
10. Transboundary Impacts

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1 Introduction

This Chapter examines the potential for transboundary impacts arising from the construction, operation and closure of the Roşia Montană Project in Romania. This Project involves the mining and processing of an average of 13 Mt/a of gold ore over a period of 17 years, from open pit mines, together with the storage and management of mining and process wastes. Over the first 14 years low grade ore from the pits will be stockpiled and afterwards it will be reclaimed and processed during years 14 to 17. Under the current plans, open pit mining will last for 14 years.

It has long been recognized that the impacts of industrial projects may be experienced outside the borders of the country in which the proposed development is located. For example, potential *pollution pathways*, such as a river system that is fed by water draining a development site, may cross national boundaries. The supply of raw materials and finished goods for the construction and operation of the project may involve traffic movements that can also cross national boundaries. Such materials may be of a hazardous nature. This creates a potential problem in that while the Environmental Impact Assessment (EIA) of a project may be administered by a national authority, natural stakeholders outside the jurisdiction of that authority may have no avenue for involvement in decision making. In turn, this increases the possibility that such transboundary impacts may not be fully or appropriately considered. This potential has been recognised in both international and national guidance and regulations as discussed in Section 5

The present chapter reviews the Project in regard to the potential for transboundary impact by highlighting issues that may have potential transboundary impacts, and by drawing on the in-depth analyses set out in this Environmental Impact Assessment Report.

The process for mitigating transboundary impacts is the same as for other potentially significant impacts that have been identified for the Project. The measures applied involve a hierarchy of approaches as set out below:

- Adoption of alternative processes, project component locations, etc. to avoid impacts arising;
- Project design measures to remove or minimise potential risks from the project options selected;
- Implementation of specific control and/or management systems to minimise impacts.

Throughout the project development process this approach has been adopted to ensure that risks posed by identified potential impacts have been minimized. Where appropriate to this section specific mitigation measures are discussed.

The Chapter is structured as follows:

- *Section 2* describes the statutory/advisory provisions relating to transboundary impact assessment;
- *Section 3* characterises the Project with regard to issues that may have significance beyond Romania's national borders;
- *Section 4* screens the environmental issues associated with the Project to identify those that pose potential transboundary issues;
- *Section 5* provides conclusions concerning potential transboundary issues.

2 Legal Framework

The environmental impact assessment procedures in Romania are set out in **Governmental Decision 918/2002** on the environmental impact assessment framework procedures and for approval of the public and private projects list subject to this procedure. This decision is supported by the following Ministerial Orders which provide procedural frameworks for the conduct of environmental impact assessments:

- **Ministerial Order 860/2002** for approval of the environmental impact assessment and the issuance of environmental agreement procedures;
- **Ministerial Order 863/2002** for approval of the methodological guidelines applicable to the stages of the environmental impact assessment framework procedure;
- **Ministerial Order 864/2002** for approval of impact assessment and public participation in the decision-making procedures for projects with transboundary impact.

These regulations transpose EU EIA legislation into Romanian law, and also reflect the UN-ECE Convention on Environmental Impact Assessment in a Transboundary Context (the 'Espoo Convention'), which was ratified by Romania through Law no. 22/2001. Under Annex 1.1 of Ministerial Order 860/2002, mining activities with an exploitation area exceeding 25 hectares require an environmental impact assessment.

In relation to the transboundary notification and consultation process, under Article 5 of Ministerial Order 864/2002 it is stated that:

'the central public authority for environmental protection is responsible for:

- a) *Carrying out an environmental impact assessment prior to a decision to authorise or undertake a proposed activity listed in Annex I which is likely to cause a significant adverse transboundary impact;*
- b) *Notification of the Affected Parties as to any proposed activity listed in Annex I which is likely to cause a significant adverse transboundary impact;*
- c) *Regular communication with the competent authority of the Affected Party and shall seek to reduce misunderstandings as regards the content and implementation of these provisions;*
- d) *Ensuring open discussions regarding transboundary environmental impact assessment and the related issues contained within this Order.'*

The implication of this framework is that the responsibility for the consultation with neighboring countries in relation to the proposed project rests with the Government of Romania. In support of any inter-governmental dialogue in relation to the Roşia Montană Project, this Chapter reviews key transboundary issues highlighted by the environmental impact assessment, for which further details on specific issues may be found in the relevant Chapters of this Environmental Impact Assessment Study.

3 Project Characterization

This section sets out:

- A basic summary of the Project;
- The project setting in terms of existing environmental issues;
- Existing mining facilities in the Project area;
- A summary of proposed mining operations;
- A summary of proposed processing operations;
- A summary of proposed waste management activities;
- A summary of proposed Project infrastructure;
- A summary of employment impacts of the Project.

3.1 Summary of the Project

A full project description is provided in Chapter 2 of this EIA report. However, in this Chapter the proposed project design is characterized to provide a framework for the review of potential transboundary impacts.

