March 2017

## ILOVICA - SHTUKA PROJECT

# Environmental and Social Impact Assessment

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REPORT

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# Ilovica-Shtuka Environmental and Social Impact Assessment Non-Technical Summary

This document is the non-technical summary of the Environmental and Social Impact Assessment (the ESIA) for the Ilovica – Shtuka Project (the Project). It describes the main features of the Project, presents the current environmental and social conditions in the area and discusses the potential environmental and social impacts associated with the Project. Mitigation, management and benefit enhancement measures to avoid and minimise adverse impacts and maximise positive impacts are then presented.

## Background

The Ilovica – Shtuka Project (the Project) is a proposed copper and gold mine with supporting facilities. The location of the proposed mine is within the Municipalities of Bosilovo and Novo Selo in south-eastern Macedonia (Figure 1). The mine is situated approximately 130 km southeast of Skopje and 18 km east of Strumica. The region is characterised by forested hills up to 1,400 m with the broad valley of the Strumica and Turija rivers to the south of the site. The surrounding land area is sufficient to support the proposed mining operations and facilities and the site is well connected to services and markets by paved roads. The Project will cover an area of approximately 500 hectares (ha) within a concession area of approximately 1,500 ha.

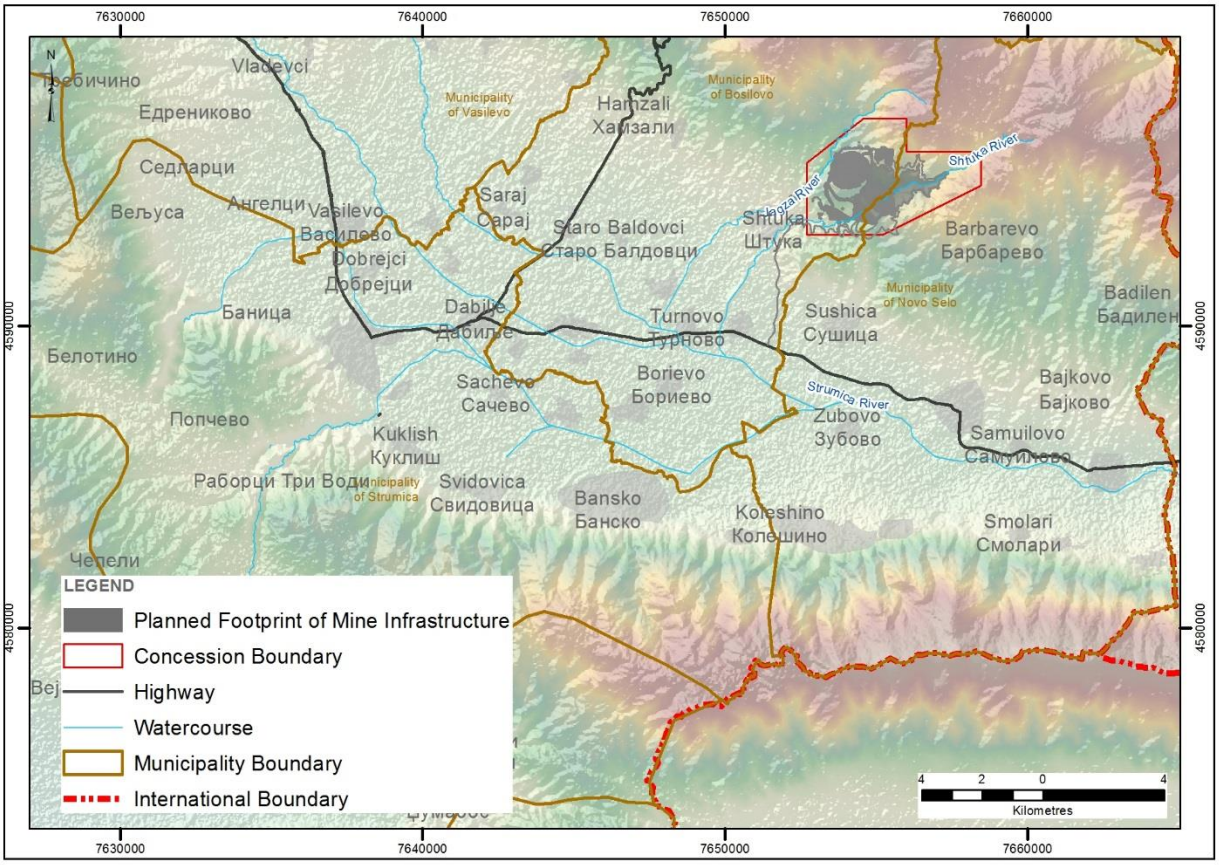


*Figure 1: Regional setting of the Ilovica Shtuka Project and concession area*

The Project will include an open pit mine, areas of ancillary facilities and warehouses and a tailings management facility (TMF) into which mine waste will be deposited. The mine will operate as an open pit, from which the ore will be extracted and crushed, then transported by a conveyor to the processing plant. The crushed ore will undergo flotation to remove the copper- and gold-bearing minerals. Leaching in a series of

tanks will be used to extract gold from a portion of the rest of the ore. The gold leachate will be processed on-site to produce doré bars.

The copper concentrate will be transported from the site in trucks to an existing smelter in Bulgaria. An access road will be constructed to connect the site to the main road.

Construction of the Ilovica-Shtuka Project is expected to take 18 months - 2 years. Construction is scheduled to commence in 2017/2018, subject to financing, and production will continue for 20 years.

Total construction workforce requirements are estimated at about 1,200 Full Time Equivalents (FTE). During operations the average number of FTEs will be approximately 487 per annum. In addition there will be indirect employment opportunities through local contractors and sub-contractors.

The Project will contribute to the local economy through its policy of seeking to maximise the procurement of goods and services from local suppliers through transparent and equitable purchasing procedures. These purchases affect the creation and development of local businesses that provide relevant products, inputs, and services to the Project.

A state royalty will be paid which has been estimated to be approximately US$3.6 million per annum at full production from the mine. According to the Minerals Law, royalties will be distributed between the national government (receiving 22% of the royalty) and the municipalities in which the concession activity is performed (receiving 78% of the royalty). As a result, the Municipalities of Bosilovo and Novo Selo will both have significant economic injections to their budgets: the Project will contribute approximately US$72 million over the life of mine, with approximately US$56 million to the municipalities.

## Legal and permitting

Early geological exploration of the Ilovica resource was carried out by the Macedonian Bureau of Geology in 1973. An Environmental Impact Assessment (EIA) was approved for a smaller concession area by the Macedonian Government in November 2011 based on a Conceptual Study.

Subsequently, the exploration licence for the two concession areas (Ilovica village locality concession area, Municipality of Bosilovo; and Ilovica locality concession area, Municipality of Bosilovo and Municipality of Novo Selo) transferred to Euromax Resources DOO Skopje, who have conducted further geological, engineering and environmental studies between 2013 and 2015.

In April 2016 a nationally compliant EIA was undertaken in accordance with the requirements of the Law on the Environment and all relevant secondary regulation. The Project Description assessed in the Macedonian EIA was based on a draft of the NI 43-101 Feasibility Study Technical Report dated 2 October 2015. At the time of writing no written feedback has been received from the Macedonian EIA review process, however stakeholder engagement activities completed by Golder throughout the Macedonian EIA process and feedback provided during the Public Enquiry has been incorporated and responded to within this (internationally compliant) ESIA.

***Shtuka Valley***

## Stakeholder Engagement and Information Disclosure

Stakeholder engagement is important to gain an understanding of how the Project will affect stakeholders and to gather their ideas on how the impacts should be mitigated and managed. Feedback from stakeholders provides an important input to project design. Stakeholder engagement also provides an early opportunity for stakeholders to become informed about planned Project activities and the process followed to refine the project design to maximise benefits while minimising adverse impacts.

Stakeholders include national and municipal government (who are interested and affected parties by virtue of their roles in the approval process, as well as their responsibilities for populations under their jurisdiction) and people living in the communities of Ilovica, Shtuka and Strumica due to their proximity to the Project site and their higher potential to benefit from the Project and be affected by any environmental changes. Other communities may also experience effects (e.g. visual, noise, traffic).

The results of stakeholder engagement for the ESIA showed that people are generally supportive of the Project and would like to see it move ahead for the economic and employment benefits that it will bring to the region and Macedonia as a whole. A lack of employment opportunity was cited in many discussions as being a primary cause for the out-migration of young, educated people from the southeastern region to the EU to pursue employment. While being generally supportive, a number of concerns and questions were raised regarding environmental and social effects of the Project. Aside from employment opportunities, the most common questions related to:

- **Impacts to water:** Stakeholders are concerned that mining activities will result in negative impacts to water quality and availability, with surface water and groundwater currently being used for human consumption and irrigation of gardens and agriculture.
- **Noise and vibration:** Noise generated by mining activity and heavy transport can be a disturbance, while some stakeholders are concerned that vibration associated with blasting and other activities could cause damage to houses.
- **Soil and agriculture:** There is concern that mining activity will result in air pollution and that this could impact upon soils, reducing agricultural productivity.
- **Perceptions of harm:** People are concerned that having a mine so close to farmland will have a negative effect on sales of agricultural products.

The results of stakeholder engagement activities were provided to the ESIA team so that the issues and questions could be addressed in the appropriate section of the ESIA. Each section of the ESIA lists the relevant environmental and/or social issues that were raised during consultations and how they have been addressed through the impact assessment process.

## Information Disclosure

This non-technical summary has been prepared for the purposes of information disclosure and to enable a wide range of stakeholders to participate in the decision-making process. More detailed information is available in the ESIA.

Information disclosure has been conducted in accordance with the requirements of the Macedonian Law on the Environment, in line with international good practice and IFC Performance Standard 1 (2012). This non-technical summary and the ESIA are available in the Sustainability section of the Euromax Resources website: **http://www.euromaxresources.com/**

***View towards Ilovica and the Project location from the Strumica Valley***

## Project Design and Consideration of Alternatives

The design of the Ilovica - Shtuka Project has been refined over a number of years as the result of studies on the engineering feasibility and the potential environmental and social impacts of the Project. The engineering studies included a Preliminary Economic Assessment, various trade-off studies (tailings and waste rock, process plant location, process flowsheet), the Pre-Feasibility Study (PFS) and the Feasibility Study (FS).

These studies applied a number of criteria to determine the best project design, including:

- The health and safety of workers and residents in surrounding communities;
- The significance of potential social, health and environmental impacts and the ability to mitigate adverse impacts through evaluation of alternative options;
- The economic extraction and production of copper concentrate and gold to meet market specifications;
- Minimising the number of residents that would be disadvantaged economically and physically;
- The availability of infrastructure and labour, including the integration of local skills base;
- Compliance with all applicable laws and regulations in the Republic of Macedonia and the international standards which the Project is committed to meeting; and
- Cost-benefit analyses to enhance Project benefits to surrounding communities, workers, investors, and the Macedonian government (through tax revenue and social investment).

Project alternatives were examined throughout the development of the Ilovica-Shtuka Project, including the Preliminary Economic Assessment (PEA; TetraTech, 2012), various trade-off studies (TetraTech, 2013; AFW, 2015a, 2015b), the Pre-Feasibility Study (PFS; Euromax, 2014) and the Feasibility Study (FS; Euromax, 2015a), and some preliminary detailed design work.

The alternatives that have been considered during the project design included:

- Mine design and infrastructure;
- Logistics and transport;
- Water supply;
- Employee accommodation;
- Non-mining waste management;
- Closure alternatives; and
- The ‘No Project’ alternative.

### Project description for the Ilovica – Shtuka Project

The ESIA assesses the potential environmental and social impacts of the Ilovica - Shtuka Project based upon a design freeze on the preliminary design work established in November 2016 (layout shown in Figure 2).

The ESIA assesses impacts associated with three phases of the life of mine:

- Construction: an 18 to 24 month period during which mine facilities are constructed and the pit area is stripped in preparation for mining;
- Operations: a 20 year period of open pit mining, processing of the ore, production and export of copper concentrate and gold doré, and deposition of the tailings; and

- Closure: a 2 year period during which mining infrastructure is decommissioned and removed (where possible) and land is rehabilitated and revegetated.

