



# Alberta Tailings Ponds II

## Factual Record regarding Submission SEM-17-001

Prepared in accordance with Article 15 of the  
*North American Agreement on Environmental Cooperation*



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All of the photographs in this publication are of Alberta oil sand facilities.



## Acronyms and abbreviations

<b>AENV</b>	Alberta Environment (until 2009) [and Sustainable Resource Development] (until 2014)
<b>AEP</b>	Alberta Environment and Parks (renamed in 2014)
<b>AER</b>	Alberta Energy Regulator
<b>ASB</b>	Aurora Settling Basin
<b>BCCA</b>	British Columbia Court of Appeal
<b>BCPC</b>	British Columbia Provincial Court
<b>CAPP</b>	Canadian Association of Petroleum Producers
<b>CEAA</b>	Canadian Environmental Assessment Act
<b>CEC</b>	Commission for Environmental Cooperation
<b>CELR</b>	Canadian Environmental Law Reports
<b>CNRL</b>	Canadian National Resources Limited
<b>DFO</b>	Department of Fisheries and Oceans
<b>ECCC</b>	Environment and Climate Change Canada
<b>EPEA</b>	Alberta Environmental Protection and Enhancement Act
<b>JOSMP</b>	Joint Oil Sands Monitoring Program
<b>KOA</b>	Keepers of the Athabasca
<b>LAR</b>	Lower Athabasca Region
<b>LARP</b>	Lower Athabasca Regional Plan
<b>NAAEC</b>	North American Agreement on Environmental Cooperation
<b>NAFTA</b>	North American Free Trade Agreement
<b>OSCA</b>	Oil Sands Conservation Act
<b>OSMP</b>	Oil Sands Monitoring Program
<b>OSPW</b>	oil sands processed water
<b>RAMP</b>	Regional Aquatics Monitoring Program
<b>REDA</b>	Alberta Responsible Energy Development Act
<b>SCC</b>	Supreme Court of Canada
<b>SEM</b>	Submissions on Enforcement Matters
<b>SPO</b>	standard operation procedures
<b>TMF</b>	tailings management framework
<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organization







## Definitions

<b>Agreement</b>	North American Agreement on Environmental Cooperation
<b>Parties</b>	The Parties to the North American Agreement on Environmental Cooperation: Canada, Mexico and the United States
<b>Ramsar Convention</b>	Convention on Wetlands of International Importance Especially as Waterfowl Habitat
<b>Martin report</b>	Martin, J., <i>State of the Science in Environmental Chemical Forensics for Distinguishing Natural and Anthropogenic Sources of Bitumen-Impacted Water</i> (23 April 2019), CEC

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## Units of measure, chemical elements, substances, abbreviations

<b>FTICR-MS</b>	Fourier Transform Ion Cyclotron Resonance Mass Spectrometry
<b>HPLC</b>	High-performance Liquid Chromatography
<b>km<sup>2</sup></b>	square kilometer
<b>K-Q</b>	Cretaceous formations (K) and Pleistocene and Recent deposits (Q),
<b>m<sup>3</sup></b>	cubic meters
<b>m<sup>3</sup>/s</b>	flow rate in cubic meters per second
<b>Mm<sup>3</sup></b>	million cubic meters
<b>NA</b>	naphthenic acid
<b>QTOF</b>	Quadrupole Time of Flight

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### Notes of clarification

Maps and other illustrations included in this factual record were produced from available sources, are not to scale, and are purely for purposes of illustration.

Unless otherwise indicated, all official documents cited in this factual record are contained in the archive of the Secretariat. The cited page numbers of the Submission and the Response refer to their original English versions.

### URL shortener

Due to the length of some of the Internet addresses cited in this document, BL.ink <bl.ink> was used to abbreviate the URLs. In each case, the functionality of the corresponding link was checked and the date viewed is specified.

### Note on agency organization

The factual record makes reference to various Canadian governmental agencies at both the federal and provincial level. At the federal level, Environment and Climate Change Canada (ECCC) is responsible for the pollution prevention provisions of the *Fisheries Act*, the primary environmental law referenced in this document. ECCC was previously known as Environment Canada (EC), and it is headed by the Minister of Environment and Climate Change. The federal Department of Fisheries and Oceans (DFO) also has authority to administer other parts of the *Fisheries Act*, which are not subject to this factual record.

At the provincial level, the two main agencies involved in tailings ponds are Alberta Environment and Parks (AEP) and the Alberta Energy Regulator (AER). AEP was previously known as Alberta Environment, including the acronyms AE and AENV. Since its creation in 1938, Alberta's energy regulator has had a number of names over the years, including the Petroleum and Natural Gas Conservation Board, the Oil and Gas Conservation Board, the Energy Resources Conservation Board, and the Alberta Energy and Utilities Board.

### Development of this factual record

This factual record was developed by Submissions on Enforcement Matters and Legal Unit of the Secretariat of the Commission for Environmental Cooperation. Also contributing to this document were Secretariat consultants Martin Olszynski, Jonathan Martin, and Patrick Kanopoulos. The information contained herein does not necessarily reflect the views of the CEC Council or the Governments of Canada, Mexico, or the United States of America.







# Summary of the Facts in this Factual Record

## Background

- i. On 26 June 2017, Environmental Defence Canada and the Natural Resources Defense Council (based in the United States), along with Canadian resident Daniel T'seleie (the "Submitters"), filed SEM-17-001 (Alberta Tailings Ponds II) (hereinafter the "Submission") with the Secretariat. The Submitters assert that the Government of Canada ("Canada") is failing to enforce the pollution prevention provisions of the federal *Fisheries Act* with respect to alleged leaking of deleterious substances, and specifically oil sands processed water (OSPW), from tailings ponds of oil sands operations in northeastern Alberta. On 20 August 2018 in Council Resolution 18-01, the CEC Council unanimously instructed the Secretariat to develop a factual record for submission SEM-17-001 (see paragraphs 6-24, below).

## Scope of Factual Record

- ii. In accordance with Council Resolution 18-01, this factual record presents relevant factual information relating to the Submitter's assertions concerning effective enforcement of the pollution prevention provisions (subsection 36(3)) of the *Fisheries Act*, in connection with:
  - Alberta's relationship with Canada with respect to the assertions and specific sites referred to in the submission, as well as other specific sites mentioned in Canada's response;
  - the state of the publicly available peer-reviewed science on identifying differences between naturally-occurring bitumen-influenced water and anthropogenic oil sands process-affected water (OSPW); and
  - how the Oil Sands Monitoring Program (OSMP, formerly the Joint Oil Sands Monitoring Program) is carried out and how it fits into Canada's enforcement of the *Fisheries Act*.
- iii. Regarding the information presented in this factual record concerning the above scope, a review of the information shows:
  - The Secretariat could not locate any information supporting any relationship between Alberta and Canada with respect to releases from tailings ponds at sites referred to in the submission or Canada's response. There are, however, a number of documents, including interagency agreements and policies, which create the structure for a relationship with respect to the *Fisheries Act* and other areas which may concern oil sands tailings ponds (e.g., interagency notification process for spills and releases between Alberta and Canada) as well as the OSMP, which is discussed below.
  - The Secretariat commissioned an independent expert to assess the state of peer-reviewed science relevant to this investigation. The expert concluded that there is scientifically valid evidence of OSPW seepage into near-field groundwater around tailings ponds, especially when compared with the first peer-reviewed evidence published in 2009. However, there is generally less publicly available peer-reviewed science that OSPW is reaching natural surface waters.
  - With respect to OSMP, as Canada noted in its response to the Submission, the program does not have an enforcement mandate but is rather an ambient monitoring program designed to support and inform regulatory and policy decision-making concerning any potential environmental impacts of oil sands operations.

## Fisheries Act—Environmental Law in Question

- iv. In this submission and factual record, the environmental law in question is Canada's *Fisheries Act*. Subsection 36(3) of this federal law prohibits the release of any deleterious substance into water frequented by fish. Subsection 36(3) also prohibits the deposit of a deleterious substance into any place from which the substance may enter water frequented by fish. According to Canadian courts, and as acknowledged by Canada in its Response, this prohibition does not require that the deposit of such deleterious substance produce a demonstrable adverse effect on the receiving environment nor does it require the deleterious substance to render the receiving water deleterious. Therefore, for a violation of subsection 36(3) to occur, it is sufficient that a deleterious substance has been deposited into water frequented by fish or that it has been deposited into a place from which the deleterious substance, or any other deleterious substance that results from the deposit, can enter such water.

## Summary of Inspections of Tailings Ponds by Canada

- v. In its response to the submission, Canada reported to the Secretariat that under the *Fisheries Act* it conducted a series of proactive inspections at various tailings ponds sites in Alberta, some of which found elevated readings of certain water quality parameters. Canada determined after these inspections, however, that it still did not have reasonable grounds to believe that there were violations of the pollution prevention provisions of the *Fisheries Act* at any of the tailings ponds inspected. Canada also stated that the main reason for its decision not to undertake any other types of enforcement activities, including prosecutions, was that it could not determine if these elevated readings came from natural or anthropogenic (i.e., oil sands processed water (OSPW)) sources.
- vi. In follow-up communications with the Secretariat, Canada confirmed that it arrived at these conclusions on the basis of samples that its officers had collected both on and off oil sands sites in the course of their inspections. Canada noted that while it relied on provincially mandated groundwater monitoring reports for added context (further discussed below), it conducted its inspections independently and not in concert with Alberta and noted that its conclusions were based on sample data collected by Environment and Climate Change Canada (ECCC).

## Provincial Law

- vii. Although provincial laws are not the primary focus of this factual record, a short review of the applicable Alberta laws relating to the approval process relating to oil sands facilities and associated tailings ponds is provided because these laws are directly related to how Alberta interacts with Canada at oil sands mining operations and through the OSMP.

## Oil Sands Mining Process

- viii. OSPW results from the separation of bitumen from sand and other materials following surface mining. Oil sands tailings ponds are designed and constructed for the purpose of temporarily storing OSPW and for allowing fine particles to settle out of the tailings, with the water levels remaining above the tailings; eventually, reclamation of the oil sands tailings pond must occur under provincial law.

- ix. OSPW is an acutely toxic substance containing, among other things, naphthenic acids and heavy metals. The outer walls of oil sands tailings ponds are constructed from excavated permeable materials from the oil sands mining process. Due in part to the unavailability and prohibitive expense of impermeable linings, and the requirement to maintain the structural integrity of the tailings pond walls, OSPW slowly seeps through the walls of the tailings ponds. Seepage collection ditches, designed to reverse migration of groundwater away from tailings ponds, intercept OSPW that seeps through the permeable walls of the tailings pond. This water is collected, usually in a seepage pond, which may or may not be lined, then pumped back into the tailings pond.

## Oil Sands Process Water Leakage

- x. The physical process that lies at the center of the Submitter's assertion is that not all OSPW seepage is being recaptured by the seepage collection systems. As a result, the Submitters assert that OSPW is entering the groundwater system and is ultimately being transported into surface waters frequented by fish (i.e., the Athabasca River and its tributaries). If this is occurring, and as the Submitters contend, this situation would clearly appear to be a violation of the *Fisheries Act*. Indeed, Canada is currently developing regulations under the Act for planned intentional releases of OSPW to the Athabasca River, confirming that OSPW is a deleterious substance.
- xi. The Canadian Association of Petroleum Producers (CAPP) submitted groundwater monitoring reports to the Secretariat from two oil sands facilities operated by Syncrude and Suncor. A review of the data presented in the Syncrude monitoring reports by the Secretariat's expert shows consistent evidence of seepage of OSPW from tailings ponds into groundwater at certain monitoring wells that are close in proximity to surface water, including tributaries to the Athabasca River.

## Peer reviewed Science on determining source of bitumen-related substances in groundwater and water

- xii. In accordance with Council's Resolution, the Secretariat's expert conducted a review of publicly available peer-reviewed literature on whether scientific analysis can determine if bitumen-related substances present in groundwater or surface waters are naturally occurring or the result of illegal discharges of OSPW from tailing ponds. Overall, the Secretariat's expert concluded that, based on the scientific tools available today, there is some scientifically valid evidence of OSPW seepage into near-field groundwater around tailings ponds when compared with the first peer-reviewed evidence published in 2009, given certain parameters being present. Even with imperfect analytical methods, as further described below, the Secretariat's expert found that the literature discloses spatial trends showing declining chemical signals moving away from tailings ponds, which can be indicative of seepage.
- xiii. The Secretariat's expert review noted that practical challenges and sources of uncertainty are not easily overcome when attempting to differentiate between OSPW and natural sources of bitumen-impacted waters. One apparent challenge has been the limited number of samples of OSPW from presumed tailings pond sources, in part due to the lack of legal authority and logistics for sampling around tailings ponds. Another challenge is that the leading edge of any groundwater plume of OSPW likely represents OSPW that is many decades old, and its water chemistry is therefore not expected to match the water chemistry in fresh OSPW taken as a reference from today's tailings ponds. Thus, spatial and temporal variability of the source (OSPW) and of the receptor (groundwater or surface waters) need to be understood to raise confidence and provide necessary statistical power to avoid false positives and false negatives. Finally, bitumen-derived organics are complex mixtures containing millions of substances that remain impossible to fully characterize, even with the most sophisticated instrumentation presently available.



CEC Secretariat

- xiv. The Secretariat's expert found that the literature shows that although tailings ponds have seepage water collection systems intended to capture horizontal seepage through the walls of the tailings pond structure, there is both experimental and monitoring evidence for a slow, vertical groundwater seepage pathway that may circumvent these collection systems and contaminate aquifers.
- xv. The Secretariat's expert also found that there is generally less publicly available evidence that OSPW is likely reaching natural surface waters, as opposed to groundwater. Although mass spectrometry fingerprinting of upwelling groundwater in the Athabasca River immediately adjacent to one of the area's oldest tailings ponds has led to conclusions by federal scientists that OSPW is reaching the river, some of these findings have been openly debated in peer-reviewed articles and there are uncertainties in the approaches and interpretations taken, despite some compelling evidence.



- xvi. In systematic surveys of the mainstem Athabasca River with the best available analytical methods, the literature shows that there is no evidence of dissolved bitumen-derived organics (natural or anthropogenic) being detectable in any water samples, although a major challenge to spotting any seepage is dilution in a very large river. Nevertheless, two tributaries (Beaver River and McLean Creek) are suspected of receiving OSPW seepage or runoff from nearby tailings ponds, based on analysis showing elevated naphthenic acid (NA) concentrations and similar organic and inorganic chemistry profiles, compared to industry studies of fresh OSPW.

## Canada's Relationship with Alberta

- xvii. To consider Canada's relationship with Alberta regarding tailings ponds referenced in the submission, and Canada's response, with respect to the pollution prevention provisions of the *Fisheries Act*, the Secretariat found a number of intergovernmental agreements, regulatory documents, and other information which creates the basis for such a relationship to exist but could not locate any information supporting a relationship between Alberta and Canada with respect to the specific tailings pond sites.
- xviii. The Secretariat reviewed a 1994 administrative agreement between Canada and Alberta and requested all public documents which indicate how the agreement is implemented. The Secretariat's review of this documentation shows that except for interagency notification of spills and releases, none of which has ever concerned releases from tailings ponds, it was unclear how Canada and Alberta coordinated on the oil sands tailings ponds referenced in the SEM process. Rather, public information the Secretariat reviewed indicated that each branch of government operates under its own laws (but see the coordination under the Oil Sands Monitoring Program, below).
- xix. Under annual reports to Parliament mandated by the *Fisheries Act*, Canada reported the basic structure of this administrative agreement to Parliament, but did not note any specific activity or coordination between Alberta and Canada concerning tailings ponds, even when inspections of oil sands ponds were taken between 2009 and 2014. Canada also indicated to the Secretariat that during this inspection period, coordination between the federal government and the province did not occur, since "inspections did not address provincial legislation." Based on the information reviewed, the provincial regulatory system and the federal system overlap only in the context of the joint environmental review process for approving new oil sands facilities.

## Oil Sands Monitoring Program

- xx. The Council also instructed the Secretariat to examine Canada's Oil Sands Monitoring Program (OSMP) and how this program fits into Canada's enforcement of the *Fisheries Act*. Canada, in its response to the Submission, as well as in communications with the Secretariat, stated that the OSMP (as well as its predecessor, the "Joint Oil Sands Monitoring Program") does not have an enforcement mandate but is rather designed to support and inform regulatory and policy decision-making. The Secretariat notes that a number of the scientific studies reviewed by its expert were the result of projects in this monitoring program.

Canada's science-based efforts at monitoring environmental effects of oil sands developments have resulted in several iterations of various programs and initiatives. The present OSMP's stated purposes include the acquisition and reporting of regional data on baseline environmental conditions, tracking environmental impacts of oil sands development, and the assessment of cumulative environmental effects. Governance of the OSMP involves representatives from First Nations, the federal government, the province, industry, and other stakeholders.



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## 1. Summary of the History of the Submission, including Scope of the Factual Record

1. This section summarizes the history of the process relating to Submission SEM-17-001 (*Alberta Tailings Ponds II*), which is the subject of this factual record. A more detailed record of the submissions process, including the related Secretariat and Council determinations, can be found on the Registry of Submission available on the Commission for Environmental Cooperation's (CEC) website.<sup>1</sup>
2. The CEC is an international organization created under the environmental side agreement to the North American Free Trade Agreement (NAFTA). That agreement, the North American Agreement on Environmental Cooperation (NAAEC or the "Agreement"), is signed by the three NAFTA countries (or Parties), Canada, Mexico, and the United States, and establishes a cooperative environmental agenda, among other undertakings. That agenda is administered by the CEC through its Secretariat office located in Montreal, Quebec, Canada.
3. The NAAEC also established, in Articles 14 and 15, a process allowing any person or nongovernmental organization to file a submission with the Secretariat asserting that a Party to the NAAEC is failing to effectively enforce its environmental law. This process is known as the Submissions on Enforcement Matters (SEM) process.<sup>2</sup> Although the term "effectively enforce its environmental law" is not defined in the NAAEC, the agreement states the following:

A Party has not failed to "effectively enforce its environmental law" or to comply with Article 5(1) in a particular case where the action or inaction in question by agencies or officials of that Party:

1. reflects a reasonable exercise of their discretion in respect of investigatory, prosecutorial, regulatory or compliance matters; or
  2. results from bona fide decisions to allocate resources to enforcement in respect of other environmental matters determined to have higher priorities;
4. Once a submission is filed, the Secretariat must determine whether it meets all NAAEC Article 14 requirements, one of the most important being whether the submitter has alleged that an environmental law, as defined by the NAAEC<sup>3</sup>, is not being effectively enforced. The NAAEC defines "environmental law":
    2. For purposes of Article 14(1) and Part Five:
      - (a) "environmental law" means any statute or regulation of a Party, or provision thereof, the primary purpose of which is the protection of the environment, or the prevention of a danger to human life or health, through
        - (i) the prevention, abatement or control of the release, discharge, or emission of pollutants or environmental contaminants,
        - (ii) the control of environmentally hazardous or toxic chemicals, substances, materials and wastes, and the dissemination of information related thereto, or
        - (iii) the protection of wild flora or fauna, including endangered species, their habitat, and specially protected natural areas in the Party's territory, but does not include any statute or regulation, or provision thereof, directly related to worker safety or health.



- (b) For greater certainty, the term “environmental law” does not include any statute or regulation, or provision thereof, the primary purpose of which is managing the commercial harvest or exploitation, or subsistence or aboriginal harvesting, of natural resources.
  - (c) The primary purpose of a particular statutory or regulatory provision for purposes of subparagraphs (a) and (b) shall be determined by reference to its primary purpose, rather than to the primary purpose of the statute or regulation of which it is part.
- 5. If the Secretariat finds that the submission meets all of the applicable requirements, it then requests a response from the Party that is the subject of the submission. Based on that response, the Secretariat determines whether to recommend to the CEC Council that it be authorized to develop a factual record on the subject of the submission. If the Council agrees, the Secretariat develops the factual record consistent with the Council’s direction.<sup>4</sup>
- 6. On 26 June 2017, Environmental Defence Canada and the Natural Resources Defense Council (based in the United States), along with Canadian resident Daniel T’seleie (the “Submitters”), filed SEM-17-001 (Alberta Tailings Ponds II) (hereinafter the “Submission”) with the Secretariat. The Submitters assert that the Government of Canada (“Canada”) is failing to enforce subsection 36(3) of the federal *Fisheries Act* (subsections 36(3) to 36(6) are also known as the Act’s pollution prevention provisions), in relation to alleged leakage of deleterious substances from oil sand operations’ tailings ponds into surface waters frequented by fish, or through groundwater and the surrounding soil into surface waters frequented by fish, in northeastern Alberta (Annex 1).<sup>5</sup> The Submitters cite documents, such as environmental assessments for oil sands projects and scientific studies, which either predict or document seepage from tailings ponds into the environment.<sup>6</sup>
- 7. Subsection 36(3) of the *Fisheries Act* specifically provides:
 

Subject to subsection (4), no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water.<sup>7</sup>

As Canada notes in its response, subsection 36(4) of the Act provides that a deposit of a deleterious substance is not an offence if permitted by regulation. Subsections 36(5) and (5.2) allow the Governor in Council and the Minister to enact regulations authorizing the deposit of deleterious substances, subject to conditions such as monitoring and reporting. No federal regulations currently exist that apply to the deposit of substances from oil sands tailings ponds, nor have they during the period covered by the Submission.<sup>8</sup> As discussed in section 3.1, however, Canada is currently in the process of developing oil sands effluent regulations under the *Fisheries Act*. Thus, 36(3) of the *Fisheries Act* constitutes a prohibition of the deposit of any oil sands processed water (OSPW), including deposits from tailings ponds, into fish-bearing waters or into any place where it may enter such waters.
- 8. According to the Submission, tailings ponds are essentially holding ponds used to contain waste product comprised of water, sand, silt, and petrochemical waste from the oil sands mining process which, in Alberta, is accomplished through surface mining followed by a separation process that removes the bitumen from the sand. For a more detailed summary of the oil sands mining process, see section 2.2.

9. Submitters assert that Canada has not “prosecuted any company” for any such incident of leakage, “nor has it pursued regulation governing tailings pond leakage.” Additionally, the Submitters assert that Canada has relied upon the Alberta provincial government, under an administrative agreement with Alberta, to monitor, report, and investigate releases from tailings ponds that may contravene subsection 36(3) and that Alberta’s reliance on an allegedly “discredited” monitoring is further evidence of Canada not enforcing the Act.<sup>9</sup>
10. In its response to the Submission, Canada advised that Environment and Climate Change Canada (ECCC) has undertaken under subsection 36(3) of the *Fisheries Act* a series of “proactive inspections” between 2009 and 2014 at the following tailings ponds facilities: Syncrude Mildred Lake and Beaver Creek; Canadian Natural Resources Limited (CNRL) Horizon; Suncor Tar Island Pond 1; Suncor South Tailings Pond; Shell Canada Limited Jackpine Project; Shell Albion Sands Muskeg River (external tailings pond); and Syncrude Canada Limited Aurora. Canada advised that these inspections, as well as other ongoing efforts regarding scientific research, constitute effective enforcement of its environmental laws.<sup>10</sup>
11. Since these inspections ended in 2014, Canada has returned to a “reactive enforcement approach,” which Canada defines as responding to incidents that occur and to information received from the public. Canada notes that these incidents can have significant adverse environmental impact and, “while unplanned, constitute a critical part of [Environment Enforcement Division’s] work,” with considerable resources set aside for these activities to be conducted throughout the year.<sup>11</sup>
12. Canada’s response also provides information about why it did not undertake any *Fisheries Act* prosecutions against tailings ponds operators:

For all of the inspections conducted, enforcement officers, after consulting in depth with ECCC scientists, determined that they did not have reasonable grounds to believe that there was a violation of the pollution prevention provisions of the Act. The primary reason for these determinations was an inability to differentiate whether the source of deleterious substances in bitumen influenced groundwater samples was anthropogenic or naturally occurring.<sup>12</sup>

Thus, even where inspections found exceedances of Canadian water quality guidelines, and according to the Secretariat’s review of information submitted by Canada, there were at least 15 exceedances found at six tailing ponds sites,<sup>13</sup> Canada asserted that it did not have reasonable grounds to believe that a violation had occurred at any of these sites because it could not determine whether such exceedances were caused by leaking from tailings ponds or were naturally occurring.

13. Canada also indicated in its Response that it could not undertake other types of enforcement activities, such as investigations or orders, because of the inability to differentiate between naturally occurring and man-made exceedances.<sup>14</sup> In order to conduct an inspection, an officer needs a reasonable ground to believe that work or an undertaking is occurring to which the Act applies and, in order to take an enforcement action such as a warning letter or a direction, an officer needs reasonable grounds to believe that an offence has occurred.
14. In addition, Canada advises that the evidentiary standard related to prosecutions precluded it from bringing any prosecutions under the *Fisheries Act* because it could not prove beyond a reasonable doubt that a violation had occurred. Thus, Canada’s position is that the inspections it undertook and other actions taken were legally sound and consistent with the NAAEC’s obligation to effectively enforce its environmental law.<sup>15</sup>



15. Canada's response also focuses on its scientific research, which it says has been advancing the knowledge and tools needed to enforce the pollution prevention provisions of the Act. Canada discusses its ongoing scientific research, separate from its enforcement branch, related to the identification of OSPW, as well as Canada's relationship with Alberta and the province's actions under its law and policies.
16. Based on this response, the Secretariat's next step was to determine whether to recommend to the Council that it be authorized to develop a factual record, under Article 15(1) of the NAAEC. On 19 April 2018, the Secretariat recommended the development of a factual record.<sup>16</sup>
17. The scope of the Secretariat's factual record recommendation dealt with three areas:
  - (i) the effective enforcement of subsection 36(3) of the *Fisheries Act* and why Canada did not implement enforcement actions other than inspections, such as investigations, orders, or information gathering actions, as well as the state of research on identifying differences between naturally-occurring bitumen-influenced water and man-made OSPW;
  - (ii) Canada's relationship with Alberta under joint agreements and other authorities, including information collection and sharing and other activities under Alberta regulatory authorities, how Alberta assists Canada in carrying out inspections, and how the joint oil sands monitoring program is carried out; and
  - (iii) the Alberta Energy Regulator's authority relating to the regulation and operation of oil sands tailings ponds, including information it collects, and how this authority relates to Canada's enforcement of the *Fisheries Act*.<sup>17</sup>
18. In response to this Secretariat recommendation, on 20 August 2018 the Council voted to instruct the Secretariat to develop a factual record in three areas but disagreed with the Secretariat's recommendation regarding the issue of whether Canada's effective enforcement of subsection 36(3) of the *Fisheries Act* should be addressed in the factual record (Annex 2). The text of the Council's resolution reads:

## THE COUNCIL HEREBY UNANIMOUSLY DECIDES TO:

**INSTRUCT** the Secretariat to prepare a factual record in accordance with Article 15(4) of the NAAEC and with the Guidelines, on the following matters arising in the context of Submission SEM-17-001 related to effective enforcement of subsection 36(3) of the *Fisheries Act*:

- The state of the publicly available peer-reviewed science on identifying differences between naturally-occurring bitumen-influenced water and anthropogenic oil sands process-affected water;
- Alberta's relationship with Canada with respect to the assertions and specific sites referred to in the submission, as well as other specific sites mentioned in Canada's response; and
- How the Oil Sands Monitoring Program (formerly the Joint Oil Sands Monitoring Program [JOSM]) is carried out and how it fits into Canada's enforcement of the *Fisheries Act*.

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"[I]t is not proper for a factual record to speculate on whether the discretionary [enforcement] powers of the Minister under the Act should have been pursued."

CEC Council

19. Regarding the Secretariat's recommendation concerning the effective enforcement of subsection 36(3), the Council noted that "Canada has exercised its enforcement authority by conducting proactive inspections under the Act to serve the purpose of assessing compliance and [the Council] is of the view that it would not be appropriate for the Secretariat to comment on how legal standards of proof should be met in relation to the Parties' domestic legal enforcement activities." The Council further reasoned that since a Party is not required to pursue every enforcement tool available to it, it was not clear what additional information a factual record could obtain, beyond that which was provided by Canada in its response. Additionally, the Council found "it is not proper for a factual record to speculate on whether the discretionary powers of the Minister under the Act should have been pursued."<sup>18</sup>
20. Regarding the Secretariat's request for authorization to develop a factual record on the state of the research on identifying differences between naturally-occurring bitumen-influenced water and man-made OSPW,<sup>19</sup> the Council agreed, finding that "there is public interest in the scientific research associated with the environmental impacts of oil sands development [...] to provide greater clarity on this matter under the submission."<sup>20</sup> Section 3.3 discusses this issue.
21. Regarding the Secretariat's recommendation that it be authorized to develop a factual record on Canada's relationship with Alberta under joint administrative agreements, including how a joint monitoring plan is conducted, the Council directed the Secretariat to develop a factual record "in the context of Submission SEM-17-001 related to effective enforcement of subsection 36(3) of the *Fisheries Act*" on "Alberta's relationship with Canada with respect to the assertions and specific sites referred to in the submission, as well as other specific sites mentioned in Canada's response." Section 3.2 discusses this relationship.
22. Further, the Council also directed the Secretariat to examine how the Oil Sands Monitoring Program (formerly the Joint Oil Sands Monitoring Program—JOSMP) is carried out and how it fits into Canada's enforcement of the *Fisheries Act*. Section 3.4 discusses this program.
23. Regarding the development of this factual record, the Secretariat posted a general information request on its website<sup>21</sup> and sent it to various stakeholders. The Keepers of the Athabasca (KOA), the Canadian Association of Petroleum Producers (CAPP), the Pembina Institute, and a member of the CEC Joint Public Advisory Committee all submitted information to the Secretariat. The Secretariat also made two similar information requests to Canada, and Canada's responses are included as Appendices 5 and 6.
24. The Parties may provide comments on the accuracy of the draft factual record in accordance with Article 15(5) of the Agreement. The Secretariat received comments from the US on 7 January 2020. Mexico filed its comments on January 17 while Canada submitted its comments on January 23. In accordance with Article 15(6) the Secretariat incorporated the relevant observations into the factual record and, on 13 March 2020, submitted the final factual record to the Council for a vote in accordance with Article 15(7). Pursuant to Guideline 12.3, a Party may request the Secretariat to post their comments on the SEM registry.







## 2. General Information on Alberta, Athabasca Region, and Oil Sands Operations

25. This section provides general background information on the Province of Alberta, the geographic area of northeast Alberta where the oil sands operations are located, and a general description of how oils sands mining and associated tailings ponds facilities operate.
26. Alberta is a western province of Canada and is the fourth-most populous province or territory in Canada (see Figure 1), with an estimated population over 4 million people as of 2016. Almost 75% of the province's population lives in the Calgary–Edmonton Corridor.
27. Alberta, with an area of 661,848 km<sup>2</sup> (255,500 mi<sup>2</sup>), is also the fourth-largest province geographically. Alberta extends for over 1,200 km (750 mi) from north to south. The province consists of boreal forest in the northern half, while the southern quarter of the province is prairie, with the central aspen park-land region dominates the populated Calgary-Edmonton Corridor.<sup>22</sup>

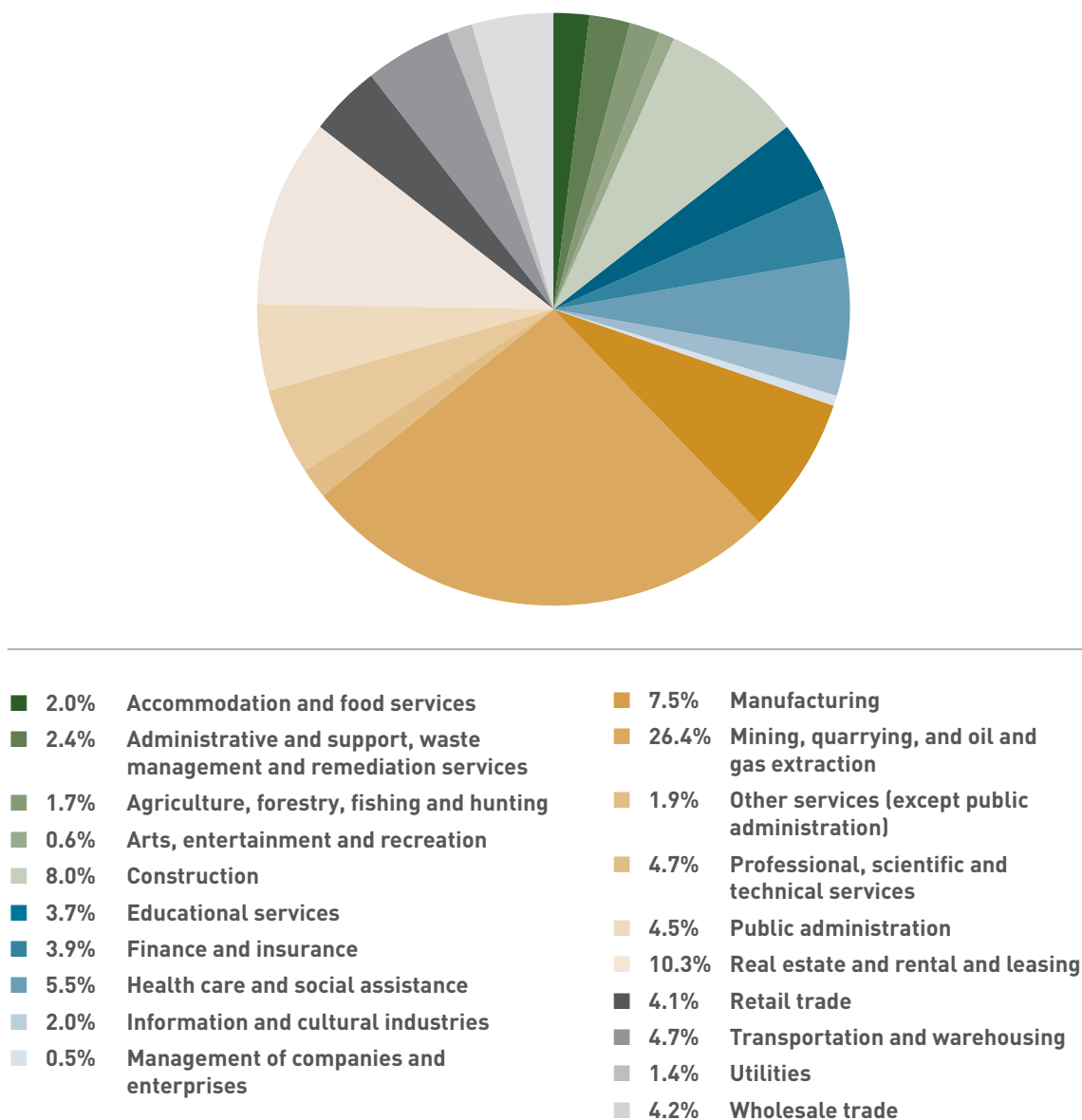
Figure 1. Map of Canada





28. Alberta's economy is driven by the energy industry,<sup>23</sup> with agriculture, forestry, and other services such as technology also contributing to the economy. Alberta's gross domestic product was C\$326 billion in 2015;<sup>24</sup> generally, its energy sector accounts for about 20% down from 23% in 1986<sup>25</sup> (see Figure 2; along with mining and quarrying, oil and gas extraction is the largest contributor to the province's GDP). The province's energy portfolio includes oil sands, which is located primarily in the Athabasca region of Alberta, natural gas, conventional oil, and mining of minerals. In 2016, Alberta produced about 81 per cent of Canada's crude oil.<sup>26</sup> Further information about oil sands is discussed below, beginning at section 2.2.

Figure 2. Gross Domestic Product per industry in Alberta, 2015



Source: Economic Dashboard of Alberta Government, available at: <<http://domestic productions/gross5>> (viewed on 25 July 2019).

## 2.1. Geography of Athabasca River Region

29. The Athabasca River is the longest river entirely within Alberta and begins at the Columbia Glacier in Jasper National Park and cuts across Alberta, from southwest to northeast, for over 1,300 km before flowing into a large delta with the Peace and Birch Rivers at Lake Athabasca, which borders Wood Buffalo National Park (Canada's largest national park and an UNESCO World Heritage Site) and straddles Alberta and Saskatchewan. The Athabasca River basin covers an area of approximately 138,000 km<sup>2</sup>, and includes landscapes as varied as snow-capped mountains, agricultural plains, boreal forest, wetlands, and small urban centres.<sup>27</sup> See Photos 1 and 2, and Figure 3.
30. The Peace-Athabasca Delta is one of the great wetlands of the world and is recognized as a wetland of international importance under the Ramsar convention,<sup>28</sup> and it is an area where the convergence of four major North American waterfowl migratory routes brings millions of ducks and geese to feed and nest there each summer. The river is also the longest undammed (or unregulated) river in the Canadian prairies and is the source of fresh surface water used in the production of oil from the Alberta oil sands. From Lake Athabasca, water flows northward, eventually into the Arctic Ocean.

Photo 1. Athabasca River (in Jasper National Park)



Source: Athabasca University, *About the Athabasca River Basin*, available at <<http://rivers.land/basin9>> (viewed on 21 August 2019)

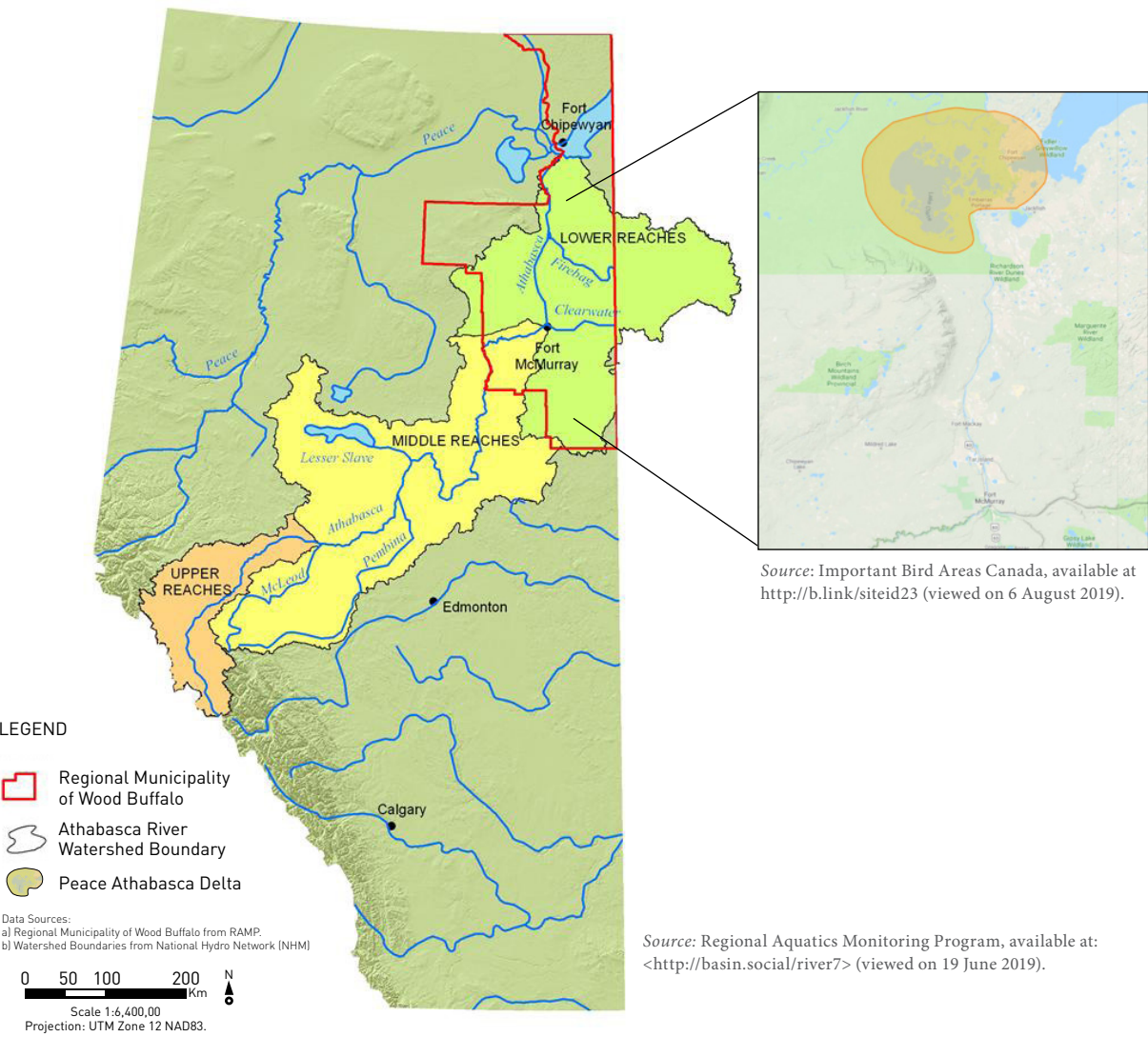


Photo 2. Athabasca River meandering



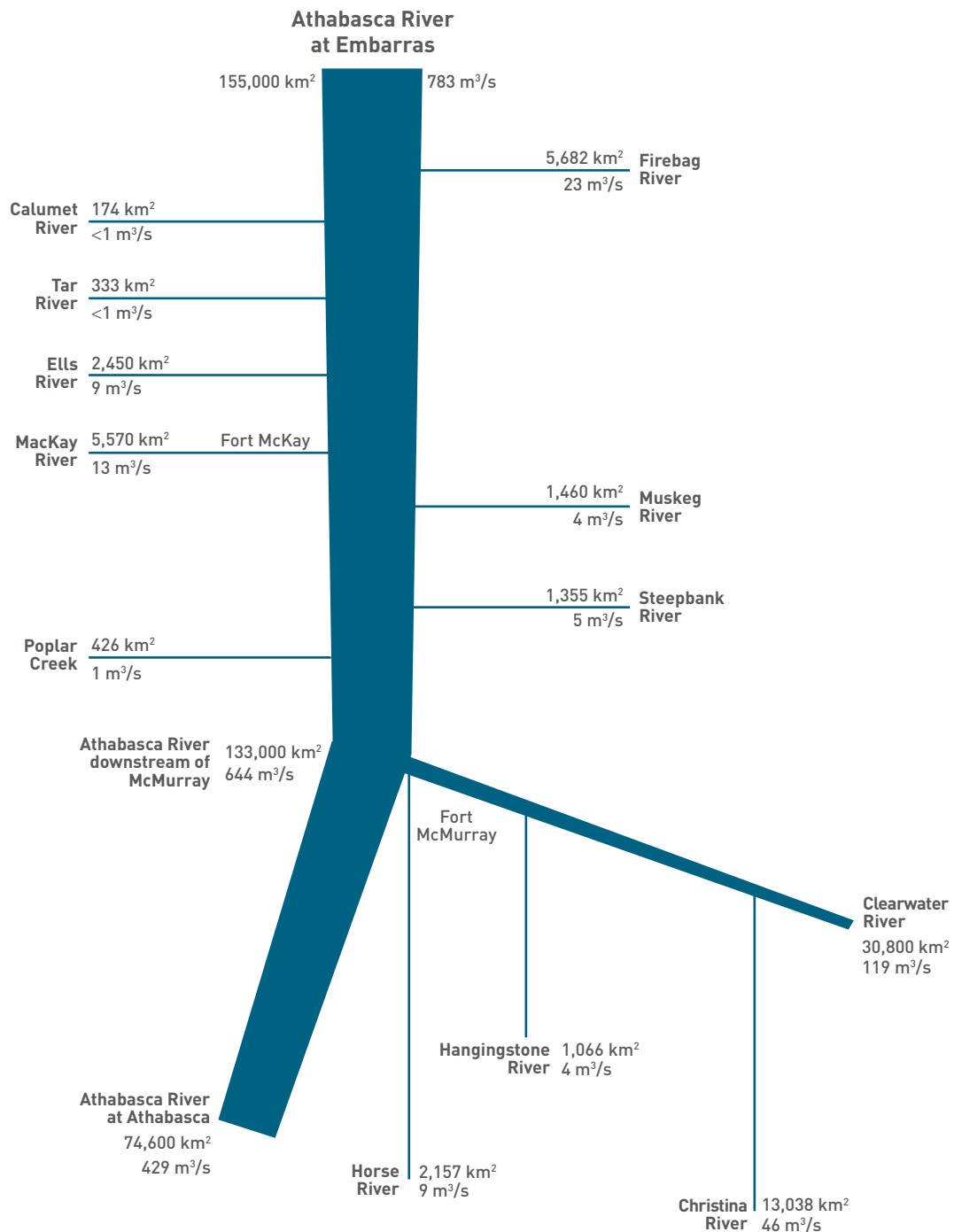
Source: Regional Aquatics Monitoring Program (RAMP), *Overview of the Athabasca River Basin Landscape*, available at: <<http://send.digital/file79>> (viewed on 19 June 2019).

Figure 3. Athabasca River regions and Peace Athabasca Delta



31. The Athabasca River system includes a total of 94 rivers, over 150 named creeks, numerous unnamed creeks, and 153 lakes.<sup>29</sup> Numerous tributaries flow into the Athabasca River, including within the Athabasca oil sands region. (See Figure 4.) The streams, rivers, lakes, and wetlands in the system have different hydrologic characteristics because of their differences in topography, climate, vegetation, geology, water storage, and groundwater-surface water interactions.<sup>30</sup>
32. The area's climate affects river flow conditions, with cold winters when most of the seasonal precipitation falls as snow and low river flows occur. Cold winters are typically followed by warm summers, when snow and glacial melt waters from the river's headwaters combine with runoff from localized snowmelt and rainfall events throughout the basin, producing the river's highest flows in June and July.<sup>31</sup>
33. The Lower Athabasca region, where most of Alberta's oil sands minable areas are located, is characterized by large tracts of forest, water resources, and fish and wildlife. Regarding fish, there are 28 (or more) species of fish in the area, including walleye, northern pike, and lake trout, and the rivers in the area serve as important wintering, spawning, and rearing grounds.<sup>32</sup>
34. The north Athabasca oil sands area<sup>33</sup> of approximately 18,000 km<sup>2</sup>, lying to the north of Fort McMurray, includes the lease areas for mineable oil sands and some in-situ developments. Approximately 950 km<sup>2</sup> (6%) is underlain by oil sands deposits accessible from the surface using traditional strip mining techniques. Groundwater in this area is contained within unconsolidated surficial deposits made up of sand and gravel of glacial origin, buried channel deposits of the same origin, and permeable sediments of deeper bedrock formations (marine to continental origin), with two major non-saline aquifer management units.<sup>34</sup>
35. Industrial activity has been taking place in the Lower Athabasca Region for more than 40 years, and at some locations effects on groundwater quality and quantity may have occurred as a result of past industrial activities.<sup>35</sup> The main groundwater challenges associated with mine development include physical disturbance of the landscape and alteration of natural drainage and recharge patterns, draw-down effects from de-watering of overburden aquifers and bedrock formations to facilitate safe mine development, potential seepage of constituents from established waste containment structures, leaching of constituents from overburden waste dumps and material stockpiles, pressure effects and constituent migration following deep-well injection of depressurization water and process wastewater, and operational upsets (spills and leaks of chemicals and hydrocarbons at processing facilities and active mine areas).<sup>36</sup>
36. According to the 2012 Lower Athabasca Region (LAR) Groundwater Management Framework, there was poor to fair knowledge of groundwater quality in the surficial sands and buried channels within the northern Athabasca oil sands area and, according to existing data, a considerable range in physical and chemical quality exists for various indicators, illustrating a high degree of variability throughout the area that results from the natural hydrogeologic complexity.<sup>37</sup>

Figure 4. Athabasca River tributaries



Source: Regional Aquatics Monitoring Program (RAMP), available at: <<http://rivers.gallery/ramp6>> (viewed on 8 July 2019).

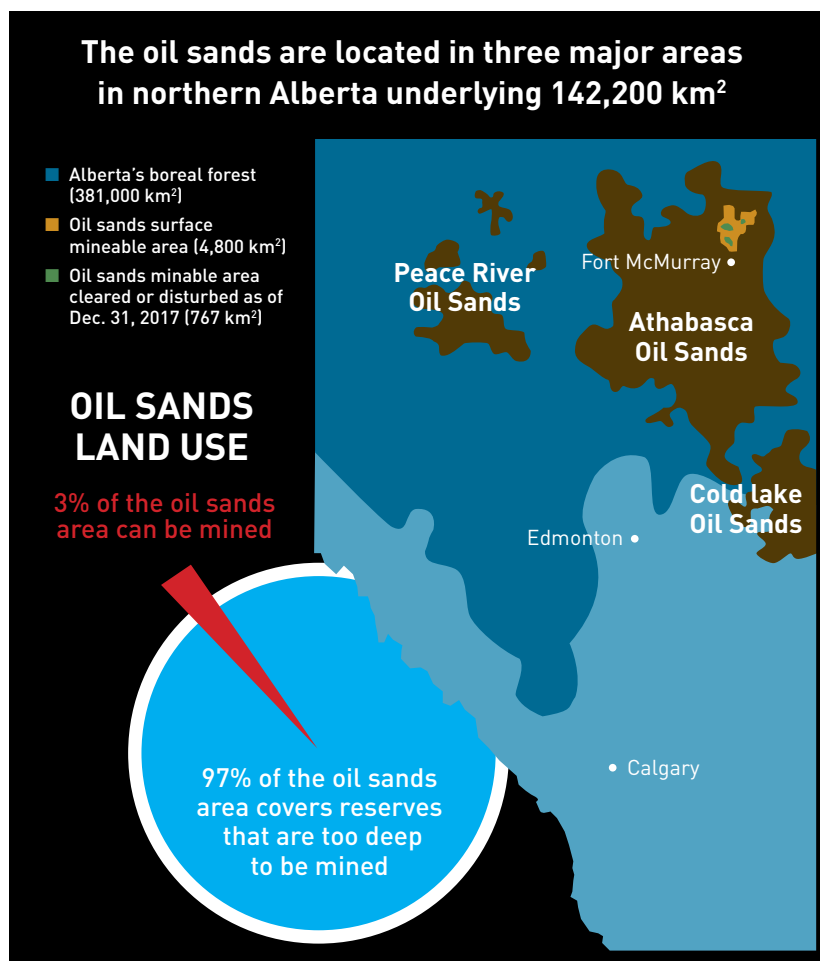
Note: m³/s = flow rate in cubic meters per second.



## 2.2. General Information about Oil Sands Deposits

37. Oil sands deposits are a unique deposit of petroleum located in several sites around the globe, including Venezuela, the United States (e.g., Utah), and Russia, but the Athabasca deposit in northeast Alberta is the largest and most developed. Oil sands are a naturally occurring mixture of sand, clay or other minerals, water and bitumen (which typically comprises only about 10% of the oil sands mixture). The mixture itself is heavy and extremely viscous, such that it must be treated before bitumen can flow and be converted into gasoline and diesel fuel. Bitumen itself is very viscous at room temperature, resembling molasses, and has been called “tar” because it appears to resemble this different substance.<sup>38</sup>
38. Alberta’s oil sands underlie 142,200 km<sup>2</sup> of the land in the Athabasca, Cold Lake and Peace River areas of northern Alberta. (See Figure 5.)

Figure 5. Alberta oil sands



Source: Province of Alberta, *Oil sands facts and statistics*, available at: <<http://b.link/sands44>> (viewed on 21 August 2019).

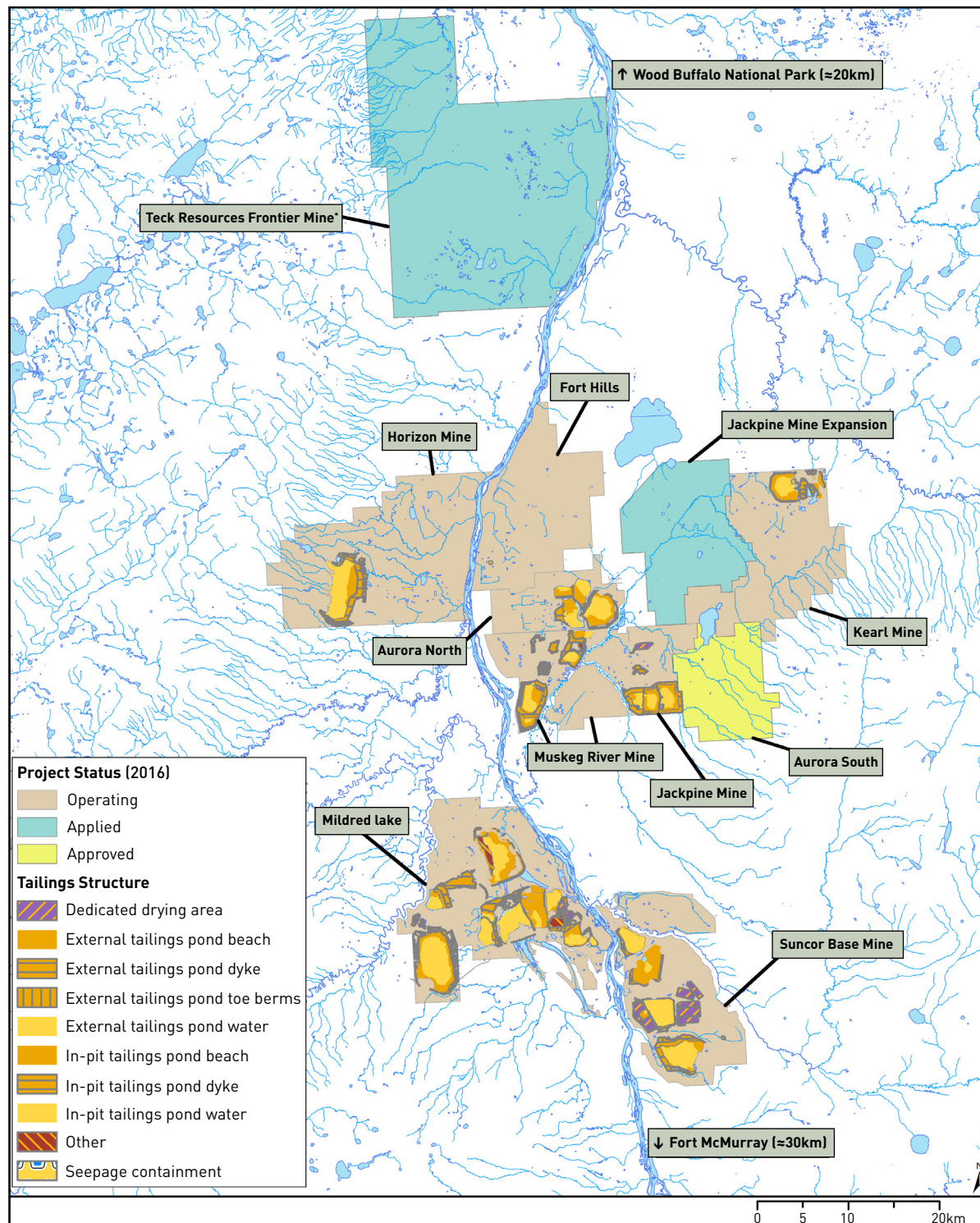


Syncrude

Reserves shallow enough to mine (to a depth of 75 meters), however, are found only within the Athabasca oil sands area, with a Surface Mineable Area (SMA) equal to about 4,800 km<sup>2</sup>, or about 3.4 per cent of total oil sands area.<sup>39</sup> Most of the bitumen deposits in the Athabasca region are found in the McMurray Formation, a layer of shale, sandstone, and oil-impregnated sands up to 150 m thick, mostly along the banks of the Athabasca River.<sup>40</sup> Oil sands exposed at the earth's surface are a widespread natural source of hydrocarbons entering the aquatic ecosystems of the area.<sup>41</sup>

39. As of 2016, the Government of Alberta reports that oil sands proven reserves were 165.4 billion barrels. Out of this volume, twenty percent is recoverable by surface mining while about eighty-percent is recoverable through *in-situ* production because the deposits are too deep to be mined; for *in-situ* production, the bitumen is heated and pumped out of the ground, leaving most of the solids behind and not producing tailings as waste.<sup>42</sup> Thus, *in-situ* process is not the subject of this factual record.
40. As of 2016, there are nine approved oil sands surface mining projects in Alberta, with seven of them operating.<sup>43</sup> (See Figure 6.)
41. Although operations vary among mines, a typical oil sands mining facility consists of the following components: an open-pit (or surface) mine; a bitumen production circuit where the bitumen is separated from the solids and water; a tailings ponds or other storage facility, where solids and OSPW are stored (process water is recovered for operational use); a tank farm, which holds the required inventories of product and diluent; and a utilities plant, which supplies steam, power and water to the facility.<sup>44</sup> Facilities also include reclamation stockpiles and overburdened stockpiles.

Figure 6. Oil sands projects along the Athabasca River, 2016



Source: Developed by the CEC Secretariat with information from: Government of Alberta (2016), Oil Sands Information Portal (OISP), available at: <<https://osip.alberta.ca>> (viewed on 22 August 2019) and Government of Canada (2016), *Lakes, rivers, glaciers in Canada-CanVec Series-Hydrographic features*, available at: <<http://b.link/datas41>> (viewed on 22 August 2019).



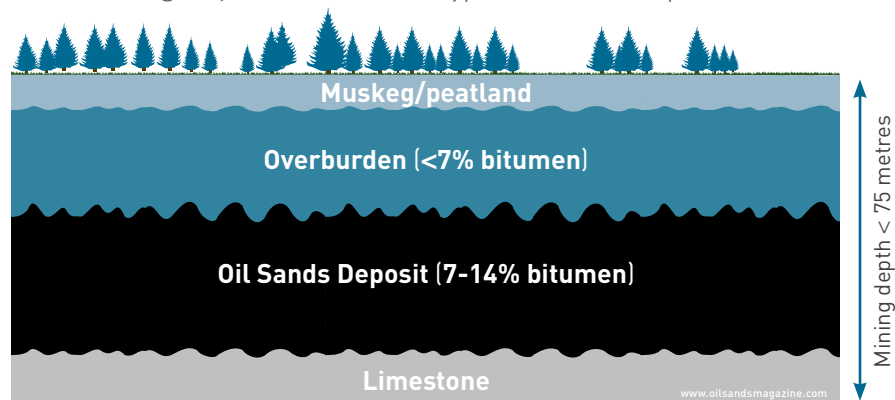
Photo 3. Aerial view of tailings ponds operations next to the Athabasca River



Source: iStock, available at: <<http://page.photos/refinery3>> (viewed on 21 August 2019).

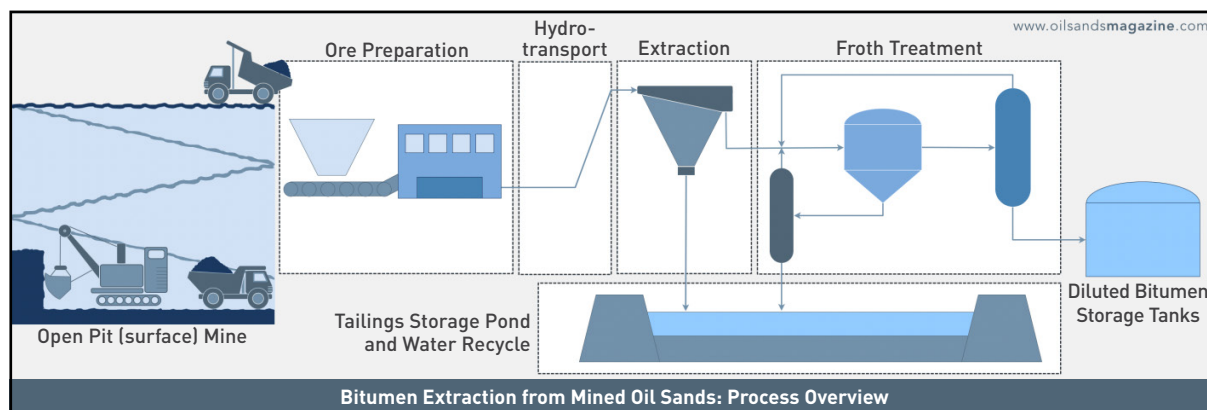
42. Initially, any vegetation, including boreal forest, is removed from the land, leaving peatland/muskeg and overburden above the oil sands deposits. (See Figure 7.) The oil sands deposits are then removed through surface mining techniques, and the excavated material is loaded into trucks. Thereafter, the bitumen-production process consists of three basic steps: (i) ore preparation, in which hot/warm water and other chemicals are added to the oil sands, producing a slurry that can be pumped to the processing plant; (ii) bitumen extraction, in which bitumen is separated by gravity from the coarse solids, producing an intermediate bitumen froth product; and (iii) froth treatment, in which a solvent or diluent is added, reducing the bitumen viscosity and removing remaining water and fine solids. The separated water and coarse and fine solids from the bitumen-production process are then deposited into tailings ponds. (See Figures 8 and 9.)

Figure 7. Cross section of typical oil sands deposit



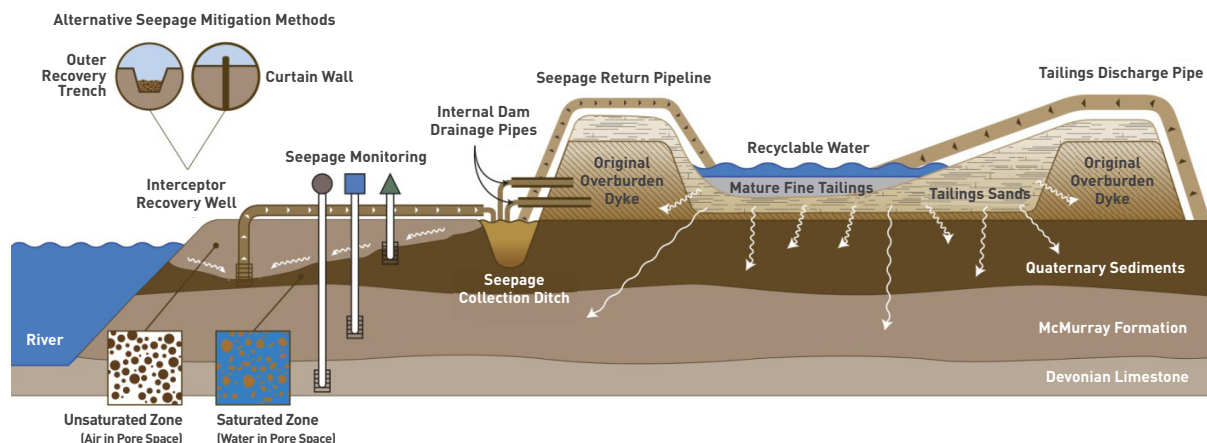
Source: *Oil Sands Magazine*, Surface mining techniques used in the oil sands, available at: <http://mines.equipment/surface1> (viewed on 21 August 2019).

