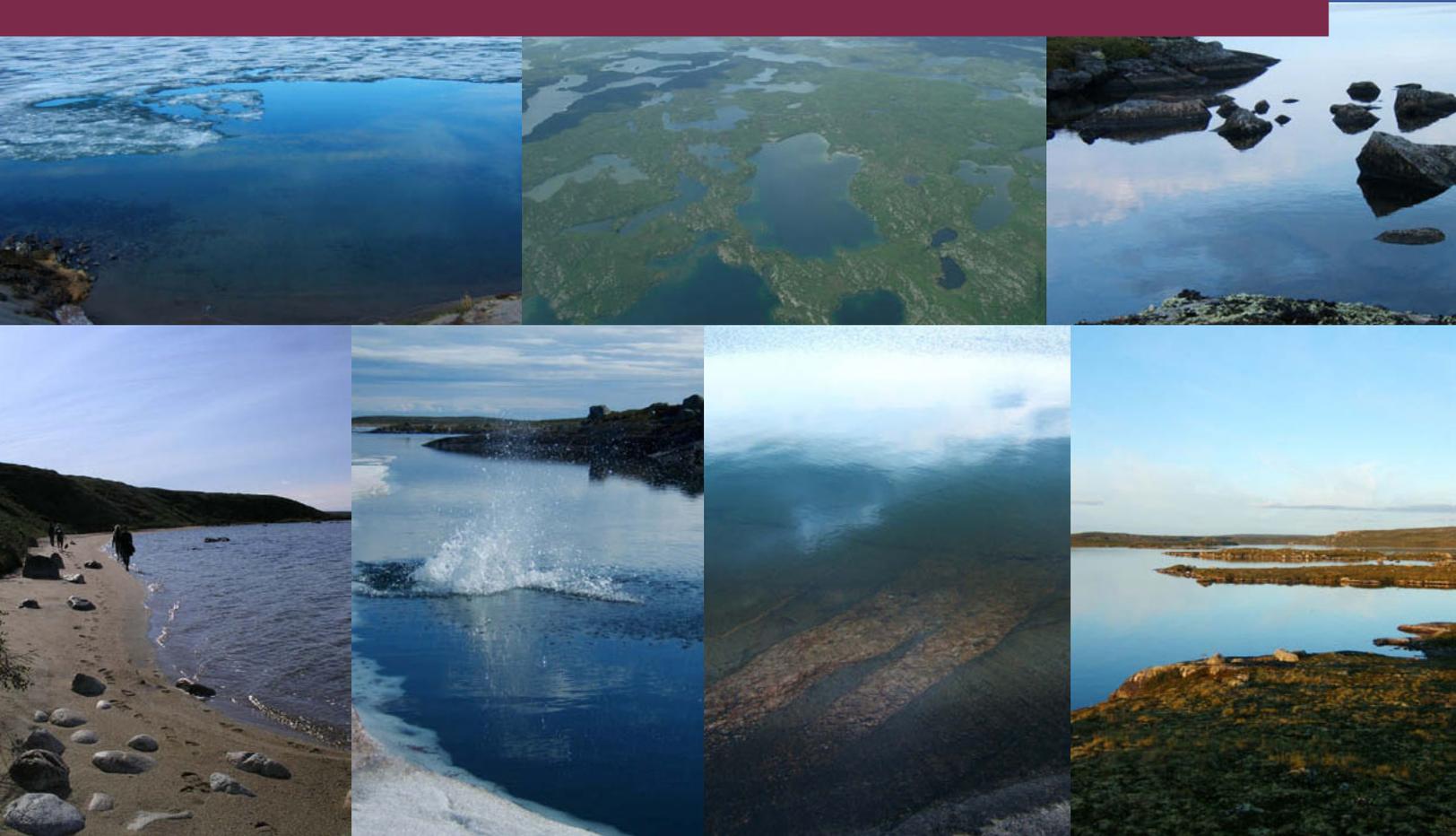


# NORTHERN LIFEblood



Empowering Northern Leaders to Protect  
the Mackenzie River Basin from Oil Sands Risks

Jennifer Grant

Jennifer Dagg

Simon Dyer

Nathan Lemphers



25 years  
of Sustainable Energy Solutions



# Northern Lifeblood

**Empowering Northern Leaders to Protect  
the Mackenzie River Basin from Oil Sands Risks**

**Jennifer Grant**

**Jennifer Dagg • Simon Dyer • Nathan Lemphers**

**July 2010**



Grant, Jennifer, Jennifer Dagg, Simon Dyer and Nathan Lemphers  
*Northern Lifeblood: Empowering Northern Leaders to Protect the Mackenzie River Basin from Oil Sands Risks*  
Published July 2010  
Editing and Layout: Roland Lines  
Cover Design: Laura Fauth  
Cover Photos: Jennifer Dagg and Jenny Adams

©2010 The Pembina Institute and The Pembina Foundation

The Pembina Foundation for Environmental Research and Education is a national registered charitable organization that enters into contractual agreements with environmental research and education experts, such as the Pembina Institute, to deliver on its work.

The Pembina Institute  
Box 7558  
Drayton Valley, Alberta  
Canada T7A 1S7  
Phone: 780-542-6272  
Email: [info@pembina.org](mailto:info@pembina.org)

Additional copies of this publication may be downloaded from the Pembina Institute website: [www.pembina.org](http://www.pembina.org).

## **About the Pembina Institute**

The Pembina Institute is a national non-profit think tank that advances sustainable energy solutions through research, education, consulting and advocacy. It promotes environmental, social and economic sustainability in the public interest by developing practical solutions for communities, individuals, governments and businesses. The Pembina Institute provides policy research leadership and education on climate change, energy issues, green economics, energy efficiency and conservation, renewable energy, and environmental governance. For more information about the Pembina Institute, visit [www.pembina.org](http://www.pembina.org) or contact [info@pembina.org](mailto:info@pembina.org). Our engaging monthly newsletter offers insights into the Pembina Institute's projects and activities, and highlights recent news and publications. Subscribe to Pembina eNews at [www.pembina.org/enews/subscribe](http://www.pembina.org/enews/subscribe).

## **About the Pembina Foundation for Environmental Research and Education**

The Pembina Foundation for Environmental Research and Education is a federally registered charitable organization. The foundation supports innovative environmental research and education initiatives that help people understand the way we produce and consume energy, the impact of energy generation and use on the environment and human communities, and options for more sustainable use of natural resources. The Pembina Foundation contracts the Pembina Institute to deliver on this work. More information about the Pembina Foundation is available at [www.pembinafoundation.org](http://www.pembinafoundation.org) or by contacting [info@pembinafoundation.org](mailto:info@pembinafoundation.org).

## About the Authors



**Jennifer Grant** is Director of Arctic Energy Solutions at the Pembina Institute. She has worked with the Institute since 2006 on a variety of issues, including the environmental impacts of Canadian oil sands development and cumulative effects and land use planning in the North. Jennifer represented the Pembina Institute on the Reclamation Working Group and the Watershed Integrity Task Group of the Cumulative Environmental Management Association (CEMA). Prior to her work with the Pembina Institute, Jennifer worked as a biologist, facilitator and educator for both government and non-government organizations. Jennifer holds an M.Sc. in Ecosystem Management from the University of Calgary and a B.Sc. in Biological Sciences from the University of Victoria.

**Jennifer Dagg** is a Policy Analyst with Pembina's Arctic Energy Solutions team. Her work focuses on the effects of climate change and oil and gas development in Canada's North. She was one of the principal founders of a climate change awareness group at Trent University and has experience in environmental education and arctic ecology from northern Manitoba, Northwest Territories and Yukon Territory. Jennifer has a B.Sc. (Honours) in Environmental Science from the University of Guelph and an M.Sc. in Environmental Science from Trent University.



**Simon Dyer** is Director of the Oil Sands Program at the Pembina Institute. He is a registered professional biologist and has worked on land-use issues in Western Canada since 1999. Simon represented the Pembina Institute on the Sustainable Ecosystems Working Group of the Cumulative Environmental Management Association (CEMA). He holds an M.Sc. in Environmental Biology and Ecology from the University of Alberta, and an M.A. in Natural Sciences from Cambridge University.

**Nathan Lemphers** is an Oil Sands Policy Analyst at the Pembina Institute. Nathan has held internships with the USGS and UNESCO and has worked internationally for NGOs, municipal and state governments, First Nations and industry clients. He holds a Master of City Planning with a Certificate in Environmental Planning and Policy from the Massachusetts Institute of Technology. He also has a B.Sc. in Environmental and Conservation Sciences from the University of Alberta.



## **Acknowledgements**

The authors would like to acknowledge the Walter and Duncan Gordon Foundation for their support of this report. We would also like to thank a number of individuals and organizations who assisted in the production of this report:

- Owen Saunders and Monique Passelac-Ross of the Canadian Institute of Resources Law
- Karin Buss, Ecojustice
- Danielle Droitch, Katherine Mackenzie and Peggy Holroyd of the Pembina Institute
- Staff at the Department of Environment and Natural Resources, Government of the Northwest Territories
- Dr. Erin Kelly, independent scientist
- Adam Driedzic, Environmental Law Centre

# Contents

- Northern Lifeblood ..... 7**
- 1. The Mackenzie River Basin..... 11**
  - 1.1 The Heart of Canada’s North ..... 11
- 2. Risks to the Basin from Canada’s Oil Sands ..... 14**
  - 2.1 Oil Sands Impacts ..... 14
  - 2.2 Toxic Tailings ..... 16
    - 2.2.1 Tailings Impacts ..... 17
    - 2.2.2 Regulations on Tailings Production ..... 17
    - 2.2.3 Tailings Containment Basics ..... 19
    - 2.2.4 Tailings Dam Failures and Accidents ..... 19
    - 2.2.5 Regulations on Tailings Dam Stability ..... 20
    - 2.2.6 Dam Failure Risks in the Oil Sands ..... 21
    - 2.2.7 Beyond Alberta: Transboundary Implications of Dam Failure ..... 22
    - 2.2.8 Oil Sands Tailings Dam Information: the Transparency Challenge ..... 23
    - 2.2.9 Who foots the bill? ..... 24
  - 2.3 Impacts on Water Quantity and Quality ..... 26
- 3. Collectively Managing the Basin ..... 29**
  - 3.1 The Constitutional Context for Water Management ..... 29
  - 3.2 Federal Authority ..... 29
    - 3.2.1 Federal Powers ..... 29
    - 3.2.2 Federal Water Policy ..... 30
    - 3.2.3 Federal Statutes Relevant to Water Management ..... 30
  - 3.3 Water Management in Alberta ..... 32
    - 3.3.1 Alberta Oil Sands Monitoring Efforts ..... 33
  - 3.4 Water Management in the NWT ..... 35
    - 3.4.1 NWT Monitoring Efforts ..... 36
  - 3.5 Transboundary Efforts to Date ..... 36
- 4. Protecting the Basin from Upstream Risks ..... 39**
  - 4.1 Enforce Existing Federal Laws ..... 39
  - 4.2 Implement the NWT Water Strategy ..... 41

4.3	Strengthen and Implement the Mackenzie River Basin Transboundary Master Agreement .....	43
4.4	Ensure Adequate Monitoring in the Basin .....	44
4.5	Participate in the Regulatory Approval Process Governing Oil Sands Development ...	45
4.6	Investigate the Opportunities for Legal Action .....	47
4.6.1	Aboriginal Water Rights .....	48
4.6.2	Land Claim Agreements .....	49
4.6.3	Federal Statutes .....	50
4.7	File Environmental Petitions .....	52
4.8	Participate in the Commission for Environmental Cooperation Citizen Submissions Process .....	53
4.9	Establish a Transboundary Community Network .....	53
<b>Appendix A</b>	.....	<b>55</b>
	Industrial Upstream Water Uses in the Mackenzie River Basin .....	55
<b>Appendix B</b>	.....	<b>56</b>
	Resolution: Protection of NWT Water Sources from Development of Oil Sands in Alberta ...	56
<b>Endnotes</b>	.....	<b>57</b>

## List of Figures

Figure 1. The Mackenzie River Basin covers about one-fifth of Canada’s land mass and consists of six major sub-basins .....	12
Figure 2. Mature fine tailings volumes, 2008 to 2040. ....	18
Figure 3. Select RAMP monitoring stations for fish, sediment quality and water quality .....	34

## List of Tables

Table 1. Compounds present in oil sands tailings waste water relative to regional lakes .....	16
Table 2. The unique features of tailings dams relative to conventional dams .....	19
Table 3: Accessibility of tailings dam management documents .....	23
Table 4. Key water-related statutes administered by the federal government.....	30
Table 5. RAMP organizational structure .....	33
Table 7. Opportunities for the federal government to increase its role in oil sands management .....	40

# Northern Lifeblood

## Empowering Northern Leaders to Protect the Mackenzie River Basin from Oil Sands Risks

The Mackenzie River Basin has sustained people and an abundance of flora and fauna for millennia — long before this land was called a country, let alone split into provinces and territories. Today, its rivers and streams cross several political boundaries, covering the northern half of Alberta, parts of British Columbia, Saskatchewan and the Yukon, and most of the Northwest Territories.

The aquatic value of the basin is widely recognized; indeed, there are few natural areas in the world that are comparably pristine or ecologically significant. The basin's streams and rivers collectively transport more than half of the fresh water that flows into the Arctic Ocean from Canada.

### *Following the Flow: Upstream Risks to the Basin*

All of the Mackenzie River Basin's streams and rivers ultimately feed into the Mackenzie River and flow North to the Arctic Ocean. Therefore, whatever happens to the Athabasca River, the Peace River, the Slave River and dozens of others ultimately happens to the Mackenzie River Basin itself. And while the Mackenzie Basin's northern waters are still abundant and supporting a diversity of life, concern is increasing about what's going on upstream.

### **Oil sands development threatens critical headwaters**

In the Peace and Athabasca watersheds, oil sands development threatens both water quality and quantity. Of all the upstream industrial activities, oil sands activity merits special attention as it is rapidly growing in critical headwaters of the broader Mackenzie River Basin and uses significant amounts of water, while leaving behind toxic sludge. Oil sands development also results in land disturbance and air pollution.

For every barrel of bitumen (a tar-like heavy oil) that is mined, between two and four barrels of fresh water are required to extract the bitumen from the sand. This water is largely taken from the Athabasca River. After being used, the water is too contaminated to go back into the river and ends up in toxic man-made lakes (tailings lakes) that currently occupy an area 1.5 times the size of the City of Vancouver.



**The Mackenzie River Basin contains six sub-basins**  
Map: Roland Lines, The Pembina Institute

## Pollution flows to the North

The Athabasca River flows north through several oil sands mines and seepage from tailings lakes and surface runoff from operations pose risks to water quality — water that people drink and fish from downstream.

Pollution from tailings ponds, upgraders and other operations can mix in the atmosphere and travel long distances before depositing on land or water.

## Toxic tailings lakes pose threat indefinitely

Tailings lakes may be the greatest threat to downstream users and to the long-term aquatic health of the Mackenzie River Basin. In addition to tailings seepage, there has been no successful reclamation of tailings to date. As it stands, these toxic tailings lakes pose a threat indefinitely. And while tailings dams are theoretically designed to prevent drainage and leaking of tailings material and water, a lack of transparency on their performance makes it near impossible to assess whether or not the current dam management measures will sufficiently protect downstream communities.

### ***Top 10 Reasons Oil Sands Tailings Threaten the Mackenzie River Basin***

1. **Toxicity:** Tailings contain a host of toxins. A major concern associated with tailings containment is the migration of pollutants through the groundwater system, which can in turn leak into surrounding soil and surface water.
2. **Seepage:** Tailings seep wastewater into groundwater below or around containment dykes or tailings lakes, which could present water quality risks downstream.
3. **Size and future growth:** Tailings are stored in large settling basins, referred to as tailings lakes. Oil sands tailings lakes currently cover an area of 170 square kilometers. With the anticipated growth in oil sands development, the volume of liquid tailings will grow 30% by 2020.



**Many tailings lakes border the Athabasca River, yet information on the performance of tailings lake dams is not publicly available**

Photo: David Dodge, Pembina Institute

4. **Risk of dam failure:** There are numerous risks to the structural integrity of tailings lakes containment structures, including seepage, the collapse of internal walls, frost effects on the foundations and the instability of partially reclaimed slopes.
5. **Impacts on wildlife:** Waterfowl and shorebirds depend on freshwater ponds for breeding, foraging and staging during their migration back to the North. Tailings lakes can be mistaken as open water ponds by waterfowl. Birds may ingest the oil and their plumage may become oiled with waste bitumen, making them unable to fly.
6. **Uncertain reclamation:** The reclamation of toxic tailings has yet to be demonstrated on a commercial scale. There is a risk that seeping tailings lakes will not be cleaned up and therefore present ongoing risks to the basin.
7. **Uncertain compliance with new regulations:** Oil sands companies submitted tailings management plans in 2009 to demonstrate how their operations would meet the new government rules (Directive 074). Out of nine plans submitted, only two will be in compliance.



**There is conflicting evidence about whether or not oil sands developments are contaminating the Athabasca River**

Photo: David Dodge, CPAWS

8. **Reliance on “end pit lakes” for long term reclamation:** A proposed long-term solution to toxic tailings reclamation is for mining companies to dump tailings waste into old mine pits and cap them with fresh water from the Athabasca River. At least 27 of these high-risk and experimental “end pit lakes” are planned for the Athabasca Boreal region.
9. **Low transparency of tailings dam status and performance:** Documents relating to the status and performance of tailings pond dams and emergency planning are not publicly available. As such, it is difficult to assess whether or not the current dam management measures sufficiently protect downstream communities.
10. **Inadequate reclamation security system:** Due to a lack of transparency, it is uncertain whether or not Mackenzie River Basin residents and Canadians at large are financially protected from a major industrial accident. The Alberta Office of the Auditor General noted a suite of flaws with the current system, including inconsistencies in how financial security was posted and the use of outdated information to estimate the full cost of reclamation.

### ***Beyond Borders: A Call for Federal Action***

While the provinces manage their own water resources, the federal government has jurisdiction over cross-boundary waterways, as well as water in the Northwest Territories. Water management within the Mackenzie River Basin is therefore a shared responsibility.

Unfortunately, the current water management efforts in Alberta are not adequately protecting the basin. The federal government has failed to utilize or enforce federal laws designed to protect public health and the environment in the face of increasing oil sands development, even though concerns have been expressed by the scientific and non-governmental sectors, Aboriginal communities and the Northwest Territories government about the impact of oil sands development on Canada’s water resources.

### ***Inadequate Monitoring Prevents Progress***

For example, the need for continuous, consistent and holistic water monitoring programs to detect environmental changes and longer-term trends in the Mackenzie River Basin is widely supported and yet the monitoring occurring around and downstream of oil sands developments is inadequate. There is increasing independent evidence that oil sands activities are directly impacting water quality and quantity.

In Alberta, most of the responsibility for monitoring the effects of oil sands activity on aquatic environments is funded by industry through the Regional Aquatics Monitoring Program, despite increasing public concern about the program’s lack of scientific integrity, design and overall failure to incorporate a regional approach.

In addition, there is evidence that federal regulations protecting upstream waters are not

being enforced; specifically the Federal Fisheries Act and the Canada Water Act are not being upheld in the face of increasing oil sands development.

### ***Taking Action in the North***

The risk oil sands development poses on the Mackenzie River Basin include growing volumes of toxic tailings waste, as well as inadequate monitoring and enforcement of existing regulations and laws. But there are opportunities for both northern leaders and the federal government to proactively protect the Mackenzie River Basin. Protecting the lifeblood of the North is still possible, but swift action is required:



**The health of the Mackenzie Basin is vital to life in the North, yet it is not being adequately protected**

Photo: Jenny Adams

1. Call on the federal government to **enforce existing federal laws**.
2. Call on the federal government to ensure the capacity exists to **implement the Northwest Territories Water Strategy**.
3. Call on the federal government to **strengthen and implement the Mackenzie River Basin Transboundary Master Agreement**.
4. Call on the federal government to help **reform water monitoring in the Mackenzie River Basin**.
5. Actively **participate in the regulatory approval process** governing oil sands development.
6. Investigate the **opportunities for legal action** based, for example, on rights to water and fish outlined in Aboriginal land claim agreements.
7. File an environmental petition with the federal government to **bring attention to concerns about water management** in the basin.
8. File a submission to the Commission for Environmental Cooperation to **demonstrate public engagement in regional environmental concerns**.
9. Create a **transboundary community network** to help raise awareness of water concerns and support new ways of addressing water management challenges.

# 1. The Mackenzie River Basin

The streams, rivers, ponds and lakes of the Mackenzie River Basin are, for the most part, productive, clean and abundant. Few natural areas in the world are comparably pristine, and the value of the basin is widely recognized, particularly by Northwest Territories (NWT) residents. Access to water is an essential part of day-to-day life in the NWT and important to traditional Aboriginal cultures.

Aboriginal peoples in the NWT are guaranteed access to clean and plentiful water through their land-claim agreements, but concerns regarding the future of NWT waters and the potential threats from upstream oil sands development are mounting. People voiced unease regarding risks to water at several gatherings, including the 2009 NWT Association of Communities Annual General Meeting, Keepers of the Water conferences (2006–2008), WaterWise (2007), and the Dene Nation Environment and Water Summit (2008). It is at such gatherings that Northerners effectively communicated: “Water is life. All life depends on it.”<sup>1</sup>

Other actions indicate Northerners’ concerns regarding upstream uses. In May 2009, the NWT Association of Communities passed a resolution calling for a moratorium on new oil sands development until important water management measures are in place.<sup>2</sup> The risks posed to water by other jurisdictions were a driving force for both the Government of the NWT and Indian and Northern Affairs Canada (INAC) to develop a territorial water strategy to guide the use and management of NWT water resources. Despite these efforts, Northerners are still wondering what else can be done.

This report explains the risks of oil sands development and explores an array of potential mechanisms to help improve transboundary water management from a Northerner’s perspective and to protect the Mackenzie River Basin’s waters and all life that depends on it.<sup>3</sup>

In 2007, the Legislative Assembly of the NWT unanimously passed a motion affirming that water is essential to life and constitutes a fundamental human right.

## 1.1 The Heart of Canada’s North

The Mackenzie River Basin, which covers 1.8 million km<sup>2</sup> (20% of Canada’s land mass<sup>4</sup>), has sustained people and an abundance of flora and fauna for millennia — long before Canada was called a country, let alone split into provinces and territories. Today, the basin crosses several political boundaries. It includes most of the NWT, the northern half of Alberta, northeastern British Columbia and parts of Saskatchewan and the Yukon.<sup>5</sup>



**Figure 1. The Mackenzie River Basin covers about one-fifth of Canada’s land mass and consists of six major sub-basins**

Map: Roland Lines, The Pembina Institute

Considered by some as the heart of Canada’s North, the basin’s rich ecological assets include tundra, boreal forests, wetlands, peatlands, fens and bogs. The Mackenzie River, Canada’s longest river, empties the basin into the Arctic Ocean. Other major rivers in the basin include the Peace River, the Athabasca River and the Liard River.

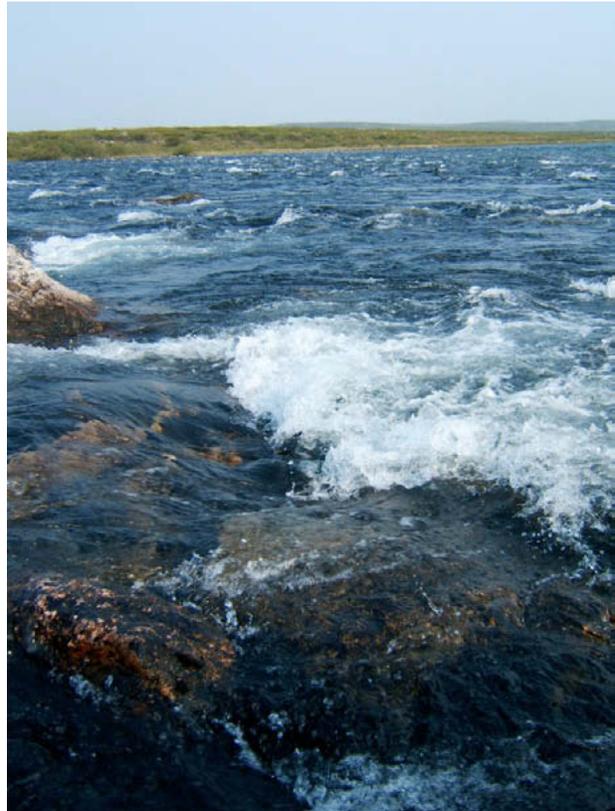
Because the Mackenzie River transports more than half of the fresh water flowing to the Arctic Ocean from Canada, the basin has a major influence on the global climate and ocean circulation systems.<sup>6</sup> Its eco-hydrological functions bring benefit to the region, the rest of Canada and North America as a whole. Additional ecosystem services provided by the basin include water filtration, carbon storage, climate regulation, cultural benefits to Aboriginal communities, recreational benefits and opportunities for a wide range of land users.<sup>7</sup>

“The lands and waters of the Mackenzie basin not only form the cultural and economic foundation of the peoples who live in the region, they perform important eco-hydrological functions that bring benefit not just to the rest of Canada but to the entire continent as a whole.”<sup>8</sup>

The basin has sustained Aboriginal peoples for millennia. Today, 400,000 people (15% of whom are Aboriginal) call the Mackenzie River Basin home.<sup>9</sup> The Mackenzie River system is an important transportation route for northern communities<sup>10</sup> and many of the communities along the river and on the Arctic Ocean rely on barges for resupply.<sup>11</sup>

The basin is home to hundreds of species of birds and other wildlife, including wolves, caribou, lynx, muskrat, beaver and moose. Over 100 migratory bird species visit the Mackenzie River Delta alone. The delta includes the last known breeding habitat of the highly endangered Eskimo curlew.<sup>12</sup> Wood Buffalo National Park is a transboundary park that occupies a portion of the basin in southern NWT and in Alberta, just north of the mineable oil sands deposits. The park sustains the world’s largest herd of wood bison and whooping cranes — both threatened species — and it is a designated world heritage site for its outstanding value as an example of ongoing ecological processes and for containing some of the largest undisturbed grass and sedge meadows in North America.<sup>13</sup>

The Mackenzie River itself originates in Great Slave Lake, which, together with Great Bear Lake, is known for its abundance and its low human disturbance.<sup>14</sup> The Peace-Athabasca Delta in the southern part of the basin is one of the world’s largest freshwater deltas. It is an internationally significant wetland at the convergence of four major migratory waterfowl flyways.<sup>15</sup>



**The Mackenzie River transports more than half of the fresh water flowing to the Arctic Ocean from Canada**

Photo: Jennifer Dagg, The Pembina Institute

## 2. Risks to the Basin from Canada's Oil Sands

The basin's waters are interconnected: whatever happens to the Athabasca River, the Peace River, the Slave River and dozens of other tributary rivers ultimately happens to the basin itself. The Mackenzie River Basin is generally healthy at this time, but concerns regarding environmental trends, information gaps and certain management practices need to be addressed to protect the basin's integrity over the long term.<sup>16</sup> Oil sands development is among a range of upstream industrial activities in Alberta and British Columbia that pose risks to the basin (see Appendix A). Among these activities, oil sands development merits special attention for several reasons. First, Canada's oil sands are largely located in the Peace and Athabasca watersheds of Alberta, critical headwaters of the broader Mackenzie River Basin. Secondly, oil sands development requires large amounts of water, and the water used for oil sands mining largely ends up as toxic tailings waste. Third, oil sands production is expected to significantly expand in the near future.

The Alberta oil sands are the second-largest petroleum reserve in the world and the world's first major foray into unconventional oil development.<sup>17</sup> The Alberta oil sands contain an estimated 175 billion barrels of crude bitumen that can be recovered using current technology.<sup>18</sup> In comparison, Canada has an estimated 5.4 billion barrels of conventional crude oil reserves.<sup>19</sup>

At the start of 2009, oil sands operations produced 1.4 million barrels of bitumen per day,<sup>20</sup> up from 300,000 b/d (barrels per day) in 1999.<sup>21</sup> Oil sands production is expected to continue along this growth trajectory. Forecasts suggest that production will be 2.2 million b/d in 2015, increasing to 3.5 million b/d in 2025.<sup>22</sup> This projection is a "growth case" scenario that is based on the assumption that oil sands projects will be developed and brought into service at a pace similar to historical and current trends.

If oil sands projects are approved at a pace similar to previous years, oil sands production will nearly triple in only 15 years.

