

Tailings Management



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Tailings are a common by-product of the mining process and tailings management is a critical element in the design, operation and closure planning of mines. Recent incidents demonstrate the potential severe impacts of tailings failures. The tailings facility failure at Brumadinho in Brazil in January 2019 has resulted in an unprecedented level of scrutiny and inquiry from regulators and other stakeholders. For example, the International Council on Mining and Metals (ICMM), UN Environment Programme (UNEP) and the Principles for Responsible Investment (PRI) co-convened an independent review following the disaster, with the aim of establishing the first international standard for tailings storage facilities, building upon best practice guidance that has existed for a number of years.

Teck context

Teck currently manages 16 active tailings facilities and 39 tailings facilities that are closed and no longer receiving tailings. Tailings storage facilities at all of Teck's operating and closed sites meet or exceed regulatory requirements, and we are continually improving the management of our facilities by developing and incorporating best practices. In 2019, Teck continued to play an active role in promoting leading practices for tailings facility management, both in our own operations and across the mining industry as part of ICMM and the Mining Association of Canada (MAC).

In 2019, we also undertook a "special review" of Teck's governance of tailings and water

retention structures, including our upstream and higher-consequence facilities. The review, which included independent external experts, was conducted to provide an extra measure of assurance over the safety and security of our facilities, to confirm the robustness of our processes and to identify opportunities for improvement. The independent reviewers reported their results to the Safety & Sustainability Committee of the Board. While the review found no immediate or emerging threats of catastrophic failures within our tailings and water dams, we remain focused on maintaining our management practices and avoiding any increased risk of failure at any of our facilities.

GRI Indicators and Topic Boundary

G4-MM3

This topic is considered one of the most material by our employees, local communities, government regulators and society in the context of all Teck sites.

How Does Teck Manage This Topic?

Information about how we manage tailings, including relevant policies, management practices and systems, is available for download on our website.

2019 Highlights

Zero

significant tailings-related environmental incidents

Conducted a special independent review of Teck’s tailings management by senior external subject matter experts, who identified no immediate or emerging threats of catastrophic failures and confirmed that Teck tailings management practices are industry leading.

Completed all independent annual inspections, safety reviews and internal governance reviews with no immediate or emerging structural concerns identified.

Contributed to the work undertaken by the ICMM, UNEP and PRI to develop an international standard for the safer management of tailings storage facilities and enhanced transparency and disclosure through a detailed response to the Church of England’s tailings facility inquiry.

Our Performance in Tailings Management in 2019

Our Targets and Commitments We are committed to conducting regular reviews of our tailings facilities and to being open and transparent with communities and other stakeholders regarding the construction and management of our tailings facilities. Our regular reviews have six levels of protection, which include a range of internal and external reviews that can create recommendations for continuous improvement. When these recommendations arise and when they align with best practices, we develop action plans based on findings, and we regularly assess the implementation of these plans.

The following table introduces our new strategic priority and goals related to tailings management.

New Strategic Priority and Goals

Strategic Priority	Goals
<ul style="list-style-type: none"> Continue to manage our tailings across their life cycle in a safe and environmentally responsible way 	<ol style="list-style-type: none"> Preferentially consider milling and tailings technologies that use less water for both new mines and any mine life extensions at existing mines. Expand the use of digitally connected surveillance technologies to assist in monitoring our tailings storage facilities.

Internal and external reviews of our facilities and procedures are conducted to ensure we maintain the highest standard of safety and environmental protection, including following best practice guidance set by MAC and ICMM. Beyond the comprehensive internal and external reviews, an additional

level of facility oversight is in place for our tailings facilities through our Tailings Working Group that includes subject matter experts from across our business units and sites. This working group also maintains Teck's own tailings guidance and governance framework documents

Internal Reviews

Staff Inspections

Tailings dams are inspected by trained operators and expert technical staff as frequently as several times daily, with formal staff inspections at least once per month.

Tailings Governance Reviews

Tailings Governance Reviews are carried out every second year at our operations and every third year at our legacy properties by internal subject matter experts. These governance reviews include confirmation that we have the personnel and procedures in place to meet our commitments, and that we are addressing recommendations for continual improvement from our external reviews in a meaningful and timely manner.

