

# MANAGEMENT AND SAFETY OF OUR TAILINGS STORAGE FACILITIES



FIRST QUANTUM  
MINERALS LTD.





First Quantum Minerals Ltd (First Quantum) operates 10 active tailings storage facilities (our TSFs) and maintains 9 closed TSFs (our closed TSFs), across seven countries. The design, construction, management, operational control and monitoring of our TSFs are a priority for the First Quantum board and our management teams. Potential TSF failure is recognised as a significant source of potential risks within our industry, which is why First Quantum conducts regular risk assessments of existing and planned TSFs at Board and management levels.

As CEO, alongside the site leadership teams at each First Quantum operation, I take a close interest in the management of our TSFs. As a Company, we demand that an appropriately high level of expertise is involved throughout the process, from design and operation to the closure of the facilities. I am updated regularly on the performance of our TSFs to ensure they are operated conservatively and within accepted guidelines, as developed by the world’s leading practitioners.

Location and number of TSFs owned and operated by First Quantum

COUNTRY	ACTIVE	CLOSED
Australia	1	
Canada		9
Finland	1	
Mauritania	3	
Panama	1	
Spain	1	
Zambia	3	
Total	10	9

August 2023

COVER PAGE:  
NORTHERN TSF  
EMBANKMENT AT  
COBRE PANAMA



# Tailings Storage Facility Design

**First Quantum's approach to TSF management is to design TSFs that are appropriate for the local conditions and tailings material to be deposited.**

## DESIGN

When designing a TSF, it is important to consider local conditions and the physical and engineering properties of the tailings. Generally, tailings from hard rock mines (e.g. copper) behave differently to tailings from other types of mining. When well managed, copper tailings typically settle, drain, and gain strength. This enables, for example, cyclones to be employed to separate the pumped tailings into coarse and fine fractions. Preferential deposition of the coarse fraction provides a free draining, competent and stable construction material for ongoing embankment raises. The fine fraction and supernatant from the tailings flow by gravity to a decant pond well away from the embankment to further enhance embankment retention integrity. In this way, the embankment stability remains well above the lower design limit.

Our TSFs are designed by Certified Professional Engineers with significant industry experience and expertise. All designs are peer reviewed by Certified Professional Engineers.

## FRAMEWORKS

Our TSFs are designed in accordance with the commonly used industry guidelines, according to their location and jurisdiction.

- ♦ Australian National Committee on Large Dams (ANCOLD)
- ♦ Canada Dam Association (CDA)
- ♦ European Union Legislative Directives
- ♦ International Commission on Large Dams (ICOLD)

### Global Industry Standard on Tailings Management (GISTM)

The Company has undertaken a comprehensive review of the GISTM guidelines, developed by the International Council on Mining and Metals.

We have committed to a phased alignment of our operations with the performance aspects of the GISTM in order to maintain our track record in tailings management.

Details on our plan are provided on the following page.





# Global Industry Standard on Tailings Management (GISTM)

First Quantum is committed to a phased alignment to the performance aspects of the GISTM

## PATHWAY TO ALIGNMENT

The GISTM's intentions are to improve the industry's performance on tailings management with zero fatalities and zero harm to people and the environment which aligns with First Quantum's approach to tailings dam management.

## GISTM Phase I

The Company has elected to align its operations to the performance aspects of the GISTM guidelines. Our alignment is focused on the following areas which we consider will facilitate the ongoing development and continuous improvement of our tailings management performance:

- ♦ **Structure and Responsibility**

We have always seen ownership and accountability as key to the success of our business and strongly support this. We continue to ensure that the existing roles and responsibilities of our tailings management teams are not only clearly defined, documented and understood, yet also align with the GISTM performance goals.

- ♦ **Dam Safety Management Systems**

Strengthening of our existing systems around our tailings management is an ongoing pursuit. Our management systems are focused on the safe operation and management of the tailings facility by following the well-established Plan-Do-Check-Act cycle. Our systems align with ANCOLD and/or CDA and also the GISTM and span planning, designing, construction, operations and closure planning. Importantly, each of our site personnel is empowered with respective levels of responsibility and accountability. Additional oversight is provided by group management and independent experts.

