

# **AYA GOLD & SILVER ZGOUNDER SILVER MINE, MOROCCO**

**Environmental and Social Audit and  
Assessment  
Non-Technical Summary**

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## ABBREVIATIONS

c.	Circa (approximately)
ESA	Environmental and Social Assessment
ESAP	Environmental and Social Action Plan
ESIA	Environmental and Social Impact Assessment
GHG	Green House Gas
H&S	Health and Safety
NTS	Non-Technical Summary
ONEE	Office National de l'Electricité et de l'Eau
ONHYM	Office National des Hydrocarbures et des Mines
RoM	Run-of-Mine
SEP	Stakeholder Engagement Plan
TSF	Tailings Storage Facility
ZMSM	Zgounder Millennium Silver Mining

## UNITS

km	Kilometers
kV	Kilovolts
m	Meters
m	Meters above mean sea level
amsl	
tpd	Tonnes per day
%	Percentage

# 1 Introduction

This document is a Non-Technical Summary (NTS) of the environmental and social assessment of the Zgounder Silver Mine in Morocco (the Project). It provides a succinct description of the Project, information on the project background, a description to the ESIA process undertaken, a summary of the benefits, potential adverse impacts and mitigation and management measures.

## 2 Project Description

### 2.1 The Project

The Project comprises the expansion of the existing mine by increasing the mine's processing capacity from 700 to 2,700 tonnes per day (tpd). The mine life is expected to be 10 years (starting from 2024). Ongoing exploration of new areas within Aya's exploration permit areas could however extend this.

### 2.2 Project Proponent

Zgounder Silver Mine is an operating silver mine owned by Canadian company Aya Gold & Silver Inc. (85%) and by the 'Office National des Hydrocarbures et des Mines' (ONHYM) (15%), a Moroccan state institution. On September 12, 2022, Aya announced it had purchased ONHYM's 15% to become 100% owner of the Project. This transaction is expected to close before the end of 2022. The operator of the Mine is the local company Zgounder Millennium Silver Mining SA (ZMSM).

### 2.3 Project Location

The mine is located in the central Anti-Atlas mountains, in the communes of Askaoun (mainly) and Taouyalte, in the province of Taroudant, within the Souss-Massa region (central Morocco). The coastal town of Agadir, located c. 260 km east of the mine, is the capital of the region. A 92-km, 60 kV transmission line is to be built from the mine site to the Igli Sidi Hmed substation in Igli, a small town and rural commune in Taroudant Province.

### 2.4 Main Project Components

The main project components comprise (Figure 1 and Figure 2):

