

Directive 074

February 3, 2009

Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes

The Energy Resources Conservation Board of Alberta (ERCB/Board) has approved this directive on February 3, 2009.

<original signed by>

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1 Purpose of This Directive

This directive sets out new requirements for the regulation of tailings operations associated with mineable oil sands. It is the first component of a larger initiative to regulate tailings management. The directive specifies performance criteria for the reduction of fluid tailings and the formation of trafficable deposits. These criteria are required to ensure that the Energy Resources Conservation Board (ERCB/Board) can hold mineable oil sands operators accountable for tailings management. Operators may use a suite of technologies to meet the requirements of this directive. Key terms are defined in Appendix A.

1.1 Direction from Alberta Energy and Utilities Board and Joint Panel Decision Reports

In past applications, mineable oil sands operators proposed the conversion of fluid tailings into deposits that would become trafficable and ready for reclamation. While operators have applied fluid tailings reduction technologies, they have not met the targets set out in their applications; as a result, the inventories of fluid tailings that require long-term containment have grown. With each successive application and approval, public concerns have also grown.

Decision reports issued by the Alberta Energy and Utilities Board (EUB—predecessor to the ERCB) and joint panels of the EUB and the Canadian Environmental Assessment Agency (CEAA)¹ identified several long-term objectives respecting tailings management:

- to minimize and eventually eliminate long-term storage of fluid tailings in the reclamation landscape;
- to create a trafficable landscape at the earliest opportunity to facilitate progressive reclamation;
- to eliminate or reduce containment of fluid tailings in an external tailings disposal area during operations;
- to reduce stored process-affected waste water volumes on site;
- to maximize intermediate process water recycling to increase energy efficiency and reduce fresh water import;
- to minimize resource sterilization associated with tailings ponds; and
- to ensure that the liability for tailings is managed through reclamation of tailings ponds.

Two joint panel decision reports issued in early July 2004 directed EUB staff to address tailings management issues through the establishment of industry-wide performance criteria by March 2008. Recognizing that the above objectives will take time to accomplish, the EUB initiated a phased approach. This directive focuses on the reduction of fluid tailings volumes and the formation of trafficable deposits.

2 Regulatory Framework for Tailings Management

The ERCB regulates oil sands mining and processing operations, as well as discard from those operations, including tailings. Approvals for mines and processing plants are required by Sections 10 and 11 of the *Oil Sands Conservation Act*. Approval to commence, suspend,

¹ Joint panel decision reports issued in 2004 for the Shell Jackpine and CNRL Horizon applications.

or abandon an oil sands site is required by Section 3 of the *Oil Sands Conservation Regulation (OSCR)*. Approval for storage of discard generated by a mine or a plant is required by Sections 24 and 48 of the *OSCR*.

Alberta Environment (AENV) and Alberta Sustainable Resource Development (SRD) also regulate oil sands development. The ERCB (then known as the EUB), AENV (then known as Alberta Environmental Protection [AEP]) and SRD have a memorandum of understanding² (MOU) outlining each agency's responsibilities and how they work together. The MOU addresses tailings ponds and other aspects of mineable oil sands management, including water use and reclamation.

AENV and SRD have primary responsibility for managing the environment, including pollution prevention and control, water allocation, use and protection of potable water, conservation and reclamation planning, and the evaluation of air, water, and land for environmental performance reporting. The ERCB, in its decisions on schemes, must approve the proposed reclamation plan and must be satisfied with water use and disposal. More specifically, Section 49 of the *OSCR* requires operators to minimize the use of fresh make-up water and the disposal of waste water, as well as to maximize the recycling of produced water.

The MOU recognizes the ERCB as the lead regulator for approving the need, location, design, and performance of discard sites. The MOU also recognizes the role and need for ERCB input to the broader process for establishing reclamation criteria that are clear and meet the objectives of the Government of Alberta.

The ERCB has directed that performance criteria be established on an industry-wide basis with specific enforcement actions.

3 Application of This Directive

This directive applies to all mineable oil sands operations and requires the reduction of fluid tailings and their conversion into trafficable deposits. Operators must satisfy the ERCB that their tailings management systems will achieve compliance with the directive. Operators are required to make submissions to the ERCB on how they will meet the new requirements and identify any project-specific constraints that may have a bearing on meeting the requirements. Requirements will be phased in and adapted, as approved by the Board, to take account of particular mining and tailings plans, facilities, and the status of a project.

The ERCB recognizes that fluid tailings management is developing and that operators may need flexibility to apply technologies and techniques that best suit the circumstances of particular projects. The ERCB will consider submissions of operators and will determine project-specific requirements related to the directive.

