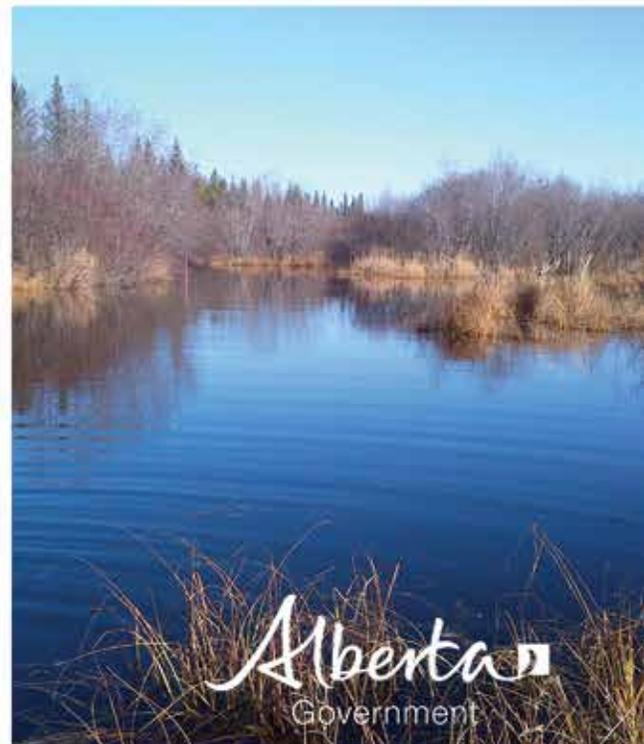


Lower Athabasca Region

Tailings Management Framework for the Mineable Athabasca Oil Sands



Alberta
Government

Table of Contents

1.0	Introduction	1
2.0	Purpose	3
2.1	Regional Context	3
3.0	Key Concepts and Principles	6
3.1	Provincial Policy Direction	6
3.2	Cumulative Effects Management and Management Frameworks	6
3.3	Policy Outcomes	7
3.4	Objective	8
3.5	Key Principles	8
3.5.1	Manage and Decrease Risk	8
3.5.2	Manage Both New and Existing (Legacy) Tailings	8
3.5.3	Holistic Approach to Tailings Management	9
3.5.4	Technological Innovation	9
3.5.5	Pursue Cost-effective Solutions	9
3.5.6	Builds on Existing Legislation, Regulations and Policies	9
3.5.7	Incorporates Flexibility and Adaptability	9
3.5.8	Clearly Communicates	9
3.5.9	Transparency	10
3.5.10	Shared Responsibility	10
3.5.11	Consider the Net Environmental Effect of Tailings Management	10
4.0	The Current Management System	11
4.1	Understanding Oil Sands Tailings within the Region	11
4.2	Regulatory and Policy Context	12
4.3	The Need for a Tailings Management Framework for the Mineable Athabasca Oil Sands	14
5.0	The Tailings Management Framework Objective	15
5.1	Indicators	15
5.2	Project-specific Target, Triggers and Limit for New Fluid Tailings	16
5.2.1	The Fluid Tailings Volume Profile for New Fluid Tailings	19
5.2.2	Setting the End of Mine Life Fluid Tailings Volume Target for New Fluid Tailings	22
5.2.3	Setting the Triggers and Limit for New Fluid Tailings	24
5.2.4	Tailings Management Plans for New Fluid Tailings	25

5.3	Managing Legacy Tailings	26
5.4	Validation and Assurance	27
5.5	Regional Performance	27
6.0	The Management System.....	29
6.1	Assignment of Fluid Tailings Management Levels	29
6.2	Management Response	33
6.2.1	Management Response: Financial Tools	34
6.3	Oversight and Delivery of Management Actions	35
6.4	Evaluation and Communication	35
6.5	Technology	36
6.6	Water Management.....	37
7.0	Implementation	38
7.1	Roles and Responsibilities	38
7.1.1	Alberta Environment and Sustainable Resource..... Development	38
7.1.2	Alberta Energy Regulator	39
7.1.3	Mine Operators.....	40
7.2	Monitoring and Reporting.....	41
7.3	Framework Review Cycle	41
7.4	Policy Integration and Alignment.....	42
7.5	Toward Implementation	43
7.5.1	Phased Implementation.....	43
7.5.2	Interim Management of Fluid Tailings during Initial	44
7.5.3	Laying the Foundation for Future Tailings Work.....	44
8.0	Terminology.....	46
8.1	Abbreviations and Acronyms.....	46
8.2	Glossary	46
9.0	References	48
10.0	Appendix A.....	48
	A Conceptual Representation of the Stages of Progressive	49
	Reclamation	
11.0	Appendix B.....	50
	Framework Development	

List of Figures

Figure 1: Oil Sands Surface Mineable Area in the Lower Athabasca Region	5
Figure 2: The Management Framework Approach	7
Figure 3: Simplified Oil Sands Mining and Bitumen Extraction Operations.....	11
Figure 4: The Steps to Establishing Project-Specific Thresholds for New Fluid Tailings	18

List of Tables

Table 1: Key Legislation and Policy for Managing Oil Sands Mine Tailings.....	13
Table 2: Description of Fluid Tailings Volume Management Levels	32
Table 3: Potential Management Actions for Each Management Level.....	33
Table 4: A Conceptual Representation of the Stages of Progressive Reclamation	49

ISBN: 978-1-4601-2174-0 (online version)
March 2015

On August 22, 2012, the Government of Alberta approved the *Lower Athabasca Regional Plan*. The Plan establishes resource and environmental management outcomes for air, land, water, and biodiversity, and will guide future resource decisions, while considering the social and economic impacts of development. Incorporating more than three years of consultation with Albertans and experts on social, economic, and environmental issues, the *Lower Athabasca Regional Plan* sets the stage for strong economic growth in northeast Alberta balanced with a comprehensive and informed approach to environmental management.

The Alberta government is committed to managing cumulative effects at the regional level, using management frameworks in a new approach to integrated management. Management frameworks outline monitoring, evaluation, and reporting requirements for resource users, set early warning triggers for government to determine the need for action, and identify what actions may be taken. The frameworks are policy documents that will be implemented through Alberta Environment and Sustainable Resource Development's, and potentially other departments', mandates and legislation.

Four environmental management frameworks have been developed for the *Lower Athabasca Regional Plan*:

- Air Quality Management Framework
- Surface Water Quality Management Framework
- Groundwater Management Framework
- Surface Water Quantity Management Framework for the Lower Athabasca River

The ***Tailings Management Framework for the Mineable Athabasca Oil Sands*** provides direction to manage fluid tailings volumes during and after mine operation in order to manage and decrease liability and environmental risk resulting from the accumulation of fluid tailings on the landscape.

The Framework builds on, but does not replace, existing provincial legislation and policy on tailings management and reclamation. It will not replace existing management systems. However, it will fill a management gap by providing a framework in which to monitor and manage long-term fluid tailings accumulation and reclamation on the landscape in the Lower Athabasca Region. Requirements under the *Tailings Management Framework for the Mineable Athabasca Oil Sands* will be administered primarily through the *Oil Sands Conservation Act* and the *Environmental Protection and Enhancement Act*.

The Lower Athabasca Region is an area of major industrial development driving Alberta's and Canada's economy. Increasing population and industrial expansion, including oil sands mining, is expected to continue in the coming years, making management frameworks important components of the Regional Plan.

2.0

Purpose

The Government of Alberta is committed to ensuring the environmentally sustainable development of Alberta's oil sands in an innovative, responsible, and collaborative manner. The many social, environmental, and economic aspects of developing the oil sands resource must be considered holistically through space and time. Thus, it recognizes that responsible development of the oil sands includes managing both long-term liability and environmental risk associated with fluid tailings. Under the *Environmental Protection and Enhancement Act*, there is an objective to reclaim the areas where oil sands were developed to equivalent land capability and return them to the Crown after development. To achieve this reclamation in a timely manner, the treatment of fluid tailings to a ready-to-reclaim state quickly, is required.

This Framework seeks to balance environmental protection and the associated risk of increasing fluid tailings volumes. Lowering fluid tailings volumes and/or minimizing accumulation can reduce the risk of seepage, reduce risks to wildlife that may come into contact with tailings ponds, contribute to dam safety, and lower the footprint of tailings – especially fluid tailings on the landscape. Under the Framework, there is also an opportunity to improve the quality of tailings, which has additional associated benefits. The use of fluid tailings volume triggers and a limit, and supporting management actions, support an overarching policy objective of reducing the amount of fluid tailings on the landscape more quickly, and of having tailings ready to reclaim within an acceptable timeframe.

Goals of the *Tailings Management Framework for the Mineable Athabasca Oil Sands*

- Establish fluid tailings volume triggers and limits to manage fluid tailings accumulation, manage long-term liability and environmental risk to the Province of having untreated fluid tailings on the landscape, clarify Government of Alberta expectations, encourage technological innovation to meet the environmental challenges faced, and support proactive management strategies.
- Enhance transparency and assurance through regular monitoring, evaluation, and reporting on fluid tailings volume accumulation and treatment.
- Establish direction for managing legacy tailings.

2.1 Regional Context

The Lower Athabasca Region covers 93 212 km² and spans the boundaries of three major river basins – the Athabasca River Basin, the Beaver River Basin and the Peace/Slave River Basin. The Region includes a substantial portion of the Athabasca oil sands area, which contains approximately 82 per cent of the province's oil sands resource, and much of the Cold Lake oil sands area. Industrial development in

the Lower Athabasca Region is an economic driver for Alberta and Canada and is expected to continue to increase in the coming years. As industrial development grows, the cumulative effects on the environment may also increase.

In the Lower Athabasca Region, new and innovative opportunities for water re-use are increasing; including approaches that involve regional sharing of water among key players in or near the oil sands mineable area. The water that is used during oil sands mining is managed and stored in tailing ponds. These ponds are used to allow sand and waste to separate, dispose of coarse and fine tailings, and most importantly store water for recycling. In 2013, there were approximately 976 million cubic metres (Mm³) of fluid tailings contained within tailings ponds, with a net cumulative footprint of about 220 km² including dykes, berms, beaches, and in-pit ponds (AESRD, 2014).

This framework applies to surface mineable oil sands operations with tailings facilities in the Lower Athabasca Region (Figure 1).

The *Tailings Management Framework for the Mineable Athabasca Oil Sands* is part of an integrated approach to landscape management in the Lower Athabasca Region, and will link to other policies and legislation. The Tailings Management Framework for the Region is complemented by the *Surface Water Quantity Management Framework for the Lower Athabasca River*, which seeks to manage oil sands mining water withdrawals. The *Water Conservation Policy for Upstream Oil and Gas Operations* will also guide the use of water in oil sands mining operations, providing direction to minimize the use of high quality fresh water.

