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Investor Briefing Note: What Investors Need to Know About Reclamation Risks in the Oil Sands

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1. Introduction

The development of Canada's oil sands has attracted considerable attention in Canada and elsewhere in the last few years, mainly due to the impact of oil sands projects on the local environment, and the fact that they constitute an important source of Canada's greenhouse gas emissions.[1] Among the impacts of oil sands projects on the local environment, land reclamation deserves special attention by investors, as there are many uncertainties regarding the effectiveness of current approaches to reclamation (in particular of wetlands and of tailings, the waste stream that results from oil sands mining), and new technologies remain unproven. These uncertainties indicate that reclamation may prove much more costly and difficult to achieve than anticipated.

Oil sands operators are required to reclaim disturbed land to an "equivalent land capability," which is defined as the ability of the land to support uses that are similar but not necessarily identical to those that existed before mining.[2]

Despite companies' assurances that disturbed lands will be reclaimed to viable ecosystems, after nearly fifty years of mining, only 0.2% of disturbed land has been certified as reclaimed by the government of Alberta (companies claim to have reclaimed 13.6% of the disturbed land, but it is unclear whether they meet regulatory requirements to obtain a reclamation certificate), and no tailings pond has been reclaimed to date.[3] Suncor projects to finalise the reclamation of Pond 1 in 2010, but the process will consume virtually no "mature fine tailings," the portion of the mining waste stream that has proven most difficult to reclaim (see section 2.1 for details).

In an effort to help our clients assess the risks associated with land reclamation, in May 2009 SHARE initiated a dialogue with five Canadian companies involved in mining projects in Alberta's oil sands region. Considering the specific features of different projects, we inquired about each company's success in the area of tailings and land reclamation, and steps taken to mitigate key risks associated with reclamation.

This briefing note summarizes those discussions, highlighting areas where greater information will be required if shareholders are to be able to thoroughly assess the value of their investments. While most questions are relevant to mining operations (notably, in situ projects do not create tailings), the issue of wetland restoration and compensation may be relevant to all projects, and therefore merits consideration by all investors.

2. SHARE's Dialogue with Canadian Oil Sands Companies

In May 2009, SHARE wrote to five Canadian companies involved in oil sands mining in our clients' portfolios: Suncor, Petro-Canada, Canadian Oil Sands Trust (which is the largest single owner of Syncrude, with a 36.74% stake in the project), Imperial Oil and Canadian Natural Resources Ltd. The letters inquired about each company's tailings management and land reclamation plans, focusing on progress achieved to date in testing or implementing selected tailings technologies, wetland restoration efforts, and management of risks associated with new or proposed regulations and other reclamation liabilities.

We received substantive responses from Petro-Canada (prior to its merger with Suncor), Canadian Oil Sands and Canadian Natural. Imperial directed us to their website and other publicly available materials, stressing that, as a matter of policy, it does not provide significant information about its operations to individual shareholders that has not been disseminated to all shareholders. We received additional information from Canadian Natural, and held conference calls with Canadian Oil Sands and with Suncor, which provided additional information on its reclamation efforts in subsequent communications with SHARE.

The following sections provide a brief description of the themes we discussed with companies, the information we gathered, and the issues where improved corporate disclosure will be necessary to enable investors to understand the long-term risks associated with reclamation and their potential impact on shareholder value.

It should be noted that the projects we looked at are at different stages of development. While Suncor and Syncrude (Canadian Oil Sands) have been operating in the oil sands for over four decades, Canadian Natural just started bitumen production in February of 2009. Meanwhile, the Fort Hills mining project, which Suncor inherited from its merger with Petro-Canada, is still in the planning stages, and Suncor is yet to make a final decision about its execution. Imperial's Kearl oil sands mining project is not included in our assessment, given that the company did not respond to our questions. However, it should be noted that Imperial holds a 25 percent stake in the Syncrude project, which we discussed with Canadian Oil Sands.

1. Reclamation of Tailings

The extraction of bitumen from oil sands mining results in a stream of waste known as tailings, a slurry of water, sand, silt, clay and residual bitumen, as well as high levels of naphthenic acids and other toxic chemicals. Tailings are discharged into ponds, where they are left to settle and a portion of the process water is extracted to be reused in the upgrading process.

When projects started, it was expected that the sediment in the tailings would settle to the bottom of the ponds within a few years, that the ponds could be dewatered by discharging the remaining tailings water –with minimal treatment required– back into the Athabasca River, and that the residual sediments would be dry and stable enough to be reclaimed as dry lands. These projections have not materialized in any of the operations to date, however, and ponds have been growing for decades and now hold an estimated 720 million cubic meters of waste.