For our TSFs this includes:

- ♦ establishing performance objectives,
- ♦ identifying and securing adequate resources,
- ♦ conducting performance evaluations and risk assessments,
- ♦ establishing and implementing risk controls,
- ♦ auditing and reviewing for continual improvement,
- ♦ implementing a management system with a clear definition of responsibilities and accountabilities,
- ♦ Emergency Preparedness and Response Plans (EPRP) in place and regularly tested.

- ♦ **Learning and Development**

This last year has seen us placing further emphasis on our existing culture of learning and continuous improvement, with a view to assisting in early problem identification and solving. Specifically this has included focused skill development, training, internal quality assurance programmes and greater information sharing and collaboration across the group by our tailings management teams.

- ♦ **Improved management of water**

In recognition of the importance of water management, we have focused on introducing industry leading predictive tools to improve daily and weekly water management decisions for our tailings decant ponds. Improved water management allows us to meet freeboard requirements while maintaining adequate return water quality.



# Tailings Storage Facility Design

First Quantum’s approach to our TSF management is to design facilities that are appropriate for local conditions and the material to be deposited.

First Quantum has three main approaches to embankment design, namely: upstream, centreline and downstream. These designs are based on a review of site characteristics, including seismicity, the availability of suitable materials for embankment construction, including maximizing the use of tailings where possible, and consideration of the geotechnical characteristics of the tailings.

These design approaches are industry best practice and used widely and successfully in hundreds of mining operations around the world.

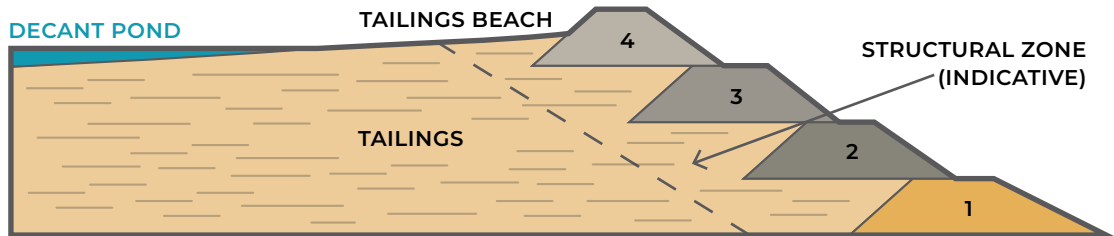
However, it must be emphasised that regardless of the design and construction, it is important that the TSF is operated in accordance with the design intent and risk controls.

First Quantum’s Board monitor and maintain risk management oversight of the TSFs and the Company’s engineering staff work with the operators of each TSF to ensure the facility is managed according to the design basis with regular risk assessments and change management procedures in place.

Personnel involved in day to day operations at our TSFs are regularly briefed on the latest developments in TSF design, operation and risk management.

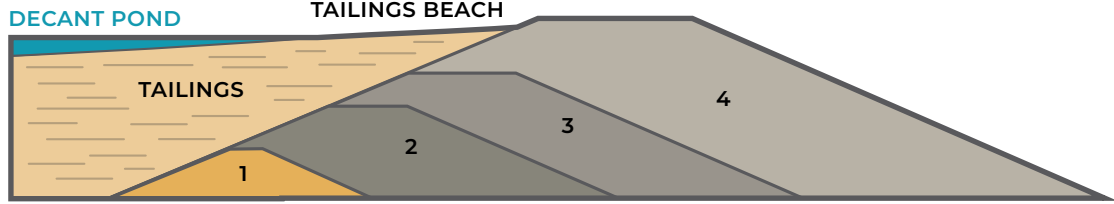
## Common types of progressively raised tailings dams