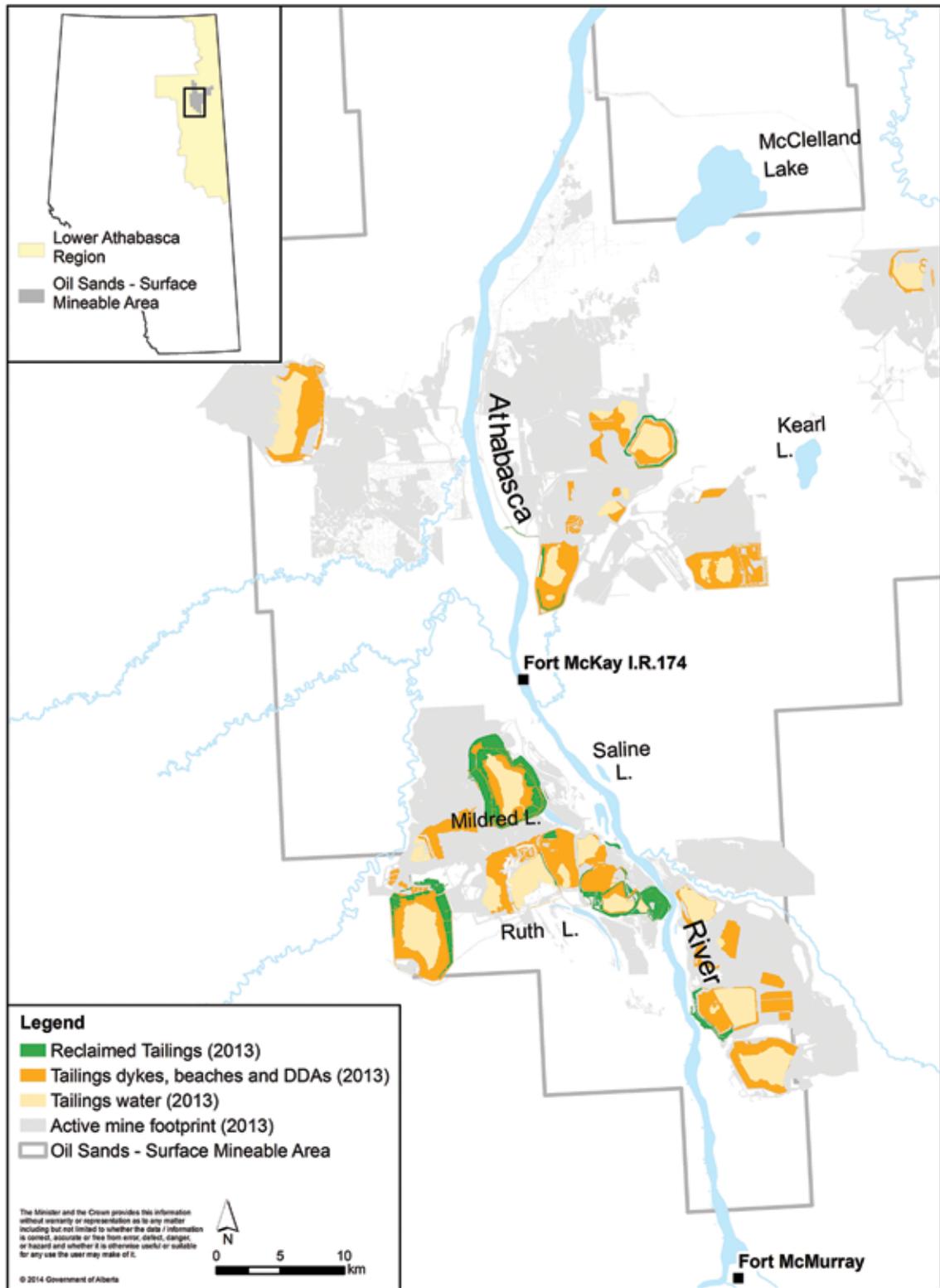


Figure 1.
Oil Sands Surface Mineable Area in the Lower Athabasca Region

3.0

Key Concepts and Principles

Two drivers have guided this Framework. The first is the need to build on provincial environmental protection and management policies and principles. The second is the need to adopt a cumulative effects management system in the Region.

3.1 Provincial Policy Direction

One of the purposes of the regional plans is to translate provincial policy to the regional scale. The *Tailings Management Framework for the Mineable Athabasca Oil Sands* helps to do that.

By reflecting the ongoing desire to balance environmental, economic, and social considerations, this framework aligns with the goals of Alberta's *Land-use Framework* and other key policies including *Water for Life* and the province's progressive reclamation strategy.

The *Tailings Management Framework for the Mineable Athabasca Oil Sands* affirms the provincial environmental principles of:

- The need for Alberta's economic growth and prosperity to be achieved in an environmentally responsible manner;
- The importance of integrating environmental protection and economic decisions in the earliest stages of planning;
- Sustainable development, which ensures that the use of resources and the environment today does not impair prospects for their use by future generations; and,
- Continuous improvement and the use of best available technology.

3.2 Cumulative Effects Management and Management Frameworks

The Government of Alberta has made a commitment to cumulative effects management that focuses on achievement of outcomes, understanding the effects of multiple development pressures (existing and new), assessing risk, collaborative work with shared responsibility for action, and improved integration of economic, environmental and social considerations. It also follows an adaptive management model, which means decision makers learn from experience and new information, and adapt to changing social expectations and demands. Performance management is an essential element, providing information on environmental conditions and identifying the need for any adjustments and changes on an ongoing basis. The

development of management frameworks is an important approach being used to accomplish the shift to a cumulative effects management system. They will play an important role in long-term planning and decision-making in accordance with the outcomes defined in the regional plan.

The management framework approach is depicted in Figure 2.

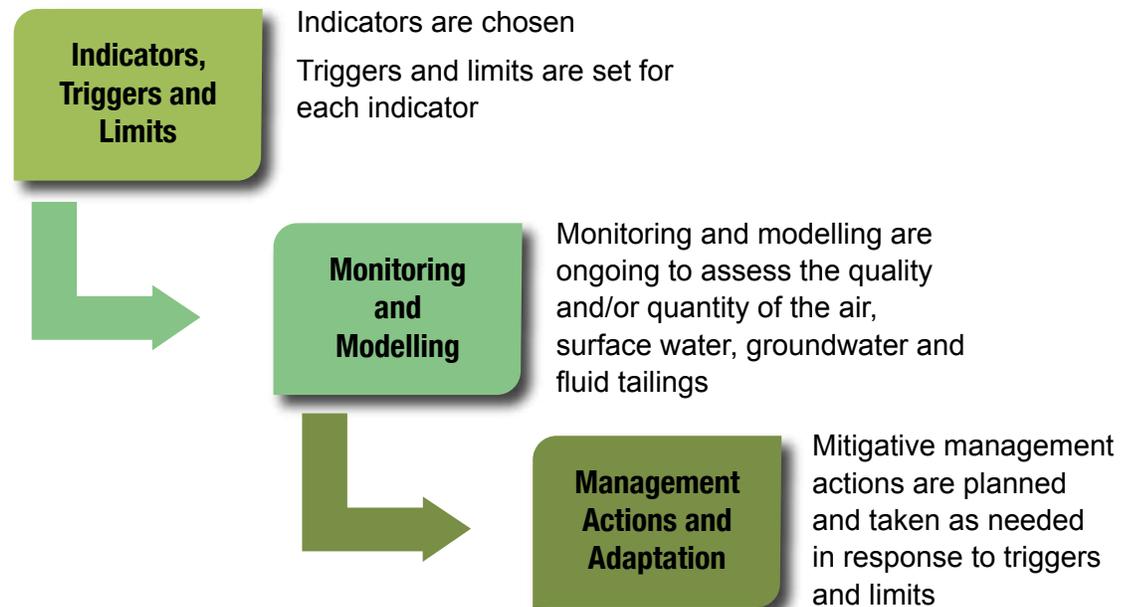


Figure 2.
The Management Framework Approach

3.3 Policy Outcomes

The Framework will contribute to the achievement of outcomes and objectives in the *Lower Athabasca Regional Plan*. This includes the objective to “increase the rate of reclamation and enhance the reduction of tailings ponds” (p.42).

Within this context, the Framework establishes the following social, environmental and economic policy outcomes:

Land use must be returned to Albertans: During and after mine life, fluid tailings must be reclaimed to enable a range of future land use options. It is recognized that the use of the land may be different from the pre-development use. Nonetheless, the land must be reclaimed to a resilient and functional boreal forest ecosystem that supports the needs of and expectations of current and future Albertans, including First Nations and Métis. Decisions that we make today should not limit the land use decisions of future generations.

Sustainable ecosystem: A stable landscape and a diverse, locally common, and self-sustaining ecosystem will be in place after reclamation.

Liability is minimized to Albertans: Achieves a responsible balance between protecting the people of Alberta from the environmental and economic costs associated with the liability of the accumulation of fluid tailings during oil sands mining, and maximizing the opportunities for responsible and sustainable resource development.

Environmental effects are managed: The risk of environmental effects is minimized now and for future generations. This includes ensuring progressive reclamation of fluid tailings over the life of mining projects, and the consideration of end landscape objectives during planning and operation phases.

3.4 Objective

Fluid tailings accumulation is minimized by ensuring that fluid tailings are treated and reclaimed progressively during the life of a project and all fluid tailings associated with a project are ready-to-reclaim within 10 years of the end of mine life of that project. The objective will be achieved while balancing environmental, social, and economic needs.

3.5 Key Principles

The following key principles apply to the development and implementation of the Framework:

3.5.1 Manage and Decrease Risk

- The Framework is designed to lower environmental and other risk to all stakeholders and the Province during mine operation and closure.
- The Framework seeks to minimize the liability associated with the accumulation of fluid tailings to the Province and all Albertans by requiring progressive treatment and reclamation over the life of the project.
- The Framework manages liability with the use of financial backstops.

3.5.2 Manage Both New and Existing (Legacy) Tailings

- The Framework addresses fluid tailings from ongoing bitumen production, as well as the current inventory of fluid tailings (legacy tailings).

3.5.3 Holistic Approach to Tailings Management

- The Framework provides sufficient flexibility to support site-specific optimization of tailings management planning and mine operation to maximize the opportunities for responsible and sustainable resource development.

3.5.4 Technological Innovation

- The Framework drives the application of technology and, technological innovation, understanding, and certainty around fluid tailings treatment options.

3.5.5 Pursue Cost-effective Solutions

- In addition to environmental and social considerations, success at the operational level requires that cost-effective solutions be developed and pursued.

3.5.6 Builds on Existing Legislation, Regulations and Policies

- The Framework is intended to add to and complement, not replace, existing policies, legislation, regulations, and requirements.
- The Framework is consistent with federal and provincial policies, strategies and frameworks, and with the stated desired outcomes for the region.

3.5.7 Incorporates Flexibility and Adaptability

- The Framework recognizes that scientific understanding, technology and performance measures will change over time, and that flexibility and adaptability is needed to ensure that desired social, economic, and environmental outcomes continue to be achieved.
- The Framework and its regulatory tools must consider the unique features of every project.
- Alberta Environment and Sustainable Resource Development will review and update the Framework to ensure alignment with other policies that are developed or revised, and to reflect changes in information, knowledge and continuing work on fluid tailings indicators.

3.5.8 Clearly Communicates

- The Framework supports long-term certainty in Alberta's policy and regulatory process. It provides clarity for industry, early in the design cycle, about operating requirements for fluid tailings management over the life of the project.

-
- The system described in this Framework and the expectations for tailings management are clearly defined and transparent.

3.5.9 Transparency

- The Framework recognizes the need for increased transparency between Government, industry and Albertans regarding tailings management. It is the responsibility of the Government of Alberta and the Alberta Energy Regulator to ensure transparency is enhanced through increased monitoring, evaluation, and reporting requirements, and to provide assurance to Albertans that fluid tailings are being managed responsibly. This necessitates the involvement of others in such activities as the evaluation of fluid tailings profiles and thresholds, reporting, and the review of the Framework.

3.5.10 Shared Responsibility

- Industry and government must share the responsibility for tailings management. Alberta Environment and Sustainable Resource Development intends to continue engaging stakeholders, First Nations and Métis organizations, and working groups who live and work in the area, as the Framework is implemented.

3.5.11 Consider the Net Environmental Effect of Tailings Management

- Potential consequences to air, land and water will be considered and balanced in the application of this Framework.
- The net environmental effect of tailings management technologies will be considered.

In addition to these guiding principles, the Government of Alberta has recognized that those First Nations and Métis communities that hold constitutionally protected rights are uniquely positioned to inform land use planning. In accordance with applicable government policy as it may be from time to time, the Government of Alberta will continue to consult with Aboriginal peoples when government decisions may adversely affect the continued exercise of their constitutionally protected rights.

4.0

The Current Management System

4.1 Understanding Oil Sands Tailings within the Region

Alberta's oil sands represent 98 per cent of Canada's oil reserves. The oil sands are a significant resource that has the potential not only to meet provincial and national energy needs, but also offer security of supply to the global community in the future.

Bitumen found in oil sands is extracted using surface mining or in situ processes. Oil sands surface mining results in a by-product called "tailings", which are a mixture of sand, clay, water, silt, residual bitumen and other hydrocarbons and organics, salts and trace metals. Tailings are contained behind dams above the ground as well as in mined-out areas of the pit. These areas are commonly known as "tailings ponds".

Once tailings are placed in a tailings pond, most of the sand and a small portion of the other constituents settle out. This settling process takes a few years and results in coarse (sand) tailings and fluid tailings. Some tailings do not settle quickly and require significant time and treatment to get to an acceptable state.

Tailings are by-products of all oil sands mining and bitumen extraction operations, which are shown in simplified Figure 3.