While coarse solids (i.e., sand) settle rapidly, fine solids remain in a suspension called "fluid fine tailings" (FFT or FT). FT concentrates to about 30 per cent solids in two to three years (the rest is made up of water that cannot be recycled), but only very slowly thereafter, forming a slurry material called "mature fine tailings" (MFT), which without intervention could take more than a century to settle. According to Alberta's Energy Resources Conservation Board (ERCB), "there is currently no demonstrated means to reclaim [MFT] without further processing," and oil sands operators "have not met the targets set out in applications to the ERCB for the consumption of [FT]," so tailings ponds continue to grow.[4]

In June 2008, the ERCB calculated the inventory of FT requiring containment in tailings ponds to be around 720 million cubic metres.[5] This inventory can be attributed to a lenient regulatory environment that has allowed companies to delay tailings reclamation, but the legal landscape appears to be changing. In response to growing public concerns over companies' poor tailings performance and a widely publicized incident in which 1,600 ducks died after landing in a

tailings pond, in February 2009 the ERCB issued a new regulation that requires companies to start reclaiming their MFT/FT or face penalties, including suspension of their operations.

The new regulation, ERCB Directive 074, requires companies to capture minimum volumes of fine tailings and to make "trafficable" deposits (i.e., deposits that are strong enough to hold heavy traffic and are thus suitable for final reclamation) that meet specific criteria, including on strength and stability, by specified dates. Directive 074 also requires companies to submit to the ERCB annual tailings plans (starting in September 2009), pond status reports (starting in September 2010), and compliance reports (starting in September 2011).

The first tailings plans submitted under Directive 074 indicate that companies face significant risks related to tailings reclamation. Of the nine plans presented, seven revealed that companies do not expect to be able to comply with Directive 074's phase-in targets. The other two plans were put forward by Suncor, one for its current mines and another for the Fort Hills mining project, which is still in the planning stages.[6] Based on all company submissions, the Pembina Institute has calculated that the volume of FT/MFT will grow by 30 percent, from 843 million m^3 in 2010 to over 1.1 billion m^3 in 2020, and will still be over 1.1 billion m^3 in 2065.[7]

What are the risks for investors?

The very limited success that companies have had with FT/MFT reclamation[8] and the new regulatory requirements to achieve tangible progress in this area or face penalties indicate that tailings reclamation presents regulatory and financial risks to operators and investors. In order to better assess these risks, we requested information from companies in the following areas:

- Total volume of FT/MFT produced to date (if applicable);
- Total volume of FT/MFT treated successfully (i.e., to a "trafficable" or strong enough deposit suitable for final reclamation), or tangible success in testing/piloting selected tailings technologies to produce trafficable deposits, as applicable;
- Amount of FT/MFT consumed or expected to be consumed in the treatment process selected (e.g., sands-to-fines ratio), as applicable; and
- Alternative tailings reclamation plans if selected technologies do not perform as expected, including provisions to cover the costs of more expensive alternatives or additional solutions (e.g., MFT cycloning or centrifuging).

All companies rely on some form of "consolidated tailings"[9] (CT) technology to treat their FT/MFT, although there are variations in terms of the additives being used or proposed to ensure that the FT/MFT deposit does not liquefy or segregate, and that it remains strong enough to be reclaimed. While "CT technology" proper uses gypsum, other additives used or proposed include CO_2, polymers, and flocculants. Other methods to further dewater MFT/FT and/or treated fines deposits include cyclones and mechanical thickeners.

Companies' responses

In essence, none of the companies we wrote to demonstrated success in treating FT/MFT inventories or in testing selected tailings technologies, with the exception of Suncor, which provided some evidence of success with a new tailings technology tested in 2009. We found that operators with substantial MFT inventories (230 million m^3 for Suncor and 465 million m^3 for Syncrude) to date have not produced deposits that consume significant amounts of MFT, or which comply with Directive 074's key requirements. Just as important, companies do not

disclose the specific costs of tailings technologies being implemented or planned, so investors cannot assess whether sums being allocated for tailings reclamation are adequate, or whether significant liabilities are being deferred by companies into the future.