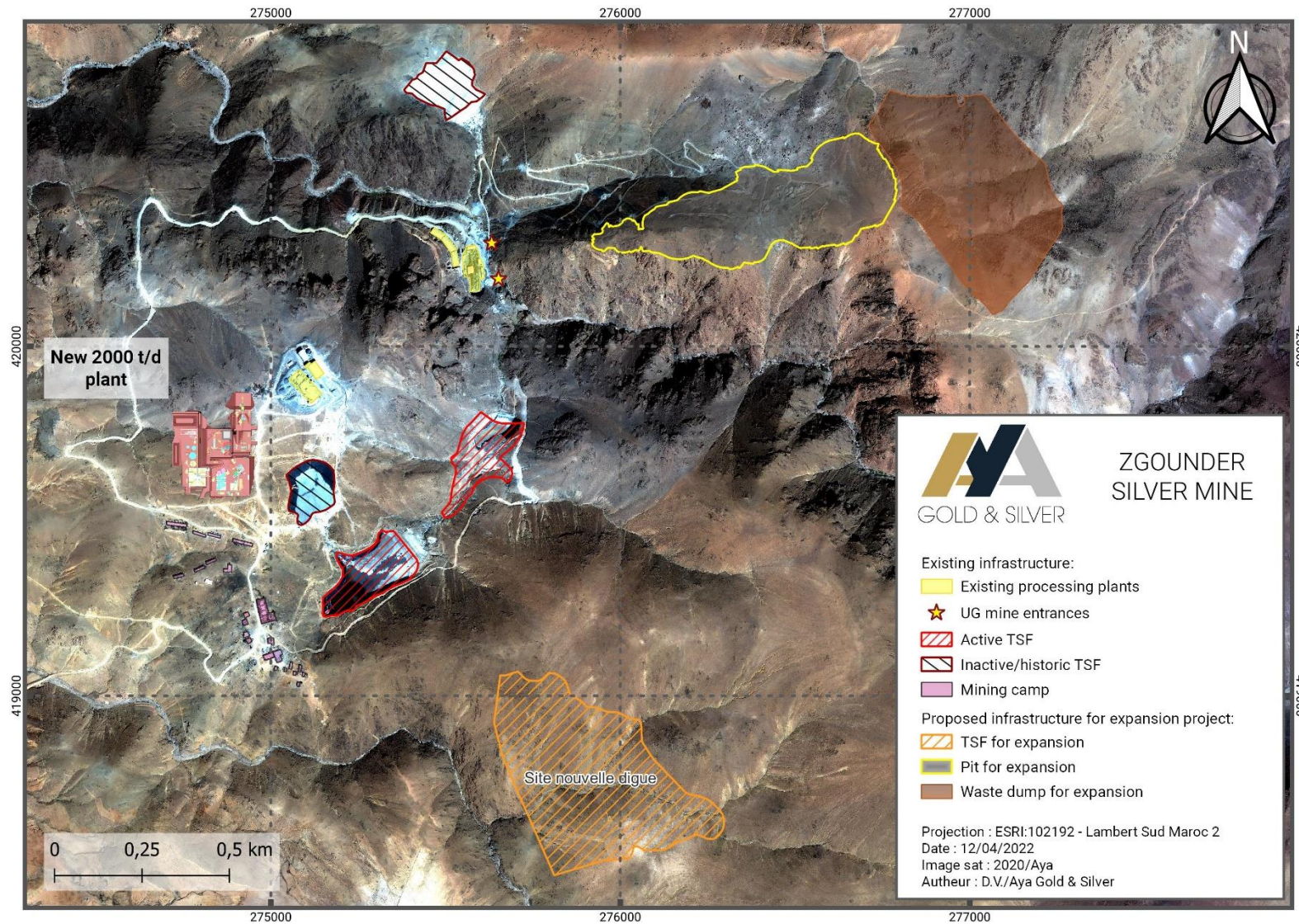
- open pit mine and associated waste rock dump,
- new processing plant,
- new Tailings Storage Facility (TSF),
- Upgrading of various other support facilities,
- 60kV 92 km transmission line.

### 2.5 Key Aspects of the Project

The key aspects of the Project can be summarised as outlined below.