### 2.1 Oil Sands Impacts

Oil sands development results in large-scale water use, land disturbance and water and air pollution. About 20% of the oil sands deposits can be surface mined, which could result in the clearing of 4,800 km<sup>2</sup> of forests and wetlands for mining pits, roads, well sites and pipelines that destroy the land's ability to maintain ecosystem health by storing and filtering water.<sup>23</sup> The remaining, deeper deposits are recovered using in situ ("in place") techniques that heat and extract the bitumen so it can be pumped to the surface.<sup>24</sup> In situ development has the potential to disturb 135,250 km<sup>2</sup> — nearly 30 times as large as the area that will be exposed to surface mining.

### Additional Threats to the Basin

Other upstream activities that occur in the Mackenzie Basin and likely affect water resources include hydroelectric dams, agriculture, forestry and sawmills, pulp and paper mills, and coal and uranium mining. (See Appendix A for a complete list of industrial uses by region). Apart from the oil sands, coal is the most actively mined fossil fuel in the Alberta portion of the basin. Water concerns associated with coal mining include potential contamination with metals, including selenium and iron, coal dust, salts and other operational wastes. Other mining activities in the basin include extraction of sand, gravel, vanadium, peat and uranium. Uranium mining operations can release radioactive materials into the aquatic environment that are hazardous in high doses to fish and other organisms.<sup>25</sup> Three uranium mines are currently operational in Saskatchewan, southeast of Lake Athabasca at the eastern edge of the basin.<sup>26</sup> In the NWT, uranium was mined historically and new exploration is in progress.

**Climate change** is thought to intensify several freshwater challenges, particularly with respect to ensuring a reliable and adequate water supply for the many uses in a watershed.<sup>27</sup> Climate variability and change has recently been linked to increased concentrations of mercury and polychlorinated biphenyls concentrations in Mackenzie River burbot.<sup>28</sup> More details on the effects of climate change on Mackenzie River Basin waters are provided in the Pembina Institute's report *The Waters that Bind Us*.<sup>29</sup>

Detailed accounts of the impacts of oil sands development on air, land and water have been reported elsewhere,<sup>30</sup> but the impacts of oil sands development on Northerners is less well understood. Because water and air resources are constantly moving, they are key conduits for pollutants to reach the North. Oil sands development results in the production of various air pollutants, including acidifying emissions, particulate matter, polycyclic aromatic hydrocarbons (PAHs), sulphur, metals, volatile organic compounds and greenhouse gases. Atmospheric releases from tailings ponds, upgraders and other operations are a major concern because they can mix in the atmosphere and travel long distances before depositing on land or water. Other air pollutants enter the Athabasca River watershed through local deposition and the funnelling of air pollutants by the Athabasca River valley has been both documented and observed by downstream communities such as Fort Chipewyan.<sup>31,32</sup>



**The production and storage of tailings waste may be the greatest threat to the long-term aquatic health of the Mackenzie River Basin**

Photo: Jennifer Grant, The Pembina Institute

## 2.2 Toxic Tailings

The production and storage of tailings waste — the toxic waste slurry that is accumulated from the oil sands mining process — may be the greatest threat to downstream users and to the long-term aquatic health of the Mackenzie River Basin. Tailings waste production is a direct result of the water used and required for current oil sands mining practices. For every mined barrel of bitumen (a tar-like heavy oil), between two and four barrels of fresh water are required.<sup>33</sup> The large majority of this water is taken from the Athabasca River, with the remainder coming from groundwater and surface runoff.<sup>34</sup>

The resulting wastewater or tailings is alkaline, slightly brackish and acutely toxic to aquatic life<sup>35</sup> due to high concentrations of organic acids leached from the bitumen during extraction. Given the toxic composition of tailings waste, it must be held and managed on-site. The tailings waste is pumped to deposition sites where it is left to separate and settle. The resulting slurry is poured into cells and beaches, where the coarser sand settles and is compacted to form containment dams. The water and suspended fine materials flow down the beach slopes into large settling basins, also referred to as tailings ponds or lakes. Oil sands tailings lakes currently cover an area of 170 km<sup>2</sup>.<sup>36</sup>

Tailings contain a host of toxic compounds, including PAHs, metals and naphthenic acids. Metals detected in tailings lakes include arsenic, cadmium, chromium, copper, lead and zinc, all of which are labelled as priority pollutants under the United States Clean Water Act.<sup>37</sup> Heavy metals, such as arsenic, cadmium and lead, are very toxic and can build up in biological systems and become a significant health hazard.<sup>38</sup> Historic data from tailings lakes indicates that metals have exceeded Canadian Council of Ministers of the Environment (CCME) water quality guidelines.<sup>39</sup> Table 1 provides a list of *some* of the toxic compounds present in oil sands tailings lakes relative to regional lakes in the Athabasca boreal forest.<sup>40</sup> Existing standards, including Alberta's Surface Water Quality Guidelines, do not incorporate water quality limits for some of these chemicals, such as naphthenic acids,<sup>41</sup> despite concerns about the persistence and aquatic toxicity of this toxin.

**Table 1. Compounds present in oil sands tailings waste water relative to regional lakes**

	<b>Syncrude Mildred Lake Settling Basin (1985-1998)</b>	<b>Suncor tailings lakes (1982-1998)</b>	<b>Regional lakes (2001)</b>
Oil and grease (mg/ℓ)	25	9–31	–
Naphthenic acids (mg/ℓ)	49	68	1–2
Cyanide (mg/ℓ)	0.5	0.01–0.04	–
Phenols (mg/ℓ)	0.008	0.03–1.8	0.002–0.004

Source: Adapted from Erik W. Allen, "Process water treatment in Canada's oil sands industry: 1. Target pollutants and treatment objectives," *Journal of Environmental Science* 7 (2008): 123–38.

In addition, biochemical oxygen demand (BOD, a measure of the oxygen used by microorganisms to decompose waste) is widely used as an indication of water quality. Most pristine rivers will have a BOD below 1 mg/ℓ whereas treated municipal sewage would have a

value of about 20 mg/ℓ. Syncrude's Mildred Lake Settling Basin had a BOD rating of 25 mg/ℓ between 1985 and 1998, whereas Suncor's tailings lakes had BODs of less than 10 mg/ℓ to 70 mg/ℓ from 1982 to 1998.

### 2.2.1 Tailings Impacts

Tailings pose threats to freshwater resources and the aquatic ecosystem, including impacts on wildlife, seepage into ground and surface waters, uncertain reclamation, and — perhaps most disconcerting — dam failure.

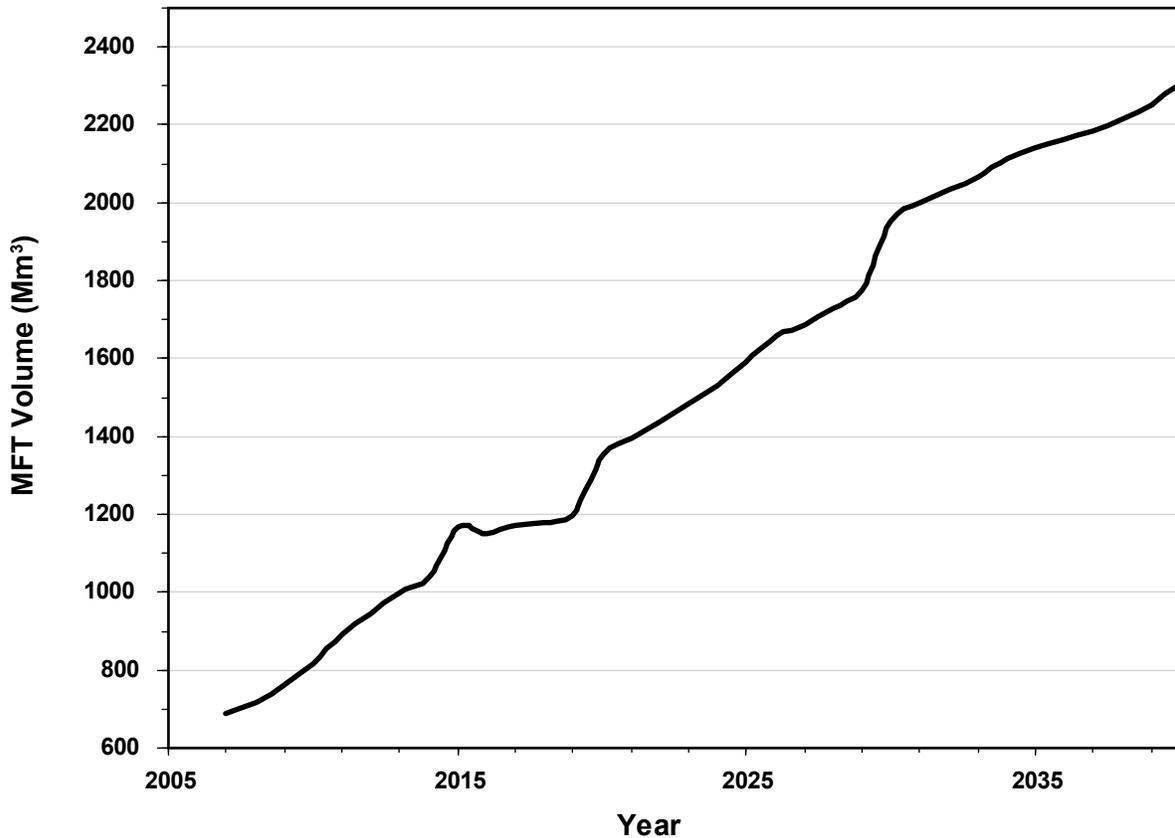
The impacts of tailings lakes on wildlife were highlighted when 1,600 ducks died from landing on a Syncrude tailings pond in 2008. Waterfowl and shorebirds depend on freshwater ponds for nesting, foraging and roosting, and as stopover sites during migration. Spring migration is becoming increasingly problematic in northeastern Alberta. While natural water bodies are still frozen, the warm waste runoff to tailings ponds from oil sands mines creates limited open-water ponds.<sup>42</sup> The tailings produced from oil sands mining are dangerous to waterfowl because birds may ingest the oil and their plumage may become oiled with waste bitumen. Oil-covered birds may be unable to fly and their feathers may lose their insulating properties, which can result in death from hypothermia.<sup>43</sup>

It is broadly acknowledged that tailings lakes seep wastewater either into the groundwater below and/or around the containment dykes or tailings lakes.<sup>44</sup> No information is available on the cumulative rates for seepage from tailings lakes, but Suncor estimated that 1,600 m<sup>3</sup> of toxic tailings wastewater seeps from the Tar Island Pond into the Athabasca River each day.<sup>45</sup> In 2007 it was estimated that tailings lakes seeped as much as 11 million litres per day into ground and surface waters.<sup>46</sup>

The reclamation of toxic tailings has not yet been demonstrated on a commercial scale. A high proportion of the water in tailings is recycled, but there is still a massive accumulation of tailings on the landscape. Reclamation issues remain relatively unaddressed while more mine applications get ushered through the regulatory queue.<sup>47</sup> Mature fine tailings (MFT) — the portion of tailings that settles to become less liquid and more dense over time — are particularly problematic to reclaim. MFT has a consistency like runny jam. It contains approximately 30% fine sand and clays by weight. The remaining 70% is composed of water that cannot be recycled because of the suspended sediments.<sup>48</sup> The production of MFT ties up water and therefore limits the availability of recyclable water for mine operation. With the anticipated growth in oil sands development comes growth in tailings waste. Figure 2 shows the projected MFT growth up to 2040.<sup>49</sup> By a conservative estimate,<sup>50</sup> as 2040 approaches the volume of tailings on the landscape would contain as much water as is needed to fill 880,000 Olympic swimming pools.<sup>51</sup>

### 2.2.2 Regulations on Tailings Production

In Alberta, new regulations emerged in 2009 to try to control tailings growth.<sup>52</sup> *Directive 074: Tailings Performance Criteria and Requirements for Oil Sands Mining Scheme* sets out targets for the capture of fine tailings materials to ensure that the tailings materials deposited on the landscape will eventually support reclamation.<sup>53</sup>



**Figure 2. Mature fine tailings volumes, 2008 to 2040.**

Source: Energy Resources Conservation Board<sup>54</sup>

Six oil sands companies submitted nine tailings management plans in September 2009 to demonstrate how their operations would meet the directive. An assessment of these plans by the Pembina Institute and Water Matters revealed that of these nine plans, only two — the Fort Hills Energy mine and the Suncor Millennium/North Steepbank mine — will comply with the rules for Directive 074.<sup>55</sup>

The Energy Resources Conservation Board (ERCB) — the quasi-judicial agency of the Government of Alberta regulates oil sands operations — reports that the current volume of tailings that require long-term containment is more than 840 million m<sup>3</sup>.<sup>56</sup> According to the Pembina Institute and Water Matters, the volume of MFT will grow 30% from 843 million m<sup>3</sup> to over 1.1 billion m<sup>3</sup> by 2020, and it will still be over 1.1 billion m<sup>3</sup> in 2065. These numbers are based on company submissions to the ERCB.<sup>57</sup> It remains unknown if the directive will result in reductions to these projected tailings volumes.

A proposed and highly experimental long-term solution to the toxic tailings problem is for mining companies to dump toxic tailings waste into old mine pits and cap them with fresh water from the Athabasca River.<sup>58</sup> At least 27 of these “end pit lakes” are planned for the Athabasca Boreal region within the next 60 years.<sup>59</sup> The landscape would then be reclaimed to drain into these artificial lakes that in turn will discharge into the Athabasca River watershed and therefore the basin at large.

### 2.2.3 Tailings Containment Basics

In theory, tailings dams are designed to prevent drainage and leaking of tailings material and water. These dams differ significantly in many aspects of construction and function from conventional dams. For example, public bodies, such as a province or a public utility company, usually own conventional dams, whereas tailings dams are owned by private mining companies. Another key difference is the life of operation: conventional dams usually have a finite lifetime, but the life of tailings ponds may be hundreds of years. As compared to conventional dams, tailings dams tend to be constructed in an adaptive fashion over many years, they may be given fewer resources by dam operators because they are not the main component of a mine operation, and they have a 10-fold greater probability of failure and greater consequences of failure due to contamination.<sup>60</sup>

Table 2 summarizes the distinct features of tailings and conventional dams. The characteristics for tailings dams in this table are not specific to oil sands operations.

### 2.2.4 Tailings Dam Failures and Accidents

Worldwide there were roughly 3,500 active tailings impoundments in 2000.<sup>61</sup> Major failures occur at a frequency of less than 2–5 per year (i.e., about 0.1%), and minor failures at a frequency of about 35 per year (i.e., 1%).<sup>62</sup> While these figures may look low, this failure rate is unacceptably high, especially compared to conventional dams.<sup>63</sup> Numerous international tailings dam failures have resulted in large loss of human life and catastrophic environmental impact.<sup>64</sup> Failures are a result of both human error and environmental factors.<sup>65</sup>

In Canada, there have been a number of tailings dam accidents.<sup>66-67</sup> Major accidents are not uncommon: 6,000–8,000 m<sup>3</sup> of tailings spilled at a former mercury mine in Pinchi Lake, B.C., in 2004;<sup>68</sup> an unknown volume of tailings were released during a dam breach at the former Opemiska copper mine near Chapais, Quebec, in 2008.<sup>69</sup>

In Canada's oil sands, there have been at least three major accidents. In 1974 an accident occurred at the Great Canadian Oil Sands (now Suncor) mine due to slope instability. In 1978 an accident occurred at Syncrude's operations due to foundation problems. In 1979 an accident occurred at Suncor's retention dam due to slope instability.<sup>70</sup> There appears to be no available data for the volume of tailings released or the consequences of these accidents.

It has been globally acknowledged that tailings safety is an issue of great concern. At a 2001 international conference on tailing dam safety, it was stated that:

“... it has become apparent that the technical and managerial challenge of responsible mine waste management is under-recognized and that the contributions that geotechnical engineers can make to meet this challenge is under-appreciated.”<sup>71</sup>

While there have been no reported oil sands tailings dam accidents since the 1970s, rigorous standards, independent monitoring and a phased approach to eliminate liquid tailings production are required to ensure future accidents do not occur. Furthermore, there are historic and recent contaminant discharges unrelated to dam failure that pose serious risks to water quality (see section 2.3).

**Table 2. The unique features of tailings dams relative to conventional dams**

	<b>Conventional dam</b>	<b>Tailings dam</b>
<b>Owners</b>	Public bodies such as a province, public utility company or water resource authority. The construction, operation, and maintenance are a high priority for owners.	Private mining companies who generally view tailings dams as an unprofitable and money-draining part of the mining operation.
<b>Dam constructors</b>	Usually public-works engineers.	Mine operators, which often rely on consultants for dam engineering.
<b>Construction time period</b>	Usually constructed in a single stage in a short time period	Usually constructed in stages or on a continuous basis over many years
<b>Expected life of a dam</b>	Finite (less than 100 years)	Indeterminate (hundreds of years)
<b>Public opinion</b>	Often positive — conventional dams are considered an asset because the public receives benefits (i.e. flood control or hydro-electric generation).	Often negative because the public does not receive any benefit.
<b>Probability of major dam failure in a given year<sup>72</sup></b>	0.01%	0.1%
<b>Consequences of a failure</b>	Flooding	Flooding and contamination of water from waste products

Source: AMEC Earth & Environmental Limited<sup>73</sup>

## 2.2.5 Regulations on Tailings Dam Stability

The regulation of the location, construction and operation of tailing lakes in oil sands mining projects is the shared responsibility of Alberta Environment's Dam Safety Branch under the *Water Act* (Part 6 — Dam and Canal Safety), the *Environmental Protection and Enhancement Act* and the ERCB's Oil Sands Division pursuant to the *Oil Sands Conservation Act*.<sup>74,75</sup> Therefore the regulation of dams is largely the responsibility of the provincial government. The federal government's role in dam management is narrower and comes into play if there are potential downstream effects or dams affect the navigability of waterways.<sup>76</sup>

Specific requirements for tailings dam construction and monitoring are not written into the provincial regulations in Alberta, unlike in other jurisdictions, such as British Columbia and Ontario. The Government of Alberta recommends oil sands operators voluntarily adhere to the Canadian Dam Association (CDA) guidelines and use due diligence when selecting how they construct and monitor their tailings dams.<sup>77</sup> CDA guidelines are not legally binding and no specific guidelines currently exist for the unique challenges associated with oil sands tailing dams.<sup>78</sup> CDA is developing oil sands-specific guidelines that are expected in late 2010.<sup>79</sup> While the vast majority of dam operators follow CDA guidelines, to date the guidelines have not been challenged in the Canadian judicial system. Consequently, it is uncertain whether dam operators would be able to claim due diligence based on their adherence to CDA guidelines if dam failure

were to occur. In addition to the CDA guidelines, the Mining Association of Canada created a set of voluntary guidelines to assist mine operators in developing a management system for their tailings facilities.<sup>80</sup>

Recently, the Alberta regulatory process increased its level of scrutiny for dam stability for new projects seeking approval. In 2007, the Environmental Impact Assessment terms of reference for the Shell Canada Jackpine Expansion and Pierre River Mining Areas project required “discussion” of containment structures, such as berms, dams, dykes and retention ponds.<sup>81</sup> One year later, the review panel for the Total Joslyn North Mine Project requested much more specific information about the probability of accidents and malfunctions of dams and a “major tailings spill to such water courses as the Ells River and Athabasca River under low flow, ice and spring flood conditions.”<sup>82</sup> Total responded by acknowledging that, as a result of inadequate strength of the foundation or dyke construction materials, seepage and erosion or overtopping, dam failure could occur, but declared that the “probability of failure in a tailings area was remote.”<sup>83</sup>

### 2.2.6 Dam Failure Risks in the Oil Sands

There are numerous risks to the structural integrity of tailings containment structures, including seepage, the collapse of internal walls, frost effects on the foundations and the instability of partially reclaimed slopes.<sup>84,85</sup> Measures currently used to prevent dam failure, such as slope angle reductions and toe berms, reduce but do not eliminate the risks of dam failure.<sup>86</sup> Because tailings dams are often constructed of earth and rocks, there is often settling of this material and associated movement,<sup>87,88</sup> but this is considered both acceptable and not necessarily an indicator of compromised structural integrity.<sup>89</sup>

The risks associated with oil sands tailings dam failure are classified as “extreme” under the 2007 CDA guidelines because of the potentially severe impacts to downstream communities and wildlife habitat.<sup>90</sup> Under CDA guidelines, such dams require a safety review audit every five years and an annual performance review in effort to address any observed deficiencies. The content of these safety review audits is not publicly available. Because the liability for dam safety is with the mine operator, it is up to the tailings dam operator to ensure deficiencies are addressed.<sup>91</sup> A tailings dam failure carries with it not only environmental consequences, but also economic ones: a failure has an average direct cost of US \$70–150 million.<sup>92</sup>

“Tailings impoundments frequently represent the most significant environmental liability associated with mining projects, both during the operational and decommissioning phases of a project.”<sup>93</sup>

Tailings dams are typically constructed in stages or on a continuous basis over many years. When Suncor’s Tar Island tailings pond was built directly abutting the Athabasca River, the foundation of the dam was intended to be 12 m tall and last only three years.<sup>94</sup> However after 40 years of production, the height of the tailings dam rose to 91 m. As the size of the tailings dam increases the downstream area affected by a catastrophic failure is also likely to increase. Suncor claims to have halted the observed foundational movement of the Tar Island tailings dam by installing an earthen berm at the toe of the dam.<sup>95</sup> This construction method is novel and unproven due to the unique engineering challenges associated with tailings management.<sup>96</sup>

Suncor is currently in the process of transferring the fluid tailings in Tar Island Pond to other ponds and infilling the pond with coarse sand.<sup>97</sup>

In another example, the foundation of Syncrude's tailing lakes has been identified as being of "extraordinarily low strength"<sup>98</sup> due to the high plasticity of the clay shales underneath the dam.<sup>99</sup> It was reported that Syncrude's tailings dam and foundation are in a critical condition with respect to yield zones<sup>100</sup> and displacements and strains.<sup>101</sup>



**Specific requirements for tailings dam construction and monitoring are not written into the provincial regulations in Alberta**

Photo: David Dodge, The Pembina Institute

### **2.2.7 Beyond Alberta: Transboundary Implications of Dam Failure**

As part of the dam safety system, dam owners are required by Alberta Environment to have Emergency Preparedness Plans (EPPs).<sup>102</sup> EPPs must assess the downstream effects of a breach of the dam, including how people and property would be affected and how emergency responders would be notified of any emergency involving a large flood, potential and/or imminent dam breach.<sup>103</sup> Dam owners identify the affected municipalities and entities, and they typically give a copy of the EPP to each stakeholder named in the EPP.<sup>104</sup>

The larger effects of a dam breach are only considered in the EPP if the result of the dam breach is not contained within the riverbanks by the time the water crosses a provincial boundary.<sup>105</sup> The Athabasca River has a large river channel and it would take a very large flood — potentially much larger than any one tailings dam — to make it breach its banks. Under the current regulation, the effects of contamination resulting from a tailings dam breach, regardless of

transboundary impacts, are not required to be considered by the Dam Safety Section of Alberta Environment because it is outside their mandate.<sup>106</sup>

Despite the management systems in place for oil sands tailings dams, there is increasing concern voiced by northern public interest groups and the academic community.<sup>107,108</sup> In 2003, the Mackenzie River Basin Board noted “an accident related to the failure of one of the oil sands tailing ponds could have a catastrophic impact on the aquatic ecosystem of the Mackenzie River Basin due to the size of these lakes and their proximity to the Athabasca River.”<sup>109</sup>

### 2.2.8 Oil Sands Tailings Dam Information: the Transparency Challenge

In researching this report, oil sands operators were unwilling to share several important documents (Table 3) on the performance of tailings dams for proprietary reasons; they claim that this information is confidential, for which they assert property rights. The Government of Alberta’s response to requests for these documents was also unsuccessful. The government noted that because it is not the owner of the information, it is required to follow the rules and regulations regarding the handling of third-party information provided to the government.

**Table 3: Accessibility of tailings dam management documents**

Document	Responsible Government Department	Availability
<i>Canadian Dam Association: Dam Safety Guidelines</i>	Canadian Dam Association	Public
<i>Emergency Preparedness Plan</i>	Dam Safety Section, Alberta Environment	Confidential
<i>Emergency Response Plan</i>	Held by dam operator; disclosed to Government of Alberta upon request by the province	Confidential
<i>Operation, Maintenance and Surveillance Manuals</i>	Held by dam operator; disclosed to Government of Alberta upon request by the province	Confidential
<i>Annual Tailing Dam Performance Report</i>	Held by dam operator; disclosed to Government of Alberta upon request by the province	Confidential
<i>5-year Tailing Dam Safety Review</i>	Held by dam operator; disclosed to Government of Alberta upon request by the province	Confidential

As such, it is difficult to assess whether or not the current dam management measures will sufficiently protect downstream communities. By making tailings dam management and performance documents publicly available, the Government of Alberta and oil sands operators could openly demonstrate their due diligence to dam guidelines. Table 3 demonstrates the lack of transparency for oil sands dam management documents.

The difficulty in acquiring information on oil sands tailings dams, combined with the Government of Alberta not publicly addressing concerns on tailings dam stability, limits the possibility for fair public scrutiny and independent dam assessment. Thus, the public is left to trust that tailings dams are safely constructed and maintained and that adequate plans for emergencies are in place. Improved accessibility to tailings dam management documents that are

currently considered proprietary would aid in alleviating local and international stakeholders' concerns regarding Canada's oil sands.

Furthermore, because the oil sands mining industry assumes full liability and responsibility to implement best practices while proving to the Government of Alberta that minimum safety standards are being attained, it is in the best interests of oil sands operators to minimize the risk of tailings dam accidents and to reduce their need to create and store liquid tailings.

### 2.2.9 Who foots the bill?

The Government of Alberta requires that all oil sands operators post a security deposit for land reclamation performance with the Government of Alberta.<sup>110</sup> The security deposit is a financial mechanism to fund any unforeseen events that may arise during the lifecycle of the mine. The funds, held in the Environmental Protection and Security Fund, are considered a surety to prevent the public from bearing the reclamation costs if, for example, a company was to go bankrupt. But is the security adequate to protect Northerners from dam failure?

Unfortunately, the current oil sands mine reclamation security program lacks transparency and it is uncertain whether or not Canadians are financially protected from a major industrial accident. Information about reclamation costs, the calculation of liability bonds and the frequency (if any) of third-party validation of reclamation plans are not publicly available or readily accessible. In addition to the lack of transparency, serious flaws in the system are noted in the Alberta Office of the Auditor General (OAG) 2005 report.<sup>111</sup> The Alberta OAG noted that there were inconsistencies in how financial security was posted for oil sands and coal mines. Some sites posted security under prior legislation and that security has been continued under existing legislation. The result is that some sites had security based on production and not on the full cost of reclamation, as currently required by Alberta Environmental Protection and Enhancement Act. Some sites used outdated information to determine their estimated full cost of reclamation. Some estimates did not include all required costs. As a result of these inconsistencies, the sufficiency of security for the completion of reclamation was not ensured.<sup>112</sup>

As of 2008, the total oil sands security in the Alberta fund is \$645 million,<sup>113</sup> on a current disturbance footprint of around 52,931 ha.<sup>114</sup> This represents only \$12,185 per hectare. In 2006, Syncrude spent a total of \$30.5 million on reclamation activities on 267 ha, or about \$114,000 per hectare.<sup>115</sup> It has been suggested that for revegetation to be successful the planting of 10 plants per square metre is required. The cost of reclamation for revegetation alone is therefore \$200,000 per hectare.<sup>116</sup> A single diamond mine in the Northwest Territories has a 900-ha disturbance footprint.<sup>117</sup> This mine is required to post a security bond in excess of \$100 million during maximum disturbance,<sup>118</sup> (approximately \$110,000 per hectare).

The Alberta OAG has repeatedly made recommendations for an improved system of obtaining sufficient financial security for mining reclamation, and it noted the Government of Alberta's lack of progress in its 2009 report:<sup>119</sup>

- 1998–1999 Annual Report (No. 30, page 157), OAG identified that the process for obtaining security was applied inconsistently and security may be inadequate.

- 2000–2001 Annual Report (No. 8, page 90), OAG recommended that Alberta Environment deal with the risks of inadequate security, noting that large land-disturbing industries (e.g., oil sands mines) were not providing security at full cost of reclamation and that there was no model in place to determine what a sufficient amount of security other than full cost might be. These industries were negotiating with the department to establish levels and types of security acceptable to both parties.
- 2004–2005 Annual Report (No. 31, page 180), OAG recommended that Alberta Environment implement a system for obtaining sufficient financial security to ensure parties complete the reclamation activity that the department regulates. OAG noted that there were still many inconsistencies in how financial security was posted for oil sands and coal mines.