Operators are required to assess, compare, and report their tailings performance against their approved tailings plans. In accordance with standard practice, any significant changes to tailings management must be reported to the ERCB and may require an application for an amendment to the approval. If the ERCB approves an application for amendment, the approval may define additional project-specific requirements.

² *Informational Letter (IL) 96-07: EUB/AEP Memorandum of Understanding on the Regulation of Oil Sands Developments.*

4 Actions Required to Comply with This Directive

This directive requires operators to

- reduce fluid tailings through fines captured in dedicated disposal areas (DDAs), and
- form and manage DDAs.

Operators are required to submit to the ERCB

- DDA plans,
- annual compliance reports for DDAs, and
- annual tailings plans and pond status reports.

4.1 Reduction of Fluid Tailings through Fines Captured in DDAs

The performance criterion for fluid tailings reduction is based on fines captured in DDAs. Fines are mineral solids with particle sizes equal to or less than 44 micrometres (μm), as defined in Appendix A. The criterion establishes a minimum mass of dry fines in the oil sands feed expressed as a percentage of total fines in feed that must report to the DDAs. This requirement applies to a one-year period between surveys (expected to be July 1 to June 30 of the following year). The phase-in sequence will be as follows:

- 20 per cent from July 1, 2010, to June 30, 2011;
- 30 per cent from July 1, 2011, to June 30, 2012; and
- 50 per cent from July 1, 2012, to June 30, 2013, and annually thereafter.

The fines captured in DDAs will be in addition to the fines captured in hydraulically placed dikes and beaches. Operators that are not constructing conventional dikes and beaches must achieve the equivalent overall fines capture.

The mass of fines captured must be reported quarterly and annually, as set out in Appendix B.

Operators must demonstrate to the satisfaction of the ERCB that sufficient monitoring, measurement, and sampling are performed to measure and report on the fines in oil sands feed.

4.2 Submission of DDA Plans

Operators must submit the plan for each DDA to the ERCB for approval. The plan must

- be provided two years prior to construction (this timing may vary for existing operators);
- specify dates for construction, use, closure, capping, and formation of trafficable deposits (existing approvals will be amended accordingly); and
- be amended in the event of significant changes.

The DDA plan will be subject to a coordinated review by the ERCB, AENV, and SRD and be approved by the ERCB.

The content of the DDA plan is set out in Appendix C.

4.3 Formation and Management of DDAs

DDAs must be formed in a manner that ensures trafficable deposits. The performance criteria are based on the strength of the deposit. The following criteria must be achieved annually:

- minimum undrained shear strength of 5 kilopascals (kPa) for the material deposited in the previous year;
- removal or remediation of material deposited in the previous year that does not meet the 5 kPa requirement; and
- ready for reclamation within five years after active deposition has ceased. The deposit will have the strength, stability, and structure necessary to establish a trafficable surface. The trafficable surface layer must have a minimum undrained shear strength of 10 kPa.

The DDAs must be monitored for geotechnical stability. Performance of the DDAs must be determined by annual surveys starting in summer 2011, as stated in Appendix D (and reported according to the schedule in Appendix G).

The ERCB requires operators to file applications to abandon DDAs after the trafficable surface layer has been achieved.

4.4 Submission of Annual Compliance Reports for DDAs

Baseline surveys for DDAs must be completed for each operation in summer 2010 and reported by September 30, 2010. The first compliance reports must be submitted by September 30, 2011. Operators must complete DDA surveys annually thereafter and submit compliance reports by September 30 of each year. This requirement applies to a one-year period (expected to be July 1 to June 30 of the following year) between surveys.

Operators must demonstrate to the satisfaction of the ERCB that sufficient monitoring, measurement, and sampling are available to measure and report on the status and properties of DDAs. A cone penetration test (CPT) as specified in Appendix A or a method approved by the ERCB must be used for measurement purposes in the DDAs.

Material in the DDAs with an undrained shear strength of less than 5 kPa does not count as contributing towards the minimum fines reduction target for that year. A detailed schedule for the removal or remediation of such material must be included in the annual DDA compliance reports.

The content of the annual DDA compliance reports is set out in Appendix D.

4.5 Submission of Annual Tailings Plans and Pond Status Reports

4.5.1 Annual Tailings Plan and Linkage to Annual Mine Plan

An annual tailings plan is required as part of the annual mine plan submission to the ERCB, in accordance with Section 30 of the *OSCR*, starting September 30, 2009. Requirements for the annual tailings management plan are described in Appendix E.

If the project has significant changes to the overall tailings management plan from that submitted in the operator's last application to the ERCB, the operator must apply for an amendment to the approval.

4.5.2 Annual Fluid Tailings Pond Status Reports

Baseline surveys must be completed for each fluid tailings pond in summer 2010. The status reports, including baseline survey information, must be submitted by September 30, 2010. Operators must complete fluid tailings pond surveys annually thereafter and submit annual status reports by September 30 of each year. This requirement applies to a one-year period between surveys (expected to be July 1 to June 30 of the following year).