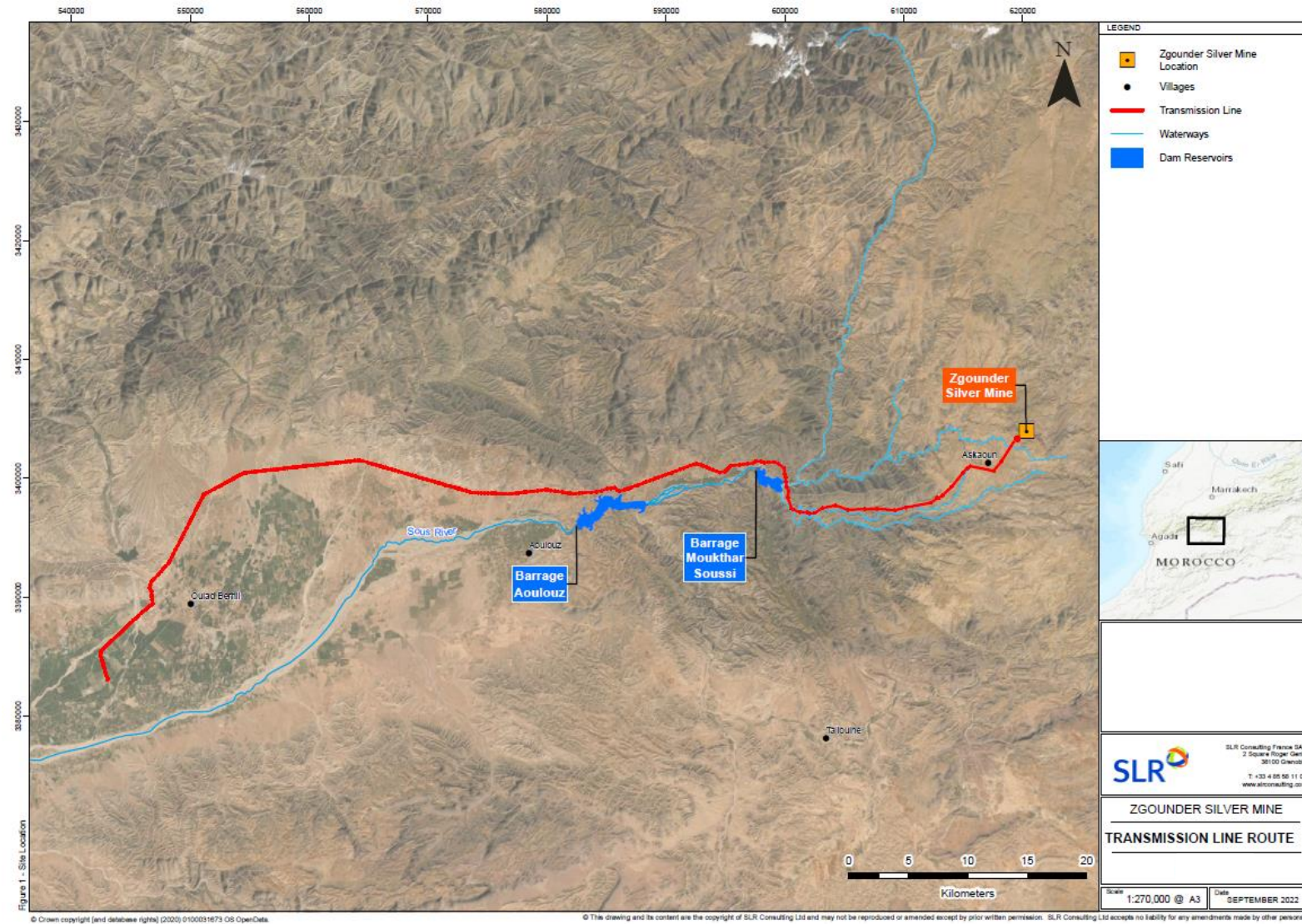
- Parts of the expansion will take place within brownfield sites (such as the plant and parts of the open pit), while others will occupy new footprint areas (such as parts of the open pit, waste rock dump, and TSF), all within Aya's existing mining license area.
- The new transmission line will be connected to the national grid managed by Office National de L'Électricité et de l'Eau Potable (ONEE).
- Open pit mining will be developed at the top of the Zgounder Mountain, with underground mining continuing in parallel. Waste rock material (i.e. non ore bearing material) will be dumped in a valley adjacent to the open pit area. The open pit once mined out, and the waste dump will remain in perpetuity with safety measures put in place.
- While the existing cyanidation plant and flotation plant will continue to operate, elements of the existing plants will be decommissioned once the new state-of-the-art plant is constructed and in operation. This will also include the decommissioning and rehabilitation of the four existing tailings facilities once the new tailings facility, aligned with international design practises, is commissioned. Some of the tailings from the existing facilities would be used to backfill areas of the underground mine.
- Silver concentrate will no longer be produced as a final product for transport off-site. All silver bearing ore will be processed into silver ingots (silver bars). While traffic will increase during the construction, the overall amount will decrease during operations by producing ingots instead of concentrate. The silver ingots would be transported to the Casablanca Airport for export, as is currently done with ingots.
- A new water supply system is being planned to address the Project's need for additional water. The additional supply will be sourced from the Zgounder River (rainfall and snowmelt water), upstream of the mine. This will supplement the mine's existing water supply from the Macoste and Agdal natural springs.
- In 2021 the total number of direct employees was 257 and the total number of contractors was 262. The 2022 Project ESIA notes an additional workforce of 500 people during construction and a total workforce of 600 people during operation (for the continuous operation of the three plants, open pit and underground mining). It is understood that the construction contractor would seek accommodation in nearby villages to accommodate its workforce. This would be similar for the operations phase.





**Figure 1: Existing and Planned Infrastructure at Zgounder Silver Mine**





**Figure 2: Approximate route of the Planned Transmission Line (final placement of tower locations may influence the final routing)**

## 3 Background

### 3.1 Project History and Rationale for the Project

The existing mine dates back to the 11<sup>th</sup> Century. The mine has remained dormant since 1989 and reopened in 2013. Commercial production of the flotation plant was declared in 2019 with the commissioning of the existing flotation plant. New management was appointed in 2020 with the aim of improving the production and operation of the mine. The Project caters for an expansion and upgrade of the mine to meet this objective.

