

# One trillion litres of toxic waste and growing: Alberta's tailings ponds

**Alberta's growing tailings ponds are an ongoing source of controversy and scientific concern. Oil sands mining operations produce significant volumes of toxic waste called tailings—a poisonous brew of water, sand, silt and petrochemical waste products. For over fifty years, the oil sands industry has stored these tailings in enormous lakes that the industry refers to as “tailings ponds.” New research shows that these tailings have now surpassed 1.18 trillion litres and their volumes continue to grow each year.<sup>1</sup> These tailings ponds have significant environmental impacts. Scientific reports have found tailings ponds leach chemicals that sicken local communities, poison wildlife, and pose the ever-growing threat of contaminating the region's water resources.**

The government of Alberta has allowed the environmental cost and economic liability of the oil sands industry's tailings ponds to grow for nearly fifty years. In 2019, Alberta's first attempt to regulate tailings — Directive 074 — failed because the province's regulator did not enforce the Directive following the oil sands mining industry's widespread noncompliance. While Alberta updated its tailings regulation in 2015 with the *Tailings Management Framework for the Mineable Athabasca Oil Sands* (TMF), the oil sands industry's response suggests the TMF will meet a similar fate unless there is strong enforcement action. The TMF aims for the volume of tailings to peak and then decline, for an acceleration of the rate of reclamation, and creates a process — Directive 085 — that gives oil sands mine operators flexibility in meeting these goals. Yet, proposals submitted by oil sands mining companies in November 2016 show that they are planning to increase the cumulative volumes of tailings ponds for the next two decades, with tailings volumes peaking as late as 2037.<sup>2</sup> Moreover, some companies propose taking seventy years after completing mining operations to rehabilitate landscapes.<sup>3</sup>

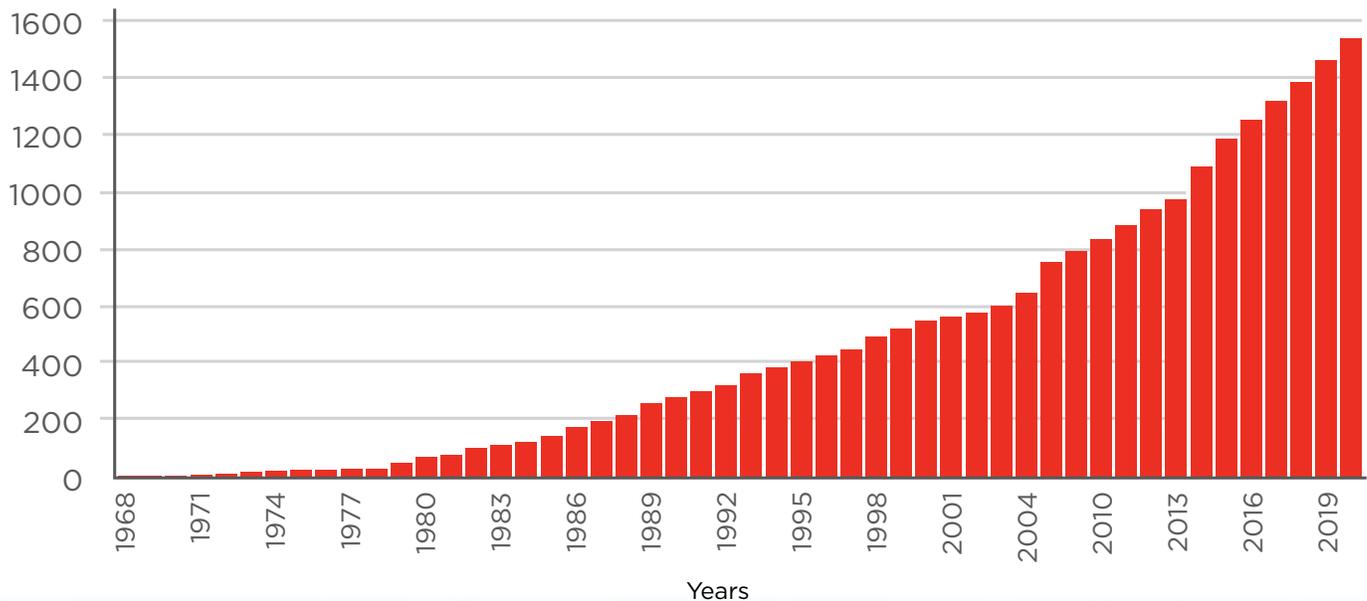
Without a clear pathway to ensure that the oil industry is internalizing this increasing liability, Albertan taxpayers could ultimately be held responsible for paying the majority of the estimated \$44.5 billion in anticipated tailings clean-up costs (as of the end of 2016).<sup>4</sup> This total does not include the estimated \$6.8 billion needed for land reclamation<sup>5</sup> and additional costs (not estimated) for water treatment and ongoing monitoring and maintenance.