The proposed Roşia Montană Project comprises the following main elements:

- Decommissioning and closure of existing mining facilities that are no longer required;
- Construction of access roads and mine infrastructure;
- Development of four adjacent open pit mines using conventional large scale truck and shovel methods;
- Temporary stockpile of low grade ore with subsequent reclaim and processing;
- Construction and operation of an ore processing plant that will produce an impure gold/silver metal (doré) for sale and further off-site refining;
- Construction and operation of a tailings management facility (TMF) to contain process solid wastes and effluent;
- Construction of waste rock dumps to contain waste rock of no economic value;
- Construction and operation of a water management system designed to ensure that the water in contact with the Project is kept separate from the rest, and either treated appropriately prior to its release to the environment or used in the Project.

3.2 Project setting

Mining activity in and around the Roşia Valley dates back over 2,000 years with large-scale industrial mining undertaken over the past 50 years. Currently, the existing activities are limited to a small open pit operation conducted by the State-owned company, Minvest. As a result of this long history of mining, during which few environmental controls were applied, there are significant environmental impacts on the surrounding areas. These include:

- Contamination of air quality by dust blown from barren working areas and mining wastes (waste rock and tailings);
- Contamination of surface and underground waters with heavy metals, as a result of oxidation of remnant sulphide minerals (Acid Rock Drainage) in old mine workings and in waste deposits;

- Contamination of surface water by process plant discharges and uncontrolled run-off from operational and derelict mined areas and mine dumps;
- Contamination of soils by waste materials and run-off from mine voids and waste dumps;
- Land dereliction as a result of un-rehabilitated mined areas and waste dumps.

In relation to the potential for transboundary impacts, the main concern regarding the existing setting is the contamination of surface streams. These form the headwaters of a river system that ultimately crosses national boundaries, and they are currently subject to contaminated discharges from the existing mining operations.

3.3 Existing facilities

As stated above, the Roşia Montană Project site contains an existing small scale mine managed by Minvest. The Roşia Montană Project and Minvest will work together to develop a transition plan for the Minvest operations and the appropriate regulatory authorities will develop a compliance schedule for the clean-up and closure of the current mining operation. Permanent closure works will be undertaken for the underground mine workings and portals, the ore transportation system and the ore milling and processing plants. Minvest tailings deposits may be amenable to reclamation and re-working to extract residual gold, however this is subject to a separate license, the objectives of which are outside the license perimeter currently owned by RMGC. All other Minvest facilities will be temporarily closed and incorporated into the Roşia Montană Project operations. These facilities will therefore come under the new mine's environmental management system which will include treatment of existing acid rock drainage currently discharging into the Roşia and Corna Valleys and polluting downstream surface waters.

3.4 Mining

During the construction phase there are no mining activities being undertaken on the site. The open pit mining operational phase will employ conventional techniques involving drilling, blasting, loading by hydraulic shovels and hauling by large off-highway haul trucks. During the 14 years, four open pits are scheduled to be worked, with a maximum pit depth of 220 m to 260 m below ground level. A total of 214, 9 Mt of ore will be extracted over the life of the mine. All low-grade ore from the pits will be placed in a stockpile for future recovery (between years 14 and 17); high grades ore will be preferentially selected and sent directly to the process plant. Part of the waste rock (rock extracted from the pits to allow access to the ore body) will be used for the construction of the TMF embankment. The waste rock not needed for construction will be either placed in two main dumps (Carnic si Cetate) adjacent to the pits or used for backfill of successive completed pits as they become available. During the operational period, all pits will be dewatered to maintain them in a dry state that will allow mineral extraction to continue. The water resulted from this operation will be discharged to the Cetate water management dam where it will be tested, treated as necessary and then discharged. Diversion channels will be built around the pits to stop surface water flows from entering the workings.

Mine operations personnel will be located within the main office building complex and mobile plant maintenance will be carried out within workshops with fuelling and lubricating bays bunded and lined to prevent pollution from accidental spills.

The bulk explosives slurry mixing facility will be located 600 m from the process plant facility and 3 km from the nearest dwelling.

During the closure phase, following the completion of workings in the open pits and their backfilling, following their dewatering and the withdrawal of mining equipment, each of the three backfilled pits will be covered by a vegetated layer. The final pit cannot be backfilled without re-excavation of deposited waste rock. Here, unwanted mine drainage openings from previous mining, encountered by current mining, will be sealed and the pit allowed to

flood by natural re-charge. Water will also be drawn from the TMF to assist this drain facility and then it will be discharged to the Cetate forming pit lake (following treatment, if required to ensure the quality is in line with Romanian standards) to accelerate the filling. Once the pit is flooded to the desired elevation, water will either be pumped to the water treatment plant if quality is not suitable for direct discharge, or released via an existing adit to a passive/semi passive treatment plant and then to the environment. Flooding and backfilling of the pits will prevent oxidation of sulphide minerals within the pit walls and therefore prevent acid rock drainage. However, if required, following analysis of water quality, pit water may occasionally be lime-dosed to reduce or eliminate any need for further treatment prior to discharge.

3.5 Processing

The proposed ore preparation and processing method incorporates the following main elements:

- Single stage crushing of run mine ore using a gyratory crusher;
- Stockpiling of crushed ore;
- Fresh water supply from the Aries River;
- Reclaim of crushed ore and wet grinding using a semi-autogenous grinding (SAG) mill followed by two ball mills in parallel;
- Cyanide leaching, which commences in the grinding circuit within the CIL agitate leach tanks to extract gold and silver;
- Adsorption of extracted gold and silver onto activated carbon followed by elution of the gold and silver from the activated carbon in pressure vessels;
- Electrowinning to recover gold and silver stripped from the activated carbon, as a precious metals sludge and smelting of this sludge to produce gold and silver ingots;
- Thickening of the tailings;
- Cyanide detoxification before the tailings leave the process plant containment zone;
- Disposal of treated tailings to the Tailings Management Facility (TMF);
- Water reclaim from the TMF for recycling and re-use.

