

OVERVIEW OF PORTFOLIO RISK MANAGEMENT AT ANGLO AMERICAN TAILINGS STORAGE FACILITIES

CoE letter, Question a): Please provide an overview of your tailings management system, and how you manage risk

Anglo American recognises that risk is inherent in all its business activities. Tailings Storage Facilities (TSFs) and water retaining dams are structures essential to the conduct of our business. Poor stewardship practices that result in loss of integrity and subsequent potential dam failure for TSFs could pose a catastrophic risk for Anglo American.

Anglo American has long identified, including in its Integrated Annual Report 2018 (page 44), that tailings dam failure is one of the group's principal risks. Rigorous risk management is essential to mitigate exposure to catastrophic risks, which could threaten Anglo American's licence to operate, reputation, solvency, viability, business model or performance.

The People and the Practice Area Team

The Mineral Residue Facilities and Water Management (MRF&WM) team within Group Projects, Studies and Infrastructure, Technical and Sustainability ("T&S"), and the members of the wider MRF practice area within Anglo American at the business unit and operational levels, provide Group-wide strategic direction and technical support to manage TSF-associated risks.

The MRF & WM team includes a dozen technical specialists with extensive relevant international and multi-commodity experience in studies, design, construction, operation and closure of TSFs. Specialties include Civil Engineers with geotechnical, hydrology, hydraulics and water resources backgrounds, as well as natural scientists and geoscientists with specialties in hydrogeology, groundwater movement and water management systems.

The MRF & WM team works closely with colleagues in other T&S areas such as Geoscience, Mining, Processing, and Safety and Sustainable Development (S&SD), and provides technical specialist support to the internal Projects, Investment and Risk Assurance teams and associated programmes.

The Ambit of the Practice Area Team

The MRF & WM practice area encompasses safe storage and management of all mineral residue streams in a post-processing stage, including tailings and water retaining dams, sludge and sedimentation ponds, as well as coal and kimberlites coarse discard dumps and smelter slag stockpiles. This practice area also covers surface flooding risk management, and water management.

The MRF & WM team owns and manages two important Anglo American Technical Standards:

- The Water Management Standard (AA TS 601 001), and
- The Mineral Residue Facilities and Water Management Structures Standard (AA TS 602 001) (the “**Group Technical Standard**”).

Anglo American Portfolio of Mineral Residue Facilities (as at May 2019)

The Anglo American portfolio of MRFs includes 91 managed TSFs across the world, of which 40 are active, with the remaining 51 being inactive or closed. This includes tailings, coarse discard dumps and slag piles. In terms of tailings dams, the Group-wide managed portfolio contains 68 managed structures, of which only 15 are built using the upstream method of construction. The total global portfolio also includes 192 water dams and ponds at managed operations.

The Anglo American Group Technical Standard

In 2013-2014, Anglo American completely revised and upgraded the approach to managing risks at its mineral residue facilities and water containment structures. The new approach moved away from sole reliance on individual facility risk management, supplementing that with a corporate, Group-wide portfolio risk management model and technical standard. The revised approach prioritises work based on the Consequence Classification of Structures (“CCS”) rating, explained further below, and embraces current leading practices world-wide including the management of change, the independent reviews and clear requirements for roles, responsibilities, and reporting protocols. The Group Technical Standard is considered to represent leading practice in this field.

The requirements of Anglo American’s Group Technical Standard exceed current ICMM (International Council on Mining and Metals) and regulatory and other industry requirements in all jurisdictions where Anglo American operates. This standard sets minimum requirements for design criteria, monitoring, inspection and surveillance, and was peer-reviewed by international specialists. The standard also adopts local requirements if these are more stringent than the Anglo American Standard.