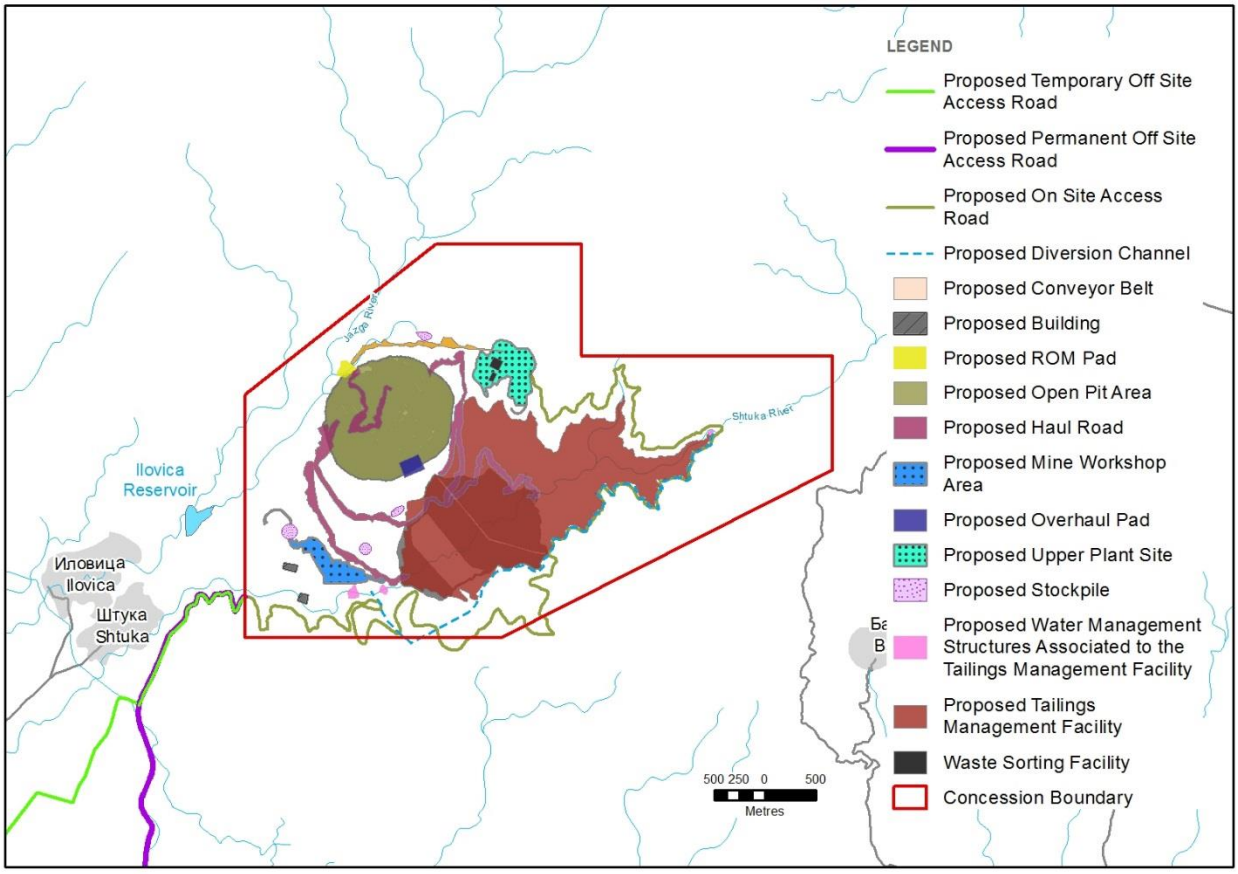


*Figure 2: Components of the Ilovica – Shtuka Project*

**Open Pit**

The proposed method of mining is by conventional open pit methods using drilling and blasting, loading with excavators and shovels, and hauling with rigid dump trucks. Ore will be deposited to the ROM pad for primary crushing and then transported to the process plant by conveyor.

During the construction phase, the open pit area will be stripped in preparation for mining. Stripping will involve blasting and earth moving to excavate covering materials, including waste rock which will be used in construction of the tailings management facility and in a buttress against the downstream face of the embankment. Any soils which can be stripped and recovered will be stockpiled for future use in rehabilitation and revegetation of the site. Around 2 to 3 blasts per week are anticipated during the construction phase.

During operations, the pit will operate 24 hours per day. Blasting will occur in the daytime only, with on average 1 blast per day. Prior notification of blasting will be provided to police and local authorities. Communities are usually notified of blasting by the municipalities or emergency response institutions, such as the Crisis Management Centre, via the media.

**Plant Site**

Following extraction from the open pit, the mined ore will be delivered to the primary crusher where it will be crushed and fed onto a conveyor which transports the crushed ore to the process plant (a distance of approximately 1.6 km). At the process plant, ore will be milled to smaller sizes before being fed into the flotation circuit. The flotation circuit consists of a number of processes which result in a copper concentrate. Another product of the flotation circuit is a solution ('cleaner scavenger tails') which is then fed into a carbon-in-leach

circuit, during which cyanide is added. This is then followed by cyanide destruction, elution and electrowinning to produce gold doré. Waste materials (tailings) are treated, and some of the water removed for reuse, prior to release to the tailings management facility.

The process plant is designed to process 10 million tonnes of ore per year. During mine operations, the process plant will operate 24 hours per day, with the exception of the crusher and conveyor which will only operate 16 hours per day.

**Tailings Management Facility**

The tailings management facility (TMF) will be a dam within the Shtuka Valley which is designed to contain the mine waste, which results from the processing of ore. The tailings in the facility will be contained along the northern, eastern and southern sides by the natural contours of the valley, and on the western side by the TMF wall.

Prior to construction of the TMF, vegetation clearance and site preparation will occur within the footprint of the starter embankment (a subsection of the TMF which is designed to hold tailings for the first years of operation). Any salvaged soils will be stockpiled for future use in rehabilitation and revegetation of the site. During construction, waste rock from the open pit area will be used to construct the TMF starter wall. The TMF embankment will be constructed using the downstream method and will be raised a number of times throughout the life of mine to a final height of 776 masl. The remainder of the footprint of the TMF will be cleared progressively as the tailings level rises.

Throughout the operations phase, approximately 7 million cubic metres ($Mm^3$) of tailings will be produced each year. Tailings will be gravity-fed or pumped from the plant to the TMF and deposited via pipeline and spigots. Surplus water from the TMF will be returned to the process plant where it will be reused.

At the end of operations, the TMF embankment will have a closure elevation of approximately 776 metres above sea level (masl) (approximately 2 m higher than the final tailings elevation). At closure, the TMF will have a surface area of approximately 191 Ha.

At the conclusion of mining, the TMF will be closed and revegetated. At closure, it will be necessary to construct a closure spillway for the TMF to enable rainfall run-off to spill from the TMF surface. The closure surface of the TMF will be shaped to direct water towards the south of the facility.

A Seepage Control Facility (SCF) will be constructed on the Shtuka River directly downstream of the TMF to capture seepage from the TMF and runoff from both the TMF embankment and waste rock butress during operations. The SCF is provided to mitigate the potential impact of seepage from the TMF on water quality in the Shtuka River.

A Storm Water Dam (SWD) will be constructed early in the construction phase on the Shtuka River downstream of the TMF and the SCF. The SWD will attenuate high flows and allow settlement of sediment-heavy runoff. Normal flows will be allowed to discharge through the porous dam of the SWD, to maintain ecological flows downstream, and high flows will be attenuated to ensure that flood risk is not increased downstream.

A diversion dam and diversion channel will be constructed to divert the Shtuka River around the TMF and discharge the flows downstream into the SWD.

**Other facilities**

The mining and administration complex will be located to the south of the pit. The mine workshop area will consist of buildings and workshops (offices, workshops, component stores, control room and gate houses and sewage treatment plants). There will be two sewage treatment plants: one at the plant site and one at the mine workshop.

Disposal of non-mineralised waste and general waste will be to a licenced facility off site. However, there will be a waste transition yard, storage facility and salvage yard on-site. Waste will be segregated and sorted at site and stored until sufficient quantities are available for removal to another facility.

A new off-site access road is planned to connect the Project to the existing M6 highway which runs between Strumica and the Bulgarian border. The new off-site access road will be developed in two stages (Figure 3). to serve mine construction and mine operations:

- The temporary off-site access road (shown in green), to be used during construction, is located along the eastern bank of the Shtuka river and through agricultural land.
- The permanent off site access road (shown in purple) will be a new paved road between the concession and the M-6 to a new junction between Serkirnik and Turnovo.

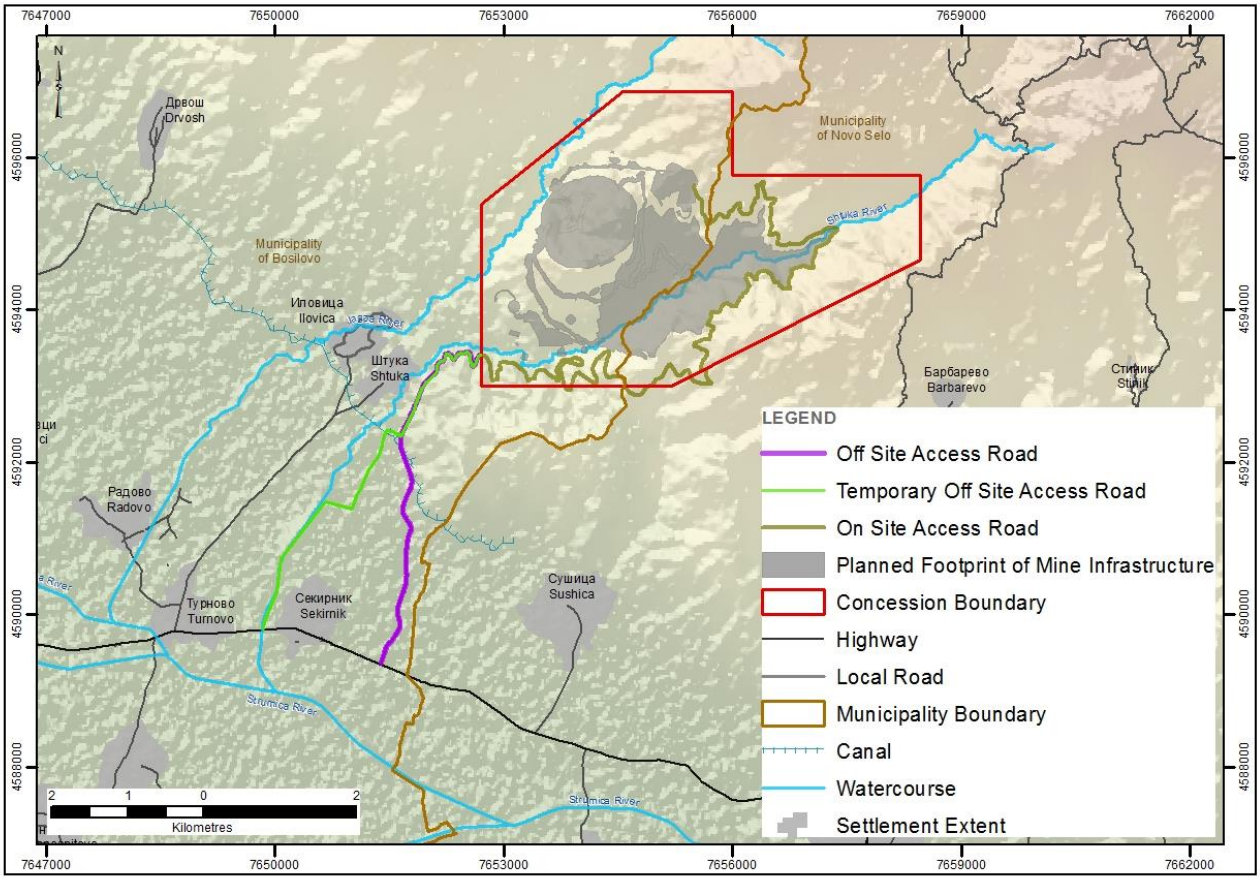


*Figure 3: Ilovica – Shtuka Project access roads*

Haul roads will be constructed from the pit to the TMF embankment and the mine workshop area. The roads will be 25 m wide and be surfaced with crushed aggregate. Haul roads will be in use 24 hours per day. The speed limit within the concession area is 50 km/h.

All surface water run-off from project infrastructure within the concession area will be diverted to sedimentation ponds, to meet Euromax's zero discharge policy for surface water.

Construction staff will be accommodated off-site at existing facilities (hotels or existing (commercial) buildings appropriately refurbished), most likely in Strumica.

During operations, all workers will live in nearby towns and villages with site visitors being accommodated in existing refurbished hotels or guest houses.

Temporary diesel generators will be used during construction until the Project is connected to the Macedonian high voltage (110kV) electricity transmission network (permanent power supply). Electricity for the operations phase (permanent power supply) will be provided via a 110 kV connection to the national high voltage transmission network owned and operated by the Macedonian transmission network operator MEPSO.