The design of this facility includes provisions for the management of planned discharges (e.g., tailings to the TMF) as well as unplanned discharges (e.g., dust from conveyors). The plant is located within the catchment managed by the Project water management scheme, consisting of run-off control structures within the Roşia and Corna Valleys and the TMF and a secondary containment dam in the Corna Valley.

Particular attention has been paid to storage and use of sodium cyanide (NaCN) in the plant, according to the International Cyanide Management Code. Plant design includes safety provisions, leak detection, emergency close-down, etc. using techniques that are recognised world-wide as industry standard and proven through extensive operational experience. The process circuit includes cyanide destruction to ensure that discharges to the TMF contain only residual cyanide at environmentally safe levels and in conformance with the latest EU standards and guidance. These include the Mine Waste Directive EC/2006/21 on mine waste management and amendment of Directive EC/2004/35 and The Best Available Techniques Reference Document (BREF) for the management of tailings slurry and waste-rocks from mining activities, developed under the auspices of the European Integrated Pollution Prevention and Control Bureau.

On closure, the process plant will be removed, materials and equipment sold as appropriate and the plant site restored to a condition similar to its former state.

The process operation (particularly the use of cyanide compounds in the leach circuit) has the potential to impact the environment. Therefore, specific mitigation measures and design

features have been implemented to control risks associated with the use of cyanide. These measures include the following:

- Supply, transportation, use and storage and disposal of cyanide and its residues will be carried out in full compliance with a Cyanide Management Plan that follows the International Cyanide Management Code;
- Tailings from the leach section of the process plant will be routed to the tailings thickener where water (containing cyanide) will be reclaimed and recycled;
- Cyanide concentrations in the process tailings will be reduced to below regulatory requirements using the SO₂/air cyanide destruction process, prior to discharge to the TMF;
- No programmed discharges of process effluent to the environment will occur. However, provisions will be made for secondary treatment of any effluent that contains cyanide in order to allow safe discharge to the environment, in line with Romanian discharge standards, should that be required for any reason, for example the restoration of full TMF storage capacity following an extreme rainfall event;
- The TMF is designed to provide safe and secure long-term storage of tailings solids and liquids (see below).

3.6 Waste management

Key waste management activities at the Project site include:

- Waste rock storage;
- Tailings management facility (TMF).

Waste rock

Approximately 265, 9 Mt of waste rock will be produced over the life of the project. Waste rock will be used for construction of the TMF embankment and other impoundments, with the remaining rock disposed into two stockpiles during the first nine years of mine life. From Year 10, the first of the open pits (Carnic) will have been mined-out and available for backfilling using waste rock from continued mining of the other pits.

The design of the waste rock storage structures has taken into account the potential for water run-off and acidic chemical breakdown of the mineral particles (potential for *acid rock drainage*) with provision for interception and re-use or treatment of contaminated water. Therefore, prior to placement of rock within these dumps, all topsoil will be stripped and stored for use in the final rehabilitation. Bedrock materials will then be scarified and compacted to form a semi-impervious layer under the rock pile to minimise seepage to groundwater. Diversion channels will be constructed around the dumps to collect surface water run-off from the upstream areas and discharged as clean water. Run-off from the dumps themselves, which may be contaminated, will be collected within the TMF for treatment or reuse prior to discharge to the environment.

On closure, following completion of the waste rock disposal operation, the dumps will be regraded to form the final restoration contours. The Cetate dump will then be soil covered and revegetated. The Carnic dump, part of which will be within the open pit, will be graded to ensure all run-off drains to the pit from where it can be tested and treated as necessary prior to discharge. The dump surface will then be soil covered and revegetated.

Tailings management facility (TMF)

As noted above, process tailings will be disposed of to a TMF located in the Corna Valley. The TMF is designed to provide the required design storage capacity for the life of the mine (forecasted at about 214, 9 Mt of tailings) plus a contingency capacity of 6 Mt to handle additional tailings if additional gold deposits are identified and mined. The following design components characterise the TMF:

- A tailings dam (Corna Dam) built according to the centreline method of construction, using rockfill material for the construction of the downstream shell, to a final height of 200 m above natural ground to retain the treated tailings;
- A containment basin (pond), created upstream from the Corna dam to store the full volume of treated tailings;
- A tailings delivery and water reclaim system;
- A secondary containment and recirculation system (low permeability dam, pumps, containment pond and monitoring system) downstream of the embankment to collect potentially contaminated seepage and surface run-off from the main embankment;
- An upstream coffer dam and run-off diversion channels to collect clean run-off from the upstream catchments and discharge them into the stream;
- A comprehensive geotechnical monitoring system; and
- Service roads.

