KGHM

# Plain Language Summary

## 3.17 Closure and Reclamation

# Overview

The following chapters of the KGHM Ajax Application/EIS have been summarized in plain language. The full Application/EIS can be viewed online at **www.ajaxmine.ca**.

# 3.17 Closure and Reclamation

## 1. Introduction

The **Closure and Reclamation** section (Section 3.17 of Chapter 3 of the Application/EIS) outlines how KGHM Ajax Mining Inc. (KAM) could be prepared for agricultural and other land uses once mining has finished or if the Project needs to close temporarily.

The closure and reclamation process is gradual, and planning and implementing activities make sure the area is stable and safe for animals, plants, and humans to use again after mining ends.

"Closure" is the time when the mining and ore processing has stopped. If closure is permanent, a part of the process is "reclamation," which includes removing buildings and equipment, landscaping and planting trees and other plants and returning natural water flow across the Project footprint.

### ▶ Regulatory Considerations

Closure and reclamation is regulated by federal, provincial, and local governments to ensure mining has a long-term positive environmental legacy. Closure and reclamation is also based on feedback from the general public, local residents, Aboriginal groups and many other stakeholders from the area.

An important step in developing a project closure and reclamation plan is estimating the cost of making the area safe and stable and returning it to local land use. British Columbia's Chief Inspector of Mines requires each company to demonstrate how it will pay for a project's closure and reclamation costs before construction or operations begin. This cost estimate is updated on a regular basis over the mine life and the Inspector will always have financial resources available to close and reclaim a project if the company cannot.

### ▶ Objectives Of Closure and Reclamation

There are six key objectives in KAM's closure and reclamation plan for the Project:

- Return the land to a state that supports cattle and wildlife;
- Return the land to a state that supports agricultural activities as a priority over other uses;

**Figure 3.17.1**

Example of a revegetated Historic Rock Storage Facility (looking south from the existing open pits in June 2014)

- Use progressive reclamation strategies during operations as much as possible;
- Re-establish the natural flow of water between Peterson Creek and Jacko Lake; and
- Cover the Tailings Storage Facility and Mine Rock Storage Facilities in a way that supports wildlife and agriculture.

The Ajax Project includes historic operations that included open pits and waste rock storage areas. Figure 3.17.1 shows an example of revegetated historic waste rock piles, showing the potential effectiveness of Project closure and reclamation methods to return the area to agricultural land use.

## 2. Key Elements of Closure and Reclamation

To meet the Project's closure and reclamation objectives, KAM's activities will centre around four main elements:

- Soil management;
- Revegetation;
- Project Closure; and
- Monitoring.

### ▶ Soil Management

Soil is important to support revegetation, making soil management an important task throughout the life of the Project. The soil management process includes removing the topsoil and overburden from all disturbed areas and storing it so it can be used during reclamation. When soil is properly removed, handled, and stored during the earlier phases of the Project, reclamation activities are typically faster and more successful at the closure phase of the Project. The most effective way of protecting stored soil from erosion by wind or water is to plant soil storage areas with grasses and other plants whose roots keep dust down.

Scientists conducted detailed studies of the soils on the Project to outline the types of material present. At Ajax they found two types of material:

- **Topsoil** (referred to in technical terms in the Application/EIS as Horizons A and B). Soil in the uppermost half metre that is suitable for reclamation because of its fine texture and organic content.
- **Overburden** (referred to in technical terms in the Application/EIS as Horizon C). Deeper-lying soils that are less suitable for reclamation because of their coarser texture or chemical properties. Overburden can be used for landscaping—such as to create post-mining landforms—and to separate mine rock or tailings from topsoil at the end of the mine life.

They then analyzed the material for its:

- Chemical properties, including its acid balance (pH) and metals content; and
- Physical properties such as texture, moisture levels, and amount of stones.

