BOLIDEN

Public Disclosure Regarding Saxberget Tailings Facility

2025-08-01

Approved by:
Emma Rönnblom Pärson
Dam Safety Accountable Closed Mines

BOLIDEN

Contents

BOLIDEN

INTRODUCTION

Boliden has committed to apply the Global Industry Standard on Tailings Management (GISTM), adopted by the International Council for Mining and Metals (ICMM) in 2020, setting a precedent for the safe management of tailings facilities, towards the goal of zero harm (the "Standard" or "GISTM").

The Standard contains 77 specific requirements that need to be fulfilled to be in conformance with the Standard. The Standard also requires that adhering members annually issue a status report on their implementation of and conformance with the requirements to support public accountability. In accordance herewith, Boliden as the operator of its tailings facilities is to publish and regularly update information on its commitment to safe tailings facility management, implementation of its tailings governance framework, its organization-wide policies, standards and approaches to the design, construction, monitoring and closure of its tailings facilities

A separate document available via Boliden web, named Public Disclosure Regarding Boliden´s Tailings Management Framework, provides a general description concerning Boliden's tailings and dam safety management for all sites, in which much of the information within requirement 15.1 is met.

This document provides additional information specifically related to Saxberget tailings facility to fully provide the required information. In addition, Chapter 11 of this document presents the status of implementation of GISTM for Saxberget.

1. Description of the tailings facility

The Saxberget tailings storage facility (TSF) is situated in Ludvika municipality in Dalarna, Sweden, see Figure 1. The coordinates (latitude, longitude) of the site are 60°9'4.1"N 14°56'40.1"E.

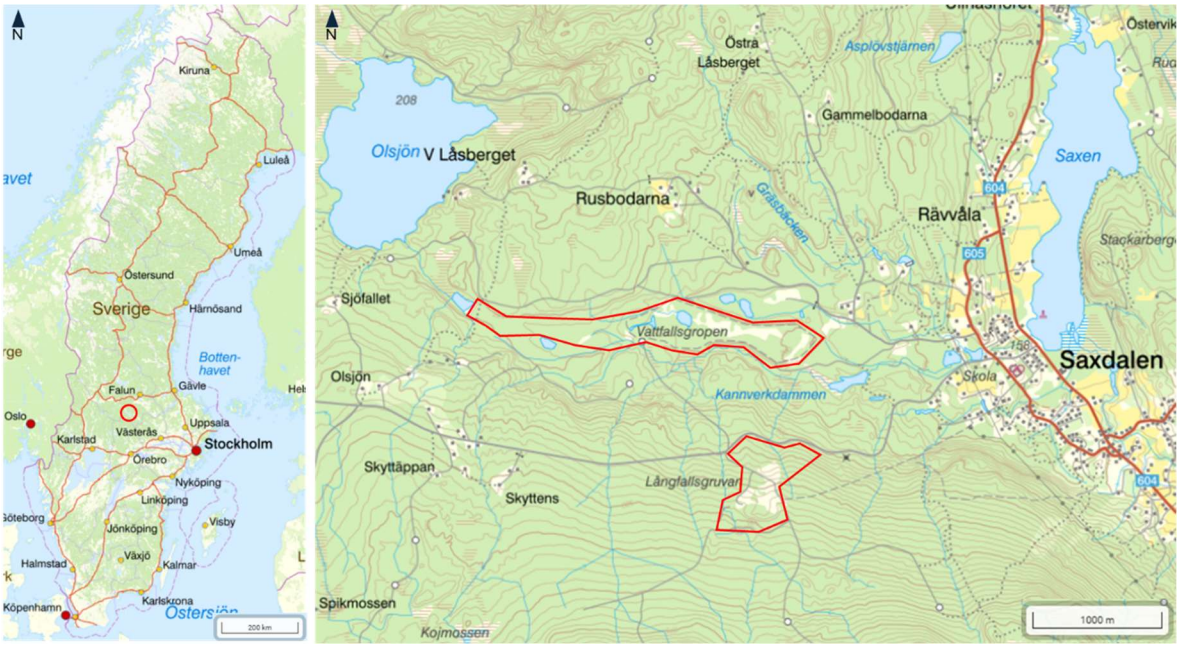

Figure 1 Geographic location of Saxberget TSF and mine in red

The tailings in the tailings facility originated from Långfallsgruvan mine (later named Saxbergsgruvan mine), which was opened in 1886. Zinc and lead grades in the ore varied between 5-20%. Initially, tailings were deposited in lake Saxen. In 1929 a new concentrator was opened, and tailings were subsequently deposited in what is now the West TSF. Boliden took over as mine owner in 1957 and moved deposition into East TSF in 1959. Tailings from lake Saxen and other areas around the mine were re-mined during the 1970's and deposited in the TSF. Mine operations ceased in 1988. An overview of the area is shown in Figure 2.