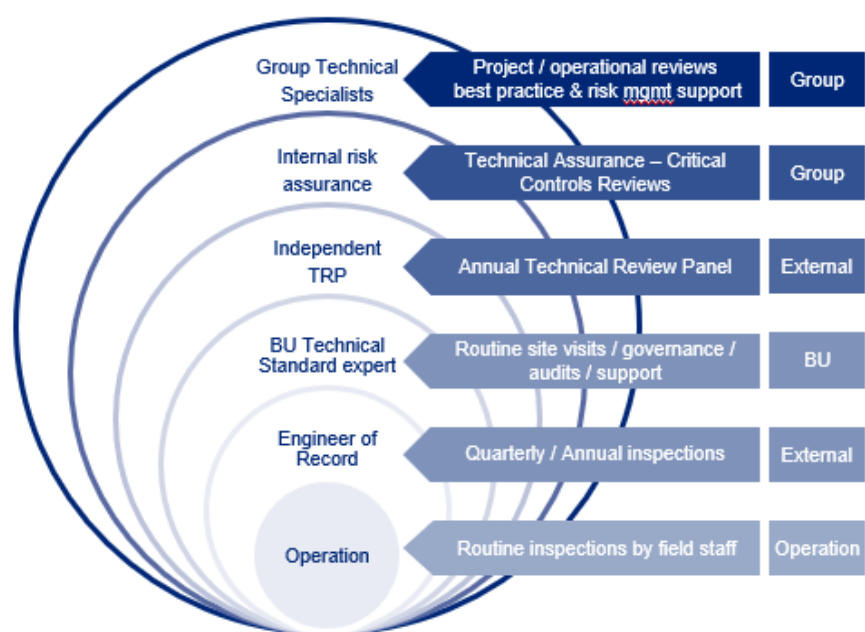
At its core, the Group Technical Standard is based on five pillars, as follows:

- Every structure in the portfolio must have a Consequence Classification of Structure (CCS) rating based on failure consequence categories. Design, monitoring and surveillance requirements are specified based on this rating. The CCS rating is evaluated independently from the probability of an unwanted event taking place. The CCS rating is described in five categories, from Insignificant, to Minor, Moderate, High, and Major. The higher the CCS rating, the more stringent the requirements are.
- Every operation with a Major or High rated structure must have a Competent Person (“CP”) in charge, required competencies for the CP being described in the standard.
- Every facility must have an Engineer of Record (EoR) working continuously with the CP and operational management staff to ensure construction and operational adherence to design, and that the structure is performing in line with the design intent.

- An appointed independent Technical Review Panel (TRP) consisting of senior external engineers is mandated for systematic and ongoing independent review.
- A list of 25 required documents and studies that are considered the absolute minimum necessary to properly manage such important facilities, ranging from design criteria and engineering documents, to risk assessment and emergency response/preparedness plans to permit and incident registers.

The Group Technical Standard establishes requirements for the overall surveillance, inspection, and assurance programme at our managed operations (see Figure 1 below) within the context of the implementation of the new dam safety management programme. The Group Technical Standard is being implemented across all managed operations in the group, with a clear target date of full conformance by December 2019. Anglo American also encourages its non-managed operations to adopt the Group Technical Standard.

Figure 1: Anglo American Surveillance, Inspection and Assurance programme of tailings storage facilities