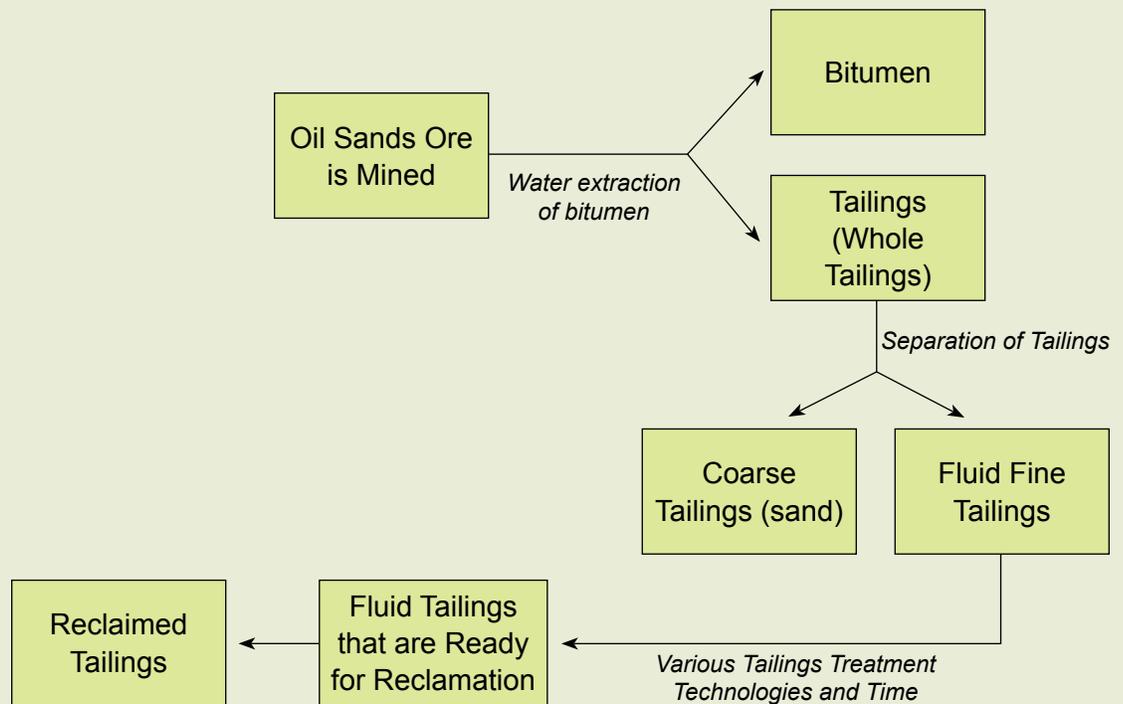


Figure 3:
Simplified Oil Sands Mining and Bitumen Extraction Operations

Many tailings treatment methods have been used over the course of oil sands mining operations in Alberta. However, the success of the methods employed to date has been limited for various reasons, including the complexities and challenges specifically associated with the settling of oil sands fluid tailings.

As total bitumen production in the oil sands surface mineable area has grown, so has the accumulation of oil sands tailings. The *Tailings Management Framework for the Mineable Athabasca Oil Sands* is intended to address the volume of oil sands fluid tailings.

4.2 Regulatory and Policy Context

A stringent regulatory system governs tailings management in Alberta. Oil sands mines with tailings facilities require approvals under the *Environmental Protection and Enhancement Act* and the *Water Act* in order to operate. Within these approvals there are many requirements related to tailings, including requirements for monitoring, reporting, research, and reclamation. The Conservation and Reclamation Regulation under the *Environmental Protection and Enhancement Act* pursues an objective that specified land is to be returned to an equivalent land capability.

The *Oil Sands Conservation Act* also requires approvals of oil sands mines having consideration of resource conservation, orderly development, and public safety, with conditions that require reporting on tailings management. Most recently, Directive 074 *Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes* of the Alberta Energy Regulator seeks to minimize and eventually eliminate long-term storage of fluid tailings in the reclaimed landscape and ensure that the liability for tailings is managed through reclamation of tailings ponds; requiring reduction of fluid tailings, the capture of fines in fluid tailings, and treating them so they can be reclaimed quickly and eventually converted into trafficable deposits.

There are also major policies and regulations that guide tailings management including the *Land Use Framework* (2008), the *Lower Athabasca Regional Plan* (2012), and the *Oil Sands Conservation Rules* (2013). Additional policy context for the Framework is provided by *Responsible Actions: A Plan for Alberta's Oil Sands* (2009) and *Launching Alberta's Energy Future: Provincial Energy Strategy* (2008). Table 1 summarizes the key legislation and policies, strategies, and agreements currently governing tailings management in Alberta.

Table 1.
Key Legislation and Policy for Managing Oil Sands Mine Tailings

Governance	Jurisdiction
Provincial Acts, Regulations, Authorizations and Directives	
<i>Alberta Public Agencies Governance Act</i>	Alberta
<i>Conservation and Reclamation Regulation</i>	Alberta
<i>Environmental Protection and Enhancement Act</i>	Alberta
<i>Directive 074: Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes</i>	Alberta
<i>Lower Athabasca Region Plan</i>	Alberta
<i>Oil Sands Conservation Act</i>	Alberta
<i>Oil Sands Conservation Rules</i>	Alberta
<i>Public Lands Act</i>	Alberta
<i>Responsible Energy Development Act</i>	Alberta
<i>Water Act</i>	Alberta
Guidelines and Policies	
<i>Dam and Canal Safety Guidelines (1999)</i>	Alberta
<i>Guidelines for Reclamation to Forest Vegetation in the Athabasca Oil Sands Region (2010, as amended)</i>	Alberta
<i>Guideline for Wetland Establishment on Reclaimed Oil Sands Leases (2007, as amended)</i>	Alberta
<i>Land Capability Classification System for Forest Ecosystems in the Oil Sands (2006, as amended)</i>	Alberta
<i>Mine Financial Security Program (Standard and Guide) (2011, as amended)</i>	Alberta
Strategies	
<i>Land Use Framework (2008)</i>	Alberta
<i>Launching Alberta's Energy Future: Provincial Energy Strategy (2008)</i>	Alberta
<i>Responsible Actions: A Plan for Alberta's Oil Sands (2009)</i>	Alberta
Federal Acts	
<i>Canadian Environmental Assessment Act</i>	Canada
<i>Fisheries Act</i>	Canada
<i>Migratory Birds Convention Act</i>	Canada

4.3 The Need for a Tailings Management Framework for the Mineable Athabasca Oil Sands

The *Tailings Management Framework for the Mineable Athabasca Oil Sands* builds upon an already strong legislative and regulatory system in place by providing overarching direction to guide the appropriate management of fluid tailings in the mineable oil sands area. It provides additional direction to enable more timely and progressive reclamation of the landscape in the Lower Athabasca Region. Although site-specific circumstances support some degree of project-specific management, there is need for a common policy framework to more effectively guide expectations for the management of all tailings – both legacy and those yet to be created. The Framework begins to address the cumulative impacts of fluid tailings in the Region by stipulating additional management requirements for all oil sands mine operators. Further, it considers the full life cycle of mining operations, as part of a holistic landscape management approach. It takes a long-term management focus on performance and results, but guides activities early in the development process and throughout the life of the project to manage liability and enable the achievement of desired long-term outcomes.

5.0

The Tailings Management Framework Objective

In support of the *Lower Athabasca Regional Plan's* strategic direction of “encouraging timely and progressive reclamation”, this framework provides guidance on managing fluid tailings so that new and legacy tailings volumes will be reclaimed in a timely manner. The Framework is aligned with the province’s progressive reclamation strategy that includes reclamation security, reclamation reporting, and a reclamation certificate program. Although the Framework focuses on fluid tailings of oil sands mining operations, the actions taken as a result of the Framework direction will contribute to progressive reclamation throughout the Region.

Tailings Management Framework Objective

Fluid tailings accumulation is minimized by ensuring that fluid tailings are treated and reclaimed progressively during the life of a project and all fluid tailings associated with a project are ready to reclaim within 10 years of end of the mine life of that project. The objective will be achieved while balancing environmental, social, and economic needs.

This Framework applies to both new and legacy tailings. The requirements for both new and legacy tailings are outlined below.

5.1 Indicators

Performance management is an essential element of a management system. It provides information on conditions and identifies the need for any adjustments and changes on an ongoing basis with regards to tailings management to ensure outcomes are met. This framework is designed to decrease overall fluid tailings volumes during and after mine operation. The volume of accumulated fluid tailings is identified as the primary indicator to be used in this framework to effectively manage and decrease liability and environmental risk resulting from the accumulation of fluid tailings on the landscape. Thresholds for this indicator are established to represent levels at which the risk is increasing. There will be additional regulatory oversight and mitigative management actions taken by operators, as needed, in response to the exceedance of threshold values.

5.2 Project-specific Target, Triggers and Limit for New Fluid Tailings

New Fluid Tailings: any fluid tailings created on or after January 1, 2015.

The volume of fluid tailings produced and accumulated over the life of an oil sands mining project varies according to the area being mined, by extraction, mining and treatment processes, and thus by project. Project-specific thresholds will be established by the Alberta Energy Regulator, with direction from this framework.

The target, triggers and limit will be set based on forecasted new fluid tailings volumes and set within range of the “end of mine life target”, which is the volume of fluid tailings that can be managed to a ready-to-reclaim state within 10 years of when bitumen mining ceases.

The long-term policy outcomes sought through this framework will be achieved through ongoing treatment of fluid tailings during mine operations, and through future and progressive reclamation activities. To meet the Framework objective, project-specific triggers and a limit (collectively referred to as “thresholds”) will be established and used to manage new fluid tailings treatment and accumulation during mining operations, ensuring that the fluid tailings are in a ready-to-reclaim (or “managed”) state, or better, within 10 years of the end of mine life (see Appendix A). Thresholds are based on the premise that a certain accumulation of fluid tailings is acceptable, provided they are closely monitored and managed. The triggers and the limit will be set at values that enable effective management of long-term liability and environmental risk associated with the production and accumulation of fluid tailings. This framework also includes expected management actions in response to the exceedance of triggers and the established limit (see Section 6.0).

The Framework is built to establish management requirements for the duration of the project, with the end in mind. It will guide tailings management activities over the life of an oil sands mining project in such a way as to ensure fluid tailings accumulate within range of the “**End of Mine Life Target**”. An End of Mine Life fluid tailings volume target will be established for individual mining projects and will reflect a fluid tailings volume that could reasonably be managed to a ready-to-reclaim state within 10 years of when bitumen mining ceases. The Total Volume Trigger and a limit, as well as a volume profile deviation trigger, will be calculated on the basis of project-specific end of mine life target.

The **Total Volume Trigger** provides an indication that the volume of fluid tailings has exceeded its approved maximum accumulation and requires additional management action (see Table 3).

A project-specific fluid tailings volume **Profile Deviation Trigger** is used to alert operators and regulators when the volume of fluid tailings is growing higher than originally approved. Additional management action is required when the Profile Deviation Trigger is exceeded (see Table 3).

The **Total Volume Limit** represents a volume of fluid tailings that presents an unacceptable risk to the environment and potential long-term liability. Exceedance of this limit will compromise the ability of an operator to have all of their fluid tailings in an acceptable managed (ready-to-reclaim) state within 10 years of end of mine life. Therefore, most severe management actions are initiated when a limit is exceeded (see Table 3).

The project-specific triggers, limit, and end of mine life target will be established through the AER; they will be based on a fluid tailings volume profile submitted by the operator for approval. Requirements under the *Tailings Management Framework for the Mineable Athabasca Oil Sands* will be administered through the *Oil Sands Conservation Act* and the *Environmental Protection and Enhancement Act*, with the use of other regulatory tools as appropriate.

Effective use of the target, triggers, and limit will ensure the timely treatment of fluid tailings over the life of a project and minimize the amount of fluid tailings on the landscape at the end of mine life.