As indicated above, only Suncor expects to be able to comply with the initial targets of Directive 074. Suncor has assured SHARE that its new tailings process (MFT drying or "MFTD"), which uses a polymer and is projected to replace CT in 2011, has been successfully demonstrated. The company has confirmed that 350,000 m^3 of MFT were consumed in polymer-based MFTD tests conducted in 2009,[10] and indicated that dried deposits have not liquefied upon contact with water (the long-term stability of dried fines has been highlighted as a key concern of polymer-based MFT drying).[11] Suncor has also assured SHARE that, while tests are still ongoing regarding shear strength of MFTD dried fines, evidence to date indicates that the deposits' shear strength will exceed the requirements of ERCB Directive 074.

Suncor's tailings plan portrays MFTD as a revolutionary technology that will allow the company to successfully reclaim its tailings inventory, much like CT was presented when Suncor pioneered the technology in the 1990s. While Suncor's claims regarding MFTD tests results give some confidence to investors that MFTD can deliver projected results, more time and large-scale projects will be required to demonstrate the long-term success of the technology.

Next steps: To more accurately assess the risks associated with tailings reclamation, investors need clear evidence of success of companies' reclamation activities or pilot tests. Success should be measured in terms of strength, trafficability and stability, as defined by ERCB Directive 074. In the absence of satisfactory evidence of success, investors can reasonably expect companies to disclose their contingency plans to treat FT/MFT, including an estimation of costs of alternative solutions (vs. costs of current techniques being used or planned), and an explanation of how those costs are being accounted for in project economics.

2. End pit lakes (EPLs)

All oil sands companies plan to create artificial lakes in mined-out pits, or "end pit lakes" (EPLs), as a means to reclaim a portion of their process water, fine tailings and/or other mine waste. EPLs involve the transfer of process water, FT/MFT and/or treated FT/MFT (e.g., "off-spec CT") that is unsuitable for reclamation to mined-out pits, and the capping of the tailings mix with a layer of fresh water.

The assumption is that the tailings mix will remain on the bottom of the EPL (i.e., that it will not mix with the fresh water layer), and that natural biological processes will eventually transform EPLs into healthy ecosystems able to support life. Only small prototype ponds have been built, however, and EPLs have "yet to be proven on a commercial scale" (ERCB). Syncrude plans to build the first EPL in 2012, and many concerns associated with the lakes remain, including environmental risks related to water quality.[12]

Studies suggest that small, isolated ponds begin to detoxify naturally over a period of several months to two years, and the degradation of naphthenic acids (the main source of acute toxicity in tailings ponds water) has been shown to occur in about ten years. However, there is also evidence that larger systems may take longer to detoxify, and that certain compounds do not biodegrade and could contribute to chronic toxicity in the lakes, making them unsuitable for fish and other aquatic biota.[13]

The government of Alberta has granted approvals of EPLs "subject to successful full-scale demonstration of this reclamation method."[14] As Alberta's Cumulative Environmental Management Association (CEMA) notes:

> "Many background studies and modelling exercises have been conducted as part of the research on EPLs. However, it is difficult to show that EPLs will be successful and will function as planned, because there are no EPLs currently in existence. The oil sands industry needs to demonstrate that EPLs will be successful, that they will meet regulatory requirements and will not have negative environmental impacts."[15]

What are the risks for investors?

EPLs may prove to be an unpractical reclamation method, which means that reclamation of process water may be much more costly than anticipated. Not only are EPL approvals subject to their successful full-scale demonstration, but, as pressure on the government rises to deal with tailings ponds, operators might be subjected to increasingly more stringent requirements and/or enforcement.[16] Because a "zero discharge" policy prevents companies from releasing tailings into the Athabasca River, oil sand producers may have to treat process water to a standard that allows its discharge into the river if natural detoxification in EPLs does not occur as projected. The process could be very expensive, as contaminated water inventories are even larger than MFT inventories, estimated at 5.5 billion cubic meters in May 2008.[17]

Concerning EPLs, SHARE asked companies to provide the following information:

- Assessment of risks and costs related to possible EPL failure (including contingency plans for dealing with potential problems such as mixing of contaminated water with the fresh water cap, or seepage of contaminated water into groundwater aquifers); and
- Consideration and costing of viable alternatives, in particular treatment of contaminated water to a standard that would allow its discharge into fish-bearing waterways.

Companies' responses

In general, we found that companies have not given enough consideration to the possibility that end pit lakes may ultimately fail as a reclamation method of FT/MFT and process water. None of the companies we talked to has adopted a detailed contingency plan to address potential problems associated with EPLs, and none of them provided a satisfactory response to the question of water treatment options and cost estimates, which operators have not implemented thus far, reportedly due to high costs and technical difficulties.

