ROSIA MONTANA GOLD CORPORATION S.A.

ROSIA MONTANA PROJECT ROMANIA

Definitive feasibility study
8MT/A

PROJECT SUMMARY

GRD Minproc LIMITED
A.B.N. 52 008 992 689

Prepared by GRD Minproc Limited
October 2001

DISCLAIMER

This feasibility study document has been prepared for Rosia Montana Gold Corporation S.A. (RMGC) by GRD Minproc Limited (Minproc), based on assumptions as identified throughout the text and upon information and data supplied by others. Minproc is not in a position to, and does not, verify the accuracy of, or adopt as its own, the information and data supplied by others.

Parts of the feasibility study have been prepared or arranged by RMGC or other third party contributors, as detailed in the document. While the contents of those parts have been generally reviewed by Minproc for suitability for inclusion and incorporation into the document, they have not been fully audited or sought to be verified by Minproc.

In respect of all parts of the feasibility study document, whether or not prepared or arranged by Minproc, no express or implied representation or warranty is made by Minproc to any third party that the contents of the feasibility study document are verified, accurate, suitably qualified, reasonable or free from errors, omissions or other defects. Third parties who rely upon the feasibility study document do so at their own risk.

Neither RMGC nor Minproc, nor any person acting for and/or on behalf of any of those companies, assumes any responsibility, duty of care or liability to any person with respect to the contents of the feasibility study document or with respect to any inaccuracy, absence of suitable qualification, unreasonableness, error, omission or other defect of any kind or nature in or with respect to the feasibility study document.

This disclaimer must accompany every copy of this feasibility study document, which is an integral document and must be read in its entirety.

ROSIA MONTANA PROJECT
DEFINITIVE FEASIBILITY STUDY - 8 Mt/a

SECTION 1
PROJECT SUMMARY

TABLE OF CONTENTS

DISCLAIMER

1.1 EXECUTIVE SUMMARY 1
- 1.1.1 Introduction 1
- 1.1.2 Key Results 1
- 1.1.3 Project Overview 3

1.2 INTRODUCTION 8
- 1.2.1 Background 8
- 1.2.2 Responsibilities 9

1.3 PROJECT BACKGROUND 11
- 1.3.1 Project Ownership 11
- 1.3.2 Project Location, Communication and Infrastructure 11
- 1.3.3 History of Mining in Rosia Montana Region 14

1.4 GEOLOGY AND RESOURCES 16
- 1.4.1 Introduction 16
- 1.4.2 Project History 16
- 1.4.3 Geology and Alteration 17
- 1.4.4 Mineralisation 18
- 1.4.5 Data Collection, Quality Control and Validation 18
- 1.4.6 Estimation Regions 21
- 1.4.7 Mineralisation Zone Interpretation and Modelling 21
- 1.4.8 Compositing 24
- 1.4.9 Assay Quality Control Data 24
- 1.4.10 Descriptive and Distribution Statistics – Gold, Silver and Sulfur 24
- 1.4.11 Determination of Upper Cuts 25
- 1.4.12 Statistical Analysis – Bulk Density Data 26
- 1.4.13 Block Model Development 26
- 1.4.14 Variography 28
- 1.4.15 Grade Estimation 29
- 1.4.16 Resource Reporting 31

TABLE OF CONTENTS

1.5 MINING....35
1.5.1 Pit Optimisation....35
1.5.2 Pit Optimisation Results....37
1.5.3 Mining Method....37
1.5.4 Mine Design....40
1.5.5 Reserves....42
1.5.6 Equipment....44
1.5.7 Labour....44
1.5.8 Materials and Consumables....46

1.6 METALLURGY AND FLOWSHEET SELECTION....47
1.6.1 Testwork Summary....47
1.6.2 Gold and Silver Recovery Process Options....49
1.6.3 Optimisation of the Gold and Silver Recovery Flowsheet....50

1.7 PROCESS DEVELOPMENT AND PLANT DESCRIPTION....52
1.7.1 Design Ore Type....52
1.7.2 Processing Rate....54
1.7.3 Crushing, Stockpile and Reclaim....55
1.7.4 Grinding and Classification....55
1.7.5 Gravity Circuit....56
1.7.6 Cyanide Leach and Adsorption....57
1.7.7 Gold Recovery....57
1.7.8 Tailings Thickening....57
1.7.9 Cyanide Management....58
1.7.10 Reagent Storage and Distribution....58
1.7.11 Process Control....58
1.7.12 Project Layout....59

TABLE OF CONTENTS

1.8 INFRASTRUCTURE AND SERVICES....60
1.8.1 Power Supply....60
1.8.2 Romanian Power Sector....61
1.8.3 Road Access....64
1.8.4 Buildings....65
1.8.5 Water Management....65
1.8.6 Water Supply....66
1.8.7 Mine Infrastructure and Services....67
1.8.8 Housing....68

1.9 TAILINGS MANAGEMENT FACILITY....70
1.9.1 General....70
1.9.2 Siting Study....70
1.9.3 Design Criteria and Parameters....70
1.9.4 Design of Tailings Management Facility....72

1.10 PROJECT OPERATIONS....75
1.10.1 Recruitment Philosophy....80
1.10.2 Availability of Personnel....80
1.10.3 Employment Contracts....81

1.11 ENVIRONMENTAL IMPACT ASSESSMENT....82
1.11.1 Background and Regulatory/Environmental Setting....82
1.11.2 Environmental Impact Assessment....83
1.11.3 Environmental Management....86

1.12 COMMUNITY DEVELOPMENT AND RESETTLEMENT....88
1.12.1 Introduction....88
1.12.2 Resettlement Action Plan Objectives....88
1.12.3 The Resettlement Action Plan Area....89
1.12.4 Socio-economic Context....90
1.12.5 Legislative Context....90
1.12.6 Key Project Issues and Impacts....91

1.12.7 Implementation of Community Development and Resettlement....94
1.12.8 Key Policy and Planning Issues....94
1.12.9 Implementation Schedule....98
1.12.10 Conclusion....99

1.13 LEGAL AND PERMITTING....100
1.13.1 Legal....100
1.13.2 Mining Law....100
1.13.3 Rosia Montana Disadvantaged Zone....101
1.13.4 Export of Production....102
1.13.5 Taxes....102
1.13.6 Foreign Investment in Romania....103
1.13.7 Environmental Laws....103
1.13.8 Private Property Rights....104
1.13.9 Permitting....104
1.13.10 Permitting Sequence....106
1.13.11 Permitting Team....106

1.14 PROJECT IMPLEMENTATION....107
1.14.1 Overall Development Plan....107
1.14.2 Structure....108
1.14.3 Transportation and Logistics....110
1.14.4 Contracting Strategy....112
1.14.5 Construction Camp....112
1.14.6 Project Construction Phase....112

1.15 CAPITAL COSTS....114
1.15.1 Summary....114
1.15.2 Mine Capital Costs....116
1.15.3 Process Plant and Infrastructure....117
1.15.4 Tailings Management Facility....118
1.15.5 Community Development and Resettlement....119
1.15.6 Owner's Costs....121

TABLE OF CONTENTS

1.16 OPERATING COSTS 125
1.16.1 Summary 125
1.16.2 Mine Operating Costs 127
1.16.3 Process Plant Operating Costs 129
1.16.4 General and Administration 131

1.17 FINANCIAL ANALYSIS 132
1.17.1 Introduction 132
1.17.2 Project Economics 133
1.17.3 Summary of Results 134
1.17.4 Sensitivity Analysis 141

1.18 RISK ASSESSMENT 148
1.18.1 Introduction 148
1.18.2 Risk Analysis and Evaluation (Risk Assessment) 148
1.18.3 Key Outcomes 150
1.18.4 Risk Framework and Methodology 153

1.1 EXECUTIVE SUMMARY

1.1.1 Introduction

The Rosia Montana Project (the Project) is owned by Rosia Montana Gold Corporation S.A. (RMGC). The Project area contains a large mineralised system which is to be exploited by a series of open pits, in particular Cirnic, Cetate, Jig and Orlea, near the existing Rosia Montana gold mine in west-central Romania.

RMGC has managed and directed a number of consultants to assist it in the generation of a Definitive Feasibility Study (Study). RMGC has contracted GRD Minproc Limited (Minproc) to conduct the Study and to cooperate with the various Study participants to ensure free information flow. Minproc has reviewed and incorporated the work of these participants into an overall Study document.

The major consultants are as follows:

- **Resource Service Group Pty Ltd (RSG)** – Exploration, Resource Estimation and Open Pit Mine Design.
- **Minproc** – Metallurgical Testwork Supervision, Process Plant and Infrastructure Design, Study Coordination, Review and Endorsement.
- **Knight Piésold Limited (Knight Piésold)** – Geotechnical (Open Pit, Plant Site and Waste Dumps); Tailings Management Facility (TMF) Design; Water Management and Supply Studies, and Environmental Impact Assessment.
- **Planning Alliance** – Village Resettlement Action Plan.

The Study is based on 2nd quarter 2001 United States dollars.

The Study has evaluated only the Project and has not considered the cashflow position or returns to shareholders of the various owners.

1.1.2 Key Results

The findings of the Study include the following important features:

- A Resource (as categorised in the Canadian National Instrument 43-101) reported at a 0.6 g/t Au lower cut-off grade:

  - Measured Resource 134.58 Mt at 1.6 g/t Au for 6.86 Moz Au
  - Indicated Resource 161.87 Mt at 1.2 g/t Au for 6.13 Moz Au
  - **Subtotal** **296.45 Mt at 1.4 g/t Au for 12.99 Moz Au**
  - Inferred 47.62 Mt at 0.9 g/t Au for 1.31 Moz Au

- A mining schedule has been developed using a Reserve of 199.7 Mt at a grade of 1.6 g/t Au and 7.8 g/t Ag containing 10.1 Moz Au and 50.4 Moz Ag.

- The production rate will average approximately 8 Mt/a yielding gold production of up to 476 000 oz/a over a 25 year life and an average of 329 000 oz/a over the life of mine.

- The ore, whilst sulfidic and low grade, responds well to conventional process techniques yielding, on average, 82.1% gold recovery.

- Cash operating costs average $119/oz (after silver credits) over the life of the Project.

- Net Present Value (NPV) (after-tax) is $331.5 M at a discount rate of 5% and the Internal Rate of Return is 20.1% at a gold price of $275/oz. Payback for the Project will be achieved in 4.3 years.

1.1.3 Project Overview

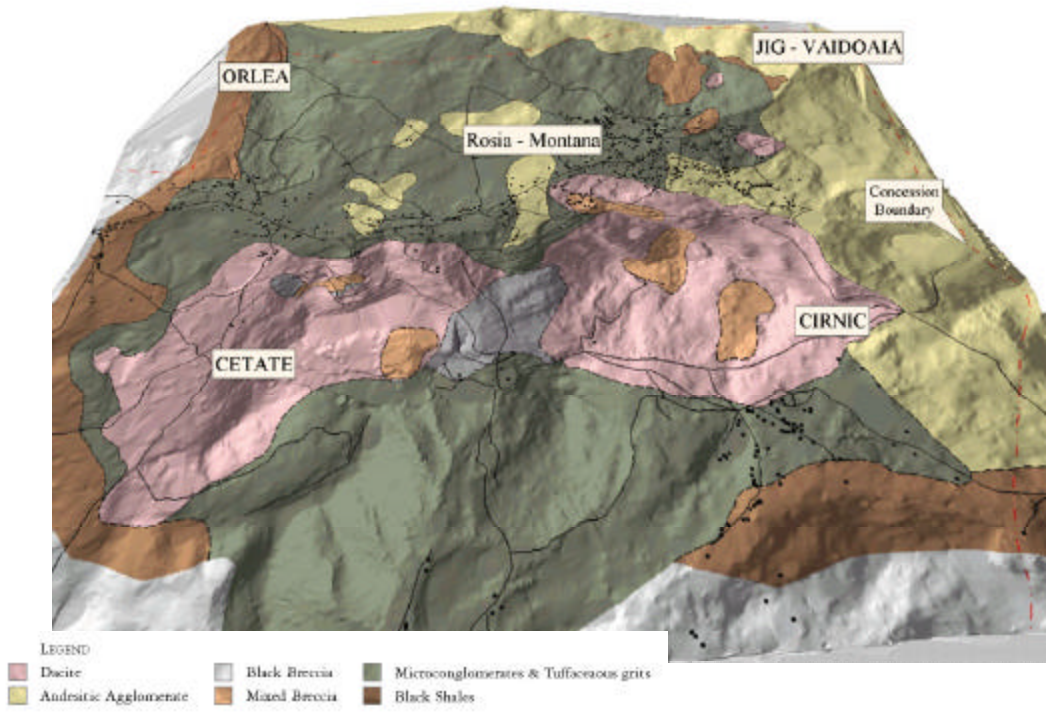
The Project is located approximately 80 km northwest of the regional capital of Alba Iulia, which lies in the west of Romania. The valley of Rosia Montana has a history of mining dating back over 2000 years and there are a number of significant operating mines in close proximity to the Project. The Project lies within a region known as the Golden Quadrilateral in the Apuseni and Metaliferi Mountains of Transylvania.

The Project layout is illustrated in drawing 50458-00/G-101.

The Rosia Montana deposit is interpreted as a series of subvolcanic intrusions emplaced into Cretaceous sediments. Mineralisation styles identified at Rosia Montana to date include:

- disseminated gold-silver mineralisation, and
- vein hosted gold-silver (and minor base metals) mineralisation.

Whilst the mineralisation is associated with a significant level of sulfide minerals, predominantly pyrite, the gold is amenable to conventional cyanidation, although with a small refractory component.



The deposit has been extensively sampled both by drilling and by channel sampling in the extensive series of underground workings used by the Romanian government for exploration and small-scale mining. Over 360 exploration drill holes have been drilled, including over 34 km of RC drilling and 27 km of diamond drilling. The drill hole database has been augmented by over 68 km of channel sampling, comprising almost 60 000 samples.

The Resource (as categorised in the Canadian National Instrument 43-101) reported at a 0.6 g/t Au lower cut-off grade for a 10 mE x 10 mN x 10 mRL block model is:

–	Measured Resource	134.58 Mt at 1.6 g/t Au for 6.86 Moz Au
–	Indicated Resource	161.87 Mt at 1.2 g/t Au for 6.13 Moz Au
–	**Subtotal**	**296.45 Mt at 1.4 g/t Au for 12.99 Moz Au**
–	Inferred	47.62 Mt at 0.9 g/t Au for 1.31 Moz Au

There is considered to be strong potential for delineation of further mineable resources, including the currently identified areas:

- to the east and west of Orlea;
- between Orlea and Carpeni;
- to the north and east of Cirnic;
- to the south of Jig, and
- the entire northern sector, beneath the andesitic cover.

Mining will be conventional, large scale open pit mining, initially further developing the small existing Cetate open pit and then in a series of three additional large open pits at Cirnic, Orlea and Jig.

Waste from the pits is used to construct the embankment for the TMF, with other waste dumps located adjacent to the pits.

The project will produce an average of 329 000 oz Au/a over the life of mine, ranging from 210 000 oz to 476 000 oz. In addition, an average of 1.1 Moz of silver per annum are produced, ranging from 0.3 Moz to 2.3 Moz.

The average total material movement will be approximately 15.6 Mt, with a maximum of 16.7 Mt and a minimum of 13.6 Mt in the first year of production. Strip ratio (waste:ore) is an average of 0.98:1 over the life of the mine.

The average mill feed will be 8 Mt/a with a minimum of 6.9 Mt in the start-up year as mill capacity ramps up and a maximum of 9.3 Mt in Year 12 when the majority of the ore will be sourced from Orlea, which is classified as soft ore. The average breakdown in ore hardness

will be approximately 10% hard, 43% medium and 47% soft. Hard ore delivered to the mill will be relatively steady throughout the life of mine, with a peak of 26% in Year 5 and dropping off to zero at the end of the operation. The proportion of ore classified as either medium or soft will fluctuate from year to year, with soft ore ranging from 19% in Year 2 to 100% in Year 25 and medium ore ranging from 0% in Year 25 to 71% in Year 17.

Table 1.1.1 summarises the Reserves as determined for the Rosia Montana Project.

Table 1.1.1
Reserves Summary

Reserve Category	Tonnes	Grade			In Situ Metal		Recovered Metal	
		Au	Ag	S	Au	Ag	Au	Ag
	(Mt)	(g/t)	(g/t)	(%)	(Moz)	(Moz)	(Moz)	(Moz)
Proven	108.0	1.8	9.4	1.9%	6.1	32.5	5.1	17.5
Probable	91.7	1.3	6.1	1.8%	4.0	17.8	3.2	9.8
Total	**199.7**	**1.6**	**7.8**	**1.9%**	**10.1**	**50.4**	**8.3**	**27.3**

An extensive metallurgical testwork programme has been undertaken in Australian laboratories. The results show that ore from the Project is amenable to treatment by a conventional SAG mill with recycle crusher (SABC) comminution circuit. The ore varies in competence from hard to soft, but pilot plant testwork has confirmed that even the hard ores are amenable to this approach. The effect of lithology on comminution performance has been extensively modelled and integrated into the mine schedule.

The testwork also indicates an average of approximately 82.1% gold recovery and 54.2 % silver recovery using a relatively coarse grind and conventional carbon-in-leach (CIL) methods, in combination with a gravity recovery circuit. Whilst recoveries can be improved by finer grinding and/or sulfide oxidation, analysis has indicated the simpler approach to be optimal in economic terms.

The Project is well serviced from an infrastructure perspective as it lies in a region with existing large mines. A 110 kV dual overhead line runs through the Project site and has adequate capacity for the Project. Discussions with power suppliers indicate that power can be supplied to the Project at a unit rate of $0.0225/kWh. The Romanian power industry is currently being deregulated, giving further potential for negotiation on power costs.

A fibre optic link will soon be installed to the Rosia Montana Valley, providing communications infrastructure.

The Project will extract water from the Aries River to the north of the site via a 13 km pipeline to the plant site. Analysis of the water balance and river system shows that a high level of confidence in water supply can be achieved with a small raw water dam and storage of water in the TMF.

Minor road building is required to link the plant site to the national highway system.

The Project is located in a region with significant unemployment and redundant housing. Only a small expatriate housing development is required.

As stated previously, the Project is located in an area where historically there has been extensive mining and farming activities. The result is very significant degradation of the environment and pollution of the surface water. The Project has been designed to capture and treat most of the run-off from the affected areas, with untreated discharges only in time of flood or snow melt. The TMF is designed to ensure no programmed discharge of cyanide contaminated effluent. Water management and archaeological patrimony are seen as the most significant environmental issues and suitable plans have been formulated for each of these. It is anticipated that the water management plan will result in an improvement to the current condition of waterways in the vicinity of the Project.

A detailed study of permitting issues has been undertaken. Whilst this is a critical area for the timely development of the Project, it is considered that this should not be a significant impediment given proper management by RMGC and a continuation of the existing cooperation from the relevant authorities.

Another significant issue to the Project's success is resettlement of residents whose properties will be affected by the mining and processing activities. An extensive programme of consultation with the local population has assisted in the development of a detailed action plan and budget for resettlement. Again, this is an area which will require ongoing attention from RMGC, but it is one which should not adversely impact on the Project if correctly managed.

Village resettlement in the area of the TMF and management of the permitting process are on the critical path for the Project, together with the supply and installation of the milling equipment. The schedule developed indicates that, on the assumption of commitments to EPCM and SAG mill supply contracts in March 2002, milling should commence 27 months later.

The initial capital cost is estimated at $192.4 M, broken down as follows:

	$ M
Pre-production Mining	9.4
Mining	24.0
Process Plant and Infrastructure	101.2
TMF	13.1
Village Resettlement	24.0
Owner's Costs	20.8
Total	**192.4**

Deferred and sustaining capital during the life of the Project amounts to $153.5 M.

The cash operating cost averages $119/oz of gold produced (after silver credits) over the Project life. The operating costs average $5.42/t milled.

Financial analysis of the Project on an after-tax, ungeared cashflow basis gives an NPV of $332 M (at 5% discount rate) and an IRR of 20.1%, assuming an average gold price of $275/oz and a silver price of $5/oz.

1.2 INTRODUCTION

1.2.1 Background

RMGC is evaluating the development of a gold and silver mine at Rosia Montana in Romania. RMGC has managed and directed a number of consultants to assist it in the generation of a Definitive Feasibility Study (Study) and Minproc was contracted to conduct the Study, including undertaking the aspects relating to the process plant and infrastructure, as well as to incorporate the work of the various Study participants into an overall Study report. In compiling this Study report, Minproc has reviewed the various contributions to ensure that the general standards of the work meet the requirements of a definitive feasibility study and to endorse them as such.

The Study addresses the development of a large scale open pit mine and processing plant located adjacent to the Rosia Montana village. Rosia Montana is located approximately 80 km northwest of the regional capital of Alba Iulia, which lies in the west of Romania.

The mine extracts large tonnages of low grade ore from a large mineralised system through the development of a number of pits straddling the Rosia Montana valley in close proximity to each other. Ore treatment consists of conventional crushing, milling and carbon-in-leach processes to produce a gold/silver doré. Tailings disposal utilises the Corna Valley which lies immediately to the south of the main open pits and the process plant.

The Project site is well serviced by existing infrastructure, especially power, roads, telecommunications and accommodation. A significant source of fresh water is also available from the Aries River, which flows in the vicinity of the mine.

A significant aspect of the Project is the need to resettle or relocate inhabitants of local villages, which has been the subject of extensive investigation and discussion with the local community and government authorities.

This Study has been conducted on the basis of mining and processing ore at the rate of 8 Mt/a. A Project life of over 25 years is anticipated, with significant potential for additional resources to be proven to extend this life.

During construction, the Project is expected to employ over 800 people, with a workforce during operation of over 490.

All currency figures are expressed in second quarter 2001 United States dollars ($) unless otherwise stated.

1.2.2 Responsibilities

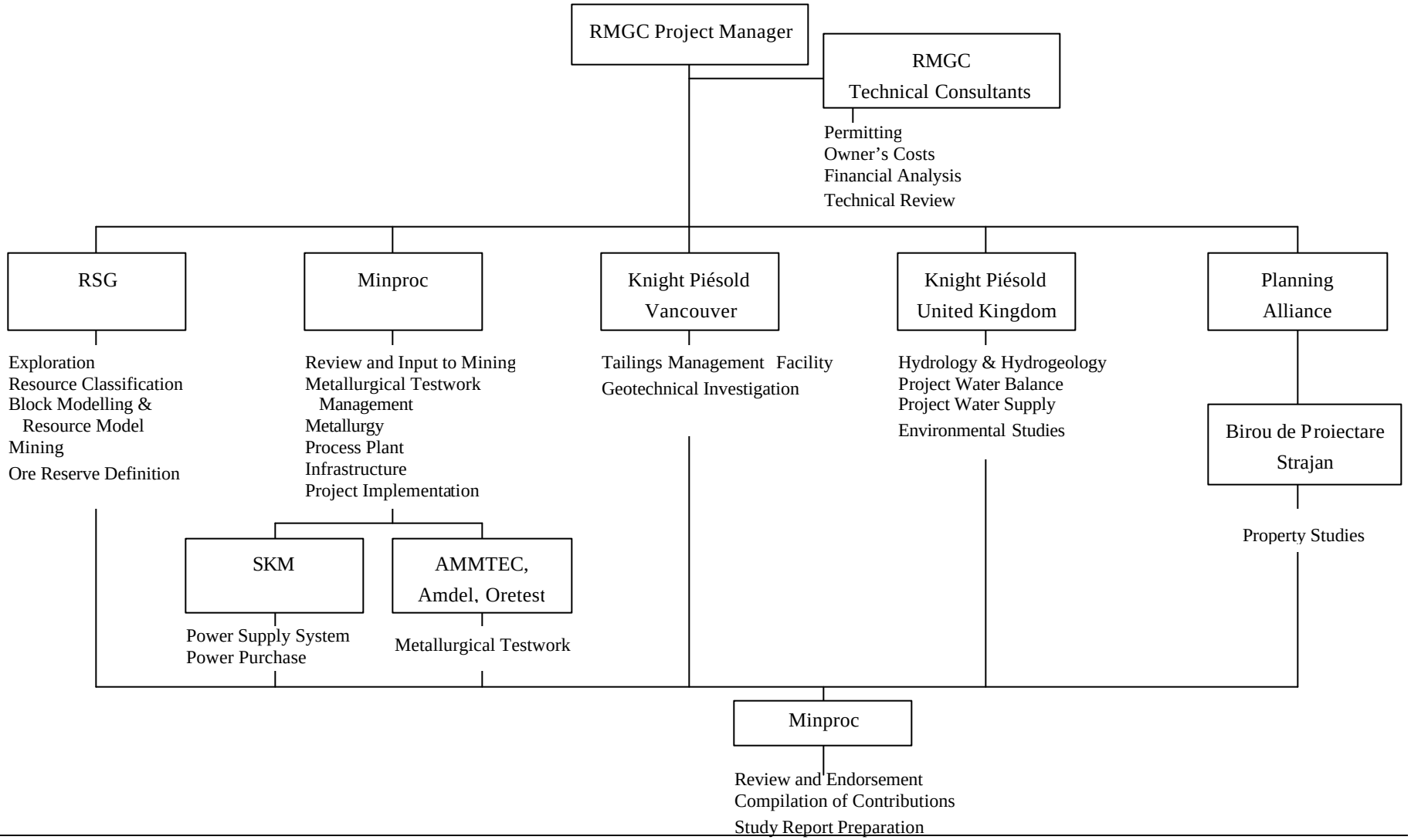
Table 1.2.1 and Figure 1.2.1 summarise the general scope areas and indicate the responsible consultant for each area.

Table 1.2.1
Rosia Montana DFS – Outline of Scope

Area	Consultant/Engineer
Exploration	RSG
Ore Resource Classification	RSG
Block Modelling and Resource Model	RSG
Mining	RSG
Ore Reserve Definition	RSG
Metallurgical Sample Collection	RSG/Minproc
Metallurgical Testwork	AMMTEC, Oretest, Amdel
Metallurgy	Minproc
Process Plant	Minproc
Power Supply	SKM
Water Supply	Knight Piésold
Water Management	Knight Piésold
Tailings Management Facility	Knight Piésold
Village Resettlement	Planning Alliance
Infrastructure	Minproc
Project Implementation	Minproc
Geotechnical (pit, plant and waste dumps)	Knight Piésold
Environmental	Knight Piésold
Land Acquisition	RMGC
Government Approvals	RMGC
Financial Analysis	RMGC
Study Management	RMGC
Study Report	Minproc

Figure 1.2.1

Study Organisation



1.3 PROJECT BACKGROUND

1.3.1 Project Ownership

Gabriel Resources Ltd holds an 80% interest in the Rosia Montana Project (the Project) through RMGC, its majority owned Romanian subsidiary. The Project consists of one exploitation concession covering approximately 4282 ha.

Pursuant to an exploitation concession licence (the Licence) dated 21 December 1998, as amended, between the National Agency for Mineral Resources (NAMR), Minvest SA (Minvest) and RMGC, an exploitation licence was issued by NAMR to Minvest as titleholder and to RMGC as the affiliated company. In October 2000, title to the Licence was transferred from Minvest to RMGC such that RMGC is the titleholder and Minvest is the affiliated company. As an affiliated company, Minvest is entitled to continue its current small scale mining operations at Rosia Montana until RMGC makes a production decision to redevelop Rosia Montana. Minvest is a Romanian state owned mining company. The Licence has an initial term of 20 years and is renewable for successive 5 year periods. Minvest is responsible for all activities associated with its current mining operations, including environmental liabilities, whilst RMGC is responsible for carrying out and funding all exploration and development activities associated with the redevelopment of Rosia Montana.

If the Project were to be redeveloped as a large scale mining operation by RMGC, then the Articles of Association of RMGC provide that RMGC will be entitled to recover 100% of all expenditures, including pre-incorporation expenditures, incurred on the Project prior to production, before dividends are paid to the shareholders of RMGC.

1.3.2 Project Location, Communication and Infrastructure

Rosia Montana is located approximately 80 km northwest of Alba Iulia (Figure 1.3.1). RMGC's current office is sited at Deva, some 85 km southwest of Rosia Montana, where Minvest also maintains its offices and records. Road access to Deva from Bucharest takes about 7 hours through the Carpathian Mountains. Alternatively, there are regular flights of about 1 hour from Bucharest to Timisoara, which is about a 2½ hour drive from Deva. International airlines fly directly into Timisoara, Oradea, Cluj-Napoca and Bucharest.

Figure 1.3.1
Project Location Plan

The Project, although in the Carpathian Mountains, is well serviced by tarmac roads from Deva (via Brad), from Alba Iulia, from Cimpeni (via Albac) and along the Aries River, from Aiud and Cluj-Napoca (Figure 1.3.2).

Figure 1.3.2
Project Location Plan

The current operation of Minvest at Rosia Montana is powered by a 20 kV powerline running off the national grid near Gura Rosiei, 4 km west of the deposit.

A 110 kV overhead power line operated by Electrica, the state utility, runs adjacent to the Project. This line connects Zlatna, some 30 km south of Rosia Montana, with Rosia Poeini, a significant Minvest operated open pit copper mine, situated 3 km east of Rosia Montana. This line has the capacity to meet both the existing loads on the system and new plant demand.

The current supply to Minvest is subject to surges and "brown outs", but these appear to be related to irregular consumer payment rather than inability to provide a consistent and reliable power supply. A more detailed discussion of the power supply infrastructure is provided in Section 8 of this report.

Land based telecommunications at site in Rosia Montana remain limited in capacity, but mobile phones can now be used. A fibre optic link is currently being installed to Rosia Montana, which will significantly upgrade capacity.

Water at site is sourced from the Aries River and is plentiful.

The mining tradition in this region of Romania means that skilled labour for a new mine will be readily available. The salary for unskilled workers is approximately $100 per month (excluding company deductions), with skilled workers commanding a premium, but still not close to Western standards. RMGC manages and directs RSG and Romanian geologists in the performance of their day-to-day exploration activities on site.

1.3.3 History of Mining in Rosia Montana Region

The Project is located in west-central Romania (Figure 1.3.1 and Figure 1.3.2), within the so called "Golden Quadrilateral". This is a 500 km^2 area of gold-silver and copper mineralisation which occurs throughout the Southern Apuseni Mountains, north of the southwestern leg of the Carpathian Arc. The Golden Quadrilateral has been historically the most important gold producing region in Europe for over 2000 years. The Dacians, followed by the Romans, initiated mining operations within the area, highlighting the richness of the deposits. The Roman conquest of Dacia at the beginning of the 2nd Century AD was undertaken to seize control of this gold producing region.

The Project has been mined from pre-Roman times. Artefacts, headstones and delivery contracts dating from the time of the Roman invasion have been recovered both in and near workings. Four principal periods of mining activity are evident at Rosia Montana:

- Pre and post Roman era.
- Medieval Period.
- Austro-Hungarian Empire era – end of 17th Century to 1918.
- Current era – 1959 to present.

The Roman era workings consist of elongated surface pits and underground voids or "glory holes" locally termed Coranda. During Dacian and Roman times (up to 200 AD), mining took place both from the surface and underground. It appears that higher grade quartz veins and high grade portions of the breccia pipes at the Cetate and Cirnic deposits were exploited initially from the surface and then underground.

The district reached maximum development and peak production during the period of the Austro-Hungarian Empire (from the end of the 17th Century until 1918). The great majority of mining was carried out by underground methods, commonly room and pillar and open unsupported stopes, as found in both the Cetate and Cirnic deposits. During this time an extensive network of adits and horizontal drives was developed. Numerous minor underground stopes have been intersected during more recent underground exploration. Workings from the Austro-Hungarian Empire cover a vertical range of approximately 400 m.

During the last century, mining was undertaken by both underground and surface methods. Tens of kilometres of underground openings, mainly adits, were developed during this period. Initially, mining was carried out by underground methods including development along individual quartz veins and by room and pillar mining. In 1970, Minvest commenced open pit mining at the Cetate deposit in part extracting previously unmined material and recovering remnant ore located in pillars from previous room and pillar mining. Underground mining by Minvest ceased in 1985 and all further production at Rosia Montana has taken place from the Cetate open pit. The open pit initially focused on the Cetate mixed breccia but has been extended to the southwest to access material hosted in dacite adjacent to the mixed breccia. Mining continues to exploit the mixed breccia which forms the pit floor. To date, mining of the open pit has removed approximately the upper 120 m of Cetate hill.

Minvest continues to conduct small scale open pit mining operations at Rosia Montana.

Exploration has also been carried out by Minvest and by the recently privatised Romanian state-owned exploration company, Minexfor SA. During the 1970s and 1980s exploration at Rosia Montana was principally carried out by:

- surface and underground drilling;
- rock chip sampling, and
- underground drive wall sampling.

The pace of exploration was greatly reduced during the late 1980s and 1990s due to budgetary constraints following the 1989 revolution in Romania.

1.4 GEOLOGY AND RESOURCES

1.4.1 Introduction

Romania includes four major Mesozoic and older terrains, namely the Southern Carpathians, the Eastern Carpathians, the Apuseni Mountains and Dobrogea. The famous mining districts of the Apuseni and Metaliferi Mountains of Transylvania comprise a 500 km^2 region of the Apuseni Mountains, immediately to the north of the city of Deva, commonly referred to as the Golden Quadrilateral.

Three major northwest-trending belts of volcanism and associated mineralisation are identified within the Golden Quadrilateral, with the Rosia Montana Complex representing part of the northernmost belt.

1.4.2 Project History

Following the earlier historical exploitation in the area (Section 1.3.3), underground mining under the control of the Romanian State Government began in 1959. Open pit mining also commenced on the Cetate deposit in 1970, being conducted simultaneously, until the cessation of underground activities in 1985. Current production is 10 000 oz to 12 000 oz of gold per annum from an annual production target of 400 000 t of ore.

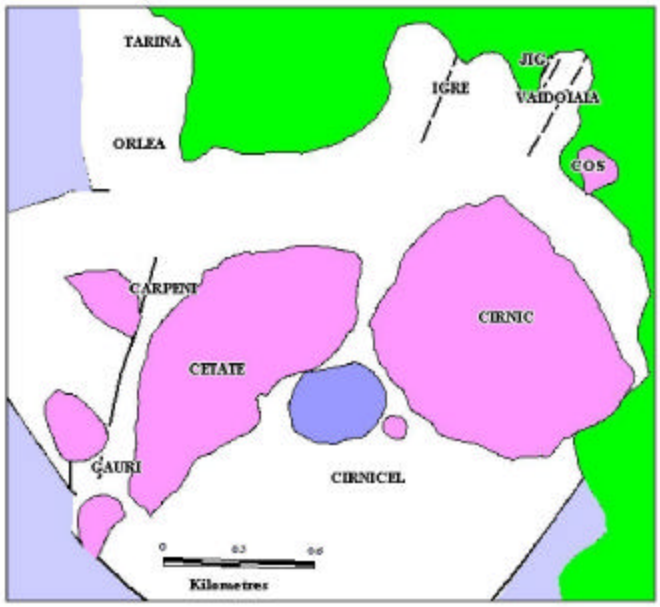
Samples collected during this period were routinely annotated onto plans and sections and gold and silver assays recorded by hand in assay ledgers. In 1984, a "feasibility study" on the Project was compiled by Regia Deva, based on information acquired from exploration carried out up to 1984, that essentially comprised compilation of the available data into a series of maps, plans, sections and tables. The study was updated in 1992, although little further exploration had occurred since 1984, due to budgetary constraints.