The Anglo American Risk Management Framework

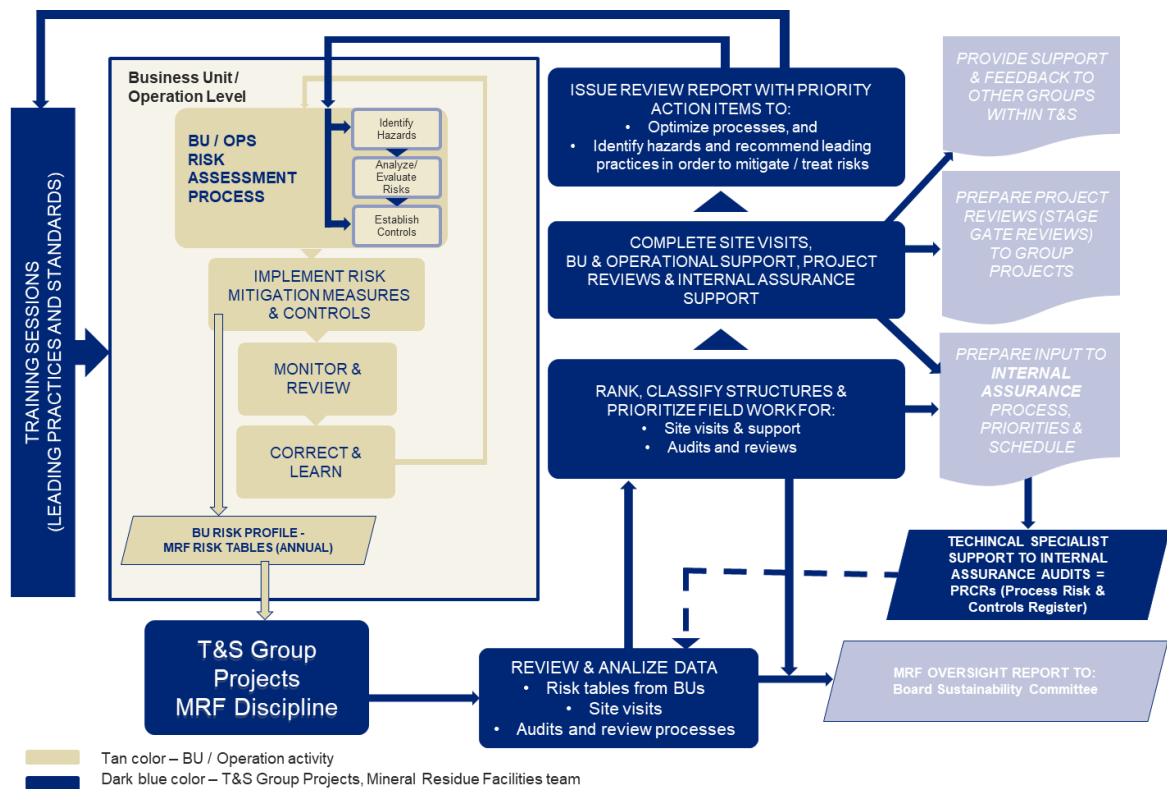
The risk management programme for the tailings and water retaining dams portfolio in Anglo American relies on three key components:

- The full implementation of the Group Technical Standard and its requirements. This is being updated quarterly and assessed annually.
- Defined support, technical oversight and risk mitigation processes. The defined risk management and mitigation process includes the following steps, presented graphically in Figure 2:

- At Operational and Business Unit levels, the risk assessment process is completed, from which mitigation measures and critical controls are identified, formalised, implemented, monitored, reviewed, and verified for effectiveness of implementation.
- Based on the risk assessments and additional information, the MRF team then analyses data, classifies structures, prioritises work and site visits, and completes site inspection reviews.
- Action items are recommended by the CPs and the MRF team to mitigate risks, and feedback is provided back to the MRF & WM Team.
- The loop is closed back to the business unit / operational level where action items are assigned to the CPs or the responsible persons, scheduled, implemented, and tracked for progress and completion.
- Training workshops are held regularly to discuss the lessons learned, share technical knowledge, and discuss success stories and leading practices in implementation of governance practices, technologies and innovation, to help improve stewardship levels and move towards “Zero Repeats”.
- Surveillance, inspection and assurance programmes. The Group Technical Standard specifies clear minimum requirements for monitoring and surveillance of TSFs, based on their CCS rating. There are several separate levels of surveillance and assurance, as presented in Figure 1, to implement and verify different sets of independent critical and non-critical controls.

Part of the risk management and oversight programme, the MRF team compiles annual reports, as well as reports from the independent reviewers (TRPs), and provides feedback to the various Business Unit executive committees, and to the Anglo American plc Board, either through direct reporting to the Board, or its Sustainability Committee. Results from various audit reports are also presented regularly to the Board’s Audit Committee.

Figure 2. Mineral Residue Facilities Portfolio Oversight and Risk Management Process



All new projects or expansion capital projects go through a rigorous Investment Assurance review, to confirm fit-for-purpose design, appropriate design criteria, and best practice implementation throughout the project, meeting minimum requirements specified in our Group Technical Standard and the IDM (Investment Development Model) protocol.

