Weight of Evidence Approach to Tailing Pond Releases to Groundwater

Submitted By:

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Summary

Release of Oil Sands Process Water (OSPW) to groundwater is required to be reported to NPRI by oil sand facilities. Apparently, to date, oil sand facilities do not report releases to groundwater. Based on available information, this paper provides a preliminary estimate to fill this information gap.

In 2014, ECCC scientists reported that Oil Sands Process Water (OSPW) was apparently leaking from tailings ponds and seeping into the Athabasca River (Frank et al., 2014). The study reported: “The resemblance between the AEO profiles from OSPW and from 6 groundwater samples adjacent to two tailings ponds implies a common source, supporting the use of these complimentary (sic) analyses for source identification. These samples included two of upward flowing groundwater collected <1 m beneath the Athabasca River, suggesting OSPW-affected groundwater is reaching the river system” (Frank et al., 2014, p. I).

ECCC did not quantify the magnitude of the release of OSPW from Oil Sands tailings ponds.

In 2020, the Secretariat of the Commission for Environmental Cooperation (CEC) released its findings, Alberta Tailings Ponds II Factual Record, stating: “data presented in the Syncrude monitoring report shows consistent evidence of seepage of OSPW (oil sands process water) 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” (Olszynski, Martin, & Kanopoulos, 2020, p. 44)**.** The CEC factual record states that in outside the Suncor containment system there was 730,319 m3 (summer), 785,431 m3 (fall) in 2017 of OSPW (Olszynski et al., 2020, p. 45).

The CEC did not quantify the magnitude of the releases of OSPW from all Oil Sands tailing ponds, and only assessed the information that was presented to the Secretariat.

In June, 2025, Friends of Fish presented information to estimate the magnitude of the total OSPW draining from all Oil Sands facilities tailing ponds. The calculations suggested tailing ponds drain some 74 - 80% of oil sands process-affected water (OSPW) to groundwater underneath tailing pond foundations and dikes. And that without treatment to remove numerous contaminants, OSPW is not suitable for reuse in the Clark hot water process (CHWP) (Allen, 2008, p. 132; Masliyah, Czarnecki, & Xu, 2011, p. 40-41).

In August, 2025, Dr. Ronald Guest, representing the Mining Association of Canada (MAC), presented to NPRI staff and stated that zero OSPW is discharged from tailings ponds; however, supporting evidence was not provided. He also stated that in 2023, oil sand mining recycled 79% of OSPW. Furthermore, he suggested that “Somehow, the concentration of naphthenic acids in the CHWP reaches a steady state.”

Immediately following the MAC presentation, an expert reviewed the findings of the Commission for Environmental Cooperation (CEC) and challenged Dr. Guest’s claim of zero OSPW discharge to groundwater.

The differences between these two presentations and the CEC findings on discharge of OSPW, suggest that NPRI, as the responsible authority under CEPA for reporting pollution emissions, should adopt a Weight of Evidence (WoE) approach to guide industry reporting on the magnitude of OSPW releases from tailings ponds to the environment. Arguably, this reflects the approach taken by the CEC.

"A WoE approach is a familiar concept found in scientific and regulatory literature. It is generally understood as a method for decision-making that involves consideration of multiple sources of information and lines of evidence. Using a WoE approach avoids relying on any one piece of information or line of evidence" (Application of weight of evidence and precaution in risk assessment, 2018).

In particular,
"1. Totality of Evidence: what types and sources of information are to be gathered and considered for subsequent assessment; and
2. Weighing Evidence: how such individual sources of evidence are assessed and integrated into an overall conclusion or recommendation" (Tao et al., 2018, p. 2).

Background

UPDATES:

NOTE: The information in this paper has been updated from that presented by Friends of Fish to NPRI in November 2024 and August 25, 2025.

The NPRI program requires reporting of releases to groundwater.