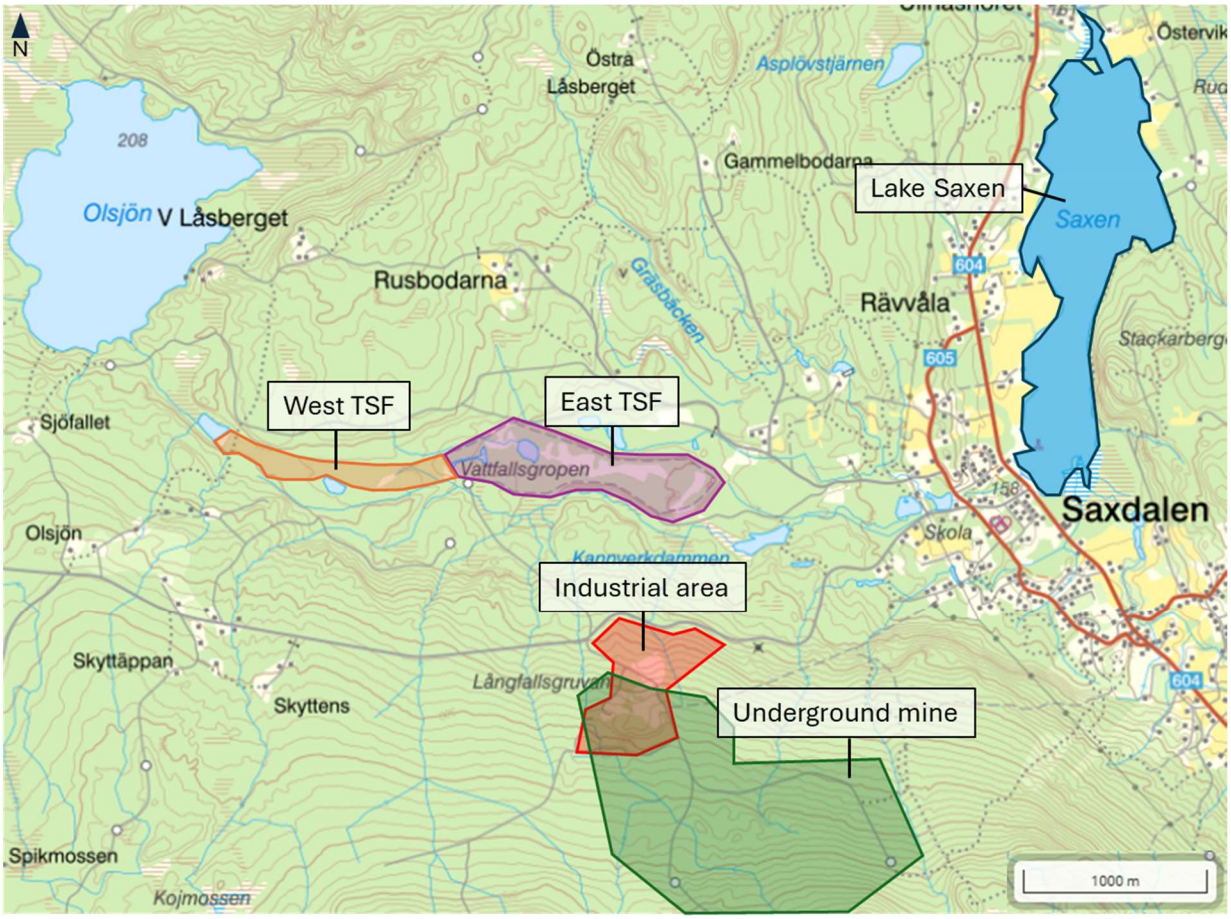

Figure 2 An overview of the Saxberget mine site and TSF, including the recipient lake Saxen.

Remediation of the tailings facility started in 1993 and continued until 1997, during which the tailings facility surface was covered with a qualified cover consisting of a 0,3 m sealing layer of sorted and compacted till, and a 1,5 m protective layer of non-compacted till. The main function of the cover is to prevent oxidation of potentially acid generating tailings. The dams were re-formed to a general slope of 3H:1V or shallower to allow for placement and compaction of the cover as well as long-term dam stability. Today, vegetation is well established on the facility, see Figure 3.