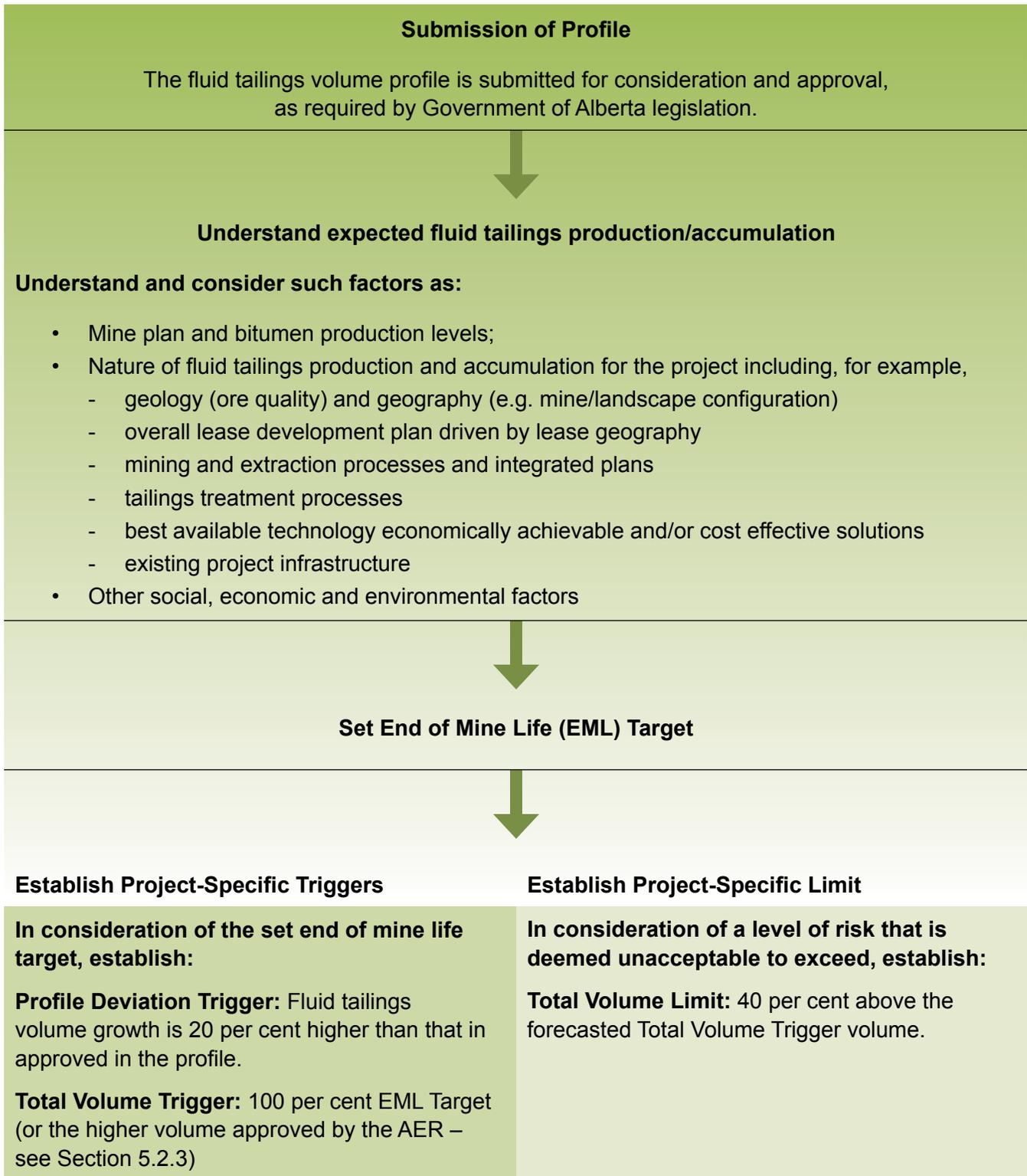


Figure 4:
The Steps to Establishing Project-specific Thresholds for New Fluid Tailings

5.2.1 The Fluid Tailings Volume Profile for New Fluid Tailings

The Fluid Tailings Volume Profile for New Fluid Tailings

Fluid Tailings Volume Profile: the forecasted accumulation and reduction of fluid tailings volumes for each year to end of mine life.

The fluid tailings volume profile reflects the approved tailings management plan, which in turn reflects operators' commitments to tailings management. Considerable detail is required to justify the fluid tailings volume profile. The fluid tailings volume profile forecasts will be reviewed annually to ensure accuracy of forecasting and that associated planning is undertaken to meet the objective of the Framework. Despite the many variables that must be considered to address tailings inventory and reclamation, all management efforts can be summarized into an expectation that the fluid tailings volume inventory will initially grow, stabilize, and decline, to meet the objective of having all fluid tailings in a ready-to-reclaim state within 10 years after end of mine life. Profiles encompass the entire life of the mine. As production expansions occur, it is expected that continuous treatment of tailings will not necessitate an allowance of volume accumulation seen at the Early Production stage of a project (Phase 1). Given the many uncertainties that exist in technologies and the timing for deployment, the Framework has identified phases to describe expectations through time.

General expectations have been identified for each phase to indicate what may be required to meet the framework objective. These are intended to ensure that volumes accumulated are minimized to a reasonable level and in line with achieving the end of mine life target. These expectations are set with the understanding that each project is unique and subject to site-specific factors; they are intended to provide a general guide to what could be expected in each phase. These expectations are intended to assist proponents in managing to the intent of the Framework and, where necessary, articulating and justifying factors contributing to any differences between the submitted profile and the expectations of the Framework.

Phase 1 - Early Production: It is expected that fluid tailings will grow in Phase 1 for all current and planned projects, but will stabilize and decline thereafter (in Phases 2 and 3). The anticipated amount of fluid tailings is based on bitumen production, and is influenced by numerous factors (see Figure 4). Emphasis in this phase will be on proving and implementing tailings treatment technologies that deliver ready-to-reclaim material, and managing and understanding growth and actual profile volumes relative to forecast.

Phase 1 Guideline: To achieve the end of mine life target, it is expected that projects manage an inventory of fluid tailings in the range of the volume that is expected to be produced during 3-10 years of full production (including expansions forecasted at the time of initial approval¹), depending on site-specific circumstances (see Figure 4). As this volume is based on full production levels, it may take more than the 3-10 years to accumulate. A key factor for this variation is the distinction between existing and new facilities. With opportunities to integrate current treatment requirements and capacity, it could be expected that existing projects would be at the lower end of this range, as they integrate existing treatment to minimize this initial inventory; whereas, new projects, particularly those seeking to utilize in-pit disposal of tailings, could be at the higher end of this range.

¹ Expansions not foreseen at the time of initial approval are not expected to require significant increases in volume accumulations and will be required to provide technical justification for new increases in fluid tailings accumulation.

It should be noted that a project may be approved to manage to a volume that is outside of this range (above or below) due to unusual project-specific circumstances. In these cases, proponents would be required to demonstrate in a transparent manner that the deviation from the Phase 1 Guideline is necessary, and be deemed appropriate and acceptable by the Alberta Energy Regulator. They would also be required to demonstrate that the plan configuration will meet or achieve better than the desired End of Mine Life target, objective and outcomes of this Framework.

Phase 2 - Design Operation: It is expected that projects approach the expected maximum volume of 3-10 years' accumulation in Phase 1, based on constant production, and then stabilize in Phase 2. The emphasis of planning during Phase 2 will be on managing and stabilizing growth, including managing through progressive treatment and reclamation.

Phase 2 Guideline: To achieve a relatively stable fluid inventory, it is expected that growth of fluid tailings will closely match the rate of treatment so that, on average, fines can be managed to a treated state as they are produced. This requires increases in fluid tailings treatment capacity as project expansions occur. It is acknowledged that there could be some fluctuation on an annual basis. It can be expected that based on specific mine planning and configuration, particularly as production increases and decreases over various phases, there will be some variation in the rate of treatment. Emphasis of profile assessments will be based on assurances that any such variation does not pose significant risk or challenges to achieving the End of Mine Life Target. Any fluctuation would occur within an acceptable and approved range. **The End of Mine Life Target for all projects will be the equivalent of 5-years, or less, of fluid tailings volume accumulation.**

Phase 3 - Post End of Mine Life: The focus in Phase 3 is the final elimination of the fluid tailings inventory. During this phase, there will be a decline in and elimination of fluid tailings in inventory and confidence in the potential for future reclamation success. In other words, the emphasis during Phase 3 is on getting all remaining fluid tailings to a ready-to-reclaim state.

Phase 3 (Meeting the Framework Objective): To achieve a ready-to-reclaim state within 10 years of end of mine life. Active treatment of fluid tailings may continue during this phase², and will eventually cease, to allow fluid tailings to achieve a ready-to-reclaim state within the required 10 years of end of mine life.

² Additional guidance may be provided to ensure appropriate lead times and planning for any treatment, in order to ensure that operators are positioned to meet the Framework objective of having all fluid tailings in a ready-to-reclaim state within 10 years after end of mine life.

Guidance for Setting the Fluid Tailings Volume Profile

Profiles and associated thresholds will be developed in consideration of the following:

- Site specific volume profiles will be generated for each mine and will consider geology, geography, production rate, and other parameters that will influence the fluid tailings volume profile (see Figure 4).
- Thresholds will be established with consideration for the end landscape and associated reclamation plan.
- Thresholds will be established with an assumption of progressive treatment of fluid tailings throughout the life of a project.
- Thresholds will be established to only allow an accumulation of fluid tailings that is able to be reduced to a managed (ready-to-reclaim) state within 10 years (or better) of the end of mine life. This is expected to be the equivalent of 5-years', or less, of fluid tailings volume accumulation.
- The intent of developing thresholds on the basis of the end of mine life target is to ensure that fluid tailings accumulate only within a manageable range or volume that can be reduced to a managed (ready-to-reclaim) state within ten years. It is not intended to disincen smaller volumes on the landscape at end of mine life.
- Existing projects may accumulate some additional fluid tailings, in line with this Framework, but must demonstrate continued treatment.
- All plans should be based on the most advanced and demonstrated technologies. Where there are uncertainties within the chosen tailings technologies, the plan will identify contingency plans to manage risk.
- Fluid tailings accumulation must be managed and minimized through the life of the project, including during production expansion. As production increases, additional accumulation of fluid tailings must be managed, while ensuring long term closure and reclamation goals are met. With significant increases in production (e.g. expansions), increases in fluid tailings treatment capacity will be made to ensure managed accumulation of fluid tailings during expansion phases.
- Tailings management plans will steward toward a safe, stable, and sustainable final landscape.
- Tailings management plans need to balance potential impacts to air, land, and water as well as ensure that the operations remain cost effective.
- Thresholds and plans will be developed in a transparent manner.

5.2.2 Setting the End of Mine Life Fluid Tailings Volume Target for New Fluid Tailings

End of Mine Life: the year in which mining of bitumen is complete for an AER-approved mine plan for a project.

End of Mine Life Target: A volume of fluid tailings that can be managed to a ready-to-reclaim (or “managed”) state within 10 years after end of mine life.

The expected general trajectory of the fluid tailings volume profile is such that the fluid tailings inventory peaks in Phase 1, stabilizes in Phase 2, and then declines to meet the objective of having all fluid tailings in a ready-to-reclaim state in Phase 3. The volume of fluid tailings still untreated at the end of mine life³ will influence the amount of time it takes to fully reclaim fluid tailings and achieve a reclaimed landscape. Thus, this framework sets triggers and a limit to guide activities during the mine life to achieve a volume (or “target”) of fluid tailings that can be managed to a ready-to-reclaim state within 10 years, or less, of end of mine life. In other words, the entire fluid tailings inventory of a project must be in an acceptable managed state within 10 years following the end of bitumen mining.

To achieve this, the fluid tailings inventory must be managed to the approved “End of Mine Life Target”, or lower, by end of mine life. This volume will be based on a review of tailings profile submissions under the *Oil Sands Conservation Act* and/or the *Environmental Protection and Enhancement Act*, as well as an assumed rate of progressive treatment and reclamation throughout the life of the project and factors influencing the accumulation of fluid tailings, identified in Figure 4.

Getting fluid tailings ready to reclaim may be achieved through the use of several technologies and approaches. In the long-term, to ensure liability is appropriately managed, technologies used to manage end of mine life tailings volume fluid tailings must be effective and results and impacts, understood. At this time the Government of Alberta understands there are several technologies being applied presently, but are not yet optimized. However, as research and development advances it expects operator choices will expand. Each approach may have different results within the 10-year timeframe as they work to optimize plans and technology configuration to reduce the entire fluid tailings inventory to a managed (ready-to-reclaim) state. **However, the End of Mine Life Target for all projects will be the equivalent of 5-years, or less, of fluid tailings accumulation.**

³ As project expectations and timelines may change over time, the “end of mine life” date may also change. The Alberta Energy Regulator will make decisions as to whether expansions, amendments, and/or extensions will be considered part of the original project approval or whether a new approval will be required for new mining plans. Such decisions will consider the site, leases, and project in question, as well as the benefits associated with such an application. Part of this decision process will include consideration of the risks associated with extending the life of a project and the related extension of the liability associated with unprocessed fluid tailings.

Of additional consideration in this framework are technologies that may be conditionally approved by the Alberta Energy Regulator, but are not yet considered viable treatment options [**note that this is not solely related to the performance of current technologies being considered, but also due to the pending need to develop appropriate criteria against which to assess viability**]. Conditional approval of the use of such technologies will continue for demonstration purposes, but until it is determined whether or not the technology is a successful treatment method, plans will be required to consider alternatives. To be considered viable, such technologies (including, for example, water-capped fluid tailings in end pit lakes) will be required to meet criteria for ready-to-reclaim status within 10 years of the final placement of tailings materials. Until fluid tailings meet ready-to-reclaim status criteria, they will be considered part of the total fluid tailings volume inventory. Regardless of whether fluid tailings are ultimately treated through centrifuge processes, end pit lakes, consolidation processes, or other means, the End of Mine Target will not be different than targets set with proven technology. This is intended to manage the risk that experimental technology becomes unable to meet ready-to-reclaim criteria in the long-run. Demonstration of treatment technology is an important ongoing task; to provide clarity in expectations the Government of Alberta will develop performance criteria for ready-to-reclaim status, as well as reclamation, following the implementation of the *Tailings Management Framework for the Mineable Athabasca Oil Sands*.