Training is undertaken annually at carefully planned workshops and site visits, with participation from all global practice area members, and including specialist guest speakers, as well as select EoRs and independent reviewers. Lessons from incidents (LFIs) – both internal and external, are part of the risk management processes in place, aligned with the Zero Harm and Zero Repeats targets. Training is also carried out annually by the EoR on site to ensure that personnel involved are familiar with the design intents, as well as the operations, maintenance and surveillance manual.

The TSF risk management programme at Anglo American is therefore a continuous cyclical process where structures are classified, work is prioritised, risk-informed decisions are being taken, and mitigation measures are implemented as quickly and as effectively as possible.

APPENDIX B:

OVERVIEW OF ACTIONS AND INITIATIVES TAKEN AS PART OF PORTFOLIO RISK MANAGEMENT AT ANGLO AMERICAN TAILINGS STORAGE FACILITIES

CoE letter, Question b):

Please confirm whether your approach to tailings management has changed or will change in light of the recent tailings disasters at Brumadinho, Mariana, Mt Polley and others. Have you, for example, reviewed all tailings storage facilities with upstream dam construction, and taken steps necessary to protect local communities and the environment e.g. buttressing, evacuation?

The catastrophic tailings dam failures that have occurred in recent years, in particular the upstream tailings dam failures at the Samarco and Córrego do Feijão iron ore mines in Brazil, resulted in highly mobile and destructive flowslides that resulted in tragic consequences for the site workers, the local communities and the environment surrounding the operations. These tragic events triggered greater global scrutiny of the safety of tailings dams in general and upstream dams in particular. They also accelerated and intensified internal scrutiny of upstream dams within Anglo American, which included the following key actions and initiatives:

- Following the Mt. Polley tailings dam failure, Group-wide technical communications were prepared and issued, related to critical controls for water management, dam surveillance and review of data completeness and information related to tailings dam foundations.
- Subsequent to the failure of the Fundao tailings dam failure at the Samarco mining operation, periodic updates and lessons learned were prepared and issued within the Group, including briefing the Board.
- A Group-wide internal review was completed to evaluate the manner in which liquefaction-related instability risks were managed within the Group's portfolio of upstream tailings dams.
- A technical workshop was convened in mid-2017 in Johannesburg, South Africa on the specific topic of static liquefaction evaluation and related stability analyses methodologies for upstream tailings dams, sharing knowledge within the Group and with active participation of external consultants acting as EoRs and independent reviewers at our TSFs, and academics.
- Active participation and engagement of Anglo American specialists in external technical groups in support of development of best practice global documentation and guidelines, including MAC (Mining Association of Canada), ICMM (International Council for Mining and Metals), ICOLD (International Commission on Large Dams), and IRMA (Initiative for Responsible Mining Assurance), to name a few.
- Developed internal guidance and prepared a document titled "Managing Static Liquefaction Risk in Upstream Tailings Dams" to be released in June 2019. A

second and closely related internal guidance document titled “Cone Penetration Testing of Tailings Dams” is to be issued in July 2019. Both documents are peer-reviewed by external specialists, to be distributed across the Group in training programmes.

- Active participation (as an Industry Partner) in a major 3-year research project titled “Evaluating Potential Static Liquefaction of Tailings to Prevent Failures”, led by UWA (University of Western Australia) and three other Australian universities in partnership with six major mining industry partners, under the auspices of the Australian Research Council (see www.tailliq.com for more information). The project is expected to be completed in 2020.
- Continuation of intensive technical training workshops and technical exchanges across the Group on tailings management and the Group Technical Standard implementation, on an annual basis, with a focus on technical knowledge sharing and learning from incidents, moving towards “Zero repeats” in the industry.

PROACTIVE FIELD ACTION

Examples of proactive actions that were completed in the field at three facilities in Anglo American include the following:

Helena tailings dam, Mototolo, Platinum, South Africa

Following the screening of the upstream tailings dams within the Group, an assessment of the Helena tailings dam indicated the localised presence of deposited tailings in a loose state and potential elevated phreatic surface. The two conditions, combined with a relatively high rate of rise, identified the structure to be more vulnerable. Work was proactively initiated to evaluate the stability of the structure in great detail. Deposition on the facility was stopped and the results of the analyses, also in line with the Group Technical Standard, led to the construction of a rockfill buttress and improved overall dam stability. Deposition was restarted about four months later, in December 2017. Critical controls were re-defined with strict monitoring and reporting, and additional instrumentation was installed to augment the existing network of piezometers. Monitoring and surveillance is currently conducted by the Engineer of Record on an ongoing basis, with independent review completed on a regular basis.

