Impact of the Global Industry Standard on Tailings Management

Overview

Global Industry Standard on Tailings Management (GISTM)

- Outline of GISTM – Preamble and 15 Guiding Principles
- Associated documents
- Relevant standards
- Impacts on existing mining operations
- Impacts on future/proposed mining operations
- Global Tailings Management Institute

GISTM - Preamble

The GISTM strives to achieve the ultimate goal of zero harm to people and the environment with zero tolerance for human fatality.

It requires Operators to take responsibility and prioritise the safety of tailings facilities, through all phases of a facility's lifecycle, including closure and post-closure.

It also requires the disclosure of relevant information to support public accountability.

GISTM - Preamble

The GISTM is difficult to translate into an auditable industry Standard for Operators for operators given existing Guidelines e.g. ICOLD, ANCOLD, CDA, MAC etc.

The trend appears to be the existing guidelines will be reworked to incorporate the GISTM principles and potentially the development of a Global Standard covering design, operation and closure of Tailings Storage Facilities (TSFs).

GISTM - Preamble

The GISTM is a framework for safe *tailings facility* management whilst affording *Operators* flexibility as to how best to achieve this goal.

Conformance supplements but does not displace requirements of specific national, state or local governmental statutes, laws, regulations, ordinances, or other government directives.

Operators are expected to comply with GISTM not in conflict with other provisions of law.

GISTM - Preamble

GISTM to be supported with implementation protocols providing guidance for certification/assurance for equivalence with other standards.

Many activities the GISTM part of a comprehensive mine-wide *environmental and social management system* where credible systems for assurance are already in place eg Independent/3rd Party audit processes are to be recognised as equivalent to avoid duplication, to the extent reasonably practicable.

GISTM - Guiding Principles 1 to 3

- **Principle 1** - *Respect the rights of project-affected people and meaningfully engage them at all phases of the tailings facility lifecycle, including closure*
- **Principle 2** - *Develop and maintain an interdisciplinary knowledge base to support safe tailings management throughout the tailings facility lifecycle, including closure*
- **Principle 3** - *Use all elements of the knowledge base - social, environmental, local economic and technical - to inform decisions throughout the tailings facility lifecycle, including closure*

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GISTM - Guiding Principles 4 and 5

- **Principle 4** - *Develop plans and design criteria for the tailings facility to minimise risk for all phases of its lifecycle, including closure and post-closure*
- **Principle 5** - *Develop a robust design that integrates the knowledge base and minimises the risk of failure to people and the environment for all phases of the tailings facility lifecycle, including closure and post-closure*

GISTM - Guiding Principles 6 to 8

- **Principle 6** - *Plan, build and operate the tailings facility to manage risk at all phases of the tailings facility lifecycle, including closure and post-closure*
- **Principle 7** - *Design, implement and operate monitoring systems to manage risk at all phases of the facility lifecycle, including closure*
- **Principle 8** - *Establish policies, systems and accountabilities to support the safety and integrity of the tailings facility*

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GISTM - Guiding Principles 9 to 12

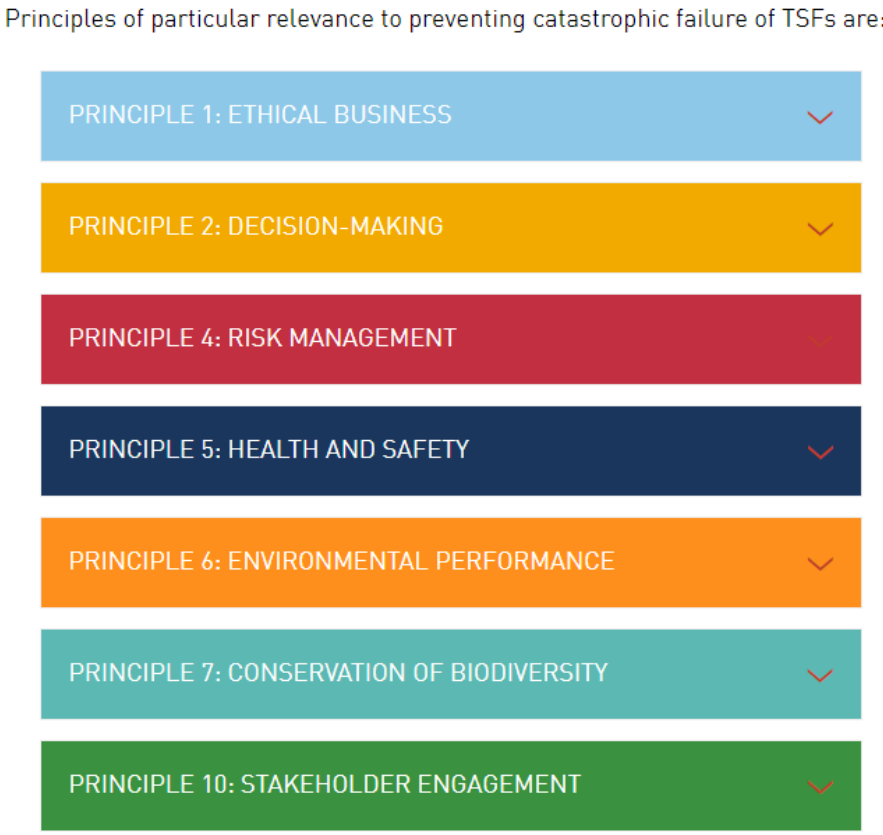
- **Principle 9** - *Appoint and empower an engineer of record*
- **Principle 10** - *Establish and implement levels of review as part of a strong quality and risk management system for all phases of the tailings facility lifecycle, including closure*
- **Principle 11** - *Develop an organisational culture that promotes learning, communication and early problem recognition*
- **Principle 12** - *Establish a process for reporting and addressing concerns and implement whistleblower protections*