**UPSTREAM**



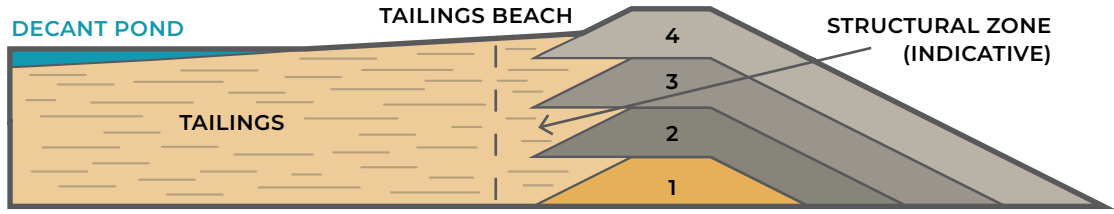
TSFs at **Kansanshi** and **Trident** are examples of this type of construction.

**DOWNSTREAM**



**Ravensthorpe** TSFs are examples of this type of construction.

**CENTRELINE**



**Cobre Panama** TSF is an examples of this type of construction.

**Starter wall 1** comprises earth and rock fill to the lower lying sections of the TSF footprint, or for a buttress, with Upstream, Downstream or Centreline referring to the direction in which the embankment is progressively raised.

**Embankments 2 to 4 and more** typically constructed from deposition of coarse tailings that have been separated by cyclones for Upstream and Centreline raises whilst earth and rock fill is typically used for Downstream embankments.

**Upstream and Centreline** raises are founded on a structural zone comprising the coarser, well-drained beached fraction of the fine tailings from the cyclone overflow.



# Tailings Storage Facilities: Robust Operating Practices and Regular Review

**We manage our TSFs in accordance with the design and operating conditions and constraints.**

## OPERATIONAL CONTROLS

The following operational controls are in place at each of our TSFs:

- TSF management review and risk oversight by the Environment, Health & Safety Committee of the First Quantum Board
- Appointment of competent persons at the mine to manage the facility with all reporting directed to the Site General Manager
- Use of approved Operations Maintenance & Surveillance Manuals prepared for each TSF
- Regular inspection by the day to day operators with overview from senior management
- Close monitoring of the volume of water held in the TSF with particular attention to embankment freeboard, drainage and beach length
- Use of drones for aerial surveillance of the TSF and tailings deposition

- The installation of instrumentation including piezometers (to measure the presence and level of the phreatic surface), inclinometers and settlement gauges to provide detailed feedback on the developing embankment
- Groundwater quality monitored via peripheral water monitoring bores
- Emergency Response Plans in place for all of our facilities. These include regular drills to test evacuation procedures as well as engagement with relevant third parties such as emergency services and local authorities.

## CLOSURE AND THE CLOSED TSFS

The closed TSFs that have shown decades of stability are treated with the same level of scrutiny as our operating sites with ongoing management including regular geotechnical inspections, dam safety risk assessments, monitoring and third party reviews. These facilities are certified under Mining Association of Canada's (MAC) Towards Sustainable Mining (TSM) criteria.