The permanent power supply connection comprises a new 110/10 kV substation at the plant site ("Ilovica-Shtuka substation"), a new 10.5 km overhead transmission line (OHL) from the Ilovica-Shtuka substation to the existing MEPSO Sushica substation ("Sushica OHTL"), and a new 27 km OHL from the Ilovica-Shtuka substation to the existing MEPSO Berovo substation ("Berovo OHL"). Construction of the Sushica OHTL is expected to be completed first being a shorter line, with Berovo OHL to follow within a few months due to longer permitting and construction timeframes. A separate EIA in accordance with the Macedonian legislation will be prepared to address permitting requirements for the construction of the Berovo overhead transmission line, and an Environmental Elaborate for the Sushica overhead transmission line.

**Water Supply**

Two major sources of water will supply the mine:

- Conserved on-site sources of water (reclaim from the TMF, including pumped water from the SCF; pit water; and treated wastewater); and
- External sources of fresh water (Ilovica Reservoir and Turija Reservoir).

The major potential source of water supply assessed in the ESIA is from the Turija Reservoir via a pipeline constructed to the Ilovica Reservoir. Water from Turija reservoir and other external sources will be pumped into Ilovica Reservoir in order to support Euromax's abstraction and maintain the reliability of water supplies of the other users. Euromax currently plans to use Ilovica Reservoir as a holding reservoir for water from Turija Reservoir. Water for mine supply will be pumped from Ilovica reservoir to the raw water storage facility at the process plant.

Euromax plans to share the reservoir with existing users – Strumichko Pole Water Management Company (SPWMC; which supplies irrigation water to Ilovica and Shtuka villages) and Ograźhden Public Utility Enterprise (PUE; which supplies seven villages in Bosilovo Municipality with treated water for domestic purposes).

**Transport**

The majority of construction personnel will be housed in Strumica or local villages. All construction personnel will be bussed from accommodation to site on a daily basis; 30 - 40 trips per day are estimated. The vast majority of operations personnel are expected to live in the surrounding areas with 24 – 28 (offsite) and 50 (onsite) bus trips anticipated on a daily basis.

During construction, between 152 and 190 trucks per month are expected to arrive at the site for the delivery of materials. In addition, throughout construction between 2 and 4 diesel fuel tankers per day and between 2 and 5 food delivery trucks per week are expected. Delivery of reagents and fuel will form a large portion of truck activity during operations, totalling between 136 and 180 vehicles per month.

Copper concentrate will be exported from site to the Bulgarian border (and on to the smelter in Bulgaria), with the haulage contractor expected to use 30 tonne articulated trucks with an estimated 210 to 270 trucks traveling each way per month.

**Capital and Operating Expenditures**

The total capital cost of Project construction is preliminarily estimated at between €425 and €450 million. The procurement of construction and mining equipment is expected to account for the majority of this expenditure. Labour, fuel and light vehicles will represent smaller, but still significant, capital costs during construction.

Operational expenditures are expected to be approximately €95 to €100 million per annum. Mine operation, including equipment and labour, will account for nearly a third (€30 million) of total annual operational expenditures. Reagents and power represent a further third (€36 million) of annual operational costs, while consumables, maintenance materials, equipment and laboratory costs are anticipated to cost €16 million.

**Employment**

During construction, peak workforce requirements will amount to about 1200 Full Time Equivalents (FTEs)[1], 1046 (87%) of which are expected to be filled by Macedonian workers. Approximately 55 managerial and technical construction FTEs will be filled by expatriates as needed.

Similarly, the majority of operations phase FTEs are expected to be filled by Macedonians (469 positions or 96% of total), with a small number (18) of managerial roles being filled by expatriates during early mining activities. Expatriate managers will gradually be replaced by local managers mentored and trained during the early years of Project operation.

[1] A Full Time Equivalent (FTE) is the hours worked by a full-time employee, and is calculated based on Macedonian labour conventions, which suggest an eight hour work day, with five days of work per week. This amounts to a FTE of 2,080 hours per annum.

# Existing Environmental Conditions

Environmental and social baseline data gathering was completed as part of the ESIA. Baseline data provides a characterisation of the existing environmental and social conditions. This characterisation provides a baseline from which the ESIA can be used to predict potential environmental and social changes as a result of the Project. The baseline also provides a benchmark against which any future changes can be monitored and managed.

Baseline data gathering for all technical areas except water commenced in October 2013 and was completed in September 2015. Water baseline data gathering extended to July 2016.

Local study areas (LSAs) and regional study areas (RSAs) were established for the baseline study. For the biological and physical disciplines, the areas are generally delineated based upon natural geographic boundaries (e.g. river catchments) or a polygon based upon a set radius from the site (e.g. 10 km from the centre of the site). For the socio-economic discipline, studies focussed on the communities which are most likely to feel the positive and adverse effects of the Project, namely the villages in the municipalities of Bosilovo and Novo Selo and the town of Strumica.

## Geology

The Ilovica copper-gold deposit is situated at the southern margin of a northwest-southeast striking Cenozoic magmatic arc, which covers part of central Romania, Serbia, Macedonia, southern Bulgaria, northern Greece and western Turkey. The deposit is situated on the northern border of the Strumica half-graben and Ograźhden granite massif, which is one of a number of Neogene-age sedimentary basins in Macedonia.

The Ilovica copper-gold deposit is one of several porphyry systems in eastern Macedonia and northern Greece. The Ilovica deposit sits within a mineralised section of a porphyry system, which is approximately 1.5 km in diameter. There is clear evidence of active faulting along the southern and western borders of the Strumica half-graben. Earthquakes have been reported in the northwest part of the Strumica half-graben.

## Geomorphology, Soils and Land Use Capability

The majority of the LSA is dominated by rugged low altitude mountains which contrast with the lowland agricultural zone of the Strumica valley. The highest summit in the LSA is Anovi at 878 masl (part of Mount Ograźhden); the lowest elevation is located in the southwest corner of the LSA along the Shtuka River at about 256 masl. Slope gradients on the mountains range from moderately steep (30% to 60%) to very steep (>60%). In lowland areas, slope gradients are mostly <15%.

The geomorphology of the LSA is dominated by complex colluvial deposits (soil, debris or rocks that have been moved by gravity) and weathered bedrock in the mountains and alluvial deposits (material that has been deposited by running water) in the lowland plains. Colluvial soils are well- to rapidly-drained soils on moderately steep to very steep slopes. Weathered bedrock is decomposed or disintegrated rock in situ, broken down by the process of mechanical and/or chemical weathering in the absence of downslope movement. Alluvial materials are associated with floodplains, terraces, fans and deltas. In the LSA, they are characterised by well- to poorly-drained, coarse- to medium-textured soils with rounded to sub-rounded coarse fragments.

The most common soil map units in the LSA are those derived from colluvial deposits. These soils are located in the highland zone (mountainous regions) and are characterised by moderately well to rapidly drained soils of variable texture and coarse fragment contents (primarily angular to subangular). These soils developed on high relief (i.e., moderately steep to very steep) slopes, dominated by Regosols and Cambisols, occupying about 50% of the total LSA (about 64% of the highland zone).

The LSA is prone to geohazards due to the mountainous landscape, intense rainfalls, aridity and highly erodible soils. Geohazards can include mass movements (e.g. landslides, debris flows, mudslides, rockfalls),

liquefaction, or seismic events (i.e. earthquakes). The Project is in an area of increased seismic hazard and this has been taken into account in the design of structures and facilities. The majority of mass movement features in the LSA were recorded as inactive (not recently moving) and relic (historical) landslides.

## Climate

Key meteorological parameters were recorded between 2013 and 2015 to characterise local climate conditions. The area has a mildly continental climate with typical seasonality, although some effects on measured conditions, such as higher wind speed, may be attributed to the elevation and position of the monitoring station.

The following key trends were identified:

- Temperature is highest during the months of June to September with peak temperatures generally recorded in August and the lowest temperatures recorded during the winter months, particularly December and January. The same trends are seen in the solar radiation data.
- Relative humidity displays the same seasonal variation as temperature, but with lower relative humidity during the summer months (approximately May to September) and higher relative humidity during the autumn and winter months (approximately October to March).
- Precipitation data for the EOX station suggests that there are a large number of low intensity rainfall days in the spring and winter, with shorter duration high intensity rainfall days tending to occur during the summer months. Monthly precipitation levels in the region tend to be consistent throughout the year with slight increases in June and towards the end of the year.
- The wind direction at the EOX meteorological station is predominantly south-easterly in direction. The wind direction for the most relevant regional station at Sandanski station showed predominantly north to north-westerly.
- The location of the EOX monitoring station within the Ograźhden mountain range is likely to influence the wind direction due to channelling of the wind. The same effect is potentially also observed in the wind speed data where the average monthly wind speeds at the EOX station are greater than those recorded at the Strumica station. Wind speeds in the area are generally greater during the spring and early summer and are slightly lower for the remainder of the year.

## Water Quantity

The baseline report on water quantity described the baseline conditions of surface water and groundwater in the local study area in qualitative and quantitative terms.

The proposed mine site is located in the upper Jazga and Shtuka catchments. Ilovica and Shtuka villages with their water supply systems, including the Ilovica Reservoir, are situated downstream of the proposed site. Further downstream, the Jazga and Shtuka catchments discharge surface water and groundwater into the Strumica valley where they contribute to the flow in the Turija and Strumica Rivers and from where groundwater is abstracted for agricultural production.

### Groundwater

Baseline groundwater data was collected through testing conducted in 2015. The testing found that the geology of the deposit/open pit area has higher permeability (a measure of the ability for water to move through rock) near the surface and lower permeability near the base of the pit.

Observations during drilling indicated that the granite underlying the TMF is weathered and highly fractured. Permeability values were higher than those in the deposit. The weathered and fractured upper surface of the granite underlying the TMF appears to form a minor aquifer that is in hydraulic continuity with the Shtuka River.

Groundwater underlies Ilovica and Shtuka villages at a relatively shallow depth. The depth to water correlates closely with proximity to the Jazga and Shtuka Rivers, with wells located close to rivers showing the shallowest depth to water and those further away from the river showing greater depths to water. A survey undertaken in

2013 identified approximately 60 wells and boreholes and two springs that are used for water supply purposes in the two villages.

The northern side of the Strumica Plain is underlain by a substantial thickness of alluvial deposits. The alluvial deposits support only a very few public or industrial water supply boreholes in the vicinity of the local study area (the public supply source for Sushica village and the dairy at Radovo). However, groundwater is a major source of water supply for agriculture on the Strumica Plain. Approximately 350 irrigation boreholes were identified in a survey of the area around Radovo, Turnovo and Sekirnik.

**Surface Water-Groundwater Interaction**

Baseline studies found that the Jazga River loses small volumes of water to the groundwater system as the river passes the proposed open pit.

In the Shtuka valley, there is a complex system of interaction between groundwater and surface water. Studies showed that approximately 30% of surface water flow was lost within the proposed TMF footprint. Immediately downstream of the TMF, surface water flow increases due to inflow from groundwater in alluvial gravels.

**Jazga River**

Flows in the upstream reaches of the Jazga River were observed year round during baseline monitoring.

Immediately downstream of the Ilovica Reservoir, flows are very low and are mainly fed by minor seepage through the reservoir embankment, supplemented by spills from the reservoir when it is full. Under dry weather conditions, flows increase slightly to the south of Ilovica as a result of inflow from the groundwater system.

The Jazga River is used for public water supply system to Ilovica and is used for domestic purposes (other than drinking) and for irrigation of plots and gardens. The water abstracted at the intake has been adequate to meet the (non-potable) needs of the residents of Ilovica.

The Ilovica Reservoir supplies agriculture and public water supply for Bosilovo, Sekirnik, Turnovo, Radovo, Borievo, Ednokukevo and Robovo, plus intermittent supplies to Shtuka and Ilovica. Peak demand occurs in the summer months (between July and September) when agricultural and domestic water demand increases. Information provided by SPWMC indicates that people in Ilovica and Shtuka use the water from Ilovica reservoir for irrigation.

**Shtuka River**

Flow in the upstream reaches of the Shtuka River were observed to flow year round during baseline monitoring. The river has been observed to dry up and become seasonal between the upper village intake and the lower village intake (both upstream of Shtuka village). Under dry weather conditions, the river channel through Shtuka village and further downstream has been observed to be mainly dry with occasional pools.

Two intakes on the Shtuka River are used for public water supply system to Shtuka. Water is used for domestic purposes (including drinking) and irrigation of plots and gardens. The water abstracted at the intake has not been adequate to meet the needs of the residents of Shtuka and is augmented by treated water supply from the Ilovica water treatment works for an average of 39 days each year during summer months.