Additionally, the selection and approval of different technologies for treating fluid tailings will need to consider the outcomes of the *Tailings Management Framework for the Mineable Athabasca Oil Sands*, including the promotion of a stable landscape that comprises a diverse, locally common and self-sustaining ecosystem after reclamation⁴.

The state of knowledge around the treatment of fluid tailings created in the course of oil sands mining is continuing to evolve, and while technologies may be understood at a smaller scale, the understanding required for the use of many technologies at a sufficiently large scale has not yet been fully achieved. Thus, a greater risk of technological failure exists. To manage this risk as technologies are proven out, fluid tailings volume profiles submitted with technologies that have yet to be proven will require contingency plans for treatment, including alternative technology options for meeting requirements. As current knowledge at a large scale is limited for numerous technologies, it is possible that these contingency plans will be based on technologies that have also not yet been proven. A key tenet of the *Tailings Management Framework for the Mineable Athabasca Oil Sands* is to drive innovation and proving of technology with the intent of enhancing certainty around fluid tailings treatment, and the eventual achievement of the outcomes of this framework.

⁴ Such outcomes may be factors for consideration in future updates to sub-regional and/or regional plans.

The *Tailings Management Framework for the Mineable Athabasca Oil Sands* seeks to manage the risk that experimental technology is unable to meet ready-to-reclaim criteria in the long-run by requiring contingency plans for unproven technology. It also promotes action to prove technologies in the shorter-term.

5.2.3 Setting the Triggers and Limit for New Fluid Tailings

Triggers and a limit (collectively referred to as “thresholds”) will be set relative to a fluid tailings volume profile generated on a project-specific basis. The triggers and limit will ensure that new fluid tailings are not accumulating beyond a volume and/or at a rate that precludes operators from meeting the ready-to-reclaim objective within 10 years of the end of mine life. Until fluid tailings meet ready-to-reclaim status criteria, they will be considered part of the total fluid tailings volume inventory.

The Alberta Energy Regulator, with guidance from this Framework, will establish project-specific thresholds, recognizing that the volume of fluid tailings produced and accumulated over the life of an oil sands mining project varies according to the area being mined and by extraction, mining, and treatment processes (i.e., by project). The AER will decide on these thresholds through a transparent review of project-specific profiles and give consideration to such factors as the mine plan and project bitumen production levels, lease geography and geology, mining and extraction processes, tailings treatment processes, best available technology, existing infrastructure, and environmental and social impacts (see Figure 4).

Under the *Tailings Management Framework for the Mineable Athabasca Oil Sands*, the following triggers and limit will be set for new fluid tailings for each oil sands mining project based on an approved project-specific fluid tailings volume profile:

Profile Deviation Trigger⁵: In any given year, the annual fluid tailings volume growth has increased by more than 20 per cent of that forecasted in a project’s approved profile.

Profile Deviation Trigger = Fluid tailings volume growth has deviated from the approved profile by 20 per cent.

⁵ The approach to calculating thresholds will be addressed in a guideline supporting the *Tailings Management Framework for the Mineable Athabasca Oil Sands*. Variables considered in the calculation of the Profile Deviation trigger include the rate of growth, the approved volume, and a 5-year rolling average to account for year-over-year variability.

Total Volume Trigger: The volume of fluid tailings has exceeded an amount (expected to be the equivalent of or less than 5-years' of fluid tailings volume accumulation) that is reasonable to get ready to reclaim within 10 years of the end of mine life. Where an approved fluid tailings volume profile has a peak greater than the End of Mine Life Target, the Total Volume Trigger will be set to that level.

Total Volume Trigger = 100 per cent of End of Mine Life Target⁶

Total Volume Limit: The volume of fluid tailings has exceeded an amount that is 40 per cent above the volume that can be managed to a ready-to-reclaim state within 10 years of the end of mine life (expected to be the equivalent of or less than 5-years' of fluid tailings volume accumulation). [Note: The 40 per cent equates to approximately two years' worth of incremental inventory of fluid tailings accumulation].

Total Volume Limit = 140 per cent of End of Mine Life Target⁷

For the purposes of the *Tailings Management Framework for the Mineable Athabasca Oil Sands*, these thresholds will be included in regulatory approvals under the *Oil Sands Conservation Act* or the *Environmental Protection and Enhancement Act*, and are subject to transparent processes enabled under these Acts. As knowledge is enhanced, these thresholds may be altered, if necessary, through a transparent regulatory process.

5.2.4 Tailings Management Plans⁸ for New Fluid Tailings

An initial tailings management plan that addresses both near-term and end of mine life fluid tailings reduction will be prepared and submitted to the AER for approval. It is understood that in addition to the volume of fluid tailings, the quality of fluid tailings will also play a role in the successful reclamation of fluid tailings, and as such should be considered in tailings management plans. Over the course of the mine life, these plans will be reviewed every five years, or as necessary, to ensure that profiles and thresholds are in line with projections and reflecting current technology and new knowledge. An amendment of the tailings management plan describing detailed plans for reduction of remaining fluid tailings after end of mine life will be submitted closer to the end of end of mine life.

All requirements outlined in Section 5.2 will be applied to new fluid tailings. Requirements for managing legacy tailings are described in Section 5.3.

⁶ For those projects that have approved ramp-up volumes of greater than the 5 years' of volume accumulation required by end of mine life, the Total Volume Trigger would be based on that higher number, provided they are able to demonstrate that the plan configuration will meet or achieve better than the desired End of Mine Life Target, and the objective and outcomes of this framework.

⁷ For those projects that have approved ramp-up volumes of greater than the 5 years' of volume accumulation required by end of mine life, the Total Volume Limit would be based on that higher number, provided they are able to demonstrate that the plan configuration will meet or achieve better than the desired End of Mine Life Target, and the objective and outcomes of this framework.

⁸ The requirements for Tailings Management Plans under the *Tailings Management Framework for the Mineable Athabasca Oil Sands* will be outlined in a guideline to support the Framework.

5.3 Managing Legacy Tailings

Legacy tailings: Fluid tailings in storage before January 1, 2015.

Note: As it is not possible to physically distinguish between legacy and new fluid tailings, for those operations that have both legacy and new fluid tailings, a single profile can be developed and managed. However, the End of Mine Life Target, and triggers and limits outlined in Section 5.2 would be set as specified for new fluid tailings (e.g. thresholds would not be based on the combined volume of legacy and new tailings, but instead, on the basis of only the new fluid tailings volume). Legacy tailings will be managed using an approved plan to reduce those volumes to a ready-to-reclaim state by end of mine life (Section 5.3). Operators must demonstrate treatment volume levels that provide assurance of treatment progress on “legacy equivalent” volumes, as well as new fluid tailings.

The Framework acknowledges and addresses the current inventory of fluid tailings (legacy tailings). Some legacy fluid tailings are located on mine sites that have been in operation for decades. The Government of Alberta recognizes that the regulatory environment has evolved significantly since the start of oil sands mining in the 1960s, however this does not diminish the responsibility to reduce the liability associated with large legacy volumes.

Operators with legacy fluid tailings will be required to submit to the AER, a legacy tailings management plan for approval, integrated with or in parallel to the submission of a new fluid tailings plan and profile. These plans will be reviewed through a transparent regulatory process.

For any projects that have an inventory of tailings prior to January 1, 2015, the Framework requires that existing volumes are brought to a ready-to-be-reclaimed state by the end of mine life. As with new fluid tailings, legacy tailings would be subject to a profile deviation trigger.

Within an approved legacy tailings management plan additional conditions of approval, including goals related to the treatment of legacy tailings (e.g. reduction milestones), may be developed for these operators to ensure their high accumulated volumes are decreasing at an acceptable rate and the risk of large accumulations is decreasing over time. There may be specific management actions⁹ associated with not meeting these goals; these will be considered in the context of the plans for managing legacy tailings. As with requirements for new fluid tailings volumes, the *Tailings Management Framework for the Mineable Athabasca Oil Sands* expects that legacy fluid tailings will be progressively reclaimed as operations continue, in order to meet the requirement that all legacy tailings be treated to an acceptable managed state (ready-to-reclaim) by end of mine life.

⁹ Management actions may include those found in Table 3, or as determined appropriate by the AER.

A 20 per cent profile deviation trigger will also be applied to the reduction of legacy tailings. In the event it is determined that operators are not treating legacy fluid tailings to a ready-to-reclaim state at a rate that is sufficient, more serious management actions may be applied (see Section 6.0 for potential management actions).

5.4 Validation and Assurance

Comparability across projects will be key to ensuring consistent management of fluid tailings in the Mineable Athabasca Oil Sands area. The development of a common accounting system for managing tailings will be important for implementing the intent of the *Tailings Management Framework for the Mineable Athabasca Oil Sands*, and ensuring continued credibility of the management system. Further, in addition to and in support of processes administered by the AER, the evaluation of project volume profiles; the assessment of established target, thresholds, and associated management actions; and, project tailings management reporting may be subject to external review and guidance in order to strengthen assurance and transparency within the system.

5.5 Regional Performance

The *Lower Athabasca Regional Plan 2012-2022* identified the volume of fluid tailings as a supporting indicator for achieving Regional Outcome 3: landscapes are managed to maintain ecosystem function and biodiversity (p. 42). Based on this direction, regional metrics will be established. Regional metrics can be used to track regional performance and evaluate whether the Framework is achieving its desired outcomes.

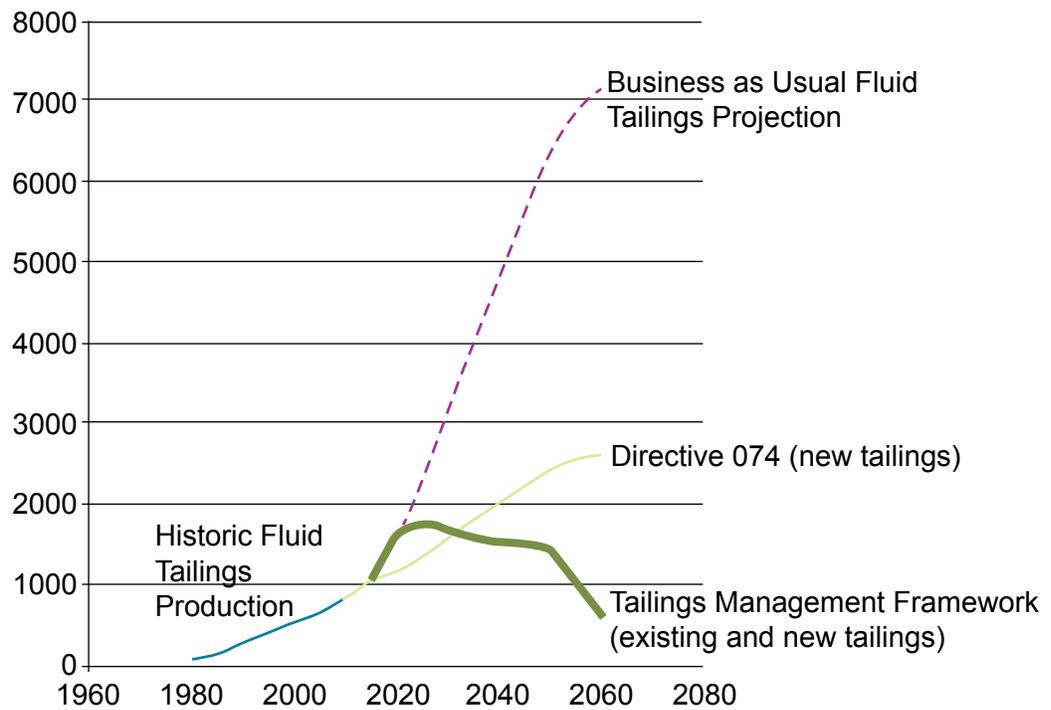
For purposes of tracking overall performance as well as to inform potential management needs and responses as part of proactive tailings management, the following regional metrics will be reported on:

Volume: Total annual volume of fluid tailings per year. This would be tracked against the aggregate of all approved tailings profiles.

Rate: Total volume of fluid tailings treated per year.

Fines: The amount of fines captured per year.

Monitoring the performance metrics on a regional basis, in combination with the enforcement of project thresholds, will reduce the growth in the regional inventory of fluid tailings. A net increase in the total volume of fluid tailings inventory is initially expected under the Framework, due to continued bitumen production. However, increasing rates of tailings treatment under the Framework will result in a substantial reduction in tailings volume over time relative to production, and a substantial decrease of legacy fluid tailings in the future.



The above graph¹⁰ provides an illustration of the estimated potential aggregate impact of the *Tailings Management Framework for the Mineable Athabasca Oil Sands* on the volume of fluid tailings on the landscape over time. Actual results will depend on policy implementation; this graph will serve as a reference point over time, as the policy is implemented.

