FRASER ALEXANDER

UNDERSTANDING TAILINGS

(A SOUTH AFRICAN CONTEXT)

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CONTENTS

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OUR PURPOSE

Frasers strategy is to invest in people, technology, assets and relationships to transition the business to a high tech, high skills, IP and assets driven services, which will enable us to be leaders in facilitating the Circular Mining Economy and to create value for all stakeholders.

*Our **STRATEGY** aims to achieve this.*
*Our **PURPOSE** statement articulates it.*

WHO WE ARE: EMBEDDED ESG

1912

Over 100 years servicing the mining industry

100% black-owned, majority women-owned

± 2713 employees, based globally

±90 client sites, servicing blue-chip clients based across 9 countries on 2 continents

Comprehensive and entrenched corporate governance framework, highest ethical standards

Striving towards the highest levels of contractor health, safety and environmental standards

EXCELLENCE | INNOVATION | INTEGRITY | CARE | TEAMWORK

Business built on VALUES

BBBEE LEVEL 1

Leading ESG in the mining services sector, evidenced in our sustainability report

rbh royal bafokeng holdings

PUBLIC INVESTMENT CORPORATION Est. 1911

Our shareholders comprise of leading South African investment companies who are themselves deeply committed to ESG

WHAT WE DO

Global leader in transforming mine waste into value

Largest
independent owner and operator of mineral processing plants in South Africa

NXT GEN SOLUTIONS

Adopting an **innovative combination of solutions approach** to enhance tailings management

Active R&D of new/drier tailings solutions, with solutions in the field-testing phase

Operate and Maintain **over 20 water plants**

Assess proposals, tenders and investments in terms of opportunities to add social and environmental value

WHAT WE DO

We are constantly seeking innovative combinations of solutions to enhance tailings management and ensure sustainable practices

LEADING global operational technologies including:

Automated pump stations

&

In-dam mechanical screening

TORAS

MONITOR. MANAGE. MITIGATE.

Developed TORAS, an **integrated tailings risk management digital solution**

ADOPTING AN INNOVATIVE COMBINATION OF SOLUTIONS APPROACH TO ENHANCE TAILINGS MANAGEMENT

ACTIVE R&D of NEW/DRIER TAILINGS SOLUTIONS, WITH SOLUTIONS IN FIELD TESTING PHASE

GLOBAL INDUSTRY STANDARD ON TAILINGS MANAGEMENT

- Following the GISTM launch in 2020, Fraser Alexander held a key stakeholder internal workshops to review the standard and its requirements.
- Fraser Alexander saw this standard as an opportunity - by effectively responding to identified threats and mitigations, we aimed to develop a differentiated tailings management service offering for clients.

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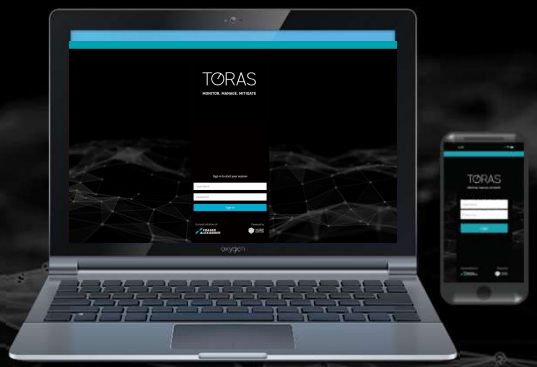
KEY AREAS

1. Knowledge-base
2. Governance and Transparency
3. Monitoring
4. Risk Management

TAILINGS OPERATIONS - RISK MANAGEMENT

TORAS

MONITOR. MANAGE. MITIGATE.



TECHNICAL AND OPERATIONAL RISK ASSESSMENT SYSTEM (TORAS) FOR TAILINGS

Fraser Alexander utilizes TORAS (Technical and Operational Risk Assessment System) to monitor and manage risk and compliance of all deposition contracts.

TORAS integrates and supports all of our digital service offerings through one online portal with an aim to provide a holistic dashboard view of all facility data.

TORAS, together with our experienced expert tailings operators, the valuable input from the engineers of record and mine management, significantly reduces the risk to tailings facility operations. Professional external parties are appointed annually to review TORAS in line with international best practice, ensuring safer operations.