Environment Canada and Climate Change (ECCC) NPRI program, in the document, REVISED BASED ON OSDQ SUB-GROUP MEMBER SUGGESTIONS AND AUG 7, 2025 SUPPLEMENTARY MEETING AND DISCUSSION, in June, on page 11, fourth bullet states: "quantities of NPRI substances released to water only includes surface water".

REVISED BASED ON OSDQ SUB-GROUP MEMBER SUGGESTIONS AND AUG 7, 2025 SUPPLEMENTARY MEETING AND DISCUSSION

Information that does not get reported

INFORMATION THAT DOES NOT GET REPORTED

- Manufacture, process or otherwise use (MPO) quantities
  - Facilities must calculate MPO quantities for Part 1 substances in order to determine if they are required to report but they do not report the MPO quantities themselves, they instead calculate and report release, disposal and recycling quantities.
- Quantities of NPRI substances that are transferred off-site in products.
- Quantities of NPRI substances released to air from the operation of transportation equipment (e.g., mine fleets).
- Quantities of NPRI substances released to water only includes surface water.
- Information to which the facility does not have or cannot reasonably be expected to have access to.

ECCC NPRI staff in September 2025, have clarified that releases to groundwater are in scope for NPRI reporting. Therefore, reporting of releases of OSPW to groundwater is required to be reported by Oil Sands Facilities.

All contributions, comments and presentations follow from the general recognition that OSPW is a toxicant, that the release of OSPW to the environment poses significant risk to aquatic fauna. In addition, the large volume of OSPW produced in the Clark Hot Water Process (CHWP) drives concern about the hydrodynamics of tailings ponds.

Premise

Concern about large volumes of Athabasca River water diverted to mineable oil sands developers' suggests OSPW requires treatment to remove contaminants before it can be reused in the CHWP. Mineable oil sand developers do not report treatment of OSPW to remove contaminants prior to reuse in the CHWP. The lack of publicly available information that demonstrates significant volumes of OSPW are reused in the bitumen extraction process suggests very little OSPW is reused in the CHWP.

Evidence that suggests the design of tailing ponds allows for drainage suggests that large volumes of toxic, contaminated OSPW are routinely released to groundwater resources. This memo includes information that suggests OSPW drains out of tailing ponds.

Information that Suggests Tailings Ponds Drain

In 1980, Alberta Environment (AENV) found that Suncor routinely wasted some 80% of Athabasca River (AR) water diverted for Industrial use, back to the Athabasca River as Industrial effluent or, OSPW (Andreychuk, 1980, Tab. 4, p. 43 & Fig. 4). AENV determined that the volume Suncor discharged was 2.27 x 10^7 m^3 of OSPW to the Athabasca River annually (Andreychuk, 1980, p. 4 of Tab. 4).

More recently, from the Handbook on Theory and Practice of Bitumen Recovery from Athabasca Oil Sands,

> An overall water mass balance around the water streams in Figure 1.24 would clearly show an accumulation of water within the plant, where the magnitude of the return water flow rate is either nil or much smaller than the freshwater intake. Such accumulation takes place in the tailings pond itself. With no water discharge from the tailings pond, the tailings pond water inventory increases with time. Indeed, most of the water in the ponds is not 'free' water, but is trapped within fine mineral solids (mainly clays), forming a sludge toward the bottom of the tailings pond. The sludge is normally referred to as mature fine tailings (MFT) and has a solids concentration of ~ 30 wt. %. It is estimated that about two barrels of sludge are formed for every barrel of synthetic crude oil produced, and that the volume of solids to water in the MFT is 1:6.
>
> Without sufficient water of acceptable quality (in terms of suspended solids, salt content, and pH), development of the oil sands resource would not be feasible with today's technology. Water is a precious commodity, and the difficult fact is that the current freshwater withdrawal is mainly centered on the Athabasca River. With increasing bitumen production, the demand on the Athabasca River increases. Water withdrawal becomes more complicated due to the large variance in river flow during the winter and summer months (Masliyah et al., 2011, p. 40-41).