In January 1998, RMGC initiated a programme of surface reverse circulation (RC) and diamond drilling, along with underground channel sampling of all accessible underground drives and cross-cuts. The exploration programme continued during 1999. In 2000, a major exploration programme was undertaken, involving up to 7 surface drilling rigs and 3 underground drilling rigs. Underground diamond drilling was undertaken from the 714 level, which marks the lowest accessible level in the Cetate and Cirnic underground development. Exploration data gathered from January 1998 to the end of 2000 provides the basis for the resource estimate in this Study.

1.4.3 Geology and Alteration

The Rosia Montana deposit is interpreted as a maar-diatreme complex emplaced into Cretaceous sediments, predominantly black shales and Tortonian (Miocene) fine to medium grained sediments and tuffaceous grits. Figure 1.4.1 displays the surface geology and the approximate location of the various zones of gold-silver mineralisation in the Rosia Montana complex.

Figure 1.4.1



Lithologies within the maar complex are dominated by breccias, including phreatic and complexly re-worked breccia, intruded by a series of porphyritic dacitic sub-volcanic intrusions. These intrusions are interpreted as Neogene age and are informally named the Cetate Dacite and Cirnic Dacite. The dacite bodies are interpreted to be intruded vertically into the maar breccias and to have spread laterally at shallower levels. A breccia, locally termed the Black Breccia, forms a subvertical pipe, located approximately at the centre of the complex, between the Cetate and Cirnic dacitic intrusions. Andesitic extrusive rocks are mapped mantling the northern and eastern parts of the Project area, forming a thin to moderately thick cover over the maar complex lithologies. Neither the Black Breccia nor the overlying andesites are host to significant gold mineralisation.

An extensive zone of strong hydrothermal alteration hosts the Rosia Montana deposits. The distribution of alteration assemblages is quite complex. However, it can be simplified to 3 key groupings.

- Clay-sericite-pyrite ("argillic") assemblages, which generally occur peripheral to the core zones of gold-silver mineralisation.

- Silica-adularia-pyrite-sericite ("silicic/potassic") assemblages, which usually represent the core zones of the various deposits at Rosia Montana.

- Chlorite-carbonate-pyrite (propylitic) alteration assemblages are regionally developed within the andesites.

1.4.4 Mineralisation

Mineralisation styles identified at Rosia Montana to date include:

- disseminated gold-silver mineralisation, and
- vein-hosted gold-silver (+ minor base metals) mineralisation.

The gold-silver mineralisation outlined at Rosia Montana is interpreted to represent a mid to shallow-level, low sulfidation epithermal system that may be associated with a porphyry-style hydrothermal system at depth. The geometry of mineralised zones and host lithologies identified at Rosia Montana include:

- sub-vertical breccia zones cross-cutting dacite intrusive bodies;
- dacite-hosted disseminated gold-silver;
- vent breccia hosted disseminated gold-silver mineralisation;
- gold-silver mineralised quartz veins within dacites, and
- quartz vein-hosted gold-silver mineralisation hosted within vent breccia.

1.4.5 Data Collection, Quality Control and Validation

All exploration carried out by RMGC at Rosia Montana was undertaken and supervised by RSG. Quality control and data validation are a major component of the Rosia Montana exploration programme. In addition, investigations to compare different sampling types (i.e. drilling and channel sampling) were undertaken prior to combining the data into the final exploration database. Data from the underground channel sampling, the surface RC and diamond drilling, and the underground diamond drilling, completed between January 1998 and 31 December 2000, were compiled into databases developed on site.

Table 1.4.1 summarises the different exploration data statistics for the database which has formed the basis of the Study.

Table 1.4.1

Summary Statistics – Exploration Sampling

Area	Drilling Metreage				Channel Metreage		Metres Sampled				Number of Samples			
	Holes	RC	DDH	Total	Channels	Metres	DDH	RC	Channel	Total	DDH	RC	Channel	Total
Cetate	148	12 763	12 667	25 430	426	24 209	12 605	12 414	20 196	45 215	12 640	12 424	20 196	45 260
Cirnic	68	4297	8787	13 084	640	32 721	8717	4117	29 001	41 835	8730	4117	29 001	41 848
Cirnicel	7	700	955	1655	95	4 846	951	688	4430	6069	954	688	4430	6072
Carpeni	45	6293	684	6977	14	432	680	6198	387	7265	683	6199	387	7269
Jig-Igre	44	4640	1863	6503	131	2975	1801	4513	2616	8930	1805	4515	2616	8936
Orlea	49	5401	2036	7437	114	3412	1998	5222	2995	10 216	2813	5226	2995	11 034
Total	**361**	**34 094**	**26 992**	**61 086**	**1420**	**68 595**	**26 753**	**33 151**	**59 625**	**119 529**	**27 625**	**33 169**	**59 625**	**120 419**

a) Sampling and Analysis

Channel sampling was completed on 1 m intervals under rigorously controlled and supervised conditions from all the accessible and safe drives within the Rosia Montana deposit, and from surface channels and pits. Field duplicate samples were routinely collected every 20 sampled metres. Duplicate samples were also produced by splitting the channel sample prior to size reduction in the laboratory.

RC and diamond drill holes were sampled at 1 m intervals. High recoveries were achieved for both RC (84% overall) and diamond drilling (approximately 96%).

Samples were prepared and assayed at an on-site, custom-built assay facility managed by Analabs Pty Ltd (Analabs), an internationally accredited assay laboratory group. Assay for gold was by fire assay followed by an AAS finish, and silver analysed by multi-acid digest followed by an AAS finish.

The precision and accuracy of the assay data was assessed by the use of field duplicates and internal laboratory standards. In addition, internationally accredited gold-silver standards were independently submitted into the assay stream at the rate of at least 5% of all samples. Approximately 1100 independent international gold-silver standards were submitted during the 2000 exploration programme. In addition, over 1500 sample pulps were sent to both Analabs in Perth and Bondar Clegg Laboratories in Canada for independent verification of laboratory bias.

b) Data Quality – Channel Sampling versus Drilling

Substantial quality control data, plus additional comparative studies, have been undertaken to ensure the channel sampling and drilling data types are both of an acceptable quality and are suitable for combining and use in estimation.

The RC samples precision is in the order of 10% to 15%. A comparison of the duplicate crusher splits data indicates a very similar precision for the diamond drilling and channel sampling data sets, with the mean precision for the both data sets of 8% to 10%. The duplicate crusher splits analysis supports the conclusion that the channel samples and diamond drilling (NQ) data can be considered to have similar total sample precision, consistent with the comparative sample volumes of the two data types.

The verification drilling and sampling study findings are considered consistent with QAQC data.

A further detailed investigation was completed on a selected region of the Cetate deposit, which contained significant drilling and channel sampling. Detailed statistical analysis and comparative resource estimations were undertaken on the chosen sub area. Similar overall declustered mean grades are noted for the gold data while significantly different declustered mean silver grades are noted. The similar declustered mean gold grades indicate that little bias between the two data sets is present. A review of the silver composites reveals little drilling data is available from the region of highest silver grade.

On the basis of the comparative studies, no bias has been identified in the channel sampling or the drilling data sets. The data has been combined for the purposes of all geostatistical evaluation and grade estimation.

c) Bulk Density

Some 5053 bulk density samples have been collected and measured since 1998, from both diamond drill core and hand specimens obtained from underground development at Rosia Montana. Bulk density determination was by standard water immersion method with each sample coated in wax prior to immersion.

d) Database Development

Exploration database development for the Rosia Montana Project used Micromine software. Database validation was carried out on site and duplicated on delivery to RSG's office in Perth. Further visual validation of the data was carried prior to the commencement of resource modelling.

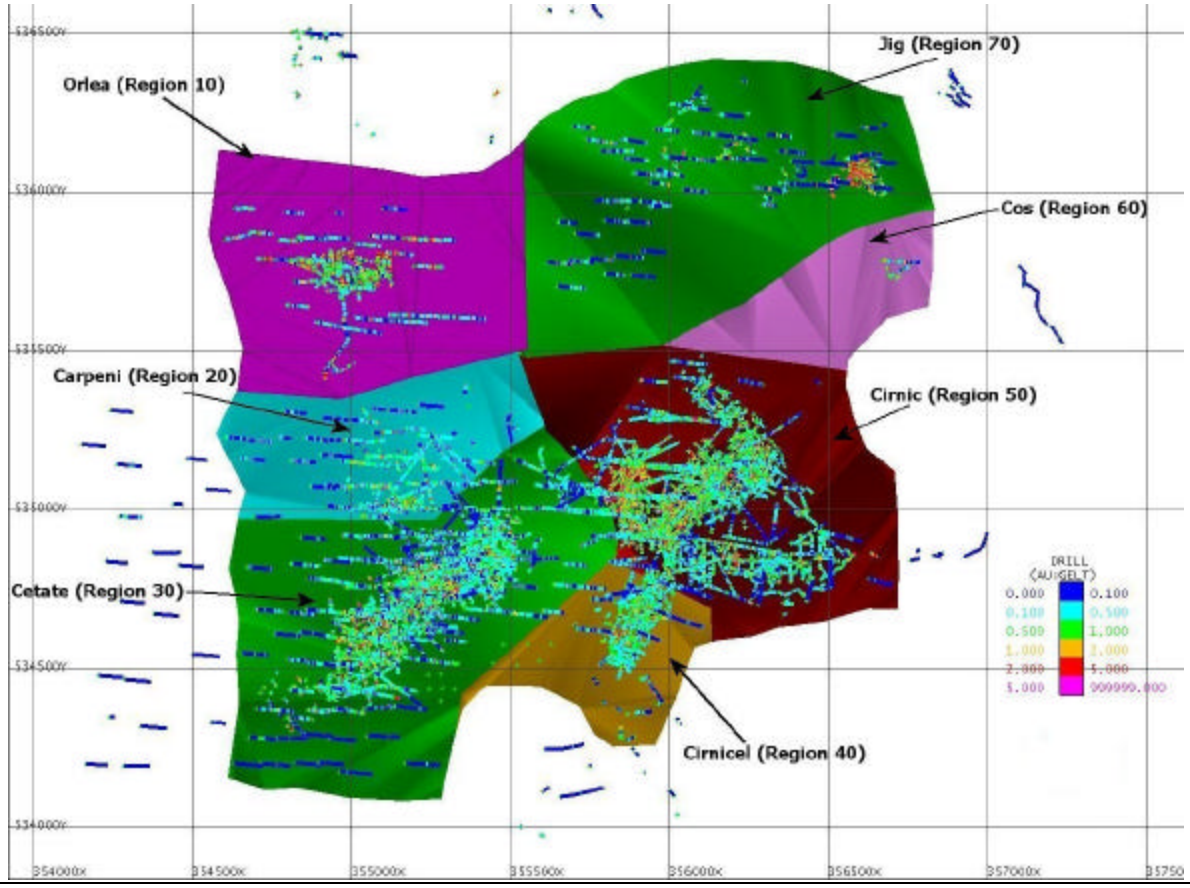
1.4.6 Estimation Regions

The data was subdivided into seven estimation regions, based primarily on the spatial distribution of the historic mining centres. Figure 1.4.2 shows the defined estimation regions relative to the channel sampling and drilling data which have been used in the definitive feasibility studies.

1.4.7 Mineralisation Zone Interpretation and Modelling

Estimation domains appropriate for grade estimation were constructed based on geological and statistical review. Field observations, supported by statistical analysis, show that the distribution of mineralisation is controlled primarily by alteration style, and not by changes in lithology. Anomalous gold and silver mineralisation generally correlates well with zones of moderate to strong silicic and potassic (adularia and sericite) alteration, in both the dacite and vent breccia.

Figure 1.4.2
Estimation Regions with the Drilling and Channel Data



a) Lithology Model

A three dimensional geological model, using wireframes, has been developed for the six primary lithologies, comprising:

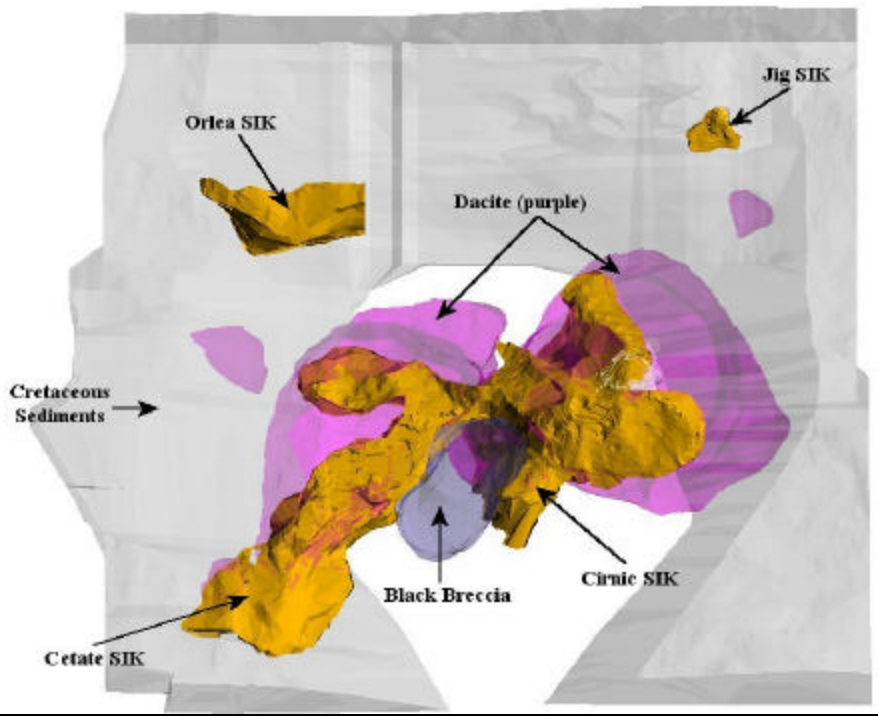
- dacite;
- vent breccia;
- internal vent breccia;
- cretaceous sediments;
- black breccia, and
- andesite.

b) Alteration Model

Statistical analysis of 2 m composite data, coded by the simplified alteration coding, demonstrates good correlation between silicic-potassic alteration and higher grade gold-silver mineralisation. An alteration model was constructed, grouping silicic and potassic alteration (SIK) zones, against data with little or no silicic or potassic alteration (NSIK). Figure 1.4.3 displays the core alteration zones. Major zones of SIK alteration are interpreted to occur at Cetate, Cirnic/Cirnicel and Orlea. A fourth region of SIK alteration occurs at Carpeni, however the alteration and mineralisation are of lower intensity.

At Cetate, the SIK alteration zone is subvertical, with a northeast-southwest strike. At Cirnic, two subvertical SIK zones are defined, one striking north and a second striking east-west in the southeast sector of the domain. These zones are interpreted to coalesce to the north of Cirnic, and the SIK zone that traverses Gauri and Cetate is considered likely to extend through to Jig, directly northeast along strike. East-west trending alteration zones are interpreted at Orlea and Carpeni.

Figure 1.4.3
Core Alteration Zones



c) Estimation Domain Development

Based on the geological modelling of lithology and alteration, a total of 14 separate estimation domains were selected. The zones are based on a combination of sub-region (e.g. Cetate, Cirnic) and alteration (e.g. SIK or NISK), with an additional lithology classification for the Carpeni sub-region, where less intense SIK alteration was logged. Further subdivision of the SIK zone at Cirnic was made to separate the less significant, southeast-trending SIK alteration zone from the main north-northeast trending SIK zone. These estimation domains are based solely on geological and region criteria and do not reflect gold grade boundaries.

As the black breccia and the overlying andesitic agglomerates post date the main mineralising event, these lithological domains were excluded from grade estimation.

The change in tenor of both gold and silver mineralisation across estimation domain boundaries is observed to be gradational. As a result, soft grade boundaries were employed in the estimation, wherein composite data from adjacent estimation domains were considered acceptable for grade estimation. Restrictions in the sample search criteria were employed to limit possible extrapolation of high grade composites into regions of lower grades.

1.4.8 Compositing

The vast majority of the data (over 95%) at Rosia Montana was collected at a 1 m sample interval. Application of a regular 2 m composite run length (downhole and along drives) was regarded as the most appropriate, to ensure a uniform sample support, whilst retaining the inherent variability in the mineralisation. Table 1.4.2 summarises pertinent statistics for the 2 m composites.

1.4.9 Assay Quality Control Data

All quality control data relevant to the gold and silver assays were statistically assessed to quantify the precision and accuracy of the data. The accuracy of the data was assessed, based on results of laboratory standards and blanks.

The precision of the gold fire assay data was grouped according to sample type (e.g. field duplicate, crusher duplicate, pulp duplicate and pulp replicate etc for each of the RC, diamond drilling and channel sampling data sets) and was further subdivided by Project sub-region.

In summary, the following conclusions can be made.

- The level of precision determined for the duplicate field samples, duplicate crusher and pulp splits, and pulp repeats are within industry accepted limits for gold fire assays and the styles of gold mineralisation observed at the Rosia Montana Project.
- There is a high degree of relative accuracy in the assays from the 3 laboratories used.
- The inter-laboratory precision between the 3 laboratories used is predominantly within accepted industry limits for round robin gold fire assay analyses.
- Industry acceptable assay results have been reported for the blanks.
- Industry acceptable levels of analytical accuracy are observed for the great majority of gold assay data for the Gura Rosiei gold standards. Rare cases of obvious mislabelling of standards were noted.

1.4.10 Descriptive and Distribution Statistics – Gold, Silver and Sulfur

Detailed statistical analysis has been undertaken on gold, silver and sulfur for the total database, grouped by lithology, alteration and estimation domain. All statistical analyses have been completed on the 2 m run length composites, excluding composites less than 1 m in

length. Table 1.4.2 summarises statistics for the master 2 m composite database, subdivided by estimation domain.

Table 1.4.2
Statistical Summary for Ore Zones – Au (g/t) - 2 m Run Length Composites

	Orlea (10)		Carpeni (20)		Cetate (30)		Cirnicel (40)		Cirnic (50)			Jig	
	SIK	NSIK	SIK	NSIK	SIK	NSIK	SIK	NSIK	SIK MAIN	SIK SE	NSIK	SIK	NSIK
Au (g/t)													
Number	2353	1619	3407	1426	15800	6416	1929	891	14671	2994	3038	663	4314
Minimum	0.010	0.006	0.006	0.010	0.006	0.006	0.006	0.008	0.010	0.010	0.006	0.020	0.006
Maximum	119.42	82.44	51.700	620.49	411.20	417.76	154.58	50.37	276.17	311.65	30.42	52.10	66.63
Mean	1.415	0.624	0.582	0.661	1.093	0.428	0.910	0.588	1.443	0.853	0.410	2.769	0.309
Median	0.700	0.273	0.265	0.060	0.410	0.115	0.415	0.245	0.690	0.385	0.160	2.020	0.045
Std Dev	3.926	2.320	1.635	16.513	6.229	5.413	4.186	2.366	5.384	6.099	1.013	3.547	1.542
Coeff Var	2.775	3.715	2.809	24.971	5.698	12.661	4.600	4.020	3.732	7.148	2.470	1.281	4.994
Ag (g/t)													
Number	2353	1619	3407	1426	15800	6416	1929	891	14671	2994	3038	663	4314
Minimum	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Maximum	34.0	150.0	38.5	212.0	1750.0	155.5	200.0	118.0	573.5	459.5	220.0	459.0	102.0
Mean	2.2	1.8	1.4	1.0	6.7	1.9	8.5	8.0	9.3	6.4	3.3	27.3	1.6
Median	2.0	1.5	1.0	0.5	3.0	1.0	5.0	5.0	6.0	4.0	1.5	13.3	0.5
Std Dev	1.7	4.2	2.1	5.7	26.9	4.7	13.2	11.3	15.9	14.5	9.5	45.9	3.7
Coeff Var	0.8	2.4	1.5	5.7	4.0	2.5	1.6	1.4	1.7	2.3	2.9	1.7	2.4

A total of 1312 sulfur records are available for investigation. An overall mean sulfur grade of 1.9% S has been calculated. Cetate shows the highest mean sulfur grade of 2.4% S, followed by Cirnicel with 2.2% S. All other regions show significantly lower levels of sulfur.

1.4.11 Determination of Upper Cuts

A detailed review of the data distribution statistics revealed the presence of extremely high grade gold and silver composites. Further assessment of the composite data in 3 dimensions revealed the higher-grade data cluster, appearing to represent a normal component of the overall sample distribution. The possible influence of the high-grade data on grade estimation was assessed, and an approach of restricting the sample search ranges for high-grade data (notionally above the 98% percentile) was implemented as a result.

The final Multiple Indicator Kriging (MIK) estimate is based on all data. The grade of the uppermost "bin" in the MIK run was determined using the cut mean grade for gold and the median value for silver.

1.4.12 Statistical Analysis – Bulk Density Data

Extensive statistical analysis was undertaken on the bulk density database with the following parameters (and combinations thereof) being assessed by total dataset, lithology, region and grouped alteration coding. The distribution of all bulk density data displays little skew and has a very low coefficient of variation, indicating that the great majority of density measurements cluster strongly around the mean.

The bulk density data has been used to assign a mean density for each of the lithological units used to create the geological model. The following densities were adopted.

- Dacite 2.46 t/m^3
- Vent breccia 2.39 t/m^3
- Black breccia 2.26 t/m^3
- Cretaceous sediments 2.45 t/m^3

1.4.13 Block Model Development

a) Block Model Dimensions

Three dimensional block models were constructed for the resource region covering all potential ore zones and sampled waste dump regions. The block models were constructed with sufficient spatial extent to permit evaluation of pit optimisation and mine planning. Two block models were constructed to allow comparative estimates and mine planning studies. A 10 mE x 10 mN x 10 mRL "base" block model and a comparative 15 mE x 15 mN x 15 mRL scenario. Table 1.4.3 summarises the block model matrix parameters.

Table 1.4.3
Block Model Construction Parameters

	Origin	10 mE x 10 mN x 10 mRL			15 mE x 15 mN x 15 mRL		
		Extent	Block Size	Number of Blocks	Extent	Block Size	Number of Blocks
East	354 400	2705	10	271	2695	15	180
North	534 000	2405	10	241	2395	15	160
Elevation	450	705	10	71	700	15	47

The attributes coded into the block models included:

- interpreted lithology (i.e. dacite, vent breccia etc.);
- rock code (air, waste dump or in situ rock);

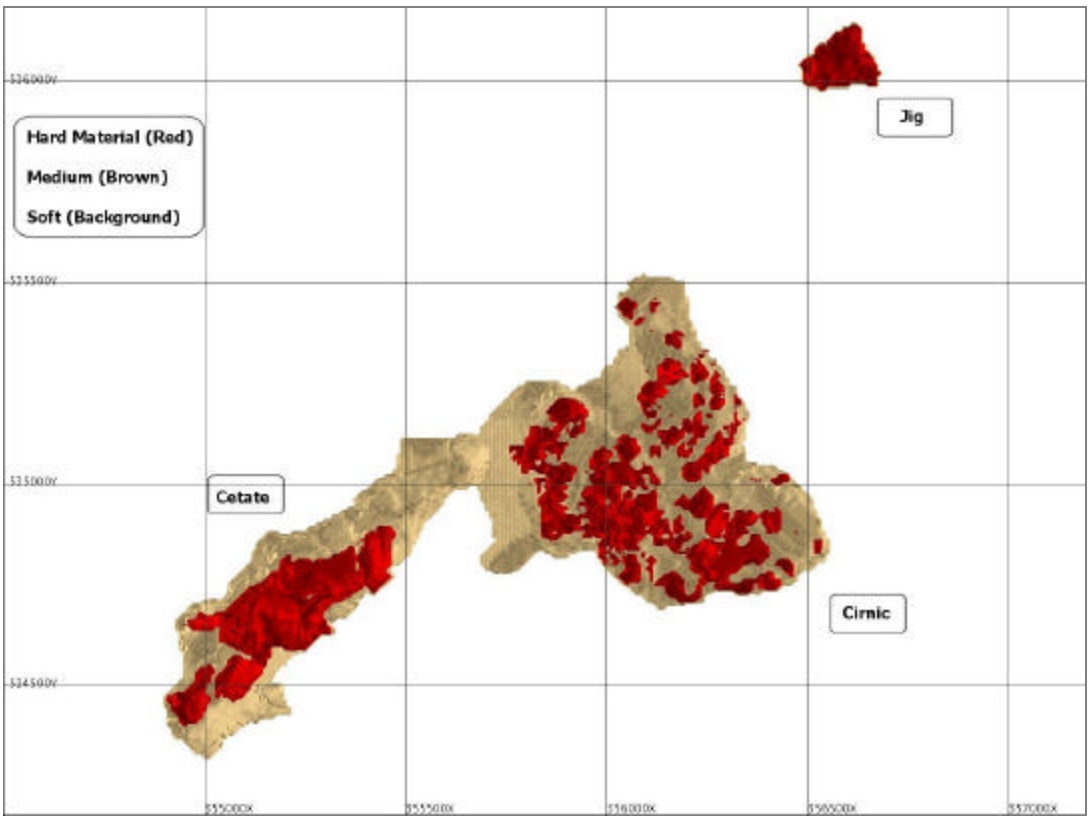
- alteration (SIK or NSIK);
- region (i.e. Orlea, Cetate etc);
- void proportion;
- bulk density, and
- "mined" density, which accounts for the underground voids.

b) Hardness Model

A hardness attribute was coded to the final block model, the 10 m base model, and regularised into the 15 m hardness model. The hardness model is based on metallurgical test work completed by Minproc that indicates that only the core regions of Cetate, Cirnic and Jig would have material considered as either medium or hard. A base soft coding was applied to all other regions. The hardness model was developed through a combination of wireframing and grade estimation using the existing geological model as the base model framework. Figure 1.4.4 displays the hardness model wireframes used to code the block model.

Figure 1.4.4

Rosia Montana – Hardness Model Wireframes

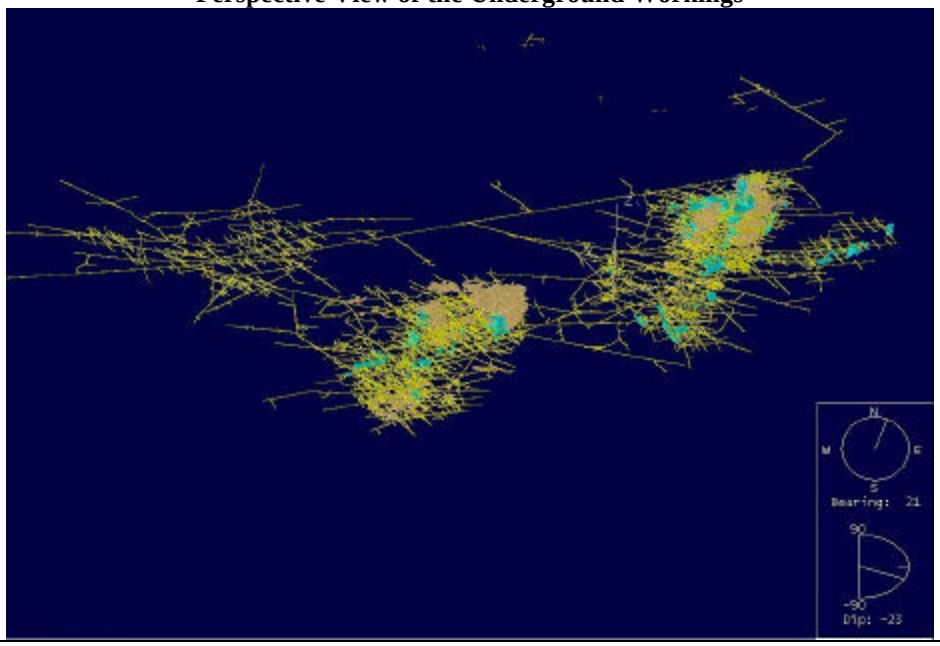


c) Coding of Underground Workings

A three-dimensional model of the underground workings and development was produced and the voids represented by this model removed from the mineralisation block model. Figure 1.4.5 shows a perspective view of the underground development and void model. The tonnage of each individual block affected by the underground development model was calculated using a "mined" density variable, which reflects the proportional reduction in volume of the block and the block bulk density. The "mined" density variable was used for all subsequent grade-tonnage reporting to ensure the previous stoping and underground development voids were removed from the resource estimate. This model estimates that approximately 3.5 Mt has been removed by previous underground mining.

Figure 1.4.5

Perspective View of the Underground Workings



1.4.14 Variography

Detailed three dimensional variography has been undertaken on the 2 m composite database, for gold and silver, and the sulfur database. Indicator variography was carried out for gold and silver, whilst grade variography was used for sulfur. For each estimation domain, generally 4 selected indicator cut-offs, representing key points in the grade distribution, were modelled in detail.

Similar characteristics were obtained for the gold and silver variography, indicating that the gross spatial distribution of gold and silver appear similar. The identified anisotropy (i.e. strike, dip etc)

of the gold-silver mineralisation is noted to be consistent with the interpreted geological controls. The modelled indicator variography is characterised by low to moderate relative nugget effects (nugget variance divided by total sill variance) generally ranging from 15% to 40%. The indicator variography generated for gold and silver was modelled with two to three spherical structures. The close range structure typically dominates the non-nugget variability and is modelled at a range at, or less than, the average data spacing. The variography is consistent with field observations, where significant short-scale variability exists, but where broad zones of mineralisation are, nonetheless, readily discernible. At the lower indicator threshold grades, extended overall ranges (typically >100 m) were fitted for the major and semi-major direction. Significantly shorter ranges, typically 50 m or less, are generally noted at higher indicator thresholds.

Due to the relatively limited data available, sulfur variography was undertaken on the grouped domains of Cetate, Cirnic and remaining regions. Similar variography was generated for all domains, with the variogram models characterised by low relative nuggets and extended ranges of continuity. The extended variogram ranges indicate that the data spacing is sufficient to produce a globally robust estimate, with the low nugget effect reflecting relatively low levels of close spaced variability.

1.4.15 Grade Estimation

a) Grade Estimation Approach

Resource estimation for the Rosia Montana Project was undertaken using Multiple Indicator Kriging (MIK) as the principal estimation methodology for gold and silver, Ordinary Kriging (OK) for sulfur. Inverse distance squared (ID2) and nearest neighbour (NN) estimation were employed as check estimation methods for gold and silver. Post processing of the MIK results was undertaken to produce whole block or E-type mean estimates.

MIK estimates were generated for both gold and silver into each of the defined estimation domains. A maximum of 15 indicator thresholds for gold and 13 indicator thresholds for silver were used in the MIK estimation.

Sample neighbourhood testing was completed, using the derived variography, to determine the most appropriate search strategy. A multiphase sample search strategy was applied, wherein an expanding sample search neighbourhood was implemented with less restrictive sample search criteria for each successive sample search. A maximum of 10 composites from any single drill hole or channel sampling run was used to restrict the effects of data clustering.
The high grade sample search restriction thresholds were selected for each estimation domain, based on sample statistics (initial threshold selected as the 98% sample

population) and variography. The identified high-grade samples were restricted from the sample search radii greater than a distance of 50 m x 50 m x 50 m. The final restriction on grade thresholds were then refined during sample neighbourhood testing, as the 98% percentile was considered too restrictive and therefore adjusted upwards.

b) MIK Post Processing - Whole Block E-type Mean Estimates

The resource estimate for gold and silver at Rosia Montana is based on the E-type mean. The E-type mean provides an estimate for the grade of the total block or bulk mining scenario (that is, selective mining of a volume smaller than the nominated block size is not considered).

c) Comparative estimates

Comparative ID2 and NN estimates were undertaken for both gold and silver as a means of comparison in the 10 m x 10 m x 10 m model only.

d) Sulfur estimate

The sulfur model is based on an Ordinary Kriging (OK) estimate. A restricted sample search was used for estimation to limit smoothing to appropriate levels. A minimum of 2 and a maximum of 6 composites were used for the OK grade estimation to ensure mapping of local variability and limit the smoothing effect of estimation. Comparisons of the input data and the sulfur model were undertaken as part of a detailed validation process to ensure that the sulfur model robustly reflects the input data. The visual and statistical validation indicates the sulfur model is globally robust.

e) Mineralised Waste Dump Estimate

Following observation of open pit mining practice currently being used at Rosia Montana, it is evident that mineralised material has been routinely sent to the waste dumps, developed immediately adjacent to the Cetate open pit. Following statistical review, an uncut inverse distance squared grade estimate was completed for the Cetate waste dumps, using only those samples collected within the waste dumps.

f) Validation

Extensive visual and statistical validation of the gold and silver grade estimates were completed.

The validation exercise indicates that the resource models replicate the gold and silver input data extremely well in regions of higher density sampling, such as the SIK domains. In the regions where the data density is lower, some smoothing is evident, however, the estimates are considered appropriate. The restriction of the sample search for high-grade composites has ensured reasonable limits on the extrapolation of high-grade data. When the declustered mean gold grade of the input data is compared with the overall gold grade, a high degree of correlation is noted, except in regions of lower data density that are classified as Inferred, or as a combination of Indicated and Inferred. Comparisons of the input data versus the estimated MIK distribution or conditional cumulative distribution function (ccdf) demonstrate a high degree of correlation. Smoothing is again evident for the domains based on a sparse data array, with the MIK model reporting comparatively less material than the declustered composite data.

The global grade-tonnage distribution defined by the inverse distance squared gold estimate shows close correlation with the MIK E-type mean estimate. This indicates that the Rosia Montana deposit is relatively insensitive to the choice of estimation technique. A nearest neighbour estimate was included for illustrative purposes only, as the technique emulates a polygonal approach, which is known to overstate grade and understate tonnes.

1.4.16 Resource Reporting

Categorisation of the MIK E-type mean gold and silver grade estimates was undertaken on the basis of the criteria laid out in the Canadian National Instrument 43-101 ("CNI43"). Measured, Indicated and Inferred Resources are defined using definitive criteria determined during the validation of the grade estimates, with detailed consideration of the CNI43 categorisation guidelines.

The following criteria are used to categorise the resources based on the MIK E-type mean grade estimates.