Features and Benefits for Safer Operations:

- CENTRALISED DATA REPOSITORY
- DAILY + MONTHLY MONITORING
- IN-CAPTURE DATA VALIDATIONS
- WORKFLOWS AND ACTION PLANS
- RISK MANAGEMENT BUSINESS INTELLIGENCE
- AUTOMATED NOTIFICATIONS
- CLIENT DATA PORTAL
- IOT READY

A proud initiative of FRASER ALEXANDER

Powered by XGRC PRODUCT RANGE

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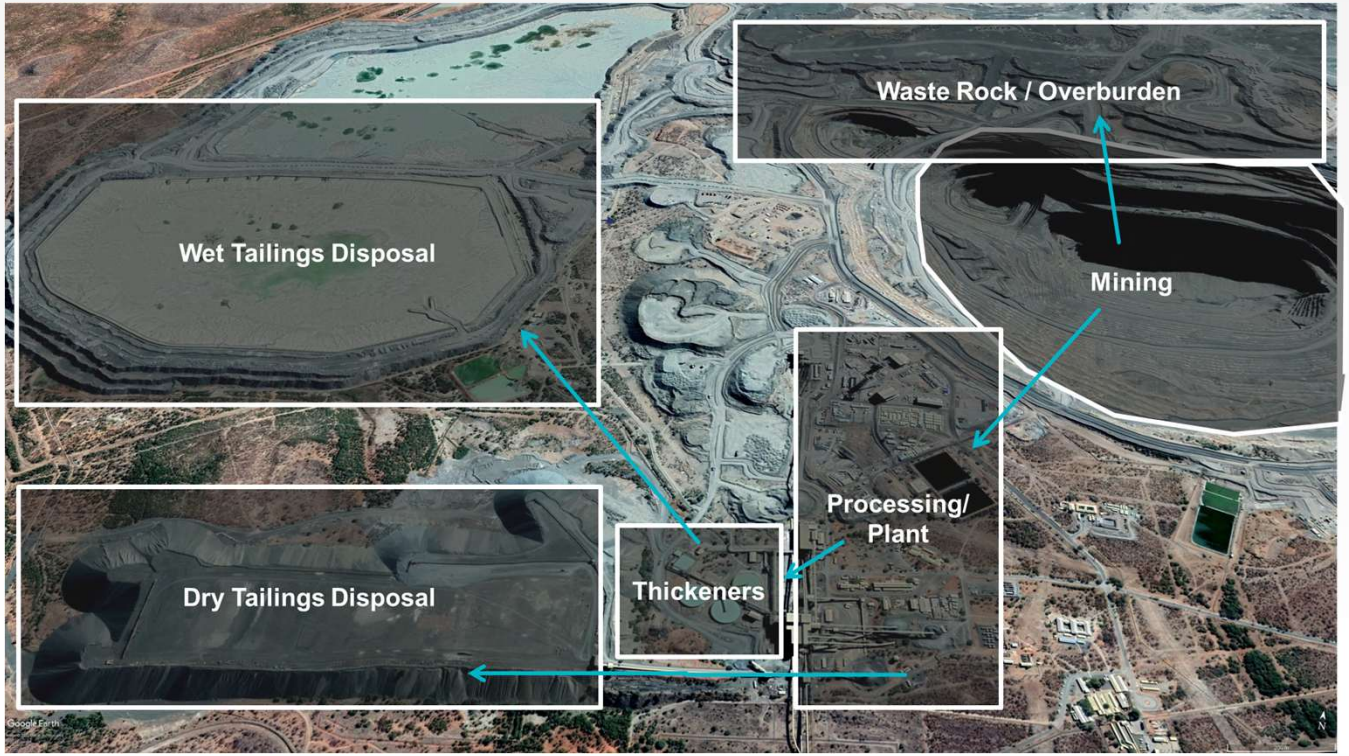
TAILINGS MANAGEMENT

WHAT ARE TAILINGS?

Mine tailings is a generally considered “waste?” stream generated from the mining process - the material left over after most of the minerals have been removed through processing.

- By-products of mineral extraction
- Finely ground rock, water, and residual chemicals
- Can vary widely in composition depending on the ore and processing method
- Not "waste" – they are a complex engineered material