Vaalkop 1 tailings dam, Mogalakwena, Platinum, South Africa

An assessment on Vaalkop 1 tailings dam in a post-screening liquefaction evaluation stage indicated that while the dam was stable, additional investigations were needed to confirm that minimum requirements were met for safety factors in an undrained shear strength condition. The stability analyses showed the structure was safe, but safety factors in certain conditions were below the minimum required by the Group Technical Standard. In addition, some of the localised steeper slopes were prone to erosion and gully formation during heavy storms. Designs for remedial works and buttressing to increase the factor of safety beyond the minimum required were carried out by the Engineer of Record. Construction of the buttress at this facility is expected to mitigate any erosion condition at the outer slopes.

Orapa FRD 1 & 2, Orapa, De Beers, Botswana

The March 2019 review and assessment of FRD 1 and 2 identified potential stability concerns, related to a scenario whereas a potential trigger may cause the deposited mine residue to behave in an undrained manner and lose strength. The stability of the two FRDs is however adequate in their current state where the material is not disturbed (i.e. drained behaviour). In a proactive manner, the deposition on FRD1 and FRD2 was stopped, and tailings deposition was diverted to the new FRD3 in April 2019. Additional in situ and laboratory testing is currently being carried out to confirm the March 2019 stability assessments for an undrained condition. Independent reviews are also planned for July 2019.

MINE EXPANSIONS AND NEW PROJECTS

Anglo American promotes the use of mine waste rock and overburden materials to be used to construct more robust TSFs, as well as to convert existing upstream tailings dams to centerline and downstream facilities with outer waste rock walls where and when it is deemed prudent to do so, and in alignment with the operational business case.

De Beers' Venetia and Jwaneng mines have, as examples, successfully converted their upstream tailings dams to modified centerline and downstream facilities, while Kumba's Sishen mine is in the process of converting four of its upstream dams in a similar manner.

Mogalakwena mine has constructed a new waste rock tailings impoundment for its mine expansion. Similarly, Orapa in Botswana has opted for and constructed a downstream configuration TSF for its Life-of-Mine TSF expansion project.

NEAR-FUTURE INITIATIVES

The key Anglo American project initiatives to be completed in the near future, many by December 2019 include, among others:

- Technology initiatives around improved real-time tailings dam monitoring (pore pressures, deformation, and seepage) using fibre optic cable are being implemented at three operations in Chile, Brazil and South Africa. In addition, micro-seismic monitoring of tailings dams and their foundations will be trialed for the first time at the Quellaveco operation that is under development in Peru.
- Technology implementation of an online dashboard for all our MRFs and the release of an inspection app for dam inspections, expected to be used starting in July 2019.
- A study initiative related to the use of drones or UAVs in conjunction with satellite monitoring and image recognition technology to inspect our TSFs, particularly in areas where human access is potentially unsafe, difficult or remote.
- A project initiative led by Anglo American titled "Earthquake Hazard Update at Tailings Dams in Group Portfolio Located in Southern Africa Region". This project, in close collaboration with the Council of Geoscience of South Africa, University of Pretoria, and the University of KwaZulu-Natal among others, will

also upgrade the locally available knowledge and information to state of practice related to seismic hazard maps for the benefit of Anglo American and the mining industry in general. The maps are intended to be made publicly available, for the benefit of the Southern African countries, for the improvement of public safety in the event of potential catastrophic failures of MRFs, as well as the protection of the environment relating to water, and mine residue spills caused by MRF failures.

- Continuing and expanding technical exchanges and knowledge sharing in the areas of tailings management as well as water management between the Business Units, as well as among mining companies, for the benefit of the practice area and the mining industry as a whole. This includes active support and participation in international specialist working groups (ICMM, ICOLD, MAC) and research programs that aim to improve the safety of mineral residue facilities at the global level.