- Measured Resource
  - Only blocks coded as occurring within the SIK Zone and within proximity to the area with a sampling density of approximately 40 m by 40 m or better.
  - Estimation pass one.
  - A minimum of 32 composites.
  - Where the distance to the nearest composite is not more than 30 m.
  - Data collected from a minimum of 3 drill holes or underground drives.

- Indicated Resource
  - Inside the SIK Zone
  - Where the distance to the nearest composite is not more than 50 m, excluding blocks already coded as Measured Resources.
  - A minimum of 16 composites.
  - Data collected from a minimum of 2 drill holes or underground drives.
  - Within the Outer Zone.
  - Where the distance to the nearest composite is not more than 50 m.
  - A minimum of 16 composites.
  - Data collected from a minimum of 2 drill holes or underground drives.

- Inferred Resource
  - Blocks lying further than 50 m from the closest composite.
  - A minimum of 16 composites.
  - Data collected from a minimum of 2 drill holes or underground drives.

Table 1.4.4 displays the grade tonnage report for the 10 mE x 10 mN x 10 mRL resource model, for the 0.6 g/t Au, 0.8 g/t Au and 1.0 g/t Au cut-off grades. Table 1.4.5 summarises the grade tonnage report for the 15 mE x 15 mN x 15 mRL resource model.

Table 1.4.4
Categorised Grade Tonnage - 10 mE x 10 mN x 10 mRL Resource Model

Class	Mt	Au (g/t)	Ag (g/t)	Moz Au	Moz Ag
0.6 g/t Au Lower Cut-off Grade					
Measured	134.58	1.6	8	6.86	36.43
Indicated	161.87	1.2	5	6.13	24.91
Subtotal	**296.45**	**1.4**	**6**	**12.99**	**61.34**
Inferred	47.62	0.9	4	1.31	5.67
0.8 g/t Au Lower Cut-off Grade					
Measured	109.57	1.8	9	6.3	31.77
Indicated	105.82	1.4	5	4.88	18.55
Subtotal	**215.39**	**1.6**	**7**	**11.18**	**50.32**
Inferred	20.99	1.1	4	0.72	2.99
1.0 g/t Au Lower Cut-off Grade					
Measured	88.76	2.0	10	5.7	27.19
Indicated	73.07	1.7	6	3.94	14.3
Subtotal	**161.83**	**1.9**	**8**	**9.64**	**41.49**
Inferred	10.12	1.3	5	0.41	1.53

Table 1.4.5
Categorised Grade Tonnage - 15 mE x 15 mN x 15 mRL Resource Model

Class	Mt	Au (g/t)	Ag (g/t)	Moz Au	Moz Ag
0.6 g/t Au Lower Cut-off Grade					
Measured	138.08	1.5	8	6.85	36.63
Indicated	163.78	1.1	5	5.92	24.39
Subtotal	**301.85**	**1.3**	**6**	**12.77**	**61.02**
Inferred	50.80	0.8	4	1.38	5.94
0.8 g/t Au Lower Cut-off Grade					
Measured	114.14	1.7	9	6.31	32.29
Indicated	104.74	1.4	5	4.62	18.05
Subtotal	**218.88**	**1.6**	**7**	**10.93**	**50.34**
Inferred	22.52	1.1	4	0.76	3.10
1.0 g/t Au Lower Cut-off Grade					
Measured	93.39	1.9	9	5.71	27.85
Indicated	69.89	1.6	6	3.62	13.69
Subtotal	**163.28**	**1.8**	**8**	**9.33**	**41.54**
Inferred	10.81	1.2	5	0.43	1.56

In addition to the Inferred Resource reported (above) for the in situ gold-silver mineralisation at Rosia Montana, an Inferred Resource in the Cetate waste dumps, Halda Hop and Halda Valea Verde, is reported on the ID2 estimates in 10 mE x 10 mN x 10 mRL blocks with no lower cut-off grade applied. An Inferred Resource of 4.0 Mt at 0.7 g/t Au, 4 g/t Ag (84 000 oz Au, 454 000 oz Ag) is reported. For the 15 mE x 15 mN x 15 mRL resource model, the waste dump section of the model reports an Inferred Resource of 4.0 Mt at 0.7 g/t Au, 3 g/t Ag (88 000 oz Au, 446 000 oz Ag).

1.5 MINING

The 10 m resource model detailed in Table 1.4.4 was used for pit optimisation, mine planning, reserve reporting, scheduling and costing. Whilst underground mining and small scale open pit operations have been carried out to date at Rosia Montana, the geometry and grade distribution of the orebodies lend themselves to bulk open pit mining as the primary extraction method.

The Study is based on the adoption of an owner operated equipment fleet utilising conventional open pit mining techniques that incorporate drilling, blasting and the use of hydraulic excavators and haul trucks for primary production. RMGC will supply overall management and technical services for the Project.

The Study has identified 4 principal areas where open pit mining would be viable, being Cetate (including Carpeni), Cirnic (including Cirnicel), Orlea and Jig (including Igre). An average ore mining rate of 8 Mt/a has been set, which will result in an annual total material movement of approximately 16 Mt.

Figure 1.5.1 displays an overview of the general layout of the mining infrastructure designed for the Study. It is envisaged that mining would commence in Cetate, which is closest to the processing plant and requires the least development. An initial 4.3 Mt of waste material is required for the TMF starter dam, with a final embankment tonnage of approximately 33 Mt. The balance of waste material mined from the open pits will be placed on waste dumps to the south of the Cirnic pit and to the west of the Orlea and Cetate pits.

1.5.1 Pit Optimisation

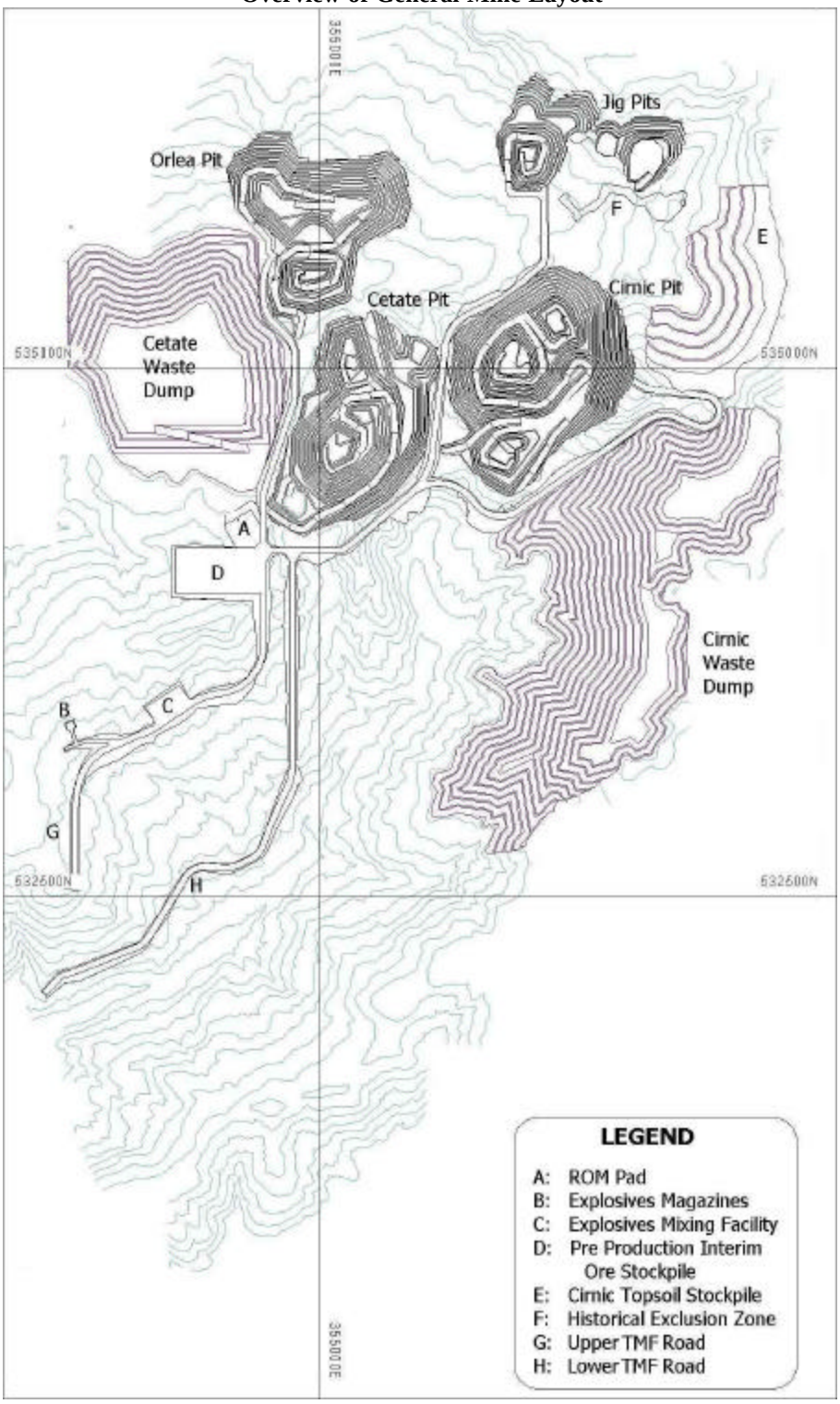
A pit optimisation model was produced based on the 10 m resource model as described in Section 1.4.

The model includes all blocks that are classified as Measured Resources, Indicated Resources or Inferred Resources using the Standards of Disclosure for Mineral Projects, National Instrument 43-101 as published by the British Columbia Securities Commission. Pit optimisation has been undertaken using Whittle Four-X, which can deal with a multi-element deposit. The package uses the Lerchs-Grossman algorithm and is considered an international standard.

Only those blocks classified as Measured or Indicated were considered for processing. Inferred resource blocks were considered as waste.

Figure 1.5.1

Overview of General Mine Layout



The pit optimisation analysis was carried out using the following assumptions and parameters.

- Mill throughput dependent on ore hardness (Hard: 6.4 Mt/a, Medium: 7.5 Mt/a and Soft: 9.6 Mt/a).
- Sufficient waste is removed each period to enable the milling rate to be maintained.
- Discount rate: 9%.
- Base case Au price: $275/oz.
- Base case Ag price: $5.00/oz.

1.5.2 Pit Optimisation Results

The pit optimisation results show that the curve of the relationship between the undiscounted operating cashflow generated and the pit size is very flat. The analysis of the pit optimisation results considered the discounted and undiscounted cashflow, incremental expansion costs, average operating surplus, the reserve size, waste tonnage and project throughput rate. After consideration of these factors, pit shell 25 was selected as the basis for pit design.

Comparison of the total operating cost and recovery inputs to the Whittle analysis, relative to the final DFS results, indicates close agreement.

1.5.3 Mining Method

a) Description

A conventional drill and blast, load and haul cycle is proposed for the Rosia Montana Project.

The geometry and grade distribution of the orebodies lend themselves to bulk open pit mining as the primary extraction method. In order to facilitate this, a bench height of 10 m was selected.

b) Load and Haul

The primary load and haul equipment selected for the Project includes 140 tonne hydraulic excavators matched to 90 t trucks.

c) Drill and Blast

Oxidation of the rock typically extends only to depths ranging from a few metres to 10 m. Whilst areas of the weathered material may be free diggable, sufficient continuity to allow practical continuous digging without the need for drilling and blasting is unlikely. It was assumed, therefore, that drill and blast will be undertaken in all mining areas from the current surface.

The majority of blasting will be done with ANFO. Powder factors range from 0.32-0.45 kg/bcm.

d) Grade Control

Grade control drilling is planned to be carried out by angled RC drilling. Three composite samples will be collected per hole per bench. At least 2 ten-metre benches will be drilled per hole. The notional initial drill spacing will be holes spaced 15m apart along lines 30 m apart.

e) Probe Hole Drilling

The earlier underground mining consists of level development and open stopes, some of which are very large (generally with dimensions in the order of tens of metres). Whilst the location of the majority of the old workings is generally known, mining around the voids will need to be managed correctly to avoid exposing personnel and equipment to a safety risk.

Whilst the grade control system will pick up some of the underground workings, a dedicated probe hole programme will need to be implemented in order to delineate the underground voids in more detail. A notional amount of 4 000 m/a was allowed for probe hole drilling.

f) Ore Recovery and Dilution

The Au and Ag grades are based on the whole block grade estimate as determined through multiple indicator kriging and ordinary kriging for Au and Ag respectively. Mining dilution forms an inherent part of these grade estimation techniques. Operationally, this reflects expected dilution due to bulk mining operations at the ore waste boundaries and full 10 m bench heights.

g) Infrastructure, Services and Support Facilities

Mine operational personnel will be located within the main mine office building complex located at the processing plant. An operations office with changeroom facilities will be located adjacent to the main mine workshop complex.

The mine maintenance workshop will be located immediately to the north of and adjacent to the main process plant. This location provides ready access to all service connections and is centrally located so as to minimise travel time between the open pit mining areas and workshop. Maintenance of light vehicles will also be undertaken in the main mine workshop.

h) Mine Dewatering

Knight Piésold was commissioned by RMGC to carry out the hydrological review of the project. Details of its investigations are described in its report "Water Baseline Report" included in Appendix 11.1. As a result of drainage provided by the underground workings, mine dewatering requirements will be negligible down to an elevation of approximately 700 mRL where the water table is likely to be encountered. Existing evidence indicates that there are no significant aquifers within the mining area. However, impounded bodies of water may be encountered in disused underground workings.

Below 700 mRL, a dewatering requirement of 7-14 L/s was estimated. In-pit sumps will be constructed to deal with these water inflows.

Drainage channels will be constructed to control surface water and run-off.

i) Waste Dump Construction

Prior to the placement of any waste in the designated waste dump areas, the surface area to be covered will be stripped of topsoil, scarified and compacted. All topsoil recovered will be stockpiled for later rehabilitation of exterior dump faces. Waste material is categorised as potentially acid producing. Scarification and compaction will provide a semi-impervious layer under the waste dumps preventing any acid water produced entering the groundwater system.

The Cirnic dump has been located such that the dump footprint is located entirely within the Corna valley catchment area and above the TMF embankment wall. This location

will ensure that any potentially acidic water running off the dump will report to the TMF decant pump. In later years this will be pumped to the water treatment plant.

The Cetate dump is located to the west of the Cetate pit on the side of the Rosia Valley. A water catchment facility will be located downstream of the dump to control and treat run-off.

A dedicated section of Cetate dump will be reserved for the placement of marginal material in order that it can be recovered in the event that an upturn in gold price makes it economic.

Waste dumps will be progressively rehabilitated where possible. All waste dumps and haul roads will be rehabilitated at the completion of the mining phase.

1.5.4 Mine Design

a) Pit Design

The Vulcan mining software package was used to design the pits for Rosia Montana. Based on pit slope recommendations by Knight Piésold and the size of the mining equipment selected, the following base parameters were adopted for the pit design.

- Ramp width of 25 m.
- Ramp width of 15 m for single lane access.
- Ramp gradient of 10%.
- Bench height of 10 m.
- Berm width varying between 8 m and 12 m, depending on rock type, for every 20 m of vertical wall height.
- Batter angle varying between 65° and 75° depending on rock type.

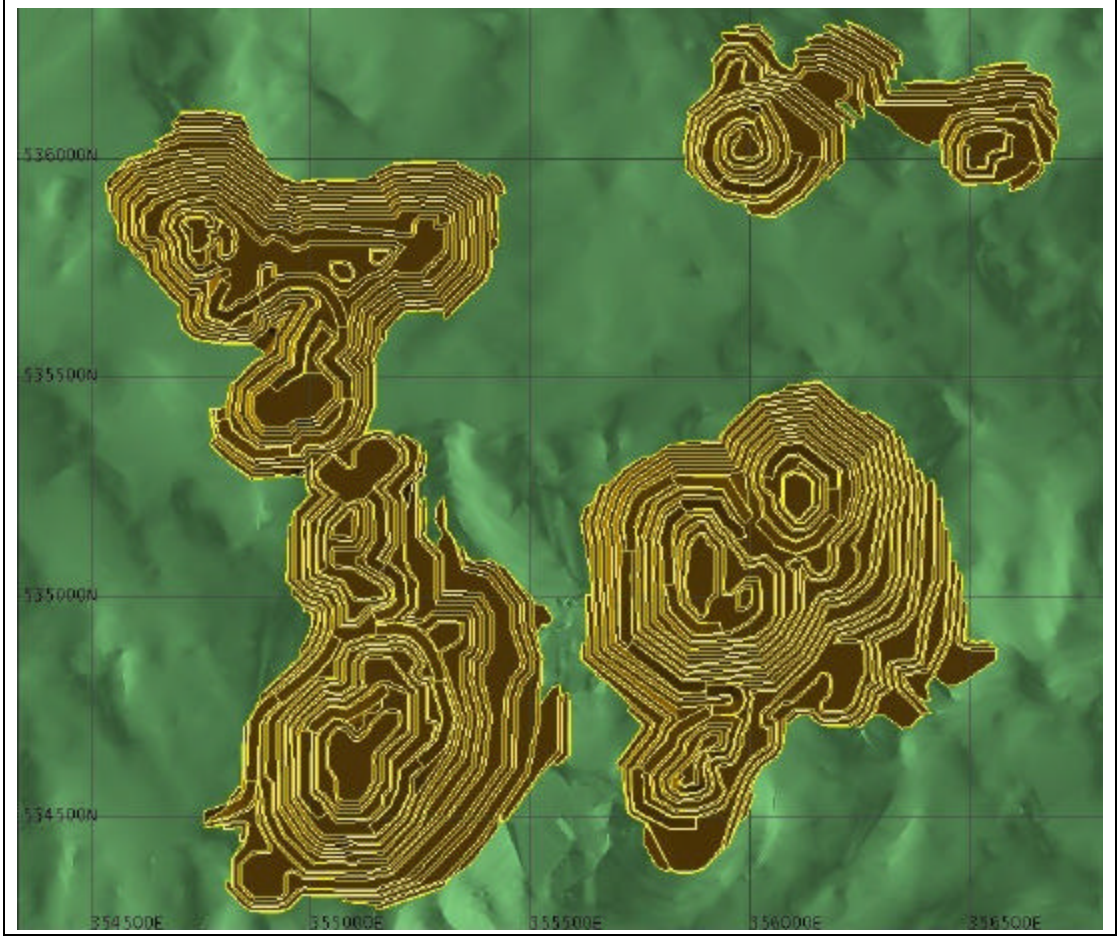
Staged pits were designed for the principal mining areas Cirnic, Cetate and Orlea; a single stage was designed for Jig. Figure 1.5.2 displays an overview of the final pits designed for the Rosia Montana Project.

Mineral Reserves, as contained within the combined pit designs, total 199.7 Mt at an in situ grade of 1.6 g/t Au and 7.8 g/t Ag for approximately 10.1 Moz of contained Au metal and 50.4 Moz of contained Ag metal.

Some 196.4 Mt of waste are contained within the pit designs with a waste to ore strip ratio of 0.98:1. The waste quantity includes 14.3 Mt of material classified as an Inferred Resource at an estimated grade of 0.9 g/t Au and 5.4 g/t Ag. The waste dumps have a design capacity of 224 Mt.

Figure 1.5.2

Plan View of Rosia Montana Pit Designs



1.5.5 Reserves

The Reserves contained within the pit designs were determined based on the cost and recovery parameters discussed in Section 5.2.2 and Section 5.2.3 using the following formula:

- Value = [((Au_rec x Au price) + (Ag_rec x Ag price)) – (Proc cost + G&A cost)]

Where
Au_rec = Recovered Au metal after refining losses
Ag_rec = Recovered Ag metal after refining losses
Proc cost = Processing cost
G&A = General and Administration cost

Those blocks that computed a positive value were flagged as Reserves. A cut-off grade was not used for determining the Reserves. Depending on the block grades, processing costs and metallurgical recoveries the gold equivalent marginal cut-off grade is approximately 0.6 g/t Au.

Table 1.5.1 summarises the Reserves as determined for the Project.

Table 1.5.1
Reserves Summary

Reserve Category	Tonnes	Grade			In Situ Metal		Recovered Metal	
		Au	Ag	S	Au	Ag	Au	Ag
	(Mt)	(g/t)	(g/t)	(%)	(Moz)	(Moz)	(Moz)	(Moz)
Proven	108.0	1.8	9.4	1.9	6.1	32.5	5.1	17.5
Probable	91.7	1.3	6.1	1.8	4.0	17.8	3.2	9.8
Total	**199.7**	**1.6**	**7.8**	**1.9**	**10.1**	**50.4**	**8.3**	**27.3**

a) Assessment and Reporting Criteria

The Reserves as summarised in Table 1.5.1 were prepared with the assistance of "Qualified Persons". These Qualified Persons contributing to the reserve determination, and their respective areas of expertise, are listed below.

- Mr Harry Warries (Senior Mining Engineer – Resource Service Group).
  Pit optimisation, pit design and mine production scheduling.

- Mr David Quinlivan (Consulting Mining Engineer – Resource Service Group).
  Mine operating and capital cost estimates and general mine infrastructure layout.

All Qualified Persons are members of the Australasian Institute of Mining and Metallurgy (AusIMM) and have the appropriate relevant qualifications, experience and independence to be considered "Qualified Person" as defined by the Canadian National Instrument 43-101 Standards of Disclosure for Mineral Projects.

Neither RSG nor the Qualified Persons as stated in this Section have or have had previously any material interest in the mineral properties as described herein.

The Reserves are based on the Measured and Indicated Mineral Resources as described in Section 4.

The economic factors contributing to the Reserve determination are described throughout this report, in particular Section 5.2.2, Section 5.2.3 and Section 5.4.

b) Production Schedule

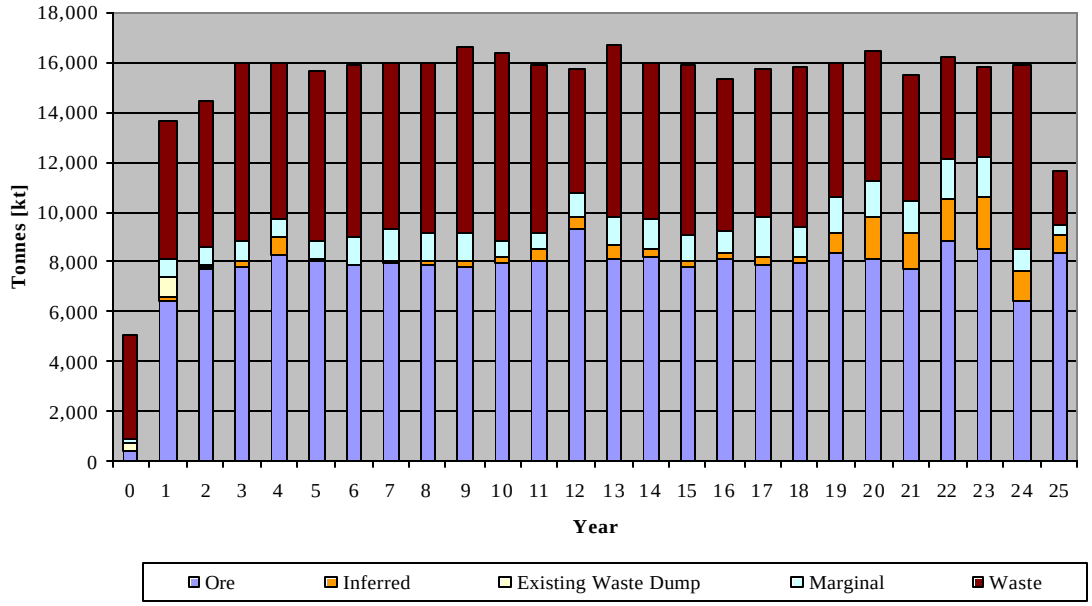
The project will produce an average of 330 000 oz of gold per annum over the life of mine, ranging from 210 000 oz to 476 000 oz. In addition, an average of 1.1 Moz of silver per annum are produced, ranging from 0.3 Moz to 2.3 Moz.

The average total material movement will be approximately 15.8 Mt, with a maximum of 16.7 Mt and a minimum of 11.6 Mt. Strip ratio (waste:ore) is an average of 0.98:1 over the life of the mine.

The average mill feed will be 8 Mt/a with a minimum of 6.9 Mt in the start-up year as mill capacity ramps up and a maximum of 9.3 Mt in Year 12 when the majority of the ore will be sourced from Orlea, which is classified as soft ore. The average breakdown in ore hardness will be approximately 10% hard, 43% medium and 47% soft. Hard ore delivered to the mill will be relatively steady throughout the life of mine, with a peak of 26% in Year 5 and dropping off to zero at the end of the operation. The proportion of ore classified as either medium or soft will fluctuate from year to year, with soft ore ranging from 19% in Year 2 to 100% in Year 25 and medium ore ranging from 0% in Year 25 to 71% in Year 17.

Figure 1.5.3 displays the annual material movement in graphical format.

Figure 1.5.3
Annual Material Movement



1.5.6 Equipment

The average equipment numbers in service for the mine are shown in Table 1.5.2.

1.5.7 Labour

Mining Department personnel will consist of expatriate and Romanian national management and technical staff and Romanian national operations personnel.

The labour component was divided into three primary groupings.

- Expatriate Staff.
- Romanian National Staff.
- Romanian National Award Personnel.

The mining department manning levels utilised in the Study are based on a four panel roster system that envisages production work at the mine site being undertaken on a:

- 24 hours per day, and
- 365 days per year basis.

Table 1.5.2
Equipment in Service

		Year															
		-2	-1	1	2	3	4	5	6	7	8	9	10-14	15-19	20-24	25	Average
Drill and Blast Equipment																	
Secondary Drill	ea		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Driltech D245SP	ea		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
966 Loader	ea		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Excavator Rock Breaker	ea		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Load and Haul Equipment																	
Liebherr R992 140 t Excavator	ea		1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Caterpillar 992G Loader	ea		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Caterpillar 90 t 777D Truck	ea		8	11	12	12	12	12	12	12	12	12	11	12	12	12	11.6
Ancillary Open Pit Equipment																	
Caterpillar D10R Track Dozer	ea		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Caterpillar 16H Grader	ea		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Water Truck 20t	ea		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Miscellaneous Plant and Equipment																	
Light Vehicles	ea	6	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Open Pit Service/Refuelling Truck	ea		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Shift Change Bus	ea		6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Mobile Crane (20t)	ea		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Lighting Plants	ea		8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
IT28 Tyre Handler	ea		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pumps (Dewatering and Standpipe)	ea		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Mine production personnel will work 3 x 8 h shifts per day. Management and technical services personnel will work an 8 h day, Monday to Friday, with weekend technical support coverage provided on a rotating roster basis.

It is expected that 4 expatriate staff will be employed in the final organisational structure. However, in the first 5 to 6 years, additional expatriate supervisory personnel and trainer/operators will be required. A primary role of expatriate personnel will be to train Romanian personnel to eventually replace them. For costing purposes, the expatriate staff is reduced progressively after the first 2 years of production.

1.5.8 Materials and Consumables

Local materials and consumables will be utilised wherever possible.

Drill consumables comprise drill bits, hammers, drill pipe and associated drilling accessories. It is expected that the Romanian agents of multinational drill consumable manufacturers will supply drill consumable products.

A bulk explosives/slurry manufacturing facility will be constructed on site. It has been assumed that a major explosives supplier will provide a down-the-hole service. Raw materials used in the explosive manufacturing process will be brought to site and stored in silos at the manufacturing facility site until required.

Fuel and lubricant products are readily available from within Romania. The average fuel consumption by the mining fleet over the life of the Project is 1.3 L/bcm.

Maintenance spares for all major equipment will be supplied by the original equipment manufacturers. Suitable quantities of spare parts for breakdown purposes will be kept in the site store. There will be some opportunities for obtaining locally manufactured minor items.

1.6 METALLURGY AND FLOWSHEET SELECTION

1.6.1 Testwork Summary

A programme of metallurgical testwork has been conducted on samples of ore from Rosia Montana. The programme was managed by Minproc and was largely undertaken at the facilities of AMMTEC and Amdel in Australia. Testwork was conducted to evaluate the following parameters of the ore.

- Chemical analysis (head assays).
- Mineralogy and diagnostic assays.
- Comminution characteristics.
- Gravity recovery of free gold and silver.
- Conventional CIP/CIL cyanide leach recovery of gold and silver.
- Heap leaching recovery of gold and silver.
- Flotation of a gold/silver/sulfide concentrate and various refractory treatment options on flotation concentrate.
- Gravity recovery of a gold/silver/sulfide concentrate and fine grinding and intensive cyanide leaching of the concentrate.
- Thickening of slurry.
- Viscosity of slurry.
- Cyanide management.
- Evaluation of gold and silver recovery with head grade.

The extensive testwork programme has assessed:

- 590 variability samples;
- 23 composite samples;
- 6 low grade composite samples;
- 7 SAG mill bench scale samples, and
- 3 SAG mill pilot plant samples.

Mineralogy, diagnostic leach and head assay data indicate that:

- the Rosia Montana ores have a high sulfur content, with the sulfur predominantly present as pyrite;
- a significant proportion of the gold is associated with pyrite, and
- nearly all of the gold lost to tailings is in sulfides, either as fine gold particles locked inside sulfur grains or as solid solution.

Analysis of the comminution data showed that:

- there is significant variability of ore competency and hardness through the orebody, but this is readily characterised from the lithological description of the ore;
- almost 50% of the orebody has been characterised as "soft" and less than 10% as "hard";
- "hard" ore has a Bond ball mill work index of 19.1 kWh/t and a Bond rod mill work index of 18.6 kWh/t, and
- the ore has been shown to be readily amenable to conventional SAG milling.

A number of process options for gold recovery have been examined. The selected optimal flowsheet includes gravity concentration and intensive leaching of coarse gold followed by carbon-in-leach (CIL). This circuit has been extensively tested, including a variability programme on 590 individual samples. The results of this programme have been integrated into the pit optimisation and mine scheduling algorithms. Preliminary mine schedules indicate an overall gold recovery of 82.1% from a feed grade of 1.56 g/t. Silver recovery has been assessed, by the same methodology, as 54.2% from 7.84 g/t.

Laboratory cyanide consumption has been assessed as 0.6-1.0 kg/t (average 0.78 kg/t). Lime consumption is relatively high, due to the sulfur content of the ore, and is estimated to be 2-4 kg/t (average 3.3 kg/t).

1.6.2 Gold and Silver Recovery Process Options

The starting point was conventional whole ore cyanidation circuit selected in the Pincock Allen and Holt (PAH) Prefeasibility Study.

The major gold recovery flowsheet options evaluated in the Study were:

- conventional cyanidation leaching;
- gravity recovery of free gold followed by conventional cyanidation;
- gravity recovery of sulfides, with leaching of the gravity tailing and gravity concentrate (sulfides) at various grind sizes;
- flotation of gold and sulfides followed by leaching of flotation tailings and flotation concentrate (sulfides) at various grind sizes;
- pressure oxidation and leaching of flotation concentrates, and
- heap leaching.

The economics of these options were evaluated using preliminary testwork data. Table 1.6.1 summarises the recoveries for the various options for a blend of ore from Cirnic, which is the major ore type at Rosia Montana. An economic ranking of these options is based on conceptual capital and operating costs.

Table 1.6.1
Summary of Recoveries and Relative Economics for a Blend of Cirnic Ore for Various Gold and Silver Recovery Process Options

Flowsheet Option	Au Rec %	Ag Rec %	Economic Ranking
Conventional whole ore cyanidation (various options)	78-81	54-58	1
Leaching of a finely ground gravity gold and sulfide concentrate to 10 µm and leaching of gravity tailings	79	59	2
Leaching of gravity gold and sulfide concentrate and gravity tailings	78	58	3
Leaching of flotation concentrate and flotation tailings	81	68	4
Leaching of a finely ground gravity gold and sulfide concentrate to 50 µm and leaching of gravity tailings	79	58	5
Heap Leach	56	40	6
Leaching of a finely ground flotation concentrate (10 µm) and flotation tailings	84	72	7
POX leach of flotation concentrate and leaching of flotation tailings	93	71	8
Leaching of flotation concentrate	65	53	9
Leaching of a finely ground flotation concentrate (10 µm)	67	58	10
POX leach of flotation concentrate	77	56	11

Conventional whole ore cyanidation was confirmed as the optimum gold and silver recovery flowsheet for the majority of Rosia Montana ores.

1.6.3 Optimisation of the Gold and Silver Recovery Flowsheet

Optimisation testwork and studies were conducted to maximise gold and silver recovery and minimise capital and operating costs with conventional cyanidation on whole ore. The following parameters were found to be most suitable for the range of ore types at Rosia Montana:

- Grind to a P_{80} of 150 µm.
- Recovery of gravity gold prior to leaching.
- Leaching in the presence of carbon (CIL) with the addition of oxygen for 15 hours.

Whole ore cyanidation testwork was conducted on the 590 individual variability samples taken from throughout the various Rosia Montana ore types to allow the prediction of gold and silver recovery and relative hardness of the samples. An analysis of the data indicates:

- the gold and silver recovery is significantly different for the majority of ore types;
- gold recovery generally increases with gold head grade;
- gold and silver recovery generally decreases with increasing sulfur head grade, and
- ore hardness is closely related to ore lithology and alteration.

Recovery algorithms were generated from the results of these tests to predict gold and silver recovery for the various ore types based on the gold, silver and sulfur head grades. These recovery algorithms were checked against the actual recoveries achieved for 29 composite samples for confirmation of the validity of the models.

The recovery algorithms were then applied to the gold, silver and sulfur grades of the ore blocks from the resource model to calculate a recovered gold and silver grade. The mine schedule was then used to provide a schedule of ore grade and recovered grade throughout the life of the mine.

Table 1.6.2 is a breakdown of the grades and recoveries for the various ore types.

Table 1.6.2
Summary Metallurgical Statistics by Pit

	Mt	Au	Ag	% S	Au Rec %	Ag Rec %
Cirnic	108.6	1.58	10.01	1.69	82.9	53.0
Cetate	43.1	1.84	7.21	2.37	81.1	47.1
Carpeni	10.7	0.98	2.14	1.64	74.0	77.2
Orlea	32.4	1.28	2.27	1.92	85.2	68.7
Jig/Igre	5.0	1.91	14.33	1.15	73.1	79.9
Total	**199.7**	**1.56**	**7.84**	**1.86**	**82.1**	**54.2**

Based on the anticipated accuracy of the sampling and testwork, it is recommended that sensitivity analysis is conducted using the cashflow model at ±2% gold recovery and ±10% silver recovery.

