RTFE Lessons Learned from a TSF Buttressing Project

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Abstract

The Responsible Tailings Facility Engineer (RTFE) role under the Global Industry Standard on Tailings Management (GISTM) assigns clear accountability for tailings facility integrity to a named individual within the operating organization. In practice, the delivery of risk-reduction measures is shaped by capital approval processes, mine sequencing constraints, material availability, and the organization's perceptions of risk exposure and risk tolerance—factors that often fall outside the RTFE's direct authority.

Drawing on the author's personal experience as an RTFE at an operating mine site, this paper presents a case history of a Tailings Storage Facility (TSF) buttressing project in which a technically justified stabilization measure—fully investigated, funded, and planned—was delayed by interacting project dependencies and shifting perceptions of urgency. A key turning point occurred when the same technical information, presented in a decision-focused visual format, changed leadership's understanding of the consequences and accelerated action.

This paper is written in a systems-focused, no-blame spirit. The intent is not to critique the GISTM framework, the Engineer of Record (EOR), or mine site management, but to clarify how the RTFE role is put into practice, how potential roadblocks may arise in real-world situations, and how obstacles can be overcome. This case history illustrates how technically justified work can stall in real operating systems and what the author learned about communicating risk in a way that leads to action. Based on these lessons learned, practical approaches are suggested for use by RTFEs and other tailings practitioners who develop, review, and communicate recommendations to support the timely execution of risk-reduction work within mine site decision pathways, governance expectations, and day-to-day execution realities.

Introduction

From 2020 to 2025, I served as the RTFE for several TSFs at an operating mine site. One of the clearest lessons from that experience was that a technically correct answer is not always immediately executable within an operating organization, even when the risk is clearly understood, the work is justified, and the funding is approved.

This paper began as a reflection on the challenges I faced as an RTFE and evolved into a lessons-learned document focused on how risk-reduction measures can stall after approval and how adapting communication formats to the context and audience can help overcome obstacles to success.

This paper is intended to help tailings practitioners who participate in identifying, evaluating, and communicating risk and risk-reduction actions—this includes RTFEs, site-based tailings management teams, EORs, independent reviewers, and internal and external technical advisors. My hope is that readers will recognize familiar implementation dynamics in their own operating environments and find practical language and tools that make risk-reduction work more likely to be executed.

The intent of this paper is not to critique the GISTM framework, EORs, or mine management, but to provide an example of how the RTFE role was put into practice and how I think the role can be empowered to achieve its intended purpose. The specific TSF buttressing case is not presented as a criticism of the owner's organization, site leadership, the EOR, or other roles. The project was pursued in good faith with robust investigation, monitoring, and governance engagement. My intent is to document how technically justified work can stall in real operating systems—and what I learned about communicating risk in a way that leads to action.

The RTFE is accountable for tailings risk outcomes, but implementation of risk-reduction measures is governed by capital funding, mine sequencing, and organizational perception. In my experience, success depends as much on risk framing and effective communication as on technical rigor.

In this paper, I summarize my experience in the RTFE role and the gaps between accountability and authority I encountered, present a TSF buttressing case history, and then extract lessons learned with practical ways to improve the implementation of risk-reduction measures.

RTFE Accountability Versus Authority

The development of the RTFE role marks a significant shift in tailings management governance. Accountability for tailings facility integrity is assigned to a named individual within the operating organization, which provides valuable clarity.

At a practical level, I experienced the RTFE role as requiring me to:

- Maintain awareness of facility performance and condition (surveillance, instrumentation, inspections, monitoring trends).
- Understand key risks and credible failure modes and ensure those risks are managed.
- Ensure technical recommendations from assessments, audits, review boards, EOR inputs, and internal investigations are tracked and implemented.
- Support effective communication up the chain of mine management when risk warrants escalation.

The RTFE role is often described with terms such as “accountable,” “responsible,” and “ensures.” These terms matter because they are intended to create clarity and ownership. However, the GISTM does not prescribe a single organizational structure, nor does it guarantee that the RTFE has authority over:

- Operational practices
- Budgets and capital allocations
- Mine sequencing or operational priorities
- Staffing levels and resourcing
- Competing project timelines and dependencies

Each organization is responsible for implementing the RTFE role and defining its authority. Responsibility is defined in the GISTM; however, at an operating mine site, authority and decision rights are distributed across multiple functions and management layers. Put simply, the RTFE may be accountable for outcomes, but the decision rights (e.g., budget, sequencing, resourcing) required to execute and achieve those outcomes, including risk mitigation, often reside with other roles. This leaves RTFEs in the uncomfortable position of having accountability without sufficient authority to fulfill their responsibilities.