### 3.2 Environmental and Social Context

The mine is located in a relatively remote area in the central Anti-Atlas mountain (central Morocco). The Anti-Atlas Mountain range is characterised by a semi-arid climate, with cool to cold winters (with snowfall), and hot to very hot and mostly dry summers. Rainfall occurs as heavy rainfall events, mainly during winter. Winds from the South-East are common at moderate wind speed.

The mine lies at an altitude of c. 2,100 m and slopes gently to the south west. Access to the underground mine and the existing cyanidation plant sit at an altitude of c. 2,000 m, with the top of the Zgounder Mountain at an altitude of c. 2,200 m. Igli, where the new transmission line will come from lies at an altitude of c. 390 m.

Surface water flow is to the west along the Zgounder (or Achkouchi) Assif and Aoulouz wadi. Both wadis drain into the Souss River basin. The Souss is the most important wadi of the hydraulic basin. In the upper reaches where the mine is located, the Zgounder river valley is rocky and steep. Some of its tributaries however have gentler side slopes.

Land uses include areas occupied by villages (mainly concentrated along the wadis), farming areas near villages, and the natural environment. Apart from the Zgounder Silver Mine, no other known planned or existing developments exist. Some tourism is suspected to exist.

In terms of distribution of flora and fauna, the mine area at c. 2000m asl is mainly dominated by a sparse cover of grasses and short woody plants (modified through grazing practises). At a lower altitude than the mine site, surrounding the area of the Barrage Moukhtar Soussi (c. 30 km downstream), forest is still present, and likely to comprise a *Juniperus-Quercus* assemblage. On the Souss plain, the highly intensified farming system has resulted in an open landscape where natural plantations (argan, oleaster, shrubs on the edge, etc.) mix with crops and planted trees. Natural vegetation in the Project area is found mainly along the banks of the Souss wadi and its tributaries. The most significant plant species endemic to the region is the argan tree (*Argania spinosa*), which is the key species of the Biosphere Reserve De l'Arganerie, located to the west of the mine site, and crossed by the proposed powerline.

The nearest settlements to the mine are between 1.3 and 2.7 km and include the villages (douars) of Tital, Miyal, Ait Hammi, Aoulousse and Tamaloute and the town of Askaoun. Villagers use land in the area surrounding the mine for grazing of livestock. Economic activities seem to be mainly derived from the land with some small commerce taking place.