## Water Quality

The majority of waterbodies monitored during the baseline campaign present relatively clean, unimpacted waters dominated by calcium, magnesium and bicarbonate. There has been little evidence of seasonal variation.

Several surface water and groundwater monitoring points showed different water chemistry, generally believed to be influenced by water draining from mineralised zones. These monitoring points showed higher concentrations of sulphate, iron and copper and lower alkalinities and pH.

A minor tributary to the Jazga River passes in close proximity to the deposit. Water quality in this tributary shows significant alkalinity towards the top of the tributary, but as the stream flowed past the mineralised zone alkalinity and pH decreased.

Shallow groundwater in the vicinity of Ilovica, Shtuka and Sushica, as well as surface waters downgradient, has been impacted by anthropogenic activities such as wastewater discharges and agricultural practices, as indicated by elevated nitrate and ammonia, sometimes exceeding drinking water guidelines.

Surface waters and groundwaters in the Strumica Plain had higher alkalinities and thus a more neutral pH. One of the exceptions to this trend was the piped spring Bela Voda (JZSP10) in the Jazga catchment. The major ions, as well as parameters like strontium, were elevated at this spring, which suggested an older or deeper groundwater source than other springs in the upper catchment.

## Sediment

Suspended sediment sampling was undertaken at three locations: one in the Jazga River (at the village intake location) and two in the Shtuka River (one at the village intake location and one at an undisturbed upstream location). The baseline study concludes that, prior to any mining exploration influences, baseline TSS concentrations in the Shtuka and Jazga Rivers are considered to be approximately 250 mg/l [2] for 95% of the time, which means the natural state exceeds the IFC guideline.

Chemical analyses of sediments collected from the Jazga and Shtuka Rivers showed that aluminium and iron were the most abundant elements in the stream sediments. Concentrations for major ions such as Al, Ca, K, Mg and Fe were higher in samples taken in the Jazga catchment than in the Shtuka catchment. Copper, iron and sulphur levels were elevated at a stream sampling point close to the deposit (within the Jazga catchment). Lead was also elevated at this sampling location, with levels more than double that recorded at other sites.

## Noise

Measured noise levels at the majority of receptors in the study area were found to be predominantly influenced by natural noise sources. These included wildlife, such as birds and insects and also domesticated animals including chickens, cows, dogs and pigs, as well as wind-induced noise from rustling vegetation. This is consistent with the rural nature of the study area, in which industrial and commercial mechanized noise sources are largely absent. At monitoring locations with significant vegetative cover, such as Sekirnik, wind-induced rustling of vegetation was a significant contributor to the ambient noise environment.

The primary anthropogenic noise source in the study area is the M6 highway from Strumica to Bulgaria. Traffic flows on the road are typically low, however, there is a significant component of articulated HGVs. Villages through which the M6 passes typically exhibited higher noise levels, with the highest ambient noise levels recorded at monitoring locations in Novo Konjarevo, Samuilovo and Novo Selo.

In villages close to the M6 where the monitoring locations were sited away from the road, including Sekirnik and Turnovo, noise levels were comparable with villages remote from major roads. This suggests that traffic noise alone is the dominant factor in the higher noise levels in villages close to the road, rather than additional anthropogenic noise associated with settlements on a major transport route.

[2] This value differs from the value of 50mg/l presented in the Macedonian EIA. Further data gathering in 2016 has provided an adjusted value

## Air Quality

Overall, the baseline monitoring indicates that ambient air quality within the study area is good and that sources of local atmospheric pollution are limited.

Ambient nitrogen dioxide ($NO_2$) concentrations were relatively consistent across the study area (slightly lower in more rural locations and higher at locations closer to roads or combustion sources in villages). Concentrations were substantially below project limits[3] for the protection of human health and for the protection of habitats/vegetation.

Sulphur dioxide ($SO_2$) concentrations were consistent across the study area. Concentrations were substantially below limits for the protection of human health and for the protection of habitats/vegetation.

Ozone ($O_3$) concentrations were high across the study area, with maximum concentrations exceeding the limit for the protection of human health. This reflects the situation throughout Macedonia, with monitoring conducted by the Ministry of Environment and Physical Planning recording exceedances at Skopje and the eastern and western zones. The MOEPP report states that the highest ozone concentrations occur in rural areas far away from the emission sources. Ozone will react with $NO_X$ in air to form $NO_2$, which explains why higher concentrations would typically be found where lower concentrations of $NO_X$ are present.

Measured levels of deposited dust were typically higher closer to roadside locations than in other parts of the villages or in rural locations. The levels of measured deposited dust are influenced by meteorological conditions, with higher concentrations measured during dry summer periods.

Monitoring of particulate matter ($PM_{10}$ and $PM_{2.5}$) indicates that annual average levels were substantially below the project limits, however short term periods of elevated concentrations were observed in the data.

## Biodiversity and Ecology

Habitat diversity in the vicinity of the Project includes intensive arable production in the Strumica valley which contrasts with the unimproved pastures that become more species-rich with greater altitude toward the sources of the Jazga and Shtuka streams. Forest communities are represented by broadleaved riverine fringes, boreo-alpine riparian galleries and continental forests. Many of the forest communities are subject to licenced and un-licenced felling which in many cases has resulted in large areas of coppice regeneration growth rather than standard trees in evidence. Habitat quality within the LSA is underlined, to some extent, by the presence of species such as the Large Blue butterfly (*Phengaris arion*) a species listed as endangered at the European scale by the IUCN. Much of the LSA is designated by Butterfly Conservation Europe as a Prime Butterfly Area (PBA).

***Large Blue butterfly (Phengaris arion)***
Photo credit: Biomaster

Anthropogenic pressure at the lower altitudes of the LSA has resulted in natural habitats becoming at best semi-natural and more likely modified habitat. In contrast, some forest communities at higher altitudes can be considered more natural owing to the lack of access and associated lower harvesting pressure. Grasslands above 800 masl are generally more species rich as a result of lower nutrient contribution from grazing animals. The diversity of flora that has developed in these areas appears to be of value to insects.

[3] Project-specific limits were established for air quality, noise, water quality and soils in the Environmental Design Criteria (included in Annex 1D to the ESIA). The EDC limits were established as a result of a review of limit values established in Macedonian and European Union regulations and other relevant international guidelines and standards.

Biodiversity, especially species richness, has been evaluated within the LSA over a number of years. A total of 271 of the most prominent vascular plant species were recorded within the LSA during baseline surveys. Furthermore, 138 species of fungi were recorded within the LSA with widespread distribution including in pasture, oak and beech forest and pine plantations. Species of conservation concern (SoCC) include bladder campion (*Silene vulgaris*), *Boletus quelletii*, and Caesar's mushroom (*Amanita caesarea*).

A high level of faunal species richness has been recorded within the LSA, with approximately 40% of the butterfly species known to occur in Macedonia, over 50% of herpetofauna (reptiles and amphibians) and 36% of bird species. Coleopterans, dragonflies and other insect groups were collected widely throughout the LSA. Special attention was given to saproxylic beetles due to their conservation status. Numerous faunal species of conservation concern (SoCC) were recorded, with designations including national protection, the European Habitats Directive and the IUCN Red List.

***Rosalia Longicorn (Rosalia alpina)***
Photo credit: Biomaster

Aquatic habitat surveys targeted communities of aquatic, emergent and marginal vegetation. Four habitat types were recorded: reed bed, willow (*Salix*) woodland, small permanent streams, and ephemeral streams. For aquatic fauna, nine species of fish were captured, all of which were common and widespread with no SoCC noted. Stone crayfish were recorded at numerous sites within the LSA and freshwater crab at one site on the Shtuka River. Stone crayfish is a protected species in Macedonia, listed on Habitats Directive-II and Bern I & III, but has not been evaluated by IUCN.

## Ecosystem Services

Ecosystem services are the direct and indirect contributions made by ecosystems to human well-being and also to Project performance. Despite considerable anthropogenic pressure being applied to many of the forest and grassland communities within the LSA, ecosystem value is noted.

The following provides a summary of the ecosystem services identified, listed under their ecosystem service categories:

- Provisioning
  - Livestock (raised for meat and milk);
  - Apiculture (bee keeping);
  - Arable, fruit and vegetable production;
  - Capture fisheries;
  - Wild foods (fungi/snails);
  - Hunting (e.g. partridge, wolf and boar);
  - Biomass fuel and timber;
  - Public water supplies obtained from the Jazga and Shtuka Rivers and from groundwater sources; and
  - Natural medicines, perfumes and pharmaceuticals (60 species of medicinal herb, e.g. chamomile, Bigroot cranesbill, Oak moss).
- Regulating
  - Mountains affecting local rainfall patterns;

- Hydrological catchments regulating run-off, ground water recharge and water storage and providing water supplies;
- Vegetative cover providing soil retention, managing scour and erosion; and
- Wildflowers used by local bee colonies and to support crop pollination e.g. orchards.

- Cultural
  - Recreational pleasure people derive from natural or cultivated ecosystems e.g. arable, water bodies, forestry and grasslands;
  - People learn how to hunt, fish and forage in the natural environment; and
  - Sacred sites and intangible cultural heritage are linked with natural ecosystems e.g. wetlands, rivers, lakes and forests.
- Supporting
  - Providing habitat for a large number of species, including some nationally protected or endangered at the European scale e.g. large blue butterfly;
  - An area is important for timber production; and
  - The area plays a part in sustainable water cycling.

## Cultural Heritage

The cultural heritage findings were classified into three types of cultural heritage: 'living' cultural heritage, intangible cultural heritage and archaeology. An historic structure at Novo Selo is the only nationally designated site within the LSA.

### Living Cultural Heritage

Fifty-three potential 'living' cultural heritage receptors were recorded during the baseline study in the LSA. A brief summary of these is presented in the table below.

| Location/associated settlement | Cultural heritage receptors |
|---|---|
| Project footprint | Two receptors were recorded: a spring site with an inscribed memorial stone and a waterfall that is a focal point for collecting Bigroot Cranesbill (*Geranium macrorrhizum*), a plant which is used to decorate homes at Easter. |
| Ilovica | Fourteen receptors were recorded: two cemeteries, a church, a mosque, three sites of religious/ritual significance, five springs, a communal feature (Ilovica Cultural Centre) and the site of an historic event. |
| Shtuka | Nine receptors were recorded: two cemeteries, two churches, a site of religious/ritual significance, two springs, a communal feature (Shtuka Cultural Centre) and the site of an historic event. |
| Turnovo | Two receptors were recorded: a cemetery and a church. |
| Sekirnik | Five receptors were recorded: a cemetery, two churches, a communal feature (Sekirnik Park) and a structure of architectural significance. |
| Sushica | Six receptors were recorded: a cemetery, a church, a communal feature (the Sushica Cultural Centre), a former mosque and two springs. |
| En-route to Bulgarian border | Six receptors were recorded: four churches, a monastery and a site of religious/ritual significance. |
| Wider region | Nine receptors were recorded: eight churches and a monastery. |

**Intangible Cultural Heritage**

The following three elements of intangible cultural heritage were recorded during the baseline study: Religious beliefs and practices, traditional music and dance, and a traditional agricultural way of life.

- Orthodox Christianity and Islam are prominent faiths in the region, with Catholicism also practiced by a minority of the population. These religious beliefs are sincerely held and actively practiced throughout the region. Religious holidays and festivals are an important aspect of the cultural heritage of the population.
- Traditional music and dance, relating in particular to the Rusalii tradition, is preserved and commemorated in a number of the settlements, with an annual meeting of Rusalii dance groups held in Sekirnik.
- The traditional agricultural way of life is widespread and is observable in the landscape.

**Archaeology**

Seventy-six potential archaeological receptors were recorded during the baseline study, with a total of twelve located within, or in close proximity to, the proposed project footprint. These 12 receptors comprise a variety of archaeological site types, including settlements, burials and sites of historical industry. Varnica and Crkvishte are the only receptors in proximity to the project footprint which have been ascribed a date, with both believed to be Late Antiquity period sites (4$^{th}$ – 6$^{th}$ century AD).

## Landscape and Visual

The landscape within and surrounding the concession area is not designated or protected. It is attractive, yet reasonably commonplace within the wider region. The project footprint extends into three landscape types: Mountain Forest, Flat Agricultural Land, and Undulating Pasture/Scrub.

Baseline analysis showed that inhabitants located in the Strumica valley to the south, southwest and west of the concession area may be afforded views of the proposed mine (or part of it).

## Socio-economics

The populations of Ilovica (1,907) and Shtuka (781) have similar demographics. Ilovica has a younger population (median age 35.0) than Shtuka (median age 36.0), and more even gender ratio of males to females (51:49 in Ilovica, compared to 54:46 in Shtuka). Ethnically, both communities are predominantly Macedonian, though small Turkish, Roma and Bulgarian populations do exist in Ilovica.