The TMF, including Corna Dam, is designed according to best international practices and Romanian standards to ensure a facility for the safe and environmentally acceptable storage of the treated tailings. The design takes into account the requirements for closure, rehabilitation and post-closure safety at the end of the mine life. The TMF is also designed and will be operated to deal with extreme flood conditions without the need for discharge to the environment. The facility is designed not to require discharge of effluent to the environment, however, if for any reason this is required, the proposed water treatment system will enable safe discharge of tailings water to the environment, fully in line with Romanian discharge standards, including that for cyanide.

Once mining is completed and the TMF is full, a low level closure spillway will be constructed and the tailings pond drained down to provide a dry surface and stable tailings behind the dam wall. The entire surface of the TMF will then be soil covered and revegetated to complete the restoration. On closure, the secondary containment dam will be retained and the seepage/run-offs collected within this will be tested and treated prior to discharge to the environment. Post closure treatment will be based on a semi passive system, including a series of lagoons, which will be established and developed during the operational phase. Outflows from this system will be monitored on a regular basis to identify when water quality has reached a point where no further active treatment is required.

Other wastes

Other wastes generated by the Project include sewage wastes as well as general refuse and scrap. These will be disposed off in an approved manner to minimise pollution.

3.7 Infrastructure

Buildings and offices

The following main buildings and offices will be built as an integral part of the Project development:

- Administration building and associated parking;
- Mine workers' change facilities;
- Metallurgical laboratory and office facilities;

- Warehouse facilities;
- Fuel and lubricant storage tanks and fuel station area;
- Truck wash facility;
- Plant maintenance facility;
- Explosives warehouse;
- Electrical sub-station building;
- Gatehouse and weighbridge.

Associated with these buildings, there will be provisions for collection, treatment and disposal or re-cycling of waste materials and effluents (other than waste rock and tailings), typical for office and industrial type facilities.

Roads and transport

Access to the site is provided via the existing highway system. Only minor road building (approximately 3.4 km) is required to link the plant site to this system. Internal roads will also be constructed to link the various facilities and provide access for inspection and servicing. In addition, a new access road to Roşia Poieni will be constructed.

The vehicle fleet comprises off-road heavy haulage vehicles for use on the internal road system only. Miscellaneous site service vehicles including fork lift trucks, graders and loaders, and water trucks will also use this internal network. On-road vehicles will include workers transport buses, an ambulance and fire truck.

In addition, construction and consumable materials will be delivered to the site by contractors using 20 tonnes road trucks. Very large items for construction will be delivered by special trucks along designated routes from the nearest international delivery point (in the majority of cases, Constanta).

Special consideration has been given to the delivery of sodium cyanide to the site. Sodium cyanide is a toxic material and a reliable production source of suitable quality NaCN is not currently available in Romania. Import across national boundaries will be required at a rate of around 11,000 to 12,000 tonnes per year.

This transportation presents a *hazard* of spillage of sodium cyanide onto soils or into water with potential exposure of humans and wildlife to toxic levels of cyanide. The concentration and volume of CN being transported (20 tonnes/load) could result in a major impact if release of a full load was to occur.

Various route options for this delivery have been identified and the aim of the transport system is to maximise the use of railroads. Moreover, several alternatives will be maintained to enable operational problems to be dealt with, e.g., to by-pass construction works or temporary facility closures.

As the *risk* of a spillage event was realised, it will be reduced to an acceptable level by adopting the practices set down in the international cyanide management Code, as established on site under a *Cyanide Management Plan*, and respecting the Roşia Montană Project responsibilities under the Code will include appropriate communication/ cooperation with authorities within and outside Romania.

The basic control system to be employed includes the following:

- Sodium cyanide to be transported in containerised steel tankers that will be resistant to rupture in the event of an accident;
- CN will be in solid briquette form during transportation, not liquid;
- At delivery, CN will be liquefied and pumped to the storage tanks directly from the transport tanker with no intermediate handling or storage;
- All haulers will be subject to strict control monitoring and audit systems to ensure they comply with the International Cyanide Management Code and EU transportation regulations;

- Full tank loading and communication during transport to allow rapid response to any accidents.

While a risk of accident remains, the control systems, the route selection and the method of transport combine to reduce the risk of any potential transboundary impacts to a minimum.

Electric power

An existing 110 kV overhead power line from Zlatna to Roşia Poieni bisects the Project site. This has sufficient capacity to meet existing demand plus the proposed Project demand. The transmission line however will need to be diverted around the operational areas. A spur from this line will then be installed for feeding the new primary substation at the Project site. Distribution around the site will be at 20 kV (Romanian Standard for local distribution) using overhead and underground cables as appropriate. Standby power generation will be provided on site in the case of a failure of the main grid.

Water control structures and channels

The general approach to water management for the Project is to minimize the need for freshwater intake and the discharge of resulting effluent, by maximizing the use of recycled water and effluent where possible. With regard to surface water management on the site, the objectives are as follows:

- As far as practicable, divert clean run-off water away from areas where it may become contaminated and discharge diverted run-off downstream of the Project. Diversion channels are therefore provided around the open pits, the TMF, low grade ore stockpiles and waste rock dumps;
- Protect structures, stockpiles and operational areas from storm flows. Diversion channels will be built around the plant site and storage facilities and are designed to cope with storm flows;
- Intercept and store contaminated run-off water for re-use within the mine process or for discharge into surface water receptors following treatment, in accordance with regulatory water quality standards. These include the construction of the Cetate Waste rock dump and Mine Drainage pond, the Cirnic Waste Rock Drainage Pond, the secondary containment pond downstream of the TMF and the Cetate water management dam. The TMF is designed to hold two successive extreme storm events without need for discharge, however, if any discharge is required, for example in relation to the restoration of full TMF storage capacity following an extreme rainfall event, the proposed water treatment system will enable this to be in line with Romanian discharge standards.