1.7 PROCESS DEVELOPMENT AND PLANT DESCRIPTION

The overall flowsheet, shown in Figure 1.7.1, consists of:

- gyratory crusher;
- 12 hour crushed ore stockpile;
- SAG milling to -12 mm;
- pebble crushing of SAG mill oversize product;
- ball milling to P_{80} 150 µm;
- primary gravity recovery of free gold by In Line Pressure Jigs (IPJ);
- secondary gravity recovery of free gold by an IPJ;
- intense cyanidation leaching of the gravity concentrates;
- CIL style leach and adsorption;
- continuous elution;
- electrowinning gold recovery, and
- tailings thickening prior to tailings disposal.

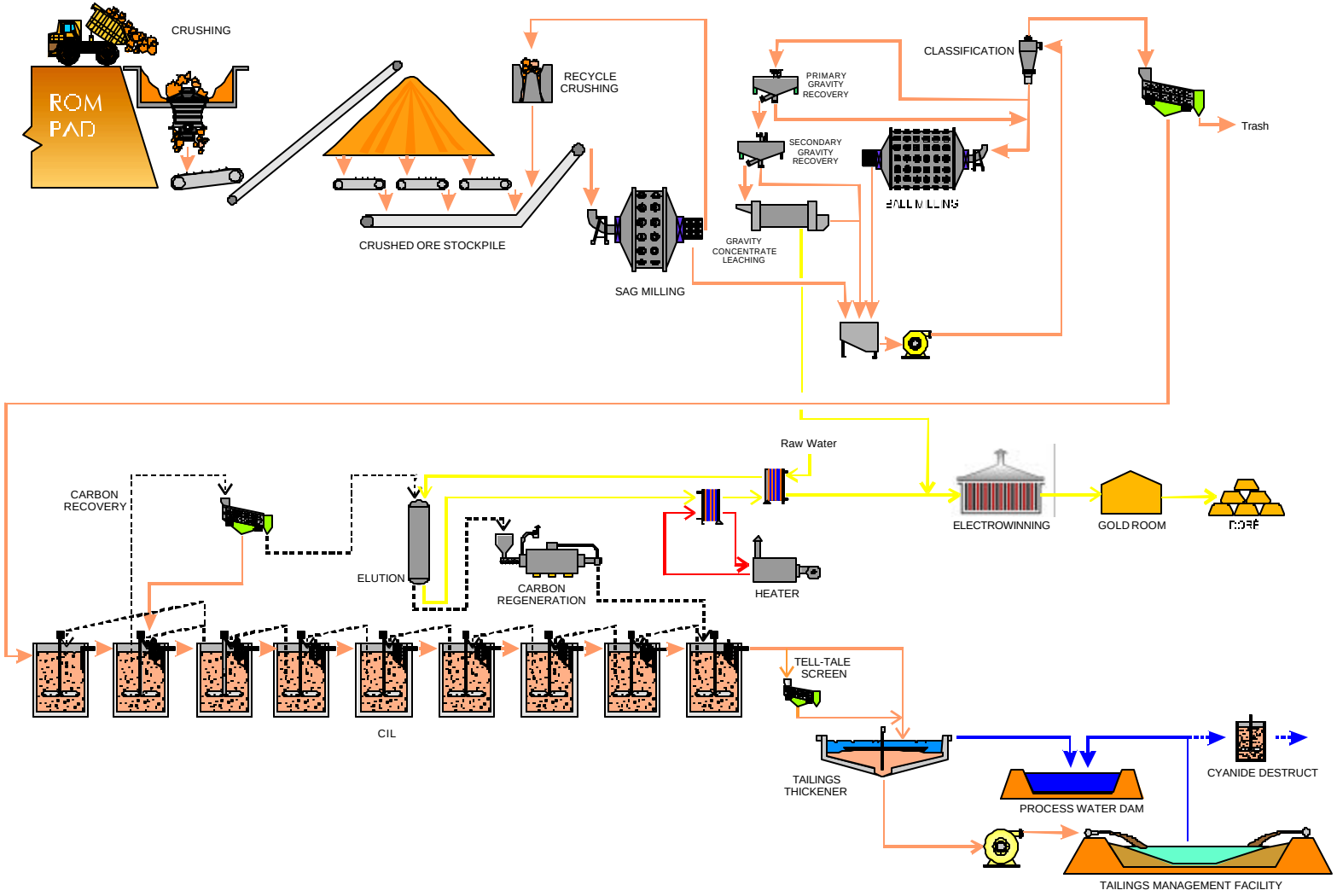
1.7.1 Design Ore Type

The process plant has been designed to process ore from the following ore zones.

- Cirnic
- Cirnicel
- Cetate
- Carpeni
- Orlea
- Jig/Igre

Figure 1.7.1

Process Flowsheet



There is significant variability in ore hardness, head grades and recoveries throughout the various ore zones. The process plant has been designed with sufficient flexibility to allow efficient processing of the various ore types.

Ore hardness and competency is affected significantly by lithology and alteration of the ore. Three categories of ore hardness have been determined based on geological interpretation and comminution testwork.

- Hard — Intensely and strongly silicified/potassic dacite.
- Medium — Moderately silicic/potassic dacite and all mixed breccia.
- Soft — Argillic altered ore, all microconglomerate and all Carpeni, Igre and Orlea.

The average head grade over the life of mine is 1.56 g/t Au and 7.84 g/t Ag. However, there are regions of ore that are significantly higher grade which impact on the plant design. The process plant has been designed to efficiently process ore with a head grade of up to 2.75 g/t Au and 22 g/t Ag.

1.7.2 Processing Rate

The philosophy used for the design of the Rosia Montana processing plant has been to maximise the throughput of the plant on all ore types as constrained by the milling circuit. An average throughput of 8 Mt/a was nominated by RMGC.

The plant throughput was calculated for the various ore types, lithologies and alterations, based on the information available at the start of the engineering phase (January 2001) and as calculated in the Comminution Options Case Study. A summary is shown in Table 1.7.1.

The final mine schedule indicates the average plant throughput for the life of mine will be approximately 1000 t/h.

Table 1.7.1
Ore Characterisation for Throughput

Ore Type	Hard	Medium	Soft
Lithology and Alteration	Intensely and strongly silicified/potassic dacite	Moderately silicic/potassic dacite	All argillic altered ore; all microconglomerate ore and all Orlea, Carpeni and Igre ore.
Plant Throughput t/h	800	940	1200

1.7.3 Crushing, Stockpile and Reclaim

A gyratory crusher has been selected capable of accepting run of mine ore direct from dump trucks. The crusher will be operating for 24 h per day, crushing to a size of approximately 120 mm on hard ore.

The crushed ore stockpile provides 12 h of live capacity and more than 3 days total capacity at the average throughput of 1000 t/h. During treatment of soft ores, live capacity will be reduced and materials handling may be more difficult than with the harder ores. Provision has been made for FEL loading of ore into the crusher from ROM stockpiles, as well as the use of a dozer on the crushed ore stockpile to push dead capacity into the feeders.

The stockpile has been designed with 3 apron feeders. Two feeders will be able to supply the maximum feedrate of 1200 t/h on soft ore.

1.7.4 Grinding and Classification

A Comminution Options Case Study was conducted to evaluate the optimum comminution flowsheet. A SAG mill, ball mill and pebble crushing circuit (SABC) was selected as the most suitable circuit for Rosia Montana. This circuit provides the highest throughput and lowest risk. On the soft ore type, the pebble crusher will not be operated in order to obtain a better balance of milling in the SAG and ball mills.

The optimum economic grind size was determined for numerous ore types based on conventional cyanidation leaching. The average optimum grind size was determined to be a P_{80} of 150 µm.

The following equipment was selected to achieve a throughput of 800 t/h on hard ore, 940 t/h on medium ore and 1200 t/h on soft ore.

- 8 MW SAG mill (design pinion power draw of 6.8 MW).
- 10 MW ball mill (design pinion power draw of 8.8 MW).
- Recycle pebble crushing of up to 25% of the new SAG mill feed.
- 500 mm hydrocyclones for classification to a final P_{80} of 150 µm.

Pilot plant testwork was conducted on 3 bulk samples to confirm the design of the comminution circuit. The pilot plant trials confirmed the design of the comminution circuit and the predicted circuit throughputs based on benchscale testwork. At the design pinion power draws of 6.8 MW and 8.8 MW for the SAG mill and ball mill respectively, there is little contingency in the design throughput. There is the potential to increase the pinion power draw

for the SAG mill and ball mills to 7.2 MW and 9.75 MW respectively, providing contingency in design power requirements.

Table 1.7.2 summarises the contingency in the mills for the Rosia Montana design based on analysis of the pilot plant data and application to the average comminution data for the 3 major ore hardness categories at Rosia Montana.

Table 1.7.2
Mill Power Contingency Based on Average Major Ore Types (%)

Ore Type (Orebody Average)	SAG	Ball
Hard	4.9	27.6
Medium	16.1	8.8
Soft	6.7	20.7

Conclusions from the assessment of contingency on the average major ore types are as follows.

- The plant will be either SAG mill or ball mill limited on different ore types.
- There is limited opportunity for the Project to exceed the plant design throughput at a grind size of P_{80} 150 µm. There is approximately 5% to 9% contingency in the design on each ore type.
- If the maximum power available in the ball mills is used, there is the potential to achieve finer grind sizes on hard and soft ore types.
- There is the potential to increase SAG mill throughput on medium ore, but at coarser than design grind size.
- There will likely be periods of operation on ore types harder than average where either plant throughput or grind size will be below design.

1.7.5 Gravity Circuit

Gravity recovery of gold using conventional laboratory techniques resulted in gold recoveries to amalgam of 10-50%, resulting in a significant increase in subsequent leach kinetics. An analysis of the results demonstrated inclusion of gravity recovery into the flowsheet allowed the total leach retention time to be significantly reduced whilst maintaining overall leach recovery.

In line pressure Jigs (IPJ) have been selected to recover free gold from the comminution circuit based on recent successful installations. Three machines will process up to 13% of the cyclone underflow. The IPJ can be expected to recover up to 10% of the feed mass which is equivalent to 45 t/h. At this rate secondary gravity treatment is needed to reduce the concentrate mass. It was considered appropriate to do this with a secondary IPJ.

Tertiary gravity concentrate treatment options included tabling and smelting or intense cyanidation leaching. The latter option was selected on the basis of improved security and the success of several recent installations throughout the world.

1.7.6 Cyanide Leach and Adsorption

Testwork and modelling of the leach circuit indicated that a full CIL circuit with no preliminary leach stages was the optimum configuration. The use of a full CIL circuit, with carbon in contact with the ground slurry at all times increased leach kinetics and leach recoveries.

The plant has been designed based on an average leach retention time of 15 hours, which was selected based on an economic analysis considering leach recovery, operating costs and capital costs. For an average throughput rate of 1000 t/h, 7 tanks of 3500 m^3 are required.

Oxygen addition was demonstrated to improve the leach kinetics and has been incorporated into the plant design.

1.7.7 Gold Recovery

A continuous elution system will treat up to 52 t/d of carbon.

Considering the large carbon movement rate and short retention times, regeneration will occur on every second strip.

Pregnant eluate will be treated by electrowinning on stainless steel cathodes, with precious metals recovered to the barring furnace via high pressure spray and/or sludging.

1.7.8 Tailings Thickening

Tailings thickening has been incorporated into the design to recover water and cyanide from the leach tailings. All available raw water and tailings decant will be used as dilution water to increase the wash efficiency of cyanide to the thickener overflow and minimise cyanide concentration in the final tailings stream.

An economic analysis was conducted comparing cyanide recovery, thickener operating and capital costs. A single stage thickener/wash circuit was selected on this basis. Approximately 60% of the free cyanide in the leach tailings is recovered in the thickener.

1.7.9 Cyanide Management

A case study "Cyanide Recovery and Destruction" (Appendix 6.21) has been undertaken to assess the results of the cyanide destruction testwork (Section 6.3.10). Key points arising from this include the following.

- CCD thickening on CIL tailings is justified on the basis of cyanide recovery and water management. The economics of this option are further improved if cyanide destruction is required on plant discharge.
- A Caro's acid facility has been provided to allow treatment of any emergency discharge from the TMF to <1 ppm, even though this is considered a very unlikely eventuality.

An SO_2/Air facility to treat the tailings slurry to achieve 50 ppm CN_{WAD} has been incorporated. This could be operated to achieve <1 ppm CN_{WAD} if necessary.

1.7.10 Reagent Storage and Distribution

Quicklime will be used for pH control in the leach circuit. Quicklime will be delivered to site in bulk containers.

Cyanide will be delivered to site in bulk Iso-tainers for on-site mixing.

Oxygen uptake testwork indicates the plant consumptions will be low for most ore types. The average requirement is 2.5 t/d based on the 10 Cirnic and Cetate metallurgical composite samples. A 4 t/d PSA facility has been selected.

A bulk acid storage tank will be used for acid storage prior to delivery to the elution circuit via dosing pumps.

Caustic soda will be delivered to site in bulk liquid form to a bulk storage tank prior to delivery to the elution circuit via dosing pumps.

1.7.11 Process Control

A central DCS system will be used for the majority of process control, drive control, data collection and start-up and shut-down sequences.

Each cyclone overflow stream will be sampled and analysed through a Particle Size Monitor.

An on-line cyanide analyser will sample and analyse cyanide concentrations in the first 4 tanks.

Data from the DCS system and other analyses will be automatically transferred to a PI data historian system.

1.7.12 Project Layout

Drawing 50458-00/G-102 illustrates the overall layout of the plant site.

1.8 INFRASTRUCTURE AND SERVICES

1.8.1 Power Supply

The estimated installed and running loads supplied from the main plant substation are 32.3 MW and 24.4 MW respectively.

The overall corrected power factor for the total plant load is 0.94 lagging, resulting in a predicted maximum demand of 25.9 MVA.

The estimated installed and running loads for the water supply facilities at the Aries River and Gura Rosiei are 4.5 MW and 2.0 MW respectively.

The loads are assumed to be uncorrected, resulting in a predicted maximum demand of 1.35 MVA.

The Project power supply is connected to the existing 110 kV dual overhead line, which links Zlatna to Preparare, at a point adjacent to the plant site.

The work on the supply system consists of:

- diversion of the 110 kV dual line around the location of the plant site and mine;
- diverting a single line in and out of the plant, and
- new HV substation at site transforming the voltage down to 10 kV.

Power supplies for the raw water pump stations are assumed to be available within 1 km of each pump station.

An outdoor switchyard is provided at the Project site to accommodate:

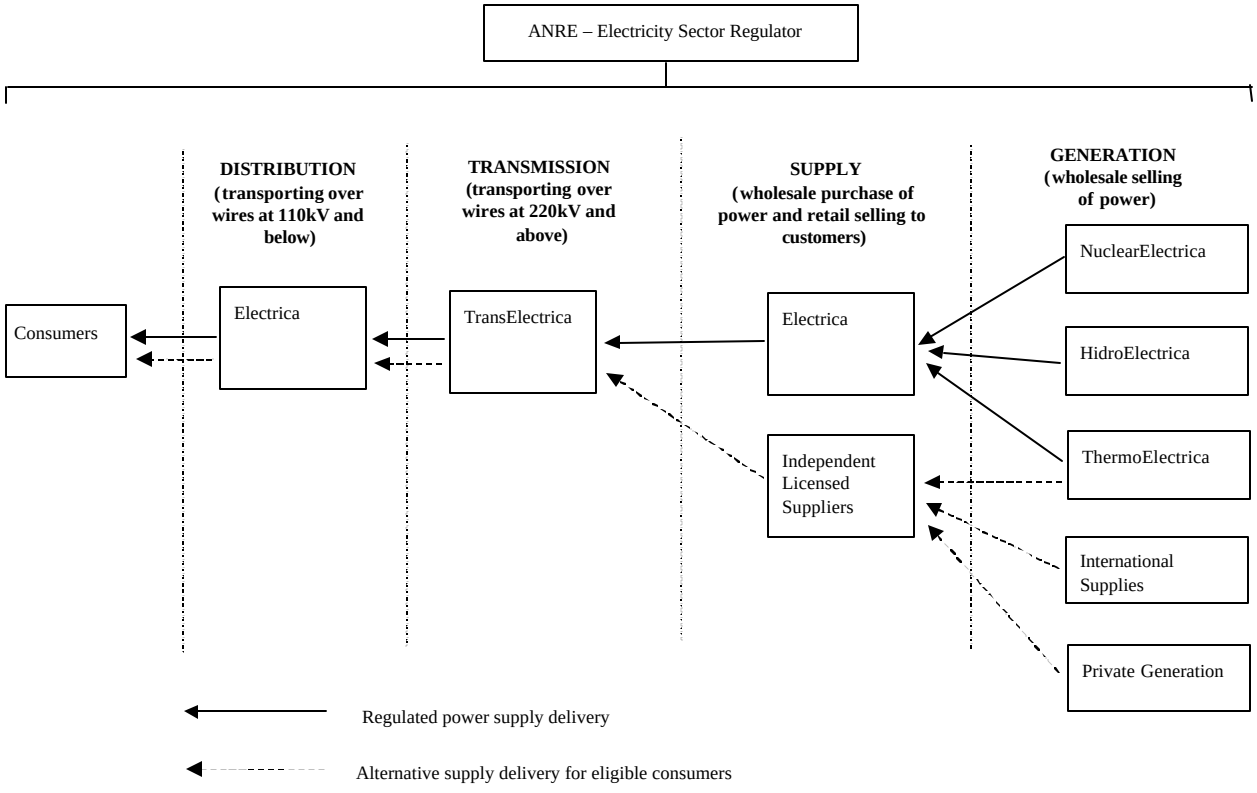
- incomer 110 kV air break isolators and circuit breakers;
- protection and metering CTs and VTs;
- 110 kV/10 kV automatic tap-charging 30 MVA transformer, with aerial insulated bushing on the HV side and 10 kV cable box, and
- power factor correction capacitors.

1.8.2 Romanian Power Sector

a) Power Sector Structure

The Romanian electricity sector is presently undergoing a gradual reform process under the direction of the government. This process is in line with the European Union directive on power sector competition and has the long-term objective of integrating the Romanian power sector with the European grid.

The following flow diagram indicates the key participants and their relationships in the power supply delivery chain:



Notes:
1. Suppliers source wholesale power from generators and sell retail power to consumers. The retail price includes components for use of the transmission wires and the distribution wires.
2. Transmission and distribution pricing is regulated. The price is the same for all Suppliers.
3. Independent suppliers can theoretically also source power from HidroElectrica and NuclearElectrica but these generators are currently fully committed to Electrica.
4. Electrica has both the supply and regulated distribution functions. Electrica will compete with independent suppliers to supply power to eligible consumers but is required to provide the distribution service to all other suppliers at a regulated price.

The Romanian Electricity and Heat Regulatory Authority (ANRE) is responsible for creating, implementing and policing the regulations for the power and heat sectors. ANRE is a public institution and is independent of the operating companies. ANRE is independently financed, primarily from licensing fees but it reports to the relevant government minister.

Its stated mission is to "create and implement unbiased and fair regulations so that the efficient, transparent and stable functioning of the electricity and heat sectors can be ensured to the benefit of all players".

As part of the reforms of the power sector consumers are progressively becoming eligible to procure power from Licensed Suppliers other than the state owned monopoly supplier (Electrica).

The Rosia Montana Project meets eligibility criteria and, as part of the power procurement process, RMGC is in the process of applying for Eligible Consumer status. ANRE has not yet accredited the Project but has indicated that no difficulties are expected with the accreditation.

The competitive electricity sector is a new initiative in Romania and at the present time no independent suppliers to Eligible Consumers are known. The Licensed Suppliers contacted in the course of collecting data for this study were typically enthusiastic about the prospect of bidding to supply power but were not experienced. The Licensed Suppliers that could supply Rosia Montana include the following.

- Electrica
  Electrica is the State-owned distribution company and the regulated supplier to all Franchise Consumers in Romania. Prior to the electricity sector reform process, Electrica managed the supply of all electricity in Romania.

- Petrom-Enron
  This is a Romanian based joint venture company between Petrom, a Romanian domestic gas company with 1999 assets of over $3 billion, and Enron, a global energy company based in USA with assets over $33 billion. Petrom supplies large quantities of gas to Thermoelectrica and is seeking to convert this to electricity under a tolling or similar arrangement.

- Hidroelectrica
  Hidroelectrica is the Romanian State-owned hydro-electric power generation company. Currently, it sells all of its power to Electrica.

- Thermoelectrica
  This is the State-owned fossil fuelled generating company, using coal, oil and gas. Thermoelectrica has significant surplus capacity but this is generally old and low efficiency power plant. It sells power to Electrica and is also able to sell to other parties.

- Nucleaelectrica
  This is the State-owned nuclear-electric generating company. Due to the strategic nature of nuclear power generation, Nucleaelectrica is bound to supply power exclusively to Electrica.

- Others
  A number of companies have licences to operate in the diversified power marketable, although only a few are yet active. These include:
  - Grivco Energy;
  - Luxton Lighting Company;
  - Romanergo;
  - Energy Consult, and
  - Eximprod Group.

b) Power Supply Capacity

The major power generators currently operating in Romania are Thermoelectrica, Nucleaelectrica and Hidroelectrica, with limited self-generation by large industrial projects. Due to the contraction in the Romanian economy since the start of economic reforms, the electricity demand in Romania has contracted by approximately 50% over the past 10 years. This has resulted in the shutting down of the older and least efficient thermal power plants.

Current (2000) sales of electricity by these generators is 37 700 GWh. The Rosia Montana power demand is approximately 211 GWh, some 0.6% of current supply.

Romania has significant transmission interconnections with Ukraine, Hungary, Moldova, Yugoslavia and Bulgaria and it is possible to import large volumes of electricity from any of these countries.

c) Supply Options

The Rosia Montana Project has the following options for sourcing of a power supply:

- Take power from Electrica as a Franchise Customer at the regulated tariff. The cost of power in this regime is estimated at $0.0278/kWh.
- Obtain accreditation as an Eligible Consumer and negotiate a supply contract from Electrica.
- Tender to the market for the most favourable supply deal with any of the Licensed Suppliers.
- Develop a new power station for the supply of electricity.

Whilst the options could be taken further during the project development and operational phases, for the purposes of the Study, RMGC has assumed accreditation as an Eligible Consumer for power supply to the Project. This would result in a unit cost of $0.0225/kWh, which has been used as the basis for operating cost estimates for the Project.

1.8.3 Road Access

As a part of the project development, 2 significant access roads will be required to be developed.

Access to the Project site will be via an all-weather, road. This road will run alongside haul roads in the pit, with an earthen berm separating the mine traffic.

An additional road is required to be built due to the inundation of the Corna Valley by the tailings management facility (TMF). The nearby Rosia Poieni copper mine has one of its major access roads running through the Corna Valley and this will need rerouting up the southern flank of the ridge running along the southeast side of the Corna Valley.

Access to the Project will also be possible for light vehicles via the existing road in the Rosia Montana valley. A metalled road links this with the mine workshop and the plant site. Access is controlled by swipe card activated boom gates.

1.8.4 Buildings

Buildings and facilities included in the capital cost estimate for the process plant and infrastructure are:

- mine workshop;
- plant workshop/warehouse, and
- administration and laboratory.

All buildings have been designed for likely snow loading conditions and incorporation of insulation into the cladding and roofing.

1.8.5 Water Management

As a means of ensuring that the Project Water Management System (PWMS) meets its specific systems objectives, the system inputs and outputs were modelled within a Project Site Water Balance (PSWB). The PSWB considers water supply, water storage, water users, water captured and water losses throughout the total PWMS. The results of the modelling indicate the robustness of the PWMS to achieve the following systems criteria.

- Maintain an overall balance of water used and stored on the facility throughout the mine life.

- Provide an assured water supply through droughts.

- For Rosia Montana and Corna valleys, identify non-contact drainage for discharge downstream of the Project.

Operation of the PWMS allows the Project to function without discharge of process effluents to the environment.

A schematic of the PWMS is provided in Figure 1.8.1.

It is concluded from the Water Management Study that:

- the PWMS can meet both the Project water demands and the environmental objectives for water resource protection;
- the PSWB establishes that the PWMS can maintain an overall balance throughout the Project life for normal and adverse conditions if allowance is made for treatment of run-off from the pits and wash dumps prior to discharge into the Rosia Montana stream;

- the PSWB also establishes that flows can be maintained in the main stream courses affected by the Project;
- an adequate supply of raw water can be maintained to meet process raw water and make-up demands without impacting other Aries River users including baseflow;
- for the latter years of operations extended wet periods stress the PWMS, and
- options for managing the TMF and tailings recycled water demands provide adequate controls for curtailing month on month increases in TMF pond volumes.

1.8.6 Water Supply

A water supply study has been undertaken, based upon abstraction from the Aries River at Cimpeni. The study reviews and analyses river flow data to provide input parameters for the engineering design of a raw water supply system for the Project.

The Aries River flows some 10 km to the north of Rosia Montana (Figure 1.8.2) collecting water from the Abrud and Cimpeni River tributaries, as well as from numerous smaller local valleys, e.g. Salistei and Stefancii. The Aries River is the most important water resource in the Apuseni mountains. Rainfall is typically about 700 mm/a and recorded flows in the river at Cimpeni are on average around 12 m^3/s, but include peak flows in excess of 500 m^3/s.

The results of the water storage modelling confirm that an abstraction point at Cimpeni on the Aries River will supply adequate raw water to meet the Rosia Montana Project water demands through the construction of a pipeline and a raw water storage facility. The assessment also establishes the following:

- Raw water storage is required for the process of between 23 000 m^3 and 69 000 m^3 depending on return period design criteria and agreed licensing basis with the authorities. The current design includes a capacity of 100 000 m^3.

- Total raw water storage is required on the TMF of up to 0.5 Mm^3.

- Raw water delivery rates depend on return period design criteria and agreed licensing basis with the authorities. A design capacity of 403 m^3/h has been set based on the 1200 t/h processing of Orlea Soft Ore with a tailings stream pulp density of 60%.

a) <u>Optimum Extraction Rates and Storage Volume</u>

The supply model also establishes that various combinations of extraction rates and storage volumes can be used to meet the demand requirements. The determination of the optimum extraction rate and storage volume will require consideration of:

- the contribution of river flows at the given abstraction point to:
  - existing licensed abstractions;
  - environmental baseflow;
- reliability of river flow data;
- costs of intake structure;
- the location options, site and cost of the raw water storage facility;
- the cost of pumping and pipeline sizes;
- pipeline construction costs, and
- the level of confidence required from the water supply system.

b) Permitting

For the purposes of permitting the following points are noted:

- Final agreement is required with the Water Authority on issues of:
  - realistic peak demands on the Aries River by existing abstractors;
  - similar protection of flows at the abstraction point as is given by RMGC to downstream abstractors in this study;
  - the contribution of downstream river flows relative to abstraction point to:
    - existing licensed abstractions, and
    - environmental baseflow.

- An abstraction rate of up to 187 m^3/h may be required.

- A raw water storage reservoir of up to 83 000 m^3 may be required.

1.8.7 Mine Infrastructure and Services

a) Fuel Storage

A fuel and lubricant storage facility and equipment-refuelling bay is located adjacent to the equipment parking area at the workshop facility. Fuel usage is expected to peak at approximately 25 000 L/d. A fuel storage facility with a capacity of 350 000 L (approximately 14 days supply of fuel when full) has been provided.

The fuel storage facility is fully bunded and lined to prevent spillage.

b) Explosives Magazine

The bulk explosives/slurry manufacturing facility is located on site. Raw materials used in the explosive manufacturing process are brought to site and stored in silos at the

manufacturing facility site until required. The explosives manufacturing facility has been provisionally sited to the south of the ROM pad and is accessible from the primary TMF haul road.

Bulk explosive usage is expected to peak at approximately 9t/d and, based on this consumption rate, the raw product storage silos at the bulk explosives manufacturing facility is designed to have a capacity of approximately 100 t or 11 days supply. The majority of raw products used in the manufacture of bulk explosives are available from within Romania.

A detonator magazine and a small mixed explosive magazine is also required for the Project. These magazines have nominal capacities of 50 t of explosives and 10 000 detonators. Whilst the mixed explosive magazine capacity is not critical, sizing of the detonator magazine at this level is considered necessary as all detonators must be imported and a reasonable buffer is prudent.

c) Radio Communication

A radio communication system provides a link with all mobile equipment, the workshop, mine office and emergency response personnel and is used for mine control, truck dispatch, issuing instruction, safety communication and to assist in control of blast guarding.

1.8.8 Housing

Permanent housing will be provided for the expatriate personnel involved with the operation of the Project. This could be addressed through rent or purchase of existing properties in the neighbouring area or larger centres such as Alba Iulia, which is approximately a 1 hour drive from the Project site. However, for the purposes of the Study, allowance has been made to provide purpose-built housing on land to be purchased by RMGC around Abrud or the Project site. This would have the benefits of integrating the personnel more closely with the local community and provide easier access to site.

Three types of houses have been used in the Study, as follows:

• General Manager	3 bedroom	185 m^2 living area	1 required
• Senior Staff	2 bedroom	140 m^2 living area	7 required
• Single Staff (shared house)	4 bedroom	185 m^2 living area	12 required

The number required has been determined by reviewing preliminary manning estimates and assuming that permanent Senior Staff (Senior Foreman and above) should receive married accommodation and that all engineers, operators, tradesmen and temporary expatriates would live in shared houses on single status. All permanent accommodation is self-catering, with running costs (power, etc.) to be at cost to the employee.

In addition to this housing, 2 off 3 bedroom guest houses and a 300 m^2 central recreational facility is provided. An allowance for small-scale sports facilities, such as gymnasium, squash and tennis courts, attached to the housing area, has been made.

1.9 TAILINGS MANAGEMENT FACILITY

1.9.1 General

The operation of the Rosia Montana mine will produce tailings at a rate of 8 Mt/a for a period of over 25 years. A TMF has been designed by Knight Piésold to provide safe and permanent storage for 250 Mt of tailings and to provide protection to the receiving environment both during operations and after mine closure. The TMF also provides a water storage facility for the Project. The embankment wall for the TMF will be constructed predominantly from mine waste rock.

1.9.2 Siting Study

A detailed siting study was undertaken that considered all available sites in the region of the mine. In that study, all aspects of the development of a tailings facility at each of the sites were compared using a weighted multiple accounts evaluation method. The method allows for appropriate weightings to be assigned to a ranking of each area of comparison in a quasi-quantitative analysis.

The sites considered for the TMF are shown on Figure 1.9.1. The siting study concluded that the highest ranked site for the TMF is Site C2 in the Corna Valley on economic and technical grounds. Although Site D1 had some attractive characteristics, RMGC considered these to be outweighed by the technical advantages of Site C2. These advantages were augmented by the identification, during the course of the study, of the need to allow for a storage capacity of up to 250 Mt of tailings.

1.9.3 Design Criteria and Parameters

a) Site Characteristics

The Corna Valley is a 5 km long valley that drains an area to the south of the Rosia Montana mine. The head of the valley is at the Rosia Montana mine at an elevation of about 1000 m. The drainage from the valley discharges into the Abrud River approximately 2 km upstream from the town of Abrud at an elevation of approximately 600 m.

The geology of the Corna Valley site is influenced by the orebody at the head of the valley and consists of residual soils and colluvium overlying cretaceous sedimentary rock throughout the site.

b) Tailings Characteristics

The ore that will be mined from the Rosia Montana mine has been classified into 3 types, being hard, medium and soft ore. Knight Piésold carried out a series of laboratory tests to determine the physical characteristics of the tailings and the densities and water yields that can be expected from each ore type. The results of these tests were used in the design.

The tailings will contain approximately 50 ppm CN_{WAD} at the point of discharge into the TMF. Other experience and specific testwork supervised by Minproc indicates that some of this cyanide will further volatilise and/or break down almost immediately on discharge. The tailings will contain about 4% sulfide minerals and will have a net acid producing potential. Under current European Union directives, the tailings are classified as "reactive – hazardous". The design of the TMF must be appropriate to respond to this classification and protect the receiving environment accordingly.

c) Site Investigation

A site investigation was carried out in the Corna valley to determine the foundation conditions and the availability and characteristics of potential construction materials. The site investigation comprised surficial mapping, aerial photo interpretation, excavation of test pits, drilling of geotechnical bore holes with permeability testing and sampling and laboratory testing of foundation soils, rock and potential construction materials. The results thereof are summarised as follows.

- The Corna Valley basin comprises residual soil and colluvium overlying sequences of sedimentary rock including interbedded shales and sandstones.
- The bedrock is relatively low strength but does not have a significant influence on the stability of the TMF embankment.
- The valley basin is quite impermeable with permeabilities in the overburden soils ranging from 10^{-7} m/s to 10^{-8} m/s and in the sedimentary bedrock ranging from 10^{-9} m/s beneath the tailings basin to 10^{-7} m/s beneath the embankment.
- Elevated groundwater in the valley ridges will provide a hydraulic barrier to seepage through the ridges.
- Minor deposits of alluvium that have high permeability were encountered in the valley bottom.

- The waste rock from the mining of the Rosia Montana deposit varies from extremely weathered non-durable breccias to more durable dacites.

- The overburden material is acceptable as a fine grained construction material for impermeable fills.

- An outcrop of andesitic agglomerate on the ridge to the north west of the TMF is suitable for quarrying and processing to produce drainage gravel and filter sands.

1.9.4 Design of Tailings Management Facility

The embankment location is at a narrowing of the Corna Valley approximately 2 km south of the plant site (Figure 1.9.2). A general arrangement of the final stage of the TMF is shown in Figure 1.9.3.

A filling curve for the TMF is shown on Figure 1.9.4. Stage 1 of the TMF will be constructed to an elevation of 730 m and will provide storage for the first 15 months of operations. This stage will be constructed to a minimum crest elevation of 708 m at start-up and construction will be completed during the first 15 months of operation. The initial rate of rise of the tailings deposit is 57 m in the first year, reducing to about 2 m in the final year. The addition of the volume required to store process water, run-off from extreme storm events and freeboard for wave protection to the tailings deposit volume at each stage during operations determines the elevation of each stage of the facility.

A cross-section of the main embankment is shown on Figure 1.9.5. The dam is conservatively designed to withstand higher hydraulic loading than the extensive embankment drainage and basin underdrainage will allow to develop. The embankment section uses the modified centreline method of construction. This method provides the intrinsic stability of the conventional centreline method while benefiting from some of the economies of the upstream method. The embankment is designed to be constructed in 19 stages over the operating life of the mine. The first stage will be a dam with a maximum height of approximately 70 m. The final height of the embankment will be approximately 180 m.

The embankment is designed to be constructed predominantly from mine waste rock. Due to the weathered nature and high fines content of the mine waste, it is necessary to provide a chimney drain in the embankment to the full height of the section. The material that will be used will be a quarried, crushed and processed gravelly sand. The design requirement is that a functional drain remains after displacements that may result from the occurrence of the maximum design earthquake. The thickness required to do this is estimated to be 2 m.