Figure 8. Bitumen production mined from oil sands



Source: *Oil Sands Magazine*, Mining for Bitumen, available at: <https://www.oilsandsmagazine.com/technical/mining> (viewed on 21 August 2019).

Figure 9. Tailings pond with seepage control



Source: Ministry of Environment and Sustainable Resource Development, *Oil Sands, A Strategic Resource for Canada, North America and the Global Market*, Government of Alberta, available at <http://b.link/tailings83> (viewed on 21 August 2019).

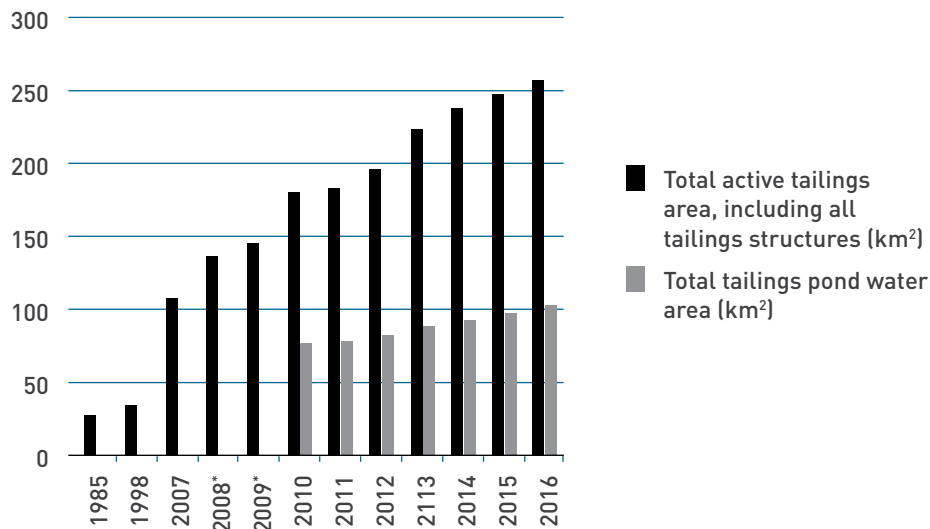




iStock.com/dan\_pnat

43. As the Government of Alberta describes it, the sand in tailings ponds settles quickly, but the remaining fine fluid tailings (44 micrometers or less in diameter) remain in suspension in the water and take decades to slowly settle, and even then only to a consistency of soft mud.<sup>45</sup> Oil sands tailings are a mixture of water, sand, fine silts, clay, residual bitumen and lighter hydrocarbons, inorganic salts and water-soluble organic compounds,<sup>46</sup> and include other compounds such as naphthenic acids, cyanide, phenols, arsenic, cadmium, chromium, copper, lead and zinc. Freshly produced OSPW is a substance acutely toxic to aquatic organisms.<sup>47</sup> Of course, the chemical profiles of OSPW from different tailings ponds and mines can be shown to be slightly different.<sup>48</sup>
44. The production of oil generally has increased by 76% in Canada since 2000, due mainly to a 300% increase from oil sands production in Alberta, although the fall in oil prices since 2014 has tempered this increase.<sup>49</sup> AER forecasts that production of upgraded and non-upgraded bitumen from oil sands will increase by 47% to 3.8 million barrels per day by 2026, up from 2.5 million barrels per day in 2016.<sup>50</sup>
45. With more oil sands production comes more tailings and greater volumes of water and fine fluid tailings released into ponds. Figure 10 shows the growth in both active tailings area and tailings pond water areas from the mid-1980s until 2016, and Figure 11 shows the growth in the volume of fine fluid tailings from the early 1970s until 2013.

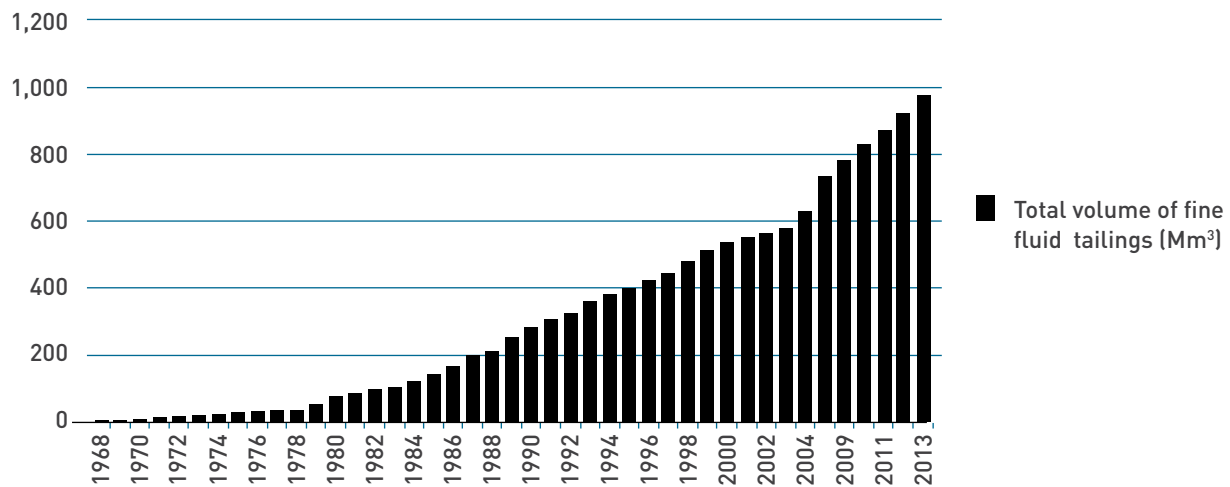
Figure 10. Total area of the oil sands tailings ponds over time



Source: Alberta Environment and Parks, *Total Area of the Oil Sands Over Time*, available at: <<http://b.link/osip96>> (viewed on 29 July 2019).

\* The data from 2008 and 2009 are estimates.

Figure 11. Total volume of fine fluid tailings

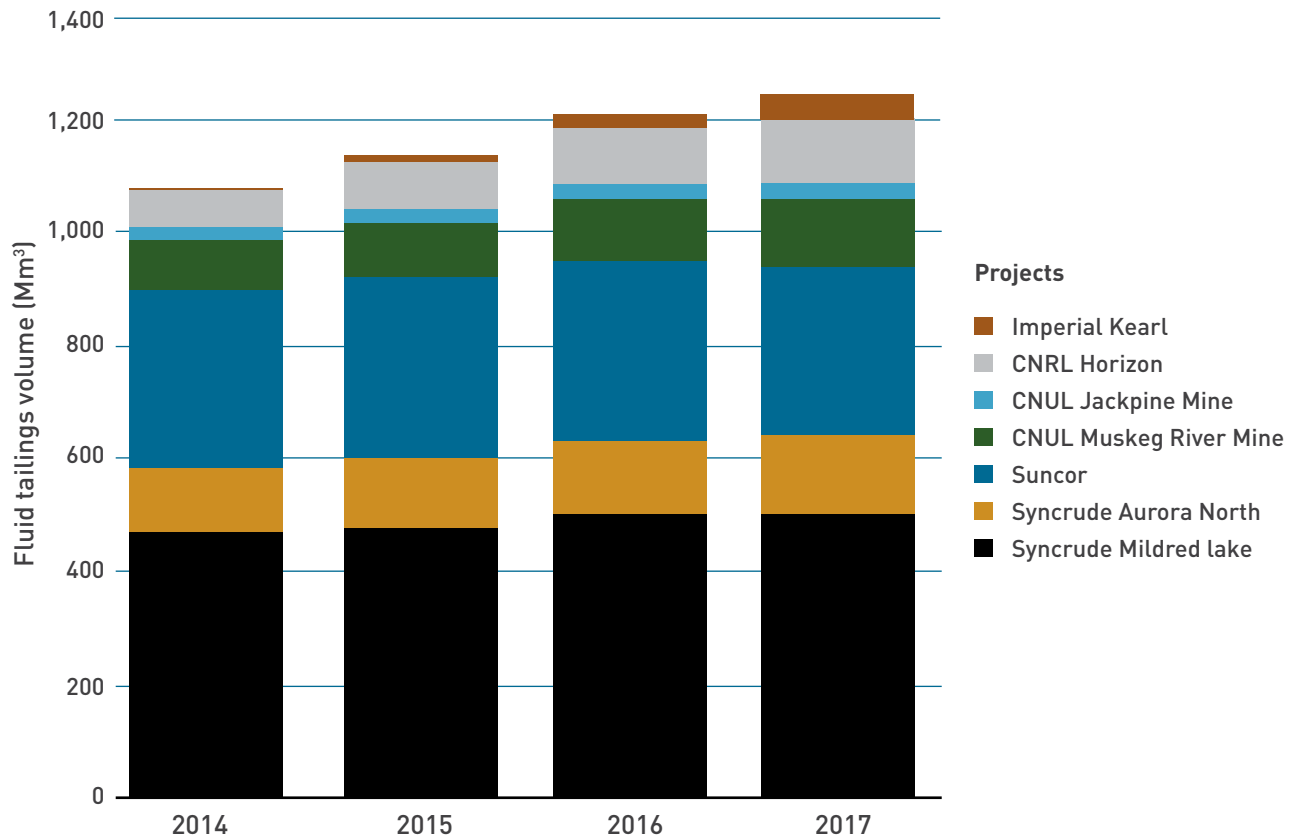


Source: Alberta Environment and Parks, *Total Area of the Oil Sands Over Time*, available at: <<http://b.link/osip30>> (viewed on 29 July 2019).

Note: "Fine tailings," "fine fluid tailings" or "FFT" is the liquid in the tailings ponds; it consists of water with very small particles of suspended clay that were produced by the mining extraction process.

46. In its 2017 annual report, AER estimated, from industry reporting, that "the amount of total fluid tailings, which includes both legacy and new fluid tailings, in the Athabasca Oil Sands region has increased from 2014 to 2017, as expected, from 1,075 Mm<sup>3</sup> to 1,240 Mm<sup>3</sup>."<sup>51</sup> These estimates, not verified by AER, are from the seven active oil sands facilities that submitted tailings management reports by the end of 2017. (See Figure 12.)

Figure 12. Tailings management report



Source: Alberta Energy Regulator, *State of Fluid Tailings Management for Mineable Oil Sands, 2017*, (September 2018), available at: <<http://latest.digital/stream8>> p. 11.

47. Historically, in their project applications, operators had proposed to convert their tailings ponds into deposits suitable for reclamation. According to a review by the Pembina Institute, operators failed to meet the commitments promised in their original operation applications, and no relevant regulatory requirements existed prior to 2009.<sup>52</sup> The volume of fluid tailings, and the area required to hold fluid tailings, continued to grow, and the reclamation of tailings ponds was further delayed. Because bitumen is generally estimated to constitute only 6%–15% of oil sands, significant amounts of water need to be used in the process to separate it from the other substances. Industry reports that 15% of the necessary water comes from freshwater from the Athabasca River, with 85% coming from recycled water from its tailings ponds.<sup>53</sup> For each barrel of bitumen, estimates range from 2-6 barrels of hot water, sometimes mixed with chemical additives to separate out constituent inorganics, silts and clays.<sup>54</sup>
48. Water use is managed in the Athabasca oil sands area by the Alberta government, under the provincial *Water Act*, whose purpose is to manage and regulate the allocation and use of water, and to support and promote water conservation.<sup>55</sup> While the use of water by industrial oil sands projects has historically been considered low enough that aquatic health for the mainstem of the Athabasca River is not impaired, current licenses allow for maximum amounts that are potentially of



concern during low flow conditions. To protect the aquatic health of the Athabasca River under low flow conditions, an Instream Flow Needs and Water Management System was developed for the Lower Athabasca River in 2007 by the provincial and federal governments, and other stakeholders.<sup>56</sup> Subsequently, this plan was superseded by the 2012 Lower Athabasca Regional Plan (LARP), and the Water Quantity Management Framework thereunder.<sup>57</sup>

49. As part of its information gathering process, the Secretariat was invited to tour the Syncrude Mildred Lake Oil Sands facility, 40 kilometers north of Ft. McMurray, Alberta.<sup>58</sup> Syncrude is a joint venture among Suncor Energy Inc., Imperial Oil Resources Limited, CNOOC Oil Sands Canada, and Sinopec Oil Sands Partnership, a Chinese company. Imperial Oil (Exxon) is the project operator. Photos taken on this tour by the Secretariat are used in this factual record with permission from Syncrude.<sup>59</sup> During the tour, Syncrude focused on its reclamation efforts, including land reclamation and a wetland created at its former East Mine and a water capping project at its Base Mine Lake, formerly the site of its original mine and tailings pond at the Mildred Lake facility. (See Photos 4, 5, 6 and 7.) Syncrude's tour also included a visit to one of its seepage ponds, which contain OSPW that has escaped from a tailings pond but has been captured by Syncrude's seepage wells. This OSPW is then pumped back to the tailings ponds. (See Photos 8 and 9.) These reclamation efforts are ongoing and are undertaken because the Alberta *Environmental Protection and Enforcement Act* [EPEA] requires all oil sand companies to return the land used in mining to a productive capability equivalent to that of the pre-disturbance landscape. According to Syncrude's website, although they have reclaimed over 3,800 hectares of land with an additional 1,000 hectares capped with soil and ready for revegetation, they have received provincial reclamation certification for only one 104 hectare parcel in 2008.<sup>60</sup>

Photos 4 and 5. Views of the Syncrude Mildred Lake Oil Sands facility and constructed wetlands

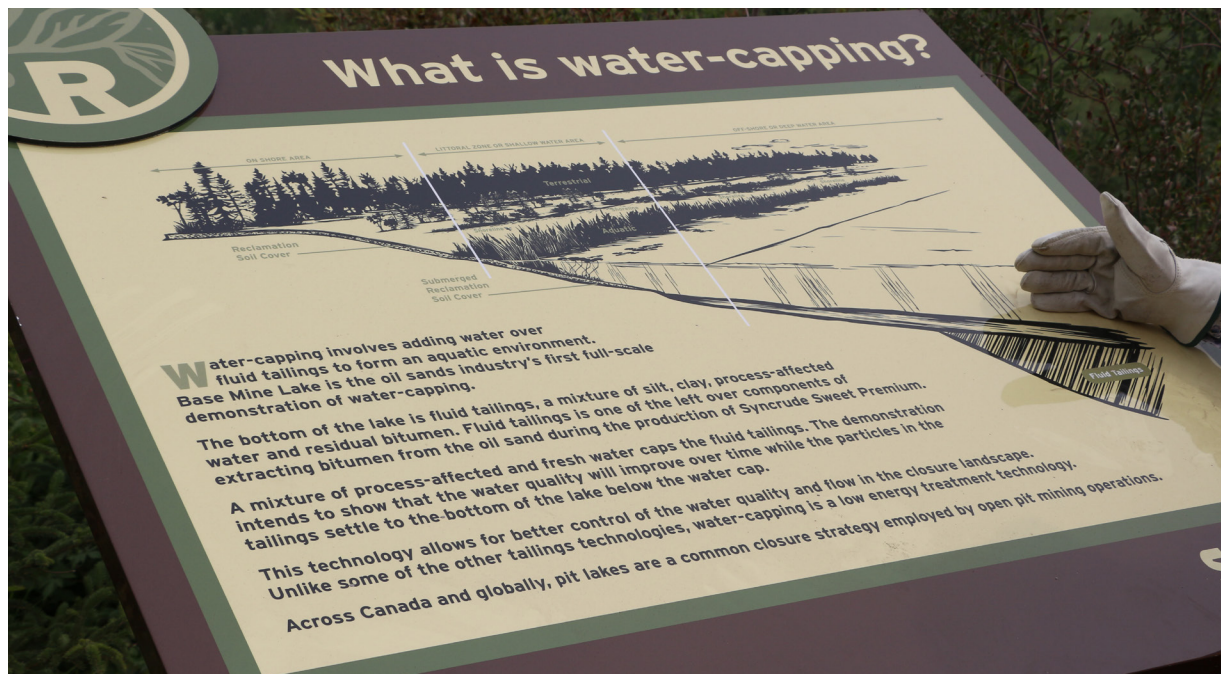


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Photo 6. Information on water capping at the Syncrude-constructed wetland



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Photo 7. Syncrude-constructed wetland



CEC Secretariat



Photo 8. Syncrude Mildred Lake seepage pond and return pipeline to tailings pond



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#### IN BRIEF

Seepage ponds contain OSPW that has escaped from a tailings pond and is then captured by a seepage well and pumped back to the tailings pond.

Photo 9. Syncrude Mildred Lake tailings pond



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### 3. Issues Addressed in the Factual Record

50. As indicated above, there are three major components that this factual record addresses within the context of the Submission related to the effective enforcement of the *Fisheries Act*: (i) Alberta's relationship with Canada with respect to the assertions and specific sites referred to in the submission, as well as other specific sites mentioned in Canada's response; (ii) the state of the science concerning the ability to distinguish between naturally occurring bitumen-influenced water and man-made discharges of OSPW from tailings ponds; and (iii) how the oil sands monitoring program is implemented by Canada and Alberta. Before disclosing the public information the Secretariat has collected regarding these three areas, background information on the factual record process, the *Fisheries Act*, and related Alberta laws and regulations are provided.
51. The NAAEC provides that, for the development of a factual record, the Secretariat must consider any information furnished by a Party and may consider other relevant technical, scientific or other information that is publicly available and submitted by others, including interested nongovernmental organizations or persons, the CEC Joint Public Advisory Committee (JPAC), as well as developed by the Secretariat or its experts.<sup>61</sup> In the *Guidelines for Submissions on Enforcement Matters under Articles 14 and 15 of the North American Agreement on Environmental Cooperation* (the "Guidelines")<sup>62</sup> additional direction on the purpose of a factual record is provided:

The purpose of a factual record is to provide an objective presentation of the facts relevant to the assertion set forth in a submission and to allow the readers of the factual record to draw their own conclusions regarding a Party's environmental law enforcement.<sup>63</sup>

52. The Guidelines further provide:

12. What is included in a factual record?

- 12.1 Draft and final factual records prepared by the Secretariat will contain:

- (a) a summary of the submission that initiated the process;
- (b) a summary of the response, if any, provided by the concerned Party; and
- (c) any other relevant factual information considered by the Secretariat pursuant to Article 15(4).

- 12.2 Draft and final factual records are to provide an objective presentation of the facts relevant to the matter(s) raised in a submission. Where draft and final factual records contain information collected pursuant to Article 15(4), they are to include proper citation for all such information.<sup>64</sup>

The overall purpose of the SEM process is to promote transparency and public participation, and to enhance understanding regarding environmental law and its enforcement in North America. A factual record is the culmination of the SEM process.

53. Before examining the three areas that are the scope of this factual record, an overview of the environmental law raised in this submission, the pollution prevention provisions of the *Fisheries Act*, is provided.

### 3.1. Environmental Law in Question: the Pollution Prevention Provisions of the Fisheries Act

54. The Submission asserts a failure by Canada to enforce subsection 36(3) of the *Fisheries Act* with respect to the leaking of deleterious substances from oil sands tailings ponds into the surface waters and groundwater of northeast Alberta. As stated above, the Submitters contend that seepage from tailings ponds is already occurring, citing to industry and government documents, such as environmental assessments for oil sands projects and scientific studies, which either predict or document seepage from tailings ponds into the environment.<sup>65</sup> In response to the submission, Canada acknowledged that it had taken enforcement through a series of inspections conducted from 2009 until 2014 (*see* discussion at paragraphs 10-15, above). Although the Council did not authorize a factual record on the enforcement assertions directly, according to the language of the Council Resolution itself, the issues that were authorized were done so within the context of the pollution prevention provisions of the *Fisheries Act*, which is consistent with the Secretariat's Article 15(1) determination and request to Council. The Secretariat notes that the entire SEM process is premised on there being a particular environmental law in question, which frames the entire submission and the proceedings conducted under the process. Without an applicable environmental law, the SEM process cannot be maintained. Thus, the pollution prevention provisions of the *Fisheries Act* are the environmental law in question in this factual record. The following is a general discussion of the *Fisheries Act* and how it operates with respect to the deposit of deleterious substances, after which the factual record addresses the three issues which comprise its scope in accordance with the Council's direction (*see* sections 3.2, 3.3, and 3.4).
55. Environmental protection in Canada is an area of shared jurisdiction between the provinces and the federal government. Under Canada's Constitution Act of 1867, environmental protection is not an enumerated head of power belonging to either the federal or provincial government. The provinces derive the majority of their jurisdiction over environmental law matters from the ownership of natural resources, pursuant to section 92A of the Constitution Act, as well as their legislative jurisdiction over property and civil rights (subsection 92(13)) and local works and undertakings (subsection 92(10) and (16)). The federal government's jurisdiction over environmental matters is derived from a number of its powers, including those over federal lands, marine pollution, and criminal law.<sup>66</sup> The *Fisheries Act* was first enacted by the Canadian Parliament in 1868.
56. Subsection 33(2) of the *Fisheries Act* (now subsection 36(3)) was the subject of a constitutional challenge on division of power grounds in 1980 before the Supreme Court of Canada in *Northwest Falling Contractors v The Queen*.<sup>67</sup> Subsection 33(2) was challenged on the basis that the provision was outside (*ultra vires*) the legislative competence of Parliament; namely, that the provision is not legislation in relation to "Sea Coast and Inland Fisheries".<sup>68</sup> The Court rejected this argument and upheld the law on this basis.

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In response to the submission, Canada stated that the enforcement related actions it had taken with respect to oil sands tailings ponds were a series of inspections conducted from 2009 until 2014, finding no violations of the *Fisheries Act*.



### 3.1.1. Subsection 36(3) and Related Provisions of the Fisheries Act

57. As previously noted, subsection 36(3) of the *Fisheries Act* reads as follows:

Subject to subsection (4), no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water.

#### IN BRIEF

Although the Council did not authorize a factual record on the enforcement assertions directly, the issues that were authorized were done so within the context of the pollution prevention provisions of the *Fisheries Act*. Thus, that law is the environmental law in question in this factual record.

58. Subsection 34(1) of the *Fisheries Act* defines a “deposit” as any “discharging, spraying, releasing, spilling, leaking, seeping, pouring, emitting, emptying, throwing, dumping or placing.” According to subsection 40(5)(a) a “deposit” takes place “whether or not any act or omission resulting in the deposit is intentional.”
59. For the purposes of the pollution prevention provisions of the *Fisheries Act*, “deleterious substance” is defined in subsection 34(1):

For the purposes of sections 35 to 43, *deleterious substance* means

- (a) any substance that, if added to any water, would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water, or
- (b) any water that contains a substance in such quantity or concentration, or that has been so treated, processed or changed, by heat or other means, from a natural state that it would, if added to any other water, degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water, [...]

#### IN BRIEF

“A deleterious substance does not have to render the water into which it is introduced poisonous or harmful to fish; it need only be likely to render the water deleterious to fish. [...]. There is no requirement in s. 36(3) or para. (a) of the definition of the term “deleterious substance” in s. 34(1), of proof that the receiving waters are deleterious to fish.”

60. Under subsection 40(2) of the *Fisheries Act*, violations of subsection 36(3) are punishable by summary conviction or by indictment. A violation of subsection 36(3) is a strict liability offence, and *mens rea* (a specific mental state or belief that one understands they are committing a crime) is not an essential ingredient to prove the offence.<sup>69</sup> Unlike an offence of absolute liability where no defence is possible, an offence of strict liability means that even if the Crown succeeds in proving all elements of the offence beyond a reasonable doubt, a defendant will not be convicted if the defendant can prove on a balance of probabilities that the facts support one of a handful of available defences. For example, section 78.6 provides that no person shall be convicted of an offence if the person establishes that they “exercised all due diligence to prevent the commission of the offence,” or “reasonably and honestly believed in the existence of facts that, if true, would render the person’s conduct innocent.”<sup>70</sup>

61. The Secretariat has previously addressed the scope of subsection 36(3) of the *Fisheries Act* and how this provision has been interpreted by the Canadian courts.<sup>71</sup> The deposit of a deleterious substance into water frequented by fish is sufficient to constitute a contravention of subsection 36(3) independently of whether the receiving water body itself becomes deleterious to fish. In *R v Kingston*,<sup>72</sup> the Ontario Court of Appeal considered whether, in addition to showing the substance was deleterious, the prosecution had to prove that the substance impairs the receiving water body thereby making the receiving water deleterious to fish to show a violation of subsection 36(3) had occurred.
62. The Secretariat notes that, as interpreted by Canadian courts, the deposit of a deleterious substance *in a place* where it *may* enter water frequented by fish is sufficient to constitute a violation of subsection 36(3). “May” connotes possibility, and not probability.<sup>73</sup> Thus, a contravention of subsection 36(3) could occur if OSPW was directly deposited into waters frequented by fish, or if it was deposited in a place where it may enter such waters.<sup>74</sup> In the context of the oil sands, OSPW is placed into tailings ponds which the Submitters allege are leaching into groundwater and the surface waters of the Athabasca river, which is a fish-bearing water body.
63. The Secretariat notes that a decision to prosecute under the *Act* ultimately lies within the discretion of the federal Director of Public Prosecutions within the Ministry of Justice, or in the case where a provincial officer designated as a Fisheries Officer has recommended prosecution, within the discretion of the provincial attorney general of the respective province.<sup>75</sup> As noted previously, neither Canada nor any provincial attorney general has ever brought a prosecution involving a deposit of a deleterious substance emanating from a tailings pond, including Alberta.<sup>76</sup>
64. In addition to subsection 36(3), oil sands companies are required to comply with related notification requirements set out in subsection 38(5) with respect to a deposit of a deleterious substance or a serious or imminent danger of such occurrence and there is a determinant to fish habitat, or such may reasonably be expected.
65. The Secretariat observes that this provision is different from the subsection 36(3) prohibition in that, unlike the prohibition, the notification requirement does stipulate that some harm (i.e., detriment to fish, fish habitat, or the use of fish by humans) be reasonably expected to result from the deposit in order to require notification. Subsequent subsections 38(6) and 38(7) require the responsible person(s) to take corrective measure and prepare a report.

### 3.1.2. Implementation of the Pollution Prevention Provisions of the Fisheries Act

66. Generally, the federal Minister of Fisheries and Oceans has the legislative responsibility for the administration and enforcement of the *Fisheries Act*. In 1978, however, the Prime Minister of Canada assigned responsibility for the pollution prevention provisions of the Act to the Minister of the Environment. In the 2012 amendments to the *Fisheries Act*, a new statutory provision was enacted to codify this longstanding arrangement. The new provision, section 43.2(1), provides authority for the Governor in Council, on the recommendation of the Minister of Department of Fisheries and Oceans, to designate by order, another Minister as responsible for the administration

and enforcement of subsections 36(3) to (6) of the *Fisheries Act* for the purposes and in relation to the subject matters set out in the order. Pursuant to this authority, in 2014 the Minister formally designated the Minister of the Environment the responsibility to enforce the pollution prevention provisions of the *Fisheries Act*.<sup>77</sup>

67. Under subsections 36(4) and (5), the federal government can adopt regulations prescribing when, where, under what circumstances and in what concentrations the deposit of specified deleterious substances, waste or pollutants is authorized. No such regulations are in force specifically relevant to oil sands tailings ponds, although Canada is currently in the development stages of developing such regulations.<sup>78</sup> Canada has, however, promulgated a number of effluent regulations under the Act, including those related to metal and diamond mining, petroleum refinery liquid, and wastewater systems effluent.<sup>79</sup> Subsection 36(6) of the Act gives the Minister authority to direct a person authorized to make a deposit under subsection (5) to conduct sampling and monitoring and report such information to the Minister.

### 3.1.3. Selected Policies Implementing the Pollution Prevention Provisions

68. With respect to the habitat protection and pollution prevention provisions of the *Fisheries Act*,<sup>80</sup> Environment Canada and the Department of Fisheries and Oceans have issued an enforcement policy statement for these two sets of provisions.<sup>81</sup> Regarding inspections, the power of which is derived from the Act, the policy states:

Inspection requires that a Fishery Officer or Fishery Guardian [including Fishery Inspectors] must have reasonable grounds to believe that there are activities or things that are subject to the *Act* or are relevant to its administration. In carrying out an inspection, the Fishery Officer or Fishery Guardian is verifying compliance with the *Act* and is not undertaking a search in order to gather evidence of an alleged offence.<sup>82</sup>

69. Searches, as opposed to inspections, generally require a warrant. Searches involve a belief of reasonable grounds that an offence has been committed:

Search requires the belief, on reasonable grounds, that an offence has been committed before a Fishery Officer [or Inspector] may enter premises to search for evidence of an alleged offence. The officer may search for anything that he or she believes on reasonable grounds will provide evidence of a violation of the *Act*, or that was used in connection with the commission of an offence against the *Act*.<sup>83</sup>

70. Notably, fishery inspectors, designated by the Minister under section 38, are not necessarily employees of the Department of Fisheries and Oceans. For the purposes of the pollution provisions of the Act, they may be employees of the Department of Environment and Climate Change Canada, and in some cases, employees of provincial or territorial governments. In any event, the authority of the federal government under the pollution prevention provision cannot be otherwise delegated (*see* further discussion at paragraph 139).



71. The Auditor General of Canada has issued two reports relating to the enforcement of the pollution prevention provisions of the *Fisheries Act*. In its 2009 report, in which it found generally that Canada could not demonstrate that it was adequately protecting fish habitat, the Auditor General also found that although Environment Canada had a compliance strategy for the two sets of effluent regulations it had in place at that time, it “did not have a *Fisheries Act* compliance strategy for the industries and activities that must comply with the Act’s prohibition requirement against the deposit of harmful substances in water frequented by fish.”
72. In 2019, the Auditor General issued a new report which examined primarily how Canada protected fish from mining effluent. Although the report concentrated on that issue, it did make a number of findings related to non-metal mines, such as oil sands, with respect to Canada’s enforcement program under the *Fisheries Act*.<sup>84</sup> The 2019 report found that although Environment and Climate Change Canada took steps to protect fish and their habitat from metal mining effluent, including enforcement action to address non-compliance with requirements related to mining effluent, it also found that the agency had not carried out a comprehensive risk analysis to prioritize inspections of non-metal mines, such as oil sands mines. The Auditor General stated that “inspecting non-metal mines regularly is important because the release of effluent with substances harmful to fish is prohibited for these mines, and the companies are not required to submit any effluent monitoring reports.”<sup>85</sup> In response to the audit, ECCC stated that it intends to undertake and complete in 2020 a risk framework that takes into account risks to the environment and human health, including from non-compliance with the Department’s laws and regulations, which will be used to inform the Department’s enforcement planning and priorities, including metal and non-metal mines.<sup>86</sup>

#### 3.1.4. Proposed Oil Sands Mining Effluent Regulations

73. The Secretariat received information and documents from a number of stakeholders, including Canada, industry representatives, and First Nation representatives, indicating that Canada is planning for the development and implementation of oil sands effluent regulations under subsections 36(4), (5), and (6) of the *Fisheries Act*.<sup>87</sup> Canada has indicated that the proposed regulations will address the release of effluent from oil sands mines under specific conditions that are protective of the environment. Further, Canada has indicated that they are working with Alberta to align these regulations, where possible, with the provincial regime for release, which is also under development. The new federal oil sands mining effluent regulations are expected to be in place in 2023 and be modeled after the Metal and Diamond Mining Effluent Regulations.
74. Additionally, the Secretariat found the following study activity, originally proposed in 2016 under the Oil Sands Monitoring Program, funded by Canada and co-managed with the government of Alberta.<sup>88</sup> For further discussion of this project, see paragraph 183. (See Table 1.)
75. In a letter dated 19 February 2019, in response to a document request by the Secretariat in the context of developing this factual record, the Canadian Association of Petroleum Producers (CAPP) also endorsed the development of a proposed oil sands mining effluent regulation.<sup>89</sup>

Table 1. “Study activity”

Focused Study Activity Title:	<b>Develop a method that accurately measures seepage from tailings ponds and evaluate its toxicological significance</b>
Project Leader:	<b>Mark Hewitt and Richard Frank</b>
Deliverables: What tangible goal(s) and/or product(s) will the monitoring produce and when?	<p>The deliverables and detailed study plan below have been modified from the existing, approved work plan in order to incorporate 2017-18 findings and progress. Further adjustments have also been made based on:</p> <ul style="list-style-type: none"> <li>i) OS Secretariat feedback requesting the results from this project be used to guide and inform management for policy decisions in relation to Naphthenic Acids (including CCME guideline development, potential addition to NPRI, analytical method development), <i>as well as development of Oil Sands Effluent Regulations</i>, [emphasis added] and</li> <li>ii) Informing and enabling federal and provincial enforcement agencies to investigate potential legislative violations by briefing and technology transfer of the OSPW seepage methodologies developed.</li> </ul>

76. CAPP acknowledges and agrees with the concern for protecting the Athabasca River and the health of its aquatic ecosystems and supports development and enactment of a science-based regulation to do so. CAPP believes a risk and outcomes-based effluent regulation under the *Fisheries Act*, including appropriate monitoring, research and mitigation measures will ensure continued environmental protection. CAPP stated its commitment that industry will continue to advance scientific research to help ensure that fish and fish habitat is protected. The Secretariat also notes that the Keepers of the Athabasca (KOA),<sup>90</sup> in response to the Secretariat’s request for information, indicated that the organization is involved with a multi-stakeholder group to advise Alberta governmental agencies, the Integrated Water Management Working Group (IWMWG), whose purpose, in part, is to provide recommendations regarding a regulatory system which would allow for the release of treated OSPW to the Athabasca River. The KOA indicated that it was very concerned about this potential action and advocated for full containment of the worst of the tailings. In its information shared with the Secretariat, KOA also identified Syncrude’s proposal to run tailings through petroleum coke.<sup>91</sup>

#### 3.1.5. Powers to Enter into Agreements under the *Fisheries Act*

77. Due in part to the overlapping jurisdiction in the application and enforcement of environmental law in Canada, the *Fisheries Act* provides a mechanism for the federal government to enter into agreements with the provincial governments. Sections 4.1 to 4.3 of the Act read as follows:
- 4.1 (1) The Minister may enter into an agreement with a province to further the purposes of this Act, including an agreement with respect to one or more of the following:
    - (a) facilitating cooperation between the parties to the agreement, including facilitating joint action in areas of common interest, reducing overlap between their respective programs and otherwise harmonizing those programs;
    - (b) facilitating enhanced communication between the parties, including the exchange of scientific and other information; and
    - (c) facilitating public consultation or the entry into arrangements with third-party stakeholders.

- (2) An agreement may establish
  - (a) the roles, powers and functions of the parties;
  - (b) programs and projects;
  - (c) principles and objectives of the parties' respective programs and projects;
  - (d) standards, guidelines and codes of practice to be followed by the parties in the administration of their respective programs and projects;
  - (e) processes for policy development, operational planning and communication between the parties, including the exchange of scientific and other information;
  - (f) the administrative structures that will be used to carry out the agreement's objectives;
  - (g) the power of the parties to create committees and public panels and to conduct public consultations; and
  - (h) the circumstances and manner in which the province is to provide information on the administration and enforcement of a provision of its laws that the agreement provides is equivalent in effect to a provision of the regulations.
- (3) The Governor in Council may make regulations establishing the conditions under which the Minister may enter into or renew an agreement, including procedures for entering into or renewing the agreement.
- (4) The Minister shall publish an agreement in the manner that he or she considers appropriate.
- 4.2 (1) If an agreement entered into under section 4.1 provides that there is in force a provision under the laws of the province that is equivalent in effect to a provision of the regulations, the Governor in Council may, by order, declare that certain provisions of this Act or of the regulations do not apply in the province with respect to the subject matter of the provision under the laws of the province.
  - (2) Except with respect to Her Majesty in right of Canada, the provisions of this Act or of the regulations that are set out in the order do not apply within that province with respect to the subject matter of the provision under the laws of the province.
  - (3) The Governor in Council may revoke the order if the Governor in Council is satisfied that the provision under the laws of the province is no longer equivalent in effect to the provision of the regulations or is not being adequately administered or enforced.
  - (4) The Governor in Council may revoke the order only if the Minister has given notice of the proposed revocation to the province.
  - (5) The order ceases to have effect either when it is revoked by the Governor in Council or when the agreement to which the order relates terminates or is terminated.
- 4.3 The Minister shall, as soon as feasible after the end of each fiscal year, prepare and cause to be laid before each house of Parliament a report on the administration of sections 4.1 and 4.2 in that fiscal year.

78. Canada has entered into a number of related administrative agreements with Alberta and their status and implementation are discussed in section 3.2. To understand this federal-provincial relationship, a limited overview of the *Canadian Environmental Protection Act* (CEPA) of 1999<sup>92</sup> and the laws and regulatory approval process in the Province of Alberta applicable to oils sands operations and tailings



ponds follow in the next paragraphs. The discussion of CEPA and Alberta laws and regulations, and their implementation, are provided only insofar as this information has a direct link and pertains to understanding Alberta's role in the aforementioned situations.

79. The *Canadian Environmental Protection Act* provides the Government of Canada with several tools to protect the environment and human health, including provisions aimed at controlling the release of toxic substances (section 65 et seq). Section 9 of the Act allows for the Minister to negotiate an agreement with a provincial government with respect to the administration of the Act. Annual reporting is required for any agreement entered into under of the Act (subsection 9(8)). Section 44 of the Act establishes that the Minister “shall (a) establish, operate and maintain a system for monitoring environmental quality; [and] (b) conduct research and studies relating to pollution prevention, the nature, transportation, dispersion, effects, control and abatement of pollution and the effects of pollution on environmental quality, and provide advisory and technical services and information related to that research and those studies.” A discussion of the joint environmental assessment process under CEPA for oil sands mining operation projects can be found at section 3.1.1.6.
80. Under sections 46-53 of CEPA, the Minister is empowered to require the reporting of information on toxic substances and other pollutants. These provisions constitute the primary legislative basis for Canada's National Pollutant Release Inventory (NPRI), a publicly accessible inventory of pollutant releases, disposals and transfers (e.g., for recycling) in Canada. The Notice with respect to substances is published in the *Canada Gazette*, Part I. (See <<http://b.link/notices17>>.)
81. Specific reporting requirements are provided in the Guide for Reporting to the NPRI 2016-2017. Schedule 3 of the Notice with respect to substances presents the criteria for activities in which reporting of NPRI-listed substances is required. Where these criteria are met, and based on number of employees, activities, and use or release of NPRI-substances, oil sands operations must report quantities released to air, water, and land, and disposed of to their tailings ponds. (See <<http://b.link/stream192>>.)

### 3.1.6. Alberta's Regulatory Framework Governing Oil Sands Facilities and Tailings Ponds

82. The main provincial laws which govern oil sands and tailings ponds approvals and oversight are briefly summarized below. The Council, in its explanatory note which accompanied its resolution regarding the scope of the factual record, noted “it would not be appropriate for the factual record to address Alberta's regulatory authorities since Alberta's environmental laws are not the subject of the assertions contained in the submission.”<sup>93</sup> The Council's resolution, however, includes two subject matters where the Province of Alberta is inherently involved: its relationship with Canada and how the Oil Sands Monitoring Plan is carried out. Because Alberta acts under its own laws when it engages in these two areas, the Secretariat determined a summary of relevant Alberta law is necessary, as background information, so the public can understand the basis for the Province's actions that do fall under the Council's resolution. If there is a conflict between the Council's instructions and its reasons, the Secretariat believes it should be resolved in favor of transparency. Further, in the Ontario Logging factual record, which concerned only the Fisheries Act and not any applicable Ontario law, both

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To understand the relationship between Canada and Alberta this factual record provides a brief overview of Alberta's regulatory process regarding oil sands operations and tailings ponds.

Canada and the United States recognized in their comments on the draft factual record that provincial laws which were not the environmental laws within the context of Article 14 and 15 could still be discussed in a factual record as long as there was a “direct link” to the issues discussed in the factual record.<sup>94</sup> That direct link is present here, as described above. As a result, the Secretariat summarizes Alberta law below.

3.1.6.1. The Alberta Environmental Protection and Enhancement Act

83. The *Environmental Protection and Enhancement Act* (EPEA) is Alberta’s central piece of environmental legislation, establishing the powers and responsibilities of the provincial Environment Minister in areas such as water, public lands, and the environmental assessment and approval process for major projects.
84. EPEA Part 5, concerns the “Release of Substances” and Sections 108 (prohibited releases where approval or regulation) and 109 (prohibited releases where no approval or regulation) provide:
  - 108(1) No person shall knowingly release or permit the release of a substance into the environment in an amount, concentration or level or at a rate of release that is in excess of that expressly prescribed by an approval, a code of practice or the regulations.
  - (2) No person shall release or permit the release of a substance into the environment in an amount, concentration or level or at a rate of release that is in excess of that expressly prescribed by an approval or the regulations.
  - (3) For the purposes of this section, if there is a conflict between an approval or a code of practice and the regulations as to an amount, concentration, level or rate of release of a substance, the most stringent requirement prevails.
  - 109(1) No person shall knowingly release or permit the release into the environment of a substance in an amount, concentration or level or at a rate of release *that causes or may cause a significant adverse effect* [emphasis added].
  - (2) No person shall release or permit the release into the environment of a substance in an amount, concentration or level or at a rate of release *that causes or may cause a significant adverse effect* [emphasis added].
  - (3) Subsections (1) and (2) apply only where the amount, concentration, level or rate of release of the substance is not authorized by an approval, a code of practice or the regulations.
  - (4) No person may be convicted of an offence under this section if that person establishes that the release was authorized by another enactment of Alberta or Canada.
85. The Secretariat notes that there is a distinct difference between a violation of section 109 of the provincial EPEA and a violation of subsection 36(3) of the federal *Fisheries Act*. The provincial law prohibits any release that causes or may cause a significant adverse effect; the *Fisheries Act* does not require that the deposit of the deleterious substance produce or be likely to produce any demonstrable “adverse effect” on the receiving environment. Rather, under the *Fisheries Act*, and as discussed in section 3.1 above, Canadian courts have held that the Act’s section 36(3) is violated if the substance is deleterious and placed into an area where it may enter waters frequented by fish.<sup>95</sup> The federal standard is thus a more stringent one, although Canada notes that the outcomes between the federal Fisheries Act and the provincial regulatory scheme are essentially the same in terms of protection of the environment.<sup>96</sup> Further, for projects which are already approved, like oil sands facilities, they are subject to the language of section 108, and most approval conditions prohibit the off-site release of industrial water.

86. Section 110 of EPEA requires a person “who releases or causes or permits the release of a substance into the environment that may cause, is causing or has caused an adverse effect” to report the release to the relevant authorities. Section 112 provides for remedial measures in circumstances wherein a release is causing adverse environmental effects, including taking all reasonable measures to “repair, remedy and confine the effects of the substance.” These reporting and remedial action provisions are similar to those in the *Fisheries Act* (subsection 38(5)), discussed above.
87. Part 10 (sections 196 et seq) of EPEA confers enforcement powers on investigators which, per section 198, includes the right of entry and inspection to determine “(i) the extent, if any, to which a substance may cause, is causing or has caused an adverse effect, (ii) the cause of any adverse effect that may occur, is occurring or has occurred, and (iii) how an adverse effect may be prevented, eliminated or ameliorated and the environment protected or restored.”
88. Regarding Alberta’s enforcement of these EPEA provisions with respect to the release of such a substance from oil sands tailings ponds, Canada notes that “during 2017 and 2018, there has been no enforcement of EPEA [by Alberta] related to the release of any substance into tailings ponds or from tailings ponds into waters in the Athabasca region.”<sup>97</sup> Canada subsequently advised the Secretariat that a review of Alberta’s “compliance dashboard,”<sup>98</sup> a database of provincial incidents, investigations, compliance activities, and enforcement actions (since July 2014), shows two enforcement actions: (i) a 2015 administrative penalty of \$14,500 related to a Suncor release of approximately 344 cubic meters of process effluent water from their Industrial Wastewater and Runoff Control System – Pond C Duckpond into the Athabasca River; and (ii) a 2019 enforcement action against Suncor by Alberta resulting in a conviction under the EPEA.<sup>99</sup>

#### 3.1.6.2 The Alberta Responsible Energy Development Act (REDA)

89. Alberta’s *Responsible Energy Development Act* (REDA), enacted in 2012, established AER as a quasi-independent regulatory corporation, funded by the industry through administrative fees. REDA consolidated the powers over energy resource activities of the Energy Resource Conservation Board and the Alberta Environment Ministry to the AER. The powers of the AER include regulatory approvals and licenses for all energy resource activities under the Public Lands Act, under the EPEA, and the provincial Water Act.
90. REDA also empowers the AER to monitor and enforce “safe and efficient practices in the exploration for and the recovery, storing, processing and transporting of energy resources.” Subsection 2(2)(i) of REDA further authorizes the AER to “monitor energy resource activity site conditions and the effects of energy resource activities on the environment.” Finally, subsection 2(2)(j) of REDA empowers the AER to “monitor and enforce compliance with energy resource enactments and specified enactments in respect of energy resource activities.”
91. The Secretariat learned that while the AER is the agency responsible for all enforcement matters related to the oil sands, the provincial ministry involved in the oil sands monitoring program with Canada—as well as the ministry named in relevant enforcement agreements—remains Alberta Environment and Parks (AEP)<sup>100</sup> (see discussion at section 3.4).



### 3.1.6.3. The Oil Sands Conservation Act (OSCA)

92. The *Oil Sands Conservation Act* (OSCA), originally enacted in 1983, applies to all oil sands extraction projects including oil sands tailings ponds. A purpose of OSCA is the control of “pollution in the development and production of the oil sands resources of Alberta.” Pursuant to OSCA, approvals to construct and operate oil sands facilities are obtained through the AER with the prior authorization of the Lieutenant Governor in Council (effectively the provincial cabinet). The authorization by the Lieutenant Governor in Council “is subject to any terms and conditions prescribed by the Lieutenant Governor in Council.” Under OSCA, the AER is empowered to conduct inspections and investigations related to oil sands sites and facilities.
93. In 2009, Alberta, through the Energy Resources Conservation Board, produced for the very first time regulatory standards for tailings management through Directive 074: *Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes*. Prior to this date, regulatory conditions were included in site-specific approvals. The primary purpose of this directive was “to minimize and eventually eliminate the long-term storage of fluid tailings in the reclamation landscape.”<sup>101</sup> Despite promises of making strides in tailings management, many stakeholders consider this directive a failure.<sup>102</sup>
94. In 2015, Alberta released a new tailings management framework (TMF), and then a year later, AER issued Directive 085: *Fluid Tailings Management for Oil Sands Mining Projects* was released to implement and enforce the TMF.<sup>103</sup> The Tailings Management Framework (TMF) and Directive 085 take a cumulative, outcomes-based approach to reclamation and permit operators to propose their own ready-to-reclaim criteria for treatment based on final landscape targets developed by each operator in their reclamation plans. These plans and criteria were required to be submitted to the AER by 1 November 2016 for evaluation and approval.<sup>104</sup> Some groups question whether this new directive will meet the goals of reducing the volumes of fluid tailings within reasonable timeframes.<sup>105</sup>

### 3.1.6.4. Relevant conditions contained in Alberta Regulatory Approvals\*

95. When Alberta approves oil sands mining projects under the above laws, they are subject to certain conditions, including conditions related to tailings ponds. The following provides examples of typical conditions that can be included in a project approval relating to surface water monitoring requirements:

The approval holder shall conduct aquatic environmental effects monitoring to monitor potential effects of the operation of the plant on surrounding water and sediment quality, resident aquatic biota including, but not limited to, fisheries, benthos and aquatic habitat potentially affected by the operation of the plant [and] any other information required by the Director.

The monitoring required in subsection 4.2.11 may be conducted by the approval holder, or alternatively, through participation in the RAMP [Regional Aquatic Monitoring Program], or another program authorized in writing by the Director.

The approval holder shall ensure that the monitoring conducted by RAMP will be on a frequency required to detect impacts in the receiving water bodies as determine by a technical review by RAMP.<sup>106</sup>

96. While the RAMP referenced above has been disbanded and replaced by subsequent programs (see section 3.4), monitoring requirements under this and other approvals persist.

\* The analysis in this section looks at groundwater monitoring requirements for design submission and does not examine any site-specific EPEA approval conditions for wastewater and run-off management. Further, since October 2018, these annual reporting requirements are clearer that seepage from other aquifers into the mine pit and Quaternary deposits need to be avoided, monitored, and managed.

97. Regarding the development of a groundwater monitoring program, operators are required to report their findings to Alberta at specified periods. For example, the following conditions are included in an approval for the Kearn Oil Sands project<sup>107</sup>:

The approval holder shall develop a proposal for a Groundwater Monitor Program for the KOS [Kearn Oil Sands] project which shall include, at a minimum, unless otherwise authorized in writing by the Director, all of the following:

- (a) a plan to gather additional information and to report on the hydrogeology and an interpretation of the hydrogeology including, but not limited to, a detailed characterization of quaternary geology, as well as baseline groundwater quality;

[...]

- (d) a map showing the location of existing and additional proposed groundwater monitoring wells;

[...]

- (i) a rationale for proposed groundwater monitoring well locations and proposed completion depths of those wells

- (j) a description of groundwater monitor well protocols;

- (k) a list of parameters to be monitored and the monitoring frequency for each groundwater monitor well or group of groundwater monitor wells;

[...]

- (m) details of a groundwater response plan specifying actions to be taken should contaminants be identified through the Groundwater Monitoring Program;

- (n) a minimum of 12 months prior to construction of the external tailings area, a proposal to provide:

- (i) detailed Quaternary deposits mapping

- (ii) additional Quaternary deposits hydraulic properties and hydrochemistry

- (iii) seepage monitoring plans for the external tailings area;

- (iv) a plan to provide updated seepage modelling results, during construction, operation and post-closure, based on additional geological information, aquifer test results and monitoring;

- (v) updated detailed seepage mitigation plans that will be implemented during construction and contingency seepage mitigation measures to limit external seepage into the Quaternary deposits during mine operation;

[...]

If the Groundwater Monitoring Program is found deficient by the Director, the approval holder shall correct all deficiencies as outlined in writing by the Director within 120 days of the deficiency letter.

The approval holder shall implement the Groundwater Monitoring Program for the project as authorized in writing by the Director.<sup>108</sup>

98. The preceding excerpt demonstrates the type of information collected by the Province pursuant to the approvals under OSCA and EPEA. While tailored for monitoring and enforcement under provincial legislation, it appears to the Secretariat that the data collected under these types of groundwater monitoring programs, and reported to the AER, may be useful for determining whether OSPW is entering the groundwater system or fish bearing waters. The Secretariat confirmed with Canada that industry does

not share this information with Canada, and that although Canada reviewed such monitoring reports during the period it conducted its inspections relating to tailings ponds, the Province does not routinely share these reports with Canada, although it has when such information is requested.<sup>109</sup> See further discussion, at paragraphs 147–150.

#### 3.1.6.5. Summary of Syncrude and Suncor Oil Sands Monitoring Reports

99. In response to its request for relevant information for the preparation of the factual record, the Secretariat received information from the Canadian Association of Petroleum Producers (CAPP), including groundwater monitoring reports produced pursuant to EPEA approvals from both Syncrude and Suncor.<sup>110</sup> The following information is based on the Secretariat’s and its experts’ review of these reports.<sup>111</sup>

#### IN BRIEF

Data presented in the Syncrude monitoring report shows consistent evidence of seepage of OSPW from tailings ponds into groundwater at certain monitoring wells that are close in proximity to surface water, including tributaries to the Athabasca River.

100. The Secretariat notes that Canada stated in its response to the submission that “[t]ailings ponds are engineered to seep, as seepage provides critical structural stability. What is scientifically unclear is whether seepage is occurring beyond containment zones, and if it is occurring, to what extent.”<sup>112</sup>
101. According to the Secretariat’s expert, data presented in the Syncrude monitoring report shows consistent evidence of seepage of OSPW from tailings ponds into groundwater at certain monitoring wells that are close in proximity to surface water, including tributaries to the Athabasca River. Data presented in the Suncor monitoring report shows that certain wells are noted to have water chemistry reflective of potential influence of OSPW.<sup>113</sup> The Secretariat notes that CAPP’s cover letter which accompanied this monitoring information does not address this aspect of the data but rather focuses on ongoing OSM programs, as well as other research studies, which have confirmed no impact to Athabasca River water quality from tailings ponds OSPW.<sup>114</sup> The Secretariat’s expert concurs with this conclusion with respect to the particular groundwater monitoring reports sent to the Secretariat, but notes that certain scientific studies have indeed concluded that there has, in fact, been an impact to the Athabasca River water quality, although some questions have been raised about these conclusions (*See* discussion in Annex 4, Report).
102. CAPP submitted Syncrude’s 2017 Groundwater Monitoring Report for the Aurora North Oil Sands Mine and its associated tailings pond, the Aurora Settling Basin. The Secretariat notes that this tailings pond is not the oldest tailings pond operated by Syncrude: that is the Mildred Lake Settling Basin, which has been the focus of peer-reviewed studies as well as federal monitoring programs.
103. The Syncrude report indicates that in the hydrology of the area “groundwater flow is typically controlled by local topography, with discharge to major rivers and tributaries.” In the lower members of the K-Q unit<sup>115</sup> north of Fort McMurray and east of the Athabasca River, groundwater flow is typically westerly from the Muskeg Mountains to the Athabasca River.<sup>116</sup> The Aurora Settling Basin (or “ASB”) is the main tailings pond that exists on the southeast end of the Aurora site and is adjacent to the Muskeg River at the borders of the Aurora lease boundary. The Muskeg River is a tributary to the Athabasca River. The report outlines a system of monitoring wells initially designed in 1999 and submitted to Alberta Environment as part of the project EPEA approval. During the 2017 monitoring program, 96 wells were sampled during summer and 90 wells were sampled during the fall.



104. Analytically, the monitoring conducted by Syncrude relies on measurements of chloride ion concentrations, as described below:

Typically, the surficial aquifer and surface waters around the Aurora North site have very low concentrations of major ions. Interpretation of the analytical results may be simplified by examining chloride concentrations of major ions. Chloride concentrations have been used to detect influence from process water due to its conservative behaviour in groundwater, and low background concentrations in the aquifer. Background chloride concentration is less than 10 mg/L in the surficial aquifer. As a conservative ion in groundwater, chloride is found at the leading edge of a process water plume, arriving before organics or most other ions.<sup>117</sup>

105. The report also contains a description of the perimeter ditch system designed to intercept process-affected water:

An integral part of the ASB design is the perimeter ditch, which was designed to act as a hydraulic sink. The ditch was excavated below the local groundwater table, to create a gradient towards the ditch from both the ASB and the surrounding environment. The perimeter ditch flows into ponds at various locations, from which water is pumped back into the ASB. This imported water becomes part of Syncrude's process-affected water inventory, which must be stored. The system has operated effectively in most areas.

The perimeter ditch system is operating as designed with the flow of gradient into the ditch system. Previous areas that had shown effects of improper ditch maintenance have shown an overall decrease in chemistry, as the process-affected water is drawn back into the system.

*Influence from process water has been identified beyond the perimeter ditch in three areas. An increase in process-affected water was detected in localized wells around the ASB, outside of the perimeter ditch [emphasis added].*<sup>118</sup>

106. Indeed, the report describes the occurrence of seepage in three areas: surrounding the southeastern corner of the ASB (in between the south seepage pond and the Muskeg River to the East),<sup>119</sup> adjacent to the perimeter ditch on the east side of the ASB,<sup>120</sup> and north of the ASB.<sup>121</sup> Elevated levels of chlorides, and in some cases naphthenic acids, appear to be seepage plumes from process-affected water (i.e., OSPW), except for the North Tailings area which may contain a confounding factor where elevated levels of chloride may also be due to the release of Basal water into Stanley Creek.<sup>122</sup>
107. Section 5 of the report provides volumetric estimates of seepage of process-affected water that has migrated from the ditch system. Chloride concentrations were used to determine volumes, using a ratio of the observed parameter to the concentration observed in the ABS.<sup>123</sup> The volume of process-affected water outside the perimeter ditch system containment area was 730,319 m<sup>3</sup> (summer), 785,431 m<sup>3</sup> (fall) in 2017, demonstrating a slight increase from the 2016 modeled volume of 630,658 m<sup>3</sup>.<sup>124</sup>
108. Calculations by Syncrude, based on monitoring well observations, have led the company to estimate that approximately 785,000 cubic meters of oil sands process-affected water have migrated past the interception ditch system. The Secretariat notes that the 2017 estimate of water that has migrated outside the perimeter ditch system is greater than the 2016 estimate of approximately 631,000 cubic meters. It should be noted that Syncrude considers process-affected water as composed of water from the plant, basal dewatering, environmental water intercepted during mining, environmental seepage into the perimeter ditch and runoff/precipitation that enters mine and ditch system.

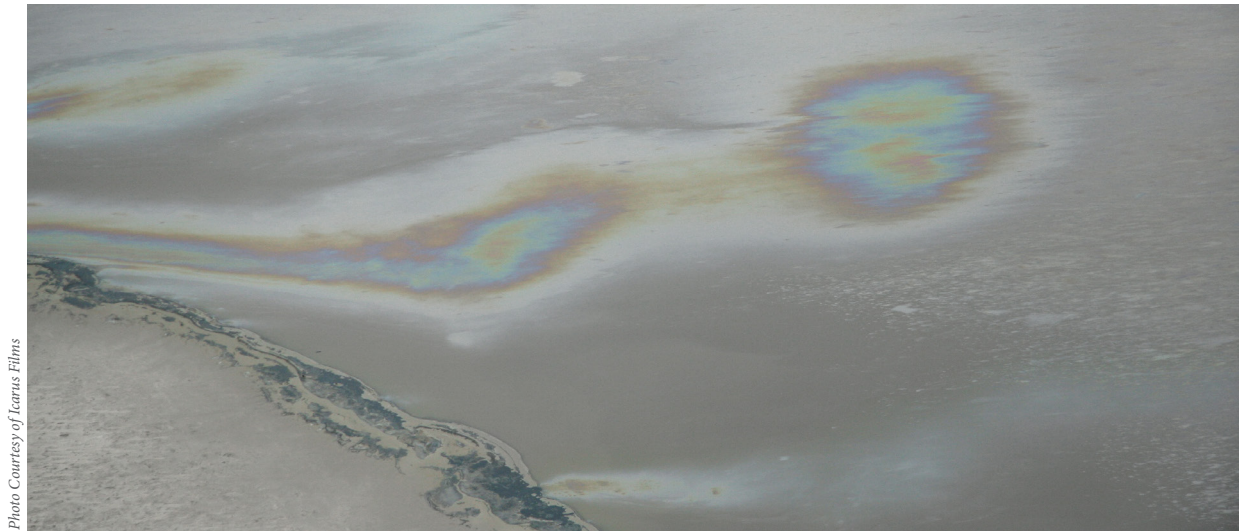


Photo Courtesy of Icarus Films

109. In its response to the Secretariat's information request, CAPP also submitted a Suncor Biennial Groundwater Monitoring Report for 2015 and 2016. The Suncor report covers groundwater monitoring at Suncor's Millenium, Steepbank and North Steepbank Extension Mine areas. Data in this report are grouped together in nodes that share common groundwater pathways, or which are hydrologically connected, and are reported in separate sections. Inorganic and organic parameters measured in collected groundwater samples include naphthenic acids (by Fourier transform infrared (FTIR)), common inorganic measurements (major anions and cations), and stable and radio-isotopes. For each monitoring well, indicator parameters are used to classify the level of concern with regards to potential seepage. These parameters include statistically increasing trends over time, gradual increases over time, changes relative to background screening levels, and spurious values.
110. The Secretariat's expert reviewed Suncor's report, which consists of primarily data and little supporting narrative, and concluded that although Suncor Pond 1 is currently being reclaimed and no longer contains any surface OSPW, 10 wells there have water chemistry reflective of a potential influence of OSPW.<sup>125</sup> All of these wells appear to be within 150 m of the Athabasca River. NA concentrations in these wells have remained stable since 2007. The Secretariat notes that these results are consistent with the published results of Frank et al. (2014) and Roy et al. (2016), which studied seepage of OSPW from the same tailings pond. This consistency appears to further confirm likely OSPW influence in these monitoring wells.
111. With respect to data from the Suncor South Tailings Pond (STP) and Pond 8A, there is generally less evidence of seepage from either of these two ponds, when compared to Pond 1. In this section, the results for a number of monitoring wells are reported around STP and an adjacent tailings pond, Pond 8A. STP began construction in 2005, while Pond 8A is older and began construction in 2000.<sup>126</sup> Two monitoring Wells at Pond 8A showed evidence of increasing chloride, sulfate, and total dissolved solids. NAs were also increasing in these two wells, based on upward trends. The report suggests (in tabular format) that Pond 8A is a possible source of OSPW to well P8A-03-14-SS, and that Clearwater formation may also contribute. For STP, there were few indications of OSPW seepage, although four wells indicated evidence for increasing sulfate. NAs were only flagged at one site (SPT-04-104-ST), based on an increased concentration in the most recent sample from 2016.<sup>127</sup>

112. Further, the Secretariat notes that despite the fact that these reports would appear to contain information relevant to the effective enforcement of the pollution prevention provisions of the *Fisheries Act*, current regulatory requirements, and the notification duty of subsection 38(5) in particular, are worded in such a way that, absent proof of harm (actual or likely), there is no federal or provincial requirement that these reports be submitted to ECCC, the DFO, or any other federal authority. In addition, it does not appear that Alberta previously shared them voluntarily with Canada, either under their administrative agreements or otherwise. The Secretariat also notes that industry uses simple biogeochemical analysis to conclude that groundwater migration outside the perimeter ditch system is occurring and that volumes are increasing, while Environment and Climate Change Canada's position is that these methods are insufficient to draw such conclusions.
113. Finally, the KOA, in information it submitted to the Secretariat during development of this factual record, indicated that it was participating in a tailings project with the Alberta Eco Trust, *Athabasca Basin: Tailings and Impacts on Aquifers*.<sup>128</sup> In this project, which is not funded under or related to the OSMP, the group is providing traditional ecological and Indigenous knowledge<sup>129</sup> toward development of a data visualization tool that can help address concerns about tailings ponds leaking into groundwater and provide a method for community-based water monitoring projects to be involved in potential solutions. KOA indicated to the Secretariat that its outreach to both Canada and Alberta on this project has gone unanswered.<sup>130</sup>

#### 3.1.6.6. The Joint Environmental Assessment Process

114. Environmental assessments for major oil sands projects are carried out jointly between the federal government and the province of Alberta. The *Canadian Environmental Assessment Act, 2012* (CEAA), aims to protect aspects of the environment subject to the federal Parliament's legislative authority from "significant adverse environmental effects caused by a designated project."<sup>131</sup> All of the currently approved major oil sands mines were assessed under the prior version of the CEAA or its predecessor; for the most part, the differences in these laws are minimal where major projects like oil sands mines are concerned. The Secretariat notes that in mid-2019 Canada enacted major amendments to the CEAA 2012, some of which may affect the environmental assessment of oil sands mines, but these amendments and their implementation are beyond the scope of this factual record.<sup>132</sup>
115. Like CEAA, 2012, the earlier version of CEAA stipulated that the relevant authorities had to decide, after "taking into account the implementation of any mitigation measures considered appropriate, whether a proposed project was likely to result in "significant adverse environmental effects." If so, the Governor in Council<sup>133</sup> had to determine whether those effects were "justified in the circumstances."<sup>134</sup> If the project was deemed likely to result in significant adverse effects, or if such effects were justified in the circumstances, the Governor in Council had the authority to approve the project and set out conditions in relation to the environmental effects with which the proponent of project had to comply.<sup>135</sup>
116. As noted above, generally environmental assessments for oil sands projects have been conducted jointly; that is, a single environmental assessment was conducted under agreement on a project-by-project basis between the federal and provincial governments. A general agreement, the *Canada-Alberta Agreement on Environmental Assessment Cooperation* (2005),<sup>136</sup> lays out the framework for provincial-federal cooperation in environmental assessments.