Agriculture dominates economic activity in Ilovica and Shtuka. Most households (72%) maintain arable land, and receive an average net agricultural income of €2,690 annually. Some households (34%) also maintain vineyards for personal consumption, or pasturable land (40% of households) for grazing livestock. In terms of crop production, potatoes are grown by most households, while tobacco, peppers and grapes are other common crops. Corn (maize) is grown in the fields around the villages for fodder.

Few households in Ilovica and Shtuka raise livestock for sale, with cows and goats being kept in small numbers for milk, chickens for meat and eggs, and pigs for meat alone. A few households keep flocks of sheep, and there are several small-scale (i.e. 50 head) cattle ranching operations run out of the villages. Supplementing incomes from agricultural activity, some villagers harvest mushrooms on the forested slopes of Ograźhden Mountain for sale at local markets and collection centres, and a few keep bees for small-scale honey production.

Mining has not been a major industry in the Southeast Region, with only a small feldspar mine on Ograźhden Mountain and the Buchim Copper and Gold Mine near the town of Radovish.

Incomes in the Southeast Region are lower than any other regions in Macedonia, with average monthly wage incomes of 16,500 denars (€269) at the regional level (influenced by the industrial, manufacturing and service sectors) and 15,600 denars (€256) at the local level (influenced by the greater reliance on agricultural and seasonal employment). Average monthly incomes for local agricultural producers (i.e. not influenced by the waged economy) are lower still at 13,700 denars (€224).

With no access to a shipping port, 93% of Macedonia's freight was transported via roads in 2014. The country's public enterprise rail system extends geographically from north to south and east to west, and across national borders with Kosovo, Serbia and Greece. There are, however, no rail lines that extend into the municipalities of Strumica, Bosilovo or Novo Selo. The Southeast Region is connected by regional highways and roadways and local access roads. The M6 highway is used to access the Southeast Region, and runs through Strumica to the Bulgarian border. Local roads connect adjacent villages (e.g. Ilovica and Shtuka). Traffic on the M6 east of Strumica is mixed, including large trucks, personal vehicles (e.g. pick-ups, cars), motorcycles, tractors, bicycles, horse and cart, and pedestrians.

***Agricultural production along the Ilovica/Shtuka road***

***Cattle grazing on the hills above Ilovica***

# Environmental and Social Impacts

The following section presents the predicted environmental and social impacts associated with Project activities. These impacts are predicted based upon spatial analysis and qualitative and quantitative modelling. In most cases, the impact assessments have taken a conservative approach by adopting a 'worst case' scenario. The impacts presented below include the application of mitigation measures to avoid, minimise, restore or offset the impacts presented above. With the application of these mitigation measures, the majority of residual impacts are reduced to low or negligible impact classification.

The approach to evaluating environmental and social impacts comprised the following steps:

- Establish baseline conditions;
- Establish the project description;
- Evaluate stakeholder engagement information to feed into the impact assessment;
- Confirm the key receptors and their sensitivity or importance;
- Characterise the potential effects of the project by modelling or qualitative analysis;
- Determine the nature and scale of impact, combined with the importance/sensitivity of receptors. The magnitude of the effect is determined by taking into account: magnitude of change, geographic extent of change, duration of change, and its frequency;
- Consider the need for mitigation measures should impacts be considered unacceptable;
- Assess the significance of residual impacts after mitigation;
- Consider other operating or planned projects in the region (the cumulative impact assessment);
- Assess environmental risks and accidents by evaluating hazards, probability and management of risks; and
- Develop monitoring and management plans.

## Geomorphology, soils and land use capability

The Project will result in the permanent loss of forested land in the Shtuka Valley for the TMF and the loss of forested land in the mine pit area. Due to the requirement to prevent deep rooting trees from establishing on the closed TMF (due to the material contained within the TMF), 284 ha of land previously suitable for forestry will not be returned to forestry after the closure of the mine. Instead, the TMF will be capped with a layer of material (e.g. rock, soil) that will enable vegetation growth. Vegetation on the TMF will include grassland and scrub which is suitable for grazing, subject to long-term monitoring of soil quality, including ecological health and risk assessment.

Effects to agricultural land use are minor as the only agricultural land lost is due to the construction of the off-site access roads.

Access to grazing land within the concession area will be restricted during the lifetime of the Project. Upon closure of the mine, restoration and revegetation of the site will return grazing land and the addition of suitable grazing land on the TMF results in a low impact classification overall.

Erosion is predicted to occur during the construction phase due to the exposure of soil surfaces to erosive forces during the construction of the haul road, access road, the pre-strip area of the open pit, the TMF starter embankment and deforestation of the TMF starter area. Installation of erosion controls (e.g. silt fences,

ditches, rock check dams, temporary surface water diversions, soakaways and small sediment ponds) during the construction phase will limit the magnitude of erosion across the site. The Storm Water Dam (SWD) will ultimately control the discharge of eroded materials in the Shtuka catchment.

Additional mitigation measures include the stockpiling of soils for reclamation of the site, with stockpiles to be seeded with native plant species to establish vegetation cover and minimise erosion. Waste rock to be used for reclamation of the TMF will be stockpiled at or above the elevation of the final tailings level to minimise double handling and transportation at closure.

Through the application of these mitigation measures, all impacts related to geomorphology, soils and land use capability are rated as low.

## Water quantity

**Jazga River**

In the Jazga River, the Ilovica Reservoir acts as a control to flow, so effects of the Project were assessed on three sections of the river: upstream of the Ilovica Reservoir (at the Jazga intake), the reservoir itself and downstream of the Ilovica Reservoir.

During construction, negligible changes to flow were predicted upstream of the Ilovica Reservoir. However, the Ilovica Reservoir would supply water for mine construction and continues to provide public water supply. The level of water in the Ilovica Reservoir would therefore, be much lower than at baseline and is predicted to empty more than once every year, until the supply from Turija Reservoir is commissioned at the start of Project operations. This effect on Ilovica Reservoir leads to high negative effects on low and median flows downstream, which rely on spills and seepage from the reservoir.

During operations and following closure, and until a lake forms in the pit (in year 110), upstream of the Ilovica Reservoir low flows are almost completely lost to the pit (median flows are only partially lost). This reduction in low and median flows is predicted to start in Year 5, when the base of the pit is excavated below the Jazga River bed elevation. From this time baseflows would be lost to the pit through underground flowpaths. This would have an impact on water supplies provided by the Jazga intake and flow contributions to the Ilovica Reservoir until year 110 at which time the baseflow will return to the Jazga and impacts will be negligible.

During operations, effects on the Ilovica Reservoir will be negligible as abstraction from the Turija reservoir will maintain the Ilovica Reservoir at a higher than baseline water level. Downstream of the Ilovica Reservoir, the low flows would be increased, but the median flows would decrease as the seepage through the dam wall increases. The reservoir would no longer spill in its managed state.

Following closure, when water supply contributions from Turija cease, and until year 110 when baseflow returns to the Jazga and treated spill water from the pit lake will be discharged to the Ilovica Reservoir, water levels in the Ilovica Reservoir, and flows downstream, will be reduced. Following year 110, these impacts will be negligible.

To mitigate potential impacts to village water supplies from the Jazga River (intake), Euromax Resources has committed to assisting Bosilovo Municipality (PUE) and Strumichko Pole Water Management Company (SPWMC), including provision of sufficient funds, to design, construct and commission:

- A water supply pipeline to Ilovica WTW from the refurbished Turija irrigation pipeline;
- A new potable water distribution network to all households in Ilovica, to be operated by PUE;
- A permanent connection between Ilovica WTW and the new distribution networks;
- An extension of the existing agricultural water distribution network to unserved households from Ilovica Reservoir, operated by SPWMC; and
- Decommissioning of Ilovica intake on the Jazga River.

In addition, Euromax commits to the following:

- Minimising abstraction of water from Ilovica Reservoir for construction purposes and developing alternative sources of water supply for construction;
- During mine operations, establish a fund that will provide financial resources for the capital replacement of infrastructure to augment Ilovica Reservoir from the Turija pipeline during closure and post-closure, including provision of power for pumping;
- At closure, maintain operational water supply infrastructure linking the Turija pipeline with Ilovica Reservoir and Ilovica WTW;
- Agree with SPWMC a limited number of releases of water from Ilovica Reservoir during operations, via its low level outlet, to mimic artificial floods that overflow the spillway; and
- Following closure, to design the provision of storage and attenuation for flood waters during extreme events within the closed pit by modifying the drainage outlet from the restored pit.

With the application of these mitigation measures, residual impacts on water quantity in the Jazga are negligible, except for the impact on low flows in the Jazga upstream of the Ilovica Reservoir which is evaluated further under the aquatic biodiversity study.

**Shtuka River**

During construction and operations only negligible changes in flows are anticipated for the Shtuka River at the village intake and further downstream.

The physical changes to the Shtuka catchment will alter the rainfall-runoff relationship; however, the design of the TMF (which will be located in the Shtuka catchment) will incorporate engineering solutions to manage effects on water quantity. A Stormwater Dam (SWD) will be installed downstream of the TMF to manage flow and sediment heavy runoff so impacts are negligible on median to high flows.

Post closure, the diversion channel is assumed to fall into disrepair, therefore, low flows generated in the section of the catchment upstream of the TMF will be lost to evaporation and infiltration on the surface of the TMF. These flows will not be able to discharge downstream and low flows will be lost downstream.

Mitigation will be applied in the form of engineered water management of the TMF to ensure low flows downstream. One of the following will be applied:

1) The diversion channel will be maintained and convey the Shtuka River in perpetuity;
2) The upper Shtuka River will be routed across the surface of the tailings in an engineered channel and low and median flows will be able to discharge downstream; or
3) Shallow groundwater in the TMF cap will be discharged under control to maintain low and median flows downstream.

With the application of this mitigation measure, the residual impacts to water quantity in the Shtuka River are predicted to be minor.

**Groundwater**

Modelling was conducted of potential impacts to groundwater resources in Ilovica, Shtuka and the Strumica Plain (between Ilovica and Turnovo). The modelling found that there would be no discernible change from baseline levels during mine life and post-closure.

## Water quality

**Jazga River**

Effects of the Project on water quality were assessed on the same three sections of the river as for water quantity.

During construction and operations, active management of discharges means that there are no impacts on water quality which exceed a low classification in the Jazga, despite the reductions in water quantity for dilution.

Following closure there will be no direct or indirect discharges to the Jazga River from the closed pit until the formation of the pit lake is complete. The pit lake is predicted to overflow approximately 90 years after the cessation of pit dewatering (i.e. at LOM year 110). Should spilling from the pit lake occur it would lead to unacceptable levels of metals and sulphate, low pH and predicted precipitation of iron hydroxides which could cause smothering in the stream bed. Major impacts would extend down the Jazga and into the Ilovica Reservoir until discharge into, and dilution from, the Turija River.

Mitigation described above under water quantity (decommissioning and replacement of intake water supply), would be added to by post closure installation of preferably passive treatment (e.g. wetlands and settling/aeration ponds), but possibly active treatment of pit lake discharge to neutralise the pH and remove metals and sulphate to acceptable discharge limits. This treatment process would be in place prior to pit lake spilling and treated water would discharge back into the Jazga.

As a result of these mitigation measures, residual impacts to water quality in the Jazga River and Ilovica Reservoir are classified as negligible.

**Shtuka River**

Contaminated water discharging from the SCF following closure, when recycling of SCF water ceases, will require active treatment. In addition, the following mitigation will also be required:

- Construction of a grout or gel curtain at the SCF to reduce the flow of contaminated groundwater under the SCF. The curtain must capture 95% of the groundwater flow;
- Active treatment in a treatment plant of seepage captured in the SCF that is not suitable for discharge. The plant should ideally be situated relatively close to the SCF, and the treated water should be discharged back into the Shtuka River channel;
- Assessment of encapsulating acid generating material in the TMF embankment;
- Assessment of hydroseeding or otherwise revegetating the TMF embankment for stabilizing and reducing infiltration and runoff; and
- Sizing the SCF to ensure that, following closure, overflows due to storm events will be adequately diluted to comply with project water quality standards.

During the construction period no direct discharges to the Shtuka River will occur as a result of the mine project. The SWD will manage sediment heavy runoff.

During operations, as a result of contaminated seepage entering the Shtuka River, the predicted effect of the mine at the Shtuka river intake is high. The predicted water quality here and downstream includes depressed pH, elevated metals, sulphate and total cyanide.