Northerners are all too familiar with the outcome of inadequate reclamation securities. The four decades of gold mining at Yellowknife's Giant Mine created a large environmental liability. It was a problem the mine's original owners left to the Canadian and NWT governments to resolve. The processing of ore to extract gold at the Giant Mine produced at least 237,000 tons of arsenic trioxide dust. During the first three years of operation, this toxic byproduct was released directly into the air, resulting in surface contamination of the mine site. It was noted in the 2002 Auditor General of Canada report that INAC did not collect sufficient financial security from mining companies operating in the North to cover the costs for the eventual cleanup and closure of mine sites<sup>120</sup> From 1998 to 2007 INAC spent \$56.51 million on Giant (including consultation, remediation, maintenance and monitoring).<sup>121</sup> The reclamation method chosen in 2007 (known as Frozen Block) is going to cost about \$200 million and take 10 years to fully implement.<sup>122</sup>



**The impacts of oil sands development on water quality are complex**

Photo: Jennifer Dagg, The Pembina Institute

## 2.3 Impacts on Water Quantity and Quality

The impacts of oil sands development on water quality are complex. The quality of monitoring by the Regional Aquatics Monitoring Program (RAMP) — the multi-agency body charged with monitoring the aquatic effects of oil sands development in Alberta — has come into question,<sup>123</sup> and RAMP's contention that contaminant levels are attributable to natural sources has created public confusion about the effects of oil sands development on water quality. Some contaminants exist in natural background levels, but this is not the whole story. Seepage from tailings lakes and releases of industrial wastewater are common. Independent and peer-reviewed scientific evidence in 2009 revealed a clear relationship between oil sands activities and water quality.

### Non-tailings contaminant discharges to the Athabasca River

Contaminant discharges to the Athabasca River are common. The following examples highlight some spills and licensed discharges that did not involve tailings but other liquids that are likely harmful to the aquatic environment.

**Licensed discharges:** Routine discharges from the Suncor wastewater pond system also occur. In 2007, the total discharge from Suncor's wastewater pond system was 11.9 billion litres.<sup>124</sup> Suncor Energy's Detailed Substance Report for mercury (and its compounds) indicates that 11 g of mercury was released into surface waters in 2008.<sup>125</sup>

**2007:** A Suncor wastewater discharge spill of 9.8 million litres of oil and grease into the Athabasca River. The volume and the chemical composition of the discharge incident have not been reported.<sup>126</sup>

**1981-1982:** A fire and a series of equipment failures at Suncor resulted in the release of more than 50 tons of oil (over several weeks) to the Athabasca River, under ice cover. This spill contaminated a large downstream section of the Athabasca River with PAHs, dibenzothiophenes, phenolics and other contaminants.<sup>127</sup>

**1970:** A Suncor pipeline break spilled three million litres of oil, which flowed down the Athabasca River to Lake Athabasca. The spill disrupted the drinking water supply and the commercial fishing on Lake Athabasca.<sup>128</sup>

Findings published in the *Proceedings of the National Academy of Sciences* demonstrated that oil sands development is a greater source of polycyclic aromatic compound (PAC) contamination than previously realized.<sup>129</sup> Dissolved PAC concentrations in tributaries to the Athabasca River were found to be greater downstream of oil sands development than upstream from development.<sup>130</sup> The study confirmed that airborne PACs from oil sands development put a considerable strain on the surrounding watershed and that large amounts of particulate PACs have been discharged since the onset of oil sands production in the 1960s. The results of this study are in direct contrast to the RAMP findings.

According to the same study, tributaries affected by oil sands development indicate a second source of PACs to receiving waters due to surface disturbances, such as new roads, deforestation, encampments, exploration and mining. These disturbances distribute bitumen and expose it to wind and soil erosion, by which it can then enter surface waters.<sup>131</sup>

### Polycyclic aromatic compounds

PACs (or PAHs) are a group of chemicals known to be carcinogenic. They do not dissolve easily in water and that are resistant to natural degradation. They are largely produced from incomplete combustion of hydrocarbon-containing fuels.<sup>132</sup>

PACs enter the air mostly as emissions from industrial plants (e.g., oil sands upgrading facilities) and vehicle exhaust. Some PAC particles can readily evaporate into the air from soil or surface waters. PACs enter water through discharges from industrial and wastewater treatment plants and natural sources (i.e., bitumen deposits). They stick to solid particles and settle to the bottoms of lakes or rivers, and they can affect the health of aquatic organisms. In soils, PACs are most likely to stick tightly to particles; certain PACs move through soil to contaminate underground water.<sup>133</sup>

The study noted that dissolved PACs did not persist as far as the Athabasca River Delta and Fort Chipewyan, at least during the seasons sampled. Researchers suggested that this could be explained by the timing of sampling and/or dilution. Sampling did not include the intervening spring snowmelt, which would release a pulse of PACs up to 50 km from oil sands upgrading facilities into nearby tributaries and the Athabasca River.<sup>134</sup> Declining concentrations of dissolved PACs in winter and summer as the Athabasca River flows north may be explained by dilution from uncontaminated waters originating upstream of the oil sands deposits and/or microbial degradation and settling of organic matter.<sup>135</sup> However, in summer elevated concentrations of dissolved PACs were identified in the Athabasca River downstream of new development. In winter, the greatest dissolved PAC concentrations in the Athabasca River were downstream of oil sands upgrading facilities and tailings ponds. With an anticipated doubling in bitumen production in 10 years, it is uncertain whether dilution and microbial degradation will keep PACs from contaminating more northern regions of the basin.

An independent analysis of compiled industry and government data also considered the effects of oil sands pollution from a variety of sources, including tailings ponds evaporation, seepage and dry tailings.<sup>136</sup> The analysis concluded that levels of contaminants (including PAHs, mercury and arsenic) increase in sites downstream of industry when compared to sites upstream of industry and that there are increased levels of contaminants over time.<sup>137</sup>

Contaminants in the water may be likely to enter the food chain. A 2009 Environment Canada study of contaminants in waterbird eggs found that concentrations of mercury and PACs in eggs from Wood Buffalo National Park and Lake Athabasca were greater than expected and greater than eggs collected from the Peace River.<sup>138</sup> Sites in Wood Buffalo National Park and Lake Athabasca are downstream of oil sands development where mercury and PAHs are known to be associated with process affected waters and tailings waste.<sup>139</sup>

These aforementioned findings that link water and air pollutants to oil sands activities conflict with the findings of RAMP. In the past 12 years, RAMP has reported that the oil sands industry has had little to no effect on the aquatic ecosystem.<sup>140</sup> Despite this disconnect, the Government of Alberta trusts the findings of RAMP to be sufficient and asserts that PAC concentrations are within baseline conditions and of natural origin:

*The Athabasca River region is unique because of the naturally occurring oil sands that the river runs through. Sediment from the banks of the river are caught in the current and because of this, there are naturally occurring contaminants in the water. Data from the*

*Regional Aquatics Monitoring Program indicates no increase in concentrations of contaminants as oil sands development has progressed.*

*The Regional Aquatics Monitoring Program also monitors polycyclic aromatic hydrocarbons (PAH) levels in the river. There is no doubt that PAHs are in the sediments downstream of the oil sands. This is due to the magnitude of the oily sand along the river banks through which the river has eroded naturally. PAH levels found in samples on other rivers in the area with absolutely no industrial oil sands activity have been found to be higher than samples taken downstream from oil sands developments. The sources in the area are natural.<sup>141</sup>*

In the Athabasca River basin, significant changes have occurred not only with respect to water quality but also water quantity.<sup>142</sup> Currently, oil sands mining operations are licensed to divert 445 million m<sup>3</sup> of fresh water each year from the Athabasca River — roughly the annual water needs for a city of three million people.<sup>143</sup> Recent findings report statistically significant declines in the Athabasca's River annual (-26%), winter (-18%) and summer (-17%) flows north of Fort McMurray over the period of record (1958–2007).<sup>144,145</sup>

If PAC deposition rates are constant throughout the year, the annual release of this contaminant is estimated at approximately 1,200 kg (associated with approximately 1,800 tonnes of bitumen particulates), and another 500 kg of dissolved PAC.<sup>146</sup> If this amount of bitumen were released in a single surge, it would be equivalent to a major oil spill, repeated annually.

# 3. Collectively Managing the Basin

## 3.1 The Constitutional Context for Water Management

The Canadian Constitution attempts to divide legislative powers of the federal and provincial levels of government. In interpreting the constitution, the courts have generally followed the principle that if the power appears to be local in nature, then it will be assigned to the provinces and territories. If it appears to be national, then it is assigned to the federal government. Canada's *Constitution Act, 1867* did not delegate matters of the environment exclusively to the provinces or parliament, and therefore both levels of government share the responsibility.

As the owners of their water resources, provinces have wide responsibilities in their day-to-day management. In contrast, the federal government has jurisdiction over water on federal land, in the territories, national parks and on Indian reserves. It also has jurisdiction over inland and ocean fisheries, inter-provincial/territorial waterways and commercial navigation. However, because both surface water and groundwater move across human-made boundaries and borders, interagency collaboration is critical.

In the NWT, the federal government, through INAC, is largely responsible for water resource management.<sup>147</sup> Devolution in the NWT is pending and would eventually transfer the legislative powers, programs and responsibilities associated with INAC to the Government of the NWT. Devolution would include the transfer of powers related to water management.<sup>148</sup>

## 3.2 Federal Authority

The federal government's role in water management is considered strong in some respects. The federal powers under the *Constitution Act* provide the legal basis for federal legislation. However, it is important to note that the role of the federal government is narrow, predicated primarily on a relatively small range of interests such as fisheries or navigable waters.

### 3.2.1 Federal Powers

The federal list of powers under the *Constitution Act* gives the Government of Canada jurisdiction over various aspects of water:

- Navigation and shipping (section 91(10))
- Sea coast and inland fisheries (section 91(12))
- Canals, harbours, rivers and lake improvements (section 108)
- Criminal law (section 91(27))

Additionally, the Peace, Order, and Good Government (POGG) power is to be used for matters not specifically assigned to either level of government that are of a national concern or to address national emergencies.<sup>149,150</sup> For example, this clause could enable the federal government to pass legislation addressing serious concerns involving transboundary waters. Similarly, the POGG power authorizes federal assessment of all environmental impacts of projects that have some affect on federal powers such as navigation and fisheries.<sup>151</sup>

### 3.2.2 Federal Water Policy

The 1987 Federal Water Policy that flowed from the Pearse inquiry on water policy in 1985 had two goals:<sup>152</sup>

1. to protect and enhance the quality of the water resource
2. to promote the wise and efficient management and use of water by developing pricing and valuation schemes as well as better technology and practices

The policy notes that the federal government will “renew, consolidate or otherwise strengthen the application of existing legislation, so as to: produce legislative provisions to address interjurisdictional water issues relating to levels, flows and quality.”<sup>153</sup> The policy also stated that the federal government would “renew, consolidate, or otherwise strengthen legislation to address interjurisdictional water issues; control the management of toxic chemicals in their entire life cycle; encourage mechanisms to handle inter-provincial water disputes like the Prairie Provinces Water Board; and ensure effective enforcement and compliances.”<sup>154</sup>

Unfortunately, the Federal Water Policy, while it contains several useful recommendations and goals, has never been fully implemented including the measures for interjurisdictional water disputes. The Federal Water Policy has no legal status and had it been implemented in the Athabasca boreal forest of Alberta, then some of the water impacts of oil sands development might have been avoided — particularly those issues associated with unregulated tailings storage and water withdrawals from the Athabasca River.

### 3.2.3 Federal Statutes Relevant to Water Management

With respect to water management, the federal government has focused primarily on its constitutional responsibility for fisheries and navigation and for waters that lie on or across international borders. Some key water-related statutes administered by the federal government are provided in Table 4. This list is not exhaustive and focuses on those statutes relevant to the upstream impacts of oil sands development.

**Table 4. Key water-related statutes administered by the federal government**

Statute	Intent and Administering Agency
<i>Canada Water Act, 1970</i>	Provides “for the management of the water resources of Canada, including research and the planning and implementation of programs relating to the conservation, development and utilization of water resources.” <sup>155</sup> The act provides legislative authority for the federal government to enter into partnerships or agreements with provinces to facilitate the coordination and implementation of water policies and programs. <sup>156</sup> (Administered by Environment Canada)

**Collectively Managing the Basin**

<p><i>Canadian Environmental Protection Act, 1999</i></p>	<p>Establishes a regime for identifying, assessing and controlling toxic substances; imposes reporting requirements on anyone releasing a toxic substance; creates a national inventory of toxic releases; requires the development of Pollution Prevention Plans; controls nutrient discharges and marine pollution. (Administered by Environment Canada)</p>
<p><i>Fisheries Act, 1868</i><sup>157</sup></p>	<p>Prohibits the harmful alteration, disturbance, or destruction of fish habitat without a permit under subsection 35(1). Fisheries and Oceans Canada (DFO) may issue a permit to alter or destroy fish habitat with conditions, such as the enhancement of other fish habitat. Subsection 36(3) prohibits the deposit of deleterious substances.<sup>158</sup> (Administered by Environment Canada)</p>
<p><i>Migratory Birds Convention Act</i><sup>159</sup></p>	<p>Prohibits the deposit of a substance that is harmful to migratory birds or permitting such a substance to be deposited in waters or an area frequented by migratory birds. (Administered by Environment Canada, Canadian Wildlife Service)</p>
<p><i>Navigable Waters Protection Act</i><sup>160</sup></p>	<p>Prohibits dumping wastes that may interfere with navigation and prohibits construction of works in navigable waters without approval. (Administered by Transport Canada)</p>
<p><i>Species at Risk Act (SARA)</i><sup>161</sup></p>	<p>Prohibits the destruction of critical habitat of a listed wildlife species on federal lands (e.g., national parks). The act also automatically applies to aquatic species and migratory birds; in addition, provides legislative base for the development of recovery planning and action plans for species listed as extirpated, endangered, or threatened and if recovery plans are called for, critical habitat for the species must be identified and protected. (Administered by Environment Canada [terrestrial], Fisheries and Oceans Canada [aquatic] and Parks Canada Agency [National Parks])</p>
<p><i>Canadian Environmental Assessment Act (CEAA)</i><sup>162</sup></p>	<p>Provides an opportunity to identify, assess and mitigate the effects of projects that could have significant impacts on groundwater or surface water. Environmental assessments under CEAA is a primary tool for integrating federal concerns into the process of natural resources management. Federal and provincial cooperation on EA has enabled the federal government to introduce its specific concerns with particular projects into approval processes for projects that are primarily of provincial interest.<sup>163</sup> (Administered primarily by Environment Canada; CEAA also has a key facilitation role in the administration of the act.)</p>
<p><i>Canada National Parks Act (2000, c. 32)</i><sup>164</sup></p>	<p>Provides for the maintenance or restoration of ecological integrity, through the protection of natural resources and natural processes, as the first priority of the minister when considering all aspects of the management of a park. "Ecological integrity" means, with respect to a park, a condition that is determined to be characteristic of its natural region and likely to persist, including abiotic components and the composition and abundance of native species and biological communities, rates of change and supporting processes. (Administered by Parks Canada Agency and Environment Canada)</p>
<p><i>Northwest Territories Waters Act</i></p>	<p>Authorizes the federal government to take responsibility for inland waters and to delegate water management responsibilities to territorial governments; prohibits depositing waste in these waters without being authorized by a licence or regulations. (Administered by Indian and Northern Affairs Canada)</p>

### 3.3 Water Management in Alberta

In Alberta, the *Alberta Water Act*<sup>165</sup> governs the allocation of all surface water and groundwater. In addition to the *Water Act* requirements for licences and approvals for water diversion and use, approval under the *Alberta Environmental Protection and Enhancement Act* (EPEA) may be required for projects that use water to enhance bitumen recovery and that store water which has been used in extracting or processing oil sands.<sup>166</sup> The Government of Alberta's Water for Life Strategy is intended to guide sustainable water use and address water quality issues in the province. Established in 2003, the strategy's goals are to ensure<sup>167</sup>

- a safe, secure drinking water supply
- healthy aquatic ecosystems
- reliable, quality water supplies for a sustainable economy

The Government of Alberta has also completed a Land-use Framework (LUF) to guide the development of regional planning in Alberta. The *Alberta Land Stewardship Act* (ALSA) creates the legal authority to implement the LUF and was proclaimed in October 2009.<sup>168</sup> Through multi-stakeholder advisory councils, the regional plans will use a cumulative effects approach to set environmental, social and economic outcomes, to assess tradeoffs associated with land use decisions, and monitor changes over time.<sup>169</sup> There are no regional plans completed to date.

Specific to oil sands development and water withdrawals, management efforts have occurred through the Phase 2 Framework Committee (P2FC).<sup>170</sup> The P2FC was a multi-stakeholder committee established to provide recommendations to Alberta Environment and DFO for a framework that was to prescribe when, and how much, water can be withdrawn from the Lower Athabasca River for cumulative oil sands mining water use.<sup>171</sup> Currently, cumulative water withdrawals from the oil sands mining industry are managed under the Phase 1 Framework for the Lower Athabasca River that was implemented in 2007. Both phases were effectively required by a federal/provincial asking Alberta Environment and DFO to come up with a "water management framework" to allow them to deal cumulatively with all of the individual mining operations.<sup>172</sup>

The P2FC did not achieve consensus on a final set of water management rules. A key area of disagreement during the P2FC process revolved around issues associated with withdrawal rules during rare low flow events. An ecosystem base flow (EBF) is a flow below which it is recommended that water withdrawals cease in order to protect the aquatic ecosystem. It fully protects aquatic habitat during the lowest flow periods. Some P2FC members supported a water management rule set that allows industry to always withdraw 4.4 m<sup>3</sup>/s of water, even during extreme low-flow events. This rule set gives priority to existing water rights over in-stream flow needs during the most sensitive periods for the aquatic ecosystem as there is no EBF. Other P2FC members could not support this rule set. They indicated that it is insufficiently precautionary with respect to the EBF concept and that there are voluntary and regulatory actions consistent with existing water rights that could be taken to implement a lower EBF exemption. These actions were not effectively explored during the process.<sup>173</sup>

From the start, the P2FC process was constrained because it was based upon a high growth oil sands mining development scenario. In other words, P2FC members were challenged in finding an acceptable tradeoff with a previously established industry growth assumption and associated

water requirements, which may or may not be possible to achieve. In addition, the Phase 1 framework is entirely voluntary and lacks necessary enforcement measures. There are concerns that the new Phase 2 framework will follow this voluntary approach.

**The Value of Monitoring Water Quality and Quantity**

Continuous, consistent and holistic water monitoring programs that use both scientific and traditional knowledge,<sup>174</sup> are essential to detect environmental changes and longer-term trends in the Mackenzie River Basin. Monitoring for biological indicators, water quality and water quantity can flag potential contamination or alterations to flow from upstream uses.

Biomonitoring (employing biological indicators) strengthens conventional monitoring programs for water quality and quantity by measuring the health of the biological community. In doing so, the combined effects of water chemistry, sediment chemistry, hydrology, physical habitat characteristics and food availability are made evident.<sup>175</sup> Reliable baseline data allows for the monitoring of cumulative impacts, the establishment of thresholds and development of mitigation measures for various water users.

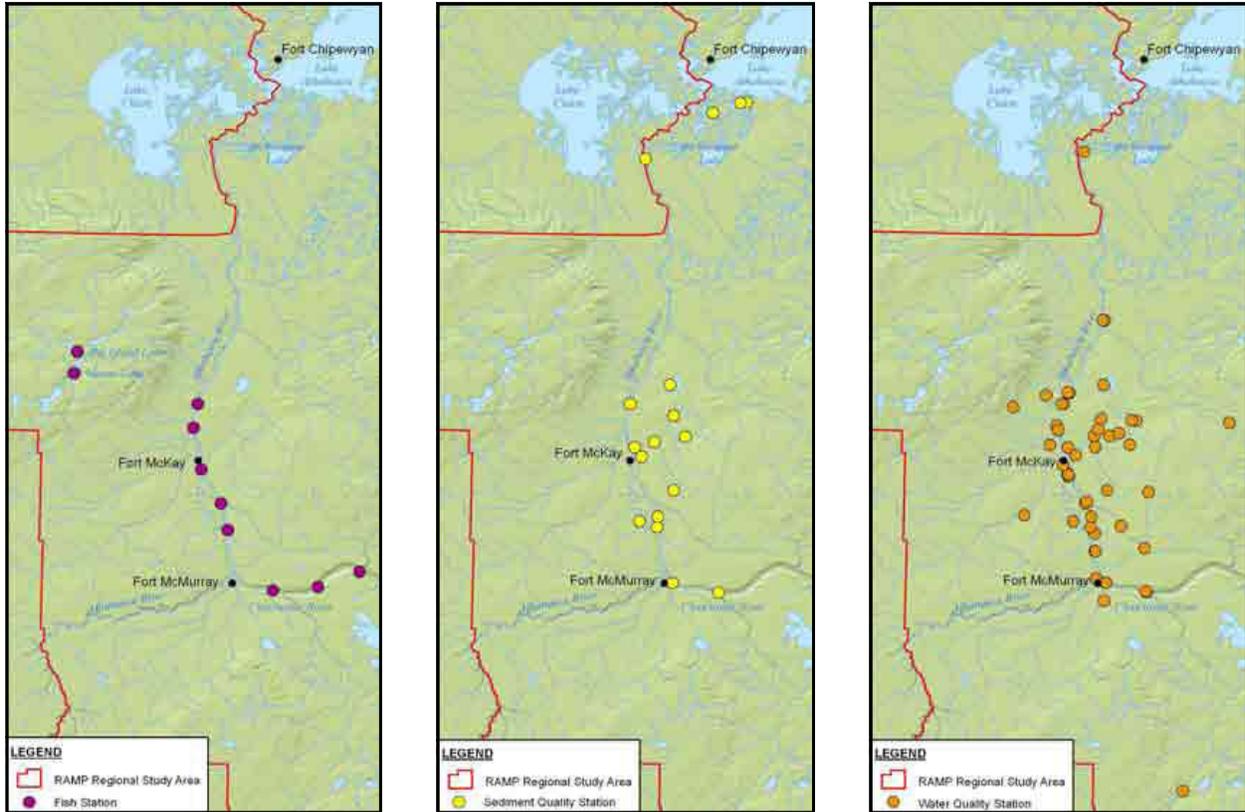
**3.3.1 Alberta Oil Sands Monitoring Efforts**

In Alberta, most of the responsibility for monitoring the effects of oil sands activity on aquatic environments is given to industry through RAMP.<sup>176</sup> Public concerns regarding RAMP’s lack of scientific integrity, design and overall failure to incorporate a regional approach are increasing.<sup>177</sup> RAMP is largely funded and coordinated by industry representatives on its steering committee (Table 5).

A peer review of RAMP noted inconsistent sampling design, inadequate statistical power and monitoring-insensitive responses.<sup>178</sup> More discouraging is the lack of response from regulators in response to the peer review findings. A second review of RAMP’s design may be planned even though there is no evidence that the past review’s recommendations have been acted upon.

**Table 5. RAMP organizational structure<sup>179</sup>**

Steering Committee		
Industry	Stakeholders	Government
Alberta Pacific Forest Industries Inc. Shell Canada Ltd. Albian Sands Energy Inc. Birch Mountain Resources Ltd. Canadian Natural Husky Energy Imperial Oil Resources Nexen Inc. OPTI Canada Inc. Petro-Canada Suncor Energy Inc. Syncrude Canada Ltd. Total E&P Joslyn Ltd./Canada2	Fort Chipewyan Métis Local No. 125 Fort McKay First Nations Fort McKay Métis Local No. 122 Fort McMurray First Nations	Alberta Energy Resources Conservation Board Alberta Environment Fisheries and Oceans Canada Environment Canada Health Canada Regional Municipality of Wood Buffalo Northern Lights Health Region Alberta Health and Wellness



**Figure 3. Select RAMP monitoring stations for fish, sediment quality and water quality**

Maps: Regional Aquatic Monitoring Program<sup>180</sup>

An independent 2009 study examining cumulative impacts within the Athabasca River Basin found that despite there being both federal and provincially managed water quality monitoring programs, there is a limited amount of consistent and reliable data available.<sup>181</sup> A conclusion of this study was, “[T]his is a significant unregulated river in Alberta and based on our data, the intensity, timing and volume of flow have changed over the past 30 years. The significance and acceptability of this change requires attention, especially considering development intensity will only increase with time.”<sup>182</sup>

Similar concerns were expressed in the 2009 Report of the Commissioner of the Environment and Sustainable Development.<sup>183</sup> The report noted that Environment Canada does not have its own independent monitoring program in Alberta because it relies on provincial regulations that are supposed to ensure that the release of tailing pond contents to surface water is prohibited and leaching into local rivers and lakes is monitored. While Alberta has a process in place to report spills to Environment Canada, including incidents that potentially fall under the *Fisheries Act*, the committee that manages this arrangement has not provided its oversight role in over two years and Environment Canada has not formally assessed the extent that the arrangements with Alberta fulfill the department’s *Fisheries Act* responsibilities.<sup>184</sup> The report determined that Environment Canada could not demonstrate that the agreement with Alberta is active and being implemented, and it does not know the extent that the legislative frameworks of other jurisdictions can be relied on to support Environment Canada’s administration and enforcement of the pollution prevention provisions of the *Fisheries Act*.<sup>185</sup>

### 3.4 Water Management in the NWT

In the NWT, the federal government through INAC has the overall responsibility for water resource management through the administration of the *Northwest Territories Waters Act*, the *Mackenzie Valley Resource Management Act* (MVRMA) and regulations, and the *Arctic Waters Pollution Prevention Act* (AWPPA). Through land claims agreements, Aboriginal and territorial governments share in this management through participation on joint resource management boards. In addition, Aboriginal governments have certain limited authorities as defined in self-government agreements.

Though responsibility for water is traditionally a provincial issue, INAC has undertaken water management responsibilities including licensing, enforcement and compliance, water data collection (in collaboration with the Government of the NWT and Environment Canada), and water planning, until full devolution takes place.<sup>186</sup>

The federally enacted MVRMA creates an integrated co-management structure<sup>187</sup> for public and private lands and waters throughout the NWT's Mackenzie Valley.<sup>188,189</sup> The Mackenzie Valley, as defined in the act, includes all of the NWT, with the exception of the Inuvialuit Settlement Region and Wood Buffalo National Park. Proclaimed in 1998, the act establishes independent boards to regulate the use of land and water, prepare regional land use plans and carry out environmental assessment and reviews of proposed developments in the Mackenzie Valley. Three regional boards, the Gwich'in, Sahtu and Wek'eezhii (Tlicho) are responsible for issuing land use permits and water licenses in their settlement areas. The act also makes provisions for independent environmental audits and for monitoring cumulative impacts on the environment. The Mackenzie Valley Land and Water Board is responsible for the remainder of the unsettled lands in the Mackenzie Valley, addressing transboundary applications and ensuring consistency across the boards. In the furthest north of the territory, the Inuvialuit regulate the use of land and water under the 1984 Inuvialuit Final Agreement.<sup>190</sup>

The Government of the NWT is responsible for domestic drinking water quality and environment protection. Although water management is not legislatively under its mandate, the Government of the NWT has championed the NWT Water Stewardship Strategy in partnership with the INAC and Aboriginal governments.<sup>191</sup> The strategy's vision is to ensure the waters of the NWT remain clean, abundant and productive and promotes an ecosystem-based approach within watersheds.



**In the NWT, water monitoring activities have been conducted by governments, communities, industry and other parties for several years**

Photo: Jenny Adams

### 3.4.1 NWT Monitoring Efforts

In the NWT, water monitoring activities have been conducted by governments, communities, industry and other parties for several years. INAC entered into cost-sharing agreements with Environment Canada in 1975 for collecting water quantity data and in 1995 for collecting water quality data. Despite the fact that both agencies have a series of water quality and quantity monitoring sites across the NWT,<sup>192</sup> there are concerns regarding their adequacy:

- In 1990 the Auditor General reported that INAC was not collecting sufficient data to manage northern water resources.<sup>193</sup> The Arctic Environmental Strategy (AEA), active from 1991 to 1997, established a water quality–monitoring network. However, once AEA ended in 1997, “it became obvious that down-sizing coupled with the effect of inflation had severely affected INAC’s capacity to deliver the required level of water monitoring.”<sup>194</sup>
- The 2009 Rosenberg Panel report notes that over the past 20 years, monitoring programs in the NWT have been reduced and that this is consistent with the rest of Canada.<sup>195</sup>
- The 2010 report of the Auditor General of Canada noted that “the federal government is not meeting its responsibilities for cumulative impact monitoring” and that the lack of progress on the implementation of the Cumulative Impacts Monitoring Program (CIMP) for the NWT limits the ability of co-management boards to understand baseline conditions, track and monitor environmental change, and ultimately identify the effect of development on the environment.<sup>196</sup>

Examples of the existing monitoring efforts include the Slave River monitoring program that was initiated in the late 1980s to establish baseline conditions in response to concerns about industrial activity upstream.<sup>197</sup> A baseline report was published in 1998 documenting water conditions from 1990 to 1995.<sup>198</sup> The next report from the monitoring program is expected in 2010.<sup>199</sup> Fish were previously monitored under this program but are no longer included.

