



# Standard 3

## **3 TAILINGS MANAGEMENT STANDARD**

---

### **3.1 STANDARD**

The purpose of this Standard is to define the requirements for the characterisation of tailings, protection of groundwater and surface water, prevention of uncontrolled releases to the environment and the management of process water.

### **3.2 CRITERIA AND REQUIREMENTS**

#### **3.2.1 Regulatory Compliance**

Sites shall manage tailings and tailings storage facilities in compliance with all relevant in-country regulatory requirements, licences and any other applicable requirements.

#### **3.2.2 Baseline Conditions**

Area baseline conditions shall be determined prior to locating and designing a new tailings storage facility. Baseline conditions shall be determined through high quality technical studies that address relevant geographic and temporal variations. These studies shall include at a minimum, groundwater and surface water hydrology, meteorological, flora, fauna, cultural heritage, geology, seismicity and soils.

Any historical or recent exploratory drill holes located within a planned tailings storage facility footprint shall be abandoned and plugged according to industry-accepted standard drill hole closure practices, prior to construction of the facility. Records of this plugging shall be retained.

#### **3.2.3 Tailings Storage Facilities**

Tailings storage facilities shall be designed, constructed and operated:

- with solution recovery systems (e.g., under-drains, pump-back wells, etc.) to prevent any adverse impacts to groundwater and surface water resources;
- to be geotechnically stable. A minimum factor of safety of 1.4 for static and 1.0 for pseudo-static conditions is required. Relevant engineering standards shall be applied for construction in high seismic areas where the pseudo static factor conditions may require more complex and accurate analysis;
- to be protective of avian and terrestrial wildlife;
- in a manner that ensures that the loss of fugitive dust from dried tailings is minimised as much as practical;
- to prevent uncontrolled releases of tailings supernatant resulting from a 100-year, 24-hour storm event; and
- to withstand the surface run-off from a 100-year, 24-hour storm event.
- Closure and reclamation requirements shall be incorporated into the design of all tailings storage facilities.



**B2GOLD CORP.**  
**Environmental and Biodiversity Standard 3:**  
***Tailings Management***

May 2018  
Page 2 of 5

#### **3.2.4 Tailings Dam Wall Lifts**

Quality assurance/quality control (QA/QC) monitoring and documentation is required for the construction of all tailings storage facilities. Final 'as-built' documentation for initial construction and all embankment lifts, with associated QA/QC reports approved by an appropriate third party (as selected and approved by B2Gold), shall be retained at the site over the life of the project until lease relinquishment is achieved.

#### **3.2.5 Leak Detection and Surface and Groundwater Contamination**

Tailings storage facilities shall be designed, constructed and operated to prevent contamination of groundwater and surface water. The design process shall assess a range of clay and synthetic liner options that predict seepage rates, seepage water quality and any resulting impact on the beneficial use of groundwater and surface water.

The decision on which liner option to proceed with shall consider potential short to long-term (post-closure) impacts and any applicable regulatory requirements. Seepage recovery systems shall be incorporated into the design/construction of the tailings storage facility.

Tailings storage facilities shall include piezometers designed to measure the solution head build up in the embankment and in the tailings. The locations and details of tailings piezometers shall be included in the engineering design.

Underdrainage collection ponds shall have a suitable synthetic liner and a Leak Collection and Recovery System (LCRS).

#### **3.2.6 Tailings Operating Manual**

A Tailings Operating Manual shall be developed, implemented and periodically reviewed/updated to ensure that tailings management practices at each site are conducted in accordance with regulatory and B2Gold requirements and to minimise short and long-term risks associated with the tailings storage facility.

#### **3.2.7 Tailings Characterisation**

Tailings shall be physically and geochemically characterised throughout the life of a tailings storage facility and data shall be utilised in the design, operation, closure and reclamation of tailings storage facilities. Acid rock drainage (ARD) potential of tailings shall be determined using reliable acid-base accounting methodologies.

#### **3.2.8 Secondary Containment**

All process plant storage tanks and transfer systems that contain tailings shall have suitable secondary containment. Secondary containment of storage tanks shall have a typical water permeability at least equivalent to untreated concrete.

Secondary containment shall be designed and sized to contain and convey process solution or slurry that could result from a storage tank, thickener and/or pipeline leak or failure.

Runoff generated outside a tailings storage facility shall be diverted away from the facility as much as practical. Temporary stormwater structures shall be designed based on the level of risk of failure. Permanent stormwater structures shall, at a minimum, be designed, operated and closed to convey and withstand a 100-year, 24-hour storm event.



**B2GOLD CORP.**  
**Environmental and Biodiversity Standard 3:**  
***Tailings Management***

May 2018  
Page 3 of 5

### **3.2.9 Process Water and Supernatant Management**

Sites shall develop and implement a Process Water Management Plan that addresses the management of process water during operations in accordance with B2Gold Environmental and Biodiversity Performance Standard 6 – Water Management.