Twenty years earlier, a similar description, "The inevitable build-up of these partially settled clay sludges presents not only an environmental problem but also *a significant repository for non-recycleable water"* [emphasis added] (Majid, Sparksf, & Ripmeester, 1992, p. 165).

Azam and Scott, who would later write "In the tailings impoundment, the solids are allowed to settle under gravity as the water drains out" (Azam & Scott, 2005, p. 43), offered insight into a possible definition of 'recycling.' "Water is often added to the tailings to allow them to be pumped more efficiently" (Caughill, Morgenstern, & Scott, 1993, p. 801). Water additions to improve pumping efficiency do not necessarily reduce the volume of Athabasca River water diverted for industrial purposes.

Detailed descriptions of the CHWP reveal information consistent with the unsuitability of reusing untreated OSPW. For example,

> Generally it is undesirable to have high concentrations of fine solids in a slurry due to the entrapment of large amounts of water within the network of loose aggregates, that subsequently interact to form a 3-dimensional gel. In oil sands ores, clay-sized

> materials of >16% w/w, or ultra-fine particles (sized less than 0.3 lm) of >1.5% w/w, were shown *to exceed the gel concentration, causing plant operational issues when present in an extraction slurry* [emphasis added] (Wang, Harbottle, Liu, & Xu, 2014, p. 119).

The significance of this description of how a gel forms in the Primary Settling Vessel (PSV) is threefold. First, a review of the clay and ultrafine clay concentrations described as problematic reveals they are somewhat routine for medium and low grade oil sand ore (OSO). Second, this high clay concentration renders the tailings unsuitable for reuse and third, flooding the PSV with fresh water remedies the risk of gel formation.

> "The presence of fine minerals (e.g. clays) makes this (PSV) vessel susceptible to solids buildup that can increase the viscosity (39, 66, 67). To maximize the flotation and sedimentation processes, the middlings region viscosity are kept low by adjusting the flood water addition and middlings removal rates" (Shaw, Schramm, & Czarnecki, 1996, p. 652).

In other words, the sensitivity of the CHWP suggests that developers continuously flood the process with fresh, AR water. The remedy of routinely adding more fresh water as described above suggests the CHWP demands significantly higher volumes of AR water than the 'closed-loop water system' MAC presented in August, 2025.

More detailed aspects of the CHWP suggest that (a) maximum bitumen recovery requires that several key, dynamic process parameters remain optimum and (b) flooding is the running-time remedy for well-described system upset conditions.

The Figures below illustrate how several of the key process parameters affect bitumen recovery rates. These are, clay content, NaOH additions and free surfactant (NAs) concentration (Shaw et al., 1996, Fig. 16).