Drains will also be installed at the upstream toe of the embankment to provide control points for hydraulic head at these locations and will maintain a drained embankment, especially in the downstream shell.

The tailings basin will be developed in 5 stages over the operating life of the mine. The site investigations carried out by Knight Piésold for the TMF and the site hydrogeology indicate that both the overburden and underlying cretaceous sediments are very impermeable. This precludes the need for a formal liner system in the basin. The basin preparation will comprise the stripping and shaping of the basin, discing and tilling of the top 300 mm of overburden, moisture conditioning and compaction to provide a continuous low permeability layer. Where 300 mm of overburden does not exist, e.g. over rock outcrop, material will be imported to provide the minimum 300 mm compacted layer. Testing of the overburden soil has demonstrated that it is prone to shrinkage and cracking would be expected if it desiccates. A 300 mm layer of waste rock from mine development will be placed over the compacted soil layer immediately after construction to protect it from desiccation and erosion during tailings deposition. The more durable mixed breccia and dacite will be used for this purpose. In addition to protecting the compacted soil layer from desiccation, the waste rock layer will provide a degree of underdrainage for the tailings deposit.

A network of tailings underdrains will be installed in the waste rock layer over the compacted soil layer, throughout the basin. These drains will control the hydraulic head on the basin foundation and will provide drainage paths for the consolidation of the tailings.

The groundwater drains and tailings underdrains will discharge by gravity through concrete encased pipes, founded on bedrock underneath the embankment. The underdrainage and the embankment drainage will discharge directly into the Drainage Collection Pond (DCP) located at the final downstream toe of the embankment. The groundwater flow will drain separately and, depending on the water quality, will be either discharged to the natural drainage downstream of the TMF or discharged into the DCP. Water in the DCP will be pumped over the left abutment of the embankment into the tailings basin.

The water balance analysis of the facility indicates that the TMF will be in water deficit under most climatic conditions, as long as run-off from the pits and waste dumps is managed. The facility will, therefore, not need to discharge water to the environment except potentially after the occurrence of an extreme storm event to provide storage capacity for ongoing operations. At all times, there will be adequate storage in the TMF to contain the run-off from a probable maximum precipitation event. In the event of an extreme storm, the excess water will be either stored in the TMF for future use in the process or treated to acceptable standards and released. If the storm water is retained for future use then the construction schedule for

embankment and basin staging would be brought forward to provide additional storm storage as soon as possible.

Provision has been made within the process plant area for treatment of any release from the TMF using Caro's acid. This facility can be relocated to the process plant should it become necessary to treat the tailings prior to discharge to the TMF.

1.10 PROJECT OPERATIONS

A plan has been established to be undertaken in parallel with construction to implement programmes and procedures for the efficient operation of the Project. These include the following.

- Occupational Health and Safety
- Training
- Standard Operating Procedures
- Emergency Procedures
- Start-up Procedures
- Maintenance Planning
- Information Systems
- Accounting Procedures

The Study has determined the manning levels required for each operational area of the Project. The operation will comprise 4 divisions for management control. Each Divisional Manager will report to the General Manager as shown in Figure 1.10.1. The divisions will comprise:

- Mining (Figure 1.10.2);
- Process Plant (Figure 1.10.3);
- Administration (Figure 1.10.4), and
- Accounting (Figure 1.10.4).

The peak operational manpower is estimated as 494. Allowances for vacation, sickness, training, absenteeism, turnover and the continuous operating regime of the Project are accounted for in this manpower complement.

Figure 1.10.1
Overall Management Structure

***** ***Denotes Expatriates***

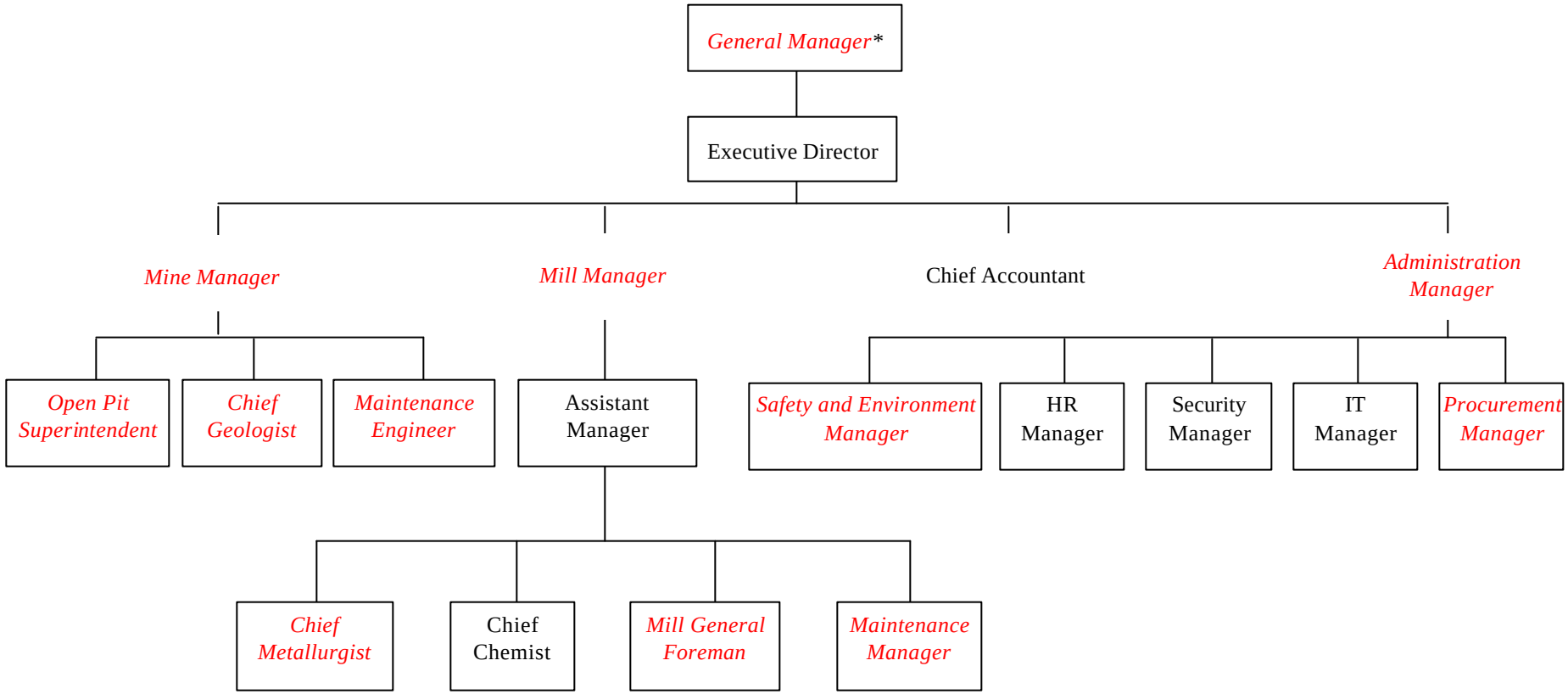


Figure 1.10.2

Mine Management Structure

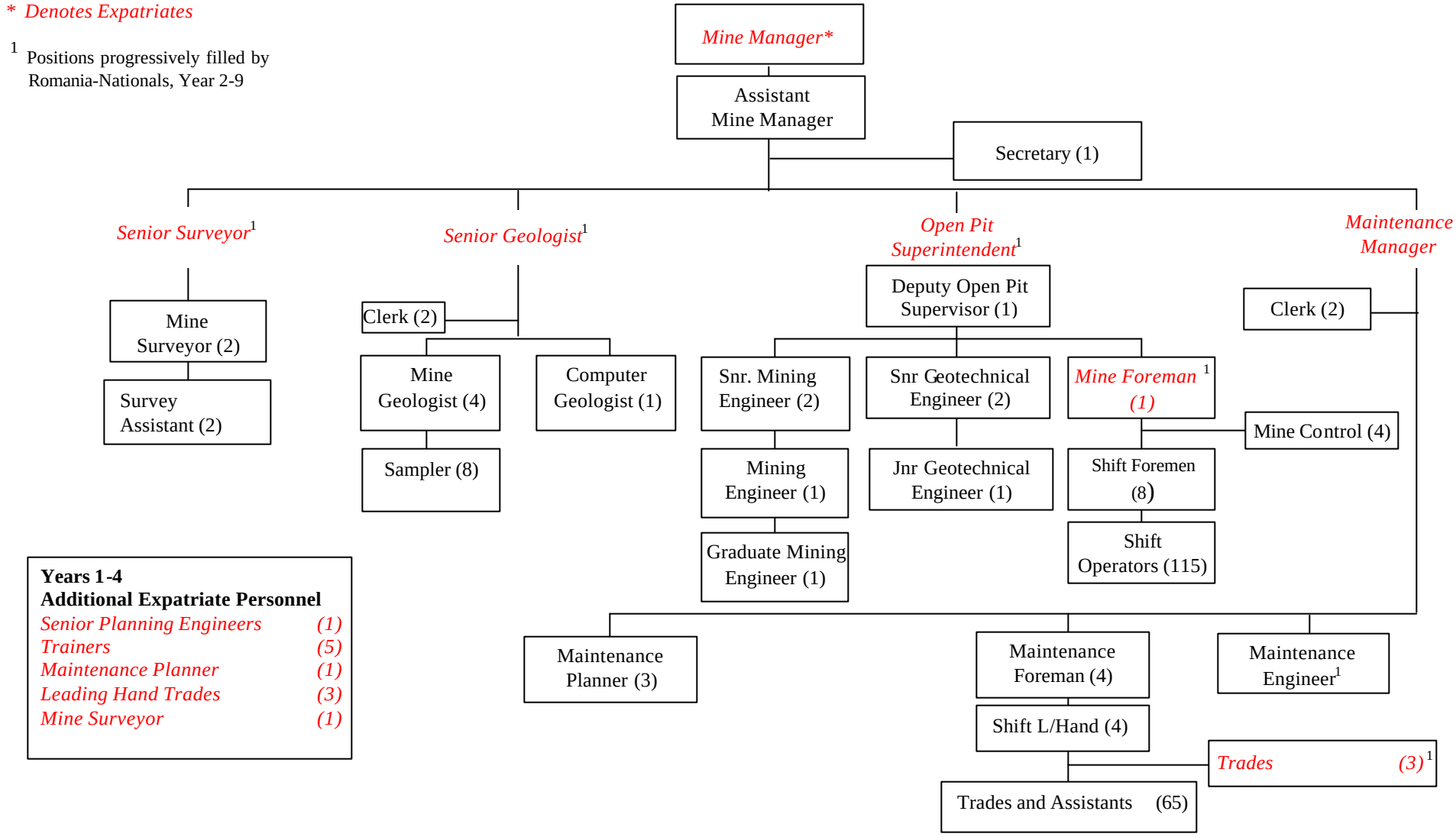


Figure 1.10.3

Mill Management Structure

* *Denotes Expatriates*

[1] After Year 4, position redundant.

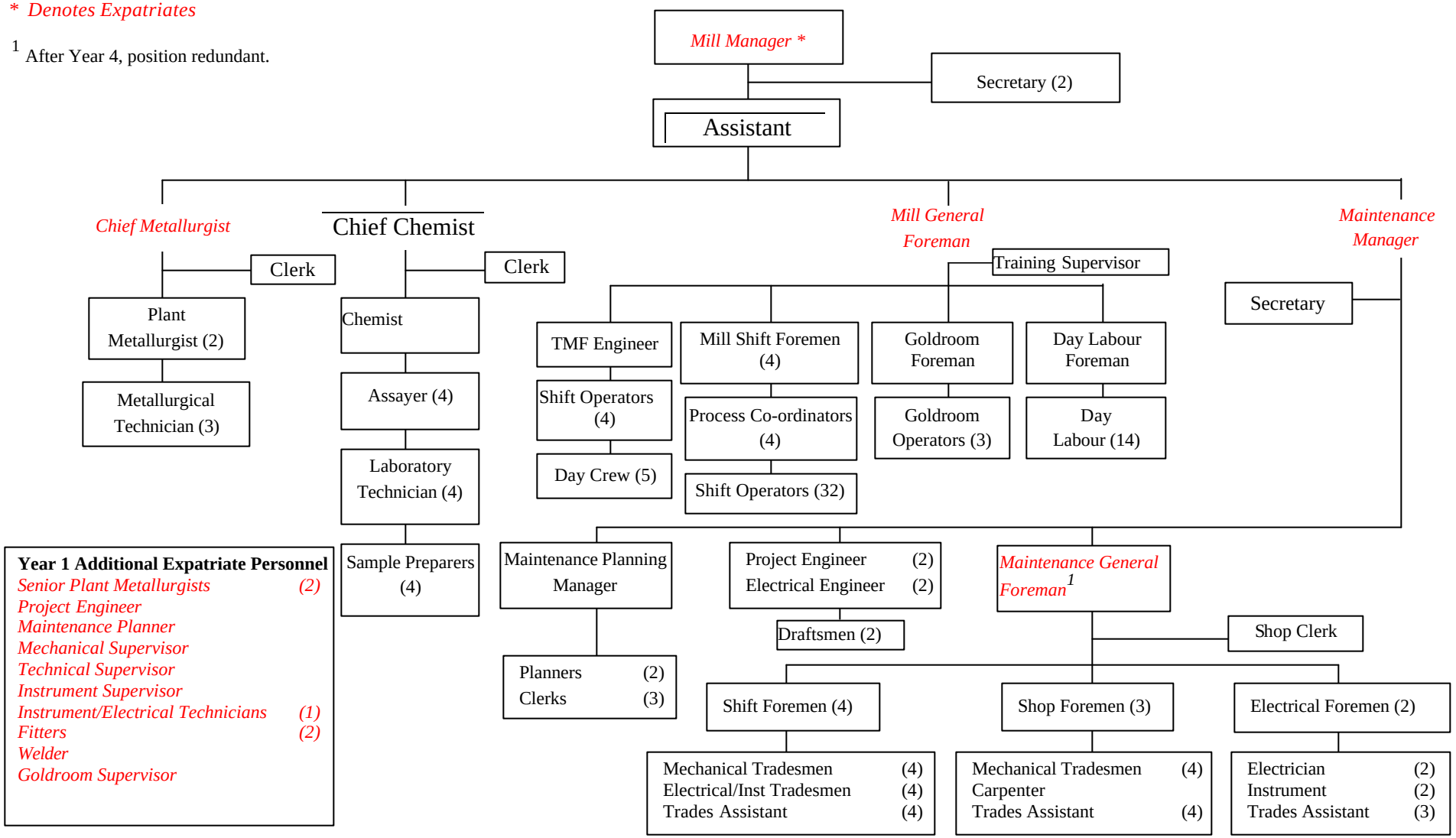
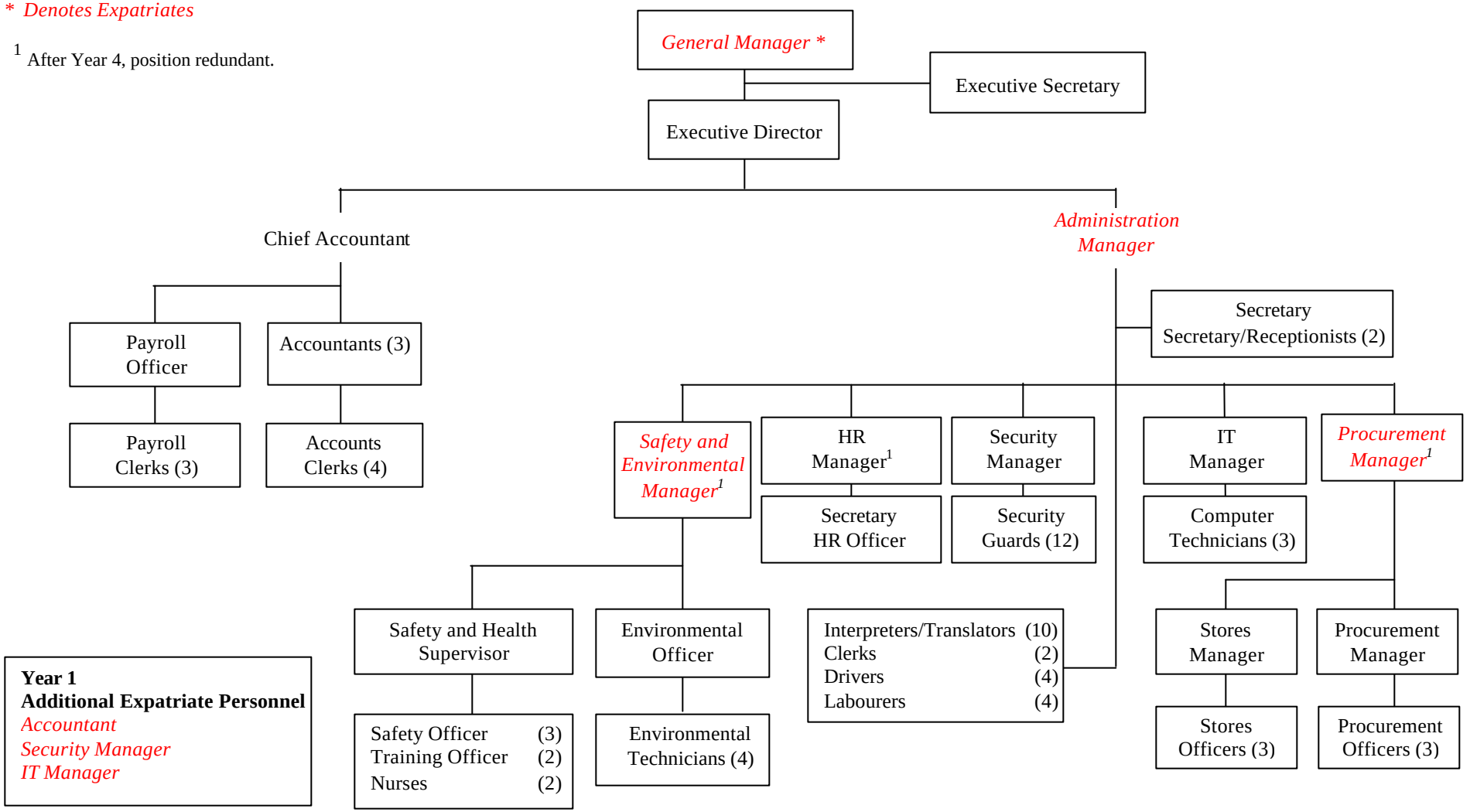


Figure 1.10.4

Administration Management



1.10.1 Recruitment Philosophy

Recruitment and manning philosophies have been produced jointly by RMGC, RSG and Minproc, with assistance from a Canadian Mining HR consultant, Clive Sanders. The strategy followed has taken cognisance that education levels in Romania are generally very high and that there is a strong history of mining in the local area in particular, and in Romania generally. However, the scale of mining is large by world standards and the technology used is state-of-the-art by world standards and generally unknown in Romania. In addition, there is a critical need to ensure an efficient ramp-up to high production levels and to ensure safe and environmentally responsible practices.

The philosophy selected is to utilise a relatively large expatriate crew for an initial 1 year period, including key maintenance and operating personnel. The operation would then continue with a reduced, but still significant, expatriate presence which would be further reduced after 5 years.

The numbers of expatriate personnel are summarised in Table 1.10.1.

Table 1.10.1
Expatriate Personnel

Years	Mine	Plant	Administration	Total
1-2	28	17	7	52
3-5	7-12	5	4	16-30
6 onwards	2	4	2	8

The salary levels for Romanian personnel have been nominated to ensure a high calibre workforce can be recruited and retained.

1.10.2 Availability of Personnel

The Romanian mining industry has reduced significantly in terms of both personnel employed and in numbers of operations since the 1980s. This has meant that there is potentially a large pool of skilled personnel available from surface and underground mines and mineral processing plants for recruitment into the Project.

It is RMGC's intention, therefore, to maximise the employment of Romanian personnel, with special preference for people residing close to the Project, and only to use expatriates in the critical areas of the operation where Romanian skills are not available. All key management positions will need to be taken up by industry professionals who have the appropriate, and demonstrated, experience and track record to carry out the particular job functions.

RMGC is well aware of the importance of establishing a well trained workforce. Hence, training will form a major portion of management's activities in the preproduction phase, and this aspect has been costed into the Project.

1.10.3 Employment Contracts

Employment relationships are regulated mainly by the Labour Code. The Labour Code and related legislation specifically regulate issues such as:

- standard working hours;
- work safety;
- rights and obligations of employees and employers;
- terms and conditions under which a binding agreement can be concluded, and
- amendment and termination of employment agreements.

Employment relationships are based on written individual employment agreements concluded between employees and employers. The employment agreements, as well as any amendments thereto and their termination, are to be registered with the governmental labour agency.

Employers with over 21 employees have to negotiate collective employment agreements with representatives of the employees (whether unionised or not), although the negotiation can be finalised without the conclusion of a collective employment agreement. Even if a company does not have a collective employment agreement of its own, the collective employment agreement at that industry level (i.e. for the mining industry) and the collective employment agreement at the national level are to be observed.

Collective employment agreements at any level (i.e. company level, industry level, national level), generally include provisions regarding: rights and obligations of employees, of the employer and of the unions (if any), conclusion, amendment and termination of individual employment agreements, conditions of work and work safety, working hours, holidays, salary rights, training, work discipline, etc.

Employees of a company can either be unionised or not. If they choose to be unionised, they can either set up a union (with a minimum of 15 members) or they can become members of an existing union.

During the Study, RMGC initiated a study of appropriate job grades, salary ranges and conditions for all expatriate and national employees. These reflect the desire to attract and maintain a high quality workforce.

1.11 ENVIRONMENTAL IMPACT ASSESSMENT

1.11.1 Background and Regulatory/Environmental Setting

Under the terms of Romanian legislation, RMGC is required to undertake an Environmental Impact Assessment (EIA) of the Project. Completion of an EIA provides the basis for grant of an Environmental Agreement for the Project to proceed. Knight Piésold has undertaken environmental baseline studies and an EIA of the Project as part of the Study.

Romania maintains an environmental regulatory regime and standards, which are comprehensive, covering all significant environmental media and issues. Further, these are generally fully in line with similar requirements set down under EU legislation (e.g. in regard to water and air quality, noise, vibration, etc). Due consideration was also given in the study to impending developments in Romanian legislation.

The Project is located in Alba County, 85 km north-northeast of Deva in west-central Romania within the Rosia Montana Borough. The district has been the subject of industrial scale mining operations since Roman times and this tradition carries on to the present time with small-scale open pit mining, supported by Government subsidy.

The site is located within the Apuseni Mountains and is hilly in character. Climate is continental temperate with about 700 mm of precipitation each year and snowfall in winter months. The region has a moderate level of seismicity.

The mountain climate promotes relatively stable hydrological conditions with permanent stream flow. However, streams are generally significantly polluted as a result of water draining unchecked from mine workings and waste dumps, as well as discharges from local communities, farms and industrial enterprises. This is likely to have been developing from the time that mining commenced some 2000 years ago to the peak of activity in the late 19th Century. In regard to groundwater, there are no significant aquifers but localised springs provide acceptable potable supplies for villages.

The land is fully utilised for agriculture (mainly pasture), forestry and housing. Employment in the area is dominated by the mining industry.

The fauna of the area is limited due to human disturbance and the only land reservations apply to geological outcrops. The district has a rich history, based on extraction of mineral resources. The principal archaeological interest lies in remains of mining and infrastructure from the Roman era.

In regard to design of the Project, the important factors for EIA are as follows.

- Land take for project construction and creation of open pits and waste management facilities.
- Management of process wastes and mining waste rock.
- Water management.
- Project closure:
  - removal of process plant and roads with revegetation;
  - capping and revegetation of the TMF and waste rock dump areas, and
  - retention of mined areas as open pits with stable faces and flooded floors (to adit drainage level).

The following environmental factors are key to assessing the impact of the Project.

- Well developed system of rivers and streams, which are already polluted.
- Potential for acid rock generation (ARD) caused by exposure of sulfide containing materials to the atmosphere.
- Presence of communities within, or close to, the area of land take.
- Introduction of employment opportunity to an economically depressed area.
- Presence of archaeologically interesting sites.

1.11.2 Environmental Impact Assessment

The EIA addresses construction, operation and closure of the Project and covers all identified significant environmental issues. In order to identify the latter, an *environmental scoping* exercise was carried out in consultation with the Romanian authorities to reach agreement on the coverage of the study and the assessment techniques to be employed. The following environmental issues provide the focus for the EIA study.

- Water resources and quality
- Air quality
- Soils and land use
- Flora and fauna
- Socio-economic issues
- Human amenity
- Archaeology
- Landscape and Visual Impact

For each significant issue, the study provides:

- characterisation of environmental baseline conditions;
- identification of potential environmental impacts;
- identification/design of an impact mitigation strategy, and
- assessment of the mitigated impact.

a) Water

Surface water quality is considered by the Romanian authorities to be by far the most significant environmental issue. The existing surface water network is heavily polluted, with a large contribution to this load being derived from discharges from the existing Rosia Montana mine site and waste dumps. Implementation of the Project captures much of the Rosia Montana mine polluted run-off and seepage prior to discharge, creating a significant positive (beneficial) impact downstream of the site.

In regard to groundwater, the strata are generally of low permeability and any impacts on quality and flows are forecast to be insignificant.

An important issue for water management in the Project is potential for pollution arising from two main sources, i.e. discharges of waste products and accidental spillage. Design of the Project was undertaken to ensure that there are no unprogrammed discharges of untreated effluent to the environment and potential for non-programmed discharge (e.g. seepage) is minimised by ground treatment and installation of drainage and recirculation systems. Spillage is controlled by confinement to the immediate area and mitigation is accomplished via implementation of an Environmental Management Plan (EMP), as described below.

The primary water supply source for the Project is the Aries River that flows to the north of the site. As part of the baseline and environmental impact studies, an investigation into the hydrological conditions of the river catchment and existing abstractions was made. Data indicate that the Aries River provides a suitable source of water under all forecast flow conditions with site storage required against possible shortfalls in prolonged droughts. These forecasts assume the maintenance of water supplies to existing users, including the environmental baseflow required to sustain aquatic life.

b) Air Quality

Considering the nature of the Project and the type of ore processing, significant potential impacts are limited to generation of fugitive dust from truck movements, blasting, excavation, etc. Industry standard mitigation via dust avoidance and suppression minimises impacts on adjacent communities. In addition, the Relocation Action Plan

(RAP) enables people potentially most vulnerable to nuisance dust to be relocated to maintain a project buffer zone.

c) Soils and Land Use

Take of land for project construction significantly impacts the area. Mitigation against this involves adopting a design to minimise site footprint and also adoption of a preliminary closure plan which aims to bring the site area back into an after-use as early as possible.

d) Flora and Fauna

Terrestrial habitats have been heavily influenced by human activity and aquatic habitats are affected by pollution. As a consequence, fauna and flora interest is low from a conservation standpoint. The main impacts relate to potential for water pollution and land take. Therefore the forecast positive impact on water quality creates potential for a similar improvement in aquatic habitat over time. Land take impacts on terrestrial habitats during the operational phase but rehabilitation creates opportunity to increase the nature conservation value of the site.

e) Socio-economic Issues

Impact on the socio-economics of the area is dominated by the employment opportunity created as well as the significant inward investment. This is a mining region with an existing pool of skills and negative impacts are forecast to be limited to pressure on services and community infrastructure, particularly during the construction phase.

f) Human Amenity

Direct impacts on quality of life for local residents include noise, ground vibration (from blasting), increase in road traffic and cutting of access to (for example) agricultural land holdings, which may be remote from dwellings. Much of this direct impact is mitigated via implementation of the RAP to create a project buffer. Thus, with implementation of standard mitigation procedures for noise, dust and vibration, operational impacts may be minimised. In any case, it is stressed that this is a mining community and such impacts are likely to be regarded as an acceptable disadvantage associated with a net benefit.

In regard to site traffic and community access, creation of a new site access road allows heavy traffic to by-pass local communities. Severed local road links are re-instated by road diversions.

g) Archaeology

The significance of the area in terms of archaeological interest is well known and RMGC has from the outset of project definition worked with the Romanian authorities to collect data and establish procedures for appropriate conservation prior to and during construction of the Project. Land take has a significant impact on archaeological remains, which is mitigated by the long-term programme of investigation and recording. Development provides opportunity for investment in appropriate conservation of historic remains, including Roman mine workings and more recent buildings, which underpin the historic and cultural identity of the community.

h) Landscape and Visual Impact

The Rosia Montana and Corna valleys already show the effects of mining and the Project creates a forecast minor impact on the landscape character.

1.11.3 Environmental Management

The Project EIA identifies environmental impacts associated with development of the Project and this information provides the basis for an outline EMP. This outline plan covers the following.

- Continued baseline condition establishment to provide the basis for judging environmental impact.
- Register of emissions and discharges.
- Definition of environmental standards and quality objectives, primarily set by the Romanian authorities.
- Definition of control systems for limiting impacts and ensuring compliance with standards.
- Specification of an environmental monitoring programme to confirm and demonstrate the efficiency of control measures.
- Development of a preliminary closure plan which will be refined through the Project with further testing, trialling and consultation in order to prepare a final closure plan for approval by the authorities.

Whilst there is no specific, all-encompassing budget for environmental work, the following amounts have been allowed during the life of the Project:

- Mining: A varying amount estimated as a % of the ancillary vehicle fleet. This amounts to $140 000/a on average and addresses the rehabilitation of the waste dumps.

- G&A: An environmental team consisting of an Environmental Officer and 4 Technicians led by the Safety & Environmental Manager. This team has a budget of $160 000/a, in addition to labour costs of $101 000/a.

The major environmental costs are incurred at the end of the Project and largely entail the closure costs for the TMF. These have been estimated by Knight Piésold as $19.53 M and are included in the capital cost schedule for the TMF. Closure costs for the plant and infrastructure areas are assumed to be covered by the second-hand value of the plant equipment and other assets. An allowance of $150 000/a has been made for 5 years after mining has been completed to allow for lime dosing of water discharges from the site, in case of ARD effects.

An environmental bond is paid by the Project each year, the value of which is calculated as 1.5% of the annual operating costs. This amounts to $16.2 M over the life of the Project. It has been assumed to be repaid at the end of the Project.

Over the Life of Mine, these costs amount to:

	$ M
Mining	3.5
TMF	19.5
G&A	6.5
Lime Dosing	0.8
Total	**30.3**

1.12 COMMUNITY DEVELOPMENT AND RESETTLEMENT

1.12.1 Introduction

The development of the Project will profoundly influence the future growth and character of this region of Romania, the Rosia Montana Comuna and the communities located within the Rosia Montana and Corna valleys. These communities have been associated with mining for hundreds of years, and are adjacent to an active, but uneconomic, (State) mining operation. The proposed 8 Mt/a Project is some 20 times larger than the current operation. In the short term, the Project will require the resettlement and relocation of these communities and the associated houses, social facilities, other structures and farmland. In the long term, the Project will offer an opportunity to the community to develop strategies for an economic livelihood that is more diverse than single sector mining activity, or subsistence farming. In order to plan for these changes, in a positive way, RMGC initiated a Resettlement Action Plan (RAP) prepared by Planning Alliance (PA).

The RAP conforms to the existing World Bank Operational Directive 4.30 on Involuntary Resettlement, as well as to Romanian legal requirements. Currently, there is no European Union (EU) legislation concerned with involuntary resettlement. A review and discussion with the affected communities, of the principles and process for resettlement and relocation occurred during the period February-April 2001, and is continuing after the submission of this report.

1.12.2 Resettlement Action Plan Objectives

A RAP is conceived and executed as a development programme, with the following objectives:

- Involuntary resettlement should be minimised where feasible, exploring all viable alternative project designs.
- Community participation in planning and implementing resettlement should be encouraged.
- Resettlers should be integrated socially and economically into host communities so that adverse impacts on host communities are minimised.
- Land, housing, infrastructure and other compensation should be provided to the affected population, who may have usufruct or customary rights to the land or other resources taken for the project. The absence of legal title to land should not be a bar to compensation.

Where displacement is unavoidable, resettlers should be provided sufficient investment resources and opportunities to share in project benefits. Displaced persons should be compensated for their losses at full replacement cost prior to the actual move and assisted in their efforts to improve their former living standards, income earning capacity, and production levels, or at least to restore them. Particular attention should be paid to the needs of the poorest groups to be resettled.

In addition to satisfying these objectives, which focus on the affected communities, the RAP has to ultimately address the needs of RMGC such that construction and mining activities can take place according to schedule and the relocation and/or resettlement process is affordable in terms of the costs RMGC can carry so that it remains viable and attractive to international investors.

1.12.3 The Resettlement Action Plan Area

At the regional level, the area of influence of the Project, and of the RAP, comprises Alba County in west central Romania, in the region of Transylvania. Within the County, the Comuna or borough, of Rosia Montana and the adjacent municipality of Abrud, or Orasul Abrud, are directly affected by the Project infrastructure.

The Rosia Montana Comuna is 42 km^2, and consists of 16 localities, or villages/hamlets, with a combined population of approximately 4146 people, according to the 1992 Census. The largest locality in the Comuna is Rosia Montana, which consists of 1556 persons. Unless otherwise indicated, "Rosia Montana" refers to the locality, and not the Comuna.

The affected areas encompass the localities of Rosia Montana (partial), Tarina (partial), Corna and Bunta in Rosia Montana Comuna, and Salistei (partial) and Gura Cornii in Orasul Abrud. These areas include:

- 2150 persons (estimated from average household population);
- 877 households, including 138 in 12 apartment buildings, and
- 39 other institutional buildings.

The total affected area, which includes all mining operations, and buffer areas, is 1600 ha. Within this are the residential properties, other private properties (church, commercial) institutional and public areas, private and public (Comuna) farming, grazing land and forests, and State land (forests and industrial). All such landowners will be addressed in the RAP. The area of the actual mining works is 722 ha which is 17% of the area of Rosia Montana Comuna.

1.12.4 Socio-economic Context

According to the 1992 Census, mining and processing is the predominant employment sector in Rosia Montana (63% of the working age population), decreasing to 50% in Corna and Bunta where there is more of a reliance on agriculture. It is estimated that in 1992 in the Comuna, 30% were unemployed, or employed in the informal sector, without receiving benefits, pension, etc. or were choosing not to work; the unemployment rate in Rosia Montana locality was 37%. The Minvest restructuring programme has affected the existing operation at Rosia Montana. The Government of Romania provides an annual subsidy of $1.4 M to Minvest in order to maintain the Rosia Montana operation. Minvest and government representatives announced in March 2001 that subsidies would be reduced by 20% annually so that in five years the mine will have to operate without subsidisation. In 1990, there were 1500 employees; as of September 2000, the number of employees had been reduced to 797. As a result of the workforce reductions in the mining sector, and general economic conditions, the population in the affected communities and the Comuna as a whole has decreased in the 8 years from 1992 to 2000.