¹⁰ The fluid tailings volumes were derived from the historical production of legacy tailings (AER, 2015: Houlihan & Haneef, 2008) cumulative bitumen production (AER, 2014) and assumed effects of Directive 074 and the *Tailings Management Framework for the Mineable Athabasca Oil Sands* in the future.

6.0

The Management System

This framework provides the following new elements to the existing management system:

- A trigger and limit on the volume of fluid tailings accumulation for each oil sands mining project;
- A trigger on the deviation of fluid tailings volume growth from each oil sands mining project's approved fluid tailings volume profile;
- A management response when thresholds (i.e., triggers and limit) are exceeded;
- A target of all fluid tailings in a ready-to-reclaim state within 10 years of end of mine life for all oil sands mining projects; and,
- A requirement to have all legacy tailings (or a legacy equivalent volume) in a ready-to-reclaim state at the end of mine life.

The *Tailings Management Framework for the Mineable Athabasca Oil Sands* sets project-specific thresholds for the production of fluid tailings volumes over the life of oil sands mining projects. This approach is somewhat different than other Environmental Management Frameworks in the Lower Athabasca Region, in that it focuses on managing the environmental pressure (i.e., fluid tailings accumulation) rather than the environmental state (regional ambient environmental conditions).

It is important to understand that this framework is intended to manage the total volume and possible deviation from the approved fluid tailings volume profile over the life of mining projects, and is intended to complement rather than replace the existing management system. The Framework requirements will be formally incorporated into new project approvals, amendments, and renewals.

6.1 Assignment of Fluid Tailings Management Levels

The assignment of management levels provides a means of managing fluid tailings accumulation so that they do not accumulate to a point that is not possible to process from the landscape within a desired timeframe.

Under the *Tailings Management Framework for the Mineable Athabasca Oil Sands*, four fluid tailings management levels are defined. Level 1 represents conditions wherein projects are operating in line with approved profile fluid tailings volume growth. Level 2 indicates volumes of fluid tailings have exceeded desirable volume growth. Level 3 indicates that the maximum volume accumulation approved for the project has been exceeded, and Level 4 indicates that the operator has exceeded the end of mine life target volume by 40 per cent during the life of the mine, thereby increasing long-term liability and environmental risk beyond an acceptable level.

There are corresponding management intentions for each level. The management intent varies depending on management level (Table 2). Assigning management levels seeks to prevent fluid tailings volumes from reaching those associated with Level 4, as defined by the Total Volume Limit, by proactively monitoring and managing tailings volume and growth indicators in Levels 2 and 3. Assignment of levels provides a means of managing fluid tailings accumulation so that they do not grow to a point that is not possible to process from the landscape within a desired timeframe. A range of increasingly severe regulatory and financial tools will be used at each management level as project volumes of fluid tailings, and associated risk, increase. Such tools may include, but are not limited to, increased planning and reporting requirements, the use of financial penalties, liability management through the Mine Financial Security Program, production curtailment, and/or enforcement provisions under current legislation. The management action will increase in severity as the volume of fluid tailings increases (see Table 3).

Level 1:

Projects are operating in line with their approved fluid tailings profile. Approval and licence conditions are being implemented, and tailings management and other relevant policy are being applied. Monitoring and reporting, and fluid tailings treatment/research associated with the Tailings Management Framework is being conducted, but no additional Framework management action is required.

Level 2:

The Profile Deviation Trigger is exceeded during mine life. Level 2 conditions indicate an increasing level of risk associated with increasing volume growth of fluid tailings at a project, beyond that which was approved in the fluid tailings volume profile; they may or may not indicate additional environmental risk. Confirming whether an undesirable trend is developing and evaluating the consequences of that trend is important to deciding on the need for management action. Additional reporting and action to bring volume accumulation back in line with the approved profile will be required, and a range of management actions, including the use of financial tools, may be used in Level 2 to address individual situations, depending on urgency and potential risk.

Level 3:

The Total Volume Trigger is exceeded during mine life. The volume of tailings has exceeded the volume that would be possible to get ready to reclaim within 10 years of the end of mine life. Confirming whether a longer-term trend is developing and evaluating the consequences of that trend is important to deciding on the appropriate level of management action.

The risk associated with such an exceedance will depend on the duration of the exceedance and/or the point in the mine life at which the exceedance occurs. A range of management actions will be used in Level 3 to address individual situations depending on urgency and potential risk. However, as this trigger is closely linked to the ultimate ability of the operator to get fluid tailings to a ready-to-

reclaim state at the end of mine life, more serious management action is required in general at this management level. Further, exceeding this trigger could result in the application of financial regulatory instruments in order to backstop the increased liability risk.

Level 4:

The Total Volume Limit on fluid tailings for the project has been exceeded.

The volume of fluid tailings exceeds the limit established to manage fluid tailings environmental objectives and liability to Albertans. **Exceedance of this limit increases risk beyond an acceptable level, and has associated significant and punitive management-, regulatory- and financial responses.** Management actions including production curtailment may be applied. Financial measures including a security posting under the Mine Financial Security Program and a compliance levy will also be applied. Level 4 conditions should be avoided through careful management of activities influencing fluid tailings accumulation in Levels 2 and 3 conditions.

The Use of the Profile Deviation Trigger

In any given year, the annual fluid tailings volume growth has increased by more than 20 per cent of that forecasted in a project's approved profile. This trigger is a key part of an early warning system, especially at lower volumes of fluid tailings. It is possible that a profile deviation trigger could be exceeded at any volume of fluid tailings accumulation. A deviation from approved fluid tailings volumes will be addressed using appropriate financial tools. A security posting set at a rate above the total approved volume will be collected into the Mine Financial Security Program, and a compliance levy may be applied. Operators will also be required to submit a plan and take immediate action to bring growth back in line with the approved profile. Other management actions required to manage the associated increase in liability and/or environmental risk may also be applied. Where operators are found to be consistently deviating year-over-year from their profile, but remain below the 20 per cent threshold, the AER may choose to institute additional regulatory or management requirements.

Table 2: Description of Fluid Tailings Volume Management Levels



Level	Description	Management Intent
Level 4	The Limit on fluid tailings volumes for the project has been exceeded.	<p>Penalize operators who fail to comply with the Framework</p> <p>Manage risk/liability of increased volumes of fluid tailings</p> <p>Obtain certainty around successful reclamation</p> <p>Quickly reduce volumes to below the Limit</p>
Total Volume Limit (140 per cent of End of Mine Life Target ¹⁰)		
Level 3	Fluid tailings volumes have exceeded the Total Volume Trigger	<p>Understand and control the growth of fluid tailings volumes to ensure that projects are able to meet the final objective</p> <p>Manage risk/liability of increased volumes of fluid tailings</p> <p>Reduce fluid tailings volumes to below the Total Volume Trigger level, as appropriate</p> <p>Control risk of exceeding the Limit</p> <p>Improve knowledge and understanding of trends</p>
Total Volume Trigger (100 per cent of End of Mine Life Target ¹¹)		
Level 2	Fluid tailings volumes have exceeded the Profile Deviation Trigger	<p>Understand and control the growth of fluid tailings volumes in order to ensure that projects are following the intent of the Framework</p> <p>Manage volumes to realign with approved profile volumes</p> <p>Manage risk/liability of increased volumes of fluid tailings</p> <p>Control risk of exceeding the Limit</p> <p>Improve knowledge and understanding, and plan</p> <p>In some cases, penalize operators who fail to comply with the Framework</p>
Profile Deviation Trigger (Actual fluid tailings volume growth is 20 per cent higher than the approved profile ¹²)		
Level 1	Fluid tailings are on the approved growth trajectory	Ensure operation according to profile/regulatory requirements

¹⁰ For those projects that have approved ramp-up volumes of greater than the 5 years' of volume accumulation required by end of mine life, the Total Volume Limit would be based on that higher number, provided they are able to demonstrate that the plan configuration will meet or achieve better than the desired End of Mine Life Target, and the objective and outcomes of this framework.

¹¹ For those projects that have approved ramp-up volumes of greater than the 5 years' of volume accumulation required by end of mine life, the Total Volume Trigger would be based on that higher number, provided they are able to demonstrate that the plan configuration will meet or achieve better than the desired End of Mine Life Target, and the objective and outcomes of this framework.

¹² The approach to calculating thresholds will be addressed in a guideline supporting the *Tailings Management Framework for the Mineable Athabasca Oil Sands*. Variables considered in the calculation of the Profile Deviation Trigger include the rate of growth, the approved volume, and a 5-year rolling average to account for year-over-year variability.

6.2 Management Response

As project fluid tailings volumes increase over time, thresholds will provide an indication that management response may be required. Part of the management response is determining the need for management actions. The management action(s) associated with the threshold exceedance will vary with the management level (and associated intent, as indicated in Table 2); increasing in severity as fluid tailings volumes increase.

Table 3: Potential Management Actions for Each Management Level



Level	Potential Management Actions
Level 4	<ul style="list-style-type: none"> Operator will provide a plan and take immediate action to bring fluid tailings volumes below Limit Use of any regulatory instruments including regulatory tools and enforcement actions available, depending on the circumstances. This could include the use of the highest consequence regulatory instruments (e.g. production curtailment, penalties, no new approvals) Application of regulatory financial tools including: <ul style="list-style-type: none"> - Payment into Mine Financial Security Program - Compliance levy Third-party audit Additional surveillance Communicate with stakeholders and First Nations and Métis
Total Volume Limit (140 per cent of End of Mine Life Target¹³)	
Level 3	<ul style="list-style-type: none"> Identify urgency of and need for additional measures Determine, for example, cause of exceedance, whether treatment capacity exists to control fluid tailings growth, and whether investment in capacity and investment in new technologies is occurring Provide action plan for approval and take action to bring below total trigger volume, if necessary Use of regulatory instruments under existing legislation and policy Depending on the nature of the exceedance, potential use of regulatory financial tools including: <ul style="list-style-type: none"> - Action under Mine Financial Security Program - Compliance levy Additional surveillance Communicate with stakeholders and First Nations and Métis
Total Volume Trigger (100 per cent of End of Mine Life Target¹⁴)	
Level 2	<ul style="list-style-type: none"> Reporting to confirm, for example, that treatment capacity exists to control fluid tailings growth, and investment in capacity investment in new technologies is occurring Operator will provide plan and take immediate action to bring fluid tailings volumes in line with approval Application of regulatory financial tools including: <ul style="list-style-type: none"> - Action under Mine Financial Security Program - Compliance levy, as appropriate Additional surveillance Communicate with stakeholders and First Nations and Métis, as needed
Profile Deviation Trigger¹⁵ (Actual fluid tailings volume growth is 20 per cent higher than the approved profile)	
Level 1	<ul style="list-style-type: none"> Verify tailings conditions of approval are being met, including volumes and growth against profiles <ul style="list-style-type: none"> - Track and trend available data - No management actions beyond base regulatory systems

¹³ For those projects that have approved volumes of greater than the 5 years' of volume accumulation required by end of mine life, the Total Volume Limit would be based on that higher number, provided they are able to demonstrate that the plan configuration will meet or achieve better than the desired End of Mine Life Target, and the objective and outcomes of this Framework.

¹⁴ For those projects that have approved volumes of greater than the 5 years' of volume accumulation required by end of mine life, the Total Volume Trigger would be based on that higher number, provided they are able to demonstrate that the plan configuration will meet or achieve better than the desired End of Mine Life Target, and the objective and outcomes of this Framework.

¹⁵ The approach to calculating thresholds will be addressed in a guideline supporting the *Tailings Management Framework for the Mineable Athabasca Oil Sands*. Variables considered in the calculation of the Profile Deviation Trigger include the rate of growth, the approved volume, and a 5-year rolling average to account for year-over-year variability.

6.2.1 Management Response: Financial Tools

Financial tools are a specific set of instruments that will be used, in combination with other regulatory tools, to help manage fluid tailings accumulation under the *Tailings Management Framework for the Mineable Athabasca Oil Sands*. In addition to the potential use of financial penalties enabled under existing legislation, two financial tools may be used to help managed fluid tailings accumulation: the Mine Financial Security Program and a compliance levy.

The Mine Financial Security Program

The Government of Alberta regulatory requirements for mine reclamation financial security ensure that there are no unsecured liabilities associated with mineable oil sands deposits. The Mine Financial Security Program (MFSP) is regulated through the *Conservation and Reclamation Regulation* under the *Environmental Protection and Enhancement Act* (EPEA). It is based on the fundamental principle that the EPEA approval holder for the mine is responsible for carrying out all aspects of suspension, abandonment, remediation, and surface reclamation work at a mine site, consistent with the standards set by the Government of Alberta, as well as maintaining care and custody of the project until a reclamation certificate has been issued.