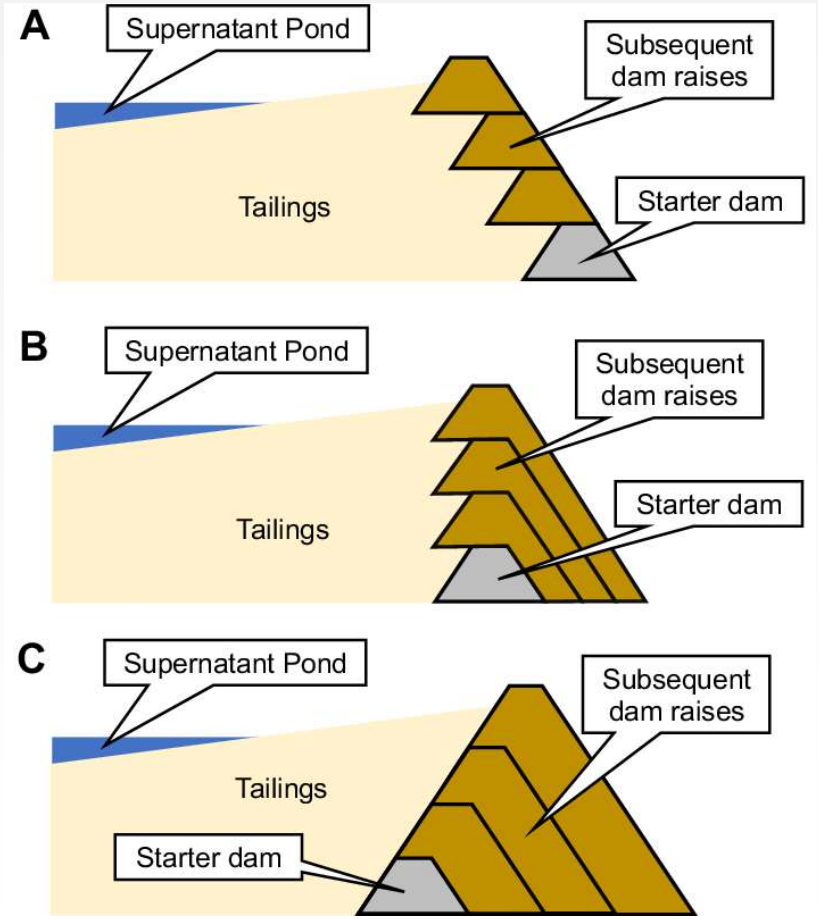


TAILINGS DISPOSAL METHODS

Upstream

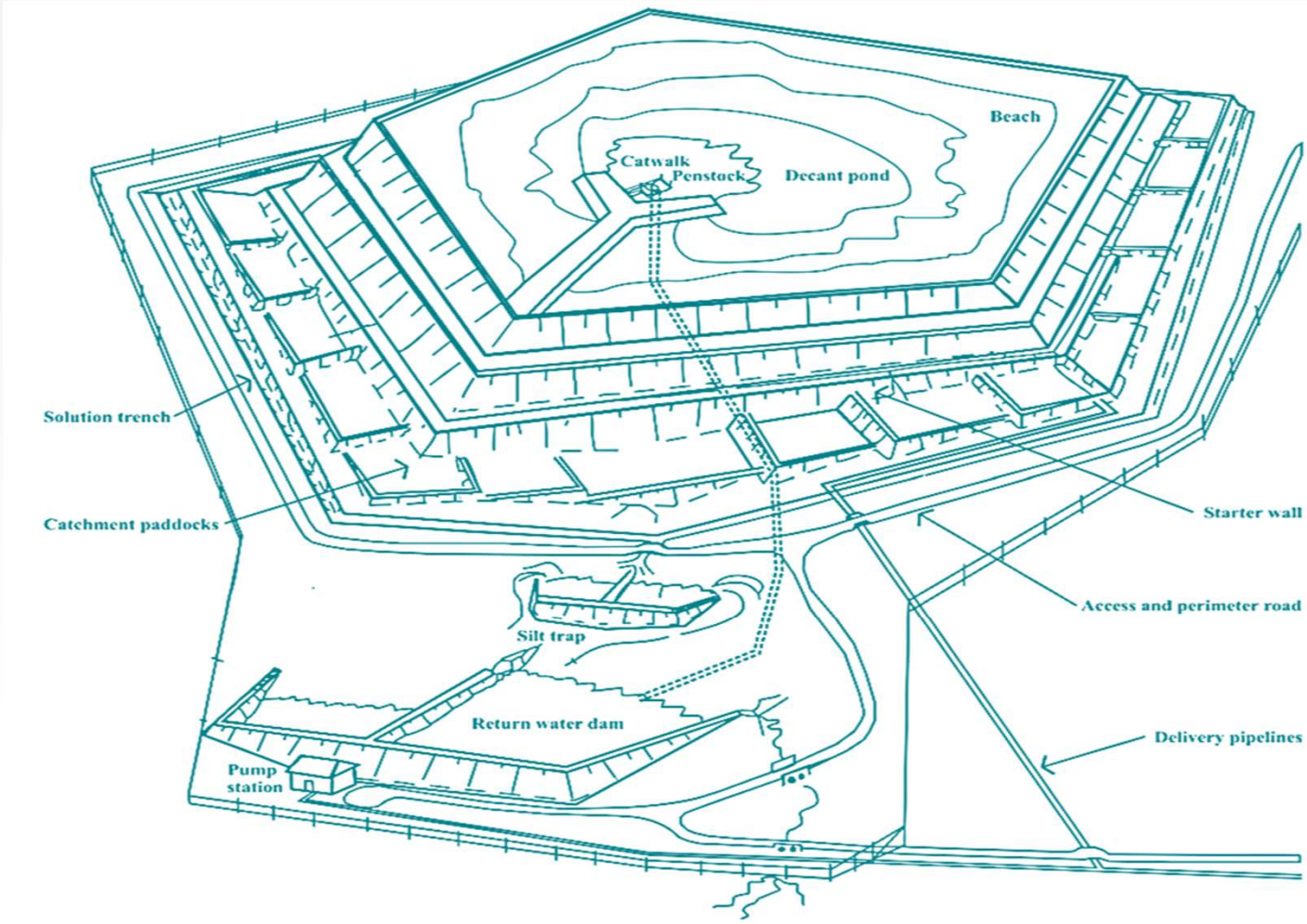
Centreline

Downstream



TAILINGS FACILITY COMPONENTS + MONITORING

There are **several components** required on and around a tailings facility:

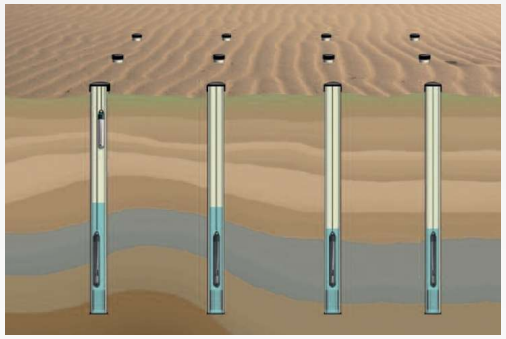


Failure Mode	Aspect To Be Monitored	Possible Instrumentation
Overtopping	Pond (location And Size)	• Pond level sensors • Small unmanned aerial system (sUAS) surveys • Satellite imagery • Cameras • Visual observations
Slope instability/ internal erosion	Phreatic Surface And Pore Pressures At Depth (e.g., Positive And Negative Pore Water Pressures)	• Standpipe piezometers (open well and isolated tip) • Vibrating wire piezometers • Tensiometers • Moisture content probes (time-domain reflectometry)
	Movement (surface)	• sUAS surveys • Interferometric synthetic aperture radar (InSAR) and satellite imagery • Visual observations
Slope instability	Load On Tailings (to Confirm Laboratory Testing)	• Pressure/settlement plates
	Internal Movement (tailings, Embankment, Foundation)	• Inclinometers (manual, in place) • ShapeArrays • Other