## REVIEW

### Independent

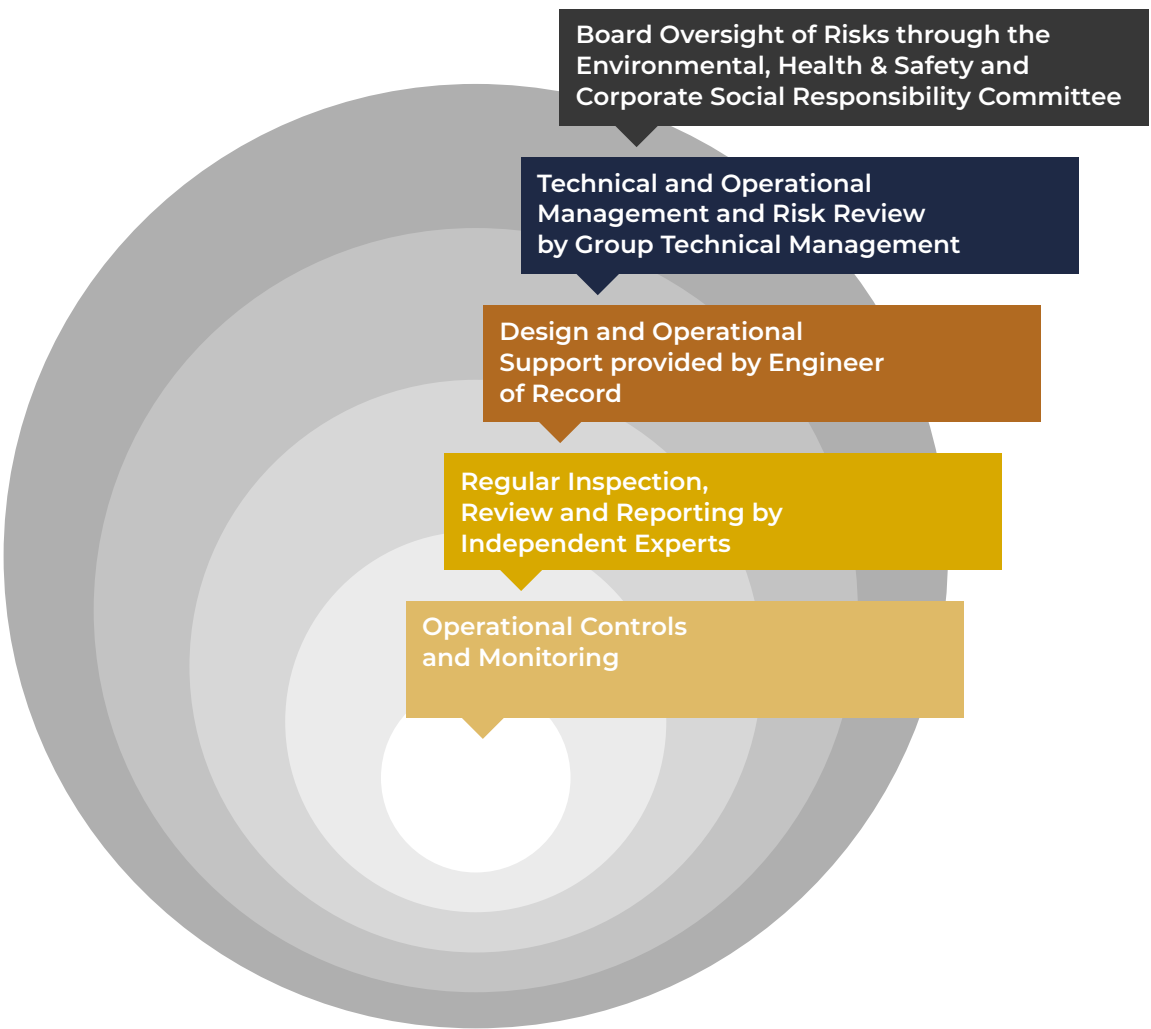
- All tailings storage facilities are subject to either quarterly, 6 monthly or annual inspections, risk review and reporting by external specialist review engineer (Engineer of Record)

- Review of piezometric and associated data by external consultants on an annual basis or more frequently if determined by site conditions

### Internal

- TSF management review and risk oversight by the Environment, Health & Safety Committee of the First Quantum Board
- Biannual risk assessment documented and reviewed by site and group management with reporting to the Board
- Our risk assessment processes identify critical controls to manage material risks. These are subject to regular internal audit according to our Dam Safety Management System
- Regular tailings beach length surveys and tailings deposition planning
- Embankments regularly inspected for erosion, seepage and slumping
- Group technical staff regularly inspects the TSFs and review the operations with mine management. Recommendations are prepared to improve all aspects of the operation of the facilities.