These objectives will be realized by construction of these water control structures and channels, including interception dams to collect run-off and seepage from operational areas and old workings.

3.8 Employment

The Project will create direct employment opportunities at the mine for both construction activities, permanent mining operations, and seasonal labour requirements relating to activities such as excavations for cultural and archaeological programmes. Total numbers for the labour force on site will vary from the base level of approximately 200 staff during the pre-construction period with up to 800 short-term staff for seasonal labour. Once the mine is operational, initial staff numbers will be of approximately 612, reducing to 530 by year four of mining, once the final construction and development activity is complete. Roşia Montană is located within an established mining district where mining is currently in decline. Therefore, an experienced mining workforce already exists in the area. The Roşia Montană Project is committed to recruiting the majority of the workforce locally. Similarly, most of the seasonal labour will be recruited locally and the company has developed a hiring

policy aimed at informing the local population of opportunities as they arise, thus maximising local recruitment.

At closure site maintenance staff will be required until full rehabilitation and physical and chemical stabilisation of the sites has been achieved. Staff numbers for this phase will however be lower than for the construction and operational periods.

4 Screening of Identified Environmental Issues for Potential Transboundary Impacts

To focus discussion of Transboundary impacts on those issues that have the potential to cause significant Transboundary impacts, a screening exercise has been undertaken. For each key environmental issue identified within this Environmental Impact Assessment, an assessment has been made of the geographic range (or 'zone of influence') of the potential impacts of each issue. From this assessment, those with a zone of influence potentially extending across national boundaries are then discussed in further detail. This assessment was conducted during the design phase, and the results are presented below, in Tables 10-1 – 10-3.

Table 10-1. Transboundary impact screening Construction Phase

Environmental issues	Project Component	Potential Impact	Zone of influence
Noise and Air quality	Process plant	Contamination of environment with vapours and fumes as a result of fires	Local
		Dust rise on unsurfaced roads during haulage for construction activity	Local
		Noise from construction activity at plant site	Local
	Fuel storage areas	Contamination of local environment with vapours and fumes as a result of spillage/fires	Local
Surface and groundwater	Fuel storage areas	Contamination of streams and groundwater as a result of fuel spillage	Local/regional
	All construction sites	High suspended solid loads entering rivers as a result of run-off from bare ground at construction site and haul road	Local
Soils, land use and ecology	Fuel storage areas	Contamination of soils and reduction in land use potential/ecological value as a result of spillage	Local
	All construction sites	Loss of land use, biodiversity and soils due to construction activity	Local
Communities	Site traffic on public roads	Increased risk of injury to other road users due to accidents involving equipment delivery trucks, etc.	Regional / transboundary
		Increased noise and vibration from site traffic on public roads	Local / regional
	Construction sites	Injury to public due to uncontrolled access to construction sites.	Local
	All activities	Creation of new employment and possible inward migration of people to the area	Regional / transboundary
		Resettlement of local residence within working areas prior to starting the mining activity	Local

Table 10-2. Transboundary impact screening Operational Phase

Environmental issues	Project Component	Potential Impact	Zone of influence
Noise and Air quality	Process plant	Contamination of local environment with process/reagent emissions *	Local
		Contamination of local environment with vapours and fumes as a result of fires.	Local
	Fuel storage areas	Contamination of local environment with vapours and fumes as a result of spillage/fires.	Local
	TMF / waste dumps	Dust rise from bare ground surfaces within working or un-restored areas of the dumps	Local
	Site traffic	Dust rise from traffic on unsurfaced roads	Local
	Open pit	Blasting activity resulting in dust and noise generation	Local
	Transport of Ammonia Nitrate	Possible risk of fire and release of fumes from accident involving transport.	Local / regional
	All active areas	Noise generation from site activities	Local
Surface and groundwater	Reagent, chemical and fuel delivery	Contamination of streams and underground waters due to accidents and spillage (eg., contamination of surface waters and impacts on rivers and ecosystem due to cyanide spill from a transportation accident)	Regional / transboundary
	Process plant	Spillage and run-off/seepage containing reagent from storage and operational areas	Local/ Regional
		River abstraction resulting in reduced overall river flows	Local
	Fuel storage areas	Spillage and run-off/seepage containing oils from storage and operational areas discharging to water	Local / regional
	Waste rock dumps	ARD and run-off resulting in a low pH, metal contaminated waters discharging from site.	Local
	Open Pit	ARD within pit walls resulting in contaminated discharge from pit dewatering system	Local
	Tailings disposal **	CN contaminated seepage from the toe drains discharging to surface water	Local
		Seepage of tailing fluids to groundwater beneath the TMF	Local
Major tailings discharge due to overtopping or failure/breaching of the main Corna dam.		Regional / transboundary	
Soils, land use and ecology	Process plant	Contamination of soils and impacts on land use potential/ecological value due to spillage, etc.	Local
	Fuel storage areas	Contamination of soils and impacts on land use potential/ecological value due to spillage	Local
	Cyanide transport	Contamination of soils and impacts on river and ecosystem due to cyanide spill from a transportation accident	Local/Regional /Transboundary
	Tailings disposal **	Tailings spill contaminating land downstream of the TMF	Local/Regional
Communities	Site traffic on public roads	Increased risk of injury to other road users from delivery traffic.	Regional
	Transport of Ammonia nitrate	Possible fire and explosive risk from transport involving accident.	Local / regional
	Transport of sodium cyanide	Possible risk of exposure to toxic reagent	Local/regional/transboundary
	Open pit mining	Injury to people and animals close to pit margins	Local
	All operational sites	Injury to public	Local
	All activities	Creation of new employment and possible inward migration of people to the area.	Regional / transboundary
NOTES * HCN gas generation scenarios are dealt with in Chapter 7. ** Tailings dam failure scenarios are dealt with in Chapter 7..			