Table 1 gives a general description of the two parts, West and East, of the tailings facility.

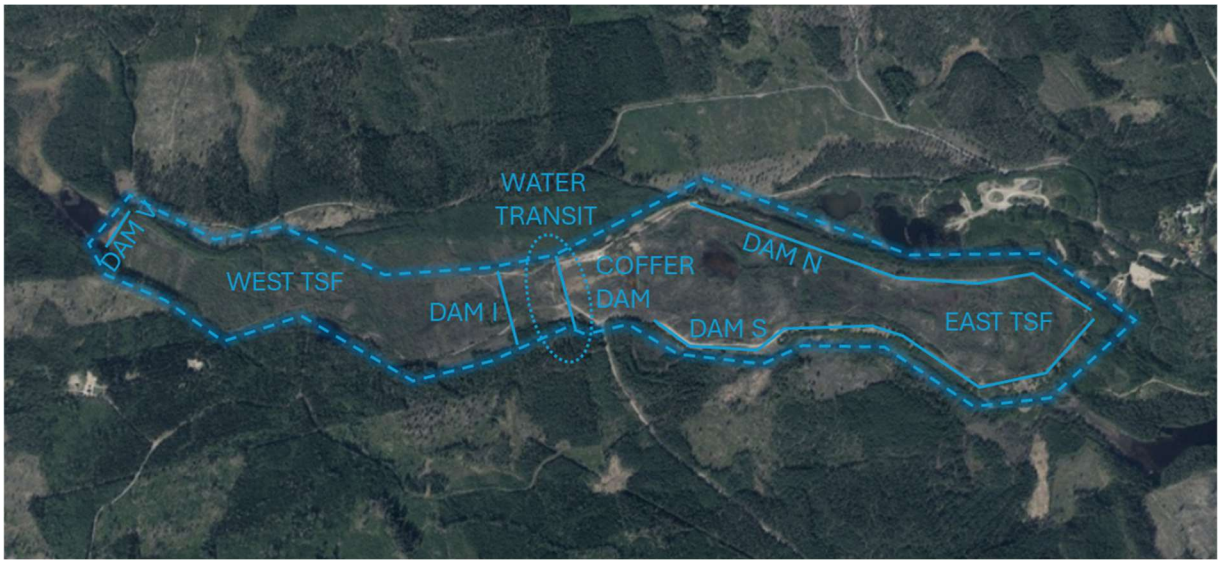

Figure 3 Aerial photo of the Saxberget TSF.

Table 1 Description of the main structures at the Saxberget tailings facility.

Object	Description
West TSF	The West part of the facility was used for deposition roughly between 1929-1958. Tailings were contained by centerline dams on each side of a narrow valley that slopes to the east. Water was released through a bottom outlet to the east. The area is approx. 15 ha. During remediation the dam and surface was covered with a qualified dry cover.
East TSF	The East part of the facility was used for deposition between 1959-1988. Dams were constructed on both the north and south side to contain the tailings. Dams were initially built from till and later raised upstream with both till and tailings respectively. It covers an area of approx. 40 ha. During remediation the dams were re-shaped to a shallow slope and both dams and surface were covered with a qualified dry cover. Ground water from the West part of the TSF daylights by design on top of the cover on the East part of the TSF. The total volume of tailings in both the East and West part of the TSF is approx. 4 Mm^3.

BOLIDEN

2. Consequence classification

The consequences in the event of a tailings facility failure in Saxberget are estimated from breach analyses, see Chapter 4. The consequence classifications refer to current conditions after remediation. The consequence classification of the tailings facility according to the Global Industry Standard on Tailings Management (GISTM) is "Significant".

BOLIDEN

3. Risk assessment

Saxberget has assessed risks in a manner consistent with the risk management instruction established by Boliden. Assessment of risks related to the operation and closure of tailings facilities have been undertaken by a team of multidisciplinary specialists. The risks have been evaluated regarding potential consequences related to a range of aspects, including but not limited to health and safety, environment, infrastructure, social aspects and local communities.

The risk assessment was based on the current understanding of the facility and its surroundings. Since the work on compiling the knowledge base for the facility is ongoing, the risk assessment will be updated every year going forward to reflect the increased understanding of the TSF.

No high or intolerable risks were identified in the risk assessment. A number of medium class risks that need to be managed and mitigated were identified and are being acted upon, mainly through investigations to increase the understanding of the risks.

The identified events which can potentially lead to flow failure events, are used as input for the dam breach analysis (see Chapter 4), as well as for the Trigger Action Response Plan and the Emergency Preparedness Response Plan (see Chapter 8).