Understanding the current ground conditions helps determine what plants grow most successfully at the Project site. For example, soils with finer particles are likely to support grasses while salty (saline) wetlands are the least suitable for revegetation because of their chemistry. The total volume of this soil—based on a study of its depth and suitability for reclamation—is estimated at 4.8 million cubic metres. Scientists estimate that the Project will need approximately 4.3 million cubic metres of topsoil to reclaim the Project. This means that the Project has a surplus of soil for reclamation and closure purposes.

Scientists also measured the soil to understand the existing metal content. They found in some places at the site, existing soil conditions had levels of metals exceeding guidelines for agricultural or industrial use, as is consistent with the site having been previously used for mining. The quality of this soil will be tested again for its suitability before it is used for reclamation.

## ▶ Revegetation

Revegetation takes time for the plants to grow and for KAM to make sure that plants survive and thrive on the reclaimed areas. The revegetation process will be progressive, using grasses and other local plant species as soon as possible, and monitored throughout the mine life and after Project closure to ensure success.

Revegetation will:

- Support cattle grazing at site, in line with the Project area's current use for agriculture;
- Support wildlife habitat comparable to what was in place before mining began;
- Physically stabilize disturbed areas;
- Prevent weeds ("invasive species") from taking over disturbed areas;
- Reduce erosion from wind and water, therefore keeping down dust; and
- Provide habitat for self-sustaining ecological communities.

Different types of plant communities, such as grasses, trees, and shrubs, are currently present at the Project site; the types of plants thriving there now have been studied in detail so revegetation plans can focus on the plants most likely to be successful in the future based on elevation, steepness of slope, and amount of sun available.

Various types of plants traditionally collected by Aboriginal groups for food and medicine are present at the Project site now.

KAM will manage invasive plants on-site throughout the Project life (as described in Chapter 11.17 of the Application/EIS) to control the potential environmental harm these plants can pose, but also to maximize the success of the closure and reclamation process. KAM will manage invasive plants through regular inspections, physical removal

of invasive species, weed control, and revegetating areas with non-invasive plants. Soil stockpiles will be seeded with grass species to avoid the possibility of being taken over by weeds, as well as to protect them from erosion.

## ▶ Project Closure

Closure is the process of ceasing the use of the mine components—such as tailings, roads, processing plant, and water management ponds—and preparing them for a safe, stable, long-term dormancy period.

### Temporary Closure

In some circumstances, mines are forced to close unexpectedly for short periods because of dips in metal prices or other factors. If the mine had to close temporarily, facilities would be put into a mode called "care and maintenance," which would involve:

- Restricting access to the site, and maintaining equipment and facilities for eventual reopening;
- Locking down any systems with moving parts or electricity;
- Safely storing of moveable heavy equipment such as mine trucks;
- Securely disposing of, or storing, explosives;
- Conducting an inventory of hazardous materials; and
- Posting warning signs around the property.

Caretakers would inspect and monitor the site for physical and chemical stability and maintain the access roads in good condition.

### Permanent Closure

Once the mine comes to the end of its useful life and ore resources have been mined out, the Project will be permanently closed using a process estimated to take a total of five years, although some closure items such as demolishing buildings may be completed much faster. The main components of the mine that will be closed, and the main approaches for closure of these components, are included in Figure 3.17.2. Pipelines, power lines, and other infrastructure will also be dismantled, and materials salvaged or disposed of safely.

In addition to removing mine infrastructure, KAM will also redirect water flows—previously diverted to avoid the mine as much as possible—into long-term natural channels and flow patterns. Peterson Creek, which will be diverted around the Project footprint during construction and operation phases, will be restored in the area of its current channel between the open pit and one of the mine rock storage facilities. The open pit will be allowed to refill with rainwater and groundwater.