Table 10-3. Transboundary impact screening Closure Phase

Environmental issue	Project Component	Potential Impact	Zone of influence
Noise and Air quality	Process plant	Contamination of local environment with vapours and fumes from fires during decommissioning	Local
	Fuel storage areas	Contamination of local environment with fuel vapours resulting from spillage/fires	Local
	All active areas	Noise generation from decommission works impacting local residents	Local
		Dust rise on unsurfaced road during haulage for decommissioning activity	Local
Surface and groundwater	Fuel storage areas	Contamination of streams and underground waters due to spillage during decommissioning	Local
	Open Pit	Discharge of potentially acid waters from pit overflow once dewatering ceases	Local
	Waste rock dumps	High suspended solid loads and ARD in site run-off prior to full vegetation establishment.	Local
	TMF	Untreated toe drain seepage discharging to surface water	Local
Flood flows or post-closure embankment failure resulting in discharge of tailings into the stream		Local / Regional	
Soils, land use and ecology	Fuel storage areas	Contamination of soils and reduction in land use potential from spills during decommission works	Local
Communities	Site traffic on public roads	Injury to other road users from traffic generated during the closure phase	Regional
	Construction sites	Injury to public	Local
	All activities	Loss of employment at closure	Regional

Based on the above summary, the key issues identified as being of potential importance from a transboundary perspective assessment are:

- Pollution of surface water systems;
- Transportation of construction materials and sodium cyanide;
- Employment creating inward migration from other areas of the country.

Each of these issues is discussed in further detail below.

4.1 Surface Water pollution

The only significant potential impact from surface water pollution on a transboundary scale relates to the operational phase of the mining project. During construction, no CN is used, and at closure all CN storage and use will cease and the the water within the TMF will be drained down, the TMF stabilised and rehabilitated.

Site setting

Surface watercourses represent both the main pathway and the receptor for any Project-related pollution having transboundary significance. A detailed assessment of the impact on surface waters is provided in Chapters 4 and 7 within this Environmental Impact Assessment study.

Polluted discharges from site and consequential changes in water quality have implications for a range of water users, including:

- Wildlife (especially aquatic wildlife);
- Communities that use river water and depend on access to useable water for their livelihoods (such as fishermen);
- Industrial and agricultural users .

As previously noted , the Project area water drains directly into the Abrud River, a tributary of the Aries River. The approximate length of the water flow at Mures drainage area level, from the proposed project site to the point of crossing the border of Romania, is about 500 km and flows along the Abrudel, Aries and Mures rivers. Aries river drains approximately 70 km, flowing East, then West (discharging in Mures river, on the East side of Cîmpia Turzii). After it leaves Romania territory, Mures river drains on an area of approx. 20 km and joins Tisa river at Szeged, before it drains into Serbia and flows into Danube, at Belgrad. Tisa / Danube basin drains a large area of Central Europe and represents an important means for navigation, water supply, recreation etc. The current water quality within this system is characterized by significant pollutant loads from domestic, industrial, farming and waste management activities and it impacts over 800,000 square km of the river. The existing and old mining activities at Roşia Montană currently contribute to pollution loads within this river system.

Existing mine discharges

As noted in Chapter 4 of this Environmental Impact Assessment study, it is proposed that the Roşia Montană Project will establish, for the first time, a comprehensive environmental management scheme which will control contamination arising from both the new operation and previous mining operations. The net impact on the water quality of the Abrud River is therefore forecasted to be positive, bringing significant contribution to the improvement in water quality in the Abrud River. However, because of the extremely small contribution (in terms of both quantity and therefore quality) of the Abrud River to the quality of water in the Mures river flowing into Hungary, this positive impact will have no significant transboundary effect, although its influence will be beneficial.

Plant site spillage

Due to the large riparian distance to the border (approximately 500 km) any water pollution from the plant site will be subject to significant dilution and chemical and physical

amelioration within the river system. Therefore, only major spillages (with a low probability of occurrence) would have the potential to cause significant transboundary impacts.

Chapter 7 of this Environmental Impact Assessment study examines the risk of large-scale industrial accidents related to the Project. In relation to potential water-related transboundary impacts, it is the use of sodium cyanide in ore processing that is of most importance. The only accidents identified that could lead to a major discharge are identified as follows:

- Spillage of sodium cyanide reagent at the plant site or leakage from pipes or holding tanks;
- Leakage of tailings fluids containing residual cyanide from the delivery and return pipe work systems;
- Release of tailings fluids to the environment, either via seepage through the TMF or failure of Corna Dam.