CIMP promotes a community-based monitoring approach intended to achieve the following:<sup>200</sup>

1. monitor cumulative impacts of land and water uses and waste deposits
2. fund and support projects to fill key gaps in monitoring, and amongst other goals
3. report to decision makers and the public on the state of the NWT environment

CIMP also promotes the use of common protocols, such as the Canadian Aquatic Biomonitoring Network (CABIN). In CABIN, benthic macro-invertebrates, habitat, and stream measurements are collected at a site using a standard protocol for the assessment of stream condition.

CIMP is a requirement of existing land claim agreements and of Part 6 of the MVRMA. Full implementation was expected to begin in 2004,<sup>201</sup> but six years later, it is not yet fully in place.

## 3.5 Transboundary Efforts to Date

Historic efforts to understand and manage the threats to transboundary waters in the Mackenzie River Basin have largely been ineffective. During 1971–73, the Peace-Athabasca Delta Project focused on transboundary water management of the Bennett Dam and its impacts on downstream jurisdictions. The project report concluded that “the problem of low water levels in Lake Athabasca is a concrete example of the complexity and confusion of the present jurisdictional

and legal framework for water management in Canada.”<sup>202</sup> The report also noted that the federal *Navigable Waters Protection Act* and *Fisheries Act* were “ineffective instruments in dealing with the complex environmental problems which can occur on interprovincial rivers.”<sup>203</sup>

The 1981 report of the Mackenzie River Basin Committee echoed the need to establish mechanisms for transboundary environmental assessment and intergovernmental cooperation on resource management issues. It proposed a intergovernmental agreement to address both water quantity and quality at jurisdictional boundary crossing points and to establish a permanent board to implement the agreement’s provisions noting an “urgent need to negotiate reasonable rules governing water flowing from one jurisdiction to another” and the advantage of securing an agreement “allowing orderly water resource development with an acceptable level of environmental protection.”<sup>204</sup> The report also acknowledged that further developments would narrow the choices and raise the potential for conflict.

In 1997, the Mackenzie River Basin Transboundary Waters Master Agreement (the Master Agreement) was signed by the governments of Canada, British Columbia, Alberta, Saskatchewan, the Northwest Territories and Yukon. Under this agreement, each jurisdiction is committed to using water in a sustainable manner; protecting the ecological integrity of aquatic ecosystems in the whole basin; and consulting with other jurisdictions on any developments that would affect the integrity of aquatic ecosystems in another jurisdiction.<sup>205</sup>

The Master Agreement prompted the creation of the 13-member Mackenzie River Basin Board (MRBB), “a cooperative forum for sharing information and advice which promotes the ecological health of the entire Mackenzie River Basin.”<sup>206</sup> The board’s work is guided by six strategic goals:<sup>207</sup>

1. improved water quality
2. maintenance of sufficient water quantity
3. maintenance of in-stream water uses
4. continued healthy, abundant and diverse aquatic species and habitat
5. ensuring human health and safety
6. ensuring that there is a knowledgeable and involved public

Some of the board’s key responsibilities are to:<sup>208</sup>

- consider the needs and concerns of Aboriginal people through the provision of culturally appropriate communication, and incorporation of their traditional knowledge and values
- recommend uniform objectives or guidelines for the quality and quantity of the water resources
- encourage consistent monitoring programs
- monitor the progress of implementing the bilateral water management agreements between neighbouring jurisdictions
- review the Master Agreement at least once every three years and propose amendments

Despite the Master Agreement being in force for 13 years, only the Yukon–NWT bilateral agreement has been signed and implemented. This agreement was simple to negotiate because little water flows between the two territories. Other reasons that explain the lack of signed bilateral agreements may be related to the MRBB’s lack of regulatory authority or any legal or

policy basis to manage resource use in any of the jurisdictions.<sup>209</sup> Furthermore, the MRBB operates on a small budget and has no internal research or monitoring capacity. The current budget of \$250,000 has not been increased since 1997.<sup>210</sup> Without all agreements in place between all jurisdictions, the Master Agreement and by implication the MRBB, have little influence on transboundary issues.

Frustration with the lack of binding bilateral agreements to protect water resources and growing oil sands development prompted the NWT Association of Communities, representing all 33 communities in the territory, to call for a moratorium on oil sands developments at its annual general meeting in May 2009 (see Appendix B). The resolution called for the Government of the NWT to establish ongoing testing and reporting of water quality and water levels in the Mackenzie Basin Watershed and to request that the Government of Alberta stop new oil sands approvals until an enforceable and robust trans-boundary water agreement is negotiated.<sup>211</sup>



**The federal government has the overall responsibility for water resource management in the NWT through Indian and Northern Affairs Canada**

Photo: Jennifer Dagg, The Pembina Institute

# 4. Protecting the Basin from Upstream Risks

In light of oil sands-related regulatory shortfalls, such as inconsistent monitoring, the absence of binding transboundary bilateral agreements and inadequate reclamation bonding, there are actions that both Northern leaders and the governments of Canada and the NWT can consider to protect the Mackenzie River Basin. Northern leaders could include prominent individuals, such as elders and knowledge holders; Aboriginal government representatives; hamlet, band and Metis councils; local non-governmental organizations; and engaged youth who live in the NWT.

The clearest opportunities for governments, particularly the federal government, are to enforce existing federal laws, support the NWT water strategy and strengthen and implement the Mackenzie River Basin Transboundary Master Agreement. Northern leaders can play a role in requesting that the federal government uphold its commitments and existing statutes that affect waters in the basin. Northern leaders can also play a direct role by participating in the regulatory approval process that governs oil sands developments by taking legal action, filing environmental petitions and/or a submission to the Commission for Environmental Cooperation, and lastly by creating a transboundary community network. These actions are listed and described in turn below.

1. Enforce existing federal laws
2. Implement the NWT Water Strategy
3. Strengthen and implement the Mackenzie River Basin Transboundary Master Agreement
4. Ensure adequate monitoring in the Mackenzie River Basin
5. Participate in the regulatory approval process governing oil sands development
6. Investigate the opportunities for legal action
7. File an environmental petition with the Federal Government
8. File a submission to the Commission for Environmental Cooperation
9. Create a Transboundary Community Network

## 4.1 Enforce Existing Federal Laws

In 2009, the federal House of Commons Standing Committee on Environment and Sustainable Development held hearings in Alberta and Ottawa on the issue of oil sands development and impacts to fresh water resources. Representatives from the scientific, non-governmental and Aboriginal communities, as well as the Government of the NWT stated there were outstanding concerns about the impact of oil sands development on Canada's water resources and a need for more federal oversight of oil sands development. The hearing testimony indicates a strong, legal basis for federal involvement in oil sands development but also emphasized that the current involvement is inadequate.<sup>212</sup>

**Recommendation:** Northern leaders can demand that the federal government, as the principle water manager in the North, uphold its obligations to existing statutes before the risks of oil sands development on the basin increase.

While the federal government is already engaged in some areas relating to oil sands development, it fails to adequately use or enforce federal laws designed to protect public health and the environment. The 2009 *Report of the Rosenberg International Forum on Water Policy to the Government of the Northwest Territories* states: “Forceful evidence was presented by experts at the forum that suggested that existing federal regulations protecting upstream waters were not being enforced. Experts on the panel were surprised by evidence that the Federal Fisheries Act, the Federal Navigable Waters Act, the Canadian Environmental Assessment Act, the Canadian Environmental Protection Act and Treaty Eight all appear to be systematically violated at Alberta’s oil sands.”<sup>213</sup> Opportunities whereby the federal government can increase its role in the use and enforcement of existing laws are provided in Table 6.

**Table 6. Opportunities for the federal government to increase its role in oil sands management**

Statute	Relevance to Oil Sands Water Management
Canada Water Act, 1970	<p>Recognizes water as a national concern — Section 4 provides how Canada can work with other provinces to ensure the optimum use of water for the benefit of all Canadians.</p> <p>Canada could use its powers under S. 4 to facilitate a water sharing agreement to ensure a sufficient supply into the Mackenzie River.</p>
Canadian Environmental Protection Act, 1999	<p>Water quality guidelines do not exist for some of the substances discharged or potentially discharged into the environment by bitumen extraction and processing.</p> <p>Federal government could conduct an assessment of all potentially toxic substances, such as naphthenic acids, released by oil sands operations and ensure standards are in place.</p>
Fisheries Act, 1868 <sup>214</sup>	<p>This provision empowers the DFO to create a regulatory framework to limit water diversions from the Athabasca River. Since 2003, DFO stated the need for such a framework and committed to release a joint framework with Alberta Environment by no later than the end of 2005.</p> <p>In 2010, the Phase 2 framework does not create an ecosystem base flow (EBF). The federal government could use its powers under the Fisheries Act to set minimum flows in the Athabasca River to protect fish habitat.</p> <p>The federal government can also make regulations prescribing what substances are deleterious for the purpose of subsection 35 (3) and specifying the quantities or concentrations of deleterious substances to be deposited.</p>
Migratory Birds Convention Act <sup>215</sup>	<p>This legislation empowers Canada to pass regulations prescribing protected areas for migratory birds and nests and for control and management of these areas. Oil sands development causes a decrease in bird habitat through deforestation and destruction of wetlands. In addition, water withdrawals and destruction of wetlands for oil sands development increases attractiveness of tailings ponds to migrating birds and reduces overall available habitat.</p> <p>The federal government could explore how oil sands developments will affect migratory bird populations because of pollution of the waters or land frequented by them, and it can continue to prosecute bird deaths on tailings ponds.</p>

<p>Species at Risk Act (SARA)<sup>216</sup></p>	<p>The yellow rail (listed in SARA as a species of Special Concern) is a bird that requires wetlands to breed in the boreal forest that spans the Alberta-NWT region. The destruction of wetlands is the greatest threat to the yellow rail.</p> <p>The federal government has listed the species under SARA but has not identified critical habitat that may impact the location of certain oil sands operations.</p> <p>The federal government should identify and protect the habitat of listed species at risk in the region affected by oil sands activity, including those that rely on wetlands and other water resources such as the yellow rail.</p>
<p>Canadian Environmental Assessment Act (CEAA)<sup>217</sup></p>	<p>Federal environmental assessment under CEAA has been triggered for several oil sands mines because of the approval requirement for the harmful alteration, disruption or destruction of fish habitat. DFO is a responsible authority for these environmental assessments.</p> <p>These assessments provide an opportunity for federal authorities to require comprehensive assessment and mitigation strategies for the cumulative effects on water in the region. However, this opportunity has not been fully realized and assessments of the cumulative impacts on the ecosystem and on water have not kept pace with the scope and scale of oil sands development.</p>
<p>Constitution Act, Natural Resources Transfer Agreement<sup>218</sup></p>	<p>When Canada negotiated the Natural Resources Transfer Agreement (Constitution Act, 1930) with Alberta in 1929, it reserved to itself certain rights including the land comprising the national parks. It also secured an agreement from Alberta to provide sufficient flow of water in rivers that flow into the Park to preserve, “the scenic beauties of the said parks.” While the term, “scenic beauty” is subjective, the phrase should include the natural river ecology required to support the park’s “scenic beauty.”</p> <p>Because Wood Buffalo National Park straddles the NWT-Alberta border, this provides an opportunity for northern leaders to request that the federal government take action to support the park’s “scenic beauty,” which presumably means viable populations of wildlife and clean, unaltered water.<sup>219</sup></p>

## 4.2 Implement the NWT Water Strategy

The federal government, as the principle manager of water resources in the North, should ensure that the NWT Water Strategy is implemented as intended. The 2010 NWT Water Stewardship Strategy is a partnership effort led by the Government of the NWT, the Government of Canada and Aboriginal governments.<sup>220</sup> It builds on the principles of ecosystem management and integrated watershed management. Key goals of the strategy include the assurance that<sup>221</sup>

- waters that flow into, within or through the NWT are substantially unaltered in quality, quantity and rates of flow
- residents have access to safe, clean and plentiful drinking water at all times
- aquatic ecosystems are healthy and diverse

While the strategy effectively gathered public input and has been regarded as a success so far for interagency cooperation, its vision that the NWT waters “remain clean, abundant and productive for all time”<sup>222</sup> may face capacity challenges in the future. Sufficient capacity (i.e., human resources and adequate training) is required to implement the strategy. Capacity in the NWT is a challenge in part because the NWT covers such a vast area and supports a very small population base. The partnership nature of the strategy may alleviate capacity constraints, but increased leadership and resources from the federal government is required to further resolve this issue.<sup>223</sup>

Actions that advance transboundary discussions, agreements and obligations are considered fundamental to the overall success of the strategy, which stands to help reduce the risks of oil sands development to the basin. Specifically, the strategy states that to advance transboundary obligations, the Government of the NWT and INAC will, in the short term,<sup>224</sup>

- identify commitments and obligations in various memoranda of understanding and other agreements
- continue to prepare for negotiations of transboundary water agreements with Alberta and other Mackenzie River Basin jurisdictions
- collaborate to implement long-term aquatic ecosystem monitoring on transboundary waters and indicator areas, including community-based monitoring

Additional and important action items relevant to reducing risks of upstream jurisdictions to the NWT include the development of consistent and comprehensive monitoring and research programs to understand ecosystem health and diversity while ensuring communities are engaged.

The principles of ecosystem management and integrated watershed management are reflected in the Federal Water Policy of 1987,<sup>225</sup> and increased federal government support could boost territorial and provincial actions already underway. The NWT has a history of programs or processes (e.g., full implementation of CIMP and acting upon the findings of the 2005 Northwest Territories Environmental Audit) that have not been fully implemented. There is a clear role for the federal government to assist with capacity in the implementation of the NWT Water Strategy; Northerners can play a role in conveying this need to decision makers.

**Recommendation:** The federal government should ensure that sufficient capacity exists to fully implement the NWT Water Strategy. Northern leaders can play a role in conveying their support for the strategy to decision makers.



**The inadequacies of monitoring systems make it challenging to determine how upstream activities, such as oil sands development, affect water resources in the Mackenzie River Basin**

Photo: David Dodge, The Pembina Institute

### 4.3 Strengthen and Implement the Mackenzie River Basin Transboundary Master Agreement

The completion of an Alberta–NWT bilateral agreement that is legally enforceable and that protects the Mackenzie River Basin requires federal leadership. The federal government has the constitutional authority — acting under its power in relation to peace, order and good government — to intervene legislatively with respect to the Mackenzie River Basin Transboundary Master Agreement. J. Michael Miltenberger, the NWT’s Minister of Finance and Minister of Environment and Natural Resources, noted:

“We see this [Master Agreement] as a mechanism that has tremendous potential if it’s revitalized, if the players, led by the federal government, come to the table to talk about how we manage the water on an integrated watershed management approach in the Mackenzie River Basin. That has yet to happen.”<sup>226</sup>

#### Recommendations:

Northern leaders can call on the federal government to both strengthen and implement the Master Agreement in three ways:

1. The federal government should provide the resources for the Alberta–NWT bilateral negotiations required for the creation of an agreement. This support would greatly enhance the NWT’s ability to prepare and participate in the negotiation process.
2. The federal government should use its constitutional authority over interprovincial pollution to set and enforce minimum water quality standards for transboundary waters, such as the Athabasca River, through an effective and binding bilateral agreement between Alberta and the NWT that is enforceable in a court of law.
3. The federal government, as a party to the Master Agreement, should incorporate principles such as equitable utilization and participation, pollution control, emergency planning, integrated monitoring and an obligation to not cause significant harm in an AB–NWT bilateral agreement.<sup>227</sup>

The Master Agreement is the most specific tool available for the purpose of integrated watershed management and the creation of transboundary agreements. Alberta and the NWT began discussions to produce a bilateral agreement on transboundary water management in 1982.<sup>228</sup> Negotiations between Alberta and the NWT are expected to be complete in 2012, 30 years later.<sup>229</sup> Some experts are not optimistic that the future bilateral agreement between Alberta and the NWT will be strong enough to change the status quo given the tone of the existing NWT–Alberta Memorandum of Understanding (MOU) for Cooperation and Development.<sup>230</sup> Signed in September 2008, the MOU sets out the conditions to “work cooperatively for mutual benefit in areas such as economic and infrastructure development, business and trade, as well as social and community development.”<sup>231</sup> Based on this MOU, it is thought that a future bilateral agreement — if ever reached — will, “be very modern, in the sense that they will say all the right things” but be largely unenforceable.<sup>232</sup>

The Prairie Provinces Water Board and its corresponding agreement (amended in 1992 to include water quality provisions) includes monitoring provisions for both water quality and quantity. The Mackenzie Master Agreement was originally based on the Prairie Provinces Master Agreement, but key distinctions are that the latter is binding and has recourse to the

federal court. In contrast, dispute resolution in the Mackenzie Master Agreement and the bilaterals created under it are referred to the Mackenzie River Basin Board, and then ultimately to the ministers of the affected jurisdictions.<sup>233</sup> The Mackenzie Master Agreement lacks timelines for the negotiation of agreements, and parties can choose to withdraw from agreements even after they are signed.<sup>234</sup>

“If one were to take the broader view and look at the likely stresses on the Mackenzie River Basin in coming years — particularly in light of possible impacts of climate change — then one is inevitably struck ... by the highly deferential role that the federal government has played in the negotiation of the interjurisdictional agreement on the Mackenzie ... there are important federal interests here and a clear need for federal leadership, which has largely been abdicated by the federal government over the past three decades.”

— J. Owen Saunders, Canadian Institute for Resources Law

Unlike the Prairie Provinces Master Agreement, dispute resolution becomes a political decision, which significantly lessens the power of a downstream jurisdiction to demand compliance from the upstream jurisdiction. As such, a bilateral between Alberta and the NWT should include effective and binding water quality and quantity provisions.<sup>235</sup> The Prairie Provinces Water Board was established to resolve conflicts between upstream uses and downstream needs among Manitoba, Saskatchewan, Alberta and Canada, and it serves as a relevant example as how the Mackenzie Master Agreement could be strengthened.<sup>236</sup>

The Mackenzie Master Agreement also offers little substantive guidance. For example, section C. 1 states that parties should manage water resources in a manner consistent with the maintenance of the “ecological integrity” of the aquatic ecosystem.<sup>237</sup> However, the term ecological integrity is not defined in the Master Agreement. It is expected that the term will be defined in the bilateral water management agreements.<sup>238</sup> In the absence of bilateral agreements, the term remains nebulous and, more importantly, the Master Agreement fails to offer management guidance.<sup>239</sup>

#### 4.4 Ensure Adequate Monitoring in the Basin

**Recommendation:** Northern leaders can call on the federal government to instigate a new approach to monitoring in the basin that is designed and supported by the Alberta, NWT and Aboriginal governments and that is independent from industry.

The inadequacies of the current monitoring systems in both Alberta and the NWT make it challenging to determine how upstream activities, such as oil sands development, affect water resources in the Mackenzie River Basin. To address the monitoring gaps in an effort to proactively protect the basin from current and future threats, the federal government should ensure that concerns regarding RAMP are immediately addressed. Furthermore, federal and provincial monitoring efforts in the basin should be amended so that consistent, continuous, publicly available data that can be easily integrated with other agencies’ databases is available. Complete independence from industry and oversight by an independent board of experts would

make better use of the existing monitoring resources and ensure that data are available for independent scrutiny and analyses.

Since RAMP's inception in 1997, the federal government, through DFO, has been a participant in this multi-stakeholder initiative. If a second independent peer review of RAMP occurs, at a minimum the federal government should ensure that at least one NWT representative be present on the review committee. Otherwise, RAMP should be dissolved and entirely reconstituted to address expressed concerns to date.

Independent of the concerns associated with RAMP, the federal government must ensure that the agreement between Alberta and Environment Canada on the monitoring of surface water is assessed and actively implemented. Failure to implement this arrangement may be a violation of the *Fisheries Act*.<sup>240</sup> While Alberta has a process in place to report spills to Environment Canada, including incidents that potentially fall under the *Fisheries Act*, the committee that manages this arrangement has not provided its oversight role in more than two years.<sup>241</sup>

Finally, the federal government should make a long-term, multi-year financial commitment to implement the NWT CIMP to comply with the MVRMA. INAC should work with Aboriginal groups to identify the information requirements of the co-management boards in the NWT for cumulative impact monitoring.

## 4.5 Participate in the Regulatory Approval Process Governing Oil Sands Development

**Recommendation:** Northern leaders can relay their concerns regarding oil sands development by participating in the public hearings for oil sands mines.

Northern leaders may be able to improve water management in upstream jurisdictions by participating in the regulatory approval process that governs oil sands developments. Concerns regarding oil sands development can be relayed at public hearings that involve both the provincial and federal governments in a Joint Review Panel process. Joint Review Panels are established to assess the environmental effects of the proposed project and review the application filed by the proponent. Most applications<sup>242</sup> for the development of an oil sands mine automatically require a Joint Review Panel comprised of a federal representative (under the *Canadian Environmental Assessment Act* (CEAA) and provincial representatives (under the *Energy Resources Conservation Act* and the *Environmental Protection and Enhancement Act*).<sup>243</sup>

Federally, section 35(3) of the CEAA provides that a review panel will be public.<sup>244</sup> Therefore, any member of the public can participate in a joint review panel. Not only can NWT residents participate in the hearing process, but compensation to do so may be available. Under CEAA, public hearing participants can request funding through the federal Participant Funding Program. This program supports public participation in comprehensive studies, assessments by review panels and assessments by joint review panels. According to the *Guide to the Participant Funding Program*,<sup>245</sup> funding is made available to individuals, Aboriginal groups and incorporated not-for-profit organizations interested in participating in an environmental

assessment. The funding can cover eligible expenses, such as travel costs and fees for experts, in support of their participation. Funding applicants must demonstrate that they:<sup>246</sup>

- have a direct, local interest in the project, such as living or owning property in the project area
- have community knowledge or Aboriginal traditional knowledge relevant to the environmental assessment
- plan to provide expert information relevant to the anticipated environmental effects of the project

In 2006, the Deninu K'ue First Nation from Fort Resolution, NWT, requested intervener status from the Alberta Energy Resources Conservation Board in the Joint Review Panel process of the Imperial Kearn oil sands mine as a result of concerns regarding threats to water from upstream oil sands operations.<sup>247</sup> The Deninu K'ue argued that it should be granted standing due to constitutional considerations, specifically aboriginal and treaty rights. In the end, the Deninu K'ue failed to meet the timeline for their constitutional (aboriginal rights) concerns but could still participate under CEAA.

In their presentation, the Deninu K'ue's representative stated how important water was to their quality of life, "The Deninu people or my people are delta people, we live in the delta, we live on water ..."<sup>248</sup> In addition, they expressed their frustration with the risks imposed by oil sands operations: "to me and to my Deninu people, it's crazy thinking. ... given the price of water versus the price of gas, oil, or whatnot, given the value of water, measured on the value of oil and given the fact that we are all made up of water and not oil ..."<sup>249</sup>

To intervene in a public hearing in a provincial process without federal representation is more difficult. Northern leaders would need to acquire standing under the *Alberta Environmental Protection and Enhancement Act* (EPEA). To gain provincial standing, participation in the regulatory approval process as an intervener largely depends on establishing that one is directly and adversely affected<sup>250</sup> by the proposed project. Section 73(1) of EPEA states that any person who is "directly and adversely affected" by a proposed activity can file a statement of concern<sup>251</sup> before the hearing commences. A person must have filed a statement of concern to file a notice of appeal to any decision of the panel. There is no participant funding available under EPEA.<sup>252</sup> Under Section 44(3) of EPEA, the director has the discretion to consider information from the public, not necessarily those who are only "directly and adversely affected." Therefore, even though the likelihood of a Northern leader acquiring standing in a provincial process is remote, the director may consider concerns submitted in writing.

In addition to EPEA, the *Alberta Water Act* has provisions for participatory opportunities under section 109(1)(a). If an individual or group (not limited to Alberta residents) feels that they are directly affected by an application or proposed amendments, they can submit a Statement of Concern to Alberta Environment. Alberta Environment says it is inclusive when determining whether someone is "directly affected,"<sup>253</sup> but no statements of concern from non-Albertans have historically been accepted.<sup>254</sup>

Given the remoteness of a northern leader acquiring standing in a provincial process, it is recommended that northern leaders engage in projects that require a Joint Review Panel comprised of a federal representative under CEAA. There are several options as to how Northerners can represent themselves in the regulatory review process. Northerners can represent

themselves as a First Nation, a community, as the territorial government or through one of the regional boards. For example, the MVRMA authorizes the Mackenzie Valley Environmental Impact Review Board to participate in a review of the environmental effects of development in regions adjacent to the Northwest Territories when the development “might have a significant adverse impact on the environment in the Mackenzie Valley.”<sup>255</sup>

The participation of northern leaders in a joint review panel oil sands hearing would emphasize the potential risks to water quality and quantity in the North. The next public hearing for an oil sands project that will involve a Joint Review Panel will take place in September 2010 for Total E&P Canada’s Joslyn North Mine Project.<sup>256</sup> Northern leaders could make requests pertaining to tailings storage and management, bilateral agreements and cumulative effects monitoring. These requests could help shape the terms and conditions for the project’s impacts on water. More specifically, northern leaders could request an effective, binding and enforceable agreement between Alberta and the NWT before a mine is approved or request that only dry tailings can be stored on the landscape. A recommendation regarding the need for a comprehensive, independently audited monitoring program for northeastern Alberta and the basin as a whole could help mitigate cumulative effects. Finally, northern interveners could request increased protection against the risks of tailings dam failure.

## 4.6 Investigate the Opportunities for Legal Action

**Recommendation:** Northern leaders can investigate opportunities to take legal action pertaining to upstream threats of oil sands development.\*

\*Note: Such legal action would require demonstrable proof that Aboriginal and treaty rights, the Canadian Constitution or federal statutes have been violated.

Legal action is increasingly being used to address both local and regional concerns regarding oil sands development.<sup>257</sup> Increased legal action may be a result of the weak enforcement efforts of the provincial and federal governments. Under *EPEA* and the *Alberta Water Act*, Alberta Environment can, for example, issue a protection order requiring the company to clean up the spill (if that is possible).<sup>258</sup> Alberta Environment can also prosecute, request/enforce court orders and cancel an approval.<sup>259</sup> However, the effectiveness of protection orders and their ability to prevent or stop an adverse environmental impact is highly questionable.<sup>260</sup>

There have been no lawsuits to date involving the oil sands and groups or individuals who reside outside Alberta, but precedents for transboundary litigation exist elsewhere.<sup>261</sup> For example, in 2001, the Alberta Court of Appeal considered *Interprovincial Cooperatives in Athabasca Chipewyan First Nation v. British Columbia* and concluded that any provincial act that authorized the carrying out of activities that would affect lands or property outside B.C. would be of questionable validity. The court also held that one province cannot authorize a corporation such as BC Hydro to commit any wrongdoing for which an action for damages may be brought or breach laws in another province.<sup>262</sup>

### 4.6.1 Aboriginal Water Rights

**Recommendation:** Northern leaders can investigate taking legal actions that build on Aboriginal water rights, such as harvesting fish.

Water and land rights have long been asserted by Aboriginal people as part of their rights to live on their lands. Aboriginal rights and treaty rights, including certain customs and practices, became constitutionally protected in 1982. Section 35 of the *Constitution Act* (1982) states that aboriginal rights and treaty rights (which include water rights) are recognized and affirmed. The Canadian Constitution makes it the responsibility of the federal government to act in the best interests of Aboriginal people and their lands.<sup>263</sup>

The uses of water that are vital to an Aboriginal community may include rights to travel and navigation; rights to use water for domestic uses, such as drinking, washing and tanning hides; rights to use water in connection with the rights to hunt, trap, fish and gather; as well as rights to use water for cultural or spiritual purposes.<sup>264</sup> The content of these rights has yet to be defined by Canadian courts and there has never been a court ruling in Canada that unequivocally established or denied Aboriginal rights to water.<sup>265</sup>



**Water rights are asserted by Aboriginal people as part of their rights to live on their lands**

Photo: David Dodge, The Pembina Institute

This uncertainty around the legal recognition of Aboriginal people's rights to water has led some groups to take legal action. For example, the Beaver Lake Cree Nation of Alberta launched an action against both the provincial and federal governments in 2008.<sup>266</sup> Beaver Lake Cree Nation asserts that in granting certain oil sands (and other) tenures, the governments of Alberta and Canada infringed upon its treaty rights to hunt, trap and fish certain wildlife species in its traditional territory.