Operators must demonstrate to the satisfaction of the ERCB that sufficient monitoring, measurement, and sampling are available to measure and report on the status and properties of fluid tailings ponds.

The content of annual fluid tailings pond status reports is set out in Appendix F.

5 Accountability and Enforcement

5.1 Compliance Assessments

The ERCB will conduct compliance assessments of an operator's performance against the criteria within Sections 4.1, 4.3, and 4.4, and their associated appendices.

5.2 Monitoring, Measurement, and Reporting Requirements

This directive requires submission of reports as outlined in Sections 4.1, 4.2, 4.3, 4.4, and 4.5 and their associated appendices. An overall schedule for filing of plans and status and compliance reports is specified in Appendix G.

5.3 Enforcement Measures

The ERCB enforces the requirements in this directive in accordance with *Directive 019: ERCB Compliance Assurance—Enforcement*. Noncompliances with any requirements in this directive are reported on the ERCB Web site www.ercb.ca in the *ST108: ERCB Monthly Enforcement Action Summary*.

Appendix A Definitions and Abbreviations

The following definitions and abbreviations are provided for the purposes of this directive:

AENV: Alberta Environment.

Cone penetration test (CPT): A standard test method for electronic friction cone and piezocone penetration testing of soils, as prescribed by ASTM *D5778–07*.

CT (consolidated tailings, composite tailings, and nonsegregating tailings): An engineered mixture of sand and fines to which a coagulant has been added. Upon deposition, the sand and fines do not segregate and water is released.

Dedicated disposal area (DDA): An area dedicated solely to the deposition of captured fines using a technology or a suite of technologies. The material deposited each year must achieve a minimum undrained shear strength of 5 kPa within one year of deposition.

ERCB: Energy Resources Conservation Board, the quasi-judicial agency responsible for energy regulation.

EUB: Alberta Energy and Utilities Board (predecessor to the ERCB), the quasi-judicial agency responsible for energy regulation from 1996 through 2007.

Fines: Mineral solids with particle sizes equal to or less than 44 µm based on sieve-hydrometer analysis or a method approved by the ERCB.

Fluid tailings: Any fluid discard from bitumen extraction facilities containing more than 1 mass per cent suspended solids and having less than an undrained shear strength of 5 kPa.

IL: Informational letter, a type of regulatory direction issued by the ERCB (formerly the EUB) to the energy sector.

Joint panel: A body with members appointed by the ERCB (formerly the EUB) and the Canadian Environmental Assessment Agency (CEAA).

MOU: Memorandum of understanding, a form of agreement among parties.

OSCR: *Oil Sands Conservation Regulation*, also known as *Alberta Regulation (AR) 76/88*.

Sand: Mineral solids with particle size greater than 44 µm based on sieve-hydrometer analysis or a method approved by the ERCB.

Segregation: Separation of fine and coarse fractions during or after deposition.

SRD: Alberta Sustainable Resource Development.

Tailings: A by-product of the bitumen extraction process composed of water, sand, fines, and residual bitumen.

Trafficable deposit: A deposit typically created through a process involving self-weight consolidation, drying, enhanced drainage, and/or capping with minimum undrained shear strength of 5 kPa one year after deposition. The trafficable surface layer must have a minimum undrained shear strength of 10 kPa five years after active deposition.

Appendix B Progress and Compliance Reports for Fines Capture

Three Quarterly Progress Reports for Fines Capture

Within 45 days of the end of each quarter starting from Q3-2010 (i.e., November 15, February 15, and May 15), an operator must provide a fines capture report for the preceding quarter that includes

- total tonnes of fines in oil sands feed,
- total tonnes of fines in oil sands feed deposited in each DDA,
- fines in DDA as a percentage of fines in oil sands feed, and
- tonnes of fines removed from DDAs due to rehandling of segregated fluid tailings.

Annual Compliance Report for Fines Capture

Each year on August 15 the operator must provide an annual fines capture report for the preceding year that includes

- total tonnes of fines in oil sands feed,
- total tonnes of fines deposited in each DDA,
- fines in DDA as a percentage of fines in oil sands feed, and
- tonnes of fines removed from DDAs due to rehandling of segregated fluid tailings.

Appendix C Content of the DDA Plan

Each DDA requires a plan that includes, but is not limited to,

- 1) engineering designs and operating procedures for the containment structure and the deposit, including details and timelines for construction, operation, closure, capping, formation of a trafficable deposit, and final landform design;
- 2) the planned rate and amount of fines captured within the deposit each year, and
- 3) a comprehensive plan on removal or remediation of segregated fluid tailings each year.

