WESSELS MINE
TAILINGS FACILITY RISK

Slimes Dam Failure Modes Findings (GISTM Requirement 15.1 B3)

A failure modes and effects analysis was completed for the Slimes Dam at Wessels with the following potential failure modes identified:

- Overtopping failure;
- Piping failure;
- Foundation failure;
- Liquefaction failure;
- External Erosion; and
- Seepage.

Review of the above failure modes in the context of the Slimes Dam, including engineering review of geotechnical reports, laboratory test work and historical reports, resulted in two credible failure modes identified by the Engineer of Record (EoR):

- Slope instability from a rise in phreatic surface due to ponding against the external wall; and
- Slope instability due to oversteepening of the upstream toe by reclamation activities.

Slimes Dam Credible Flow Failure Risk Assessment Outcomes (GISTM Requirement 15.1 B4)

In line with international best practice, a dam break assessment was conducted for two broad scenarios:

- A rainy/flood day failure, or overtopping scenario, which may cause the erosion of the supporting embankment and may also result in the release of a large volume of contaminated water. This water would entrain some tailings as it erodes the embankment and would behave as a non-Newtonian fluid. Thus, the erosion of the supporting embankment could result in either a flow slide (if the tailings liquefy), or a slump (if the tailings fail due to its residual shear strength without liquefying). The solids concentration of the liquefied tailings is likely to be reduced by dilution with the overtopping flood water; and
- A sunny day failure, which refers to a situation where the cause of removal of the supporting embankment would be by any mechanism other than overtopping erosion. Within this scenario, either a slump or flow slide may occur.

Table 1 below summarises the impact assessments and the environmental and human exposure and vulnerability to tailings facility credible flow failure scenarios for the Slimes Dam.

TSF	Credible Flow Failure Scenario	Assessment Outcomes	Environmental and Human Exposure
Slimes Dam	Flow slide failure on the northeast embankment following the initiating faults of: Slope instability due to ponding against the outer wall increasing the phreatic surface within the embankment; and Slope instability due to reclamation oversteepening of upstream outer wall leading to slope failure.	Inundation mapping shows that the residue and water outflow should be contained within the Wessels mine site.	The potential for human exposure is limited to within the operation. There is no off-site impact to wildlife, water sources and plants.

Table 1: Credible Flow Failure Risk Assessment Outcomes