The potential taxpayer liability for tailings cleanup alone now exceeds the \$41.3 billion in royalties the province of Alberta has collected from the oil sands industry from 1970 to 2016.<sup>6</sup> This poses a growing threat to First Nations communities, the boreal forest, aquatic ecosystems and the province of Alberta and Canada. The Alberta government should halt all new tailings developments until industry successfully demonstrates that it is capable of properly reclaiming them. The government should also ensure that industry, rather than Alberta taxpayers, be required to pay for the clean-up of industry's polluting projects.

# What are oil sands tailings?

For over half a century, the oil sands industry has created tailings ponds that today cover an area greater than cities of Toronto (pre-amalgamation) and Vancouver combined, or Manhattan and Boston combined.<sup>7</sup> Tailings are produced during the process of separating bitumen — the thick, extra heavy substance which is raw oil sands crude — from the mixture of sand, clay, and bitumen that make up the oil deposits.<sup>8</sup> Industry uses hot water and chemicals to separate the bitumen from the slurry of other materials. It then skims off the bitumen and pumps the remaining waste slurry into tailings ponds.<sup>9</sup> Every barrel of oil sands extracted adds 1.5 barrels of liquid waste to Alberta's tailing ponds, and each day industry needs to store 25 million new litres of tailings.<sup>10</sup> Today, Alberta's liquid tailings now make up more than 1.18 trillion litres of toxic waste, and continue to grow.<sup>11</sup>

## TOTAL VOLUME OF FINE FLUID TAILINGS (Mm<sup>3</sup>)



# Environmental impacts of oil sands tailings

Oil sands extraction in Alberta has attracted international attention for destroying tens of thousands of hectares of boreal forest and polluting nearby communities.<sup>12</sup> Tailings ponds are one of the most toxic features of the oil sands extraction process. The tailings ponds leach dangerous chemicals into the surrounding environment. These ponds are also prone to structural flaws that could cause a breach. A breach of just one of these poisonous ponds could be devastating to downstream rivers and the communities along them. In 2013, the University of California's Rosenberg Forum, which convenes international water experts to tackle some of the world's most challenging water issues, evaluated threats to the Mackenzie river basin (where the oil sands are located) and concluded, "... the largest single threat to the Mackenzie River Basin would be a large breach in the tailings ponds at one of the sites where surface mining bitumen is conducted."<sup>13</sup> And because of industry's longstanding failure to clean them up, the ponds become larger every year.

## TAILINGS PONDS CONTAIN:

- **LEAD**, which can permanently impair children's brain and nervous system development;<sup>16</sup>
- **MERCURY**, which can have damaging impacts on the nervous, immune, and digestive systems and harm children's development;<sup>17</sup>
- **ARSENIC<sup>18</sup> AND BENZENE**: well-established sources of cancer in humans.<sup>19</sup>

Federal research has determined that tailings ponds are seeping into groundwater and the Athabasca River.<sup>20</sup> An Environmental Defence analysis of industry data calculated that the ponds are leaking 11 million litres per day — equivalent to nearly 70,000 barrels — but noted that this data is likely conservative.<sup>21</sup> Environment Canada scientists have highlighted research showing that a single pond can leak 6.5 million litres per day.<sup>22</sup> Moreover a National Academy of Sciences study found that likely carcinogenic chemicals called Polycyclic Aromatic Hydrocarbons (PAHs)<sup>23</sup> are evaporating from the ponds and being deposited in Alberta's water systems at a rate that could be as high as from tailings seepage.<sup>24</sup> The ponds also emit carbon dioxide and methane, and industry estimates that 10 per cent of oil sands greenhouse gas emissions come from tailings ponds.<sup>25</sup>

**Tailings ponds include a significant number of toxic chemicals,<sup>14</sup> including five\* of the World Health Organization's "ten chemicals of major public concern."<sup>15</sup>**

\* These are: arsenic, benzene, lead, mercury, and air pollution.