One company assured us that process water treatment will be implemented if no other management options are feasible. The company said it could not provide an accurate cost estimate for water treatment because of insufficient design work, but that the cost is comparable to the selected "biological process" (which entails the establishment of small lakes and wetlands to allow for the progressive biological breakdown of water pollutants) and is therefore included in the budget.

While we were encouraged to hear that water treatment is being considered as an option, it is vital that investors obtain precise cost estimates from companies of both natural biological degradation processes and alternative water treatment options (taking into account *volumes* of water to be treated), so as to confirm that costs are indeed comparable, and that alternative options selected would achieve the desired water quality criteria (e.g., those of the Canadian Water Quality Guideline For Freshwater Aquatic Life).

As discussed above, the natural biodegradation process that companies are currently relying on may not deliver water that is suitable for discharge into fish-bearing waterways. Bio-degradation of the acutely toxic fraction of naphthenic acids (NAs) has been demonstrated in pond experiments, but high molecular weight NAs appear to be resistant to biodegradation and may contribute to chronic toxicity in reclaimed environments. Aromatic hydrocarbons (e.g., PAHs), which have been linked to endocrine disruption and deformities in fish, are also a concern.[18] Alternative water treatment options should therefore remove NAs, PAHs and other relevant contaminants to safe levels for fish and other aquatic life.

Next steps: Since EPL viability remains unproven and alternatives such as water treatment could prove much costlier, investors can reasonably expect companies to disclose their contingency plans in the event that EPLs fail as a reclamation method. Contingency plans should include a calculation of costs of water treatment options (taking into account projected volumes of process water that may require treatment) that would enable discharge of treated water into fish-bearing waterways.

3. Dike failures/process water seepage

Oil sands operators are not allowed to discharge their tailings into natural waterways, so they deposit them in ponds. Nearly a dozen ponds are located along the Athabasca River, separated from it by dikes or dams. In theory, the dikes prevent process-affected water from reaching groundwater systems or waterways. Independent studies based on company data, however, claim that the ponds are leaking an estimated 11 million litres of contaminated water per day, creating a serious long-term contamination problem for the Athabasca watershed.[19]

Operators contend that seepage of process water is part of the dikes' design to ensure dike stability, and that seepage collection systems (e.g., interception ditches) are in place in all tailings ponds to allow for leaked process water to be pumped back into ponds. Companies admit that some seepage of process water occurs beyond design parameters, but they point to monitoring programs which indicate that the seepage is not significant to be a cause of concern. Their claims are supported by the Regional Aquatic Monitoring Program (RAMP), an industry-funded, multi-stakeholder program founded in 1997 to monitor aquatic ecosystems in the oil sands region. Independent researchers have criticized RAMP for its lack of transparency regarding the data it collects and the methods it uses to analyze and report on data, and are calling for improved scientific and technical oversight of the program to ensure that data are available for independent scrutiny and analyses.[20] Following a request by Environmental Defence, Environment Canada is investigating the potential leakage of tailings ponds water into the Athabasca River, in possible violation of the federal Fisheries Act.[21]

Irrespective of seepage levels, which could entail financial liabilities for investors if companies are indeed underestimating the problem, extreme weather events or earthquakes could trigger a collapse of even the best engineered dike. Given the massive size of the tailings ponds, a dike failure along the Athabasca River would have a devastating effect on the river and the Mackenzie River Basin, which is fed by the Athabasca and carries a fifth of Canada's freshwater to the Arctic Ocean. In 2003, the Mackenzie River Basin Board concluded that an accident in one of the tailings ponds could have a "catastrophic impact on the aquatic ecosystem of the Mackenzie River basin due to the size of [the] ponds and their proximity to the Athabasca River."[22] A dike failure would also affect 300,000 aboriginal people that depend on the Mackenzie River basin, some of whom already have reported high incidences of cancer and other negative health effects from oil sands projects.

What are the risks for investors?

While the risk of a major dike failure appears to be very small, it exposes companies to considerable liabilities, including massive clean-up costs and litigation and reputational risks. The actuality of litigation risks is emphasized by the recent decision by the governments of Canada and Alberta to press charges against Syncrude Canada Ltd. over the death of 500 (later estimated to be 1,600) ducks in one of its tailings ponds, following a wave of media coverage of and public outrage over the incident.[23] In addition, if process-affected water seepage levels prove to be as serious as independent research suggests, companies could be subjected to significant liabilities, including costly clean-up and litigation.[24]

In order to better assess these risks, we asked companies to provide the following information:

- Assessment of possible costs and liabilities associated with a tailings pond dike failure, such as clean-up costs and litigation risks;
- Insurance or plans to insure against a major dike failure; and
- Volume/levels of process water seepage into surface or ground water (for companies with tailings ponds).