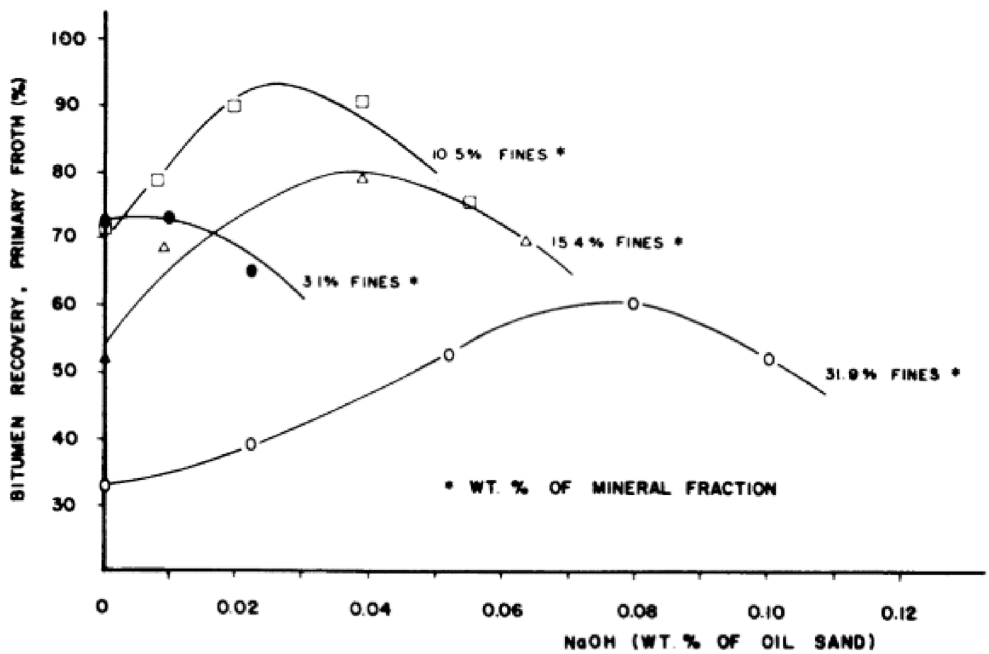

Figure 16. Processibility curves (laboratory batch extraction) for four oil sands of different composition. (Reproduced with permission from reference 60. Copyright 1983 Canadian Society for Chemical Engineering.)