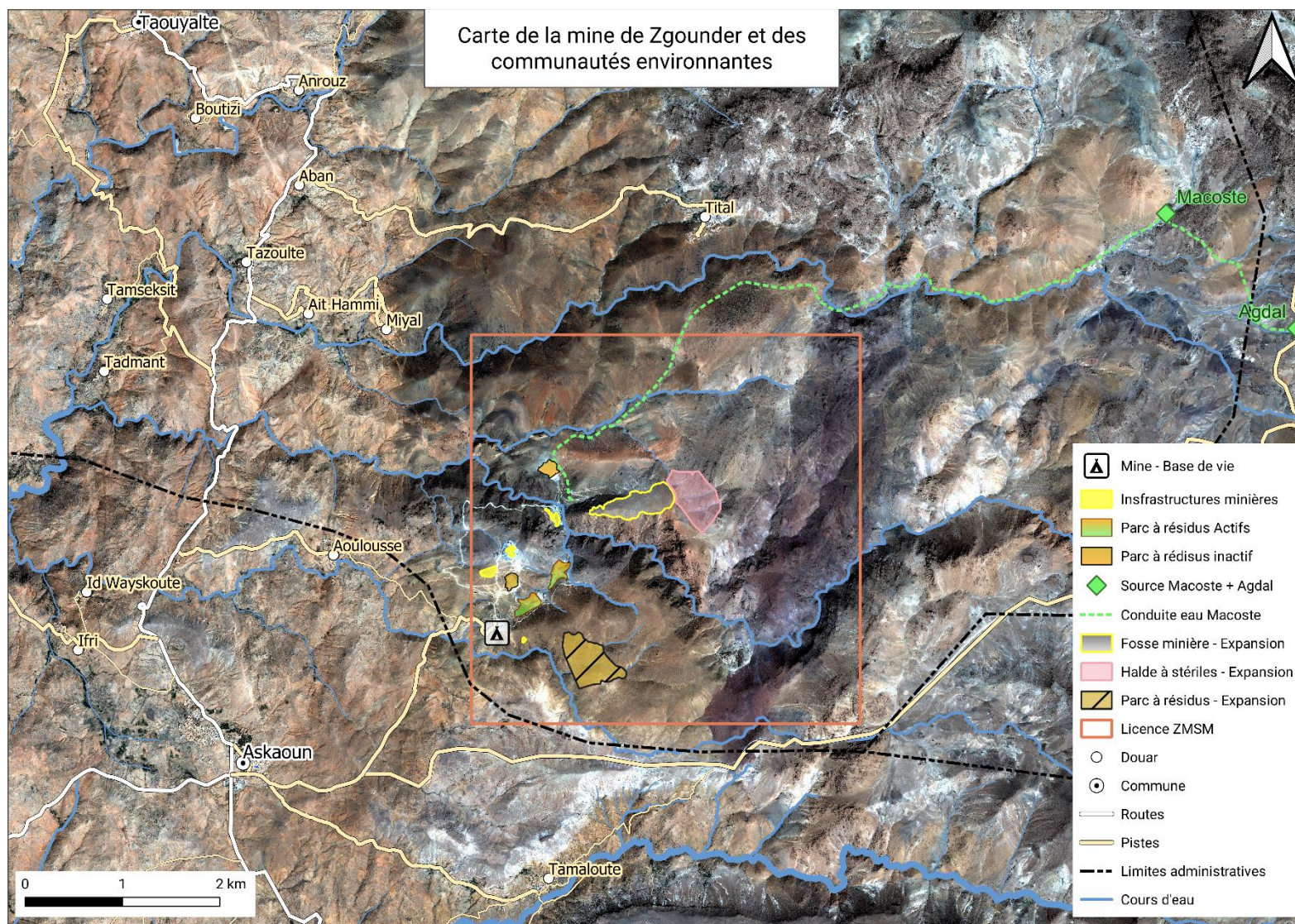


Figure 3: Environmental and Social Setting of the Zgounder Silver Mine and Expansion Project



### 3.3 Project Planning

Construction activities started in 2022, with elements of the Project still under detailed engineering. Commissioning of the new plant is expected in 2024.

## 4 ESIA

### 4.1 ESIA Process

An ESIA has been prepared for the Project (excluding the transmission line) by Novec in 2021 with an environmental permit issued in February 2022. The environmental approval is valid on condition that the conclusions of the impact study are complied with including the terms of reference attached to the decision, and that the project be completed with five years from the date of obtaining the approval. The expansion of the mine falls within Aya's existing mining license.

### 4.2 Public Consultation and Disclosure

In line with Moroccan legislation, a Public Enquiry carried out in October 2021 (over a 20-day period) made the results of the ESIA available to communities by making the reports available at the affected communes (via local authorities at the *caïd* office). No meetings took place. The most relevant issues raised by communities and line ministries' departments include:

- Surface and ground water pollution;
- Health risks for livestock due to water pollution;
- Depleting of natural resources; and
- Land rights and delimitation.

Additionally, a Stakeholder Engagement Plan (SEP) for the Project has been prepared and the Project will conduct stakeholder engagement. The Non-Technical Summary and the SEP are available on the Project web site at this link <https://ayagoldsilver.com/corporate-governance/>

## 5 Summary of Environmental Benefits, Potential Adverse Impacts, Mitigation and Management Measures

### 5.1 Green House Gas Emissions

GHG emissions have been calculated for the current operations and are available on the Project website. As a Power Purchase Agreement has now been signed to supply renewable energy from 2024, the specific GHG emissions will be significantly lower. Opportunities for energy efficiency initiatives should be identified and built into the upgrading of the mining operations.