## MOUNT POLLEY TAILINGS DISASTER

On August 4, 2014, the catastrophic failure of a mining company's dam in British Columbia, Canada, released over 2.5 billion gallons of contaminated water from a containment pond into the upper Fraser River watershed. Only a few hundred miles east in Alberta, at least half a dozen dams containing the wastewater from the oil sands mining industry hold more than 100 times the volume of the British Columbia release and span over 43,000 acres of Canada's boreal forest. A breach from any one of these mine-tailings ponds would pose enormous risks to local communities and the surrounding boreal forest ecosystem."

# ENVIRONMENTAL IMPACTS OF OIL SANDS TAILINGS (cont'd)

**Studies show that leaks from these ponds are harming the health of communities that rely on local rivers, fish, and wildlife, such as First Nations living in Fort Chipewyan, located 200 kilometers downstream from oil sands development sites.<sup>26</sup>**

Researchers found that levels of mercury, lead, and other pollutants were higher downstream from oil sands mining sites than recommended under federal and provincial guidelines for the protection of aquatic life.<sup>27</sup> Studies commissioned by the Canadian and Alberta governments<sup>28</sup> found unusually high rates of cancer among the community of Fort Chipewyan.<sup>29</sup> In 2014, researchers determined that Fort Chipewyan members' consumption of traditionally-caught fish and meat were linked to these high cancer rates.<sup>30</sup>

In addition to their significant health impacts, tailings ponds pose the constant threat of spills, which would pollute tens of thousands of acres of land and surrounding waterways. International water experts say the largest threat to the Mackenzie River basin, which empties to the Beaufort sea, would be a breach of oil sands tailings ponds.<sup>31</sup>

Tailings ponds can be deadly to wildlife that confuse them with natural lakes. Migrating birds often land in the ponds and become covered in bitumen. In one 2008 incident, 1,600 migrating ducks died after landing in a tailings pond; in a separate 2010 case, 230 ducks died after landing.<sup>32</sup> Biologists note that there is so little monitoring of the environmental impacts that these lakes have on wildlife that it is impossible to know how far reaching the impacts are.<sup>33</sup>

Every year, the toxic materials in tailings ponds increases. Because it takes hundreds of years for the bitumen-infused sand and clay particles in the ponds to settle to the bottom naturally, it is exceedingly difficult to clean them up.<sup>34</sup> The tailings ponds simply continue to expand. Despite the growing threats tailings ponds pose, the oil sands industry does not have any proven solutions to reclaiming them, and the Alberta government's regulations around tailings ponds have not held companies responsible for the ponds' clean-up.

**While the government of Alberta has acknowledged that tailings ponds have threatened the surrounding environment for nearly fifty years, the government has failed to implement effective regulations to address the growing environmental impact and economic liability of oil sands tailing ponds. Oil sands mining companies have responded to this lax regulatory regime by consistently failing to meet the tailings pond commitments promised in their original project applications. The government's new requirements for industry, introduced in 2015, are not strong enough to protect communities and ecosystems.**

## THE TIMELINE

### 1967 - 2009

No regulations or requirements to limit tailings ponds

### 2009 - 2015

Directive 074 is proposed but without enforcement capacity, is ignored by industry

### MARCH 2015

Tailings Management Framework (TMF) announced — sets targets for tailings reductions

### JULY 2016

Directive 085 released to enforce TMF, requires companies to submit Tailings Management Plans.

### NOVEMBER 2016

Oil sands operators submit plans which would lead to two more decades of tailings ponds expansion.



