

# CANNINGTON MINE SITE TAILINGS FACILITY RISK

## Risk Assessment Findings (GISTM Requirement 15.1 B3)

A qualitative risk assessment and a failure modes effects analysis (FMEA) has been carried out for Cannington's tailings storage facilities (TSFs).

From the FMEA the following failure mechanisms are considered as credible:

- Flow slide under static conditions;
- Flow slide under seismic conditions;
- Overtopping (spillway fails causing severe slope erosion); and
- Geotechnical piping failure.

The FMEA credible failure modes have been considered in the dam break assessment (DBA) undertaken for the TSFs. The purpose of the DBA assessment was to understand impacts of the credible failure modes for each of the cells of the facility.

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

Dam break assessments were conducted for two broad scenarios in line with international practice:

- A rainy day 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 residues 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 residue liquefies), or a slump (if the residue fails due to its residual shear strength without liquefying). The solids concentration of the liquefied residues are likely to be reduced by dilution with the overtopping flood water; and
- A sunny day scenario, 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 summarises impact assessments and environmental and human exposure and vulnerability to tailings facility for the highest impact credible flow failure scenarios for each Cell.

TSF	Credible Flow Failure Scenario	Assessment Outcomes	Environmental and Human Exposure
Cell 1	A piping and foundation failure has been assessed for both scenarios as a credible failure case. The gradual release of the stored tailings and water in Cell 1 can potentially overtop the downstream decant pond causing a cascade failure.	<p>A cascade failure of Cell 1 into the decant dam that would cause it to over top.</p> <p>Discharge of tailings and water to Trepell Creek and the Hamilton River is estimated to travel between 10-20km downstream.</p>	<p>The potential for human exposure to tailings is limited to within the operation.</p> <p>Release of surface water could result in contaminants being released into the Trepell Creek and Hamilton River. No townships or homesteads are within 20km of Cell 1 so human exposure is unlikely however there is potential contamination of livestock/</p>

TSF	Credible Flow Failure Scenario	Assessment Outcomes	Environmental and Human Exposure
			fauna water supply.
Cell 2	A piping and foundation failure has been assessed for the both scenarios as a credible failure case on the western embankment. In this case, the gradual release of the stored tailings and water will overtop the effluent dam and cause a cascade failure.	<p>A cascade failure of Cell 2 into the effluent dam would cause the effluent dam to over top carrying a high environmental risk for the Hamilton River and further downstream. A failure on the eastern embankment would cause outflow impact on Trepell Creek and Hamilton River.</p> <p>Discharge of water to Trepell Creek and the Hamilton River is estimated to travel between 10-20km downstream.</p>	<p>The potential for human exposure is limited to within the operation.</p> <p>Release of surface water could result in contaminants being released into the Trepell Creek and Hamilton River. No townships or homesteads are within 20km of Cell 2 so human exposure is unlikely however there is potential contamination of livestock/fauna water supply.</p>
Cell 3	A piping failure has been assessed for both scenarios as a credible failure case. In this case it results in the gradual release of the stored tailings.	<p>Sunny Day inundation mapping shows that the residue and water outflow would be contained within the TSF and Plant Area.</p> <p>Rainy Day inundation mapping shows that the sediment is estimated to be carried away up to 25km downstream from the TSF into the Hamilton River due to existing flooding.</p>	<p>The potential for human exposure is limited to within the operation.</p> <p>Release of surface water could result in contaminants being released into the Trepell Creek and Hamilton River. No townships or homesteads are within 25km of Cell 3 so human exposure is unlikely however there is potential contamination of livestock/fauna water supply.</p>

Table 1: Credible Flow Failure Risk Assessment Outcomes

Review of the credible failure modes and potential causes indicate that the risks are well understood and managed with appropriate controls. The risk assessment outcomes have been agreed and reviewed with the Engineer of Record (EoR) and Independent Technical Review Board (ITRB).