### 5.2 Water resources

Additional water is required for the Project which will mainly be sourced from the Zgounder River during the rainy season (from rainfall and snowmelt) and stored in water basins. In addition, to keep the mine

workings safe, any water that enters the open pit (during rainfall) or underground mine (from the surrounding underground water aquifer) will be pumped and re-used within the mine's water circuit. This abstraction and dewatering by the mine may affect groundwater levels and downstream water users. Information on downstream water users (surface- and groundwater) is being collected by Aya as part of a complementary social baseline study. This data will be used to assess the likelihood of the mine's activities affecting downstream users. While no information on community water consumption is available, it is expected that pressure from human activities over water is significant in the area due to its scarcity and the importance of agriculture and livestock breeding activities. Potential risks will be minimised by implementing measures related to (i) maximising water reuse to minimise supply needs, (ii) maximising existing water supply sources through maintenance of the water supply system, (iv) water loss compensations (if needed) and (v) grievance management.

Contamination of surface- and groundwater through seepage from pollution sources, accidental spills may occur as a result of the Project. Silver mineralisation occurs in association with lead, zinc, arsenic and mercury. Studies conducted for the Project suggest a low or non-acid generating potential which is being confirmed by Aya through additional test work. Mining operations also typically generate water that can contain high concentrations of metals and salts. Strict controls to ensure contaminated water does not enter the surface or groundwater systems is needed for the Project. One of these controls is to build the new tailings facility according to global industry standards. Potential risks will be minimised by implementing measures related to (i) pollution prevention and control, (ii) wastewater treatment, (iii) hazardous substance and waste management, (iv) quick response to incidents and (v) staff training. Surface and ground water quality monitoring will continue to be carried out to ensure the effectiveness of these measures.

Risks associated with the powerline are expected to be limited as tower placement can be done to avoid or minimise impacts to water resources.

## 5.3 Biodiversity Conservation

The mine site is located on a mountain plateau and in spring is likely to have a flush of green plants, with grasses, short woody shrubs and annual bulb flowering plants potentially present. As the altitude decreases towards the Souss river valley sparse forests, with pistachio and walnut, characteristic of the area are present. As soon as the ground levels, and water is available manmade fields with irrigation are the norm. In these areas, the only remaining natural vegetation is adjacent to the water sources. Within farmed areas, argan, olive and almond trees can be found; ornamental plants may also be found here.

While habitat loss will occur, the importance of the habitats is likely to be low. A high-level critical habitat assessment was undertaken for the Project. The assessment noted five plants species as being potential critical habitat and Priority Biodiversity Feature (PBF) triggers. Three bird species may be present along the transmission line route. Further surveys will be undertaken to confirm the presence of the plant and bird species. For all plant species but the argon tree, the plants are seasonal. No argan trees occur at the mine site. While argan trees occur along the transmission line route, placement of tower locations can be done to avoid disturbance to this tree species.

Due to the presence or likely presence of vulnerable bird species in the Barrage Moukhtar Soussi, the reservoir (following further confirmatory surveys) will likely qualify as a PBF. The Reservoir will not be directly affected by the project; however, is hydrologically linked (30km) to the mine site.

Ecosystem services related to harvesting of natural resources for use by communities, collecting bulbs or herbs for culinary or medicinal uses and reliance on seasonal flows within the wadis by downstream land users for water supply and irrigation are likely to exist in the area. Other services such as regulating services and cultural services are expected to occur to some extent within the area.

At both the mine site and along the transmission line route, disturbance to biodiversity may arise from water contamination, sedimentation, dust fallout, noise emissions, lighting and road kills. The most significant impact is expected to be the risk to the aquatic environment from pollution events at the mine site (see discussion above on water contamination).

Impacts on biodiversity will be minimised by implementing measures focused on (i) limiting surface disturbance, (ii) lighting design to avoid attracting invertebrates, (iii) zero tolerance for biodiversity harm, (iv) speed control, (v) staff training and awareness, (vi) revegetation trials and (vii) rehabilitation planning. For the transmission line, tree cutting will be limited as much as possible through design of the route. Where tree cutting is needed, this will be done for safety reasons only. The transmission line will be equipped with bird deterrent measures. Biodiversity monitoring will be carried out to ensure the effectiveness of these measures.

## 5.4 Soil disturbance and contamination

Soils at the mine site are shallow soils on limestone crust. Once disturbed, the soils become prone to erosion and instability issues. The type of soils along the powerline route are not known but are likely to vary from soils similar to those found at the mine to deeper, more structured soils with higher agricultural potential. The loss of soils with higher agricultural potential along the transmission line route can be avoided through the placement of tower locations. Potential risks will be minimised by implementing measures related to (i) limiting the Project's footprint to what is absolutely necessary, (ii) slope stabilisation and erosion control, and (iii) energy dissipation at water discharge points.