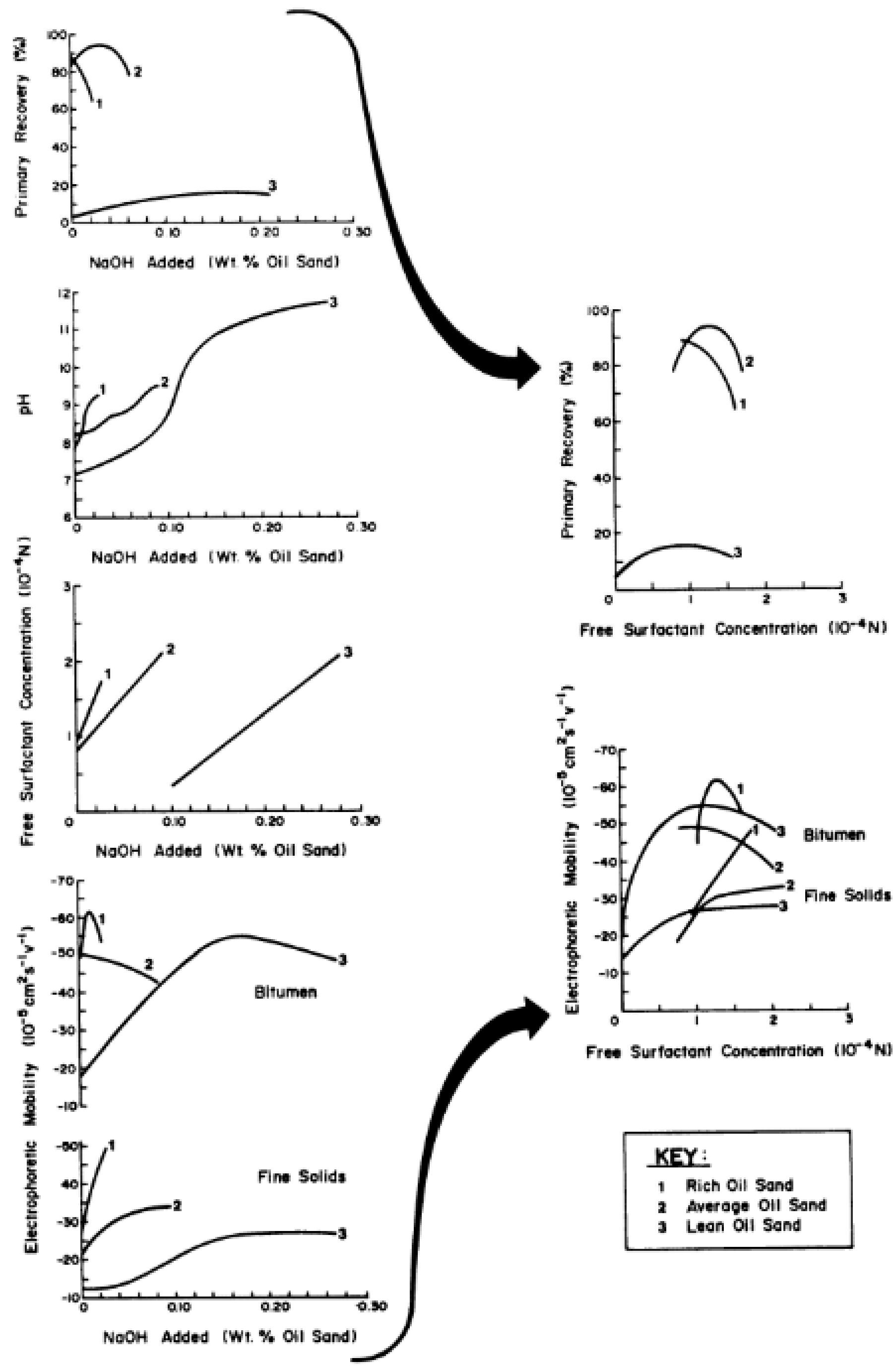

Figure 17. Examples of the connection between hot water flotation process efficiency and measured chemical and physical properties. (Reproduced with permission from reference 85. Copyright 1987 Canadian Society for Chemical Engineering.)

Figure 17 illustrates how sensitive the CHWP is to variations in the dynamic of sodium hydroxide additions and concentration of NAs that dissolve from the bitumen into OSPW. According to the figure, slight variations in these process conditions can lead to a rapid reduction in bitumen recovery.

Of particular note, where the 'free surfactant concentration' or, concentration of NAs, ranges out of optimum, bitumen recovery reduces markedly. The sensitivity of NAs concentration to bitumen recovery suggests that without treatment to remove NAs, OSPW is not suitable for reuse. Otherwise, the concentration of NAs that "readily dissolve into the slightly alkaline extraction water" would quickly elevate and significantly reduce bitumen recovery (Clemente & Fedorak, 2005, p. 587). Given the CHWP sensitivity to process aid parameters and clay content described above, it was not easy to understand what the MAC representative meant on August 7, 2025, by the statement "Somehow, the concentration of naphthenic acids in the CHWP reaches a steady state."

Furthermore, ECCC scientists documented the presence of OSPW in groundwater and beneath the Athabasca River (Frank et al. 2014). They conclude their study stating:

> "The resemblance between the AEO profiles from OSPW and from 6 groundwater samples adjacent to two tailings ponds implies a common source, supporting the use of these complimentary (sic) analyses for source identification. These samples included two of upward flowing groundwater collected <1 m beneath the Athabasca River, suggesting OSPW-affected groundwater is reaching the river system" (Frank et al., 2014, p. I).

> 'The SFS profiles of OSPW from the two mining operations studied (Figure 2) were consistent with those obtained in previous analyses. (16,31) Concentrations of total NAs in the OSPW samples were 54 and 60mg L−1, consistent with values previously reported for OSPW" (Frank et al., 2014, p. D).

Applications Suggest Tailing Ponds Drain

With respect to the degree tailing ponds drain OSPW to the environment Applications and an estimate of sludge permeability suggest OSPW drainage is routine. Below are three excerpts from a Suncor Application. Each describes ongoing or, future intention to release of OSPW to the Athabasca River.

1. Suncor included estimated volume of POND 1 OSPW drainage in their Application "The probable volume of foundation seepage entering the Athabasca River is about 1700 m^3/day" (*Steepbank Mine Project Application*, 1996, p. 366; AEUB, Decision 97-1, an application for amendment to Approval No. 7632 for proposed Steepbank Mine, 1997, p. 5).