GISTM - Guiding Principles 13 to 15

- **Principle 13** - *Prepare for emergency response to tailings facility failures*
- **Principle 14** - *Prepare for long-term recovery in the event of catastrophic failure*
- **Principle 15** - *Publicly disclose and provide access to information about the tailings facility to support public accountability*

GISTM – Associated Documents

- Tailings Governance Framework – Position Statement (2020) by ICMM – Mining with Principles



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GISTM – Associated Documents

- Tailings Management – Good practice guide (May 2021) by ICMM – Mining with Principles https://www.icmm.com/en-gb/guidance/environmental-stewardship/tailings-management-good-practice
- Towards Zero Harm (August 2020) A Compendium of Papers Prepared for the Global Tailings Review. London: Global Tailings Review https://globaltailingsreview.org/.
- COMMUNITY ENGAGEMENT AND DEVELOPMENT Leading Practice Sustainable Development Program for the Mining Industry (September 2016)
- WORKING WITH INDIGENOUS COMMUNITIES Leading Practice Sustainable Development Program for the Mining Industry (September 2016)

GISTM – Associated Documents

- TAILINGS MANAGEMENT Leading Practice Sustainable Development Program for the Mining Industry (September 2016)
- PREVENTING ACID AND METALLIFEROUS DRAINAGE Program for the Mining Industry (September 2016)
- WATER STEWARDSHIP Leading Practice Sustainable Development Program for the Mining Industry (September 2016)
- MINE REHABILITATION Leading Practice Sustainable Development Program for the Mining Industry (September 2016)
- EVALUATING PERFORMANCE: MONITORING AND AUDITING Leading Practice Sustainable Development Program for the Mining Industry (September 2016)

Relevant Standards

- ANCOLD ‘Guidelines on Tailings Dams - Planning, Design, Construction, Operation and Closure’, Revision 1 dated July 2019
- DMIRS (formerly DMPWA) Code of Practice ‘Tailings storage facilities in Western Australia’, dated 2013
- DMIRS (formerly DMPWA) ‘Guide to the preparation of a design report for tailings storage facilities (TSFs)’, dated August 2015
- ICOLD Bulletin 153 ‘Sustainable Design and Post-Closure Performance of Tailings Dams’, dated 2013
- Canadian Dam Association, Dam Safety Guidelines (2013)
- The Mining Association of Canada, Management of Tailings Facilities
- International Cyanide Management Code
- Specific Company Standards, eg Rio Tinto, BHP, Newmont

Relevant Standards

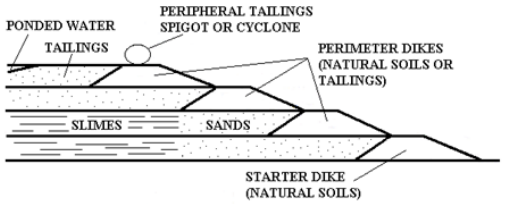
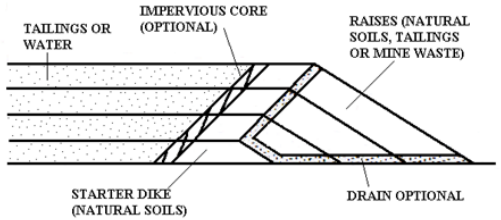
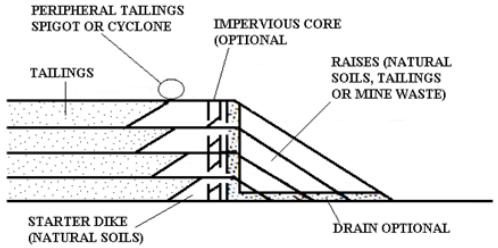
- ANCOLD Guidelines are being revised to accommodate GISTM
- DMIRS documents will likely be revised
- ICOLD Bulletin 153, expect to be updated
- Canadian Dam Association and The Mining Association of Canada expected to be updated
- International Cyanide Management Code would not change
- Specific Company Standards, eg Rio Tinto, BHP, Newmont expected to be updated
- Development of specific technical requirements for the GISTM