Companies' responses

Although most companies carry operation interruption insurance for property loss and lost operations related to dike failures, none of them is insured for clean up costs or litigation liabilities arising from a dike failure. There appear to be two key reasons for this: first, while companies acknowledge that a major accident could occur, they consider the risk to be too low to merit attention; second, the liabilities related to the environmental effects of a major dike failure (including clean-up costs) would be so high that they are essentially uninsurable.

Regarding process water seepage into waterways, companies responded that most process water is captured in collection systems and returned to the ponds, and that they are not aware of seepage exceeding approved design parameters. While companies mentioned monitoring systems are in place in the Athabasca River and surrounding waterways, they stated that seepage data are not currently reported, since water tests have shown no changes in concentrations of any items of concern beyond naturally occurring levels.

As discussed above, independent studies claim that all tailings ponds are leaking beyond design parameters, and that the various methods companies use to recapture process water are letting considerable volumes of contaminated water to escape into groundwater and surface waterways.[25] The reconciliation of these two conflicting conclusions would provide investors with assurance that companies are not underestimating seepage levels and the ability to assess financial risks associated with the environmental impacts of process water seepage, including potential litigation and clean-up costs.

Next steps: Since it is apparent that no insurance company will cover the environmental liabilities associated with a major dike failure, investors cannot realistically expect companies to purchase such insurance. In that context, it is vital that investors learn more about the policies and measures companies have adopted to ensure dike integrity and stability and mitigate risks associated with dike failures and process water seepage. Specifically, investors should inquire about monitoring of process water seepage entering the groundwater systems or surface waterways, and request periodic data on seepage levels and actions to minimize seepage.

4. Reclamation (i.e., restoration) of wetlands

Oil sands mining projects have disturbed or are projected to disturb around 240,000 hectares of wetlands,[26] which constitute about 40 percent of the mineable oil sands region in Alberta and are critical for healthy aquatic systems and for a wide variety of plants and wildlife species.[27] Most wetlands in the oil sands region are peatlands (bogs or fens), which take "thousands of years of evolution" to form and could be very difficult to restore.[28]

While the restoration of peatlands may ultimately prove unviable, the construction of other types of wetlands (e.g., marshes) is also a challenge. According to experts, after two decades of research, "reclamation of wetlands on oil sands leases is still in its infancy."[29]

So far, only small, pilot-scale marshes and ponds have been created, and they enjoy considerably less biological diversity (including of vegetation) than natural wetlands, as do wetlands created accidentally through tailings ponds seepage (which have proven toxic to some aquatic organisms). Syncrude is pioneering the creation of a 54-hectare fen, but the project is in the early stages and "before the government will provide a reclamation certificate, Syncrude must prove that the reclaimed area sustains vegetation and wildlife to the same capacity that was in the region before the area was disturbed."[30]

What are the risks for investors?

Wetlands carry two sets of risks for companies and investors. The first relates to the ability of operators to obtain a government reclamation certificate for restored wetlands. The second stems from a new policy that would require companies to compensate for wetlands lost in Alberta through wetland restoration, creation or enhancement, which industry claims could cost billions of dollars to the oil sands sector.

Regarding the first issue, although criteria for certification of restored wetlands have yet to be established, the *Guideline for Wetland Establishment on Reclaimed Oil Sands Leases* (2007) suggests as possible criteria for evaluation the following three questions:

1. Will the wetland be viable/sustainable in the long term as a wetland ecosystem?
2. Does the wetland have structural and functional integrity? and
3. Does the wetland have capacity to support intended functions and uses?

Given that the viability of wetland (especially peatland) restoration remains unproven and that the government of Alberta is under increasing public pressure to adopt and enforce stricter environmental standards in the oil sands region, companies may be deferring significant reclamation costs into the future.

Even if companies are able to obtain reclamation certificates for restored wetlands, the area of wetlands restored will be much smaller than the total area of wetlands destroyed (i.e., most disturbed wetlands will not be reclaimed as wetlands). That leads to a second set of risks, which arise from a new proposed regulation that would require oil sands producers to compensate for wetlands lost to their operations.