2. As a consequence of the Consolidated Tailings (CT) technology to advance dewatering of sludge, Suncor declares "the challenge of managing large volumes of released water…will (create) a need for environmental discharge." Accordingly "it is likely most of this (OSPW) would be discharged to the Athabasca River" (*Steepbank Mine Project Application*, 1996, p. 359 & 360; AEUB, Decision 97-1, an application for amendment to Approval No. 7632 for proposed Steepbank Mine, 1997, p. 7).

3. Suncor positioned Pond 5 over a limestone formation that has "significant fracture porosity," and a hydrogeological investigation predicted downward seepage flow at up to 475 m^3/day (*Steepbank Mine Project Application*, 1996, p. 368 & Tab. D3.0-4).

Note, these estimated OSPW volumes flowing to the Athabasca River from the two ponds add up to about 800,000 m^3 per year.

Regional Scale Tailing Pond Drainage Estimate

2020 Commission for Environmental Cooperation (CEC) report: CEC Alberta Tailings Ponds II

There is sufficient evidence that the tailing ponds drain to groundwater and the question is the 'scale and quantity of releases. The tailing ponds are uniquely designed and each needs careful analysis.

This issue of tail ponds draining to groundwater has been brought forward in the past and the Commission for Environmental Cooperation (CEC) report: CEC Alberta Tailings Ponds II Factual Record regarding Submission SEM-17-001 has made a decision based on the "weight of evidence" (WoE) (Olszynski et al., 2020, p. 121).

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 (Olszynski et al., 2020, p. 147).

The summary of the report states:

> 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.

> xvi. … 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

The report itself states:

> 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.
>
> 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.
>
> 123 The volume of process-affected water outside the perimeter ditch system containment area was 730,319 m3 (summer), 785,431 m3 (fall) in 2017, demonstrating a slight increase from the 2016 modeled volume of 630,658 m3.
>
> 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 (Olszynski et al., 2020, p. 45).
>
> 168. 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 (Olszynski et al., 2020, p. 60)**.**

168. 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 (Olszynski et al., 2020, p. 60).

168. 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 (Olszynski et al., 2020, p. 60).

The NPRI program staff need to prioritize the findings of the CEC over the unsubstantiated claims of Dr. Ronald Guest. In August, 2025, Dr. Ronald Guest, for the Mining Association of Canada (MAC), presented to NPRI staff and claimed, without evidence, that zero OSPW discharged from tailings ponds. And, that in 2023, oil sand mining recycled 79% of OSPW. Furthermore, that "Somehow, the concentration of naphthenic acids in the CHWP reaches a steady state."

Of note Dr. Guests's unsupported claim of zero OSPW discharge to groundwater is contradicted by Industry's reports to the CEC, and was refuted immediately following his presentation, by reading to NPRI staff the CEC (2020) findings that OSPW leaked into the groundwater.

The CEC report notes the calculations by Syncrude, based on monitoring well observations, have led the company to estimate that in 2017, approximately 785,000 cubic meters of oil sands process-affected water have migrated past the interception ditch system (Olszynski et al., 2020, p. 45).

Total Estimate of Tailings Ponds Release of OSPW

Permeability of Sludge

With respect to the permeability of sludge, there is a suggestion that low permeability over a large area results in significant OSPW discharge to the environment. To illustrate this suppose,

Area of regional tailing ponds = 120 km^2
Thickness of sludge = 30 m

Height of freewater = 5m
Hydraulic conductivity (k) = 1×10^{-10} m/s, which is low and equivalent to about 0.03 m distance travelled per year.

Darcy's Law may not be the best formula to apply because the sludge contains bitumen however; to avoid the complication of determining void ratios Darcy's Law suggests 1,210 m^3/day discharge to groundwater resources. This is equivalent to 440,000 m^3/ year. Notably, the estimated drainage from all tailings ponds in the region returns a result that is about half the drainage volume Suncor reported from only two tailings ponds. One suggestion for the difference is that dikes are engineered to drain OSPW to groundwater (Azam & Scott, 2005).

