BHP

Tailings Challenge – Tailings Characterization

What are tailings dams?

- A dam is a barrier constructed for the retention of water, water containing any other substance, fluid waste, or tailings[1].
- Tailings dams are designed and operated differently to conventional dams.
- A tailings storage facility, is not yet a formally defined term. Generally it refers to one or more co-located tailings dams[2].

	Tailings	Conventional
Purpose	Contains unrecovered solids, chemicals, and process water, normally as a slurry.	Hydroelectric dams Water reservoirs
Contents	Solids and liquid	Water
Design	Dynamic; the structures are intended to grow over time to accommodate increased tailings over the life of mine. Structures often stand in perpetuity.	Static; once they fill the structures are typically not expanded. At end of life structures can be decommissioned and removed.
Construction	Earth[3], rock	Rock, concrete


Escondida Tailings Storage Facility, Chile

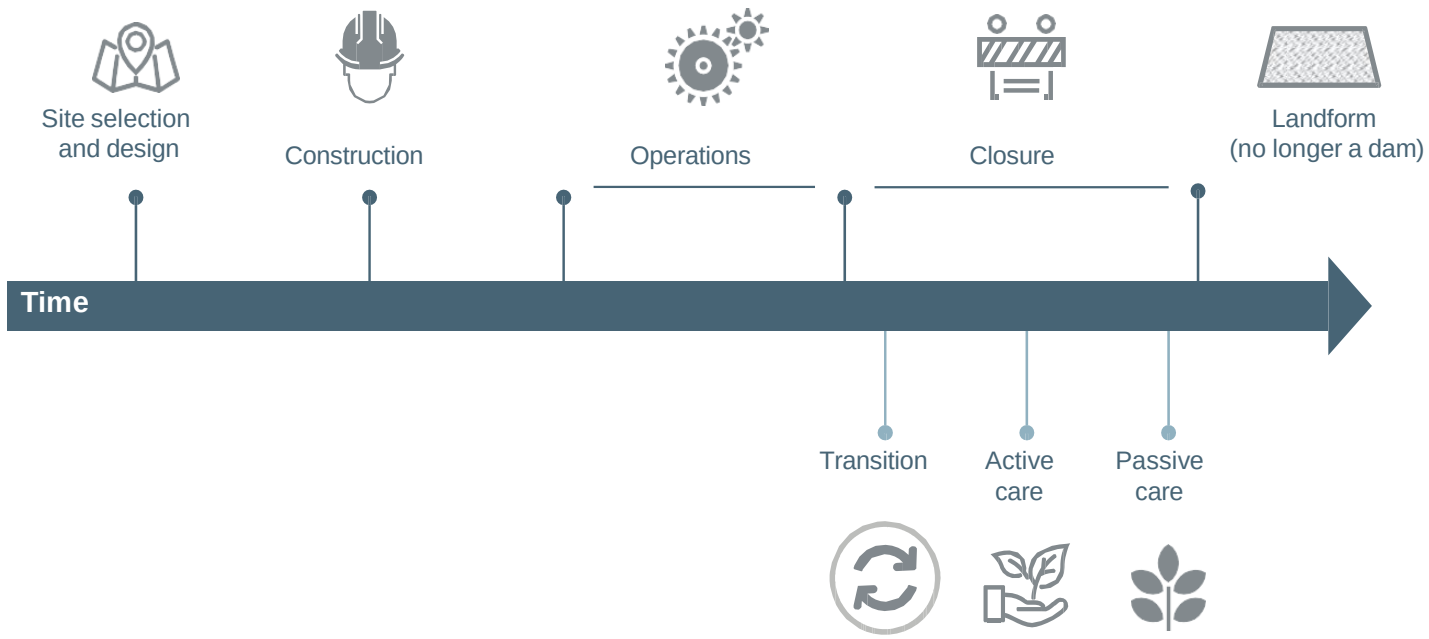

Hoover dam, US (a hydro / water reservoir dam)

1. Canadian Dam Association Dam Safety Guidelines 2007 (2013 Edition).
2. For the purposes of the Church of England disclosure, a tailings storage facility has been defined by the International Council on Mining and Metals Tailings Advisory Group as an operationally integrated facility of dams/walls. This definition is applied throughout this presentation.
3. Includes cyclone sands.

BHP

Life cycle of tailings dams

Design, construction and operation of tailings dams need to account for possible changes over their long life cycle



- The operational phase of a dam is dynamic and is likely to include expansion of the dam, raising of the dam height and/or addition of dams.
- The closure phase of a dam can often exceed the operational phase of the dam. It may include transition from operations to active care such as ongoing water, geochemical and physical management to maintain integrity.
- Over time, inactive tailings facilities may transition to passive care where the ongoing water, geochemical, and physical management requirements are reduced or eliminated.

BHP tailings technology strategy

Accelerating the pathway to safer, more sustainable management

We get there through R&D in key workstreams…

…with the approach to de-risk technology options linked to Asset challenges

Our Goal

Reducing tailing dam failure risk by accelerating technology for safer, more sustainable tailings management.

Harnessing benefits including increased water recovery, reduced land disturbance and reduced closure costs.

WORKSTREAMS

Characterisation
In process & deposition

Monitoring
Real-time sensing & prediction

Dam Stabilisation
Active, legacy dam strengthening

Tailing & Deposition
Reduce, Dewatering, Deposition

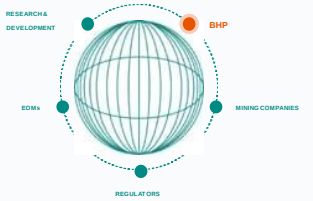
Closure
Reprocess, Reuse, Landform

Avoid
In-situ extraction

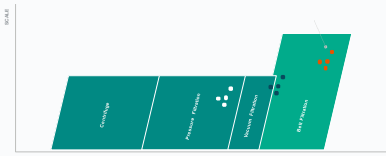
APPROACH

TECHNOLOGY OPTIONS

INDUSTRY COLLABORATION



TECHNOLOGY PLAYBOOK



Tailings Characteristics

- **Production parameters:**
  - Average production: 50 Mton/year
  - Solids content: 40% w/w
  - Approximate Particle size distribution (PSD):
    - D90 → 160 µm
    - D80 → 110 µm
    - D60 → 75 µm
    - D50 → 40 µm
    - D20 → 10 µm
  - Clay content:
    - 0-25% (Kaolinite and montmorillonite)

- **Geochemical parameters:**
  - pH: 7 (neutral)
  - Potential acid generator
  - Tailings Mineralogy:
    - Silicate → 29-92%
    - Carbonate → 2-83%
    - Sulphide → <1-40%
    - Sulfate → <1-10%
    - FeOxide → 0-8%
    - Others → ~2%


BHP