The RTFE accountability/authority gap becomes apparent when a technically justified risk reduction measure must compete with operational constraints and capital priorities in a system where decisions are evaluated through multiple responsibility and functional lenses, such as engineering, operations, finance, and leadership/management. Even when a project is technically justified, it must compete with important operational priorities and very real resource constraints. Often, successful execution of risk reduction measures relies on other coordinated activities across the entire mine site.

To illustrate how that gap plays out in practice, the next section presents a TSF buttressing case history. The case is technically straightforward, but it is useful because it shows how implementation can be shaped by dependencies, sequencing, and the way in which risk is communicated and understood across the organization.

TSF Buttressing Project Case History

Before I describe the TSF buttressing project, I want to emphasize that the investigation, monitoring, and management engagement were strong throughout. I am highlighting that execution can still be delayed by dependencies, sequencing, and perception—even when the technical case is solid and adequate funding is allocated.

The TSF buttressing project was a significant risk-reduction initiative intended to mitigate a potential failure mode identified in the foundation of a portion of the TSF. Over several years, geotechnical

investigations, material classification, and engineering analyses culminated in the construction of a several-million-ton rockfill buttress in 2024 and 2025.

In 2013, a weak clay unit was encountered in a drill hole into the TSF foundation. At that point, data on the clay's nature and extent were limited, but the geological condition warranted further investigation. Subsequent investigation programs in 2015 and 2018 confirmed the presence of the clay zone and enabled preliminary sampling.

Between 2020 and 2022, a more detailed drilling and characterization program was carried out. Approximately 30 drill holes were completed to characterize the clay and delineate its extent. Several inclinometers and piezometers were installed in the foundation clay zone, the underlying competent foundation materials, and the TSF embankment. Laboratory testing of recovered clay samples established strength parameters, including residual strength behavior. The clay was characterized as high-plasticity silty clay with strain-softening behavior. As displacement occurs, the clay transitions from peak to residual strength and becomes weaker over time.

In early 2022, during a monthly inclinometer reading, the probe failed to pass through the clay zone in one of the recently installed inclinometers. Although movement rates were low, the interpretation confirmed that the clay zone was deforming and that displacement was occurring. This event reinforced the need for expedited evaluation and continued careful monitoring. To better understand the impact of the clay zone, several GPS monitoring stations and a radar unit were deployed to improve monitoring of the TSF in and around the clay zone. Additionally, several manually read inclinometers were converted to shape array accelerometers. Engineering analyses indicated that a buttress—comprising several million tons of rockfill—would be required to meet the static and post-earthquake design criteria.

Capital funding was incorporated into the budget, and an authorization for expenditure (AFE) was submitted and approved in late 2022. The plan was for buttress construction to begin in the fourth quarter of 2023, once an access road had been constructed, the topsoil stockpile in the buttress footprint had been relocated, new instrumentation in the buttress footprint had been installed, and a new diversion channel had been constructed.

In 2023, the buttressing plan and associated work were reviewed by the Independent Tailings Review Board (ITRB). The ITRB encouraged expediting construction where possible but agreed the schedule was reasonable and that a clear path forward had been defined.

The buttress plan assumed that suitable non-potentially acid-generating (non-PAG) waste rock would be sourced from a nearby open-pit layback, a separate capital project. The layback was scheduled to begin in mid-2023, but mining was delayed by the timing of required infrastructure relocation.

Once mining commenced, subsequent waste characterization identified the mine waste as potentially acid-generating (PAG) rather than non-PAG, reducing the available material for buttress construction. As

mining in the layback progressed, a localized slope failure developed after the first benches were mined, further delaying waste availability and buttress construction.

By the spring 2024 ITRB meeting, preparation work for the buttress had progressed:

- access roads were constructed,
- the diversion channel was completed,
- the topsoil stockpile had been relocated,
- topsoil clearing of the footprint had been completed, and
- additional instrumentation had been installed in the buttress footprint.

Despite the preparation work, no significant buttress construction had occurred because mine waste was unavailable. Monitoring data from the foundation and embankment continued to show a consistent, low-rate movement trend with no notable acceleration. Pore pressures were present, but the instrumentation did not indicate a significant increase. Overall, the monitoring data reflected a non-accelerating (steady-state) condition. During the review, the ITRB expressed serious concern about the lack of buttress placement.