# Historical failure to regulate tailings

As far back as 1973, the government of Alberta published reports highlighting the significant health and environmental threats of tailings ponds, stressing industry's inability to effectively treat them.<sup>35</sup> Yet industry's obligations around reclaiming these ponds were essentially voluntary until 2009. In that year, and in response to decades of public concerns, the Alberta government finally released new standards for tailings management called Directive 074.<sup>36</sup> This directive proved to be far too permissive, allowing the approval of new tailings plans even when they did not comply with the directive's requirements.<sup>37</sup> The government ultimately acknowledged that every single oil sands mining company has failed to meet either the regulations established in Directive 074 or weaker targets the companies had negotiated.<sup>38</sup> Despite this noncompliance, Alberta's regulator imposed no enforcement action.<sup>39</sup>

Recognizing the weakness of Directive 074, Alberta replaced it with a new regulatory approach. In March 2015, Alberta released the Tailings Management Framework (TMF), which aimed to minimize the creation of new tailings and ensure that all fluid tailings would be treated and reclaimed within the lifetime of a oil sands project.<sup>40</sup> For the first time, it set reduction targets for legacy fluid tailings produced between 1967 and 2015. To enforce the TMF, Alberta introduced Directive 085, and in November 2016, oil sands mining companies submitted their Tailings Management Plans (TMPs) to comply with this directive.<sup>41</sup> However, these plans reveal that Directive 085 is too vague and permissive to adequately protect communities and the environment from the detrimental impacts of tailings ponds.

## **Ninety-six percent of Albertans believe that companies working in the oil sands should be held financially liable for their operations' environmental impacts.<sup>49</sup>**

Under the TMF, growth in total tailings pond volumes are supposed to be halted as soon as technically possible, and then steadily reduced while companies increase the rate of reclamation. Yet, industry's submitted plans show that they are planning to increase the cumulative volumes of tailings ponds for the next two decades, with tailings volumes peaking as late as 2037. This is inconsistent with the TMF's goal of rapidly reducing cumulative volumes.<sup>42</sup>



*Photo Credit: Natural Resources Defense Council*

Industry has also proposed a broad range of technologies for reclaiming the ponds, even though there are significant data gaps regarding these technologies' efficacy. Nearly every company has proposed "water capping," or dumping fluid tailings into old mine pits and covering them with freshwater from the Athabasca to create permanent "pit end lakes."<sup>43</sup> Companies assert that the tailings will naturally settle to the bottom and the "lakes" will become part of the natural landscape.<sup>44</sup> However, there is no evidence that the particles in these lakes would successfully separate and settle out, and many of the companies have no contingency plans if this strategy fails.<sup>45</sup> There are other proven technologies, but these are more expensive.<sup>46</sup>

Directive 085 is also opaque and overly permissive. For example, it has no fixed criteria for effective reclamation activities, and it does not include clear enforcement actions for non-compliance.<sup>47</sup> In spite of the ongoing environmental degradation that tailings ponds cause, some companies propose taking 70 years to reclaim landscapes after completing mining operations.<sup>48</sup>

To effectively protect communities and wildlife, Alberta should reassess Directive 085 and require that companies have demonstrably effective reclamation technologies and enforceable plans to rapidly reduce tailings pond volumes. The laxity of the existing Directive is all the more concerning in light of the fact that Canadians, rather than industry, could be obliged to pay most of the ever-growing costs of cleaning up Alberta's tailings ponds.

# Liability

Oil sands tailing ponds represent a large and growing unfunded liability for the province of Alberta and its citizens. In July 2015, the Alberta auditor general released a report estimating the total reclamation liabilities for the province's oil sands mines at \$20.8 billion.<sup>50</sup> However, industry's own figures suggest that the cost to Alberta may be far higher. Estimates from oil sands operator Total Canada suggest that treating fluid tailings could cost as much as \$44.5 billion and growing, and reclaiming the disturbed area could add an additional \$6.8 billion to those costs.<sup>51</sup> All told, this suggests that the liability associated with oil sands tailings ranges from \$20.8 billion to \$44.5 billion. (That doesn't include liability from land reclamation, estimated to be at least \$6.8 billion<sup>52</sup>, and additional costs (not estimated) for water treatment and ongoing monitoring and maintenance.) The liability from tailings alone exceeds the total value of the \$41.3 billion in oil sands royalties collected by the province of Alberta from 1970 to 2016.<sup>53</sup> In 2015 and 2016, financial liability for government grew more quickly than government revenues from royalties.