The supernatant pond size shall be minimised to prevent seepage to groundwater and be located away from the walls of tailings storage facilities. Where a liner system has been installed, the footprint of the supernatant pond shall remain within the boundary of the liner to prevent a direct hydraulic pathway to groundwater.

Tailings storage facilities shall be operated to maintain minimum freeboard requirements as specified by design, any regulatory requirements and/or the site-wide water balance.

Tailings storage facilities shall be operated to maintain piezometric head in the embankment within design specifications.

Disposal of any waste other than tailings in the tailings storage facility requires the waste to be compatible for disposal and compliant with relevant regulatory and licensing requirements, and not to compromise closure and reclamation success.

### **3.2.10 Monitoring**

Groundwater monitoring wells shall be installed up-gradient of a tailings storage facility to establish control/background conditions, and down-gradient to monitor for uncontained seepage from the tailings storage facility.

An ongoing tailings geochemical characterisation program shall be implemented (e.g., static and kinetic ARD and leachate analyses) to confirm ARD predictions and to monitor any potential changes.

During operations, sites shall develop and implement a detailed monitoring plan for tailings storage facilities (including monitoring groundwater wells, under-drains, LCRS and discharges to the environment). Monitoring shall continue through the closure, reclamation and post-closure period until release from liability is granted by the appropriate regulatory agency.

Tailings storage facilities shall be inspected for geotechnical stability by a qualified engineer (selected and approved by B2Gold) on an annual frequency. Recommendations shall be actioned utilising the site action management process. Reports and evidence of completed correct actions shall be retained.

Tailings storage facilities shall be reviewed by an independent third party (i.e., independent of B2Gold and not the Engineer of Record) at least every five years. This review shall include the geotechnical stability of the facility and operational practices. Submitted report(s) and evidence of completed correct actions shall be retained.

Embankment and tailings piezometers shall be measured on a routine basis. Monitoring data shall be graphed, reviewed and compared to design specifications, and adverse data reported to site management.

Reclamation completion criteria shall be monitored to validate closure and reclamation techniques and to support lease relinquishment.



**B2GOLD CORP.**  
**Environmental and Biodiversity Standard 3:**  
***Tailings Management***

May 2018  
Page 4 of 5

### 3.3 TERMS AND DEFINITIONS

Relevant key terms and definitions that relate to B2Gold's Tailings Management Standard are provided below:

**Acid Rock Drainage:** Drainage of acidic water from facilities that contain acid generating material (e.g., open pits or waste rock disposal facilities). It is caused by the oxidation of sulfide minerals in rock following their exposure to oxygen. Water that percolates through or comes in contact with these minerals becomes acidic and may mobilize metals.

**Baseline Conditions:** The existing environmental conditions, i.e., the physical, chemical, or biological setting, of a proposed project area prior to disturbance by project-related development.

**Closure:** The process followed when a site has reached the stage in its life cycle where the intended mining use has been permanently concluded. This generally includes issues such as decommissioning activities, reclamation and revegetation of disturbed areas for long-term physical and chemical stabilisation of the site. This also often includes stakeholder consultation regarding post-mining use.

**Decommissioning:** The process that begins near or at the cessation of mineral processing and ends with the removal of all unwanted infrastructure and services.

**Leachate:** Water that has percolated through a solid material (e.g., tailings, ore, waste rock) and leached out some of the constituents of that solid material.

**Leak Collection Recovery System (LCRS):** Fluid pumping system located between two liners (with at least one of the liners being a geosynthetic liner) that collects and pumps out detected fluid.

**Monitoring:** The gathering, analysis (especially for trends) and interpretation of information for the assessment of performance.

Examples of monitoring subjects are: occupational health and safety, air, soil and water quality, flora and fauna, reclamation, social aspects including complaints, operational dust, noise, vibration, property damage, community health, community investment, historical and cultural sites.

Monitoring may be continuous, short-term or long term and may be undertaken manually or automated.

**Reclamation:** The return of disturbed land to a physically and chemically stable, self-sustaining condition compatible with future land use objectives.

### 3.4 REFERENCE MATERIAL

Nil



**B2GOLD CORP.**  
**Environmental and Biodiversity Standard 3:**  
***Tailings Management***

May 2018  
Page 5 of 5

### 3.5 DOCUMENT CONTROL

| Revision | Approved  | Date                         | Description  |
|----------|-----------|------------------------------|--|
| Final    | Ken Jones | 17 <sup>th</sup> August 2014 | Original 2014 issue of the B2Gold Environmental and Biodiversity Performance Standards                           |
| Final    | Ken Jones | 24 <sup>th</sup> May 2018    | 2018 revision, update and issue of the original 2014 B2Gold Environmental and Biodiversity Performance Standards |