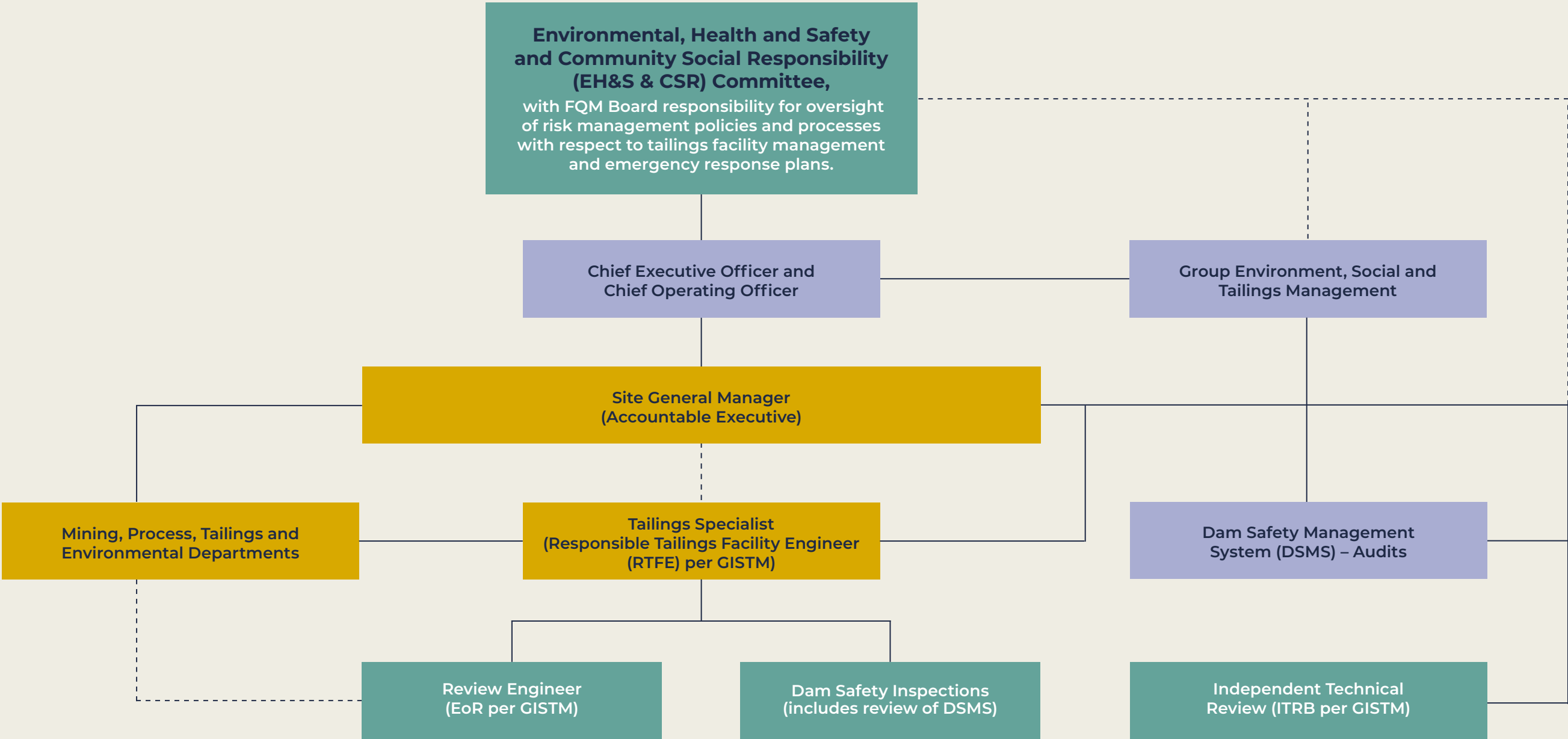
## Dam Safety Management



# Governance:

## FQM Tailings Storage Facility Management (with GISTM alignment)

- Site-based
- Corporate
- Independent



# Appendix: CofE Tailings\* disclosure – summarised

TSF Name/identifier	Location	Status	Is the Dam currently operated or closed as per currently approved design?	Raising method	Most recent Independent Expert Review	What is your hazard categorization of this facility, based on the consequence of failure?	What guideline do you follow for the classification system?	Formal dam breach analysis?	Closure plan in place?	Weather and climate change impacts considered in tailings facility operation?
Cobre Panama TSF	Panama	Active	Yes	Earthfill Starter dam to Elevation 76 followed with Downstream construction up to Elevation 85 using cyclone tailings, then modified centreline to Elevation 146.	Dam Safety Review conducted by Senior Engineers from KCB during February 2020.  Six-monthly Dam Safety Inspections by independent expert, Hillerton Consulting Ltd UK.	Extreme	Canadian Dam Association (CDA)	Yes. Dam breach analysis by Kohn Crippen Berger in 2018.	High level closure plan in place	Yes – designed against extreme storm events.
Kansanshi TSF1	Zambia	Active	Yes	Upstream	October 2022, Hillerton Consulting Ltd UK	Extreme	Australian National Committee on Large Dams (ANCOLD)	Yes – Dam Breach Analysis and Inundation Study was finalised in November 2020.	High level closure plan in place	Yes – designed against extreme storm events.
Kansanshi TSF2	Zambia	Active	Yes	Upstream	October 2022, Hillerton Consulting Ltd UK	High A	ANCOLD	Yes – Dam Breach Analysis and Inundation Study was finalised in November 2020.	High level closure plan in place	Yes – designed against extreme storm events through installation of additional pumping capacity to control free board level.
Sentinel TSF	Zambia	Active	Yes	Upstream	July 2022, Hillerton Consulting Ltd UK	Very High	ANCOLD	Yes - Dam breach analysis done by Knight Piesold in 2020	Closure Plan is currently under development	Yes – designed against extreme storm events.
Cobre Las Cruces TSF	Spain	Active	Yes	Dry stacked pressure filtered tailings	November 2020, Subterra	High	CDA Spanish Legislation (RD975/2009) for residuals waste management.	No	Yes	Yes – designed against extreme storm events.
Mauritania Copper Mines TSF1	Mauritania	Care & Maintenance	Yes	Upstream	November, 2018 Wardell Armstrong UK	Low/Very Low	CDA	No	Yes	No. TSF1 is located in the Sahara Desert with very low annual rainfall and a very high annual evaporation rate.