BOLIDEN

4. Impact assessment

The impact assessments for the Saxberget tailings facility are based on breach analyses of credible flow scenarios conducted in 2021. The results are used to evaluate the consequence classification (see Chapter 2) of the dams and to develop the Emergency Preparedness Response Plan, see Chapter 8.

The impact assessment has been evaluated according to the Global Industry Standard on Tailings Management (GISTM), as presented in Table 2. The impact assessment is reviewed if any major changes to the facility or local area occur, or in 2034 during the next dam safety review at the latest.

Table 2 Summary of the Saxberget impact assessment to the GISTM

Consequence Criteria	Classification	Impact assessment
Potential Population at risk (PAR)	Significant	1-10 people in the risk of harm.
Potential Loss of Life (LOL)	Low	No expected loss of life.
Environment	Significant	The inundation area in the event of a dam failure is estimated to be 0,5 km^2. Most of the tailings are expected to stay in lake Saxen and cause low visibility and damage to bottom habitats. There are no endangered species in lake Saxen. The lake is also already affected by historical use of the lake as a tailings storage. Therefore, only significant damage is expected in case of a failure. Reclamation of the affected area is estimated to be possible within 1-5 years.
Health, Social and Cultural	Low	Affects usage of downstream lakes for recreation and fishing.
Infrastructure and Economics	Low	A few hundred meters of road need to be repaired. However, affected roads are not considered significant infrastructure. No loss of operation as the facility is closed. The expected economic loss is estimated to be below 1 million dollars.

5. Description of the design of the tailings facility

See Table 6 for a description of the design of the main dams. For a description of the overall tailings facility and the location of the dams is presented in Chapter 1.

Table 3 Description of the design for the Saxberget tailings facility

Dam	Description
West TSF	The West part of the TSF was originally constructed in 1929. Documentation from the original design is non-existent. The tailings were deposited in a narrow valley and the original dam, dam I, was constructed on the east side of the valley to contain the slurry, likely using till. Later, a smaller dam – considered to be constructed of tailings – was added on the western side to further contain the tailings. Deposition took place in the facility until 1958. The foundation of the facility consists of glacial till. In 1964 heavy rains caused a failure of dam I that allowed tailings to spill into the East TSF. A coffer dam was constructed downstream of dam I to contain the spill and also act as a border between the West and East TSF. The breach in dam I was filled in with tailings and other materials from the breach. The facility was covered with a qualified dry cover during remediation works. The cover consisted of a 0,3 m sealing layer of sorted and compacted till and a 1,5 m protection layer of uncompacted till. The cover was then vegetated. Today, large parts of the area are covered in trees and other native vegetation. A cross-country ski track, maintained by the local ski club, runs on the facility. The West TSF is located higher in the terrain than the East TSF and thus has a higher groundwater level in the tailings. A water transit area was constructed over the coffer dam during remediation, to allow groundwater from the West TSF to daylight on top of the cover of East TSF.
East TSF	The East part of the TSF was originally constructed in 1958 and commissioned in 1959. Documentation from the original design is sparse. The facility consisted of several consecutive internal berms that contained both water and tailings. The foundation of the facility is mainly glaciofluvial sediments. Starter dams were constructed from till. Later raises were mostly also constructed from till, but tailings were used on parts of the facility, mainly along the south dam. Dam raises were constructed upstream everywhere except at the spillway, where a downstream construction was used instead. The spillway moved location over the active years but was always located near the north-east corner. The internal berms were raised and maintained for some years but were later buried under tailings. The facility was covered with a qualified dry cover during remediation works. The cover consisted of a 0,3 m sealing layer of sorted and compacted till and a 1,5 m protection layer of uncompacted till. The cover was then vegetated. Today, large parts of the area are covered in trees and other native vegetation. A cross-country ski track, maintained by the local ski club, runs on the facility. A new spillway was constructed on top of the cover to allow collecting water to flow away from the facility. It consists of a wide submersion of cover at the dam crest, covered in erosion protection materials. Water from the West TSF, as well as from the surrounding hills, collect on the cover and meanders through a series of small pools and wetlands towards the spillway.

The Saxberget TSF has already been closed and remediated according to best available technology at the time of closure, as described. Currently, work is ongoing to evaluate the sustainability of the performed remediation measures over time, and to develop a safe closure plan for the area in accordance with ICMM expectations. If needed, additional measures will be taken to ensure the long-term stability and safety of the area. As far as possible, objects of cultural and historical importance will be kept. The current use of the facility as a recreational area will be upheld to the extent possible.