In relation to a potential spill of sodium cyanide reagent or leakage of liquids from the plant, the proposed risk mitigation measures include:

- Management systems and standard operating procedures within the Cyanide Management Plan to implement the requirements of the International Cyanide Management Code and appropriate national and international legislation;
- Leak detection and spill containment systems in line with best practice and the International Cyanide Management Code.

Similar control systems have been successfully adopted at many mine sites across the world to reduce, as much as possible, the risk of any major spills being released to the environment. In addition, the amount of reagent held at the plant site at any one time will be relatively small. In order to minimize the cyanide quantity kept on the plant site at any moment, there will be a maximum 2 weeks supply for the process plant operation's requirement only.

Taking account of the significant distance to the Hungarian border, the natural dilution and attenuation effects over that distance within the river system and the relatively small volumes held (in terms of transboundary impacts) even with direct discharge of any spillage into a surface watercourse, these would be unlikely to be significant in a transboundary context.

TMF release

In relation to a mass release of tailings fluids due to Corna dam failure, such a mechanism does have the potential to release pollutants into the river, both in a liquid and a solid phase. Release scenarios have been modelled (see Chapter 7) and, based on this, a forecast of a worst case discharge scenario has been made as follows (although the risk of such an event happening is extremely small):

- The solids, i.e. tailings material, was estimated to travel between 0.8 km to 1.6 km downstream from Corna dam;
- The decant water discharged in Corna Valley would impact downstream water quality and cyanide could migrate downstream and eventually cross national boundaries at very low concentrations (between 0.03 and 0.5 mg/l in an over-conservative simulation).

At its final operating level, the decant pond in the TMF has a design volume of approximately 2.5 M m³ and an additional 7.5 Mm³ of storage capacity for precipitation, although it is likely to be operated at a fraction of this maximum capacity.

Such an accident scenario was experienced at the Baia Mare site in northern Romania. It was this incident that encouraged faster development of regulation of mining wastes in the European Union and resulted in the drafting of the EU Mining Wastes Directive, the European Seveso II Directive and the associated Mining Wastes Management Best Reference Document (BREF). Both the Directives and the BREF have been used as a key reference for the design of the process plant and waste management facilities for Roşia Montană and the following measures are central to the Project design:

- Adoption of a cyanide “kill” circuit that reduces the concentration of WAD CN in tailings discharged into the TMF to below 10 ppm (Baia Mare spill reported as containing 120 ppm of free cyanide);
- The use of natural degradation within the TMF to reduce WAD CN concentration still further;
- Construction of the Corna dam and the TMF using design criteria in line with the EU BREF as well as international best practice;
- Ensuring a storage capacity for precipitation and snow melt equivalent to twice the volume of a probable maximum flood (PMF) event;
- Use of rockfill material in the construction of the downstream shell and face of the Corna dam, minimising the potential for erosion;
- Adoption of appropriate *Standard Operating Procedures* with accident prevention functions as well as a *Cyanide Management Plan* and an *Emergency Preparedness and Spill Contingency Plan*.

The above mitigation methods will reduce the risks posed by the storage and use of sodium cyanide at the plant site to an acceptable level and reduce the hazard and risk created by the storage of tailings materials containing residual cyanide in the TMF. Emergency and Contingency planning is designed to be appropriate to meet the requirements of the Seveso II and III Directive established for the EU, to mitigate against large scale accidents and to minimize their impact (see Chapter 7).

Conclusion

In summary, only a major accident scenario that results in mass release of tailings fluids during the operational phase has the potential to impact upon surface water quality of adjacent states and, hence, the potential to impact their aquatic wildlife (and animals dependent upon aquatic wildlife and habitat), communities and other water users. The risk of such an incident occurring is assessed as very low (improbable) and is discussed further in Chapter 7.

4.2 Transportation

Transportation impacts have been assessed across all three phases of the project, however, transportation issues only arise during the construction and operational phases as outlined below.

Construction phase

During the construction phase, large quantities of equipment and materials will be transported to the Project mine site for the development of the plant site, accommodation facilities, offices, etc. The majority of this will be basic construction materials or simple fabrication and will be sourced from within Romania. However, the Project will require the import of some special equipment that is not currently available in Romania, leading to transboundary transport requirements.

In terms of the construction phase, the overall timeframe is 2 to 3 years and the need for import of equipment will not be continuous, but will occur occasionally during short periods within the overall construction schedule. In addition, the total quantity of materials being sourced from outside the country will be relatively small.

The method of import is not yet defined but may include all modes of transports and established transport networks exist for each of these modes. The overall impacts on the transboundary shipment of goods for construction will therefore be insignificant due to the short period of operations, the use of major transport routes and the relatively low overall volume of goods being imported.

Operational phase – CN transportation

As noted above, sodium cyanide will be transported to Roşia Montană at a rate of around 11,000 to 12,000 tonnes per year.

This transportation presents a *hazard* of spillage of sodium cyanide onto soils or into streams, with potential exposure of humans and wildlife to toxic levels of cyanide. The concentration and volume of CN being transported (20 tonnes/load) could result in a major impact if release of a full load were to occur.