Following closure, the change in water quality as a result of contaminated seepage entering the Shtuka River downstream of the Seepage Collection Facility (SCF), without considering potential discharge from the SCF, is classified as high. The pH of the water is predicted to decrease and there will be elevated levels of metals and sulphate.

Major impacts during operations and following closure would extend down the Shtuka until it discharges into the Strumica River, where the impact reduces due to dilution.

To mitigate potential impacts to village water supplies from the Shtuka River (intakes), Euromax Resources has committed to assisting Bosilovo Municipality (PUE) and Strumichko Pole Water Management Company (SPWMC), plus provision of sufficient funds to design, construct and commission:

- Provision of funds to design, construct and commission a water supply pipeline to Ilovica WTW from the refurbished Turija irrigation pipeline;

- A new potable water distribution network to all households in Ilovica, to be operated by PUE;
- A permanent connection between Ilovica WTW and the new distribution networks;
- An extension of the existing agricultural water distribution network to unserved households from Ilovica Reservoir, operated by SPWMC; and
- Decommissioning of Shtuka intakes on the Shtuka River.

With the application of these mitigation measures, the residual impacts to water quality in the Shtuka River are low or negligible.

**Sushica River**

The Sushica River was considered as a receptor in the ESIA due to stakeholder concerns around impacts to the Sushica River associated with groundwater contamination from the TMF. However, the potential risk of thoughflow occurring from the TMF to the Sushica River is likely to be negligible.

**Groundwater**

Potential water quality impacts to groundwater were assessed at community water supplies in Ilovica and Shtuka and at irrigation wells between Ilovica and Turnovo. Water quality modelling predicted that no significant change will occur to groundwater quality at any community water supply receptors in Ilovica or Shtuka villages.

## Sediment

The primary source of sediment entering the Jazga River will be the preparation of the pit area during construction. During operations, the mine site will operate on a zero discharge basis, consequently erosion within the site will not affect the Jazga River and TSS in the watercourse will remain similar to baseline levels. During closure, the site will be revegetated to minimise erosion.

The pre-strip area of the pit is situated on the steep slopes along the ridge line between the Jazga and Shtuka catchments. Exposed surfaces will lead to increased erosion within the catchment, though the natural catchment between the stripping area and watercourse will act as a “buffer strip” or natural sediment trap. Exposed surfaces will lead to minor impacts in the Jazga River between the site and Ilovica Reservoir. Best practice will be adopted to minimise erosion and control discharge of sediment. This includes the installation of sediment dams, water management infrastructure and erosion control measures, phased removal of vegetation, and the maintenance or establishment of a vegetated buffer around watercourses.

The primary source of sediment entering the Shtuka River will be from stripping of the TMF area during construction; direct rainfall on this area could lead to sediment-laden surface water runoff entering the Shtuka River. To manage sediment from the TMF area, silt fences will be installed on contours within the cleared area of the TMF starter dam and also around the downslope boundaries.

To capture remaining eroded material, the SWD downstream of the TMF will be developed prior to stripping of the upstream catchment. To minimise the discharge from the SWD of clays and any fine silts remaining in the water, the storage may be flocculated as required based on sampling.

During operations, the SWD will be in place and will retain sediment-heavy runoff from the TMF embankment and infrastructure within its catchment. The SWD will allow settlement of sediment prior to discharge to the environment. The mine site will operate on a zero discharge basis.

During closure, the site will be revegetated to minimise erosion and act as a natural sediment trap. Runoff/sediment ponds including the SWD will be decommissioned following closure, once monitoring identifies that discharge water quality is acceptable for discharge to the environment.

With the application of the design considerations and additional mitigation measures, the residual impacts from sediment are low in both the Jazga and Shtuka Rivers.

## Noise and vibration

Potential impacts were identified at Shtuka and Sekirnik, primarily related to construction and operation of the off site access road. A number of mitigation measures are required to minimise these impacts.

The short duration of the access road construction works will limit the scale of the noise impacts at individual receptor villages and sensitive timing of noisy works will aid in reducing annoyance. Good community relations and the selection of low-noise plant during the construction works will further assist in minimising impacts. During the programming of access road construction works, the proposed schedule will be discussed with the municipalities and local residents. Actions will then be put in place to minimise noise impacts.

Apermanent acoustic barrier prior to construction of the road itself will not be feasible at Shtuka, however dependent on consultation with local communities, temporary noise protection will be considered. Euromax will consider the use of additional noise protection for properties within 50 m of the access road if the impacts of the road construction are deemed unacceptable by residents.

Mitigation for noise impacts from use of the permanent off-site access road includes an acoustic barrier at Shtuka during mine construction and throughout operations and at Sekirnik throughout operations. The cut-fill profile of the road will be used to maximise screening.

With the application of these mitigation measures, moderate residual impacts remain at Shtuka and Sekirnik associated with construction of the off-site access road. All other residual noise impacts are classified as minor or negligible.

The assessment of potential vibration impacts considered ground-borne vibrations and air overpressure associated with the mining operations and potential impacts on nearby villages. The assessment found that during both the construction and operations phases, vibration impacts will be minor or negligible at all receptors.

Good practice will be adopted to minimise any concerns related to blasting. Blasts will occur during the daytime period only and the proposed blasting schedule will be clearly communicated to neighbouring communities in advance and vibration monitoring will be undertaken in the event that complaints arise. In response to stakeholder concerns, Euromax will undertake a condition survey of all properties in Ilovica and Shtuka prior to commencement of any blasting and will monitor them throughout operations for any change in condition due to blasting.

## Air quality

The air quality impact assessment looked at the Project's contribution to air quality parameters ($NO_2$, NOx, $SO_2$, CO, TSP, particulate matter, dust, odour) associated with a number of project activities (including earthworks, drilling and blasting, traffic on unpaved haul roads, material transfer, ore processing, carbon regeneration, combustion emissions from vehicles and mobile equipment, emergency generators, sewage treatment plant).

Impacts to human health were assessed at surrounding villages (Ilovica, Shtuka, Turnovo, Sekirnik and Sushica) with relation to the Project's emissions (including baseline) and the results were below the project limits for human health. In addition, at all locations, the predicted dust deposition fell below the limit values for loss of amenity.

The assessment for impacts to habitats (vegetation) were assessed and the overall environmental concentration will be below the limit value for the protection of habitats. As all air quality impacts were classified as low, no additional mitigation measures are required.

## Biodiversity

### Terrestrial Habitat and Species

Impacts to terrestrial habitats and species vary by habitat type and quality. Of most concern are impacts to natural habitat and flora and fauna SoCC. However, the more natural forest communities and most

species-rich grassland occur at higher elevations and are impacted less than the average loss across all habitats.

At its maximum extent, the project footprint will result in approximately 508 hectares of habitat loss. The bulk of this habitat loss is from turkey oak forest (approximately 243 hectares), which is widespread across the LSA. Other areas of habitat loss include sessile oak forest (90 hectares), oak and hornbeam forest (102 hectares) and pastures (49 hectares). The complete avoidance of impacts to beech and beech/pine forest reduces the overall impact to natural forest communities. However, some SoCC are associated with modified forest habitats, including fauna such as bats, and fungi which are associated with oak and hornbeam forest.

Some forest clearance will be permanent due to the construction of the pit and the TMF. Therefore permanent loss of forested habitat associated with the TMF is classified as a moderate residual impact.

The conceptual revegetation plan proposes that much of the site (excluding the TMF footprint) be rehabilitated with forest species which reflect baseline conditions. Flora SoCC will be salvaged during site clearance for use in progressive ecological restoration, revegetation trials will be undertaken during operations, mandatory environmental training will be undertaken by all workers and contractors, and potential bat roosting locations will be surveyed prior to construction. These mitigations reduce the residual impact to forested habitat to minor.

Due to the materials contained within the TMF, the closure surface of the TMF will be unsuitable for deep-rooted vegetation such as trees. Instead, the surface of the TMF will be revegetated to scrub and grassland which are suitable for Large Blue butterfly and other invertebrates. This will result in a positive residual impact to the pastures habitat type, with a gain of approximately 234 hectares.

Additional mitigations for terrestrial fauna SoCC include:

- Pre-clearing rapid surveys plus selective SoCC salvage and relocation;
- Where possible clearing will be in a direction that would push mobile species away from the Project area;
- Undertake progressive ecological restoration to minimise impacts to wildlife;
- Develop and apply species action plans for SoCC;
- Placement of artificial bat roosting habitat;
- Implement invasive flora and fauna mitigations;
- Seasonal constraints applied to earthworks (where practicable) and hibernacula active searches during spring, summer and autumn; and
- Removal of bird nesting habitat outside of the nesting season. Bird scaring techniques used to prevent ground nesting species from using the construction footprint.

As a result of the mitigations presented above, residual impacts to terrestrial flora and fauna SoCC are classified as minor.

**Critical Habitat**

The focus of critical habitat recognition has been generating an understanding of the biodiversity features of the Prime Butterfly Area (PBA) and associated designating species such as the Large Blue butterfly. The quality of habitat varies across the PBA and the Project footprint avoids much of the best quality habitat.

Although the critical habitat is essentially avoided, the predicted impact to the moderate biodiversity zone and broader PBA will have a major consequence. However, given that the high biodiversity zone was avoided and the Large Blue butterfly was also observed outside the PBA, it is possible that impacts would be classed as low if a fuller understanding of species regional distribution and habitat use was obtained.

Post closure, a focus on re-vegetation to pasture will allow for the creation of habitat suitable for the Large Blue butterfly, as well as numerous other invertebrates which naturally occur on the site. The Large Blue

butterfly becomes the main faunal focus of the re-vegetation strategy. Aside from creation of Large Blue habitat, the strategy is to return areas to the pre-existing vegetation type, where feasible. The conceptual revegetation strategy includes:

- Creation of a grassland and scrub mosaic suitable for grazing on the surface of the TMF; and
- Planting native forest species to achieve a scrub and forest mosaic on restored footprint of haul roads, conveyor, upper benches of the open pit, plant site and the workshop site.

Based upon this conceptual revegetation strategy, the residual change in land cover would be lessened for the forest community and there would be a positive impact on the pasture land cover which is of value to invertebrates, including the Large Blue butterfly, plus flora SoCC.

**Aquatic Habitat and Species**

The Jazga River upstream of the Ilovica reservoir will lose low flows during operations and closure (from year 5 to year 110) to such an extent that the aquatic habitat will be entirely degraded. As such, the mitigation strategy must focus on fish and decapod rescue and translocation. A sample of released individuals will be marked to enable success of relocations to be determined. Site options for release will be planned in congruence with reclamation planning.

Unmitigated effects on water quantity and quality in the Ilovica Reservoir and downstream on the Jazga would lead to effects during construction and post closure (prior to year 110). However, no species of conservation concern are explicitly linked to an exact water level or the requirement for the level to seasonally fluctuate in Ilovica Reservoir. In addition, there is limited ecological value to the Jazga downstream of the reservoir, due to the existing flow regime (restricted to seepage from and overflows from the Ilovica Reservoir) and the baseline nutrient loading associated with surrounding agriculture and other human activities. Therefore proposed mitigation ensuring water levels are maintained in the reservoir and regular flushing of the Jazga downstream will lead to negligible impacts on Ilovica Reservoir and downstream.

In the Shtuka River, the main impact to aquatic habitat and species is from the loss of 4 km of natural aquatic habitat when the Shtuka is diverted into the diversion channel around the TMF. As a permanent impact, this results in a major impact consequence. Mitigation for aquatic ecology on the Shtuka include undertaking fish and decapod rescue and translocation prior to diversion of the Shtuka River. The successful execution of this mitigation would reduce the residual impact classification to moderate.

Impacts and mitigation of impacts are managed by the mitigation presented in the water quality and quantity assessments. The design of the gel or grout curtain at the SCF and the discharge of treated water from the SCF post closure must be driven by not only drinking water standards for human and livestock consumption, but consideration for aquatic habitats downstream of the TMF.

## Ecosystem Services

The ecosystem services assessment has identified that the Project will affect beneficiaries of priority ecosystem services, including: raising livestock; bee-keeping; arable farming; hunting and gathering foodstuffs; collection of biomass fuels and timber; freshwater supplies and the gathering of medicinal plants. Freshwater is also an example of a priority service necessary for both the operational performance of the Project as well as for the livelihood of the local population.

A water pipeline will be constructed between Turija reservoir and Ilovica WTW, preserving the reliability and quality of water entering the WTW for treatment and supply to villages; this plus other water management control measures reduce residual impacts.

The project could lead to economic effects and/or displacement or impacts on livelihoods of herding communities, loss of grazing and arable land, foraging communities, sustainable farming, eco/sustainable hunting tourism or other activities that provide alternative food sources and income. These impacts will be mitigated by the delivery of community engagement action planning and associated management plans including delivery of livelihood restoration assistance (LRP) within the Land Acquisition and Resettlement Framework (LARF).