1.12.5 Legislative Context

The new democratic governments from 1990 to the recent election in 2000, have implemented a series of policy reforms designed to facilitate Romania's transition to a market-based economy, including currency devaluation, privatisation and liberalisation of both trade and prices. During the 1990-2000 period slow rate of privatisation and restructuring and the continuing macroeconomic instability was a cause of concern for investors. The newly elected government (November 2000) of Illiescu and the PSDR are firm supporters of political and economic reform geared towards European Union integration.

The government supports the mining sector by providing incentives for exploration as described in the Mining Law 61 of 16 June 1998. Under the Mining Law, exploration and exploitation licenses confer property-related rights, distinct and independent from the ownership of the land on which they are located. Access to the lands required to conduct mining activities can be achieved in various ways including sale-purchase, lands exchange (together with moving the affected owner and the reconstruction of the buildings on the new granted land), land rental, or expropriation for public interest, in accordance with the law. The Expropriation Law No. 33/1994 provides the legal framework for expropriation of the right of private ownership and for establishing compensation, for works that serve the cause of public interest. If expropriation proceeds, compensation must be paid to the owners of the expropriated works, and can be contested.

Other legislation governing new mining developments relates to planning authority. The General Urbanism Regulation of Decision No. 525/1996 defines the urbanism plan (Plan Urbanistic General) (PUG) and regulations which Local Councils are required to prepare and update annually and which constitute the technical and legal basis for any modifications to the territory. The plans identify the long-term socio-economic development objectives and establish the location and growth of residential areas, industrial areas, agricultural areas and the relationships between these and the public facilities, utilities, transportation routes and other territories. The PUG incorporates and authorises new public utility projects such as mining. The PUG for Rosia Montana Comuna was completed in October 2000 and approved by all government ministries, in December 2000. Final approval from the local Rosia Montana Council occurred on 27 March 2001. The PUG identifies and endorses the Project as an integral part of Rosia Montana Comuna. The Abrud PUG will be amended to include the proposed Tailings Management Facility in Corna and Gura Cornii.

The main environmental legislation is the Law on Environmental Protection No. 137/1995. This law and associated legislation are in a constant process of modification and improvement to bring them in line with the standards of the EU environmental legislation. The preparation of an EIA and Environmental Audit (of existing facilities) are central to the permitting process for mining developments under both Romanian Environmental Law and the EU Environmental Legislation. The EIA for the Project is presently being completed. The Law also includes sections on the protection of human settlements, including historical and cultural monuments. Urban and territorial planning are subject to this law, and therefore the plans for the new resettlement site will undergo an Environmental Impact Assessment procedure, in order to obtain an Environmental Approval.

1.12.6 Key Project Issues and Impacts

The future of Rosia Montana Comuna, in all aspects, is tied to the management of the Project. The impacts of the Project on the community can be assessed at this stage, but the options for the initial resettlement, and longer-term community development will continue to be evaluated and amended in parallel with changes to the mine plan, throughout the life of the Project.

a) Social and Cultural

There has been some difficulty in obtaining "community" opinions on the future of Rosia Montana with respect to the Project, and to development and resettlement. This is because people are not accustomed to speaking as a community, but prefer to discuss such issues on a household basis. Comments have been received through site visits to the Targu-Jui coal mining resettlement project, a series of public workshops, written comments, and a door-to-door survey. Social issues concern almost exclusively the

resettlement and relocation of the community and not the development of the Project per se.

The main concerns with respect to the Project are based on experience of State sponsored "mega projects" which have failed or never been completed, and of rapid change, or even reversal, of other development policies or legislation, again implemented by the State in the past. Some 86% agree with the Project and that without the Project, Rosia Montana will be "sad" or will disappear altogether. The anxiety about the Project development and operation should be recognised and addressed by RMGC at all steps of Project implementation.

The main issues for the resettlement and relocation of the community concern the loss of the sense and history of what was Rosia Montana. People look forward to improved services in the resettlement site, such as better roads which will end their sense of isolation, but the location of the new site is also important. Again, based on previous experience with government, people are uncertain about the compensation they will be offered, and the extent to which they will be allowed to participate in the negotiations. Some 52% wish to resettle, 29% wish to relocate and the remaining 19% are undecided (of 63% interviewed). The emotional attachment to the existing home, especially for the elderly, and the neighbourhood support networks for the poor, have also been stressed as important social considerations which have to be addressed in the resettlement and relocation process.

b) Economic

The critical issue for the future of Rosia Montana is that within a relatively short period of time – possibly 4 years – there will be very few job opportunities. There does not appear to be any government or social assistance planning in place to address this. Although Rosia Montana is considered to be a Disadvantaged Zone, and as such is included in the Special Programme for Supporting Socio-economic Development (Government Decision 323/1996), no such programmes have been implemented in the Comuna.

By contrast, the Project will invest up to approximately $346 M with annual investment (operation costs) of up to $47 M. It has been estimated that during the construction period, some 800 jobs will be created through direct employment at the Project site and 1500 through indirect employment. During the life of the Project, it has been estimated that over 400 jobs will be created associated with the mine operation, which is an improvement on the 360 now employed at the mine. The salaries paid to the Project employees may be higher than those currently paid by Minvest. Other possible

employment will be associated with the development of tourism centred on the historical mining and architectural exhibitions, and around the new mining operation. The total investment in terms of financial and human resources should attract other sources of funding both from international financial institutions (EU, PHARE), non-governmental agencies and the private sector.

The choice between resettlement and relocation is clearly tied to the prospect of employment. People have indicated that if they have a job with the new mine they will be more likely to resettle than to relocate. The Project is welcomed in terms of the estimated 494 direct job opportunities as presented by RMGC. It is evident that the indirect employment potential in associated construction and service sectors is not well understood by the community, so that a schedule of potential employment opportunities with either the mine or other associated companies in the area should be prepared, prior to the negotiations for resettlement and relocation. Also, the income substitution derived from subsistence agriculture is important and should be available in the new resettlement site. The communities of Corna and Bunta, are farm-based, not mining-based and the justification for leaving the area will not be dependent on mining employment but on the opportunity of securing equal or better quality farmland in the region.

The issue of sustainability of development in Rosia Montana has to be addressed, since it is already a concern. During the life span of the mine operation, new economic opportunities will have to be identified by all stakeholders. RMGC can provide leadership and act as a catalyst, but support and entrepreneurship from the Government through NAD, other Regional Development Agencies and the community will also be required. Simultaneously, people will have, within the span of one generation, the opportunity to train themselves or their children for an occupation other than mining and possibly move on to another location.

c) Environmental Issues

It is important to note that the residents of Rosia Montana Comuna already live in an area that has been heavily mined for hundreds of years with minimal regard for environmental protection. As a result, the mining legacy of the community includes widespread pollution. The construction and operation of the Project in adherence to international environmental standards is likely to lead to significant improvements to the local environment, through, for example, the control and remediation of existing pollution sources, such as ARD, and the subsequent reduction in water pollution. Environmental concerns of the community about mining include noise and vibration levels, increased dust, visual degradation, and possible surface water contamination.

The main negative impact of the Project is the large-scale renovation of the landscape through open pit operation, waste rock dumping and the TMF, and the removal, on a permanent basis, of farmland, rangeland, or forestland. This is about 722 ha, or an addition of 625 ha to the existing operation and 17% of the total Comuna land.

The Final Closure Plan prior to decommissioning will detail the closure strategy in line with land uses, goals, and after-care provisions agreed with the Romanian authorities and following appropriate consultation with local communities and NGOs.

1.12.7 Implementation of Community Development and Resettlement

The community development and resettlement process consists of distinct, although not necessarily sequential, phases which include mobilisation, negotiations, implementation and evaluation and monitoring. The negotiations phase, during which the compensation packages for resettlement and relocation are agreed by RMGC and the affected communities, is as important as the implementation phase.

To support the process, the Project will have a dedicated Community Development and Resettlement team. Short term experts, both local and expatriate, will assist as required for specific tasks. The team will operate for the period 2001-2007. However, a reduced staff will be in place after 2004 by which time the negotiations will be completed and construction will be underway. Several of the personnel for the team are already in place.

It is proposed that some of the key government ministries and agencies form an Advisory Committee to provide advice to RMGC and add credibility to the negotiations and implementation process. It is also recommended that a Resettlement Steering Committee be formed of the residents who choose to resettle, to provide guidance and review of the selection and planning of the resettlement site(s).

1.12.8 Key Policy and Planning Issues

The principles governing the approach to the development of the Comuna and the resettlement of the affected communities can include the following, which should be reviewed at the start of the process.

- Integrate mine planning and community planning in a coherent, fair and iterative manner throughout the resettlement and development process.

- Avoid setting precedents that would render low grade deposits being uneconomical to develop in the future thereby making it impossible to turn them to account for the benefit of all.

- Provide fair and equitable compensation which reflects the varying degrees of existing investment in housing and agriculture by affected persons, in particular:
  - persons who invested more in structures and farms should receive relatively more compensation than people who invested less;
  - a minimum standard of housing and infrastructure should be used, and
  - in making the choice between resettlement and relocation, individuals would know that the package they received for either was fair.

- Adopt a comprehensive approach to the Project which would combine social, economic and environmental considerations with physical resettlement or relocation.

- Develop an approach that would address the community's immediate, interim and long-term well being.

- Develop a consultative and participatory approach in order to foster public acceptability and support.
- Maintain and where possible improve access to income generation.

- Avoid paternalism by RMGC in order to encourage ongoing community self-reliance.

The more important of these are:

a) Negotiations Process

The negotiations process to determine the compensation (category and amount) is usually done by a representative committee of the community, so that the same terms are ultimately applied to all affected households, and the concept of fairness and transparency is maintained. In Rosia Montana, there has been strong opposition to the concept of a community representative committee, and people have indicated that they wish all negotiations to be conducted separately between the negotiating team and the household. There are several risks involved in this approach, namely, how will equity in compensation be recognised, between households of apparently equal investment, and how will fairness in compensation be recognised, between households of differing investment? Also, it is likely to take a much longer time to negotiate all details with each household, than to develop a consensus on compensation with all affected communities.

To date, no one in the affected communities has expressed the opinion that they would debate the compensation of their neighbour and there is a strong respect for legal documentation and contracts. Presently, the RAP strategy indicates negotiations on a household level to agree on the inventory of assets, the value of the assets, and the relocation or resettlement compensation package, and on a community level, through the Resettlement Steering Committee, to review the proposed resettlement site locations, plan, infrastructure, social and institutional facilities. However, it is recommended that the approach to achieve equity in negotiations be reviewed again with the affected communities, once the process starts.

b) Determining Compensation

The compensation package is based on the replacement cost of the existing immovable property and assets (house, annexes, land, agricultural land, crops, and orchards) and other costs such as moving, temporary accommodation, loss of income due to relocation/resettlement, etc.. The replacement cost is a percentage over the evaluation cost based on an evaluation of the market price for these assets and property, and is prepared by a professional evaluator according to established parameters. Due to the continuing inflation of the Romanian lei (40% in 2000 and projected at possibly 20-30% in 2001), all replacement costs have to be in US dollars.

The compensation definition emphasises replacement with area and quality similar to or better than that of the affected assets. The "better than that of the affected assets" is addressed to households which are currently living in shacks, which are obviously not going to be replaced. Therefore, a minimum standard quality of house, annex, and services has to be established at the outset, which defines the minimum replacement costs. This implies that the very poor households will ultimately have a much higher replacement value (the percentage over the evaluation value) than the wealthier households, which is not equitable as discussed in the previous section, but is obviously the only option. This issue may cause disputes and grievances from the other households, and is another example of an issue which should be negotiated at community level.

c) Resettlement Sites

Potential resettlement sites will be limited to areas of Rosia Montana Comuna which are outside of the impacted areas, or Orasul Abrud. The sites will be evaluated for suitability based on criteria developed with the Resettlement Steering Committee. The proposed infrastructure includes the off-site, or the infrastructure needed to support the new resettlement sites and integrate with the existing remaining localities in Rosia Montana,

and the on-site, or the infrastructure within the new resettlement sites. The on-site includes a new water supply and distribution, new or upgraded existing roads, extension of the existing electrical distribution, a sewage system utilising septic tanks, and gas connections from on-site tanks. Other service levels will be available to households.

Using an upper (70%) estimate of resettling numbers of households as homesteads only (614), the total land requirements for resettlement sites will be 141 ha, and includes typical institutional, religious, commercial and road area allocations. The areas of the homestead plots are assumed to vary from 375 m^2 to 7500 m^2, which reflects the typical area distribution within the existing built-up area in Rosia Montana. Several resettlement sites have been identified with approximate areas of 125 ha, 100 ha and 75 ha. Additional area is required if farm property is replaced. It is expected that some of the existing farm property will be compensated financially and that many areas of farmland in the impacted area will remain accessible and useable to the resettlers.

d) Relocation Sites

Relocation sites are chosen by the individual household and are not normally the responsibility of the implementing agency. Some affected households in the Corna, Gura Cornii, Bunta and Tarina valleys have indicated they would be interested in farming near to Alba Iulia, where land is of better quality but higher value and therefore less land would be needed. Fair compensation in this case is an important negotiating issue. For an assumed 30% relocating, or 263 households, the area of land required is 30 ha if only homestead property is considered or up to 325 ha is average farmland is required.

e) Economic Development

The economic development programme has to be comprehensive to consider both the Project short-term and other future long-term economic development strategies, and to address economic issues at the regional level and the household level. The economic development programme has to focus on growth and diversification of the economy, more than sustainability, since the 30% unemployment rate currently in Rosia Montana Comuna, is not a basis even for sustainability. The Economic Development Officer is a key member of the RMGC team and will be required from the start of negotiations to the end of on-site monitoring.

1.12.9 Implementation Schedule

The implementation of the RAP will occur in two stages, and is based on the assumption of 70% of affected residents choosing to resettle. This is a conservative estimate. Stage I is for the period 2001-2004 and addresses the immediate resettlement and relocation requirements of the affected communities around the Plant Site and the Tailings Management Facility. Stage II is for the period 2003-2007 which concentrates on the remaining affected households in Rosia Montana and Tarina.

The Schedule assumes that households will be interviewed on an individual basis for every step of negotiation. Every attempt will be made to develop community-wide agreements on principles and compensation. Households which have their legal documents in order and are anxious to relocate will be interviewed immediately. From approximately March 2002, when the sign-off on compensation for the first group of households around the plant site is finished, and the principles of compensation have been demonstrated, other households may come forward in this manner. This means that any affected households could start leaving the site as early as March 2002. The schedules shown for Stage I and Stage II below reflect the more conservative time frames.

a) Stage I

In Stage I, the key Milestone is the date of sign-off on compensation packages for those who have to be moved for the plant site and the TMF. The actual resettlement of the affected households from site is dependent on the speed of construction of house and infrastructure. For both moves, the infrastructure has to be completed to allow for house connections. The infrastructure for Stage I will be limited to the minimum required to get access to the resettlement sites and to provide basic services of water, sanitation and electricity. Some of the plant site and TMF affected households may have to be temporarily accommodated in apartments, such as those in Abrud. The number of households that will accept an early temporary resettlement is unknown.

Other factors which affect the completion of the houses and the Relocation and Resettlement Occupancy dates are that farmland is identified and possibly purchased for those relocating especially from Corna/Bunta and Gura Cornii and that working drawings for houses cannot be completed before the sign-off on compensation occurs, so that the final number of resettlers and relocatees is known.

Resettlement and Relocation Schedule			
	Stage I		Stage II
Activity	**Plant Site**	**TMF**	**Mining**
Affected Households	20	178	679
Sign-off Compensation	Oct 2002 – Jan 2003	Oct 2002 – Jan 2003	June – Oct 2004
Construction Start	Feb 2003	Apr 2003	Jul 2004
Resettlement Site Development Start	Jul 2002	Jul 2002	Mar 2003
Relocation	Aug 2002 – Feb 2003	Oct 2002 – Jun 2003	Jun 2004 – Jun 2005
Temporary Resettlement	Oct 2002 – Feb 2003	Oct 2002 – Mar 2004	
Resettlement	Sep 2003 – Feb 2004	Mar 2004 – Sep 2004	Nov 2005 – Oct 2006

1.12.10 Conclusion

The RAP is based on the concepts that:

- mining activities will be expanded in the Rosia Montana Comuna through the Project and that the required national and local approvals will be obtained;
- the socio-economic benefits of the Project outweigh the socio-economic costs for those directly and indirectly affected;
- there is significant community support for the expansion of mining activities in the Rosia Montana Comuna;
- the localities of Rosia Montana, Corna, Bunta and Tarina will be most directly affected by the expansion of mining activities;
- there is an adequate amount of suitable land available for resettlement purposes;
- there is adequate time for the negotiations, relocation and resettlement process within the Project implementation plan and that the Project implementation plan is flexible to accommodate changes and delays to this process; and
- there are adequate human and financial resources available to carry out the relocation and resettlement process.

This RAP indicates that without major investment in the mining sector in Rosia Montana, the residents employed in mining and the service trades in the affected localities will continue to experience an economic downturn. They will likely continue to relocate from the community. The current economic situation and long term sustainability of the farming community is not well documented, but there is clearly a desire to move to better quality farmland, which supersedes family ties to Rosia Montana. The Project will allow people the opportunity to plan and influence their future.

1.13 LEGAL AND PERMITTING

This section outlines the important elements of the relevant legal framework under which the Project will operate, and the permitting requirements to bring the Project into operation.

1.13.1 Legal

The Rosia Montana Project is held by RMGC, which is a joint stock company incorporated in Romania in 1997. Gabriel Resources Ltd (Gabriel) holds an 80% interest in the Project through its majority owned Romanian subsidiary, RMGC. Minvest, a Romanian state owned mining company, holds 19.31% of RMGC and three other Romanian companies collectively hold the remaining 0.69%.

The Project is covered by Exploitation Concession Licence No. 47/1999 (the Licence) which was granted on 21 December 1998 and covers an area of approximately 4282 ha. RMGC is the titleholder and Minvest is the affiliated company. Minvest is entitled to continue its current small scale mining operations at Rosia Montana until RMGC makes a production decision. The Licence has an initial term of 20 years and is renewable for successive 5 year periods. Minvest is responsible for all past and current operating activities, including environmental liabilities, associated with its current mining operations, and RMGC is responsible for carrying out and funding all exploration and development activities associated with the redevelopment of Rosia Montana.

RMGC will be entitled to recover 100% of all expenditures, including pre-incorporation expenditures, incurred on the Project prior to production, before dividends are paid to the shareholders of RMGC.

1.13.2 Mining Law

In June 1998, a new mining law came into force and effect, which provides that all mineral resources are administered by the National Agency for Mineral Resources (NAMR). Some of the more important aspects of the mining law are:

a) Mineral Ownership

All mineral resources located in Romania and in the portion of the continental shelf of the Black Sea adjoining Romania, belong to the State of Romania. Mineral rights in Romania are acquired by way of a prospecting permit, exploration concession or exploitation concession granted by NAMR. An exploration or exploitation concession is a property-related right, distinct and independent from the ownership of the land on

which it is located. The rights granted by an exploration or exploitation concession are exclusive to the holder, chargeable, defensible against third parties and are transferable with the consent of NAMR.

b) Exploration Concessions

An exploration concession may be obtained for a maximum period of 5 years, with a renewal right of 3 years. After the first 2 years, the exploration concession must be reduced by 50% and after 4 years by a further 25% of the initial perimeter. An annual fee of ROL20 000 (approximately $0.67) per square kilometre is payable to the Government of Romania, and is not presently adjusted for inflation. The annual fee doubles 2 years after the issue of the concession and quintuples after four years. Exploration concessions confer on the holder the exclusive right to explore for all mineral substances lying within the perimeter of the concession. Exploration concessions may be converted into exploitation concessions at any time upon the preparation of, and approval by NAMR, of a feasibility study on the exploration concession. As provision for environmental reclamation a holder must pay an annual guarantee of at least 0.5% of the value of the estimated value of the annual works.

c) Exploitation Concessions

An exploitation concession is granted for an initial term of 20 years and is renewable for successive 5 year periods. An annual fee of ROL5 000 000 (approximately $167) per square kilometre is payable to the Government of Romania and is not presently adjusted for inflation. Holders of exploitation concessions must pay to the Government of Romania a 2% royalty on the gross production. Exploitation concessions confer on the holder the right to explore, exploit, process, refine and trade all mineral substances (except oil, gas and radioactive substances) lying within the perimeter of the concession as well as the right to access the surface of the land and the right to use the available water. As provision for environmental reclamation a holder must pay an annual guarantee of at least 1% of the value of the estimated annual works, or operating costs in the case of a producing mine. The annual guarantee is 1.5% for the Rosia Montana exploitation concession.

1.13.3 Rosia Montana Disadvantaged Zone

The Project is located in a "Disadvantaged Zone" created by the Romanian government in October 1999. The Disadvantaged Zone has a 10 year life commencing in October 1999 and may, under certain circumstances, be extended. Assuming the Project were to be placed into commercial production in mid-2004, it would not be subject to corporate tax during the first 5

years of its mine life. The Disadvantaged Zone also eliminates the 19% value added tax and all customs duties for a period of 10 years.

1.13.4 Export of Production

Provisions of the Licence provide the right to dispose of Project production. Provisions of the Mining Law confer the obligation to grant the Government of Romania a pre-emptive right to purchase Project production on commercial terms, at international prices.

1.13.5 Taxes

The Project will be influenced by two different regimes – the Mining Law and "Disadvantaged Zone" legislation. The following conditions apply.

- There are no restrictions on the repatriation of capital, dividends or profits.
- Under "Disadvantaged Zone" law the Project is exempt from payment of Corporate Profits Tax until October 2009. After October 2009, the tax rate is 25% of taxable income - or 5% of taxable income on that portion of income derived from exports, provided that proceeds are deposited in a Romanian bank account. If these proceeds were to be distributed as dividends they would then be subject to the 25% tax rate.
- Under the Mining Law, the Project is exempt from Customs Duty for all imported goods necessary for mining activities (including plant, equipment, materials, consumables and reagents) during the life of the Project, for the Project owner and all subcontractors.
- Temporary imports are not covered by the Mining Law and are therefore subject to Customs Duty and VAT.
- Under "Disadvantaged Zone" law the Project will be exempt from VAT, until the expiration of the tax free period in October 2009.
- Where applicable, VAT is applied at a rate of 19% on goods and services and is not applicable to sales of the products of the Project offshore.

a) Royalties

Holders of exploitation concessions must pay to the Government of Romania a 2% gross production royalty on all production.

b) Withholding Tax

For services performed in Romania, non-resident companies have to pay withholding tax of up to 15%. These requirements may be reduced for services provided by companies operating from countries that have Double Tax Agreements with Romania. Payments of interest on third party loans to non-resident companies may also be subject to a withholding tax.

c) Customs Clearance Commission

Customs Clearance Commission is payable at a rate of 0.5% of the value of imported goods, unless imported from the EU, Turkey or CEFTA Agreement members, in which case they are exempt.

d) Employee/Payroll/Social Taxes

There is a range of other employee, payroll, or social taxes that are to be paid by either employees or by the Project directly, as follows. All of these taxes have been included in the total cost of labour used in operating and capital cost estimates. There is no period of exemption for any of these taxes.

1.13.6 Foreign Investment in Romania

Romanian law establishes basic rights and principles for investors, including the right to incorporate Romanian companies, to invest in Romanian companies, to acquire and to own Romanian companies and assets, which were previously owned by the State, and to freely transfer that ownership and other contractual rights.

No restrictions are imposed on foreign ownership and participation in Romanian companies and a foreign entity may own 100 percent of a Romanian registered company. There are no restrictions on the amount of capital that can be invested and earnings and profits may be repatriated after payment of liabilities due to the State, and capital can be repatriated upon cessation of the investment or upon the wind-up of the business.

1.13.7 Environmental Laws

The mining law makes provision for preservation of the natural environment. Applicants for an exploitation concession must prepare and submit to NAMR an environmental impact study and rehabilitation plan as part of their application and provide an annual bank guarantee for a minimum of 1% of the estimated value of the annual work programme to be conducted on the

concession. The Ministry of Waters and Environmental Protection administer environmental issues.

1.13.8 Private Property Rights

Since 1991, land ownership and use has been regulated by the Constitution and the Land Law (Law 18/1991). Legal Romanian persons are entitled to land ownership, and companies with foreign participation fall under this category. No restrictions are imposed on foreign ownership of shares in Romanian companies.

1.13.9 Permitting

a) Introduction

The Romanian system for permitting industrial and mining projects such as the Rosia Montana Project requires dealing with a large number of agencies at the national, regional and local levels of government. RMGC has undertaken a study in order to identify the permits required to enable the project to be constructed and operated. The study identifies the responsible agencies, permit requirements and sequencing, likely timing, manpower requirements and cost, permitting fees and the estimated cost of maintaining permits throughout the mine life.

b) Permitting Approach

There are a large number of permits required to construct and operate a mine in Romania. It is a far more regulated process than found in most countries with modern mining industries. Consequently, the time taken to gain approvals may be longer. Typically, the approach to permitting a mining operation in Romania has involved completing detailed design of the mine, process facilities and infrastructure prior to submission of applications for issuance of construction and other permits and approvals. However, there are recent examples in the mining and brewing industries where the permitting process has been flexible in accommodating project schedule requirements. Generally, the approach in other countries would be to issue one approval from the regulatory authority and complete design and construction in accordance with prescribed standards. This allows projects to be “fast tracked” to completion.

In Romania, Government departments at the national level tend to be responsible for issuing endorsements and agreements in principal that relate to nationally administered policy such as that affecting the environment, forestry and cultural patrimony. Once approval has been given at the national level, responsibility passes to the regional or

county level, in this case the Alba Iulia county council, and then down to the local level, in this case the local councils at Rosia Montana, Abrud and Cimpeni.

The county council is responsible for administering laws and regulations at the county level and ensuring that boroughs, such as Rosia Montana, Abrud and Cimpeni meet their obligations in doing the same.

Boroughs have the authority to issue permits and approvals that relate specifically to activities within their boundaries. These may include issuance of such things as residential or industrial construction permits or approval of documents relating to land use and zoning. However, if the borough does not have the resources to manage these activities the county assumes those responsibilities subject to approvals being granted with agreement of the borough's Mayor. In the case of the Rosia Montana council, because it does not have adequate resources, the Alba Iulia county council issues approvals and permits for construction activities and the like subject to approval being granted with agreement of Rosia Montana's Mayor. Abrud has restricted permitting responsibilities, which are based upon project value.

Approval of the General Urbanism Plan (PUG) illustrates the manner in which the levels of government interact. Under Romanian law, the borough of Rosia Montana is obliged to have a PUG prepared, approved and updated every 5-10 years. A PUG identifies the land use approved within the boundaries of the borough, thereby giving a basis for future development plans in the area. During 2000 the Rosia Montana local council had a consultant prepare a PUG, which received all necessary approvals and was published in February 2001. Upon completion, the PUG was approved by the local council and submitted to the Alba Iulia county council for their approval. At the county level various departments review and approve the PUG, and the council decides what, if any, national approvals are required and submits the document to the appropriate ministries. When the ministry approval process is complete the county council issues its approval and returns the PUG, with any comments, to the local council. The PUG is made available for public comment, after which, members of the council issue final approval of the PUG whereupon it is published as an official document.

Timely completion of the permitting process is key to successful implementation of the proposed construction schedule for the Project. Streamlining the permitting process will require the full cooperation, at all levels of government, of the relevant permitting authorities. In some cases, the permitting authority has the discretion to nominate what approvals or permits are required. Therefore, to minimise unnecessary requirements being imposed on the Project, it is essential that authorities be fully appraised well in advance.

In order to gain the confidence and cooperation of the authorities, it is essential that RMGC explain all aspects of the Project, including schedule requirements. Accordingly, a detailed permitting plan must be developed and presented.

The management of RMGC believes the Rosia Montana Project is sufficiently important to development of the region that the political will and support exists to enable all necessary permits and approvals to be obtained in the timeframe outlined in the development schedule.

1.13.10 Permitting Sequence

The permitting sequence is generally as follows:

- General Urbanism Plan (PUG)
- Expropriation
- Zonal Urbanism Plan (PUZ)
- Detailed Urbanism Plan (PUD)
- Environmental Approval
- Water Management Approval
- Removal of Lands from Agriculture and Forestry Circuit
- Urbanism Certificate
- Tailings Dam Permit
- Construction Permit
- Water Management Permit
- Environmental Permit
- Operating Permit

1.13.11 Permitting Team

A permitting team, reporting to the Project Director, will be assembled and based in the RMGC office in Alba Iulia. The team will build up to a maximum of 15 Staff during the project construction phase and include a manager, secretary, 3 translators and 10 diriginte de santiers. The team reduces to 4 staff after the operating permits have been obtained during the first year of operation. The team is further reduced to the manager and secretary after completion of village resettlement activity during Year 4 of operations.

1.14 PROJECT IMPLEMENTATION

1.14.1 Overall Development Plan

The overall development plan comprises a series of logical phases which bring the Project to a full operating status. These phases are:

- pre-project phase;
- project construction phase, and
- project commissioning phase.

A summarised schedule of the Project's development from project commitment to commissioning, is shown in Figure 1.14.1. This schedule shows a timeframe of 33 months from Project commitment to completion of the commissioning process.

It is assumed that full Project commitment during December 2001 and that pre-project activities commence prior to Project commitment.

Several assumptions which are critical to the development of the Project implementation plan have been adopted for the Study:

- Open pit mining operations will be carried out by RMGC. Delivery of waste rock to the starter wall of the TMF can be incorporated in the mine ramp-up schedule.

- Village relocation activities will be managed by RMGC. Acquisition of land and resettlement of existing residents will be accomplished within the required timeframe to enable works to begin on the plant site and TMF.

- The design, procurement and construction of the process plant, utilities and infrastructure will be undertaken by an Engineer-Constructor (EPCM Contractor) under the direction of RMGC, utilising local and overseas construction organisations.

Key milestones are summarised in Table 1.14.1.

Table 1.14.1 Project Development Milestones	
Milestone	**Start Date**
Project Commitment	December 2001
Award EPCM	March 2002
Commence Plant Earthworks	March 2003
Commence TMF	April 2003
Plant Practical Completion	July 2004

1.14.2 Structure

Development of the Project will be achieved through an integrated RMGC development team under the control of a Project Director. This team will include personnel who will form the core of the Operations organisation as well as short-term personnel focussed on the implementation activities. The organisation structure and responsibilities are shown in Figure 1.14.2.

Figure 1.14.2

Project Implementation Organisation Structure

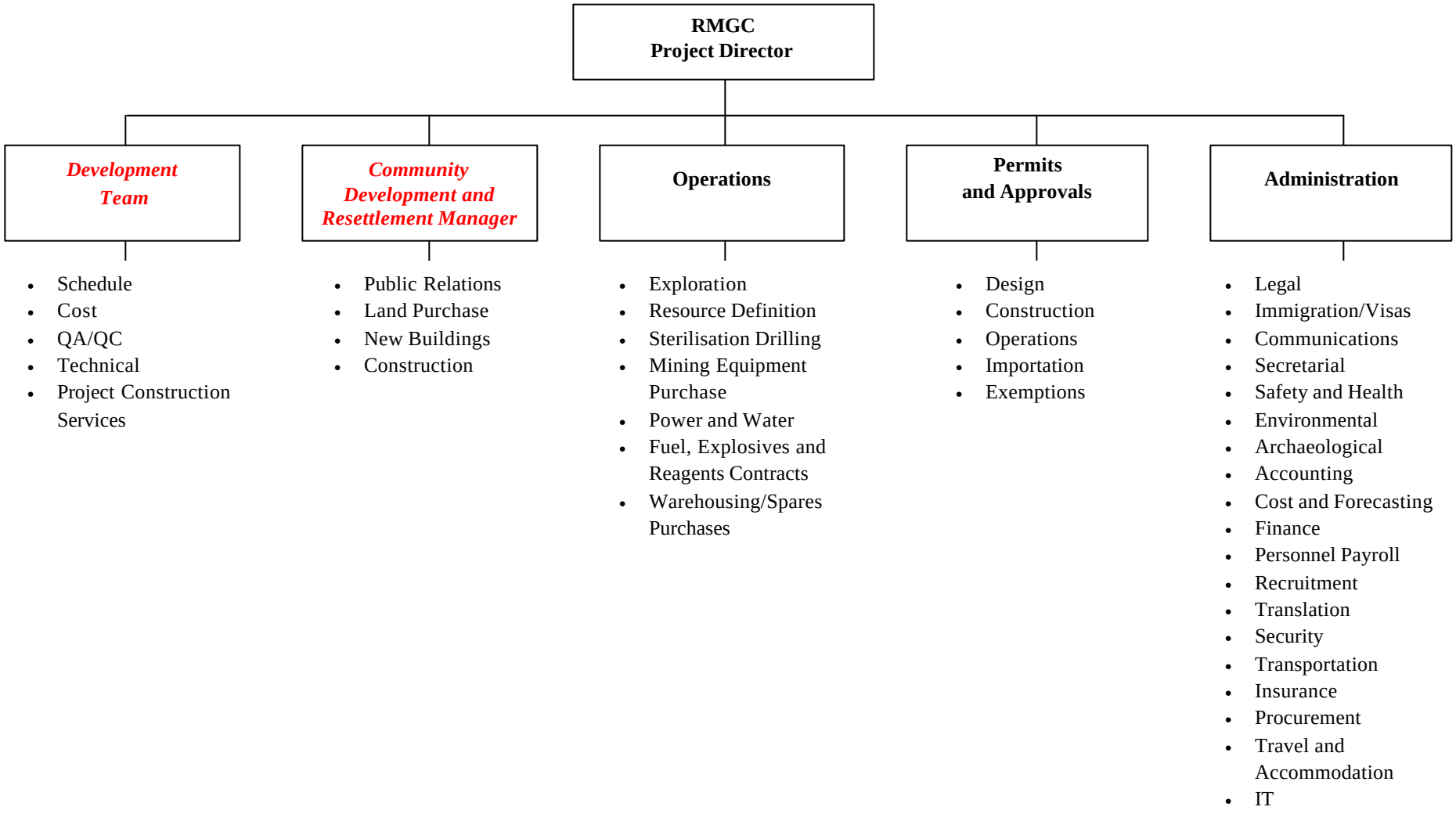
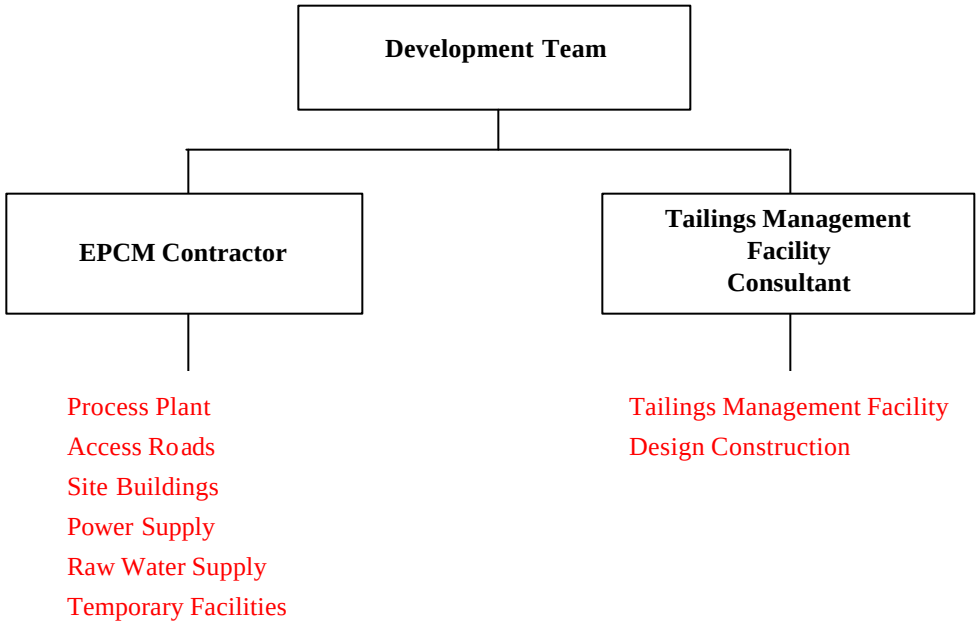


Figure 1.14.3 provides an overview of the recommended implementation plan for each of the elements. From this figure the following key points should be noted:

- The majority of the plant and infrastructure is to be implemented by an EPCM contractor experienced in the design of these types of plants and their construction in overseas locations. The value of this component of the work is approximately $100 M.