117. Under the *Canada-Alberta Agreement on Environmental Assessment Cooperation*, the responsible federal and provincial bodies are to cooperate on the development of the terms of reference for the environmental assessment such that each party can meet their respective requirements.<sup>137</sup> The parties then proceed to review the information provided by the proponent (i.e., environmental impact statement) to ensure that it meets the requirements of the terms of reference for the environmental assessment report and the parties' respective environmental assessment requirements.<sup>138</sup> Where hearings are required, as they typically are for oil sands projects, a joint panel will be appointed to conduct a joint panel review.<sup>139</sup>

118. This agreement also states:

Where a cooperative environmental assessment results in an approval of a project subject to related federal and Alberta conditions, the Parties agree to coordinate, where possible, their respective responsibilities for monitoring and follow-up arising from the assessment. The Parties may also coordinate other monitoring and follow-up programs as appropriate.<sup>140</sup>

Thus, not only does the agreement set out the parameters for the conduct of the environmental assessment, it also provides for the coordination of regulatory environmental monitoring *after* the conclusion of the environmental assessment.

119. The purposes for which the environmental assessment is conducted under federal and provincial legislation are distinct. Under the CEAA, the joint review panel, upon reviewing the application of the project proponent, makes an approval *recommendation* to the responsible federal authority or to the cabinet. Under provincial legislation, however, the joint review panel renders a project *decision* on behalf of Alberta authorities.<sup>141</sup> Certain applications may require a further Order in Council from Alberta's Lieutenant Governor in Council before they receive approvals from the AER.

120. In the context of the joint environmental assessment process for oil sands projects and their associated tailings ponds, the concern is that OSPW may be seeping into groundwater that is hydraulically connected to fish-bearing surface waters. This possibility has been raised on numerous occasions, over many years, by federal authorities and has at times been predicted by industry as well. A 2007 Syncrude environmental assessment, referencing a 1973 study, stated:

Seepage through the dyke [of the tailings pond] will be controlled by the use of continuous gravel filters, and will be monitored by piezometers. The seepage will reduce with time as voids in the sands are sealed by sludge fines; thus contributing further to the safety of the dykes.<sup>142</sup>

121. While the Secretariat acknowledges that in this circumstance seepage was being considered for the evaluation of structural integrity of the dykes, the passage adequately demonstrates that seepage of OSPW was known to occur in the earliest periods of oil sands development in the Athabasca region of Alberta. Another example of the joint environmental review process and potential seepage follows.

122. The Horizon Oilsands project<sup>143</sup> is a large extraction and upgrading facility in the Fort McMurray area, proposed, constructed, and operated by Canadian Natural Resources Limited (CNRL). The project, at the time of application<sup>144</sup> to the Joint Review Panel (2003), proposed the extraction of 37,000 cubic meters of upgraded bitumen product per day.

123. The Joint Review Panel<sup>145</sup> noted in its report that CNRL, a company headquartered in Canada, predicted seepage from the external tailings areas into the groundwater system:

CNRL indicated that, during development and following closure, it expected water to seep from the External Tailings Areas (ETA) into the groundwater system and/or discharge into the mine surface water drainage system. CNRL stated that during development, ditches would capture some of the seepage flow and direct it back to the tailings or recycle water ponds.

[...]

CNRL indicated that in-pit tailings seepage would occur following placement of tailings into mined-out pits. CNRL stated that depressurization activities would potentially capture seepage during development. CNRL indicated that backfilling of mine pits with tailings would have a moderate environmental consequence on groundwater levels, flows, and flow patterns and a low impact on water quality within the basal aquifer.<sup>146</sup>

124. The panel also noted that CNRL also committed to monitoring, for the purposes of reducing uncertainties in its groundwater modelling and to confirm its environmental impact assessment predictions:

CNRL stated that it would continue to gather data to evaluate and potentially reduce the uncertainties in its groundwater models and to confirm its EIA predictions through the continued investigation of the hydrogeology of the Quaternary deposits in the vicinity of the ETA [External Tailings Area] and of the hydrogeology of the basal aquifer.

CNRL stated that it would undertake a comprehensive groundwater monitoring program and was willing to involve stakeholders in the design and implementation of the program, as well as to share the results of monitoring. CNRL state that it was willing to participate in a regional groundwater-modelling program.<sup>147</sup>

125. In response to CNRL's modeling and associated conclusions, Canada noted several concerns and outstanding uncertainties relating to the use of relatively few data points and some detection limits above water quality guidelines, and noted that any tailings release or seepage from end pit lakes (EPLs) into fish-bearing waters might constitute a violation of the *Fisheries Act*, which would warrant ECCC taking enforcement action.<sup>148</sup>
126. Concerns of uncertainty from the Government of Alberta also seemed to echo those of Environment and Climate Change Canada, with Alberta Environment pointing to water quality modeling and the lack of site-specific historical data and hydrologic-process information."<sup>149</sup> Alberta also noted that "monitoring was necessary to validate and calibrate the models and confirm water quality predictions [and...] that it might include a monitoring condition in any Water Act or EPEA approval."<sup>150</sup>
127. The Joint Panel emphasized that, "both agencies [ECCC and AENV] advocated a thorough monitoring program to identify and address any effects that might occur. Therefore, the Panel recommended that the Department of Fisheries and Oceans (DFO) and AENV include a condition in any approvals to be issued to CNRL that it develop and implement a comprehensive monitoring program."<sup>151</sup> It went on to state that "CNRL is ultimately responsible for implementing the monitoring program."<sup>152</sup> And once again, the panel noted that ensuring significant environmental effects did not occur was contingent on a monitoring plan and an adaptive management strategy:

Although there are some predicted exceedances of water quality guidelines, the Panel believes that by implementing a comprehensive monitoring plan and adaptive management strategies to ensure adherence to the water quality guidelines, the project is unlikely to result in significant adverse environmental effects on water quality.<sup>153</sup>

128. The Secretariat notes that approvals for oil sands operations, and tailings ponds specifically, are typically conditioned on the implementation of adequate monitoring methodologies to confirm and validate seepage models used in the design of tailings ponds. The Syncrude and Suncor reports discussed above are examples of such monitoring. In light of this information, the Secretariat requested information from Canada on what role these monitoring reports played in its investigation of oil sands tailings ponds between 2009 and 2014. To this end, the Secretariat asked the following:

Oil sands groundwater monitoring reports produced by industry show that oil sands process-affected water is seeping into groundwater on the basis of analysis and measurement that does not include the use of chemical fingerprinting methods but rather compares various contaminant concentrations against established background levels. Please provide any ECCC documents that discuss the potential relevance and/or efficacy of this type of analysis and whether it can be used to determine whether OSP is seeping into groundwater.

129. In response, and referencing the Syncrude water monitoring report, in which the presence of chloride [ion] was used to detect and define OSPW seepage at the Aurora tailings pond, Canada stated:

The premise here is the use of simple, conventional types of analyses that do not involve sophisticated chemical fingerprinting for seepage detection. Generally, the use of conventional parameters (such as chloride) work well where you have on-site groundwater monitoring and/or site access, and where the local hydrogeological setting permits the use of routinely-measured parameters to distinguish OSPW from background. Where these conditions are not met, more sophisticated approaches need to be employed.<sup>154</sup> [...]

130. Based on the above response and the position generally taken by the government of Canada in the context of the joint environmental review process, it appears to the Secretariat that oil sands monitoring reports produced pursuant to regulatory approvals may be either adequate or inadequate for their intended purposes, depending on whether the local hydrogeological settings are suitable or not for the conventional type of analysis. Where local hydrological conditions are adequate to assess tailings leakage into groundwater without requiring chemical fingerprinting, and this analysis is employed by an oil sands company pursuant to provincial approvals, it is not clear to the Secretariat why Canada does not use such analysis under the *Fisheries Act*.

### 3.2. Alberta's Relationship with Canada in Relation to Effective Enforcement of Subsection 36(3) the Fisheries Act and Certain Oil Sands Tailings Sites

131. The structure for a relationship between Canada and Alberta regarding tailings ponds, in respect to the pollution prevention provisions of the *Fisheries Act*, is documented in a number of intergovernmental agreements as well as documents from Canada and other public information the Secretariat obtained during the preparation of this factual record. As shown below, however, the Secretariat could not determine, in accordance with the Council's direction, that there was any relationship between the governments with respect to the tailings ponds identified in the Submission or in Canada's response.



### 3.2.1. Administrative Agreement for the Pollution Prevention Provisions of the Fisheries Act

132. The 1994 *Canada-Alberta Administrative Agreement for the Control of Deposits of Deleterious Substances under the Fisheries Act* is the primary document governing the relationship between the Canadian federal government, as represented by the Minister of the Environment, and the Province of Alberta, as represented by the Minister for Alberta Environment and Parks, related to the enforcement of the pollution prevention provisions of the *Fisheries Act*. The stated purpose of the agreement is “to establish the terms and conditions for the cooperative administration of subsection 36(3) and the related provisions of the *Fisheries Act* (e.g., subsection 38(5)), the regulations under the *Fisheries Act* designated in the annexes, and Alberta’s *Environmental Protection and Enhancement Act*].”<sup>155</sup> The stated objective of the agreement is “to streamline and coordinate the regulatory activities of Canada and Alberta in relation to the protection of fisheries and to reduce duplication of regulatory requirements for the regulated sector.”<sup>156</sup>
133. Each of the parties to this agreement has the legislative authority to enter into such arrangements. Under section 7 of the Department of the Environment Act, Canada’s Minister of the Environment “may, with the approval of the Governor in Council, enter into agreements with the government of any province or any agency thereof respecting the carrying out of programs for which the Minister is responsible.”<sup>157</sup> Further, as discussed above in subsection 3.1.5, the *Fisheries Act* provides additional authority for the Minister to enter into agreements with a Province.<sup>158</sup> Section 19 of Alberta’s EPEA enables the Minister of the Environment to enter into agreements with the government of Canada relating to any matter pertaining to the environment.
134. The Administrative Agreement concerns four major activities: inspections; investigations and enforcement; reporting of releases; and administration of regulations. Basically, under this agreement the parties agree to coordinate their activities to make better use of limited resources.
135. The Secretariat also notes that, for the most part, the powers enunciated in Canada’s *Fisheries Act* cannot be delegated to the provinces. There are, however, some instances in which a form of delegation can occur. For example, provincial wildlife or conservation officers may be designated by Canada as fishery officers under the federal Act. Further, the *Fisheries Act* allows the federal Minister to enter into “equivalency agreements” with provinces, whereby a provincial regulation is deemed by the federal government to be equivalent to an existing federal regulation.<sup>159</sup> If such an agreement is implemented, the federal regulation will not be applicable in that province but replaced by the provincial regulation. An example of this administrative procedure is the equivalency agreement Canada entered into with Quebec concerning the Wastewater System Effluent Regulations (WSER) promulgated by Canada under the *Fisheries Act*.<sup>160</sup>
136. The Administrative Agreement regarding the pollution prevention provisions of the Act is not, however, a delegation agreement. Nor could such an equivalency agreement be created with respect to tailings ponds since Canada has not issued any applicable effluent regulations.

#### IN BRIEF

The Administrative Agreement regarding the pollution prevention provisions of the Act is not, however, a delegation agreement. Nor could such an equivalency agreement be created with respect to tailings ponds since Canada has not issued any applicable effluent regulations.

137. The Administrative Agreement provides in relevant part:

**4.0 PRINCIPLES OF COOPERATION**

4.1 The principles of this Agreement are:

**COMMITMENT TO ACTION**

the Parties to this Agreement recognize that they are committed to act on environmental matters within their respective areas of jurisdiction while respecting the jurisdiction of other governments.

...

**CONSULTATION**

where one Party's legislation, regulations, policies, programs and projects affect the other Party's jurisdiction, the Parties undertake to provide one another with timely notification and appropriate consultation.

...

**5.0 ACTIVITIES**

...

**INFORMATION SHARING**

the Parties may agree to procedures for sharing information related to the administration of their respective legislation. . . .

**INSPECTION**

the Parties may agree to coordinate their inspection activities in order to make better use of limited resources and to reduce the administrative burden for those subject to both federal and provincial requirements

**INVESTIGATION AND ENFORCEMENT**

the Parties may agree to cooperate in the investigation of offences and in taking enforcement actions in response to violations of their respective legislation. Such cooperation may involve, but is not limited to the sharing of technical and compliance data and the attendance in court of inspectors, analysts and expert witnesses.

**REPORTING**

the Parties agree to share such information as will enable each to meet its statutory reporting obligations to the Legislature or Parliament, as the case may be.

**ADMINISTRATION OF REGULATIONS**

the Parties may agree to specific arrangements and roles in the administration of regulations made pursuant to the *Fisheries Act* and regulations made pursuant to EPEA.

138. Section 6 of the agreement establishes a management committee "to direct the implementation" of the agreement, including developing "collaborative arrangements for the various activities identified in the agreement." Annex 1 to the agreement, which concerns this management committee, notes that the committee will meet at least once a year, in part to prepare a report "to satisfy the statutory reporting requirements set out in the respective federal and provincial legislation."

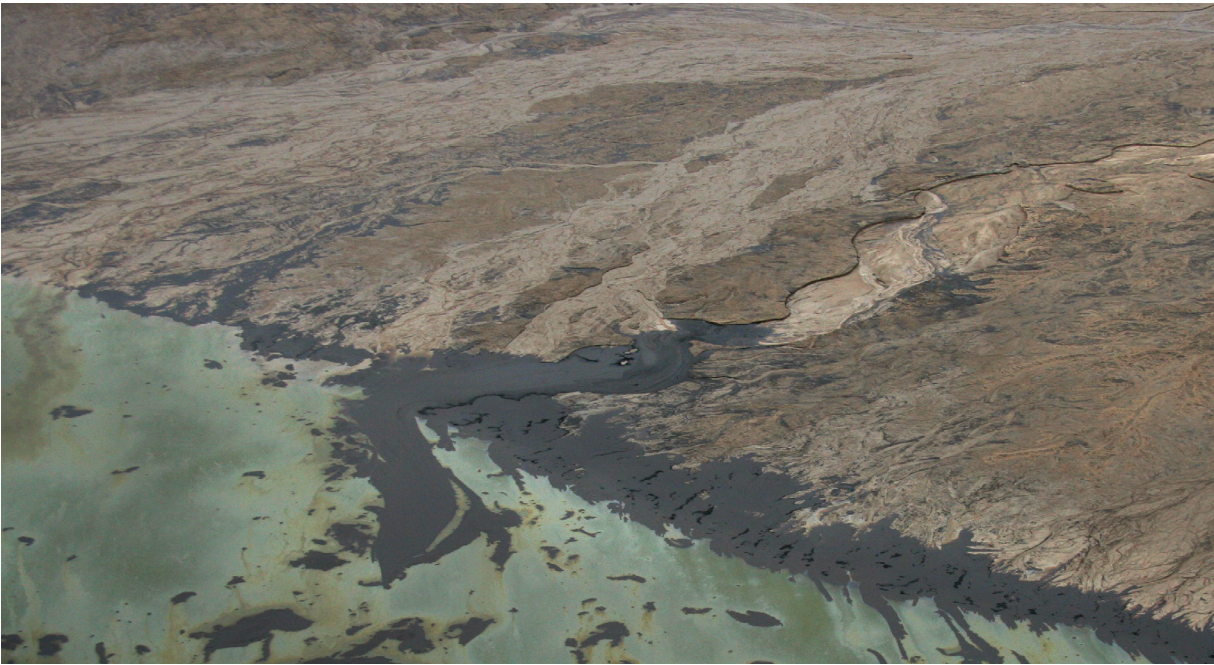


Photo Courtesy of Icarus Films

139. The Administrative Agreement was first created in 1994 and has been amended twice since then, once in 2011 when a separate *Canada-Alberta Environmental Notifications Agreement* was issued after Canada's Deposit Out of the Normal Course of Events Notification Regulations<sup>161</sup> and the Release and Environmental Emergency Notification Regulations<sup>162</sup> were promulgated, and again, in 2017, after the 2011 agreement expired and a new one was signed.<sup>163</sup> These two notification regulations, issued under the *Fisheries Act* and the *Canadian Environmental Protection Act, 1999* (CEPA, 1999), function in the same way and designate persons who can also receive notifications under the following situations:
- (a) a release of a substance into the environment, or the likelihood thereof, in contravention of a regulation described in section 95, 169, 179 or 212, or in contravention of an order described in section 95, of CEPA, 1999;
  - (b) an environmental emergency under section 201 of CEPA, 1999;
  - (c) a deposit of a deleterious substance in water frequented by fish, as described in subsection 38(5) of the *Fisheries Act*,<sup>164</sup> or the serious and imminent danger of such a deposit;
  - (d) other environmental incidents of federal interest; or
  - (e) a request for Environment Canada's emergency scientific or technical expertise;<sup>165</sup>
140. Once notified, provincial officials transfer this information to ECCC for appropriate federal support. This process does not regulate the environmental activities which may give rise to a reportable event but rather delineates the process by which public notification is provided, e.g., by telephone to the designated provincial contact. The Secretariat notes that under this Notification Agreement, the parties also agreed to establish a management committee and create standard operation procedures (SOPs) "for the collection and processing of notifications of environmental occurrences received by Alberta" and transmitted to Canada.<sup>166</sup>



141. The Environmental Emergency Regulations require that any person who owns, has the charge, management or control of a regulated substance at or above a certain concentration must notify ECCC of releases of such substances into the environment, in accordance with the applicable CEPA provisions. CEPA defines “release” as “discharge, spray, inject, inoculate, abandon, deposit, spill, leak, seep, pour, emit, empty, throw, dump, place and exhaust.” Certain higher-risk facilities are required to prepare and implement an environmental emergency plan. Facilities with quantities in tailings ponds, however, are excluded from the calculation of the total amount on site that is used to determine if the threshold for having a plan is met.<sup>167</sup> Further, regarding tailings, the placement of OSPW in tailings ponds is not considered a “release” under CEPA because this action is considered a “disposal,” and any disposal of OSPW, which may contain substances listed on the CEPA toxics list, such as polycyclic aromatic hydrocarbons (PAHs), must be reported subject to the thresholds described above.
142. The Secretariat notes that naphthenic acids (NAs), the main constituent of tailings, are not currently considered toxic under CEPA.<sup>168</sup> Canada recently assessed certain commercial naphthenic acids (NAs) under CEPA and proposed to take no further action.<sup>169</sup> The notice accompanying this assessment stated the following:

This assessment addresses two commercial NAs obtained via the extraction of petroleum distillates. Nineteen other commercial NAs have been or are being addressed through various approaches under the CMP [footnote omitted]. The commercial NAs differ from complex mixtures of naphthenic acids present as a by-product in oil-sand processed water (OSPW) generated from oil sands mining, extraction and processing of bitumen. Activities to better understand OSPW naphthenic acids are occurring under the Canada-Alberta Joint Oil Sands Monitoring Program (JOSM). In addition, Environment and Climate Change Canada is proposing to add naphthenic acids and their salts that are present in waste generated by processing of oil sands to the National Pollutant Release Inventory (NPRI), beginning in the 2020 reporting year.”

The Secretariat notes that Environmental Defence, one of the Submitters, filed a 2010 proposal asking Canada to add NAs to the NPRI.<sup>170</sup>

143. The 2017 *Environmental Notifications Agreement*, which amends the 1994 *Administrative Agreement*, envisions the establishment of a management committee, as did the 1994 and 2011 agreements, and states that the committee should establish “standard operating procedures for the collection and processing of notifications of environmental occurrences received by Alberta under this Agreement, as well for the transmittal of this information by Alberta to Environment Canada.”<sup>171</sup>
144. The Secretariat requested from Canada all documents related to how Canada and Alberta implement the above agreements since their inceptions. Canada provided six (6) documents: (i) a list of the current Management Committee membership, with names of officials from the Canadian and Alberta governments, consistent with the membership paragraph of the 1994 administrative agreement<sup>172</sup>; (ii) two one-page written agendas for Management Committee meetings held on 29 December 1999 and 24 February 2000; (iii) a letter of 13 March 2000 from ECCC to Alberta Environment regarding procedures related to environmental incident reports; (iv) notes from a meeting on 10 July 2000 between ECCC and Alberta Environment on incident reporting and coordinating compliance/enforcement activities; and (v) a one-page undated document relating to the SOPs established under the *Notifications Agreement* discussed above. ECCC indicated there were no other responsive records to the Secretariat’s request.

145. The Secretariat notes that since 2012 provincial enforcement activities have been assigned to the AER, not AEP, and neither the Administrative Agreement, nor a recent update, contains any references to the AER. The Secretariat cannot determine what role, if any, the AER has with respect to the implementation of this agreement, except as otherwise noted in its discussion of Alberta law or the OSMP. The Secretariat is aware, however, that AEP sets the applicable provincial policy and the AER implements the policy through directives and other oversight activities.<sup>173</sup> ECCC enforcement representatives did note to the Secretariat that provincial inspectors who had been at AEP had transferred to AER when that entity was created and, at times, do coordinate certain joint inspections with ECCC, although most provincial and federal inspections appear to be done independently under the respective laws.<sup>174</sup>
146. Aside from the interactions between Canada and Alberta with respect to the notification requirements discussed above and the documents listed above, the Secretariat's review of public information did not indicate there was any relationship between Canada and Alberta with respect to the oil sands tailing locations referred to in the Submission or Canada's response. Further, Canada confirmed that when it did conduct its inspections of tailings ponds from 2009–2014 in Alberta, there was no coordination with Alberta because "these inspections did not address provincial legislation."<sup>175</sup> Moreover, in its Information Request to ECCC, the Secretariat requested all documents related to how the two government agencies carry out the overall agreement, including beyond the tailings ponds context, but except for the agreement itself, the related notifications agreement and the information shared under it, and the documents discussed in paragraph 144, Environment Canada indicated there were no other relevant records. Thus, the Secretariat could not determine, in accordance with the Council's direction, that there was any relationship between the governments with respect to the tailings ponds identified in the Submission or in Canada's response.

### 3.2.2. Reports to Parliament

147. Section 42.1(1) of the *Fisheries Act* requires the Minister to table an annual report to Parliament on the administration and enforcement of both the fish habitat protection and pollution prevention provisions. Similarly, section 4.3 of the *Fisheries Act* requires the Minister to provide an annual report to Parliament on the administration of any agreements with Provinces on furthering the purposes of the Act. These annual reports from 2004 to 2017 are available online.<sup>176</sup>
148. The Secretariat reviewed the annual reports for the years 2009–2017, and relevant information from two of the reports (for 2016/2017 and 2014/2015) are summarized below.
149. In the 2016/2017 annual report, the following relevant information is reported. During this period, ECCC reported that it conducted a total of 2,975 inspections (of which 1,112 were on-site) and 1,512 were related to the general prohibition of subsection 36(3) and not related to any of the effluent regulations established under the *Fisheries Act*. Forty-five new investigations were started during this time period, 18 prosecutions were filed, and 7 convictions were obtained, the latter two categories relating to the general prohibition.<sup>177</sup> As indicated above, however, none of these enforcement actions related to oil sands tailings ponds.<sup>178</sup>

150. The 2016/2017 report also indicated that 4,219 notifications were received involving the unauthorized deposit of a deleterious substance under the environmental emergencies program. It appears to the Secretariat that none of these were related to oil sands tailings ponds.
151. Regarding the *1994 Administrative Agreement* with Alberta, ECCC reported to Parliament only the basic structure of this agreement but did not note any specific activity implemented during this time frame.<sup>179</sup> Finally, with respect to the *Environmental Occurrences Notification Agreements*, ECCC noted that it renewed its agreement with Alberta and other provinces.<sup>180</sup>
152. In the 2014/2015 report ECCC reported to Parliament the following activities related to the enforcement of subsection 36(3) (the following focus primarily on activities not related to established effluent regulations):
  - Contributed to environmental emergency management activities by managing Environment and Climate Change Canada's pollution incident notification system and undertaking response actions to significant pollution incidents related to the deposit of deleterious substances not authorized under the Act, as per subsections 38(5) and 38(7);
  - Implemented administrative and notification agreements with provinces that support effective administration of the pollution prevention provisions and associated regulations;
  - Administered, performed compliance promotion and enforced the subsection 36(3) general prohibition on deposit of deleterious substances in water frequented by fish and subsections 38(5), 38(6) and 38(7) which require notification, preventive and remediation measures and reporting in the event of an unauthorized deposit.<sup>181</sup>
153. In the section under "Compliance Promotion for General Prohibition of Releases of Deleterious Substances to Waters Frequented by Fish," ECCC noted in the report relating to the Province of Alberta that it had "made presentations about the *Fisheries Act* and the *Canadian Environmental Protection Act of 1999* to five Department of National Defence Canadian Forces Bases in Alberta."<sup>182</sup>
154. Further, under the section entitled "Agreements with Provinces and Territories" Canada noted:

Following referrals received by [Alberta], Environment and Climate Change Canada conducted 108 (on-site and off-site) inspections and 5 investigations during 2014–2015. Environment and Climate Change Canada conducted 10 additional planned on-site inspections, including 1 under the Pulp and Paper Effluent Regulations, in accordance with the Agreement.
155. As far as the Secretariat can determine, these "referrals" consist of notifications of releases under the notifications agreement discussed above, but none of these notifications appear to be related to releases from tailings ponds.
156. Further, the Secretariat notes that the reports to Parliament during the 2009–2015 timeframe do not specifically identify the inspections done in Alberta related to oil sands tailings ponds.



### 3.3. State of the Science on the Identification of Naturally Occurring Bitumen-Influenced Water versus Anthropogenic Process-Affected Water

157. To implement this section of the factual record, the Secretariat contracted with a subject matter expert to assess peer-reviewed scientific articles on the state of the science related to the ability to distinguish between naturally occurring bitumen-influenced waters and waters affected by man-made process-affected water. Dr. Jonathan Martin's full report<sup>183</sup> (the "Martin report") is attached as Annex 4 and is summarized below. The Secretariat notes that in response to both the submission and the Secretariat's information request, Canada provided citations to many of these peer-reviewed articles which form the basis of the Secretariat's expert's report, including those reports in which the government of Canada was a participant.<sup>184</sup>
158. Concerns about OSPW seeping from tailings ponds into groundwater and surface water have been raised for over a decade at sites throughout the Athabasca region. To address some of these questions, scientific studies and field-monitoring have been undertaken by various universities, federal and provincial environmental agencies, industry, and environmental non-government organizations. The basic question—are tailings ponds leaking into the environment?—has historically been challenging to answer through environmental monitoring for a couple of major reasons. The first reason is the physical proximity of industrial and natural sources of bitumen-impacted waters.<sup>185</sup> In other words, bitumen is a naturally occurring and viscous form of petroleum found throughout the Athabasca oil sands region, and bituminous sands can be seen on the banks of the Athabasca River. In warm weather, bitumen can be seen bleeding from the outcrop face into the river, and groundwater that has naturally come into contact with the bitumen carries residues of the bitumen into the Athabasca River or its tributaries.<sup>186</sup> When bitumen-derived substances are detected in groundwater or surface water, chemical forensic tools and knowledge of surrounding hydrology need to be applied and carefully considered before the source can be assigned as natural, anthropogenic, or a mixture of both. The second reason is that bitumen-derived organics are complex mixtures containing many millions of substances that remain impossible to fully characterize, even with the most sophisticated instrumentation available today.<sup>187</sup> This complexity was not appreciated until 2005–2010, when high-resolution mass spectrometry began to be applied to analysis of OSPW and natural bitumen impacted waters.<sup>188</sup> Subsequently, detection levels of some potentially important chemical forensic tools had improved sufficiently by around 2011/2012. These tools continue to evolve and be utilized in combination with measurement of other organic and inorganic geochemical parameters.
159. The Martin report summarizes publicly available science on methods and applications of environmental chemical forensics to differentiate between natural and anthropogenic bitumen-impacted water in Canada's Athabasca oil sands region, in accordance with the Council's factual record instructions. The focus of the report is on original peer-reviewed literature, but reports from federal or provincial research efforts have also been considered when deemed to be of sufficient quality and relevance.
160. Section 1 of the report is a summary of relevant analytical chemistry methods for water, as well as a description of the quantitative or qualitative parameters that are used to measure in the Athabasca oil sands region. This analysis is included to make subsequent sections more easily understandable to the reader. In part, this material may be useful because the peer-reviewed science is based on a broad range of routine to advanced analytical methods that are highly technical and likely unfamiliar to the

general public. Moreover, the quality or diagnostic value of the data from each method may vary; thus for some methods Dr. Martin's expert opinion is included or citations to scientific literature are provided to explain why some methods can be trusted more than others. In particular, many early studies purporting to characterize or quantify naphthenic acids (NAs) in OSPW or environmental water were based on methodologies that are now recognized to be biased (i.e., NA concentrations were too high) and inaccurate (i.e., NA profiles reported were incorrect). Section 1 is summarized below.

161. Section 2 of the report contains a review of state of the science and Dr. Martin's expert opinion on (i) the state of the science for identifying chemical differences between naturally-occurring bitumen-influenced water and anthropogenic OSPW, and (ii) whether the state of the science is sufficient to determine whether OSPW is leaking, or has leaked, into groundwater and/or surface water, based on combined evidence of all studies examined. Section 2 is summarized below.
162. Section 3 is a study-by-study summary of the scientific literature from which information in Section 2 was drawn, arranged chronologically. The study context and type of samples analyzed in each study are explained, and major conclusions of the authors are summarized, sometimes along with Dr. Martin's expert opinions. Section 3 is not summarized in this section of the factual record since that information is effectively included in the Report itself; the Secretariat refers the reader to the attached full report for the section 3 information.

### 3.3.1 Key Findings regarding the Analytical Methods or Parameters Measured in Water Samples (Section 1 of the report)

163. The Secretariat's expert maintains that analytical mass spectrometry methods for the analysis of bitumen-impacted waters have progressed in quality by leaps and bounds over the last 20 years, but were sufficient for environmental monitoring by approximately 2011. Dr. Martin's opinion is that the tools for environmental monitoring of OSPW and of natural bitumen-impacted waters are now sensitive and accurate, and are part of a larger toolbox of organic and inorganic geochemical techniques used for understanding sources of water in the Athabasca oil sands region<sup>189</sup> High-resolution mass spectrometry (e.g., High-performance Liquid Chromatography) is now the accepted entry point for accurate characterization and semi-quantification of naphthenic acids in OSPW and in environmental water samples. Ultrahigh-resolution mass spectrometry (e.g. HPLC-Orbitrap, infusion FTICR-MS) is necessary to profile chemical species other than NAs, including many other important toxic chemical species in bitumen-impacted water.
164. Based on his review of the literature, the Secretariat's expert found that validation studies have demonstrated that chemical profiles of OSPW can be distinguished from the chemical features of natural bitumen-impacted water. Thus, he believes that the state of the science is now, and has been for some time, at a point where the distinction between naturally occurring bitumen-influenced water and OSPW can be made.<sup>190</sup> The Secretariat's expert cautions, however, that in such validation studies the source of each sample is known at the outset, and notes that there have yet to be any 'blind' tests to prove method performance in unknown samples, or with samples containing a mixture of OSPW and natural sources of bitumen-impacted water. In real-world field situations where sources are unknown and could very well be mixed, the Secretariat's expert believes there is high uncertainty in using these methods alone to determine source, and that there is limited sensitivity to detect small contributions of OSPW in otherwise naturally bitumen-impacted water samples.<sup>191</sup>

165. It is the opinion of Dr. Martin that the literature shows that although no individual mass spectrometry-based analytical method available today can be used to confidently assign the source of bitumen-derived organics in water, when it is used in combination with other geochemical analyses, or when applied to strategic sample sets, the overall body of evidence would be strong enough to make such an assessment.<sup>192</sup> The Secretariat's expert opinion is that it is important not only to consider analytical chemistry but also to have knowledge of the hydrological system where samples are taken, the site history, historic measurements, and spatial trends.

### 3.3.2 Key Findings regarding the State of the Science of Analytical Methods and their Applications to Source Discrimination (Section 2 of the report)

166. The Secretariat's expert recognizes that practical challenges and sources of uncertainty are not easily overcome when attempting to differentiate between OSPW and natural sources of bitumen-impacted waters. He notes that one challenge has been the limited numbers of samples of OSPW from presumed tailings pond sources, in part due to legal authority and logistics of sampling around tailings ponds. The other issue he recognized is that the leading edge of any groundwater plume of OSPW likely represents OSPW that is many decades old, and its water chemistry is therefore not expected to match the water chemistry in fresh OSPW taken from today's tailings ponds as a reference. He notes that the spatial and temporal variability of the source (OSPW) and of the receptor (groundwater or surface water) should both be understood to raise confidence and provide necessary statistical power to avoid false positives and false negatives.<sup>193</sup>

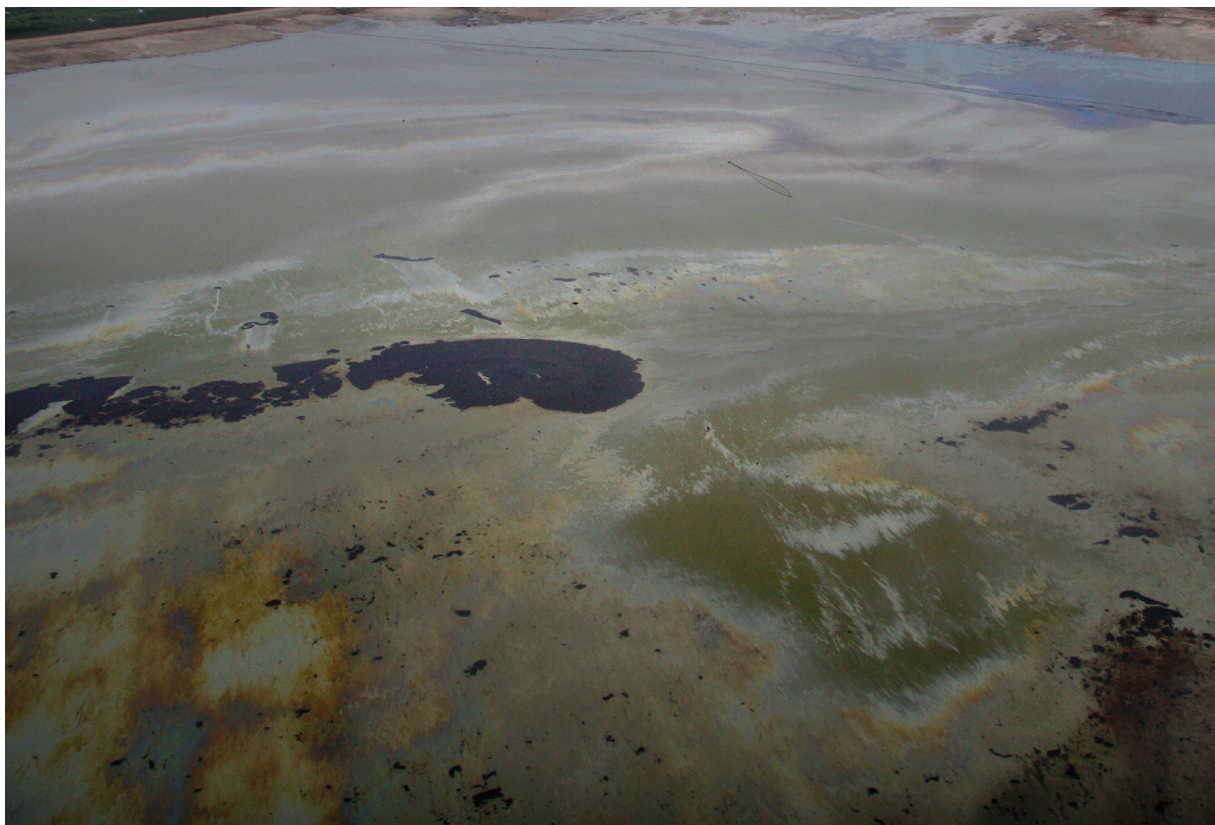


Photo Courtesy of Icarus Films



167. Overall, Dr. Martin concludes that despite some limitations as described above, based on the scientific tools used today, the current literature shows that there is strong scientifically valid evidence of OSPW seepage into near-field groundwater around tailings ponds, when compared with the first peer-reviewed evidence published in 2009.<sup>194</sup> In some cases, he notes that the same sites have been revisited and consistent results have been found with new analytical approaches in new studies. Even with imperfect analytical methods, Dr. Martin found that the literature discloses spatial trends showing declining chemical signals moving away from tailings ponds, which he notes are critical lines of evidence. Dr. Martin found that although tailings ponds have seepage water collection systems which capture horizontal seepage through the walls of the structure, the literature shows that there is both experimental and monitoring evidence for a slow vertical seepage pathway that may circumvent these collection systems and contaminate aquifers through groundwater.<sup>195</sup>
168. The Secretariat's expert also found that the scientific literature shows that there is generally less evidence that OSPW is reaching natural surface waters, as opposed to groundwater. He notes that mass spectrometry fingerprinting of upwelling groundwater in the Athabasca River, immediately adjacent to one of the oldest tailings ponds, has led to conclusions by federal scientists that OSPW is reaching the river. He also notes that some of these findings have been openly debated in peer-reviewed articles, and is of the opinion that although this evidence may be compelling, there are uncertainties in the approaches and interpretations taken.<sup>196</sup> In systematic surveys of the mainstem Athabasca River with best available analytical methods, his review finds that there is in fact no detectable evidence of dissolved bitumen-derived organics (natural or anthropogenic) in any water samples, and notes that dilution in this very large river would present a major challenge to spotting any seepage. Nevertheless, the Secretariat's expert acknowledges that two tributaries (Beaver River, McLean Creek) are suspected of receiving OSPW seepage or runoff from nearby tailings ponds.<sup>197</sup> This is based on elevated NA concentrations, and similar organic and inorganic chemistry profiles compared to fresh OSPW. McLean Creek's upper watershed was redirected by construction of a nearby tailings pond, and its lower watershed is known by the industry to be a possible site of OSPW seepage. According to non-peer reviewed industry documents, Beaver River is known to have historically received seepage and runoff from the nearby Syncrude Mildred Lake Settling Basin.<sup>198</sup>

### 3.4 The Oil Sands Monitoring Program and the Enforcement of the Fisheries Act

169. In its Response to the Submission under Article 14(3), Canada referred to its participation in the Oil Sands Monitoring Program as consistent with its obligations pursuant to Article 5.1 of the NAAEC:

ECCC has taken appropriate governmental action (as per Article 5.1 of the NAAEC) by supporting the advancement of scientific knowledge and tools necessary to improve ECCC enforcement officers' ability to enforce ss. 36(3) of the Act. The scientific advancements and ongoing work include the development and validation of an "analytical toolbox":

- to distinguish between natural and anthropogenic sources of deleterious substances; and
- to identify substances unique to OSPW, alongside forensic tools, to support the ability to attribute the source of the deleterious substance and distinguish between individual tailings ponds.<sup>199</sup>

170. Consequently, the Council instructed the Secretariat to prepare a factual record in relation to “how the Oil Sands Monitoring Program (OSMP, formerly the Joint Oil Sands Monitoring Program (JOSMP)) is carried out and how it fits into Canada’s enforcement of the Fisheries Act.” This section provides information within this context on joint efforts between the federal and Alberta governments related to the implementation of regional monitoring efforts and how these efforts relate (or do not relate) to effective enforcement of the Fisheries Act.

#### 3.4.1 Background information on the Oil Sands Monitoring Program

171. The current OSMP was preceded by a number of regional monitoring programs, including the 1997 Regional Aquatic Monitoring Program (RAMP), an industry funded monitoring program mandated to determine, evaluate, and communicate the state of the aquatic development and any changes that may result from the resource (e.g. oil sands) development. The RAMP was criticized as inadequate by many stakeholders in a series of reports, including a 2010 report by the RAMP Scientific Review Panel.<sup>200</sup> The Royal Society of Canada reiterated similar concerns about water quality monitoring under RAMP, concluding that the “environmental regulatory capacity of the Alberta and Canadian Governments does not appear to have kept pace with the rapid expansion of the oil sands industry over the past decade.”<sup>201</sup>
172. The federal government, in response to the critical reports of RAMP, set out a conceptual framework for a monitoring plan for the lower Athabasca region, which was released in March 2011 (“Phase 1 Report”).<sup>202</sup> A second report, *An Integrated Oil Sands Environment Monitoring Plan* expanded the geographic scope of the aquatic monitoring program.<sup>203</sup> Details on provincial and federal implementation were set out in the *Joint Canada-Alberta Implementation Plan for Oil Sands Monitoring*.<sup>204</sup> The program outlined by these three documents was collectively referred to as the “Joint Oil Sands Monitoring Program” (“JOSMP”). The JOSMP called for the near-term gathering of baseline data throughout the Lower Athabasca Region against which to measure future environmental changes. The implementation plan stated that the “current constellation of monitoring arrangements will be rationalized and integrated into a single, government-led program under the joint management of the two governments.”<sup>205</sup> The Federal Minister of Environment and Climate Change and the Alberta Minister of Environment and Parks were jointly responsible for administering and funding the JOSMP.
173. Referring to both provincial and federal legislation (CEPA and the Fisheries Act *inter alia* at the federal level, as well as EPEA, and OSCA *inter alia* at the provincial level), the Phase 1 Report had stated the following in relation to the “legislative context” of the program:

*The monitoring program must also be designed to inform pertinent legislative and regulatory action.* In this context, Box 2 [list of legislation mentioned above] summarizes the primary federal and provincial legislative authorities that the water quality monitoring systems can inform. Government representatives were queried for their respective surface water quality monitoring data needs. These data needs are accommodated in this monitoring plan.<sup>206</sup> [Emphasis added].

174. The monitoring plan envisioned by JOSMP was regional in nature. The approach described was not aimed specifically at monitoring for the purposes of regulatory compliance of individual oil sands operations but rather to assess the general effects of oil sands activities in the lower Athabasca region: “an appropriately designed and adaptive, integrated, multi-media monitoring and research program is required to understand, predict and report on the status and trends of water quality and quantity, accumulated state, changes in ecosystem structure, function and health and ultimately determine cumulative impacts.”<sup>207</sup> The implementation plan stated: “[t]he monitoring commitments contained in the Implementation Plan are in addition to compliance monitoring requirements already outlined in regulatory approvals.”<sup>208</sup>

#### 3.4.2 The current Oil Sands Monitoring Program

175. The JOSMP was replaced by the Oil Sands Monitoring Program in 2015 and is documented in a Memorandum of Understanding between the Alberta and federal governments. The three stated purposes of the OSMP are the acquisition and reporting of regional data on baseline environmental conditions, tracking any environmental impacts, and the assessment of cumulative environmental effects from oil sands development in accordance with existing legislative and regulatory controls.<sup>209</sup> The MOU also stated that Canada and Alberta “intend to provide the data and information obtained from the [integrated monitoring, evaluation and reporting] System to decision-makers and other stakeholders to inform management and regulatory action.”<sup>210</sup> The governance of the OSMP consists of an Oversight Committee composed of representatives from government agencies, indigenous communities, and industry.<sup>211</sup> The OSMP also differs from the JOSMP in that decisions for project funding are made on a “top-down,” program-based selection process as opposed to a proposal-based process. The Secretariat confirmed much of this information about how the OSMP is implemented in discussions with representatives from both Canada and Alberta Environment and Parks.<sup>212</sup>
176. In the development of the factual record, the Secretariat made a request for records to the government of Canada, specifically asking for “[p]olicies and/or guidance documents relating to the implementation of the monitoring program and how it relates to the enforcement of section 36(3) of the Fisheries Act.” Notwithstanding its invocation of the OSMP in its Response (as noted at the outset of this section), Canada’s response to this request for records reads as follows:
- No relevant records were identified. For further clarity, the Oil Sands Monitoring Program does not have a regulatory or enforcement mandate. It provides relevant, credible science to decision makers by collecting water quality data through the region. However, the program does not collect water samples on industrial sites but rather in the receiving environment; as such the water quality in tailings ponds is not monitored.<sup>213</sup>
177. The Secretariat also requested “[r]ecords relating to any proposed or implemented changes to the monitoring program which relate to the enforcement of section 36(3) of the Fisheries Act.” Environment and Climate Change Canada indicated that “[n]o relevant records were identified.”<sup>214</sup>
178. Thus, with respect to how the oil sands monitoring program is connected to the enforcement of the pollution prevention provisions of the Fisheries Act, the Secretariat could not establish that there was such an actual connection, except as noted in the above statement from Canada.



179. Despite the absence of a direct relationship between the OSMP and enforcement activities related to oil sands tailings ponds, activities arising out of the OSMP and JOSMP have provided relevant information related to potential seepage of OSPW from tailings ponds. The 2017/2018 Annual Report also summarizes groundwater monitoring as follows:

In 2015-16 a data discovery effort led to a compilation of over 100,000 groundwater records. In 2017-18, a groundwater monitoring workshop was conducted to share updates, outline data needs, and identify existing barriers to data sharing between industry, provincial regulators, and provincial and federal governments. As a result of this effort, several areas of future integration between groundwater and wetland monitoring components were identified and are informing future wetland monitoring design.

Regional groundwater monitoring was conducted in 2017 to further inform characterization of baseline conditions, changes and cumulative effects. Monitoring was conducted at wells classified as strategic, surveillance, and investigative; however, several wells were inaccessible due to poor road conditions or other logistical issues. Groundwater level data was collected both manually and from in situ instruments, and groundwater samples collected were analyzed for chemical and isotopic composition. Monitoring confirmed two previously identified geochemical anomalies where there may be aquifer connectivity, including a potential connection between the Surficial Sands and McMurray Formation, as well as between the McMurray Formation and saline Devonian formations along the salt scarp in areas north of Fort McMurray. The ecological implications of these findings are being assessed.

Monitoring has focused on groundwater and surface water interactions and the importance of groundwater to flow regimes in some rivers in the region. Overall, groundwater chemistry in the regional network is spatially diverse, both within and between formations. Focus in future years will be on consolidation and rationalization of the design of the groundwater monitoring program.

Monitoring of process water seepage from tailings ponds into the Athabasca River is ongoing with a focus on determining the occurrence outside of containment in groundwater and surface water and also on the development of techniques to better characterize the chemical signatures of process waters from natural waters containing bitumen.<sup>215</sup>

180. In the Oil Sands Monitoring Program Technical Report Series, AEP and ECCC released the “Assessments of Groundwater Influence on Selected River Systems in the Oil Sands Region of Alberta.” This report highlighted some of the difficulties in validating previous reports<sup>216</sup> (citing Baker, 1999; Hunter, 2001; Ferguson et al, 2009) suggesting possible leakage of OSPW to the Athabasca river:

[T]his assessment is complicated by the current lack of definitive parameters for OSPW source attribution. Groundwater passing through natural oil sands deposits is expected to contain many of the same, or similar, compounds found in OSPW (a concentrated wash water of mined oil sands). Groundwater may also obtain constituents found in OSPW from other geological formations in the area (e.g., salts, metals), and from various anthropogenic sources (e.g., domestic waste; landfill, etc.). A primary knowledge gap is how to identify with strong certainty the presence of OSPW-affected groundwater in river water receptors (including river waters, sediments and associate aquatic organisms), especially in cases where detailed on-site groundwater monitoring is not available.<sup>217</sup>

181. The report also provides an assessment of current scientific efforts aimed at distinguishing natural groundwater from OSPW adjacent to the reclaimed Suncor Pond 1 tailings pond. The report concludes that, for the particular site and particular conditions in question, distinguishing between these two sources is possible:

A restricted set of OSPW and groundwater samples (Part 2) were subjected to Level-2 profiling analyzes: i.e., electrospray ionization high-resolution mass spectrometry (ESI-HRMS) and comprehensive multidimensional gas chromatography time-of-flight mass spectrometry (GC × GC-TOF/MS). Differentiation of natural groundwater (even those with bitumen-derived AEOs) from OSPW sources was apparent through measurements of O<sub>2</sub>:O<sub>4</sub> ion-class ratios (ESI-HRMS) and diagnostic ions for two families (A and B) of suspected monoaromatic acids (GC × GC-TOF/MS) [see Fig. 13 (Fig. 5 Frank et al. 2014) for a comparison of these analyzes]. The resemblance between the AEO profiles from OSPW and from six groundwater samples adjacent to two tailings ponds, in particular two of these associated with on-site tailing drainage collection systems, implies a common source. The profiles provided by these methods, used in complement with the Level 1 analyzes, collectively suggest that differentiation of OSPW from natural groundwater is possible. However, it is not yet known whether these methods will apply to other tailings ponds not investigated here, due to potential differences in oil sands sediments or in treatment processes, or variable effects of aging. These issues are being explored in related Environment and Climate Change Canada research (e.g., Lengger et al. 2015; Frank et al. 2016).<sup>218</sup>

182. The report concludes that while “generally there is no broad-scale (i.e., covering 100s of m) increased risk posed to aquatic life,” there are nonetheless “indications that OSPW-affected groundwater has reached Athabasca River sediments beside Pond 1 at several locations.”<sup>219</sup>
183. Finally, the Secretariat notes that funding for the following study activity under the OSMF, i.e., “Develop a method that accurately measures seepage from tailings ponds and evaluate its toxicological significance” (referred to in section 3.1 above, in the context of proposed oil sands effluent regulations), has been paused.<sup>220</sup> According to the study activity summary on the OSMF website, the funding was paused because:

Funding in 2018/19 is dependent upon key project members participating in Oil Sands Process Water release discussions occurring provincially and federally. The Oil Sands Monitoring Program Secretariat will coordinate a meeting with the lead of the Alberta Environment and Parks OSPW Science Team for discussion. If these science discussions indicate work is warranted, activity will be considered for further funding.<sup>221</sup>

As noted by the ECCC scientists who would be carrying out this project, the above-referenced briefing “was committed to in the Government of Canada’s response to the Tailings Pond Seepage submission to Commission on Environmental Cooperation (November 2017). We anticipate that beyond the briefing and as part of the technology transfer, our participation in sample analysis and data interpretation of initial enforcement investigations using the methodology will be required going into 19/20.”<sup>222</sup>

## 4. Continuing Commitment to Transparency

184. Factual records provide detailed information regarding asserted failures to effectively enforce environmental law in Canada, Mexico or the United States that may assist submitters, the NAAEC Parties, and other interested members of the public in following up on the matters addressed. This factual record draws no conclusions regarding Canada's alleged failures to effectively enforce its environmental law, nor does it draw conclusions regarding the effectiveness of Canada's enforcement efforts.
185. In accordance with NAAEC Article 15(3), this factual record is "without prejudice to any further steps that may be taken" in regard to submission SEM-17-001 (*Alberta Tailings Ponds II*).
186. In 2014, the Council of the CEC stated that each year, the NAAEC Parties will provide updates on actions taken in connection with submissions concluded in the past year (including those on which a factual record has been prepared).<sup>223</sup>

Twenty years ago, North American leaders made a commitment that trade and economic growth would go hand-in-hand with effective trilateral cooperation and protection of the environment across the continent.

[...]

This year, we implemented a new reporting approach for submissions on enforcement matters (SEM) as part of our continued commitment to transparency and to the SEM modernization process. Following a proposal by the Joint Public Advisory Committee, each country provided an update on actions taken in connection with submissions concluded in the past year.

[...]

187. The Secretariat notes since 2014, the Parties have provided updates on actions taken in connection with certain submissions, but these updates have generally occurred during Council in camera sessions and the information has not been shared with the public. With respect to any follow-up to this factual record that the Government of Canada may wish to provide, the Secretariat encourages that such follow-up be made public.
188. Finally, the Secretariat further notes that in the Environment Chapter<sup>224</sup> of the new trade agreement that updates NAFTA,<sup>225</sup> the Parties have included the SEM and factual record process in the chapter and specifically included references to follow-up activities at Article 24.28<sup>226</sup>
7. The Environment Committee shall consider the final factual record in light of the objectives of this Chapter and the ECA and may provide recommendations to the Council on whether the matter could benefit from cooperative activities.
  8. The Parties shall provide updates to the Council and the Environment Committee on final factual records, as appropriate.



## ENDNOTES

- 1 SEM Registry of Submission SEM-17-001 (*Alberta Tailings Ponds II*), available at: <<http://b.link/tailings58>> (viewed on 25 July 2019).
- 2 Information regarding the various stages of the process, as well as previous Secretariat determinations and factual records, can be found on the CEC's website at: <<http://www.cec.org/submissions>>. Reference to an "Article" throughout this factual record, unless otherwise stated, is to an article of the NAAEC.
- 3 See NAAEC, Article 45 (2).
- 4 The Secretariat reviews these submissions to determine whether they meet the criteria contained in NAAEC Articles 14 and 15 and the *Guidelines for Submissions on Enforcement Matters under Articles 14 and 15 of the North American Agreement on Environmental Cooperation* (Montreal: CEC, 2012), available at: <[www.cec.org/guidelines](http://www.cec.org/guidelines)> ["Guidelines"].
- 5 See Annex 1: SEM-17-001 (*Alberta Tailings Ponds II*) Submission pursuant to Article 14(1) (26 June 2017) [Submission].
- 6 Submission, at 7-9.
- 7 *Fisheries Act*, R.S.C., 1985, c. F-14, available at: <<http://pages.today/laws1>> (viewed on 19 June 2019).
- 8 Regulations do exist, for example, for mining effluent and other categories, and may be proposed in the near future for oil sands tailings discharges. See further discussion at section 3.1.1.
- 9 Submission, at 2.
- 10 See Annex 3: SEM-17-001 (*Alberta Tailings Ponds II*) Response pursuant to Article 14(3) (November 2017) [Response], pp. 10-13.
- 11 *Id.*, at pp. 14-15.
- 12 Response, at 13.
- 13 Response, at 9-13. See, also SEM-17-001 (*Alberta Tailings Ponds II*), Notification under Article 15(1) (19 April 2018), [15(1) Notification], available at: <<http://b.link/pdf81>>.
- 14 Response, at 5,13. Additionally, Canada maintains that it cannot use these enforcement tools because it does not have a reasonable basis to conclude that a violation of the Act is present due to this inability to differentiate between naturally occurring and man-made exceedances.
- 15 Response, at 13.
- 16 15(1) Notification.
- 17 *Id.*, at 17-18.
- 18 See Annex 2: Council Resolution 18-01, instructing the Secretariat to prepare a factual record for SEM 17-001 (*Alberta Tailings Ponds II*), p. 3.
- 19 This aspect of the Secretariat's request was included its recommendation regarding the effective enforcement of subsection 36(3) of the *Fisheries Act*, since Canada's response to that assertion was rooted in its inability to distinguish between naturally occurring and man-made oil sands processed water.
- 20 Reasons for Council Instructions, at 3.
- 21 SEM-17-001 (*Alberta Tailings Ponds II*) Request for Information under Article 15(4) (27 December 2018), available at: <<http://pages.today/pdf11>> (viewed on 21 August 2019).
- 22 Wikipedia, *Alberta*, available at: <https://en.wikipedia.org/wiki/Alberta> (describing the Canadian province), (viewed on 19 June 2019); See also: *Canadian Encyclopedia*, Alberta Timeline, available at: <<http://resources.digital/canadian3>> (describing the Canadian province) (viewed on 19 June 2019).
- 23 Context Energy Examined, *Oil and Natural Gas: backbone of the Alberta economy*, available at: <<http://b.link/gas84>> (viewed on 9 March 2020).
- 24 Government of Alberta, *Gross Domestic Product*, available at: <<http://b.link/gross53>> (viewed on 25 July 2019).
- 25 See *Highlights of the Alberta Economy 2018*, available at: <<http://send.digital/stream60>> (viewed on 8 July 2019).
- 26 *Id.*
- 27 Regional Aquatics Monitoring Program, *Overview of Athabasca River Basin Landscape*, available at: <<http://b.link/river85>> (19 June 2019).

- 28 Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention), *Canada*, available at: <<http://b.link/ramsar13>> (providing general information about the Canadian Ramsar sites) (viewed on 19 June 2019).
- 29 Regional Aquatics Monitoring Program (RAMP), *Athabasca River Hydrological Profile*, available at: <<http://rivers.gallery/athabasca6>> (viewed on 19 June 2019).
- 30 *Id.*
- 31 *Id.*
- 32 Government of Alberta, *Profile of the Lower Athabasca Region* (July 2009), available at: <<http://pages.today/stream62>> (viewed on 3 July 2019).
- 33 The south Athabasca oil sands area encompasses approximately 35,215 square kilometers south of Fort McMurray and includes the lease areas for in situ development, as none of the oil sands deposits are accessible using surface mining techniques.
- 34 Government of Alberta, *Lower Athabasca Region Groundwater Management Framework* (August 2012), available at <<http://b.link/stream400>> (viewed on 6 February 2020).
- 35 *Id.*, at p. 15.
- 36 *Id.*
- 37 *Id.*, at p. 20. Since 2012, progress has been made toward a better understanding of groundwater quantity and quality (see, Alberta Geological survey (Andriashek 2014, Pawley 2013)).
- 38 See (generally) Alberta Energy Regulator, *What are Oil Sands?* Available at <<http://sites.digital/faqs4>> (viewed on 8 July 2019).
- 39 Government of Alberta, *Oil Sands Facts and Stats (June 2017)*, available at: <<http://send.digital/dataset4>> (viewed on 29 July 2019)
- 40 Regional Aquatics Monitoring Program, *Geological Features of the Athabasca oil sands*, available at: <<http://b.link/ramp33>> (viewed on 29 July 2019).
- 41 *Id.*
- 42 *Oil Sands Facts and Stats* (June 2017).
- 43 *Id.* The Secretariat notes that on 25 July 2019, the Joint Review Panel, representing Canada and Alberta, recommended that Teck's Frontier Mine be approved, acknowledging that the Project "is likely to result in significant adverse environmental effects to wetlands, oldgrowth forests, wetland, and old-growth-reliant species at risk, the Ronald Lake bison herd, and biodiversity. " The Panel's document also represents the decision of the Alberta Energy Regulator to approve the mine under AER's authorities, although the federal approval from Canada's Environment Ministry is still needed, as are other provincial approvals for some other aspects of the project. This mine would be Alberta's largest. See, Joint Review Panel, *Report of the Joint Review Panel, Teck Resources Limited Frontier Oil Sands Mine Project*, (25 July 2019), available at: <<http://b.link/aer66>> (viewed on 22 August 2019). Frontier is located 30 km south of the park's southern border, 110 km north of the city of Fort McMurray. If constructed, it would be the most northern oil sands mine in the Athabasca region. On 23 February 2020, before any federal decision was made, Teck withdrew its application for the project, noting that "global capital markets are changing rapidly and investors and customers are increasingly looking for jurisdictions to have a framework in place that reconciles resource development and climate change, in order to produce the cleanest possible products. This does not yet exist here today and, unfortunately, the growing debate around this issue has placed Frontier, and our company squarely at the nexus of much broader issues that need to be resolved." See, <https://www.teck.com/media/20-14-TR.pdf> (viewed on 26 February 2020).
- 44 *Oil Sands Magazine*, Mining for Bitumen, available at <<https://www.oilsandsmagazine.com/technical/mining>> (viewed on 19 June 2019).
- 45 2012 *Tailings Management Assessment Report* (Oil Sands Mining Industry), June 2013, issued by Alberta's Energy Resources Conservation Board, the predecessor to the Alberta Energy Regulator, p. 1.
- 46 Natural Resources Canada, *Oil Sands Tailings Management Information Sheet* (May 2015), available at: <<http://b.link/tailings83>> (viewed on 29 July 2019).