The final route for this delivery has not yet been finalised but, due to high accident rates on Romanian roads, the aim of the transport system is to maximise the use of rail. The main local alternative for rail depot is at Alba Iulia (some 45 km from the Rosia Montana site). Road haulage will be used for final local delivery. A number of options have been considered for rail and road combinations within Romania. However, the conclusion was that for the road transport element little difference existed between the options. The condition of the rail network and the facilities at the rail depots have therefore been considered as the primary selection criteria.

The risks associated with this hazard will be reduced to an acceptable level by adopting the practices set down in the cyanide code, as established on site under the *Cyanide Management Plan*, in addition to selecting the routes and modes of transport that offer the optimum level of security and safety. This hazard and risk is discussed in Chapter 7, and it is noted here that due to the validity of transboundary concerns regarding sodium cyanide shipment, the meeting of the Roşia Montană Project's responsibilities under the International Cyanide Management Code will include appropriate liaison with authorities outside Romania.

The main control system to be employed has already been summarised above.

Details of these controls are set out within Section 7 and within the main EIA sections on transport (Section 4.10).

Whilst the final route option has not been defined, and will in part depend on the selected supplier, the initial proposal is that all transboundary transport will be by rail with road transport only within Romania. If, however, the main import is by sea, then shipping will use the Romanian Black Sea port of Costanza and, therefore, no overland transboundary haulage will occur.

Whilst a risk of accident remains, the control systems, the route selection and the method of transport combine to reduce any potential transboundary impacts to a minimum.

4.3 Employment

As stated above, the project will employ up to 800 staff at any one time and, therefore, it has the potential to attract workers from across the region and potentially across national borders. Therefore, this has the potential to affect the transboundary labour market as well as impacting the local labour market through the introduction of expatriate labour.

However, the key factor in relation to the Project is that the proposed Project is being developed within an existing mining area. When the new Roşia Montană Project mine opens, all existing operations (Minvest) will cease and be decommissioned. Consequently, there will be a large pool of trained labour available within the immediate locality to staff the Roşia Montană Project. In addition, the majority of the seasonal jobs that make up the largest section of the identified workforce requirements will be for unskilled labour. These again will be sourced locally.

As part of the *Social and Economic Development Plan*, the Roşia Montană Project has developed a hiring policy that will aim to maximise local employment by advertising locally and giving preference to local people for jobs. This, combined with the already available skilled workforces, is likely to reduce significantly any pressure for inward migration of workers to the area. Therefore, the mine is unlikely to have any significant transboundary impacts in relation to employment markets.

5 Conclusions

The Environmental Impact Assessment study carried out for the proposed Roşia Montană Project has considered a comprehensive range of environmental issues related to the construction, operation and closure stages of the proposed Project. As required under Romanian and international laws and guidelines, the Environmental Impact Assessment has considered those issues that may cause impacts beyond Romania's borders.

In relation to the nature of the Project and its environmental setting, as well as the specific pollutant pathways available, it is concluded that the potential for impact on surface waters has the highest importance in relation to transboundary impacts. The Project area is drained by a series of streams that discharge to a river system that ultimately crosses the Romanian border. However, due to the distance to the Romanian-Hungarian border (approximately 500 km), only a catastrophic failure of the Corna dam at the TMF location would likely have the potential to cause measurable impact outside Romania. The risk of such an event is however defined as very low (see Chapter 7).

The Project will use sodium cyanide reagent and its storage, use and disposal (at residual levels) on the site creates a hazard with a potential to create significant transboundary impacts should a major accidental release occur. Recognising this issue, the design of the Project includes provision for mitigation against pollution of surface waters and the proposed water management system will control both the new operations and the significant existing pollution problem. While it is unlikely, due to the riparian distance of the Project site from the national border, that any change in surface water quality arising from operation of the project will be experienced outside Romania, normal operation of the facility will have a beneficial influence on local water quality.

Having considered the extreme conditions or large scale accidents, provision has been made through the design of the various key facilities to minimise these risks (see Chapter 7) and an *Emergency Preparedness and Spill Contingency Plan* has been developed to reduce the likelihood of accidental releases from occurring and to mitigate the consequences of any water pollution that does occur.

The cyanide reagent is also likely to be transported from a production site outside Romania to the mine site and this transportation constitutes a hazard that has transboundary significance in regard to risk of accident and spillage during the journey. Transport of cyanide to the Project will therefore be carried out in full compliance with the International Cyanide Management Code, using transport routes and delivery methods that will reduce the risk of accident and spillage to an acceptable level, and minimise the consequences of any accident that may occur.

With regard to employment, major developments of this type can attract inward migration of workers from outside the country. However, the locally available skilled workforce and readily available unskilled workforce effectively remove the potential for large scale labour movements. The Roşia Montană Project hiring policy will also enhance this local sourcing of labour for the operations.

It is therefore concluded that, subject to effective implementation and management of the proposed mitigation measures, the Roşia Montană Project will have no significant transboundary environmental impacts under normal operating conditions. The Project design also reduces the risk of large scale accidents that may have transboundary impacts to a very low level as befits a project designed to international best-practice and to meet Romanian and EU regulatory requirements and associated implementation guidance.