#### 4.6.2 Land Claim Agreements

**Recommendation:** Northern leaders can investigate how land claims, in their recognition of water rights, can serve as the basis for legal action.

Settled land claim agreements carry federal force and contain several provisions that are useful in securing the water resources of the North. In the Mackenzie Valley, there are three completed comprehensive land claim and/or self-government agreements and four land claim and self-government agreements under negotiation.<sup>267</sup> Generally speaking, these agreements provide for the right to have waters remain substantially unaltered as to quality, quantity and rate of flow. In addition, these agreements include provisions for standing and provisions around the nature of future transboundary water agreements.<sup>268</sup>

For example, the Gwich'in Comprehensive Land Claim Agreement states that with respect to water rights and management, "the Gwich'in have the right to have waters which are on or flow through or are adjacent to Gwich'in lands remain substantially unaltered as to quality, quantity and rate of flow when such waters are on or flow through or are adjacent to Gwich'in lands."<sup>269</sup>

The Agreement also states that the Gwich'in Tribal Council has "standing at all times in a court of competent jurisdiction to seek a declaration of the authority of any person to alter the quality, quantity or rate of flow of water in the settlement area."<sup>270</sup> Furthermore, the agreement provides a provision for interjurisdictional agreements: "the Government shall use its best efforts to negotiate agreements with other jurisdictions which manage drainage basins shared with the settlement area for the management of water in the shared drainage basin."<sup>271</sup> The federal government must also consult with the Gwich'in Tribal Council with respect to the formulation of government positions on the management of water in a shared drainage basin before negotiating any transboundary agreements.

The 1993 Sahtu Dene and Métis Comprehensive Land Claim Agreement and the 2003 Tlicho Land Claims and Self-Government Agreement<sup>272,273</sup> contain similar provisions as the Gwich'in agreement for access to unaltered water, standing and interjurisdictional agreements. With respect to interjurisdictional agreements, the Tlicho agreement states that the government "shall use its best efforts to negotiate agreements with territorial or provincial governments which manage drainage basins any part of which are in Wek'èezhii<sup>274</sup> for the management of water in the drainage basin."<sup>275</sup> Section 21.4.2 of the Tlicho agreement states that the federal government shall consult with the Tlicho Government with respect to the formulation of government positions on the management of water in a drainage basin before negotiating any interjurisdictional agreement.<sup>276</sup>

#### **Inuit test land claims in federal lawsuit**

In Nunavut, Nunavut Tunngavik Inc. (NTI) filed a statement of claim against the Attorney General of Canada for breach of contract, stating that the federal government failed to live up to its obligations and has therefore violated the *Nunavut Land Claims Agreement Act*. NTI, a body established to assist in the implementation of the land claims agreement negotiated by the Inuit and the government of Canada, coordinates and manages Inuit responsibilities set out in the Agreement, while ensuring that the federal and territorial governments fulfill their obligations. Under the *Nunavut Land Claims Agreement Act* the federal government was required to establish a Nunavut Wildlife Management Board that would implement and monitor a plan to oversee ecosystem and social changes. However, this work has not yet been done.<sup>277</sup>

Canadian law regarding the rights of Aboriginal people has been evolving in many ways ever since Aboriginal rights were entrenched in the Constitution in 1982.<sup>278</sup> Its shifting state has been influenced by ongoing negotiations and settlement of comprehensive land claims and self-government agreements as well as a number of court cases in the last decade.<sup>279</sup> This suggests that untested legal opportunities to reduce the risks posed by upstream developments exist.

### **4.6.3 Federal Statutes**

**Recommendation:** Northern leaders can explore legal avenues for the enforcement of existing federal laws regarding water quality threats posed by its upstream neighbours.

As previously discussed, the federal government has neglected some of its responsibilities in the management of Canada's oil sands. The Rosenberg Regional Forum Panel suggested that the NWT should be pressing hard, even to the point of threatening legal action, for enforcement of existing federal laws regarding water quality threats posed by its upstream neighbours.<sup>280</sup> In light of this suggestion, several federal obligations relevant to the oil sands and northern leaders are explored as possible avenues for legal action.

#### ***Fisheries Act***

Subsection 36(3) of the *Fisheries Act* prohibits the deposit of deleterious substances into waters frequented by fish (unless permitted). The research highlighted in section 1.3 of this report states that this may be happening. If fish habitat is being negatively affected by oil sands development, northern leaders can bring a private prosecution under Section 35 or apply to the court to review a decision by DFO to issue an approval for the harmful alteration, disruption or destruction of fish habitat. Strong scientific data on the transboundary water impacts of oil sands development would be required to prove this link in court. An example of a Northern downstream community challenging such a licence is the 1993 case involving the Eastmain River. Despite significant changes to the flow regime of the Eastmain River,<sup>281</sup> the Cree community of Eastmain, Quebec, was unsuccessful in its appeal of a permit given to Hydro-Quebec for the James Bay Project.<sup>282</sup>

Outside the North, a successful challenge of a licence was made in the Union of Nova Scotia Indians v Canada (1996) case.<sup>283</sup> The Mi'kmaq people of Cape Breton, N.S., took the Government of Canada to court over the impact of dumping dredged materials into the waters they use for aquaculture.

### ***Migratory Birds Convention Act***

The impacts of oil sands development on migratory birds are evident both in the literature<sup>284</sup> and in the recent Syncrude duck case.<sup>285</sup> If, for example, tailings ponds affect waterfowl migrating to the NWT, then Northern leaders can investigate whether or not the MBCA has been violated. The Migratory Bird Regulations of the MBCA include a provision that prohibits against pollution (defined as the deposit of oil, oil wastes or any other substance harmful to migratory birds) in any waters or any area frequented by migratory birds.<sup>286</sup>

In April 2008, it was reported that more than 1,600 migrating waterfowl died after landing on a tailings pond in northern Alberta owned by Syncrude Canada Ltd. Syncrude claimed they had not been able to deploy deterrent systems due to a late spring storm. In February 2009, Syncrude Canada was charged with one count under Section 155 of the Alberta *Environmental Protection and Enhancement Act*, for allegedly failing to ensure that hazardous substances directly or indirectly not come into contact or contaminate any animals, plants, food or drink; and one count under the federal Migratory Birds Convention Act, for allegedly depositing or permitting the deposit of a substance harmful to migratory birds in waters or an area frequented by birds.<sup>287</sup>

In September 2009, Syncrude Canada pleaded not guilty to charges laid by Alberta Environment and Environment Canada in relation to the toxic substances in its Aurora Mines tailings pond that resulted in the death of the ducks. The judge delivered guilty verdicts on both charges on June 25, 2010.<sup>288</sup> Sentencing was scheduled for August 20, 2010.

### ***Canadian Environmental Protection Act***

Federal enforcement on the harmful impacts of toxic substance releases falls under the *Canadian Environmental Protection Act (CEPA)*.<sup>289</sup> CEPA exists to prevent pollution and to protect environmental and human health,<sup>290</sup> yet there are no standards for naphthenic acids, acutely fatal toxins that enter surface water systems through tailings discharge. The migration of naphthenic acids through the groundwater system presents serious risks to the boreal landscape and beyond. A key element of CEPA is the listing and assessment of substances that are potentially harmful to people and the environment based on risk assessments, but which substances earn designation under CEPA is discretionary.

The federal government's "ability to detect, understand, and prevent the harmful effects of toxic substances is still limited. The processes we observed seem to defy timely, decisive, and precautionary action... .. we are leaving our children the responsibility of assessing, and certainly of managing, toxic substances in use today."<sup>291</sup>

— Report of the Commissioner of the Environment and Sustainable Development

Information regarding the contents of materials sent to tailings and waste rock areas is important to communities because of the risks associated with tailings and waste rock facilities at active and abandoned mines. Communities should be aware of the possible threats posed by large facilities such as oil sands mines. On April 2009, the Federal Court found that the Minister erred in his interpretation of CEPA by not requiring, through the National Pollutant Release Inventory (NPRI), information on releases and transfers to tailings and waste rock disposal areas by mining facilities and making this information available to the public.<sup>292</sup> While the mining sector has

always been required to report releases of NPRI substances to the environment from tailings or waste rock areas, the substances contained in materials added to tailings or waste rock areas were not reported.

The Federal Court decision means that oil sands operators will be required to start reporting of NPRI-listed substances contained in tailings<sup>293</sup> or waste rock to determine whether releases fall within the mass reporting thresholds of the program. Companies were required to submit the information in June 2010 and then annually thereafter.<sup>294</sup>

## 4.7 File Environmental Petitions

**Recommendation:** Northern leaders can file one or several environmental petitions with federal departments and agencies to publicly communicate concerns regarding the risks of oil sands development on the basin.

The environmental petitions process under the Auditor General Act provides a formal means for Canadians to bring their concerns about environmental issues to the attention of federal ministers and departments and to obtain a response to their concerns.<sup>295</sup> Eligible petitioners must be Canadian residents — either an individual or an organization, and the issue in question must be about an environmental matter in the context of sustainable development. The issue must also fall within the scope of federal responsibilities.<sup>296</sup> For example, concerns regarding the federal government's responsibilities for enforcing federal environmental protection legislation, implementing treaty obligations and protecting fish habitat as they relate to oil sands development are valid issues of concern.

A 2007 OAG report stated that 79% of petitioners are satisfied with the OAG response. Historically, environmental petitions have not been widely used in the North. Between 1995 and 2007 there were only three petitions from the NWT compared to 22 in Alberta and 104 in Ontario.<sup>297</sup> In the south, there are successful examples in which oil sands issues have been addressed through the petitioning process. The Treaty 8 First Nations initiated a petition in 2006, requesting the Commissioner examine the regional, cumulative impacts of resource development in Northern Alberta — particularly oil sands development on First Nations.<sup>298</sup> In their petition, the Treaty 8 First Nations of Alberta stated that resource developments in Northern Alberta are “proceeding at an unsustainable pace that threatens the environment upon which First Nations people rely upon to pursue their constitutionally protected Treaty Rights.”<sup>299</sup>

The response to the petition came from Environment Canada and Parks Canada, and it acknowledged that the current project-specific environmental assessment is not designed for examining broader regional or policy issues that may arise in the context of a given development and that the Agency is committed to exploring the potential of applying environment assessment at a regional scale to inform assessment and decision-making at the project level. A subcommittee of the federal Minister of the Environment's Regulatory Advisory Committee was asked to make “meaningful linkages between strategic environmental assessment [including environmental assessment on a regional or sectoral basis] and project EA that contribute to more timely, effective and efficient processes within a more comprehensive EA framework.”<sup>300</sup>

While disappointed by the lack of federal government leadership in examining the cumulative effects of oil sands development, those involved in this petition noted that the process was an effective method to understand the position of the Government of Canada and would consider using the petitioning process in the future.<sup>301</sup>

## 4.8 Participate in the Commission for Environmental Cooperation Citizen Submissions Process

**Recommendation:** Northern leaders can consider filing a submission to the Commission for Environmental Cooperation as a means of communicating concerns to senior decision makers.

The Commission for Environmental Cooperation (CEC) was established by the *North American Agreement on Environmental Cooperation*, the side agreement that emerged from NAFTA negotiations among Canada, Mexico and the United States.

The goals of the CEC are to address regional environmental concerns, mitigate potential conflict relating to trade and the environment, and promote enforcement of environmental laws.<sup>302</sup> Citizens or groups in Canada, the United States and Mexico may file a petition with the CEC Secretariat alleging that one of the NAFTA countries is failing to effectively enforce its environmental law.<sup>303</sup> The secretariat may recommend to the environment ministers of the three countries that a factual record be prepared to explore such an allegation.<sup>304</sup>

In April 2010, a submission was made to the CEC by Environmental Defence Canada, the Natural Resources Defense Council and three private citizens who live downstream of the oil sands, one of whom is an NWT resident. Their submission states that the Government of Canada has failed to effectively enforce the Canadian *Fisheries Act*,<sup>305</sup> which prohibits adding dangerous substances to water frequented by fish.<sup>306</sup> Their submission details findings of water contamination and condemns the governments of Canada and Alberta for relying on RAMP, a program that has been discredited.<sup>307</sup> If the CEC finds the submission to have merit, a response will be requested from the Government of Canada, and a factual record of the issue may be developed and published on the CEC site.<sup>308</sup>

## 4.9 Establish a Transboundary Community Network

**Recommendation:** Northern leaders can create a new or join an existing transboundary community network to help raise awareness, communicate concerns and generate solutions regarding the risks of oil sands development to the basin.

A final mechanism for northern leaders to become engaged in how oil sands development risks downstream waters is through coalitions with other communities, organizations or individuals. Transboundary community networks provide the opportunity to raise awareness, communicate concerns and learn new ways of addressing water management challenges. Increased public awareness of issues such as water security may increase a network's political power and lead to

the desired change. For remote northern communities, linking with outside communities and organizations can help bridge the geographic divide.

Sophisticated transboundary community networks are forming around a host of pressing issues. A northern example of a grassroots effort to protect a transboundary watershed is the Yukon Inter-Tribal Watershed Council, an Aboriginal organization consisting of 66 First Nations. Since 1997, the this council has provided Yukon First Nations and Alaska Tribes (in the Yukon River Watershed) with technical assistance, training opportunities and educational/awareness programs designed to promote the health of the Yukon River Watershed.<sup>309</sup> Some of the projects completed to date include a unified watershed assessment, a watershed assessment to assess the overall health of the Fortymile watershed in partnership with the Bureau of Land Management, and a handbook on federal statutory strategies for the protection of the Yukon River.<sup>310</sup>

In the NWT, communities affected by Diavik diamond have partnered in the past with a Peruvian community also affected by copper mine owned by BHP Billiton.<sup>311</sup> The Black Mesa Water Coalition is an inter-tribal, inter-ethnic NGO in the southwest United States that uses international networks to help address issues of water depletion, natural resource exploitation and health promotion within Navajo and Hopi communities.<sup>312</sup>

Northern leaders could join forces with an existing group such as the Waterkeeper Alliance. The Waterkeeper Alliance provides a way for communities to “stand up for their right to clean water and for the wise and equitable use of water resources” while linking these communities with a regional and global movement.<sup>313</sup> The Alliance is primarily a watchdog group that believes that water belongs to the people. There are nearly 200 local Waterkeepers patrolling rivers, lakes and coastal waterways on six continents.<sup>314</sup> Founded in 1999 by environmental attorney and activist Robert F. Kennedy, Jr., and several veteran Waterkeepers, the Waterkeeper Alliance emphasizes grassroots environmentalism and the “polluter pays” principle. They are able to fund testing of water and provide legal advice on environmental issues.<sup>315</sup> If a new group is to be forged, then the Yukon Inter-Tribal Watershed Council, which serves as model for a grassroots transboundary network, could join forces with NWT residents, Aboriginal governments and Treaty 8 First Nations of Northern Alberta.

# Appendix A

## Industrial Upstream Water Uses in the Mackenzie River Basin

Adapted from NWT Water Stewardship Strategy Appendix A. November 2009.

Basin	Rivers	Industrial Uses
<b>Athabasca Basin</b>	Athabasca River Clearwater River South Heart River Lesser Slave River Paddle River Pembina River Charlot River Wapiti River Lesser Slave Lake Lake Athabasca Peace-Athabasca Delta	Oil sands development Pulp mills Agriculture Forestry, including saw mills Conventional oil and gas development Coal mining Uranium mining Dam for flood control and water supply Hydroelectric power production
<b>Peace River Basin</b>	Peace River Williston Lake	Conventional oil and gas development Coal Mining Agriculture Hydroelectric power production
<b>Great Slave Basin</b>	Lockhart River Tazin River Talston River Slave River Yellowknife River Snare River Hay River Great Slave Lake Snare Lake	Oil and gas development Gold and Copper mining (current and historic) Agriculture Forestry Commercial fishery Hydroelectric power production
<b>Liard Basin</b>	Muskwa River Fort Nelson River South Nahanni River Liard River	Conventional oil and gas development Forestry Tungsten mining
<b>Peel Basin</b>	Peel River	Mining and oil and gas exploration and potential development

---

# Appendix B

## **Resolution: Protection of NWT Water Sources from Development of Oil Sands in Alberta<sup>316</sup>**

Submitted by: Board of Directors

WHEREAS there is widespread concern in the Northwest Territories that the Governments of Alberta and Canada have not managed the Alberta oil sands in a sustainable way that protects the environment and downstream communities; and,

WHEREAS the Government of Alberta has encouraged the rapid expansion of the Alberta oil sands; and,

WHEREAS the Government of Canada needs to take stronger steps to protect water, fish, migratory species and people living in downstream communities; and,

WHEREAS this is no longer just an issue for Albertans, and now poses a risk to all downstream communities in the Mackenzie Basin, most critically at this point in time, in terms of risks to water quality in the Athabasca River posed by leaks from, and even possible failure of oil sands tailings ponds; and,

WHEREAS there is concern that oil sands expansion will result in great use of water, reducing the amount flowing into the Mackenzie Basin Watershed; and,

WHEREAS all development affecting water throughout the Mackenzie River Watershed should reflect the 14 principles stated in the NWT discussion paper, Northern Voices, Northern waters — Towards a Water Resources Management Strategy for the Northwest Territories; and,

WHEREAS the Dene Nation passed a very similar motion on February 19, 2009 at its Dene Leadership meeting in Yellowknife;

NOW THEREFORE BE IT RESOLVED THAT the NWT Association of Communities call on the GNWT Minister of Environment and Natural Resources to establish ongoing testing and reporting of water quality and water levels in the Mackenzie Basin Watershed to determine and monitor downstream impacts of oil sands development;

AND BE IT FURTHER RESOLVED THAT the NWTAC petitions the GNWT to ask the Government of Alberta to halt new oil sands approvals until it negotiates an enforceable trans-boundary water agreement with the NWT that ensures water flowing into the Northwest Territories is clean, uncontaminated and that water flows are unimpeded;

AND BE IT FURTHER RESOLVED THAT the GNWT regularly update the NWTAC on negotiations with the Government of Alberta;

AND BE IT FURTHER RESOLVED THAT the President of the NWTAC communicate this resolution to the Premiers of the NWT and Alberta, to the Prime Minister of Canada, to other responsible territorial, provincial and federal officials, and to the Federation of Canadian Municipalities.

---

# Endnotes

- 1 Spoken by Francois Paulette, former Chief of Smith’s Landing First Nation, who lives on the Slave River by the Alberta–NWT border.
- 2 Northwest Territories Association of Communities, Resolution 2009-19 Protection of NWT water sources from development of oil sands in Alberta, [www.nwtac.com/2009\\_19.html](http://www.nwtac.com/2009_19.html) (accessed November 17, 2009).
- 3 This report builds on the 2009 Pembina Institute report *The Waters That Bind Us: Transboundary Implications of Oil Sands Development* (Peggy Holroyd and Terra Simieritsch, [arctic.pembina.org/pub/1790](http://arctic.pembina.org/pub/1790)).
- 4 Natural Resources Canada, “Drainage Patterns,” Atlas of Canada, [atlas.nrcan.gc.ca/site/english/maps/freshwater/distribution/drainage/1](http://atlas.nrcan.gc.ca/site/english/maps/freshwater/distribution/drainage/1) (accessed November 18, 2009).
- 5 Mackenzie River Basin Board Annual Report 2004–2006, [www.mrbb.ca/documents/Ministers\\_Report\\_2004-6\\_en.pdf](http://www.mrbb.ca/documents/Ministers_Report_2004-6_en.pdf), 2.
- 6 Rosenberg International Forum on Water Policy, *Report of the Rosenberg International Forum on Water Policy to the Government of the Northwest Territories*, (University of California, 2009) [www.enr.gov.nt.ca/\\_live/documents/documentManagerUpload/Rosenberg\\_Forum\\_Report.pdf](http://www.enr.gov.nt.ca/_live/documents/documentManagerUpload/Rosenberg_Forum_Report.pdf) (accessed December 7, 2009).
- 7 Mark Anielski and Sara Wilson, *The Real Wealth of the Mackenzie Region: Assessing the Natural Capital Values of a Northern Boreal Ecosystem* (Ottawa: Canadian Boreal Initiative, 2009).
- 8 Rosenberg International Forum on Water Policy, *Report of the Rosenberg International Forum on Water Policy to the Government of the Northwest Territories*, (University of California, 2009) [www.enr.gov.nt.ca/\\_live/documents/documentManagerUpload/Rosenberg\\_Forum\\_Report.pdf](http://www.enr.gov.nt.ca/_live/documents/documentManagerUpload/Rosenberg_Forum_Report.pdf) (accessed December 7, 2009), 7.
- 9 Mackenzie River Basin Board, *Highlights of the Mackenzie River Basin Board’s State of the Aquatic Ecosystem Report 2003*, [www.mrbb.ca/reports.asp](http://www.mrbb.ca/reports.asp) (accessed November 18, 2009).
- 10 Regional Aquatics Monitoring Program, *The Mackenzie River Basin*, [www.ramp-alberta.org/river/geography/mackenzie.aspx](http://www.ramp-alberta.org/river/geography/mackenzie.aspx) (accessed November 18, 2009).
- 11 GNWT Department of Transportation, *Inside the Hard Drive*, [www.dot.gov.nt.ca/\\_live/pages/wpPages/publications.aspx](http://www.dot.gov.nt.ca/_live/pages/wpPages/publications.aspx) (accessed November 18, 2009).
- 12 Boreal Songbird Initiative, *Mackenzie River Watershed*, [www.borealbirds.org/mackenzie.shtml](http://www.borealbirds.org/mackenzie.shtml) (accessed November 18, 2009).
- 13 UNESCO World Heritage Centre. 2010. Wood Buffalo National Park. [whc.unesco.org/en/list/256](http://whc.unesco.org/en/list/256).
- 14 M. S. Evans, “The large lake ecosystems of northern Canada,” *Aquatic Ecosystem Health and Management* 3, no. 1 (2000): 65–79.
- 15 Water Matters Society of Alberta, *Watered Down: Overcoming Federal Inaction on the Impact of Oil Sands Development to Water Resources*, [www.water-matters.org/pub/watered-down](http://www.water-matters.org/pub/watered-down) (accessed December 11, 2009), 6.
- 16 Mackenzie River Basin Board, *Highlights of the Mackenzie River Basin Board’s State of the Aquatic Ecosystem Report 2003*, [www.mrbb.ca/reports.asp](http://www.mrbb.ca/reports.asp) (accessed November 18, 2009).
- 17 Government of Alberta, “Talk about oil sands,” [www.energy.gov.ab.ca/OilSands/pdfs/FS\\_OilSands.pdf](http://www.energy.gov.ab.ca/OilSands/pdfs/FS_OilSands.pdf) (accessed May 5, 2009).
- 18 Energy Resources Conservation Board, “Oil Sands,” [www.ercb.ca/portal/server.pt?open=512&objID=249&PageID=0&cached=true&mode=2](http://www.ercb.ca/portal/server.pt?open=512&objID=249&PageID=0&cached=true&mode=2) (accessed May 14, 2009).
- 19 Natural Resources Canada, “Canadian Oil Market: Review of 2006 and Outlook to 2020,” modified January 12, 2009, [nrcan.gc.ca/eneene/sources/crubru/outape-eng.php](http://nrcan.gc.ca/eneene/sources/crubru/outape-eng.php).
- 20 Energy Resources Conservation Board, “Supply and Disposition of Crude Oil Equivalent (January and February 2009),” updated March 2009, [www.ercb.ca/docs/products/STs/st3/Oil\\_current.xls](http://www.ercb.ca/docs/products/STs/st3/Oil_current.xls). Based on an average of January and February production numbers converted into barrels of bitumen.

- 21** Natural Resources Canada, “1999/2000 Annual Sector Reports — Oil Sands,” [www.nrcan.gc.ca/Publications/infosource/Pub/cipec/annual\\_report99-00/oil.cfm?text=N&printview=N](http://www.nrcan.gc.ca/Publications/infosource/Pub/cipec/annual_report99-00/oil.cfm?text=N&printview=N) (accessed May 1, 2009).
- 22** Canadian Association of Petroleum Producers. 2010. Crude Oil: Forecast, Markets & Pipeline Expansions. <http://www.capp.ca/aboutUs/mediaCentre/NewsReleases/Pages/2010-Oil-Forecast.aspx#WQLBWSOVbhXW>. Accessed 4 July 2010.
- 23** The total potential mineable area has expanded to 4801 km<sup>2</sup> of which 2000 km<sup>2</sup> are wetlands. Government of Alberta. Facts About Alberta’s Oil Sands: The Resource. July 2009. [www.oilsands.alberta.ca](http://www.oilsands.alberta.ca) (accessed September 26, 2009).
- 24** Natural Resources Canada, “Canadian Oil Market: Review of 2006 and Outlook to 2020,” modified January 12, 2009, [nrcan.gc.ca/eneene/sources/crubru/outape-eng.php](http://www.nrcan.gc.ca/eneene/sources/crubru/outape-eng.php).
- 25** Government of Alberta, *Northern River Basins Study Final Report: Major Findings, Environmental Overview*, [www3.gov.ab.ca/env/water/nrbs/sect3/sect32.html](http://www3.gov.ab.ca/env/water/nrbs/sect3/sect32.html) (accessed November 25, 2009).
- 26** Government of Saskatchewan, *Saskatchewan Exploration and Development Highlights 2008* (Saskatchewan Ministry of Energy and Resources, 2008), [www.er.gov.sk.ca/adx/asp/adxGetMedia.aspx?DocID=3445,3440,3385,5460,2936,Documents&MediaID=24648&Filename=SaskExplorationHighlights2008.pdf](http://www.er.gov.sk.ca/adx/asp/adxGetMedia.aspx?DocID=3445,3440,3385,5460,2936,Documents&MediaID=24648&Filename=SaskExplorationHighlights2008.pdf) (accessed November 25, 2009).
- 27** Morin, Anne and Bernard Cantin. 2009. Strengthening Integrated Water Resource Management in Canada. Policy Research Initiative. [www.policyresearch.gc.ca/doclib/2009-0009-eng.pdf](http://www.policyresearch.gc.ca/doclib/2009-0009-eng.pdf).
- 28** Carrie, J., F. Wang, H. Sanei, R.W. Macdonald, P.M. Outridge and G.A. Stern. 2010. Increasing Contaminant Burdens in an Arctic Fish, Burbot (*Lota lota*), in a Warming Climate. *Environ. Sci. Technol.* 44, 316–322.
- 29** Holroyd, Peggy and Terra Simieritsch. 2009. *Waters that Bind Us: The Transboundary Implications of Oil Sands Development*. Calgary: Pembina Institute. [www.pembina.org/pub/1790](http://www.pembina.org/pub/1790).
- 30** Oil sands impacts on water: Holroyd, Peggy and Terra Simieritsch. 2009. *Waters that Bind Us: The Transboundary Implications of Oil Sands Development*. Calgary: Pembina Institute. [www.pembina.org/pub/1790](http://www.pembina.org/pub/1790); Griffiths, Mary, Dan Woynillowicz, and Amy Taylor. *Troubled Waters, Troubling Trends - Technology and Policy Options to Reduce Water Use in Oil and Oil Sands Development in Alberta: The Pembina Institute, 2006*. Oil sands impacts on land, see: Grant, Jennifer, Simon Dyer, and Dan Woynillowicz. "Fact or Fiction: Oil Sands Reclamation." Calgary: The Pembina Institute, 2008; Schneider, Richard, and Simon Dyer. "Death by a Thousand Cuts: Impacts of in Situ Oil Sands Development on Alberta’s Boreal Forest." Edmonton, Alberta: Canadian Parks and Wilderness Society and the Pembina Institute, 2006.
- 31** Addison PA, Puckett, KJ. Deposition of atmospheric pollutants as measured by lichen element content in the Athabasca oil sands area. *Can J Bot* 1980; 58: 2323–34.
- 32** Timoney, Kevin P., and Peter Lee. "Does the Alberta Tar Sands Industry Pollute? The Scientific Evidence." *The Open Conservation Biology Journal* 3, no. 65-81 (2009).
- 33** In 2004, the Albian Sands, Suncor and Syncrude mining operations used on average 2.62 m<sup>3</sup> of water to produce 1 m<sup>3</sup> of bitumen. When the upgrading of bitumen to synthetic crude oil is included, the overall average is 4.04 m<sup>3</sup> of water (Alberta Energy Utilities Board, personal communication, February 8, 2006). Suncor reported using 2.29 m<sup>3</sup> of water per cubic metre of synthetic crude oil in 2008 (Suncor Energy Ltd., *A Closer Look: An Update on Our Progress*, 4.) Note that Suncor’s operations include in situ projects, which use less water per unit of bitumen produced than do mining operations, so Suncor’s average water use for mining operations may exceed 2.29 m<sup>3</sup> of water per cubic metre of synthetic crude oil. Syncrude reported using 2.26 m<sup>3</sup> of water per cubic metre of synthetic crude oil in 2008 (Syncrude Canada Ltd., 2007 Sustainability Report ). See also R. J. Mikula, V. A. Munoz and O. Omotoso, “Water Use in Bitumen Production: Tailings Management in Surface Mined Oil Sands,” presented at the World Heavy Oil Congress, Edmonton, 2008, 1.
- 34** Alberta Environment, “Water Diversion by Oilsands Mining Projects in 2007,” data received September 2008.
- 35** MacKinnon, M.D., and Sethi, A. 1993. A comparison of the physical and chemical properties of the physical and chemical properties of tailings ponds at the Syncrude and Suncor oil sands plants. In *Proceedings of Our Petroleum*