- 47 Bickerton, G., Roy, J.W., Frank, R.A., Spoelstra, J., Langston, G., Grapentine, L. & Hewitt, L.M., *Assessments of Groundwater Influence on Selected River Systems in the Oil Sands Region of Alberta*, Oil Sands Monitoring Program and Technical Report Series No. 1.5 (2018) at p. 17, citing MacKinnon, MD & Boerger, H, “Description of two treatment methods for detoxifying oil sands tailings pond water” (1986) 21 Water Qual. Res. J. of Canada 496; Li, C et al., “The toxicity of oil sands process-affected water (OSPW): A critical review” (2017) 601-602 Sci. Total Environ. 1785.
- 48 Annex 4: Martin, J., *State of the Science in Environmental Chemical Forensics for Distinguishing Natural and Anthropogenic Sources of Bitumen-Impacted Water*, (23 April 2019), at 14 [“Martin report”].
- 49 OECD Environmental Performance Reviews: Canada (2017), p. 57-58, at: <<http://environmental.reviews/oecd8>> (viewed on 19 June 2019).
- 50 Government of Alberta, *Highlights of the Alberta Economy 2018*, at: <<http://send.digital/stream60>> (viewed on 29 July 2019).
- 51 *State of Fluid Tailings Management for Mineable Oil Sands*, 2017, Alberta Energy Regulator, p. 10.
- 52 Pembina Institute, Backgrounder, *Review of Directive 085 Tailings Management Plans* (13 March 2017), p. 4, at: <<http://plans.management/tailings3>> (viewed on 29 July 2019).
- 53 Syncrude Canada Ltd., *Water*, at: <<http://provide.supply/water3>> (providing information on water needs by the company) (viewed on 4 June 2019).
- 54 Pembina Institute, Backgrounder, *Review of Directive 085 Tailings Management Plans* (22 March 2017), p. 3, at: <<http://plans.management/tailings3>> (viewed on 25 July 2019).
- 55 *Revised Statutes of Alberta 2000*, Chapter W-3, *Water Act*, at: <<http://b.link/alberta19>> (viewed on 3 July 2019).
- 56 Government of Alberta, *Water management framework: instream flow needs and water management system for the lower Athabasca River*, at: <<http://b.link/open30>> (viewed on 25 July 2019).
- 57 Alberta Environment and Parks, *Lower Athabasca Regional Planning*, at: <<http://b.link/default16>> (viewed 3 July 2019).
- 58 The Secretariat’s tour was held on 24 July 2019. The Director of the Submissions on Enforcement Matters and Legal Unit at the CEC Secretariat was accompanied by representatives of Syncrude, ECCC, and AEP. The Secretariat also visited Syncrude’s research facility in Edmonton, AB; viewed on 22 July 2019.
- 59 Syncrude notes that the day the photos were taken, forest fires north of its facility caused haze, affecting air quality and visibility.
- 60 Syncrude, Progress on land reclamation, available at: <<http://b.link/progress26>> (viewed on 8 October 2019).
- 61 See NAAEC Article 15(3), (4). See also para. 24.
- 62 “These guidelines do not modify the Agreement and, therefore, at all times, should be interpreted in a manner consistent with the Agreement” Guideline 18.1 of the *Guidelines for Submissions on Enforcement Matters under Articles 14 and 15 of the North American Agreement on Environmental Cooperation* [the “Guidelines”], available at: <<http://www.cec.org/sem-submissions/sem-guidelines>> (viewed on 25 July 2019).
- 63 Guidelines, Introduction at p. 3.
- 64 Guideline 12.
- 65 See discussion at paragraph 6, above, and sections 3.1.6 and 3.4, below.
- 66 The *Canadian Environmental Protection Act* was upheld on the Government’s criminal powers by the Supreme Court of Canada in *R v Hydro-Quebec*, [1997] 3 SCR 213.
- 67 [1980] 2 SCR 292.
- 68 *British North America Act*, s 91(12).
- 69 See e.g., *R v MacMillan Bloedel Ltd.* (2002), 2002 Carswell BC 2106 (BCCA).
- 70 For examples of the use of the due diligence defence, see *R v Sault Ste Marie (City)*, [1978] 2 SCR 1299; *R v Ontario (Ministry of Environment)*, [2001] OJ No 2851 (Ont Ct of Justice); *R v BHP Diamonds Inc* [2002] NWTJ No 91 (NTSC); and *R v Northwest Territories (Commissioner)* [1994] 1 WWR 441 (NWT Terr Ct).
- 71 SEM-98-004 (*BC Mining*) Factual Record (12 August 2003) at 23-24; SEM-02-003 (*Pulp and Paper*) Factual Record (5 February 2007), at 47-49; SEM-03-005 (*Montreal Technoparc*) Factual Record (23 June 2008), at 35-37; SEM-00-004 (*BC Logging*) Factual Record (11 August 2003), at 31-34.



72 *Her Majesty the Queen v The Corporation of the City of Kingston* [2004] OJ No 1940, 70 OR (3d) 577 [*R v Kingston*].

73 *Id.*

74 *R v Western Stevedoring Co*, [1984] 13 CELR 155 (BCCA), leave to appeal to SCC refused (1984), 13 CELR 155n (SCC).

75 *Compliance and Enforcement Policy for the Habitat Protection and Pollution Prevention Provisions of the Fisheries Act* (November 2001).

76 For a discussion of applicable Alberta provincial laws, see section 3.1.6.

77 The designation order currently in effect is SI/2014-21, which can be found at: Minister of Justice, *Order Designating the Minister of the Environment as the Minister Responsible for the Administration and Enforcement of Subsections 36(3) to (6) of the Fisheries Act*, at: <<http://b.link/pdf33>> (viewed on 25 July 2019). The Minister does not have authority under this delegation with respect to aquaculture and the control and eradication of aquatic invasive species and aquatic pests.

78 See discussion at section 3.1.4 below.

79 Government of Canada, *Effluent Regulations under the Fisheries Act* (June 2017), at: <<http://regulations.services/fisheries4>> (viewed on 25 July 2019).

80 The habitat protection and pollution prevention provisions of the *Fisheries Act* include sections 20 through 22, 26 through 28, 30, 32, and 34 through 42.

81 Government of Canada, *Compliance and Enforcement Policy for the Habitat Protection and Pollution Prevention Provisions of the Fisheries Act* (November 2001), at: <<http://b.link/fisheries32>> (viewed on 25 July 2019).

82 *Id.*, at 6-7.

83 *Id.*, at 7.

84 Office of the Auditor General of Canada, *Report 2—Protecting Fish From Mining Effluent*, available at: <<http://b.link/mining28>> (viewed on 25 July 2019).

85 *Id.*, at p. 18.

86 *Id.*, at p. 34.

87 In May 2019, the *Globe and Mail* reported that: “The federal government is targeting final regulations for 2022 modelled on existing rules that authorize releases from metal, mineral and diamond mines, provided contaminants are within regulated limits for “deleterious” substances under the federal Fisheries Act, according to documents obtained by The Globe and Mail.” Lewis, J., Ottawa, *Alberta eye looser rules for releasing oil-sands wastewater*, The Globe and Mail, 20 May 2019, available at: <<http://b.link/alberta84>> (subscription required) (viewed on 25 July 2019).

88 Government of Alberta, *Alberta’s Environmental Monitoring and Science Program*, available at: <<http://environmentalmonitoring.alberta.ca/>> (viewed on 21 August 2019). For further discussion of the Oil Sands Monitoring Program, of which this study is a part (available at: <<http://b.link/stream50>> see section 3.4.

89 CAPP letter to Robert Moyer, Director of the Submissions on Enforcement Matters and Legal Unit at the CEC Secretariat (CAPP Letter) (19 February 2019). The letter also noted the following: “As a result of the engineered and designed controls and the ongoing monitoring activities described above, it is important to note that no adverse impact has been found within the Athabasca River as a result of potential seepage from tailings ponds.”

90 The Keepers of the Athabasca is a nongovernmental organization comprising First Nations, Métis, Inuit, environmental groups, and Watershed citizens working together for the protection of water, land and air, in the Athabasca River Watershed. See *Keepers of the Water*, available at: <<http://www.keepersofthewater.ca/athabasca>> (viewed on 10 July 2019).

91 Syncrude Canada, Ltd., *Water Quality*, available at: <<http://b.link/water27>> (providing information on water discharges) (viewed on 10 July 2019). Syncrude officials confirmed this proposal to Secretariat staff during a site visit to Syncrude’s Mildred Lake oil sands facility. For further discussion about this site visit, see paragraph 49.

92 Canadian Environmental Protection Act, S.C. 1999, c. 33, available at: <<http://b.link/laws14>> (viewed on 7 October 2019)

93 Reasons for Council Instructions Regarding Submission SEM-17-001 (*Alberta Tailings Ponds II*), at p.3.

94 See, SEM-04-006 (*Ontario Logging II Factual Record*) Factual Record (June 2006) at pp. 226 and 265.

95 In other words, under the *Fisheries Act*, an adverse effect is merely a possible form of proof that the deleterious substance is entering the receiving water body.

- 96 SEM-17-001 (*Alberta Tailings Ponds II*) Canada's Comments to the Secretariat on the Accuracy of the Draft Factual Record pursuant to Article 15(5) (23 January 2020).
- 97 Annex 5: Canada's response to the Secretariat's information request (15 February 2019), at 3, no. 6.
- 98 Alberta Energy Regulator, *Compliance Dashboard*, available at: <<http://www1.aer.ca/compliancedashboard/enforcement.html>> (viewed on 29 July 2019).
- 99 See, [http://www1.aer.ca/compliancedashboard/enforcement/201503-22\\_AP\\_Decision\\_SuncorEnergy\\_2013-040\\_DS.pdf](http://www1.aer.ca/compliancedashboard/enforcement/201503-22_AP_Decision_SuncorEnergy_2013-040_DS.pdf) and <<http://pages.today/compliance2>> (viewed 2 June 2020 and 10 February 2019). The latter case involves a conviction Alberta secured against Syncrude in January 2019 for failing to keep a hazardous substance relating to an external sump from coming into contact with animals.
- 100 Discussion between ECCC Regional Enforcement Director and the Director of Submissions on Enforcement Matters and Legal Unit, 23 July 2019, Edmonton, Alberta. Canada noted in its comments on the draft Factual Record that there is a link between the OSMF and its funding mechanism, or how the monitoring under the program is associated with operator regulatory approvals issued by the Alberta Energy Regulator. It stated that the OSMF is funded by industry under an Alberta regulation and that under that regulation where industry has paid its assessment, industry is deemed to have complied with the conditions of its approval, including any set out in the applicable approved annual monitoring plan.
- 101 Energy Resources Conservation Board, Directive 074 Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes (3 February 2009), at p.2, available at <<http://pages.today/lao8>> (viewed on 29 July 2019).
- 102 Pembina information submission, at p.4.
- 103 See Alberta Energy Regulator, *Tailings*, available at: <<http://management.supply/tailings1>> (providing information on tailings management by the Government of Alberta) (viewed on 25 July 2019).
- 104 Pembina information submission, at p. 5.
- 105 *Id.*, letter of 17 August 2017 from Pembina to Alberta Environment and Parks.
- 106 *Approval: Imperial Oil Resources Ventures Limited, Oil Sands; Imperial Oil Resources Kearl Oil Sands Processing Plant and Mine* (9 November 2007), Alberta Environment, approval no. 46586-00-00, at pp. 4.2.11-4.2.13 [hereafter, *Kearl Oil Approval*], available at the following database: <<https://avw.alberta.ca/ApprovalViewer.aspx>> (consulted on 22 August 2019).
- 107 See Imperial Oil Limited, *Kearl*, available at: <<http://operations.digital/imperial3>> (providing information on one of Canada's largest, highest-quality oil sands deposit) (viewed on 5 July 2019).
- 108 *Kearl Oil Approval*, at 40-1.
- 109 Annex 6: Canada's Supplemental Response (5 June 2019), at pp. 2-3 ["Supplemental Response"].
- 110 CAPP letter.
- 111 The Secretariat's consultant, Dr. Jonathan Martin, who prepared the Annex 4, "Martin report," also assisted the Secretariat in reviewing these monitoring reports.
- 112 Response of the Government of Canada, Annex 3, at 21.
- 113 Supplemental Report of Dr. Jonathan Martin, 6 June 2019, at p. 7. See also, discussion at para. 110.
- 114 CAPP letter.
- 115 K-Q: Cretaceous formations (K) and Pleistocene and Recent deposits (Q), *Hydrogeology Environmental Setting Report For The Suncor Voyageur South Project*, Suncor Energy Inc. (July 2007), p. 13 available at: <<http://opens.media/alberta2>>.
- 116 Syncrude 2017 Aurora Groundwater Monitoring Report (29 March 2018), at p. 5.
- 117 *Id.*, at p. 27.
- 118 *Id.*, at p. 27.
- 119 *Id.*, at p. 27-29.
- 120 *Id.*, at p. 29-30.
- 121 *Id.*, at p. 33-34.
- 122 See p.33: "Groundwater contamination was identified north of the ASB in monitoring well OWS0110-01 in 2003. A localized area around OWS9710027, OWS9710028, and OWS0410-02 showed elevated chloride values. There are two possible sources for the elevated chloride values: the release of basal water to Stanley Creek and possible seepage from the ASB."

- 123 See p. 50: The following assumptions were made for the volume calculations: porosity was assumed to be constant in the surficial aquifer; where the surficial aquifer overlays the oil bearing McMurray Formation, the McMurray is an aquitard and does not permit the movement of water; the observed chemistry in the wells are vertically uniform throughout the aquifer; the chemistry isopach was determined by using the kriging statistical method. Areas may or may not have chemistry as modelled; and drawdown from the tailings perimeter ditch was not taken into consideration to simplify the modeling. This will lead to a slightly higher volume.
- 124 See p. 50: Breaking the volume down into the three areas of concern is as follows: North Seepage – Summer 679,418 m<sup>3</sup>, Fall 727,769 m<sup>3</sup> (574,951 m<sup>3</sup> in 2016); East Tailings Area – East Seepage – Summer 15,763 m<sup>3</sup>, Fall 19,997 m<sup>3</sup> (10,480 m<sup>3</sup> in 2016); South Seepage – Summer 35,138 m<sup>3</sup>, Fall 37,665 m<sup>3</sup> (45,227 m<sup>3</sup> in 2016).
- 125 See wells PD1-98-27B-SS, PD1-89-03D-SS, PD1-89-05A-SS, PD1-89-05B-SS, PD1-93-08A-SS, PD1-15-09A-SS, PD1-93-09B-SS, PD1-93-12A-SS, PD1-93-13-SS, PD1-98-28B-SS in the 2015/2016 Suncor Biennial Groundwater Monitoring Report Project No.: 407031-01672 (20 September 2017), at pp. 458 et seq (note that page numbers referred to for the Suncor report are the global pdf page numbers, not the locally defined page numbers of each individual sub-report).
- 126 *Id.* Locations of each well and around STP and Pond 8A, and the basic results, are shown on p. 1209.
- 127 *Id.*, see figure on p. 1256.
- 128 See Alberta Ecotrust Foundation, *Athabasca Basin: Tailings and Impacts on Aquifers*, available at: <<http://b.link/alberta22>> (viewed on 11 July 2019).
- 129 In 2015, the CEC Council established a roster of experts on traditional ecological knowledge to provide advice and recommendations on opportunities to integrate that knowledge into CEC's work. See CEC, *Traditional Ecological Knowledge Expert Group*, available at: <<http://www.cec.org/about-us/jpac/tek-members>> (viewed on 11 July 2019). Also, in late 2017, Canada and Alberta recently established a *Memorandum of Understanding Respecting Environmental Monitoring of Oil Sands Development*, which established the Parties' mutual intentions to engage Indigenous communities in the oil sands region in the monitoring, evaluation, and reporting of environmental impacts of oil sands development including the use of best available Indigenous knowledge, document available at: <<http://b.link/stream17>> (viewed 11 July 2019).
- 130 KOA letter to the Director of the Submissions on Enforcement Matters and Legal Unit at the CEC Secretariat (4 February 2019), p. 7.
- 131 *Canadian Environmental Assessment Act, 2012* (SC 2012, c 19, s 52) at s 4(1)(a) [CEAA]. Readers should note that many oil sands projects were assessed under the previous *Canadian Environmental Assessment Act*, S.C. 1992 c. 37.
- 132 In fact, the CEAA was recently replaced by the 2019 Impact Assessment Act, R.S.C., 2019, c. 28, s.1, available at: <<http://b.link/canlii31>> (viewed on 8 October 2019).
- 133 In Canada, the "Governor in Council" consists of the Prime Minister and the Cabinet, e.g., the executive branch.
- 134 CEAA 2012 at s 52 (4).
- 135 *Id.*, at s 53.
- 136 Government of Canada, *Canada-Alberta Agreement for Environmental Assessment Cooperation (2005)*, available at: <<http://environmental.agency/alberta8>> (viewed on 25 July 2019).
- 137 *Id.*, at s 6.12.
- 138 *Id.*, at s 6.14.
- 139 *Id.*, at s 7.4.
- 140 *Id.*, at s 8.2.
- 141 *Pembina Institute for Appropriate Development v Canada (AG)* 2008 FC 302 at para 8. The Secretariat notes that in order to commence a request for approval under the Alberta OSCA, the project proponent must make a detailed submission to AER pursuant to section 10 and 11 of the Act. The environmental assessment process is typically required for oil sands developments pursuant to sections 39-59 of the Alberta EPEA. Jurisdiction to hold such hearings for "energy resource activities," both for environmental assessments and regulatory approvals, is under the authority of the AER, as specified by sections 23-26 of the Alberta REDA. Collectively, these provisions of the three statutes set out the regulatory process for environmental approval of an oil sands project and the basis upon which Alberta regulators will render a decision—this is the hearing usually held jointly with the federal government for environmental assessments required under the CEAA.



142 *Approval: Imperial Oil Resources Ventures Limited; Imperial Oil Resources Kearl Oil Sands Processing Plant and Mine*  
(9 November 2007) Alberta Environment, approval no. 46586-00-00, at paras 4.2.11-4.2.13.

143 See Canadian Natural, *Horizon Oil Sands*, available at: <<http://oilproductions/sands7>> (viewed on 5 July 2019).

144 *Canadian Natural Resources Limited: Application for an Oil Sands Mine, Bitumen Extraction Plant, and Bitumen Upgrading Plant in the Fort McMurray Area* (27 January 2004) Joint Panel Report, EUB Decision 2004-005 [*Horizon Joint Panel Report*].

145 Established by the Ministry of the Environment, Canada, and the Alberta Energy and Utilities Board (predecessor to the AER) pursuant to the *Agreement to Establish a Joint Review Panel for the Horizon Oil Sands Project between the Minister of Environment, Canada and the Alberta Energy Utilities Board* (18 August 2003), see appendix B of the *Horizon Joint panel report*.

146 *Horizon Joint Panel Report* at s 12.1, p 30.

147 *Id.*, at s 12.1, p 31.

148 *Id.*, at s 14.4, p 45.

149 *Id.*, at s 14.5, p 46.

150 *Id.*

151 *Id.*, at s 14.6 at p 47.

152 *Id.*

153 *Id.*

154 Supplemental Response, p. 5.

155 *Canada-Alberta Administrative Agreement for the Control of Deposits of Deleterious Substances under the Fisheries Act*, paragraph 2.

156 *Canada-Alberta Administrative Agreement for the Control of Deposits of Deleterious Substances under the Fisheries Act*, paragraph 3.

157 R.S.C., 1985, c. E-10, section 7.

158 R.S.C., 1985, c. F-14, section 4.1.

159 *Fisheries Act*, section 4.2.

160 Canada-Quebec Agreement on Acts and Regulations Applicable to Municipal and Provincial Wastewater Systems, *Canada Gazette*, Part I, Vol. 152, No. 37 (15 September 2018), available at: <<http://sites.digital/stream3>> (viewed on 25 July 2019).

161 Deposit Out of the Normal Course of Events Notification Regulations, SOR/2011-91 (25 March 2011), at: <<https://laws-lois.justice.gc.ca/PDF/SOR-2011-91.pdf>> (viewed on 25 July 2019).

162 Release and Environmental Emergency Notification Regulations, SOR/2011-90 (25 March 2011), available at: <<https://laws-lois.justice.gc.ca/PDF/SOR-2011-90.pdf>> (viewed on 25 July 2019).

163 See Annex 5: Canada's Response to the Secretariat's information request (15 February 2019).

164 Subsection 38(5) is the 2012 follow-on provision to subsection 38(4) of the *Fisheries Act*, which prior to 2012 required a duty to report where, "out of the normal course of events, there occurs a deposit of a deleterious substance . . ." After the 2012 amendments, new subsection 38(4) requires notification of an occurrence that results in serious harm to fish that are part of a commercial, recreational, or Aboriginal fishery; this provision is not derived from the subsection 36(3) prohibition.

165 2017 *Canada-Alberta Environmental Occurrences Notifications Agreement*, p.2. Annex 8.

166 *Id.*, at para. 4.4.1.

167 Canada's supplemental response, Annex 6, p. 3. See also paragraph 3(2)(c) of the release regulations effective 24 August 2019.

168 See Commercial Naphthenic Acids Group – information sheet, available at: <<http://b.link/acids35>> (viewed on 25 July 2019) and Ecojustice, *Release: Canada must assess toxicity of tailings pond chemicals, enviro groups argue*, (18 October 2018), available at: <<http://b.link/tailings80>> (viewed on 11 July 2019).

169 *Canada Gazette*, Part I, vol. 152, No. 33, available at: <<http://b.link/gazette65>> (viewed on 21 August 2019).

170 Environment and Climate Change Canada, Proposal by Environmental Defence to Add Naphthenic Acids to the NPRI, available at: <<http://b.link/npri35>> (archived web page, viewed on 15 August 2019).

171 See section 4.4 of the *Canada-Alberta Environmental Notifications Agreement* (2017).

172 1994 *Administrative Agreement*, Annex 1, para. 5.0.

173 See also, Canadian Association of Petroleum Producers, *Regulating and Monitoring*, available at <<http://monitoring.network/sands8>> (viewed on 13 August 2019).

174 Discussion between the Director of the Submissions on Enforcement Matters and Legal Unit at the CEC and Daniel Smith of ECCC enforcement, 23 July 2019.

175 Supplemental Response, p. 2.

176 Department of Fisheries and Oceans, Annual report to Parliament on the administration and enforcement of the fish habitat protection and pollution prevention provisions of the *Fisheries Act*, available at: <<http://b.link/publications14>> (viewed on 25 July 2019).

177 2016/2017 Annual Report, pp. 37-39.

178 In the 2010/2011 report, at p. 36, ECCC highlighted the following Alberta enforcement case:  
 “On 22 December 2010, Suncor Energy Inc. pleaded guilty to two charges under s. 36(3) of the *Fisheries Act* for the deposit of a deleterious substance into waters frequented by fish and was assessed a penalty of \$200,000. The penalty includes a \$20,000 fine, with the remaining \$180,000 to go the Environmental Damages Fund.” At p. 46 in the 2014/2015 Annual Report, ECCC highlighted the following Alberta enforcement action: “On 10 July 2014, Plains Midstream Canada ULC (PMC) was ordered to pay \$850,000 after pleading guilty to one count under the *Fisheries Act* and one count under provincial environmental legislation. The charges were for failing to notify authorities of a deposit of a deleterious substance into the Red Deer River. The release had originated from an underground pipeline owned by PMC. Of the total \$850,000 penalty, \$400,000 relates to the *Fisheries Act* offence and of this amount, \$380,000 was directed to the EDF. This money will be directed toward projects in the Red Deer River Watershed. The remaining \$450,000 relates to the provincial offence.” Lastly, in a 2017 enforcement case, Canadian National Railway Company (CN) pleaded guilty to one *Fisheries Act* offence (s. 36(3)) and three CEPA offences, and agreed to a provincial fine of \$125,000 for charges brought by AEP under the EPEA. The cases related to a leaking oil-water separator and fuel storage system into a storm sewer at a CN Alberta facility. Government of Canada, *Canadian National Railway Company to pay over \$2.5 million in penalties for environmental offences*, available at, <<http://b.link/canada30>> (viewed on 21 August 2019)

179 2016/2017 Annual Report, at p. 42. The 1994 Agreement was in force until amended by the *Environmental Notifications Agreement* in 2017. See paragraph 157, above.

180 *Id.*, at p. 44.

181 2014/2015 Annual Report, pp. 32-33.

182 *Id.*, at p. 36.

183 Dr. Martin is a professor of Toxicological and Environmental Chemistry at Stockholm University (Stockholm, Sweden), and adjunct professor at University of Alberta (Edmonton, Alberta). His research programs involve development of new analytical methods for understanding the sources, environmental fate and toxic effects of organic contaminants. Current projects include development of methods for nontarget exposomics in biofluids and environmental samples, monitoring of air and water around the Canadian oil sands industry, and revealing the developmental effects of emerging contaminant exposures in birth cohort studies. He has published more than 160 peer-reviewed papers and was listed by Thomson Reuters (2014) as a Highly Cited Researcher and among the World’s Most Influential Scientific Minds. He is currently an elected member of the Royal Society of Canada’s College of New Scholars, Artists and Scientists, and has been awarded research prizes from the Society of Environmental Toxicology and Chemistry (Roy Weston Award) and the Canadian Society of Chemistry (Fred Beamish Award). Through academic research grants, Dr. Martin has received funding from the Government of Canada, the Province of Alberta, and the oil sands industry on the issues described above.

184 See Supplemental Response and Martin report, Section 3.

185 For example, an island in the Athabasca River once known as ‘Tar Island’ later became the site of the first tailings pond (Suncor Pond 1) in the 1960s; this pond no longer exists because the wall of the tailings pond (also called a dyke) is now built over it. See Martin report, at 4.

186 Martin report, at 6.

187 Martin report, at 4.

188 Martin report, at 4.

189 Martin report, at 3.

190 *Id.*, at 11.

191 Martin report, at 11.

192 *Id.*, at 11-12.

193 Martin report, at 12.

194 *Id.*, at 13.

195 *Id.*, at 3.

196 Martin report, at 4.

197 *Ibid*, at 4.

198 Golder Associates, *Final Report. Beaver Creek Profiling Program. 2008 Field Study. Submitted to: Syncrude Canada Ltd. Fort McMurray, Alberta.* (2009), at: Martin report, at 20.

199 Response, at 26-27.

200 Erin N Kelly et al., Oil sands development contributes elements toxic at low concentrations to the Athabasca River and its tributaries, (2010) 107:37 *Proc Natl Acad Sci USA* 16178; D Schindler, Tar sands need solid science, (2010) 468 *Nature* 499. Alberta Innovates Technology Futures, *2010 Regional Aquatics Monitoring Program (RAMP) Scientific Review*, (6 January 2011), available at: <<http://b.link/file7606>> (viewed on 29 July 2019). The purpose of the review was to evaluate the methods used by the RAMP to assess aquatic ecosystems and suggest changes to update the program. The review noted the purpose of the RAMP was to understand potential effects of oil sands development so that long-term trends can be identified, cumulative effects can be assessed, and potential impacts can be addressed (p.1 of the report). The review found that the RAMP did not successfully address three key questions—can the RAMP detect changes if they occur, can the source of potential changes be identified, and are the appropriate questions being asked and are the appropriate criteria being monitored?

201 Pierre Gosselin et al., *The Royal Society of Canada Expert Panel: Environmental and Health Impacts of Canada's Oil Sands Industry*, Ottawa: Royal Society of Canada (2010) at 7, online: at: <<https://rsc-src.ca>> (viewed on 25 July 2019).

202 *Lower Athabasca Water Quality Monitoring Program Phase 1* (March 2011), Catalogue no. En14-42/2011E-PDF [*Phase 1*].

203 *An Integrated Oil Sands Environment Monitoring Plan* (July 2011), Catalogue no. En14-47/2011E-PDF.

204 *Joint Canada-Alberta Implementation Plan for Oil Sands Monitoring* (2013), Catalogue no. En84-89/2013E-PDF [*Implementation Plan*].

205 *Id.*

206 *Phase 1*, at p 4.

207 *Phase 1*, at p 6.

208 *Implementation Plan*, at p 2.

209 Memorandum of Understanding Respecting Environmental Monitoring of Oil Sands Development, dated 1 December 2017, between the Government of Alberta and the Government of Canada (signed 20 December 2017). Available at <<http://b.link/stream42>> (viewed 2 August 2019).

210 *Id.*, at s. 1.0.

211 Oil Sands Monitoring Program, Letter of Agreement and Operational Framework, September 2018, at s. 3.1.1, available at: <<http://b.link/open43>> (viewed 19 August 2019).

212 Telephonic discussion between Director of the Submissions on Enforcement Matters and Legal Unit at the CEC and ECCC/AEP officials, 30 July 2019. Including Dr. Monique Dube and Kevin Cash, science co-leads of the OSMP from AEP and ECCC.

213 See Response at 3.

214 Canada did provide to the Secretariat 49 publicly accessible records that relate to completed or ongoing studies attempting to distinguish between anthropogenic (industrially-derived) chemicals from those that are naturally occurring in waters. A summary of several of these studies has been provided in Annex 4 (the Martin report), and section 3.3 of the factual record provides a discussion of the major findings of these studies.



- 215 OSMMP, *Oil Sands Monitoring Program Annual Report for 2017-2018*, AEP and ECCCC, at p 21, available at: <<http://b.link/ecc76>> (viewed on 9 March 2020).
- 216 Citing Baker, K.M., *Identification of process water in a surficial aquifer at Syncrude's Mildred Lake site* (1999) BSc Thesis, University of Waterloo; Hunter, G.P., *Investigation of groundwater flow within an oil sands tailings impoundment and environmental implications* (2001) MSc Thesis, University of Waterloo; Ferguson, G.P., Rudolph, D.L., Barker, J.F., (2009) Hydrodynamics of a large oil sand tailings impoundment and related environmental implications. 46 Can Geotech J 1446.
- 217 Bickerton, G., Roy, J.W., Frank, R.A., Spoelstra, J., Langston, G., Grapentine, L. & Hewitt, L.M., *Assessments of Groundwater Influence on Selected River Systems in the Oil Sands Region of Alberta*, Oil Sands Monitoring Program and Technical Report Series No. 1.5 (2018) at p. 1.
- 218 *Id.*, at pp 23-25.
- 219 *Id.*, at p 25.
- 220 Government of Alberta, Focused Study Activity Work Plan, available at <<http://b.link/stream50>> (viewed on 21 August 2019)
- 221 *Id.*
- 222 *Id.* Further, in its comments on the draft factual record, Canada noted that the work was paused to provide the opportunity for the project leads to better integrate their work with the core monitoring programs under OSM so the gaps in knowledge related to the question of seepage could be better assessed.
- 223 CEC Council, CEC Ministerial Statement – 2014, Twenty-first Regular Session of the CEC Council, Yellowknife, Northwest Territories, Canada (17 July 2014), available at <<http://www.cec.org/about-us/council-statements/cec-ministerial-statement-2014>> (viewed on 16 October 2019).
- 224 See Canada-United States Mexico Agreement, Chapter 24. Environment, available at: <<http://b.link/gzunx>> (viewed on 10 July 2020). Also, the Environmental Cooperation Agreement between the governments of Canada, Mexico and the United States is available at: <<http://b.link/epa87>> (viewed on 16 October 2019).
- 225 The new trade agreement was ratified by all three Parties and came into force on 1 July 2020. In Canada it is the Canada-United States Mexico Agreement (CUSMA, *see* <http://agreement.exchange/trade8>); in Mexico it is known as T-MEC (*see* <http://b.link/textos85>); and in the U.S., the agreement is known as the United States-Canada-Mexico Agreement (USMCA, *see* <http://visit.news/agreement2>).
- 226 The Secretariat acknowledges that this reference is not applicable to this factual record, but is consistent with transparency principles that have guided the NAAEC SEM process and prior Council direction.



An aerial, grayscale photograph of a large industrial complex, likely a refinery or chemical plant. The facility is characterized by numerous tall smokestacks emitting thick plumes of white smoke that drift across the sky. The complex is filled with a dense network of pipes, walkways, and various industrial buildings. In the background, a wide river flows, with a multi-span bridge crossing it. The overall scene conveys a sense of large-scale industrial activity and environmental impact.

# APPENDICES





## **APPENDIX 1**

Submission SEM-17-001 (*Alberta Tailings Ponds II*)

## SUBMISSION TO THE COMMISSION FOR ENVIRONMENTAL COOPERATION

### Pursuant to Article 14, NORTH AMERICAN AGREEMENT ON ENVIRONMENTAL COOPERATION

June 2017

#### THE SUBMITTING ORGANIZATIONS AND INDIVIDUAL

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## I. SUMMARY OF SUBMISSION

This submission asserts that the Government of Canada is failing to effectively enforce subsection 36(3) of the Canadian *Fisheries Act* with respect to the leaking of deleterious substances from oil sands tailings ponds into surface waters and the groundwater of Northeast Alberta. The Submitters therefore believe that a factual record on the subject is warranted.

Oil sands tailings ponds result from the extraction of bitumen from mined oil sands deposits in Northern Alberta. As of 2013, the tailings ponds had a surface area of 220 square kilometers (85 square miles), with a volume of 975.6 billion litres (244 billion gallons).<sup>1</sup> The volume of tailings now exceeds 1 trillion litres.<sup>2</sup>

Tailings ponds contain a large variety of substances that are deleterious to fish, including naphthenic acids, ammonia, benzene, cyanide, oil and grease, phenols, toluene, polycyclic aromatic hydrocarbons, arsenic, copper and iron.

[The submission has been reformatted for publication in this factual record and thus the pagination here is not that of the original document.]

Tailings ponds are constructed from the earthen materials that oil sands companies mine from the area. They are not lined and therefore leak contaminated substances into the environment. Companies attempt to recapture the leakage, but do not recapture it all.

There are documented cases of contaminated tailings substances reaching or projected to reach surface waters in Jackpine Creek (from Shell), Beaver Creek (from Syncrude), McLean Creek (from Suncor) and the Athabasca River (from Suncor).

With regards to the groundwater, one study used industry data to estimate that by 2008 the tailings ponds were leaking four billion litres (1 billion gallons) each year, with projections that this figure could reach over 25 billion litres (6.6 billion gallons) within a decade should proposed projects go ahead (see **Appendix III** at p. 2). This contamination can migrate to reach surface waters due to a hydrogeological setting that is punctuated by downcutting glacial and post-glacial meltwater channels and modern stream courses. In fact, a study published in *Environmental Science & Technology* in 2014 suggests that “oil sands process-affected groundwater is reaching the [Athabasca] river system” (see **Appendix XXI** at pp. 1 and 9).

Subsection 36(3) of the Canadian federal *Fisheries Act* establishes a general prohibition on the deposition of deleterious substances into waters frequented by fish.

The Canadian federal government is on record several years ago with concerns regarding contaminated tailings leakage in the area, and has been present at environmental assessment hearings when companies have projected surface water contamination and water quality degradation.

The Canadian government has neither prosecuted any company for documented surface water contamination, nor has it pursued regulation governing tailings pond leakage. It relies on the Government of Alberta to alert it to possible violations of the *Fisheries Act*, and Alberta in turn relies on industry self-reporting. An industry-funded regional water monitoring body that Canada relies on – the Regional Aquatic Monitoring Program – has been discredited as scientifically inadequate and for failing to identify significant water pollution in the region.

## II. SUBSECTION 36(3) OF THE *FISHERIES ACT*

### A. Subsection 36(3) of the *Fisheries Act*

Subsection 36(3) of the Canadian federal *Fisheries Act* deals with pollution prevention, and establishes a general prohibition on the deposition of “deleterious substances” into waters frequented by fish.

Subsection 36(3) provides that:

Subject to subsection (4), no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water.<sup>3</sup>

Subsection 36(4) of the *Fisheries Act* provides that a deposit of a deleterious substance is not an offence if permitted by regulation.<sup>4</sup>

Subsections 36(5), (5.1) and (5.2) of the *Fisheries Act* empower the federal government to adopt regulations prescribing when, where, under which circumstances and in which concentrations the deposit of specified deleterious substances, waste or pollutants is authorized.<sup>5</sup>

Subsection 40(5)(a) provides that a deposit occurs whether or not the act or omission resulting in the deposit was intentional.<sup>6</sup>

The Governor in Council has made regulations prescribing the allowable deposits from facilities within specific industry classes such as the pulp and paper industry and the petroleum refining industry.<sup>7</sup> The Governor in Council has not made any regulations pertaining to oil sands mining, oil sands tailings ponds or any effluent types released by those operations. Therefore, there are no regulatory exemptions from the requirements of subsection 36(3) of the *Fisheries Act* that are relevant to oil sands mining or tailings ponds resulting from oil sands mining.

In addition to prohibiting the direct deposit of deleterious substances into water frequented by fish, the second half of subsection 36(3) clearly prohibits the *indirect* deposition of deleterious substances and has a preventative element of prohibiting deposition “in any place under any conditions where the deleterious substance ... may enter any such water” (emphasis added).

### B. Subsection 36(3) is an Environmental Law

Subsection 36(3) of the *Fisheries Act* prohibits the release, discharge or emission of pollutants or environmental contaminants for the primary purpose of the protection of the environment or the prevention of danger to animal or human life or health and as such falls within the definition of an environmental law in Article 45(2) of the *North American Agreement on Environmental Cooperation*.



### C. Interpretation of Subsection 36(3)

Canadian case law has clarified that it is not necessary that the receiving water be rendered deleterious to fish. The question is whether or not the substance being deposited is a “deleterious substance.” In *R. v. Kingston (Corporation of the City)*, (2004) 70 O.R. (3d) 577, (2005) D.L.R. (4th) 734 (Ont. C.A.) (“Kingston”), (see **Appendix I**) the Court stated:

[65] The focus of s. 36(3) is on the substance being added to water frequented by fish. It prohibits the deposit of a deleterious substance in such water. It does not prohibit the deposit of a substance that causes the receiving water to become deleterious. It is the substance that is added to water frequented by fish that is defined, not the water after the addition of the substance. A deleterious substance does not have to render the water into which it is introduced poisonous or harmful to fish; it need only be likely to render the water deleterious to fish. The *actus reus* is the deposit of a deleterious substance into water frequented by fish. There is no requirement in s. 36(3) or paragraph (a) of the definition of the term “deleterious substance” in s. 34(1), of proof that the receiving waters are deleterious to fish.

In Canada, jurisdiction over environmental matters is shared between the provincial and federal governments. Therefore, the issue can arise as to whether provincial permitting can serve as a defence to the contravention of a federal law. However, under the doctrine of federal paramountcy, where there is an inconsistency or conflict between a federal law and a provincial law, the federal law prevails.<sup>8</sup> A provincial approval cannot excuse the proper enforcement of federal law. Furthermore, the existence of a federal-provincial cooperation agreement does not excuse the federal government from the active responsibility to enforce its legislation.

### III. EVIDENCE OF TAILINGS POND LEAKAGE

#### A. Oil Sands Tailings Ponds Leakage

Canada's oil sands are a large deposit of thick hydrocarbons trapped in sand and clay in Northern Alberta. The thick hydrocarbons, called "bitumen," are currently extracted by one of two methods: (1) strip mining or (2) melting it in place (in situ) by injecting steam into the ground and pumping the bitumen out of the ground.

In the strip mining method, hot water is used to help separate the bitumen from the clay, sand, and other materials. This results in a large stream of contaminated liquid waste that is put into holding areas called "tailings ponds," although they are more like lakes in size. Oil sands tailings ponds currently have a surface area of at least 220 square kilometers (85 square miles), and likely exceed 1 trillion litres in volume.<sup>9</sup>

The containment areas for tailings ponds in the oil sands are built from materials the companies excavate from the surrounding area – earthen materials – and are not lined. In their project proposals (see e.g. **Appendix II**, at pp. 1-2) companies assume that tailings ponds will systematically leak into the surrounding area, and the companies deploy a range of measures to recapture some of the leakage.

These recapture methods, however, are imperfect. As outlined below, there have been documented cases of contaminated tailings materials reaching surface waters, and leakage to deeper aquifers is not recaptured (see **Appendix III**, at p. 11 and **Appendix II** at pp. 1, 3-4, 7-8, 10-12).

In December 2008, Environmental Defence Canada released a report (see **Appendix III**) that for the first time publicly estimated how much contaminated water the tailings ponds leak. The report compiled company data from environmental assessment reports to conservatively estimate that the tailings ponds were leaking at a rate of four billion litres (1 billion gallons) each year, with projections that this figure could reach over 25 billion litres (6.6 billion gallons) within a decade should proposed projects go ahead (see also **Appendix II**).

There are documented cases of contaminated tailings water reaching surface water. In an environmental assessment (see **Appendix IV**, p. 43) Shell Canada Ltd. projected that contaminated tailings from its operations would reach Jackpine Creek. A 2007 academic study from the University of Waterloo (see **Appendix V**) estimates that Suncor Energy's Tar Island pond was then leaking almost 6 million litres a day into the Athabasca River.<sup>10</sup>

Another incident is documented in correspondence between the Alberta government and Syncrude, and in an assessment commissioned by Syncrude from Golder Associates (see **Appendix VII** at pp. 24, 31, 37, 45 and **Appendix VI**, respectively). It is clear that contaminated tailings materials leaked into Beaver Creek, a tributary of the Athabasca River, over a number of years.

Another incident of leakage into surface water concerns Suncor's South Tailings Pond leaking into McLean Creek. A study on the issue, in part by a Suncor engineer (see **Appendix VIII** at pp. 7-8: "Seepage Mitigation Design Options" and "Seepage Design Elements") admits that the leakage into the creek would not be stopped, but rather that the company would try to manage the concentrations of deleterious substances in the creek. Again, case law establishes that it is not necessary that the receiving water be rendered deleterious to fish; the question is whether or not the substance being deposited is a "deleterious substance."

With regards to the medium to long term issue of what happens to the leakage to deeper aquifers from tailings ponds, migration of contaminants in tailings leakage from groundwater into surface water over time can be facilitated by the hydrogeological setting of the oil sands. A case study on the oil sands by the Council of Canadian Academies' Expert Panel on Groundwater (see **Appendix IX**, case study 6.4 at p. 144), states:

The land cover in the Athabasca oil-sands area is primarily wetlands and boreal forest. These are underlain by varying thicknesses of overburden, comprising a range of coarse materials in buried valleys or glacial deposits and modern organic deposits sitting atop thick clay tills and sandy tills. The overburden is vertically punctuated by downcutting glacial and post-glacial meltwater channels and modern stream courses.

The issue of more permeable underlying settings for tailings ponds can be seen with the example of Suncor's South Tailings Pond of its Millennium mine. There, the Pleistocene meltwater channel deposits underneath the pond have led to a management strategy of letting contaminated leakage into an adjacent creek, as referenced above (see **Appendix VIII**).

Given that the second half of subsection 36(3) of the *Fisheries Act* prohibits the indirect deposit of deleterious substances from areas that "may" lead to surface waters frequented by fish, deep leakage into deeper aquifers in an area "punctuated by downcutting glacial and post-glacial meltwater channels" is as much of an issue as leakage into surface water in the oil sands region. A study published in *Environmental Science & Technology* in 2014 suggests that "oil sands process-affected groundwater is reaching the [Athabasca] river system" (see **Appendix XXI** at pp. 1 and 9).

## **B. Effects of Tailings Ponds Leakage**

Tailings ponds contain a large variety of substances that are deleterious to fish. A scientific article (see **Appendix X**) compiles the results of several studies of the inorganic chemistry, organic chemistry and toxicity of oil sands tailings waters and finds the waters exceed the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines: Surface Water Quality Guidelines for the Protection of Aquatic Life<sup>11</sup> for several substances including ammonia, benzene, cyanide, oil and grease, phenols, toluene, polycyclic aromatic hydrocarbons, arsenic, copper and iron. The author concludes that:

Chemicals of environmental concern in oil sands process water include NAs [naphthenic acids], bitumen, ammonia, sulphate, chloride, aromatic hydrocarbons, and trace metals. While NAs are the main contributors of acute toxicity to aquatic biota, various compounds have exceeded CCME water quality guidelines at some point during oil sands operations and could contribute to chronic toxicity in reclaimed aquatic environments.<sup>12</sup>

Naphthenic acids are of particular concern not just because of their toxicity, but also because of their longevity, taking many decades to break down<sup>13</sup> (see **Appendix XI**).

Evidence is emerging that the surface waters of the region are being rendered more harmful to fish by oil sands activities. A pair of independent water monitoring studies published in 2009 and 2010 (see **Appendix XII** and **Appendix XIII**) found concentrations of polycyclic aromatic compounds (PACs) at levels several times over the levels considered toxic to fish embryos in areas most heavily impacted by industry, and that Canada or Alberta's guidelines for the protection of aquatic life were exceeded for seven priority pollutants.

## IV. CANADA'S FAILURE TO ENFORCE SUBSECTION 36(3)

### A. Environment Canada's Monitoring and Investigation Failure

In 1994, Canada and Alberta signed the *Administrative Agreement for the Control of Deposits of Deleterious Substances under the Fisheries Act* ("Agreement") (see **Appendix XIV**). The Agreement was entered into pursuant to section 5 of the federal *Department of Fisheries and Oceans Act*, section 7 of the federal *Department of Environment Act*, and section 20 (now section 19) of the Alberta *Environmental Protection and Enhancement Act*.<sup>14</sup> These provisions permit the federal Minister of Fisheries and Oceans, the federal Minister of the Environment and the Alberta Minister of the Environment to enter into agreements with respect to programs that the federal Ministers are responsible for carrying out, and in the case of the Alberta Minister, for "agreements relating to any matter pertaining to the environment."<sup>15</sup> Therefore, the Agreement is a mechanism for the federal Minister of the Environment to carry out his/her responsibilities and is a subsidiary agreement under an environmental law.

While the Agreement provides for a sharing of responsibility for responding to and investigating releases that may contravene subsection 36(3) of the *Fisheries Act*, the Agreement designates Alberta Environment as the lead agency in responding to and investigating releases within Alberta. However, Annex 3 of the Agreement confirms that:

2.1 The Parties are responsible for inspections under their respective legislation...

3.1 [Environment Canada and Alberta Environment] will conduct investigations into alleged contraventions of their respective legislation...

3.2.8 The parties recognize that both federal and provincial Attorneys General retain their discretion to prosecute violations of their respective legislation.

The Agreement confirms that the federal government will continue to have the responsibility to conduct inspections, investigations, and prosecutions under the *Fisheries Act* and that Environment Canada has a positive obligation to investigate alleged contraventions of the *Fisheries Act*.

In practice, Environment Canada has relied on Alberta Environment to monitor, report and investigate releases from tailings ponds that may contravene subsection 36(3), and Alberta Environment relies on industry self-reporting of tailings leakage (see **Appendix XV**, at p. 7 of 7).

Both the provincial and federal levels of government have delegated regional monitoring of releases to an organization called the Regional Aquatic Monitoring Program (RAMP).<sup>16</sup> RAMP is funded by the oil sands operators, and despite being billed as having a "multistakeholder" governance structure, key First Nation and environmental participants distanced themselves from RAMP in 2008 and 2009.<sup>17</sup>

An independent expert review of RAMP in 2004 found "significant concerns" with scientific leadership effective design, and a failure to incorporate a regional approach (see **Appendix XVI**). A 2009 independent monitoring study (see **Appendix XII**, at p. 5) in the oil sands by leading water specialists found high levels of contamination unreported by RAMP and concluded that:



Our study confirms the serious defects of the RAMP. More than 10 years of inconsistent sampling design, inadequate statistical power, and monitoring- insensitive responses have missed major sources of [polycyclic aromatic compounds] to the Athabasca watershed.

Environment Canada's historical reliance on the discredited RAMP program for monitoring of tailings pond leakage is a further abdication of its responsibility to monitor, investigate and enforce subsection 36(3).

The Canada-Alberta Joint Oil Sands Monitoring (JOSM) program, created in 2012 to replace RAMP, has been assessed as an improvement in terms of scientific integrity and removing conflicts of interest.<sup>18</sup> Nonetheless, problems remain, including insufficient evidence to assess whether current monitoring activities are adequate to assess the full impacts of the oil sands, the lack of a fully documented and uniform approach to quality assurance in the monitoring program, and, most disturbingly, the lack of a planning document that clearly articulates the policy and scientific goals of JOSM.<sup>19</sup>

### **B. Environment Canada's Failure to Enforce Subsection 36(3)**

Despite the failure to directly monitor and investigate subsection 36(3) violations, Environment Canada has known for several years about the problem of contaminated tailings pond leakage. In 2004, the National Energy Board wrote:

...the principal environmental threats from tailings ponds are the migration of pollutants through the groundwater system and the risk of leaks to the surrounding soil and surface water...the scale of the problem is daunting...<sup>20</sup>

Under the previous (prior to 2012) *Canadian Environmental Assessment Act*, each proposal for a new oil sands mine and associated tailings ponds underwent assessment by a Joint Review Panel (in partnership with the Alberta Energy Resources Conservation Board). The proponent provided all relevant federal agencies with information regarding the project.

As outlined below, notable about the environmental assessment process is that the companies themselves predict to relevant agencies tailings leakage into surface waters and water quality impacts, yet Environment Canada does not enforce subsection 36(3) in relation to these deposits; nor does it regulate the releases pursuant to subsection 36(4) of the *Fisheries Act*. For example, the Joint Review Panel in the Shell Jackpine project noted (see **Appendix IV**, at p. 43) that:

Shell stated that it would construct a 6 m deep perimeter ditch to intercept seepage flow from the tailings disposal area, but that some seepage would discharge to the ground surface between the tailings area and Jackpine Creek and that half of this seepage would enter the creek.

In the CNRL Horizon Joint Review Panel report (see **Appendix XVII**, at pp. 14, 30, 46 and 49):

CNRL also stated that there were the following significant cost and environmental benefits associated with the new mine plan that resulted from the new plant site location:

- a reduction in the seepage through the Pond 1 tailings dike ...

... CNRL ... expected water to seep from the [external tailings area] into the groundwater system and/or discharge into the mine surface water drainage system. ... ditches would capture some of the seepage flow ... seepage rates would decline over time ... .

[Environment Canada] noted that any tailings release or seepage from [End Pit Lakes] into fish-bearing waters might constitute a violation of the Fisheries Act, which would warrant EC taking enforcement action.

The Joint Review Panel also noted the company's admission regarding overall impacts on water quality:

CNRL acknowledged that it predicted some chemical substances would exceed chronic effects levels for fish and other aquatic biota, but it did not believe that there would be any effects on fish health as a result of those exceedances.

The Jackpine and CNRL tailings ponds are currently operating as anticipated in the respective JRP reports.

In a January 2009 Memorandum to Canada's Environment Minister from his Deputy Minister (see **Appendix XVIII**), Environment Canada acknowledges the leakage ("seepage") issue, and the fact that the agency is alerted to it by oil sands companies:

Seepage would not likely be directly into surface waters, but move first into groundwater. It may take decades to reach surface waters. In their environmental assessments, many oil sands companies acknowledge that this may occur.

Two things are notable about this statement. First is the qualification of "not likely" in the first sentence regarding leakage into surface waters, which is an acknowledgement of the prospect of it taking place. Second is an acknowledgement that the leakage may reach surface waters in "decades," well within the life span of naphthenic acids, one of the key pollutants from tailings ponds (see section III. B. "Effects of Tailings Ponds Leakage," above).

The federal government claims that "Alberta has a zero-discharge policy for oil sands tailings ponds" (see **Appendix XVIII**, at p. 1). The Alberta legislation is structured similarly to the *Fisheries Act* in that it states a general prohibition on the release of pollution unless authorized by the regulator.

In March, 2009, Environment Canada communicated with the Canadian Parliament's House of Commons Standing Committee on the Environment and Sustainable Development where the specific question regarding how Environment Canada enforces the *Fisheries Act* with regards to tailings leakage was taken up (see **Appendix XV**, especially at p. 7 of 7). In its communication, Environment Canada indicated that despite the fact that "Alberta Environment inspectors are not designated as Fishery Inspectors under the *Fisheries Act*," it is the practice of Environment Canada (EC) to wait for a referral from Alberta Environment should the latter suspect a *Fisheries Act* violation. And,

To date, EC Enforcement has not received a referral from Environment Alberta indicating that they suspect any possible *Fisheries Act* violations.

To repeat, no referrals from Environment Alberta have been forthcoming, and this is despite the documented instances, outlined above, of contaminated tailings pond leakage reaching surface waters.

It is also clear that Environment Canada is fully aware of the general issue of groundwater contamination and migration to surface waters, and in other circumstances is an advocate against the practice. On its webpage on groundwater contamination, Environment Canada states:

It has often been assumed that contaminants left on or under the ground will stay there. This has been shown to be wishful thinking.<sup>21</sup>

Environment Canada is also aware of the issue of migration of groundwater pollution:

Several studies have documented the migration of contaminants from disposal or spill sites to nearby lakes and rivers as this groundwater passes through the hydrologic cycle, but the processes are not as yet well understood. In Canada, pollution of surface water by groundwater is probably at least as serious as the contamination of groundwater supplies. Preventing contamination in the first place is by far the most practical solution to the problem.<sup>22</sup>

Environment Canada's failure to enforce the pollution prevention provisions of the *Fisheries Act* has been taken up more than once by Canada's Commissioner of the Environment and Sustainable Development. In a 1999 report, the Commissioner found several shortcomings in the approach of Environment Canada,<sup>23</sup> yet a subsequent 2009 review found that the problems persisted. In 2009 the Commissioner concluded:

Environment Canada does not have a *Fisheries Act* compliance strategy for the industries and activities that must comply with the Act's prohibition requirement against the deposit of harmful substances in water frequented by fish.<sup>24</sup>

In 2009, the Commissioner also specifically addressed Environment Canada's enforcement with regards to its administrative agreement with Alberta and oil sands tailings pond contamination. Its conclusion in this regard was:

Environment Canada relies on the Agreement and the arrangements with Alberta to meet its *Fisheries Act* responsibilities. However, the Agreement's Management Committee 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>25</sup>

### **C. Submitters' Past Requests for Enforcement**

As outlined above, the Canadian federal government has known about the problem of oil sands tailings leakage for several years, and has also participated in environmental assessment processes where specific instances have been identified.

When Environmental Defence released its December 2008 report on tailings pond leakage and failure to enforce the *Fisheries Act*, there was extensive media coverage across Canada. A national newspaper, *The Globe and Mail*, ran an editorial that concluded that “the federal government has failed to enforce the *Fisheries Act*.”<sup>26</sup>

In January 2009, Environmental Defence Canada (EDC) began direct written correspondence with Environment Canada (EC) to request enforcement of the *Fisheries Act* with regards to tailings pond leakage (see **Appendix XIX**). Here is a summary:

- January 26, 2009: EDC to EC. EDC summarizes findings of its report and requests enforcement.
- April 7, 2009: EC to EDC. EC claims no evidence of particular point of leakage into Athabasca watershed and says will visit oil sands sites to investigate.
- May 8, 2009: EDC to EC. One letter to Deputy Minister regarding the narrow-casting of the leakage issue into specific surface water incidents rather than considering long- term groundwater leakage. Another letter to enforcement division outlining specific instances of surface water leakage and the law. (Supporting document: **Appendix XX**).
- May 29, 2009: EDC to EC. Enclosed copies of Syncrude groundwater monitoring report (see **Appendix XX**) and Expert Panel on Groundwater of the Council of Canadian Academies (see **Appendix IX**) that flags risk to Athabasca River of oil sands operations. Again flags indirect leakage issue.
- July 6, 2009: EC to EDC. Reports that its studies are inconclusive to date, and indicates that “independent monitoring” will be undertaken.
- September 28, 2009: EC to EDC. Sylvie Ladouceur, Executive Assistant to the Deputy Minister declined via email an in-person meeting with EDC.
- January 13, 2010: EDC to EC. Request results of studies and flags new independent monitoring report of Dr. David Schindler finding elevated pollution levels in Athabasca and tributaries near oil sands.
- February 22, 2010. EC to EDC. Indicates that studies are still underway.
- March 25, 2010. EDC to EC. Flags that studies at this point are unlikely to capture information about past surface water incidents. Also flags that EC has known about the leakage problem for several years. Outlines what enforcement of the *Fisheries Act* would look like.
- May 27, 2015. EDC to EC. Despite the CEC Council voting against the preparation of a factual record, contrary to the recommendation of the CEC Secretariat, the matters raised in the 2010 *Alberta Tailings Ponds* submission remain unchanged: there is strong evidence that toxic chemicals continue to leak from tar sands tailings ponds into nearby rivers. Moreover, a study has now been published showing that chemicals found in groundwater and migrating into the Athabasca River have the chemical “fingerprint” of tailings ponds wastewater (See **Appendix XXII**).

Environmental Defence has received no response to its letter of May 27, 2015.



## **V. ARTICLE 14 REQUIREMENTS**

### **A. This is a Submission the Secretariat May Consider – Article 14.1**

This Submission meets the threshold requirements established under Article 14.1 of the NAAEC.

**Article 14.1(a).** The Submission is presented in English.

**Article 14.1(b).** Environmental Defence Canada presents the Submission on behalf of itself, the Natural Resources Defence Council, and Daniel T'seleie (the "Submitters").

**Article 14.1(c).** This Submission is based on information and documentary evidence contained in environmental assessment submissions, regulatory correspondence, academic papers, and other sources.

**Article 14.1(d).** The Submitters have a long-standing interest in the health of natural ecosystems, including water pollution issues. The Submitters do not have a financial interest in oil sands operations or their competitors. The Submitters present this Submission with the aim of promoting enforcement.

**Article 14.1(e).** This matter has been communicated in writing to Environment Canada in a series of correspondence between January 2009 and January 2015 (see **Appendix XIX** and **Appendix XXII**).

**Article 14.1(f).** The Submitters are not-for-profit organizations and one individual based or residing in the territory of Canada and the United States.

### **B. The Issues Raised in this Submission Merit a Response from the Government of Canada – Article 14.2**

The Submitters respectfully submit that they have met the criteria set out in Article 14.1, and ask that the Secretariat request a response from the Government of Canada.

#### **Article 14.2(a) - Harm to the Submitters**

The individual Submitter is a person who has lived, hunted, and fished downriver from the oil sands. The non-governmental Submitters are organizations whose members include over 2.7 million individuals who have a shared interest in protecting the ground and surface waters of Canada and North America, including the reduction and elimination of pollution from industry.

The Submitters and their members make use of these waters and water pollution harms the entire ecosystem, including people, fish and their habitat. The harm that the contaminants found in tailings ponds can do is not in dispute, and as outlined above, contaminants like naphthenic acids are very long-lived, with their toxic legacy extending into many decades. Given the amount of tailings being generated, the scale of the problem is of national and international concern.

#### **Article 14. 2(b) - Advancing the Goals of the NAAEC**

This Submission raises matters whose further study in this process would advance the goals of the NAAEC. In particular, the preparation of a factual record would:

- Foster the protection and improvement of the environment for present and future generations (Preamble par.1, Article 1(a));
- Promote sustainable development based on cooperation and mutually supportive environmental and economic policies (Article 1(b));
- Increase cooperation between governments to better conserve, protect, and enhance the environment (Articles 1(c), and 10(2)(i));
- Strengthen cooperation on the development and improvement of environmental laws, regulations, procedures, policies and practices (Article 1(f));
- Enhance compliance with, and enforcement of, environmental laws and regulations (Articles 1(g), and 10(2)(p)); and
- Promote pollution prevention policies, practices, techniques and strategies (Articles 1(j), and 10(2)(b)).

#### **Article 14. 2(c)-Private Remedies**

There are no realistic alternative private remedies available. The Submitters either do not have status for civil remedies or they would be impractical to pursue. While Canadian citizens do have the right to commence private prosecutions under the *Fisheries Act* and its regulations where the government refuses to enforce the law, the evidentiary burden is hard to meet for actors without access to significant resources, and such proceedings do not address the systemic problem of persistent non-enforcement by the authorities.

Also, private prosecutions can be stayed by the Crown. Private prosecutions are beyond the financial capacity of most citizens, and are not a viable option for effective enforcement where there are numerous violations of federal law. The Government of Canada has the resources and the obligation to effectively enforce these domestic environmental laws.

#### **Article 14. 2(d)-Mass Media Reports**

This Submission is based primarily upon information obtained from governments, industry, and academic research resources, and not simply mass media reports.

#### **Remedy**

The Submitters therefore request that the CEC prepare a factual record of the allegation that the Government of Canada is in breach of its commitment under the NAAEC to effectively enforce subsection 36(3) of the *Fisheries Act* against the practice of leaking deleterious substances from oil sands tailings ponds into the surface waters and groundwater of Northeast Alberta.