Currently, the Mine Financial Security Program is a regulatory requirement to ensure that:

- the people of Alberta are protected from the costs associated with the liability of coal and oil sands mines;
- mine operators progressively reclaim lands when they are no longer needed for industrial development; and
- the operators post financial security so that costs associated with suspension, abandonment, remediation, and surface reclamation are fully secured when there is less than 6 years of reserves left.

Under the *Tailings Management Framework for the Mineable Athabasca Oil Sands*, additional security¹⁶ may be required under the MFSP that would address aspects of risk and liability posed by a project that exceeds a management threshold for fluid tailings. The operator would be required to post security under the following circumstances:

- (a) **the Profile Deviation Trigger is exceeded** – the actual fluid tailings volume growth is 20 per cent higher than that approved in the fluid tailings volume profile; and/or
- (b) the volume of fluid tailings **exceeds the Total Volume Limit**.

¹⁶ The operationalization of this security requirement, including a determination its value, will be addressed during the implementation of the *Tailings Management Framework for the Mineable Athabasca Oil Sands*.

The MFSP could also be used at other management threshold points if specific conditions of performance pose a significant level of risk relating to liability.

Once the operator takes action and is within its approved profile for an acceptable period of time, this additional security will be released.

Compliance Levy

The Alberta Energy Regulator may also apply a non-refundable financial penalty¹⁷ in response to the exceedance of a threshold. A compliance levy will be applied when the Total Volume Limit is exceeded, and may also be used as part of a management response for other thresholds, depending on circumstances. The levy will be used to support activities that contribute to the achievement of the objective and outcomes of the *Tailings Management Framework for the Mineable Athabasca Oil Sands*.

6.3 Oversight and Delivery of Management Actions

The appropriate parties to be involved in the development and implementation of management actions will be identified. There will be shared responsibility amongst these parties to make sure the actions are taken. Such parties include ESRD and the AER. Roles include ensuring that any key changes in the regulatory and/or management system that are needed are undertaken, and serving in an oversight role for actions being taken by other parties. Direct regulatory delivery and oversight is the responsibility of the AER.

6.4 Evaluation and Communication

The AER will complete an annual review of the performance of operators to ensure they are within their approved profile or consider the appropriate management action(s). Operators will be required to report on their performance annually, including actions taken as part of a management response and associated progress.

In addition to reporting on project-specific performance, the AER will prepare an annual report that will summarize the status of fluid tailings volumes in the region, and describe any actions initiated as part of a management response. The report may also identify gaps in data, knowledge, and monitoring, report on progress in implementing the Framework, and provide recommendations for improvement. The contents and details of the reports will be determined as part of implementation of the Management Framework. This report, and tailings management reports submitted by individual operators, will be posted on the AER's website.

¹⁷ The operationalization of the compliance levy will be addressed during the implementation of the *Tailings Management Framework for the Mineable Athabasca Oil Sands*. This will include consideration of, among other factors, the potential implications for comparable industry and/or government-related initiatives.

6.5 Technology

Many of the advancements or improvements in environmental performance in the oil sands, including those related to tailings, are dependent on technology. Improving existing technology and developing new technology and funding for research will play a large part in reducing the impact of tailings in the future, including the development of technology to better manage ores with higher fine content.

Technology development and full-scale technology implementation is critical to the success of tailings reclamation. There are commercial tailings treatment options, but many potential tailings management technologies are still in the development and field trial stages.

The direction for technology development and implementation highlights the need for collaboration, given that significant effort and expenditure are required to commercialize and implement the most promising tailings treatment methods. Collaboration between operators, agencies, academia, and other partners could lead to effective demonstration and commercialization of innovative solutions to tailings management. Monetary and intellectual property barriers that impede the public distribution and use of tailings treatment knowledge and technologies that progressively meet environmental objectives will also need to be considered. Effective sharing of technical information, progress, and performance of tailings solutions will be encouraged in order to advance the state of knowledge and practice across the oil sands mining industry.

It is likely that a suite of technologies will be required to achieve long-term reclamation objectives across the life of any given mining operation and across different mines sites. Mechanisms need to be established to support evaluation and validation of the performance of specific technologies. Objective metrics are required to assess the viability of any particular technology or suite of technologies in the context of meeting future reclamation criteria and expectations. The Government of Alberta and the Alberta Energy Regulator will continue to support technology development and implementation through existing regulatory approvals.

6.6 Water Management

As fluid tailings are reclaimed, process-affected water will be liberated from the tailings matrix. Over time, the onsite storage of process-affected water may constrain site management options for some mine operators. Alternatives to current water management practices may be considered at that time. As part of this process, operators will be required to provide a detailed assessment of water management alternatives that address the end fate of process-affected water and optimize the following water management approaches:

- Reducing water consumption and water intake
- Recycling water wherever feasible
- Re-using water wherever possible
- Leveraging opportunities to share water regionally

The net environmental effects of the various water management options will need to be clearly evaluated before final decisions on the acceptability of alternatives will be made. Where preferred approaches are found insufficient to manage all of the liberated process-affected water generated and stored on site, regulatory applications that seek the return of new wastewater streams to the environment may be considered. Such applications would be evaluated on a case-by-case basis and require considerable supporting analyses including (but not limited to) the evaluation of potential ecosystem and human health risks. These applications would be subject to existing provincial wastewater policy and legislation and would be subject to supplemental requirements, which may include enhanced wastewater characterization (i.e., physical, chemical and toxicological evaluation), additional criteria and guidelines for acceptable quality of release, wastewater treatment performance standards, more comprehensive in-stream modelling, and more stringent environmental effects monitoring requirements. The details on these supplemental requirements will be developed by the Government of Alberta following the implementation of the *Tailings Management Framework for the Mineable Athabasca Oil Sands*.

7.0

Implementation

This management framework is part of a series of management frameworks and plans developed by Alberta Environment and Sustainable Resource Development (AESRD) in support of the Government of Alberta's *Lower Athabasca Regional Plan* (LARP). As the LARP is implemented, all of the outcomes and objectives in it, including those for tailings management as well as for air, surface water and groundwater, land management, and biodiversity will be considered in planning and decision-making for the Region by all provincial government departments and agencies, and municipal governments.

7.1 Roles and Responsibilities

Alberta Environment and Sustainable Resource Development, the Alberta Energy Regulator, and regulated oil sands mine operators all have direct responsibilities related to managing fluid tailings. These roles and responsibilities are described only briefly in the context of the Framework, so should not be regarded as an exhaustive list.

Additionally, local communities, including First Nations and Métis, will continue to be engaged in the ongoing management of tailings as it pertains to final landscape outcomes and the use of land in the region.

7.1.1 Alberta Environment and Sustainable Resource Development

Alberta Environment and Sustainable Resource Development is responsible for ensuring the Framework is developed, reviewed, and revised with the engagement of stakeholders, including First Nations and Métis. Alberta Environment and Sustainable Resource Development is also responsible for:

- developing an implementation plan for this framework in collaboration with the AER, including ensuring alignment and integration with other existing requirements;
- undertaking a review of *Directive 074: Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes*, in collaboration with the AER, to ensure alignment with the *Tailings Management Framework for the Mineable Athabasca Oil Sands*;
- revising the Mine Financial Security Program to include the liability associated with fluid tailings, and ensure alignment with the Framework;
- working with the AER to develop policy and criteria for assessing the ready-to-reclaim status of treated fluid tailings for reclamation;

-
- working with the AER to develop policy and performance criteria for establishing ready-to-reclaim status applicable to end pit lakes;
 - working with the AER to develop conditions, including policy and criteria, for tailings water release;
 - the development of components required to further operationalize the requirements of the *Tailings Management Framework for the Mineable Athabasca Oil Sands*;
 - continuing to support industry, academic/research organizations and other government agencies in assessing tailings treatment technologies; and,
 - public reporting

7.1.2 Alberta Energy Regulator

The Alberta Energy Regulator (AER) is responsible for ensuring the Framework is implemented and adhered to.

The AER is also responsible for:

- developing an implementation plan for this framework, in collaboration with Alberta Environment and Sustainable Resource Development, including ensuring alignment and integration with other existing requirements;
- undertaking a review of *Directive 074: Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes*, in collaboration with Alberta Environment and Sustainable Resource Development, to ensure alignment with the Tailings Management Framework, and amending Directive 074, as appropriate;
- working with Alberta Environment and Sustainable Resource Development to develop criteria for assessing the ready-to-reclaim status of treated fluid tailings for reclamation;
- working with Alberta Environment and Sustainable Resource Development to develop performance criteria for establishing ready-to-reclaim status applicable to end pit lakes;
- working with Alberta Environment and Sustainable Resource Development to develop conditions, including criteria, for tailings water release;
- operationalizing the requirements of the *Tailings Management Framework for the Mineable Athabasca Oil Sands* – including developing guidelines for the content of tailings management plans, and tailings management reports and other reporting requirements;
- evaluating existing regulatory tools and amending as required to align with the *Tailings Management Framework for the Mineable Athabasca Oil Sands*;
- ensuring oil sands mine approvals follow or incorporate the requirements of the Framework;

-
- ensuring tailings management plans and profiles are reviewed and decided on in a transparent regulatory process in the time required by the *Tailings Management Framework for the Mineable Athabasca Oil Sands*;
 - determining, approving, and reviewing fluid tailings volume profiles, project specific triggers and limits;
 - reviewing Tailings Management Reports submitted as a requirement by this framework;
 - assigning a management level and initiating a management response when required based on the assessment of monitoring data including information provided in tailings reports;
 - implementing the revised Mine Financial Securities Program, as applicable to tailings;
 - reporting on the regional tailings performance metrics as determined by the Framework;
 - public reporting; and,
 - ensuring transparency through sharing of tailings monitoring data and information.

7.1.3 Mine Operators

Operators of oil sands mines are the key to the success of this framework. It is the role and responsibility of operators to ensure that the objective of this framework is achieved through minimization of fluid tailings volume accumulations and progressive reclamation of treated fluid tailings. The mine operators will be responsible for:

- submitting new or revised tailings management plans and legacy tailings management plans in timelines specified in the Framework;
- completing and submitting Tailings Management Reports;
- undertaking required management actions;
- reporting on progress of implementation of management actions; and,
- sharing of information on tailings technology and research and reporting with the AER and Alberta Environment and Sustainable Resource Development.

7.2 Monitoring and Reporting

Individual projects will prepare Tailings Management Reports¹⁸, and submit them to the AER. These reports will be made available by the AER. The Tailings Management Report will include, at a minimum:

- the volumes and locations of fluid tailings;
- the volumes of ready-to-reclaim tailings;
- the volumes of fluid tailings treated in the reporting period;
- status of previously treated fluid tailings;
- location, volume, and chemistry of ponds storing tailings water, including the volume and quality of water recovered from fluid tailings, and runoff from ready-to-reclaim fluid tailings and/or reclaimed fluid tailings where applicable;
- plans for managing tailings water recovered from the treatment of fluid tailings;
- confirmation of accuracy of forecasted fluid tailings volume profile;
- management actions undertaken and progress made during the reporting year; and,
- progress on and results of tailings technology performance and development

7.3 Framework Review Cycle

The *Tailings Management Framework for the Mineable Athabasca Oil Sands* is intended to be reviewed on a five-year cycle and involve stakeholders, First Nations, and Métis. This will ensure:

- changes expected from this framework in the short-term to meet the long-term outcomes are occurring, and adjustments to the Framework, as necessary;
- compliance with the Framework is being achieved;
- the approach to profile and threshold calculation is appropriate, reflects the current state of technology knowledge and understanding, and meets the management intent of the Framework;
- the Framework adjusts for new information, knowledge, and performance understanding, as it relates to the ability of projects to meet the framework objective as mines reach their end of mine life;
- the Framework is informed by best available technology;
- the identification of ongoing knowledge, technology and policy gaps;
- the review period for tailings management plans is appropriate;

¹⁸ Additional monitoring and reporting requirements will be specified in a guideline to accompany the *Tailings Management Framework for the Mineable Athabasca Oil Sands*.

-
- the Framework is up-to-date and consistent with new and revised policy and legislation;
 - the Framework aligns with best practices of other jurisdictions;
 - the implementation process has been effective, and modify where implementation of the Framework has not been as intended; and,
 - the identification and addressing of any changes required to improve the effectiveness, clarity, or approach of the Framework. For example, by the end of the first five-year cycle, the following information to guide Framework evaluation will be available:
 - industry performance with respect to thresholds;
 - trends in regional metrics;
 - preliminary results of the technologies developed and implemented; and,
 - the adequacy of the management actions in achieving the intent of the Framework

A review of the Framework should be complemented by regular review of the development and implementation of treatment technologies to ensure incorporation of evolving or new technologies, and adjusting performance expectations accordingly.