Mauritania Copper Mines TSF2	Mauritania	Active	Yes	Upstream	January 2022, Wardell Armstrong UK	Low/Very Low	CDA	No.	Yes	No. TSF2 is located in the Sahara Desert with very low rainfall and very high evaporation.

\* Based on the response provided to the Church of England following their 2021 information request, updated for the latest information.



# Appendix: CofE Tailings disclosure – summarised continued

TSF Name/identifier	Location	Status	Is the Dam currently operated or closed as per currently approved design?	Raising method	Most recent Independent Expert Review	What is your hazard categorization of this facility, based on the consequence of failure?	What guideline do you follow for the classification system?	Formal dam breach analysis?	Closure plan in place?	Weather and climate change impacts considered in tailings facility operation?
Mauritania Copper Mines TSF3	Mauritania	Active	Yes	Upstream	January 2021 Wardell Armstrong UK	Low/Very Low	CDA	No	Yes	No. TSF3 is located in the Sahara Desert with very low rainfall and very high evaporation.
Ravensthorpe Nickel Operation TSF	Australia	Active	Yes	TSF 1 is a variation of upstream, centreline and downstream.  TSF 2 is filled to initial starter embankment and is being uplifted by downstream construction in 2021.	March 2019 – SRK Consulting	High C (ANCOLD)	ANCOLD	Yes – TSF 1 – Knight Piesold 2005 - Design Report for TSF and EP's (Assessing options to review TSF 1 dam break assessment);  Yes – TSF 2 – Golder 2021	Yes	Yes – designed against extreme storm events.
Pyhasalmi TSF, Ponds A, B, C and D	Finland	A: Closed site B, C & D Active	Yes	Upstream	October 2020 Ramboll Finland Oy	1 (former A)	EU legislation Directive 2006/21/EC Annex III	Yes, February 2021	Yes	Yes – designed against extreme storm events
Lac Shortt TSF	Canada	Closed site*	Closed	Centreline	July 2020 - SRK Consulting (Canada) Inc.	Low Hazard Risk  The small dam size does not require registration under Quebec Dam Safety Act.	Quebec Dam Safety Regulations/Dam Safety Act	No – dam breach analysis is not considered necessary because the TSFs are small and there are no communities, critical ecosystems or significant infrastructure immediately downstream.	Yes	To be performed as part of the next dam safety review
Millenbach TSF	Canada	Closed site*	Closed	Unknown	June 2020 – SRK Consulting (Canada) Inc.	Low Hazard Risk  The small dam size does not require registration under Quebec Dam Safety Act.	Quebec Dam Safety Regulations/Dam Safety Act	Yes – 2020	Yes	To be performed as part of the next dam safety review