## List of Appendices

- Appendix I: R. v. Kingston (Corporation of the City), (2004) 70 O.R. (3d) 577, (2005) D.L.R. (4th) 734 (Ont. C.A.)
- Appendix II: Jeremy Moorhouse, “Appendix I — Methodology and Sample Calculations” (Pembina Institute, December 2008)
- Appendix III: Matt Price, “1 Million Litres a Day: The Tar Sands’ Leaking Legacy” (Environmental Defence, December 2008)
- Appendix IV: Joint Panel Report, EUB Decision 2004-009, Shell Canada Limited, Applications for an Oil Sands Mine, Bitumen Extraction Plant, Cogeneration Plant, and Water Pipeline in the Fort McMurray Area, February 5, 2004, page 43.
- Appendix V: Jim Barker et al, “Attenuation of Contaminants in Groundwater Impacted by Surface Mining in Oil Sands, Alberta, Canada” (University of Waterloo) November, 2007
- Appendix VI: Golder Associates, “Final Report: Beaver Creek Profiling System” (Golder Associates, February 2009)
- Appendix VII: Femi Baiyewun, Syncrude Canada, “2007 Groundwater Monitoring Report, Mildred Lake Site” (March 15, 2008)
- Appendix VIII: “Design of Tailings Dams on Large Pleistocene Channel Deposits, A Case Study – Suncor’s South Tailings Pond,” by B. Stephens et al, date unknown.
- Appendix IX: “The sustainable management of groundwater in Canada,” Expert Panel on Groundwater, May 2009
- Appendix X: Erik W. Allen, “Process water treatment in Canada’s oil sands industry: I. Target pollutants and treatment objectives,” Journal of Environmental Engineering and Science, 7:123-138, 2008
- Appendix XI: “Naphthenic Acids in Athabasca Oil Sands Tailings Waters Are Less Biodegradable than Commercial Naphthenic Acids,” Angela C. Scott et al, Environ. Sci Technol. 2005, 39, 83888-8394.
- Appendix XII: E. N. Kelly et al, “Oil sands development contributes polycyclic aromatic compounds to the Athabasca River and its tributaries” (December 2009) Proceedings of the National Academy of Sciences
- Appendix XIII: Erin Kelly et al, “Oil sands development contributes elements toxic at low concentrations to the Athabasca River and its tributaries” in (September 114, 2010) 107 Proceedings of the National Academy of Sciences 37, 16178-16183
- Appendix XIV: Canada-Alberta Administrative Agreement for the Control of Deposits of Deleterious Substances under the Fisheries Act
- Appendix XV: “Follow-up on Committee Hearings,” (20 March 2009) (responses of Alberta Environment and Environment Canada to questions posed by the Chair of the House of Commons Standing Committee on the Environment and Sustainable Development)
- Appendix XVI: Oil Sands Regional Aquatic Monitoring Program (RAMP) Scientific Peer Review of the Five Year Report (1997-2001) (February 13, 2004)
- Appendix XVII: Alberta Energy and Utilities Board and Canadian Environmental Assessment Agency, “Report of the Joint Review Panel ... Decision 2004–005: Canadian Natural Resources Limited, Application for an Oil Sands Mine, Bitumen Extraction Plant, and Bitumen Upgrading Plant in the Fort McMurray Area” (EUB/CEAA, 2004)
- Appendix XVIII: “Memorandum to the Minister: Oil Sands Tailings Ponds” (Environment Canada, 19 January 2009)
- Appendix XIX: Correspondence between the Submitter Environmental Defence and Environment Canada (January 2009 - March 2010)
- Appendix XX: Aurora Mine: 2007 Annual Groundwater Monitoring Report, Syncrude Canada Limited (March 2008)
- Appendix XXI: Richard Frank et al., “Profiling Oil Sands Mixtures from Industrial Developments and Natural Groundwaters for Source Identification,” in (2014) 48 Environmental Science and Technology 5, pp 2660–2670
- Appendix XXII: Letter from Environmental Defence to federal Environment Minister (27 May 2015)

## ENDNOTES

1. Alberta Energy: <http://www.energy.alberta.ca/Oilsands/791.asp>
2. McNeill, J. & N. Lothian, "Review of Directive 085 Tailings Management Plans." Pembina Institute. 13 March 2017: <http://www.pembina.org/reports/tailings-whitepaper-d85.pdf>.
3. *Fisheries Act*, R.S.C. 1985, c. F-14, s. 36(3).
4. *Ibid.*, s. 36(4).
5. *Ibid.*, ss. 36(5), (5.1) and (5.2).
6. *Ibid.*, s. 40(5)(a).
7. *Pulp and Paper Effluent Regulations*, S.O.R./92-269; *Petroleum Refinery Liquid Effluent Regulations*, C.R.C. c. 828.
8. Peter W. Hogg, *Constitutional Law of Canada*, 2005 Student Ed. (Toronto: Thomson Carswell, 2005) at 16.1.
9. Pembina Institute: <http://www.pembina.org/blog/oilsands-tailings-back-spotlight>
10. "Attenuation of Contaminants in Groundwater Impacted by Surface Mining in Oil Sands, Alberta, Canada," Jim Barker et al, University of Waterloo, November 2007 (**Appendix V**) (65 L/s in dyke construction water seepage plus 2 L/s in pond seepage = 67 L/s X 60 [for seepage per minute] X 60 [for seepage per hour] X 24 [for seepage per day] = 5,788,800 L/day).
11. See: <http://ceqg-rcqe.ccme.ca/>
12. Erik W. Allen, "Process water treatment in Canada's oil sands industry: I. Target pollutants and treatment objectives," *Journal of Environmental Engineering and Science*, 7:123-138, 2008, at 135.
13. See: "Naphthenic Acids in Athabasca Oil Sands Tailings Waters Are Less Biodegradable than Commercial Naphthenic Acids," Angela C. Scott et al, *Environ. Sci Technol.* 2005, 39, 8388-8394 (**Appendix XI**); see also: Imperial Oil Resource Ventures Limited: Kearl Oil Sands Project – Mine Development Application and Supplemental Information," Imperial Oil Ltd., 2005, Volume 6.
14. *Department of Fisheries and Oceans Act*, R.S.C. 1985, c. F-15, s. 5; *Department of Environment Act*, R.S.C. 1985, c. E-10, s. 7; *Environmental Protection and Enhancement Act*, R.S.A. 2000, c. E-12, s. 19.
15. *Environmental Protection and Enhancement Act*, R.S.A. 2000, c. E-12, s. 19.
16. See: <http://www.ramp-alberta.org/RAMP.aspx>
17. The Athabasca Chipewyan First Nation released a Media Release on May 9, 2008 titled "ACFN Withdraws from R.A.M.P and W.B.E.A." Personal communication on November 18, 2008 from Shannon Crawley with the Chipewyan Prairie First Nation confirms that Band wrote to RAMP in 2008 to withdraw. Personal communication with Simon Dyer of the Pembina Institute on April 9, 2010 confirmed that Pembina asked RAMP to remove its name from the RAMP website in 2009.
18. Expert Review Panel assessment of JOSM: <http://aemera.org/wp-content/uploads/2016/02/JOSM-3-Yr-Review-Full-Report-Feb-19-2016.pdf>
19. *Ibid.*
20. "Canada's Oil Sands: Opportunities and Challenges to 2015," National Energy Board, 2004. <<http://tinyurl.com/zfor-jxw>>.
21. See: <http://www.ec.gc.ca/eau-water/default.asp?lang=En&n=6A7FB7B2-1>
22. *Ibid.*
23. See: 1999 Report of the Commissioner of the Environment and Sustainable Development, Chapter 5— Streamlining Environmental Protection Through Federal-Provincial Agreements: Are They Working?
24. Report of the Commissioner of the Environment and Sustainable Development—Spring 2009 Chapter 1 p. 35.
25. Report of the Commissioner of the Environment and Sustainable Development—Spring 2009 Chapter 1 p. 39.
26. Globe & Mail: "Prevention is best" (12 December 2008) Online: <http://www.theglobeandmail.com/opinion/prevention-is-best/article1323854/>



## **APPENDIX 2**

### **Council Resolution 18-01**

20 August 2018

COUNCIL RESOLUTION: 18-01

**Instruction to the Secretariat of the Commission for Environmental Cooperation regarding the Secretariat's Article 15(1) Notification that a Factual Record is warranted with regard to Submission SEM-17-001 (*Alberta Tailings Ponds II*) in connection with the assertions that Canada is failing to effectively enforce subsection 36(3) of the federal Fisheries Act.**

**THE COUNCIL:**

SUPPORTIVE of the process provided for in Articles 14 and 15 of the North American Agreement on Environmental Cooperation (NAAEC) regarding submissions on enforcement matters and the preparation of factual records;

AFFIRMING that the process provided for in Articles 14 and 15 of the NAAEC was established by the Parties of the NAAEC to provide an opportunity for persons or nongovernmental organizations residing or established in Canada, Mexico, and the United States to present their concerns regarding effective enforcement of environmental law;

RECOGNIZING that the Submissions on Enforcement Matters (SEM) process is designed to promote information-sharing between members of the public and the governments on matters concerning the effective enforcement of environmental law;

ACKNOWLEDGING that factual records are an important way to increase public participation, transparency, and openness on issues related to the enforcement of environmental law in Canada, Mexico and the United States;

HAVING CONSIDERED the submission filed on 26 June 2017, by Environmental Defence Canada, the Natural Resources Defense Council and a Canadian resident, and the Response provided by Canada on 10 November 2017;

HAVING REVIEWED the 19 April 2018 Notification by the Secretariat recommending the development of a factual record with respect to the effective enforcement of subsection 36(3) of the federal Fisheries Act of Canada;

REAFFIRMING that the purpose of a factual record is to provide an objective presentation of the facts relevant to the assertion set forth in a submission and will generally outline the history of the environmental enforcement issue raised in the submission, the relevant legal obligations of the Party, and the actions of the Party in fulfilling those obligations;

TAKING INTO ACCOUNT that Section 10.4 of the *Guidelines for Submissions on Enforcement Matters under Articles 14 and 15 of the North American Agreement on Environmental Cooperation* (Guidelines), in relation to the preparation of a factual record, states that “[t]he Council will provide its reason(s) for the instructions in writing and they will be posted on the [SEM] public registry”.

**HEREBY UNANIMOUSLY DECIDES TO:**

INSTRUCT the Secretariat to prepare a factual record in accordance with Article 15(4) of the NAAEC and with the Guidelines, on the following matters arising in the context of Submission SEM-17-001 related to effective enforcement of subsection 36(3) of the *Fisheries Act*:

- The state of the publicly available peer-reviewed science on identifying differences between naturally-occurring bitumen-influenced water and anthropogenic oil sands process-affected water;
- Alberta's relationship with Canada with respect to the assertions and specific sites referred to in the submission, as well as other specific sites mentioned in Canada's response; and
- How the Oil Sands Monitoring Program (formerly the Joint Oil Sands Monitoring Program) is carried out and how it fits into Canada's enforcement of the *Fisheries Act*;

DIRECT the Secretariat to post Council's reasons for its vote on the SEM public registry;

DIRECT the Secretariat to conclude the preparation of the draft factual record, as provided in Section 19.5 of the Guidelines, and present it to the Council in accordance with Article 15(5) of the NAAEC; and

FURTHER DIRECT the Secretariat to provide the Council with its overall work plan for gathering the relevant facts; to keep the Council informed of any future changes or adjustments to such plan; and to promptly communicate with the Council in connection with any clarification required with respect to the scope of the factual record hereby authorized.

**APPROVED BY THE COUNCIL:**

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Isabelle Bérard  
Government of Canada

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Enrique Lendo Fuentes  
Government of the United Mexican States

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Jane Nishida  
Government of the United States of America

## **Reasons for Council Instructions**

### **Regarding Submission SEM-17-001 (*Alberta Tailings Ponds II*)**

Pursuant to its commitment to transparency and in its capacity as the governing body of the Commission for Environmental Cooperation responsible for overseeing the implementation of the *North American Agreement on Environmental Cooperation* (“NAAEC”), the Council of the Commission for Environmental Cooperation (the “Council”) hereby makes public its reasons for the instructions to the Secretariat for the preparation of a factual record regarding SEM-17-001 (*Alberta Tailings Ponds II*).

#### **1. The Secretariat’s Article 15(1) Notification**

In its Article 15(1) notification issued on 19 April 2018 (the “15(1) notification”), the Secretariat notified the Council that the development of a factual record was warranted regarding the Submitters’ assertions of a failure to effectively enforce subsection 36(3) of the federal *Fisheries Act* in relation to the alleged leakage of deleterious substances from tailings ponds into surface waters frequented by fish, or through groundwater and the surrounding soil into surface waters frequented by fish in northeastern Alberta.

#### **2. The Council’s Instruction to the Secretariat**

In Council Resolution 18-01, the Council unanimously instructed the Secretariat to prepare a factual record strictly regarding the following aspects of the submission:

- a) The state of the publicly available peer-reviewed science on identifying differences between naturally-occurring bitumen-influenced water and anthropogenic oil sands process-affected water;
- b) Alberta’s relationship with Canada with respect to the assertions and specific sites referred to in the submission, as well as other specific sites mentioned in Canada’s response; and
- c) How the Oil Sands Monitoring Program (formerly the Joint Oil Sands Monitoring Program) is carried out and how it fits into Canada’s enforcement of the *Fisheries Act*.

#### **3. Explanation of the Council’s Reasons**

##### **Article 45(1)(a) of the NAAEC**

1. Article 45(1)(a) of the NAAEC provides that a Party has not failed to effectively enforce its environmental law where the action or inaction in question “reflects a reasonable exercise of [the Party’s] discretion in respect of investigatory, prosecutorial, regulatory or compliance matters”. Guideline 9.4 of the *Guidelines for Submission on Enforcement Matters under Articles 14 and 15 of the North American Agreement on Environmental Cooperation* (Guidelines) provides that if a Party informs the Secretariat in its response that it is not failing to effectively enforce its environmental law pursuant to Article 45(1)(a), the Party response should provide sufficient information to explain how the Party’s action or inaction reflects a reasonable exercise of discretion. Guideline 9.5 further provides that the Secretariat is to “consider whether the Party has included sufficient information” to this effect.



2. In its response, Canada explained the enforcement actions it has taken pursuant to Subsection 36(3) of the *Fisheries Act* in relation to tailings ponds in northeastern Alberta. Canada described proactive inspections it has undertaken in relation to specific tailings ponds, including all of the specific sites identified in the submission, the results of those inspections, the inability to conclude there were reasonable and probable grounds to believe a violation of subsection 36(3) of the Act had occurred, and the reasons why Canada then redirected proactive enforcement efforts toward other priorities while ECCC's scientific research in relation to tailings ponds continued. In the Council's view, Canada's response provided sufficient information concerning its reasonable exercise of discretion under Article 45(1)(a) and Guidelines 9.4 and 9.5.

**Use of enforcement tools other than prosecutions under the *Fisheries Act***

3. The Secretariat's 15(1) notification recommends developing a factual record in connection with the "use of enforcement tools other than prosecutions". The Council notes that, as indicated in Canada's response, Canadian law requires reasonable grounds to believe an offence has occurred in order to take an enforcement action. The Council further notes Canada's explanation that other enforcement tools, such as those identified by the Secretariat in its 15(1) notification, were not available to enforcement officers because of a lack of reasonable grounds to believe that an offence had occurred. In its response,<sup>1</sup> Canada distinguishes the relevant legal standards for undertaking enforcement actions (reasonable grounds) and securing a conviction (beyond a reasonable doubt). The Council notes that Canada has exercised its enforcement authority by conducting proactive inspections under the Act to serve the purpose of assessing compliance and is of the view that it would not be appropriate for the Secretariat to comment on how legal standards of proof should be met in relation to the Parties' domestic legal enforcement activities.
4. In the Council's view, a Party is not required to pursue every enforcement tool available to meet the standard of "effective enforcement" under the NAAEC. In the matter at hand, it is not clear to the Council what new or additional information could have been gathered by the authorities of Canada that would have resulted in a different outcome had they resorted to other tools of enforcement. As Canada explained in its response, the *Fisheries Act* allows the Minister of Environment and Climate Change to request information relating to activities that are likely to result in the deposit of deleterious substances, and based on such information, the Minister may resort to orders "where a violation has occurred or is likely to occur".<sup>2</sup> As Canada further explained, enforcement officials in this matter were challenged by a lack of analytical tools to assess whether seepage from tailings ponds is occurring into water frequented by fish and thus is actionable under the *Fisheries Act*. In the Council's view, it is not proper for a factual record to speculate on whether the discretionary powers of the Minister under the Act should have been pursued.

<sup>1</sup> Response, at pp. 13-14

<sup>2</sup> Response Annex 1, *Compliance and Enforcement Policy for the Habitat Protection and Pollution Prevention Provisions of the Fisheries Act*, at pp. 21..

### **State of the Research**

5. The Council recognizes the Secretariat's view that there is public interest in the scientific research associated with the environmental impacts of oil sands development. While Canada's Response included the latest available information at the time the Response was provided, the factual record may explore any publicly available information on the state of the research with respect to identifying the differences between naturally-occurring and anthropogenic bitumen-influenced water to provide greater clarity on this matter under the submission.

### **Relationship with Alberta**

6. The Council notes it would not be appropriate for the factual record to address Alberta's regulatory authorities since Alberta's environmental laws are not the subject of the assertions contained in the submission. The Council agrees, however, with the Secretariat's recommendation for the factual record to address Alberta's relationship with Canada in enforcing subsection 36(3). This examination should focus exclusively on the assertions raised in the submission rather than a broad review of Alberta's role in relation to all enforcement actions under the *Fisheries Act*.

## **APPENDIX 3**

### **Response of Canada under Article 14(3)**

ALBERTA TAILINGS PONDS II

Commission for Environmental Cooperation

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Response to Submission SEM-17-001

Prepared by: Environment and Climate Change Canada for the Government of Canada

November 2017

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## 1. INTRODUCTION

On June 26, 2017, the CEC Secretariat received the *Alberta Tailings Ponds II* Submission on Enforcement Matters (SEM), filed by Environmental Defence Canada, the Natural Resources Defense Council, and a private individual, resident in Canada.

The submission alleges that Canada is failing to effectively enforce ss. 36(3) of the *Fisheries Act*<sup>1</sup> (the ‘Act’) with respect to the leaking of deleterious substances from oil sands tailings ponds into the surface waters and groundwater of Northeast Alberta. The submitters allege that tailings ponds systematically seep into waters frequented by fish<sup>2</sup> and that the effluent which seeps from tailings ponds into waters frequented by fish is deleterious to fish.<sup>3</sup> The submitters maintain that Canada has neither prosecuted nor pursued regulation governing tailings pond leakage. Furthermore, the submitters assert that the federal government has relied on the Alberta government to monitor, report and investigate illegal releases from tailings ponds and that Alberta in turn relies on industry self-reporting of tailings leakage.<sup>4</sup>

On August 16, 2017, the Secretariat concluded that the submission met the criteria set out in Article 14(1) of the *North American Agreement on Environmental Cooperation* (NAAEC) and in accordance with Article 14(2) determined that the submission merits a response from Canada.

In its determination, the Secretariat indicated Canada may provide information concerning enforcement of ss. 36(3) of the Act in the Alberta oil sands region, in relation to both direct and indirect deposits of deleterious substances from tailings ponds into water frequented by fish.

This document represents Canada’s response to the Secretariat, in accordance with NAAEC Article 14(3), and provides information concerning the Government of Canada’s enforcement of the pollution prevention provisions of the Act in the Alberta oil sands region. Specifically, the response explains the results of Environment and Climate Change Canada’s (ECCC) most recent proactive inspections at oil sands tailings ponds, which were a national enforcement priority between 2009 and 2014. In addition, the legal and scientific justifications for transitioning to a reactive enforcement approach in 2014 are discussed. The roles of the federal and provincial governments are outlined as well. It is Canada’s position that the inspections conducted by enforcement officers, other enforcement activities described in the response, and ongoing scientific research to better understand if ss. 36(3) violations are occurring in the oil sands region, constitute effective enforcement of environmental laws, as per Article 45(1) of the NAAEC.

1. (R.S.C., 1985, c. F-14); Available at: <http://laws-lois.justice.gc.ca/eng/acts/F-14/>

2. Submission, page 4-5.

3. Submission, page 5-6.

4. Submission, page 2.

## 2. EXECUTIVE SUMMARY

Canada is a land of vast natural resources and the people of Canada want those resources to be developed responsibly - for the preservation and protection of the country's rich and varied environment and for the health and safety of future generations. It is Canada's position that Environment and Climate Change Canada (ECCC)'s actions in the oil sands region, including its record of inspections and its continuing scientific research to distinguish natural versus anthropogenic depositions, demonstrate Canada's effective enforcement of the pollution prevention provisions of the *Fisheries Act*.

The oil sands are the third-largest proven oil reserve in the world. The Alberta oil sands formation comprises 142,000 square kilometres (km<sup>2</sup>) of land in Athabasca, Cold Lake, and Peace River areas in northern Alberta.<sup>5</sup> Oil sand itself is a naturally occurring mixture of sand, clay or other minerals, water, and bitumen.<sup>6</sup> Within the Alberta oil sands, reserves shallow

enough to mine (up to 75 metres) are found only within the Athabasca oil sands area, which comprises 4,800 km<sup>2</sup> and accounts for about 3.4% of the total oil sands formation, of which only a fraction is actively mined.<sup>7</sup> When bitumen is extracted, residual waste known as tailings is produced. Tailings contain a mixture of water, clay, unrecovered bitumen, and solvent, including some organic and inorganic compounds that are toxic. These tailings are stored in large basins called tailings ponds to allow the mineral fraction to settle out, with a total fluid tailings volume of 1.2 billion cubic metres.<sup>8</sup>

The Athabasca River is a major feature of the region, and its waters flow through areas of surface mining activity and natural outcroppings of oil sands (Sun et. al, 2017). There is potential for tailings water, also known as oil sands process-affected water (OSPW), to interact with the Athabasca watershed. Tailings ponds are designed to prevent the seepage of OSPW outside of containment zones. Individualized tailings management plans and mitigation measures are required under Alberta legislation with the intention of managing any risk of seepage.

Differentiating between anthropogenic (oil sands industrial activity) and natural sources of bitumen is the primary scientific challenge in determining whether seepage is occurring beyond containment zones as the natural oil sands formation leaches bitumen into groundwater to form a complex mixture (known as natural bitumen-influenced water) which closely resembles the chemical mixture of tailings water. Differentiating between natural bitumen-influenced groundwater and OSPW is scientifically and technically challenging as methods for their analysis have not been available and only now are in their preliminary stages of development and verification.

5. Alberta Energy Facts and Statistics: <http://www.energy.alberta.ca/OilSands/791.asp>

6. Natural Resources Canada "What are the oil sands": <http://www.nrcan.gc.ca/energy/oil-sands/18089>

7. Alberta Energy Facts and Statistics: <http://www.energy.alberta.ca/OilSands/791.asp>

8. Total fluid tailings volume at end of 2016, based on the 2016 tailings reports received by the Alberta Energy Regulator (AER).

Subsections 36(3) to 36(6) of the Act, also known as the “pollution prevention provisions,” establish a general prohibition against the unauthorized deposit of deleterious substances in waters frequented by fish. ECCC enforcement officers seek to enforce these provisions through proactive and reactive enforcement activities.

From 2009 to 2014, ECCC’s Enforcement Branch, in collaboration with its Science and Technology Branch, conducted proactive enforcement activities at various tailings ponds in Alberta. During this period, ECCC conducted onsite inspections at seven tailings ponds, including at the sites highlighted by the submitters in the submission. Following their inspections, enforcement officers, in consultation with ECCC’s scientists, determined that they did not have reasonable grounds to believe that there were violations of the pollution prevention provisions of the Act for any of the inspections conducted. The main reason for this, was that when deleterious substances were found in groundwater samples, enforcement officers could not determine if they came from natural or anthropogenic (i.e. oil sands industrial activity) sources; officers were not able to establish that a person deposited or permitted the deposit of a deleterious substance.

At the time of inspections, the scientific tools were unavailable to attribute any deleterious substances found in groundwater to tailings ponds. In 2014, following five years of effort to inspect tailings ponds with no reasonable grounds to support violations of the Act, ECCC redirected its proactive enforcement efforts toward other regional and national issues where resources could have a greater positive impact on the environment. This decision to reallocate resources was made in the context of an annual national planning process and the development of a national enforcement plan, and was consistent with Article 45 of the NAAEC.

In parallel, in an effort to address the knowledge gaps related to identifying seepage from tailings ponds, ECCC scientists have been working diligently to develop the scientific tools necessary to determine whether tailings pond seepage is occurring, and its extent and impact. ECCC scientists have been at the forefront of this important work and have made promising advances on discovering the compositions of OSPW and natural bitumen-influenced groundwater, and the ability to distinguish the two. Scientific advances from the past three years are expected to lead to an improved ability for ECCC to enforce the pollution prevention provisions of the Act in the coming years.

The Government of Canada works in coordination with the Government of Alberta, as with other provinces, to promote compliance with federal laws.

Collectively, these actions, including ECCC’s record of inspections, and its continuing scientific research, demonstrate that Canada is effectively enforcing its environmental laws in a manner consistent with the NAAEC, including Articles 5 and 45.

### 3. ECCC ENFORCEMENT ACTIVITIES UNDER THE *FISHERIES ACT*

#### 3.1 The Pollution Prevention Provisions of the Fisheries Act

The “fisheries protection and pollution prevention provisions” comprise ss. 34 through 42 of the *Fisheries Act* (the ‘Act’). Fisheries and Oceans Canada (DFO) has primary responsibility for the administration of the Act, which includes responsibility for administration and enforcement of the provisions intended to prevent serious harm to fish and manage threats to the sustainability and on-going productivity of Canada’s commercial, recreational, and Aboriginal fisheries. Since 1978, ECCC has been responsible for the administration and enforcement of ss. 36(3) to 36(6), also known as the “pollution prevention provisions” of the Act, with respect to the deposit of deleterious substances in water frequented by fish.<sup>9</sup>

Subsection 36(3) of the Act, which is the subject of the submission, establishes a general prohibition against the deposit of deleterious substances in waters frequented by fish. It provides that:

“Subject to subsection (4), no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water.”

Subsection 36(4) of the Act provides that a deposit of a deleterious substance is not an offence if permitted by regulation. Subsections 36(5) and (5.2) allow the Governor in Council and the Minister to enact regulations authorizing the deposit of deleterious substances, subject to conditions such as monitoring and reporting. However, no regulations currently exist that apply to the deposit of substances from oil sands tailings ponds.

For clarity, ss. 34(1) of the Act defines a “deleterious substance” as:

- a) any substance that, if added to any water, would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water, or
- b) any water that contains a substance in such quantity or concentration, or that has been so treated, processed or changed, by heat or other means, from a natural state that it would, if added to any other water, degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water.

9. From 1978 to 2014, ECCC was responsible for the administration and enforcement of the pollution prevention provisions of the Act in accordance with the 1978 Prime Ministerial Instruction and Directive issued by the Right Honourable Pierre Trudeau. ECCC’s responsibilities were later formalized by a Governor in Council Order (also referred to as the Designation order) published in Canada Gazette, Part II on March 12, 2014, which resulted in the Minister of Environment and Climate Change having legal responsibility for the administration and enforcement of ss. 36(3) to (6) of the Act for all purposes and subject matters with the exception of aquaculture, and aquatic invasive species or aquatic species that constitute a pest to fisheries, which remain the responsibility of the Minister of Fisheries, Oceans and the Canadian Coast Guard.



In addition, Canadian case law has clarified that it is not necessary that the receiving water be rendered deleterious to fish. In *R. v. Kington*, the Court stated: “...It is the substance that is added to water frequented by fish that is defined [in ss. 36(3)], not the water after the addition of the substance.”<sup>10</sup>

### 3.2 ECCC’s Enforcement Branch Organization and Authorities

ECCC’s Enforcement Branch (EB) is responsible for the protection and conservation of the environment and wildlife within federal jurisdiction for current and future generations. In-the- field enforcement officers across Canada enforce environmental and wildlife laws, including the following:

- *Canadian Environmental Protection Act, 1999* (CEPA)<sup>11</sup>
- pollution prevention provisions of the Act, including ss. 36(3)<sup>12</sup>
- *Migratory Birds Convention Act, 1994* (MBCA)<sup>13</sup>
- *Canada Wildlife Act* (CWA)<sup>14</sup>
- *Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act* (WAPPRIITA)<sup>15</sup>
- *Species at Risk Act* (SARA)<sup>16</sup>

EB has two operational directorates: the Environmental Enforcement Directorate (EED), and the Wildlife Enforcement Directorate (WED). Officers are spread across the following five administrative regions:

- Pacific and Yukon Region (British Columbia and Yukon);
- Prairie and Northern Region (Alberta, Manitoba, Saskatchewan, the Northwest Territories and Nunavut);
- Ontario Region (Ontario);
- Quebec Region (Quebec); and,
- Atlantic Region (Newfoundland and Labrador, New Brunswick, Nova Scotia, and Prince Edward Island).

10. Submission, page 3; Submission Appendix I

11. Available here: <http://ec.gc.ca/alef-ewe/default.asp?lang=En&n=4CD78F9F-1>

12. Available here: <http://ec.gc.ca/alef-ewe/default.asp?lang=En&n=9ABFA22F-1>

13. Available here: <http://ec.gc.ca/alef-ewe/default.asp?lang=en&n=3DF2F089-1>

14. Available here: <http://ec.gc.ca/alef-ewe/default.asp?lang=en&n=E8EA5606-1>

15. Available here: <http://ec.gc.ca/alef-ewe/default.asp?lang=en&n=65FDC5E7-1>

16. Available here: <http://ec.gc.ca/alef-ewe/default.asp?lang=en&n=ED2FFC37-1>

There are 150<sup>17</sup> enforcement officers in EED responsible for enforcing CEPA and the pollution prevention provisions of the Act, including 30 officers in the Prairie and Northern Region. There are 80<sup>18</sup> enforcement officers in WED responsible for enforcing the MBCA, the CWA, WAPPRIITA, and SARA.

Throughout this document, the term “enforcement officer” refers only to officers in EED. These officers are designated by ECCC as both inspectors and fishery officers under the Act. Officers are provided with training with respect to the application of the Act and have legal authorities, including powers of inspection and search, seizure and detention (section 3.4).

### Responding to alleged violations

In addition to authorities and powers set out in the Act, the provisions of the Act are enforced in accordance with the *Compliance and Enforcement Policy for the Habitat Protection and Pollution Prevention Provisions of the Fisheries Act* (Compliance and Enforcement Policy, Annex 1).<sup>19</sup> The Compliance and Enforcement Policy outlines general principles for the application of the provisions of the Act. It explains the role of regulatory officials in promoting and enforcing the Act. It sets out principles of fair, predictable, and consistent enforcement governing the application of the law, and responses by enforcement officers to alleged violations.

Enforcement officers carry out two main enforcement activities: inspections and investigations. The purpose of an inspection is to assess compliance; inspection powers are set out in s. 38 of the Act, and further described in the Compliance and Enforcement Policy. The purpose of an investigation is to gather evidence of a suspected violation. An enforcement officer may conduct an investigation when he or she has reasonable grounds to believe that an offence has been committed under the Act.

The Act and the Compliance and Enforcement Policy establish several enforcement measures to address alleged violations. Officers may (i) issue warnings and directions in response to alleged violations, (ii) recommend that the Minister of Environment and Climate Change consider exercising the authority to issue an order requiring that a person provide plans or other information, (iii) recommend that the Attorney General seek an injunction from a court to stop an alleged violation, or (iv) recommend a file for prosecution to the Public Prosecution Service of Canada.

When taking enforcement action, an enforcement officer considers each element of an offence. For ss. 36(3), the elements of the offence include the following:

- that a substance was deposited;
- that one or more persons have deposited or have permitted the deposit of the substance;
- that the substance deposited is deleterious to fish; and,
- that the substance was deposited in water frequented by fish, or in a place where it may enter such water.

17. Head count as of Aug. 17, 2017; includes managers.

18. Head count as of September 8, 2017; includes managers.

19. Available here: <http://www.ec.gc.ca/alef-ewe/default.asp?lang=en&n=D6B74D58-1As>

When deciding on the appropriate response to a violation, enforcement officers consider factors set out in the Compliance and Enforcement Policy including the nature of the violation, effectiveness in achieving the desired result, and consistency in enforcement. To take an enforcement action, an enforcement officer needs reasonable grounds to believe that an offence has occurred. With regards to prosecutions, the minimum standard to lay a charge is reasonable grounds to believe that an offence has occurred. However, for conviction of an accused, each element of an offence must be proven to the higher threshold of beyond a reasonable doubt.

The standards of “reasonable grounds to believe” and “beyond a reasonable doubt” have specific, legal meanings, and have been addressed in case law:

- Reasonable grounds requires the “person in authority” to believe both subjectively and objectively that a criminal offence has been committed (*R. v. Storrey* (1990), 1990 CarswellOnt 78 (S.C.C.)).
- Proof “beyond a reasonable doubt” is closer to an absolute certainty than to a reasonable probability (*R. v. Starr* (2000), 147 C.C.C. (3d) 449 (S.C.C.)).

### 3.3 Enforcement Activities at Oil Sands Tailings Ponds in Alberta

This section describes the most recent inspections carried out by ECCC enforcement officers and their results.

#### *Inspections at Oil Sands Facilities*

Between 2009 and 2014, with support from Science and Technology Branch, EED enforcement officers conducted proactive inspections at oil sands tailings ponds in Alberta. Oil sands were specifically included as a priority in EED’s National Enforcement Plans for fiscal years 2010- 2011 through 2013-2014.

Inspections were conducted by enforcement officers at seven different tailings pond sites to determine if oil sands process-affected water (OSPW, i.e. tailings water) was being deposited contrary to the Act. The submission references five sites: Syncrude Beaver Creek and Mildred Lake; Canadian National Resources Limited (CNRL) Horizon Mine; Suncor Tar Island Pond 1; Suncor South Tailings Pond; and Shell Jackpine Project. Inspections were conducted by officers at all five sites, as well as two that are not mentioned in the submission: Shell Muskeg River (External Tailings Pond), and Syncrude Aurora. A list of inspections is attached as Annex 2.

Over 600 samples were taken during the inspections. The range of tests conducted on samples taken during the inspections was determined in consultation with scientists in ECCC’s Science and Technology Branch.

Below is a summary of inspections conducted at the seven sites. Inspection dates are listed as occurring between 2009 and 2014. While physical, on-site inspections occurred between calendar years 2009 and 2013, work on the inspection files continued into 2014.

## **1. Syncrude: Beaver Creek and Mildred Lake**

In May 2009, ECCC officers conducted an inspection at Syncrude Canada Ltd. Mildred Lake. Officers returned on September 23, 2009, to collect groundwater samples from the Mildred Lake Settling Basin. Levels of major ions, dissolved metals, dissolved organic carbon, total alkalinity, and ammonia-nitrogen were found to be below Canadian Council of Ministers of the Environment (CCME) Guidelines,<sup>20</sup> and not deleterious to fish. Levels of naphthenic acids were measured to be higher than in the Athabasca River. At the time of the inspection, further scientific research was required in order for ECCC scientists to develop a methodology to determine if naphthenic acids in the natural environment were from anthropogenic or naturally occurring sources.

ECCC officers returned to the site on June 23, 2010, with departmental scientists. Samples were taken from monitoring wells, Beaver Creek, the drainage collection system, and an interception well, which is a well installed to intercept groundwater before it reaches Beaver Creek in case it is being influenced by the pond. Based on sample results, there was not enough data to conclude that groundwater was being contaminated by the tailings pond, or being deposited into Beaver Creek. Again, further scientific research was needed to determine the origin of substances.

On August 15, 2012, the site was inspected again by enforcement officers, to determine whether substances associated with mining could be found in groundwater near or in Beaver Creek.

Samples were taken from monitoring wells and from Beaver Creek and analyzed for anions, ammonia, total metals, naphthenic acids, and benzene, toluene, ethylbenzene and xylene (BTEX). The only compound with elevated levels was naphthenic acids. At the time, the technology was still not available to determine whether the naphthenic acids were anthropogenic or naturally occurring.

As a result, enforcement officers did not have reasonable grounds to believe an offence under ss. 36(3) had occurred. In particular, they were unable to determine that a deleterious substance was deposited by a person.

## **2. Canadian Natural Resources Limited (CNRL) Horizon Mine**

In May 2009, ECCC officers conducted an aerial inspection of the CNRL Horizon Mine tailings pond. Officers did not observe any visible discharges from the tailings pond into fish bearing water.

On September 27, 2010, ECCC officers collected groundwater samples from monitoring wells and had them analyzed for ammonia, total and dissolved metals, anions, mercury, polycyclic aromatic hydrocarbons (PAHs), and naphthenic acids. Results showed that ammonia levels in one sample were elevated, but only in a sample collected a half a kilometer away from any water body; the remaining samples, including the ones collected closer to the Athabasca River, did not contain results that would indicate a potential violation.

20. CCME Guidelines provides a voluntary set of science-based goals for the quality of aquatic and terrestrial ecosystems.



On August 16, 2012, enforcement officers once again took groundwater samples from monitoring wells at CNRL's Horizon mine, and had them analyzed for ammonia, dissolved metals, naphthenic acids, BTEX, and anions. None of the substances were found to be at elevated levels.

### **3. Suncor Tar Island Pond 1**

On June 22, 2010 enforcement officers, accompanied by ECCC scientists, took samples from five monitoring wells near Suncor's Tar Island Pond 1, as well as from a floodplain pond and interception well. All samples except for the interception well sample were analyzed for naphthenic acids, PAHs, mercury, anions, and dissolved metals. The interception well sample was analyzed by Science and Technology Branch for chemistry and toxicity evaluation for research purposes. Regarding sample results, three wells had arsenic concentrations higher than the CCME guideline of 5 µg/L. Two wells had chloride concentrations higher than the CCME guidelines.

In September 2010, again accompanied by ECCC scientists, enforcement officers inspected Tar Island Pond 1 and took samples from groundwater monitoring wells adjacent to the pond.

Samples were analyzed for ammonia, total and dissolved metals, anions, mercury, PAHs, and naphthenic acids. Levels of arsenic, ammonium, zinc, chloride, boron, and vanadium were found to be high in comparison to the CCME Guidelines.

Enforcement officers corresponded significantly with scientists on this file. During the time that the file was open, while progress was made on differentiating naturally occurring from anthropogenic sources, there was still no clear indication of whether or not the substances were coming from the pond rather than from natural sources. As a result, enforcement officers did not have reasonable grounds to believe that an offence under ss. 36(3) had occurred, in particular, that deleterious substances were deposited by a person.

In June 2011, ECCC enforcement officers and scientists collected groundwater samples from the Athabasca River at various locations upstream of Suncor Pond 1. Sample results were compared to sample results taken adjacent to Pond 1 in 2010. The purpose was to help determine if there was a difference between compounds found in groundwater upstream of Pond 1 to those found adjacent to Pond 1.

The following parameters were collected at each location: trace metals, anions, BTEX, naphthenic acids, ammonium, ammonium isotopes, cations, sulphur isotopes, water isotopes, as well as field parameters which included pH, temperature, dissolved oxygen, conductivity, and oxidation reduction potential.

The results of this inspection were inconclusive. Enforcement officers did not have reasonable grounds to believe that there was an offence under ss. 36(3), in particular, that a deleterious substance was deposited by a person.

#### **4. Suncor's South Tailings Pond**

Enforcement officers conducted an inspection at Suncor's South Tailings Pond on May 14-16, 2013. The inspection included analysis of samples from groundwater monitoring wells and the tailings pond, and determining groundwater flow direction in the area of concern. The following parameters were analyzed: anions, ammonia, dissolved metals, naphthenic acids, synchronous fluorescence spectroscopy, BTEX, and sweetener. Sweetener was used as an attempt to link groundwater samples to the tailings pond, as it may be an indication of anthropogenic sources.

Following the analysis of samples, there was no indication of OSPW found except for one well. However, data of the direction of groundwater flow showed that Suncor pumps this groundwater back into their tailings ponds and not towards surface waters.

Based on the information obtained during the inspection, there were no reasonable grounds to believe that a violation of ss. 36(3) had occurred.

#### **5. Shell Canada Limited's Jackpine Project**

On May 24, 2012, enforcement officers collected groundwater samples from monitoring wells between the tailings pond and Jackpine Creek. Samples were analyzed for anions, dissolved metals, ammonia, BTEX, and naphthenic acids. The samples did not contain concentrations either above CCME Guidelines or significantly above natural background levels for substances where there were no recommended concentrations in those guidelines.

Based on the information obtained during the inspection, enforcement officers did not have reasonable grounds to believe that an offence under ss. 36(3) of the Act had occurred.

#### **6. Shell's Albion Sands-Muskeg River Mine – External Tailings Pond**

Officers inspected the Shell's Albion Sands Muskeg River External Tailings pond on May 26, 2009; September 28, 2010; June 26-28, 2011; September 22, 2011 and May 24, 2012. During this time, numerous samples were collected from groundwater monitoring wells as well as from the Muskeg River and from a manmade outfall (August 2011). Elevated concentrations of naphthenic acids were detected twice: first in 2010 and then in September 2011. It was unknown if the naphthenic acids were from anthropogenic or natural sources. When no elevated levels of substances were found in 2012, the file was recommended for closure.

#### **7. Syncrude Aurora**

Officers inspected the Syncrude Canada Ltd. Aurora Operations on May 26, 2009; June 24, 2010; and August 14, 2012. During this time numerous samples were collected from groundwater monitoring wells as well as from an interception well. All samples except for the interception well were tested for naphthenic acids, PAH, mercury, anions, and dissolved metals. The interception well sample was analyzed by ECCC's Science and Technology Branch for chemistry and toxicity. There were no elevated concentrations in the samples taken, except for naphthenic acids. However, it was unknown if the naphthenic acids were from natural or anthropogenic sources. As such, enforcement officers did not have reasonable grounds to believe that a violation of ss. 36(3) had occurred.

### *Inspection Results*

For all of the inspections conducted, enforcement officers, after consulting in depth with ECCC scientists, determined that they did not have reasonable grounds to believe that there was a violation of the pollution prevention provisions of the Act. The primary reason for these determinations was an inability to differentiate whether the source of deleterious substances in bitumen influenced groundwater samples was anthropogenic or naturally occurring.

Enforcement actions, such as issuing a direction under ss. 38(7.1) of the Act, only require officers to have *reasonable grounds to believe* that a violation of the Act has occurred. On the other hand, in a prosecution, significantly greater certainty is needed as the Crown must prove the accused guilty *beyond a reasonable doubt*. In a successful prosecution for an alleged offence of ss. 36(3) of the Act, the Crown must prove the accused guilty beyond a reasonable doubt. At the time of the inspections, existing science prevented the officers from having reasonable grounds to believe a violation of ss. 36(3) of the Act had occurred, and they were unable to take either of these enforcement measures.

ECCC has conducted inspections: inspections may lead to investigations and investigations may lead to prosecution. This can only occur where there is the means to establish sufficient grounds to believe an alleged violation has occurred. The submission maintains that Canada has failed to prosecute. However, as outlined in NAAEC Article 5, prosecution is just one aspect of enforcement.

The submitters' appendices contain information from environmental assessments and reports of the oil sands where authors project or report unintended seepages and then outline mitigation measures to manage any risks to surface waters. In the documentation provided it is clear that operators' intentions are to contain OSPW so that it does not reach surface water bodies. The estimates of seepage provided by the submitters are insufficient proof of violations of ss. 36(3) of the Act for enforcement purposes. As discussed, the most recent inspections undertaken by enforcement officials at the same sites referenced by the submitters did not provide enforcement officers with reasonable grounds to believe that there was a violation of the pollution prevention provisions of the Act.

Further, as documented and explained above, the decisions taken by enforcement officers were based on facts and available information. A high threshold must be met for a conviction, namely proof beyond a reasonable doubt that an accused has committed an offence.

In conclusion, the decisions taken by enforcement officers in relation to each file constitute legally sound decisions.

### *Prioritization of Enforcement Resources*

Under Article 45(1) of the NAAEC, a Party has not failed to effectively enforce its environmental law or to comply with Article 5(1), where the Action or inaction in question by agencies or officials of that Party:

“ (a) reflects a reasonable exercise of their discretion in respect of investigatory, prosecutorial, regulatory or compliance matters; or (b) results from *bona fide* decisions to allocate resources to enforcement in respect of other environmental matters determined to have higher priorities.”

In accordance with Article 45(1), given the high number of regulations under the many federal environmental laws that ECCC enforces (see section 3.2) and given the numerous regulatees coupled with Canada's vast and, at times, remote geography, EED is required to prioritize its resources. Environmental enforcement priorities are defined annually in consultation with experts from ECCC's Environmental Protection Branch and Science and Technology Branch.

Approximately 40% of inspections conducted by the EED are related to the pollution prevention provisions of the Act and its regulations. The remaining 60% of inspections are related to CEPA and its regulations. Inspection activity under the Act spans numerous sectors including the petroleum and chemicals industry, logging, mining, agriculture, cement plants, aquaculture, manufacturing, and food processing.

During the prioritization process, instruments enforced by EED are placed within three categories divided roughly equally in terms of inspection effort: high priority, proactive, and reactive:

1. High Priority Regulations: Various factors are considered when choosing high priority instruments. These include instruments that are new and require enforcement strategy to implement, instruments that are part of governmental and/or departmental priorities, and instruments for which a high level of risk is identified.
2. Proactive inspections: Instruments are selected for proactive inspections when there is a moderate to high level of non-compliance, when maintenance is required to ensure that the level of compliance is maintained when the environmental risk is high, and when more information is being sought on the regulated community.
3. Reactive inspections: Enforcement officers respond to incidents that occur, and information received from the public. These often have significant adverse environmental impact, and, while unplanned, constitute a critical part of EED's work. Therefore, considerable resources are set aside for these activities to be conducted throughout the year. A considerable amount of inspections under the Act are reactive in nature. Whenever officers receive actionable information on potential non-compliance of a regulation, they will take the necessary actions, regardless of where the regulation is in terms of priority, to ensure adherence to the relevant Act and its regulations.

Enforcement officers also conduct reactive inspections upon referral from other branches within ECCC. This accounts for a small proportion of inspection effort. It includes instruments for which there is a big compliance promotion push, instruments undergoing significant amendments, instruments for which the level of risk is known to be low, and instruments for which increased attention would not yield an increase in compliance

Following the annual planning process, a National Enforcement Plan is developed, which forms the cornerstone of environmental enforcement efforts for the relevant fiscal year.



Over five years (2009 to 2014) EED allocated significant resources to enforcement activities in Alberta, including tailings ponds inspections that involved the gathering and analysis of over 600 samples. These inspections did not result in enforcement officers having reasonable grounds to believe a violation had occurred or sufficient information regarding the elements of an offence and to take enforcement measures, including initiating investigations or recommending prosecutions. As a result, ECCC stopped conducting proactive inspections of groundwater at oil sands tailings ponds in Alberta. This decision was taken in the context of ECCC's risk-based approach for planning and prioritizing its enforcement activities, consistent with Article 45 of the NAAEC. It was also a reasonable exercise of discretion in respect of compliance matters.

Within the context of resource constraints and the need to prioritize enforcement efforts, ECCC redirected its proactive enforcement efforts toward other regional and national issues where resources could have a greater positive impact and better serve the interests of the Canadian population. While enforcement continues on a reactive basis in the Alberta oil sands, in relation to tailings ponds and the Act, ECCC scientific research has been advancing the knowledge and tools needed to enforce the pollution prevention provisions of the Act. Section 4 describes the science-based reasons for ECCC's decision-making.

#### *Prioritization of Enforcement Activities in Prairie and Northern Region*

As mentioned above, in part due to the challenges created by scientific uncertainties related to tailings ponds in Alberta, in 2014, the Prairie and Northern Region realigned its priorities in relation to this issue. Since 2014, the region has redirected proactive enforcement efforts to other national and regional issues where resources could have a greater positive impact on the environment. The Prairie and Northern Region has focused on addressing national priorities, known regulated communities, and investigating alleged offences (harm that is known).

Since 2014, the officer who led the oil sands tailings ponds inspections (with support from other officers in Alberta), has conducted many inspections and investigations, including the following:

- Acklands-Grainger Inc.: The lead enforcement officer led the investigation into alleged violations of the *Ozone-Depleting Substances Regulation, 1998*. On Dec. 12, 2016, Acklands-Grainger Inc. pleaded guilty in the Provincial Court of Alberta, for contravening the Regulations, made under CEPA. The company was fined \$500,000. The investigation determined that between 2012 and 2014, the company sold HV Switchgear Lubricant and Sprayon EL2204, which contained the prohibited HCFC-225.
- PCB investigation: An investigation into the release of oil containing PCBs from a transformer, above the threshold set in the Regulations.
- Engines investigation: An ongoing investigation into the import of engines for alleged contraventions of the *Off-Road Compression-Ignition Engines Emission Regulations*, *Off-Road Small Spark-Ignition Engine Emission Regulations* and CEPA.
- Act investigation: An investigation into the release of diesel into water frequented by fish. The file is currently before the courts.

In addition, since 2014, successful prosecutions in Alberta Provincial Court have included the following:

- On Oct. 3, 2017, Sherritt International Corporation (Sherritt) pleaded guilty to three counts of contravening the Act. Sherritt was sentenced to pay \$1,050,000. The charges relate to releases of deleterious effluent that occurred at Coal Valley Mine, on Aug. 3, 2012, and July 27, 2011. Coal Valley Mine, which was owned by Sherritt from 2001 to 2014, is an open pit coal mine located 90 km south of Edson, Alberta;
- On June 15, 2017, Canadian National Railway Company (CN) pleaded guilty to one offence under the Act and three offences under CEPA. It was the result of an incident on April 9, 2015, in which ECCC enforcement officers responded to a report of an oil sheen on the North Saskatchewan River. A joint investigation with Alberta Environment and Parks was conducted. CN was ordered to pay \$2,500,000. An additional fine of \$125,000 was levied on May 25, 2017, in relation to provincial charges under the *Environmental Protection and Enhancement Act*;
- Prairie Mines & Royalty ULC (formerly known as Coal Valley Resources Inc.) pleaded guilty on June 9, 2017, to two counts of violating the Act, and was ordered to pay \$3,500,000. On Oct. 31, 2013, a dike at the Obed Mountain Mine failed, resulting in more than 670 million litres of contaminated water and sediment spilling into two creeks, and impacting the Athabasca River. This file was a joint investigation between Fisheries and Oceans Canada, the Province of Alberta, and ECCC;
- On September 20, 2016, the manager of Page the Cleaner, a dry-cleaning facility in Edmonton, pleaded guilty to one count of contravening the *Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements) Regulations*, made under CEPA. He was fined \$20,000. The charges stem from inspections of the business' premises in 2014 and 2015, when ECCC enforcement officers identified tetrachloroethylene waste water and residue stored in uncovered containers, in contravention of the Regulations;
- On July 28, 2015, Panther Industries (Alberta) Inc. (Panther Industries) pleaded guilty and was ordered to pay \$375,000 in penalties under the Act and CEPA, for an offence related to a spill of hydrochloric acid into the environment and into water frequented by fish. ECCC's investigation determined that on Dec. 9, 2012, approximately 150,000 litres of hydrochloric acid spilled through a broken sight glass on a storage tank system at the Panther Industries site in Edmonton, Alberta; and,
- On Nov. 25, 2015, Shooter's Hill Livestock Inc. pleaded guilty to allowing the deposit of a deleterious substance (liquid hog manure) into water frequented by fish and was ordered to pay \$50,000. ECCC was notified of the incident on May 10, 2014, and subsequently opened an investigation.

The allocation of resources to address priority matters constituted a reasonable exercise of discretion and *bona fide* decisions to allocate resources, in accordance with the definition of effective enforcement under article 45 of NAAEC.

### 3.4 Other Enforcement Activities

ECCC undertakes a variety of enforcement activities to promote compliance with the pollution prevention provisions of the Act. As recognized in Article 5, section 1, of the NAAEC, relevant governmental enforcement actions go beyond simple prosecution. In addition to monitoring compliance and investigating suspected violations, including through on-site inspections (NAAEC Article 5.1(b)), ECCC has supported the following enforcement activities with respect to the pollution prevention provisions of the Act:

*a) Appointing and training inspectors (NAAEC Article 5.1(a))*

Enforcement officers in EED are designated as both inspectors and fishery officers under the Act. Subsection 38(1) of the Act provides the authority for the appointment of inspectors, and s. 5(1) provides the authority for the appointment of fishery officers. Every enforcement officer is furnished with a certificate of designation which defines the specific powers and authorities that they are provided. For the purpose of designating enforcement officers, including designations as inspectors and fishery officers, ECCC has a program that outlines the requirements that enforcement officers must meet to be designated. Once standards have been met, a designation is issued.

ECCC enforcement officers are provided with training with respect to the application of the Act and the use of enforcement tools authorized by the Act. Enforcement officers must successfully complete the EB Officer Designation Training Program. This consists of 160 hours of Environmental Enforcement Standardized Training (EEST), and 170 hours of Applied Enforcement Training (AET) that is facilitated by a certified Law Enforcement Training institution. The Act component of EEST is 12 hours; the sampling component is 24 hours. These training courses are augmented by field training on enforcement activities and enforcement measures used by officers in response to non-compliance. In addition, the Department provides on-going training to its enforcement officers, such as regulatory training, professional development, and/or training on any enforcement matter that would require officer knowledge and skills to be enhanced.

*b) Publicly releasing enforcement information (NAAEC Article 5.1(d))*

ECCC maintains a public registry of corporations convicted under certain laws, including the pollution prevention provisions of the Act.<sup>21</sup> In addition, the ECCC website contains Enforcement Notifications, which provide information about penalties resulting from prosecutions under laws that ECCC enforces, including the pollution prevention provisions of the Act.<sup>22</sup>

*c) Providing for search, seizure, and detention (NAAEC, Article 5.1(k))*

Powers of inspectors and fishery officers are set out in the Act. The Act gives inspectors (ss. 38(3)) and fishery officers (ss. 49(1)) the authority to enter places for the purpose of verifying compliance with the Act. In relation to ss. 36(3) of the Act, inspectors must have reasonable grounds to believe that an activity is occurring that is likely to result in the deposit of a substance into water frequented by fish. While verifying compliance, inspectors may examine substances or products, take samples, and conduct tests of measurements (ss. 38(3.1)); fishery officers may open any container, conduct tests or and require any person to produce any relevant records (ss. 49 (1) - 49(1.1)). These powers were used in the inspections mentioned above.

The Act gives fishery officers the powers of search, seizure, and detention. Fishery officers may carry out a search after a warrant has been issued (ss. 49.1(1)) and without a warrant in exigent circumstances (ss. 49(3)). Fishery officers have the power to arrest (s. 50), and the authority to seize anything that will afford evidence of an offence under the Act (s. 51).

21. Available here: <http://www.ec.gc.ca/alef-ewe/default.asp?lang=En&n=1F014378-1>

22. Enforcement Notifications available here: <http://www.ec.gc.ca/alef-ewe/default.asp?lang=En&n=8F711F37-1>

In addition to the authorities under the Act, ECCC provides enforcement officers with training on these powers during their designation training, described below. Enforcement officers receive a minimum of 14 hours of training specifically on search warrants, along with additional training related to search, seizure, and detention.

*d) Issuing administrative orders, including orders of a preventative, curative or emergency nature (NAAEC Article 5.1(l))*

NAAEC Article 5 section 1(l) provides for the issuance of administrative orders, including orders of a preventative, curative, or emergency nature. The Act provides for the issuance of administrative orders of a preventative, curative, or emergency nature:

- Directions: Under ss. 38(7.1), an inspector may direct a person to take measures to prevent or to counteract, mitigate or remedy adverse effects from a deposit of a deleterious substance in water frequented by fish. Directions can be preventive, curative and of an emergency nature;
- Orders: Under ss. 37(1) of the Act the Minister may request information such as plans, specifications, analyses, and samples concerning any work or undertaking to enable the Minister to determine if a deposit of a deleterious substance is occurring that would be an offence under the Act. If the Minister believes that an offence is being or is likely to be committed, the Minister may issue orders requiring changes to the work or undertaking, restricting the operation of the work or undertaking, or closing the work or undertaking for a stipulated period of time;
- In addition, the Attorney General of Canada has the authority to seek an injunction from a court in order to stop an alleged violation of the Act. Enforcement personnel recommend injunctive action where continuation of the activity constitutes a significant and immediate threat to fish.

*e) Other appropriate government action (NAAEC Article 5.1)*

Departmental scientific efforts (described in section 4) demonstrate that ECCC is taking the appropriate government actions needed to develop and improve the scientific tools needed to assess compliance with the Act with respect to oil sands tailings ponds.

### 3.5 Relationship with Alberta

The Government of Canada is committed to cooperating with the province of Alberta to manage the oil sands responsibly and promote compliance with environmental laws, including the pollution prevention provisions of the Act. As is evident from the proactive work conducted by federal enforcement officers in the oil sands, ECCC enforces its federal laws. Nonetheless, an effective working relationship with Alberta is central to the enforcement of federal and provincial environmental laws. This relationship is facilitated by the following Agreements and regulations:



- The *Deposit Out of the Normal Course of Events Regulations*, under the Act (referred to as “Notification Regulations,” Annex 3);
- The *Canada-Alberta Environmental Occurrences Notification Agreement* (referred to as the “Notification Agreement,” Annex 4);<sup>23</sup> and
- The *Administrative Agreement for the Control of Deposits of Deleterious Substances under the Fisheries Act* (referred to as the “Administrative Agreement,” Annex 5).

Federal, provincial and territorial laws require, in most cases, notification of the same type of environmental emergency or environmental occurrence, such as oil or chemical spills or other unauthorized deposit of a deleterious substance in Canadian fisheries waters. In 2011, in order to reduce duplication of effort and streamline notification of these events, the *Deposit Out of the Normal Course of Events Regulations* was created under the *Fisheries Act*. These are referred to as the “Notification Regulations”.

ECCC and Fisheries and Oceans Canada have entered into Notification Agreements<sup>24</sup> with the Governments of Alberta, British Columbia, Manitoba, Ontario and Saskatchewan, as well as with the Governments of the Northwest Territories and Yukon. The Notification Agreements complement the Notification Regulations under the Act as well as the Release and Environmental Emergency Notification Regulations, made under the *Canadian Environmental Protection Act, 1999* (CEPA).

The purpose of the *Canada-Alberta Environmental Occurrences Notification Agreement* is to establish a streamlined system for persons required to notify Canada and Alberta of environmental emergencies or occurrences.<sup>25</sup> Under the Notification Agreement, the province operates a 24-hour telephone line and transfers relevant information to ECCC.

The *Administrative Agreement*<sup>26</sup> allows the coordination of regulatory activities between the federal and provincial levels in an effort to provide coherence where regulatory requirements are duplicated at the federal and provincial levels for the regulated sector. It does not result in the delegation of the enforcement of ss. 36(3) of the Act to the province of Alberta.

Inspections conducted by ECCC as a result of referrals from Alberta are published annually in the *Fisheries Act Annual Report*.<sup>27</sup>

Notification regulations and agreements allow provinces to inform federal enforcement officers when a breach of the pollution prevention provisions might have occurred, and is standard practice with every province and territory.

Alberta’s policies, regulations and requirements for the management of the oils sands are summarized in section 5.

23. Available here: <http://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=3BA6536B-1>

24. Available here: <http://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=5200AB4B-1>

25. An environmental occurrence includes the release, or the likelihood of a release, of a substance into the environment in contravention of regulations referred to in section 95, 169, 179 or 212 of CEPA 1999, an environmental emergency under section 201 of CEPA 1999, or an unauthorized deposit of a deleterious substance, in water frequented by fish, or a serious and imminent danger of such an occurrence under ss. 38(5) of the Act.

26. Available here: <http://ec.gc.ca/ee-ue/default.asp?lang=En&n=26F90F87-1>

27. Available here: <http://publications.gc.ca/site/eng/9.505666/publication.html>

## 4. RESEARCH FOR WATER QUALITY MONITORING IN THE ALBERTA OIL SANDS

ECCC's Science and Technology Branch is responsible for the department's scientific research activities related to water quality monitoring in the Alberta oil sands region. The Canada Centre for Inland Waters (CCIW) in Burlington, Ontario, a shared ECCC and DFO facility, has state-of-the-art laboratories designed for studying the health of fish, other aquatic life, and water chemistry.

Routine water quality monitoring in the Alberta oil sands region is conducted under the Joint Oil Sands Monitoring Program (JOSM). Alberta Environment and Parks, along with ECCC's Water Science and Technology Directorate within the Science and Technology Branch, jointly conduct these monitoring efforts as well as advance scientific understanding of the impacts of bitumen influenced waters.

Tailings ponds are engineered to seep, as seepage provides critical structural stability.<sup>28</sup> What is scientifically unclear is whether seepage is occurring beyond containment zones, and if it is occurring, to what extent. Scientists from ECCC have been working to assess the environmental impacts of the oil sands on the Athabasca watershed. Since 2014, ECCC scientists have made significant advancements in the development of an "analytical toolbox" (a set of five methods to distinguish between natural and anthropogenic sources of deleterious substances) as well as in the identification of substances unique to OSPW (source attribution to OSPW) alongside forensic tools that can now distinguish between individual tailings ponds and improved sampling methodologies. These advances will support ECCC enforcement officers' efforts to assess compliance of ss. 36(3) of the Act in the coming years and represent governmental action in support of effective enforcement, as per Article 5(1) of the NAAEC.

### 4.1 Identifying the Sources of Bitumen-Influenced Waters

Establishing scientific certainty with respect to identifying and sourcing OSPW is a central challenge to verifying compliance with section 36(3) of the Act. The Alberta oil sands region is characterized by large deposits of thick hydrocarbons called bitumen trapped in a mixture of sand, clay, minerals and water. Following mining of the oil sand formation, the bitumen is extracted with a hot water wash, with no unique chemical additives. The liquid portion of the remaining (waste) tailings, which comprise OSPW, is a highly complex mixture of inorganic and organic compounds, which has a similar composition to the groundwater that passes through the natural oil sands formation.

ECCC has conducted extensive research on differentiating bitumen-derived contaminants found naturally in the environment from anthropogenic sources, including analyzing all possible contaminant-flow vectors such as aerial deposition, biota contamination, sediment and water/snow contamination and the potential for OSPW seepage via groundwater systems. Recent work by ECCC scientists Kurek et al. (2013); Kirk et al. (2014); Zhang et al. (2014); Summers et al. (2016); Evans et al. (2016), has led to much improved understanding of natural and industrial airborne deposition within the oil sands region and may provide a stronger scientific basis for future enforcement actions. In addition, ECCC scientists have developed various methodologies to characterize, and close existing knowledge gaps with regards to groundwater-surface water interactions (see Roy et al., 2016). For the purposes of this Response the discussion will focus on the research conducted on OSPW seepage.

28. The geological setting for tailings ponds varies significantly. Impermeable geological strata under some ponds results in minimal seepage, while more permeable underlying sediments may result in higher rates of seepage. For the latter, seepage will mix with natural groundwater beneath the pond. The natural groundwater flow is often greater than the seepage rate, resulting in dilution. Interception trenches are built down gradient from tailings ponds to collect seepage before it can reach any surface water bodies.

This research has focused on analyzing groundwater as it would be the first recipient of OSPW seepage and would presumably have the highest concentrations of OSPW, providing the best probability of detection. It is important to distinguish that the goal of this research is to ascertain if seepage is occurring *beyond* containment structures. Such structures include interceptor wells, ditches and relief well structures that are all designed to capture and return seepage to the containment zone. Samples from these containment structures have been included in research efforts to distinguish OSPW from natural bitumen-influenced waters.

#### Efforts to build an “Analytical Toolbox”

Given the complex chemical composition of OSPW (including new substances, with no prior chemical identities), it is necessary to develop new analytical methods to detect any OSPW that may be entering into groundwater or surface waters. Early efforts to build an “Analytical Toolbox” capable of differentiating natural from anthropogenic sources of bitumen influence in groundwater samples are presented in the 2014 study by Frank et al.<sup>29</sup> The study analyzed a suite

of inorganic and organic chemical indicators, both routine and high-resolution, at two tailings ponds from two different mining operations and concluded that differentiation was possible. Results from this study also indicated that OSPW-affected groundwater was likely reaching the Athabasca River at one location (Tar Island Pond 1). However, this publication did not describe any chemicals or chemical classes that were exclusively unique to OSPW. Instead, the weight of evidence from a complement of analyses led to the study’s conclusions. It provides potential indication that OSPW seepage is reaching the Athabasca River at one location but did not examine the broader scope of the river to confirm that this is the case, and did not constitute proof of a violation of the pollution prevention provisions of the Act for enforcement purposes.

Since this seminal 2014 study, research has continued at ECCC to improve the “analytical toolbox”, to identify chemicals unique to OSPW, to better understand the chemical variabilities of anthropogenic and natural bitumen-influenced environments within the oil sands region and to determine if OSPW seepage itself is toxic, relative to the natural bitumen background. In efforts to improve the confidence in detecting seepage, additional chemicals were evaluated for their diagnostic capabilities (flame retardants, artificial sweeteners), as well as additional background groundwater sites (including those influenced by natural bitumen). The toolbox was then reapplied to the original study sites used by Frank et al. 2014 and samples of the Mildred Lake tailings plume (Oiffer et al., 2009). This current research (Hewitt et al. 2018 forthcoming publication) has not yet been accepted in the peer reviewed scientific literature; therefore its results must be categorized as preliminary.

In the Hewitt et al. (2018) study, the entire chemical compositions in groundwater samples from both pond sites and the new reference sites were statistically analyzed to determine which chemicals showed the greatest diagnostic potential for identifying OSPW seepage. The chemicals which showed the greatest potential were two groups of naphthenic acids (termed Family A and B). Although these acids do occur naturally at low levels in bitumen-influenced groundwater, they are enriched significantly in OSPW and groundwater affected by OSPW seepage. It is likely that these compounds are enriched in tailings during the bitumen extraction process. The Family A and B naphthenic acids were discovered in 2014 as a result of extensive and ongoing collaborations between ECCC and the University of Plymouth (UK). Commercially available standards for these acids do not exist, so custom synthesis of them has been undertaken to determine their exact structures and to make authentic standards available to all stakeholders for seepage assessments, general naphthenic acid method development and toxicological evaluations. This custom synthesis is expected to be completed in 2018.