In September 2008, the Alberta Water Council (AWC) submitted a draft wetland policy to Alberta's Minister of Environment. The proposed policy seeks to maintain wetland area *and* ecological functions in Alberta, and requires companies to ensure that all wetland losses are compensated for if they cannot be avoided, including through construction of wetlands where none existed or where "their form has been removed through development activities." In areas such as the mineable oil sands region, where wetland degradation or loss has been low (the

greatest historic loss of wetlands has occurred in Alberta's settled area), "wetland objectives may be designed to allow some loss at a regional and watershed scale, provided that a comparable wetland gain occurs elsewhere."[31]

Although the Canadian Association of Petroleum Producers (CAPP) and the Alberta Chamber of Resources (ACR) were initially involved in the policy drafting process, both have rejected the wetland policy submitted by the AWC. They claim that a "no net wetlands loss" approach would be too burdensome on oil sands producers, as companies would need to restore wetlands outside the oil sands region. Based on 1:1 and 1:3 compensation ratios, they have estimated that the new policy would cost oil sands companies "billions of dollars."[32]

CAPP and ARC are asking the Alberta government to make an exception to the no "net loss" approach for the oil sands industry, and to allow the government to decide, on a case-by-case basis, whether wetland loss compensation should be required.[33] Environmental groups are urging the government not to give in to industry pressure, and the most likely outcome is that a watered-down version of the AWC's policy will be adopted. Alberta Environment has delayed adoption of the wetland policy to 2012, but it remains likely that it will require oil sands producers to restore the wetland area they destroy on at least a 1:1 ratio (the AWC's policy seeks to ensure no net loss of wetland area *and functions*, which would typically require restoring a much larger area than the wetland area destroyed).[34]

In order to assess the risks related to wetland restoration, SHARE asked companies to provide the following information:

- Total area (in hectares) of wetlands disturbed to date, and total area (in ha) of wetlands to be permanently lost (i.e., not to be reclaimed as wetland);
- Alternative plans in case proposals to reclaim wetlands do not go as expected; and
- Provisions made to meet possible future requirements concerning wetland loss compensation, such as those that have been proposed by the Alberta Water Council in the new wetland policy for Alberta.

Companies' responses

The responses we received revealed some differences between companies concerning wetland disturbance, restoration plans, and management of associated risks.

All companies anticipate destroying some wetlands permanently, with areas ranging from 1,100 to nearly 10,000 hectares (see Table 1 below). In general, companies are confident that wetland restoration (in particular of marshes and other non-peat forming wetlands) will be achieved successfully, and none has adopted a plan to compensate for wetlands permanently lost to their operations.

Regarding regulatory risks, some operators have adopted a "wait and see" approach and are waiting for the government to adopt the wetland policy before they even consider the implementation of a wetland offset/compensation program. One company is exploring the option of purchasing conservation offsets, but only at the local level and as a temporary measure, until reclamation is finalized. Another is already engaged in a conservation offsets program, which seeks to protect tracts of habitat in Alberta's Boreal forest to offset some of the habitat disturbance caused by its operations. Around 900 hectares of land have been protected thus far, including some wetlands,[35] but the area represents a very small fraction of wetlands

lost (around 10,000 hectares, of which only 74 ha will be restored), and it is unlikely to satisfy new regulatory requirements concerning wetland compensation.

Table 1. Wetlands disturbance and restoration

Company	Wetlands area disturbed (in ha)	Wetlands area to be restored (in ha)	Total wetlands area to be permanently lost (in ha)
Suncor	10,000 (approx.)	74 (as per TRO plan)	9,926 (approx.)
Syncrude (COS et al)	2,381	1,289 (incl. 54-ha fen)	1,092
Canadian Natural	3,995	1,986	2,009
Petro-Canada	5,471	1,968	3,503
Imperial Oil*	11,000	5,000 (incl. 383-ha fen)	6,000

* Information contained in the Kearl Oil Sands Project application

Next steps: In order to assess the regulatory and financial risks associated with wetland restoration and compensation, investors can reasonably expect companies to provide an assessment of the costs of implementing a wetland compensation scheme under different compensation ratio scenarios (e.g., 1:1, 1:2 and 1:3 ratios).

3. Conclusion

Our exchanges with selected companies in the oil sands region revealed that important information gaps remain regarding companies' performance regarding reclamation of land and tailings, valuation of reclamation technologies and methods being used or proposed, and management of risks associated with reclamation.