- Future Conference, Alberta Oil Sands Technology and Research Authority (AOSTRA), Edmonton, Alta. As cited in: Allen, Erik W. 2008. Process water treatment in Canada's oil sands industry: 1. Target pollutants and treatment objectives. *J. Environ. Sci.* 7: 123-138 (2008).
- 36** Government of Alberta. "ERCB Approves Fort Hills and Syncrude Pond Plans with Conditions." (2010), [www.ercb.ca/docs/new/newsrel/2010/nr2010-05.pdf](http://www.ercb.ca/docs/new/newsrel/2010/nr2010-05.pdf).
- 37** Allen, Erik W. 2008. Process water treatment in Canada's oil sands industry: 1. Target pollutants and treatment objectives. *J. Environ. Sci.* 7: 123-138 (2008).
- 38** United States Department of Labor. Occupational Safety and Health Administration. Safety and Health Topics Toxic Metals. [www.osha.gov/SLTC/metalsheavy/index.html](http://www.osha.gov/SLTC/metalsheavy/index.html).
- 39** Allen, Erik W. 2008. Process water treatment in Canada's oil sands industry: 1. Target pollutants and treatment objectives. *J. Environ. Sci.* 7: 123-138 (2008).
- 40** Allen, Erik W. 2008. Process water treatment in Canada's oil sands industry: 1. Target pollutants and treatment objectives. *J. Environ. Sci.* 7: 123-138 (2008).
- 41** Headley and McMartin, "A Review of the Occurrence and Fate of Naphthenic Acids in Aquatic Environments."
- 42** Robert A. Ronconi and Colleen Cassady St. Clair, "Efficacy of a Radar-Activated On-Demand System for Detering Waterfowl from Oil Sands Tailings Ponds," *Journal of Applied Ecology* 43, no. 1 (2006).
- 43** Golder Associates Ltd., *Oil Sands Tailings Pond Bird Deterrent Systems: A Review of Research and Current Practices*. Report for Suncor Energy Inc., Oil Sands, Syncrude Canada Ltd. and Albian Sands Energy Inc. (Calgary, AB: 2000).
- 44** Several documents clearly state that seepage is occurring including outside tailings containment structures: Alberta Energy and Utilities Board, Application by Suncor Inc. Oil Sands Group for Amendment of Approval No. 7632 for Proposed Steepbank Mine Development, Decision No. 97-1, Application No. 960439, Calgary, 1997 (Shell Jackpine proposal acknowledging that 1600 m<sup>3</sup>/day seeps from the Tar Island Pond into the Athabasca River); Worley Parsons Komex, 2006 Suncor Groundwater Monitoring Report, prepared for Suncor Energy Inc., submitted to Alberta Environment, 31 March 2007; Golder Associates, Final Report: Beaver Creek Profiling Program, 2008 Field Study, submitted to Syncrude Canada Ltd., February 2009; Syncrude Canada Limited, 2008 Groundwater Monitoring Report, Syncrude Canada Limited, Aurora, submitted to Alberta Environment, 27 March 2009 (the approval requires Syncrude to report biannually on the seepage of tailings releases into groundwater and surface water and to identify proposed mitigation strategies revealing that Alberta Environment was aware that tailings seepage was reaching groundwater and surface water).
- 45** Alberta Energy and Utilities Board, *Application by Suncor Inc. Oil Sands Group for Amendment of Approval No. 7632 for Proposed Steepbank Mine Development*, Decision No. 97-1, Application No. 960439, Calgary, 1997.
- 46** Environmental Defence, "11 million litres a day: the tar sands leaking legacy" (2008) [www.environmentaldefence.ca/reports/pdf/TailingsReport\\_FinalDec8.pdf](http://www.environmentaldefence.ca/reports/pdf/TailingsReport_FinalDec8.pdf) (accessed April 19, 2010).
- 47** As of February 2010, there are four applications for new oil sands mines in the Athabasca region waiting for approval. They include: Total's Joslyn mine, Shell's Pierre River mine, Shell's Jackpine expansion and Suncor's Voyageur mine. In addition there are four new mining projects that have been announced: UTS/Teck Resources Equinox and Frontier mines, Total's Joslyn mine expansion, and Syncrude's Aurora mine expansion.
- 48** Rogers, "Surface Oil Sands Water Management Summary Report."
- 49** Houlihan, Richard and Haneef Mian. 2008. Oil Sands Tailings – Regulatory Perspective. Presentation. This information is based on operator's submissions to the Energy Resources Conservation Board.
- 50** This estimate is conservative because it only includes mature fine tailings.
- 51** Olympic-sized swimming pool holds approximately 2500 m<sup>3</sup> of water.
- 52** Energy Resources Conservation Board. 2009. Directive 074: Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes (Released: January 29, 2009)

[www.ercb.ca/portal/server.pt?open=18&objID=2529381&qid=68956933&rank=3&parentname=SearchResult&parentid=2&mode=2&in\\_hi\\_userid=240&cached=true](http://www.ercb.ca/portal/server.pt?open=18&objID=2529381&qid=68956933&rank=3&parentname=SearchResult&parentid=2&mode=2&in_hi_userid=240&cached=true).

**53** Energy Resources Conservation Board. 2009. Directive 074: Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes (Released: January 29, 2009

[www.ercb.ca/portal/server.pt?open=18&objID=2529381&qid=68956933&rank=3&parentname=SearchResult&parentid=2&mode=2&in\\_hi\\_userid=240&cached=true](http://www.ercb.ca/portal/server.pt?open=18&objID=2529381&qid=68956933&rank=3&parentname=SearchResult&parentid=2&mode=2&in_hi_userid=240&cached=true). Page 7. A trafficable deposit is a deposit typically created through a process involving self-weight consolidation, drying, enhanced drainage, and/or capping with minimum undrained shear strength of 5 kPa one year after deposition. The trafficable surface layer must have a minimum undrained shear strength of 10 kPa five years after active deposition.

**54** Richard Houlihan and Haneef Mian (Energy Resources Conservation Board), *Oil Sands Tailings – Regulatory Perspective*, Presentation to the First International Oil Sands Tailings Conference, December 10, 2008, <http://ostrfdownload.civil.ualberta.ca/1st%20International%20Oil%20Sands%20Tailings%20Conference%202008/OSTC%20Dec%202010%20Presentations/Richard%20Houlihan.pdf>. This information is based on operator's submissions to the Energy Resources Conservation Board. Note that the MFT volume in the graph does not include thickened tailings or consolidated tailings. Consolidated, or non-segregating, tailings are an engineered mixture of sand and fines to which a coagulant has been added. Theoretically, upon deposition, the sand and fines do not segregate and water is released.

**55** Simieritsch, Terra, Joe Obad and Simon Dyer. 2009. Tailings Plan Review — An Assessment of Oil Sands Company Submissions for Compliance with ERCB Directive 074: Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes.

**56** News Release – ERCB Approves Fort Hills and Syncrude Tailings Pond Plans with Conditions. April 23, 2010, [www.ercb.ca/portal/server.pt/gateway/PTARGS\\_6\\_0\\_308\\_0\\_0\\_43/http%3BercbContent/publishedcontent/publish/ercb\\_home/news/news\\_releases/2010/nr2010\\_05.aspx](http://www.ercb.ca/portal/server.pt/gateway/PTARGS_6_0_308_0_0_43/http%3BercbContent/publishedcontent/publish/ercb_home/news/news_releases/2010/nr2010_05.aspx) (accessed July 19, 2010).

**57** Simieritsch, Terra, Joe Obad and Simon Dyer. 2009. Tailings Plan Review — An Assessment of Oil Sands Company Submissions for Compliance with ERCB Directive 074: Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes.

**58** Synenco Energy Inc., Application for approval of the Northern Lights Mining and Extraction Project, Volume 3: Management Plans, 2006, 6–28.

**59** Fay Westcott and Lindsay Watson, *End Pit Lakes Technical Guidance Document*, prepared for The Cumulative Environmental Management Association End Pit Lakes Subgroup Project 2005-61, 2007, 4.

**60** Martin, T.E, M.P. Davies, S. Rice, T. Higgs and P.C. Lighthall. 2002. Stewardship of Tailings Facilities. AMEC Earth & Environmental Limited, Burnaby, B.C. Canada AMEC Simons Ltd., Vancouver. [www.pebblescience.org/pdfs/tailings\\_stewardship-1.pdf](http://www.pebblescience.org/pdfs/tailings_stewardship-1.pdf). Page 9.

**61** Martin, T.E and M.P. Davies. 2000. Trends in the stewardship of tailings dams. AGRA Earth & Environmental Limited, Burnaby, B.C. Canada, pg 3.

**62** Martin, T.E and M.P. Davies. 2000. Trends in the stewardship of tailings dams. AGRA Earth & Environmental Limited, Burnaby, B.C. Canada, Page 3.

**63** Martin, T.E and M.P. Davies. 2000. Trends in the stewardship of tailings dams. AGRA Earth & Environmental Limited, Burnaby, B.C. Canada.

**64** This includes the 1985 failure of the Stava tailings dam in Italy dam which lead to 269 deaths and release of 190,000 m<sup>3</sup> of tailings, and the Jingshan China failure which involved a flow of 700,000 m<sup>3</sup> of tailings, 19 deaths and 95 injuries. Norbert Morgenstern, “Geotechnics and mine waste management – update” (paper presented at the Seminar on Safe Tailing Dams Constructions, Sweden, 2001).

**65** Generally speaking the integrity of tailings dams are most seriously impacted by two factors: unusual rain events and seismic activity. Climate change models predict that unusual rain events in Alberta will increase as global temperatures increase. However, because the tailings dams do not block the flow of the Athabasca River and because the majority of precipitation in the region is snow, unusual rain events do not pose a material risk for oil sands operators. While seismic events are rare in Alberta, they do occur. Despite Fort McMurray being located in

the ‘low hazard’ zone of Alberta, there have been several small earthquakes in the region. The Canadian Dam Association recommends building dams that withstand low probability ‘shaking’ from a 1/10,000 year earthquake, an earthquake substantially larger than those predicted for the Fort McMurray region.

**66** Martin, T.E and M.P. Davies. 2000. Trends in the stewardship of tailings dams. AGRA Earth & Environmental Limited, Burnaby, B.C.

**67** Tailings Related Accidents - Failures, Breaches and Mudflows- data collected from International Commission of Large Dams, Bulletin 121 - Tailings Dams, Risk of Dangerous Occurrences. Lessons learnt from practical experiences [www.tailings.info/accidents.htm](http://www.tailings.info/accidents.htm) (Accessed April 19, 2010).

**68** Tailings Related Accidents - Failures, Breaches and Mudflows- data collected from International Commission of Large Dams, Bulletin 121 - Tailings Dams, Risk of Dangerous Occurrences. Lessons learnt from practical experiences [www.tailings.info/accidents.htm](http://www.tailings.info/accidents.htm) (Accessed April 19, 2010).

**69** Grand Council of the Crees, *The failure of the retaining dyke at the Opemiska Mine near Chapais*, [www.gcc.ca/newsarticle.php?id=148](http://www.gcc.ca/newsarticle.php?id=148) (accessed Nov 19, 2009).

**70** Tailings Related Accidents - Failures, Breaches and Mudflows- data collected from International Commission of Large Dams, Bulletin 121 - Tailings Dams, Risk of Dangerous Occurrences: Lessons learnt from practical experiences [www.tailings.info/accidents.htm](http://www.tailings.info/accidents.htm) (Accessed April 19, 2010).

**71** Norbert Morgenstern, “Geotechnics and mine waste management – update” (paper presented at the Seminar on Safe Tailing Dams Constructions, Sweden, 2001). p. 1  
[ec.europa.eu/environment/waste/mining/pdf/mining\\_dams\\_seminar.pdf](http://ec.europa.eu/environment/waste/mining/pdf/mining_dams_seminar.pdf).

**72** Based on reviews of the history of tailings and conventional (water storage) earth dam failures. See: Martin, T.E, M.P. Davies, S. Rice, T. Higgs and P.C. Lighthall. 2002. Stewardship of Tailings Facilities. AMEC Earth & Environmental Limited, Burnaby, B.C. Canada AMEC Simons Ltd., Vancouver.  
[www.pebblescience.org/pdfs/tailings\\_stewardship-1.pdf](http://www.pebblescience.org/pdfs/tailings_stewardship-1.pdf). Page 9.

**73** Martin, T.E, M.P. Davies, S. Rice, T. Higgs and P.C. Lighthall. 2002. Stewardship of Tailings Facilities. AMEC Earth & Environmental Limited, Burnaby, B.C. Canada AMEC Simons Ltd., Vancouver.  
[www.pebblescience.org/pdfs/tailings\\_stewardship-1.pdf](http://www.pebblescience.org/pdfs/tailings_stewardship-1.pdf). Martin and Davies used data from U.S. Committee on Large Dams (USCOLD) 1994. *Tailings Dam Incidents*; United Nations Environment Program (UNEP) 1996. *Tailings Dam Incidents 1980-1996*. and files of T.E. Martin. Note: this table is not specific to oil sands tailings dams.

**74** Informational Letter IL 94-19, *ERCB/AEP Dam Safety Accord*, [www.ercb.ca/portal/server.pt/gateway/PTARGS\\_0\\_0\\_303\\_263\\_0\\_43/http%3B/ercbContent/publishedcontent/publication/ercb\\_home/industry\\_zone/rules\\_regulations\\_requirements/information\\_letters\\_interim\\_directives/informational\\_letters/il94\\_19.aspx](http://www.ercb.ca/portal/server.pt/gateway/PTARGS_0_0_303_263_0_43/http%3B/ercbContent/publishedcontent/publication/ercb_home/industry_zone/rules_regulations_requirements/information_letters_interim_directives/informational_letters/il94_19.aspx) (accessed October 19, 1994).

**75** Informational Letter IL 96-07, *EUB/AEP Memorandum of understanding on the regulation of oil sands development*, [www.ercb.ca/portal/server.pt/gateway/PTARGS\\_0\\_0\\_303\\_263\\_0\\_43/http%3B/ercbContent/publishedcontent/publication/ercb\\_home/industry\\_zone/rules\\_regulations\\_requirements/information\\_letters\\_interim\\_directives/informational\\_letters/il96\\_07.aspx](http://www.ercb.ca/portal/server.pt/gateway/PTARGS_0_0_303_263_0_43/http%3B/ercbContent/publishedcontent/publication/ercb_home/industry_zone/rules_regulations_requirements/information_letters_interim_directives/informational_letters/il96_07.aspx) (accessed November 24, 2009)

**76** If there are potential downstream effects then the Joint Review Panel to determine if the downstream or cumulative effects are considered relevant in a specific context.

**77** Personal communication, Dam Safety Section, Alberta Environment, November 2009.

**78** Personal communication, Dam Safety Section, Alberta Environment, November 2009.

**79** Personal communication, Dam Safety Section, Alberta Environment, November 2009.

**80** The Mining Association of Canada.1998. A Guide to the Management of Tailings Facilities, [www.mining.ca/english/publications/tailingsguide.pdf](http://www.mining.ca/english/publications/tailingsguide.pdf).

**81** Draft Terms of Reference for the Environmental Impact Assessment Report for the shell Canada Jackpine Expansion and Pierre River Mining Areas, 2007. [environment.alberta.ca/2318.html](http://environment.alberta.ca/2318.html).

- 82** See question #5 in: Joint Review Panel. *Letter to Fraser Milner Casgrain LLP re: Application No. 1445535, Athabasca Oil Sands Area, Joslyn North Mine Project, Total E&P Joslyn Ltd. Sept 18, 2008.* [www.ceaa-acee.gc.ca/050/documents/28895/28895E.pdf](http://www.ceaa-acee.gc.ca/050/documents/28895/28895E.pdf) (accessed Nov 23, 2009).
- 83** Joslyn North Mine project Joint Review Panel Additional Information Request Response. Section 4, question 5, pg. 27, February 2010.
- 84** Environmental Defence, “11 million litres a day: the tar sands leaking legacy” (2008) [www.environmentaldefence.ca/reports/pdf/TailingsReport\\_FinalDec8.pdf](http://www.environmentaldefence.ca/reports/pdf/TailingsReport_FinalDec8.pdf) (accessed April 19, 2010).
- 85** U.S. Environmental Protection Agency. “Technical report: Design and evaluation of tailings dams.” EPA 530-R-94-038. August 1994. [www.epa.gov/wastes/nonhaz/industrial/special/mining/techdocs/tailings.pdf](http://www.epa.gov/wastes/nonhaz/industrial/special/mining/techdocs/tailings.pdf) (Accessed April 19, 2010).
- 86** U.S. Environmental Protection Agency. “Technical report: Design and evaluation of tailings dams.” EPA 530-R-94-038. August 1994. [www.epa.gov/wastes/nonhaz/industrial/special/mining/techdocs/tailings.pdf](http://www.epa.gov/wastes/nonhaz/industrial/special/mining/techdocs/tailings.pdf) (Accessed April 19, 2010).
- 87** Morsy et al., “Simulation of creep deformation in the foundation of Tar Island Dyke,” *Canadian Geotechnical Journal* 32, no. 6 (1996):1002-1023.
- 88** Wedage et al., “Simulation of time-dependent movements in Syncrude tailing dyke formations,” *Canadian Geotechnical Journal* 35, no. 2 (1998): 284-298.
- 89** Personal communication, Dam Safety Section, Alberta Environment, November 2009.
- 90** Extreme consequence classification is defined by the CDA as the following: there is either permanent population residing in the dam-breach inundation zone, a potential loss of life of more than 100, the potential for major loss of critical fish or wildlife habitat with restoration or in-kind compensation impossible, or the possibility for extreme losses affecting critical infrastructure or services. Canadian Dam Association, “Dam Safety Guidelines, 2007” pg 26.
- 91** Issues related to slope angle is a common deficiency in oil sands tailing dams. This can be addressed by putting extra weight at the toe of the berm or by flattening the angle of the berm. Personal communication, Dam Safety Section, Alberta Environment.
- 92** Mining Association of Canada. “Managing Tailings for Continual Improvement” Presentation to the CIM Annual General Meeting by Elizabeth Vardiner and David Gladiwn. Edmonton Alberta. May 11, 2004.
- 93** Martin, T.E and M.P. Davies. 2000. Trends in the stewardship of tailings dams. AGRA Earth & Environmental Limited, Burnaby, B.C. Canada, Page 1.
- 94** Morgenstern, Norbert R, and J Don Scott. 1997. Oil Sand Geotechnique. *Geotechnical News*, no. Special: 102-109. [www.infomine.com/publications/docs/Morgenstern1997.pdf](http://www.infomine.com/publications/docs/Morgenstern1997.pdf).
- 95** Morgenstern, Norbert R, and J Don Scott. 1997. Oil Sand Geotechnique. *Geotechnical News*, no. Special: 102-109. [www.infomine.com/publications/docs/Morgenstern1997.pdf](http://www.infomine.com/publications/docs/Morgenstern1997.pdf).
- 96** Morgenstern, Norbert R, and J Don Scott. 1997. Oil Sand Geotechnique. *Geotechnical News*, no. Special: 102-109. [www.infomine.com/publications/docs/Morgenstern1997.pdf](http://www.infomine.com/publications/docs/Morgenstern1997.pdf).
- 97** Richard Houlihan, Haneef Mian, and ERCB Tailings Team, “Past, Present and Future Tailings: Regulatory Perspective,” presented at the International Oil Sands Tailings Conference, Edmonton (2008), 2.
- 98** Norbert Morgenstern, “Geotechnics and mine waste management – update” (paper presented at the Seminar on Safe Tailing Dams Constructions, Sweden, 2001).
- 99** Alencar, J., N.R. Morgenstern, and D.H. Chan. Analysis of foundation deformations beneath the Syncrude tailings dyke. *Canadian Geotechnical Journal* 31, no. 6 (1994): 868–84.
- 100** A yield zone is the area in a dam of potential maximum tensile or compressive stress that could be considered the location of failure under extreme loads.

- 101** Hossein Soltani-Jigeh and Abbas Souroush, “Numerical analysis of Syncrude tailings dam with consideration of strength anisotropy of foundation material” (paper presented at Geotechnical engineering for disaster mitigation and rehabilitation, 1<sup>st</sup> annual conference, Singapore, Dec 12-13, 2005).
- 102** Alberta Environment, *Dam Safety*, [www3.gov.ab.ca/env/water/wmo/dam\\_safety/index.html](http://www3.gov.ab.ca/env/water/wmo/dam_safety/index.html) (accessed Nov 24, 2009). [www.qp.alberta.ca/570.cfm?frm\\_isbn=9780779745005&search\\_by=link](http://www.qp.alberta.ca/570.cfm?frm_isbn=9780779745005&search_by=link).
- 103** Alberta Environment, *Emergency preparedness for flood emergencies at dams: guidelines* (August 2003), [www3.gov.ab.ca/env/water/wmo/pubs/EPP\\_ERP\\_Guidelines.pdf](http://www3.gov.ab.ca/env/water/wmo/pubs/EPP_ERP_Guidelines.pdf) (accessed November 24, 2009).
- 104** Personal communication, Dam Safety Section, Alberta Environment, May 2010.
- 105** Personal communication, Dam Safety Section, Alberta Environment, November 2009.
- 106** Personal communication, Dam Safety Section, Alberta Environment, November 2009. Modelling the contamination that would occur from a tailings lake spill is done by the Oil Sands Environmental Management Division of Alberta Environment. (Personal communication, Science, Research and Innovation, Oil Sands Environmental Management Division, Alberta Environment.) The outputs of the contamination modelling are shared informally with the Dam Safety Section or oil sands operators for consideration in their emergency planning. The informal sharing is meant to allow for more flexibility and efficiency when model improvements and new scientific findings are made. Other than informal sharing, the potential environmental impacts from a tailing dam breach help inform the “extreme” consequence classification of tailing dams under the voluntary CDA guidelines.
- 107** Friends of the Athabasca. 1998. Exhibit 49: Letter of Concern to the EUB re: Application No 98107, Suncor Energy Inc., Millenium Project p. 7.
- 108** Environmental Defence, “11 million litres a day: the tar sands leaking legacy” (2008) [www.environmentaldefence.ca/reports/pdf/TailingsReport\\_FinalDec8.pdf](http://www.environmentaldefence.ca/reports/pdf/TailingsReport_FinalDec8.pdf) (accessed December 14, 2009).
- 109** Mackenzie River Basin Board. 2003. State of the Aquatic Ecosystem Report 2003. p. iv.
- 110** Security deposits are only required for oil sands mining operations and not in situ operations. The EUB Licensee Liability Rating and Orphan Fund governs in situ operations’ securities.
- 111** Auditor General of Alberta. Annual Report of the Auditor General of Alberta." Edmonton, Alberta, 2005. Page 180.
- 112** Auditor General of Alberta. Annual Report of the Auditor General of Alberta." Edmonton, Alberta, 2005. Page 180.
- 113** Alberta Environment, Environmental Protection *Security Fund Annual Report: April 1, 2007–March 31, 2008*.
- 114** Alberta Environment, Oil Sands Disturbance and Reclamation Data, personal communication with Alberta Environment staff. 2008.
- 115** Hanneke Brooymans, “Reclaimed Oilsands Site Receives Provincial Blessing - a ‘Nice Milestone’ Says Syncrude, Which Likely Spent \$114,000 Per Hectare to Restore Land,” The Edmonton Journal, March 20, 2008.
- 116** Dr. David Walker, personal communication, 2007. This estimate is based on the requirement for 10 plants per square metre, at the cost of \$2 per plant.
- 117** Diavik, “Diavik Fact Book,” [www.diavik.ca/PDF/DiavikFactBook.pdf](http://www.diavik.ca/PDF/DiavikFactBook.pdf).
- 118** Diavik Environmental Agreement 2000. Agreement between the Government of Canada, Government of the Northwest Territories, Diavik Diamond Mines Inc., Dogrib Treaty 11 Council, Lutsel K’e Dene Band, Yellowknives Dene First Nation, North Slave Métis Alliance and Kitikmeot Inuit Association.
- 119** Auditor General of Alberta. "Annual Report of the Auditor General of Alberta." 2009. pg. 207 [www.oag.ab.ca/files/oag/OAGOct2009report.pdf](http://www.oag.ab.ca/files/oag/OAGOct2009report.pdf).
- 120** Office of the Auditor General of Canada. 2002 October Report of the Commissioner of the Environment and Sustainable Development. [www.oag-bvg.gc.ca/internet/English/parl\\_cesd\\_200210\\_03\\_e\\_12409.html](http://www.oag-bvg.gc.ca/internet/English/parl_cesd_200210_03_e_12409.html).
- 121** Indian and Northern Affairs Canada. 2002. INAC Northern affairs Organization Contaminated Sites Program Performance Report 2001-2002 ([www.ainc-inac.gc.ca/nth/ct/ncsp/pubs/csrep0102/csrep0102-eng.pdf](http://www.ainc-inac.gc.ca/nth/ct/ncsp/pubs/csrep0102/csrep0102-eng.pdf)) and Indian

Northern Affairs Canada. 2007. Northern Affairs Organization Contaminated Sites Program Performance Report 2006-2007. [epe.lac-bac.gc.ca/100/201/301/northern\\_affairs\\_org\\_contaminated\\_sites\\_prog\\_perf\\_rep/2006-2007.pdf](http://epe.lac-bac.gc.ca/100/201/301/northern_affairs_org_contaminated_sites_prog_perf_rep/2006-2007.pdf).

**122** Indian and Northern Affairs Canada. 2007. *Giant Mine Remediation Project. Frozen Block Method*. [www.ainc-inac.gc.ca/ai/scr/nt/pdf/fb-bc-eng.pdf](http://www.ainc-inac.gc.ca/ai/scr/nt/pdf/fb-bc-eng.pdf).

**123** Kelly, Erin N., Jeffrey W. Short, David W. Schindler, Peter V. Hodson, Mingsheng Ma, Alvin K. Kwan, and Barbra L. Fortin. "Oil Sands Development Contributes Polycyclic Aromatic Compounds to the Athabasca River and Its Tributaries." *Proceedings of the National Academy of Sciences* (2009). 106(52): 22346–22351; Timoney, Kevin P., and Peter Lee. "Does the Alberta Tar Sands Industry Pollute? The Scientific Evidence." *The Open Conservation Biology Journal* 3, no. 65-81 (2009).; Timoney, Kevin P. "A Study of Water and Sediment Quality as Related to Public Health Issues, Fort Chipewyan, Alberta on Behalf of the Nunee Health Board Society Fort Chipewyan, Alberta." *Treeline Ecological Research*, 2007; Ayles, G.B., M. Dubé, and D. Rosenberg. "Oil Sands Regional Aquatic Monitoring Program (Ramp) Scientific Peer Review of the Five Year Report (1997-2001)." 2004.

**124** Suncor. 2007. Annual Industrial Wastewater Report. Fort McMurray: Suncor Energy Inc. 2008.

**125** National Pollutant Release Inventory Library. Detailed Substance Report for Mercury (and its compounds) reported by Suncor Energy Inc. Oil Sands. [http://www.ec.gc.ca/pdb/websol/querysite/substance\\_details\\_e.cfm?opt\\_npri\\_id=0000002230&opt\\_cas\\_number=NA%20-%2010&opt\\_report\\_year=2008](http://www.ec.gc.ca/pdb/websol/querysite/substance_details_e.cfm?opt_npri_id=0000002230&opt_cas_number=N A%20-%2010&opt_report_year=2008)

**126** Alberta Environment incident number 283162. As cited in: Timoney, Kevin P., and Peter Lee. "Does the Alberta Tar Sands Industry Pollute? The Scientific Evidence." *The Open Conservation Biology Journal* 3, no. 65-81 (2009).

**127** Birkholz DA, Hrudey SE, Kimble BJ, Rawluk M, Gray M (1987) Characterization of water soluble components of a waste water oil sample from an oil sands bitumen upgrading plant. *Oil in Freshwater: Chemistry, Biology, Countermeasure Technology*, Vandermeulen JH, Hrudey SE (Pergamon Press, New York), p 42–57.