	External Movement (embankment Slopes, Foundation Bulging)	• Tiltmeters • Fiber-optic cables • Microseismicity • Unmanned aerial system surveys • InSAR and satellite imagery • Visual observations
	Moisture Content To Infer State Parameter	• Reconciliation of stored density through terrestrial-based survey, sUAS or satellite survey, and tailings delivery data
	Seismicity	• Seismographs (one on tailings storage facility crest, one on natural ground [outcrop preferred])
	Unexpected Conditions (e.g., Sinkholes)	• sUAS surveys • InSAR and satellite imagery • Cameras on critical areas • Visual observation

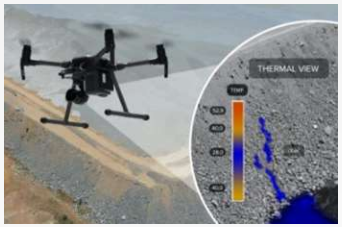
Supporting monitoring systems

COMPREHENSIVE MONITORING PROGRAMMES FOR TSFs

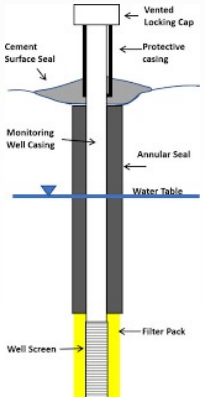
Piezometer – Water level in TSF walls



Surveying – movement, geometry, pool size and depth…



Groundwater monitoring well – water quality and levels



Drains – water extraction

Regular inspections and audits:
- Skilled tailings operators
- Engineers
- RTFE

A multi-layered approach designed to ensure the integrity and safety of the TSF.