GISTM

Impacts on existing mining operations

- Financiers for existing new projects will not support TSF projects based on upstream construction, particularly where mine tailings are proposed – potential problem for underground mines as the LOM TSF will likely have a significant structure upfront
- Insurers are reducing the extent of cover and increasing premiums
- Regulatory authorities unlikely to approve upstream construction without rigorous analysis

GISTM – Style of above ground TSF

DAM TYPE	ADVANTAGES	DISADVANTAGES
UPSTREAM METHOD  	1. REQUIRES LEAST QUANTITY OF DIKE FILL MATERIAL. 2. OFTEN LEAST COSTLY METHOD.	1. REQUIRES CAREFUL ATTENTION AND CONTROL OF TAILINGS DISCHARGE AND WATER DECANTING. 2. RATE OF HEIGHT INCREASE MAY BE LIMITED. 3. NOT WELL SUITED TO LARGE RUNOFF INFLOWS OF WATER STORAGE. 4. MAY BE SUSCEPTIBLE TO LIQUEFACTION IN HIGH SEISMIC AREAS.
DOWNSTREAM METHOD  	1. COMPATIBLE WITH ANY TYPE OF TAILINGS. 2. CAN BE USED FOR WATER STORAGE. 3. GOOD SEISMIC RESISTANCE.	1. REQUIRES GREATEST QUANTITY OF DAM FILL. 2. DAM FILL VOLUMES INCREASE FOR EACH SUCCESSIVE RAISE. 3. OFTEN MOST COSTLY METHOD.
CENTRELINE METHOD  	1. SHARES BOTH ADVANTAGES AND DISADVANTAGES OF UPSTREAM AND DOWNSTREAM METHODS.	

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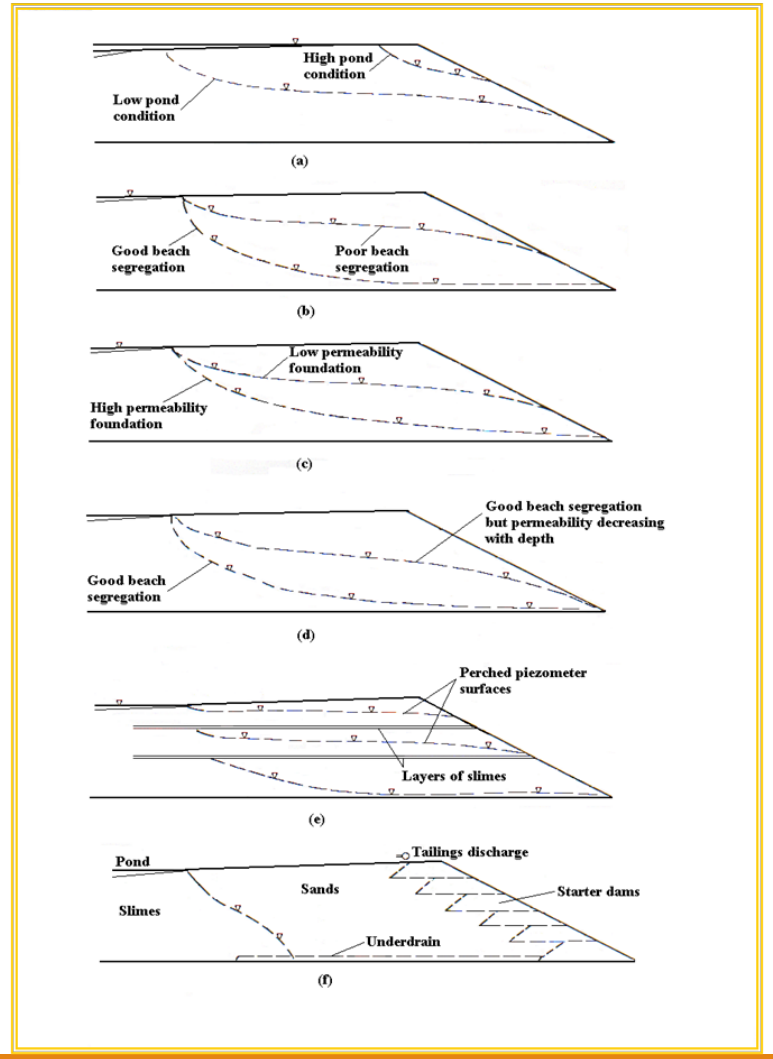
GISTM – Phreatic surface drives stability