Contamination of soils through accidental spills or discharges (including seepage) from the use and handling of fuels, lubricants, other potential contaminants and poor waste management could result in a permanent loss of soil resources. Soils are noted to have an overall coarse texture with implications for having a potentially high infiltration rate (a risk to any type of pollution) affecting surface- and groundwater resources. Impacts on soil also have the potential to impact ecological systems. The nature of the soils at the mine site will also influence the rehabilitation of the mine and the rehabilitation objectives that can be met. This impact will be minimised by implementing measures focused on (i) facility design to prevent and control pollution, (ii) waste and hazardous substance management, (iii) soil bioremediation, (iv) wastewater treatment to EU limits prior to discharge, (v) quick response to spill incidents management and (vi) staff training. Visual inspections and soil quality monitoring will be carried out to ensure the effectiveness of these measures.



## 5.5 Air Quality

Fugitive emissions from mining activities and gaseous emissions from refining may pose a risk to air quality. As the construction of a state-of-the-art plant will significantly reduce emissions from the refining process the more significant source of impacts is expected to be the continuous activities at the open pit (blasting, exposed areas, material handling, hauling). These are likely to materially increase air emissions from the mine and result in impacts outside of the mine's fence. The inhalable components of particulates (and associated metals) can cause human health impacts at high concentrations over extended periods, while the larger particulate component can cause animal and plant health impacts. Further studies will be completed by Aya to quantify the potential risk from its activities on the nearest receptors. Nuisance dust can also be expected throughout the Project's cycle, but this impact will be intermittent and of short duration. Negative impacts on air quality will be minimised by implementing measures focused on (i) air emission reduction system designed to comply with emission limits, (ii) road surfacing and maintenance, (iii) dust suppression, (iv) maintenance of equipment and machinery and (v) community awareness and grievance management. A meteorological station is maintained at site and emissions will be monitored at site and at receptors to ensure the effectiveness of these measures.

## 5.6 Noise and Vibration

Noise from the construction of the powerline is expected to be transitory and of low significance. For the mine, the most significant noise source is expected to be the open pit and hauling of run of mill (RoM) between the mine and new processing plant. Given the 24-hour operation of the site, it is expected that the night-time impact will present the greatest impact. Further studies will be completed by Aya to quantify the potential risk from its activities on the nearest receptors. The risk of increased noise will be minimised by implementing measures related to (i) low-noise equipment, (ii) facility design including enclosures and barriers, (iii) road surfacing and maintenance, (iv) optimised circulation plan minimising the need for reverse hooters, (v) scheduling noisy activities for day-time hours and (vi) community awareness and grievance management. Noise will be monitored on site and at receptors to ensure the effectiveness of these measures.

Blasting impacts on third-party structures are expected to be negligible provided correct blast design processes are followed. Monitoring of blasts at the start of the open-pit operations will provide a baseline to manage complaints about real or perceived impacts, should they arise.

## 5.7 Landscape and visual resource

The landscape is rural in nature, with sparse vegetation on rocky areas. More lush vegetation is associated with the wadis, where villages and related farming practises are located. The visibility of the mine is mostly shielded by its location within valley areas. Elements of the mine which are visible to the surrounding areas are those located on ridges or on the side slopes facing villages. The development of the open pit at the top of the Zgounder Mountain will introduce a noticeable change in the landscape. Impacts on the landscape will be minimised by implementing measures related to (i) limiting surface disturbance, (ii) integrating facilities into the landscape, (iii) screening of facilities as needed, and (iv) concurrent rehabilitation as far as possible.

## **5.8 Cumulative Impacts**

Cumulative impacts are considered to potentially occur where there is a temporal and spatial overlap of alteration of the receiving environment from the Project activities with operational impacts from existing activities. The Project will incrementally contribute to impacts from the existing mining operations given that the nature of the Project is similar to that of the existing operations. No other known existing/planned developments occur within proximity to the mine. Cumulative impacts along the transmission line route are expected to be limited as most impacts are transitory in nature and of short duration (except for the tower footprints).