Ninety-six percent of Albertans believe that companies working in the oil sands should be held financially liable for their operations' environmental impacts,<sup>54</sup> yet there is no system in Alberta to ensure that polluters will pay to clean up their tailings ponds. Industry pays into a Mine Financial Security Program, which is meant to cover the clean-up costs of the oil sands industry,<sup>55</sup> but the \$1.57 billion in funds collected<sup>56</sup> are a small fraction of the future clean-up costs of the ponds, leaving 93 per cent to 97 per cent of the cost to Albertan taxpayers. If companies responsible for tailings ponds go bankrupt or are otherwise unable to pay for the reclamations costs, the onus could move to the public, which led an Auditor General report to conclude in 2015 that "Albertans could be forced to pay the reclamation costs" of the polluting oil sands industry."<sup>57</sup> The potential cost ranges from \$5,000 to \$10,600 per Albertan — and under current industry plans it will continue to grow.<sup>58</sup>

## GOVERNMENT LIABILITY FROM TAILINGS PONDS & ORPHANED WELLS

The unfunded liabilities of the tailings ponds are part of a broader picture of unfunded liabilities in Alberta's oil and gas industry: mining and extraction areas that are meant to be the responsibility of industry to reclaim, but could become the burden of taxpayers. In Alberta, companies in the oil and gas industry often leave wells inactive with the prospect that their owners may no longer be around to pay for their eventual cleanup. One third of all the province's oil and gas wells are currently inactive.<sup>59</sup> The government of Alberta estimates that the cost of the province's oil and gas liabilities is \$36 billion,<sup>60</sup> yet it has collected from industry only a fraction of the funds that will be necessary for cleanup.<sup>61</sup> The number of Alberta's orphaned wells (for which no entity is responsible for their cleanup) is steadily rising. In February 2016, the closure of a single company (Lexin Resources) almost doubled the number of oil wells in Alberta without a legal owner.<sup>62</sup> Alberta's taxpayers could be responsible for paying for the bulk of these clean-up costs.<sup>63, 64</sup>

# Recommendations

**For half a century, Alberta's tailings ponds have released pollution that has harmed communities, wildlife, and the surrounding lands and water. Without proper safeguards, the footprint of these tailings will continue to grow exponentially.<sup>65</sup> The government of Alberta should update safeguards for tailings ponds to create a regulatory regime with clear enforcement and funding mechanisms.**

In order to protect communities in Alberta, the government should strengthen Directive O85 and ensure that regulations are stringent, binding, and effective.

## **The Alberta government should:**

- Require an immediate reduction in tailings volumes. With tailings volumes making up more than 1 trillion litres of waste, it would be irresponsible to allow volumes to continue growing. Industry should be required to reduce these ponds' footprint rather than engage in irresponsible tailings management.

- Ensure that in existing tailings ponds, tailings are treated at a faster rate than they are produced. Across Alberta's landscapes, toxic tailings ponds cover an area larger than Toronto and Vancouver combined. In order to ensure that these areas will be reclaimed, tailings must be cleaned up at a faster rate than they are produced. Otherwise, Alberta faces a future of ever-growing tailings volumes.

- Do not approve any new tailings ponds. Until industry demonstrates the ability and willingness to clean-up the tailings ponds it has already created, it would be reckless to approve new ponds.

- Do not approve any new end pit lakes. Oil companies have not demonstrated that injecting toxic waste slurry and clean water into abandoned mines is a safe form of reclamation. Industry should be required to show that proposed solutions are effective and safe.

- Bond companies for full liability of tailings clean up. Communities in Alberta, including First Nations, have suffered high pollution levels and the destruction of boreal and wildlife populations. It would be unjust and uneconomical for these same communities to have to pay to clean up after industry. Government policies must ensure that oil sands companies bear the full financial responsibility for the tailings ponds they have produced.