In the ITRB closeout presentation to site leadership, the ITRB presented a cross-section that emphasized the low residual-strength factor of safety for the unbuttressed condition. The consequences of delaying the buttress and the urgency of construction were unmistakable in the ITRB messaging. After the closeout meeting, a manager remarked, “If I had seen it presented that way, I would have understood the urgency sooner.”

What changed was not the factor of safety, but the way it was presented. The same cross-section and data supported both the buttress design and the AFE justification. While this was understood within the tailings management technical team, it was not consistently recognized across all levels of management. In the AFE, the technical information was presented alongside cost estimates, execution steps, schedule, and approval details. While the factor of safety remained unchanged, the different framing influenced how the need for and the urgency of the buttress were perceived.

In hindsight, I assumed the urgency for the buttress would be clear from the AFE request itself and that site leadership would share the same perception of consequences and urgency. This moment reinforced that technical completeness and documentation do not guarantee a shared perception of risk, particularly outside the tailings and geotechnical community. This experience led to a realization of the importance of effective communication that is presented in a way the audience will understand—not necessarily in the way the presenter understands.

Prior to the ITRB presentation, site leadership heard that the buttress was needed for the long-term stability of the TSF and that movement rates were low, implying there was time to complete the buttress.

After the ITRB presentation, seeing the same information framed differently, site leadership understood the urgency and the potential consequences more clearly.

Ultimately, non-PAG waste was sourced from an alternative open pit mine at a higher cost. Buttress construction began in mid-2024 and was completed at the end of 2025 to meet the design criteria for both short-term and long-term stability. To my knowledge, the buttress met its design objectives and stabilized the affected portion of the facility.

Although the technical solution was straightforward, constructing the buttress was not. Delays resulted from the interaction among capital sequencing, waste availability assumptions, operational constraints, and how urgency was perceived. Once the urgency and consequences were understood, management was committed to the project and led the organization to prioritize the buttress construction and overcome implementation obstacles.

Lessons Learned from the TSF Buttress Project

The TSF buttressing project reinforced that technically sound risk-reduction measures can still be slow to implement in an operating mine environment. The investigation, monitoring program, and engineering design work were robust, and the stabilization concept was straightforward. What proved more complex was translating the technical need into construction progress within a system governed by capital processes, mine sequencing, material availability, and shifting perceptions of urgency.

This section summarizes the key lessons from the case history. Although the details are site-specific, the underlying implementation challenges—capital execution pathways, operational dependencies, and risk communication—are common across many tailings projects and may be useful to practitioners in other operating environments.

Lesson 1: Dependencies Set the Schedule

A key lesson from the project was that securing funding approval and defining a technically justified plan did not guarantee that the plan could be executed on the intended schedule. Even after the AFE was approved, the start of buttress construction depended on a chain of preparatory work and assumptions outside the RTFE's direct control—most critically, the source, timing, availability, and suitability of rockfill for buttress construction.

In this case, the buttress design assumed that non-PAG waste rock would be sourced from a nearby open-pit layback, which itself depended on separate infrastructure relocations and mine-plan timing. When the layback was delayed, and later when waste classification and localized slope instability reduced or constrained the availability of suitable rock, the buttress schedule became controlled by those dependencies rather than by the readiness of the buttress design or the existence of an approved budget. The result was a

delay in placing the primary stabilization measure and the need to secure material from an alternative source at higher cost.

The operating reality is that risk reduction work frequently competes with and depends on other site priorities and project pathways. The practical implication for RTFEs and tailings teams is that key dependencies must be treated as execution risks, not background assumptions. For large risk reduction projects, this includes explicitly identifying the single points of failure that could control the schedule (e.g., waste source, waste classification, haul routes, permitting windows, contractor availability, competing priorities, and mine-plan tie-ins). Where possible, viable fallback options should be identified early—along with the approximate cost, schedule, and constructability implications—so the site can make deliberate trade-offs rather than reacting under time pressure.

Lesson 2: Risk Reduction, Not Progress, is the Goal

A second lesson was the ease with which progress can be interpreted as risk reduction, even when the primary risk-reduction element has not yet been implemented. In the period leading up to buttress placement, substantial preparatory work was completed. Access was built, diversion and footprint earthwork progressed, and additional instrumentation was installed. These are positive indicators of progress in the overall project schedule. At the same time, monitoring data continued to show a consistent trend of low-rate movement with no notable week-over-week changes. Pore pressures did not show a significant increasing trend. Together, the monitoring data indicated that conditions in the foundation clay were not rapidly deteriorating.