\* Closed property acquired as part of the acquisition of Inmet Mining Corporation by First Quantum in 2013.



# Appendix: CofE Tailings disclosure – summarised continued

TSF Name/identifier	Location	Status	Is the Dam currently operated or closed as per currently approved design?	Raising method	Most recent Independent Expert Review	What is your hazard categorization of this facility, based on the consequence of failure?	What guideline do you follow for the classification system?	Formal dam breach analysis?	Closure plan in place?	Weather and climate change impacts considered in tailings facility operation?
Norbec 2 TSFs	Canada	Closed site*	Closed	TSF #1 North – Downstream, South – Downstream, & West Dams – Downstream TSF #2 Main Dam – Downstream	2020 – SRK Consulting (Canada) Inc.	Low Hazard Risk  The small dam size does not require registration under Quebec Dam Safety Act.	Quebec Dam Safety Regulations/Dam Safety Act	Yes – 2020	Yes	To be performed as part of the next dam safety review
Samatosum TSF	Canada	Closed site*	Closed	Downstream	2020 – Piteau Associates	High	CDA	Yes – 2017	Yes	To be performed as part of the next dam safety review
Sturgeon Lake 3 TSFs	Canada	Closed site*	Closed	TSF Cell 1 Main Dyke – Modified Centerline TSF Cell 2 Internal & West Dyke – Centerline TSF Cell 3 North & Saddle Dyke – Centerline	2020 – SRK Consulting (Canada) Inc	High	CDA	Yes – 2020	Yes	To be performed as part of the next dam safety review
Winston Lake TSF	Canada	Closed site*	Closed	Centerline	2020 – SRK Consulting (Canada) Inc	High	CDA	Yes – 2020	Yes	To be performed as part of the next dam safety review

\* Closed property acquired as part of the acquisition of Inmet Mining Corporation by First Quantum in 2013.





[www.first-quantum.com](http://www.first-quantum.com)Certain of the information contained in this document constitutes “forward-looking statements” within the meaning of the Private Securities Litigation Reform Act of 1995 and forward-looking information within the meaning of applicable Canadian securities legislation. Such forward-looking statements and information include statements regarding operational controls and procedures at First Quantum’s TSFs. Often, but not always, forward-looking statements or information can be identified by the use of words such as “plans”, “expects” or “does not expect”, “is expected”, “budget”, “scheduled”, “estimates”, “forecasts”, “intends”, “anticipates” or “does not anticipate” or “believes” or variations of such words and phrases or statements that certain actions, events or results “may”, “could”, “would”, “might” or “will” be taken, occur or be achieved. First Quantum undertakes no obligation to update forward-looking statements or information as a result of new information after the date of this document except as required by law.

First Quantum’s operations, including the TSFs at each of its projects, and results are subject to a wide variety of risks, including those set out under the heading “Risk Factors” in First Quantum’s annual information form, which is available under First Quantum’s profile at [www.sedar.com](http://www.sedar.com). With respect to risks related to First Quantum’s TSFs, see in particular the risks outlined under the heading “Environmental, Health and Safety Risk Factors”.

More detailed descriptions of the tailing storage facilities for each of First Quantum’s material mineral properties, being the Kansanshi, Trident and Cobre Panama projects, are available in the respective technical reports prepared in accordance with National Instrument 43-101 – Standards of Disclosure for Mineral Projects, which are available under First Quantum’s profile at [www.sedar.com](http://www.sedar.com).



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