Mitigation measures including slope stabilization, prompt revegetation and controls such as silt fences, berms and mats will result in minor residual effects from site clearance/Project footprint upon soil quantity and quality, limiting exposure to dust and weathering.

The presence of Project infrastructure will also change physical characteristics of the landscape associated with intangible ecosystem values, in a spiritual and cultural context. Sites such as Shtuchki Vodopad are natural features which offer belief in fertility, spiritual fulfilment and wellbeing. Mitigation in the form of (participatory) site relocation and site preservation will reduce effects on ethical and spiritual values.

With the proposed mitigation measures and management in place the residual impact on ecosystem services are reduced to minor.

## Cultural heritage

The cultural heritage assessment considered the potential for impacts to 19 'living' cultural heritage sites, intangible cultural heritage and 8 archaeological sites. The assessment included consideration of ground disturbance through earthmoving or excavation and the effects of noise, vibration, dust or visual changes.

Mitigation for impacts on Living cultural heritage included relocation of Preslop Spring Memorial Stone, Photographic recording of Shtuchki Vodopad and provision of enhanced access to other collection sites. Mitigation of impacts on intangible cultural heritage includes noise mitigation and sympathetic scheduling of construction activities and blasting regime, thereby reducing residual impacts on living and intangible cultural heritage to minor.

At archaeological sites, photographic recording, sympathetic blasting regime and vibration monitoring, archaeological watching brief and archaeological evaluation and excavation reduce residual impacts to minor at the Adit tunnel, Crkvishte, Domus Gaber and Old Mill. Residual impacts following Archaeological evaluation and excavation will be reduced to moderate at Anovi, Preslop, Krvavichevo and Golemata Niva and Gradishte.

## Landscape and Visual

The Project will be visible throughout the LSA. The Project will have an effect on the mountain forest landscape, given the removal of forested areas and the presence of an open pit mine, the tailings management facility (TMF), and associated Project infrastructure. Reclamation to pasture and scrub will be the favoured end use for the TMF.

The Project's effect on the landscape of the agricultural plains in the Strumica Valley and undulating pastures/scrubland in the hills approaching the Ograźhden Mountains is expected to be low, with the only changes to the landscape being the addition of the off-site access road.

Visual disturbance will vary by the viewer's location, with some villages affected by permanent changes in the skyline associated with the TMF or pit. Visual disturbance decreases with distance, so villages that are closer and affected by permanent changes will have a greater degree of disturbance.

Mitigation will include planting of trees around the periphery of the mine workshop area to reduce the prominence of the elevated buildings/plant from Shtuka and the Monastery of St George; Project lighting will be located away from the prominent summit and southern faces of Čukar; elsewhere 'cut-off' lighting (directional lights) will be used to minimise light pollution. The outer face of the TMF embankment will be revegetated at closure to minimise the extent of bare ground visible from the surrounding areas.

## Socio-economics

The Project is expected to have a highly positive effect on the economies of Macedonia, the city of Strumica, and the Municipalities of Bosilovo and Novo Selo. The Project's effects on national GDP, national government revenue, and the growth of the mining sector will be of high magnitude and will continue for the life of the Project. The same is true of the Project's effects on municipal government revenues and business development. Consumer spending of employee incomes, while a less pronounced effect, is expected to result in a moderate positive effect on local economic activity over the life of the Project.

As with economic effects, the Project's employment effects are positive. Nationally, the impact of Project employment is positive but low in magnitude, given that most employment is expected to accrue locally. In the local area, the Project's effect on employment is expected to result in a high positive impact, representing a substantial increase in the availability of high-quality, permanent employment. The effect of consumer spending by employees is expected to generate induced employment growth locally, but at a lower magnitude. All of the Project's impacts on employment will be realised over the life of the Project.

The Project is not expected to influence wages in sectors outside of mining. As a result, the impact of national indirect and induced incomes is expected to be low. Locally, the relatively high incomes paid to direct employees are expected to have a high impact, given the Project's maximisation of local employment and high direct wages paid. Changes to project-related indirect and induced employment incomes are expected to be less prominent, but still of moderate magnitude. As all income effects are related to Project-generated employment, the impact of incomes will persist over the life of the Project.

The Project's ability to influence population increase or decrease in the local area is limited: most of the workforce is expected to already reside locally. The Project will not result in substantial in-migration that would offset the current trend of out-migration from the region. The Project's effect of slowing out-migration through the provision of employment opportunities is expected to have a negligible impact on population, but one that is permanent.

The Project's effects on community health, safety and security are mixed in direction. The small amount of in-migration will result in continued demand for healthcare services. This is of negligible magnitude given the Project's negligible population impact. The effect of potential accidental injuries on the demand for healthcare services could be considered adverse given their unplanned nature and unknown severity and extent. The impact on healthcare services is, however, expected to be low given the capacity of the system and presence of an on-site medical clinic. This on-site clinic could potentially result in a positive effect on local healthcare services, providing for the medical needs of employees. Given the number of people employed by the Project, this would be a moderate positive impact.

Effects to quality of life as a result of the Project are similarly mixed in direction. The Project's positive effects on community investment and income generation are moderate to high (respectively) and will persist throughout the life of the Project. The Project's adverse effects of increased noise and heavy truck traffic, alteration of the visual environment, and generation of perceptions of harm are expected to be of high impact when taken together, given that they have the potential to alter peoples' day-to-day lives and that they cannot be fully mitigated. The impact of increased noise in communities beyond guideline values will persist into the medium-term, but not at unacceptable levels given the mitigation/management applied in the noise impact assessment. Perceptions of harm may extend beyond operations into the long-term due to perception that the environment is contaminated, and some people may not accept that reclamation has addressed any potential environmental issues. The impact of the alteration of the visual environment for those in the viewshed of the mine (particularly the TMF) is expected to be permanent.

The Project's effect on transport infrastructure and utilities is expected to be of low impact, not substantially changing current conditions. The replacement of the water reticulation system in Ilovica and Shtuka has the potential to have a moderately positive impact on water distribution and treatment systems in both villages, and a negligible adverse impact on the cost of water for users.

Project effects on land use in the local area are expected to have a negative impact on agriculture, forestry, and other land uses. The removal of arable and grazing land due to Project land-take is expected to have a high impact on those who currently use that land, given the relative lack of suitable alternative grazing land with access to water in the area. The removal of forestry land base for the TMF is expected to have high impact on users. Although the Forestry Management Company and other users (e.g. fuel wood collectors) will be able to continue operating in other forested parts of the Ograźhden Mountains, the land over the TMF will no longer produce forestry resources, effectively removing forestry land base permanently. The Project's land take will also temporarily displace other land users (e.g. recreational hunters in the concession area, beekeepers on the slopes of the Ograźhden Mountains, and mushroom harvesters in the forested areas). The number of individuals affected by these displacements is small and in most cases they are not primary

livelihood activities; bee hives will be relocated and harvesters of special crops will be consulted and suitable mitigation considered.

Overall, the Project is expected to have substantial economic benefits to the Republic of Macedonia, representing a major contributor to national economic activity and government revenues. It will also benefit the local economy through procurement of goods and services, payment of municipal royalties, employment, and associated incomes. The Project is not expected to result in important population or demographic change in local communities, or the associated changes in demand for and pressure on public infrastructure and community services. Project-related impacts on community health, safety and security, and on the quality of life for residents of nearby communities (primarily in Ilovica, Shtuka and Strumica), have the potential to be both positive (e.g. community development, increased incomes, medical services on site) and negative (e.g. noise along roads, changes to the visual environment, increased traffic). Positive effects will be supported by benefit enhancement measures, while negative effects will be minimised to the greatest extent possible through mitigation. The Project's effects on land use will be mitigated through the implementation of a Land Acquisition and Resettlement Framework and Livelihood Restoration Plan.

## Environmental and Social Management Plans

Environmental and social management plans will provide a framework for the implementation of mitigation measures and monitoring required to help avoid or minimise adverse impacts and to optimise beneficial effects of the Project. These management plans will be developed by Euromax and implemented throughout the life of the Project to form live management plans and company policies which will be updated on a regular basis.

The plans will be aligned with relevant international good practice guidelines including the EBRD Environmental and Social Policy (2014) including Performance Requirements, IFC Performance Standards (2012), International Cyanide Management Code, Equator Principles and Sustainable Development Policies of ICMM, as well as meet Macedonian Legislation.

Contractors working on the Project will be required to adhere to the obligations of the environmental and social management plans. Where appropriate, major contractors will be required to submit health, safety and environment plans and evidence of their own environmental and health and safety management systems to the HSEC Manager for approval prior to commencing work.

The following environmental and social management plans will be developed for the Project:

- Compliance Monitoring Plan;
- Water Management Plan;
- Soils, Rehabilitation and Reclamation Management Plan;
- Air Quality, Noise and Vibration Management Plan;
- Construction Environmental Management Plan (CEMP);
- Biodiversity Action Plan;
- Cultural Heritage Management Plan;
- Social Management Plan:
  - Workers Health and Safety Plan;
  - Livelihood Restoration Plan;
  - Community Health, Safety and Security Management Plan;
  - Human Resources Plan;
  - Local Content and Procurement Plan; and
  - Community Investment Plan.
- Closure Plan;
- Traffic Management Plan
- Hazardous and Non-hazardous Waste Management Plan;
- Hazardous Materials Management Plan;
- Mine Waste Plan;
- Resource Efficiency Plan;
- Emergency Preparedness and Response Plan; and
- Stakeholder Engagement Plan.

## Conclusion

The ESIA presents how positive effects of the Project will be supported by benefit enhancement measures, while negative effects will be minimised to the greatest extent possible through management and mitigation measures. The ESIA presents that, with the successful implementation of the mitigation measures and management plans, any adverse residual environmental and social impacts identified are considered acceptable throughout the life of the Project.

All residual impacts identified for geomorphology, soils and land use capability, water quality and quantity, sediment and vibration, are low or negligible. A summary of residual impacts for the Project is presented in Table 1 below.

The following residual impacts were identified as moderate or high and warrant reference in this conclusion:

- Noise in Shtuka and Sekirnik during access road construction has potential to present a moderate residual impact. Mitigation has been presented, but may not fully mitigate the impacts. Community consultation and sensitive working will be maintained throughout the construction period;
- Noise during religious practices at Ilovica Muslim cemetery, Ilovica Christian cemetery, Shtuka Christian cemetery and Sts. Cyril and Methodius Church during construction has potential to present a minor to moderate residual impact. Mitigation has been presented, but may not fully mitigate the impacts. Community consultation and sensitive working will be maintained throughout the construction period;
- Land take of habitats supporting endangered species in the Ograźhden Prime Butterfly Area has the potential to have a moderate residual impact. However Euromax has committed to maintain the existing grazing regime (or replicate), avoid disturbance to high quality pasture at higher elevations and revegetate the TMF to pasture and scrub mosaic at closure, designed for suitability for Large Blue butterfly and other invertebrates;
- The placement of the TMF within Shtuka River will result in the loss of 4 km of natural aquatic habitat which has the potential to have a high impact. In addition the loss of baseflow in the Jazga upstream of the Ilovica Reservoir will lead to the derogation of aquatic habitats. The decapods will be translocated reducing this impact;
- The uncertainty associated with the effectiveness of the grout curtain and the residual impact on aquatic habitats and species has led to a requirement for design criteria for grout curtain and SCF design to ensure protection of aquatic habitats and species;
- Despite archaeological evaluation, excavation and recording implemented as mitigation at directly impacted archaeological sites, a moderate residual impact may result where sites are permanently lost. Strumica Museum has been engaged by Euromax to implement mitigation;
- Project components altering the visual character of the landscape will present a residual impact. Revegetation and restoration will partially mitigate this, however a permanent moderate visual impact will remain; and
- The Project will result in the permanent loss of productive forestry land-use over the reclaimed TMF, which results in a high residual impact on forest land use. Euromax has committed to revegetation of the TMF to pasture and scrub mosaic at closure, designed for suitability for Large Blue butterfly and other invertebrates, which has the potential to have a net positive impact on biodiversity at closure.

Despite these residual impacts, the Project is expected to have substantial economic benefits to the Republic of Macedonia, representing a major contributor to national economic activity and government revenues and benefits to the local economy. In addition, positive impacts on the quality of life for residents of nearby

communities (primarily in the Municipalities of Bosilovo and Novo Selo and more broadly in the Strumica region) will include community development, increased incomes and improved infrastructure and services.