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GISTM

Impacts on existing mining operations

- Most mining companies are looking at remedial works and buttressing downstream slopes is underway on many sites
- Alternatives such as in-pit tailings storage is attracting significant interest
- Downstream construction and the use of integrated waste landforms are also attracting significant interest
- Alternative technology (frontend engineering) to reduce the water content of the slurry
- Existing technology optimised (backend engineering) to improve water recovery = increased insitu dry density and shear strength of the deposited tailings

GISTM – InPit Tailings Storage

IPTSF controlled deposition of tailings into, and recovery of water from, an abandoned mine pit to maximise the density of the deposited tailings

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GISTM – Integrated Waste Landforms

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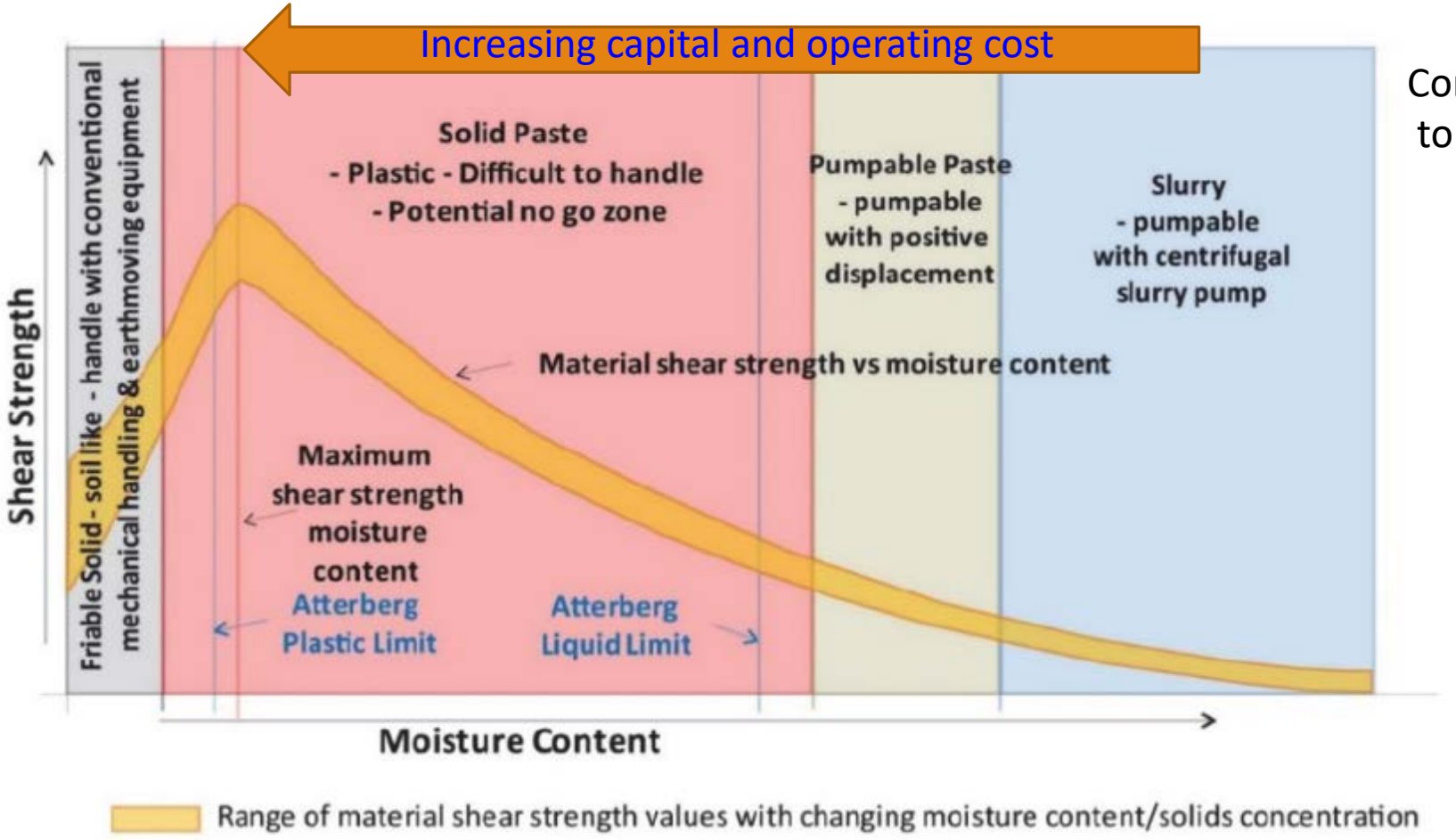
GISTM - Tailings Technology