29. Submission Appendix XXI

This improved toolbox will provide stronger indications of OSPW seepage. In an effort to close this knowledge gap, ECCC has conducted a parallel study of the same two pond sites and all new reference sites to examine all the chemicals detected, including unknowns, so that new chemicals unique to OSPW and seepage can be identified. Preliminary results have identified four new substances unique to OSPW and OSPW-affected groundwater and chemical structures have been proposed for each as no commercial standards are available (Milestone et al. 2018 forthcoming publication). The incorporation of unique chemicals present in OSPW into the analytical toolbox could help provide enforcement officers with reasonable grounds to believe a violation of s. 36(3) of the Act has occurred, or potentially prove beyond a reasonable doubt that OSPW is present in a given sample.

Methods that are part of this improved “analytical toolbox” will, once published in the scientific literature, be transferred to the Joint Oil Sands Monitoring Program and federal and provincial enforcement agencies.

#### Sampling Methodology

It is important to note that for future use of the toolbox for enforcement purposes, officers will need to collect composite samples. ECCC research into the variability of natural surface and ground waters, as well as OSPW (Frank et al. 2016 study) has revealed that single samples are not likely to be accurate representations of their original sources. Therefore, composite samples should be taken in efforts to accommodate the high range of variability present within all (anthropogenic and natural) bitumen-influenced samples. Forensic tools developed in this study also now enable scientists to differentiate tailings ponds from each other, which may allow enforcement agencies to attribute seepage to specific sources.

It is also worth noting that while ECCC scientists have adopted this sampling methodology, many in the research community and industry have yet to agree and to adjust their collection methods..

#### 4.2 Understanding the Impacts of Bitumen-Influenced Waters

In addition to the research undertaken by ECCC scientists to characterize OSPW and identify its source, ECCC scientists have been working to understand the impacts of any deleterious substances (whether natural or anthropogenic) occurring in the Athabasca watershed on aquatic life and ecosystems.

While chemicals associated with bitumen-influenced waters, including tailings ponds, are known to be toxic, the most sensitive organisms and biological endpoints have not yet been determined. Nor has it been determined which areas in the oil sands region would be most likely to be impacted by industrial activities, or how these impacts would differ from organism exposure to natural bitumen formations. This important research is briefly described below.

#### Toxicological Effects of Bitumen-Influenced Ground waters

Tailings ponds do contain substances that are deleterious to fish. These include soluble organic chemicals (such as naphthenic acids), residual bitumen, ammonia, sulphate, chloride, aromatic hydrocarbons, and trace metals. Research led by ECCC on the toxicity of bitumen-influenced groundwater (natural and anthropogenic) has been ongoing since 2010, with the objectives of understanding their chemistry and their health effects on aquatic life.



The soluble organic fraction of OSPW, including naphthenic acids, has been shown to be a primary contributor to toxicity (MacKinnon et al. 1986, Brown et al. 2015, Mahaffey et al. 2016). ECCC scientists' research surrounding soluble organic mixtures (Marentette et al. 2015a, 2015b, 2017, Bartlett et al. 2017) have indicated that the observed toxicity differs between species and biological endpoints within the same soluble organic mixture.

This result is important because it shows that different types of organisms should be assessed when trying to determine if a sample is toxic, and also that a non-descriptive measurement like a "total naphthenic acid concentration" is not a useful measure of potential harm to fish, as these organic compounds represent the summation of thousands of sub-compounds whose toxicity is dynamic. Another result from these aforementioned studies was the conclusion that commercially available naphthenic acids, derived from petroleum sources other than bitumen, are not comparable to naphthenic acids derived from bitumen, further supporting the need for the development of more relevant chemical standards.

Additional research addressing the toxicity and complexity of soluble organic mixtures within bitumen-influenced waters (Bauer et al. 2018b (collaboration between U. Waterloo and ECCC), Frank et al. 2018 forthcoming publications) support previous findings. Ongoing research is attempting to identify toxic bitumen-derived chemicals, with research into lethal (Bauer et al. 2018 forthcoming publication; a collaboration between U. Waterloo and ECCC)) and sub-lethal effects (research underway, Houde et al. 2018, forthcoming publication) at environmentally relevant concentrations. As these toxic chemicals are identified, assessment of their origin (anthropogenic or natural) will be vital for environmental monitoring and enforcement initiatives.

In addition to assessing the toxicity of soluble organic mixtures within bitumen-influenced waters, ECCC researchers have assessed the toxicity of environmental samples (sediments, snow melt, surface water, and groundwater) in controlled laboratory experiments. This current research stream is ongoing and will provide support for wild organism health assessments led by ECCC in the same locations (Parrott et al. 2018 forthcoming publication).

#### *Development of Standards and Certified Reference Materials*

In an effort to develop analytical standards for complex bitumen-derived soluble organic mixtures, ECCC in collaboration with the University of Waterloo developed a new extraction method in 2017 that isolates soluble organic compounds from the source materials relevant to the oil sands (Bauer et al. 2018a forthcoming publication). With this method, large quantities of naturally-derived mixtures will be collected by ECCC and used for the preparation of Certified Reference Materials. ECCC is currently making the reference materials from composite samples of an unprecedented 2017 industry-wide sampling of all active tailings ponds and from an Alberta provincial groundwater monitoring well.

In addition, no standards currently exist for acid-extractable organics, including naphthenic acids, which contribute to observed toxicity in bitumen-influenced waters. ECCC scientists, through JOSM, are leading an initiative to synthesize a previously identified individual naphthenic acid (Family A isomer), in order to be able to quantify acid-extractable organics in all bitumen-influenced waters. This work will be necessary in the development of CCME guidelines for the protection of aquatic life from naphthenic acids and for diagnostic purposes in tracking OSPW seepage. The final products of the Certified Reference Materials and the Family A naphthenic acid standard will be made available to all stakeholders through the National Research Council.

### Ecological Effects of Contaminants

In 2011, the Governments of Canada and Alberta, through JOSM, designed a monitoring plan for surface water quality and quantity, air quality and biodiversity of the lower Athabasca River between Fort McMurray and its confluence with Lake Athabasca.

The three year monitoring plan (2012 to 2015) had a number of objectives:

- To support sound decision-making by governments as well as stakeholders;
- to ensure transparency through accessible, comparable and quality-assured data;
- to enhance science-based monitoring for improved characterization of the state of the environment and collect the information necessary to understand cumulative effects;
- to improve analysis of existing monitoring data to develop a better understanding of historical baselines and changes; and,
- to reflect the transboundary nature of the issue and promote collaboration with the Governments of Saskatchewan and the Northwest Territories.

Based on the results of monitoring, ECCC scientists have been assessing the health of wild fish and benthos living within the oil sands region and developing baselines for use in assessing change into the future. Where methodologically feasible, the data are being compared to historical fish and benthos collections. ECCC is in the process of finishing seven reports<sup>30</sup> along with a synthesis report interpreting all of the data collected during the first three years of JOSM. Changes in fish health, benthic communities, and contaminant levels have been documented in some tributaries in these JOSM reports. A summary of the baseline fish health and toxicology work for the oil sands program can be found in McMaster et al. (2017 in press).

Baseline data is being used by the JOSM Fish Program to develop tiers and triggers within the program to be used by JOSM management – or future Canada-Alberta agreement - when significant change in ecosystem health is detected.<sup>31</sup> The completion of “trigger values” will allow rapid and timely adjustments to monitoring, ensuring that ECCC and collaborative research groups are capable of detecting significant environmental effects outside normal variability in the oil sands region.

To date there have been no reports of OSPW-derived chemicals in surface waters, or of observed ecological effects in areas near tailings ponds.

30. The seven reports are expected to be completed by December 2017 and cover the following areas of research: atmospheric deposition; water quality (tributaries); water quality (mainstem and extended geographic area); groundwater quality/quantity; water quality/quantity modelling; benthic invertebrates, and; fish health.

31. Some sites are still in baseline data collection but those with baseline data complete have entered a 3-year cycle of data collection (once every three years) which is evaluated against the baseline for change.

#### 4.3 Summary of Findings and their Impact on Enforcement

ECCC has taken appropriate governmental action (as per Article 5.1 of the NAAEC) by supporting the advancement of scientific knowledge and tools necessary to improve ECCC enforcement officers' ability to enforce ss. 36(3) of the Act. The scientific advancements and on- going work include the development and validation of an “analytical toolbox”:

- to distinguish between natural and anthropogenic sources of deleterious substances<sup>32</sup>; and
- to identify substances unique to OSPW, alongside forensic tools, to support the ability to attribute the source of the deleterious substance and distinguish between individual tailings ponds.

The most recent scientific advances of ECCC scientists are in process of being reviewed through the usual independent peer-review validation for publication in scientific journals. Previous ECCC scientific findings are publicly available, and the most recent findings will be shared with enforcement officers to help inform appropriate future enforcement activities.

In addition to the above activities related to the effective enforcement of the Act, the department is also taking action to understand the impacts of bitumen-influenced waters on the ecosystem through JOSM. Besides the current knowledge and practice of measuring ecotoxicological effects, there remain some knowledge gaps to determine if seepage of OSPW, and specific industrial sources into surrounding groundwater, would influence toxicity and pose a risk to the receiving environment; or alternatively, whether migration of that groundwater into surface water could be expected to cause deleterious effects.

Additional ongoing research initiatives include:

- Pursuing identifying chemicals within bitumen-influenced groundwater with the greatest toxicity, as well as the organisms and bioassay endpoints that are most sensitive, and;
- Assessing changes in fish health and benthic community composition now that baseline information and tiers and triggers of change have been identified.

32. ECCC and academic scientists have indicated that OSPW-affected groundwater was likely reaching the Athabasca River at one location (Franck et al. 2014) and are in the process of publishing forthcoming manuscripts (Hewitt et al., 2018; Milestone et al., 2018; Bauer et al., 2018a; Bauer et al., 2018b; Frank et al. 2018; Houde et al. 2018; Parrott et al. 2018) which will present an improved “analytical toolbox” (a set of five methods to distinguish between natural and anthropogenic sources of deleterious substances).\

## 5. PROVINCIAL POLICIES AND REGULATIONS

The Government of Alberta's oil sands strategy, *Responsible Actions: A Plan for Alberta's Oil Sands* (Annex 6)<sup>33</sup> commits to developing resources in an environmentally responsible way. The Government of Alberta uses all available regulatory tools to achieve desirable environmental outcomes and sustainable resource development including:

- effective laws and policies;
- timely stakeholder engagement;
- cooperative inter-governmental arrangements;
- rigorous environmental assessment processes;
- comprehensive project approvals;
- thorough environmental monitoring;
- innovative research and industrial practices; and
- risk-informed compliance assurance programs including inspections and enforcement when appropriate.

To ensure environmental impacts are either avoided or mitigated, the Government of Alberta continuously reviews comprehensive laws, policies, programs and cooperative monitoring efforts.

### 5.1 Provincial Policies for Environmental Management of the Oil Sands

Alberta's oil sands strategy, *Responsible Actions: A Plan for Alberta's Oil Sands* includes specific goals for the environmental management of tailings ponds, including the development of a Land-use Framework regional plan and the reduction of oil sands projects' environmental footprint.

Alberta's Land-Use Framework Regional plans consider cumulative effects in the management of development and growth in Alberta. Environmental management frameworks established under the *Lower Athabasca Regional Plan* (LARP)<sup>34</sup> are a key tool to implementing this approach in the oil sands region. Environmental management frameworks have regulatory backing under the *Alberta Land Stewardship Act*, and assist in managing long-term, regional scale cumulative effects by the setting of thresholds, triggers, limits and/or targets. The following frameworks have been developed and implemented in the Lower Athabasca Region and are summarized below:

- i. Surface Water Quality Management Framework;
  - ii. Surface Water Quantity Framework;
  - iii. Groundwater Management Framework; and,
  - iv. Tailings Management Framework.
- i. Surface Water Quality Management Framework:

33 Available at: [http://energy.alberta.ca/pdf/OSSgoaResponsibleActions\\_web.pdf](http://energy.alberta.ca/pdf/OSSgoaResponsibleActions_web.pdf)

34 Available at: <https://landuse.alberta.ca/LandUse%20Documents/Lower%20Athabasca%20Regional%20Plan%202012-2022%20Approved%202012-08.pdf>



The LARP *Surface Water Quality Management Framework* (2012)<sup>35</sup> protects existing and future water uses of the Lower Athabasca River. Water quality limits are based on provincial guidelines, and triggers are based on statistical deviation from historical ambient concentrations. If monitoring indicates a limit or trigger has been exceeded, there will be a regional management response. This framework describes the types of management actions that may be required, such as the preparation of management plans (individual or collective), further monitoring, and the use of best management practices.

ii. Surface Water Quantity Framework:

The LARP *Surface Water Quantity Management Framework* (2015)<sup>36</sup> articulates the Government's commitment to ensuring that river flow conditions, oil sands sector water withdrawals, and ecosystem conditions within the lower Athabasca River downstream of the Grand Rapids are monitored, evaluated, and reported to the public. The Government of Alberta continues to work with oil sands water license holders to promote compliance with requirements established through the framework.

The objective of this framework is to manage cumulative water withdrawals to support both human and ecosystem needs, while balancing social, environmental, and economic interests. To enable this, the framework identifies indicators for both the condition of the water resource (natural variations in water flow) and pressures on the water resource (use).

The framework sets weekly management triggers and water withdrawal limits that are used to enable proactive management of water use from the Athabasca River during the oil sands mining process. These are enacted through the establishment of water management agreements amongst oil sands mine operators. Weekly water withdrawal limits reflect seasonal variability and become more restrictive as flows in the river decrease. In addition, adaptive management triggers indicate when river flow and water use conditions are close to, or outside of, the range of predicted future conditions used in modelling and development of the weekly management triggers and withdrawal limits. Adaptive management triggers are used to direct a management response process, led by the Alberta Ministry of Environment and Parks.

iii. Groundwater Management Framework:

The LARP *Groundwater Management Framework* (2012)<sup>37</sup> protects groundwater from contamination by maintaining conditions within the range of natural variability, and ensuring the integrity of regional groundwater flows. This framework builds on existing site specific groundwater monitoring approval conditions and incorporates a cumulative effects approach to resource management. It includes a set of indicators based on the nature of the aquifers and potential impacts of both mining and in situ operations. The framework includes interim triggers and provides for the establishment of final triggers and limits. The information required to finalize triggers and limits is being collected through regional groundwater monitoring networks. Like the Surface Water Quality Management Framework, the groundwater framework describes the types of management actions that may be required, such as the preparation of mitigation plans (individual or collective), further monitoring, and the use of best management practices.

35 Available at: <http://aep.alberta.ca/land/cumulative-effects/regional-planning/documents/LARP-SurfaceWaterFramework-Aug2012.pdf>

36 Available at: <https://open.alberta.ca/publications/9781460121733>

37 Available at: <http://aep.alberta.ca/land/cumulative-effects/regional-planning/documents/LARP-GroundwaterFramework-Aug2012.pdf>

#### iv. Tailings Management Framework:

The LARP *Tailings Management Framework* (2015)<sup>38</sup> for the Mineable Athabasca Oil Sands (TMF) provides direction to manage fluid tailings volumes during and after mine operation in order to manage and decrease liability and environmental risk resulting from the accumulation of fluid tailings. Based on the 2016 tailings reports received by the Alberta Energy Regulator (AER) the total fluid tailings volume by the end of 2016 was 1.2 billion cubic metres.

The TMF seeks to balance increasing fluid tailings volumes with associated risks to environmental protection. Lowering fluid tailings volumes and/or minimizing accumulation can reduce the risk of seepage, reduce risks to wildlife that may come into contact with tailings ponds, contribute to dam safety, and lower the environmental footprint of tailings. Under the TMF, there is also an opportunity to improve the quality of tailings, which would have additional environmental benefits.

The objective of the TMF is to minimize fluid tailings accumulation by ensuring that fluid tailings are treated by oil sands operators and reclaimed by them progressively during the life of a project. The Government of Alberta expects that all fluid tailings associated with a project are ready-to-reclaim within 10 years of the end of mine life. The objective will be achieved while balancing environmental, social, and economic needs. The goals of the TMF are to:

- establish fluid tailings volume triggers and limits to manage accumulation;
- manage long-term liability and environmental risk of untreated fluid tailings, especially tailings ponds;
- clarify Government of Alberta expectations;
- encourage technological innovation to meet environmental challenges;
- support proactive management strategies;
- enhance transparency and assurance through regular monitoring, evaluation, and reporting on fluid tailings volume accumulation and treatment; and
- establish direction for managing legacy tailings.

## 5.2 Provincial Regulations

The Government of Alberta has a suite of regulatory requirements in place to manage tailings ponds and issues associated with any potential seepage. The regulatory requirements are designed to ensure that provincial regulators can hold mineable oil sands operators accountable for tailings ponds management. The Government of Alberta policy is to contain and reuse oil sands process-affected water (including water that has contacted bitumen).

Most regulatory aspects of oil sands development are implemented by the Alberta Energy Regulator (AER). The AER ensures that oil sands are developed within government policy and in an environmentally responsible way.

38 Available at: <http://aep.alberta.ca/land/cumulative-effects/regional-planning/documents/LARP-TailingsMgtAthabascaOilsands-Mar2015.pdf>

The AER has comprehensive rules, regulations, and requirements in place for the safe design, construction, and operation of tailings ponds. Companies allowed to develop Alberta's oil and gas resources must follow all rules, regulations, and requirements, including under the *Environmental Protection and Enhancement Act* (EPEA),<sup>39</sup> the *Water Act*,<sup>40</sup> and the *Public Lands Act*.<sup>41</sup>

Proposed oil sands mines are subject to rigorous environmental assessment processes with extensive hydrological studies, in order to identify potential negative effects and ensure these are managed and mitigated by the operators of oil sands facilities. Furthermore, an approval is required under the *Oil Sands Conservation Regulation*<sup>42</sup> for companies' storage of oil sands tailings.

The EPEA *Conservation and Reclamation Regulation*<sup>43</sup> requires that mine operators reclaim disturbed lands including tailings ponds to an equivalent land capability in accordance to EPEA approval conditions and any other applicable standards, criteria and guidelines.

*Directive 085: Fluid Tailings Management for Oil Sands Mining Projects*<sup>44</sup> establishes application and reporting requirements that operators must meet in order to demonstrate that all fluid tailings will be ready to reclaim within 10 years of the end of mine life, as outlined in the *Tailings Management Framework*. Oil sands operators are required to submit a tailings management plan application to the AER to demonstrate how each project will comply with the *Tailings Management Framework* and *Directive 085*.

The approvals process under the Water Act establishes requirements for monthly reporting of the volume of OSPW collected by the recapture systems. It also includes conditions to maximize reuse of OSPW. Oil sands operators must make efforts to manage seepage through containment systems (the extent of which is dependent on the local geology).<sup>45</sup>

Approvals issued under EPEA, set out requirements for groundwater recapture systems, monitoring of groundwater quality, evaluation and reporting. All oil sands tailings ponds are constructed with systems and facilities to recapture seepage from the ponds. Intercepted seepage is pumped back into the pond or to a water treatment plant. Furthermore, groundwater monitoring wells are installed down gradient of interception systems to monitor conditions. This monitoring is required under the EPEA approval. Technical staff of the AER review submitted reports to assess whether any samples contain substances that exceed provincial and national water quality standards,<sup>46</sup> or that could lead to potential adverse effects on the environment.

All newer tailings ponds (1994 to present) naturally seep from their dykes, but all the seepage is intercepted and pumped back to the recycle water system. These newer ponds are often equipped with interception walls or barrier walls – in-ground obstacles made of special clay that stops seepage from progressing further to other water bodies. If it is necessary to enhance the interception system, additional pumps are installed downhill of tailings ponds to deplete ground waters and prevent seepage progression. Everything is closely monitored using numerous groundwater wells. New monitoring and interception wells are installed whenever necessary as mandated by the AER.

38 Available at: <http://aep.alberta.ca/land/cumulative-effects/regional-planning/documents/LARP-TailingsMgtAthabascaOilsands-Mar2015.pdf>

39 Available at: <http://www.qp.alberta.ca/documents/Acts/E12.pdf>

40 Available at: <http://www.qp.alberta.ca/documents/Acts/w03.pdf>

41 Available at: <http://www.qp.alberta.ca/documents/Acts/P40.pdf>

42 Available at: [http://www.qp.alberta.ca/documents/Regs/1988\\_076.pdf](http://www.qp.alberta.ca/documents/Regs/1988_076.pdf)

43 Available at: [http://www.qp.alberta.ca/documents/Regs/1993\\_115.pdf](http://www.qp.alberta.ca/documents/Regs/1993_115.pdf)

44 Available at: <https://www.aer.ca/documents/directives/Directive085.pdf>

45 The geological setting for tailings ponds varies significantly. Impermeable geological strata under some ponds results in minimal seepage, while more permeable underlying sediments may result in higher rates of seepage. Interception trenches are built down gradient from tailings ponds to collect seepage before it can reach any surface water bodies.

46 These standards are: CCME Canadian Environmental Quality Guidelines (national) and Alberta Surface Waters and Alberta Tier 1/2 Soil and Groundwater Remediation Guidelines (provincial).

## 6. CONCLUSIONS

It is the Government of Canada's position that ECCC's actions in the oil sands region, including its record of inspection and its continuing scientific research demonstrate Canada's effective enforcement of the pollution prevention provisions of the *Fisheries Act*.

### 6.1 Canada exercises its enforcement functions in a manner consistent with its domestic laws

Between 2009 and 2014, ECCC proactively inspected oil sands tailings ponds operating in the Northeast Alberta region with respect to the pollution prevention provisions of the Act.

Following the inspections, enforcement officers, in consultation with ECCC scientists, determined that they did not have reasonable grounds to believe that there were violations of the pollution prevention provisions of the Act. The enforcement officers' activities and decisions were guided by the Compliance and Enforcement Policy, as well as the scientific knowledge and tools available to determine, to the relevant legal standard, the source of deleterious substances. Given the information available to enforcement officers, Canada exercised its enforcement functions in a manner consistent with its domestic laws.

### 6.2 Canada exercises its discretion and uses priority setting processes in a reasonable manner

In 2014, following the significant allocation of resources to inspections at oil sands tailings ponds in Alberta, the Prairie and Northern Region realigned its priorities to focus on other national and regional issues where resources would have a greater positive impact on the environment. This decision to reallocate resources was taken in the context of an annual national enforcement planning process, and the development of a national enforcement plan. This was a reasonable exercise of discretion in respect of compliance matters, and a bona fide decision to allocate resources to enforcement in respect of other environmental matters determined to have higher priorities.

### 6.3 Canada's enforcement actions are effective

ECCC assumes its role of enforcing the pollution prevention provisions of the Act seriously and responds in a timely fashion when spills, leakages or deposits are reported. Canada maintains that its decisions and actions, including ECCC's record of inspections and its continuing scientific research, demonstrate Canada is effectively enforcing its environmental laws in a manner consistent with the NAAEC.



## LIST OF ANNEXES

- Annex 1: Compliance and Enforcement Policy for the Habitat Protection and Pollution Prevention Provisions of the *Fisheries Act*
- Annex 2: List of Inspections in the Alberta Tailings Pond Sites by ECCC enforcement officers
- Annex 3: The *Deposit Out of the Normal Course of Events Regulations*, under the *Fisheries Act*
- Annex 4: The Canada-Alberta Environmental Occurrences Notification Agreement
- Annex 5: The Administrative Agreement for the Control of Deposits of Deleterious Substances Under the *Fisheries Act*
- Annex 6: Responsible Actions: A Plan for Alberta's Oil Sands

## REFERENCES

- Bartlett A.J., Frank R.A., Gillis P.L., Parrott J.L. Marentette, J., Headley J.V., Peru, K. and Hewitt L.M. 2017. Toxicity of naphthenic acids to invertebrates: Extracts from oil sands process-affected water versus commercial mixtures. *Environ. Poll.* 227: 271-279.
- Bauer, A.E., R.A. Frank, J.W. Roy, G. Bickerton, C.B. Milestone, D.G. Dixon and L.M. Hewitt. 2018a. A preparative method for the isolation and fractionation of dissolved organics from bitumen-influenced waters. (Expected submission to *Science of the Total Environment*, 2017).
- Bauer, A.E., J.L. Parrott, A. Bartlett, P. Gillis, L.M. Hewitt, L. Deeth, M.D. Rudy, R. Vanderveen, L. Brown, A. Farwell, D.G. Dixon and R.A. Frank. 2018b. Assessing the toxicity of groundwater proximate and distal to a tailings pond to a suite of aquatic species. (Expected submission to *Aquatic Toxicology*, 2017).
- Brown LD, AC Ulrich. 2015. Oil sands naphthenic acids: a review of properties, measurement, and treatment. *Chemosphere* 127: 276-290.
- Evans, M., Davies, M., Janzen, K., Muir, D., Hazewinkel, R., Kirk, J., & de Boer, D. (2016). PAH distributions in sediments in the oil sands monitoring area and western lake athabasca: Concentration, composition and diagnostic ratios. *Environmental Pollution*, 213, 671-687.
- Frank, R.A., A.E. Bauer, J.V. Headley, S.J. Rowland, A. Scarlett, C.E. West, K. Peru, D.G. Dixon and L.M. Hewitt. 2018. Chemical analyses of groundwater fractions proximate and distal to a tailings pond. (Expected submission to *Environmental Toxicology and Chemistry*, 2018).
- Frank, R.A., G. Bickerton, J.W. Roy, S.J. Rowland, J.V. Headley, A.G. Scarlett, C.E. West, K.M. Peru, M. Conly and L.M. Hewitt. 2014. Profiling oil sands mixtures from industrial developments and natural groundwaters for source identification. *Environ. Sci. Technol.* 48(5): 2660-2670.
- Frank R.A., Milestone C., Kavanagh R.J., Headley J.V., Rowland S.J., Scarlett A.G., West C.E., Peru K.M. and L.M. Hewitt. 2016. Assessing variability of acid extractable organics within two containments of oil sands process-affected water. *Chemosphere*, 160: 303-313.
- Golder 1996. Golder associates: Athabasca River Water Releases impact Assessment. Prepared for Suncor. Submitted to Syncrude Canada Ltd. A copy of the report resides with Water Policy Branch, Alberta Environment and Parks, Oxbridge Place, Edmonton, Alberta.
- Golder 2004. Ecological Risk Assessment of the Lower Beaver Creek Area. Submitted to Syncrude Canada and Alberta Environment. Submitted to Syncrude Canada Ltd. A copy of the report resides with Water Policy Branch, Alberta Environment and Parks, Oxbridge Place, Edmonton, Alberta.
- Golder 2008. Beaver Creek Ecological Risk Assessment: Field Study 2007. Submitted to Syncrude Canada Ltd. Submitted to Syncrude Canada Ltd. A copy of the report resides with Water Policy Branch, Alberta Environment and Parks, Oxbridge Place, Edmonton, Alberta.
- Golder 2012a. Golder Associates: 2011 Beaver Creek Study. Submitted to Syncrude Canada Ltd. Submitted to Syncrude Canada Ltd. A copy of the report resides with Water Policy Branch, Alberta Environment and Parks, Oxbridge Place, Edmonton, Alberta.

- Golder 2012b. Golder Associates: 2012 Beaver Creek Study. Submitted to Syncrude Canada Ltd.  
Submitted to Syncrude Canada Ltd. A copy of the report resides with Water Policy Branch, Alberta Environment and Parks, Oxbridge Place, Edmonton, Alberta.
- Hewitt, L.M., Roy J.W., Frank, R.A., Bickerton G., Rowland S.J., Scarlett A.G., West, C.E., De Silva A., Headley J.V., Peru K.M., Milestone, C.B., and L. Grapentine. 2018. Analytical methodologies to identify industrially influenced groundwater in the McMurray Formation of northern Alberta, Canada (Expected submission to Environmental Science and Technology, 2018).
- Kirk, J. L., Muir, D. C. G., Gleason, A., Wang, X., Lawson, G., Frank, R. A., Wrona, F. (2014). Atmospheric deposition of mercury and methylmercury to landscapes and waterbodies of the athabasca oil sands region. *Environmental Science & Technology*, 48(13), 7374.
- Kurek, J., Kirk, J. L., Derek C. G. Muir, Wang, X., Evans, M. S., & Smol, J. P. (2013). Legacy of a half century of athabasca oil sands development recorded by lake ecosystems. *Proceedings of the National Academy of Sciences of the United States of America*, 110(5), 1761-1766. ;
- Mahaffey A, M Dubé. 2017. Review of the composition and toxicity of oil sands process- affected water. *Environmental Reviews* 25: 97-114.
- Marentette, J.R., R. Frank, A. Bartlett, P. Gillis, L.M. Hewitt, K. Peru, J. Headley, P. Brunswick, D. Shang and J. Parrott. 2015 (a). Toxicity of naphthenic acid fraction components extracted from fresh and aged oil sands process-affected waters, and commercial naphthenic acid mixtures, to fathead minnow (*Pimephales promelas*) embryos. *Aquat. Toxicol.* 164: 108-117.
- Marentette, J.R., R.A. Frank, L.M. Hewitt, P. Gillis, A. Bartlett, P. Brunswick, D. Shang, and J.L. Parrott. 2015 (b). Sensitivity of walleye (*Sander vitreus*) and fathead minnow (*Pimephales promelas*) early-life stages to naphthenic acid fraction components extracted from fresh oil sands process-affected waters. *Environ. Poll.* 207: 59-67.
- Marentette, J.R., K. Sarty, A.M. Cowie, R.A. Frank, L.M. Hewitt, J.L. Parrott, and C.J. Martyniuk. 2017. Molecular responses of Walleye (*Sander vitreus*) embryos to naphthenic acid fraction components extracted from fresh oil sands process-affected water. *Aquat. Toxicol.* 182: 11-19.
- McMaster et al. (2017 in press) "Aquatic ecosystem health assessment of the Athabasca River mainstem and tributaries using fish health and fish and invertebrate toxicological testing: A synthesis report prepared for the Canada-Alberta joint oil sands monitoring plan" (Expected publication)
- Miall, A.D. 2013. The environmental hydrogeology of the oil sands, lower Athabasca area, Alberta. *Geoscience Canada* 40: 215-233.
- Milestone, C.B, Roy, J.W. Bickerton, G., Frank R.A. and L.M. Hewitt. 2018. Untargeted profiling of bitumen influenced waters for the identification of tracers of oil sands processed water (OSPW) migrations in the Athabasca watershed of Alberta Canada. (Expected submission to Environmental Science and Technology, 2017/2018).
- Parrott J.L., J.R. Marentette, L.M. Hewitt, M.E. McMaster, P. Gillis, W.P. Norwood, J.L. Kirk, K.M. Peru, J.V. Headley, Z. Wang, C. Yang and R.A. Frank. 2018. Fathead minnow chronic exposures to snow and freshet from the oil sands region of Alberta. (Expected submission to Environmental Pollution, 2017).
- Roy, J.W., Bickerton G., Frank R.A., Grapentine L. and L.M. Hewitt. 2016. Assessing risks associated with constituents detected in shallow riparian groundwater near a tailings pond in the Athabasca oil sands region of northern Alberta, Canada. *Groundwater*, 51(4): 545-558.
- Summers, J. C., Kurek, J., Kirk, J. L., Muir, D. C. G., Wang, X., Wiklund, J. A., Smol, J. P. (2016). Recent warming, rather than industrial emissions of bioavailable nutrients, is the dominant driver of lake primary production shifts across the athabasca oil sands region. *PloS One*, 11(5), e0153987.
- Sun, C. Shotyk, W. Cuss, C.W. Donner, M.W. Fennell, J. Javed, M. Noernberg, T. Poesch, M. Pelletier, R. Sinnatamby, N. Siddique, T. Martin, J.W. 2017. Characterization of naphthenic acids and other dissolved organics in natural water from the Athabasca Oil Sands Region, Canada. *Environmental Science and Technology*. 51: 9524-9532.
- Wang, Z., C. Yang, J. Parrott, R. A. Frank, Z. Yang, C. E. Brown, B. Hollebone, M. Landriault, B. Fieldhouse, Y. Liu, G. Zhang, and L.M. Hewitt. 2014. Forensic source differentiation of petrogenic, pyrogenic, and biogenic hydrocarbons in Canadian oil sands environmental samples. *J. Haz. Mat.* 271: 166-177.
- WorleyParsons, 2009. Groundwater Flow and Solute Transport Model for Mildred Lake Settling Basin. Submitted to Syncrude Canada Ltd. A copy of the report resides with Water Policy Branch, Alberta Environment and Parks, Oxbridge Place, Edmonton, Alberta.
- Zhang, L., Cheng, I., Muir, D., & Charland, J. -. (2015). Scavenging ratios of polycyclic aromatic compounds in rain and snow in the Athabasca oil sands region. *Atmospheric Chemistry and Physics*, 15(3), 1421-1434.

## **APPENDIX 4**

### **State of the Science in Environmental Chemical Forensics for Distinguishing Natural and Anthropogenic Sources of Bitumen-impacted Water**

## **SUMMARY REPORT**

### **State of the Science in Environmental Chemical Forensics for Distinguishing Natural and Anthropogenic Sources of Bitumen-impacted Water**

Jonathan W. Martin, PhD

April 23, 2019

This report was prepared by Dr. Jonathan Martin, PhD., an independent consultant for the Secretariat of the Commission for Environmental Cooperation. The information contained herein is the responsibility of the author and does not necessarily reflect the views of the CEC, or the governments of Canada, Mexico or the United States of America.

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## Glossary of Terms

<b>APCI</b>	Atmospheric Pressure Chemical Ionization
<b>CI</b>	Chemical Ionization
<b>ECCC</b>	Environment and Climate Change Canada
<b>EI</b>	Electron ionization
<b>ESI</b>	Electrospray Ionization
<b>FTICR-MS</b>	Fourier Transform Ion Cyclotron Resonance Mass Spectrometry
<b>FTIR</b>	Fourier Transform Infrared Spectroscopy
<b>GC</b>	Gas Chromatography
<b>GCxGC</b>	Two-dimensional gas chromatography
<b>GCxGC-TOFMS</b>	Two-dimensional GC coupled with Time-of-Flight Mass Spectrometry
<b>HPLC</b>	High Pressure Liquid Chromatography
<b>HRMS</b>	High resolution mass spectrometer
<b>ICP-MS</b>	Inductively Coupled Plasma Mass Spectrometry
<b>MS</b>	Mass Spectrometry (low resolution)
<b>MS/MS</b>	Tandem mass spectrometry
<b>NAs</b>	Naphthenic Acids
<b>OSPW</b>	Oil Sands Process-Affected Water
<b>PCA</b>	Principal Components Analysis
<b>Pore water [pressure]</b>	Groundwater under a certain amount of pressure from being contained between particles of soil or rock (pressure as measured in piezometers)
<b>RAMP</b>	Regional Aquatic Monitoring Program
<b>QTOF</b>	Quadrupole Time- of-Flight (used together with HPLC)
<b>SFS</b>	Synchronous Fluorescence Spectroscopy
<b>TOF</b>	Time-of-Flight

## Background

Bitumen is a naturally occurring and viscous form of petroleum found in the Athabasca oil sands region of Alberta, Canada. The bituminous sands (i.e., *oil sands*, *tar sands*) are present in the McMurray Formation, a geological layer of the Lower Cretaceous period that can be seen on the banks of the Athabasca River, north of Fort McMurray. In warm weather, bitumen can be seen bleeding from the outcrop face into the river,<sup>1</sup> and groundwater that has naturally come into contact with the bitumen carries residues of the bitumen into the Athabasca River or its tributaries.<sup>2</sup> The McMurray formation is shallow enough to be surface-mined in some areas, and the surface mining industry has long employed the Clark Hot Water Extraction Process<sup>3</sup> to recover bitumen by from the raw ore. This activity, which slurries the ore with warm water (35°–75°C) and uses aeration to recover the bitumen by flotation,<sup>3</sup> results in acutely toxic water<sup>4–6</sup> containing a complex mixture of dissolved organics and inorganics called oil sands process-affected water (OSPW). The OSPW is stored in above-ground walled structures called tailings ponds, some of which are very close to the Athabasca River. For example, an island in the Athabasca River, once known as ‘Tar Island’, later became the site of the first tailings pond (Suncor Pond 1) in the 1960s, and no longer exists because the wall of the tailings pond (also called a dyke) is now built over it.<sup>1</sup> Concerns about OSPW seeping from tailings structures into groundwater and surface water have logically been raised, at this site as well as others in the region.

To address some of these questions, scientific studies and field-monitoring have been undertaken by various universities and also by federal and provincial environment agencies. However, the basic question—*are tailings ponds leaking into the environment?*—is challenging to answer through environmental monitoring for a couple of major reasons. The first is the physical proximity of industrial and natural sources of bitumen-impacted waters, as illustrated above for Suncor Pond 1 and the former ‘Tar Island’. When bitumen-derived substances are detected in groundwater or surface water at such a location, chemical forensic tools and knowledge of the surrounding hydrology need to be applied and carefully considered before the source can be assigned as natural, anthropogenic, or a mixture of both. The second reason is that bitumen-derived organics are complex mixtures containing many millions of substances that remain impossible to fully characterize, even with the most sophisticated instrumentation available today.<sup>7,8</sup> This complexity was not appreciated until 2005–2010, when high-resolution mass spectrometry began to be applied to analysis of OSPW<sup>9,10</sup> and natural bitumen-impacted waters.<sup>11</sup> Therefore, some important chemical forensic tools have only recently become adequate (i.e., since 2011<sup>12</sup>) to assist in answering the question, and these continue to evolve and be utilized in combination with measurement of other organic and inorganic geochemical parameters.

## Purpose and Organization of the Report

This report summarizes publicly available science on methods and applications of environmental chemical forensics to differentiate between natural and anthropogenic bitumen-impacted water in Canada’s Athabasca oil sands region. In this region there is mounting public concern that OSPW from surface mining activities may be migrating into groundwater or natural surface water. Uncertainty arises due to natural interactions between groundwater and oil sands deposits in the same areas, resulting in natural water that has a similar chemical profile as OSPW.

The focus of this report is on original peer-reviewed literature, but reports from federal or provincial research efforts have also been considered when deemed to be of sufficient quality and relevance. A supplied list of literature was considered, but other literature was included through a targeted literature review completed in March 2019. Some scientific review articles<sup>13–15</sup> do not contain original data and were excluded from summary in this report.

The document is arranged into three sections:

**Section 1** is a summary of relevant analytical chemistry methods for water, as well as a description of the quantitative or qualitative parameters that they are used to measure in the Athabasca oil sands region. This is included to make subsequent sections more easily understandable to the reader. In part, this material may be useful because the peer-reviewed science is based on a broad range of routine to advanced analytical methods that are highly technical and likely unfamiliar to the general public. Moreover, the quality or diagnostic value of the data from each method may vary; thus for some methods the author's expert opinion is included or citations to scientific literature are provided to explain why some methods can be trusted more than others. In particular, many early studies purporting to characterize or quantify 'naphthenic acids' (NAs) in OSPW or environmental water were based on methodologies that are now recognized to be biased (i.e., NA concentrations too high) and inaccurate (i.e., incorrect NA profiles).

**Section 2** contains the state of the science, and is a summary and expert opinion on (i) the state of the science for identifying chemical differences between naturally-occurring bitumen-influenced water and anthropogenic OSPW, (ii) whether the state of the science is sufficient to determine whether OSPW is leaking, or has leaked, into groundwater and/or surface water, based on combined evidence of all studies examined.

**Section 3** is a study-by-study summary of the scientific literature from which information in Section 2 was drawn, arranged chronologically. The study context and type of samples analyzed in each study are explained, and major conclusions of the authors are summarized, sometimes along with my personal opinions.

## Key Findings

- Analytical mass spectrometry methods for the analysis of bitumen-impacted waters have progressed in quality by leaps and bounds over the last 20 years, but were insufficient for environmental monitoring until approximately 2011. The tools for environmental monitoring of oil sands process-affected water (OSPW) and of natural bitumen-impacted waters are now sensitive and accurate, and are part of a larger toolbox of organic and inorganic geochemical techniques used for understanding sources of water in the Athabasca oil sands region. High-resolution mass spectrometry (e.g., HPLC-QTOF) is now the accepted entry point for accurate characterization and semi-quantification of naphthenic acids (NAs) in OSPW and in environmental water samples. Ultra-high-resolution mass spectrometry (e.g., HPLC-Orbitrap, infusion FTICR-MS) is necessary to profile chemical species other than NAs, including many other important toxic chemical species in bitumen-impacted water.
- Validation studies have demonstrated that chemical profiles of OSPW can be distinguished from the chemical features of natural bitumen-impacted water, however, in such studies the source of each sample is known at the outset, and there have yet to be any 'blind' tests to prove method performance in unknown samples, or with samples containing a mixture of OSPW and natural sources of bitumen-impacted water. In real-world field situations where sources are unknown and could very well be mixed, there is high uncertainty in using these methods alone to determine source, and limited sensitivity to detect small contributions of OSPW in otherwise naturally bitumen-impacted water samples.
- No individual mass spectrometry-based analytical method today can be used to confidently assign the source of bitumen-derived organics in water, but when used in combination with other geochemical analyses, or when applied to strategic sample sets, the overall body of evidence may be strong. It is important to consider not only analytical chemistry, but also knowledge of the hydrological system from which samples are to be taken, the site history, historic measurements, and spatial trends.

- Practical challenges and sources of uncertainty are not easily overcome when attempting to differentiate between OSPW and natural sources of bitumen-impacted waters. One challenge has been the limited numbers of samples of OSPW sourced from presumed tailings ponds, in part due to the issues of obtaining legal authority and arranging the logistics for sampling around tailings ponds. The other issue is that the leading edge of any groundwater plume of OSPW likely represents OSPW that is many decades old, and its water chemistry is therefore not expected to match the water chemistry in fresh OSPW taken from today's tailings ponds as a reference. The spatial and variation over time (hereafter: temporal variability) of the source (OSPW) and of the receptor water body (groundwater or surface water) should be understood both to raise confidence and also to provide the necessary statistical power to avoid false positives and false negatives.
- Overall, there is strong evidence of OSPW seepage into near-field groundwater around tailings ponds, and has been since the first peer-reviewed evidence was published in 2009. In some cases, the same sites have been revisited and consistent results have been found with newer analytical approaches and published in new studies. Even with imperfect analytical methods, spatial trends showing declining chemical signatures as one moves away from tailings ponds have been critical lines of evidence. Although tailings ponds have seepage water collection systems which capture seepage coming horizontally through the walls of the structure, there is both experimental and monitoring evidence for a slow vertical seepage pathway that may circumvent these collection systems and contaminate aquifers.
- There is generally less evidence that OSPW is reaching natural surface waters. Mass spectrometry fingerprinting of upwelling groundwater in the Athabasca River, immediately adjacent to one of the oldest tailings ponds, has led to conclusions by federal scientists that OSPW is reaching the river. Although compelling, there are uncertainties in the approaches and interpretations, some of which have been openly debated in peer-review. Systematic surveys of the main channel of the Athabasca River (hereafter: mainstem) with the best available analytical methods have shown that there is in fact no evidence of dissolved bitumen-derived organics (natural or anthropogenic) being detectable in any water samples; however, a major challenge to spotting any seepage is dilution in this very large river. Nevertheless, two tributaries (Beaver River, McLean Creek) are suspected of receiving OSPW seepage or runoff from nearby tailings ponds. This is based on elevated NA concentrations, and similar organic and inorganic chemical profiles compared to those of fresh OSPW. The upper watershed of McLean Creek was redirected by construction of a nearby tailings pond, and its lower watershed is known by the industry to be a possible site of OSPW seepage. And according to industry documents, Beaver River is known to have historically received seepage and runoff from the nearby Syncrude Mildred Lake Settling Basin.

## SECTION 1: Summary of Analytical Methods or Parameters Measured in Water Samples

### Category 1. Mass Spectrometry Methods for Bitumen-Derived Organics in Water

Definition: Mass spectrometry methods are a range of techniques all involving introduction of charged molecules into a vacuum for measurement of their mass (i.e., mass to charge ratio), which gives information about molecular weight, and sometimes atomic composition (i.e., molecular formula), structure, or presence of chemical functional groups.

**HPLC-Orbitrap:** Among the most powerful techniques available, this method utilizes high performance liquid chromatography (HPLC) to first separate mixture components, followed by Orbitrap detection, a form of ultrahigh-resolution mass spectrometry. The chromatography allows the methods to be quite quantitative and sensitive, while the resolution and mass accuracy of Orbitrap allows most unknown analytes to be assigned an empirical chemical formula, ( $C_xH_yO_aS_bN_c$ ). In negative ion mode, the method can detect organic acids (including naphthenic acids) and, in positive ion mode, the method detects non-acid polar neutrals and organic bases.<sup>16, 17</sup> The most common ionization source used has been electrospray ionization (ESI),<sup>17, 18</sup> but atmospheric pressure chemical ionization (APCI)<sup>2</sup> has also been employed to detect a broader range of analytes. When combined with in-line, solid-phase extraction, the method is also highly sensitive (LOD ~ 1 µg/L) and useful for monitoring of rivers.<sup>2</sup>

**infusion-Orbitrap and infusion-FTICR-MS:** These two methods achieve similar results to the above HPLC-Orbitrap methods, but no HPLC separation is used and, therefore, they may be less quantitative or less sensitive due to matrix effects. The FTICR-MS is the highest resolution (most selective) mass spectrometer available and can generally distinguish more chemical species than any other mass spectrometer (MS). Like the above HPLC-Orbitrap method, these methods may utilize different ionization sources [e.g., APCI, ESI or atmospheric pressure photoionization (APPI)]<sup>2, 19</sup> and either positive or negative ionization modes to capture a range of compounds from organic acids, polar neutrals, organic bases, and hydrocarbons.<sup>9, 19-21</sup> While these two infusion methods, with ultrahigh-resolution mass spectrometry, provide accurate characterizations of bitumen-impacted water, early variations of these utilized low-resolution quadrupole MS instruments, i.e., **infusion-MS (low-resolution)**, which have been shown to be inaccurate and to have no diagnostic value.<sup>22</sup>

**GC-FTICR-MS:** Two preliminary studies have reported the powerful combination of gas chromatography separation inline with FTICR-MS, using either APCI<sup>23</sup> or electron ionization (EI)/chemical ionization (CI)<sup>24</sup> ionization sources. These methods have not yet been applied in detailed field studies, but in comparing oil sands process-affected water (OSPW) versus two natural groundwaters have shown potential for forensic discrimination of sources. The extracted chromatograms for each formula/species may serve as additional 'fingerprints', as has also been shown by supercritical fluid chromatography (SFC) with Orbitrap for OSPW analysis.<sup>7</sup>

**HPLC-QTOF:** This is a similar approach as HPLC-Orbitrap, except that the mass spectrometer (quadrupole time-of-flight, QTOF) has lower resolution but still considered a high-resolution mass spectrometer (HRMS). This setup is capable of accurately characterizing and semi-quantifying NAs in bitumen-impacted water<sup>10, 25</sup>. Using this approach, a common strategy to avoid false positives is to exclude non-cyclic NAs,<sup>2, 18, 26</sup> which are common components of all natural water (i.e., humic or fulvic acids, not bitumen-derived). Unlike Orbitrap and FTICR-MS, the HPLC-QTOF method cannot reliably characterize the thousands of other organic chemicals containing sulfur, nitrogen, or higher oxygen content. An emerging application is the combination of ion mobility separation with HPLC-QTOF, which provides some additional selectivity<sup>27</sup> but is not yet used for differentiating OSPW from natural bitumen-impacted waters.



**GCxGC-TOF:** Among the most powerful fingerprinting analytical tools available, this method uses two-dimensions of gas-chromatography (GCxGC) to achieve among the best separation of analytes in complex mixtures.<sup>18</sup> However, the TOF is typically a low-resolution mass spectrometer, and therefore it is difficult to identify what the separated substances are, unless their spectra are already in databases or authentic standards are available for matching. With authentic, pure standards, this technique has been used in combination with other methods for source profiling and is based on relative concentrations compared to OSPW.<sup>28</sup>

**GC-MS:** Many early studies and a historic long-term monitoring program (i.e., Regional Aquatic Monitoring Program, RAMP) relied on a basic gas-chromatograph (GC) in combination with a low-resolution quadrupole mass spectrometer (MS) to qualitatively and quantitatively measure naphthenic acids in water samples<sup>29, 30</sup>. This method was later shown to have no diagnostic value,<sup>22</sup> and quantitative data thus produced from environmental samples by this method are orders of magnitude too high for NAs.<sup>18</sup>

## Category 2. Spectral Methods used for identifying Bitumen-Derived Organics in Water

Definition: Spectral methods comprise a range of techniques, all involving the interaction between molecules and an incoming source of electromagnetic radiation (e.g., visible light, ultraviolet or infrared). The absorption or subsequent emission (i.e., fluorescence) is recorded at specific wavelengths and this can give information about molecular structure or the presence of certain functional groups.

**Synchronous Fluorescence Spectroscopy (SFS):** SFS is a spectrophotometric technique that has been used in studies by ECCC. The method is primarily used as a screening tool to prioritize samples for mass spectrometry analysis. Sample extracts are excited with light and the resulting fluorescence emission spectra are recorded: samples derived from bitumen produce spectra with maxima at wavelengths of 282, 320, and 333 nm. ECCC suggests that this method is good for identifying bitumen-affected waters, but that far-field samples (far from OSPW) have yielded spectra similar to those from OSPW, and thus it has no further diagnostic value on its own.<sup>28</sup>

**Fourier Transform Infrared (FTIR):** FTIR is a spectrometric analytical method and was an early method developed by industry for quantifying total NA concentrations in OSPW. However, the method as utilized is actually not specific to NAs, but measures total acid extractable carboxylic acids. Although FTIR is not very sensitive and overestimates NA concentrations,<sup>22</sup> it can nevertheless be useful for monitoring spatial or temporal trends of bitumen-derived organic acids on industrial sites.

## Category 3. Inorganic Geochemical Parameters in Water

Definition: Geochemical parameters may be measured by a wide variety of techniques and can include measurements of any of Earth's constituent chemicals and elements, as well as their isotopes (stable or radioactive). Inorganic geochemicals are those that contain neither carbon nor carbon-hydrogen bonds.

**Major ions:** This is a routine geochemical analysis involving quantitative analysis of major anions (e.g., chloride ( $\text{Cl}^-$ ), sulfate ( $\text{SO}_4^{2-}$ ), and nitrate ( $\text{NO}_3^-$ )) and cations [including sodium ( $\text{Na}^+$ ), calcium ( $\text{Ca}^{++}$ ) and ammonium ( $\text{NH}_4^+$ )]. Groundwater samples are often categorized graphically according to relative abundance of major ions using Piper plots. A study by ECCC<sup>28</sup> indicated that this analysis alone cannot distinguish natural bitumen-impacted water from OSPW, as most ions or their ratios (e.g.,  $\text{Na}^+$ , Boron ( $\text{B}^{+3}$ ),  $\text{NH}_4^+$ , and the Na:Cl ratio) from far-field samples encompassed those for OSPW, and when Piper plotted there was overlap between far-field sample water types (i.e., alkaline, saline, sulfate, fresh) and OSPW water types (i.e., alkaline or saline).

**Stable isotopes (e.g.,  $^{18}\text{O}$  and  $^2\text{H}$ ).** The analysis of stable isotopes of oxygen ( $^{18}\text{O}$ ) and hydrogen ( $^2\text{H}$ ) incorporated by water molecules can be useful because OSPW can contain a distinctive enrichment of heavy isotopes as a result of evaporative losses from the surface of the pond, in part from heating during the bitumen extraction process.<sup>1</sup> Nevertheless, the proportion of these stable isotopes can also be affected by natural water cycling and transport, such that precipitation, groundwater and surface waters will have unique signatures useful for identification of sources and flow pathways.<sup>31</sup> The use of other stable isotope enrichment patterns, such as boron ( $\delta^{11}\text{B}$ ), lithium ( $\delta^7\text{Li}$ ), and strontium ( $^{87}\text{Sr}/^{86}\text{Sr}$ ) have been investigated in a few studies of relevance.<sup>32</sup>

**Radioisotopes ( $^3\text{H}$ ,  $^{14}\text{C}$ ).** Tritium ( $^3\text{H}$ ) is a natural radioactive isotope of hydrogen with a half-life of 12.4 years. Since the 1950s, atmospheric concentrations of tritium have increased due to thermonuclear weapons testing; thus it can be effectively used as a diagnostic tracer of modern water, such that the presence of significant tritium indicates water that has been in contact with the atmosphere during the last 60 years.<sup>31</sup> Radiocarbon ( $^{14}\text{C}$ ) in dissolved inorganic carbon is an established method to constrain the age of waters that are younger than 50,000 years old.

**Trace elements, including heavy metals:** A suite of elements present at lower concentrations may be analyzed by inductively coupled plasma-mass spectrometry (ICP-MS) and can include, for example, aluminum (Al), arsenic (As), boron (B), barium (Ba), beryllium (Be), cadmium (Cd), cobalt (Co), chromium (Cr), copper (Cu), molybdenum (Mo), nickel (Ni), lead (Pb), rhenium (Re), antimony (Sb), selenium (Se), tin (Sn), strontium (Sr), titanium (Ti), vanadium (V) and zinc (Zn). Some of the trace elements are relatively toxic (e.g., As, Cd, Pb) and are routinely monitored for risk assessment, others are enriched in bitumen and may therefore be diagnostic of bitumen-impacts (e.g., V, Ni, Mo and Re).<sup>33</sup>

## Category 4. Organic Geochemical Parameters in Water

Definition: Geochemical parameters may be measured by a wide variety of techniques and can include measurements of any of Earth's constituent chemicals and elements, as well as their isotopes (stable or radioactive). Organic geochemicals are those that contain carbon, and which are derived from living organisms, including petroleum.

**Napththenic Acid (NA) Concentrations:** NA is the general term given to organic carboxylic acids derived from petroleum sources. These carboxylic acids share the general chemical formula of  $\text{C}_n\text{H}_{(2n-Z)}\text{O}_2$  where Z specifies the number of rings or double bonds in the molecule. NAs are a constituent of OSPW and are responsible for most of its acute toxicity.<sup>34</sup> They are also present in natural bitumen-impacted groundwater, but OSPW generally has higher concentrations of NAs. Thus, to some extent, the NA concentration can be a marker of groundwater containing OSPW. However, caution must be exercised because reliable studies have shown unusually high natural NA concentrations in groundwater (2 mg/L NAs) that approach OSPW concentrations (6–29 mg/L).<sup>2</sup> Most natural bitumen-impacted groundwater usually has sub-ppm concentrations of NAs (i.e., <0.1 mg/L).<sup>2</sup>

NA concentrations in OSPW and natural water reported in the scientific literature for are often confusing, due to many incorrect measurements of NA concentrations that are based on low-resolution mass spectrometry (**infusion-ESI-MS**, **GC-MS**<sup>30</sup>) or spectroscopy (**FTIR**<sup>30, 35</sup>), because these techniques over-predict the true NA concentration by several orders-of-magnitude.<sup>18, 22, 36, 37</sup> In general, NA concentrations can best be trusted if they were measured by (ultra)-high-resolution mass spectrometry (QTOF, Orbitrap, FTICR-MS) but, even then, the results are only semi-quantitative and should not be compared between studies that used different methods or calibration standards, such as commercial NAs<sup>2</sup> or pure model compounds such as decanoic- $\text{d}_{19}$  acid<sup>38</sup>. One possible exception is a derivatization low-resolution tandem-MS method (**HPLC-MS/MS**) for accurate analysis of NA concentrations, but it has not been widely used.<sup>39</sup>

**O<sub>2</sub>/O<sub>4</sub> ratio:** An ECCC study<sup>28</sup> proposed that the ratio of total naphthenic acid response (i.e., O<sub>2</sub>) to total dioxidized naphthenic acid response (i.e., O<sub>4</sub>) by **infusion-ESI-Orbitrap** may be a qualitative marker of OSPW in groundwater. Although the approach has been criticized,<sup>40</sup> there appears to be some internal validity, for example when all values are produced by the same high-resolution mass spectrometry method in the same lab. However, even ECCC only utilizes this parameter in combination with many other analyses, and never on its own for source discrimination studies.<sup>41</sup>

**Intramolecular <sup>13</sup>C (δ<sup>13</sup>C<sub>pyr</sub>) isotopic signature:** This is a specialized method, developed by Ahad et al.<sup>42</sup> and currently only used by the Geological Survey of Canada. Here, organic carboxylic acids (including naphthenic acids) are first fractionated off-line with preparative GC. The fractions are then pyrolyzed to release the carboxylic groups (e.g., from NAs and other carboxylic acids) as CO<sub>2</sub> gas, which is then analyzed for its relative content of <sup>13</sup>C, a stable and natural heavy isotope of carbon. The measurement is therefore different from bulk, total molecular δ<sup>13</sup>C, measured by complete molecular oxidation methods. The instrument used for the detection is a thermal conversion/elemental analysis–isotope-ratio mass spectrometer. The original theory for development of this method was that tailings pond OSPW would have a distinct δ<sup>13</sup>C<sub>pyr</sub> signature because organic carboxylic acid groups of naphthenic acids could exchange with dissolved inorganic carbon, a process that is favoured at alkaline pH typical of the oil sands extraction process. However, initial data showed no significant difference between the δ<sup>13</sup>C<sub>pyr</sub> signature of OSPW and natural McMurray formation water.<sup>42</sup> Nevertheless, the method is capable of distinguishing between bitumen-derived organics and other natural sources (i.e., modern biogenic, such as humic acids) of dissolved organic acids.<sup>42</sup>

**Polycyclic Aromatic Hydrocarbons (PAHs) or Compounds (PACs):** PAHs and a broader family of PACs (e.g., alkylated PAHs) are known to be present in tailings ponds. However, they are primarily present on suspended particles, or in the underlying sediments composed of fine tailings. They have very low concentrations in the dissolved water phase and are therefore not strong candidates for monitoring of OSPW seepage. Some environmental monitoring studies have reported PAH or PAC concentrations in snow, rain, surface water, moss, lichen, or in lake and river sediments of the Athabasca oil sands region,<sup>43-46</sup> but these studies are likely not relevant to tailings ponds seepage or discharge. Rather, atmospheric deposition of PAHs and PACs is known to come from airborne emissions from bitumen upgrader stacks and petroleum coke dust.<sup>33, 46</sup>

## SECTION 2 State of the Science

### (i) State of the Science of Analytical Methods and Their Applications to Source Discrimination

Analytical mass spectrometry (MS) methods for the analysis of bitumen-impacted waters have progressed greatly in quality over the last 20 years. It was once thought that the only organic acids in OSPW were the naphthenic acids (NAs,  $C_n H_{(2n-2)} O_2$ ), and thus that low-resolution MS was a suitable means for profiling and quantification of these in OSPW. This was disproven in studies conducted between 2004 and 2008,<sup>9, 10, 22</sup> and all bitumen-impacted waters are now recognized as highly complex mixtures of acids, non-acids and organic bases, which may contain sulfur, nitrogen or multiple oxygen atoms in their molecular structures.<sup>7, 17, 19, 21</sup> For its increased specificity, high-resolution mass spectrometry (e.g., HPLC-QTOF) is now the accepted entry point for accurate characterization and semi-quantification of NAs in OSPW and in environmental samples, based on cumulative evidence produced between 2006<sup>10</sup> and 2016.<sup>26, 47</sup> This new analytical approach has revealed that previous NA concentrations were too high, and that previous qualitative profiles were incorrect, and for the first time has enabled accurate environmental monitoring of water sources in the Athabasca oil sands region. For example, when such high-resolution methods were finally applied to samples from the Athabasca River, the concentrations of NAs therein were shown to be 100-fold lower than previously reported by low-resolution MS.<sup>18</sup> Applications of ultra-high-resolution mass spectrometry (e.g., HPLC-Orbitrap, infusion FTICR-MS) are necessary to profile chemical species other than naphthenic acids, including many important toxic chemical species<sup>16</sup> in bitumen-impacted waters that contain nitrogen, sulfur and/or additional oxygen atoms.<sup>17, 19, 21, 23</sup> With pairing to in-line extraction techniques, ultra-high-resolution mass spectrometry methods are also quantitative and very sensitive, capable of detecting part-per-billion ( $\sim 1 \mu\text{g/L}$ ) concentrations of NAs in water samples.<sup>2</sup> The tools used now for environmental monitoring of OSPW and of natural bitumen-impacted waters are sensitive and accurate, and are important parts of a larger toolbox of techniques used for understanding sources of water in the Athabasca oil sands region.

Progress has also been made with regard to applications of mass spectrometry methods for differentiating anthropogenic (i.e., OSPW) and natural bitumen-impacted water. Several validation studies have demonstrated that chemical profiles of OSPW, analyzed by high- or ultra-high-resolution mass spectrometry, or GCxGC-MS,<sup>8, 28</sup> can be distinguished from the chemical features of natural bitumen-impacted water.<sup>11, 12, 31, 48-50</sup> Similarly, the chemical profiles of OSPW from different tailings ponds and mines can be shown to be slightly different.<sup>31, 50, 51</sup> However, in these validation studies the source of each sample was known at the outset of the study (i.e., from tailings ponds, or natural groundwater far from industry), and there have yet to be any 'blind' tests to prove method performance in unknown samples, or with samples containing a mixture of OSPW and natural sources of bitumen-impacted water. Moreover, even in the existing validation studies, analytical differentiation is not usually based on statistical significance but on more subjective groupings by principal components. This is partly because there are currently no known chemical features in OSPW that are not also found in natural bitumen-impacted waters, thus source differentiation has largely relied on relative abundance of the same chemical features among different samples. In real-world field situations where sources are unknown and could very well be mixed (e.g., 10% OSPW NAs and 90% natural NAs), there is higher uncertainty in using these methods alone to determine source, and limited sensitivity to detect small contributions of OSPW in otherwise naturally bitumen-impacted water samples.