The information we collected suggests that companies are facing considerable risks associated with reclamation, in particular of fine tailings, process water and wetlands. Very limited progress has been achieved to date, and uncertainty remains regarding the future success of selected technologies and reclamation methods. Companies do not disclose the costs of specific reclamation technologies (in particular to treat their fine tailings), or of alternative methods that may need to be implemented if selected technologies prove inadequate. This means that investors currently do not have enough information to assess whether significant reclamation liabilities are being deferred by companies into the future.

In order to better assess the risks associated with reclamation, including regulatory, litigation and financial risks (e.g., clean-up costs from environmental impacts), investors will need to request companies to provide the following information:

- **Tailings reclamation:** Concrete evidence of success of reclamation activities or pilot tests, measured in terms of strength, trafficability and stability, as defined by Directive 074. Contingency plans to treat fine tailings, including costs estimates of alternative solutions, and details on how those costs are being accounted for in project economics.
- **End Pit Lakes:** Contingency plans in the event of EPL failure, including calculation of costs of water treatment options (taking into account volumes of process water to be treated) that would enable discharge of treated water into fish-bearing waterways.
- **Dike integrity and stability:** Measures and policies adopted to ensure dike integrity and stability, including periodic data on process water seepage levels entering ground and surface water, and actions taken to minimize seepage.
- **Wetland restoration:** Assessment of costs of implementing a wetland compensation scheme under different compensation ratio scenarios.

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NOTES

[1] See "Canadians ponder cost of rush for dirty oil," John Vidal, The Guardian (12 July 2008); "Energy Giants Urged to Abandon Oilsands" Calgary Herald (15 September 2008); and "Economic engine or environmental hazard?" CBC News (8 October 2008).

[2] See Alberta Regulation 115/93, *Conservation and Reclamation Regulation* (of Alberta's Environmental Protection and Enhancement Act), Arts. 1(k), 2 and 3.

[3] See Pembina Institute, "Fact or Fiction: Oil Sands Reclamation," by Jennifer Grant et al (May 2008) at 7-8.

[4] ERCB Backgrounder, Draft Directive: Tailings Performance Criteria & Requirements for Oil Sands Mining Scheme (June 2008).

[5] ERCB News Release, "ERCB Releases Draft Directive on Oil Sands Tailings Management and Enforcement Criteria" (26 June 2008).

[6] Directive 074 notes that operators "may need flexibility to apply technologies," and that the ERCB "will determine project-specific requirements related to the directive." Some companies have interpreted this as enabling them to set their own targets, but it remains to be seen whether the ERCB accepts this interpretation.

[7] The Pembina Institute and Water Matters, "Tailings Plan Review: An Assessment of Oil Sands Company Submissions for Compliance with ERCB Directive 074" (December 2009).

[8] Consolidated Tailings (CT) technology (and its variations) is the most relied on tailings technology at existing and newly approved oil sands mining operations. CT technology involves mixing MFT, coarse sand and chemical agents to form a mixture (in theory, a soft clay) that can be reclaimed to a stable solid deposit, thereby "consuming" the MFT. Although CT has been applied commercially in the past 10 years, operators are "continually challenged to produce CT on specification" (ERCB). Suncor, which pioneered the technology in the 1990s, has conceded that CT has not achieved the desired level of performance, and in 2006 the ERCB's predecessor expressed concern that "Suncor ha[d] not met proposed targets in the management of its tailings," with CT production being 19 % of projected values. Energy and Utilities Board (EUB), "Decision 2006-112: Application for Expansion of an Oil Sands Mine and Bitumen Upgrading Facility (Suncor Energy Inc.)," p. 30.

[9] See *supra* note 8.

[10] Suncor's TRO Application provides some details on MFTD tests, but these refer to tests that were conducted prior to using the polymer that was ultimately selected by the company (e.g., a test conducted in Pond 1 in Dec-07 to Jan-08 consumed 90,000 cubic meters of MFT, but the polymer was not used in that test).

[11] While Suncor's TRO Application lists as a parameter of the MTFD process that "dried fines do not revert to MFT upon contact with water," a research paper presented at a Canadian International Petroleum Conference symposium in June 2008 notes that "the polymer treated dry MFT has a significantly greater propensity to re-adsorb any rainfall. The resulting effect on the long term properties of a dried MFT deposit created with a polymer are not known." Randy J. Mikula et al., CANMET, "Water Use in Bitumen Production: Tailings Management in Surface Mined Oil Sands" (June 2008).