**There is also a role for the Canadian government. Alberta needs a mechanism to prevent oil sands companies from escaping liability by declaring bankruptcy, thus downloading financial responsibility for cleaning up tailings ponds onto governments. But this has to come from the federal government.<sup>66</sup>**

## **As such, the Canadian government should:**

Ensure environmental cleanup takes priority over creditors in bankruptcy cases. The federal government should therefore amend the *Bankruptcy and Insolvency Act* and the *Companies' Creditors Arrangement Act* such that, in bankruptcy cases, the cleanup of environmental damage takes priority over creditors.<sup>67</sup> This would internalize the cost of environmental damage while treating secured creditors fairly.

<sup>1</sup> McNeill, J. & N. Lothian. (Mar. 13, 2017). Review of Directive O85 Tailings Management Plans. Pembina Institute. p. 2. Retrieved from: <http://www.pembina.org/reports/tailings-whitepaper-d85.pdf>.

<sup>2</sup> Ibid.

<sup>3</sup> Ibid.

<sup>4</sup> Hyndman, A. & P. Eng. (Mar. 31, 2015). Tailings Management Evolution and COSIA Guidance Documents. Total E&P Canada.

<sup>5</sup> Calculated by taking total area of land disturbed (from Alberta Environment and Parks) and multiplying by the estimated cost of reclamation per hectare (from Alberta Energy Regulator): Alberta Environment and Parks. (2015). "Oil Sands Mine Reclamation and Disturbance Tracking by Year." Retrieved from: <http://osip.alberta.ca/library/Dataset/Details/27>

<sup>6</sup> Alberta Energy Regulator. (2017). Mine Financial Security Program. Retrieved from: <https://www.aer.ca/abandonment-and-reclamation/liability-management/mfsp>.

<sup>7</sup> Tailings ponds span over 220km<sup>2</sup> (85 miles<sup>2</sup>) across Northern Alberta: McNeill, J. (Feb. 8, 2017). Will Alberta's oilsands tailings finally be cleaned up? Pembina Institute. Retrieved from: <http://www.pembina.org/blog/will-alberta-s-oilsands-tailings-finally-be-cleaned-up>. The size of Toronto, pre-amalgamation is 97.15 km<sup>2</sup>, Vancouver is 114.97 km<sup>2</sup>, Manhattan is 87 km<sup>2</sup>, and Boston is 125.41 km<sup>2</sup>.

<sup>8</sup> Droitsch, D. (Aug. 26, 2014). Huge Ponds Hold Tar Sands Sludge, And Great Risks. NRDC, Retrieved from: <https://www.nrdc.org/experts/danielle-droitsch/huge-ponds-hold-tar-sands-sludge-and-great-risks>.

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- <sup>10</sup> Droitsch, supra note 8.
- <sup>11</sup> McNeill & Lothian, supra note 1, at 2.
- <sup>12</sup> Struzik, E. (March 27, 2014). "On Ravaged Tar Sands Lands, Big Challenges for Reclamation." Yale School of Forestry and Environmental Studies." Retrieved from: [http://e360.yale.edu/features/on\\_ravaged\\_tar\\_sands\\_land\\_big\\_challenges\\_for\\_reclamation](http://e360.yale.edu/features/on_ravaged_tar_sands_land_big_challenges_for_reclamation).
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- <sup>36</sup> Ibid.
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- <sup>53</sup> Alberta Energy Regulator, supra note 6.
- <sup>54</sup> Lemphers et al., supra note 49, at 9.
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- <sup>56</sup> McNeill & Lothian, supra note 1, at 9 (noting that in July 2015, Alberta's Auditor General announced that estimated reclamation liabilities for Alberta's mines were CAD \$20.8 billion (with only \$1.57 billion currently being held in securities).
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- <sup>61</sup> Lemphers, N. et al, supra note 49, at 7.
- <sup>62</sup> The Globe & Mail. (Mar. 21, 2017). "Alberta court puts Lexin Resources in receivership." Reuters. Retrieved from: <http://www.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/alberta-puts-lexin-resources-in-receivership-after-licenses-suspended/article34377432/>.
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