**Figure 3.17.2**

## Mine Infrastructure Components, and Examples of Closure and Reclamation Actions

| Mine Infrastructure Component | Description of Component | Max. Area | Design Features that Favour Eventual Closure and Reclamation | Closure and Reclamation Actions |
|---|---|---|---|---|
| **Tailings Storage Facility** (surface and embankments | The tailings storage facility is where mine waste is stored in a wet, thick paste during the mine's operations phase. It is surrounded by supporting walls ("embankments") made of mine rock whose valuable ore content is low, and therefore hasn't been processed to make copper or gold. | 604 ha | • The embankments and tailings storage facility have been designed with slopes that will be stable over the long term, including post-closure. | • Embankments will be progressively reclaimed with topsoil throughout the mine's life and seeded with native and agricultural-use species. Trees will be planted at the bases of the embankments.<br>• Water from the tailings storage facility will be pumped into the open pit when the mine is being closed.<br>• The tailings surface will be covered with layers of rock, then clay, then silt and sand, then topsoil (in that order), in a system designed to "store and release" water. Clay helps seal the tailings off from rainwater, rock provides stability, and soils provide a growing medium for the grasses and other plants that will be planted on its surface to create wildlife habitat and grazing area.<br>• Exess water from the tailings storage facility will drain into Humphrey Creek through a man made spill channel when it is of suitable quality.<br>• Tailings will be net pH-neutral (neither acidic nor alkaline). It will therefore be safe for water that drains off the tailings storage facility to be released into the environment. |
| **Mine Rock Storage Facilities** | Areas of the site for storage of rock that is not profitable to crush and process into copper or gold. Mine rock storage facilities can appear as man-made mountains on the landscape. Some of this mine rock can react with air and rainwater to create poor quality water that can release to the environment. | 594 ha | • As the mine rock storage facilities accumulate, various types of rock with different chemistries will be mixed with one another to improve their chemical stability and environmental safety.<br>• The mine rock storage facilities have been designed with slopes that will be stable over the long term, including post-closure. | • Mine rock storage facilities will be covered with various depths of rock ("overburden") and topsoil during the reclamation process to retain moisture and support re-vegetation<br>• Mine rock storage facilities will be progressively covered with soil and grasses over the life of the mine, starting from the lower areas. The plant mix is designed to be self-sustaining, and to provide wildlife habitat areas. |
| **Low-Grade Ore Stockpile Footprint** | Areas of the site where rock that is less profitable to crush and process will be stored until shortly before the end of mine life. Low-grade ore is typically the last to be processed before the mine closed. Once the mine closes, this location will be a flat "pad" as the stockpile will have been consumed. | 55 ha | • This stockpile will be at an already disturbed site —the location of the mine rock storage facilities for the former Afton Mine —which reduces total disturbance on the mine footprint. | • Scientists will sample the stockpile footprint to make sure that any remaining ore has been removed.<br>• The pad will be covered in rock ("overburden") and then soil. KAM will plant grasses and other native plants to encourage wildlife habitat and grazing. |