[12] For details see CEMA, "Oil sands end pit lakes: A review to 2007" (March 2007) at 34-36.

[13] See Erik W. Allen, "Process Water Treatment in Canada's Oil Sands Industry: Target Pollutants and Treatment Objectives" (2008) J. Environ. Eng. Sci. 7(2) pp. 123-138.

[14] EUB Decision 2007-013 (Imperial Oil Kearl project). Decisions on Shell's Jackpine mine and Canadian Natural's Horizon mine applications requested that the efficacy of EPLs be proven by 2018 (see *ibid.* at 44).

[15] See CEMA, *supra* note 12 at i.

[16] This applies to both provincial and federal legislation, such as Alberta's surface water quality guidelines and Directive 074, and the Fisheries Act ("any tailings release or seepage from EPLs into fish-bearing waters might constitute a violation of the Fisheries Act," which would warrant enforcement action by Environment Canada. EUB/CEAA Joint Panel Report (EUB Decision 2004-005) (January 27, 2004) [Horizon project] at 46).

[17] See Pembina Institute, *supra* note 3 at 15.

[18] See Allen, *supra* note 13.

[19] See Environmental Defence, *11 Million Litres a Day: The Tar Sands' Leaking Legacy* (December 2008), and Kevin P. Timoney and Peter Lee, "Does the Alberta Tar Sands Industry Pollute? The Scientific Evidence," The Open Conservation Biology Journal, 2009, Vol. 3, 65-81 at 72.

[20] See Erin N. Kelly et al., "Oil sands development contributes polycyclic aromatic compounds to the Athabasca River and its tributaries" Proceedings of the National Academy of Sciences (PNAS) Early Edition, Oct. 2009; and G. Burton Ayles et al, *Oil Sands Regional Aquatic Monitoring Program (RAMP) Scientific Peer Review of the Five Year Report (1997-2001)*, Fisheries and Oceans Canada, Winnipeg, MB (2004).

[21] See Mike De Souza, "Environment Canada probes water contamination at oilsands," Canwest News Service (27 November 2009).

[22] Mackenzie River Basin Board, "State of the Aquatic Ecosystem Report 2003" at iv.

[23] The provincial government charged the company for violating the EPEA, for failing to have functioning bird deterrents at the site, while Ottawa pressed charges under the Migratory Birds Convention Act. The Alberta charges carry a maximum penalty of $500,000, and the federal charges carry a maximum penalty of $300,000 and/or six months in jail.

[24] See *supra* note 16.

[25] See Environmental Defence, *supra* note 19.

[26] Simon Dyer (Oil Sands Program Director at The Pembina Institute), "Will Alberta finally protect wetlands, or will the oil sands continue to get a free pass?" (25 January, 2010).

[27] The Fort Hills project, for instance, will directly disturb 45% of a rich, patterned fen that hosts many rare plants and more than 100 species of birds, and affect 49% of the larger complex in which the fen is embedded. For that reason, the Alberta Wilderness Association and other environmental NGOs have asked the government to revoke access to the wetland complex and compensate the project partner if necessary.

[28] See Alberta Environment, Oilsands Wetland Working Group, 2000. *Guideline for Wetland Establishment on Reclaimed Oil Sands Leases*, Neil Chymko, ed., at ii.

[29] See *Guideline for Wetland Establishment on Reclaimed Oil Sands Leases* (revised, 2007 version) at 84.

[30] Syncrude Canada Ltd., "Syncrude researches new ways to reclaim disturbed land" (March 2009).

[31] Alberta Water Council, "Recommendations for a new Alberta wetland policy" (16 September 2008) at 15.

[32] For details, see letters from Tim Ryan (ACR) and David Pryce (CAPP) to Gordon Edwards, Alberta Water Council (both dated 30 July 2008), available at: <http://pubs.pembina.org/reports/wetland-policy-letters.pdf>.

[33] See *ibid*.

[34] Under Alberta's Water Act, which does not apply to the oil sands region, project proponents are usually required to compensate for natural wetlands destroyed by restoring much larger areas of wetlands (e.g., four hectares restored per each ha destroyed), since "it is almost impossible to fully replicate a wetland ecosystem." Alberta Environment, *Provincial Wetland Restoration/Compensation Fact Sheet* (November 2005).

[35] See Alberta Conservation Association, "Suncor Energy Foundation," online: <http://www.ab-conservation.com/go/default/index.cfm/our-partners/corporate-partners-in-conservation-program/suncor-energy-foundation/>.