The case history shows how this combination—visible activity plus steady-state monitoring—can inadvertently reduce perceived urgency. Preparation work is often highly visible and readily trackable, while risk reduction can be less obvious until the controlling design element, the buttress, is in place. Likewise, steady-state monitoring trends are reassuring, but they do not necessarily mean the facility meets design criteria for all relevant strength assumptions and loading conditions.

In this case, two statements could remain true simultaneously: monitoring indicated no rapid deterioration, yet the unbuttressed condition did not meet the required design criteria under residual-strength assumptions for the strain-softening foundation clay. If these two truths are not communicated together, stakeholders may reasonably conclude that the risk is managed simply because the instrumentation response shows steady-state conditions and preparation work is underway.

A practical improvement is to clearly distinguish in project updates between preparation tasks and work that directly changes the risk (e.g., increases the factor of safety, changes resisting forces, or limits consequences). Progress reporting can drive critical decisions when it answers two questions in parallel: “What tasks were completed?” and “What changed in risk terms?” This can be as simple as a short statement

in each update identifying whether the work completed advanced the project, reduced risk, or both. Where risk reduction is pending, it is also useful to state explicitly what risk condition remains unchanged until the primary measure is in place.

Lesson 3: Risk Framing Matters

The TSF buttressing project also reinforced that risk perception can vary across an operating organization, and that this variability should be anticipated in risk communication. Tailings and geotechnical practitioners tend to interpret risk in terms of potential failure mechanisms, design criteria, and consequences. Other stakeholders responsible for broader operational, financial, and schedule outcomes may interpret risk using other project metrics, such as production rates, project spending, and visible progress. Under those conditions, the same technical facts can lead to different internal conclusions about urgency.

The turning point in the TSF buttressing project came when information long available was presented in a decision-focused visual format that highlighted consequences and the design criteria gap. The underlying factor of safety and technical justification did not change; what changed was shared understanding. The case shows that technical completeness (reports, calculations, and AFE documentation) does not guarantee that decision makers who control prioritization and resourcing see the risk the same way the technical team does.

For risk reduction projects, the most effective communication approach is often to separate technical detail from decision-critical content and consistently present a small set of decision-ready elements alongside the supporting technical work. These elements might include:

1. the credible failure mode and what drives it,
2. the design criteria and the current gap,
3. consequence and time sensitivity, and
4. the key dependencies that control execution, including what changes if a dependency fails.

When those points are consistently communicated, organizations can better prioritize risk reduction in a way that aligns with engineering consequence and time sensitivity.

Conclusion

The RTFE role under the GISTM clarifies accountability for tailings facility integrity, but it does not eliminate the operating realities that govern implementation: capital timing, mine sequencing, material availability, competing priorities, and how risk is perceived across functions. The TSF buttressing case history illustrates how a technically justified stabilization measure can be investigated, funded, designed, and planned yet still be delayed when execution depends on other project pathways and when steady-state

monitoring and visible preparation work reduce perceived urgency. At a broader level, the lessons from this case suggest that organizations should formally address the RTFE accountability/authority gap, where such systems are not already in place, to ensure that the RTFE's accountability is supported by organizational pathways, escalation mechanisms, and the influence needed to drive execution.

The case history also shows that the pace of risk reduction is strongly influenced by how risk information is framed for decision makers. Buttress construction accelerated when the design criteria gap and consequences were presented in a concise, decision-focused format that created shared understanding beyond the technical team. This highlights the value of pairing technical rigor with effective communication explicitly oriented toward decisions: what must be done, why it is time-sensitive, what assumptions control the schedule, and what alternatives exist if key dependencies fail.

For RTFEs and tailings practitioners, a practical takeaway is that effective implementation depends on both geotechnical conditions and the organizational system delivering the work. Key prerequisites and constraints for execution must be identified, preparation work must be clearly distinguished from measures that materially reduce risk, and the design criteria gap and its consequences must be communicated in a decision-ready way. When these elements are in place, risk reduction is more likely to be well understood and executed on timelines consistent with the engineering risk, with mutual understanding across all levels of the organization.

Ultimately, the experience described here suggests that clear accountability under the GISTM is a necessary but often insufficient condition for timely risk reduction. Pairing effective risk communication with organizational structures that define RTFE decision rights and escalation pathways would help ensure that accountability is supported by the authority needed to achieve that outcome.