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| **Soil and Overburden Stockpile Footprint** | Areas of the site where materials to be used in the reclamation process are stored. | 79 ha | • Much of the accumulated soil (overburden) will be stored together with mine rock to help reduce the size of the stockpile footprint and to reduce mine rock to contact air and water, and generate poor quality water | • Soil and overburden that is not removed from the stockpile to reclaim other parts of the site will be contoured and revegetated. |
| **Open Pit** | The site where ore is removed from the ground for processing. The open pit will be 2.5 kilometres by 1 kilometre across at its widest point. | 2.5 km by 1 km across | • The benches or descending levels in the open pit have been designed with long-term stability in mind | • Mine rock will be moved into the pit toward the end of the mine life. The portion of the pit closest to Jacko Lake will be backfilled for long-term stability<br>• The pit will be filled with water from the tailings storage facility, and after that it will naturally fill up with groundwater and precipitation (rain and snow) and become a lake. After 1,000 years, the pit lake will reach a stable state 200 metres below the edge of the pit. The lake will never release water into the environment.<br>• Water quality at the pit lake has the potential to exceed some government guidelines for water quality. If this occurred, KAM would enhance the plant and other aquatic life in the pit lake so that it naturally moderates levels of contaminants in the water. The lake will never release water into the environment. |
| **Plant, Buildings and Truck Shop Footprints** | Structures that support the mining process | 29 ha | • The infrastructure was clustered as close together as possible to reduce initial disturbance, and therefore the eventual need to reclaim areas of the Project footprint. | • Where soil contamination is suspected, scientists will conduct soil tests. Soil that exceeds regulatory standards will be removed for safe disposal or treated on site.<br>• Equipment will be removed for sale, salvage, or disposal. Salvageable materials such as steel or wiring will be removed for recycling. Unused materials such as chemicals and explosives will be returned to suppliers or safely disposed of off-site.<br>• Buildings and concrete surfaces will be demolished; rubble will be buried where it is or moved to the open pit for long-term disposal.<br>• Pads where demolished infrastructure once stood will be reshaped, covered with overburden and soil, then planted with grasses and other plants to blend in with the existing landscape. |
| **Roads** | Ways to access the mine and to transport vehicles and materials inside the Project footprint | 36 ha | • The Ajax Mine Access Road was designed to be a public road providing access to Lac Le Jeune Road and Jacko Lake after closure | • Many roads will be demolished and reclaimed with overburden, soil, and plants post closure<br>• Some roads will remain to allow vehicle access to monitor the site, and others may be repurposed to allow access to land parcels and support ranching after closure |
| **Water Management Ponds and Ditches** | Ways to control the amount and type of water the mine releases into the environment. | 27 ha | • The mine has been designed to limit the amount of water that has come into contact with mine components that will be released into the environment throughout the Project life | • Water that collects in the downstream management ponds for the tailings storage facility will be pumped back up to the tailings storage facility or to the open pit.<br>• Once closure is complete, water management ponds are not expected to receive water from other parts of the site; as such, there will be water evaporation (rather than water collection) |

### Closure Costs

The Application/EIS must provide an estimate of long-term costs KAM could face to close, reclaim, and monitor the site. KAM estimates (based on information currently available) that it will cost approximately $195 million (in 2015 dollars) to close the site. KAM's estimate provides a dollar figure for closure and reclamation activities if the government were to undertake them, as is the regulatory requirement. Actual costs would be paid by KAM, and would potentially be lower because they would be incurred over the course of the Project life. Actual closure reclamation and closure costs would be revised as more detailed closure plans are created.

## ▶ Monitoring

KAM will be monitoring the environment on site throughout the life of the mine to understand how the Project is interacting and affecting the local environment, residents, and community, to make sure the effects predicted in the Application/EIS are being mitigated as planned, and to make sure the closure plan and end land use objectives can be met. Monitoring plans are reviewed and updated on a regular basis over the Project life, but for closure, important monitoring includes:

- The safety of dams, including underlying ground stability (according to provincial requirements);
- Types and coverage of plants in reclaimed areas;
- Plants' uptake of minerals;
- Surface water and groundwater; and
- Aquatic life in the water bodies downstream of the Project.

Monitoring of the Project during the closure phase is also a government requirement. Reclaimed areas will be monitored annually for up to five years following reclamation, then every one or two years until plants and grasses are well established. Monitoring details may be found in Chapter 11.19 of the Application/EIS, which outlines the overall restoration plan.

# 3. How will Closure Affect KAM's Workforce?

As the mine moves toward closure, the permanent workforce of approximately 500 people during the operations period is expected to drop significantly. Some of the operations-period workforce is expected to remain employed to implement decommissioning, reclamation, and closure activities. Total workforce will drop over the course of the five-year decommissioning and closure period. After this period, staff levels would be very low to intermittent.

Effects to KAM's workforce, and how KAM plans to manage those effects, are described in the *Labour Force, Employment, and Training Effects Assessment* (Section 7.2 of Chapter 7 of the Application/EIS).

# Access the Summaries

Key sections of the KGHM Ajax Environmental Assessment have been summarized and made available to the public:

### View the Summaries Online

ajaxmine.ca

### Request a Copy

Request copies of individual chapters:
ajax.project@kghm.com
250-374-5446

### View a Copy

The following locations have a copy of each Plain Language Summary available to read during their business hours:

**KGHM Ajax**
**Head Office**
124 Seymour Street
Kamloops, BC

**TNRD Library**
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