WoE Summary

To summarize the WoE approach, there are multiple lines of evidence that suggest significant drainage. The lines of evidence include patents, Suncor Applications, AB Government Approvals, AB Government Water Licenses, multiple government reports of large drainage volumes from tailing ponds, NRCan peer-reviewed articles, technical, peer-reviewed industry publications and ECCC, CIWG OSMW Science Team Final Reports.

Based on the materials offered in this submission, a summary of the lines of evidence MAC shared on August 7, 2025 remains a concern. MAC offered unspecified, unsubstantiated, vague and undefined claims from Industry and the Alberta Government. Furthermore, the MAC presentation did not specifically respond to Suncor Application documents that suggest large volumes of OSPW drain from tailing ponds. In addition, the MAC presentation did not refute the excerpt from the Azam & Scott tailings management article, "In the tailings impoundment, the solids are allowed to settle under gravity as the water drains out" (2005).

A WoE approach to determine the degree tailing ponds drain may accept that there are significant contradictions within the sets of information on both sides of the gap in understanding. Also, many aspects of information produced by the Alberta Government and the Mineable Oil Sand Industry require verification to confirm their reliability. On the other hand, information like bitumen production values may be reliable.

That said, there is a history of controversy regarding the reliability of reports about the environmental impacts of mineable oil sand developments. In part, numerous changes to monitoring regimes sparked some scientists to speak out. In 2019 after 3 major changes to monitoring programs within 5 years, David Schindler said "Anything that could possibly be wrong in the oilsands is now subject to political censorship, so that the public at large will not know whether what they're hearing is straight propaganda or the truth" (Reith, 2019). In 2023, William Donahue added "I don't think one could design a better regulatory system for allowing industry to get their cake and eat it, too" (Nikiforuk, 2023).

A WoE approach could evaluate the relative merits of information on either side of the gap in understanding. According to the Federal Government of Canada and the Alberta Government, surveillance of polluters is a shared responsibility. That is, shared with Canadian citizens and residents. Therefore, just as residents owe a duty of surveillance to the public interest; Responsible Authorities owe a duty to weigh the evidence on either side of a gap in understanding. This may be especially relevant for NPRI when multiple lines of evidence suggest a significant, reportable pollution emission is not reported.

A Comparison of NAFC Emissions to Air and On-site Disposal

Although the requirement to report releases to water may not be within the scope of the OSDQ SG Action Plan, significant underreporting of on-site disposals or emissions to water or land may affect proper understanding of toxicants emitted to air. For example, as part of their August 7 presentation, MAC quoted NPRI data showing that "Over 11 years (2013-2023), 113 tonnes of NPRI-reportable substances have been released to water by the oil sands sector" (FINAL REVISION SEPTEMBER 15, 2025 NPRI Oil Sands Data Quality Sub-Group Meeting Summary, 2025, p. 29).

The 113 tonnes value may seem low to many observers. Alternatively, the 113 tonnes of pollutants released to water may mean pollutants released to the environment notwithstanding, claims of a 'zero discharge' policy.

Drilling deeper into the dashboard revealed that for the 5 year period (2020-2024) Suncor reported 12,551 tonnes of on-site disposals for naphthenic acid fraction compounds (NAFC) (and their salts) including, 7 tonnes released to water.