Continuum of solid through plastic to liquid tailings

Source AGC Paste Conference 2019 – Wimmler et al from (Whitton et al 2015)

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GISTM – Alternative Technology

Front end engineering – high capital investment and operating cost

- Production of a filter cake from a vibrating screen

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GISTM – Simple Solution

Backend engineering – low capital investment and operating cost with significant advantages

GISTM

Impacts on existing/future/proposed mining operations

- Surveys (Socio-economic, ethnographic, etc increased time frame)
- Regulatory approvals increased time frame
- Investment decisions increased time frame
- Access to finance and insurance will be limited
- Potential oversight by an Independent, Global Tailings Management Institute which is proposed to be established

GISTM

Impacts on existing/future/proposed mining operations

- Insufficient experienced senior personnel to fulfil Engineer of Record (EoR) roles
- EoRs have too many demands – Andy Robertson (Canada) indicates EoR can look after 6 to 8 TSFs
- Major consultants set limits of 3 to 4
- Depending on size of facility and production rates maybe a limit of 4 to 6?
- Company staffing – majors building teams of tailings engineers
- Consultants struggling to keep up
- Increasing charge out rates pushed be demand and head-hunting pushing salaries
- Professional Indemnity Insurance costs rising
- Who should bear the risk?

Global Tailings Management Institute (GTMI)

Rationale for the establishment of the GTMI

- 18,000 TSFs worldwide with 3,500 active TSFs
- Growing need for independent oversight
- GTMI Partnership
    a. UN Environment Programme (UNEP) and the Principles for Responsible Investment (PRI), Co Convenors of the Global Tailings Review
    b. Church of England Pensions Board
    c. Council on Ethics of the Swedish National Pension Funds

Information sourced from presentation by Dr David Cooling at ACG 2021 Paste and Thickened Tailings Short Course

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GTMI

Role of GTMI to Deliver

- Promoting adoption of the GISTM by mining companies
- Working with community representative groups, insurance professionals, investor groups and other stakeholders to continually improve and update the Standard GISTM.
- Managing an assurance framework through independent third party auditing and certification
- Overseeing a certification process for auditors who will be carrying out the tailings facility audits

GTMI

Role of GTMI to Deliver

- Liaising with regulators with a view to align regulatory oversight of tailings facilities with the Standard.
- Liaising with other industry representative bodies who have developed parallel standards and best practice guidelines to align these with the Standard where appropriate
- Facilitating best practice transfer to improve overall knowledge in tailings management
- Providing a central location for company disclosures on tailings facility details and establishing a system providing public disclosure of auditing outcomes

GTMI

Role of GTMI and GISTM Principle 5

- *Develop a robust design that integrates the knowledge base and minimises the risk of failure to people and the environment for all phases of the tailings facility lifecycle, including closure and post closure.*

GTMI

Role of GTMI and GISTM Principle 5.1

- *For new tailings facilities, incorporate the outcome of the multi criteria alternatives analysis including the use of tailings technologies in the design of the tailings facility. For expansions to existing tailings facilities, investigate the potential to refine the tailings technologies and design approaches with the goal of minimising risks to people and the environment throughout the tailings facility lifecycle.*

GTMI

GTMI objectives to satisfy GISTM Principles 5 and 5.1

- Supporting the ongoing development of technologies (thickened, paste and filtered tailings) which are aimed at lowing the risks of tailings dam failures is going to be a key focus for the Institute.
- Being able to demonstrate that these alternatives have been thoroughly assessed (and implement where appropriate) will be a key requirement for certification of TSF in the future.

GTMI

Role of GTMI to Deliver

- Facilitating ongoing updates to company disclosures on tailings facility details.
- Working with academic institutions to promote appropriate training for a range of professionals working with tailings facilities.
- Working with the mining industry and research institutes on improved understanding of tailings behavior and storage practices

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GTMI

GTMI Auditing and Certification

- The GTMI is working toward a process for independent verification and certification against the standard
- The purpose will be to provide assurance that the unit of certification conforms to the requirements of the Standard
- The Standard was written with the intent of certifying individual TSFs - not operations or companies, but this proceeds is still to be decided
- It is likely that the process of auditing will include public disclosure of a summary of the audit findings