- The TMF design is to be completed by a specialist consultant who will be responsible for supervision of all the site works. It may be possible for the EPCM contractor to be made responsible for the construction management. Considerable liaison will be required with the RMGC mining team who will be responsible for delivering waste material from the mine to the TMF site. The initial capital required for the TMF is $13.1 M pre-production and an additional $1.1 M in the first year of operation.

Figure 1.14.3
Organisational Structure



1.14.3 Transportation and Logistics

Romania's major sea port is Constanta and this is serviced by a number of shipping lines and thus cargo can be shipped to Romania by regular liner service. Additionally, there are road and rail connections to Europe. The Danube is navigable and connects to the Rhine, which allows river barges to sail either from Constanta or Rotterdam to Drobeta-Turnu Severin (Figure 1.14.4). Drobeta-Turnu Severin is approximately 200 km by road from site and has

150 t cranes. The Romanian road system is sound and good connections exist to site for in gauge loads. The roads in the mountains approaching the Project site appear to be prone to damage in the river valleys when the rivers are in flood and some sections were observed to be undercut during route surveys.

The bulk of the cargo (in gauge, mainly Iso-tainers) will be sea freighted to Constanta and shipped by road to site. The out of gauge cargo is of a size that will require careful management. It is planned that this will be loaded on to a river barge at Constanta and unloaded at Drobeta-Turnu Severin. The route has a number of restrictions including many overhead power lines that will have to be isolated/lifted/disconnected and there are pipe bridges that will require modification. It is also possible that sections of road that have been eroded or otherwise damaged will require some work. A survey will be required by the roads department closer to the shipping time to approve a route. The loads will then proceed in convoy (probably 3 load beds at a time) to make best use of the escorts and electrical precautions.

Figure 1.14.4
Project Logistics

1.14.4 Contracting Strategy

A review has been made of Romanian companies and contractors for equipment supply and construction disciplines. There is significant evidence that the in-country capability for this size and scale of project is limited. The main concern is that practitioners in country do not have experience to organise a construction effort on this scale and within the timeframe outlined, nor is there adequately sized equipment to undertake the work efficiently. This would be a demanding task in locations where such undertakings are regular occurrences, but the risk to the Project is significantly greater in Romania. Obviously, to expose the project to the risk of contractors who do not have capability of executing the work in the required timeframe would be unwise, as this would pose a significant risk to the initiation of cash flow from the facility.

The contracting strategy is a balance of maximising Romanian content, as this is the lowest cost option whilst accepting that in many areas there need to be components that add reliability of service delivery (quality and schedule). The rates used to price the work have reflected site work contracts being awarded to European contractors with proven track records and expatriate supervision of a Romanian workforce to ensure quality, productivity and adherence to the schedule. At the same time, the Construction Supervision component of the EPCM estimate has been strengthened. This combination is intended to ensure that work will be completed in accordance with the Project needs.

1.14.5 Construction Camp

The early establishment of a construction camp is essential to service the Project. The location for this and the availability of services requires to be finalised. The camp as costed in the estimate is based on temporary demountable buildings. Minproc believes that a better solution could be either to build permanent style accommodation using local builders and materials or refurbish and utilise existing buildings in the area that will be vacated by the village relocation. This had been considered earlier, but it was not possible to evaluate this during the Study period. It is recommended this be reviewed further and finalised prior to the full commitment being given to the Project. This schedule indicates this is an activity that must be commenced prior to full commitment to maintain schedule.

1.14.6 Project Construction Phase

The Project schedule shows that a critical factor in achieving the overall duration is having the relevant documentation and permits in place to allow the following activities to take place as indicated.

- Award EPCM contract March 2002
- Award SAG mill supply contract April 2002
- Commence process plant earthworks March 2003
- Land clearing for mine development March 2003
- Commence TMF earthworks April 2003
- Commence raw water pumping March 2004
- Commence ore commissioning July 2004

The Project schedule has taken account of weather disruption and has attempted to minimise this by avoiding outdoor site works in mid winter. The schedule plans for earthworks to commence in March 2003, with concrete work for the CIL and Mill area starting as soon as these areas are prepared. The extent of earthworks required for these is minor compared to the crusher or stock pile, with the balance of mining and the TMF both commence in spring thus allowing the more weather sensitive work to be undertaken in the warmer months.

Erection of the CIL tanks will commence before all the ring beams are cast and, once completed, will open up a significant number of work fronts for mechanical and electrical subcontractors.

The critical activities through this period are the mill civil works, the erection of the mill building and the assembly of the mills. The mill assembly will utilise the building's overhead crane and will be a 24 h, two-shift operation continuing through the winter of 2003-2004 to have this completed by end June 2004.

The permitting and relocation of residents activities is a major component of the project and needs to be commenced immediately. The schedule has assumed that this will prevent site activities (earthworks) from commencing prior to 2003. There would be benefits if these could be commenced earlier (October-November 2002) as this would allow an earlier start on concrete works in 2003 and may reduce cash by allowing a higher component of the work to be undertaken by a Romanian workforce.

1.15 CAPITAL COSTS

1.15.1 Summary

The total initial capital cost for the Project is summarised in Table 1.15.1.

Table 1.15.1
Initial Project Capital Expenditure
($ M)

Item Description	Estimate
Pre-production Mining	9.4
Mining	24.0
Process Plant and Infrastructure	101.2
Tailings Management Facility (Stage 1)	13.1
Community Development and Resettlement	24.0
Owner's Costs	20.8
Total Estimate	**192.4**

Table 1.15.2 provides a summary of the sustaining and deferred capital required over the life of the Project.

Table 1.15.2A
Sustaining and Deferred Capital Expenditure Schedule
($'000)

	Years After Commencement												
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Mining	3 768	1 228	2 530	382	577	1 270	4 551	4 133	1 199	3 118	3 118	3 118	3 118
Process Plant and Infrastructure	-	-	732	996	-	732	-	-	732	-	-	732	-
Tailings Management Facility	1 146	3 288	1 856	493	3 114	451	428	2 230	962	4 127	35	542	533
Community Development and Resettlement	13 513	14 593	5886	78	-	-	-	-	-	-	-	-	-
Owner's Costs	997	21	1 136	286	-	-	234	-	-	-	-	-	-
Total	**19 425**	**19 131**	**12 140**	**2 234**	**3 691**	**2 453**	**5 213**	**6 362**	**2 893**	**7 245**	**3 153**	**4 392**	**3 651**

Table 1.15.2B
Sustaining and Deferred Capital Expenditure Schedule
($'000)

	Years After Commencement													
	14	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**Total**
Mining	3 118	1 342	1 342	1 342	1 342	1 342	3 449	3 449	3 449	3 449	3 449	(54)		59 132
Process Plant and Infrastructure	-	732	-	-	732	-		732	-	-	732			6 852
Tailings Management Facility	35	616	141	588	2 318	5 879	23	1 092	23	662	23	677	19 526	50 806
Community Development and Resettlement	-	-	-	-	-	-	-	-	-	-	-	-	-	34 070
Owner's Costs	-	-	-	-	-	-	-	-	-	-	-	-	-	2 675
Total	**3 153**	**2 691**	**1 483**	**1 930**	**4 392**	**7 221**	**3 472**	**5 273**	**3 472**	**4 111**	**4 204**	**624**	**19 526**	**153 535**

1.15.2 Mine Capital Costs

The pre-production mine capital expenditure includes Capitalised Pre-production Operating Costs, Initial Capital and Replacement Capital. Table 1.15.3 summarises the Pre-production Mine Capital at $24 M.

Table 1.15.3
Summary of Pre-production Mine Capital

	Total ($'000)
Clear and Grub	106
Primary Haulroad Construction	3 624
Establishment Costs:	
- Other Site Civil Work	165
- Services	525
- Buildings and Infrastructure	685
- Office and Workshop Equipment	758
- First Fill Consumables	1 366
- Administration and Training	375
- Miscellaneous	440
Equipment Purchase:	
- Drill and Blast Equipment	2 207
- Load and Haul Equipment	8 869
- Ancillary Open Pit Equipment	3 448
- Miscellaneous Plant and Equipment	1 681
Haulage Cost Attributable to TMF	(331)
Services Withholding Tax	12
Customs Clearance Commission	41
Total	**23 970**

The labour costs prior to Quarter 3 of Year -1 are included in the Owner's Costs (Table 1.15.9) and are not shown in the mining costs.

Table 1.15.4 shows the Capitalised Pre-production Operating Costs by activity.

The sustaining and deferred mine capital through the life of the mine totals $59 M.

Details of the sustaining and deferred capital expenditure are shown in Table 1.15.5.

Table 1.15.4 Summary of Capitalised Pre-production Operating Costs	
	Total ($'000)
Activity	
Drill and Blast Equipment	428
Load and Haul Equipment	2 326
Ancillary Open Pit Equipment	1 097
Miscellaneous Plant and Equipment	340
Fuel Taxes	386
Mine Administration	155
Mine Services	1 027
Explosives and Blasting	494
Labour	3 093
Services Withholding Tax	12
Customs Clearance Commission	7
Total	**9 364**

Table 1.15.5 Summary of Sustaining Mining Capital Expenditure in Years 1-25 (Life of Mine)	
	Total ($'000)
Clear and Grub	79
Primary Haulroad Construction	4 846
Other Site Civil Work	1 765
Services	75
Office and Workshop Equipment	1 028
Administration and training	113
Miscellaneous	120
Equipment Purchase	
Drill and Blast Equipment	3 497
Load and Haul Equipment	34 399
Ancillary Open Pit Equipment	7 822
Miscellaneous Plant and Equipment	7 321
Haulage Cost Attributable to TMF	(2 211)
Services Withholding Tax	144
Customs Clearance Commission	133
Total	**59 132**

1.15.3 Process Plant and Infrastructure

The capital cost estimate for the Process Plant and Infrastructure is summarised in Table 1.15.6. Directs are given as a bare cost without accuracy provision or fee component. These are shown as Indirects.

The total capital cost estimated is $101 M.

Table 1.15.6
Initial Capital Cost Summary – Process Plant and Infrastructure

Cost Element	Estimated Cost ($'000)
Directs	
General Site Preparation	5 893
Crushing, Screening and Stockpile	2 882
Reclaim, Grinding and Classification	21 279
Thickening	726
Leaching and Adsorption	5 567
Desorption and Goldroom	1 811
Reagents	526
Plant Services	5 382
Cyanide Detoxification	2 983
Buildings	6 044
Mobile Equipment	2 266
Power Supply System	3 446
Temporary Services and Freight	11 976
Spares and First Fill	6 386
Housing	1 318
Subtotal Directs (excluding Accuracy Provision)	**78 484**
Indirects	
EPCM Cost	11 956
EPCM Fee	2 438
Accuracy Provision	7 714
Withholding Tax on Services	555
Customs Clearance Commission	14
Subtotal Indirects	**22 677**
Total	**101 161**
Future Water Treatment Plant	**996**

1.15.4 Tailings Management Facility

The capital cost for the TMF has been scheduled on an annual basis as the TMF embankment increases in height. The cost schedule is summarised in Table 1.15.7.

Table 1.15.7 TMF Capital Cost Schedule	
Year	**$'000**
Pre-production	13 117
1	1 146
2	3 288
3	1 856
4	493
5	3 114
6	451
7	428
8	2 230
9	962
10	4 127
11	35
12	542
13	533
14	35
15	616
16	141
17	588
18	2 318
19	5 879
20	23
21	1 092
22	23
23	662
24	23
25	677
Post Closure	19 526
Total	**63 923**

Haulage costs of waste from the mine to the TMF embankment have been calculated within the mining cost estimate, but included as part of the TMF costs in Table 1.15.7.

1.15.5 Community Development and Resettlement

The cost estimate for community development and resettlement is shown in Table 1.15.8.

Table 1.15.8
Community Development and Resettlement Costs
($'000)

Description	Pre-production	During Operation
Relocation/Resettlement Costs	18 848	31 906
Consultant Costs	2 515	853
Owners Resettlement Team	945	638
Resettlement Office Costs	1 117	523
Resettlement Office Capital	170	-
Contingency	302	127
Withholding Tax On Services	68	23
Total	**23 966**	**34 070**

In order to prepare the estimate for Community Development and Resettlement, effort has been taken to:

- quantify the surface affected by the Project;
- identify the land type - forestry, grazing, residential, commercial - and whether privately or publicly held;
- identify public buildings affected;
- for the majority of households - survey property boundaries, measure each house and outbuilding, record the subsistence agriculture;
- search property titles to establish the owner and condition of the title;
- have a licensed valuer prepare low, midpoint and high values for buildings, residential land, agricultural land and forestry;
- estimate the cost of replacing land and buildings on a square metre basis, using national averages for the region, and
- use infrastructure design codes for sewerage, power and roads to provide square metre or per capita rates for these facilities.

The estimate assumes that 30% of affected residents will relocate outside the Project area and that 70% will be resettled within the area.

RMGC believes that the procedure adopted has resulted in a relatively conservative estimate.

Other aspects of the overall Community Development and Resettlement estimate have been prepared using a combination of the following principles, as appropriate for each part of the estimate.

- Established costs for facilities and services in Romania (e.g. telephone, office rent, office charges).
- Established costs in Romania for miscellaneous equipment (e.g. office equipment, vehicles).
- Estimates for building and shipping costs.
- International rates for specialised services and consultants.
- Assessment of number of national personnel required to perform Permitting and Village Resettlement functions, in conjunction with specialist consultants.
- Adopting allowances where reliable information was difficult or impossible to obtain.

1.15.6 Owner's Costs

Estimates of Owner's costs have been prepared to identify and quantify costs associated with development of the Project that fall outside the areas of mining, processing, administration and tailings. Table 1.15.9 contains the estimated costs, both pre-production and after operations commence.

All Owner's Costs, regardless of whether they occur prior to or after commencement of operations, have been treated as capital costs, as they are considered to be associated with the development of the Project, rather than its operation, and as such are of a capital nature.

Table 1.15.9
Owner's Costs
($'000)

Description	Pre-Production	During Operation
MANAGEMENT		
Owners Project Management Team Labour	2 969	535
Project Office		
- Alba Iulia	1 939	74
- Site	368	0
Subtotal	**5 276**	**610**
LAND/ROADS		
Land Acquisition - Access Roads/Pipeline/Pumping Station	127	Included in
Community Development	150	Operating Costs
Subtotal	**277**	
CORPORATE		
Legal Fees (EPCM Contract)	250	
Public Relations Budget	150	
Sterilisation Programme – Corna Valley	0	330
Subtotal	**400**	**330**
GOVERNMENT		
Permits/Licences/Fees	2 735	Included in
Exploitation Fees	21	Operating Costs
Land Tax on Concession Area	930	
Subtotal	**3 687**	
CONSTRUCTION		
Construction Security Costs	132	
Insurance - Construction/Other	2 004	
Medical	36	
Apartment Refurbishment - Abrud	200	
Owners Commissioning Costs	100	25
Subtotal	**2 472**	**25**

Table 1.15.9 (cont) Owner's Costs ($'000)		
Description	**Pre-Production**	**During Operation**
CONSULTANTS		
Water Sampling etc	23	
Environmental Approvals	90	
Hydrogeological	30	
Mining (Pit Optimisation etc)	200	
Geology	75	
Logistical - Detailed Transport Plan	40	
Security Plan - Kidnap	40	
Mapping/Surveying	75	
Manuals/Training Procedures	200	
Archaeology	1 175	1 250
Further Testwork	20	
Geotechnical Work	899	210
Power Studies	110	
Tailings Consulting Support	105	
Water Supply Line	35	
Engineering	315	
Subtotal	**3 432**	**1 460**
PRE-PRODUCTION COSTS		
Pre-production Operations Team		
- Salaries	2 699	
- Recruitment	635	
- Travel and Accommodation	516	
Expatriate Housing Whitegoods	100	
Subtotal	**3 950**	
Contingency	**1 303**	**228**
Withholding Tax on Services	**51**	**22**
Total Owner's Costs	**20 848**	**2 675**

Appendix 15.6 contains details of the Owner's Cost Estimate.

The Owner's Cost estimate has been prepared using a combination of the following principles, as appropriate for each part of the estimate.

- Established costs for facilities and services in Romania (e.g. telephone, office rent, office charges).

- Established costs in Romania for permits, taxes and other government fees and charges.
- Established costs in Romania for miscellaneous equipment (e.g. office equipment, vehicles).
- Assessed market rates (e.g. land, easements).
- Established rates for work in Romania (e.g. drilling).
- Quotes (e.g. insurances).
- International rates for specialised services (e.g. legal).
- Assessment of number of personnel required to perform Project Management, Permitting, Village Resettlement and Administration functions, in conjunction with specialist consultants.
- Assessment by Minproc and RSG of the likely build-up of personnel prior to operations.
- Adopting allowances where reliable information was difficult or impossible to obtain.

1.16 OPERATING COSTS

1.16.1 Summary

The life of mine project operating costs are summarised in Table 1.16.1 and the annual costs in Tables 1.16.2 and 1.16.3.

Table 1.16.1
Life of Mine Operating Costs

	$ M	Average $/t milled
Mine	321.0	1.61
Process Plant	653.2	3.27
General and Administration	100.6	0.50
Tailings Management Facility	8.0	0.04
Total – on site cash operating costs	**1 082.8**	**5.42**
Transport and Refining	25.2	0.13
Building Tax	1.8	0.0
Cash Operating Costs	**1 109.8**	**5.56**
Royalties	47.9	0.24
Total Cash Costs	**1 157.7**	**5.80**

Table 1.16.2
Annual Operating Costs
($ M)

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Mine	14.8	14.7	13.9	13.1	12.8	12.9	13.1	12.9	12.9	12.4	12.4	12.4	12.4	12.4	12.7	12.7	12.7	12.7	12.7	13.0	13.0	13.0	13.0	13.0	9..3	-
Process Plant	27.0	27.6	26.3	27.5	26.5	28.6	27.6	26.9	26.4	26.2	26.4	25.3	26.1	26.4	26.2	26.6	26.5	26.8	27.3	27.9	26.7	25.5	25.5	17.1	21.6	0.15
General and Administration	4.7	4.2	4.2	4.2	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	-
Tailings Management Facility	0.3	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	-
Total – on site cash operating costs	**46.8**	**46.9**	**44.8**	**45.1**	**43.6**	**45.8**	**45.0**	**44.1**	**43.5**	**43.0**	**43.1**	**42.0**	**42.8**	**43.1**	**43.2**	**43.6**	**43.5**	**43.8**	**44.3**	**45.2**	**44.0**	**42.8**	**42.8**	**34.3**	**35.1**	**0.15**
Transport and Refining	1.0	1.3	1.7	1.4	1.8	1.0	0.9	1.1	1.1	1.0	1.3	0.9	1.1	1.0	1.0	0.9	1.0	0.9	0.8	0.8	0.7	0.7	0.7	0.5	0.6	-
Building Tax	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
Royalties	2.0	2.0	2.1	2.3	2.8	2.1	1.9	2.1	1.8	2.0	2.2	2.0	1.9	1.6	1.8	1.7	1.8	1.9	1.7	1.9	1.8	1.6	1.9	1.2	1.9	
Total Cash Costs	**50.0**	**50.3**	**48.7**	**49.0**	**48.4**	**49.0**	**47.9**	**47.3**	**46.6**	**46.1**	**46.7**	**44.9**	**45.8**	**45.7**	**46.1**	**46.3**	**46.4**	**46.6**	**46.9**	**47.8**	**46.5**	**45.1**	**45.4**	**36.0**	**37.6**	

Table 1.16.3
Annual Operating Costs
($/t milled)

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Mine	2.13	1.93	1.80	1.59	1.60	1.64	1.65	1.64	1.65	1.56	1.53	1.33	1.52	1.52	1.63	1.56	1.61	1.60	1.53	1.60	1.69	1.48	1.52	2.04	1.11	-
Process Plant	3.89	3.60	3.40	3.31	3.30	3.64	3.47	3.42	3.38	3.31	3.28	2.72	3.21	3.23	3.36	3.28	3.35	3.38	3.30	3.43	3.47	2.89	2.98	2.67	2.58	-
General and Administration	0.67	0.55	0.55	0.51	0.49	0.50	0.50	0.50	0.51	0.50	0.49	043	0.49	0.49	0.51	0.49	0.50	0.50	0.48	0.49	0.52	0.45	0.46	0.62	0.48	-
Tailings Management Facility	0.05	0.05	0.04	0.04	0.05	0.04	0.04	0.04	0.04	0.05	0.04	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.04	0.05	0.04	-
Total – on site cash operating costs	**6.75**	**6.13**	**5.78**	**5.45**	**5.45**	**5.83**	**5.65**	**5.60**	**5.58**	**5.42**	**5.34**	**4.51**	**5.26**	**5.27**	**5.53**	**5.37**	**5.51**	**5.52**	**5.35**	**5.55**	**5.72**	**4.85**	**5.01**	**5.37**	**4.21**	**0.00**
Transport and Refining	0.15	0.17	0.22	0.17	0.22	0.13	0.11	0.14	0.14	0.13	0.17	0.10	0.13	0.12	0.13	0.11	0.13	0.11	0.10	0.09	0.09	0.08	0.08	0.07	0.07	-
Building Tax	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Royalties	0.29	0.26	0.27	0.28	0.35	0.26	0.24	0.27	0.24	0.26	0.28	0.21	0.23	0.20	0.23	0.21	0.23	0.23	0.21	0.23	0.23	0.18	0.22	0.19	0.22	-
Total Cash Costs	**7.21**	**6.58**	**6.28**	**5.91**	**6.04**	**6.24**	**6.02**	**6.01**	**5.97**	**5.81**	**5.79**	**4.83**	**5.63**	**5.59**	**5.90**	**5.70**	**5.87**	**5.88**	**5.66**	**5.88**	**6.05**	**5.11**	**5.31**	**5.63**	**4.50**	**0.00**

In general, international costs for consumables and reagents have been used rather than Romanian rates, due to increased certainty relative to the inflation and currency exchange rate fluctuations in recent times. This could be regarded as a conservative approach as it is likely that many of these materials could be sourced locally to the Project. Table 1.16.4 summarises the unit costs of some of the major items.

Table 1.16.4
Major Reagents and Consumables

	Average Consumption	Cost (fis)
Mine		
Diesel	1.3 L/bcm	$0.33/L
Explosives	0.32 to 0.45 kg/bcm	$350/t
Plant		
Lime	2.06 kg/t ore	$50/t
Sodium Cyanide	0.75 kg/t ore	$1250/t
Carbon	28 g/t ore	$1334/t
LPG	2 000 t/a	$354/t
Hydrochloric Acid	1 800 t/a	$269/t
SAG mill balls	0.2-0.62 kg/t	$526/t
Ball mill balls	0.24-0.64 kg/t	$504/t

1.16.2 Mine Operating Costs

Operating costs for the mining operation are defined as those production costs incurred after plant commissioning. Unit operating costs average $0.82/t and vary from $1.08/t in Year 1 to $0.77/t in Year 10-14. Table 1.16.5 shows the total operating costs over the life of the Project by cost element. The costs are shown by activity in Table 1.16.6. Table 1.16.7 shows the unit costs in $/t for the activity centres.

Table 1.16.5 Life of Mine Mining Operating Costs by Cost Element	
	Total ($)
Labour	52 296 307
Fuel	70 627 295
Parts Domestic	10 969 224
Parts Imported	98 723 019
Consumables Domestic	50 569 735
Consumables Imported	23 071 397
Other	14 274 154
Services Withholding Tax	147 600
Customs Clearance Commission	304 486
Total	**320 983 218**

Table 1.16.6 Life of Mine Mining Operating Costs by Activity	
	Total ($)
Drill and Blast Equipment	17 777 552
Load and Haul Equipment	129 629 134
Ancillary Open Pit Equipment	35 989 050
Miscellaneous Plant and Equipment	10 683 214
Fuel Taxes	19 198 906
Mine Administration	3 235 000
Mine Services	18 080 935
Explosives and Blasting	33 641 035
Expatriate Staff	11 008 510
Romanian Staff	13 924 136
Romanian Award	27 363 661
Services Withholding Tax	147 600
Customs Clearance Commission	304 486
Total	**320 983 218**

Table 1.16.7	
	Total ($/t Ore and Waste)
Drill and Blast Equipment	0.05
Load and Haul Equipment	0.33
Ancillary Open Pit Equipment	0.09
Miscellaneous Plant and Equipment	0.03
Fuel Taxes	0.05
Mine Administration	0.01
Mine Services	0.05
Explosives and Blasting	0.09
Expatriate Staff	0.03
Romanian Staff	0.04
Romanian Award	0.07
Services Withholding Tax	0.00
Customs Clearance Commission	0.00
Total	**0.82**

1.16.3 Process Plant Operating Costs

Base operating costs have been estimated based on a weighted average of the various ore types. Separate process plant operating cost estimates have been developed for the following categories:

Rock type:

- Hard
- Medium
- Soft

} major variables are mill throughput, power consumption and steel consumption

Pits:

- Cetate
- Cirnic
- Orlea
- Carpeni/Jig/Igre

} major variables are lime and cyanide consumption

Table 1.16.8 summarises the costs for each category.

Table 1.16.8 Process Plant Operating Cost by Ore Category			
Pit	**Rock Type**	**Throughput (t/a)**	**$/t**
Base Case	Average	1000	3.093
Base Case	Hard	800	3.726
	Medium	940	3.324
	Soft	1200	2.613
Cetate	Hard	800	4.096
	Medium	940	3.694
	Soft	1200	2.983
Cirnic	Hard	800	3.694
	Medium	940	3.292
	Soft	1200	2.581
Orlea	Hard	800	-
	Medium	940	-
	Soft	1200	2.381
Carpeni/Jig/Igre	Hard	800	3.441
	Medium	940	3.039
	Soft	1200	2.328

The costs in Table 1.16.8 will be higher in Year 1 by a fixed cost of $1 253 700 as a result of additional expatriate labour. After Year 4, a reduction of $122 640 is required as a result of reduced expatriate labour.

Table 1.16.9 summarises the breakdown of the operating costs for the base case.

Table 1.16.9 Process Plant Operating Cost Breakdown for Base Case		
Category	**$/annum**	**$/t**
Labour	1 576 854	0.197
Power	3 991 500	0.499
Maintenance Materials	2 348 586	0.294
Consumables	4 520 840	0.565
Reagents	11 580 492	1.448
Miscellaneous	722 540	0.090
Total	**24 740 812**	**3.093**

During the initial ramp-up phase of the Project in Year 1, plant throughput rates will be lower than design. As labour costs are fixed, the processing costs in $/t will increase in this period. Table 1.16.10 summarises the ramp-up and the additional costs in terms of $/t of ore processed. In each quarter of Year 1, the average costs by ore category (Table 1.16.8) will be increased by the additional costs for that quarter, as shown in Table 1.16.10. These additional costs have been taken into account in the operating costs used in the financial model.

Table 1.16.10
Ramp-up Additional Costs in Year 1

	% of Design Throughput	Additional Costs for the Quarter ($/t)
Quarter 1	75	0.118
Quarter 2	85	0.062
Quarter 3	95	0.019
Quarter 4	100	0

1.16.4 General and Administration

The general and administration costs are summarised in Table 1.16.11.

Table 1.16.11
General and Administration Costs
($/a)

	Year 1	Years 2-4	Years 5+
Labour (site)	1 527 223	1 172 983	913 843
Labour (Alba Iulia)	20 807	20 807	20 807
Direct Costs	3 127 296	3 029 931	3 029 931
Total	**4 675 326**	**4 223 721**	**3 964 581**

These costs are additional to the process plant operating costs shown in Table 1.16.8 and Table 1.16.9.

The direct administration costs include insurances, permits, telephones, office supplies, travel expenses, consultants, training, recruitment and miscellaneous maintenance costs.

1.17 FINANCIAL ANALYSIS

1.17.1 Introduction

Financial analysis for the Rosia Montana Project has been undertaken by preparation of a discounted cash flow model to which the capital and operating cost estimates and the production schedule of the Study are input data.

Analysis is based on extraction of ore from one mineralised system through development of a number of open pits in close proximity to each other, and processing on site at a rate of 8 Mt/a to produce a gold/silver doré. The doré will be exported from Romania to a foreign refinery.

Fundamental assumptions are that:

- metal prices of $275/oz for gold and $5/oz for silver will be maintained throughout the life of the project;
- there will be no hedging of metal prices;
- all production will be sold in the period in which it is produced;
- the life of the Project will be 25.0 years; and
- ramp-up to full throughput will occur progressively through the first year of operations as follows:

Quarter 1	75%
Quarter 2	85%
Quarter 3	95%
Quarter 4	100%

Evaluation has encompassed a 3 year development period prior to commencement of ore feed to the mill, through to the end of the life of the mine.

Modelling has been conducted in United States dollars ($) since it is the predominant currency to which the Project will be tied through metal prices, capital expenditure and operating costs. US$ escalation has been excluded from the analysis, but for capital and operating costs is included as part of sensitivity analysis.

The financial analysis is conducted both before and after tax, based on exemption from corporate Profits Tax under “Disadvantaged Zone” legislation applying to Rosia Montana until October 2009.

The analysis is based on the project being wholly equity funded, but debt financing has been included as part of sensitivity analysis in order to indicate the effects on Project returns and assess the ability of the Project to service debt.

Details of the basis for the analysis and all assumptions made are contained in Section 17 of the Study.

NPV results for the Project are reported at a discount rate of 5%, but this should not be interpreted as the required rate of return for the Project.

1.17.2 Project Economics

Based on the above assumptions and 100% equity funding, the Project is anticipated to yield, after tax, the following:

- Internal Rate of Return (IRR): 20.1%;
- Net Present Value (NPV): $332 M at a discount rate of 5%;
- Initial capital payback: 4.3 years after commencement of production.

At overall head grades of 1.56 grams gold per tonne of ore and 7.84 grams of silver per tonne of ore, and with average metallurgical recoveries of 82.1% for gold and 54.2% for silver, the 200 Mt of ore treated for the project is calculated to produce 8.2 Moz of gold and 27.3 Moz of silver. At constant metal prices over the life of the project of $275/oz gold and $5.00/oz silver, and allowing for transport, treatment and refining of doré, it is anticipated that $2 368 M will be realised in revenue over the life of the Project, for an initial capital outlay of $192.4 M.

After silver credits, Cash Operating Costs (before government royalties) are anticipated to average $119/oz of gold produced over the life of the project, or $4.88/t of ore treated. Total cash costs (after government royalties) are expected to average $124/oz of gold produced, or $5.12/t of ore treated.

Before silver credits, Cash Operating Costs (before government royalties) are anticipated to average $135/oz of gold produced over the life of the project, or $5.55/t of ore treated. Total cash costs (after government royalties) are expected to average $141/oz of gold produced, or $5.79/t of ore treated.

Over the life of the Project $1 083 M is expected to be paid in on site operating costs. Another $47.9 M will be paid to the Government of Romania in the form of royalties, $1.8 M as Building Tax and $98.3 M as Profits Tax and Romania Fund tax. A further $2.7 M is expected to be paid in fees for permits prior to commencement of operations.

Undiscounted, cashflows from the Project are expected to total $890 M pre-tax and $792 M after tax.

1.17.3 Summary of Results

The key project statistics for the life of the project are summarised in the tables below, the content of which is:

Table	Content
1.17.1	Project Results
1.17.2	Production and Revenue
1.17.3	Operating and Capital Costs
1.17.4	Project Cashflows
1.17.5	Debt Finance
1.17.6	Production Summary

Table 1.17.1
Project Results

Item	Unit	Life of Mine
Throughput	Mt/a	8
Project Life	Years	25.0
Gold Price	$/oz	275
Silver Price	$/oz	5.00
Project Economics - Ungeared		
Pretax		
NPV at a discount rate of 5%	$ M	374.3
Internal Rate of Return	%	21.0
Payback Period	years	4.3
After Tax		
NPV at a discount rate of 5%	$ M	331.5
Internal Rate of Return	%	20.1
Payback Period	years	4.3
Operating Cost Statistics (after silver credits)		
Cash Operating Costs/tonne ore treated	$/t ore	4.88
Total Cash Costs/tonne ore treated	$/t ore	5.12
Cash Operating Costs/oz gold	$/oz Au	119
Total Cash Costs/oz gold	$/oz Au	124
Operating Cost Statistics (before silver credits)		
Cash Operating Costs/tonne ore treated	$/t ore	5.55
Total Cash Costs/tonne ore treated	$/t ore	5.79
Cash Operating Costs/oz gold	$/oz Au	135
Total Cash Costs/oz gold	$/oz Au	141

Note: Cash Operating Costs and Total Cash Costs include some reclamation costs, equivalent to approximately $0.52/oz Au.

