

Recent improvements in water monitoring by Environment Canada show promise of resolving the controversies, although independent governance for Canada’s and Alberta’s water monitoring programs in the lower Athabasca River will be necessary to rebuild public confidence in the data and their interpretation by government and industry.

The global development of [heavy oil] and the increase in oil production from oil sands has caused environmental concerns over the presence of toxic compounds in nearby ecosystems and acid deposition. The contribution of oil sands exploration to secondary organic aerosol formation, an important component of atmospheric particulate matter that affects air quality and climate, remains poorly understood.

Here we use data from airborne measurements over the Canadian oil sands, laboratory experiments and a box-model study to provide a quantitative assessment of the magnitude of secondary organic aerosol production from oil sands emissions. We find that the evaporation and atmospheric oxidation of low-volatility organic vapours from the mined oil sands material is directly responsible for the majority of the observed secondary organic aerosol mass. The resultant production rates of 45–84 tonnes per day make the oil sands one of the largest sources of anthropogenic secondary organic aerosols in North America.

Heavy oil and bitumen account for over ten per cent of global oil production today, and this figure continues to grow.

Our findings suggest that the production of the more viscous crude oils could be a large source of secondary organic aerosols in many production and refining regions worldwide, and that such production should be considered when assessing the environmental impacts of current and planned bitumen and heavy oil extraction projects globally.

Pollution From Canada’s Oil Sands May Be Underreported
By Bobby Magill
Published: April 24th, 2017, Climate Central - Web based newsletter

Canadian scientists have found that the standard way of tallying air and climate pollution from Alberta’s oil sands vastly understates pollution levels there — by as much as 4.5 times, according to a Canadian government study published Monday. The study shows that air samples collected using aircraft may be a more accurate way to tally air and climate pollution from oil and gas production than using industry estimates.

Accurate accounting of the oil and gas industry’s pollution is critical for scientists to understand how fossil fuel production affects the climate and to find ways to cut the pollution to address air quality and climate change, said Allen Robinson, director of the EPA-funded Center for Air, Climate and Energy Solutions at Carnegie Mellon University, who is unaffiliated with the study.
Both the U.S. and Canadian governments rely on energy companies’ self-reported emissions estimates in order to count all the pollution from oil and gas operations. Few actual pollution measurements are taken. If official tallies underestimate the actual emissions, climate models will likewise underestimate the extent to which fossil fuel pollution is contributing to climate change, Robinson said. The Canadian research shows that the energy industry has been underreporting its emissions.

This article refers to this study:
Differences between measured and reported volatile organic compound emissions from oil sands facilities in Alberta, Canada, Meng, Leithead, et al, PNAS, 2016

Contaminant problems in the Athabasca River not overstated, David Schindler
Letter March 13th, 2017, in response to an industry friendly study:

We disagree with the assessment of Prof. William Shotyk that “contamination problems in the oilsands region are overstated.” Like Shotyk, previous research (including Kelly et al. 2010, Proceedings of the U.S. National Academy of Sciences) has found that the concentrations of elements dissolved in the Athabasca River were well below Canadian Council of Ministers of the Environment (CCME) guidelines for drinking water. Most of the elements are carried in suspended particles, which he filters out before analyzing water samples. However, these particles are not inert — they contain a cocktail of toxic elements and petroleum hydrocarbons. They are ingested by people and animals that drink directly from the river, and may enter the bloodstream.

Considering the toxicity of one element at a time also overlooks potential interactive toxicity among elements and between elements and organics.

The fate and behaviour in particulates are also modified in the river ecosystem. A good example is mercury, which can undergo chemical and biological transformation into a potent neurotoxin, methyl mercury, that bioaccumulates in aquatic food chains. In the Athabasca system, this has contributed to increasing mercury in the eggs of fish-eating birds and consumption advisories for walleye. Another example is polycyclic aromatic hydrocarbons (PAHs), some of which are more toxic in sunlight than in the dark.

A thorough assessment of toxic contaminants in the oilsands region must include a broad suite of chemicals in both suspended and dissolved phases to understand the true potential ecosystem impact. Comprehensive water quality monitoring must include water samples under a range of seasons and river conditions. Sampling the river only at autumn low flow minimizes the apparent contaminant problem because that is when the river carries its lowest load of particles. Inputs from tributaries that drain the active mining area, which have higher concentrations of contaminants than the mainstream Athabasca River, and input from snowmelt, are also lowest in the autumn when soil erosion from mining activities is least.
The acidity of the river in the oilsands area increases significantly during snowmelt, as the result of acid deposition in snow. This too would increase the solubility of many elements, enhancing their mobility into food chains.