**Table 1: Summary of Residual Impacts**

| Project Phase/s | Receptor | Impact before mitigation | Mitigation | Residual impact classification |
|---|---|---|---|---|
| **Geomorphology, terrain and soils** | | | | |
| Construction | Control of erosion/ sediment loading | **Moderate** | Erosion control measures incorporated into the Project design. | **Low** |
| Construction, operations, closure, Post-closure | Agricultural land use | **Moderate** | Road will be routed to minimise loss of productive agricultural land. | **Low** |
| | Grazing land use | **Moderate** | Reclamation, monitoring of soil quality. | **Low** |
| | Forestry land use (fuel, timber) | **Major** | Capping of TMF with soil or waste rock. Long-term monitoring. | **Low** |
| **Water Quantity** | | | | |
| Operations (Yr 20) and Closure (Yr 27) | Jazga River at Ilovica water supply intake | **Major** | Facilitating new village water supply systems for Ilovica and Shtuka and decommissioning Ilovica and Shtuka intakes on the Jazga and Shtuka rivers. | **Negligible** |
| Operations (Year 20) and Closure (Yr 27) | Jazga River upstream, of Ilovica Reservoir | **Major** | None | **Major (see aquatic biodiversity)** |
| Construction (Yr -1) | Ilovica reservoir | **Moderate** | Euromax to minimise abstraction of water from Ilovica Reservoir for construction purposes.<br>Develop alternative sources of water supply for mine construction. | **Negligible** |
| Operations (Yr 20) and Closure (Yr 27 onwards) | | **Major** | Euromax to work with SPWMC and others to design, construct and operate supply from Turija Reservoir. At closure, the water supply infrastructure, power supply and pumps will be maintained, linking the Turija pipeline with Ilovica Reservoir and Ilovica WTW. Euromax to work with SPWMC and others to pump water into Ilovica Reservoir from Turija Reservoir to augment river inflows prior to the pit lake spilling. | **Negligible** |
| Operations (Yr 20) | Jazga River downstream of Ilovica reservoir | **Major** | Euromax to agree with SPWMC that they will make a limited number of releases of water from Ilovica Reservoir of agreed magnitude (flow) and duration (a few days). | **Negligible** |
| Post Closure (Yr 110+) | Jazga River through Ilovica | **Moderate** | Euromax to design provision of storage and attenuation for flood waters. | **Negligible** |
| Post Closure (Yr 27+) | Shtuka River at the intake | **Major** | Euromax will develop engineering designs for water management on the TMF to maintain low flow downstream. | **Minor** |

| Project Phase/s | Receptor | Impact before mitigation | Mitigation | Residual impact classification |
|---|---|---|---|---|
| Operations<br>Years 1 and 2-20 | Turija irrigation area | **Moderate** | Euromax to agree with SPWMC to operate abstraction from the proposed refurbished Turija pipeline to ensure flow remains in the Turija pipeline downstream of Euromax's abstraction point. | **Minor** |
| Post pit lake (Yr 110) | Jazga River at Ilovica water supply intake | **Major** | Euromax will co-fund with Bosilovo Municipality and SPWMC new village water supply systems for Ilovica and Shtuka, to be commissioned before mine construction stage starts, plus decommission Ilovica and Shtuka intakes on the Jazga and Shtuka rivers.<br>Euromax will collect the pit lake overflow and pipe to a passive or active treatment system where the pH will be neutralised and metal concentrations will be reduced (as described in Table 6-1). | **Negligible** |
| | Ilovica reservoir | **Major** | | **Negligible** |
| | Jazga River at Radovo | **Moderate** | | **Negligible** |
| **Water Quality** | | | | |
| Operations (Yr 20)<br>Closure (Yr 21) and<br>Closure (Yr 220) | Shtuka River at Shtuka water supply intakes | **Major (all phases)** | Euromax will co-fund with Bosilovo Municipality and SPWMC new village water supply systems for Ilovica and Shtuka, to be commissioned before mine construction stage starts, and decommission Ilovica and Shtuka intakes on the Jazga and Shtuka rivers.<br>Euromax will construct a grout or gel curtain at the SCF to capture 95% of the flow of contaminated groundwater under the SCF, encapsulate acid generating material in the TMF embankment and develop methods for stabilizing and reducing infiltration into and runoff from the TMF embankment surface using vegetation.<br>Euromax will treat seepage captured in the SCF that is not suitable for discharge in a treatment plant.<br>The SCF will be sized to ensure that, following closure, overflows due to storm events will be adequately diluted and comply with project water quality standards. | **Negligible (water supply security)**<br><br>**Low (other receptors)** |
| Operations (Yr 20) | Shtuka River at Sekirnik road bridge | **Moderate** | As above for Shtuka River at Shtuka water supply intakes. | **Low** |
| Closure (Yr 21) | | **Moderate** | | **Negligible** |
| Closure (Yr 220) | | **Moderate** | | **Low** |
| **Sediment** | | | | |
| Construction | Shtuka River - downstream of TMF and diversion | **High** | SWD will be constructed prior to TMF stripping and construction, flocculation in SWD. | **Low** |
| **Noise & Vibration** | | | | |
| Construction | Shtuka | **Moderate** | Sensitive timing of works, screening of noisy activities. | **Moderate** |
| | | | Acoustic barrier adjacent to access road. | **Negligible** |

| Project Phase/s | Receptor | Impact before mitigation | Mitigation | Residual impact classification |
|---|---|---|---|---|
| | Sekirnik | **Moderate** | Sensitive timing of works and screening of noisy activities. | **Moderate** |
| Operations | Shtuka | **Major** | Acoustic barrier adjacent to access road. | **Negligible** |
| | Sekirnik | **Major** | | **Negligible** |
| **Biodiversity** | | | | |
| Construction and operations | Terrestrial habitats – forest communities (excluding the TMF) | **Moderate** | Salvage flora SoCC during site clearance, for use in progressive ecological restoration.<br>Revegetate project footprint to forest and scrub mosaic which reflects baseline conditions. | **Minor** |
| Construction, operations, closure, post closure | Terrestrial habitats – forest communities (TMF) | **Major** | Salvage flora SoCC during site clearance, for use in progressive ecological restoration.<br>Revegetate TMF to pasture and scrub mosaic at closure, designed for suitability for Large Blue butterfly and other invertebrates. | **Major** |
| Construction, operations, closure, post closure | Critical Habitat - Habitats supporting endangered species – Ogražden Prime Butterfly Area | **Major** | Deliver BMP and biodiversity offset feasibility study in consultation with local and regional experts.<br>Avoid disturbance to high quality pasture at higher elevations. Fences to be installed to prevent access.<br>Maintain the existing access and grazing regime (or replicate through artificial means) for the higher elevation grasslands.<br>Compensatory habitat creation will be undertaken by revegetating the TMF to pasture and scrub mosaic at closure plus offsetting feasibility study delivery. | **Moderate (potentially moderate positive post-closure)** |
| Construction, operations, closure, post closure | Flora SoCC | **Moderate** | As feasible, salvage flora SoCC during site clearance Revegetate project footprint (except TMF) to forest and scrub mosaic.<br>Revegetate TMF to pasture and scrub mosaic at closure.<br>Avoid disturbance to high quality pasture at higher elevations. Fences to be installed to prevent access. | **Minor** |
| Construction, operations, closure, post closure | Terrestrial fauna SoCC (non-butterfly) | **Moderate** | Pre-clearing rapid surveys plus selective SoCC salvage and relocation.<br>Undertake progressive ecological restoration to minimise impacts to wildlife.<br>Placement of artificial bat roosting habitat.<br>Implement invasive fauna mitigations.<br>Seasonal constraints applied to earth works.<br>Removal of bird nesting habitat outside of the nesting season. Prior to construction activities, carry out an assessment of amphibian and reptile migration corridors. | **Minor** |

| Project Phase/s | Receptor | Impact before mitigation | Mitigation | Residual impact classification |
|---|---|---|---|---|
| Operations, closure | Aquatic habitat and species – Upstream of Ilovica Reservoir | **Moderate** | Undertake fish and decapod rescue prior to operations. | **Minor** |
| Construction, operations, closure, post-closure | Aquatic habitat and species – Shtuka River upstream of SWD | **Major** | Undertake fish and decapod rescue prior to diversion of the Shtuka River. | **Major** |
| Post-closure | Aquatic habitat and species – Shtuka River downstream of TMF | **Moderate** | Define design criteria for grout curtain and SCF design to ensure protection of aquatic habitats and species. | **Minor** |
| **Ecosystem Services** | | | | |
| Operations, closure, post-closure | Freshwater Type 1 | **Major** | Euromax to work with SPWMC and others to ensure the supply of water to the WTW will be switched from Ilovica reservoir to Turija reservoir. Water intakes on both Jazga and Shtuka to be decommissioned.<br>Euromax to agree with SPWMC to ensure a prescribed flow remains in the Turija pipeline downstream of Euromax's abstraction point.<br>Active and or passive treatment of water discharge from the TMF following closure, plus active treatment of discharge form the pit lake once formed following closure. | **Minor** |
| Operations, closure, post-closure | Freshwater Type 2 | **Major** | A water pipeline will be constructed between Turija reservoir and Ilovica WTW to preserve the reliability and quality of water entering the WTW. | **Minor** |
| Construction and operation | Erosion Control type 1 and 2 | **Moderate** | Development of stable embankment slopes, mechanical stabilisation and installation of erosion control features, and prompt revegetation of appropriate areas. Installation of physical erosion control features. | **Minor** |
| Construction, operation, closure and post closure | Regulation of Water and Slowing of the water cycle (Including Filtering water and slowing of the water cycle) | **Moderate** | Construction of SWD. Zero surface water discharge from the site during construction and operations phases.<br>Passive and active treatment and closure and post closure. | **Minor** |
| Construction, operation, closure and post closure | Ethical and Spiritual Values | **Moderate** | Relocation of receptors and photographic logging and preservation of sites. | **Minor** |

| Project Phase/s | Receptor | Impact before mitigation | Mitigation | Residual impact classification |
|---|---|---|---|---|
| **Cultural Heritage** | | | | |
| Construction | Preslop Spring Memorial Stone | **Moderate** | Relocation of receptor. | **Minor** |
| | Shtuchki Vodopad | **Moderate** | Photographic recording and enhanced access. | **Minor** |
| | Religious beliefs and practices | **Moderate** | Sympathetic construction schedule. | **Minor** |
| | Adit/Tunnel Site | **Moderate** | Photographic recording. | **Minor** |
| | Domus Gaber | **Moderate** | Archaeological watching brief. | **Minor** |
| | Preslop | **Major** | Archaeological evaluation and excavation. | **Moderate** |
| | Krvavichevo and Golemata Niva | **Major** | Archaeological evaluation and excavation. | **Moderate** |
| | Gradishte | **Major** | Archaeological evaluation and excavation. | **Moderate** |
| | Old Mill | **Moderate** | Archaeological evaluation and excavation. | **Minor** |
| Construction and operation | Anovi (AR-06) | **Major** | Archaeological evaluation and excavation. | **Moderate** |
| Operation | Religious beliefs and practices | **Major** | Sympathetic blasting regime. | **Minor** |
| | Crkvishte (AR-04) | **Moderate** | Sympathetic blasting regime and visual inspection and vibration monitoring. | **Negligible** |
| **Socio-economic** | | | | |
| Construction, operation | Economy | **High (positive)** | None Required. | **High (positive)** |
| Construction, operation | Employment | **High (positive)** | None Required. | **High (positive)** |
| Construction, operation | Incomes | **High (positive)** | None Required. | **High (positive)** |
| Construction and operation | Population and health | **Moderate** | Euromax will assist in improving the Ilovica clinic. | **Moderate (positive)** |
| All phases | Noise for local communities | **Moderate** | Considered above. | **Moderate** |
| | Visual for local communities | **Moderate - High** | None practical. | **Moderate to High** |

| Project Phase/s | Receptor | Impact before mitigation | Mitigation | Residual impact classification |
|---|---|---|---|---|
| | Perception of harm by local communities | **High** | Public education of environmental effects. | **Low** |
| Operation, post-closure | Physical infrastructure | **Moderate (positive)** | None required. | **Moderate (positive)** |
| All phases | | **Moderate (positive)** | | **Moderate (positive)** |
| Construction, operation | Land use – grazing and forestry | **Moderate - High** | Addressed through LRP. | **Negligible – Low** |
| All phases, post-closure | Land use – forestry land over TMF | **High** | None. TMF will be restored to scrub, there is net positive impact on biodiversity at closure, but forest users remain impacted through all phases. | **High** |

# Report Signature Page

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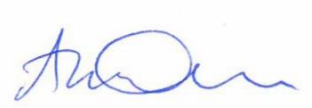

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Date: 20 March 2017

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