Table 1.17.2
Production and Revenue

Item		Unit	Life of Mine
Production			
Ore Mined and Processed		Mt	199.7
Waste Mined		Mt	196.4
Strip Ratio			0.98
Head Grades	- Gold	g/t Au	1.56
	- Silver	g/t Ag	7.84
Metallurgical Recoveries	- Gold	%	82.1
	- Silver	%	54.2
Total Gold Production		Mozs	8.23
Total Silver Production		Mozs	27.26
Revenue			
Base Gold Price		$/oz	275
Base Silver Price		$/oz	5.00
Gold Revenue		$ M	2 251.9
Silver Revenue		$ M	135.3
Net Revenue (less treatment and doré transport charges)		$ M	2 368.5

Table 1.17.3
Operating and Capital Costs

Item	Unit	Life of Mine
Unit Operating Costs (excluding silver credits)		
Mining	$/t ore	1.61
Processing	$/t ore	3.27
Administration	$/t ore	0.50
Tailings Management Facility	$/t ore	0.04
Total Unit Operating Costs	**$/t ore**	**5.42**
Total Operating Costs		
Mining	$ M	321.0
Processing	$ M	653.2
Administration	$ M	100.6
Tailings Management Facility	$ M	8.0
Total On Site Operating Costs	**$ M**	**1 082.8**
Capital Costs		
Initial Capital		
Pre-production Mining	$ M	9.4
Mining	$ M	24.0
Process Plant and Infrastructure	$ M	101.2
Tailings Management Facility	$ M	13.1
Village Resettlement	$ M	24.0
Owner's Costs	$ M	20.8
Total Initial Capital	**$ M**	**192.4**
Working Capital - Initial (Quarter 1 Year 1)	$ M	2.0
Sustaining and Deferred Capital		
Mining	$ M	59.1
Process Plant and Infrastructure	$ M	6.9
Tailings Management Facility	$ M	50.8
Village Resettlement	$ M	34.1
Owner's Costs	$ M	2.7
Total Sustaining and Deferred Capital	**$ M**	**153.5**

Table 1.17.4 Project Cashflows		
Item	**Unit**	**Life of Mine**
Total Pretax Cashflow	$ M	890.1
Profits Tax and Romania Fund	$ M	98.3
Total After Tax Cashflow	$ M	791.8

Table 1.17.5 Debt Finance		
Item	**Unit**	**Whole of Life**
Project Economics - Geared		
Pretax		
Geared NPV at a discount rate of 5%	$ M	345.7
Return on Equity	%	25.1
Equity Recovery Period	years	4.3
After Tax		
Geared NPV at a discount rate of 5%	$ M	303.4
Return on Equity	%	23.9
Equity Recovery Period	years	4.3
Project Cashflows – Geared		
Total Pretax Cashflow	$ M	824.3
Profits Tax and Romania Fund	$ M	97.4
Total After Tax Cashflow	$ M	726.8
Finance		
Proportion of Initial Capital Debt Financed	%	65
Initial Equity	$ M	68.0
Loan Principal	$ M	126.4
Interest	$ M	34.5
Debt Service Ratios		
Debt Coverage - minimum		1.7
Project Life Ratio - minimum		3.7
Loan Life Ratio - minimum		1.6
Cashflow Ratio - minimum		0.8
Reserve tail at end loan life		68%

Table 1.17.6
Production Summary – Years –1 to 12

		-1	1	2	3	4	5	6	7	8	9	10	11	12
MINING														
Ore Mined	000 t	444	6 487	7 647	7 748	8 280	8 014	7 859	7 954	7 867	7 804	7 932	8 067	9 299
Waste	000 t	4 614	7 127	6 789	8 252	7 720	7 619	7 962	8 046	8 133	8 822	8 452	7 869	6 382
Strip Ratio		10.40	1.10	0.89	1.07	0.93	0.95	1.01	1.01	1.03	1.13	1.07	0.98	0.69
TREATMENT														
Mill Feed Quantity	000 t		6 930	7 647	7 748	8 280	8 014	7 859	7 954	7 867	7 804	7 932	8 067	9 299
Head Grades														
Gold	g/t Au		1.87	1.66	1.65	1.78	2.22	1.76	1.60	1.71	1.52	1.64	1.73	1.36
Silver	g/t Ag		10.37	12.80	15.55	11.81	13.78	8.68	6.46	8.36	10.07	8.14	11.56	4.37
Metallurgical Recoveries														
Gold	%		83.1%	82.3%	81.4%	83.6%	83.1%	80.4%	81.1%	83.3%	81.7%	83.2%	84.2%	83.6%
Silver	%		48.6%	52.0%	60.5%	51.3%	62.4%	49.6%	52.3%	52.7%	52.8%	53.2%	52.7%	63.6%
METAL PRODUCTION														
Gold	ozs		345 740	336 676	335 506	396 681	476 191	358 619	331 351	361 146	311 432	348 759	377 564	340 391
Silver	ozs		1 122 506	1 636 429	2 343 209	1 613 881	2 214 622	1 087 471	864 700	1 114 410	1 334 077	1 105 370	1 579 973	830 693
OPERATING COST STATISTICS (after silver credits)														
Cash Operating Costs	US$/oz Au		123	119	104	98	73	116	126	110	123	111	97	114
Total Cash Costs	US$/oz Au		128	125	111	103	79	122	132	116	129	117	103	120

Note: Cash Operating Costs and Total Cash Costs include some reclamation costs, equivalent to approximately $0.52/oz Au.

Table 1.17.6 (cont)
Production Summary – Years 13 to 25

		13	14	15	16	17	18	19	20	21	22	23	24	25	**Life of Mine**
MINING															
Ore Mined	000 t	8 134	8 172	7 818	8 121	7 897	7 929	8 287	8 139	7 686	8 822	8 553	6 397	8 344	**199 699**
Waste	000 t	8 590	7 828	8 087	7 237	7 834	7 856	7 687	8 307	7 793	7 414	7 190	9 457	3 297	**196 363**
Strip Ratio		1.06	0.96	1.03	0.89	0.99	0.99	0.93	1.02	1.01	0.84	0.84	1.48	0.40	**0.98**
TREATMENT															
Mill Feed Quantity	000 t	8 134	8 172	7 818	8 121	7 897	7 929	8 287	8 139	7 686	8 822	8 553	6 397	8 344	**199 699**
Head Grades															
Gold	g/t Au	1.47	1.31	1.50	1.39	1.48	1.56	1.44	1.56	1.56	1.15	1.44	1.24	1.47	**1.56**
Silver	g/t Ag	9.14	8.23	8.53	7.51	9.10	6.83	5.43	4.70	4.33	3.75	3.28	2.61	1.79	**7.84**
Metallurgical Recoveries															
Gold	%	81.9%	79.6%	81.8%	79.6%	81.3%	81.3%	78.8%	80.2%	81.2%	83.9%	84.5%	82.2%	84.9%	**82.1%**
Silver	%	53.6%	53.2%	52.7%	52.0%	51.6%	52.1%	51.4%	50.9%	51.4%	61.1%	58.2%	63.2%	62.5%	**54.2%**
METAL PRODUCTION															
Gold	ozs	315 751	274 257	307 687	289 930	304 868	322 432	301 949	327 428	312 591	273 578	333 980	210 369	334 157	**8 229 033**
Silver	ozs	1 280 700	1 150 253	1 128 930	1 019 800	1 193 198	906 619	744 227	626 387	549 567	649 096	525 133	338 941	300 808	**27 261 000**
OPERATING COST STATISTICS (after silver credits)															
Cash Operating Costs	US$/oz Au	119	140	126	137	127	125	138	131	135	148	123	158	103	**119**
Total Cash Costs	US$/oz Au	125	146	132	142	133	131	143	137	140	153	128	163	108	**124**

Note: Cash Operating Costs and Total Cash Costs include some reclamation costs, equivalent to approximately $0.52/oz Au.

1.17.4 Sensitivity Analysis

a) Parameters Selected

Sensitivity analysis has been conducted to assess the effects of changes in key parameters upon the IRR, NPV and the period required for payback of the initial capital.

The analysis encompasses the following range of variation in key inputs:

Gold Price: *$215 per ounce to $335 per ounce in $30 increments.*

Silver Price: *$4.00 per ounce to $6.00 per ounce in $0.50 increments.*

Operating costs: *Variations of ±10% and ±20% in total operating costs.*

Capital Costs: *Variations of ±10% and ±20% in total capital costs, including sustaining and deferred capital throughout the life of the project.*

Escalation of Costs: *US$ escalation of 1.5% to 3.0% per annum in 0.5% increments for both capital and operating costs together.*

Proportion Debt Finance: *Variations in the proportion of debt finance established for the project from 50% to 90%;*

Tax Rate on Profit returned to Romania: *Variations in the tax rate on Profit returned to Romania, from the base rate of 5% to the full tax rate of 25% in 5% increments.*

Corporate Profits Tax Rate: *Variations in the Corporate Profits Tax rate after 2009, from 25% to 45% in 5% increments.*

No Indexation for Depreciation: *Effects of indexation not being available for depreciation purposes, considering ROL inflation rates of 0% to 30% in 10% increments.*

Working Capital: *Delays in construction and ramp-up to full throughput.*

Exchange Rates: *Combinations of 10% depreciation in each of the Euro and Australian dollar (A$), to 20% appreciation in the value of the Euro and 30% appreciation in the value of the A$.*

In assessing the sensitivity of the project returns, each of these parameters is varied independently of the others. Combined beneficial or adverse variations in any of these parameters will have a more marked effect on the economics of the project than the individual variations considered.

b) Relative Metal Price/Operating Cost/Capital Cost Sensitivity

As illustrated by Tables 1.17.7 and 1.17.8 and Figures 1.17.1 and 1.17.2, the Project is more sensitive to changes in gold price than it is to the same percentage changes in operating and capital costs.

The Project is essentially equally sensitive to the same percentage change in operating and capital costs, with the IRR a little more sensitive to capital costs and the NPV a little more sensitive to operating costs. The effects of changes in silver price upon the returns of the Project are nominal only.

c) Gearing

Gearing has the potential to significantly increase returns on equity. Based on some 65% of initial equity being financed by debt, the Project may be anticipated to yield, after tax:

- Return on Equity (ROE): 23.9%;
- Net Present Value (NPV): $303 million at a discount rate of 5%;
- Equity Recovery Period: 4.3 years after commencement of production.

The initial equity required would be approximately $68 million, with $126 million provided by debt. Under these conditions, and without optimisation to match repayments each year to available cashflows, the minimum of each of the following banking ratios for the Project would be:

- Debt Service Coverage: 1.7
- Project Life Ratio: 3.7
- Loan Life Ratio: 1.6
- Cashflow Ratio: 0.8
- Reserve Tail at end of loan: 68%

Table 1.17.7
Sensitivity Analysis –After Tax

PARAMETER/ VARIATION	VALUE	IRR (%)	NPV at 5% ($ M)	Payback Period
Gold Price	**Average Spot Gold Price ($/oz)**			
-22%	215	10.8	112.1	7.0
-11%	245	15.7	221.8	4.9
0%	275	20.1	331.5	4.3
11%	305	24.2	441.1	3.8
22%	335	28.1	550.8	3.4
Silver Price	**Average Spot Silver Price ($/oz)**			
-20%	4.00	19.5	318.1	4.4
-10%	4.50	19.8	324.8	4.4
0%	5.00	20.1	331.5	4.3
10%	5.50	20.3	338.1	4.3
20%	6.00	20.6	344.8	4.2
Operating Costs	**Overall Total Cash Costs per oz Au (with Ag credits)**			
-20%	$100	23.5	421.4	3.9
-10%	$112	21.8	376.4	4.1
0%	$124	20.1	331.5	4.3
10%	$136	18.3	286.5	4.5
20%	$148	16.4	241.5	4.8
Capital Costs	**Initial Capital $ M**			
-20%	156	25.5	379.6	3.7
-10%	175	22.5	355.5	4.0
0%	194	20.1	331.5	4.3
10%	214	18.0	307.4	4.6
20%	233	16.2	283.3	4.9

Table 1.17.7 (cont)
Sensitivity Analysis – After tax

PARAMETER/ VARIATION	VALUE	IRR (%)	NPV at 5% ($ M)	Payback Period
Escalation of operating and capital costs	**Escalation % pa**			
	0.0	20.1	331.5	4.3
	1.5	16.6	216.0	4.6
	2.0	15.2	171.2	4.7
	2.5	13.5	121.9	4.9
	3.0	11.1	66.2	5.0
Proportion of Debt Finance	**Debt Finance %**			
	50.0	22.3	310.5	4.3
	60.0	23.2	305.6	4.3
	70.0	24.5	300.6	4.3
	80.0	26.3	295.0	4.4
	90.0	28.6	288.7	4.4
Tax Rate on Revenue returned to Romania	**Tax Rate %**			
	5.0	20.1	331.5	4.3
	10.0	19.9	322.2	4.3
	15.0	19.6	312.9	4.3
	20.0	19.4	303.7	4.3
	25.0	19.2	294.4	4.3
Corporate Profits Tax Rate after 2009	**Tax Rate %**			
	25.0	19.2	294.4	4.3
	30.0	18.9	279.0	4.3
	35.0	18.5	263.6	4.3
	40.0	18.1	248.2	4.3
	45.0	17.7	232.7	4.3
Effect of Non Indexing for Depreciation	**ROL Inflation Rate %**			
	0.0	20.1	331.5	4.3
	10.0	19.9	324.6	4.3
	20.0	19.9	322.2	4.3
	30.0	19.8	321.0	4.3

Table 1.17.8
Sensitivity to Exchange Rate Changes

UNGEARED AFTER TAX NPV AT A DISCOUNT RATE OF 5%

				Exchange Rate Euro/US$			
	After Tax NPV @ 5% US$M			Base -10%	Base	Base +10%	Base +20%
				0.818	0.900	1.000	1.125
				1.22	1.1111	1.00	0.89
Exchange	Base - 10%	0.440	2.2737	338	333	328	321
Rate	Base	0.484	2.0670	336	331	326	319
	Base + 10%	0.538	1.8603	334	329	324	317
A$/US$	Base + 20%	0.605	1.6536	331	327	321	314
	Base +30%	0.691	1.4469	328	323	318	311

AFTER TAX IRR

				Exchange Rate Euro/US$			
	After Tax IRR %			Base -10%	Base	Base +10%	Base +20%
				0.818	0.900	1.000	1.125
				1.22	1.1111	1.00	0.89
Exchange	Base - 10%	0.440	2.2737	20.4	20.2	20.0	19.7
Rate	Base	0.484	2.0670	20.2	20.1	19.8	19.6
	Base + 10%	0.538	1.8603	20.0	19.8	19.6	19.3
A$/US$	Base + 20%	0.605	1.6536	19.7	19.5	19.3	19.0
	Base +30%	0.691	1.4469	19.4	19.2	19.0	18.7

Table 1.17.8 (cont)
Sensitivity to Exchange Rate Changes

INITIAL CAPITAL

				Exchange Rate Euro/US$			
	Initial Capital US$M			Base -10%	Base	Base +10%	Base +20%
				0.818	0.900	1.000	1.125
				1.22	1.1111	1.00	0.89
Exchange Rate A$/US$	Base - 10%	0.440	2.2737	190	190	191	191
	Base	0.484	2.0670	192	192	193	193
	Base + 10%	0.538	1.8603	194	195	195	196
	Base + 20%	0.605	1.6536	197	198	198	199
	Base +30%	0.691	1.4469	201	201	202	202

CASH OPERATING COSTS (After silver credits)

				Exchange Rate Euro/US$			
	Cash Operating Costs US$/ounce Au			Base -10%	Base	Base +10%	Base +20%
				0.818	0.900	1.000	1.125
				1.22	1.1111	1.00	0.89
Exchange Rate A$/US$	Base - 10%	0.440	2.2737	118	119	120	121
	Base	0.484	2.0670	118	119	120	121
	Base + 10%	0.538	1.8603	118	119	120	121
	Base + 20%	0.605	1.6536	118	119	120	121
	Base +30%	0.691	1.4469	118	119	120	121

Figure 1.17.1
After Tax Internal Rate of Return

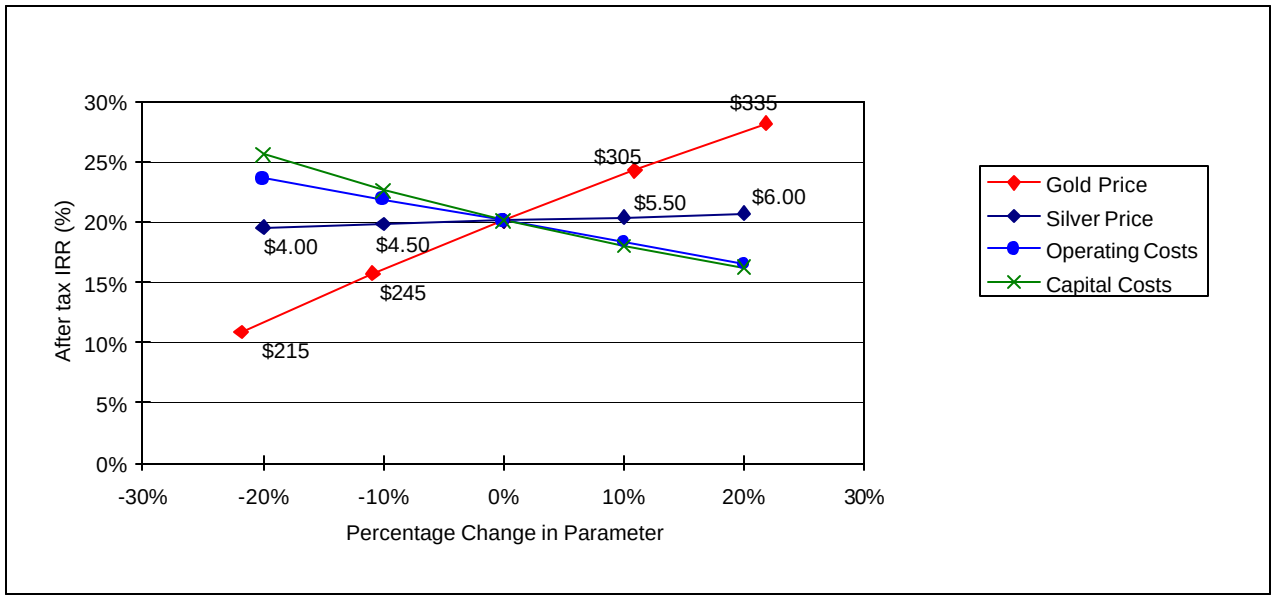
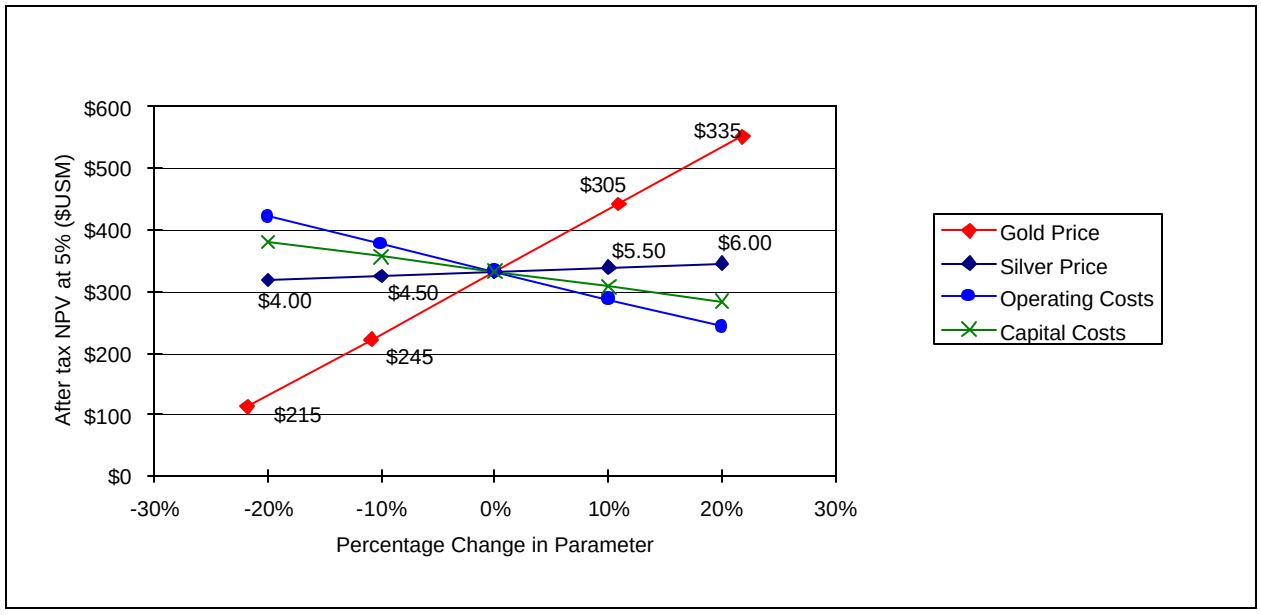


Figure 1.17.2

After Tax Net Present Value



1.18 RISK ASSESSMENT

1.18.1 Introduction

As part of the Study for the Rosia Montana Project, a risk assessment was conducted to identify risks, assess the impact of them upon the Project and identify actions that could be taken to mitigate the higher-level risks. As a result of the assessment, and where appropriate, action has been taken to mitigate risks as part of the Study. Other treatment actions are best implemented in further stages of development of the Project.

The risk assessment approach was workshop-based, utilising expertise from all of the expert contributors to the Project. A workshop was held in Perth on 3 April 2001. Contributors from RMGC, Minproc and RSG attended the workshop, while other contributors including personnel from RMGC in Romania, Knight Piésold in London and Vancouver, Price Waterhouse Coopers in Romania, and Planning Alliance in Toronto, participated remotely in the process. Normet LM Pty Ltd (Normet), in conjunction with Minproc, facilitated the workshop and coordinated the outcomes and reporting.

The review provided a high level assessment on the full spectrum of risks faced by the Project including internal and external factors. The approach taken to the review was consistent with the recommendations contained in the Australian Standard for Risk Management, AS/NZS 4360:1999, with the objectives being to:

- identify and assess project risks in a systematic manner;
- integrate and improve risk control;
- analyse business activities in a consistent manner, and
- develop pragmatic risk mitigation and improvement programmes.

It should be noted that risk, by definition, is a function of the likelihood of an event occurring and the consequence if the event does occur. Neither likelihood nor consequence can stand alone in assessing risk.

1.18.2 Risk Analysis and Evaluation (Risk Assessment)

Following risk identification, semi-quantitative risk analysis was conducted on each risk using descriptors of likelihood and consequence prepared prior to the workshop. These descriptors are given in Table 1.18.1 and Table 1.18.2. “Project Development” risks are those that impact on the Project from the outset, while “Operational” risks are risks that occur on a recurring basis through the operational phase.

Table 1.18.1
Risk Likelihood Ratings

Rating		Project Development	Operational
A	Almost certain	At least once per project	Within 12 months
B	Likely	Up to once per project	Once every 2 years
C	Possible	Less than once in five projects	Once every 5 years
D	Unlikely	Less then once in ten projects	Once every 10 years
E	Rare	Less then once in 30 projects	Once every 20 years

Table 1.18.2
Risk Consequence Ratings

Rating	Management Effort	$ Loss
1 Insignificant	An event, the impact of which can be absorbed through normal activity	<$0.5 M
2 Minor	An event, the consequences of which can be absorbed but management effort is required to minimise the impact	$0.5 M - $3 M
3 Moderate	A significant event that can be managed under normal circumstances	$3 M - $10 M
4 Major	A critical event that with proper management can be endured	$10 M - $30 M
5 Catastrophic	A disaster with potential to lead to the collapse of the business	>$30 M

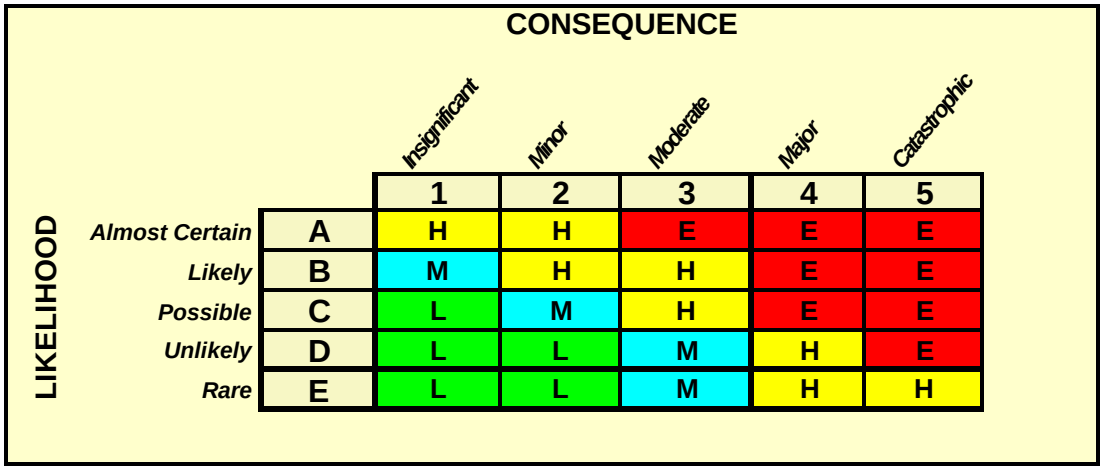
Risks were analysed given the controls that were already in place to control or manage the risk.

Consequence was rated as expected consequence for a given risk event.

Likelihood was rated as the likelihood of an event occurring.

The matrix as shown in Figure 1.18.1 was used to rank each risk as extreme, high, moderate or low using the given descriptors of likelihood and consequence.

Figure 1.18.1
Risk Ranking Matrix



1.18.3 Key Outcomes

Out of a total of 66 business risks identified, 2 rated as extreme and 20 as high.

Risks categorised as extreme and high resulting from the assessment are given in Table 1.18.3.

Table 1.18.3
Extreme and High Risk Summary

Item #	Risk Issue	Broad Risk Category	L/hood	Conseq	Risk Rating
1.1	Working Capital Under Estimated	Economic	**B**	**4**	**E**
8.5	Failure of Negotiations causing Resettlement Delays	Community Relations	**B**	**4**	**E**
1.2	Capital Costs Under Estimated	Economic	**C**	**3**	**H**
1.3	Capital Cost of Tailings Systems Under Estimated	Economic	**B**	**3**	**H**
1.7	Devaluation of ROL	Economic	**B**	**2**	**H**
2.1	Change to Romanian Tax Legislation	Commercial and Legal	**B**	**2**	**H**
2.5	Change to Social Charges and Turnover Tax Regime	Commercial and Legal	**B**	**2**	**H**
3.4	Mining Equipment Productivity not Achieved	Technical - Resource and Mining	**C**	**3**	**H**
5.3	Local Constructors and Contractors Poorly Managed	Construction and Logistics	**C**	**3**	**H**
6.2	Plant Ramp-up not to Plan	Operations	**C**	**3**	**H**
6.3	Supply of Consumables Unreliable	Operations	**A**	**1**	**H**
7.1	Tailings Embankment Failure - Unforeseen Geotechnical Factors	Environmental	**E**	**5**	**H**
7.3	Tailings Embankment Earthquake Max Design Exceeded	Environmental	**E**	**5**	**H**
7.5	Tailings Embankment Topped -Inflow Flood	Environmental	**E**	**5**	**H**
7.6	Major Environmental Incident	Environmental	**D**	**4**	**H**
8.1	Delays in Village Relocation	Community Relations	**B**	**3**	**H**
9.1	Environmental Permitting Delay/Refusal	Political	**B**	**3**	**H**
9.2	Delays in Permits from Government	Political	**B**	**3**	**H**
9.2a	Delay in Obtaining PUG for Abrud Borough	Political	**C**	**3**	**H**
9.3	Change in Project Design - Environmental Permitting Reasons	Political	**B**	**3**	**H**
9.5	Historical and Cultural Requirements	Political	**B**	**3**	**H**
9.6	Land Ownership not Settled	Political	**C**	**3**	**H**

The risk of avian kills as a result of cyanide concentration in the tailings pond being higher than threshold levels is considered to be low, because a cyanide destruction circuit has been included in the process plant to reduce cyanide concentration to less than 50 ppm WAD, and to 1 ppm WAD if required.

It should be noted that risks with catastrophic consequence are ranked as “high”, even although their likelihood may be rare. Examples of these are tailings and environmental risks. Although it is extremely unlikely that these events will occur, the risk ranking as high alerts

management to the need to continually monitor and review these risks. Any change leading to an increase in the likelihood of that event can then be identified and steps taken to prevent the event occurring.

Treatment strategies and actions have been determined for risks ranked as extreme and high. Treatment actions have been incorporated into the Study wherever appropriate, and action plans have been proposed for other risks to be addressed during the next stages of project development.

Risk analysis was conducted on quantifiable risks rated as extreme and high by the semi-quantitative assessment process. Those extreme and high risks not subjected to quantitative assessment were not assessed either because their consequences were not considered to be practically capable of quantification (e.g. consequences of TMF failure) or because they were closely related to other risks which were subjected to assessment.

Quantitative analysis provides a means of measuring risk through loss expectancy in dollar terms, and then reducing loss through design and implementation of cost-effective treatment plans. The process involves:

- estimating the probability of occurrence of the risk;
- determining expected consequences of the risk event;
- estimating consequence cost;
- calculating loss expectancy as probability x consequence;
- determining an action plan to treat the risk;
- estimating the cost of the proposed action plan, and
- checking that the proposed treatment cost is less than the loss expectancy.

A summary of the outcomes of the fully-quantitative work is given in Table 1.18.4.

Table 1.18.4
Quantitative Risk Analysis Summary

Risk #	Risk Issue	Probability	Consequence ($ M)	Loss Expectancy ($ M)	Treatment Action ($ M)
1.1	Working Capital Under Estimated*	1 in 6	22.8	3.8	2.3
8.5	Failure of Resettlement Negotiations Causing Delays	1 in 2	24.0	12.0	3.7
1.2	Project Capital Costs Under Estimated	1 in 2.5	18.5	7.4	5.2
1.3	Capital Cost Tailings Systems Under-estimated	1 in 2	3.5	1.7	0.35
3.4	Mining Equipment Productivity not Achieved+	1 in 5	5.8	1.2	0.0
5.3	Local Constructors and Contractors Poorly Managed	1 in 5	11.2	2.2	0.4
6.2	Plant Ramp-up not to Plan	1 in 10	11.6	1.2	0.5
6.4	Supply of Consumables Unreliable	1 in 2	1.1	0.6	0.5
7.6	Major Environmental Incident**	1 in 5	0.6	0.12	0.3

Symbols:

* Actual cashflow requirement would be $4.3 M, as loss expectancy takes into account delayed NPV to end of Project.

\+ Treatment actions are included in the Study.

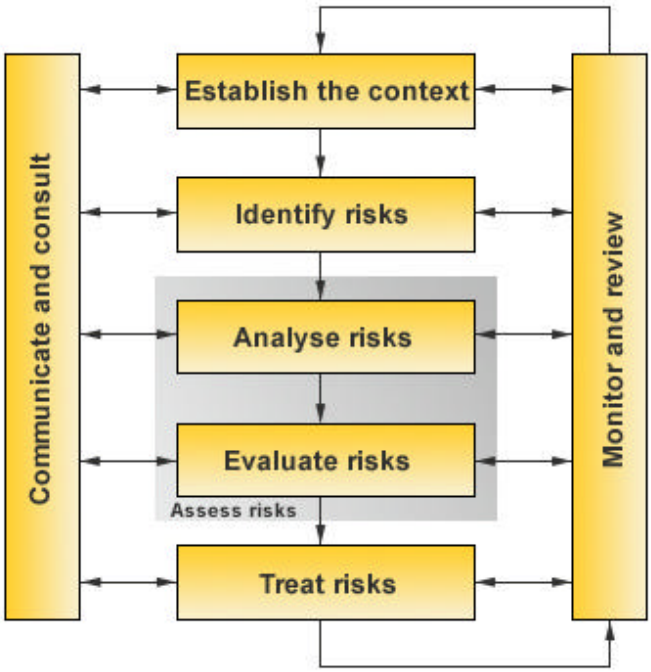
** Loss expectancy is annual. Treatment cost is one-off.

The remaining 44 risks, rated as moderate or low, were not further evaluated for risk action at this stage. However, these risks need to be monitored to ensure that their likelihood or consequence ratings do not creep, pushing the risks into a high risk category. Further assessment of these risks, including quantitative assessment and identification of cost effective treatment strategies, is appropriate for the next stage of project development beyond the Study.

1.18.4 Risk Framework and Methodology

The framework for risk assessment is based on the Australian Standard for Risk Management, AS4360:1999 and is given in Figure 1.18.2.

Figure 1.18.2
AS 4360:1999 – Risk Assessment Framework



The following methodology describes the steps involved in fulfilling each stage of the risk management process for the Project.

a) Stage 1 – Establish the Context

The context was an assessment of the business risks associated with the development of the Rosia Montana Project in Romania, and to incorporate actions where appropriate into the Study. During the risk assessment, risk treatment actions that could be incorporated into the Study were identified, together with other actions that would be more appropriately managed during further stages of project development.

As part of establishing the context:

- objectives for the exercise were set;
- likelihood and consequence descriptors were established in line with the Project and its objectives, and
- risk criteria against which to evaluate risks were set.

The risk assessment was to be reported as part of the Study.

b) Stage 2 – Risk Identification

Prior to the workshop, participants were asked to complete pro-forma risk forms for each risk identified in their respective areas of expertise, describing:

- risk issue;
- issue explanation (a reasonably detailed explanation of the issue);
- contributing factors (causes);
- consequences, and
- existing control effectiveness (control strengths and control weaknesses).

These risk issues were compiled and collated prior to the workshop. Risks were categorised as shown in Table 1.18.5.

Table 1.18.5
Risk Categories

Risk Category	Examples
Economic	Commodity Prices and Markets Inflation Energy Prices Interest Rates
Commercial and Legal	Debt Funding and Cost of Funds Taxation Exchange Rates Licence Agreements Off-take Agreements Stock Exchange Requirements Legal Regime
Technical – Resource and Mining	Resource Model Resource Distribution Mining Method Ore Characteristics Mining Expertise Geotechnics Statistical Analysis Historical Data Maintenance
Technical – Ore Treatment	Process Selection Ore Variability Metallurgical Behaviour Equipment Selection Tailings and Waste Disposal Water Supply

Table 1.18.5 (cont)
Risk Categories

Risk Category	Examples
Construction and Logistics	Access to Site Contractor Capability Construction Cost and Productivity Materials Availability Suppliers Geotechnical Conditions Design Expertise Industrial Relations Natural Events Hydrology
Operations	Power Supply Access to Site Workforce Capability Management Capability Industrial Relations Security Utilities and Services Integration with Existing Operations Natural Events
Environmental	Waste discharge Noise Dust Contamination
Community Relations	Employment Cultural Services Impact Village Relocation
Political	Permits and Approvals Repatriation Import/Export Local Content Stability