COMPREHENSIVE MONITORING PROGRAMMES FOR TSFs

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A COLLABORATIVE APPROACH: PARTIES INVOLVED IN TSF MANAGEMENT

	Client (the Mine Owner)	Engineer of Record (EOR)	Tailings Operator
Responsibility	• Overall accountability for the Tailings Storage Facility (TSF) • Appoints the ITRB	• 3rd party appointed by the Owner • Provides technical guidance (design, modifications and ensuring compliance with that design)	• 3rd party appointed by the Owner • Supports the operational responsibility • Does not take hold any technical or design responsibility
Role / Duties	• Can outsource certain design and operating functions • Ensures all legal obligation are fulfilled (appointments and compliance with laws and guidelines).	• Technical oversight on operational mgmt.	• Supports carrying out the obligations in the management (operation) of TSFs under the guidance of our Clients and EoR.

The Independent Tailings Review Board (ITRB)

- Independent reviewer of the Tailings facility, including work undertaken by the EoR

Tailings management is underpinned by regulation

- National laws (Enforceable legal obligation)
- International standards (Voluntary compliance)
- International best practice guidelines (moral and social obligations)

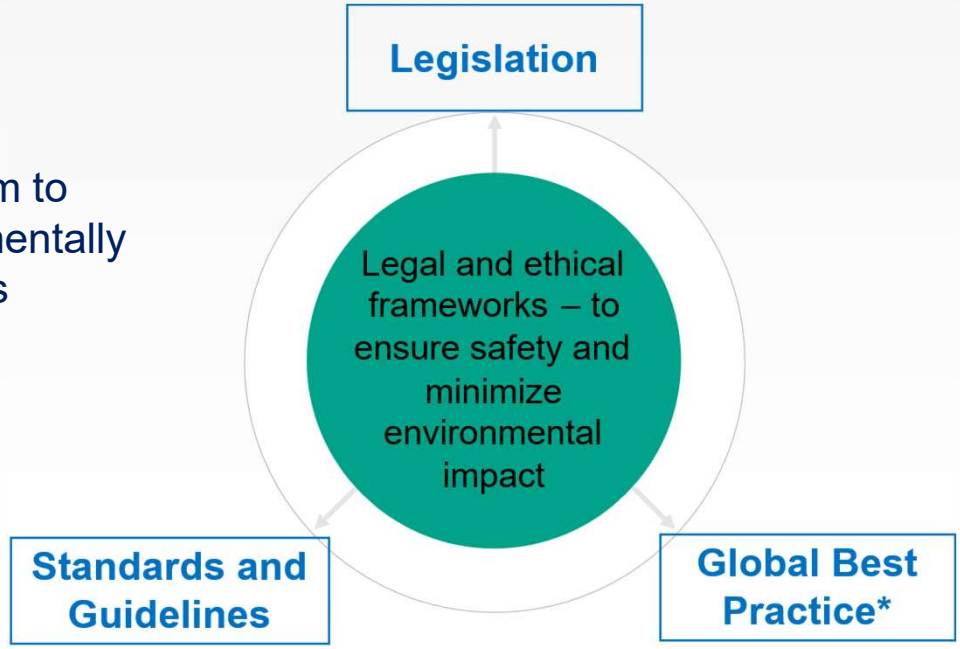
SOUTH AFRICAN REGULATORY & BEST PRACTICE FRAMEWORKS FOR TSF MANAGEMENT

Legislation (laws and regulations governing the management and disposal of tailings)

- National Environmental Management Act (NEMA)
- National Water Act (NWA), along with DWS
- Mine Health and Safety Act (MHSA)

Standards & Guidelines (Aim to ensure the safe and environmentally responsible operation of TSFs throughout their lifecycle)

- SANS 10286
- Mine COPs



Global Best Practice (Not legally mandated)

- Global Industry Standard on Tailings Management (GISTM)
- TSM, ANCOLD, ICOLD

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THANK YOU

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OUR PURPOSE

Fraser Alexander is a Global leader in mine waste management contracting.

Frasers strategy is to invest in people, technology, assets and relationships that will enable us to be leaders in facilitating the transition to a mining circular economy.

*Our **STRATEGY** aims to achieve this.*
*Our **PURPOSE** statement articulates it.*

QUESTIONS?