The governance reviews also evaluate the performance of our Engineers of Record and other external reviewers to look

for signs of complacency or lack of succession planning by those outside of Teck who we rely upon as part of our overall management processes. For our joint venture projects, we have an ongoing process with the other shareholders of the Antamina mine and the Fort Hills oil sands mine that meet the requirements of our governance review process.

From the combined Governance Review process in 2019, there were no significant findings; however, several value-added items were identified and are being actioned by the sites. As a result of our ongoing Tailings Governance Review processes and based on themes from the MAC and ICMM advancements, we are further strengthening our guidance related to change management, roles and responsibilities, enhancing integration of risk evaluation and identifying critical controls.

External Reviews

Dam Safety Inspections and Dam Safety Reviews

A fully licensed, qualified individual who is vetted by our Tailings Working Group conducts formal dam safety inspections (DSIs) at least annually. Independent, qualified engineers also conduct periodic reviews, with timing dependent upon the consequence classification of the facility. For all facilities, the annual inspection reports are provided to the appropriate authority in each jurisdiction. DSIs and Dam Safety Reviews are conducted to evaluate our conformance with international best practices, our internal policy/standards and applicable regulatory requirements. Teck makes DSIs and other information about our tailings facilities, both operating and legacy, available on our website at www.teck.com/tailings.

from once to several times per year, depending upon the nature of the facility and the issues being considered by the board, to conduct a third-party review of design, operation, surveillance and maintenance of our storage facilities. The results from the Review Board assessments are communicated directly to senior management.

Additional Detailed Third-Party Reviews

A qualified independent tailings reviewer, vetted by our Tailings Working Group, conducts comprehensive third-party dam safety reviews every three to 10 years for active and inactive facilities. The frequency of inspection is based on the consequence classification for each facility.

Independent Review Boards

A key element of Teck's review process is the use of Independent Review Boards. These boards, typically comprising three very senior subject matter specialists, meet

Tailings Reviews Conducted in 2019

All of our operating and legacy facilities are reviewed against our internal policy and guidance documentation on a regular schedule, as described in Table 17.

Table 17: 2019 Status of Major Tailings and Water Retaining Structures

Location	Annual Dam Safety Inspections ⁽¹⁾	Dam Safety Reviews ⁽²⁾	Independent Review Board Activity ⁽³⁾	Tailings Governance Reviews
	Up to Date	Up to Date		
Carmen de Andacollo	✓	✓	✓	Current — reviewed in 2019
Elkview	✓	✓	✓	Current — next review in 2020
Fording River	✓	✓	✓	Current — reviewed in 2019
Greenhills	✓	✓	✓	Current — next review in 2020
Highland Valley Copper	✓	✓	✓	Current — next review in 2020
Red Dog	✓	✓	✓	Current — reviewed in 2019
Sullivan ⁽⁴⁾	✓	✓	✓	Current — next review in 2020
Louvicourt ⁽⁴⁾	✓	✓	✓	Current — next review in 2021
Quebrada Blanca Phase 2	Not yet operating	Not yet operating	✓	Current — reviewed in 2019

(1) The Engineer of Record performs a detailed examination of the facility, its related infrastructure and the records relating to these, to identify any conditions or changes that might contribute to, or signal the potential for, a compromise to the safety and reliability of the structure.
 (2) A facility review by an independent, third-party engineer not affiliated with the Engineer of Record or the Tailings Review Board. The frequency of these reviews depends on the failure consequence risk-rating of that structure.
 (3) Review by a team of independent senior subject matter experts who review the facility design approach, surveillance results and a site’s overall approach to tailings management, including performance of the Engineer of Record.
 (4) Legacy property.

Special Reviews

In addition to internal and external reviews, Teck will occasionally complete a special review. The Mount Polley event (2014) and the Samarco event (2015) both triggered such reviews. In 2019, in response to the tragic failure at Brumadinho in Brazil, Teck conducted a special independent review of its tailings and water retention structures, inclusive of our upstream and higher-consequence facilities that was reported to the Safety and Sustainability Committee of the Board. This special review included three external senior subject matter experts and was performed in three stages:

- **Phase 1:** Tabletop confirmation of all consequence classification and risk ranking of Teck’s operating, legacy tailings and water retention structures, as well as major projects.
- **Phase 2:** Evaluation of the effectiveness of technical design and governance of the evaluated facilities, with special

focus on critical controls for facility event triggering, emergency warning/response and dedicated personnel, both in terms of capacity and competence/training.