BOLIDEN

6. Annual Performance Review

In conformance with GISTM and Boliden's framework for tailings management, an annual performance review has been conducted for the Saxberget tailings facility. The facility was assessed to have satisfactory safety with need for additional actions.

The following activities were performed in 2024:

- Inspections conducted as planned (spring and autumn).
- Extra inspection during spring flood.
- Geotechnical field investigations performed on West TSF.
- Installation of groundwater pipes on West TSF and downstream of East TSF.
- Geochemical analysis of tailings.
- Safe closure workshops and development of a work breakdown structure for achieving safe closure.
- Environmental monitoring activities as planned.
- Risk analysis performed and risk register in place.
- Site Characterization; seismic hazard, hydrology, geology, etc., including report.
- Initial stability analyses.
- OMS-manual in place, including updated drawings.
- EPRP in place.
- Design criteria agreed and documented in Design Basis Report.
- Dam Safety Review conducted, including failure mode analysis.
- IR review.

The main recommendation from the review was to follow the plan to implement the GISTM, as that will ensure full implementation of the tailings management system at the site.

7. Environmental and social monitoring program

The environmental performance of the tailings facility at Saxberget is monitored according to an established environmental monitoring program.

Groundwater monitoring is carried out in 14 monitoring wells. The water is sampled and analyzed four times a year. Surface water is monitored in 16 locations around the mine and the tailings facility, measured monthly or quarterly depending on location.

The result from the environmental monitoring is reported to the supervising authority yearly, and an annual environmental report is uploaded to the Swedish portal for environmental reporting.

An environmental, social, and local economic impact assessment was carried out in 2022-2023 and will be updated in 2027. The results are available on the Boliden external website. The Boliden portal for stakeholder feedback, available online, is used for the site and Boliden uses the Borealis system to record and address any potential grievance.

Stakeholder meetings with neighbors, the municipality and the county administrative board is being held when necessary

8. Emergency Preparedness and Response Plan (EPRP)

The Emergency Preparedness and Response Plan (EPRP) is triggered by a failure or a near failure. The triggers of the EPRP are defined in the Trigger Action Response Plan (TARP).

The EPRP is common for all of Boliden's Closed Mines, supported by local appendices specific to each site and it's credible flow failure scenarios. The structure of the dam safety emergency group is similar to the dam safety organization in normal operation. Emergency response simulations are held every year for at least one of the Boliden Closed Mine sites. A simulation is planned for Saxberget during 2025. The EPRP is reviewed yearly after every simulation and updated when necessary.

In case of an emergency, the EPRP provides routines for cooperation with local emergency authorities.

BOLIDEN

9. Independent review

A Senior Independent Reviewer (IR) conducted a review of the Saxberget site in 2024, see Table 4. However, this reviewer will not continue in the role from 2025 onward. A new IR will be appointed to take over the responsibilities.

A Dam Safety Review (DSR) was conducted in 2024 by AFRY, as part of their initial onboarding as DoR for the site. The reviews are scheduled every ten years as required based on the consequence classification. The review highlighted the limited information available on the oldest parts of the facility and the need for additional investigations regarding both the dam construction and the foundation. The recommendations have been prioritized and actioned.

Table 4 Planned, ongoing, and conducted independent reviews (2024-2025).

Type	Conducted/planned	Year	By
Independent review	Online meeting (October 21)	2024	Michael Nelson (WSP)
DSR	Q3-Q4	2024	AFRY

10. Reclamation securities and other financial safeguards

The financing of operation and reclamation work costs at Boliden legacy sites is budgeted according to an annually updated work plan. Based on the updated long-term plan for closed mines, annual provisions are made to cover future costs. This long-term plan is reviewed with the responsible controller ahead of each budget process.

11. Implementation of the Global Industry Standard on Tailings Management

Even though the tailings facility at Saxberget was originally closed according to relevant standards and legislation at the time, it has been deemed by Boliden that the remediated facility does not fully meet ´safe closure´ as defined in GISTM. For the Saxberget tailings facility this has initiated a comprehensive work to characterize the site and to update the closure design.

A self-assessment of the conformance to GISTM, based on the guidance in the ICMM Conformance Protocols, has been conducted by the personnel involved in all the closed mine sites. The results show that Saxberget is in partial conformance with the Standard. While significant progress has been made towards conformance, there are still several actions that need to be taken for the tailings facility to be in conformance with all requirements. These actions have been summarized in a corrective action plan that has been submitted and approved by the Dam Safety Accountable. Based on the plan it is expected that Saxberget meets all GISTM requirements during 2026.