**128** Hogge HL, Allman RJ, Paetz MJ, Bailey RE, Kupchanko EE. Alberta Government committee report on Great Canadian Oil Sands oil spill to Athabasca River, June 6, 1970. Edmonton: Alberta Environment 1970. As cited in: Timoney, Kevin P., and Peter Lee. "Does the Alberta Tar Sands Industry Pollute? The Scientific Evidence." *The Open Conservation Biology Journal* 3, no. 65-81 (2009).

**129** Kelly, Erin N., Jeffrey W. Short, David W. Schindler, Peter V. Hodson, Mingsheng Ma, Alvin K. Kwan, and Barbra L. Fortin. "Oil Sands Development Contributes Polycyclic Aromatic Compounds to the Athabasca River and Its Tributaries." *Proceedings of the National Academy of Sciences* (2009). 106(52): 22346–22351.

**130** Kelly, Erin N., Jeffrey W. Short, David W. Schindler, Peter V. Hodson, Mingsheng Ma, Alvin K. Kwan, and Barbra L. Fortin. "Oil Sands Development Contributes Polycyclic Aromatic Compounds to the Athabasca River and Its Tributaries." *Proceedings of the National Academy of Sciences* (2009) 106(52): 22346–22351.

**131** Kelly, Erin N., Jeffrey W. Short, David W. Schindler, Peter V. Hodson, Mingsheng Ma, Alvin K. Kwan, and Barbra L. Fortin. "Oil Sands Development Contributes Polycyclic Aromatic Compounds to the Athabasca River and Its Tributaries." *Proceedings of the National Academy of Sciences* (2009) 106(52): 22346–22351.

**132** Lau, Ee Von, Suyin Gan, and Hoon Kiat Ng. 2009. *Remediation of Polycyclic Aromatic Hydrocarbon (PAH) contaminated soil using vegetable oil: a potential solution for land availability problems in growing cities*. Universitas 21 International Graduate Research Conference: Sustainable Cities for the Future Melbourne & Brisbane. Nov 29 – Dec 5, 2009. Accessed at: [www.universitas21.com/GRC/GRC2009/vonLau.pdf](http://www.universitas21.com/GRC/GRC2009/vonLau.pdf).

**133** Agency for Toxic Substances and Disease Registry. 1996. ToxFAQs for Polycyclic Aromatic Hydrocarbons (PAHs). [www.atsdr.cdc.gov/tfacts69.html#bookmark02](http://www.atsdr.cdc.gov/tfacts69.html#bookmark02).

**134** Kelly, Erin N., Jeffrey W. Short, David W. Schindler, Peter V. Hodson, Mingsheng Ma, Alvin K. Kwan, and Barbra L. Fortin. "Oil Sands Development Contributes Polycyclic Aromatic Compounds to the Athabasca River and Its Tributaries." *Proceedings of the National Academy of Sciences* (2009) 106(52): 22346–22351.

- 135** Kelly, Erin N., Jeffrey W. Short, David W. Schindler, Peter V. Hodson, Mingsheng Ma, Alvin K. Kwan, and Barbra L. Fortin. "Oil Sands Development Contributes Polycyclic Aromatic Compounds to the Athabasca River and Its Tributaries." *Proceedings of the National Academy of Sciences* (2009) 106(52): 22346–22351.
- 136** Timoney, Kevin P., and Peter Lee. "Does the Alberta Tar Sands Industry Pollute? The Scientific Evidence." *The Open Conservation Biology Journal* 3, no. 65-81 (2009). The other sources of pollution considered in the study were: permitted (licensed) discharges to air and land; leaks from pipelines; major spills of bitumen, oil, and wastewater; stack emissions; windblown, coke dust, tar sands dust; outgassing from mine faces; and ancillary activities such as transportation, construction of mines, ponds, roads, pipelines, and facilities, and landscape dewatering.
- 137** Timoney, Kevin P., and Peter Lee. "Does the Alberta Tar Sands Industry Pollute? The Scientific Evidence." *The Open Conservation Biology Journal* 3, no. 65-81 (2009).
- 138** Hebert, Craig. Environment Canada. Metals and PAHs in Colonial Waterbird Eggs from Wood Buffalo National Park and Lake Athabasca, 2009.
- 139** Griffiths, Mary, Dan Woynillowicz, and Amy Taylor. *Troubled Waters, Troubling Trends - Technology and Policy Options to Reduce Water Use in Oil and Oil Sands Development in Alberta*: The Pembina Institute, 2006.
- 140** Annual Technical Reports Available for Download. [www.ramp-alberta.org/ramp/results/report.aspx](http://www.ramp-alberta.org/ramp/results/report.aspx).
- 141** Government of Alberta. 2007. FAQs on Oil Sands. [environment.gov.ab.ca/info/faqs/faq5-oil\\_sands.asp](http://environment.gov.ab.ca/info/faqs/faq5-oil_sands.asp).
- 142** Squires AJ, Westbrook CJ, Dubé MG. 2009. An Approach for Assessing Cumulative Effects in a Model River, the Athabasca River Basin. *Integrated Environmental Assessment and Management*. Volume 6 Issue 1, Pages 119–34.
- 143** Jennifer Grant, Simon Dyer, Dan Woynillowicz. Oil Sands Myths: Clearing the Air, June 200 (citing Alberta Environment, *Water Diversion by Oilsands Mining Projects in 2007*. Data received September 2008).
- 144** Squires AJ, Westbrook CJ, Dubé MG. 2009. An Approach for Assessing Cumulative Effects in a Model River, the Athabasca River Basin. *Integrated Environmental Assessment and Management*. Volume 6 Issue 1, Pages 119–34.
- 145** P2FC by Gill and Rood (2009) and Burn (2009) – Appendices 3 and 4 respectively of the following report: Lebel, M., Kerkhoven, E., Bothe, R., Hornung, J. and Ohlson, D. 2009. Climate Change Sensitivity Analysis. Report Prepared for the Phase 2 Framework Committee.
- 146** Kelly, Erin N., Jeffrey W. Short, David W. Schindler, Peter V. Hodson, Mingsheng Ma, Alvin K. Kwan, and Barbra L. Fortin. "Oil Sands Development Contributes Polycyclic Aromatic Compounds to the Athabasca River and Its Tributaries." *Proceedings of the National Academy of Sciences* (2009) 106(52): 22346–22351.
- 147** The *Constitution Act, 1867* gives the federal government responsibility for the territorial governments. These governments have more or less the same responsibilities as the provinces, but do not control land and natural resources. Territorial powers are not guaranteed by the Constitution but are granted by the federal government, which can change them when it is considered necessary.
- 148** Government of the Northwest Territories. 2010. Office of Devolution. [www.executive.gov.nt.ca/offices/devolution/](http://www.executive.gov.nt.ca/offices/devolution/).
- 149** A basic principle of the *Constitution Act, 1867* is that any power not specifically assigned to provincial legislatures belongs to the Parliament of Canada. Such powers are called residual powers and are captured under the P.O.G.G. clause that allows the national government to make any laws in areas not explicitly reserved to the provinces.
- 150** Crown Zellerbach (1988) 49 D.L.R. 161 (S.C.C.).
- 151** Friends of the Old Man River (1992) 88 D.L.R. (4<sup>th</sup>).
- 152** Environment Canada, Federal Water Policy 1987, (Ottawa, ON: Government of Canada, 1987) [www.ec.gc.ca/eau-water/D11549FA-9FA9-443D-80A8-5ADCE35A3EFF/e\\_fedpol.pdf](http://www.ec.gc.ca/eau-water/D11549FA-9FA9-443D-80A8-5ADCE35A3EFF/e_fedpol.pdf) (accessed April 13, 2010).

- 153** Environment Canada, Federal Water Policy 1987, (Ottawa, ON: Government of Canada, 1987) [www.ec.gc.ca/eau-water/D11549FA-9FA9-443D-80A8-5ADCE35A3EFF/e\\_fedpol.pdf](http://www.ec.gc.ca/eau-water/D11549FA-9FA9-443D-80A8-5ADCE35A3EFF/e_fedpol.pdf) (accessed April 13, 2010), 8.
- 154** Environment Canada, Federal Water Policy 1987, (Ottawa, ON: Government of Canada, 1987) [www.ec.gc.ca/eau-water/D11549FA-9FA9-443D-80A8-5ADCE35A3EFF/e\\_fedpol.pdf](http://www.ec.gc.ca/eau-water/D11549FA-9FA9-443D-80A8-5ADCE35A3EFF/e_fedpol.pdf) (accessed April 13, 2010) Sections: Goals, and Strategy 4: Legislation. Page 8.
- 155** R.S.C. 1985, c. C-11.
- 156** R.S.C. 1985, c. C-11.
- 157** *Fisheries Act*, R.S. 1964 C. F-14.
- 158** *Fisheries Act*, R.S. 1964 C. F-14. Section 36(3). While the deposit of deleterious substances to surface waters is clearly contemplated, Section 36(3) also suggests that the deposit of such substances into groundwater is not excluded for consideration.
- 159** Migratory Bird Regulations, C.R.C., c. 1035. Section 35 of the Migratory Bird Regulation states that “no person shall deposit or permit to be deposited oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds” unless allowed by regulations, or allowed by permit.
- 160** R.S. 1985, c.N-22.
- 161** Species at Risk Act, S.C. 2002, c.29.
- 162** Canadian Environmental Assessment Act (1992, c. 37).
- 163** Canada National Parks Act (2000, c. 32 ).
- 164** Canada National Parks Act (2000, c. 32) [laws.justice.gc.ca/en/N-14.01/251405.html](http://laws.justice.gc.ca/en/N-14.01/251405.html).
- 165** Water Act, RSA 2000, c.W-3.
- 166** Environmental Protection and Enhancement Act, Schedule 1, Division 2, Part 8 and Division 3(b).
- 167** Government of Alberta, *Water for Life* (Edmonton, Alberta: Alberta Environment, 2003).
- 168** Government of Alberta. 2010. Land Use Framework. [www.landuse.alberta.ca/AlbertaLandStewardshipAct/Default.aspx](http://www.landuse.alberta.ca/AlbertaLandStewardshipAct/Default.aspx).
- 169** Government of Alberta, *Land Use Framework* (Edmonton, AB, Government of Alberta, 2007), [www.landuse.alberta.ca/](http://www.landuse.alberta.ca/).
- 170** The P2FC consisted of government (Alberta Environment, Alberta Sustainable Resource Development, Fisheries and Oceans Canada, Parks Canada, Regional Municipality of Wood Buffalo, Energy Resources Conservation Board), industry (Suncor, Syncrude, Shell, Canadian Natural, Imperial Oil, Total), environmental organizations (WWF-Canada, Alberta Wilderness Association, South Peace Environmental Association) and First Nations and Métis Groups (Fort McKay First Nation, Fort Chipewyan Métis Association).
- 171** Phase II Framework Committee, 2007. Backgrounder - [www.cemaonline.ca/index.php/component/docman/doc\\_download/2284-backgrounder-phase-ii-framework-committee](http://www.cemaonline.ca/index.php/component/docman/doc_download/2284-backgrounder-phase-ii-framework-committee).
- 172** Fisheries and Oceans Canada. 2010. [www.dfo-mpo.gc.ca/regions/central/pub/water-eau/section2-eng.htm](http://www.dfo-mpo.gc.ca/regions/central/pub/water-eau/section2-eng.htm).
- 173** Ohlson, D., Long, G. and T. Hatfield. 2010. Phase 2 Framework Committee Report. Compass Resource Management, Vancouver, B.C.
- 174** Traditional knowledge refers to the knowledge and understanding of the environment that is passed from one generation to the next. Traditional knowledge can improve resource management decisions. A community-based program to monitor cumulative impact would use both scientific and traditional knowledge. This definition is taken from the 2010 Report of the Auditor General of Canada to the House of Commons. Chapter 4 Sustaining Development in the Northwest Territories. [www.oag-bvg.gc.ca/internet/docs/parl\\_oag\\_201004\\_04\\_e.pdf](http://www.oag-bvg.gc.ca/internet/docs/parl_oag_201004_04_e.pdf).

- 175** Environment and Natural Resources. 2009. NWT State of the Environment. Report – Highlights 2009. Department of Environment and Natural Resources, Government of Northwest Territories, Yellowknife, NT.
- 176** Annual Technical Reports Available for Download. [www.ramp-alberta.org/ramp/results/report.aspx](http://www.ramp-alberta.org/ramp/results/report.aspx).
- 177** Environmental Defence Canada, Natural Resources Defense Council, John Rigney, Don Deranger, and Daniel T'seleie, *Submission to the Commission for Environmental Cooperation, pursuant to Article 14, North American Agreement on Environmental Cooperation, submission SEM-10-002 (Alberta Tailings Ponds)*. [www.cec.org/Storage/80/8348\\_01-SUB.pdf](http://www.cec.org/Storage/80/8348_01-SUB.pdf); Timoney, Kevin P., and Peter Lee. "Does the Alberta Tar Sands Industry Pollute? The Scientific Evidence." *The Open Conservation Biology Journal* 3, no. 65-81 (2009); Kelly, Erin N., Jeffrey W. Short, David W. Schindler, Peter V. Hodson, Mingsheng Ma, Alvin K. Kwan, and Barbra L. Fortin. "Oil Sands Development Contributes Polycyclic Aromatic Compounds to the Athabasca River and Its Tributaries." *Proceedings of the National Academy of Sciences* (2009) 106(52): 22346–22351; Ayles, G.B., M. Dubé, and D. Rosenberg, *Oil Sands Regional Aquatic Monitoring Program (RAMP): Scientific Peer Review of the Five Year Report (1997-2001)*, prepared for the RAMP Steering Committee, 2004, iv.
- 178** Ayles, G.B., M. Dubé, and D. Rosenberg, *Oil Sands Regional Aquatic Monitoring Program (RAMP): Scientific Peer Review of the Five Year Report (1997-2001)*, prepared for the RAMP Steering Committee, 2004, iv.
- 179** RAMP 2008 Implementation Team (Hatfield Consultants, Kilgour and Associates Ltd., Klohn Crippen Berger Ltd., and Western Resource Solutions) 2009. Regional Aquatics Monitoring Program 2008 Technical Report Final. Prepared for: RAMP Steering Committee. Page 1-4.
- 180** Regional Aquatic Monitoring Program, *2008 Monitoring Results*, Fort Chipewyan presentation, June 9, 2009, [www.ramp-alberta.org/UserFiles/File/CommunityReports/2009/Fort%20Chipewyan%20meeting\\_presentation%20for%20website.pdf](http://www.ramp-alberta.org/UserFiles/File/CommunityReports/2009/Fort%20Chipewyan%20meeting_presentation%20for%20website.pdf).
- 181** Squires AJ, Westbrook CJ, Dubé MG. 2009. An Approach for Assessing Cumulative Effects in a Model River, the Athabasca River Basin. *Integrated Environmental Assessment and Management*. Volume 6 Issue 1, 119–34.
- 182** Squires AJ, Westbrook CJ, Dubé MG. 2009. An Approach for Assessing Cumulative Effects in a Model River, the Athabasca River Basin. *Integrated Environmental Assessment and Management*. Volume 6 Issue 1, 119–34.
- 183** Office of the Auditor General of Canada. 2009. Report of the Commissioner of the Environment and Sustainable Development to the House of Commons. Chapter 1. [www.oag-bvg.gc.ca/internet/English/parl\\_cesd\\_200905\\_01\\_e\\_32511.html](http://www.oag-bvg.gc.ca/internet/English/parl_cesd_200905_01_e_32511.html) (Accessed February 12, 2010).
- 184** Office of the Auditor General of Canada. 2009. Report of the Commissioner of the Environment and Sustainable Development to the House of Commons. Chapter 1. [www.oag-bvg.gc.ca/internet/English/parl\\_cesd\\_200905\\_01\\_e\\_32511.html](http://www.oag-bvg.gc.ca/internet/English/parl_cesd_200905_01_e_32511.html) (Accessed February 12, 2010).
- 185** Office of the Auditor General of Canada. 2009. Report of the Commissioner of the Environment and Sustainable Development to the House of Commons. Chapter 1. [www.oag-bvg.gc.ca/internet/English/parl\\_cesd\\_200905\\_01\\_e\\_32511.html](http://www.oag-bvg.gc.ca/internet/English/parl_cesd_200905_01_e_32511.html) (Accessed February 12, 2010).
- 186** Indian and Northern Affairs Canada, [www.ainc-inac.gc.ca/ai/scr/nt/index-eng.asp](http://www.ainc-inac.gc.ca/ai/scr/nt/index-eng.asp).
- 187** Co-management boards means that Aboriginal land claim organizations nominate half of the board members, and the federal and territorial governments nominate the other half of the board members.
- 188** The Mackenzie Valley, as defined in the Act, includes all of the Northwest Territories, with the exception of the Inuvialuit Settlement Region, and the Wood Buffalo National Park.
- 189** Indian and Northern Affairs Canada. 2007. *The Mackenzie Valley Resource Management Act. A Citizen's Guide*. [ainc-inac.gc.ca/ai/scr/nt/pdf/mvrma-lgrvm-eng.pdf](http://ainc-inac.gc.ca/ai/scr/nt/pdf/mvrma-lgrvm-eng.pdf).
- 190** The Northwest Territories Water Board is responsible for managing water resources in portions of the Mackenzie Delta and Arctic Islands in the Inuvialuit Settlement Region. The Board is appointed by the Minister of Indian and Northern Affairs and Northern Development and is made up of at least one nominee of each department of the Government of Canada. See: Northwest Territories Water Board, [www.nwtwb.com/index.html](http://www.nwtwb.com/index.html).
- 191** Northern Voices, Northern Waters. NWT Water Stewardship Strategy, May 2010. [www.enr.gov.nt.ca/\\_live/documents/documentManagerUpload/NWT\\_Water\\_Stewardship\\_Strategy.pdf](http://www.enr.gov.nt.ca/_live/documents/documentManagerUpload/NWT_Water_Stewardship_Strategy.pdf).

- 192** Indian and Northern Affairs Canada. Water Resources Division. Renewable Resources & Environment. 2010. Water Today: Water Quality and Quantity in the NWT. [www.ainc-inac.gc.ca/ai/scr/nt/pdf/wt10-eng.pdf](http://www.ainc-inac.gc.ca/ai/scr/nt/pdf/wt10-eng.pdf).
- 193** Indian and Northern Affairs Canada, *Water Monitoring Business Plan: Northwest Territories and Nunavut*, [www.ainc-inac.gc.ca/nth/wa/pubs/wmbp/wmbp-eng.asp](http://www.ainc-inac.gc.ca/nth/wa/pubs/wmbp/wmbp-eng.asp) (accessed December 11, 2009).
- 194** Indian and Northern Affairs Canada, *Water Monitoring Business Plan: Northwest Territories and Nunavut*, [www.ainc-inac.gc.ca/nth/wa/pubs/wmbp/wmbp-eng.asp](http://www.ainc-inac.gc.ca/nth/wa/pubs/wmbp/wmbp-eng.asp) (accessed December 11, 2009).
- 195** Rosenberg International Forum on Water Policy, *Report of the Rosenberg International Forum on Water Policy to the Government of the Northwest Territories*, [www.enr.gov.nt.ca/\\_live/pages/wpPages/whats\\_new.aspx?nid=261](http://www.enr.gov.nt.ca/_live/pages/wpPages/whats_new.aspx?nid=261) (accessed December 7, 2009).
- 196** Office of the Auditor General of Canada. 2010. Report of the Auditor General of Canada to the House of Commons. Chapter 4 Sustaining Development in the Northwest Territories. [www.oag-bvg.gc.ca/internet/docs/parl\\_oag\\_201004\\_04\\_e.pdf](http://www.oag-bvg.gc.ca/internet/docs/parl_oag_201004_04_e.pdf).
- 197** J. Sanderson, C. Lafontaine, and K. Robertson, *Slave River Environmental Quality Monitoring Program: Summary Report* (Yellowknife, NT: Water Resource Division Indian and Northern Affairs Canada, 1998) [nwt-tno.inac-ainc.gc.ca/pdf/wr/Slave\\_River\\_Environmental\\_Quality\\_Monitoring\\_Program.pdf](http://nwt-tno.inac-ainc.gc.ca/pdf/wr/Slave_River_Environmental_Quality_Monitoring_Program.pdf) (accessed September 25, 2008).
- 198** Ibid.
- 199** Bob Reid, personal communication, February 2010.
- 200** Fact Sheet: What are the differences among the ESF, CIMP, and Audit? NWT CIMP Secretariat, March 2009. [www.nwtcimp.ca/documents/CIMP\\_AUDIT\\_ESF\\_DIFFERENCES.pdf](http://www.nwtcimp.ca/documents/CIMP_AUDIT_ESF_DIFFERENCES.pdf) (accessed February 15, 2010).
- 201** Indian and Northern Affairs Canada. 2009. Environment and Conservation Division [www.ainc-inac.gc.ca/ai/scr/nt/ntr/pubs/EC-eng.asp](http://www.ainc-inac.gc.ca/ai/scr/nt/ntr/pubs/EC-eng.asp) (accessed February 15, 2010).
- 202** Peace Athabasca Delta Project Group. 1973. The Peace Athabasca Delta Project Technical Report. P. 14.
- 203** Peace Athabasca Delta Project Group. 1973. The Peace Athabasca Delta Project Technical Report. P. 14.
- 204** Mackenzie River Basin Committee, 1981. MRB Study Report. A report under the 1978-1981 Federal-Provincial Study Agreement Respecting the Water and Related Resources of the Mackenzie River Basin, Canada. Pg. 155.
- 205** The Mackenzie River Basin Board, *Highlights of the Mackenzie River Basin Board's State of the Aquatic Ecosystem Report 2003*, [www.mrbb.ca/documents/Final\\_MRBB4\\_HighlightsEng1\\_pg.pdf](http://www.mrbb.ca/documents/Final_MRBB4_HighlightsEng1_pg.pdf) (accessed Nov. 18, 2009), 2.
- 206** The Mackenzie River Basin Board, *Highlights of the Mackenzie River Basin Board's State of the Aquatic Ecosystem Report 2003*, [www.mrbb.ca/reports.asp](http://www.mrbb.ca/reports.asp), (accessed Nov. 18, 2009). Page 2.
- 207** The Mackenzie River Basin Board, *Highlights of the Mackenzie River Basin Board's State of the Aquatic Ecosystem Report 2003*, [www.mrbb.ca/reports.asp](http://www.mrbb.ca/reports.asp), (accessed November Nov. 18, 2009). Page 2.
- 208** Mackenzie River Basin Board, About Us, [www.mrbb.ca/about.asp](http://www.mrbb.ca/about.asp) (accessed Apr. 17, 2010).
- 209** Mackenzie River Basin Board, "About Us" (Mackenzie River Basin Board, 2008) [www.mrbb.ca/about.asp](http://www.mrbb.ca/about.asp) (accessed September 25, 2008).
- 210** Hon. J. Michael Miltenberger (Deputy Premier and Minister of Environment and Natural Resources, Government of the Northwest Territories. Remarks to House of Commons Standing Committee on Environment and Sustainable Development, Calgary, Alberta. May 12, 2009.
- 211** Northwest Territories Association of Communities, Resolution 2009-19 Protection of NWT water sources from development of oil sands in Alberta, [www.nwtac.com/2009\\_19.html](http://www.nwtac.com/2009_19.html), (accessed November 17, 2009).
- 212** Water Matters Society of Alberta, *Watered Down: Overcoming Federal Inaction on the Impact of Oil Sands Development to Water Resources*, [www.water-matters.org/pub/watered-down](http://www.water-matters.org/pub/watered-down) (accessed December 11, 2009).

**213** Rosenberg International Forum on Water Policy, *Report of the Rosenberg International Forum on Water Policy to the Government of the Northwest Territories*, [www.enr.gov.nt.ca/\\_live/pages/wpPages/whats\\_new.aspx?nid=261](http://www.enr.gov.nt.ca/_live/pages/wpPages/whats_new.aspx?nid=261) (accessed December 7, 2009). Page 24.

**214** *Fisheries Act*, R.S. 1964 C. F-14. Section 36(3). While the deposit of deleterious substances to surface waters is clearly contemplated, Section 36(3) also suggests that the deposit of such substances into groundwater is not excluded for consideration.

**215** Migratory Bird Regulations, C.R.C., c. 1035. Section 35 of the Migratory Bird Regulation states that “no person shall deposit or permit to be deposited oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds” unless allowed by regulations, or allowed by permit. In addition, the *Migratory Bird Regulations* addresses (but is not limited to) the following: requirements for permits, and other restrictions, on hunting of migratory birds; a prohibition on disturbing the nests or eggs of migratory birds without a permit from the Minister; a general prohibition against introducing non-indigenous migratory bird species;. If it can be shown that a development will have a significant, negative impact upon migratory bird populations because of pollution of the waters or land frequented by them, the Act can be raised as an argument for protecting the significant habitat.

**216** Species at Risk Act, S.C. 2002, c.29.

**217** Canadian Environmental Assessment Act (1992, c. 37).

**218** Alberta Natural Resources Act, S.C. 1930, c. 3 [www.canlii.org/en/ca/laws/stat/sc-1930-c-3/latest/sc-1930-c-3.html](http://www.canlii.org/en/ca/laws/stat/sc-1930-c-3/latest/sc-1930-c-3.html).

**219** Buss, Karin. 2009. Ecojustice Submission to the Standing Committee on Environment and Sustainable Development. Committee Hearings on Oil Sands Development and the Impacts of Water. [www.ecojustice.ca/publications/submissions/Ecojustice%20Submission%20to%20StandingCommittee%20FINAL%202009-05-11.pdf/at\\_download/file](http://www.ecojustice.ca/publications/submissions/Ecojustice%20Submission%20to%20StandingCommittee%20FINAL%202009-05-11.pdf/at_download/file).

**220** Northern Voices, Northern Waters. NWT Water Stewardship Strategy, May 2010. [www.enr.gov.nt.ca/\\_live/documents/documentManagerUpload/NWT\\_Water\\_Stewardship\\_Strategy.pdf](http://www.enr.gov.nt.ca/_live/documents/documentManagerUpload/NWT_Water_Stewardship_Strategy.pdf).

**221** Northern Voices, Northern Waters. NWT Water Stewardship Strategy, May 2010. [www.enr.gov.nt.ca/\\_live/documents/documentManagerUpload/NWT\\_Water\\_Stewardship\\_Strategy.pdf](http://www.enr.gov.nt.ca/_live/documents/documentManagerUpload/NWT_Water_Stewardship_Strategy.pdf), 11.

**222** Northern Voices, Northern Waters. NWT Water Stewardship Strategy, May 2010. [www.enr.gov.nt.ca/\\_live/documents/documentManagerUpload/NWT\\_Water\\_Stewardship\\_Strategy.pdf](http://www.enr.gov.nt.ca/_live/documents/documentManagerUpload/NWT_Water_Stewardship_Strategy.pdf), 10.

**223** Morin, Anne and Bernard Cantin. 2009. Strengthening Integrated Water Resource Management in Canada. Policy Research Initiative. [www.policyresearch.gc.ca/doclib/2009-0009-eng.pdf](http://www.policyresearch.gc.ca/doclib/2009-0009-eng.pdf).

**224** Northern Voices, Northern Waters. NWT Water Stewardship Strategy, May 2010. [www.enr.gov.nt.ca/\\_live/documents/documentManagerUpload/NWT\\_Water\\_Stewardship\\_Strategy.pdf](http://www.enr.gov.nt.ca/_live/documents/documentManagerUpload/NWT_Water_Stewardship_Strategy.pdf), 67.

**225** Environment Canada. 1987. Federal Water Policy. [www.ec.gc.ca/eau-water/D11549FA-9FA9-443D-80A8-5ADCE35A3EFF/e\\_fedpol.pdf](http://www.ec.gc.ca/eau-water/D11549FA-9FA9-443D-80A8-5ADCE35A3EFF/e_fedpol.pdf).

**226** Hon. J. Michael Miltenberger (Deputy Premier and Minister of Environment and Natural Resources, Government of the Northwest Territories. Remarks to House of Commons Standing Committee on Environment and Sustainable Development, Calgary, Alberta. May 12, 2009. [www2.parl.gc.ca/HousePublications/Publication.aspx?DocId=3895450&Language=E&Mode=1&Parl=40&Ses=2#nt-2762063](http://www2.parl.gc.ca/HousePublications/Publication.aspx?DocId=3895450&Language=E&Mode=1&Parl=40&Ses=2#nt-2762063).

**227** Holroyd, Peggy and Terra Simieritsch. 2009. Waters that Bind Us: The Transboundary Implications of Oil Sands Development. Calgary: Pembina Institute. [www.pembina.org/pub/1790](http://www.pembina.org/pub/1790).

