



# The lifecycle of an oil sands mine

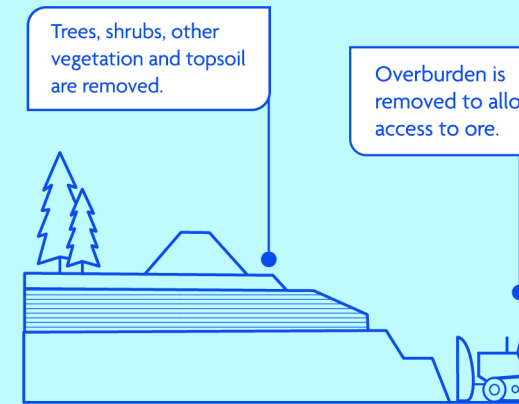
Before mining operations begin, producers develop plans that map out the full life cycle of the planned project, from the first shovel through to reclamation. Once complete, these plans are filed with the Alberta Energy Regulator (AER).

Throughout mining operations, ongoing research and monitoring provide data to inform mine plans. The operator submits annual plans and reports to the regulator detailing activity as the project evolves. It's all part of an adaptive management approach, which sees new data, reclamation techniques and other information used to inform future practices and approaches.



## Clearing

The first step in preparing the land for mining is to clear trees, shrubs, other vegetation and soil. Then muskeg (peat bog) and overburden (clay, silt, sand and rocks) have either dewatering ditches or wells installed to remove excess water before that overburden material is removed. Overburden material is often used to build roads, embankments and tailings dams on-site. Soil and muskeg are stockpiled and used during the reclamation process.



## Mining the ore

With the overlying material removed, ore mining can begin. This ore is a mixture of bitumen, sand, clay and water. Massive shovels remove the ore from the ground and deposit it into large heavy haul trucks for transport.



Large shovels scoop the oil sands ore into heavy haul trucks.

## Processing the ore

The trucks move the oil sands ore to processing facilities. The first step of processing is crushing, where ore is broken down into smaller pieces. These smaller pieces are then conveyed, mixed with hot water and sent to an extraction plant.

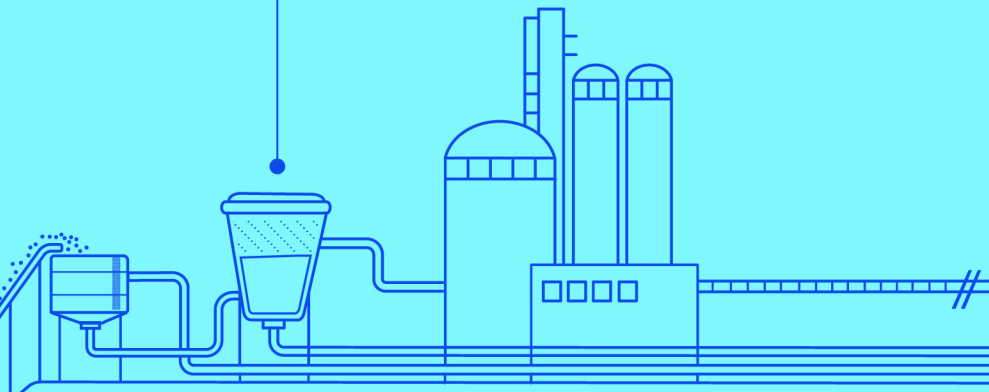


Heavy haul trucks dump ore into crushers.

## Extracting the resource

Once at the plant, the water and oil sands mixture goes through a series of pipelines and vessels that allow the bitumen to separate and be recovered. Once recovered, the bitumen goes to an upgrader for processing or is sent directly to market depending on how it was processed.

Bitumen is separated from the other components of oil sands.



## Tailings

The material that is left over after the bitumen is removed — referred to as tailings — is deposited into engineered storage facilities. As water is recovered from tailings through treatment and settlement, it's recycled to use in operations. In 2024, 78% of water used for oil sands mining was recycled water, according to the AER.



Tailings are made up of sand, clay, water and residual hydrocarbons.

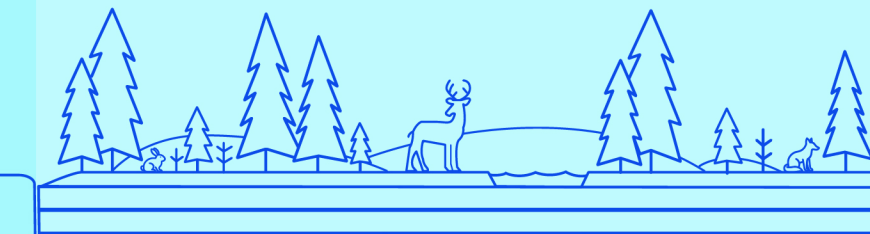
## Reclaiming the land

Reclamation takes place progressively during the life of a mine. Parts of the mine that are no longer needed for operations can be reclaimed even while the mine is still active. As progressive reclamation occurs, surface water, groundwater, vegetation and wildlife are all monitored.

The goal of reclamation is to return the land to equivalent capability. Operators develop mine closure plans to create a landscape that supports various uses similar to those that existed prior to operations.

Planned reclaimed landscapes for current mines include a mosaic of uplands, wetlands and lakes. Landforms are created using the soil and overburden that were removed and stored early in the process. Vegetation is planted as the landscape was designed so that over time, native plants, insects and wildlife can begin to return.

Once defined reclamation and closure criteria are met, the AER grants final certification.



Mining life cycle diagram is for illustrative purposes only.

## Who we are

COSIA is the innovation arm of Oil Sands Alliance, a collaboration between five of Canada's largest oil sands producers.



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