- **Phase 3:** Visits to select sites from Phase 2 to respond to questions from the external reviewers. The outcome of this phase was the final assessment of higher-priority facilities, which included a review of residual risk of failure events and subsequent loss of life or environmental damage, taking into account potential locations of people downstream of the tailings and water retention structures.

The review concluded that no immediate or emerging threats of catastrophic failures were apparent within Teck’s tailings and water dams.

Tailings Performance in 2019

Total tailings and fine coal refuse generated from processing ore and raw coal, stored in the 35 facilities at our operating mines, are reported in Table 18. This total does not include our minority joint venture operations at Antamina and Fort Hills.

Table 18: Tailings and Fine Coal Refuse Generated from Processing Ore and Raw Coal (million tonnes)

2019	2018	2017	2016
74	76	75	73

Industry Association Activities

Teck chairs the MAC Tailings Working Group, which has been responsible for providing industry-leading best practice guidance, including key industry guidance documents issued in 2019.

Teck was also an active participant in ICMM's Tailings Position Statement and Governance Framework, and is a participant in ICMM's leadership work on a long-term goal of developing safe and sustainable alternatives to conventional wet tailings storage facilities. We are also actively involved in

Tailings Incidents

Building on our strong track record of tailings management, in 2019, we had zero significant incidents at our tailings storage facilities and all of our facilities performed as intended, with their inspections and assorted internal and external reviews conducted as scheduled.

the work underway by the ICMM, UNEP and PRI to develop an international standard for the safer management of tailings storage facilities.

We remain committed to transparency and enhanced disclosure, and have participated in providing detailed information about our tailings facilities on our website and through responses to the tailings facility inquiry by the Church of England and the Swedish Council on Ethics for the AP Funds.

Case Study: Improving Tailings Monitoring and Safety with Real-Time Data Collection in Chile

Chile is one of the most seismically active countries in the world. It is also an arid environment, but one that can have flash flooding from extreme but infrequent rainfall events. Because of these inherent characteristics of the region, a team from Teck's Carmen de Andacollo Operations has implemented a system to continuously monitor the instruments and sensors for the tailings facility remotely. Vibrating wire piezometers, which are sensors installed within the tailings dams and foundation that are used to monitor water pressure in the foundation and fill, were connected to dataloggers

that wirelessly transmit the piezometric information to a custom-built web-based platform. This information is automatically uploaded and entered into a database that enables several features, including sending automatic alerts via email, mobile platforms, and allowing for visualization, recording and downloading of data. Other installations that monitor and evaluate seismic activity and rainfall events are also part of the comprehensive automated system. Read the full case study at teck.com/news/stories/.

Outlook for Tailings Management

As the mining industry reviews and improves leading practices for tailings management, Teck will continue to maintain the highest standards for tailings management and play an active role in collaborating with industry partners, communities, investors and other stakeholders. For example, we collaborated with five industry peers and four academic institutes based in Australia where there is a centre of excellence in researching tailings liquefaction. Tailings liquefaction is a factor in nearly half of all historical facility failures, and work on better predicting where and when it can occur will improve the safety of facilities susceptible to this phenomenon. We will also continue to work with ICMM on the global tailings standard development and continue our engagements with ICMM's and MAC's tailings working groups in 2020 to evaluate ways in which the industry guidance that is developed through these efforts can be used to improve our practices.

Moving forward, we will work towards our strategic priority of continuing to manage our tailings across their life cycle in a safe and environmentally responsible way. We have set new goals on tailings management, which includes preferentially considering milling and tailings technologies that use less water for both new mines and any mine life extensions at existing mines and expanding the use of digitally connected surveillance technologies to assist in monitoring our tailings storage facilities. Our focus in 2020 will be to make progress towards achieving our new goals.