**228** Jack Van Camp, personal communication, October 2008.

**229** Personal communication with Environment and Natural Resource staff, Government of the Northwest Territories.

- 230** Owen Saunders. Remarks to House of Commons Standing Committee on Environment and Sustainable Development, Calgary, Alberta. May 13, 2009. Canadian Institute of Resources Law (remarks made as an individual).
- 231** Government of the Northwest Territories. 2008. Media release, “Alberta, NWT Premiers renew cooperation agreement” R(16)091 - Friday, September 12, 2008. The MOU can be accessed at [www.premier.gov.nt.ca/documents/NWT-AB\\_MOU\\_2008.pdf](http://www.premier.gov.nt.ca/documents/NWT-AB_MOU_2008.pdf).
- 232** Owen Saunders. Remarks to House of Commons Standing Committee on Environment and Sustainable Development, Calgary, Alberta. May 13, 2009. Canadian Institute of Resources Law (remarks made as an individual). [www2.parl.gc.ca/HousePublications/Publication.aspx?DocId=3908218&Language=E&Mode=1&Parl=40&Ses=2#nt-2774205](http://www2.parl.gc.ca/HousePublications/Publication.aspx?DocId=3908218&Language=E&Mode=1&Parl=40&Ses=2#nt-2774205).
- 233** Part E of the Mackenzie River Basin Transboundary Master Agreement: [www.mrbb.ca/document\\_details.asp?DID=2&File=MasterAgreement.zip](http://www.mrbb.ca/document_details.asp?DID=2&File=MasterAgreement.zip). Part E: “Any Board member may refer a dispute or question under this Agreement, excluding the Bilateral Water Management Agreements, directly to the Board, and the Board, before recommending terms of settlement to the Parties, may, where appropriate, undertake the following actions, as it deems necessary.”
- 234** Bruce, J.P., H. Martin, P. Colucci, G. McBean, J. McDougall, D. Shrubsole, J. Whalley, R. Halliday, M. Alden, L. Mortsch and B. Mills. 2003. *Climate Change Impacts on Boundary and Transboundary Water Management*. Ottawa, Ontario: CCAF.
- 235** The Yukon-NWT bilateral agreement includes non-binding ecosystem objectives for water quantity and quality.
- 236** Prairie Provinces Water Board. Sharing a Prairie Resource: Prairie Provinces Water Board. [www.prairiewaternews.ca/water/vol13no1/story7a.html](http://www.prairiewaternews.ca/water/vol13no1/story7a.html).
- 237** Mackenzie River Basin Transboundary Master Agreement: [www.mrbb.ca/document\\_details.asp?DID=2&File=MasterAgreement.zip](http://www.mrbb.ca/document_details.asp?DID=2&File=MasterAgreement.zip).
- 238** In the Yukon-NWT bilateral agreement, ecological integrity is defined as, “Chemical, physical, hydrological and biological conditions necessary to maintain a healthy and diverse aquatic ecosystem as determined using traditional knowledge and contemporary science.”
- 239** Kennett, Steven A. 2001. Integrated Watershed Planning for the Northern River Basins+ Thirty Years and Counting. *Canadian Water Resources Journal*. Vol. 26. No. 3. Page 337-338. Ecological Integrity" means the conditions that the Parties to any of the Bilateral Water Management Agreements determine are necessary to maintain a healthy and diverse Aquatic Ecosystem.
- 240** Office of the Auditor General of Canada. 2009. Report of the Commissioner of the Environment and Sustainable Development to the House of Commons. Chapter 1. [www.oag-bvg.gc.ca/internet/English/parl\\_cesd\\_200905\\_01\\_e\\_32511.html](http://www.oag-bvg.gc.ca/internet/English/parl_cesd_200905_01_e_32511.html) (Accessed February 12, 2010).
- 241** Office of the Auditor General of Canada. 2009. Report of the Commissioner of the Environment and Sustainable Development to the House of Commons. Chapter 1. [www.oag-bvg.gc.ca/internet/English/parl\\_cesd\\_200905\\_01\\_e\\_32511.html](http://www.oag-bvg.gc.ca/internet/English/parl_cesd_200905_01_e_32511.html) (Accessed February 12, 2010).
- 242** Typically, in-situ oil sands projects do not trigger a Joint Review Panel.
- 243** Under the Canada-Alberta Agreement on Environmental Assessment Cooperation, projects that require an environmental assessment by both the Government of Canada (through the Canadian Environmental Assessment Act - CEAA) and the Government of Alberta (through the Environmental Protection and Enhancement Act) are subject a single cooperative assessment undertaken by a Joint Review Panel. Canadian Environmental Assessment Agency, “Canada-Alberta Agreement on Environmental Assessment Cooperation (2005),” [www.ceaa-acee.gc.ca/default.asp?lang=En&n=F93B8BF6-1](http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=F93B8BF6-1) (accessed July 20, 2010).
- 244** Government of Canada, *Canadian Environmental Assessment Act*.

- 245** Guide to the Participant Funding Program Guide to the Participant Funding Program under the Canadian Environmental Assessment Act. 2008. [www.ceaa-acee.gc.ca/default.asp?lang=En&n=9772442E-1&offset=3&toc=show](http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=9772442E-1&offset=3&toc=show).
- 246** Guide to the Participant Funding Program Guide to the Participant Funding Program under the Canadian Environmental Assessment Act. 2008. [www.ceaa-acee.gc.ca/default.asp?lang=En&n=9772442E-1&offset=3&toc=show](http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=9772442E-1&offset=3&toc=show).
- 247** Letter dated October 10, 2006 from Robert Sayine, Chief Deninu Kue First Nation to Kate Parsons of the Alberta Energy and Utilities Board. See: [www.ceaa.gc.ca/050/documents/18916/18916E.pdf](http://www.ceaa.gc.ca/050/documents/18916/18916E.pdf).
- 248** Hearing Proceedings. November 7, 2006, Fort McMurray, Alberta. Vol. 2. Hearing Proceedings from Joint Panel Review by the Government of Canada and Alberta Energy and Utilities Board for Applications No. 1408771 and No. 1414891. Quotes from Patrick Simon, Chipewyan Deninu Deninu Kue First Nation, Fort Resolution, Northwest Territories. Page 317.
- 249** Hearing Proceedings. November 7, 2006, Fort McMurray, Alberta. Vol. 2. Hearing Proceedings from Joint Panel Review by the Government of Canada and Alberta Energy and Utilities Board for Applications No. 1408771 and No. 1414891. Quotes from Patrick Simon, Chipewyan Deninu Deninu Kue First Nation, Fort Resolution, Northwest Territories. Page 310.
- 250** In *Martha Kostuch v. the Environmental Appeal Board and the Director of Air and Water Approvals Division*, “the Act requires that individual appellants demonstrate a personal interest that is directly impacted by the approval granted. This would require a discernible effect, i.e., some interest other than the abstract interest of all Albertans in generalized goals of environmental protection. ‘Directly’ means the person claiming to be ‘affected’ must show causation of the harm to her particular interest by the approval challenged on appeal. As a general rule, there must be an unbroken connection between one and the other. Second, a person will be more readily found to be “directly affected” if the interest in question relates to one of the policies underlying the Act. This second issue raises a question of law, i.e., whether the person’s interest is supported by the statute in question.” Full reference: *Martha Kostuch v. the Environmental Appeal Board and the Director of Air and Water Approvals Division*, Justice R.P. Marceau, Action No. 9503-19741, pp. 10-11 (March 28, 1996). [www.eab.gov.ab.ca/dec/94-017.html](http://www.eab.gov.ab.ca/dec/94-017.html).
- 251** Filing of a statement of concern is a prerequisite to filing a Notice of Appeal to the Environmental Appeal Board under EPEA and the *Alberta Water Act*. The Environmental Appeals Board is governed by Part 4 of EPEA and Part 9 of the *Water Act*. Again, an individual or group must qualify as “directly affected” in order to appeal, however this is an independent decision, as the Alberta Environment decision is not binding on the Board. The Board has stated that “that the definition of which persons are ‘directly affected’ is flexible and will depend upon the circumstances of each case” (see: *Ouimet et al. v. Director, Regional Support, Northeast Boreal Region, Regional Services, Alberta Environment re: Ouellette Packers (2000) Ltd.* (28 January 2002), Appeal No. 01-076-D). There has never been an appeal before the Environmental Appeals Board dealing with transboundary issues.
- 252** *Alberta Environmental Protection and Enhancement Act* RSA 2000 Chapter E-12.
- 253** *Ouimet et al. v. Director, Regional Support, Northeast Boreal Region, Regional Services, Alberta Environment re: Ouellette Packers (2000) Ltd.* (28 January 2002), Appeal No. 01-076-D.
- 254** A number of Saskatchewan residents attempted to file statements for the Total Upgrader (Application No. 001-245130) near Fort Saskatchewan in 2008, but these were not accepted by Alberta Environment.
- 255** *Mackenzie Valley Resource Management Act* (1998), 142.
- 256** Total. Mining Technology. [www.total-ep-canada.com/joslyn/mining\\_technology.html](http://www.total-ep-canada.com/joslyn/mining_technology.html).
- 257** Since 2008, there have been several lawsuits involving the oil sands. In 2007, Ecojustice on behalf of the Pembina Institute, Sierra Club of Canada, Toxics Watch Society of Alberta and the Prairie Acid Rain Coalition, argued that the environmental assessment of the Imperial Kearn Project was flawed and that the project should be halted until a proper assessment has been completed. On May 14, 2008, the Beaver Lake Cree Nation filed a Statement of Claim against the Province of Alberta and the Attorney General of Canada alleging that, in granting certain tar sands (and other) tenures, the Governments of Alberta and Canada infringed upon the treaty rights of the BLCN to hunt, trap and fish certain wildlife species in their traditional territory. On June 4, 2008, the Chipewyan

Prairie Dene First Nation (“CPDFN”) filed a legal action in the Alberta Court of Queen’s Bench for a Judicial Review of the Government of Alberta’s grant of oil sands tenures to MEG Energy Corp. On December 10, 2008, the Athabasca Chipewyan First Nation (“ACFN”) filed a legal action in the Alberta Court of Queen’s Bench for a Judicial Review of the Government of Alberta’s granting of certain tar sands tenures without consultation with the ACFN.

**258** Environmental Protection and Enhancement Act, R.S.A. 2000, c. E - 12.

**259** Government of Alberta. 2010. Approvals, inspections, abatement and enforcement. <http://environment.alberta.ca/01527.html> (accessed June 29, 2010).

**260** Enforcement records for 2007 show that Alberta Environment issued two Environmental Protection Orders against Syncrude and Suncor and one Environmental Enforcement Order against Suncor. Neither company was prosecuted or fined. In 2005, Alberta Environment issued one Environmental Protection Order to Syncrude and one warning letter to Devon and Suncor (see: Enforcement of the Environmental Protection and Enhancement Act and Water Act quarterly reports 2006-2007). However, that same year Suncor reported in their 2007 Report on Sustainability, that their operations resulted in 30 air quality exceedances and showed an increasing trend of 240 air quality exceedances and greater volume of spills and leaks in 2006, but none were fined or prosecuted.

**261** The Garrison diversion project proposals raised concerns regarding the use of Missouri River water for irrigation in the Hudson Bay drainage basin. The Governments of Manitoba and Canada raised concerns over the possible negative impacts that would come with the transfer of non-native species between basins and the introduction of invasive species, fish disease and pathogens.<sup>261</sup> In 2002, Manitoba filed a legal challenge in U.S. District Court in Washington, D.C., arguing that one of the Garrison Diversion projects could cause severe and irreparable harm to Manitoba and had been improperly assessed. The Government of Manitoba successfully challenged the U.S. Bureau of Reclamation under the U.S. National Environmental Protection Act on the basis that a more thorough Environmental Impact Statement was needed rather than a cursory Environmental Assessment. The Bureau of Reclamation completed an Environmental Impact Statement in 2008, fulfilling the Bureau’s obligation under the 2002 court order. See: United States Bureau of Reclamation, “Reclamation signs Northwest Area Water Supply record of decision,” [www.usbr.gov/newsroom/newsrelease/detail.cfm?RecordID=26261](http://www.usbr.gov/newsroom/newsrelease/detail.cfm?RecordID=26261); and Government of Manitoba, “Potential transboundary water projects,” [www.gov.mb.ca/waterstewardship/water\\_info/transboundary/potential.html](http://www.gov.mb.ca/waterstewardship/water_info/transboundary/potential.html).

**262** Athabasca Chipewyan First Nation v. British Columbia, 2001 ABCA 112.

**263** The statutory authority for governance of Aboriginal lands and peoples is the *Indian Act*, which was passed pursuant to Section 91(24) of the *Constitution Act*. Under the Constitution, the federal government has legislative jurisdiction over “Indians and lands reserved for Indians.” This power extends federal authority not only to lands but also to waters.

**264** Laidlaw, D. K. and M. Passelac-Ross. 2010. Water Rights and Water Stewardship: What about Aboriginal Peoples? Canadian Institute of Resources Law. Page 3.

**265** Laidlaw, D. K. and M. Passelac-Ross. 2010. Water Rights and Water Stewardship: What about Aboriginal Peoples? Canadian Institute of Resources Law. Page 2.

**266** Beaver Lake Cree Nation v. Alberta and Canada, ACQB Action No. 0803-06718.

**267** In the Mackenzie Valley, there are three completed comprehensive land claim and/or self-government agreements are: the Gwich’in Comprehensive Land Claim Agreement, the Sahtu Dene and Métis Comprehensive Land Claim Agreement and the Tlicho Land Claims and Self-Government Agreement. There are also four land claim and self-government agreements under negotiation: the Acho Dene Koe First Nation in the Fort Liard area, the Akaitcho Dene First Nation in the southeast, the Dehcho First Nations in the south central part of the territory, and the Northwest Territory Métis Nation. The Inuvialuit Final Agreement was the first comprehensive land claim agreement signed in the NWT – the Inuvialuit Settlement Area lies outside the Mackenzie Valley in the NWT.

**268** The legally protectable interest that an individual or a group has in a dispute that entitles it to bring the controversy before the court to obtain judicial relief.

- 269** Gwich'in Comprehensive Land Claim Agreement, 1992. Chapter 19 Water Rights and Management [www.gwichin.nt.ca/documents/GCLCA.pdf](http://www.gwichin.nt.ca/documents/GCLCA.pdf). Section 19.1.9. Page 88.
- 270** Gwich'in Comprehensive Land Claim Agreement, 1992. Chapter 19 Water Rights and Management [www.gwichin.nt.ca/documents/GCLCA.pdf](http://www.gwichin.nt.ca/documents/GCLCA.pdf). Section 19.1.10. Page 88.
- 271** Gwich'in Comprehensive Land Claim Agreement, 1992. Chapter 19 Water Rights and Management [www.gwichin.nt.ca/documents/GCLCA.pdf](http://www.gwichin.nt.ca/documents/GCLCA.pdf). Section 19.1.11. Page 88.
- 272** Tlicho Land Claims and Self-Government Agreement, [www.ainc-inac.gc.ca/al/ldc/ccl/fagr/nwts/tliagr/tliagr-eng.pdf](http://www.ainc-inac.gc.ca/al/ldc/ccl/fagr/nwts/tliagr/tliagr-eng.pdf) (accessed April 21, 2010).
- 273** Sahtu Dene and Métis Comprehensive Land Claim Agreement, [www.ainc-inac.gc.ca/al/ldc/ccl/fagr/sahtu/sahmet/sahmet-eng.pdf](http://www.ainc-inac.gc.ca/al/ldc/ccl/fagr/sahtu/sahmet/sahmet-eng.pdf) (accessed November 18, 2009).
- 274** With the signing of the Tlicho agreement, the Wek'eezhii Land and Water Board was created, becoming a legally recognized management authority for the area known as Wek'eezhii.
- 275** Tlicho Land Claims and Self-Government Agreement, [www.ainc-inac.gc.ca/al/ldc/ccl/fagr/nwts/tliagr/tliagr-eng.pdf](http://www.ainc-inac.gc.ca/al/ldc/ccl/fagr/nwts/tliagr/tliagr-eng.pdf) (accessed November 18, 2009). Section 21.4. Page 178.
- 276** Tlicho Land Claims and Self-Government Agreement, [www.ainc-inac.gc.ca/al/ldc/ccl/fagr/nwts/tliagr/tliagr-eng.pdf](http://www.ainc-inac.gc.ca/al/ldc/ccl/fagr/nwts/tliagr/tliagr-eng.pdf) (accessed November 18, 2009). Section 21.4. Page 178.
- 277** Millan, Luis. 2010. Climate change intersects with Inuit land claims agreements. *The Lawyers Weekly*. April 23 2010 issue. [www.lawyersweekly-digital.com/lawyersweekly/2947?folio=15#pg16](http://www.lawyersweekly-digital.com/lawyersweekly/2947?folio=15#pg16).
- 278** de Loë, R.C., Varghese, J., Ferreyra, C. and Kreutzwisser, R.D. 2007. *Water Allocation and Water Security in Canada: Initiating a Policy Dialogue for the 21st Century*. Report prepared for the Walter and Duncan Gordon Foundation. Guelph, ON: Guelph Water Management Group, University of Guelph.
- 279** de Loë, R.C., Varghese, J., Ferreyra, C. and Kreutzwisser, R.D. 2007. *Water Allocation and Water Security in Canada: Initiating a Policy Dialogue for the 21st Century*. Report prepared for the Walter and Duncan Gordon Foundation. Guelph, ON: Guelph Water Management Group, University of Guelph.
- 280** Rosenberg International Forum on Water Policy, *Report of the Rosenberg International Forum on Water Policy to the Government of the Northwest Territories*, [www.enr.gov.nt.ca/\\_live/pages/wpPages/whats\\_new.aspx?nid=261](http://www.enr.gov.nt.ca/_live/pages/wpPages/whats_new.aspx?nid=261) (accessed December 7, 2009). Page 24.
- 281** D'Anglejan, B, and J Basmadjian. "Changes in sedimentation following river diversion in the Eastmain Estuary (James Bay), Canada." *Journal of Coastal Research* 3, no. 4 (1987): 457-468. [www.jstor.org/pss/4297334](http://www.jstor.org/pss/4297334).
- 282** Eastmain Band v. Canada (Federal Administrator) [1993] 1 F.C. 501. [www.canlii.org/en/ca/fca/doc/1992/1992canlii2415/1992canlii2415.html](http://www.canlii.org/en/ca/fca/doc/1992/1992canlii2415/1992canlii2415.html) (accessed December 1, 2009).
- 283** Union of Nova Scotia Indians v. Canada (Minister of Fisheries and Oceans) [1996] F.C.J. No. 1373.
- 284** See: Wells, Jeff, Susan Casey-Lefkowitz, Gabriela Chavarria, and Simon Dyer. "Danger in the Nursery: Impact on Birds of Tar Sands Oil Development in Canada's Boreal Forest." Boreal Songbird Initiative, Natural Resources Defence Council, and the Pembina Institute, 2008. And Ronconi, Robert A., and Colleen Cassidy St. Clair. "Efficacy of a Radar-Activated on-Demand System for Detering Waterfowl from Oil Sands Tailings Ponds." *Journal of Applied Ecology* 43, no. 1 (2006): 111-19.
- 285** CBC News, "Syncrude guilty in Alberta duck deaths," June 25, 2010, [www.cbc.ca/canada/edmonton/story/2010/06/25/edmonton-syncrude-duck-trial-verdict-expected.html](http://www.cbc.ca/canada/edmonton/story/2010/06/25/edmonton-syncrude-duck-trial-verdict-expected.html) (accessed June 28, 2010).
- 286** Migratory Bird Regulations, C.R.C., c. 1035. Section 35 of the Migratory Bird Regulation states that "no person shall deposit or permit to be deposited oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds" unless allowed by regulations, or allowed by permit. The regulations also lay out provisions whereby it is illegal to harm, capture or have in one's possession any of the species of birds listed in the Act.

**287** Specifically, Syncrude Canada was charged with an offence under the federal Migratory Birds Convention Act, 1994, S.C. 1994, c. 22 (MBCA) and an offence under the Alberta Environmental Protection and Enhancement Act, R.S.A. 2000, c. E-12.

**288** R. v. Syncrude Canada Ltd., 2010 ABPC 229 [www2.albertacourts.ab.ca/jdb%5C2003-%5Cpc%5Ccriminal%5C2010%5C2010ABPC0229.pdf](http://www2.albertacourts.ab.ca/jdb%5C2003-%5Cpc%5Ccriminal%5C2010%5C2010ABPC0229.pdf)

**289** CEPA, S.C. 1999, c. 33 identifies and regulates identified toxic substances. It does this by either regulating the substance (e.g., PCB Regulations) or in some cases regulating an industry (e.g., Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans Regulation). CEPA, pursuant to s. 48, also established up the National Pollutant Release Inventory (NPRI) that requires the annual reporting of releases of specified pollutants. Up until now, oil sands companies have not been required to report releases to tailings ponds as these were deemed to be contained.

**290** Environment Canada. 2009. Canadian Environmental Protection Act, 1999 (CEPA 1999) [www.ec.gc.ca/CEPARegistry/the\\_act/](http://www.ec.gc.ca/CEPARegistry/the_act/).

**291** Office of the Auditor General of Canada, *2002 October Report of the Commissioner of the Environment and Sustainable Development*, Chapter 1—Toxic Substances Revisited, [www.oag-bvg.gc.ca/internet/English/parl\\_cesd\\_200210\\_01\\_e\\_12407.html](http://www.oag-bvg.gc.ca/internet/English/parl_cesd_200210_01_e_12407.html), sec. 1.3.

**292** *Great Lakes United v. Canada* (Environment), 2009 FC 40.

**293** NPRI substances commonly associated with the chemical composition of oil sands mine tailings are aluminum, arsenic, chromium, copper, lead, nickel, zinc, ammonia, cyanides, phenol and polycyclic aromatic hydrocarbons.

**294** Environment Canada. 2009. Guidance for the Reporting of Tailings and Waste Rock to the National Pollutant Release Inventory (Version 1.3) [www.ec.gc.ca/inrp-npri/C115DEB3-F4FC-4972-8EE4-08B93935D2B0/NPRI%20FINAL-Guide%20on%20Tailings%20and%20Waste%20Rock%20\(Ver%201.3\).pdf](http://www.ec.gc.ca/inrp-npri/C115DEB3-F4FC-4972-8EE4-08B93935D2B0/NPRI%20FINAL-Guide%20on%20Tailings%20and%20Waste%20Rock%20(Ver%201.3).pdf) (accessed April 23, 2010). Environment Canada also wants to collect retroactive data for the 2006 through 2008 reporting years. NPRI substances commonly associated with the chemical composition of oil sands mine tailings are aluminum, arsenic, chromium, copper, lead, nickel, zinc, ammonia, cyanides, phenol and polycyclic aromatic hydrocarbons.

**295** Office of the Auditor General, “OAG Getting Answers – A guide to the environmental petitions process,” [www.oag-bvg.gc.ca/internet/English/pet\\_lp\\_e\\_930.html#ex3](http://www.oag-bvg.gc.ca/internet/English/pet_lp_e_930.html#ex3) (accessed February 12, 2010).

**296** Office of the Auditor General, “OAG Getting Answers – A guide to the environmental petitions process,” [www.oag-bvg.gc.ca/internet/English/pet\\_lp\\_e\\_930.html#ex3](http://www.oag-bvg.gc.ca/internet/English/pet_lp_e_930.html#ex3) (accessed February 12, 2010).

**297** Office of the Auditor General, Chapter 2 - Report of the Commissioner of the Environment and Sustainable Development – October 2007. [www.oag-bvg.gc.ca/internet/English/parl\\_cesd\\_200710\\_e\\_26831.html](http://www.oag-bvg.gc.ca/internet/English/parl_cesd_200710_e_26831.html) (accessed December 2, 2009).

**298** Office of the Auditor General, “The impact of resource development in Northern Alberta on First Nations, Petition No. 188” [www.oag-bvg.gc.ca/internet/English/pet\\_188\\_e\\_28924.html](http://www.oag-bvg.gc.ca/internet/English/pet_188_e_28924.html) (accessed April 24, 2010).

**299** Office of the Auditor General, “The impact of resource development in Northern Alberta on First Nations, Petition No. 188” [www.oag-bvg.gc.ca/internet/English/pet\\_188\\_e\\_28924.html](http://www.oag-bvg.gc.ca/internet/English/pet_188_e_28924.html) (accessed April 24, 2010).

**300** Office of the Auditor General, “The impact of resource development in Northern Alberta on First Nations, Petition No. 188” [www.oag-bvg.gc.ca/internet/English/pet\\_188\\_e\\_28924.html](http://www.oag-bvg.gc.ca/internet/English/pet_188_e_28924.html) (accessed April 24, 2010).

**301** Personal communication, John Giroux, Economic Development Manager, Treaty 8 First Nations of Alberta and Jim Webb, Little Red River First Nation.

**302** Article 1 of *North American Agreement on Environmental Cooperation*, [www.cec.org/Page.asp?PageID=1226&SiteNodeID=567](http://www.cec.org/Page.asp?PageID=1226&SiteNodeID=567).

**303** Article 14 of the *North American Agreement on Environmental Cooperation*. Submissions on Enforcement Matters. [http://www.cec.org/Page.asp?PageID=122&ContentID=2732&SiteNodeID=567&BL\\_ExpandID=](http://www.cec.org/Page.asp?PageID=122&ContentID=2732&SiteNodeID=567&BL_ExpandID=) (accessed June 29, 2010)

- 304** Article 15 of the *North American Agreement on Environmental Cooperation*. Factual Record. [http://www.cec.org/Page.asp?PageID=122&ContentID=2732&SiteNodeID=567&BL\\_ExpandID=](http://www.cec.org/Page.asp?PageID=122&ContentID=2732&SiteNodeID=567&BL_ExpandID=).(accessed June 29, 2010)
- 305** Environmental Defence Canada, Natural Resources Defense Council, John Rigney, Don Deranger, and Daniel T'seleie, *Submission to the Commission for Environmental Cooperation, pursuant to Article 14, North American Agreement on Environmental Cooperation, submission SEM-10-002 (Alberta Tailings Ponds)*. [www.cec.org/Storage/80/8348\\_01-SUB.pdf](http://www.cec.org/Storage/80/8348_01-SUB.pdf).
- 306** Subsection 36(3) of the Canadian *Fisheries Act*.
- 307** Environmental Defence Canada, Natural Resources Defense Council, John Rigney, Don Deranger, and Daniel T'seleie, *Submission to the Commission for Environmental Cooperation, pursuant to Article 14, North American Agreement on Environmental Cooperation, submission SEM-10-002 (Alberta Tailings Ponds)* . [www.cec.org/Storage/80/8348\\_01-SUB.pdf](http://www.cec.org/Storage/80/8348_01-SUB.pdf).
- 308** Article 15 of *North American Agreement on Environmental Cooperation*, [www.cec.org/Page.asp?PageID=1226&SiteNodeID=567](http://www.cec.org/Page.asp?PageID=1226&SiteNodeID=567).
- 309** Yukon Inter-Tribal Watershed Council. 2008. About us. [www.yritwc.org/AboutUs/AboutUs/tabid/56/Default.aspx](http://www.yritwc.org/AboutUs/AboutUs/tabid/56/Default.aspx).
- 310** Yukon Inter-Tribal Watershed Council. 2008. Publications. [www.yritwc.org/Media/Publications/tabid/80/Default.aspx](http://www.yritwc.org/Media/Publications/tabid/80/Default.aspx).
- 311** Barton, Brooke. 2005. A global/local approach to conflict resolution in the mining sector: the case of the Tintaya dialogue table. Unpublished Masters of Arts in Law and Diplomacy Thesis. The Fletcher School: Tufts University. [fletcher.tufts.edu/research/2005/Barton.pdf](http://fletcher.tufts.edu/research/2005/Barton.pdf) Accessed 15 December 2008.
- 312** Black Mesa Water Coalition, "Behind the scenes," [www.blackmesawatercoalition.org/orgStructure.html](http://www.blackmesawatercoalition.org/orgStructure.html) (accessed December 9, 2009).
- 313** Waterkeeper Alliance, "Our mission," [www.waterkeeper.org/ht/d/sp/i/187/pid/187](http://www.waterkeeper.org/ht/d/sp/i/187/pid/187) (accessed December 9, 2009).
- 314** Waterkeeper Alliance, "What we do" [www.waterkeeper.org/ht/d/sp/i/182/pid/182](http://www.waterkeeper.org/ht/d/sp/i/182/pid/182). (Accessed February 12 2010).
- 315** Waterkeeper Alliance, "Who we are" [www.waterkeeper.org/ht/d/sp/i/181/pid/181](http://www.waterkeeper.org/ht/d/sp/i/181/pid/181). (Accessed February 12 2010).
- 316** NWT Association of Communities. 2009. [www.nwtac.com/2009\\_19.html](http://www.nwtac.com/2009_19.html).