## **6 Summary of Social Benefits, Potential Adverse Impacts, Mitigation and Management Measures**

### **6.1 Economic and Social Benefits**

The main benefits of the Project are (i) increased employment opportunities and related increases in employee spending power, (ii) economic stimulation through contributions to the Moroccan tax system and procurement of services, (iii) contribution to local economic development and (iv) skills development for employees and contractors. Measures to enhance benefits from the Project will focus on (i) local employment and procurement as far as possible, (ii) implementations of a skills development programme, (iii) development and implementation of worker and contractor health programmes, (iv) local development, (v) early closure planning and (vi) grievance management. Contributions to society and the profile of employees and contractors will be regularly monitored to ensure the effectiveness of mitigation measures.

### **6.2 Contractor Management**

The construction of the main project components will be undertaken by contractor(s). Contractors are also used for the operation of the mine. A prequalification questionnaire for contractors is systematically used for all tender processes. The contractors will seek accommodation in nearby villages. Management of contractors will be undertaken by Aya to manage social risks.

### **6.3 Worker Health and Safety**

Workers are exposed to worksite hazards which have the potential to cause temporary harm, permanent injury or fatality. These include typical worksite hazards such as noise, fire, electrical, extreme temperature, confined spaces, working at height, rotating machinery, sanitation and hygiene, and communicable diseases. During operation, the hazards present are expected to include many of the types of hazards present for the construction phase, but as the nature of the work will be different, the level of risk for the workers will be different. However, other type of hazards will be present (handling toxic and corrosive chemical substances, chronic exposure to toxic gases and vapours, working in proximity to open water or tailings vessels, risk of process deviation leading to an accident – causing fire, explosion and release of toxic gases). Aya is in the process of further developing its health and safety (H&S) management system to mitigate risks to its employees and contractors. In addition, potential risks will be minimised by implementing measures related to (i) safety controls on equipment

and facilities, (ii) accident management, (iii) staff and contractor training, (iv) emergency preparedness and response and (v) employee and contractor grievance management. H&S inspections and audits of the H&S management system will be carried out to ensure the effectiveness of this measure.

## 6.4 Community Health and Safety

The main community health and safety impacts are those associated with external labour influx, blasting operations (where land is used close to the open pit operations), exposure to contaminants (air emissions, noise, water) and increased traffic. With the introduction of large heavy vehicles during the construction phase, road safety incidents are expected to occur due to the poor conditions of the roads (often dirt roads) and the grazing livestock in the area. Ramping up of activities at the mine site due to construction of the Project will increase the exposure of receptors to potential impacts. Risks to community health and safety will be minimised by implementing measures related to (i) site security and access control, (ii) labour influx management, (iii) blast design and management (for the open pit), (iv) staff training on emergencies and hazards, (v) community awareness, (vi) closure planning, (vii) emergency response and preparedness and (viii) grievances management. To ensure the effectiveness of this measure, the Project will monitor labour numbers and contractor facilities, blasts from the open pit, and H&S indicators at receptor level.

## 6.5 Local Livelihoods

Since the Project falls within the existing mine footprint no additional land take is needed. The surface directly impacted by the transmission line right of way and the land take needs are still to be established. A complementary social baseline study is currently being conducted by Aya to inform this. It is however expected that no physical displacement will be required.

The number of people affected by economic displacement has not yet been confirmed; ongoing studies are being undertaken by Aya to inform this. It is however expected that at the mine site the Project is likely to cause a permanent restriction on grazing land previously used by shepherders. Along the transmission line, if livestock grazing occurs in the area, the impact will be temporary and during the construction phase. During operations there will be no limit to access the right of way outside the pylon locations.

A Land Acquisition and Livelihoods Restoration plan will be developed by Aya. The complementary social baseline study will be used to establish livelihood restoration measures. The implementation of livelihood restoration activities will be monitored by Aya.

## 6.6 Cultural Heritage

There is no evidence of any cultural heritage elements (archaeological and/or of local value for the local communities) at the mine site. While it is likely that this is also the case for the Expansion Project footprint and transmission line, this needs to be confirmed as part of the complementary social baseline study. It is however expected that intangible cultural heritage is present due to mining in the area dating back to the 11<sup>th</sup> Century. Other intangible cultural heritage elements may also exist. A Chance Find Procedure will be implemented to minimise the risk of affecting cultural heritage.

## **7 Communications**

The process to manage external communications and grievances is outlined in the Stakeholder Engagement Plan that is available on the Aya website.