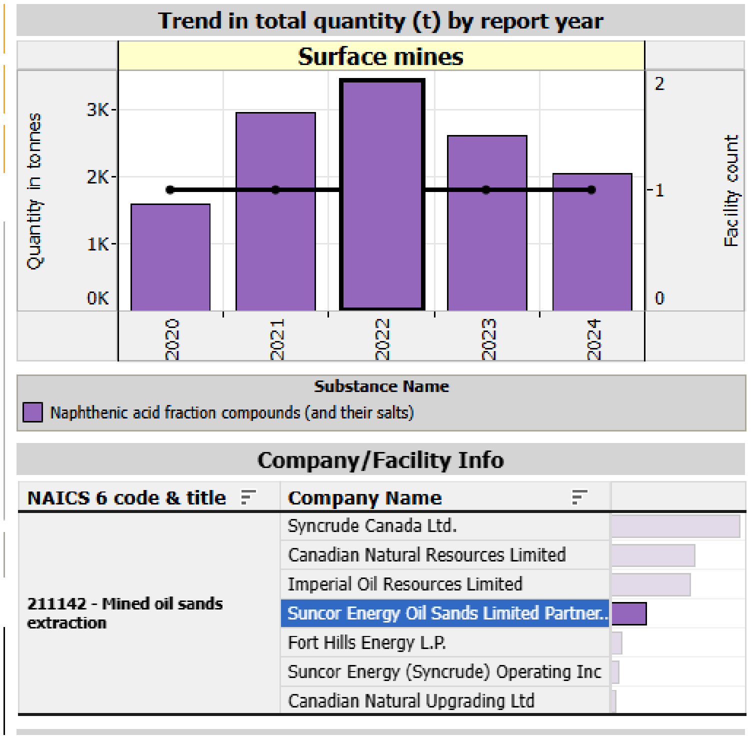

Figure 1 Detail from the Dashboard shows Suncor surface mine on-site disposals of NAs. Mean annual NAs on-site disposals equals 2,510 tonnes per year. https://public.tableau.com/app/profile/alicia.berthiaume/viz/NPRIOSDQdashboard_Part1-4andPart5data2013-2023/Part1-4data

In 2025, Moussa et al., published results of an experiment that used aircraft to measure air emissions of NAs at the Suncor facility. Hourly air emission rates for NAs "converted to annual emissions totaled 1,228 tonnes per year" (Moussa et al., 2025, p. H).

A comparison suggests that half of Suncor's reported on-site disposals of NAs volatilize from tailing ponds and other surfaces at the facility. Is it reasonable to think half of the largely hydrophilic NAFCs volatilize? A WoE approach may reveal a better understanding of the nature and fate of NAFCs discharged to tailing ponds and/or on-site disposals.

Clemente & Fedorak utilized a WoE approach to understand the mass of NAs discharged to tailings at a major oil sand facility (2005). Their method started with the concentration of NAs found in typical oil sand ore (OSO). Scaled up to regional production, the mass of OSO processed suggests developers that collectively mine 3.30 X 10^6 m^3 of OSO per day will potentially discharge about 660 tonnes of NAs to tailing ponds (Clemente & Fedorak, 2005, p. 587).

The Fate of OSPW is Material to the Public Interest

One method to foster understanding about the significance of OSPW reuse in the CHWP is for MAC to provide details about how OSPW reuse processes operate. An outline of the reuse process might show:

- **Treatment Methodology**: is it a method based on adsorption under reduced pH (Allen, 2008, p. 128; MacKinnon & Boerger, 1986, p. 498)?
- **Operationalized treatment methods**: what pipes and tanks are required to meet the demand for process water?
- **Performance**: what contaminants are removed, what is the fate of recovered contaminants?
- **What is the quality of treated water**: what parameters are tested, suspended solids % wt, NAs, sodium?
- **Where on the facility does treatment occur**: what is the spatial footprint, what are energy requirements for treatment?
- **What volume of OSPW is treated**?
- **Does treatment produce water that is suitable for release to the environment**?
- **What is the history of the treatment process?**
- **When did it start**?

A presentation that addressed the above would satisfy many of the questions posed by Natural Resources Canada and provide a basis for a material balance of AR water diversions (Allen, 2008).

This lack of evidence that industry reuses OSPW may be interpreted as a failure to produce information that is material to the public interest. With respect to the Presentation from MAC, continued reliance on unspecified, unsubstantiated claims suggests an adverse inference. In the event there are reasonable grounds to find an adverse inference then, that determination should be made by a responsible authority like, NPRI.

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