For the reasons discussed above, no individual mass spectrometry-based analytical method today can be confidently used to assign the source of bitumen-derived organics in water. Nevertheless, when these techniques are used in combination with other geochemical measurements (e.g., major ions, trace elements, stable isotopes and radioisotopes) or when applied to strategic sample sets (e.g., spatial surveys or temporal sample sets) the overall

body of evidence increases. Major ions (Piper plots), stable isotopes of water ( $^{18}\text{O}$  and  $^2\text{H}$ ), and tritium ( $^3\text{H}$ ) have proven to have diagnostic value for differentiating between sources of bitumen-derived organics, when considered together.<sup>2, 18, 28, 31, 52</sup> Although less important to the task at hand, other methods or parameters, such as synchronous fluorescence spectroscopy (SFS),<sup>28, 52</sup> intramolecular carbon-13 signature ( $\delta^{13}\text{C}_{\text{pyr}}$ ),<sup>42, 53</sup> and radiocarbon,<sup>31, 53</sup> can be useful for pre-screening and differentiating natural dissolved organics (e.g., fulvic and humic acids) from bitumen-derived organics.

As discussed in one of the most detailed surveys of water chemistry in the Athabasca oil sands region,<sup>31</sup> it is important to consider not only analytical chemistry, but also knowledge of the groundwater hydrological system where samples are taken, including the effect of geological stratigraphy on the chemistry, occurrence, and movement of water. Moreover, site history, historic measurements, and spatial trends can also be very important lines of evidence. With combined analytical evidence from various tools, and considering hydrology, site histories, and spatial trends, several scientific studies have proposed OSPW as a source affecting groundwater<sup>28, 40, 52-55</sup> or surface water<sup>2, 18</sup> in the vicinity of tailings ponds.

Nevertheless, there are practical challenges and various uncertainties that are not easily overcome when differentiating between OSPW and natural sources of bitumen-impacted waters. One limitation to most existing studies of tailing pond monitoring and seepage is the very limited number of samples collected from the presumed anthropogenic sources, in part due to legal authority and logistics of safely sampling in and around tailings ponds. Thus, most reference OSPW samples are taken from the surface of a pond at a single time (often by the industry or their contractors, rather than by scientists), thereby not capturing the variability of pond location, pond depth, or temporal variability of the OSPW. A few studies have shown within-pond variability (spatial and temporal) to be less significant than variability between ponds,<sup>48, 49, 51</sup> but these have only considered a sampling period of weeks to months. In my opinion, without more comprehensive reference OSPW samples from tailings ponds suspected of leaking, conclusions from analytical chemistry regarding the presence of OSPW in environmental samples may fall short in rigor and statistical significance. Ideally, the spatial and temporal variability, both of the source (OSPW) and also of the receptor (groundwater or surface water), should be understood to raise confidence and provide greater statistical power in future studies. This recommendation is in the best interest of industry and of the public, to avoid false positives and false negatives.

Related to the above limitation, it has become routine in existing studies of tailings pond leakage to compare and contrast the chemistry of environmental samples along a presumed flowpath (groundwater, or surface water) to that of fresh surface OSPW taken from the tailings pond. This approach is a limitation because the chemistry of OSPW at the surface of today's tailings ponds is unlikely the same as OSPW generated in the 1960s and 1970s when the first tailings ponds were constructed and filled. Thus, the leading edge of any groundwater plume of OSPW likely represents OSPW that is many decades old, and its water chemistry should therefore not be expected to match exactly the water chemistry of modern, fresh OSPW. Although the oil sands extraction process remains largely the same, bitumen is now being mined from different locations, and it is well known that the hot water extraction process has become much more reliant on OSPW-recycling/reuse, with the result that the concentrations of organics and inorganics are much higher today than historically.<sup>52</sup> Moreover, over decades of slow movement in the subsurface, it is possible that OSPW dissolved organics will undergo degradation or attenuation processes that further distort the original water chemistry signature. One recommendation is that OSPW collected from tailings pond dyke seepage collection systems (representing old OSPW from the time of dyke construction) is a better reference sample for comparison to environmental samples than fresh OSPW taken from the surface of a tailings pond. The walls of tailings pond contain drains to limit water saturation, thereby maintaining mechanical strength of the sand structures,<sup>1</sup> and water can be sampled from the associated drainage ditches prior to pumping back into the ponds.<sup>56</sup>



## (ii) State of Evidence for OSPW Seepage or Runoff from Tailings Ponds into Natural Water

There is ample strong evidence of OSPW seepage into near-field groundwater around tailings ponds, and in some cases multiple studies at the same sites increase the weight of evidence. The first peer-reviewed evidence came in 2009<sup>54</sup> for Mildred Lake Settling Basin, when OSPW was detected in a shallow sand aquifer adjacent to the tailings impoundment between September 2004 and November 2005. All samples were confined to within 900 m of the pond, and declining concentrations were evident in samples taken further from the dyke. Such spatial trends are themselves strong evidence that the source was anthropogenic, and not natural. This same general site was revisited and reported on by Ahad et al. in 2013,<sup>53</sup> who found strong evidence for bitumen-derived organics in the shallow aquifer. Moving away from the dyke, the gradual decline of  $\delta^{13}\text{C}_{\text{pyr}}$ ,  $\text{O}_2$  and  $\text{O}_2\text{S}$  classes (infusion-Orbitrap) and  $^{14}\text{C}$  were together strong evidence for bitumen impacts of OSPW in the aquifer within a distance of approximately 2 km. Although their analytical methods could not differentiate natural from anthropogenic sources, the spatial trend over a distance of 2 km, and the site history indicating no previous traces of bitumen-derived organics in the same aquifer,<sup>53</sup> reasonably point to the tailings pond as the only possible source. Finally, the same site was assessed by Frank et al. (Site A) who concluded that water from the interceptor well and a monitoring well adjacent to the tailings pond contained water that resembled OSPW, based on  $\text{O}_2:\text{O}_4$  ratio and isomer patterns determined by GCxGC-TOFMS.

The study of Yasuda et al. (2010)<sup>55</sup> was a spatial survey of groundwater around a tailings pond at Muskeg River Mine, and provides further evidence that tailings ponds can indeed seep into underlying groundwater. Although the methods used for naphthenic acids are now considered of low diagnostic value on their own, they showed a slowly declining trend, moving away from the dyke and inner ditch, similar to the results for pH, stable isotopes of water ( $^{18}\text{O}$  and  $^2\text{H}$ ), sodium, and chloride—all of which are tracers of OSPW. Although there was no evidence of OSPW migration outside of an outer interception ditch, approximately 300 m away, this important study suggests a mechanism of seepage that can explain the above seepage from Mildred Lake Settling Basin, or from Suncor Pond 1 as suggested and discussed below. The same seepage mechanism was proven in a small-scale test pond adjacent to Suncor South-Tailings Pond,<sup>57</sup> where it was shown that OSPW seeped 0.9 meters into clay-till over a two-year period.

The earliest peer-reviewed suggestions of seepage from Suncor Pond 1 are based on the study of Ferguson et al.,<sup>58</sup> which showed modest evidence of seepage based on analysis of water from wells installed in the river sediments at the toe of the dyke; however, Ferguson et al. cited a 2001 Masters thesis<sup>59</sup> for this evidence which is considered weak evidence in context of this review. Nevertheless, it is notable that the more recent study of Frank et al.<sup>28</sup> (Site B) was conducted in the same general location, in upwelling river sediments at the base of the dyke. Here, government scientists from ECCC concluded, based on application of a battery of methods, that the upwelling water in river sediments resembled OSPW.<sup>28</sup> Because this tailings pond is so close to the river (in fact, the dyke is constructed over the former Tar Island in the river) there have been no spatial studies similar to those of Ahad et al.<sup>53</sup> and Oifer et al.<sup>54</sup> with a spatial transect that would provide greater evidence that the source of bitumen impacted water was the tailings pond. Although the methods of Frank et al.<sup>28</sup> have been questioned,<sup>40, 41</sup> specifically the use of the  $\text{O}_2:\text{O}_4$  ratio from infusion-Orbitrap, it is my opinion that the ratio has internal validity and contributes to weight of evidence that the groundwater samples could be impacted by OSPW. Roy et al.<sup>52</sup> later showed that there are other sites in the vicinity, in sediments on the western bank of the Athabasca River, with similar water chemistry as the OSPW-like water sample reported by Frank et al.<sup>28</sup>

There is generally less evidence that OSPW is reaching natural surface waters. In a review on the topic published in 2013, Miall<sup>1</sup> concluded that OSPW was not yet reaching natural surface waters; however, more recent evidence should be considered that has appeared since 2013. These include Frank et al.<sup>28</sup> and Roy et al.,<sup>52</sup> which are concerned with upwelling sediments in the Athabasca River, and Frank et al. implied that OSPW is reaching the Athabasca River. Nevertheless, surface water samples from the Athabasca River were not reported in their studies, and to date I am unaware of any direct analytical evidence of bitumen-derived organics (natural or anthropogenic) being detectable in water samples from the mainstem Athabasca River. Ross et al.<sup>18</sup> and Sun et al.<sup>2</sup> conducted surveys of surface water and groundwater around the Athabasca River and its tributaries, and although bitumen-impacted profiles were evident in certain upwelling groundwaters and at the mouths of tributaries (i.e., where the tributary joins the Athabasca River), the same signals were never detected in the mainstem Athabasca River. Thus, a major practical challenge to monitoring bitumen-impacts in the Athabasca River is the dilution effect in this very large river.

In a broad survey of water samples collected in 2011, Ross et al.<sup>18</sup> highlighted surface water samples from two tributaries (Beaver River, McLean Creek) suspected of receiving OSPW seepage or runoff from nearby tailings ponds. This was based on their elevated NA concentrations compared to other surface waters, a similarity of their NA profiles compared to fresh OSPW, and similarities of their major ion chemistry to that of fresh OSPW. Sun et al.<sup>2</sup> effectively duplicated the findings of Ross et al. in a sampling campaign in 2015, reporting elevated NA concentrations in McLean Creek (30.1 µg/L) and Beaver River (190 µg/L) as well as bitumen-impacted chemical profiles similar to OSPW. However, neither Ross nor Sun (et al.) had samples of OSPW from South Tailings Pond or Mildred Lake Settling Basin available for direct comparison.

The site histories around Beaver River and McLean Creek are important to consider and have been discussed in the submission to CEC. McLean Creek's upper watershed was redirected by construction of a nearby tailings pond (Suncor South Tailings Pond), and lower McLean Creek is well known by the industry to be a possible site of OSPW seepage.<sup>60</sup> In fact, a system of interception pumping wells was installed in 2006 to mitigate future risk, as the mine operators assume that a natural sand channel under South Tailings Pond will become contaminated by OSPW over time.<sup>60</sup> Nevertheless, NAs are detectable in this creek at relatively high concentrations; it contained the highest concentrations of NAs among any surface water analyzed by Ross et al. (81 µg/L) and was also found to be elevated by the study of Sun et al. (30.1 µg/L).

Ross et al. noted that Beaver River is known to have historically received seepage and runoff from the nearby Syncrude Mildred Lake Settling Basin; this according to a 2008 consultant report.<sup>61</sup> Dams were constructed in 1999–2000 control runoff and seepage of OSPW, but the authors note that OSPW was nevertheless detected below the lower dam.<sup>61</sup> The dams were upgraded in 2004.<sup>61</sup> Concentrations of NAs measured in Beaver River by Ross et al. in 2011 (190 µg/L) are the highest for any surface water sample examined in their study. Overall, it is surprising how few monitoring data are publicly available for these two sites. Prior to the work of Ross et al. reported in 2012,<sup>18</sup> these sites were monitored under the RAMP monitoring program using GC-MS, which Ross et al.<sup>18</sup> and previous studies<sup>10</sup> showed to be biased and inaccurate.

### SECTION 3. Summary of Key Individual Scientific Studies

All scientific sources of information considered in this report are summarized below, arranged alphabetically by first author and year of publication. **N.B.** It has unfortunately become tradition in peer-review studies and in government reports not to explicitly identify the tailings pond from which OSPW or groundwater analysis samples have been taken. Nevertheless, in many cases it is possible from maps, discussion, authorship or acknowledgement in the manuscripts to presume which tailings ponds are under investigation, and to be quite confident when the author has provided the common name of the tailings pond and mine-site on which it is located. This important information is absolutely necessary when weighing the evidence from all published studies: linking analytical information and site history from early studies to that from more recent investigations.

Oiffer, A.A.L., J.F. Barker, F.M. Gervais, et al. *J Contam Hydrol*, 2009, **108**(3-4): 89

Oiffer et al.<sup>54</sup> is the first peer-reviewed study of groundwater monitoring for naphthenic acids around a tailings pond. Samples of groundwater were taken along a 900 m transect from a shallow sand aquifer adjacent to the dyke of a tailings impoundment between September 2004 and November 2005. Although the site is not explicitly identified, they acknowledge financial and administrative support from Syncrude Canada Ltd. Frank et al.<sup>28</sup> later characterized this site as a similar location to their 'Site A', which I assume to be Syncrude's Mildred Lake Settling Basin, also studied and reported by Savard et al.<sup>62</sup> and Ahad et al.<sup>63</sup>

The authors measured major ions, pH, trace metals, naphthenic acids (FTIR and GC-MS) and various other organics in the water samples. It was assumed by the authors that they were sampling a plume of OSPW with an estimated 27-year lifespan at the time of publication, in part based on previous industry reports. In my opinion, this is a reasonable assumption, based on the data presented in the paper, showing rapidly declining concentrations of chloride, sodium, ammonium, pH, and NAs (FTIR) moving away from the tailings pond dyke. One of the conclusions from the authors was that NAs were not significantly attenuated relative to chloride ion, a conservative tracer for subsurface groundwater movement. Therefore, this early study demonstrates that OSPW does indeed seep from a tailings pond into near-field groundwater, and that bitumen-derived organic acids (likely NAs) are mobile in the subsurface environment.

Grewer DM, Young RF, Whittall RM, et al. *Sci Total Environ* 2010, **408**(23): 5997

Although Grewer et al.<sup>11</sup> is not a forensic study of OSPW seepage, it used a reliable infusion-FTICR-MS method to profile naphthenic acids in OSPW samples from six different tailings structures, and of six natural surface waters. Although not surprising, the OSPW samples were distinguishable from natural waters (i.e., not bitumen impacted) in PCA plots (i.e., PC1), but more noteworthy is that there was also relatively high variability between OSPW samples (i.e., PC2). This study is one of the earliest to emphasize that OSPW contains much more than naphthenic acids, including sulfur-containing species, and therefore that high-resolution mass spectrometry must be a requirement for accurate analysis.

Headley JV, Barrow MP, Peru KM, et al. *Rapid Commun Mass Spectrom* 2011, **25**(13): 1899

Headley et al.<sup>12</sup> used infusion-FTICR-MS to profile the organics in two tailings ponds located close to the Athabasca River, seven groundwater locations and two interceptor wells between the tailing ponds and the Athabasca River, all sampled during the same period in 2009, although the groundwater and interceptor wells were each sampled in duplicate at two different times. The authors note that the locations of the groundwater sites, with respect to possible influence between the tailing ponds and interceptor wells, is a topic of ongoing research. Grab samples at a reference site, Gregoire Lake, and in the Athabasca River at five sites upstream and downstream sites were also collected in the same period.

Of relevance to the current report, duplicate sampling and analysis of OSPW from the two tailings ponds showed visual similarity in class-profiles across duplicates within a site, but differences between the sites. Although no statistical testing was done, this is also demonstrated in PCA plots, whereby the company's two tailings ponds and associated groundwater/interceptor wells were separated, demonstrating that profiles within sites were more similar than profiles between the two sites; these were also distinguishable from Athabasca River and Gregoire Lake, although the variability among Athabasca River sites was not shown. This paper does not specifically present any means for differentiating natural and anthropogenic bitumen-derived organics, but in my opinion provides preliminary data that suggest groundwater around tailings ponds contains a mixture of organics that is 'similar' to the water in the ponds. The authors conclude that a "wider range of source OSPW samples and a more diverse range of reference sites is needed to establish whether or not this approach can provide conclusive evidence for leakage of source materials to natural waters."

Gibson JJ, Birks SJ, Moncur M, et al. 2011. OSRIN Report No. TR-12. 109 pp

Although not a peer-reviewed study, Gibson et al.<sup>31</sup> is a detailed report of high relevance which I find to also be of high quality. Parts of it seem to have been published later in peer-review.<sup>64</sup> The authors used a great number of chemical tracers and aimed to fingerprint OSPW, natural groundwater, and natural surface waters, but they also sampled a selection of riverbed seeps, to identify the source(s). In total 39 samples were collected, including eight OSPW samples, six groundwater samples, eight riverbed seepage samples, and 15 river water samples. Geochemical analyses conducted included major ions and trace elements, a range of metals, nutrients, and total organic carbon, as well as naphthenic acids and infusion-FTICR-MS of bitumen-derived substances. A variety of isotope tracers were measured, including stable isotopes in water (<sup>18</sup>O, <sup>2</sup>H), enriched tritium (<sup>3</sup>H) in water, stable isotope of carbon in dissolved organic carbon (<sup>13</sup>C- DOC), <sup>13</sup>C and <sup>14</sup>C in dissolved inorganic carbon, <sup>34</sup>S in dissolved sulfate, <sup>37</sup>Cl in dissolved chloride, and <sup>87</sup>Sr versus <sup>86</sup>Sr (<sup>87</sup>Sr/<sup>86</sup>Sr) and <sup>11</sup>B in dissolved solids. [Note: S=sulfur, Cl=chloride ion, Sr=strontium ions, B=boron ion]

Key findings include that analyzing for enriched tritium was useful, as OSPWs contained abundant tritium, thus lack of tritium can be taken as strong evidence that water samples are not from OSPW. Carbon-14 may be of limited use for differentiating natural and anthropogenic sources because OSPWs had anomalously old radiocarbon signatures, which is perhaps logical, given their contact with oil sands from the McMurray Formation, and mixing with local surface waters. Also, although OSPWs are enriched in <sup>18</sup>O and <sup>2</sup>H through evaporation, which allows one to distinguish them from natural groundwater and also river water and riverbed seepage, these evaporative signatures were, however, similar to those observed in other natural surface waters and thus are not unambiguous. As in other studies, using infusion-FTICR-MS enabled the researchers to distinguish between OSPW from individual operators, and the patterns also appeared distinct from groundwater signatures. However, additional samples of groundwater are necessary to confirm this.

The conclusion was that there was no evidence of robust connections between tailings ponds and the sampled river seeps. While the seeps did appear to be directly related to occurrence of natural groundwater seepage, the researchers could not rule out the possibility that minor or trace amounts of process-affected water might have been present in some of them. Moreover, the authors recommended that while some of the isotopic and geochemical tracers were definitive for labeling certain water sources, it is not reliable to attempt to universally label water sources based on individual tracers or simple combinations of them.<sup>31</sup>

Ross MS, Pereira Ados S, Fennell J, et al. *Environ Sci Technol*, 2012. **46**(23): 12796

Ross et al.<sup>18</sup> used HPLC-QTOF to monitor NA concentrations and NA profiles in OSPW (n = 2), Athabasca River pore water (n = 6, representing groundwater contributions) and surface waters (n = 58) from the Athabasca oil sands region. This study was the first time that high-resolution mass spectrometry was applied to environmental monitoring of NA concentrations, and the concentrations in surface water were all <100 µg/L, which is 100-fold lower than previous measurements with low-resolution mass spectrometry. Using principal components analysis (PCA) it was shown that NA profiles and correlations to water quality variables (e.g., major ions) could be used to distinguish natural organic acids from bitumen-derived NAs. Based on similarity to OSPW NAs and water chemistry, two tributaries to the Athabasca River were also flagged as possibly receiving OSPW seepage: Beaver River and McLean Creek. It is notable that McLean Creek, whose upper watershed is impounded by a tailings pond, contained the highest concentrations of NAs of any surface water sample (81 µg/L). The authors moreover noted that Beaver River is known to have historically received seepage and runoff from the nearby Syncrude Mildred Lake Settling Basin, according to a 2008 consultant report.<sup>61</sup> Consistent with the results of Ross et al, Sun et al. also flagged these two tributaries of the Athabasca River in their survey, reported in 2017.<sup>2</sup>

Miall AD. *Geosci Can* 2013, **40**: 215

Miall 2013<sup>1</sup> is a review of the hydrology of the Athabasca oil sands region, and of specific tailings pond case studies published in peer-review or in reports. Miall concludes in his summary that hydrogeological studies indicate tailings ponds are not seeping into surface waters but, with more nuance, he discusses certain evidence of limited seepage into surrounding groundwater. In Miall's opinion, the most concerning site is Suncor's Pond 1 (Site B as defined by Frank et al.<sup>28</sup>), which was built to a height of nearly 100 m adjacent to the Athabasca River, and opines, "Current environmental impact procedures would in no way permit the siting of a tailings pond in such a sensitive position." A study of Pond 1's Tar Island dyke by Ferguson et al.<sup>58</sup> was discussed by Miall as showing modest evidence of seepage based on analysis of water from wells installed in the river sediments at the toe of the dyke; however, upon inspection of Ferguson et al., I was unable to evaluate these data, as the citation was to a 2001 master's thesis.<sup>59</sup> It is notable that the more recent study of Frank et al.,<sup>28</sup> discussed above, was conducted in the same general location (Site B).

Miall also discussed a study by Yasuda et al. (2010),<sup>55</sup> which is a case study of the tailings pond at the Muskeg River Mine. This pond has an inner seepage ditch, at the toe of the dyke to collect water from drains and to intercept dyke seepage, as well as an outer ditch approximately 300 m away from the dyke. Yasuda sampled water along this transect with piezometers and drive points, and analyzed for naphthenic acids (FTIR and GC-MS), major ions, and stable isotopes. Although the methods used for naphthenic acids are now considered of low diagnostic value, they showed a slowly declining trend in sampling spots moving away from the dyke and inner ditch, eventually falling to approximately zero outside the outer ditch. Similar trends were evident for pH, stable isotopes <sup>18</sup>O and <sup>2</sup>H, Na<sup>+</sup> and Cl<sup>-</sup>, which are all tracers of OSPW. The authors raised the likelihood of a flow path for OSPW from the bottom of the tailings pond that travels underneath the inner seepage dyke, but which appears to be intercepted by the outer seepage ditch, at least at the depths sampled in this study. Overall, I feel this study is important as it provides strong evidence that tailings ponds can seep into underlying groundwater, and that any off-site movement of this water will likely depend on local conditions and underlying hydrology.



Abolfazlzadehdoshanbehbazari M, Birks SJ, Moncur MC, et al. *J Contam Hydrol*. 2013. 151: 83

Abolfazlzadehdoshanbehbazari et al.<sup>57</sup> is a field study of OSPW in a (10x10 m) test infiltration pond, part of South Tailings Pond (STP), a relatively new tailings pond operated by Suncor Energy Inc., and that has contained OSPW since 2006. This is an interesting site because the pond is underlain by a clay till, which is itself underlain by a natural sand channel and thus is a concern for offsite migration of OSPW if OSPW were to migrate vertically down through the clay till. Pore water in the underlying till was analyzed prior to filling the pond with OSPW in 2008 and two years later, in 2010. Analysis included metals, major cations and anions, and stable isotopes in water (<sup>2</sup>H and <sup>18</sup>O). The results for <sup>18</sup>O and chloride indicated migration of the process-affected waters to a depth of approximately 0.9 m into the clay till, but migration of other major cations and metals was less, and it was suggested that adsorption and ion exchange reactions were one of the attenuation processes lessening the vertical transport of inorganic solutes. This is an important result, showing that the inorganic ions (primarily cations) can be attenuated, such that the ion composition might be expected to change as they migrate through clay substrates. Limitations are that this was only a two-year study, is not a full-scale tailings pond, and that bitumen-derived organics, including naphthenic acids, were not measured.

Ahad JM, Pakdel H, Savard MM, et al. *Environ Sci Technol* 2013. 47(10): 5023

Ahad et al. 2013.<sup>53</sup> is a follow-up to the field-study originally conducted and published as a report in 2012 by the Geological Survey of Canada (Savard et al.<sup>62</sup>). OSPW samples and groundwater samples were collected in 2011 along a flow path from the dyke of an unidentified tailings pond and toward the edge of the Athabasca River, 3 km away. The chosen site location is one of the older tailings ponds, although the operator was not disclosed I believe the site to be Mildred Lake Settling Basin. The pond has been used for several decades, and in the authors' opinion this is sufficient time to have allowed contaminants to have moved into and through a shallow Pleistocene-era glacio-fluvial aquifer, which has a depth of between 5 and 25 m. This glacio-fluvial aquifer sits on top of the Cretaceous Clearwater/McMurray formations and, below that, Devonian limestone. The authors believe that the underlying Clearwater and McMurray formations act as an aquitard, therefore limiting vertical migration and favoring horizontal flow within the glacio-fluvial formation, and the authors suggest that any natural groundwater bitumen-derived organics from the underlying McMurray formation is minor; moreover, background naphthenic acids in the glacio-fluvial aquifer, measured by Fourier transform infrared (FTIR) spectroscopy (the industry standard), were <1 mg/L in past oil sands industry mining reports, indicating no significant bitumen in the aquifer at one time in the past.

Dissolved organics in the water samples were extracted and analyzed for the intramolecular carbon isotope signature by online pyrolysis ( $\delta^{13}\text{C}_{\text{pyr}}$ ), natural abundance (<sup>14</sup>C) radiocarbon, and infusion-Orbitrap mass spectrometry. OSPW had  $\delta^{13}\text{C}_{\text{pyr}}$  of approximately -21‰, and relatively high proportions of O<sub>2</sub> and O<sub>2</sub>S classes by infusion-Orbitrap, and major fossil carbon by radiocarbon analysis. Although it is not yet evident that bitumen-impacted groundwater has reached the Athabasca River, as one moves away from the dyke and up to ~2 km towards the Athabasca River, there is strong evidence for bitumen-derived organics in the shallow aquifer. Likewise, moving away from the dyke toward the river, the gradual decline in ions,  $\delta^{13}\text{C}_{\text{pyr}}$ , O<sub>2</sub> and O<sub>2</sub>S classes (infusion-Orbitrap) and <sup>14</sup>C, are together strong evidence for bitumen-impacted waters in the aquifer within a distance of approximately 2 km. A follow-up study showed evidence of some in-situ microbial degradation capacity in the groundwater, but only for simple monocyclic model naphthenic acids, whereas a more relevant tricyclic naphthenic acid was not degraded.<sup>63</sup>

Frank RA, Roy JW, Bickerton G, et al. *Environ Sci Technol* 2014, 48(5): 2660

Frank et al. 2014<sup>28</sup> is a key document as it is authored by ECCC scientists and describes the results of a battery of chemical analyses for water sampled in the vicinity of tailings ponds, including Suncor Pond 1, which is immediately adjacent to the Athabasca River. The methods utilized included a combination of advanced analytical methods,

including profiling by infusion-ESI-Orbitrap (qualitative profiling and semi-quantitative NA concentrations) and GCxGC-TOFMS, as well as basic geochemical analysis. In pre-screening, they used synchronous fluorescence spectroscopy (SFS), which is useful for indicating water samples that may contain bitumen-derived organics, as well as infusion-ESI-MS (low resolution), which has no diagnostic value, in my opinion.

In the first phase of this research (2009) they collected duplicate OSPW samples from each of two tailings ponds from different companies (OSPW 1, 2), and far-field groundwater samples that are presumed to be of natural origin were collected from 20 sites. For the second part of this investigation, seven near-field samples (<200 m from tailings ponds) were collected, including two from Site A (an interceptor well and a monitoring well, I believe, adjacent to Syncrude Mildred Lake Settling Basin) and five from Site B (interceptor well, monitoring well, and three drivepoint groundwater sites along the western shore of the Athabasca River next to Suncor Pond 1).

The authors point out, and I agree, that their level 1 analyses (SFS and geochemistry) were useful for identifying samples that may be bitumen-impacted, but that these alone are not helpful for distinguishing natural from anthropogenic sources. Therefore, a focus was placed on results of their infusion-ESI-Orbitrap and GCxGC-TOFMS analyses. For infusion-ESI-Orbitrap, the authors acknowledge that the method is only semi-quantitative and may suffer from matrix effects. Although they reported up to 35 classes of species (i.e.,  $O_x$ ,  $O_xS_y$ ,  $N_xO_y$ , and  $N_xO_yS_z$ ) in each sample, they limited their diagnostic interpretation of the data to the ratio of  $O_2:O_4$ , and to a lesser extent, the ratio of  $SO_2:SO_4$ , whereby higher ratios (particularly at Site A, but also at Site B) are indicative of OSPW-impacted samples. A comment on this approach appeared in the same journal (*Environmental Science and Technology*) soon after publication of their study, in which Yi et al.,<sup>40</sup> after a review of published data, urged caution in using these ratios due to their apparent wide variation. However, the internal  $O_2:O_4$  ratio data of Yi et al. broadly grouped sample types (OSPW, near field, far field, surface waters); although, by their methods, the ratio was lowest in OSPW, and higher in other natural waters. Frank et al.<sup>41</sup> responded to this, pointing out that the ratio will be highly dependent on methods of extraction and ionization mode in mass spectrometry (e.g., see the work of Barrow et al.<sup>19</sup>). It is my opinion that any ratio measured by mass spectrometry has no external validity, but may be useful when compared to other samples analyzed in exactly the same way in the same study. It is also my opinion that this ratio, on its own, is not highly diagnostic, but perhaps useful in a weight-of-evidence approach combined with other geochemical analyses and knowledge of site history and hydrology.

Returning to the results of the study of Frank et al., using GCxGC-TOFMS, two families (A, B) of individual naphthenic acids that had strong signals in the two OSPW samples were profiled in the various environmental samples, including seven distinct NA isomers in Family A and two distinct NA isomers for Family B. Unfortunately, Drive-points 1 and 2 and far-field samples revealed only one or two detectable isomers in Family A, and only minimal signals for Family B. At site A, the interceptor and monitoring well samples showed four or five detectable isomers from Family A, both isomers from Family B in both samples, and both of these 'on-development' samples were identical, with the exception of one missing isomer from the Interceptor well. The authors state that these results, together with the enriched intensities of Family B ions, were consistent with the two OSPW samples, and different from all far-field samples. The authors conclude that, collectively, all combined analyses demonstrate similarity between the two Site A samples and OSPW, and consequently that 'both samples likely contain differing proportions of OSPW'. At Site B, near-field samples had detectable Family B isomers, and most contained at least 4 (of 7) Family A isomers; Drive-point 4 had all seven Family A isomers detectable, suggesting it was OSPW-impacted, while Drive-point 6 had none, suggesting it was not impacted.

Overall, the authors conclude that their overall battery of methods was able to differentiate between sources, and that the resemblance between organics in OSPW and six groundwater samples adjacent to two tailings ponds "implies a common source", including in two upward-flowing groundwater streams collected <1 m beneath the Athabasca River, which thereby implies that OSPW is reaching the river."<sup>28</sup>

Frank RA, Milestone CB, Rowland SJ, et al. *Chemosphere* 2016, **160**: 303

Two years after their previous paper (above), Frank et al. 2016<sup>51</sup> applied a similar battery of analytical methods (SFS, infusion-MS, infusion-Orbitrap, HPLC-QTOF, GC-MS, GCxGC-QTOF, HPLC-QTOF) to samples of OSPW that had been collected from two oil sands companies in 2011. Although this research considers no natural environmental samples, it nonetheless has important implications because it evaluates (i) spatial variation in four samples from the same tailings pond, one sample from an adjoining recycling pond (of Company B), and (ii) temporal variation in five samples collected from a single tailings pond at the same location over a two-week interval (Company A).

Among the most important findings produced by this research are from the infusion-Orbitrap analysis. Samples from the two companies could be readily distinguished from each other in their principal component plots, meaning that the variation between the organic profiles of the two companies' waters was much greater than the variation within companies. Second, the analyses revealed that spatial variability within a pond (Company B) was greater than the temporal variation of sampling at the same location (Company A), although neither of these variabilities was as great as the variation between companies. A limitation of the temporal variation study is that it only considered a two-week period, which is very short, considering that seepage from tailings into groundwater or surface water would occur over a span of years. The authors also showed that using statistics or Venn diagrams to profile the features in each sample, as determined by GCxGC-TOF and HPLC-QTOF, could allow additional differentiation of the samples, by company.

Roy JW, Bickerton G, Frank RA, et al. *Groundwater*, 2016, 54(4): 545

Roy et al.<sup>52</sup> collected two OSPW and 177 shallow groundwater samples between 2009 and 2011 from riparian areas along the Athabasca River and its tributaries around oil sands development. Importantly, the study area included the same groundwater zone previously investigated and reported by Frank et al. 2014<sup>28</sup>, but Roy et al. conducted a much broader survey along the entire length (3 km) of the now-reclaimed tailings pond (this paper called it the 'Study Pond', but it is the former Suncor Pond 1). In fact, five of the six drive-point samples assessed for OSPW-influence by Frank et al.<sup>28</sup> were included here, two of which are referenced as 'likely OSPW affected'. The authors classified all samples as either "pond-site" samples (n=71 samples from six labeled zones, four adjacent to 'study pond' (zones PA, PB, PC, and PD), and two adjacent to other tailings ponds, termed zones EP and MR), or "non-pond" samples (n=54; not near any tailings pond). All samples were analyzed all for major ions, trace metals and SFS profiling (i.e., for bitumen-derived naphthenic acids).

A similar rate of exceedance of various Canadian aquatic life guidelines was found at the pond- and non-pond sites, and statistical analyses showed that pond-site and non-pond sites were indistinguishable for most parameters, except for major ions, certain trace metals, and profiles obtained by synchronous fluorescence spectroscopy (SFS). Geological and potential OSPW influences could not be distinguished based on results for major ions and metals, but similarities in the SFS profiles for fluorine (F), molybdenum (Mo), selenium (Se), and the sodium-chloride (Na:Cl) ratio were noted between a subset of samples from two study pond-site zones (PA and PB), the two OSPW samples, and the two shallow groundwater samples previously documented as 'likely OSPW affected' by Frank et al.<sup>28</sup> The authors acknowledged that the OSPW samples, which were similar in composition, might not be representative of older OSPW, which underwent less recycling. The study authors, scientists from Environment Canada, conclude that these indicators suggest the presence of OSPW-impacted groundwater in zones PA and PB, and that these may be reaching the Athabasca River sediments at more locations than previously documented by Frank et al.<sup>28</sup> The authors explicitly acknowledge the possibility that the samples from zones PA and PB on the west bank of the Athabasca river may be naturally impacted by natural bitumen deposits, which are evident as outcroppings in this area; however, other sources of groundwater, including those on the other side of the river (zone EP, adjacent to a different tailings pond) grouped differently in PCA compared to zones PA and PB.

Sun C, Shotyk W, Cuss CW, et al. *Environ Sci Technol*, 2017. **51**(17): 9524

Sun et al.<sup>2</sup> used HPLC-Orbitrap, with in-line solid-phase extraction to monitor surface water and groundwater upstream and downstream of the surface mining oil sands industrial sites. Consistent with the previous finding of Ross et al.,<sup>18</sup> elevated NA concentrations were detected in McLean Creek (30.1 µg/L) and Beaver River (190 µg/L), two tributaries that are physically impacted by tailings structures. This was suggestive of OSPW seepage, but the authors noted that conclusive differentiation of anthropogenic and natural sources remained difficult. This difficulty was in part due to high NA concentrations and complex bitumen-derived organics observed in natural water located far north of the industry, including very high concentrations in groundwater upwelling into the Athabasca River (i.e., 2 mg/L) and high concentrations in a tributary river (Pierre River, 34.7 µg/L). Despite the evidence for both natural and anthropogenic seepage, it is an important finding that no evidence of any bitumen-derived organics were ever detected at any location in Athabasca River mainstem surface water.

Yi, Y., J. Han, S.J. Birks, et al. *Environ Earth Sci*, 2017. **76**(24): 1

Yi et al.<sup>50</sup> conducted a primarily analytical methodological development of infusion-FTICR-MS, but environmental samples were also examined. The unique aspect of this method was the use of two complimentary water extraction conditions prior to analysis by infusion FTICR-MS in both positive and negative modes. Each sample was extracted under acidic condition (fraction LLE1), but also under alkaline conditions (fraction LLE2). The water samples included six OSPW samples from three oil sands operators, but also some environmental samples defined only as two 'seepages' and two 'lake' waters from unknown locations. As an environmental field study the numbers of samples is small, and the nature of the seepage samples is unknown (i.e., natural versus tailings pond seepage?), thus only a few conclusions can be drawn from the work. One that is consistent with other studies is that differences in the composition of dissolved organics were noted between OSPW samples and environmental water samples, but also among the three oil sands operators. Another general conclusion was that sulfur-containing compounds (SO classes) appear to have great potential to be used for evaluating impact by OSPW.

Harkness JS, Warner NR, Ulrich A, et al. *Appl Geochem* 2018. **90**: 50

Harkness et al.<sup>32</sup> examined isotope patterns from inorganic compounds including of boron ( $\delta^{11}\text{B}$ ), lithium ( $\delta^7\text{Li}$ ), and strontium ( $^{87}\text{Sr}/^{86}\text{Sr}$ ) in various samples of OSPW, groundwater and oil sands leachates, in part to evaluate the potential for these to serve as forensic tracers of OSPW in the region. OSPW was collected directly from six different tailings ponds, while two OSPW samples were collected from associated drainage systems. Groundwater was collected from seven wells from freshwater aquifers, sampled annually from 2010 to 2012. Oil sands leachates were generated in the lab with deionized water and five oil sands solids were collected from open pit mines. The authors also reviewed and compiled published information on the geochemical composition of natural source waters in the region. OSPW samples showed elevated chloride, boron, and lithium concentrations relative to what was detected in the Athabasca River, and could be characterized by narrow ranges of  $\delta^{11}\text{B}$ ,  $\delta^7\text{Li}$ , and  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios, reflecting the saline formation water (Lower Cretaceous) mixing with fresh surface water that had had contact with oil sands. Elevated boron and lithium concentrations, and  $\delta^{11}\text{B}$ ,  $\delta^7\text{Li}$ , and  $^{87}\text{Sr}/^{86}\text{Sr}$  variations were distinct from the analyses of shallow freshwater aquifers, but deeper natural groundwater and saline springs had a wider range of values that were not always distinguishable from those of OSPW. Nevertheless, the authors conclude that these parameters could be a monitoring tool for tracing OSPW release to local freshwater sources.

Huang R, Chen Y, Meshref MNA, et al. *Water Res*, 2018. 128: 129–137 and Huang R, Chen Y, Meshref MNA, et al. *Sci Total Environ*, 2018. 645: 277

These two studies by Huang et al. in 2018<sup>48, 49</sup> involved HPLC-QTOF and infusion-FTICR-MS analysis of the same 30 water samples collected in 2015; the main analytical difference between the studies is that one used liquid-liquid extraction,<sup>49</sup> while the other used solid-phase extraction.<sup>48</sup> The sample sites included three tailings ponds (OSPW) and seven aquifers at Shell Canada Limited's Muskeg River Mine and Jackpine Mines, which started mining in 2003 and 2010, respectively. Each sample was taken at three time points in 2015 (June, August and October). The groundwater sites were either from a deep oil sands basal aquifer (OSBA, five samples, depths of 67 to 144 m) or an overlying Pleistocene channel aquifer (PLCA, two samples, at depths of 45 to 51 m).

In the first study, with liquid-liquid extraction,<sup>49</sup> the authors reported that NA concentrations were highest in OSPW, followed by OSBA, followed by PLCA, thus concluding that NAs in the OSBA samples were not likely from OSPW; the authors made no explicit conclusions on the source of NAs in the PLCA. My strongly felt personal opinion is that conclusions based solely on NA concentrations are not logical, because any contribution from OSPW will be diluted by the natural groundwater in the aquifers. Nevertheless, the principle component analysis of the HPLC-QTOF data suggested that O<sub>2</sub> and O<sub>4</sub> species profiles were different among the three sample types, and FTICR-MS results revealed other compositional differences among the NA species that differentiate OSPW, PLCA, and OSBA. Similar to the findings of the study of Frank et al.,<sup>51</sup> variation in contents of the species detected over the three samples (taken over the five months from June to October) was found to be 'slight'; however, they did not quantify the variation or compare it over time to spatial variability (raw data for each sample was presented in their Figure 3), and they acknowledge that even studies of temporal variation over a longer-term are needed. Overall, no explanation for the source of bitumen-derived organics in the PLCA was provided, whether from OSPW or OSBA. In the second study with solid-phase extraction,<sup>48</sup> very similar data and results are presented, however, the authors noted that the PLCA samples (unlike those from OSPW or OSBA) had no sulfur-containing species. This is thus an ambiguous result, and could mean either that the organics in PLCA are not bitumen-derived, or (more likely) that the sulfur species were simply below the limit of detection for the method used. Overall, the authors do not discuss the source of chemicals in the PLCA samples, and slightly different from the first paper in *Water Research*, the authors acknowledge that current results cannot rule out the presence of OSPW in OSBA.



## Literature Cited

1. Miall, A.D., *The Environmental Hydrogeology of the Oil Sands, Lower Athabasca Area, Alberta*. **Geoscience Canada**, 2013. 40: p. 215-233.
2. Sun, C., W. Shotyk, C.W. Cuss, et al., *Characterization of Naphthenic Acids and Other Dissolved Organics in Natural Water from the Athabasca Oil Sands Region, Canada*. **Environ Sci Technol**, 2017. 51(17): p. 9524-9532.
3. Masliyah, J., Z.J. Zhou, Z.H. Xu, et al., *Understanding water-based bitumen extraction from athabasca oil sands*. **Canadian Journal of Chemical Engineering**, 2004. 82(4): p. 628-654.
4. Rogers, V.V., M. Wickstrom, K. Liber, et al., *Acute and subchronic mammalian toxicity of naphthenic acids from oil sands tailings*. **Toxicol Sci**, 2002. 66(2): p. 347-55.
5. Clemente, J.S. and P.M. Fedorak, *A review of the occurrence, analyses, toxicity, and biodegradation of naphthenic acids*. **Chemosphere**, 2005. 60(5): p. 585-600.
6. Armstrong, S.A., J.V. Headley, K.M. Peru, et al., *Phytotoxicity of oil sands naphthenic acids and dissipation from systems planted with emergent aquatic macrophytes*. **J Environ Sci Health A Tox Hazard Subst Environ Eng**, 2008. 43(1): p. 36-42.
7. Pereira, A.S. and J.W. Martin, *Exploring the complexity of oil sands process-affected water by high efficiency supercritical fluid chromatography/orbitrap mass spectrometry*. **Rapid Commun Mass Spectrom**, 2015. 29(8): p. 735-44.
8. Rowland, S.J., A.G. Scarlett, D. Jones, et al., *Diamonds in the rough: identification of individual naphthenic acids in oil sands process water*. **Environ Sci Technol**, 2011. 45(7): p. 3154-9.
9. Barrow, M.P., J.V. Headley, K.M. Peru, et al., *Fourier transform ion cyclotron resonance mass spectrometry of principal components in oilsands naphthenic acids*. **J Chromatogr A**, 2004. 1058(1-2): p. 51-9.
10. Bataineh, M., A.C. Scott, P.M. Fedorak, et al., *Capillary HPLC/QTOF-MS for characterizing complex naphthenic acid mixtures and their microbial transformation*. **Analytical Chemistry**, 2006. 78(24): p. 8354-8361.
11. Grewer, D.M., R.F. Young, R.M. Whittall, et al., *Naphthenic acids and other acid-extractables in water samples from Alberta: what is being measured?* **Sci Total Environ**, 2010. 408(23): p. 5997-6010.
12. Headley, J.V., M.P. Barrow, K.M. Peru, et al., *Preliminary fingerprinting of Athabasca oil sands polar organics in environmental samples using electrospray ionization Fourier transform ion cyclotron resonance mass spectrometry*. **Rapid Communications in Mass Spectrometry**, 2011. 25(13): p. 1899-1909.
13. Mahaffey, A. and M. Dube, *Review of the composition and toxicity of oil sands process-affected water*. **Environmental Reviews**, 2017. 25(1): p. 97-114.
14. Headley, J.V., K.M. Peru, and M.P. Barrow, *Advances in mass spectrometric characterization of naphthenic acids fraction compounds in oil sands environmental samples and crude oil--A review*. **Mass Spectrom Rev**, 2016. 35(2): p. 311-28.
15. Headley, J.V., K.M. Peru, M.H. Mohamed, et al., *Chemical fingerprinting of naphthenic acids and oil sands process waters-A review of analytical methods for environmental samples*. **J Environ Sci Health A Tox Hazard Subst Environ Eng**, 2013. 48(10): p. 1145-63.
16. Morandi, G.D., S.B. Wiseman, A. Pereira, et al., *Effects-Directed Analysis of Dissolved Organic Compounds in Oil Sands Process-Affected Water*. **Environ Sci Technol**, 2015. 49(20): p. 12395-404.
17. Pereira, A.S., S. Bhattacharjee, and J.W. Martin, *Characterization of oil sands process-affected waters by liquid chromatography orbitrap mass spectrometry*. **Environ Sci Technol**, 2013. 47(10): p. 5504-13.
18. Ross, M.S., S. Pereira Ados, J. Fennell, et al., *Quantitative and qualitative analysis of naphthenic acids in natural waters surrounding the Canadian oil sands industry*. **Environ Sci Technol**, 2012. 46(23): p. 12796-805.
19. Barrow, M.P., M. Witt, J.V. Headley, et al., *Athabasca oil sands process water: characterization by atmospheric pressure photoionization and electrospray ionization fourier transform ion cyclotron resonance mass spectrometry*. **Anal Chem**, 2010. 82(9): p. 3727-35.
20. Barrow, M.P., L.A. McDonnell, X. Feng, et al., *Determination of the nature of naphthenic acids present in crude oils using nanospray Fourier transform ion cyclotron resonance mass spectrometry: the continued battle against corrosion*. **Anal Chem**, 2003. 75(4): p. 860-6.
21. Barrow, M.P., K.M. Peru, B. Fahlman, et al., *Beyond Naphthenic Acids: Environmental Screening of Water from Natural Sources and the Athabasca Oil Sands Industry Using Atmospheric Pressure Photoionization Fourier Transform Ion Cyclotron Resonance Mass Spectrometry*. **J Am Soc Mass Spectrom**, 2015. 26(9): p. 1508-21.
22. Martin, J.W., X. Han, K.M. Peru, et al., *Comparison of high- and low-resolution electrospray ionization mass spectrometry for the analysis of naphthenic acid mixtures in oil sands process water*. **Rapid Commun Mass Spectrom**, 2008. 22(12): p. 1919-24.
23. Barrow, M.P., K.M. Peru, and J.V. Headley, *An Added Dimension: GC Atmospheric Pressure Chemical Ionization FTICR MS and the Athabasca Oil Sands*. **Analytical Chemistry**, 2014. 86(16): p. 8281-8288.

24. Ortiz, X., K.J. Jobst, E.J. Reiner, et al., *Characterization of Naphthenic Acids by Gas Chromatography-Fourier Transform Ion Cyclotron Resonance Mass Spectrometry*. **Analytical Chemistry**, 2014. 86(15): p. 7666-7673.
25. Brunswick, P., D. Shang, G. van Aggelen, et al., *Trace analysis of total naphthenic acids in aqueous environmental matrices by liquid chromatography/mass spectrometry-quadrupole time of flight mass spectrometry direct injection*. **J Chromatogr A**, 2015. 1405: p. 49-71.
26. Brunswick, P., L.M. Hewitt, R.A. Frank, et al., *Specificity of high-resolution analysis of naphthenic acids in aqueous environmental matrices*. **Analytical Methods**, 2016. 8(37): p. 6764-6773.
27. Huang, R., K.N. McPhedran, and M. Gamal El-Din, *Ultra Performance Liquid Chromatography Ion Mobility Time-of-Flight Mass Spectrometry Characterization of Naphthenic Acids Species from Oil Sands Process-Affected Water*. **Environ Sci Technol**, 2015. 49(19): p. 11737-45.
28. Frank, R.A., J.W. Roy, G. Bickerton, et al., *Profiling oil sands mixtures from industrial developments and natural groundwaters for source identification*. **Environ Sci Technol**, 2014. 48(5): p. 2660-70.
29. Holowenko, F.M., M.D. MacKinnon, and P.M. Fedorak, *Characterization of naphthenic acids in oil sands wastewaters by gas chromatography-mass spectrometry*. **Water Res**, 2002. 36(11): p. 2843-55.
30. Scott, A.C., R.F. Young, and P.M. Fedorak, *Comparison of GC-MS and FTIR methods for quantifying naphthenic acids in water samples*. **Chemosphere**, 2008. 73(8): p. 1258-64.
31. Gibson, J.J., S.J. Birks, M. Moncur, et al., *Isotopic and Geochemical Tracers for Fingerprinting Process-Affected Waters in the Oil Sands Industry: A Pilot Study*. Oil Sands Research and Information Network, University of Alberta, School of Energy and the Environment, Edmonton, Alberta. OSRIN Report No. TR-12. 109 pp. 2011.
32. Harkness, J.S., N.R. Warner, A. Ulrich, et al., *Characterization of the boron, lithium, and strontium isotopic variations of oil sands process-affected water in Alberta, Canada*. **Applied Geochemistry**, 2018. 90: p. 50-62.
33. Zhang, Y.F., W. Shatyk, C. Zaccane, et al., *Airborne Petcoke Dust is a Major Source of Polycyclic Aromatic Hydrocarbons in the Athabasca Oil Sands Region*. **Environmental Science & Technology**, 2016. 50(4): p. 1711-1720.
34. Morandi, G.D., S.B. Wiseman, M. Guan, et al., *Elucidating mechanisms of toxic action of dissolved organic chemicals in oil sands process-affected water (OSPW)*. **Chemosphere**, 2017. 186: p. 893-900.
35. Jivraj, M.N., M.D. MacKinnon, and B. Fung, *Naphthenic acids extraction and quantitative analyses with FT-IR spectroscopy*. *Syncrude Analytical Methods Manual*. 4th ed. Syncrude Canada Ltd. Research Department, Edmonton, Alta. 1995.
36. Brown, L.D. and A.C. Ulrich, *Oil sands naphthenic acids: a review of properties, measurement, and treatment*. **Chemosphere**, 2015. 127: p. 276-90.
37. Hughes, S.A., R. Huang, A. Mahaffey, et al., *Comparison of methods for determination of total oil sands-derived naphthenic acids in water samples*. **Chemosphere**, 2017. 187: p. 376-384.
38. Brunswick, P., L.M. Hewitt, R.A. Frank, et al., *A traceable reference for direct comparative assessment of total naphthenic acid concentrations in commercial and acid extractable organic mixtures derived from oil sands process water*. **J Environ Sci Health A Tox Hazard Subst Environ Eng**, 2017. 52(3): p. 274-280.
39. Woudneh, M.B., M.C. Hamilton, J.P. Benskin, et al., *A novel derivatization-based liquid chromatography tandem mass spectrometry method for quantitative characterization of naphthenic acid isomer profiles in environmental waters*. **Journal of Chromatography A**, 2013. 1293: p. 36-43.
40. Yi, Y., J. Gibson, J. Birks, et al., *Comment on "Profiling oil sands mixtures from industrial developments and natural groundwaters for source identification"*. **Environ Sci Technol**, 2014. 48(18): p. 11013-4.
41. Frank, R.A., J.W. Roy, G. Bickerton, et al., *Response to Comment on "Profiling oil sands mixtures from industrial developments and natural groundwaters for source identification"*. **Environ Sci Technol**, 2014. 48(18): p. 11015-6.
42. Ahad, J.M., H. Pakdel, M.M. Savard, et al., *Extraction, separation, and intramolecular carbon isotope characterization of athabasca oil sands acids in environmental samples*. **Anal Chem**, 2012. 84(23): p. 10419-25.
43. Kurek, J., J.L. Kirk, D.C. Muir, et al., *Legacy of a half century of Athabasca oil sands development recorded by lake ecosystems*. **Proc Natl Acad Sci U S A**, 2013. 110(5): p. 1761-6.
44. Zhang, L., I. Cheng, D. Muir, et al., *Scavenging ratios of polycyclic aromatic compounds in rain and snow in the Athabasca oil sands region*. **Atmospheric Chemistry and Physics**, 2015. 15(3): p. 1421-1434.
45. Evans, M., M. Davies, K. Janzen, et al., *PAH distributions in sediments in the oil sands monitoring area and western Lake Athabasca: Concentration, composition and diagnostic ratios*. **Environmental Pollution**, 2016. 213: p. 671-687.
46. Wang, Z., C. Yang, J.L. Parrott, et al., *Forensic source differentiation of petrogenic, pyrogenic, and biogenic hydrocarbons in Canadian oil sands environmental samples*. **J Hazard Mater**, 2014. 271: p. 166-77.

47. Hindle, R., M. Noestheden, K. Peru, et al., Quantitative analysis of naphthenic acids in water by liquid chromatography-accurate mass time-of-flight mass spectrometry. *J Chromatogr A*, 2013. 1286: p. 166-74.
48. Huang, R., Y. Chen, M.N.A. Meshref, et al., Monitoring of classical, oxidized, and heteroatomic naphthenic acids species in oil sands process water and groundwater from the active oil sands operation area. *Sci Total Environ*, 2018. 645: p. 277-285.
49. Huang, R., Y. Chen, M.N.A. Meshref, et al., Characterization and determination of naphthenic acids species in oil sands process-affected water and groundwater from oil sands development area of Alberta, Canada. *Water Res*, 2018. 128: p. 129-137.
50. Yi, Y., J. Han, S.J. Birks, et al., Profiling of dissolved organic compounds in the oil sands region using complimentary liquid-liquid extraction and ultrahigh-resolution Fourier transform mass spectrometry. *Environmental Earth Sciences*, 2017. 76(24): p. 1-13.
51. Frank, R.A., C.B. Milestone, S.J. Rowland, et al., Assessing spatial and temporal variability of acid-extractable organics in oil sands process-affected waters. *Chemosphere*, 2016. 160: p. 303-13.
52. Roy, J.W., G. Bickerton, R.A. Frank, et al., Assessing Risks of Shallow Riparian Groundwater Quality Near an Oil Sands Tailings Pond. *Groundwater*, 2016. 54(4): p. 545-558.
53. Ahad, J.M., H. Pakdel, M.M. Savard, et al., Characterization and quantification of mining-related "naphthenic acids" in groundwater near a major oil sands tailings pond. *Environ Sci Technol*, 2013. 47(10): p. 5023-30.
54. Oiffer, A.A.L., J.F. Barker, F.M. Gervais, et al., A detailed field-based evaluation of naphthenic acid mobility in groundwater. *Journal of Contaminant Hydrology*, 2009. 108(3-4): p. 89-106.
55. Yasuda, N., N.R. Thomson, and J.F. Barker, Performance evaluation of a tailings pond seepage collection system. *Canadian Geotechnical Journal*, 2010. 47(12): p. 1305-1315.
56. Han, X., M.D. MacKinnon, and J.W. Martin, Estimating the in situ biodegradation of naphthenic acids in oil sands process waters by HPLC/HRMS. *Chemosphere*, 2009. 76(1): p. 63-70.
57. Abolfazlzadehdoshanbehazari, M., S.J. Birks, M.C. Moncur, et al., Fate and transport of oil sand process-affected water into the underlying clay till: a field study. *J Contam Hydrol*, 2013. 151: p. 83-92.
58. Ferguson, G.P., D.L. Rudolph, and J.F. Barker, Hydrodynamics of a large oil sand tailings impoundment and related environmental implications. *Canadian Geotechnical Journal*, 2009. 46(12): p. 1446-1460.
59. Hunter, G.P., Investigation of groundwater flow within an oil sand tailings impoundment and environmental implications. M.Sc. thesis, University of Waterloo, Waterloo, Ont. 2001.
60. Stephens, B., C. Langton, and M. Bowron, Design of Tailings Dams on Large Pleistocene Channel Deposits. A Case Study – Suncor's South Tailings Pond. REPORT. [http://www.ccc.org/sites/default/files/submissions/2016\\_2020/17-1-sub-appendix\\_viii\\_-\\_stephens\\_et\\_al\\_-\\_design\\_of\\_tailings\\_dams\\_on\\_large\\_pleistocene\\_channel\\_deposits.pdf](http://www.ccc.org/sites/default/files/submissions/2016_2020/17-1-sub-appendix_viii_-_stephens_et_al_-_design_of_tailings_dams_on_large_pleistocene_channel_deposits.pdf). ?
61. Golder Associates, FINAL REPORT. BEAVER CREEK PROFILING PROGRAM. 2008 FIELD STUDY. Submitted to: Syncrude Canada Ltd. Fort McMurray, Alberta. 2009.
62. Savard, M.M., J.M.E. Ahad, P. Gammon, et al., A local test study distinguishes natural from anthropogenic groundwater contaminants near an Athabasca oil sands mining operation; Geological Survey of Canada, Open File 7195, 140 p., doi:10.4095/292074. 2012.
63. Ahad, J.M.E., H. Pakdel, P.R. Gammon, et al., Evaluating in situ biodegradation of (13)C-labelled naphthenic acids in groundwater near oil sands tailings ponds. *Sci Total Environ*, 2018. 643: p. 392-399.
64. Birks, S.J., M.C. Moncur, J.J. Gibson, et al., Origin and hydrogeological setting of saline groundwater discharges to the Athabasca River: Geochemical and isotopic characterization of the hyporheic zone. *Applied Geochemistry*, 2018. 98: p. 172-190.

## **APPENDIX 5**

### **Canada's Response to Secretariat's Information Request**

Environment and Climate Change Canada

February 15, 2019

Robert Moyer

Head, Submissions on Enforcement Matters and Legal Unit

700 de la Gauchetière Street West, Suite 1620

Montréal, Québec. H3B 5M2

Ref: Information request regarding Submission 17-0001 (Alberta Tailings Ponds II)

Dear Mr. Moyer,

Environment and Climate Change Canada (ECCC) is pleased to respond to your December 19, 2018 information request in support of the Submission SEM-17-001 (Alberta Tailings Ponds II).

As part of this process, ECCC consulted internally, as well as with the Canadian Environmental Assessment Agency (CEAA), and Alberta Environment and Parks (AEP), to provide documents on the requested matters. Records maintained by Alberta Energy Regulator are also included in our response.

Please find below a description of the material that responds to your information request. A bibliographical list of these documents is provided in Annex I and electronic copies of these documents will be uploaded in a cloud storage platform.

- A. The state of the publicly available peer-reviewed science on identifying differences between naturally-occurring, bitumen-influenced water and anthropogenic oil sands process-affected water**  
*Records from 2015 and subsequent years, which discuss, summarize, or reference publicly available peer-reviewed science on identifying differences between naturally-occurring, bitumen-influenced water and anthropogenic oil sands process-affected water.*

The records search revealed no new peer reviewed literature on differences between naturally-occurring, bitumen-influenced water and anthropogenic oil sands process-affected water since Canada's response to the Submission SEM-17-001 in November 2017. Please refer to the bibliographical list of relevant literature included in Canada's response in November 2017(Annex I).

- B. Alberta's relationship with Canada with respect to the assertions and specific sites referred to in the submission, as well as other specific sites mentioned in Canada's response**

- 1. Written agreements between Canada and Alberta regarding the enforcement of section 36(3) of the Fisheries Act or intergovernmental cooperation involving tailings ponds associated with oil sands facilities, including all policies, directives, guidelines or other documents interpreting, implementing, or referencing these agreements or the relationship/cooperation between Canada and Alberta on the regulation of tailings ponds.**

There are three written agreements on notifications (Annex I).

- 2. Records evidencing communication between Canada and Alberta which discuss the specific oil sands facilities referenced in the submission and Canada's response to the submission.**

The search revealed no communication records with the province of Alberta with respect to the specific oil sands facilities referenced in the submission. ECCC's inspections in the oil sands region on possible leaking from the oil sands tailings ponds were conducted independently, and focused solely on compliance with the federal *Fisheries Act*. These inspections do not address provincial legislation.



3. *Records created since 2008 related to the Management Committee established under section 6 of the Canada-Alberta Administrative Agreement for the Control of Deposits of Deleterious Substances under the Fisheries Act, including those related to the responsibilities of the Management Committee (see 6.3 of the agreement) and those related to the annual report (see section 6.3 (8) of the agreement).*

A complete account of ECCC activities relevant to the specific sites was provided in Canada's November 2017 response. No further relevant records were identified.

4. *Records from the Province of Alberta which describe Alberta's legal and regulatory program relating to the leaking of deleterious substances into Alberta waters and which may relate to the Alberta's relationship with Canada under section 36(3) of the Fisheries Act, including records which discuss any differences between the federal program under the Fisheries Act and the Alberta provincial program, and any records relating to the transfer of enforcement responsibility from AEP to AER (including the responsibilities of the Dam Safety Branch).*

No relevant records were identified on Alberta's legal and regulatory program relating to the leaking of deleterious substances into Alberta waters and which may relate to the Alberta's relationship with Canada under section 36(3) of the Fisheries Act.

5. *Records relating to any recommendations or follow-up programs established through the joint environmental assessment process for mineable oil sands projects relating to the potential release of substances from tailings ponds into waters regulated by Canada or Alberta.*

A decision statement and two reports have been provided (Annex 1).

6. *Records relating to any intent to develop a set of applicable effluent regulations under section 36 (5 or 5.1) of the Fisheries Act related to oil sands tailings ponds, including the scope of said potential regulations.*

Two documents were identified (Annex 1).

7. *Records related to the notification requirements of section 38(5) of the Fisheries Act requiring notification of a deposit of a deleterious substance in waters frequented by fish that is not authorized under section 36(3).*

No relevant records were identified. Substances in tailing ponds are not regulated under the Environmental Emergency Regulations.

**C. How the Oil Sands Monitoring Program (formerly the Joint Oil Sands Monitoring Program) is carried out and how it fits into Canada's enforcement of the Fisheries Act.**

1. *Policies and/or guidance documents relating to the implementation of the monitoring program and how it relates to the enforcement of section 36(3) of the Fisheries Act.*

No relevant records were identified. For further clarity, the Oils Sand Monitoring Program does not have a regulatory or enforcement mandate. It provides relevant, credible science to decision makers by collecting water quality data through the region. However, the program does not collect water samples on industrial sites but rather in the receiving environment; as such the water quality in tailing ponds is not monitored.

2. *Records relating to instances in which the governments of Alberta and Canada requested from or shared information with each other relating to the regulation of oil sands tailings ponds.*

No relevant records were identified.

3. *Monitoring data records from 2017 and 2018 for the Suncor Tar Island Pond I and the Syncrude Canada Limited Aurora Operation tailings ponds and related to any exceedances of any applicable water quality standards or guidelines, under either federal or provincial law.*

No relevant records were identified.

4. *Records relating to any proposed or implemented changes to the monitoring program which relate to the enforcement of section 36(3) of the Fisheries Act.*

No relevant records were identified.