Appendix D Annual Compliance Report for DDAs

Beginning in 2011, each year by September 30 the operator must report the status of each DDA. This report must include a detailed assessment of the deposit within the DDA, including

- 1) the assessment (include sampling frequency) of the deposits within the DDAs by CPT or other methods approved by ERCB to verify that the undrained shear strength of 5 kPa has been achieved by the material deposited in the previous year;
- 2) measured values for the amount of fines captured within the deposit (the amount of fines captured is in addition to the fines in dikes and beaches);
- 3) the site-wide fines mass balance;
- 4) details on the removal or remediation of segregated fluid tailings;
- 5) details of dewatering, sand capping, and other DDA management activities;
- 6) details of geotechnical monitoring of the deposits within the DDAs;
- 7) identification of deviations from the DDA plan; and
- 8) any other information that the ERCB requires.

Appendix E Annual Tailings Management Plan

Beginning in 2009, an annual tailings management plan for the next calendar year must be submitted by September 30 each year. The plan must include annual projections for the first ten years, followed by five-year intervals to the end of the scheme. This plan must include

- 1) a description of the tailings management plan and any deviations from the approved tailings plan for the entire mine scheme;
- 2) a process flow diagram for the scheme's tailings operations;
- 3) a mineable oil sands reserves table for the life of the mine scheme that includes
 - mine total waste, overburden, and interburden, and
 - ore quantity, bitumen grade, fines, sand, and water (as a weight per cent of the ore), and recovered barrels of bitumen;
- 4) a production forecast table for the life of the mine scheme by time period, including
 - mined total waste,
 - mined ore, bitumen grade, and recovered barrels of bitumen, and
 - total tailings production by type;
- 5) a table of waste material (overburden and interburden) classified by
 - geologic formation (Holocene, Pleistocene, Clearwater, McMurray, etc.) with associated volume and weight,
 - type and per cent of material suitable for tailings impoundment construction, and
 - the amount projected for use in tailings impoundment construction;
- 6) a table that schedules the source and destination of waste material by
 - mass and volume, classifying material type by structure,
 - the material types—overburden, interburden, crusher rejects (or oversize), and tailings—used for structures,
 - destination area, including DDAs, external and in-pit waste disposal areas, external and in-pit tailings impoundment structures, and external and in-pit tailings areas;
- 7) a starting baseline for all structures, including the present elevation of each waste material type within each structure;
- 8) a construction schedule, volume, and projected life span for each tailings impoundment structure;
- 9) an illustration of fluid tailings impoundment and DDA capacity versus the associated storage requirements;
- 10) destination and description of each tailings type by structure, including mass, volume, and components (water, fines, sand, and bitumen, as a per cent of the ore);
- 11) a site-wide tabulation and illustration of fluid tailings inventory;

- 12) site-wide sand, fines, and water balance;
- 13) mine scheme development maps by reporting period, and a text description of the major development activities as illustrated on each map;
- 14) a summary of tailings water chemistry, seepage water chemistry, and seepage water rates into the groundwater from reports of groundwater and tailings monitoring programs provided to AENV;
- 15) a description of the process for remediation or rehandling of segregated fines within the DDAs within one year of segregation;
- 16) planning assumptions and criteria used to support the tailings management plan, such as fines distribution in the ore body, tailings stream-specific gravities, tailings consolidation curves, tailings deposition angles, and tailings impoundment design and construction criteria; and
- 17) any other information that the ERCB requires.

Appendix F Annual Status Report for Fluid Tailings Ponds

Each year by September 30, the operator must report the status of each fluid tailings pond. This report should include a detailed assessment of the materials, as well as

- 1) sampling, materials analysis, and description of each layer within the ponds;
- 2) amount of dry fines reporting to the dikes and beaches site wide;
- 3) update of all fluid tailings management activities, including
 - measured values for the amount of fines reporting to each fluid tailings pond,
 - volume of fluid tailings in each pond,
 - volume of water in each pond,
 - cumulative volume for all fluid tailings ponds site wide,
 - fluid tailings addition and removal operations; and
- 4) status report on tailings impoundment construction, with a comprehensive schedule of infilling levels versus containment dike construction levels.

Appendix G Schedule for Filing of Plans and Reports

The schedule for filing of plans and reports is as follows:

Fines capture progress reports	Quarterly—three reports 45 days after the end of each calendar quarter starting in Q3-2010, i.e., November 15, February 15, and May 15
Fines capture—annual compliance report	August 15 of each year starting in 2011
DDA plan	2 years prior to construction or as approved for existing operators
DDA—annual compliance report	September 30 of each year starting in 2011
Tailings plan integrated with annual mine plan—annual	September 30 of each year starting in 2009
Fluid tailings pond—annual status reports	September 30 of each year starting in 2011