The Kelly et al. papers have been among the most intensively scrutinized science in recent Canadian history. Many studies by the new government-sponsored monitoring program agree well with their assessment that the oilsands industry is an important source of contaminants in the area. Oilsands developments are associated with airborne emissions of contaminants, groundwater seepage from tailings ponds, and wind and water erosion of soils from landscapes stripped of their vegetation and topsoil for mining, road development, pipelines, power corridors, and survey lines.

In summary, focusing only on a few dissolved elements misses important pathways to wildlife and humans, particularly indigenous people, and oversimplifies the complex nature of oilsands contaminants and the Athabasca River itself.

Fortunately, the current monitoring program carried out by Alberta Environment and Parks and Environment and Climate Change Canada measures both suspended and dissolved fractions of a wide suite of water quality parameters. Results from this program have continued to build upon the Kelly et al. papers, reinforcing the need for better, more integrated scientific efforts.

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Finally here is our last reference in regard to cumulative impacts. This study was just published in July 2018 and shows alarming new information in regard to the cumulative impact of years of acid rain and acid deposition in the downwind region of the oil sands operations. It clearly shows there is no more room for added air pollution, in fact it shows that the current emissions will need to be cut dramatically to prevent collapse, first of lake ecosystems, and the forests later (in an area the size of Germany).

Estimates of Exceedances of Critical Loads for Acidifying Deposition in Alberta and Saskatchewan
Paul Makar, et al, Atmospheric Chemistry and Physics, July 13, 2018

Estimates of potential harmful effects on ecosystems in the Canadian provinces of Alberta and Saskatchewan due to acidifying deposition were calculated [along with] estimates of aquatic and terrestrial ecosystem critical loads. The model simulation was evaluated against two different sources of deposition data: total deposition in precipitation and total deposition to snowpack in the vicinity of the Athabasca oil sands.

Aircraft-based estimates of fugitive dust emissions, shown to be a factor of 10 higher than reported to national emissions inventories (Zhang et al., 2018), were used to estimate the impact of increased levels of fugitive dust on model results. Model comparisons to open snowpack
observations were shown to be biased high, but in reasonable agreement for sulfur deposition when observations were corrected to account for throughfall in needleleaf forests.

Potential ecosystem damage was predicted within each of the regions represented by the ecosystem critical load datasets [analyzed], using a combination of 2011 and 2013 emissions inventories. The spatial extent of the regions in exceedance of critical loads varied between 10,000 and 330,000 km sq., for the more conservative observation-corrected estimates of deposition, with the variation dependent on the ecosystem and critical load calculation methodology. The larger estimates (for aquatic ecosystems) represent a substantial fraction of the area of the provinces examined.
Dr John O’Connor
MB ChB BAO

PROFESSIONAL SUMMARY
1982: Medical Degree-National University of Ireland (Galway)
1984-1993: Family Physician-Barrington Passage Nova Scotia
1993-Date: Family Physician-Northern Alberta
1993-Date: Staff Member-Northern Lights Health Centre Fort McMurray
2007-Date: Hospitalist-Northern Lights Health Centre Fort McMurray

AWARDS
2014: Fellowship of Rural and Remote Medicine (FRRMS) of the Society of Rural Physicians of Canada
2017: College of Family Physicians of Canada Environmental Health Award
2017: College of Family Physicians of Canada Nicole Bruinsma Award for Environmental Leadership

I have worked extensively in the Indigenous Communities outlying Fort McMurray since 1994, being the sole primary care in-community provider for many years. My advocacy for the health of residents living downstream of the Tarsands has helped to focus attention on the plight of communities adversely impacted by the widespread destruction wrought by the mining of the land in Northern Alberta.

Memberships: Council of the College of Physicians and Surgeons of Alberta (CPSA)
Board Member Rural Health Professions Action Plan (RhPAP)
Board Member Keepers of the Athabasca
Canadian Association of Physicians for the Environment (CAPE)
Society of Rural Physicians of Canada (SRPC)
Concerned Health Professionals of Ireland (CHPI)

I am married to Charlene, RN, and together we have 7 children, and 4 grandchildren.