5. *Records relating to any OSMP project regarding methods for monitoring bitumen-influenced waters in the Athabasca region relating to tailings ponds, including:*

- a. records relating to the distinction between industrially-derived chemicals from those that are naturally occurring in waters;*
- b. records relating to whether such project is ongoing, whether it is currently funded, and, if it is not currently funded, why it is not;*
- c. records relating to any data results or data collection efforts relating to such project; and,*
- d. records relating to the establishment of an analytical toolbox as identified on pages 21-23 of Canada's response to the Submission.*

Forty nine records were identified (Annex I).

Several OSMP projects pursued in 2018/2019, and related either directly or indirectly to distinguishing 'industrially-derived chemicals from those that are naturally occurring in waters' were funded. Web links are provided for six projects (Annex I).

Publically available data from OSMP are available on the web (Annex I).

6. *Records relating to the enforcement of Alberta's provincial regulatory program under the Alberta Environmental Protection and Enhancement Act (EPEA) with respect to the release of any substance into tailings ponds or from tailings ponds into waters in the Athabasca region which may violate the EPEA.*

AEP indicated that during 2017 and 2018, there has been no enforcement of EPEA related to the release of any substance into tailings ponds or from tailings ponds into waters in the Athabasca region. AEP provided a copy of the EPEA and web links associated to the management and inspection of tailing ponds in the Athabasca region.

Should you have additional questions on the documents provided to respond to the information request, please contact Daniel Hallman for ECCC at [Daniel.hallman@canada.ca](mailto:Daniel.hallman@canada.ca) or 819-938-3763.

Sincerely,

Isabelle Bérard

Assistant Deputy Minister

International Affairs Branch

Environment and Climate Change Canada

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Gatineau, Quebec. K1A 0H3

## **APPENDIX 6**

### **Canada's Supplemental Response to Secretariat's Information Request**

**Canada's response follows each question from the Secretariat:**

**Question B-1)**

1. **If Canada and Alberta have established a management committee under the 2017 (or any prior) notification agreement, please provide all relevant documents with respect to the operations of the Committee and the implementation of the agreement. If no committee has been established, please confirm.** Canada and Alberta have not formally established the Management Committee with Alberta as detailed within the 2017 Notification Agreement.
2. **If Canada and Alberta have developed standard operating procedures under the 2017 (or any prior) notification agreement as provided for under paragraph 4.4.1, please provide a copy of these SOPs.** Please consult the attached standard operating procedures (SOP).

**Question B-3)**

1. **Does Canada have any records evidencing implementation of the 1994 *Administrative Agreement for the Control of Deposits of Deleterious Substance under the Fisheries Act (Administrative Agreement)*, whether or not these implementing measures reference tailings ponds?** Since the establishment of the 1994 *Administrative Agreement for the Control of Deposits of Deleterious Substance under the Fisheries Act (Administrative Agreement)*, ECCC has taken action and implements programs that align with its objectives. Examples include the establishment of the 2017 *Canada-Alberta Notification Agreement*, which amends the 1994 *Canada-Alberta Administrative Agreement*, the provided SOPs, and the two notification regulations (*Deposit Out of the Normal Course of Events Notification Regulations* under the *Fisheries Act*; *Release and Environmental Emergency Notification Regulations* under the *Canadian Environmental Protection Act*, 1999). In addition, ECCC through its National Environmental Emergencies Centre (NEEC) has and continues to work closely with Alberta, in their role as the lead agency, to provide science and technical advice to support response to incidents occurring in that jurisdiction. The extent to which science and technical services are provided depends on the circumstances of the incident, but can include the provision of atmospheric modelling, identification of environmental sensitivities and site-specific weather forecasting, among other scientific information. The attached SOP is an example of us documenting such support.
2. **Has a Management Committee been established under the *Administrative Agreement*? Is there documentation evidencing any meetings of the Management Committee? If so, please provide.** A management committee was established as per the above agreement and the titles of members were identified in the *Administrative Agreement*. There are electronic files between 1998 and 2004 regarding management committee meetings, *Fisheries Act* yearly reports as per the agreement as well as other letters related to the agreement. The electronic files were shared on the CEC SharePoint folder; please refer to the attached list of documents.
3. **Please provide any records related to any “collaborative arrangements” (section 5) developed by the Management Committee of the *Administrative Agreement*, including any records pertaining to the sharing of information between provincial and federal regulatory authorities?** 10 electronic files covering the period between 1998 and 2004 pertaining to the reporting requirement as per the Agreement (Annual Report on the Canada-Alberta Agreement or the Control of Deposits of Deleterious Substances under the *Fisheries Act*) were shared on the CEC SharePoint folder.

#### Question B-1) and B-3)

*Regarding Canada's lack of production of documents under Questions B1 and B3 above, please note that the scope of Secretariat's original requests for relevant documents was for any document that would be applicable to carrying out the administrative and notification agreements, not just those documents which specifically reference tailings ponds.*

1. **Based on Canada's original response, it appears to the Secretariat that there is no evidence that Canada and Alberta have memorialized in writing any relationship regarding subsection 36(3) of the *Fisheries Act* except for the 1994 Administrative Agreement and the subsequent notification agreements (and regulations) amending that agreement. Is that correct? If this is not correct, please provide documentation demonstrating otherwise.** The statement saying that "there is no evidence that Canada and Alberta have memorialized in writing any relationship regarding subsection 36(3) of the *Fisheries Act* except for the 1994 Administrative Agreement and the subsequent notification agreements (and regulations) amending that agreement" is not correct.

As stated within the document, the 2017 Canada-Alberta Notification Agreement amends the 1994 Canada-Alberta Administrative Agreement for the Control of Deposits of Deleterious Substances under the *Fisheries Act*, with respect to the notification of environmental occurrences. In addition, ECCC has established standard operating procedures (SOP) with Alberta regarding notifications (see the document attached to this email).

#### Question B-2)

*Canada's search "revealed no communication records with the province of Alberta with respect to the specific oil sands facilities [...]".*

1. **Based on this response, it appears to the Secretariat that there was no coordination between ECCC and any Alberta provincial agency during ECCC's proactive inspections of tailings ponds between 2009 and 2014. Please confirm.** ECCC's inspections in the oil sands region on possible leaking from the oil sands tailings ponds were conducted independently, and focused solely on compliance with the federal *Fisheries Act*. As these inspections do not address provincial legislation, they did not require coordination with the province.
2. **At any time prior to, during, or after Canada's inspections of the tailings ponds did Environment Canada have access to and/or knowledge of the Oil Sands Monitoring Reports required under Alberta's *Environmental Protection and Enhancement Act (EPEA)* approvals? If so, were these reports used in any way in carrying out the proactive inspections?** The inspections in the oil sands occurred over a number of years. ECCC enforcement reviewed the oil sand monitoring reports during the inspections for added context. However, the inspections were conducted independently and the conclusions were based on sample data collected by ECCC.
3. **Since 2008, has there been any data, monitoring, or other relevant documentation pertaining to provincially mandated industry monitoring relating to oil sands facilities that has been shared by Alberta regulatory authorities with Environment Canada (and later ECCC)? If so, please provide relevant examples.** In 2018, Alberta shared the 2017 Annual Waste Water Reports submitted by operating oil sands mines. This information was requested by ECCC officials to inform oil sands effluent regulatory development.



4. **Has industry shared any monitoring information it collects pursuant to provincial approvals with Environment Canada or ECCC? If so, please provide relevant examples.** Industry has not shared with ECCC any of the monitoring information that it collects pursuant Alberta provincial approvals.

**Question B-4)**

**Please provide any records the Alberta Energy Regulator has shared with ECCC regarding surface or ground-water monitoring data from oil sands facilities.** Note that during 2017 and 2018, there has been no enforcement of the *Environmental Protection and Enhancement Act* as it relates to the release of any substance into tailings ponds or from tailings ponds into waters in the Athabasca region.

Other records that the Alberta Energy Regulator has shared with ECCC include the following:

- General information regarding tailings management in Alberta for the year 2017 can be accessed from: <https://www.aer.ca/providing-information/by-topic/tailings/tailings-management>.
- General Compliance and Inspection Information, including incidents, investigations, compliance activities and enforcement actions, can be accessed through this link: [Compliance Dashboard](#)
- A list of incidents (complaints and releases) associated with wells, pipelines and facilities reported to the Alberta Energy Regulator can be accessed through this link: [Field Surveillance Incident Inspection List](#)

Note that groundwater monitoring reports are not accessible online; however, the reports can be requested under Routine Disclosure. The reports are housed in Alberta Environment and Parks' Electronic Record keeping System (ERKS).

1. **Upon the formation of the Alberta Energy Regulator, please provide any documents exchanged between any Alberta provincial agency and ECCC on how Alberta's obligations under the 1994 Administrative Agreement would change, if at all.** Canada's response provided on November 10, 2017 addresses this question. The information was included in page 31 of the Canada's initial response. There have been no changes concerning the obligations under the 1994 Administrative Agreement.

**Question B-7)**

1. **ECCC states that substances in tailings ponds are not regulated under the Environmental Emergency Regulations. Please provide any documents which confirm this statement, as well as whether substances in tailings ponds are also not regulated under the Deposit Out of a Normal Course of Events Notification regulations.** The referenced Deposit Out of the Normal Course of Events Notification Regulations (under the *Fisheries Act*), as well as the Release and Environmental Emergency Notification Regulations (under the *Canadian Environmental Protection Act, 1999*) do not regulate substances but rather designate persons who can receive notifications in compliance with notification requirements found in their enabling legislation.

The statement provided in the letter of February 15, 2019, in response to B7 with respect to the Environmental Emergency Regulations needs further explanation. With respect to the *Canadian Environmental Protection Act, 1999* (CEPA), the notification requirements under Section 201(1)(a) are triggered "Subject to any regulations

made under subsection 200(1) or any interim orders made under section 200.1, if there occurs an environmental emergency in respect of a substance on a list established under the regulations or interim orders”. The Environmental Emergency Regulations, provide for an exemption for tailings with respect to Emergency Plan provisions. However, a person is not exempted from notifying under Section 201(1)(a) of CEPA for an environmental emergency involving a substance on Schedule 1 of those regulations. The applicability of Section 201(1) in relation to tailing ponds depends on the specific circumstances.

2. **If any substance from tailings ponds is deposited into a water frequented by fish or a place from which it may enter such waters, and is therefore a potential violation of subsection 36(3) of the *Fisheries Act*, is it Canada’s conclusion that such a deposit would not trigger the notification requirements of the regulations cited above or be covered under the notification agreement ECCC has with Alberta? Please provide any documentation or explanation regarding this conclusion.** ECCC is responsible for administering and enforcing the pollution prevention provisions of the *Fisheries Act*, which prohibit the deposit of deleterious substances into water frequented by fish, unless authorized by regulations made under the *Fisheries Act* or under another act of Parliament. Section 38(5) of the *Fisheries Act* requires a person to notify an officer or prescribed authority if there occurs a deposit of a deleterious substance in water frequented by fish that is not authorized under this Act, or if there is a serious and imminent danger of such an occurrence, and detriment to fish habitat or fish or to the use by humans of fish results or may reasonably be expected to result from the occurrence. When enforcement officers find evidence of an alleged contravention, they may take enforcement measures in accordance with the Compliance and Enforcement Policy for the Habitat Protection and Pollution Prevention Provisions of the *Fisheries Act*.

#### **Additional follow-up questions**

1. **Oil sands groundwater monitoring reports produced by industry show that oil sands process affected water is seeping into groundwater on the basis of analysis and measurement that does not include the use of chemical fingerprinting methods but rather compares various contaminant concentrations against established background levels. Please provide any ECCC documents that discuss the potential relevance and/or efficacy of this type of analysis and whether it can be used to determine whether OSP is seeping into groundwater.** In email exchanges with your office, you referred us to a report prepared by Syncrude, which was shared with the CEC in the original response. This report refers specifically to use of chloride to detect and define Oil Sands Process-affected Water (OSPW) seepage at the Aurora tailings pond. The premise here is the use of simple, conventional types of analyses that do not involve sophisticated chemical fingerprinting for seepage detection. Generally, the use of conventional parameters (such as chloride) work well where you have on-site groundwater monitoring and/or site access, and where the local hydrogeological setting permits the use of routinely-measured parameters to distinguish OSPW from background. Where these conditions are not met, more sophisticated approaches need to be employed. ECCC documents that refer to the relevance and/or efficacy of this type of analysis can be found in the following two documents:
  - 1) Oil Sands Monitoring Program Technical Report Series 1.5 - Assessments of Groundwater Influence on Selected River Systems in the Oil Sands Region of Alberta - This publically available report states the following:

“A primary knowledge gap is how to identify with strong certainty the presence of OSPW-affected groundwater in river water receptors (including river waters, sediments and associated aquatic organisms), especially in cases where detailed on-site groundwater monitoring is not available.”

- 2) Hewitt et al., 2019, Advances in distinguishing groundwater influenced by Oil Sands Process-affected Water (OSPW) from natural bitumen-influenced groundwaters - This draft manuscript, which is pending publication, states the following:

“In the case of the Mildred Lake Settling Basin (MLSB) containment, an OSPW-affected groundwater plume has been distinguishable from ambient local groundwater by elevated concentrations of routinely-measured parameters, including salts or NAs. However, detecting potential seepage at other ponds is hindered by several factors. Firstly, inorganic and organic OSPW compositions closely resemble those in natural bitumen-affected groundwater within the McMurray geological formation. Further, as the caustic aqueous extraction of bitumen does not require the addition of industrial additives, potential tracers of OSPW migration are not readily available. Finally, despite recent discoveries of adamantane, bicyclic naphthenic acids (NA), and alicyclic, aromatic and sulfur-containing acids in OSPW, there are few commercially available authentic standards of OSPW constituents, hampering efforts to develop and standardize analytical methodologies for NAs and seepage detection.”

“While this plume can be distinguished from the surrounding and relatively-pristine groundwater by routine analyses (i.e., major ions, ammonium, and total NAs), it is nevertheless important that potential OSPW-tracers, such as the Family A and B compounds, be assessed in their ability to identify OSPW-affected groundwater throughout the length of the plume.

2. **Please provide any documents evidencing any role industry or provincial monitoring information played in Canada’s 2009-2014 inspections of oil sands facilities.** ECCC’s inspections in the oil sands region on possible leaking from the oil sands tailings ponds were conducted independently (without the involvement of the industry or provincial authorities), and focused solely on compliance with the federal *Fisheries Act*.
3. **In CAPP’s response to the Secretariat’s information request, documents from Syncrude, referenced on pages 53 and 54 of the response, indicate 19 site releases and reported incidents at the Aurora oil sands plant of various substances, including OSPW, bitumen, and tailings (cumulatively, several thousand meters of volume). Were any of these releases reported to ECCC, either directly from Syncrude or from the Alberta Energy Regulator and/or Alberta Environment and Parks?** No notification records have been identified with respect to the referenced releases. The referenced releases in Syncrude’s submission include the following two assessment statements “Not expected to adversely affect groundwater due to release contained within industrial waste water system” and “Not expected to adversely affect groundwater due to majority of release contained within industrial waste water system with the remaining being removed immediately from soil and disposed of.”

Given this context, it suggests that the series of releases noted in the Syncrude submission on pages 53 and 54 were likely deemed to not have triggered S36(3) of the *Fisheries Act*, which could account for the non-reporting of these releases to ECCC under these provisions.

With respect to *Canadian Environmental Protection Act*, 1999 (CEPA), the notification requirements under Section 201(1)(a) are triggered “if there occurs an environmental emergency in respect of a substance on a list established under the regulations or interim orders.” Given these releases occurred in 2017, the Environmental Emergency Regulations in force at that time would be relevant. The applicability of Section 201(1) of CEPA in relation to tailing ponds depends on the specific circumstances.

## **APPENDIX 7**

### **Canada-Alberta Agreement for the Control of Deposits of Deleterious Substances under the *Fisheries Act***

Source: <http://www.ec.gc.ca/ee-ue/default.asp?lang=En&n=26F90F87-1>

**Canada-Alberta Administrative Agreement for the Control of Deposits of Deleterious Substances under the Fisheries Act**

**This agreement between**

**THE GOVERNMENT OF CANADA** as represented by the Minister of Fisheries and Oceans and the Minister of Environment (herein referred to as “Canada”)

**OF THE FIRST PART**

**AND**

**THE GOVERNMENT OF ALBERTA** as represented by the Minister of Environmental Protection (herein referred to as “Alberta”)

**OF THE SECOND PART**

**WHEREAS**, both Canada and Alberta recognize that sustainable development and social wellbeing depend upon the preservation of a high standard of environmental quality;

**AND WHEREAS**, the Canadian Council of Ministers of the Environment have endorsed the Statement of Interjurisdictional Cooperation on Environmental Matters to provide an overall framework for effective intergovernmental cooperations on environmental matters;

**AND WHEREAS**, the Canadian Council of Ministers of the Environment have endorsed the National Commitment to Pollution Prevention as a key component of environmental protection and sustainable development;

**AND WHEREAS**, both Canada and Alberta are committed to minimizing duplication and overlap, and maximizing cooperation and coordination for environmental matters;

**AND WHEREAS**, Section 5 of the Department of Fisheries and Oceans Act enables the federal Minister of Fisheries and Oceans, with the approval of the Governor in Council, to enter into agreements with a provincial government respecting the carrying out of programs for which the Minister of Fisheries and Oceans is responsible;

**AND WHEREAS**, Section 7 of the Department of Environment Act enables the federal Minister of Environment, with the approval of the Governor in Council, to enter into agreements with a provincial government respecting the carrying out of programs for which the Minister of Environment is responsible;

**AND WHEREAS**, Section 20 of the Environmental Protection and Enhancement Act (EPEA) enables the Minister of Environmental Protection to enter into agreements with the Government of Canada relating to any matter pertaining to the environment;

**AND WHEREAS**, the Governor in Council, by Order in Council P.C. 1994-879, dated May 26, 1994, has authorized the federal Minister of Fisheries and Oceans and the federal Minister of the Environment to enter into this Agreement with Alberta;

**NOW THEREFORE**, Canada and Alberta agree as follows:



## **1.0 DEFINITIONS FOR THIS AGREEMENT AND THE ANNEXES HERETO:**

“Access to Information Act” means the Access to Information Act R.S. 1985 c. A-1 as amended;  
“Agreement” means the Canada - Alberta Administrative Agreement for the Control of Deposits of Deleterious Substances under the Fisheries Act;  
“annual report” means the state of the environment report prepared annually pursuant to section 15 of EPEA;  
“approval” means an “approval” as defined in section 1(f) of EPEA;  
“authorization” means an authorization issued under the Pulp and Paper Effluent Regulations (PPER);  
“Authorization Officer” means the official named in Column II of Schedule V of the PPER;  
“CEPA” means the Canadian Environmental Protection Act; R.S. 1985 c.16 (4th supp.) as amended;  
“deleterious substance” means “deleterious substance” as defined in subsection 34(1) of the Fisheries Act;  
“deposit” means “deposit” as defined in subsection 34(1) of the Fisheries Act;  
“DFO” means the Federal Department of Fisheries and Oceans;  
“EC” means the Federal Department of the Environment (Environment Canada);  
“EPEA” means the Environmental Protection and Enhancement Act, S.A. 1992 c. E-13.3;  
“EP” means the provincial Department of Environmental Protection;  
“federal lands” means “federal lands” as defined in section 52 of the CEPA;  
“federal works and undertakings” means “federal works and undertakings” as defined in section 52 of the CEPA;  
“Fisheries Act” means the Fisheries Act R.S. 1985, c.F-14, as amended;  
“fish habitat” means “fish habitat” as defined in subsection 34(1) of the Fisheries Act;  
“inspector” means an “inspector” as defined under clause 1(gg) of EPEA and subsection 38(1) of the Fisheries Act;  
“investigator” means an “investigator” as defined under clause 1(hh) of EPEA;  
“PERT” means the Alberta Environmental Protection Pollution Emergency Response Team;  
“Privacy Act” means the Privacy Act; R.S. 1985 c. P-21 as amended;  
“PPER” means the Pulp and Paper Effluent Regulations made pursuant to the Fisheries Act, SOR/92-269 as amended;  
“release(s)” means a release that is required to be reported under section 99 of EPEA and under section 3 of the Release Reporting Regulation AR 117/93 as amended by AR 247/93 and deposits of deleterious substances which are required to be reported pursuant to subsection 38(4) of the Fisheries Act and the PPER;  
“Technical Advisory Panel” means the panel established pursuant to Annex 1 to EPS 1/RM/18 describing aquatic environmental effects monitoring requirements at pulp and paper mills and off-site treatment facilities regulated under the PPER;  
“water frequented by fish” means “water frequented by fish” as defined in subsection 34(1) of the Fisheries Act.

## **2.0 PURPOSE**

**2.1** The purpose of this Agreement is to establish the terms and conditions for the cooperative administration of subsection 36(3) and the related provisions of the Fisheries Act, the regulations under the Fisheries Act designated in the annexes, and the EPEA.

## **3.0 OBJECTIVE**

**3.1** The objective of this Agreement is to streamline and coordinate the regulatory activities of Canada and Alberta in relation to the protection of fisheries and to reduce duplication of regulatory requirements for the regulated sector.

## **4.0 PRINCIPLES OF COOPERATION**

**4.1** The principles of this Agreement are:

**COMMITMENT TO ACTION** the Parties to this Agreement recognize that they are committed to act on environmental matters within their respective areas of jurisdiction while respecting the jurisdiction of other governments.

**COLLABORATION** to maximize efficiency and effectiveness, the Parties are committed to recognizing each other's strengths and capabilities and to cooperate in the harmonization of environmental legislation, regulations, policies, programs and projects.

**CONSULTATION** where one Party's legislation, regulations, policies, programs and projects affect the other Party's jurisdiction, the Parties undertake to provide one another with timely notification and appropriate consultation.

**TRANSBOUNDARY ENVIRONMENTAL EFFECTS** recognizing the transboundary nature of the environment, the Parties undertake to cooperate in the management of environmental issues that traverse jurisdictional boundaries within Canada.

**SERVICE TO STAKEHOLDERS** the Parties undertake to provide improved service to all stakeholders by minimizing duplication and overlap of operational activities and providing single window delivery to the fullest extent possible.

**INFORMATION SHARING** each Party agrees to share information with the other Party relating to the administration of their respective legislation subject to each Party's legislated requirements and to protect confidential business and personal information.

**EMERGENCY RESPONSE** the Parties undertake to continue to cooperate in ensuring an immediate and coordinated response to environmental emergencies.

**COST SHARING** each Party will bear its own costs in relation to this Agreement. Each Party's financial obligation under this Agreement is subject to sufficient funds being appropriated and allocated to the respective Party for the purposes of this Agreement. Where one Party carries out work, by prior agreement between the Parties, that is identified as solely of interest to the other Party, the Party not carrying out the work will reimburse the Party carrying out the work for its incremental costs in carrying out that work. Environment Canada's financial obligation under this Agreement is subject to the approval of the Treasury Board, Government of Canada and to sufficient funds being appropriated and allocated.

## **5.0 ACTIVITIES**

**5.1** The Parties agree to establish detailed collaborative arrangements for a variety of activities related to the administration of their respective legislation. Such collaborative arrangements shall be detailed separately as annexes which form part of this Agreement.

**5.2** Without limiting this Agreement, the following activities shall be considered as appropriate subjects for detailed collaborative arrangements:

**MONITORING** the Parties may agree to develop complementary and cooperative monitoring programs with provisions for information sharing. Such programs can be used to evaluate and detect trends in environmental quality and to determine the effectiveness of pollution control programs.

**RESEARCH** the Parties may agree to develop complementary and cooperative research programs with provisions for information sharing.

**PUBLICATIONS** the Parties may agree to cooperate in the publication of reports arising from their respective activities in the administration of EPEA and the Fisheries Act.

**CONFERENCES** the Parties may agree to cooperate in the organization and sponsorship of conferences, meetings and symposia dealing with fisheries, environmental quality and toxic substance issues of both national and regional interest.

**INFORMATION SHARING** the Parties may agree to procedures for sharing information related to the administration of their respective legislation. The Parties may also agree to share confidential business and personal information to the extent permitted by their respective legislation and on the understanding that the legislated confidentiality requirements of each Party will be fully respected.

**RELEASES** the Parties may agree to immediately inform each other of releases that are required to be reported pursuant to their respective legislation and releases that violate the requirements of their respective legislation. The Parties may also agree to coordinate their response to such releases.

**INSPECTION** the Parties may agree to coordinate their inspection activities in order to make better use of limited resources and to reduce the administrative burden for those subject to both federal and provincial requirements.

**INVESTIGATION AND ENFORCEMENT** the Parties may agree to cooperate in the investigation of offences and in taking enforcement actions in response to violations of their respective legislation. Such cooperation may involve, but is not limited to the sharing of technical and compliance data and the attendance in court of inspectors, analysts and expert witnesses.

**REPORTING** the Parties agree to share such information as will enable each to meet its statutory reporting obligations to the Legislature or Parliament, as the case may be.

**ADMINISTRATION OF REGULATIONS** the Parties may agree to specific arrangements and roles in the administration of regulations made pursuant to the Fisheries Act and regulations made pursuant to EPEA.

## **6.0 MANAGEMENT COMMITTEE**

**6.1** A Management Committee shall be established to direct the implementation of this Agreement. The membership of the Committee shall include an equal number of federal and provincial officials appointed respectively by the Parties. The Management Committee shall be co-chaired by one federal and one provincial member.

**6.2** The membership of the Management Committee shall be prescribed in annex 1.

**6.3** The responsibilities of the Management Committee shall include:

1. implementing this Agreement;
2. establishing terms of reference to guide its activities;
3. developing collaborative arrangements for activities such as those listed in section 5.2 and detailing those arrangements in annexes to this Agreement;
4. establishing a mechanism whereby disagreements between the Parties can be addressed in accordance with the legislative obligations of each Party;
5. making cost sharing arrangements for the implementation of this Agreement in accordance with the Principles of this Agreement;
6. establishing a cooperative approach to public communications and media inquiries arising from the activities undertaken pursuant to this Agreement;
7. evaluating the administration of this Agreement on a regular basis and preparing recommendations for its revision and amendment as appropriate;

8. reviewing and preparing a report on the administration of this Agreement on an annual basis to satisfy the statutory reporting requirements of the Parties.

**6.4** Decisions of the Management Committee shall be taken on the basis of unanimous consent amongst the Committee members.

## **7.0 TERM OF THE AGREEMENT**

**7.1** This Agreement, including annexes 1, 2, 3, 4, and 5, shall enter into force on the 1st day of September, 1994 and shall remain in force until terminated by one or both Parties.

## **8.0 AMENDMENT OF THE AGREEMENT**

**8.1** This Agreement or any annexes may be amended from time to time subject to the approval of the Governor in Council.

## **9.0 TERMINATION OF THE AGREEMENT**

**9.1** This Agreement and Annexes may be terminated by either Party giving to the other Party at least six (6) months written notice of its intention to terminate the Agreement.

**IN WITNESS WHEREOF**, this Agreement has been executed on the day of , 1994 on behalf of Canada by the Minister of Fisheries and Oceans and the Minister of the Environment and on behalf of Alberta by the Minister of Environmental Protection.

### **IN THE PRESENCE OF:**

#### **GOVERNMENT OF ALBERTA**

\_\_\_\_\_  
Witness

\_\_\_\_\_  
Minister of Environmental Protection  
Approved pursuant to the Alberta  
Department of Federal and  
Intergovernmental Affairs Act

\_\_\_\_\_  
Witness

\_\_\_\_\_  
Minister of Federal and  
Intergovernmental Affairs  
**GOVERNMENT OF CANADA**

\_\_\_\_\_  
Witness

\_\_\_\_\_  
Minister of Fisheries and Oceans

\_\_\_\_\_  
Witness

\_\_\_\_\_  
Minister of the Environment and  
Deputy Prime Minister

## **Annex 1**

### **Management Committee**

#### **1.0 Purpose and Responsibilities:**

**1.1** The Management Committee is responsible for ensuring this Agreement is implemented and for the development of collaborative arrangements for the various activities identified in this Agreement.

**1.2** Collaborative arrangements developed by the Management Committee will be recommended to the Federal and Provincial Ministers for inclusion as annexes to this Agreement.

**1.3** The Management Committee may establish joint federal- provincial working groups for purposes of developing collaborative draft arrangements.

**1.4** The Management Committee may discuss and develop proposals, for consideration by the Ministers of EP, EC and DFO, for cost sharing in respect of any of the annexes in accordance with the Principles of this Agreement.

#### **2.0 Resolution of Disagreements**

**2.1** Any disagreements between the Parties pursuant to the administration and implementation of this Agreement should be resolved as soon as practicable.

**2.2** Disagreements may be resolved through oral or written communication between the cochairpersons or at a regular or specially called meeting of the Management Committee.

**2.3** Failure to resolve an issue at this level will result in the issue being forwarded to the Regional Director General, Central and Arctic Region, for the Department of Fisheries and Oceans, the Regional Director General, Prairie and Northern Region, for the Department of the Environment, and one or more of the Assistant Deputy Ministers of the Department of Environment Protection.

**2.4** Where a consensus cannot be reached, each Party shall be free to take whatever action it considers necessary and appropriate under its own legislation, after providing reasonable notice to the other Party of the nature and timing of such action.

#### **3.0 Public Communications**

**3.1** Where possible, public communications and media inquiries, arising from the activities undertaken pursuant to this Agreement, will be coordinated by the co-chairpersons.

**3.2** Special arrangements for public communications or media inquiries may be developed for specific annexes.

**3.3** Where one co-chairperson responds to public communications and media inquiries without prior consultation with the other Party, that co- chairperson will inform the other co-chairperson and other committee members, as soon as possible.



#### **4.0 Meetings**

**4.1** The Management Committee will meet a minimum of once (1 time) per year to evaluate the administration and implementation of this Agreement and the annexes and if necessary provide recommendations for its revision and updating as appropriate.

**4.2** The annual meeting will be held in April of each year or as mutually agreed to by the cochairpersons and will include the review of the administration of this Agreement and the preparation of a report to satisfy the statutory reporting requirements set out in the respective federal and provincial legislation.

#### **5.0 Membership**

**5.1** The Committee shall be comprised of three (3) federal and three (3) provincial members as follows:

Federal

Manager, Alberta Office,  
Environmental Protection Directorate,  
Prairie and Northern Region, Environment Canada -  
Co-chairperson

Director, Habitat Management  
Central and Arctic Region  
Fisheries and Oceans Canada  
Chief, Ecosystem Quality Branch  
Environmental Conservation  
Prairie and Northern Region  
Environment Canada  
and;

Provincial

Director, Standards and Approvals  
Alberta Environmental Protection - Co-chairperson  
Director, Pollution Control Division  
Alberta Environmental Protection  
Director, Fisheries Management Division  
Alberta Environmental Protection

**5.2** Management Committee members may designate alternates to attend Management Committee meetings in their respective places when unable to personally attend.

**5.3** The Management Committee may invite individuals to meetings as observers or for the purpose of making presentations.

## **Annex 2**

### **Releases**

#### **1.0 Purpose**

The purpose of this annex is to clarify roles and responsibilities of the Parties in sharing information respecting releases and in responding to releases in identified areas of shared jurisdiction.

#### **2.0 Objectives**

**2.1** The Parties share the objective of encouraging and monitoring the reporting of releases by widely publicizing the single toll-free telephone number to be used to satisfy the reporting requirements under EPEA and the Fisheries Act.

**2.2** The Parties share the objective of minimizing the number of releases in Alberta through preventative means such as contingency planning and pollution prevention and control regulation.

**2.3** The Parties share the objective of mitigating the adverse effects of releases through fast and effective response.

**2.4** The Parties share the objective of informing the public in a timely and thorough manner concerning releases.

#### **3.0 Reporting**

**3.1** PERT will maintain and operate a 24 hour, seven (7) day a week environmental spill response toll-free telephone number, to receive reports of all releases in Alberta.

**3.2** EP will advise EC immediately upon receipt of a report of the following types of release:

1. a release involving a deposit of a deleterious substance into water frequented by fish or a release which is likely to result in harmful alteration, disruption or destruction of fish habitat;
2. a release on federal lands, works or undertakings; or
3. a release involving or which may affect lands or waters outside of the territorial boundaries of Alberta.

**3.3** EC will advise EP immediately of any release in Alberta that is reported directly to EC.

#### **4.0 Response**

**4.1** For the purpose of this annex the lead response agency will be the agency with the primary responsibility for responding to releases and may include, but not be limited to

1. accident investigation;
2. providing clean - up advice;
3. ensuring remedial action;
4. co-ordinating remedial response by multiple agencies;
5. providing information for the purpose of public notification; and
6. following up on remedial activities.

**4.2** For the purpose of this annex the support agency will be the agency that provides technical advice, monitoring equipment and coordination with other agencies as requested by the lead response agency.

4.3 EP will be the lead response agency for releases in Alberta with the exception of releases under paragraph 3.2 (b).

4.4 EP will be the lead response agency for releases under paragraph 3.2(a) and (c) unless agreed otherwise by the Parties on a case by case basis.

4.5 EC will act as a support agency for releases under paragraph 3.2 (a) and (c) and as requested for specific releases.

4.6 EC will be the lead response agency for releases under paragraph 3.2 (b).

4.7 EP will act as a support agency for releases under paragraph 3.2 (b).

4.8 Both Parties will consult with and advise one another regarding actions taken in dealing with specific releases of joint interest, and will document actions taken and present the other Party with evidence gathered as necessary to support possible legal or other action.

4.9 EP and EC will provide reports of releases as requested by the other Party.

4.10 At the request of either Party, a joint review of release response procedures, either for specific releases or for releases in general, will be held.

4.11 The lead response agency will be responsible for coordinating news media relations in the event of a release, without limiting the other Party from acting within its jurisdictional mandate.

4.12 Where feasible, the Parties will mutually share and provide mutual access to training programs, expert advice, research and development information, and specialized analytical laboratory services.

## **5.0 Disagreements**

Any disagreements between the Parties may be referred to the Management Committee at any time by either Party for resolution.

## **Annex 3**

### **Inspection, Investigation and Enforcement**

#### **1.0 Purpose**

The purpose of this annex is to coordinate inspection activities of the Parties in order to make better use of resources and to coordinate investigation and enforcement roles and responsibilities in response to alleged contraventions of the provincial or federal legislation.

#### **2.0 Inspections**

2.1 The Parties are responsible for inspections under their respective legislation.

2.2 The Parties will meet annually to co-ordinate inspection strategies for the regulated sectors of common interest.

**2.3** At the annual meeting the Parties will consider the following areas:

1. development of an inspection plan to co-ordinate the inspections conducted by EP and EC;
2. timely sharing of information obtained during inspections by one Party with the other Party;
3. development of a single point of contact for the purpose of compliance reporting by the regulated sector; and
4. conducting joint inspections where necessary.

**2.4** The Parties agree to share information acquired through the conduct of inspections respecting possible contraventions of provincial or federal legislation.

**2.5** The Minister of DFO may, with the consent of the Minister of EP, designate employees of EP who in the opinion of the Minister of DFO are qualified to be so designated, as Fisheries Act inspectors with the power to conduct inspections with respect to the Fisheries Act regulatory requirements and the power to take or direct remedial action pursuant to Section 38 of the Fisheries Act.

### **3.0 Investigation and Enforcement**

**3.1** EC and EP will conduct investigations into alleged contraventions of their respective legislation.

**3.2** The parties will conduct a joint investigation for alleged contraventions of both federal and provincial legislation.

**3.2.1** EP shall be the lead party in joint investigations unless otherwise agreed upon by the parties.

**3.2.2** The Parties will confer upon undertaking an investigation and agree on the roles of the lead party and the support party in the investigation.

**3.2.3** The Parties agree to exchange all relevant information obtained during an investigation.

**3.2.4** The Parties will discuss the appropriate enforcement response at the conclusion of the investigation.

**3.2.5** Each party will attempt to coordinate enforcement responses but each party reserves the right to proceed unilaterally with its own enforcement action.

**3.2.6** Each party has the right to set and follow its own enforcement policy.

**3.2.7** The Parties agree to share evidence, staff, expertise, witnesses and analysts for the purpose of preparing for and conducting trials.

**3.2.8** The parties recognize that both federal and provincial Attorneys General retain their discretion to prosecute violations of their respective legislation.

### **4.0 Training of Inspectors and Investigators**

**4.1** Training may be provided to inspectors or investigators of Alberta and Canada for the implementation of the Agreement and this annex.

**4.2** EC will provide EP staff with access to the requisite training courses for Fisheries Act inspector designation.

### **5.0 Meetings**

The Parties agree to meet once per month or as mutually agreed upon to provide updates on ongoing investigations of mutual interest and to review decisions respecting joint investigations.

## **6.0 Disagreements**

Any disagreements between the Parties may be referred to the Management Committee at any time by either Party for resolution.

## **Annex 4**

### **Information Sharing**

#### **1.0 Purpose**

The purpose of this annex is to facilitate the full and open sharing of information between the Parties for the purpose of the administration of this Agreement.

#### **2.0 Types of Information**

Information that may be shared between the Parties pursuant to this Annex will include, but not be limited to, information in the possession of the Parties relating to:

1. fish and fish habitat;
2. environmental effects of deleterious substances and in particular their effect on fish;
3. human health effects of deleterious substances;
4. industrial processes;
5. pollution prevention and abatement technology;
6. compliance monitoring;
7. investigation and enforcement activity; and,
8. economic impacts of regulatory controls and technologies.

#### **3.0 Disclosure of Information**

**3.1** Each Party will share information received pursuant to this Agreement or the annexes with the other Party in a timely fashion or as provided in the other annexes to this Agreement.

**3.2** Each Party is subject to the limitations for public disclosure contained in section 33 of EPEA, the federal Privacy Act and the federal Access to Information Act.

**3.3** Information provided by one Party to the other Party, pursuant to this Agreement or any of the annexes, shall not be released to the public if it could reasonably be expected to harm the enforcement of any law of Canada or a province or to the conduct of lawful investigations.

#### **4.0 Manner of Disclosure between the Parties**

**4.1** EC and EP shall each identify one employee of their respective Departments to act as a contact for requests for information under the Agreement and annexes.

**4.2** Within a reasonable time after receipt of a request for information under section 2, the Party receiving the request shall provide the information to the other Party.

#### **5.0 Disagreements**

Any disagreements between the Parties may be referred to the Management Committee at any time by either Party for resolution.



## **Annex 5**

### **Administration of Pulp and Paper-effluent Regulations**

#### **1.0 Purpose**

The purpose of this annex is to facilitate federal-provincial cooperation in the regulation of pulp and paper mill effluent in order to maximize the effectiveness of regulatory efforts and reduce the administrative burden on the pulp and paper industry.

#### **2.0 Roles and Responsibilities of the Authorization Officer**

**2.1** The Authorization Officer shall receive all of the information described in Section 4.1 of this Annex, which mill operators are required to submit to an Authorization Officer pursuant to the PPER.

**2.2** The Authorization Officer shall conduct the issuance, amendment and withdrawal of any authorizations pursuant to Sections 16, 17, and 18 of the PPER.

**2.3** The Authorization Officer shall form the Technical Advisory Panel described in Annex 1 to “Aquatic Environmental Effects Monitoring Requirements” EPS 1/RM/18.

#### **3.0 Reports of Deposits Out of the Normal Course of Events**

**3.1** Where pulp and paper mill operators are required to report deposits out of the normal course of events pursuant to Section 38 of the Fisheries Act, they may meet this requirement by reporting to PERT.

**3.2** Upon receipt of a report pursuant to Section 38 of the Fisheries Act, PERT will immediately notify the Alberta Office Manager, Environmental Protection Branch, Prairie and Northern Region of EC.

**3.3** The arrangements outlined in paragraphs 3.1 and 3.2 above, constitute an arrangement for the purposes of paragraph 36(1)(b) of the PPER.

#### **4.0 Information Sharing - Monthly Monitoring Reports; Ownership Information; Emergency Response Plans; Reference Production Rates; Effluent Outfalls**

**4.1** Where the Authorization Officer is a provincial employee, he/she will provide the Alberta Office Manager, Environmental Protection Branch, Prairie and Northern Region of EC with a copy (in hard copy or electronic format) of the following information submitted by operators pursuant to the PPER:

1. monthly reports on the results of monitoring referred to in paragraphs 7(1)(b) and 7(3)(b) of the PPER;
2. information on the ownership of mills and off-site treatment facilities referred to in paragraphs 7(1)(c) and 7(3)(c) of the PPER;
3. emergency response plans referred to in paragraphs 7(1)(e) and 7(3)(d) of the PPER; and,
4. the notification of reference production rates referred to in subsection 12(3) of the PPER.

**4.2** Where the Authorization Officer is a provincial employee, copies of information referred to in section 4.1 of this annex will be provided to the Alberta Office Manager, Environmental Protection Branch, Prairie and Northern Region of EC within ten (10) working days of receipt of the information.

**4.3** The Regional Director of Fisheries and Habitat Management in DFO shall provide the Authorization Officer with copies of information respecting effluent outfalls provided to the Minister of DFO pursuant to section 27 of the PPER within ten (10) working days of receipt of the information.

## **5.0 Environmental Effects Monitoring**

**5.1** The Authorization Officer will convene a meeting of the Technical Advisory Panel at least once per year to review the implementation of environmental effects monitoring requirements contained in the PPER and in approvals.

**5.2** Whenever feasible, the Authorization Officer shall harmonize federal and provincial environmental effects monitoring requirements.

## **6.0 Disagreements**

Any disagreements between the Parties may be referred to the Management Committee at any time by either Party for resolution.

## **APPENDIX 8**

### **Canada-Alberta Environmental Occurrences Notification Agreement**

CANADA-ALBERTA  
ENVIRONMENTAL OCCURRENCES NOTIFICATION AGREEMENT  
(the “Agreement”)

**BETWEEN**

**Her Majesty the Queen in right of CANADA**  
as represented by the Minister of the Environment for Canada  
 (“Canada”)

**AND**

**Her Majesty the Queen in right of ALBERTA**  
as represented by the Minister of Environment and Parks for Alberta  
 (“Alberta”)

(collectively, the “Parties”)

**WHEREAS** both Canada and Alberta are committed to attaining the highest level of environmental quality as a means to enhance the health and well-being of Canadians and to preserve the natural environment;

**WHEREAS** the Canadian Council of Ministers of the Environment endorsed the *Statement of Interjurisdictional Cooperation on Environmental Matters* (1990) to provide an overall framework for effective intergovernmental cooperation on environmental matters;

**WHEREAS** Canada and Alberta recognize that there is a benefit to adopting a cooperative approach to reduce administrative duplication resulting from comparable legislative and regulatory provisions and that there is a need to specify the procedures of this approach in an agreement;

**WHEREAS** the Designation Order made under section 43.2 of the *Fisheries Act* designates the Minister of the Environment for Canada as the Minister responsible for the administration and enforcement of subsections 36(3) to (6) of the *Fisheries Act* for all purposes and subject matters, except for the following for which the administration and enforcement remains with the Minister of Fisheries and Oceans for Canada:

- (a) the construction, operation, modification and decommissioning of, and other activity in relation to, an aquaculture facility, and any resulting effects of those activities on the waters frequented by fish; and
- (b) the control or eradication of any aquatic invasive species or aquatic species that constitute a pest to the fisheries;

**WHEREAS** section 9 of the *Canadian Environmental Protection Act*, 1999, S.C. 1999, c. 33 (CEPA, 1999), authorizes the Minister of the Environment for Canada, with the approval of the Governor in Council, to enter into an agreement with a government with respect to the administration of CEPA, 1999;

**WHEREAS** section 4.1 of the *Fisheries Act*, R.S.C. 1985, c. F-14, authorizes, by virtue of the Designation Order, the Minister of the Environment for Canada, to enter into agreements with a province to further the purpose of this Act;

**WHEREAS** section 19 of the *Environmental Protection and Enhancement Act*, R.S.A. 2000, c. E- 12, authorizes the Minister of Environment and Parks for Alberta to enter into agreements relating to any matter pertaining to the environment with the government of another jurisdiction or an agency of that government;

**WHEREAS** the Governor in Council, by Order in Council No. P.C. 2016-1054, dated the 25th day of November, 2016, has approved that the Minister of the Environment for Canada, on behalf of Canada, enter into this Agreement with Alberta;

**AND WHEREAS** a Canada-Alberta Environmental Occurrences Notification Agreement was signed by the federal Minister of the Environment on December 3, 2010, by the Minister of Fish-eries and Oceans for Canada on December 21, 2010 and by the Minister of Environment for Al-berta on January 6, 2011, and expires on March 24, 2016 (the “Previous Agreement”).

**NOW THEREFORE**, in consideration of the mutual premises contained in this Agreement, the Parties agree as follows:

## 1.0 INTRODUCTION

This is an Agreement between Canada and Alberta establishing procedures for the receipt and timely transfer of information between the Parties concerning the notification of environmental occurrences.

This Agreement amends the 1994 Canada-Alberta Administrative Agreement for the Control of Deposits of Deleterious Substances under the *Fisheries Act*, with respect to the notification of environmental occurrences.

## 2.0 DEFINITIONS

In this Agreement, the terms below have the following meanings:

“aboriginal land” means aboriginal land as defined in subsection 3(1) of CEPA, 1999;

“Alberta” means the Alberta Ministry of Environment and Parks;

“CEPA, 1999” means the *Canadian Environmental Protection Act*, 1999, S.C. 1999, c. 33, as amended;

“deleterious substance” means deleterious substance as defined in subsection 34(1) and prescribed by regulations under subsection 34(2) of the *Fisheries Act*.

“deposit” means deposit as defined in subsection 34(1) of the *Fisheries Act*;

“Designation Order” means the *Order Designating the Minister of the Environment as the Minister Responsible for the Administration and Enforcement of Subsections 36(3) to (6) of the Fisheries Act*, SI/2014-21;

“Environment Canada” means the Department of the Environment for Canada;

“environmental occurrence” means:

- a) a release of a substance into the environment, or the likelihood thereof, in contravention of a regulation described in section 95, 169, 179 or 212, or in contravention of an order described in section 95, of CEPA, 1999;



- b) an environmental emergency under section 201 of CEPA, 1999;
- c) a deposit of a deleterious substance in water frequented by fish, as described in subsection 38(5) of the *Fisheries Act*, or the serious and imminent danger of such a deposit;
- d) other environmental incidents of federal interest; or
- e) a request for Environment Canada's emergency scientific or technical expertise;

"federal land" means federal land as defined in subsection 3(1) of CEPA, 1999;

"*Fisheries Act*" means the *Fisheries Act*, R.S.C. 1985, c. F-14, as amended;

"Fisheries and Oceans Canada" means the Department of Fisheries and Oceans for Canada;eans

"notification" or "notify" means the transfer of any information concerning an environmental occurrence by a person to Canada by means of its twenty-four hours a day, seven days a week (24/7) notification system or to Alberta by means of its twenty-four hours a day, seven days a week (24/7) notification system, but does not refer to the written follow-up reports as may be required under CEPA, 1999 or the *Fisheries Act*.

"other environmental incidents of federal interest" include the following:

- (a) a release or deposit of a substance harmful to the environment, other than a release or deposit that is subject to CEPA, 1999 or the *Fisheries Act*, that occurs on federal land or aboriginal land;
- (b) a release of a substance that causes or threatens to cause adverse effects to public safety, security, health or welfare, to the environment or to property along an interjurisdictional or international boundary; and
- (c) a release of a substance that is of a magnitude that causes or threatens to cause substantial adverse effects to public safety, security, health or welfare, to the environment or to property of Canadian citizens;

"Party" means, as the case may be, Her Majesty the Queen in right of Canada or Her Majesty the Queen in right of Alberta;ten follow

"Previous Agreement" means the *Canada-Alberta Environmental Occurrences Notification Agreement* signed by the Minister of the Environment for Canada on December 3, 2010, by the Minister of Fisheries and Oceans for Canada on December 21, 2010 and by the Minister of the Environment for Alberta on January 6, 2011, which came into force on March 25, 2011 and expires on March 24, 2016.ten follow

"release" means release as defined in subsection 3(1) of CEPA, 1999;

### 3.0 OBJECTIVES

- 3.1 provide an effective and efficient system for persons required to notify the appropriate authorities of environmental occurrences, under federal or provincial legislation; andThe objectives of this Agreement are to:
- 3.2 provide an effective and efficient system for Alberta to receive and advise Environment Canada of any notification of an environmental occurrence received.environmental occurrences, under federal or provin:

## 4.0 MANAGEMENT COMMITTEE

### 4.1 Establishment

The Management Committee, established under the Previous Agreement, to oversee the implementation of the Previous Agreement is continued under this Agreement. The Management Committee includes an equal number of federal and provincial officials appointed by each Canada and Alberta, respectively.

### 4.2 Co-chairs

The Management Committee is co-chaired by one representative for Canada and one for Alberta. The co-chairs are *de facto* members of the Management Committee.

### 4.3 Operation

#### 4.3.1 The Management Committee meets

- (a) at a minimum once per fiscal year (April 1 to March 31); and
- (b) upon the written request of one of the Parties, at a place and time mutually agreed to by the co-chairs.

4.3.2 When a member of the Management Committee is unable to attend a Committee meeting, the Party who appointed that member appoints a substitute for this member for that meeting.

4.3.3 All decisions of the Management Committee are made on a consensus basis. In the case that the Management Committee cannot reach a consensus, the outstanding issue shall be submitted to the Contacts identified in section 12.0 of this Agreement.

4.3.4 The Management Committee may establish procedures for the administration and operation of the Management Committee.:

4.3.5 Notwithstanding the termination of this Agreement, the Management Committee has six (6) months to complete its activities following such termination.

### 4.4 Responsibilities

The responsibilities of the Management Committee include the following:

#### 4.4.1 establishing standard operating procedures:

- (a) for the collection and processing of notifications, of environmental occurrences received by Alberta under this Agreement, as well as for the transmittal of this information by Alberta to Environment Canada; and
- (b) for the collection and processing of notifications of environmental occurrences in Alberta received by Environment Canada under this Agreement, as well as for the transmittal of this information by Environment Canada to Alberta.

4.4.2 exploring opportunities and implementing changes that enhance the effectiveness of information management (including, but not limited to, information receipt, transfer and archiving, and notification generation):

4.4.3 establishing performance standards regarding information management, including information receipt, transfer and archiving, and notification generation;4.4.1 establishing standard operating procedures:

4.4.4 reviewing the administration of this Agreement on an annual basis;

4.4.5 within 10 business days following every Management Committee meeting, preparing minutes and transmitting these minutes to the members of the Management Committee; and

4.4.6 making written recommendations to the Contacts identified in section 12.0 of this Agreement on the potential need to revise this Agreement, as and where appropriate, and consolidating in a finalized document all written recommendations no later than two (2) years before the termination of this Agreement.

## **5.0 ACTIVITIES**

### **5.1 Notification of an Environmental Occurrence**

5.1.1 Alberta and Environment Canada agree to maintain and monitor a 24/7 notification system to receive, assess, and document the notification of environmental occurrences.

5.1.2 Alberta agrees to maintain and operate a 24/7 toll-free telephone line, as part of its 24/7 notification system.

5.1.3 Upon receiving a notification of an environmental occurrence, Alberta agrees to advise Environment Canada in accordance with the standard operating procedures, as amended from time to time, established under section 4.4.1 of this Agreement.

5.1.4 In the event that Environment Canada receives a notification of an environmental occurrence in Alberta, Environment Canada agrees to advise Alberta in accordance with the standard operating procedures, as amended from time to time, established under section 4.4.1 of this Agreement.

5.1.5 Alberta agrees to provide mutually acceptable access to the audio recordings of telephone calls related to the notification of environmental occurrences for at least two (2) years following the date on which the calls were received.

5.1.6 Environment Canada agrees to publicize Alberta's 24/7 toll-free telephone line through various means, including printed publications and on-line announcements or notices.

### **5.2 Transfer of Written Information Related to the Notification of an Environmental Occurrence**

5.2.1 Alberta agrees to provide Environment Canada with electronic copies of the records of environmental occurrence notifications that Alberta receives, in accordance with the standard operating procedures, as amended from time to time, established under section 4.4.1 of this Agreement.

5.2.2 Environment Canada agrees to provide Alberta with electronic copies of the records of environmental occurrence notifications that Environment Canada receives, in accordance with the standard operating procedures, as amended from time to time, established under section 4.4.1 of this Agreement.

### **5.3 Provision of Other Information**

Environment Canada agrees to provide Alberta with training and information sessions, without cost to Alberta, on an annual basis, or more frequently if either Party deems it to be necessary, concerning Canada's information requirements related to this Agreement.

#### **5.4 Provision of Bilingual Service**

In accordance with federal requirements under the *Official Languages Act*, R.S.C. 1985, c. 31 [4th Supp.], Environment Canada agrees to provide 24/7 telephone support service to Alberta for the receipt of notifications of environmental occurrences made in French, without cost to Alberta and in accordance with the standard operating procedures, as amended from time to time, established under section 4.4.1 of this Agreement.

### **6.0 ACCESS TO INFORMATION AND PRIVACY**

6.1 The Parties expressly acknowledge that their respective access to information and protection of privacy legislation may be applicable to information received pursuant to this Agreement and agree to work together to honour and respect each other's legal obligations under that legislation.

6.2 The Parties agree to provide each other with notice of any application for access to information received pursuant to this Agreement.

### **7.0 FINANCIAL PROVISIONS**

In support of the operation and maintenance of Alberta's 24/7 notification system, the following financial provisions apply:

7.1 For the fiscal year April 1, 2015 to March 31, 2016, Alberta shall provide an invoice for payment in the amount of \$54 713. The invoice shall be sent between February 1 and February 25 of 2016. Environment Canada shall make a payment to Alberta for that amount, within 30 days of receipt of the invoice.

7.2 For each subsequent fiscal year after the Agreement comes into effect, Alberta shall provide an invoice for payment that corresponds to the payment made in the previous fiscal year, indexed in accordance with the Annual Average Percentage Changes for the Consumer Price Index - All Items, Not Seasonally Adjusted, Canada, Provinces, Urban Centres, for the calendar year that immediately precedes the fiscal year for which payment is being requested, for the services rendered between April 1 and March 31 of that subsequent fiscal year. Alberta shall send its invoice to Environment Canada between February 1 and February 25 of the fiscal year during which the services are rendered. Upon receipt of this invoice, Environment Canada shall make a payment to Alberta for that amount, within 30 days of receipt of the invoice.

7.3 The definitions in this subsection apply in section 7.0:

"Annual Average Percentage Changes for the Consumer Price Index - All Items, Not Seasonally Adjusted, Canada, Provinces, Urban Centres" means the annual average percentage change for Canada regarding the Consumer Price Index - All items, not seasonally adjusted, Canada, provinces, urban centres, established annually by Statistics Canada;

"Consumer Price Index" means an indicator of changes in consumer prices experienced by Canadians, obtained by comparing through time the cost of a fixed basket of commodities purchased by consumers;

"Statistics Canada" means national statistical agency for Canada.

## 8.0 INTERPRETATION

Nothing in this Agreement shall be construed as:

8.1 having an impact on the distribution of Constitutional powers between the two Parties;

8.2 restricting in any way the respective authority of Canada or Alberta to enforce their statutes or regulations;  
or

8.3 modifying the application of any statute or regulation in effect in Canada or in Alberta.

## 9.0 DURATION OF THE AGREEMENT

9.1 This Agreement comes into effect upon termination of the Previous Agreement.

9.2 This Agreement expires five (5) years after the date on which it comes into effect, i.e. March 25, 2016, in accordance with subsection 9(7) of CEPA, 1999, or at a later date should this statutory time period be modified.

9.3 Either Party may terminate this Agreement by giving the other Party at least three (3) months notice.

9.4 Notwithstanding sections 9.2 and 9.3, each Party agrees to make all reasonable efforts to provide the other Party with at least six (6) months written notice of the early termination of this Agreement.

## 10.0 AMENDMENT TO THE AGREEMENT

This Agreement may be amended from time to time, in writing, by consent of the Parties and subject to any necessary approval of the Governor in Council.

## 11.0 DISPUTE RESOLUTION

Any disputes regarding the interpretation or implementation of this Agreement will be resolved by consultation between the Parties and will not be referred to a tribunal, court or any other third party for settlement.

## 12.0 CONTACTS

The following persons are the Contacts for this Agreement:

Director  
Environmental Emergencies Division  
Environmental Protection Operations  
Directorate  
Environment Canada

Director  
Alberta Environment Support and  
Emergency Response Team  
Alberta Ministry of Environment and  
Parks



IN WITNESS WHEREOF, This Agreement has been executed on behalf of Canada by the Minister of the Environment for Canada, and on behalf of Alberta by the Alberta Minister of Environment and Parks;

**GOVERNMENT OF CANADA**

Minister of the Environment

JAN 31 2017

Date

**GOVERNMENT OF ALBERTA**

Minister of Environment and Parks

March 8, 2017

Date

**FOR THE GOVERNMENT OF ALBERTA**

Approved pursuant to the *Government Organization Act*

Intergovernmental Relations, Executive Council

March 17, 2017

Date



## ATTACHMENT 1

Council Resolution 20-03, instructing the Secretariat  
to make public the factual record for Submission SEM-17-001  
(*Alberta Tailings Ponds II*) (1 September 2020)

01 September 2020

**COUNCIL RESOLUTION: 20-03**

**Instruction to the Secretariat of the Commission for Environmental Cooperation to make public the Factual Record concerning Submission SEM-17-001 (*Alberta Tailings Ponds II*)**

**THE COUNCIL:**

**SUPPORTIVE** of the process provided for in Articles 14 and 15 of the *North American Agreement on Environmental Cooperation* (NAAEC) regarding submissions on enforcement matters;

**NOTING** that the *Environmental Cooperation Agreement* (ECA) among the Governments of Canada, the United States of America and the United Mexican States entered into force on July 1, 2020 and superseded the NAAEC on that date;

**RECOGNIZING** that Article 2(4) of the ECA provides that any submission made pursuant to the NAAEC and not concluded as of entry into force of the ECA shall continue in accordance with the procedures established under Articles 14 and 15 of the NAAEC, unless the Council decides otherwise;

**EMPHASIZING** that factual records are an important way to increase public participation, transparency, and openness on issues related to the enforcement of environmental law in Canada, Mexico and the United States;

**AFFIRMING** that the purpose of a factual record is to provide an objective presentation of the facts relevant to the matter raised in a submission and to allow the readers to draw their own conclusions regarding a Party's environmental law enforcement in said matter;

**HEREBY UNANIMOUSLY DECIDES:**

**TO MAKE PUBLIC** the attached factual record for Submission SEM-17-001 (*Alberta Tailings Ponds II*).

APPROVED BY THE COUNCIL:

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Catherine Stewart  
Government of Canada

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Jane Nishida  
Government of the United States of America

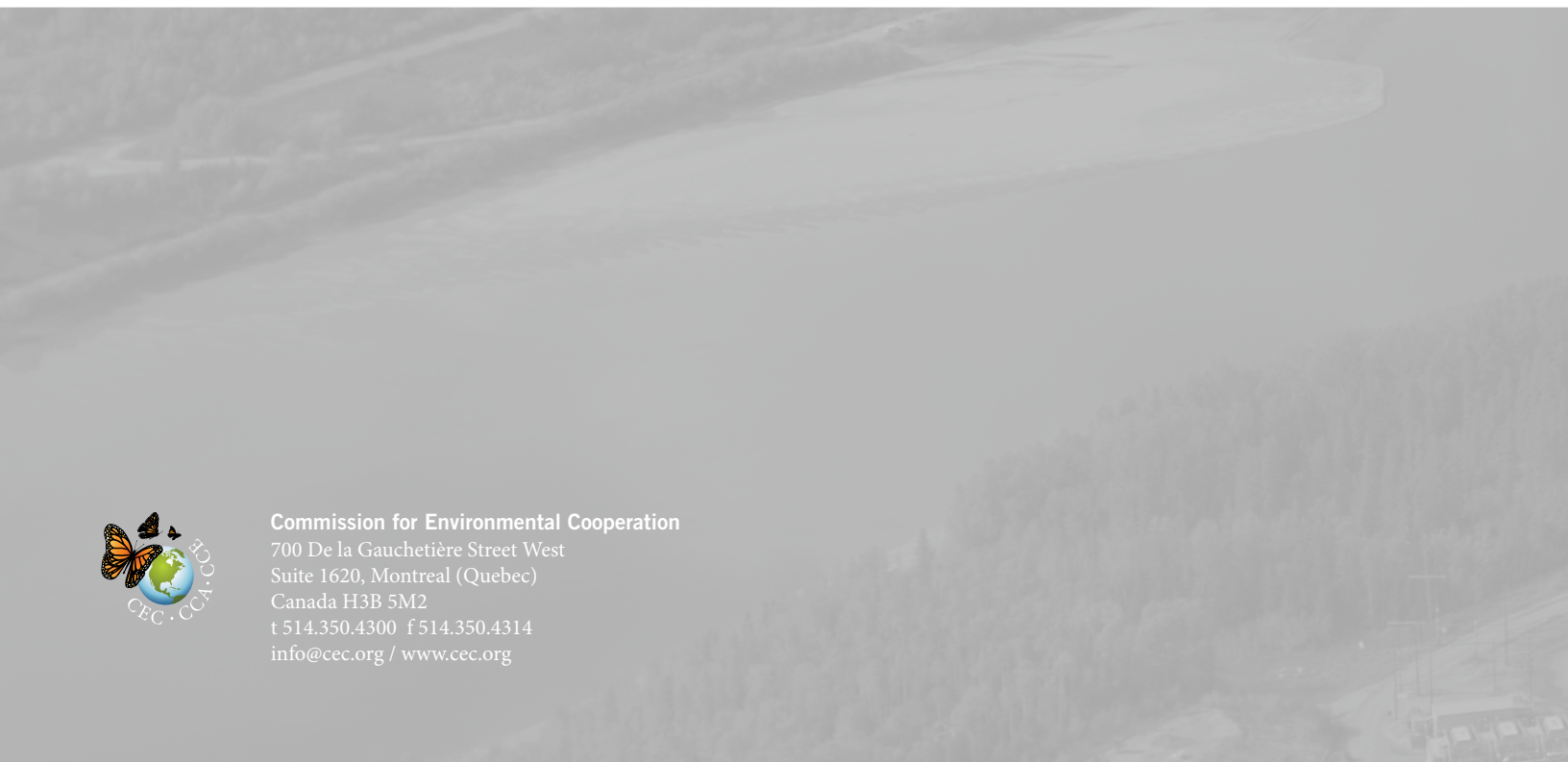
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Rodolfo Godínez Rosales  
Government of the United Mexican States









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