7.4 Policy Integration and Alignment

To ensure appropriate alignment with existing policies and directives, as well as integration with other current and planned policies, this framework will seek to ensure consistency of existing and future policies in support of the outcomes identified for tailings management.

The *Tailings Management Framework for the Mineable Athabasca Oil Sands* will trigger, for example, a review and/or adjustment to the following programs:

- *Directive 074: Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes*. This will be reviewed to ensure the program is supportive of meeting the outcomes of the Framework. Reporting requirements may be adjusted during the review period.
- *Mine Financial Security Program*. The program will be reviewed, and where required modified, to ensure that fluid tailings liability is more fully addressed.

7.5 Toward Implementation

7.5.1 Phased Implementation

A phased approach to implementation will be pursued for the *Tailings Management Framework for the Mineable Athabasca Oil Sands*. Phase I of implementation will focus primarily on those elements required for operators to submit fluid tailings profiles and tailings management plans in line with the requirements of the Framework. Phase II of Framework implementation will focus on the development or modification of existing management responses to support the needs of the *Tailings Management Framework for the Mineable Athabasca Oil Sands*, as well as continued development of operational guidelines and a review of key programs required to support ongoing management of tailings, including management actions.

Phase I (January 2015 – Fall/Winter 2015)

- Development of a guideline(s) providing direction on setting thresholds, specific monitoring and reporting requirements, and a standardized system for measuring and accounting for fluid tailings inventory;
- Submission of draft fluid tailings volume profiles and management plans; and
- Review of *Directive 074: Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes* to ensure the Directive is supportive of meeting the outcomes of the Framework.

Phase II (Fall/Winter 2015 – Fall/Winter 2016)

- Submission of final profiles and plans;
- Continued development of regulatory tools and guidelines to implement the intent of the *Tailings Management Framework for the Mineable Athabasca Oil Sands*;
- Operationalization of a compliance levy;
- Development of incentives to support the achievement of the intent of the Framework;
- A review of the Mine Financial Security Program and modification for use to manage fluid tailings as intended in the *Tailings Management Framework for the Mineable Athabasca Oil Sands*;
- Development of ready-to-reclaim criteria for different landforms; and
- Continued development of supporting Government policy to implement the intent of the *Tailings Management Framework for the Mineable Athabasca Oil Sands*.

7.5.2 Interim Management of Fluid Tailings during Initial Implementation

The development of a supporting guideline to guide the creation of fluid tailings volume profiles and management thresholds under the *Tailings Management Framework for the Mineable Athabasca Oil Sands*, including a review of *Directive 074: Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes*, will be undertaken immediately following the approval of the Framework. Until such time as fluid tailings volume profiles are submitted for approval, there is an expectation that oil sands mine operators will continue to report on tailings management to the Alberta Energy Regulator.

7.5.3 Laying the Foundation for Future Tailings Work

The Framework has defined clear thresholds to achieve timely reduction of fluid tailings volumes for all oil sands mining operations in the mineable Athabasca oil sands area. The Government of Alberta is committed to ensuring that tailings management expands beyond the management of the volume of fluid tailings volumes. The Government has identified key policies to be developed after the implementation of this Framework that will be incorporated into the next revision of the *Tailings Management Framework for the Mineable Athabasca Oil Sands*. Establishing performance measures for tailings technologies and reclamation criteria are key policies to be developed.

7.5.3.1 Tailings Treatment Technologies

Outcomes-based performance measures are needed to enable assessment and decision-making regarding the approval of the various tailings management and treatment technologies that oil sands operators may propose, including water-capped tailings in end pit lakes. The direct benefits of fluid tailings reduction must be balanced against the economic costs and overall environmental impacts. Outcomes-based performance measures will be used to evaluate the appropriateness of tailings technologies in meeting long-term reclamation outcomes.

The net environmental effects of tailings management technologies may be evaluated by looking at the following (but are not limited to):

- tailings footprint - total and wet;
- timely reclamation;
- water use intensity;
- water quality impacts;
- greenhouse gas emissions; and/or,
- energy intensity.

7.5.3.2 Reclamation Criteria

Being “ready-to-reclaim” is just one stage in the process of progressive reclamation of fluid tailings. Specific criteria and performance measures to define each stage, or the transition from one stage to the next, will be developed.

Criteria and performance measurement systems are required to evaluate success in getting tailings ready for reclamation. Criteria should support the meeting of reclamation outcomes for fluid tailings such as:

- tailings deposits are integrated into the closure landscapes that have functional drainage systems with acceptable water quality in shallow soil and runoff;
- tailings landforms are geotechnically stable and have a natural appearance consistent with the region; tailings structures will remain stable under a natural disturbance regime typical for their location;
- regional groundwater criteria, as established outside of this Framework, are adhered to;
- reclaimed landforms on tailings deposits have soil and soil process development consistent with boreal forest soils; and/or
- ecological communities on reclaimed tailings have functional and structural aspects consistent with the regional boreal forest.

Some criteria and associated measures already exist. Several Government of Alberta and multi-stakeholder initiatives are currently proceeding with, or have developed, criteria and performance measurement systems that naturally link with or support the Framework. These are found in approved closure plans, reclamation plans, regulatory approvals, or authorized guides and manuals for terrestrial and wetland reclamation. Where gaps exist, development of the criteria will be an iterative process, as more is learned about getting tailings ready for reclamation through adaptive management.

8.0

Terminology

8.1 Abbreviations and Acronyms

AER	Alberta Energy Regulator
AESRD	Alberta Environment and Sustainable Resource Development
EPEA	<i>Environmental Protection and Enhancement Act</i>
kPa	Kilopascals
LARP	<i>Lower Athabasca Regional Plan</i>
MFSP	Mine Financial Security Program
Mm ³	Million cubic meters
µm	Micrometres

8.2 Glossary

Active Fluid Tailings

Fluid tailings that have not been processed through an accepted technology, may be receiving new tailings on an ongoing basis, and/or may not be moved to its final landscape position.

End of Mine Life

The year in which mining of bitumen is complete for an AER-approved mine plan.

End of Mine Life Target

A volume of fluid tailings that can be managed to a ready-to-reclaim (or “managed”) state within 10 years after end of mine life.

Fines

Solids with particle sizes equal to or less than 44 micrometres (µm).

Fluid Tailings

Any fluid discard from bitumen extraction facilities containing more than 5 mass per cent suspended solids and having less than an undrained shear strength of 5 kPa¹⁹. The term ‘fluid tailings’ is used synonymously with ‘fluid fine tailings’.

Fluid Tailings Inventory

The volume of fluid tailings at a project site at any given time.

Fluid Tailings Volume Profile

The forecasted accumulation and reduction of fluid tailings volumes for each year to end of mine life.

¹⁹ This is a working definition that will be refined during implementation.

Legacy Equivalent Volume

A volume of fluid tailings equivalent to the volume of fluid tailings in storage before January 1, 2015.

Legacy Tailings

Fluid tailings in storage before January 1, 2015.

Limit

Clear boundaries in the system not to be exceeded.

New Fluid Tailings

Fluid tailings created on or after January 1, 2015.

Project

A mining operation that is the subject of an approval under the *Oil Sands Conservation Act*. The term 'project' is used synonymously with 'scheme' and 'approval'.

Ready-to-Reclaim (Fluid Tailings)

State achieved when fluid tailings have been processed through an accepted technology, have been placed in their final landscape position, and have achieved necessary performance criteria.

Reclamation Activities

Include activities that support permanent reclamation, such as landform construction and contouring, clean material placement (where necessary), reclamation material placement, and revegetation.

Reclaimed Fluid Tailings

Fluid tailings that have been processed through an accepted technology, have achieved ready-to-reclaim performance criteria, and have, subsequently, achieved the performance criteria required to meet the approved end land use.

Reclamation Criteria

A category of conditions or processes by which the achievement of a reclamation objective is assessed. A criterion (singular) is characterized by one or more related indicators that are used to determine success or to assess change over time.

Tailings

A mixture of sand, clay, water, silts, residual bitumen and other hydrocarbons, salts, and trace metals.

Thresholds

Triggers and limits within a management framework system.

Trigger

Warning signals to allow for evaluation, adjustment, and innovation on an ongoing basis.

9.0

References

Alberta Energy Regulator. 2009. *Directive 074: Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes*.

Alberta Energy Regulator. 2014. *ST98-2014: Alberta's Energy Reserves 2013 and Supply/Demand Outlook 2014–2023*.

Alberta Energy Regulator. 2015. *Tailings Plans Submissions*. Retrieved from www.aer.ca/rules-and-regulations/directives/directive-074

Alberta Environment and Sustainable Resource Development. 2014. Reclamation Information System, 2013. *Annual Conservation and Reclamation Report Submissions*.

Alberta Land Stewardship Act, SA 2009, c. A-26.8

Burkus, Z., J. Wheler and S. Pletcher. 2014. *GHG Emissions from Oil Sands Tailings Ponds: Overview and Modelling Based on Fermentable Substrates. Part I: Review of the Tailings Ponds Facts and Practices*. Alberta Environment and Sustainable Resource Development.

Burkus, Z. 2014. *GHG Emissions from Oil Sands Tailings Ponds: Overview and Modelling Based on Fermentable Substrates. Part II: Modeling of GHG Emissions from Tailings Ponds Based on Fermentable Substrates*. Alberta Environment and Sustainable Resource Development.

Environmental Protection and Enhancement Act, RSA 2000, c E-12

Government of Alberta. 2003. *Water for Life: Alberta's Strategy for Sustainability*. Pub.No. I/955.

Government of Alberta. 2008. *Land-use Framework*. Pub No 1/321.

Government of Alberta. 2009. *Responsible Actions: A Plan for Alberta's Oil Sands*.

Houlihan, R. and M. Haneef. 2008. Oil Sands Tailings: Regulatory Perspective. *In Proceedings of International Oil Sands Tailings Conference*, Edmonton, Alberta.

Oil Sands Conservation Act, RSA 2000, c 0-7

Oil Sands Conservation Regulation, Alta Reg 76/1988

A Conceptual Representation of the Stages of Progressive Reclamation

Table 4.

A Conceptual Representation of the Stages of Progressive Reclamation.

Specific criteria and performance measures to define each stage, or the transition from one stage to the next, will be developed during implementation of the framework.

Stage of Reclamation	Tailings Management Goals	Examples of Tailings Management Activities
<p>Active Mining</p> <p>(Fluid tailings are not reclaimed and remain as part of the landbase classified as disturbed)</p>	<ul style="list-style-type: none"> • Technologies are developed and improved • Fluid Tailings inventory is limited and treated as soon as possible 	<ul style="list-style-type: none"> • Criteria are developed to evaluate stages of tailings remediation and reclamation • Commercial scale implementation of technologies • Research continues on tailings technologies and linkages with reclamation outcomes
<p>Ready for Reclamation</p> <p>(Fluid tailings classified as “undergoing reclamation”)</p>	<ul style="list-style-type: none"> • Fluid tailings are treated and placed in final position • Incremental performance criteria are achieved. 	<ul style="list-style-type: none"> • Progressive reclamation options are maximized • Material is placed and monitored • Landforms are designed for ecosystem sustainability and reporting • Physical and chemical characteristics are managed to achieve performance criteria
<p>Reclaimed</p>	<ul style="list-style-type: none"> • Ecosystem is established • Ecosystem matures 	<ul style="list-style-type: none"> • Cap (soil or water) has been placed • Revegetation has occurred • Ecosystem development is monitored and succession is occurring
<p>Certification</p>	<ul style="list-style-type: none"> • Public land is returned to the Crown 	

Framework Development

Within the *Lower Athabasca Regional Plan*, the Government of Alberta committed to the establishment of a tailings management framework for mineable oil sands in the Region "...to provide guidance on managing tailings to provide assurance that fluid fine tailings will be reclaimed as quickly as possible, and that legacy (current) inventories will be reduced" (*Lower Athabasca Regional Plan*, p.26).

The Framework as it appears today is the result of ongoing work related to tailings management and reclamation and draws on recent advances made by the Alberta Energy Regulator in the management of tailings.

To develop the *Tailings Management Framework for the Mineable Athabasca Oil Sands*, a phased approach involving stakeholders and First Nations and Métis was taken. In late 2013 and early 2014, Alberta Environment and Sustainable Resource Development led an engagement process to gather feedback on key components of an approach to tailings management in the Region; this feedback was considered and a draft Framework, developed. Feedback was sought on this draft, and revisions made, in mid-2014. The initial development and subsequent refinement of this Framework relied on technical input from regulators, industry, municipalities, non-governmental organizations, and First Nations and Métis. Overall, feedback received during the processes supported a tailings management framework as a tool for managing tailings in the mineable oil sands region.



